MOTRON

SERVICE MANUAL

X-NORD 125 (TOURING)

Contents

Chapter 1 Overview

Section 1 Overview of Complete Motorcycle

X-Nord motorcycles are a model applicable to run on highways developed by the Company. The model is novel in appearance design and easy to operate. It applies a four-stroke ari-cooled engine with a single cylinder, which renders an excellent cooling effect, strong power and good acceleration performance and other advantages. The model has a tube-welded main frame, giving high strength and rigidity. The brake system is configured with front and rear disc brakes, which enable stable, safe and reliable braking. Nice and durable, wheels are made of aluminum alloy.

Figure 1-1 LHS Elevation of Complete Motorcycle

[1] Front fender
[2] Front damper
[3] Steering mechanism
[4] Fuel tank
[5] Rear handrest
[6] Front wheel
[7] Front disc brake
[8] Gear shift pedal
[9] Side stand
[10] Rear wheel

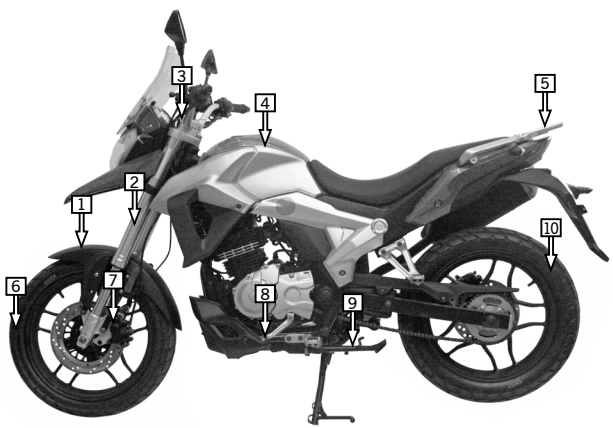


Figure 1-2 RHS Elevation of Complete Motorcycle

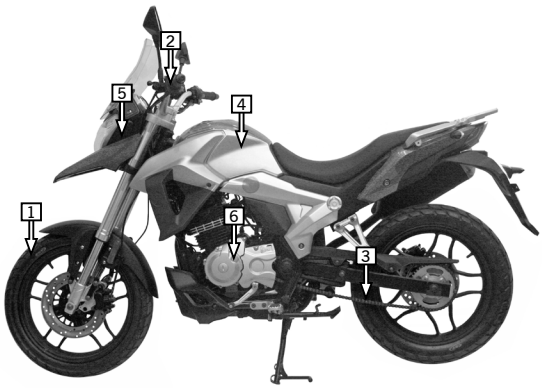
[1] Tail lamp assembly
[2] Silencer
[3] Seat cushion
[4] Ignition lock
[5] Headlamp
[6] Rear disc brake
[7] Rear pedal
[8] Front pedal
[9] Rear brake pedal

Section 2 General Construction

The motorcycle is mainly composed of running system, steering and braking system, transmission system, oil supply system, electrical system and engine, and other portions, as shown in Figure 1-3.

Figure 1-3 General Construction Chart of a Complete Motorcycle

[1] Running system
[2] Steering and braking system
[3] Transmission system
[4] Oil supply system
[5] Electrical system
[6] Engine



1. Running System

Basic functions of the running system include:

[1.]To make the motorcycle as a whole, and support the whole mass;

[2.]To accept the output torque from driveline, and to produce the traction to drive the motorcycle through the adhesive action between drive wheels and road surface;

[3.]To bear and pass various external forces and the resulting torque effected by road surface on wheels;

[4.]To absorb or mitigate the impact and vibration of the running motorcycle. The running system mainly consists of main frame assembly, front and rear dampers and front and rear wheels and other accessories.

2. Steering and braking system

The steering and braking system mainly functions to exert direct control on running direction, driving running speed, braking, lighting and signals, etc., to ensure the safe driving of the motorcycle.

The steering and braking system consists mainly of steering devices, brake devices, and accessories such as operating handle, control switch and mechanic’ s wire connected to some devices.

3. Transmission System

Based on road conditions and driving needs, the transmission system transmits the torque increased or rotated speed reduced by a certain ratio to drive wheels, so as to drive the motorcycle.

The transmission system consists mainly of a starter, clutch, gearshift and rear transmission device and other accessories.

[1.]Starter

A motorcycle start device activates the motionless engine and enables it in operation. Motorcycle start devices can be divided into treadle-type starter and electric starter.

[2.]Clutch

The clutch ensures reliable, gentle transmission or cut-off of output power from the engine, thus the motorcycle can start running and shift gears in a balanced way. The clutch ensures reliable, gentle transmission or cut-off of output power from the engine, thus the motorcycle can start running and shift gears in a balanced way. The model adopts an automatic wet-type multi-plate clutch.

[3.]Gearshift

The gearshift changes the rotate speed and drive torque of the motorcycle transmission system and ensures that the motorcycle has the appropriate traction and speed so as to adapt to regularly changing driving conditions.

[4.]Rear Transmission Device

The rear transmission device transmits the power from the engine to rear whey further reducing the rotate speed and increasing the torque, so as to drive the motorcycle. The rear transmission device of this model adopts a chain drive.

4. Oil Supply System

The oil supply system regularly and quantitatively feeds a mixed gas prepared with clean gasoline and air in proper proportion, according to different working conditions of the engine, into the combustion chamber for combustion. The oil supply system mainly includes a fuel tank, fuel pump, fuel injector, fuel filter and oil tube.

5. Electrical System

The electrical system provides electric energy to start and run the vehicle and emits a variety of acoustic-optical signals to ensure safe and reliable driving. The electrical system generally includes a power supply portion, an electricity consumption portion and a control portion.

[1.]Power Supply Portion

The power supply portion consists mainly of a generator (magneto) and a storage battery and other components. When the engine drives the generator to reach a certain rotate speed, the generator outputs electric energy. In addition that it supplies to electricity consumption equipment, it also charges the storage battery. And the storage battery converts the stored chemical energy into electrical energy for consumption by start devices, lamps and signal equipment.

[2.]Electricity Consumption Portion

The electricity consumption portion provides a variety of acoustic-optical signals to guarantee traffic safety, while it also easily and rapidly starts the engine. The electricity consumption portion mainly includes lamps, a signaler, and a electric starter.

[3.]Control Portion

The control portion guarantees and coordinates the normal operation of the power supply portion and the electricity consumption portion. The control portion is mainly composed of a regulator, a rectifier, a starting relay, a fuse protector (protective tube), a control switch and a main wire harness.

6. Engine

As the power source of the motorcycle, the engine is a power unit that makes the fuel burn in the cylinder and converts the heat energy into mechanical energy. The overall structure of the engine consists of a cylinder head, cylinder block, crankcase, piston group, crankshaft connecting rod group, valve train, lubrication system, ignition system, cooling system and so on.

Chapter 2 Knowledge about Maintenance

Section 1 Cautions

Subject to a breakdown, the motorcycle should be sent to an after-sales service station of the Company or a professional motorcycle repair point. Besides, this Service Manual can be referred to for maintenance. As the process of driving may cause components to be loosened and abraded to different degrees, without proper maintenance, the motorcycle may be subject to decrease in power performance, economical efficiency, reliability and security and also a shortened life. Therefore, proper maintenance can eliminate breakdowns in a timely manner, extend the service life of motorcycle and reduce maintenance costs, for purpose of driving safety.

[1.]For the maintenance of the motorcycle, please use original parts, accessories, lubricants and other auxiliary materials manufactured or recommended by the Company. Use of parts that are not recognized or recommended by the Company will affect the power performance, reliability, stability and comfort of the motorcycle, and may further damage it.

[2.]For a reassembly after a disassembly, it is necessary to install a new washer, a sealing member and a cotter pin, if applicable.

[3.]Bolts or nuts should be fastened in an order of diagonal cross, and gradually tightened 2 to 3 times to reach a standard torque value as required.

[4.]To clean parts, the use of flammable cleaning solution is not allowed. Before assembly, the surface of parts shall be wiped with lubricating oil or grease.

[5.]After assembly, check whether the parts are installed correctly by way of rotation, move, operation, inspection, etc.

[6.]The dismantling of the motorcycle shall adopt special maintenance tools and commonly used maintenance tools as provided.

[7.]The motorcycle shouldn’ t be repaired until the flameout. In the case of maintenance with the engine in operation, it must be conducted in a well ventilated site, as the waste gas exhausted from the motorcycle contains toxic carbon monoxides (CO).

[8.]As gasoline is flammable and explosive, it is prohibited to smoke, ignite or shoot off fireworks in the maintenance site.

[9.]The battery electrolyte contains sulfuric acid. Eyes, skins, and clothes, etc. accidentally splashed with electrolyte can be rinsed by clean water thoroughly. In a severe case, please immediately seek medical advice.

[10.]The storage battery will release hydrogen, which is flammable and explosive, so it is prohibited to smoke, ignite or shoot off fireworks in the vicinity of the storage battery, especially when it is being charged.

Section 2 Common Sense of Maintenance

1. Maintenance Classification

According to the broadness of working range and the length of interval time, maintenance work can be divided into overhaul (heavy repair), medium repair, minor repair and unit repair.

[1.]An overhaul is a thorough comprehensive repair towards the motorcycle, requiring a complete disassembly, cleaning, inspection, repair or replacement of parts, and assembly and debugging. An overhaul restores the original performance indicators such as motorcycle power performance, economical efficiency, reliability and security.

[2.]A medium repair is to mend and adjust the position that affects the usability. A medium repair can eliminate hidden dangers, to avoid the development of a failure and to maintain a good operating state.

[3.]A minor repair is maintenance of maneuverability, mainly to eliminate temporary faults and local damages in the operation process.

[4.]A unit repair is adopted to take a separate repair to an assembly due to the damage, abrasion, deformation, etc. of a certain assembly or a component that affects the usability of the complete motorcycle

2. Repair Process

1)Decomposing the Motorcycle

A decomposition can also be called a disintegration or a disassembly. It is an important link of repair operations. The correctness of the decomposition method directly affects the quality and efficiency of repair operations. An improper decomposition may cause parts to be damaged or stuck. It not only expands the range of repair operations, but also delays the repair period, or even causes a pause to the decomposition. The basic principle of a decomposition: to disassemble parts in an order and direction inverse to the assembly, that is, firstly to disassemble those parts that have been assembled latter and then those parts assembled earlier. In general, it can be conducted in the order from outside to inside, from upside to downside, and from big to small. In particular, pay Caution to parts storage environment and ordering to prevent from damages or confusion.

Decomposition order and method is not absolute. According to different models, decomposition procedures and methods can be different. Refer to the subsequent methods given in respect of demolition, installation and maintenance.

The engine assembly and other part assemblies are decomposed by the basic principles same to the decomposition of a complete motorcycle. Due to differences of different part assemblies in structural style and characteristics, the decomposition procedures and methods are also different. Meanwhile, as a part assembly is decomposed into scattered parts, so it requires more in respect of storage environment and ordering.

The following points should be noted in regard to the decomposition of a complete motorcycle and its part assemblies:

[1.]For a part that expects much in locational fit, fit marks should be checked when the part is being disassembled. If marks are not clear, it should be re-marked.

[2.]A part with a interference fit should be disassembled by use of special tools. Without special tools, you can first cushion the part with a wooden or soft metal ware, and then ram it in the right direction and position with a rubber hammer in the way that prevents the part from damages.

[3.]Front and rear dampers and wheels and other assemblies shall be decomposed when the main frame is firmly supported, so as to prevent the main frame and parts from being overturned and damaged.

[4.]Decomposed parts should be placed in order of demolition. Painted parts, chromium-plated parts and high-precision parts should not be directly put on the ground.

[5.]Removed nuts and bolts should be carefully stored, or be equipped to original positions without being tightened.

[6.]Parts necessary to be removed by use of special tools should be carefully operated. Note the force evenly exerted and proper direction.

[7.]Parts and components should be decomposed by use of proper tools and attaching importance to the size and direction of force, so as to avoid damages to parts.

[8.]Removed brake shoes should be placed separately, and are strictly prohibited to contact with lubricating oil, otherwise it will lead to a brake failure.

[9.]In case of any difficulty in decomposition due to the corrosion of screw elements, soaking the parts

in gasoline for a few minutes can make the decomposition easier.

[10.]Washers and gaskets shall be decomposed meticulously in ways to prevent from damages.

2)Cleaning the Parts

Parts having been removed are mostly stained with greasy dirt or carbon deposits. Cleaning such parts favors the maintenance and fitting. Gasoline, kerosene and cleaning fluid are optional. The cleaning method is determined according to the characteristics of the part to be cleaned.

[1.]Cleaning greasy dirt

Metal parts can be cleaned by way of cold wash and hot wash. Put the parts are in gasoline or kerosene as the cleaning agent and scrub with a brush. This is called the cold wash method. In respect of hot wash method, put parts in alkaline solution as a cleaning agent, heat it to 79℃ ~ 90℃, and then soak for 10min ~ 15min. After that, take out the parts and rinse.

Nonmetal parts should be cleaned in different methods based on the different materials. Rubber parts should be cleaned by use of alcohol, and it is strictly prohibited to use kerosene or gasoline, lest the rubber would swell and go bad. However, the clutch and brake shoes shall be scrubbed with gasoline, instead of alkaline solution.

[2.]Removing carbon deposits

Carbon deposits on machine elements can be removed in the mechanical method or chemical method. As for the mechanical method, a bamboo scraper or blade is first applied to remove carbon deposits, and then purify the element with gasoline; as to the chemical method, a hairbrush is used to remove carbon deposits after the element has been soaked in a cleaning solution and finally wash it with hot water.

3)Detecting the Parts

Cleaned parts should be rendered for appropriate detection operations. The purpose of detection is to determine whether a part needs to be repaired or discarded. Parts detection methods include direct inspection, measurement and probing.

[1.]Direct inspection

Instruments and other tools are not necessary in a direct inspection, which relies solely on the human sensory organs to test and determine the technical status of parts. Simple and easy to practice, this method is widely used in maintenance.

[2.]Measurement

The measurement method is to measure dimensions and geometrical shapes of parts with gauges and instruments and compare the obtained data with the allowable limits to determine the technical condition of parts. By this method, results are highly accurate, but the precision of measuring instruments and tools must be carefully checked before the detection, and components to be measured should be reasonably chosen.

[3.]Probing

Concealed defects on parts can be detection by way of probing. The simplest immersion-based hammering method is generally applied in the maintenance. In this method, a part to be detected is firstly immersed into kerosene or diesel for a few minutes. Take it out and dry the surface. Spread talcum powder evenly on the surface of the part, and then tap gently the part on a non-working surface with a small hammer. As the hammering will cause a vibration of the part, if the part has a crack, the oil left in the crack when the part is immersed will be spilled out due to the vibration and make the talcum powder yellow-colored on the surface, so that a yellow line emerges on the crack.

4)Maintenance Methods and Skills

In the maintenance process, it comes to main maintenance stage after decomposition, cleaning and detection, etc. Mastering the basic maintenance skills is the key to ensure the quality of maintenance. Machine elements are generally maintained in the following methods:

[1.]Chiseling, filing, and scraping

Chiseling is a method applied to process metal parts by means of knocking on a chisel with a hammer. It functions to cut and split. Filing is a method applied to process metal parts by rasping off a layer of metal on the surface of a machine element with a file. Filing includes coarse filing and fine filing.

The roughness of the surface of the filed machine element mainly depends on the thickness of file teeth. The cross-sectional shape of the file and the filing movement are determined by the surface shape required by the machine element. Scraping is a method applied to process metal parts by razing a layer of metal on the surface of a machine element with a scraper.

As the scraping is a precision work, so scrapping allowance should not be too large, generally about 0.005 ~ 0.01 mm every time. Before scraping, the surface of the machine element should be coated with

a layer of red lead, and the machine element should be ground to match a plate, standard part or finished part. The resulted high points are the objects to be scraped. After repeated grinding and scraping, high points and sub-high points are gradually scraped, so that the scraped element has increased contact points on the surface to form the required shape and achieve the fine fit.

[2.]Grinding

Grinding is to raze a thin metal layer from the surface of a machine element by use of grinding tools, so that the surface has a precise size, accurate geometry and very low surface roughness. This is the most finish machining method adopted to process the surface of a machine element. It can be divided into face grinding, bore grinding and cylindrical grinding. The face grinding adopts a plate as grinding tool, while the bore grinding adopts a grinding rod. In the maintenance process, grinding methods are often applied to process crankcase planes and inner bores in connecting rod reducers.

[3.]Riveting and jointing

Riveting is to connect two or more machine elements together by use of rivets. The method of riveting is widely used in the maintenance process, such as the riveting of the clutch sheet and the riveting of various assembling units. According to its application, riveting can be divided into fixed riveting, movable riveting and stitched riveting.

Jointing is to joint two metal faces firmly together by use of soldering tools and soldering flux. It is widely used in the maintenance process.

Such as the recovery of cracks on solder joints of the main frame and other parts.

[4.]Drilling and reaming

Drilling is a method to process holes in a machine element or material with a drill bit.

The main drilling equipment and tools are radial drilling machines, bench drills, electric hand drills, twist gimlets and fixtures. The purpose of reaming is to improve the accuracy of holes on a machine element and reduce the surface roughness of holes, and reamers are used for hole finish machining.

Reaming can improve the accuracy of fit between a hole and a shaft up to Level 6 to Level 8. The main reaming tools are reamers. Commonly used reamers include fixed hand reamers, adjustable reamers and conical hand reamers, etc. A basic hole must be drilled before reaming. Drilling a basic hole is to leave a proper processing allowance for the reaming process according to the accuracy requirements of a formed hole required for a machine element.

[5.]Thread tapping and thread die cutting

Thread tapping is to process internal threads with screw taps, while thread die cutting is to ream external threads with threading dies. Screw taps are the main tool for thread tapping. A set of hand screw taps is usually composed of two pieces (head tap and second-tap). The two taps are different in the angle of the cutting part: the head tap is smaller and the second-tap is bigger in angle. A chamfered basic hole must be drilled before thread tapping. The diameter of the drill bit used for drilling the basic hole can be referred to a specific table or calculated by the following formula:

Drilling diameter = thread external diameter -1.1mm × pitch (applicable to pig iron, bronze, etc.).

Drilling diameter = thread external diameter -1.2mm × pitch (applicable to steel, brass, etc.)

When tapping, the head tap is tapped along the chamfered basic hole, and retreats after the tapping. Then tap with a second-tap to shape the thread.

Threading dies are the main tool for thread die cutting. Threading dies are classified into fixed, adjustable and movable types. Fixed dies are commonly used, that is, circular dies. For the thread die cutting, threading dies and bars in corresponding diameters should be selected based on the required materials, thread diameters and pitches. Dimension relations can be found in a special table or calculated by the following formula:

Bar diameter = thread external diameter -0.13mm × pitch

Before the thread die cutting, an end of the bar need to be chamfered (15° ～ 20°). The minimum diameter at the cone angle should be less than the internal diameter of the thread so that the die and bar is vertical, and facilitate aligned cutting.

[6.]Correction

Corrections intend to eliminate unevenness defects on plates, bars or cylindrical machine elements. Corrections enable plastic deformation of machine elements. Therefore, only metal parts of high plasticity (such as low carbon steel, red copper, etc.) can be directly corrected. Metal parts with higher carbon content can be corrected after being annealed. Correction methods include twisting method, stretching method, bending method and extending method.

[7.]Bonding

Bonding technology is a simple process and requires no special equipment and precious materials. Bonded parts demand no high-precision machining. Due to these advantages, bonding technology is widely used in the manufacture and maintenance process, such as the adhesion of the handlebar and the steering bar, the plastic sign and painted metal parts, the brake pad and the brake shoe, etc. There are many types of bonders, commonly used in epoxy resin and phenolic resin.

5)Assembling the Motorcycle

The last process of maintenance is assembly, which is the key to ensure that the vehicle achieves various technical indicators.

[1.]Assembly is divided into minor assembly, sub-assembly and general assembly. In the assembly processes, the minor assembly goes first, and then sub-assembly and lastly the general assembly. The order of assembly is exactly opposite to the order of disassembly. That means to assemble those parts that have been disassembled earlier, and then those parts disassembled earlier later.

[2.]The minor assembly is an early working procedure of the entire assembly process. In this procedure, a number of related parts are connected to form a separate structural unit. Such as the brake drum cover combination on the front wheel, brake shoe combination, and wheel rim combination, etc.

[3.]The sub-assembly is based on the minor assembly. In this procedure, all components and parts belonging to a structural unit (an assembly) are assembled to form a separate integral structure. Such as the front wheel assembly and rear wheel assembly, front fork assembly, and damper assembly, etc.

[4.]In a general assembly, all parts, components, units and structures are installed in proper order on the main frame through a variety of connections so as to form a complete set.

[5.]Generally, order of operation of assembly is basically identical. The operation steps are as follows: complete all minor assemblies firstly and then the sub-assemblies, and install the engine assembly and gearbox assembly on the main frame; and then the following assemblies are installed in the following order: front fork assembly, handlebar assembly, front and rear fender assembly, damper assembly, storage rack assembly, front and rear wheel assemblies, fuel tank assembly, saddle assembly, etc; on this basis, install the headlamp, tail lamp, sidelight, klaxon and storage battery assembly; connect all the electrical circuits and control cables; install the transmission chains or toothed belts, various wind shields and chain covers or belt covers, etc; finally, lubricate the entire vehicle assembled.

[6.]Because of different types and structures, the assembly sequences are also different. It may refer to the demolition, installation and inspection procedures below.

[7.]The following points should be noted in assembly processes: choose a clean wide site; strictly follow the assembly process requirement in the installation order; connections among parts shall meet the requirements,

so as to prevent all kinds of washers, cotter pins and anti-loose lock plates from being mal-assembled or missing.

3. Debugging After Maintenance

After maintenance, the interrelationship among the parts and components are affected to a certain extent. In order to restore its performance indicators, adjustments must be made properly as provided in this Service Manual, so that the interrelationship among the parts meets the working requirements. The following items are to be adjusted:

1)Adjusting the duration of ignition

Improper engine ignition advance angle will cause difficulty in starting, power coastdown, fuel consumption increase, engine overheating, incomplete combustion, excessive emission, lower service life and so on. Therefore the ignition advance angle must be adjusted firstly.

If the ignition system is abnormal, check the electronic igniter, high voltage coil, the ignition coil on magneto, trigger coil and other components.

2)Adjusting the Clutch

The clutch is a key component of transmission system to transmit power, must be adjusted based on the maintenance requirements provided later. To adjust the clutch is mainly to adjust the free stroke of control grip on the clutch (usually 10 mm ~ 20 mm), and for some vehicles, also to adjust the adjusting screws on the detatching mechanism.

3)Adjusting the Brake

Braking performance is closely related to the driving safety, and thus the correct adjustment of the brake is essential. To adjust the brake is mainly to adjust the free stroke of front braking grip (usually

10 mm ~ 20 mm) and the free stroke of rear brake pedal (usually 20 mm ~ 30 mm). The adjustment methods are basically the same, and may be implemented according to the maintenance requirements

provided later.

4)Adjusting the Electrical Installations

The adjustment items of electrical equipment are mainly the headlamp and klaxon.

[1.]To adjust the headlamp is to adjust the light irradiation distance by moving up and down the headlamp mounting position.

[2.]To adjust the klaxon is to adjust the volume and tone. Generally, the volume of a motorcycle klaxon is set to (95 ~ 105) dB; the volume, whether big or small, and the tone, whether too thick or too thin, can be adjusted through the adjusting screw on the back.

5)Adjusting the Throttle Line

The throttle twist grip should maintain a free stroke of 2mm ~ 6mm, in which process, the engine should not be subject to speed increase and speed loss. The free stroke, whether too big or too small, shall be adjusted. This adjustment item is generally coordinated with the idle-speed adjustment.

Section 3 Data Adjusting for Maintenance

Table 2-1: Steering/Brake/Damper/Wheel Maintenance and Adjustment

Items		Standard Value (mm)	Limit Value (mm)
Free stroke of front braking grip		10～20	20～30
Free stroke of rear brake pedal		20～30	30～40
Free stroke of fuel charging handle		2～6	10～12
Tire tread pattern depth		4.0	2.0
Front damper stroke		120	———
Free length of front damper spring		375	———
Rear damper stroke		40	———
Free length of rear damper spring		210	———
Wheel hub runouts	Axial runout	———	0.8
	Radial runout	———	0.8
Wheel axle runouts	Front	———	0.8
	Rear	———	0.8

Table 2-2: Maintenance Periodic Table

Maintenance frequency		Odometer km			
		1000km	4000km	8000km	12000km
●	Fuel system		I	I	I
●	Fuel filter	A	R/I	R/I	R/I
●	Control system	I	I	I	I
●	Choke cable	I	I	I	I
	Air cleaner filter element	A/R	R	R	R
	Spark plug gap	I	I	I	I
●●	Valve lash	I	I	I	I
	Transmission chain	I/L	I/L	I/L	I/L
	Storage battery	I	I	I	I
	Brake shoe abrasion	I	I	I	I
	Braking system	I	I	I	I
●	Brake lamp switch	I	I	I	I
●	Headlamp dimming	I	I	I	I
	Main side stand	I	I	I	I
●●	Front and rear dampers	I	I	I	I
●	Nut/bolt/fastener	I	I	I	I
	Front and rear tyre covers	I	I	I	I
●●	Steering mechanism bearing	I	I	I	I

Motorcycles should be repaired as specified above. The symbols in the above table have the following meanings:

R-Rinse, A- Adjustment, L-Lubrication, I- Inspection

●These maintenance items shall be serviced by our after-sales service personnel. Please refer to this manual if any self-maintenance.

●●The Company suggests that these items be serviced by our after-sales service personnel, to ensure driving safety.

⚠ Caution

If a motorcycle is driven in dusty areas, it is appropriate to shorten the maintenance cycle.

Table 2-3: Tightening Torque Table

Items		Specifications	Torque Value (N.m)
Motorcycle	Stand pipe lock nut	M24×1	67~75
	Handlebar tube fixed bolt	M6×20	8~12
	Front wheel axle nut	M14×1.5	85~95
	Rear wheel axle nut	M14×1.5	85~95
	Engine suspension bolt	M8×16	28~32
	Rear damper fixed nut	M12×1.25	85~95
	Chain wheel fitting nut	M8	28~32
	Rear rockshaft nut	M10×1.25	65~75
	Fork shaft nut	M14×1.5	85~95
	Fork shaft nut	M14×1.5	85~95

Chapter 3 Complete Motorcycle

Section 1 Fuel Supply System

The oil supply system includes a fuel tank, fuel pump, fuel injector, fuel filter and oil tube.

1. Structure and Working Principles of Fuel System

[1.]Fuel tank

The fuel tank is usually made of a 0.8mm ~ 1.0mm thick steel plate processed through stamping and jointing. Some tanks have division plate with holes inside, which not only improves the tank strength, but also prevents fuel from surging when the vehicle is driving. As the gasoline is strongly corrosive, the internal tank surface should be galvanized or otherwise as an anti-corrosion treatment. The top of the tank is equipped with a fuel filler and is covered with a fuel tank cap with a vent hole. This prevents the fuel from overflowing when the motorcycle is driving and also maintains the balance between the internal and external air pressure, so that the fuel can flow out naturally.

[2.]Fuel pump

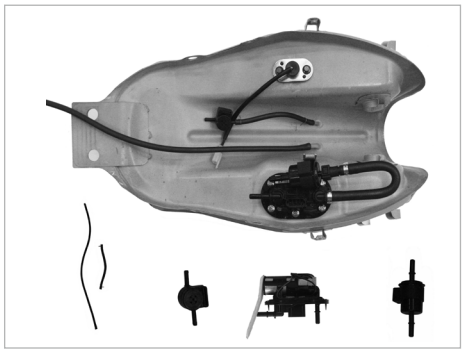
The fuel pump assembly is composed of an oil pump, a bracket and an oil pressure regulator. The elastic installation method can reduce the direct impact of vibration on the fuel pump. The fuel pump installed in the fuel tank can make the oil supply system simple and hinder the fuel leakage.

The fuel pump is a turbine single-stage electric fuel pump, driven by a 12-volt DC motor and controlled by ECU through the fuel pump relay. The pump outlet is designed with a one-way valve, so that the stored oil in the tube will not retreat to the fuel tank when the engine does not work, to ensure re-start performance.

[3.]Fuel injector

The fuel injector timely and exactly injects moderate atomized fuel into the engine intake pipe, and then the atomized fuel is further sucked into the cylinder for combustion.

[4.]Fuel filter



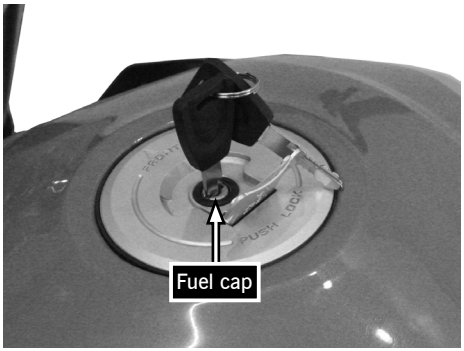
The fuel filter is connected in series on a channel for oiling between the electric fuel pump and the fuel guide rail. To ensure the filtering effect and prevent the nozzle from being blocked due to remains, it is necessary to adopt a fuel filter specially used for electronic injection. The enclosure of a filter must be of sufficient strength to avoid breaking due to fuel pressure.

[5.]Fuel pipe

The fuel supply pressure of the system is 250kPa. For safety reasons, the selected fuel pipe must have sufficient insurance factor.

2. Demolition and Maintenance of Fuel System

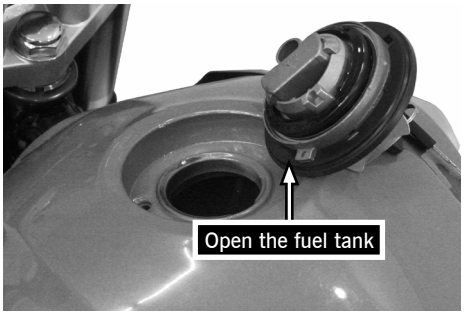
[1] The motorcycle fuel tank capacity: 20L.
The fuel must be filled in well ventilated and circulated venues away from the sparks and flames.



⚠ Warning

As the fuel is flammable, smoking and open fire are strictly prohibited.
The motorcycle should be shut down and fueled in a ventilated area.

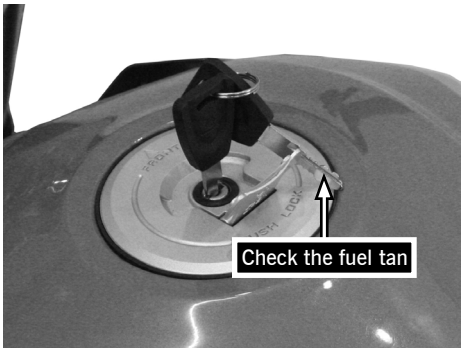
[2] If the fuel tank cap is subject to fuel penetration, install a new gasket on the fuel tank cap.



⚠ Warning

The fuel should be ≥ 90 # gasoline, and other fuels are prohibited.

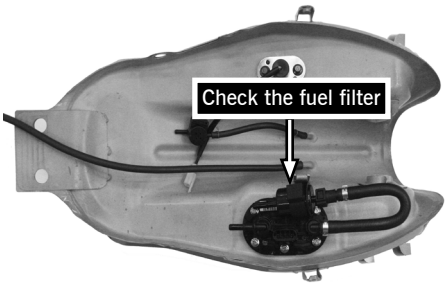
[3] Check if the fuel tank is subject to fuel penetration. if the oil leakage occurs, the fuel tank must be restored or replaced.



⚠ Caution

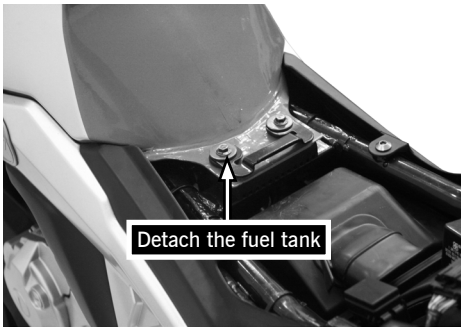
If the fuel tank is deformed due to an external force, for example a pit occurs, a wooden hammer may be used to knock the pit. If the fuel tank cracks, it is best not to repair, but to replace the fuel tank.

[4] Check if the fuel pipe is subject to fuel penetration or aging phenomenon, and check if the fuel filter is blocked. A blocked fuel filter must be cleaned or replaced.



⚠ Caution

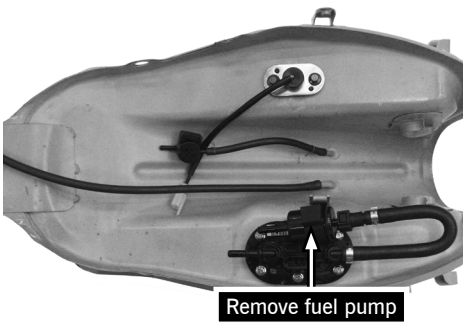
A penetrated or aged fuel tube must be replaced.
To replace the fuel tube or fuel filter, the ignition switch must be turned off to stop the fuel pump and prevent the fuel from flowing out of the tank.



[5] Firstly, remove the LHS and RHS side covers and seat cushion. Then loosen fixed bolts on the fuel tank and take out the fuel tank.

⚠ Warning

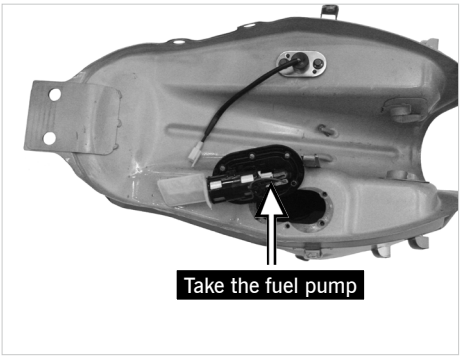
To let out the fuel, the location must be kept away from fire sources.



[6] Apply an allen wrench to release six M4×12 fixed bolts on the fuel pump.

⚠ Warning

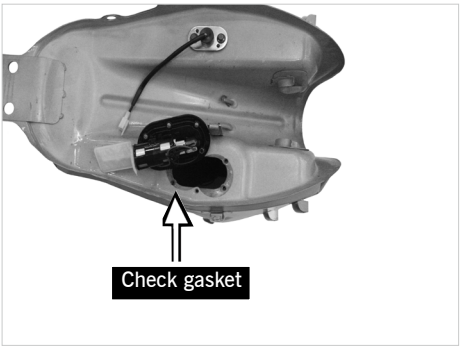
Let out the fuel firstly before detaching the fuel pump, and the location must be kept away from fire sources.



[7] Take out the fuel pump. Wash away the oil residues and moisture in the fuel tank with a cleaning agent.

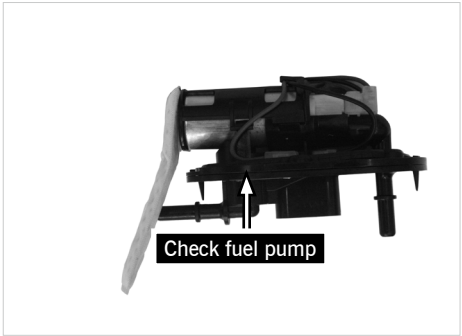
⚠ Caution

Place and dry the cleaned fuel tank in a well ventilated place before you can use it.



[8] Check the fuel pump gasket for aging or crack as well as for fuel penetration. In case of any of these found, install a new fuel pump gasket.

[9] Check if the fuel pump motor rotates and clean or replace the fuel filter screen.



⚠ Suggestion

For a motorcycle that has driven for 8000 ~ 10000 Km, a new fuel filter should be installed.

3. Refer to Table 4-1 in respect of damage forms, fault phenomena and common maintenance methods of the fuel system:

Table 4-1: Maintenance of Fuel Supply System

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Fuel tank	The tank is rusted with broken holes.	The fuel tank leaks.	----------	Repair or place the tank.
	The vent hole is blocked.	Fuel is supplied improperly.	The motorcycle fails to start.	Unclog the vent hole.
	The fuel tank is deformed.	The fuel tank becomes uneven.	The motorcycle looks not good.	Repair or place the tank.
Fuel pump	The oil-filter screen is too dirty or clogged.	Fuel is supplied improperly.	The motorcycle has difficult in starting or fails to start, the engine is under powered, the engine idling is of instability	Clean the fuel filter screen
	The chamber of fuel pump is clogged.	Fuel is supplied improperly.	The motorcycle fails to start.	Clean or replace the fuel pump.
	The fuel pump motor does not rotate.	Oil supply fails.	The motorcycle fails to start.	Replace the fuel pump motor.
	The oil pressure regulator is clogged.	The fuel fails to retreat.	The oil conduit blows out.	Clean or replace the fuel pump.
	The oil pressure regulator is always open.	The fuel is supplied at low pressure.	The motorcycle has difficult in starting or fails to start, the engine is under powered, the engine idling is of instability.	

Section 2 Cooling System

The engine is an internal combustion engine operating at high temperature. Many parts on the engine are subjected to a considerable heat load, especially the cylinder head, cylinder block, piston, valve and other parts are in high temperature gas state. Improper cooling measures will cause the engine to overheat. Parts withstanding high temperature are easy to burn out, while the interoperable parts will be subject o extremely poor fit clearance due to thermal expansion. Excessive temperature can also cause deterioration of the lubricating oil, resulting in damage to the engine. Therefore, a high-efficient cooling system is very important for the engine.

The main function of the engine cooling system is to take away the heat on surfaces of high-temperature parts, so that the engine temperature is controlled within the allowable range. The motorcycle cooling system is the water-cooled type

1. Structure and Working Principles of Cooling System

Water cooling means that, the water as a medium takes away the heat of high-temperature parts, reduces their temperature, and distributes the heat to the atmosphere. Water cooling system include: water tank, water pump, water jacket, fan, thermostat and radiator.

Water tank: it is used to store cooling water. Water pump: as the power source of water cycle, it is driven by the engine. Water-cooled motorcycles generally use centrifugal water pumps. Water jacket: water jacket is the place where the water exchanges heat with high-temperature parts, generally arranged around the cylinder block and cylinder head. Radiator: exposed to the air and right on the upwind section of the motorcycle, the radiator emits the heat of high-temperature water gained from the engine to the air, and then the water becomes low-temperature water.

Working Principles of Water Cycle

The low-temperature water in the radiator is pumped into the water jacket through the water pump, and becomes high-temperature water after exchanging heat with high-temperature cylinder block and cylinder head, and then flows into the thermostat. At this time, according to the level of water temperature, the water is cycled in two ways:

[1.]When the water temperature is lower than the specified value, the thermostat valve is closed, water from the water jacket flows into the radiator for the water cycle through the low-temperature water outlet. The low-temperature water outlet has a very small cross-sectional area, so the flow of circulating water at this time is very small.

[2.]When the water temperature is higher than the specified value, the expansive monomer feels the water temperature and expands to hold out against the piston. As the piston is fixed, so the piston sleeve drives the valve to move down. In this way, the valve opens, the water flows simultaneously from the high-temperature and low-temperature water outlets to the radiator, the flow becomes larger and the cooling effect is strengthened.

When the high-temperature water flows into the radiator, the water temperature decreases, and the water flows back to the pump for re-cycling. At the outlet of the radiator, a temperature control switch is provided to monitor the water temperature of the water cooling system and show to the driver at the instrument cluster.

Working Principles of Water Amount Control

To ensure the proper operation of the water cooling system, it is necessary to secure a constant water amount in the circulating water path. The water tank or the motorcycle is generally marked with a cooling water amount. The cooling water amount of this motorcycle model is: 800 mL. The upper part of the water tank has a vent. The tank and the radiator cover control the water amount in the circulating water path through the siphon. The radiator cover has the function of automatically adjusting the amount of water in the circulating water path. It works by the following principles:

[1.]When the water temperature in the path is too high, causing the water pressure to exceed a specified value, the pressure valve opens automatically and some water retreats to the water tank.

[2.]When the water temperature in the path is falling, it will have a larger negative pressure. If the negative pressure dropped to the specified value, vent valve opens and the water in the water tank flows to the path due to siphon effect.

Minimum Temperature	Mixed Concentration	Coolant	Distilled Water
above -15℃	30%	1.2L	2.8L
below -16℃	30%	2.0L	2.0L

2. Demolition and Maintenance of Cooling System

[1.]Selecting the coolant

A malfunctioned engine cooling system will cause the engine to overheat, so maintenance of the cooling system is important.

The cooling medium used in water cooling system is the coolant actually formed by mixing distilled water with the cooling stock solution. It not only has a cooling effect, and also has function of rust and freeze protection. Besides, such liquids are mixed based on different coolant ratios according to different regions of different temperature. Users formulate coolants as required in the above table (the temperature required shall be 5 ℃ lower than the actual temperature). Distilled water is required for formulating the coolant, instead of tap water and other impure water, so as not to form lime scale.

[2.]Changing the coolant

First, open the auxiliary water tank cap after being cooled for 20 minutes. Loosen the screw to release the coolant. When the coolant is totally discharged, re-tighten the screw. The coolant is slowly injected through the hole in the auxiliary tank cape. Pay Caution to keep the liquid surface at the edge of the hole.

Start the engine to maintain idling operation, and shut down the engine when bubbles in the circulating path disappear from the tank cap. Re-fill the coolant to the edge of the hole in the tank cap. Coolant is toxic liquid and undrinkable; if the coolant sticks to the skin, it is necessary to rinse with water; if it sticks to the motorcycle body, wipe it off in time. If there is water leaking from the weep hole below the water pump, it indicates the water seal is not properly attached and it is necessary to replace a new water seal or water pump.

[3.]Inspecting the radiator

For the inspection and repair of the radiator, it is necessary to clear the dirt between the heaters in time.

3. Refer to Table 3-13 in respect of damage forms, fault phenomena and common maintenance methods of the cooling system:

Table 3-13: Maintenance of Cooling System

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Water tank	The water tank cracks.	The engine lacks cooling water.	The water tank leaks.	Repair or place the tank.
	No water in the water tank.	The engine lacks cooling water.	The engine is of low radiating capability.	Supplement the cooling water.
Radiator	Too much sediment.	The power has a lower power performance.	The engine overheats.	Clean the cooling fins of the radiator.
	The cooling fins break.	The engine is of low radiating capability.	The engine overheats.	Replace the radiator.
Connecting tube	The tube breaks or ages.	The connecting tube leaks.	The engine overheats.	Replace the connecting tube.
Water pump	The turbine is damaged.	The cooling water cycle is under-powered.	The engine overheats.	Replace the turbine of water pump.
	The water seal breaks or ages.	The water pump leaks.	The cooling water cycle is under-powered and the engine is overheated.	Replace the water seal.
Thermostat	The thermostat breaks.	Water leakage	The engine overheats.	Replace the thermostat.
	The thermostat is clogged.	The thermostat does not guide water.	There is no cooling water in the water jacket and the engine overheats.	Repair or place the thermostat.

Section 3 EFI System

The EFI system assembly mainly consists of electronic control unit (ECU), nozzle, throttle valve body assembly, intake air temperature and pressure integrated sensor, engine temperature sensor, ignition coil, crankshaft position sensor, oil pump assembly, oxygen sensor.

The engine EFI management system can precisely control the mixing ratio of air and fuel into the engine cylinder, the combustion process and the exhaust gas con, so as to optimize engine performance, improve driving performance, and strengthen the control of air pollution by exhaust emissions from the motorcycle.

The engine control unit (ECU) is a singleship-cored microprocessor. The ECU analyzes and determines the engine’s working state and through sensors and work request switches installed on the engine and at different locations on the main frame; and then it exerts precise control on the engine and corresponding mechanisms through the engine and actuators.

The sensor for engine rotate speed and crank angle are magnetoelectric. The system uses it to determine the crankshaft rotation position and speed. The crank angle sensor is mounted on the transmission clutch housing and works with the 24x ring gear on the flywheel.

The manifold absolute pressure (MAP) sensor installed on the intake pipe to measure the pressure of the intake pipe. ECU determines the amount of air into the engine through this signal.

The MAP sensor consists of a sealed elastic diaphragm and a ferromagnetic core. The diaphragm and the core are precisely placed in the coil. When the pressure is sensed, a 0 to 5V output signal proportional to the input pressure is generated.

The throttle position sensor is mounted on the throttle valve body assembly, coaxial with the throttle lever and throttle valve. It is a linear variable resistor structure, whose sliding terminal is driven by the throttle shaft.

Different opening degrees of the throttle valve leads to different resistance signals transmitted by the sensor to the ECU. The system determines the real-time load and dynamic changes in the engine according to its output signal value and its rate of change; it also exerts the timely control on the engine.

The intake air temperature sensor is mounted on the transition line of the induction system to detect the air temperature entering the engine. It also adopts a thermistor with a negative temperature coefficient as an sensing element.

As the air temperature changes will directly affect its density, therefore, the intake air temperature sensor is one of the important parameters to calculate the actual amount of air into the cylinder.

The nozzle structure is an electromagnetic switch gear. The coil lead to the poles communicates with ECU through the engine harness. The ECU exerts the control to impose voltage on the coil, resulting in the generation of coil magnetic force to overcome the spring force. The fuel pressure and the vacuum suction of intake pipe suck the iron core up. The fuel goes through the sealed surface of ball valve as an organic whole with the iron core, and spray from the guiding nozzle hole to form a mist injection. After power failure, the magnetic force disappears and the nozzle is closed.

The top of the fuel injector adopts a rubber seal ring and a fuel rail interface to form a reliable pressure fuel seal. The lower part also uses a rubber seal ring and the engine intake pipe to form an airtight seal. The nozzle will spray the fuel into the intake valve in a mist form.

The throttle valve body is installed in front of the intake pipe, and is composed of a valve body in itself, a throttle position sensor and an idle control valve. The main function is to control the air intake when the engine is working. It is the most basic channel of dialogue between the electronic control system and the driver.

The oxygen sensor mounted on the exhaust pipe of the engine is an important landmark part of the closed-loop fuel control system. The main sensitive material of the oxygen sensor is zirconia. When the zirconia is heated and activated by exhaust gas (300° C), oxygen ions pass through the zirconia element to reach its external electrode. The zirconia element senses the oxygen content of the engine exhaust and changes its output voltage value.

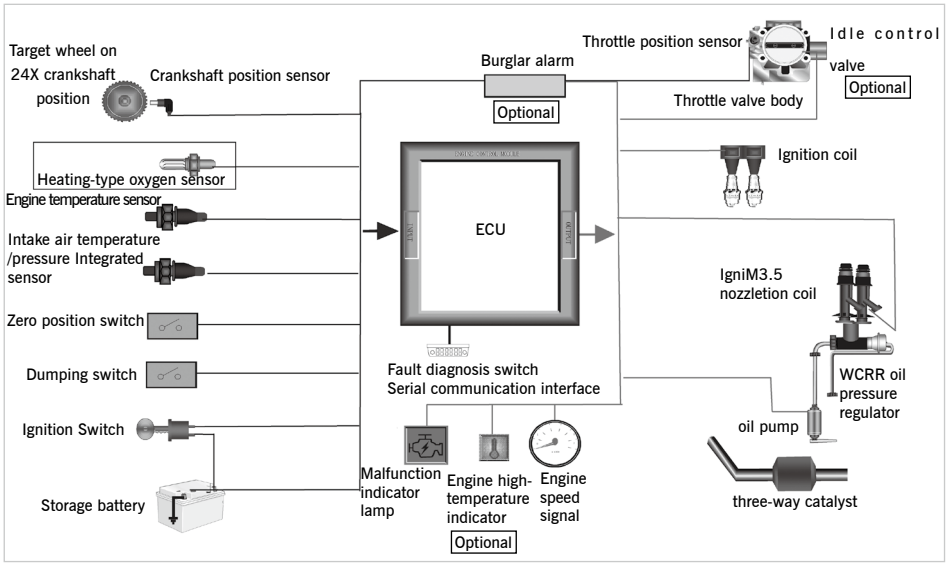
The oxygen sensor uses teflon insulated wire and stainless steel formed elements. Reference air is input by the wire, without any blocking problem.

When the ratio of air to fuel that involved in engine combustion is increased, the oxygen concentration in the exhaust gas increases and the output voltage of the oxygen sensor decreases. Conversely, the output voltage increases, thereby feeding real-time engine air-fuel ratio back to the ECU.

2. Demolition and Maintenance of EFI System

The motorcycle EFI system has been commissioned before leaving the factory. If any failure of the EFI system, it is strictly forbidden to adjust the idle-speed screw on the throttle valve body by oneself, and it is not permitted to replace or adjust the EFI system parts by oneself. If any questions, please visit our special maintenance service station for maintenance.

The motorcycle EFI system has an EFI malfunction indicator lamp on the dash board. When the ignition system circuit opens, the indicator lamp keeps bright under normal working conditions; if there is a fault, the lamp does not work. When the engine starts, the indicator lamp goes out under normal working conditions; if there is a fault, the lamp keeps bright or flashes.



Structural Schematic Diagram for EFI System

3. Common Faults of EFI System

The fault diagnosis device is used to check the EFI system for any fault information. If any fault, then install corresponding new EFI parts; if no fault, please check for the following items:

1.Check whether the lines are connected properly, with or without any damage;

2.Check whether the voltage reaches more than 9V;

3.Check whether the vehicle fuse and EFI fuse are damaged;

4.Check whether the oil channel is proper, and whether the oil tube is blocked, squeezed and damages, to ensure smooth oil flow.

Section 4 Air Intake and Exhaust System

The induction system of the motorcycle engine is composed of air cleaner, intake pipe and so on. The main function of the induction system is to guide and filter the air, reduce the noise and control the amount of the gas mixture into the engine.

The exhaust system mainly consists of a exhaust pipe and a silencer. The main function of the exhaust system is to remove the exhaust gas from the engine to the atmosphere, reduce the noise and exhaust gas temperature during the exhaust, and eliminate the flames and sparks in the exhaust gas. A good exhaust system can also improve the induction and exhaust efficiency, increase the engine power, and reduce fuel consumption, etc. The exhaust system including an exhaust pipe and a muffler is known as the exhaust silencer.

1. Structure and Working Principles of Induction System

[1]Structure and Working Principles of Air Cleaner

The air cleaner is an important part of the induction system. It filters and purifies the air into the cylinder, prevents dust, sand and other particulars in the air from entering the cylinder, and reduces the abrasion of cylinder, piston and piston ring. Its work performance has a great influence on the engine' s power performance, induction noise and service life. Experiments show that the absence of air cleaner will cause the cylinder subjected to 8 times increase the abrasion loss, the piston to 3 times and the piston ring to 9 times, greatly reducing the reliability of the engine and shortening its service life. Therefore, the motorcycle must be equipped with an air cleaner. Under the premise of satisfactory filtering effect, the air cleaner is required to impose low airflow resistance, so as to improve the intake by the engine. Besides, the air cleaner is also required to be reliable in operation, simple in structure, small in size, light in weight and easy for maintenance. An air cleaner mainly includes a filter element and a shell of airtightness and so on. When the engine is running, the air enters the front chamber of the air cleaner via the air duct, passes through the filter element and flows into the rear chamber of the air cleaner, and then enters the throttle valve.

[2.]Structure and Working Principles of Intake Pipe

The intake pipe is an important part that connects the throttle valve to the engine inlet, and also supports the function of the throttle valve. It is simple in structure. Its curved shape mainly depends on the relative locations of the throttle valve and the engine inlet, but also considers the impact on intake resistance. A long airway is conducive to fuel atomization, but subject to higher airflow resistance; a short airway is disadvantageous to fuel atomization, but subject to lower airflow resistance.

The gas mixture atomized by the injector enters the engine cylinder via the engine inlet and through the intake pipe. The intake pipe reduces the heat transferred from the engine to the throttle valve and isolates the impact of engine vibration on the throttle valve.

2. Structure and Working Principles of Exhaust System

The exhaust pipe in the exhaust muffler is made of a bent steel pipe. Located between the engine outlet and the silencer, It serves to direct the exhaust gas from the engine to the silencer.

3. Demolition and Maintenance of Induction System

[1] Remove the cap screws on air cleaner element and take out the air cleaner element assembly.

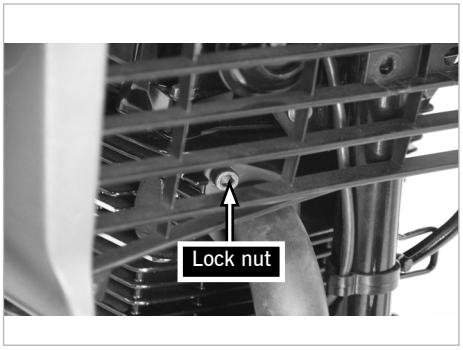
[2] Check the air cleaner element for excessive dust. Install a new element when there is too much dust.

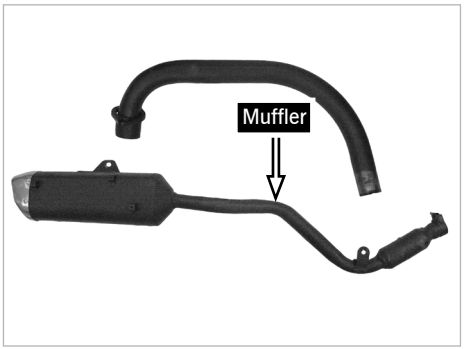
4. Demolition and Maintenance of Exhaust System

[1] Remove the lock nuts on muffler exhaust pipe and suspension bolts on the silencer. Check the muffler suspension bracket for any breakage. A broken muffler suspension bracket needs to be re-welded.

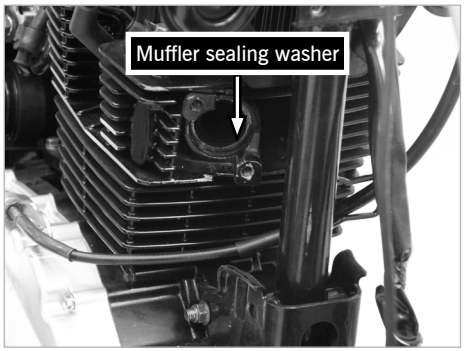
⚠ Caution

A broken muffler suspension bracket needs to be replaced or re-welded.





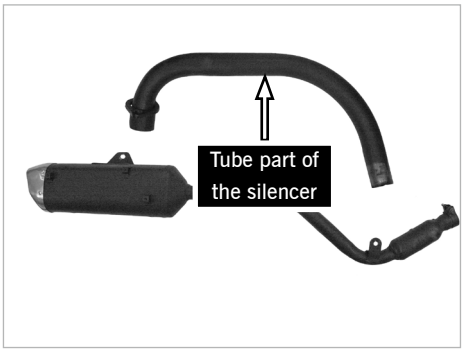
[2] Remove the silencer. Check the muffler for any breakage or damage. A broken or damaged muffler needs to be replaced or re-welded.



[3] Remove the muffler sealing washer. Check the muffler sealing washer for any breakage. A broken muffler sealing washer needs to be replaced or re-welded.

⚠ Caution

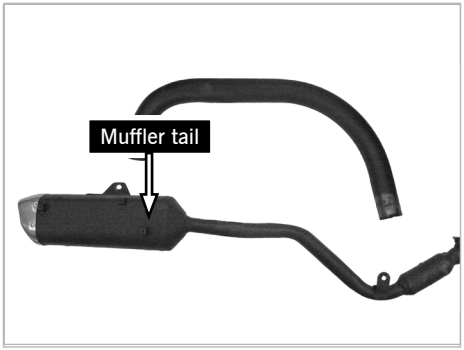
Every time the muffler is disassembled, a new seal must be installed.



[4] Check the tube part of the muffler for any carbon deposits. Remove the carbon deposits in the tube.

⚠ Caution

Check the muffler for any corrosion or crack. Install a new muffler or repair it if it is corroded or cracked.



[5] Check the tail part of the muffler for any carbon deposits. Remove the carbon deposits in the tail.

5. Refer to Table 4-3 in respect of damage forms, fault phenomena and common maintenance methods of the induction & exhaust system:

Table 4-1: Maintenance of Induction & Exhaust System

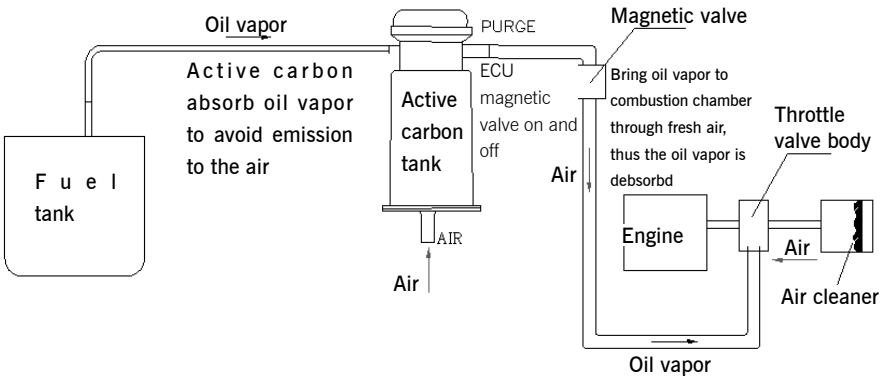
Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Induction system	There is excessive dust on the filter element.	----------	The engine has difficult in starting; the engine is under-powered; the engine idling is of instability; the fuel is consumed excessively; the exhaust muffler exhausts black smoke.	Clean or replace the filter element
	The filter element housing of the air cleaner is broken or fractured.	----------	The engine has a big induction noise.	Replace the air cleaner housing.
Exhaust system	The air leaks from the exhaust pipe orifice.	----------	The engine has a big exhaust noise.	Replace the sealing washer of the exhaust pipe
	The housing of exhaust muffler breaks.	----------	The engine has a big exhaust noise.	Replace the exhaust silencer.

Section 5 Evaporative System (EVAP)

1. Working Principles of Evaporative System

Attach a carbon tank and close the fuel tank. The fuel vapor in the fuel tank can only be connected to the atmosphere through the carbon tank. When the vehicle is at rest, the fuel vapor in the fuel tank enters the carbon tank through the absorption mouth, and is adsorbed in the activated carbon in the carbon tank. The desorption mouth of the carbon tank is installed on the intake pipe. When the vehicle is running, the negative pressure in the connecting tube sends the fuel vapor adsorbed in the activated carbon of carbon tank back to the engine via the carbon tank solenoid valve. Thus the pollution is reduced.

State III Emission and Fuel Evaporation Schematic Diagram



When a large amount of incompletely combusted mixed gas flows into the hot catalytic converter, it may appear a re-combustion phenomenon, and lead to the catalyst converter being overheated in a way to leave the catalytic converter invalid. To prevent this phenomenon and any other damage, please note the following matters:

[1.]Only unleaded gasoline (#90 or #93 unleaded gasoline) can be used. The use of leaded gasoline will cause the catalyst converter to fail.

[2.]When the motorcycle is running, do not turn off the master switch or slide the motorcycle in zero position state taxi, to avoid the generation of a large amount of incompletely combusted mixed gas.

[3.]If the ignition or combustion system is not working properly, it will also cause the catalyst converter to overheat.

[4.]After the motorcycle runs for a while, be careful that the exhaust pipe surface will become very hot.

[5.]When refueling, do not spill or overflow the gasoline on the exhaust pipe (high-temperature exhaust pipe contacting with gasoline may be cause a burning).

⚠ Warning

Try to avoid dumping the vehicle. It results in fuel leakage from the fuel tank and causes the carbon tank to fail.

Ensure the firm pipe connections of the fuel evaporation system, to prevent pipes from dropping out, which may result in the direct discharge of fuel vapor into the atmosphere.

Do not adjust the carburetor at will.

2. Maintenance of Evaporative System

It is the role of the professional maintenance staff or the company' s after-sales service personnel to maintain the fuel evaporation device in order to eliminate the failure timely, extend the service life, and reduce maintenance costs. Thus the best performance of the fuel evaporator can be guaranteed to achieve the purpose of environmental protection and pollution reduction.

The specific maintenance methods are implemented according to the following steps:

[1] Check the intake negative-pressure hose clamp, intake rubber hose clamp and intake iron pipe fixing bolts for any looseness. In the above situation, it is necessary to tighten or replace the clamps. [2] Check the intake negative-pressure hose and intake rubber hose for any aging, leakage or breakage. In the above situation, it is necessary to replace the intake negative-pressure hose and intake rubber hose.

[3] Check the service condition of the carbon tank and anti-dumping valve. If the carbon tank and anti-dumping valve are clogged or fails to work properly, it is necessary to replace the carbon tank and anti-dumping valve.

[4] Check the air cleaner for any clogging or damage phenomenon. If this is the case, it is necessary to replace the air cleaner. [5] Check the service condition of the catalytic converter. If the catalytic converter is damaged or fails to work properly, it is necessary to replace the catalytic converter.

3. Refer to Table 3-5 in respect of damage forms, fault phenomena and common maintenance methods of the evaporative system:

Table 3-5: Maintenance of Evaporative System (EVAP)

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Evaporative devices	The evaporating pipe of the fuel tank is clogged.	The fuel vapor in the fuel tank cannot be discharged smoothly.	Too high air pressure in the fuel tank causes the oil vapor to be discharged into the atmosphere directly.	Dredge the evaporating pipe or replace the fuel tank
	The anti-damping valve is clogged.	The fuel vapor in the fuel tank cannot be discharged into the carbon tank smoothly.	Too high air pressure in the fuel tank causes the oil vapor to be discharged into the atmosphere directly.	Dredge or replace the anti-damping valve.
	The anti-damping valve is broken.	The fuel vapor in the fuel tank cannot be discharged into the carbon tank smoothly.	Too high air pressure in the fuel tank causes the oil vapor to be discharged into the atmosphere directly.	Replace the anti-damping valve.
	The connecting hose becomes loose.	The inlet leaks.	The oil vapor is discharged into the atmosphere directly.	Replace the connecting hose.
	The carbon tank is clogged.	The fuel vapor cannot be discharged into the carbon tank smoothly.	Too high air pressure in the fuel tank causes the oil vapor to be discharged into the atmosphere directly.	Dredge or replace the carbon tank.
	The carbon tank is broken.	The carbon tank leaks.	The oil vapor is discharged into the atmosphere directly.	Replace the carbon tank
	The catalytic device is damaged	----------	The motorcycle emission cannot reach State III standards	Replace the catalytic device

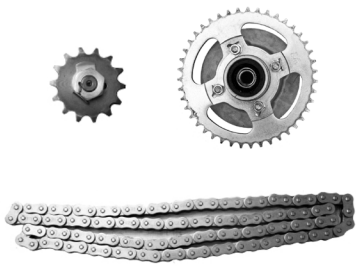
Section 6 Rear Driveline

Due to smaller torque and faster speed initially output by the motorcycle engine, it must go through three-level slowdowns so as to improve the engine torque to ensure the proper driving of the motorcycle. For Level 1 slowdown, it goes through the driving gear and driven gear of the clutch; for Level 2 slowdown, it goes through the main shaft and auxiliary shaft of the gearshift; for Level 3 slowdown, it goes through the driving gear and driven gear of the rear transmission device. Such an arrangement contributes to more economical and reasonable use of the power and speed output by the engine.

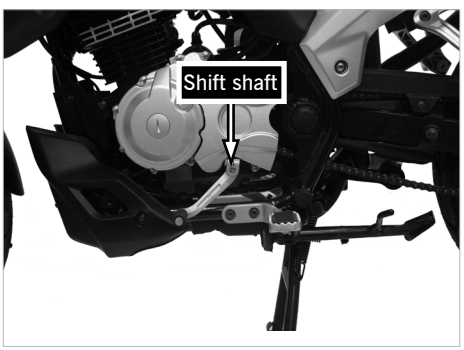
1. Structure and Working Principles of Rear Driveline

The motorcycle rear transmission device is driven through the chain. It mainly consists of the driving gear, driven gear, transmission chain, chain connector, transmission chain set, chain adjuster, buffer block and other components.

The power is firstly output through the driving sprocket at the end of engine transmission sub-shaft (power output shaft), and then transmitted through the transmission chain to the driven sprocket, and then goes through three-level slowdowns. Bolts are applied to fix the driven sprocket on the buffer body, which is joined by a rubber buffer block with the rear wheel hub. Therefore, when the gear is shifted in driving, the power buffered by the rubber piece is softly transmitted, avoiding the abrasion between parts while improving the motorcycle driving comfort and stability.



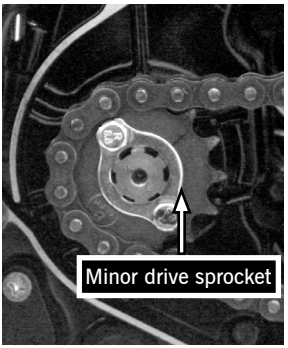
2. Demolition and Maintenance of Rear Driveline



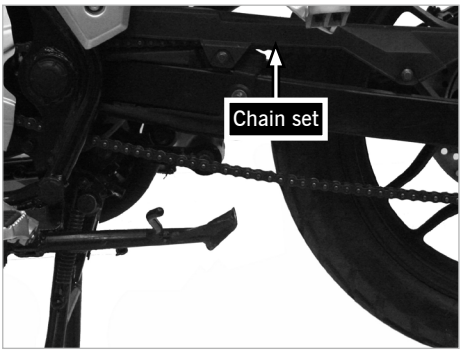
[1] Remove the fixing bolts on shift pedal and take down the shift pedal.

[2] Remove the bolts on the LHS rear case cover of the LHS crankcase and remove the LHS rear case cover of the LHS crankcase.

[3] Check the minor drive sprocket for any abrasion. If necessary, replace a complete set of major and minor sprockets.



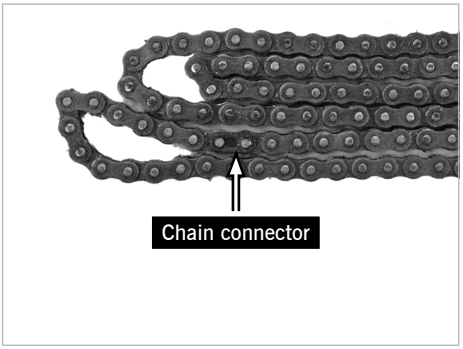
[4] Remove the fixing bolt on the chain set and take out the chain set.



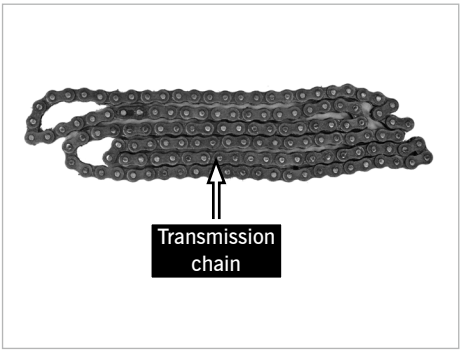
[5] Detach the snap spring on the transmission chain and remove the chain connectors and the transmission chain. Check the chain connectors for any abrasion. Replace the chain connectors if necessary.

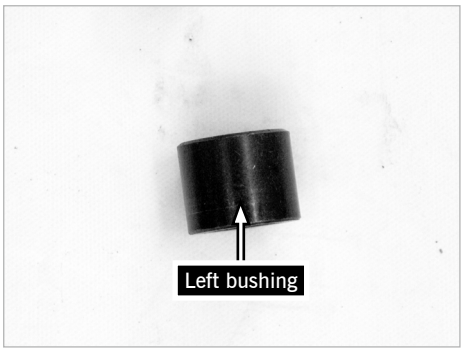
⚠ Caution

The open end of a snap spring of a chain connector should be opposite to the movement direction of the chain.

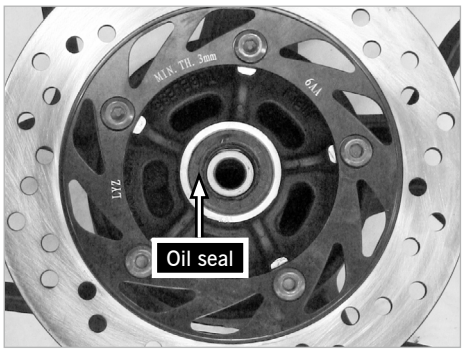


[6] Check the transmission chain for any abrasion and deformation. Replace a complete set of drive sprockets and transmission chain. If necessary.





[7] Loosen the lock nuts on the rear wheel axle and remove the rear wheel assembly. Remove the rear wheel left bushing and check it for any abrasion.



[8] Remove the oil seal of rear drive sprocket and check it for any abrasion.

[9] Remove the rear drive sprocket and check it for any abrasion.

⚠ Caution

If the major and minor drive sprockets are seriously abraded, it is necessary to replace a complete set of drive sprockets and the transmission chain.

[8] Remove the neck bush of rear drive sprocket and check the bearing of drive sprocket for any abrasion. Replace the bearing in time if seriously abraded; otherwise it will affect the normal operation of the transmission system.

⚠ Warning

Replace the rear drive sprocket bearing if abraded, otherwise it will cause the rear wheel to swing drastically o to be stuck.

3. Refer to Table 4-4 in respect of damage forms, fault phenomena and common maintenance methods of the rear transmission device:

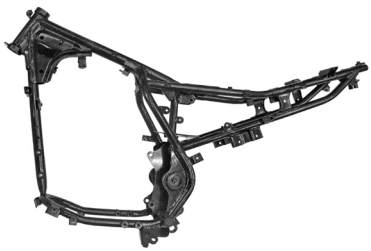
Table 4-4: Maintenance of Rear Transmission Device

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Driving sprocket	The teeth are abraded excessively.	The transmission chain jumps off the teeth.	The transmission chain makes an abnormal sound when transmission.The transmission chain is easy to fall off.	Replace a complete set of driving and driven sprockets and the transmission chain.
	The spline teeth are abraded excessively.	The transmission chain makes an abnormal sound when transmission.	The transmission chain is easy to fall off.	Replace a complete set of driving and driven sprockets and the transmission chain.
Driven sprocket	The teeth are abraded excessively.	The transmission chain jumps off the teeth.	The transmission chain makes an abnormal sound when transmission. The transmission chain is easy to fall off.	Replace a complete set of driving and driven sprockets and the transmission chain.
	The spline teeth are abraded excessively.	The transmission chain makes an abnormal sound when transmission	The transmission chain is easy to fall off.	Replace a complete set of driving and driven sprockets and the transmission chain.
Transmission chain	The chain is too dirty or poorly lubricated.	----------	The transmission chain makes an abnormal sound when transmission	Rinse or lubricate the chain.
	The chain is too tight.	The degree of tightness of the chain is improperly adjusted.	The transmission chain makes an abnormal sound when transmission	Adjust the degree of tightness to 15mm~25mm.
	The chain is too loose.	The degree of tightness of the chain is improperly adjusted.	The transmission chain makes an abnormal sound when transmission	Adjust the degree of tightness to 15mm~25mm.
	The chain is abraded excessively.	The transmission chain jumps off the teeth.	The transmission chain is easy to fall off.	Replace a complete set of driving and driven sprockets and the transmission chain.
Transmission chain set	The chain set is damaged.	----------	The chain set makes a sound.	Replace the transmission chain set.
Adjuster	RHS and LHS adjusters are regulated improperly.	The rear wheel tilts to the left or right side.	The transmission chain is easy to fall off.	Re-regulate the RHS and LHS adjusted in the way to the RHS and LHS scales are consistent.
	The adjuster is damaged.	The adjuster fails.	The transmission chain is easy to fall off.	Replace the adjuster.
Buffer rubber jacket	The buffer rubber jacket is seriously abraded.	The buffer rubber jacket is damaged.	The rear wheel makes an abnormal sound when transmission.	Replace the buffer rubber jacket.

Section 7 Frame and Accessory Mechanism

The main frame is the supporting structure and the main bearing part of the motorcycle. As the motorcycle is subject to strong road impact and vibration when driving, the selected materials and structure are required to have a very high strength and stiffness, and the main frame must be light in weight. In this way, it is advantageous to high-speed motorcycle driving.

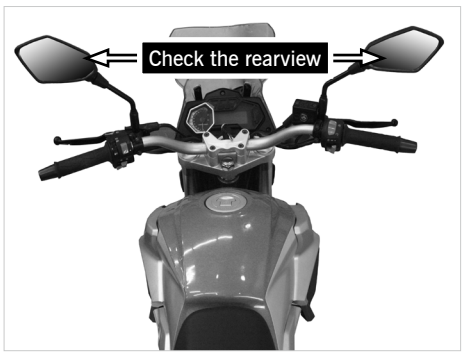
1. Structure and Working Principles of the Main Frame and Accessory Mechanism



The main frame is the plate-welding type. It is high in strength, stiffness and applicability and so on. The main frame mainly included the front-section frame, tail frame and engine cradle.

The main frame is used to support the motorcycle engine, transmission system, control system, seat cushion, fuel tank and brake system, etc; it also provide support points to install other accessory mechanism, so that the motorcycle forms a complete whole.

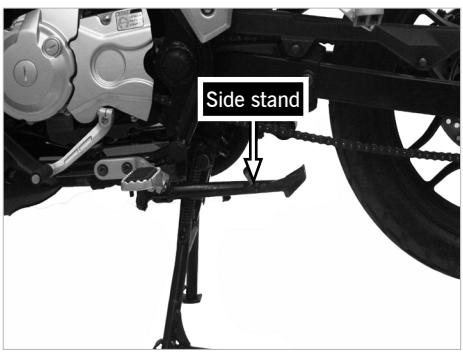
2. Demolition and Maintenance of the Main Frame and Accessory Mechanism



[1] Check the rearview mirror for any looseness or damage. If the rearview mirror becomes loose or is damaged, it is necessary to tighten or replace the mirror timely.

⚠ Caution

Before driving the motorcycle, the driver must ensure the rearview mirror is clean and dust free, and adjust the rearview mirror to the best angle.



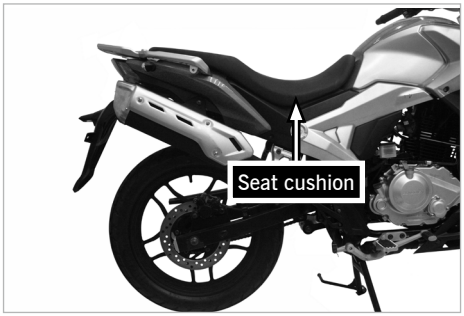
[2] Check whether the side stand is bent and deformed and replace or correct it if necessary.

[3] Check the motorcycle closure panel for any damage and place it when necessary.

⚠ Suggestion

If the closure panel is damaged, it should be replaced.

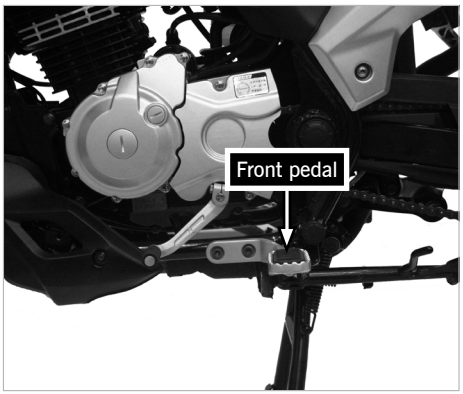
[4] Check the seat cushion for any damage and place it when necessary.



⚠ Suggestion

If the seat cushion is damaged, it should be replaced.

[5] Check the rubber jacket of the front pedal for any damage and place it when necessary.



⚠ Suggestion

If the rubber jacket of the front pedal is damaged, it should be replaced.

3. Refer to Table 4-5 in respect of damage forms, fault phenomena and common maintenance methods of the main frame and accessory mechanism:

Table 4-5: Maintenance of the Main Frame and Accessory Mechanism

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Main frame	The main frame crashes or falls.	The main frame is bent and deformed.	The motorcycle runs off tracking.	Rectify or replace the main frame.
	The main frame crashes or falls.	The main frame cracks or breaks.	The motorcycle cannot be driven.	Joint or replace the main frame.
	The main frame is subject to road shocks and vibration.	The joints fall off the main frame.	The motorcycle shivers orruns off tracking.	Joint the main frame.
Side stand	The side stand deforms or breaks.	The side stand fails to return normally.	The motorcycle makes a sound when driving, affecting the parking of the motorcycle.	Rectify or replace the side stand.
	The return spring loses its spring feature.	The side stand fails to return normally.	The motorcycle makes a sound when driving,affecting the parking of the motorcycle.	Replace the return spring.
LHS side cover	It is damaged due to a crash.	The LHS side cover is damaged.	The appearance is negatively influenced.	Replace or mend the LHS side cover.
RHS side cover	It is damaged due to a crash.	The RHS side cover is damaged.	The appearance is negatively influenced.	Replace or mend the RHS side cover.
Front fender	It is hit or vibrated.	The front fender deforms or breaks.	The motorcycle makes a sound when driving.	Replace the front fender.
Rear fender	It is hit or vibrated.	The rear fender deforms or breaks.	The motorcycle makes a sound when driving.	Replace the rear fender.
Front and rear seat cushions	----------	The leather sheath of the seat cushion is worn.	The riding comfort is reduced.	Replace the front and rear seat cushions.
Front pedal	----------	It deforms or breaks.	The driving safety is affected.	Replace the front pedal.
Rear pedal	----------	It deforms or breaks.	The riding comfort is reduced.	Replace the rear pedal.
Pedal rod	----------	It deforms or breaks.	Affect the start-up performance	Replace the pedal rod
Rearview mirror	It is hit or vibrated.	It deforms or breaks.	The driving safety is affected.	Replace the rearview mirror.

Section 8 Steering Gear

The motorcycle is steered by manipulating the steering bar. The steering bar is connected with the steering column. As the frame stand pipe is centered, the twirl of the steering column drives the front damper so as to steer the front wheel.

1. Structure and Working Principles of Steering Mechanism

[1]Steering bar

On the right of the steering bar is the throttle twist grip, which controls the fuel flow, the right handle is the front brake handle. The RHS and LHS bars have been installed with the left and right combination switches, rearview mirrors, air choke switch and so on.

[2]Steering column

The steering column is an important part of the motorcycle steering mechanism, including the steering column, lower yoke plate, bearing, bearing rings and other components. The steering column and the lower yoke plate are jointed together and set in the frame stand pipe. The mass of the motorcycle and the crew is transmitted to the front wheel via the steering column, while the impact load generated by the impact from the road surface is transmitted to the motorcycle body through the steering column. Therefore, the steering column has to bear a greater impact load, and also to ensure the flexible rotation in the running.

2. Demolition and Maintenance of Steering System

In order to maintain a good maneuverability of the vehicle, the steering mechanism should be maintained on a regular basis. For the first 1500km and every 600km afterwards a motorcycle runs, the steering mechanism should be demolished to check the bearing rings and balls for any abrasion. If necessary, install new pieces. Balls must be replaced completely. The mixed use of old and new balls is not permitted.

The maintenance of steering column focuses on the thrust bearing. If the bearing is not lubricated for a long time and adjusting nuts become loose, it will result in excessively lengthened bearing clearance and the vehicle may jitter dramatically in the driving, affecting the stability and safety of the vehicle. On the other hand, if the bearing is damaged or adjusting nuts are screwed too tight, the steering bar may be subject to undue rotation resistance or even be stuck, resulting in operational difficulties and even out-of-control.

Hold up the vehicle with a main stand-up and make the front wheel hang in the air. Shake the front fork or front damper, and check the bearing for any looseness. Steer to the left and right to check whether the bearing is flexible. Whether too tight or too loose, it should be adjusted. Loosen the lock nuts on the steering column. While turning the adjusting nuts, check the bearing for its degree of tightness until it becomes normal, and then re-tighten the lock nuts on the steering column.

Refer to Table 4-6 in respect of damage forms, fault phenomena and common maintenance methods of the steering column:

Table 4-6: Maintenance of the Steering Column

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Ball race	Adjusting nuts are screwed too tight.	There leave a too narrow fit clearance between balls and ball races.	The steering bar cannot be turned flexibly.	Adjust nuts with a wrench until the steering column can be twisted flexibly and there is no axial movement between the steering column and the stand pipe.
	The ball raceways are excessively braded, or have pits, dents, cracks and damage.	----------	The steering bar cannot be turned flexibly, and jitters or shakes in the driving.	Replace a complete set of ball races.
Ball	Balls are abraded, deformed or damaged.	----------	The steering bar cannot be turned flexibly, and jitters or shakes in the driving.	Replace a complete set of balls.
Steering column	The steering column is bent and deformed.	The steering column is bent and deformed.	The motorcycle runs off tracking and the steering bar does not work.	Rectify or replace the steering column.

Section 9 Steel Wire Rope for Control

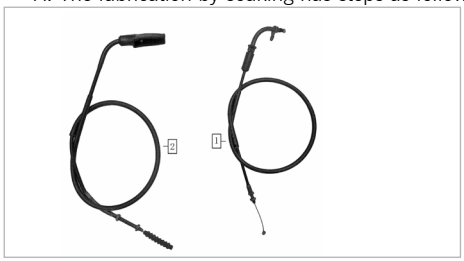
1. Structure and Working Principles of Steel Wire Rope for Control

The steel wire rope for control includes a steel rope, a wire-draw head and a plastic hose with a metal spring, etc. Made of multiple strands of steel wires, the steel rope should be soft and durable and is able to carry a heavy load. This will not only ensure the strength of the steel rope, but also make it very soft. The wire-draw head and steel rope are connected using soldering, ramming, zinc alloy die casting and other methods. The outer layer of the hose is plastic, and the inner layer is spring-like flexible pipe by winding a steel wire. It not only adapts to multi-direction bending, but also changes the length when subject to axial pressure. A layer of nylon sleeve is attached between the metal-spring plastic hose and the steel rope, in order to avoid the direct friction between them.

2. Maintenance of Steel Wire Rope for Control

It is essential to clean and lubricate the steel wire rope for control regularly in order to ensure reliable operation and to extend its service life. For the first 1500km and each 3000km afterwards a vehicle runs, the wire rope should be cleaned and lubricated. The wire rope can be lubricated in two ways: soaking and dripping.

A. The lubrication by soaking has steps as follows:



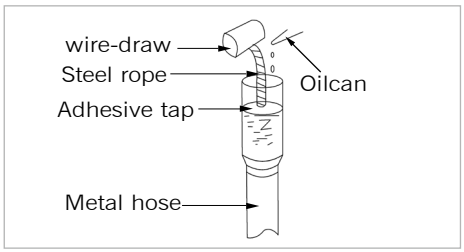
[1.]Soak the entire set of wire rope in kerosene for 5-10min, while pulling it back and forth to wash out the debris inside the hose.

[2.]Soak the entire set of wire rope in mixed oil prepared by 1: 1 to and lubricant for 5min, while pulling it back and forth to push mixed oil into the hose.

[3.]Take out the steel wire rope for control and wipe out the mixed oil outside.

B. Drip-feed lubrication

Steps are as follows:



[1.]Wrap a transparent tape to the end of metal-spring plastic hose in a tubular form as shown.

[2.]Hold up the end wrapped with the tape, and pull out the wire-draw head.

[3.]Use the oil tank to slowly immerse the hose in the oil until the bottom of the steel rope drips oil.

Refer to Table 4-7 in respect of damage forms, fault phenomena and common maintenance methods of the control system:

Table 4-7: Maintenance of Control System

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Steering bar	The steering bar is bent and deformed.	The steering bar is bent and deformed.	The motorcycle runs off tracking.	Rectify or replace the steering bar.
Clutch control rope	The rope is pulled inflexibly in the rope coat.	It takes great efforts to manipulate the clutch control rope or the rope does not return to position properly.	Clutch slips or drags	Clean, lubricate or replace the control rope.
	The steel rope breaks.	----------	Clutch drags	Replace the control rope.
Rear brake pedal	Too short free stroke	----------	The rear brake shoe fails to return.	Readjust the free stroke.
	Too long free stroke	----------	The rear brake fails.	Readjust the free stroke.

Section 10 Damper

The front damper is an elastic connecting member between the front wheel and the vehicle body. The rear damper mainly receives the axial force from the rear wheel. They both support the weight of the vehicle body. In the process of driving the motorcycle, dampers effectively and quickly decay the impact and shock from wheels to occupants and buffer the stress on various parts of the motorcycle to extend the service life and improve the riding comfort, operability and stability.

1. Structure and Working Principle of Front and Rear Dampers

[1]Front damper

The front damper is a combined type with a hydraulic spring. The front damper is mainly composed of a damper spring, a seal ring, a dust cover, a piston ring, a damper column, a piston rod, a buffer spring, a one-way valve spring seat, a one-way valve spring, a one-way valve, one-way valve seat, a damper cylinder, piston rod seat and other components.

When the front wheel is subjected to the impact and vibration from the road surface, the damper cylinder ascends, and the damping oil in the damper flows up through the one-way valve and the hole in the piston rod; at this time, the damping force is not big. When the damper cylinder continues to ascend, the gap between the one-way valve seat and the cone of the piston rod seat is getting smaller and smaller, and the damping force is increased to prevent the front damper cylinder from colliding with the front damper. When the damper cylinder descends due to the restoring force of the front damper spring, the damping oil can only flow out of the small hole in the piston rod due to the closed one-way valve, to form a larger damping force, effectively attenuating the vibration of the front damper spring.

[2.]Rear damper

The rear damper is also a combined type with a hydraulic spring. It consists mainly of an upper joint, rubber jacket, a bush, a rear damper spring, a rear damper rod, a piston, a buffer, and a lower joint, etc.

The rear damper is mainly stressed by the rear wheel axial force. When the rear wheel is subjected to the impact and vibration from the road surface, the rear damper compresses and stretches, the hydraulic oil in the buffer is forced to flow through the damping hole, effectively attenuating the vibration of rear damper.

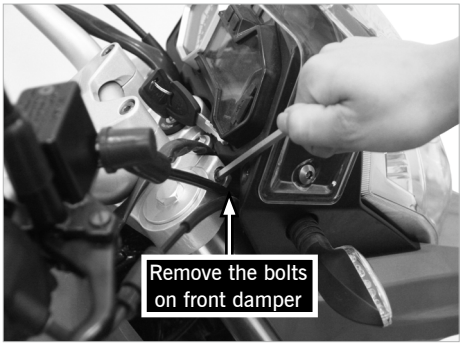
2. Demolition and Maintenance of Front Damper

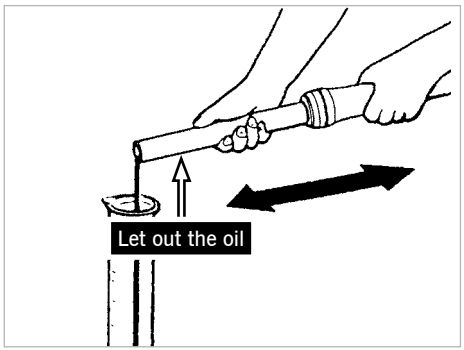
[1] Check the front damper for its effective stroke and operating performance and for any leakage.

⚠ Caution

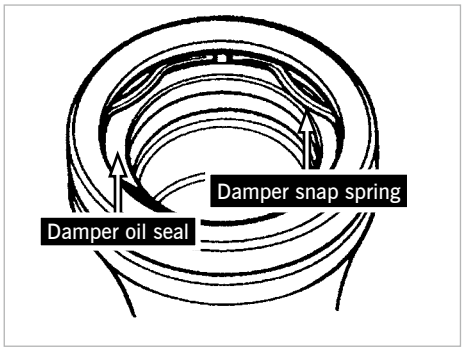
The front damper, subject to an abnormal situation, should be timely inspected and maintained, so as to ensure traffic safety.

[2] Remove the fixing bolts on the front damper and take out the front damper.

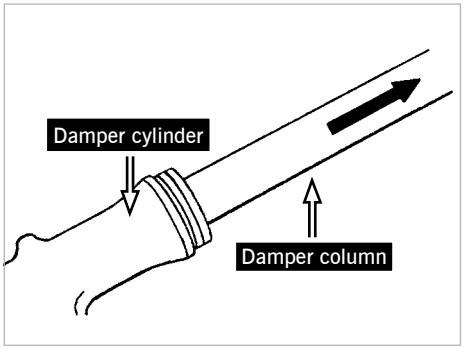




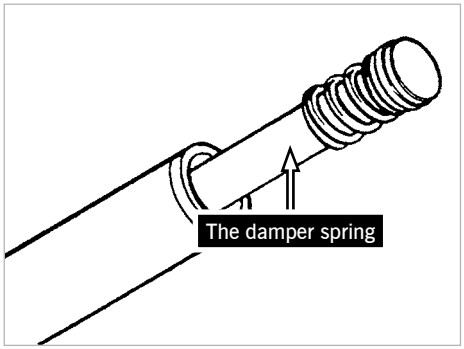
[3] Remove the drain bolt on the front damper. Pour out the oil and check if the oil is deteriorated. If the oil is deteriorated, It is necessary to replace the oil.



[4] Remove the oil seal and snap spring on the front damper. Check the oil seal for any abrasion on its edge and if necessary, replace it.

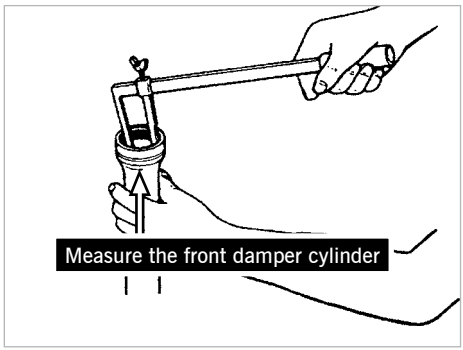


[5] Remove the damper column and the damper cylinder. Check the damper column and the damper cylinder for any abrasion. Replace them if necessary.

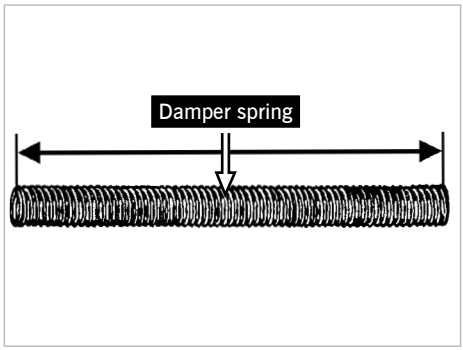


[6] Remove the return spring on the column and check it for any abrasion or deformation. Replace it if necessary.

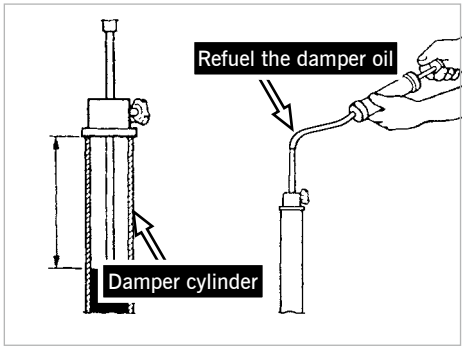
[7] Apply a caliper to measure the inside diameter of the front damper cylinder. If the diameter exceeds the limit for maintenance, replace the front damper cylinder.



[8] Remove the return spring on the front damper, and check it for any abrasion. Replace it if necessary.

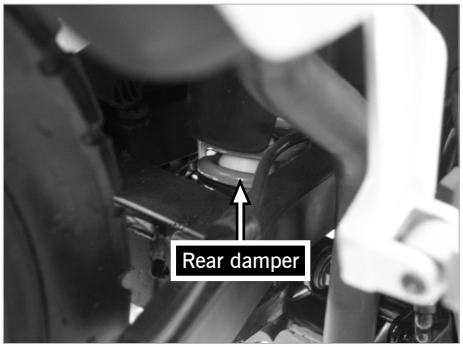


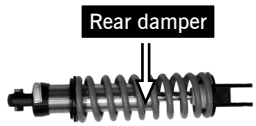
[9] To install the front damper, the damper oil must be added as specified, and the standard capacity of the front damper oil is (330 ± 5) mL.



3. Demolition and Maintenance of Rear Damper

[1] Check if the rear damper spring is flexible. Check the rear damper buffer of any oil leakage. It is necessary to replace the damper assembly if the buffer leaks.





[2] Check if the RHS and LHS springs on the rear damper are consistent in length. Check the springs for any crack or damage on the surface. Replace the rear damper if necessary.

⚠ Caution

When rubber parts are damaged, worn or aged, it is necessary to replace new pieces.

4. Refer to Table 4-8 in respect of damage forms, fault phenomena and common maintenance methods of front and rear dampers:

Table 4-8: Maintenance of Front and Rear Dampers

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Front damper	The front damper spring loses its elastic force or breaks off.	The front damper is too soft or makes an abnormal sound.	Riding comfort, stability and security decrease.	Replace front damper or front damper spring.
	The front damper column is bent and deformed.	The RHS and LHS front damper columns are not in a horizontal line.	The front motorcycle wheel runs off tracking, affecting the comfort, stability and security.	Rectify or replace the front damper or front damper column.
	The surface of operating stroke of front damper column is impacted or scratched.	The front damper leaks oil at the oil seal.	Riding comfort, stability and security decrease.	Replace front damper or front damper column.
	The chromium coated surface of operating stroke of front damper column is abraded and the metal part is exposed.	The front damper leaks oil at the oil seal.	The front motorcycle wheel runs off tracking, affecting the comfort, stability and security.	Replace front damper or front damper column.
	The front damper cylinder is heavily abraded or broken.	The front damper leaks oil.	The front motorcycle wheel runs off tracking, affecting the comfort, stability and security.	Replace front damper or front damper cylinder.
	The piston rod is excessively abraded or damaged.	The front damper is too soft.	Riding comfort, stability and security decrease.	Replace front damper or piston rod.
	The piston ring is excessively abraded or damaged.	The front damper is too soft.	Riding comfort, stability and security decrease.	Replace front damper or piston ring.
	The edge of oil seal is excessively abraded or damaged.	Oil leaks from the oil seal, the front damper is too soft.	Riding comfort, stability and security decrease.	Replace the oil seal of front damper.
	The front damper oil is insufficient or deteriorated.	The front damper becomes soft.	Riding comfort, stability and security decrease.	Add or replace front damper oil as required.
Rear damper	The rear damper spring loses its elastic force or breaks off.	The rear damper is too soft.	The rear motorcycle wheel runs off tracking, affecting the comfort, stability and security.	Replace the rear damper.
	The rear buffer leaks oil.	The rear damper is too soft.	Riding comfort, stability and security decrease.	Replace the rear damper.
	The piston rod on the buffer is bent, deformed, or broken.	The rear damper is bent and deformed.	The rear motorcycle wheel runs off tracking, affecting the comfort, stability and security.	Replace the rear damper.
	The upper and lower rubber jackets are abraded or aged.	The rear damper is bent or makes a sound.	Riding comfort, stability and security decrease.	Replace the upper and lower rubber jackets.

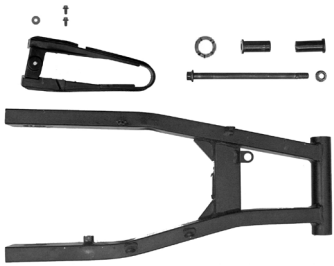
Section 11 Rear Fork

The rear fork of the motorcycle connects the rear wheel with the main frame, and enables the rear wheel to move up and down in a certain range around a fixed point on the frame through the rear damper to withstand the impact and vibration suffered by the rear wheel.

1. Structure and Working Principles of Rear Fork

Subject to big impact and vibration from the rear wheel, the rear fork requires high intensity and rigidity in respect of material selection and jointing. Processes include jointing, riveting, etc. The rear fork assembly mainly includes a rear fork, dust seal, dustproof sealed cap, and fork shaft sleeve, etc.

In order to ensure that the rear fork can move up and down around a fixed center, joints of the rear fork and vehicle body are equipped with bushings or bearings. The rear fork makes the rear wheel more flexible and reliable.

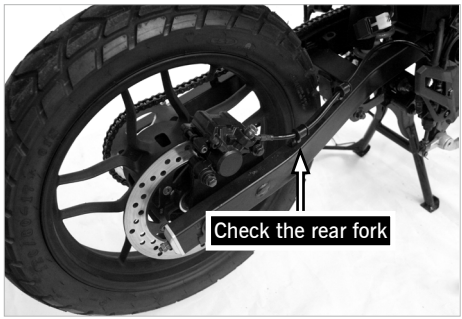


2. Demolition and Maintenance of Rear Fork

[1] Check the rear fork for any deformation or crack generated due to the impact of external forces. Check whether the fit clearances of various parts of the rear fork become larger, and the rear fork swings too dramatically.

⚠ Caution

In any of the above conditions, please replace or repair the rear fork timely, to ensure the riding comfort and safety.



3. Refer to Table 4-9 in respect of damage forms, fault phenomena and common maintenance methods of the rear fork:

Table 4-9: Maintenance of Rear Fork

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Rear Fork	The rear wheel is impacted.	The rear fork is bent and deformed.	The front motorcycle wheel runs off tracking, affecting the comfort, stability and security.	Rectify or replace the rear fork.
	The motorcycle rolls over, the rear fork falls and breaks.	The rear fork breaks.	The motorcycle cannot run properly.	Joint or replace the rear fork.
	The rear wheel is subject to too violent impact and vibration.	The rear fork falls off.	Riding comfort, stability and security decrease.	Joint the rear fork.
	Subject to poor road conditions, the motorcycle suffers too violent impact and vibration.	The dust seal of rear fork shaft sleeve is heavily abraded.	The rear fork shaft sleeve or bearing is poorly sealed.	Replace the dust seal of rear fork shaft sleeve.

Section 12 Wheels

The front and rear wheels are the running parts of the motorcycle, which support the mass of the whole vehicle and ensures a reliable adhesion to the road when driving to prevent slipping. The wheels can mitigate and absorb vibrations and shocks for road reasons. The front wheel together with the steering part of the motorcycle determines the driving direction. The rear wheel is powered by the engine and drives the motorcycle. The wheels are mainly composed of cover tires, inner tubes, aluminum wheels, wheel hubs, bearings, bushings, oil seals, wheel axles and other components.

1. Structure and Working Principles of Wheels

[1.]Tires

Motorcycle tires are an important part of the running system. Tires contact with the road directly, bear the mass of the whole vehicle, ease the driving vibrations and shocks by virtue of the elasticity, and ensure the driving balance. Tires are of reliable adhesion. Tires include cover tires, inner tubes and liner bands.

Cover tire

The cover tire consists of the tread, carcass, buffer layer and bead. The cover tire treads directly contact with the road. Various tread patterns enable the motorcycle to get the appropriate adhesive forces in different pavements. The carcass should be of a certain strength, but not too thick for purpose of heat dissipation. The bead is made of the cord fabric edges, the bead ring and the wrapper, so that the tire is firmly fixed on the rim. If the circumference of the bead is too short, it is difficult to disassemble and assemble the tire. Too long circumference may make it easy for the tire to jump out. The cord fabric layer is the skeleton of the cover tire, and the cord fabrics of the cover tire intersect with each other and forms a corner with the tire cross section (crown angle). The cord fabric lines in a radial tire are arranged in the radial distribution direction. The crown angle is 0 ° . The radial tire has merits such as reduced power loss, fuel savings, and long life, etc.

Inner tube and liner band

The inner tube is made of rubber and has a circular shape. It is equipped with a cycle valve, through which the pressure inside the tube can be adjusted. The inflatable pressure in the inner tube is the main factor affecting the use of wheels and tires. The main indicator of the inner tube is the air tightness. The liner band is an annular rubber band, which separates the inner tube from the rim, protects the air tightness of the inner tube, and prevents the inner tube from being punctured by the sharp protrusions.

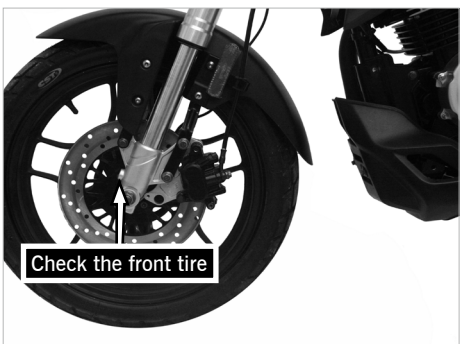
[2.]Wheel rim

The wheel rim is a skeleton that supports and secures the tire. The wheel rim may be a die-cast rim and a spoke-type rim. Die-cast the wheel rim and wheel hub into a whole by use of aluminum alloy and then machine it, consequently forming a die-cast rim. Such a rim is high in strength, simple in process and easy in assembly, but it is of poor elasticity and cannot be adjusted. If deformed or damaged, the rim should be replaced completely. The spoke-type rim is made by rolling steel strips. There are a number of hole seats in the circumference of the rim. Each hole seat is fitted with a spoke and spoke nut. The other end of a spoke is connected to the hub. Such a rim has a good impact resistance, is adjustable and easy for maintenance. In this section, take the die-cast rim as an example.

[3.]Wheel hub

Wheel hubs of a motorcycle are divided into front wheel hub and rear wheel hub. Front and rear wheel hubs are basically similar in structure, but as the rear wheel is a driving wheel, a power transmission structure is added to the rear wheel. For the benefit of normal movement of wheel hubs, front and rear wheel hubs are equipped with bearings, bushings, oil seals and wheel axles, etc.

2. Demolition and Maintenance of Wheels

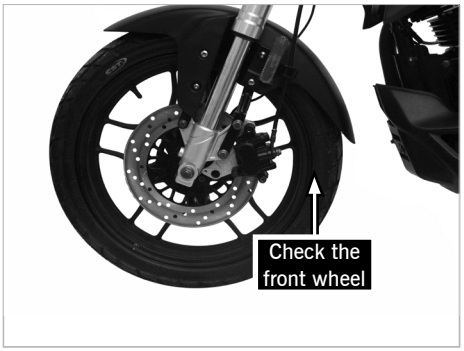


[1] Check whether the tire pressure is kept within the normal pressure range. Remove foreign matters attached to the tread pattern so as to keep the adhesion of tire to the ground and prevent inner and outer tires from being damaged.

⚠ Caution

Check the cover tire for any abrasion. If it exceeds the limit for maintenance: 2.00mm, it should be replaced.

[2] If the front wheel is deformed due to vibration or impact, or runs off tracking, or if the steering bar jitters or shakes in the driving, it is necessary to replace or adjust the wheel.



⚠ Caution

The wheel needs to be replaced when the wheel runs out beyond the limit for maintenance .

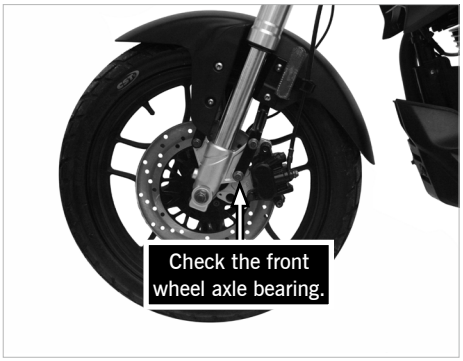
[3] Before the disassembly of the front wheel, the motorcycle body must be firstly secured in the way that hangs the front wheel off the ground, and then remove the fitting nuts on front axle and take out the front axle and take down front wheel assembly.

[4] Take out the front axle bushing and check it for any abrasion. If the front wheel bushing is severely worn, replace it.

⚠ Caution

▶ The bushing should be greased when installed

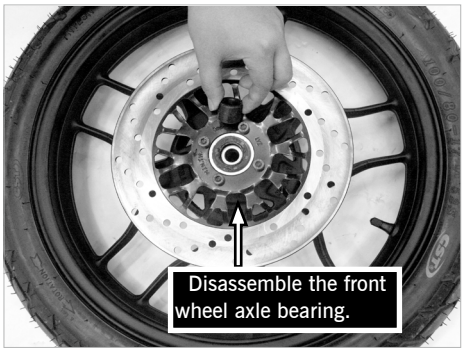
[5] Take out the front axle oil seal and check it for any abrasion on the edge. If the edge of front wheel oil seal is severely worn, replace it.



[6] Place the front wheel on the calibration stand and rotate the front wheel at a high speed. Check the front wheel for any abrasion and the free stroke. Check whether the front wheel bearing is abraded. If it is abraded, it should be replaced.

⚠ Caution

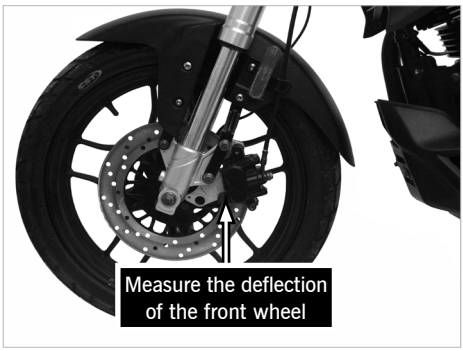
If it makes a noise or the free stroke is too wide, the bearing must be replaced. The bearing should be greased when installed, and bearing oil seal should be outwards.



[7] If the front wheel bearing is severely worn and damaged, apply a remover to gently knock out the bearing and install a new bearing.

⚠ Caution

The front wheel bearing should be greased when installed, and bearing oil seal should be outwards.



[8] Place the front wheel on the calibration stand and check the deflection of front wheel. Rotate the front wheel by hand and measure and read the front wheel deflection value with a dial indicator.
Limit for maintenance: radial 2.0 mm
axial 2.0 mm

⚠ Caution

If the front wheel deflection value exceeds the above maintenance limit of 2.0mm, the front wheel should be corrected or replaced.

[9] Check the cover tire of front wheel for any abrasion. The abrasion of tread pattern of the front wheel is subject to a maintenance limit: 2.00 mm. In the use of the motorcycle, if the front wheel tire pressure is insufficient, check the tire valve core first and then the inner tube for any air leakage.

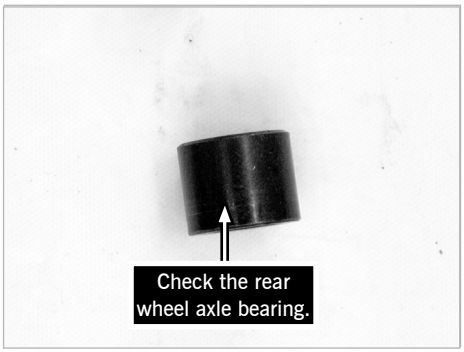
⚠ Caution

If the inner tube valve core leaks, it must be repaired or replaced.
If the inner tube leaks, it must be repaired or replaced.

[10] Loosen the lock nuts on the rear wheel axle, take out the rear wheel axle and remove the rear wheel assembly.

[11] Remove the rear wheel and check the rear wheel hub for any damage. Replace the rear wheel hub if necessary.

[12]Check whether the rear wheel bearing is abraded. If it is abraded, it should be replaced.



⚠ Caution

The bushing should be greased when installed

[13] Check the front and rear aluminum wheels for any deformation. Rectify or replace the front and rear aluminum wheels if necessary. \Check the rear wheel tread pattern for any abrasion. If it exceeds the limit for maintenance, cover tire of the rear wheel should be replaced.

3. Refer to Table 4-10 in respect of damage forms, fault phenomena and common maintenance methods of wheels:

Table 4-10: Maintenance of Wheels

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Front wheel	The front wheel is twisted or deformed.	The front wheel is twisted or deformed.	The front wheel runs off tracking, and the steering bar jitters or shakes in the driving.	Replace the front wheel
	The seat hole for bearing of wheel hub is excessively worn.	The fit of the bearing and the bearing seat hole becomes loose.	The front wheel runs off tracking, and the steering bar jitters or shakes in the driving.	
	The bearing is excessively abraded or damaged.	The radial and axial clearances between the outer ring and inner ring of the bearing are too large or the bearing rotates inflexibly.	The front wheel runs off tracking, and the steering bar jitters or shakes in the driving.	.Replace the bearing
Front tire	The tire is abraded excessively.	----------	The tire is easy to slip in the driving, and is of poor side slip prevention.	Change the cover tire.
Odometer gear box	The gear is damaged	----------	The odometer pointer does not move.	Replace the odometer gear box
	The gear ring is damaged	----------	The odometer pointer does not move.	Replace the odometer gear box
Rear wheel	The rear wheel is twisted or deformed.	The rear aluminum wheel is twisted or deformed.	It runs off tracking, the rear wheel shakes in the driving	Replace the bearing
	The rear wheel is broken	----------		
	The wheel hub bearing hole is excessively worn.	The fit of the bearing and the bearing seat hole becomes loose.		
	The bearing is excessively abraded or damaged.	The radial and axial clearances between the outer ring and inner ring of the bearing are too large or the bearing rotates inflexibly.		
Rear tire	The tire is abraded excessively.	----------	The tire is easy to slip in the driving, and is of poor side slip prevention.	Change the cover tire.

Section 13 Brake

Motorcycles often slow down to stop in the drive. This requires the brake on the wheel to exert a force or torque to prevent its rotation, for the purpose of deceleration or parking. For an average motorcycle, the right hand manipulates the front wheel brake and the right foot operates the rear wheel brake. For some models using automatic clutch engines, such as mopeds or motor scooters, the rear wheel is operated by the left hand. Motorcycle brakes can be divided into drum brakes and disc brakes. The motorcycle is a front and rear disc brakes.

1. Structure and Working Principles of Brakes

Disc brakes include mechanical and hydraulic types. Most motorcycles are currently equipped with hydraulic disc brakes. A hydraulic disc brake generally include a braking grip (brake pedal), brake master cylinder, oil storage cylinder (the oil storage cylinder and the brake master cylinder are generally made as one in the front brake), brake caliper, brake disc, brake pipe and other components. When braking is applied, the brake grip compresses the master cylinder to raise the pressure in the hydraulic system and urge the main piston in the caliper, which presses the friction plate against the brake disc so that the brake disc fixed to the wheel gets the braking torque. Disc brake is characterized by gentle operation, automatic cleaning and scare failures.

Structure of disk brake

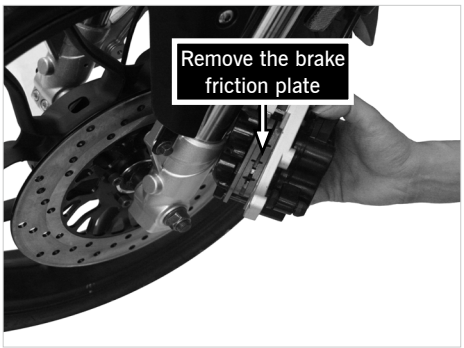
2. Demolition and Maintenance of a Brake

[1] Hold the front brake grip by the right hand and check the braking performance of the front brake. The standard free stroke of the front brake grip is: 10mm ~ 20mm.

⚠ Caution

If the front brake grip can not reach the standard value of 10m m ~ 20mm, it must readjusted.

[2] Remove the front brake caliper lock bolts and take down the front brake caliper.



[3] Remove the disc brake friction plate and check the brake caliper piston for its performance. If the brake caliper piston cannot function properly, the hydraulic brake must be repaired or replaced.

[4] Remove the front axle fastening nuts and the speedometer flexible shaft. Take down the front wheel.

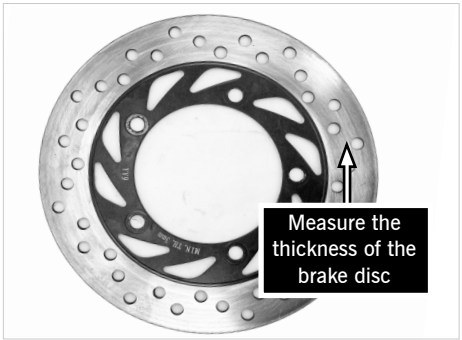
[5] Take out the speedometer and check it for any abrasion on the oil seal edge. If the oil seal edge of speedometer is severely worn, replace it.

[6] Remove the front wheel and the fixing bolts of front brake disc. Take out the front brake disc.

⚠ Warning

When front brake disc is installed , the locking glue must be applied to the bolts, to avoid the looseness of bolts.

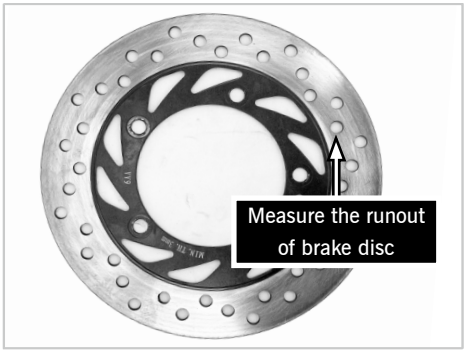
[7] Apply a micrometer to measure the thickness of the front brake disc. The maintenance limit is: 2.0mm.



⚠ Caution

If the brake disc thickness exceeds the maintenance limit of 2.0mm, it should be replaced.

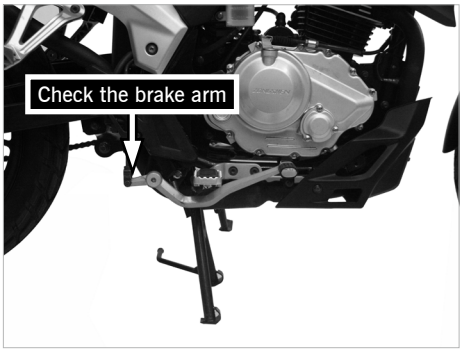
[8] Apply a dial indicator to measure the runout of front brake disc. The maintenance limit is: 0.3mm.



⚠ Caution

If the brake disc runs out beyond the maintenance limit: 0.3mm, it should be replaced.

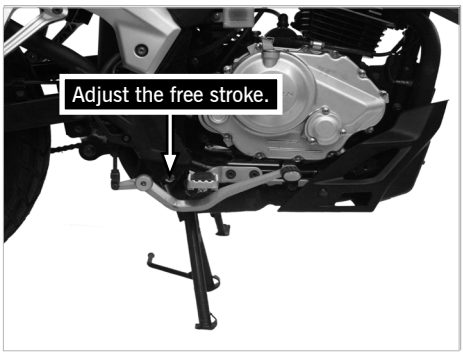
[9] Check whether the brake pedal can return to position normally and whether the free stroke of brake pedal is too large or too small. Adjust the free stroke of brake pedal to 20mm ~ 30mm.

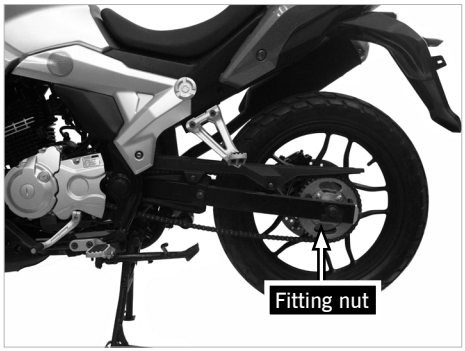


[10] When the free stroke of the rear brake pedal is too large or too small, adjust the free stroke of the brake pedal by adjusting the nuts on the rear brake lever.

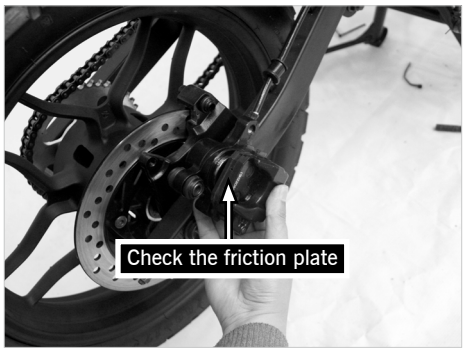
[a] Adjust the adjusting nuts on the rear brake and set the free stroke of the rear brake pedal to 20mm ~ 30mm.

[b] Tread the rear brake pedal for several times and then release it. Rotate the rear wheel assembly to check whether the rear wheel can rotate freely.

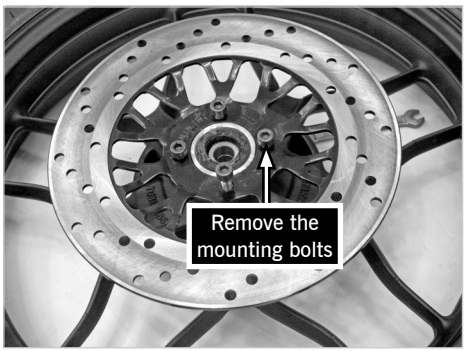




[11] Loosen the nuts on the rear wheel axle, take out the rear wheel axle and remove the rear wheel assembly.



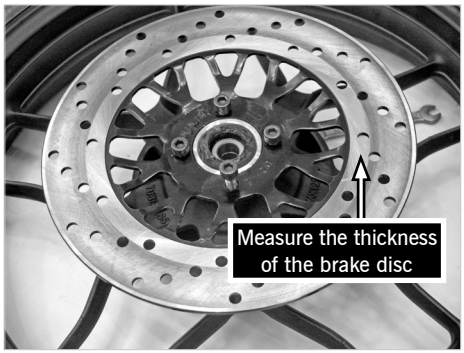
[12] Remove the rear brake friction plate and check the friction plate for any abrasion. The maintenance limit is: 2.0mm. Check the brake caliper piston for its performance. If the brake caliper piston cannot function properly, the hydraulic brake must be repaired or replaced.



[13] Remove the mounting bolts on rear brake disc and take out the rear brake disc.

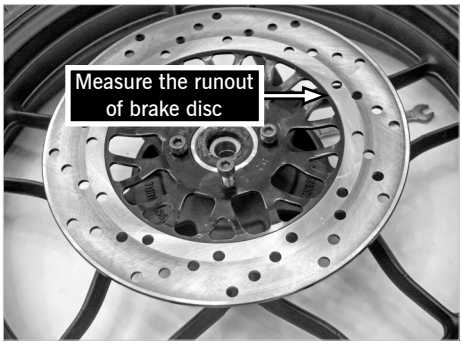
⚠ Warning

When rear brake disc is installed , the locking glue must be applied to the bolts, to avoid the looseness of bolts.



[14] Check the rear brake disc for any abrasion.

[15] Apply a dial indicator to measure the runout of the brake disc. The maintenance limit is: 0.3mm.



⚠ Caution

If the brake disc runs out beyond the maintenance limit of 0.3mm, it should be replaced.

4 Inspection and maintenance of ABS

Determine if ABS works properly: switch on the ignition switch and ABS trouble light (red) should be illuminated to conduct self-testing. Upon completion of self-testing, ABS trouble light turns off (Saifu or Bosch) or begins to flick (Continental); ABS trouble light turns off when the speed is higher than 10km/h and if the wheel speed sensor connector and ABS module connection are plugged in or the front wheel or rear wheel is separately rotated just before driving. Otherwise, ABS trouble light is faulty.

1. Common troubles, cause study and troubleshooting

Trouble A: after the motorcycle is energized, ABS trouble light is illuminated constantly

Cause study: ①. Disconnected ABS interfaces; ②. Improper connection of wire harness: ③. One or more broken ABS modules or wheel speed sensors; ④. Lower or higher power source voltage. Normal voltage stands between 9V and 16V.

Methodology: ①. Check all interfaces for missing connection or improper connection while eliminating the trouble;

②.Check if the wire harness matches the electrical schematic diagram;

③.Read the trouble code and the description using ABS fault diagnosis tester. In case A sensor distortion is indicated, install a new appropriate sensor; a elimination process is employed if ABS fault diagnosis tester is not available. To eliminate the trouble by replacing the existing sensor one after another. (after installing a new sensor, the trouble light would turn off when speed is higher than 20km/h)

④.Check power source voltage using a multimeter (in case the motorcycle is able to start as usual, the voltage is normal. Such check item can be cancelled.)

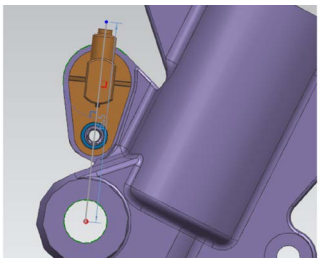
Trouble B: switch on the ignition lock, ABS trouble light turns off at end of self-testing. It is illuminated again as the motorcycle is running or the braking is applied.

Cause study: ①. Poor contact of wire harness; ②. Misled installation of wheel speed sensor;

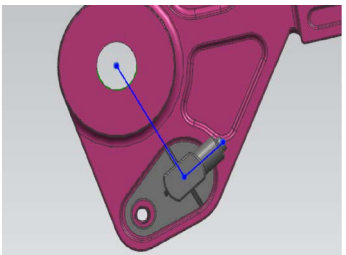
Methodology: ①. Check front&rear wheel speed sensor interfaces for possible poor contact of pins and eliminate the troubles; in case a fault diagnosis tester is available, read ABS trouble code using it. If a sensor grounded or with open circuit is indicated, check the sensor connector for poor contact carefully and eliminate the trouble;

②. Check if the wheel speed sensor wire harness code is in compliance with the design, code "87361..." stands for parallel mounting of sensor;

Parallel mounting of sensor (wheel axle in parallel with the outlet direction of the sensor)Code "87362..." stands for vertical installation of sensor.



Parallel mounting of sensor



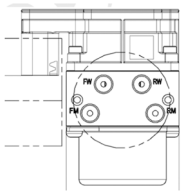
Vertical installation of sensor

Trouble 3: after several attempts to apply the brake, it feels like braking is soft or gone.

Cause study: 1. Poor sealing of brake fluid which leads to leakage of brake fluid; 2. Brake system vacuum filling fails. It fails to fill brake fluid with the 2nd circuit of ABS control module; 3. Brake caliper falls off.

Methodology: 1. Check the brake lines for leakage of brake fluid and fasten the leaking points and bleed air again.2. After bleeding, attempts are made to drive. Ensure bleeds occur again when ABS is operating until it feels comfortable with braking (mainly for the purpose of filling the 2nd circuit of ABS control module with brake fluid); 3. Fasten the brake caliper again.

Trouble 4: as brake is applied, the wheel is locked and can not released. There is no reacting force from ABS.



Interface definition
FM front wheel master cylinder
FM front wheel wheel cylinder
RM rear wheel master cylinder
RM rear wheel wheel cylinder

Cause study: misled connection of brake line

Methodology: reconnect the brake line in a correct sequence which is shown in the figure below:

2. The torque required for the connecting bolt for the braking system:

Mushroom head connecting bolt, required torque: 20N.m±2N.m

Cooper packing connecting bolt, required torque: 30N.m±2N.m

3. The requirements on brake fluid: DOT 4 or higher can be used only.

3. Refer to Table 3-11 in respect of damage forms, fault phenomena and common maintenance methods of front and rear wheels:

Table 3-11: Maintenance of Front and Rear Brakes

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Brake pads	Friction plates are worn.		Brake is out of control or brake pads cannot return.	Replace brake pads as a set.
	The end of brake pad is worn to a slot.		Rear brake makes abnormal sound or is out of control.	
	The area of brake shoe touching with brake drum is too small.		Brake is out of control .	Repair or replace friction plates of brake pads
	The elasticity of brake shoe spring is not enough or broken.		Brake pads cannot return.	Replace return spring.
Brake cam	Moving parts are rusty or have foreign things.	The rotation of brake cam is not flexible.	Brake is out of control or cannot return.	Clean and lubricate brake cam.
	The circle surface of brake cam is worn.		Brake is out of control .	Replace brake cam.

Section 14 Instrument

The motorcycle instrument shows the operation condition of the motorcycle.

1. Structure and Working Principles of the Instrument

[1]Odometer

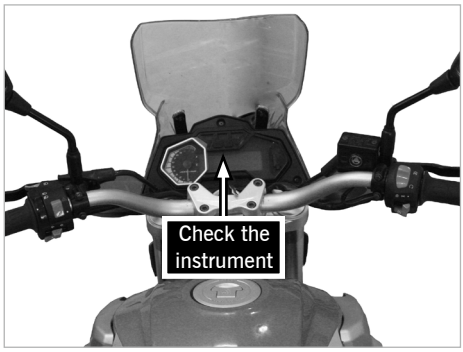
The odometer shows the current speed and the cumulative mileage of the motorcycle. It is driven by the front wheel. The rotate speed of the front wheel passes through the transmission mechanism, via the flexible shaft to the odometer, so that the cylinder rotates. The eddy current disc cutting the magnetic line of force generates an eddy current and a magnetic field, which interact with the magnetic field of the magnetic cylinder. Consequently, the eddy current disc is subjected to a torsional moment to overcome the gossamer resistance and to cause the pointer to rotate. The higher the speed, the stronger the magnetic field of the eddy current disc. Thus the torsional moment and the angle of deflection increases, so the pointer has an increased angle of deflection and points to a higher speed on the panel. At the same time, the rotated spindle drives the counter through the worm, and the counter shows the cumulative mileage of the motorcycle.

The odometer should be maintained once a year, and be lubricated at necessary locations.

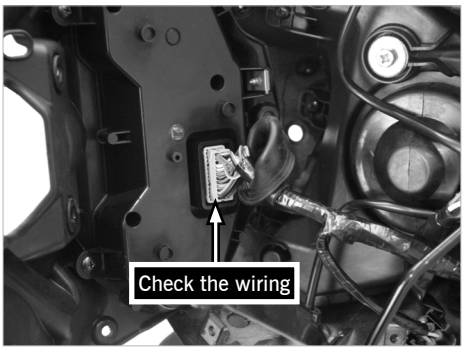
[2.]Fuel gauge

The fuel gauge shows the oil amount in the fuel tank. The fuel gauge shows the oil changes indicated by the fuel indicator, which receives changes in sensor resistance due to the height changes in oil level.

2. Demolition and Maintenance of the Instrument



[1] When instrument indicators cannot work properly, it is necessary to dismantle and check the odometer.



[2] Check if the instrument wiring is loose.

3. Refer to Table 4-12 in respect of damage forms, fault phenomena and common maintenance methods of the instrument:

Table 4-12: Maintenance of the Instrument

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Instrument assembly	The indicator lamp filament is burnt out.	The indicator lamp filament is burnt out.	The indicator lamp does not light.	Replace the bulb of the indicator lamp
	The instrument lamp filament is burnt out.	The instrument lamp filament is burnt out.	The instrument lamp does not light	Replace the instrument lampBulb
	The odometer is damaged	The odometer is damaged	The odometer does not work.	Change the odometer

Chapter 4: Electrical Parts

Section I Basic Knowledge

In order to understand the structure and working principles of the electrical system of the motorcycle, we must first have a basic knowledge of some electricity concepts.

1. Electricity, Current, Voltage and Resistance

The essential component of any substance is an atom, where there are positively charged nucleuses and negatively charged electrons, both of which maintain a balance in the amount of charge. The positive offsets the negative, so that the atoms are non-charged neutral. Once the object is affected by external factors, such as friction, magnetic field, etc., this balance will be broken, so that electrons transfer. At this time, the object is charged because atoms are no longer neutral. The nature of the charge carried by the object is relevant to the increase or decrease in the number of electrons. When the electrons increase, the object is negatively charged; when the electrons decrease, the object is positively charged.

Charges regularly move in a conductor in a certain direction, known as the current. Usually, the amount of charge in a unit interval is used to measure the current intensity, expressed by I. The current intensity is in amperes, expressed by A. Generally, the current flows from the positive pole to the negative pole of a battery.

As there is interaction force among charges, it is necessary to apply work to overcome this force for purpose of making charges to move. When moving positive charges, the work applied to overcome the attraction among charges is called the potential. The difference in potential between any two points is called the voltage, denoted by U. The voltage is in volts, expressed by V (v).

When the current flows in the object, the object will produce some resistance to it. This resistance is called the electronic resistance, denoted by R. The resistance is Ohms, expressed by Ω.

Different materials have different resistances. For example, copper, iron, aluminum and other metal have smaller resistances, known as conductors; wood, ceramics, plastic and other have greater resistances, known as insulators; some objects are neutral in electrical conductivity (such as silicon), known as the semiconductors.

2. Ohm’s Law

The Ohm’s Law reflects the correlation among the voltage, resistance and current, that is, the current I is in direct proportion to voltage U and the resistance R is inversely proportional to both of them. The formula is: I=U/R, the formula can be changed to: U=IR, R=U/I.

3. Electrical Equipment, Direct Current and Alternating Current, Power Supply

The so-called electrical equipment, which is commonly referred to as the load, means the equipment able to consume electricity and converts electricity into other forms of energy.

The device that provides the required electrical energy for the electrical equipment is called a power supply, also called a power unit. The power supply provides the current for the electrical equipment in two forms: direct current, whose scale and direction do not change over time; and alternating current, whose scale and direction periodically change over time.

4. Circuit, Series Circuit and Parallel Circuit

A closed loop consisting of a power supply, electrical equipment, and a connecting wire is called a circuit. The circuit has two basic forms: a series circuit and a parallel circuit. In a series circuit, several electrical devices are connected to each other end-to-end without forks between. Then the currents passing through each electrical device are identical. In a parallel circuit, two ends of each electrical device are connected to the same two points, and the voltages at two ends are equal. In more complex motorcycle circuits, series circuits and parallel circuits tend to exist at the same time.

5. Short Circuit and Open Circuit

In the normal circuit, if the two wires from the power supply to the electrical equipment are directly connected without electricity equipment, this phenomenon is called a short circuit. In a loop consisting of the power supply, electrical equipment and connecting wires, as the wire is switched off, the current can not form a closed loop, this phenomenon is called an open circuit.

6. Left-hand Rule and Right-hand Rule

In a magnetic field where the electromagnetic induction phenomenon occurs, extend the left hand and flatten the palm. Let the thumb be vertical to the rest of the four fingers, so that the magnetic lines perpendicular to the palm. The four fingers direct to the direction of the current. Then the direction of the thumb is the direction of magnetic field force. This is called the Left-hand Rule.

Unbend the right-hand thumb. The four fingers hold the coil along the current direction. Then the direction of the thumb refers to the magnetic line of force of the magnetic field generated by coil. This is the Right-hand Rule

The structure and function of the electric system as an important part of the motorcycle has a direct impact on the performance and riding comfort of the motorcycle.

The electrical system generally includes a power supply portion, an electricity consumption portion and a control portion. As the ignition system in the electrical portions is the core of the motorcycle, the ignition system will be illustrated as one part of the engine section. In the daily use, users should always maintain the electrical system. The electrical schematic diagram is always used to detect common faults of motorcycle electrical system, so the company generally provides electrical schematic diagrams in motorcycle maintenance manuals and service manuals.

Section 2 Power Supply

The power supply portion generally includes the magnetic motor (generator) and the storage battery. Its main function: in the motorcycle's own closed circuit, the magnetic motor and the battery provide electricity through the parallel operation to the electricity consumption portion, and store the excess energy in the battery.

1. Structure and Working Principles of Power Supply Portion

The power supply portion generally includes the magnetic motor (generator) and the storage battery. Its main function: in the motorcycle’s own closed circuit, the generator and the battery provide electricity through the parallel operation to the electricity consumption portion, and store the excess energy in the battery.

Generators, according to different features of output currents, can be divided into DC generators and alternators. Depending on structures, alternators can be divided into flywheel alternators, magnet rotor alternators and three-phase alternators. The magnetic poles in the first two alternators are permanent magnets, so they are also known as permanent magnet alternators; the latter is to produce magnetic poles by energizing the coils, so it is also called exciter alternator. Generally, a magnetic motor refers to a flywheel alternator.

Storage batteries can be divided into 6V battery and 12V battery, based on rated voltages. Storage batteries with identical rated voltages can be divided into multiple types according to battery capacity. In accordance with structures, storage batteries can can be classified into lead-acid batteries and fully sealed maintenance-free batteries.

[1.]Structure and principles of DC magnetos

A DC magneto works based on the principles of electromagnetic induction, that is, when the wire

perpendicular to the magnetic field lines moves in a uniform magnetic field, an induced electromotive force generated in the wire. If the wire and other external circuit form a closed loop, the induced current is generated in the wire, and the direction of the current is judged by the Right-hand Rule.

[2.]Structure and principles of alternators

Alternators can be divided into flywheel alternators, magnet rotor alternators and three-phase alternators.As with DC magnetos, alternators also work by principles of electromagnetic induction. An alternator does not produce currents by use of a wire perpendicular to the magnetic field lines moving in a uniform magnetic field. Instead, the rotor made of the permanent magnet continuously rotates so as to form a rotating magnetic field. Magnetic lines intermittently alternate through the fixed coil, resulting in inducted alternating current.

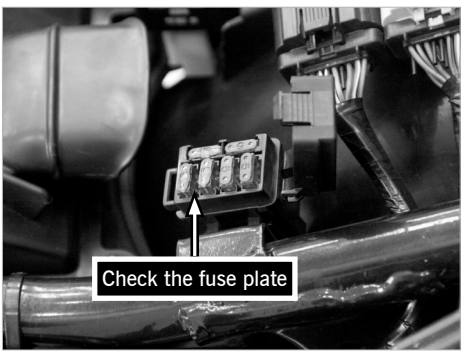
[3.]Structure and working principles of storage batteries

The battery has a light weight and small size. It is of good sealing and anti-vibration performance. A lead-acid battery also has other merits such as small internal resistance, voltage stability and so on. It consists mainly of shell, cover, polar plate, electrolyte and separator. The shell is made of hard rubber or plastic that resists acid, heat and vibration. According to rated voltages, batteries can be divided into three different or six independent parts. The outside of the shell is generally marked with two upper and lower lines, marked "H" for the upper line and "L" for the lower, indicating the upper and lower limits of the battery. Meanwhile, it is also marked with positive "+" and negative " - " to indicate the positive and negative poles..

The polar plate is the main working material to charge and discharge. A polar plate is made by electrificating a lead-antimony alloy grid plate coated with active material. The plate is divided into positive plate and negative plate. The active material on the positive plate is lead dioxide PbO2, while the active material on the negative plate is sponge-like pure lead Pb.

The electrolyte is a special sulfuric acid and distilled water mixture. The electrolyte density shall be measured at the standard measurement temperature of 20 ℃. At the standard temperature and in the condition that it is fully charged, the battery has a density generally between 1.24 ～ 1.29g/cm3. In each separate part of the shell are equipped with a group of plates and electrolytes. Each group of plates produces chemical reaction with electrolytes, constituting a separate single cell. The voltage is about 2V. 3 or 6 single cells in series constitute a battery at a rated voltage of 6V or 12V. The cover is made of hard rubber or hard plastic with high insulation properties, forming a complete interior space with the shell.

2. Demolition and Maintenance of the Power Supply Portion

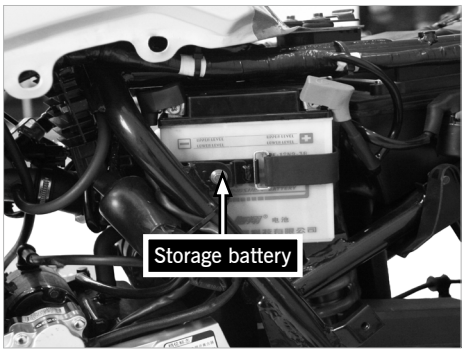


[1] Remove the fuse plate and check it for any burn-out. Install a new fuse plate of the same model.

Fuse plate model: 12V/20A

⚠ [redacted]

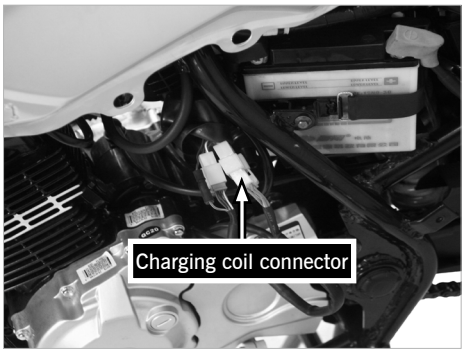
Install a new protective tube of the same model if it is damaged.



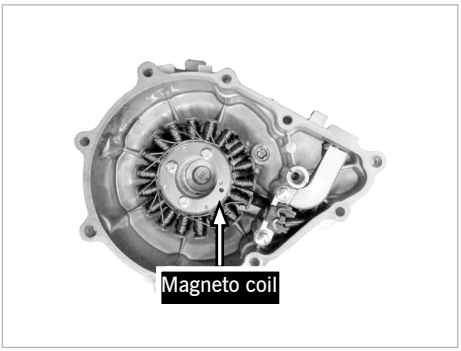
[2] Remove the battery and apply a multimeter to measure whether the voltage across the battery is "12V" or more. If it is lower than "12V", it is necessary to remove and charge the battery.

⚠ Caution

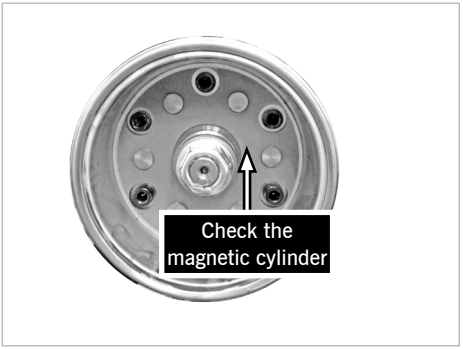
Tighten the bolts at battery connecting posts when they are loose.
Fill distilled water when the battery electrolyte liquid level is below the lower limit.
Keep away from the fire source when the battery is charge, because flammable and explosive gas may be released when charging.



[3] Remove the magneto charging coil socket and apply a multimeter to measure whether the magneto charging coil is a short circuit. If the magneto charging coil is a short circuit, it is necessary to replace it.



[4] Remove the LHS engine cover and take out the magneto stator. Apply a multimeter to measure the magneto stator resistor is in short circuit or open circuit. Replace the stator if the magneto stator resistor is in a short circuit or open circuit.



[5] Check the magnetic motor rotor cylinder for any faded magnetism. If it is the case, it is necessary to replace the magnetic cylinder.

3. Refer to Table 5-1 in respect of damage forms, fault phenomena and common maintenance methods of the power supply portion:

Table 5-1: Maintenance of the Power Supply Portion

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Charging coil	Short circuit	Electricity shortage	The headlamp does not light, the engine has difficult in starting, the engine is under-powered, the engine idling is of instability.	Replace the charging coil
	Open circuit (value of resistance∞)	No spark between poles of spark plug	The engine fails to start	
magneto rotor	Deformation	The magneto does not output a current or outputs a low current.	The engine has difficult in starting or fails to start, the complete motorcycle is under-charged, the electrical equipment fails to work properly	Replace the magneto rotor
	Magnetism fading	The magneto does not output a current	The engine fails to start, the headlamp does not light	
Storage battery	The storage battery is damaged	No power	The starting dynamo does not run	Replace the storage battery
	The battery has been placed for a long time	Electricity shortage and low voltage	The starting dynamo does not run or runs weakly, the signaling system works improperly.	Charge or replace the storage battery
	Electrolyte shortage	Electricity shortage and low voltage	The starting dynamo does not run or runs weakly, the signaling system works improperly.	Supplement distilled water or replace the storage battery
Protective tube	It is damaged or burnt out	No power	The starting dynamo does not run	Replace the protective tube

Section 3 Control Part

1. Composition and Function of the Control Part

In the electric system of the motorcycle, the control portion assures the normal operation of the power supply portion and the electricity consumption portion, as well as the harmonization among them, and enables the driver to control the electrical system at any time.

The control portion is mainly composed of a regulator, a rectifier, flicker relay, a a starting relay, a fuse protector, a control switch and an electrical cable assembly.

1)Regulator

The regulator is an important control element of the power supply portion of the motorcycle electrical system. It can be divided into two types: DC generator regulator and alternator regulator according to the generator form.

[1.]DC generator regulator

As the output voltage of DC generator regulator is proportional to the rotate speed, it results in some problems:

[a] When the vehicle is running at a high speed, the engine speed is higher, and the DC generator connected to the engine outputs very high voltage. Thus it is easy to burn out the electrical equipment and make the battery over-charged.

[b] When the vehicle is running at a low speed, the engine speed is lower, causing the battery to discharge a large current to the DC generator and burn it out. Therefore, regulators are needed to work together with generators.

[2.]Alternator regulator

In a motorcycle mounted with a magneto, a rectifier is installed to convert an alternating current generated by the magneto into a direct current; a AC regulator is also required to stabilize the output of the magneto.

Now more commonly used AC regulators are electronic. An AC regulator includes a transistor, diode and thyristor and other components. When the magneto works, the lighting and signalling coils will produce alternating currents.

2)Rectifier

Common rectifiers include single-phase half-wave rectifier and full-wave bridge rectifier. Both types take advantages of one-way conduction property of a silicon diode to work as an electronic valve which allows only one direction of current.

3)Flicker relay

Commonly used flicker relays, also known as scintillators, include three types: thermal resistance, capacitance and transistor.

4)Starting relay

When the starting motor is at work the current is very large, reaching dozens of amperes. The starting relay is actually an electromagnetic switch. When you press the start switch on RHS handlebar, the current passes through the battery, battery terminal, relay coil, start switch terminal and start switch and a loop forms by bonding.

5)Fuse protector

A fuse protector is typically made of a fuse holder and fuse tube therein.

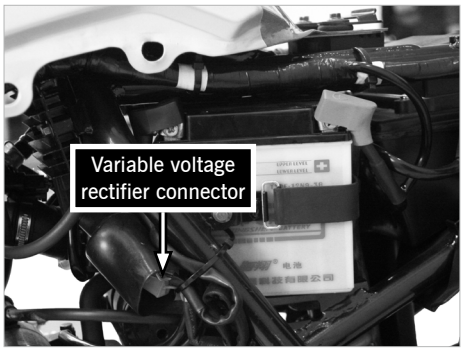
6)Control switch

Various control switches of the electrical system are positioned on RHS and LHS handlebars. Generally, on the LHS handlebar, there is a long-range dimmer switch, short-range dimmer switch, sidelight switch and horn switch from top to bottom. On the RHS handlebar, there is a sidelight, headlamp switch and electric start switch from top to bottom. A circuit master switch stays in the center.

7)Main cable

Various portions of the motorcycle electrical system are connected as a whole by wires. To avoid clutter of wires wound together and for easy arrangement on the frame, the wires in the same direction are often bundled with insulating tapes. This is a cable assembly.

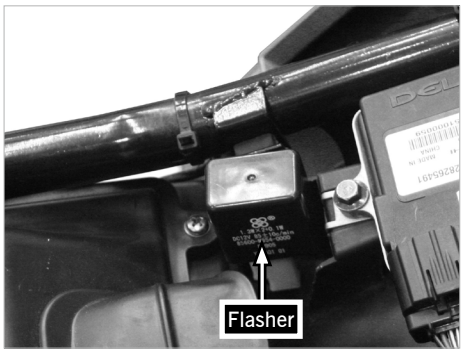
2. Demolition and Maintenance of the Control Portion



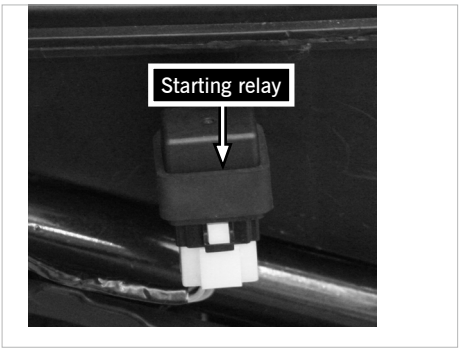
[1] Apply a multimeter to measure whether the voltage of variable voltage rectifier is in the range of “13V～14.0V”. If it is lower than “13V”, it is necessary to install a new .variable voltage rectifier.

⚠ Caution

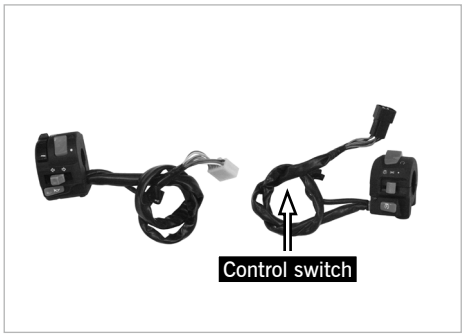
If the heat sink of the variable voltage rectifier is damaged, it is necessary to install a new .variable voltage rectifier.



[2] Remove the flasher socket of the signal system and apply a multimeter to measure whether the flasher is short-circuited. If the flasher is short-circuited, it is necessary to replace it.



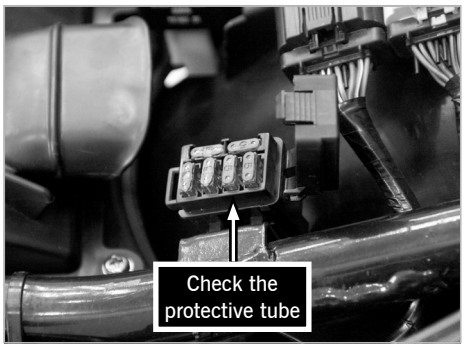
[3] Check whether the starting relay is working properly. If the starting relay does not work properly, it is necessary to install a new starting relay of the same model.



[4] Remove the RHS and LHS combination control button switch and check whether these control button switches are short-circuited or damaged. Repair or replace such switches if necessary.

⚠ Caution

Check whether the front and rear brake lamp switches are working properly. If the brake lamp switches cannot work properly, it is necessary to re-adjust and replace them.
If the front and rear brake lamps do not light during braking, it indicates there is no electrical start.



[5] Remove the protective tube and check it for any burn-out. Install a new protective tube of the same model.
Protective tube model: 12V/20A

⚠ Caution

Install a new protective tube of the same model if it is damaged.

[6] Check the main cable for any damage. If insulation tape of the main cable is damaged, it is necessary to bundle it timely.

3. Refer to Table 5-2 in respect of damage forms, fault phenomena and common maintenance methods of the control portion:

Table 5-2: Maintenance of the Power Control Portion

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Rectifier	Damage	The variable voltage rectifier is damaged or short-circuited	The storage battery cannot be charged, the lighting lamp gives off a weak light or does not light, the lighting lamp is easily burnt out.	Replace the variable voltage rectifier
Starting relay	The internal coil is short-circuited or open-circuited	The starting dynamo does not work	The motorcycle fails to electrically start.	Replace the starting relay.
	Internal contactor is ablated.	The starting dynamo runs weakly.		
Start-up button	Poor or damaged internal contact	The starting dynamo does not work	The motorcycle fails to electrically start.	Replace the start-up button
	Ablated internal contact	The starting dynamo does not work or runs weakly	The motorcycle fails to electrically start.	Check the storage battery
Protective tube	It is damaged or burnt out	No power	The starting dynamo does not run	Replace the protective tube
Lighting/ dimmer switch	Poor or damaged internal contact	Poor or damaged internal contact	The lighting lamp does not work or works improperly.	Repair or place the lighting/dimmer switch
Steering lamp switch	Poor or damaged internal contact	Poor or damaged internal contact	The sidelight does not light.	Repair or replace the sidelight.
Flasher	Burnt-out inside	The flasher is burnt out inside.	The sidelight does not light or flashes.	Replace the flasher
Brake lamp switch	Internal contactor does not return or is damaged.	The brake lamp switch does not return or is damaged.	The brake lamp switch keeps bright all the time or does not light.	Repair or replace the brake lamp switch.
Klaxon button	Poor or damaged internal contact	The klaxon button is poorly contacted or damaged.	The klaxon fails to make a sound or makes an abnormal sound	Repair or replace the klaxon button

Section 4 Power Consumption

The power consumption of motorcycle electrical system includes:

1)Lighting and Signal Devices

Lighting devices include the headlamp, the sidelight, the tail lamp (license plate lamp), the instrument lamp and so on. These devices mainly serve to provide lighting for the driver at night and remind other vehicles so as to ensure the safety of driving.

Signal devices include an indicator lamp, a klaxon, a gear position indicator lamp, a brake lamp and the like for indicating the driving state of the vehicle to the driver and related persons and expressing the driver's operational intention through the sound and optical signals.

2)Electric Starting Device

An electric starter includes a starting motor and an engaging mechanism, etc., mainly used to start the engine. (See Section VII, Chapter II)

1. Lighting and Signal Devices

A. Headlamp and sidelight

The headlamp illuminates the driver's front road so that it is easy to identify various road conditions and the traffic on the road, and can send signals to persons and vehicles, or expresses an overtaking intention by flashing the headlamp. When driving in fog, the headlamp is often open to ensure traffic safety.

The sidelight is used to indicate the position of the vehicle, which meets other vehicles or drives in the city where the lighting conditions are better at night, or to remind others. It is usually installed in the headlamp assembly.

The headlamp mainly includes a condenser, glass cover, bulb, lamp holder, lamp cover and shell. The role of the condenser is to make the light emitted by the bulb be effectively concentrated to form a beam with high brightness. It is mostly made of stamped aluminum.

The glass cover is mainly used to diffuse the light beam reflected by the condenser, to ensure that a large enough area in front can be uniformly lighted, to avoid making an oncoming driver dazzled.

Bulbs can be divided into mono-filament bulbs and double-filament bulbs.

A lamp holder is generally stamped from galvanized sheet iron and has a cylindrical shape with three unequal lugs at the edge and a hole opened at the bottom, through which wires can pass.

The lamp cover and the shell form a complete space, accommodating the rest of the headlamp.

B. Tail lamp and brake lamp

Tail lamps are used to show the position of vehicles rearward and make the license number clearly visible at night. A tail lamp mainly includes the lampshade, lamp shell, lamp holder and bulb. The lampshade is made of red plexiglass and the lower part is fitted with a transparent plexiglass window so that the light can illuminate the license plate.

The lamp shell is made of plastics. Each side of the bottom is a support with a round hole. The lamp can be connected with the lamp shell by screws.

C. Klaxon

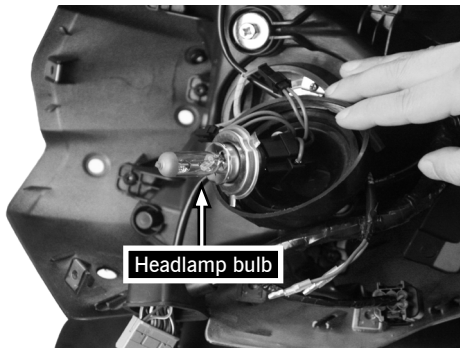
In the process of driving, a motorcycle driver can make the klaxon to sound through the switch, to remind pedestrians and other vehicles and ensure traffic safety.

According to different power supplies, klaxons can be divided into AC klaxons and DC klaxons. This model adopts a DC klaxon.

D. Sidelight

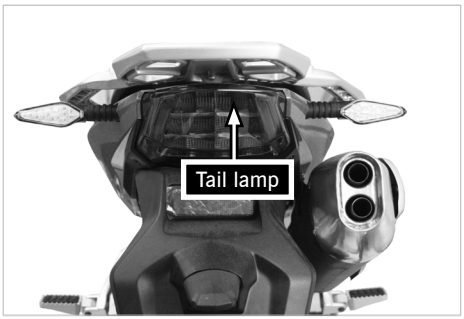
When the motorcycle intends to turn a corner, the sidelight can emit yellow light flashing signal through the flicker relay to remind others that the vehicle is to make a turn. A sidelight generally includes lamp shell, lamp holder, light bulb and lampshade.

2. Demolition and Maintenance of the Lighting and Signal Devices

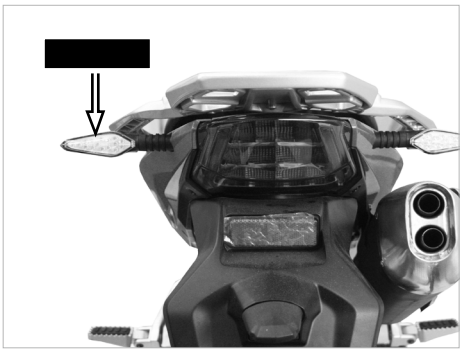


[1] Remove the headlamp shell and check whether the headlamp holder is in good contact with the bulb. Remove the headlamp bulb and check if the bulb is burnt out. Install a new headlamp bulb of the same model.

Headlamp bulb model: 12V60W / 55W

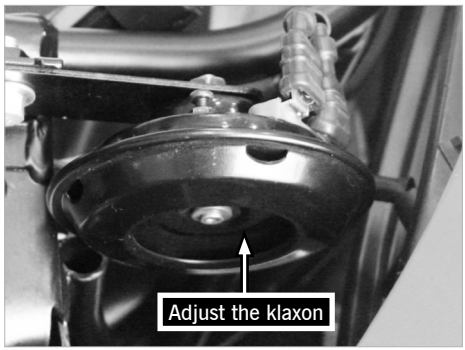


[2] Check whether the tail lamp is burnt out. If the tail lamp is burnt, it is necessary to install a new tail lamp of the same model.



[3] Check whether the sidelight is burnt out. If the sidelight is burnt, it is necessary to install a new side light of the same model.

[4] Check whether the instrument lamp is burnt out. If the instrument lamp is burnt, it is necessary to install a new instrument lamp of the same model.



[5] If the klaxon makes a hoarse sound or no sound, adjust the volume of the klaxon, or install a new klaxon of the same model, where appropriate.

3. Refer to Table 5-3 in respect of damage forms, fault phenomena and common maintenance methods of the electricity consumption portion:

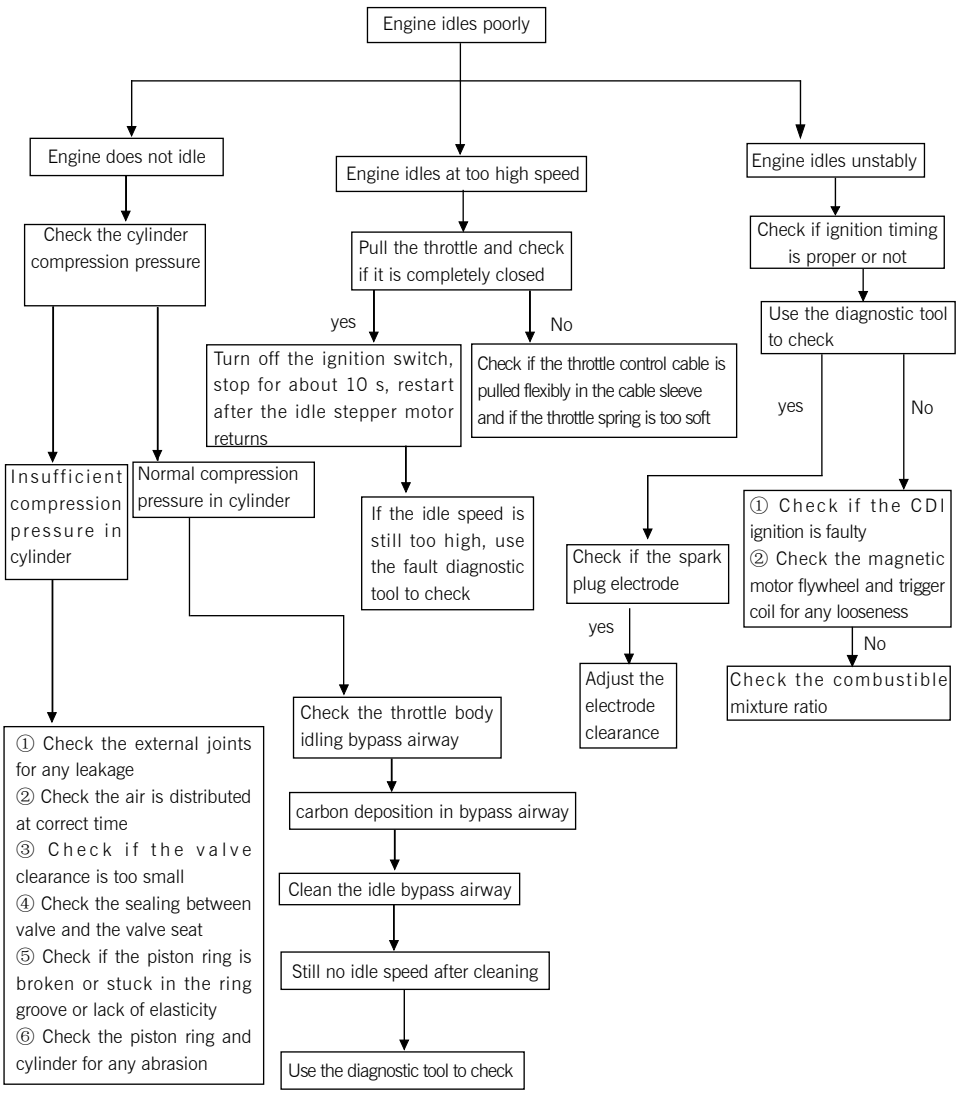
Table 5-3: Maintenance of the Electricity Consumption Portion

Component Name	Damage Form	Component Fault Phenomenon	Motorcycle Fault Phenomenon	Maintenance Method
Headlamp assembly	Light beam is improperly adjusted	The headlamp gives off light beam too near or too far.	———	Adjust the headlamp light beam
	The headlamp filament is burnt out.	The headlamp filament is burnt out.	The headlamp does not light	Replace the bulb of the headlamp
Tail lamp/ brake lamp	Tail lamp/brake lamp filament is burnt out.	Tail lamp/brake lamp filament is burnt out.	Tail lamp/brake lamp filament is burnt out.	Repair or replace the tail lamp/brake lamp bulb
Steering lamp	The filament is burnt out.	The side light filament is burnt out.	The side light does not light.	Replace the bulb of the sidelight
Gear indicator	The filament is burnt out.	The gear indicator filament is burnt out.	The gear indicator does not light.	Replace the bulb of the gear indicator
Klaxon	Burnt-out or damaged inside	The klaxon is burnt-out or damaged inside	The klaxon fails to make a sound or makes an abnormal sound	Replace the klaxon

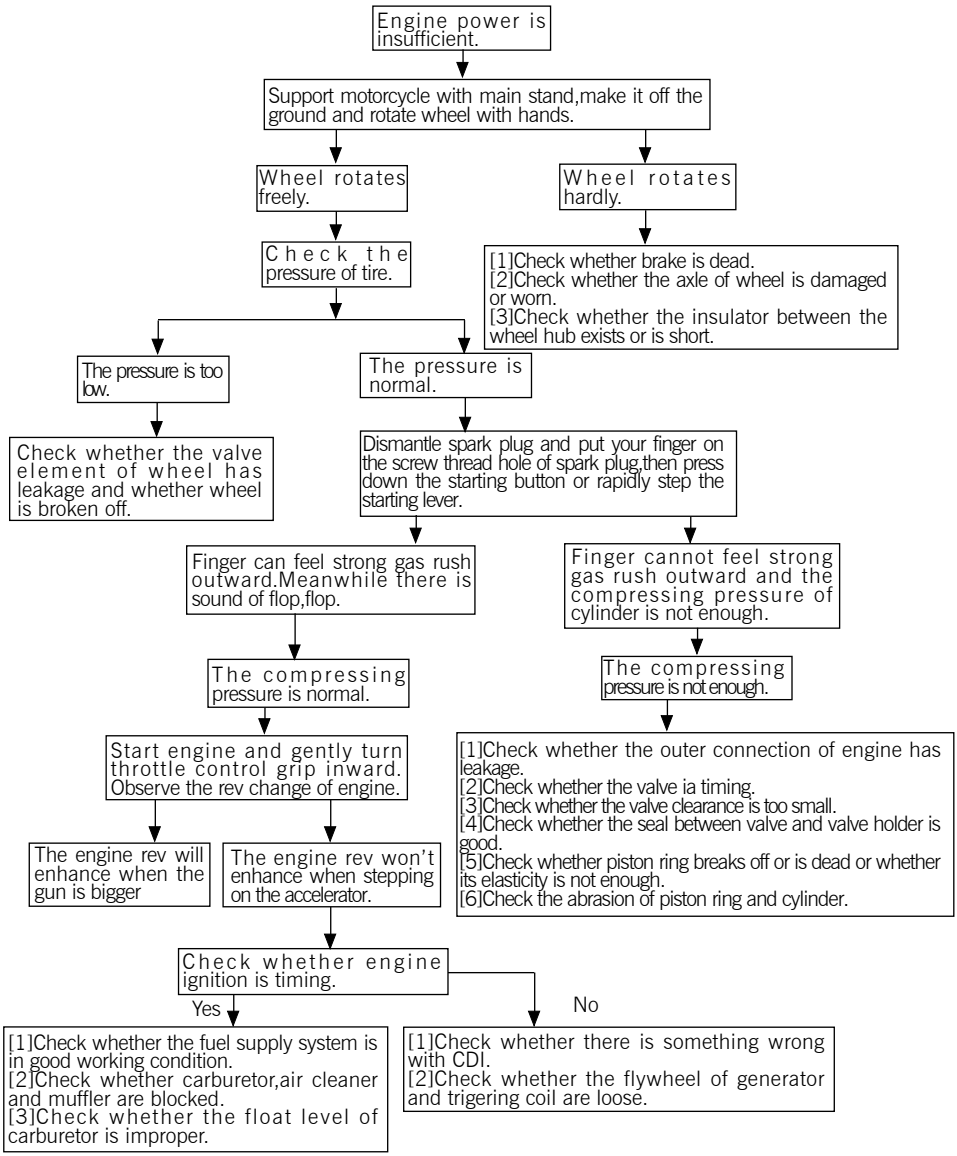
Chapter 4 Motorcycle Fault Diagnostic Procedure

Section 1 Engine Fault Diagnostic Procedure

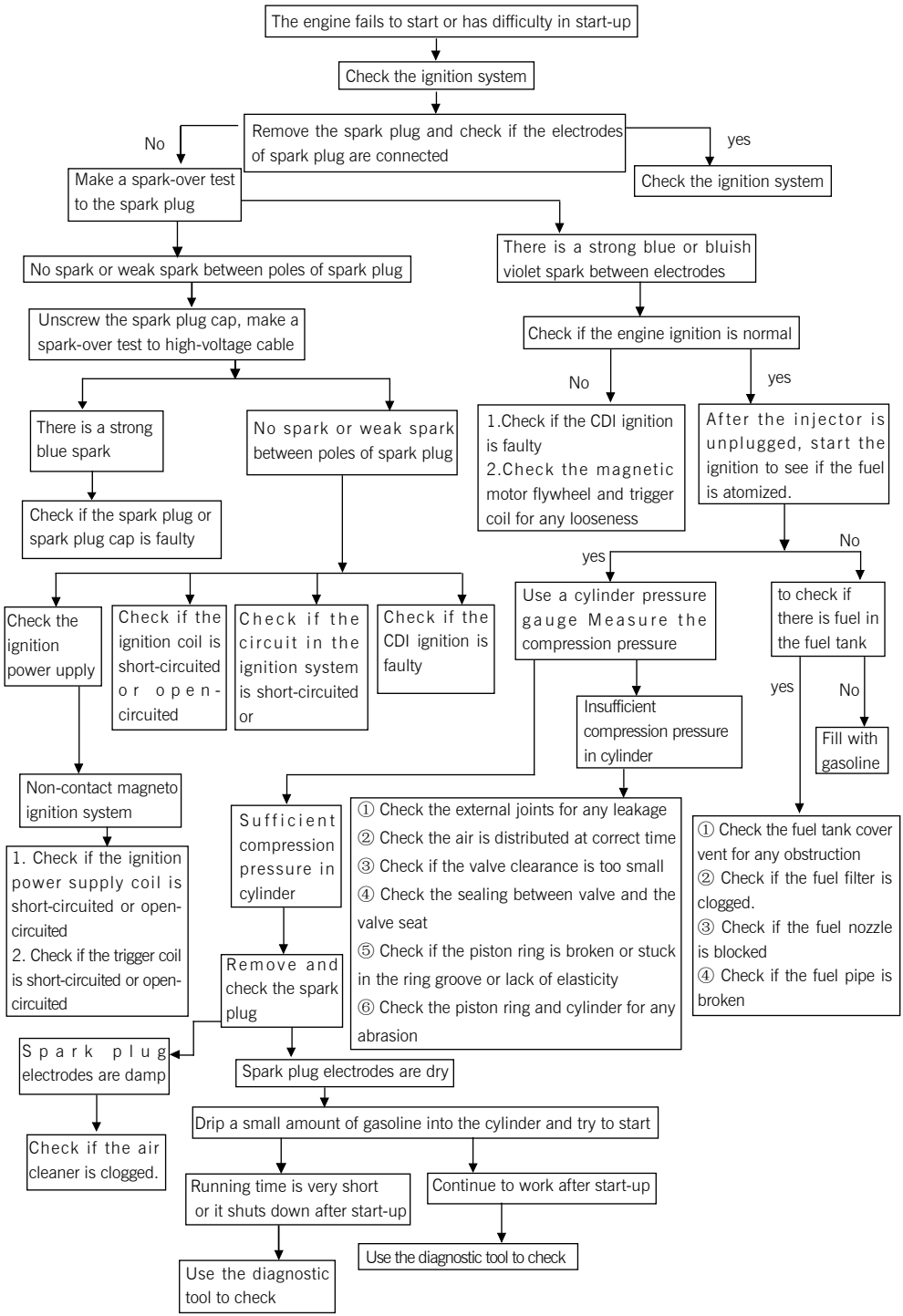
1.1Fault diagnostic procedure for poor engine idling



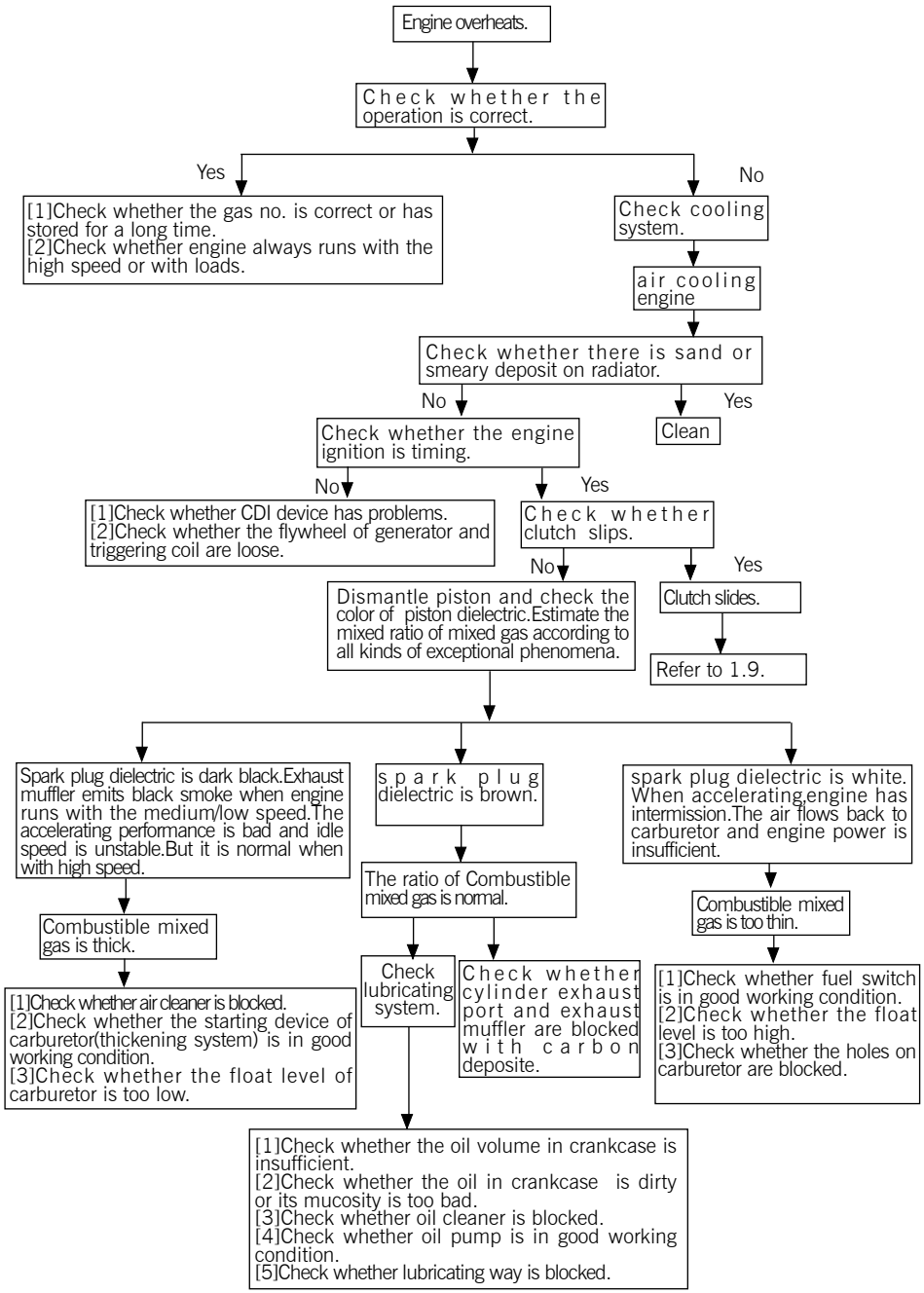
1.2 Analysis of Insufficient Engine Power



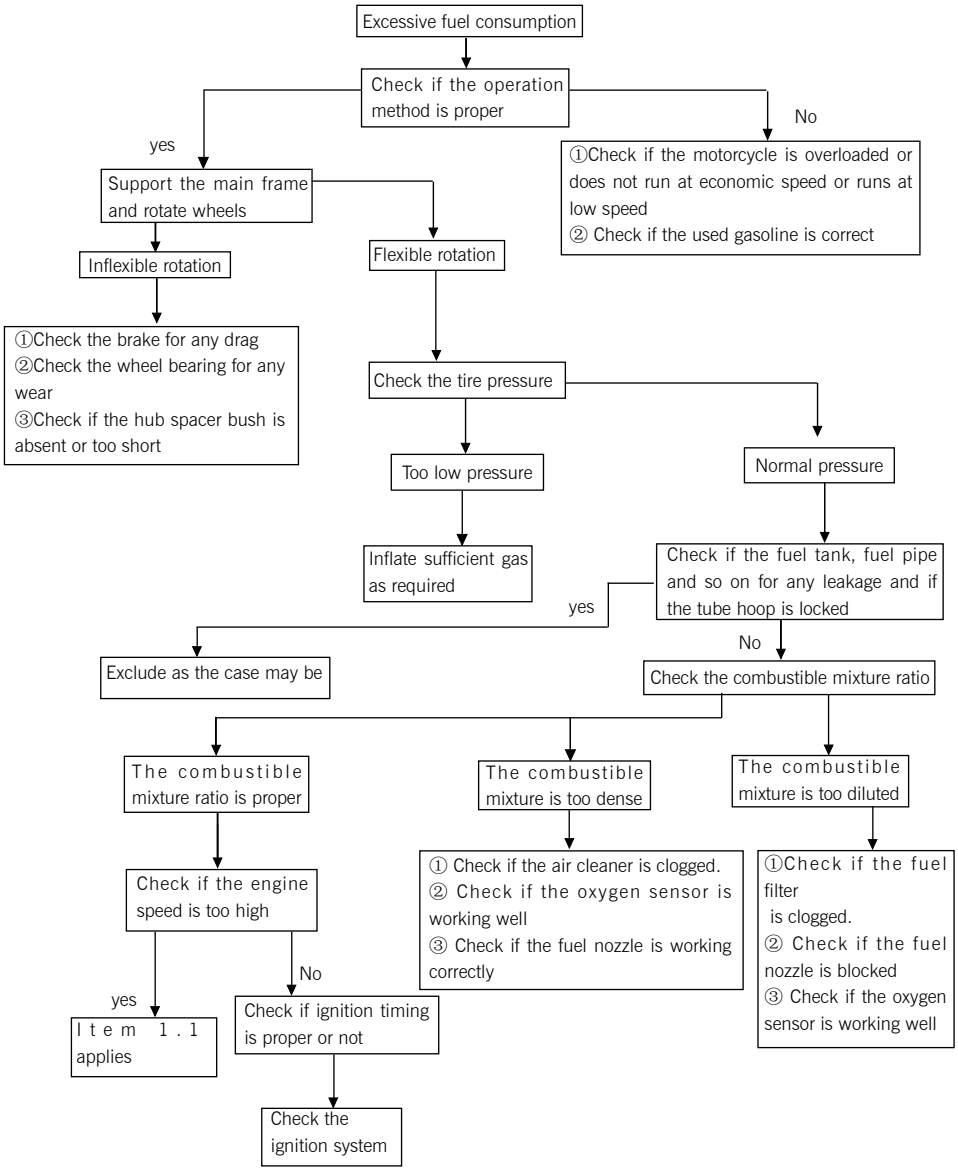
1.3 Fault diagnostic procedure for engine start failure or difficulty



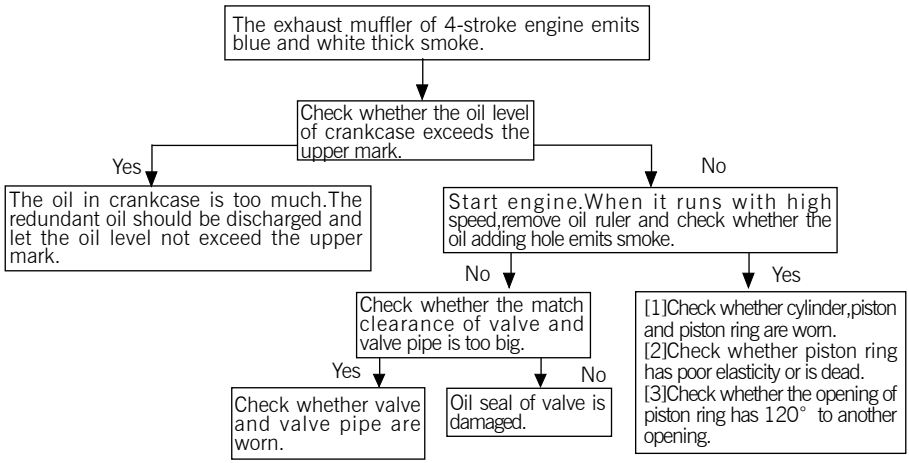
1.4 Analysis of engine overheating



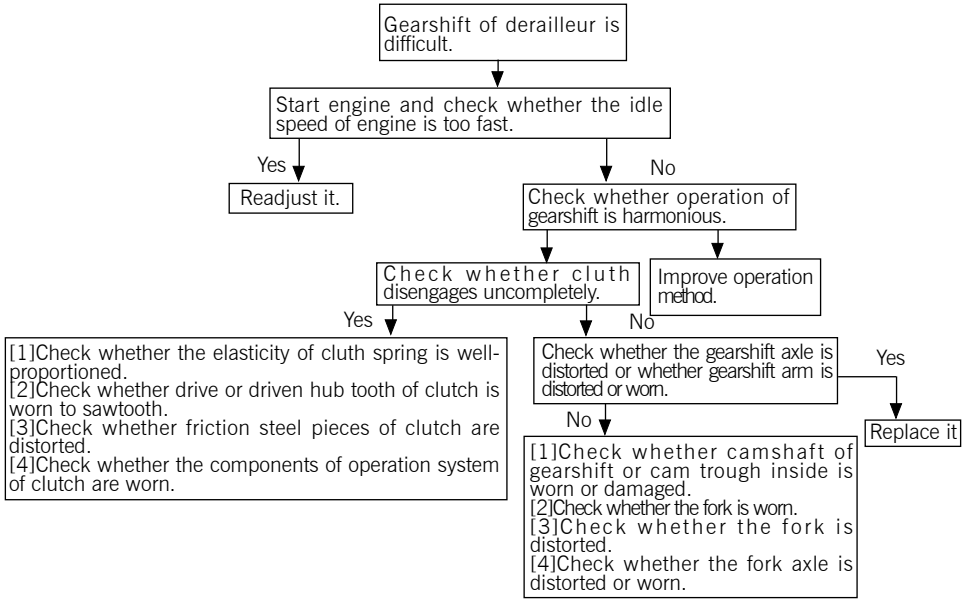
1.5 Fault diagnostic procedure for excessive fuel consumption



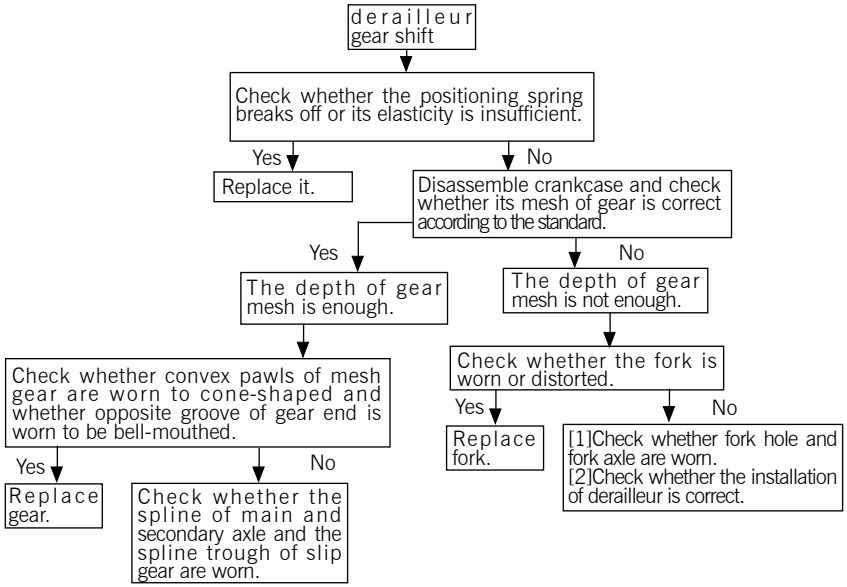
1.6 Analysis of exhaust muffler of 4-stroke engine



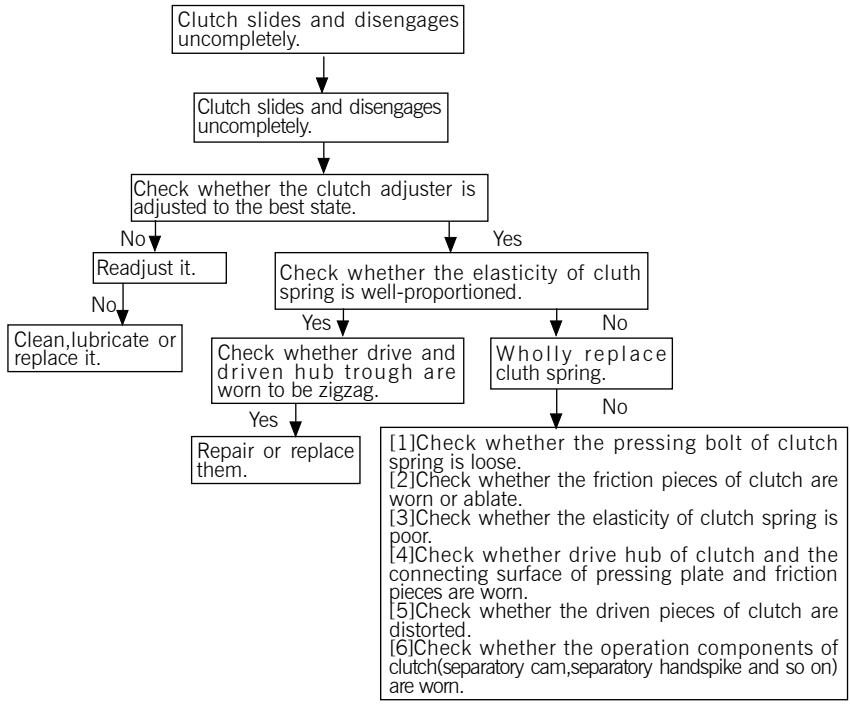
1.7 Analysis of gearshift



1.8 Analysis of derailleur gearshift

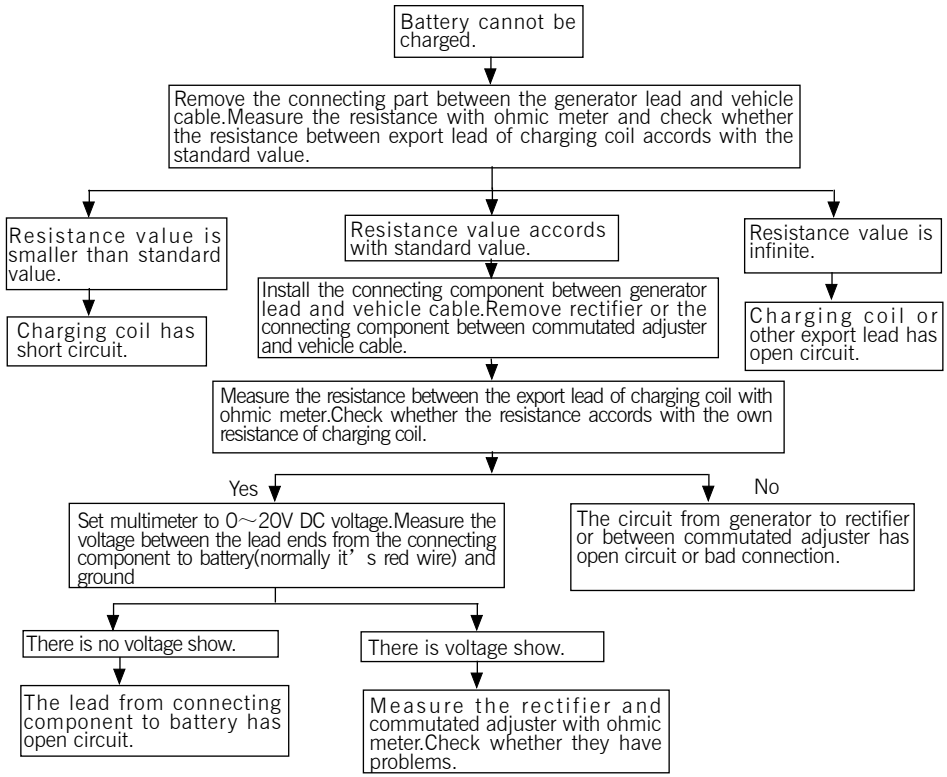


1.9 Analysis of slide and uncomplete disengagement of clutch

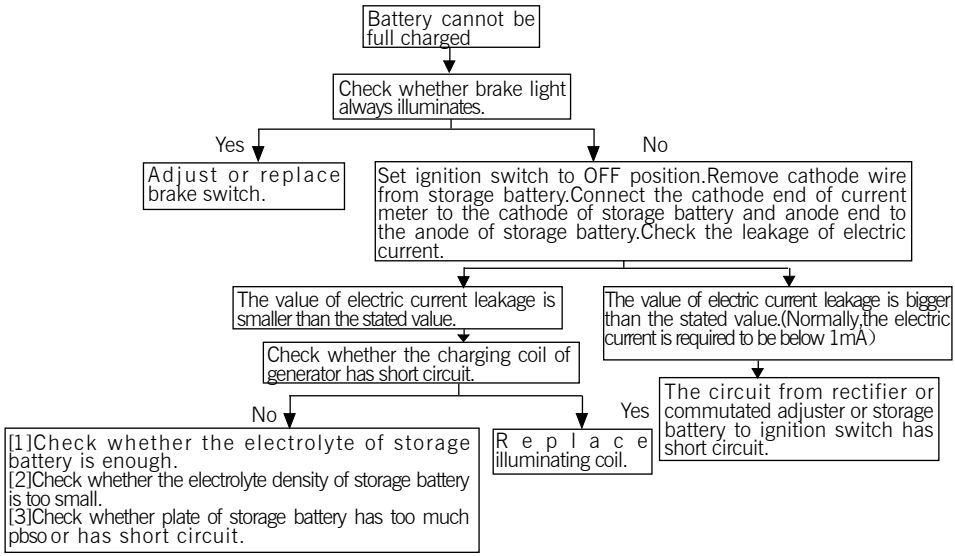


Section 2 Analysis of electrical part

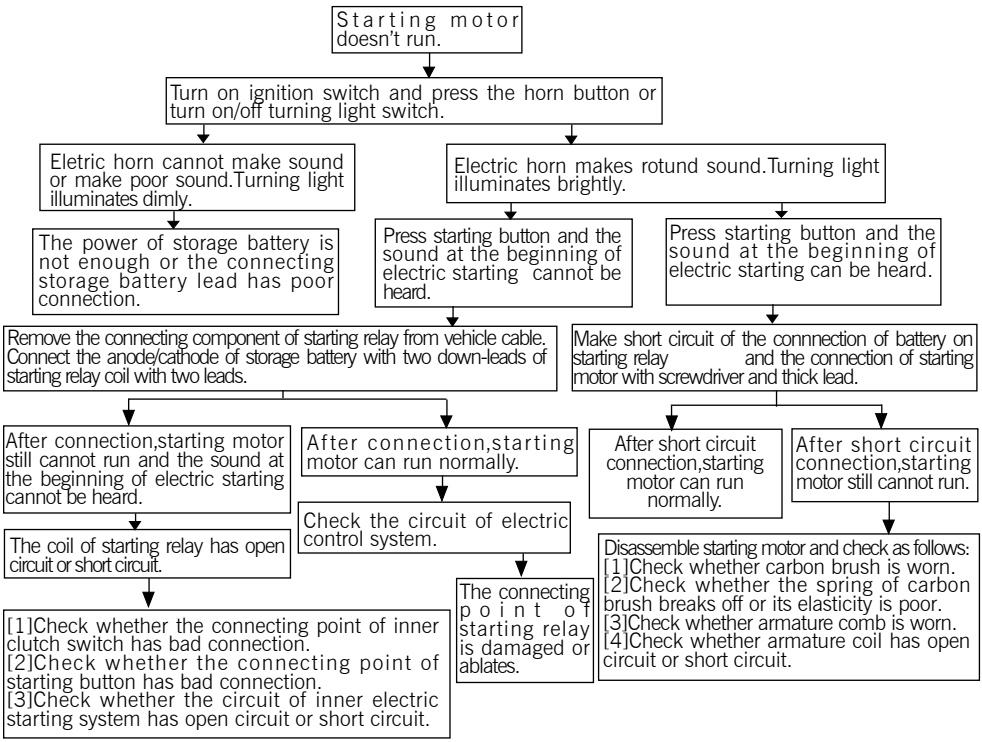
2.1 Analysis of battery



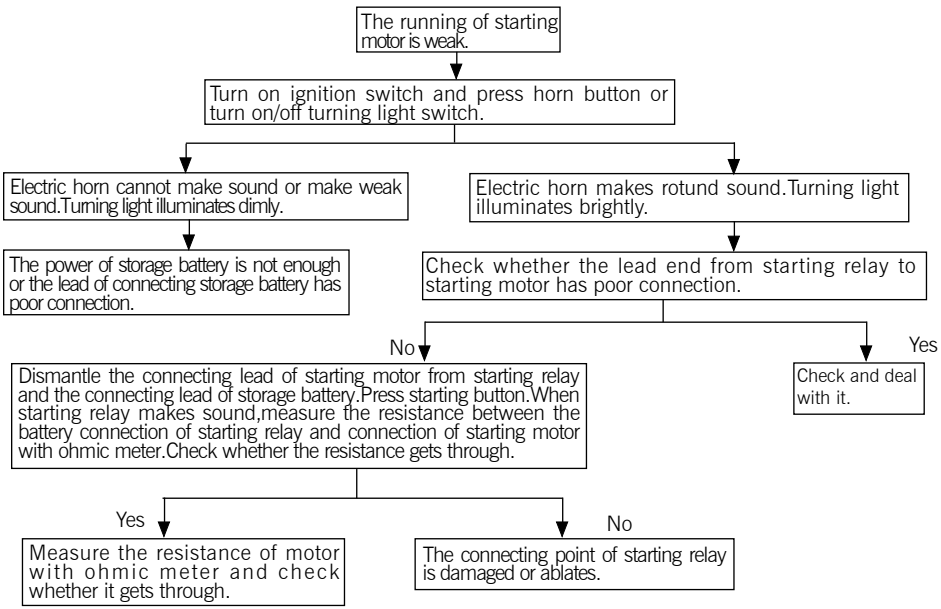
2.2 Analysis of battery



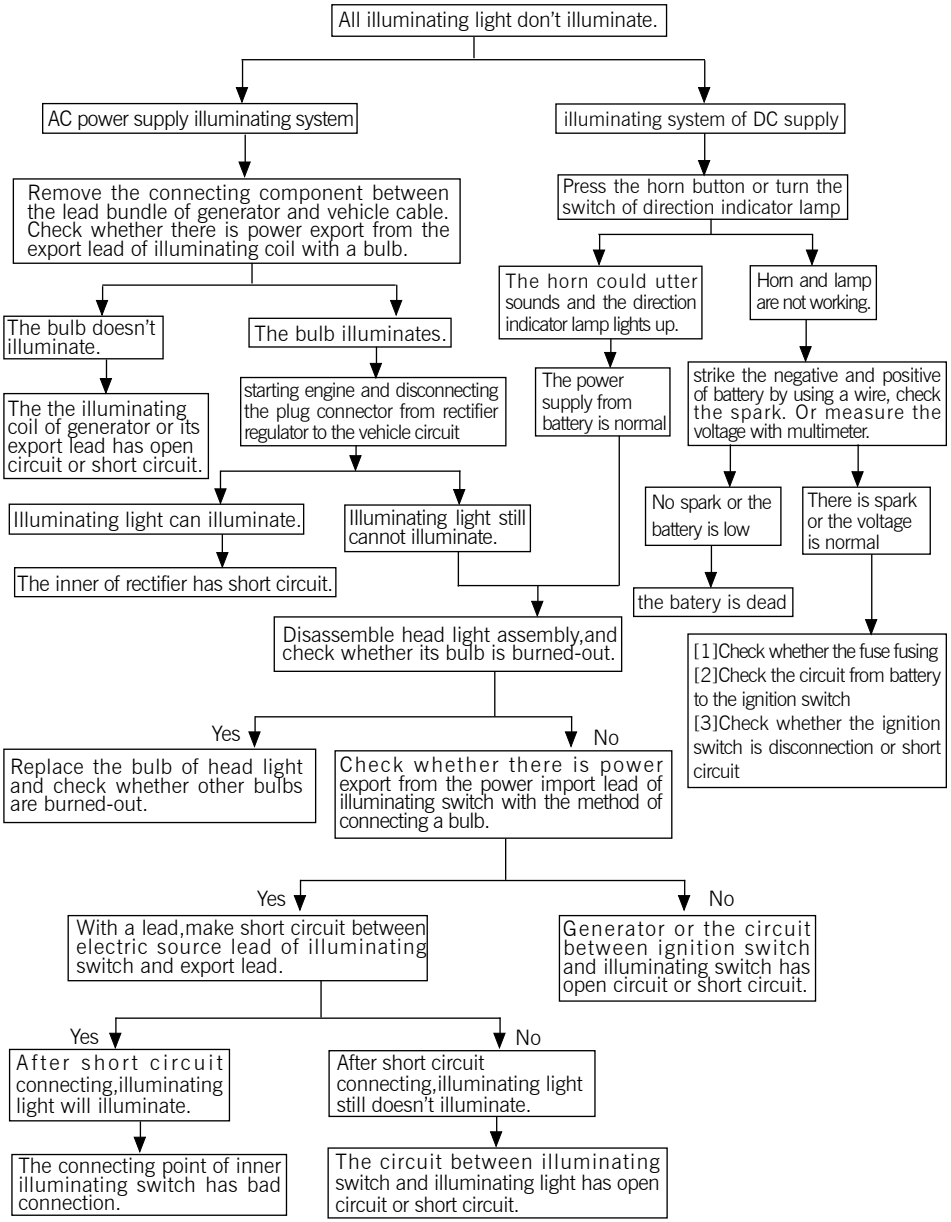
2.3 Analysis of starting motor



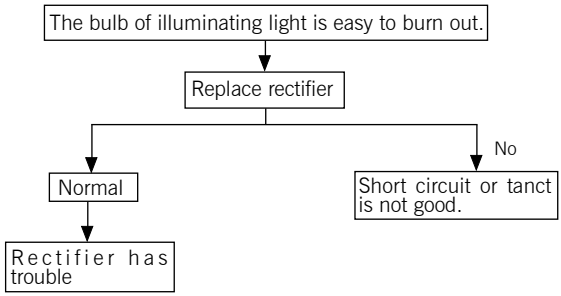
2.4 Analysis of starting motor



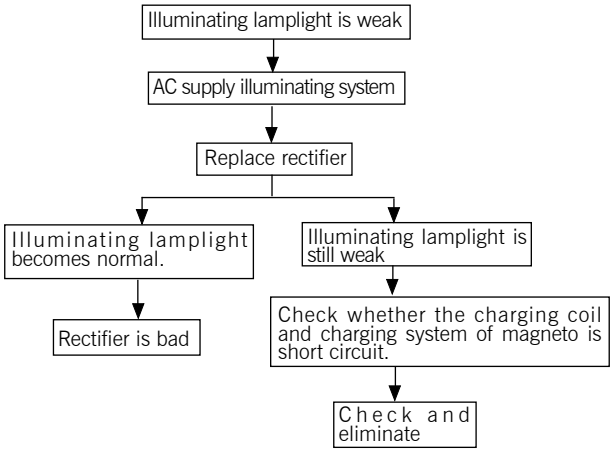
2.5 Analysis of illuminating light



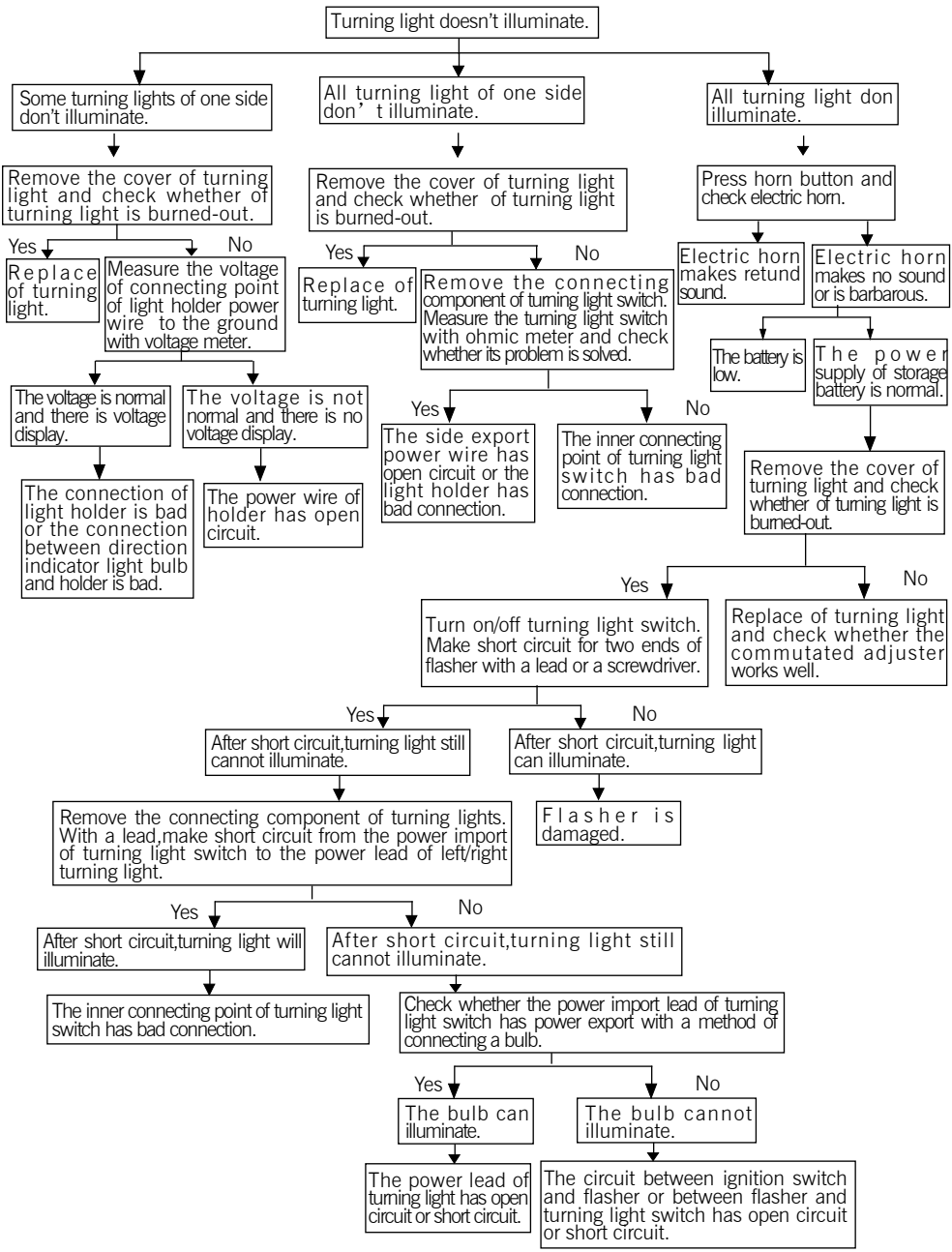
2.6 Analysis of illuminating light bulb



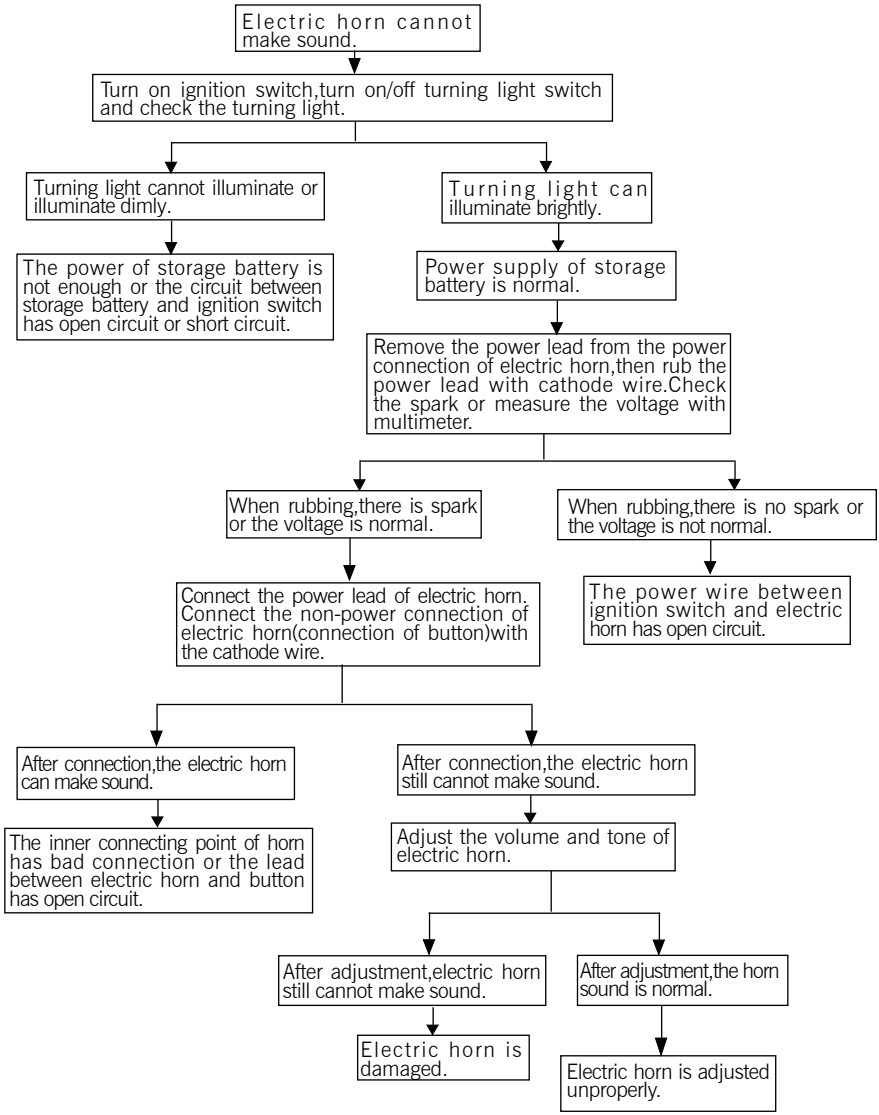
2.7 Analysis of illuminating light



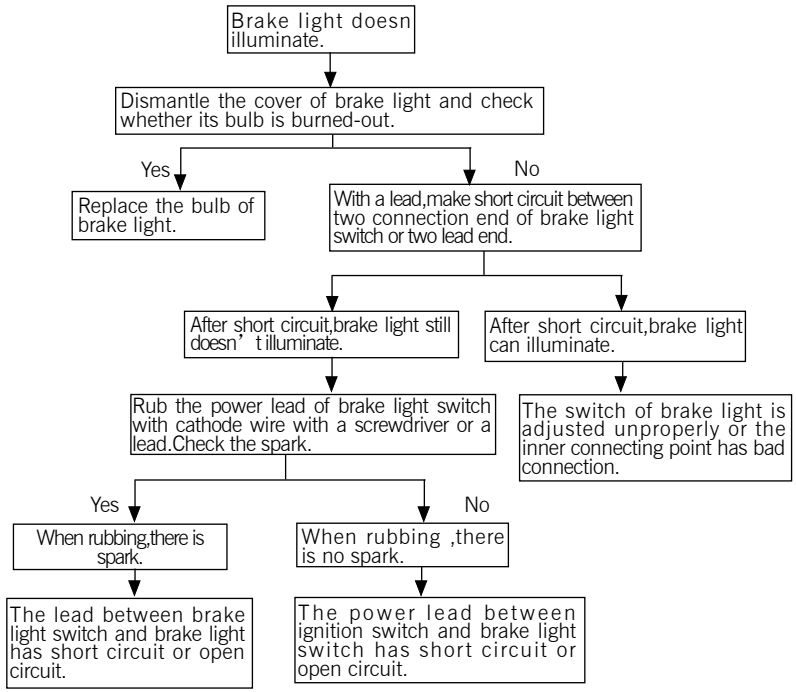
2.8 fault diagnostic program of direction indicator lamp



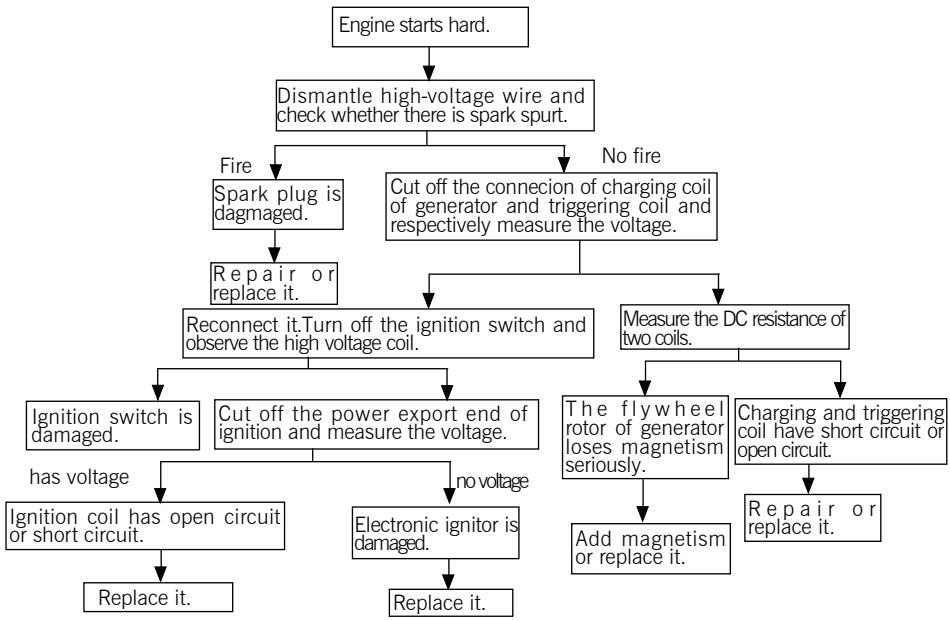
2.9 Analysis of electric horn



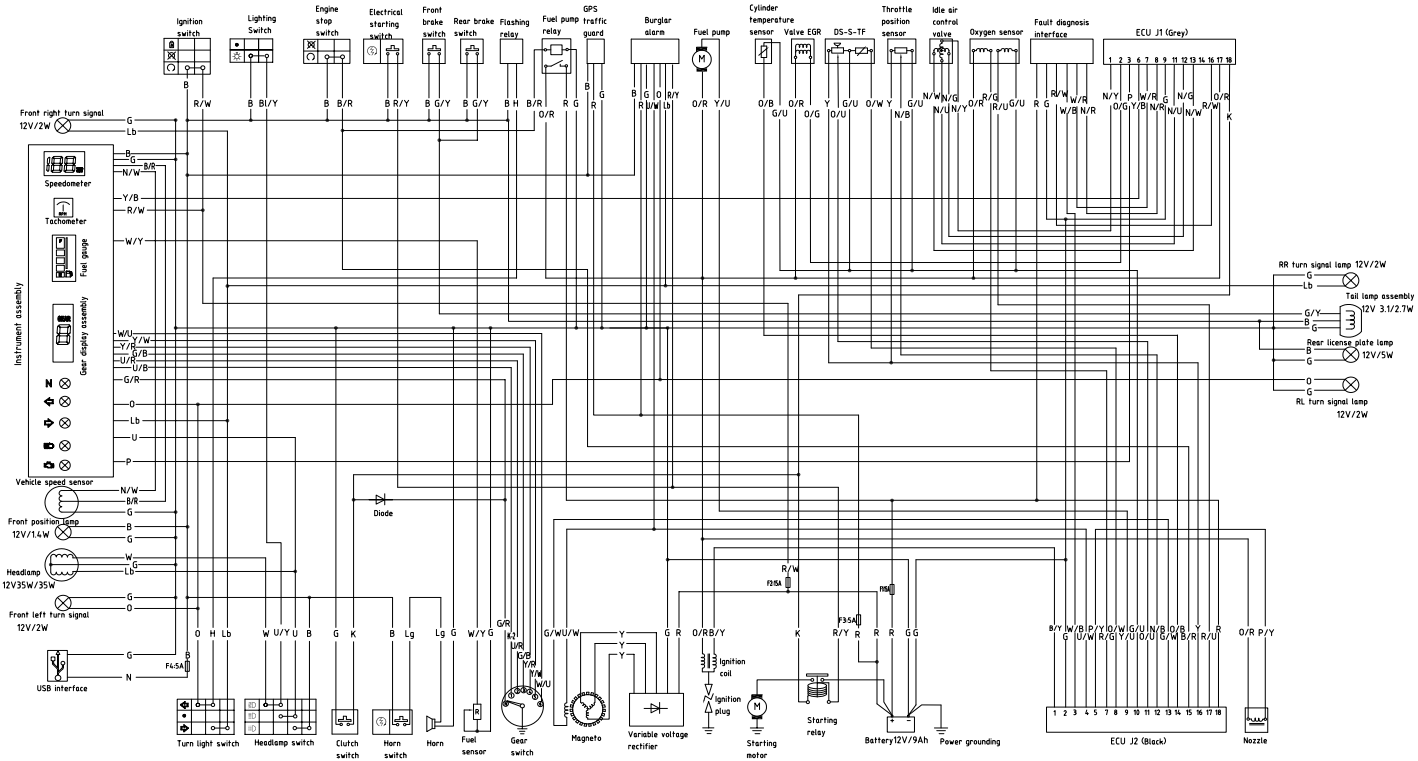
2.10 Analysis of brake light



2.11 Analysis of ignition system



Appendix: Electrical Schematic Diagram



Black-B,Red-R,Green-G,Orange-O,Blue-U,Purple-P
Grey-H,Pink-K,Brown-N,Light blue-Lb,Light green-Lg