User Manual of EFI Motorcycle

(Lifan EFI System)

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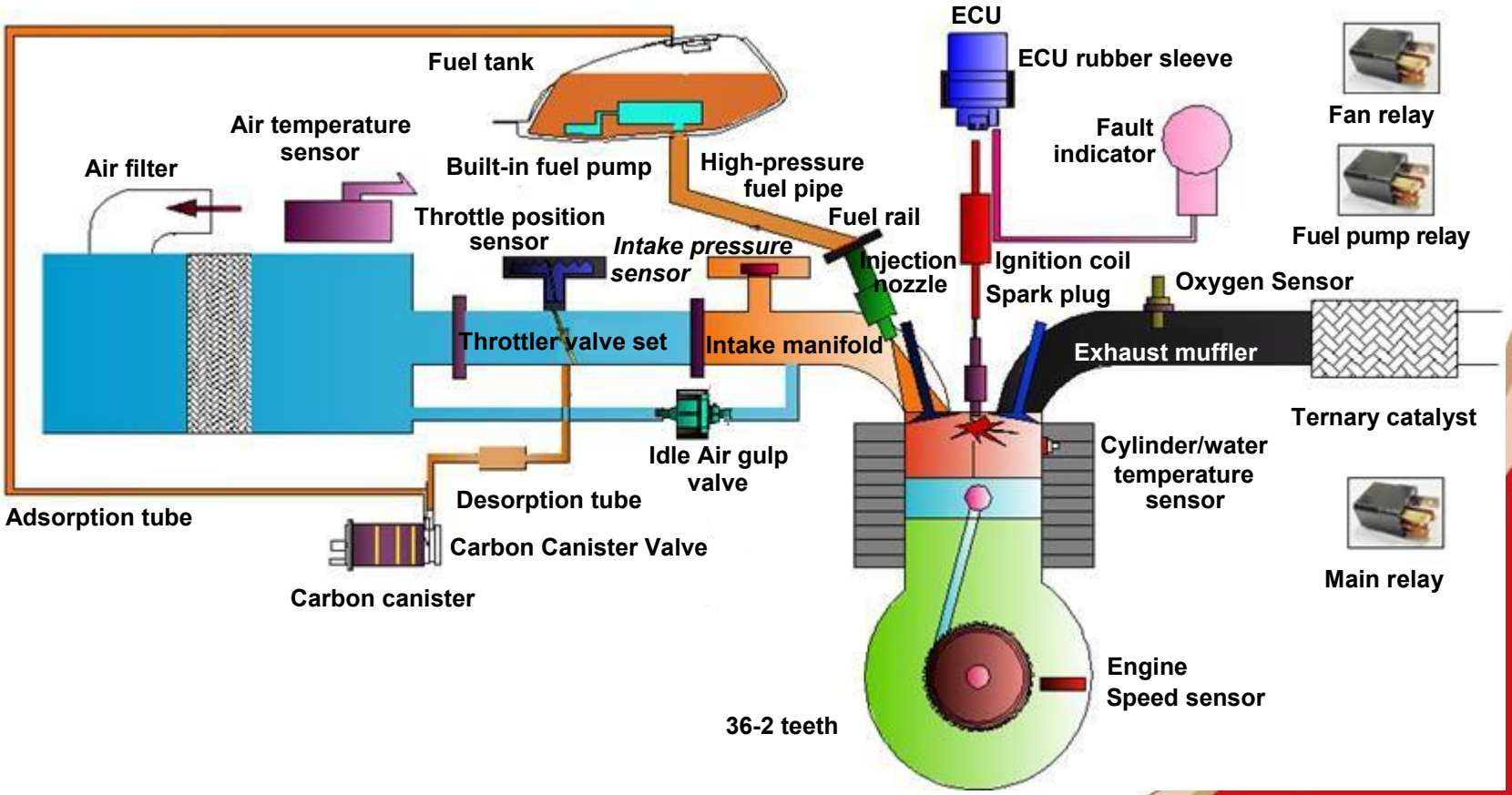
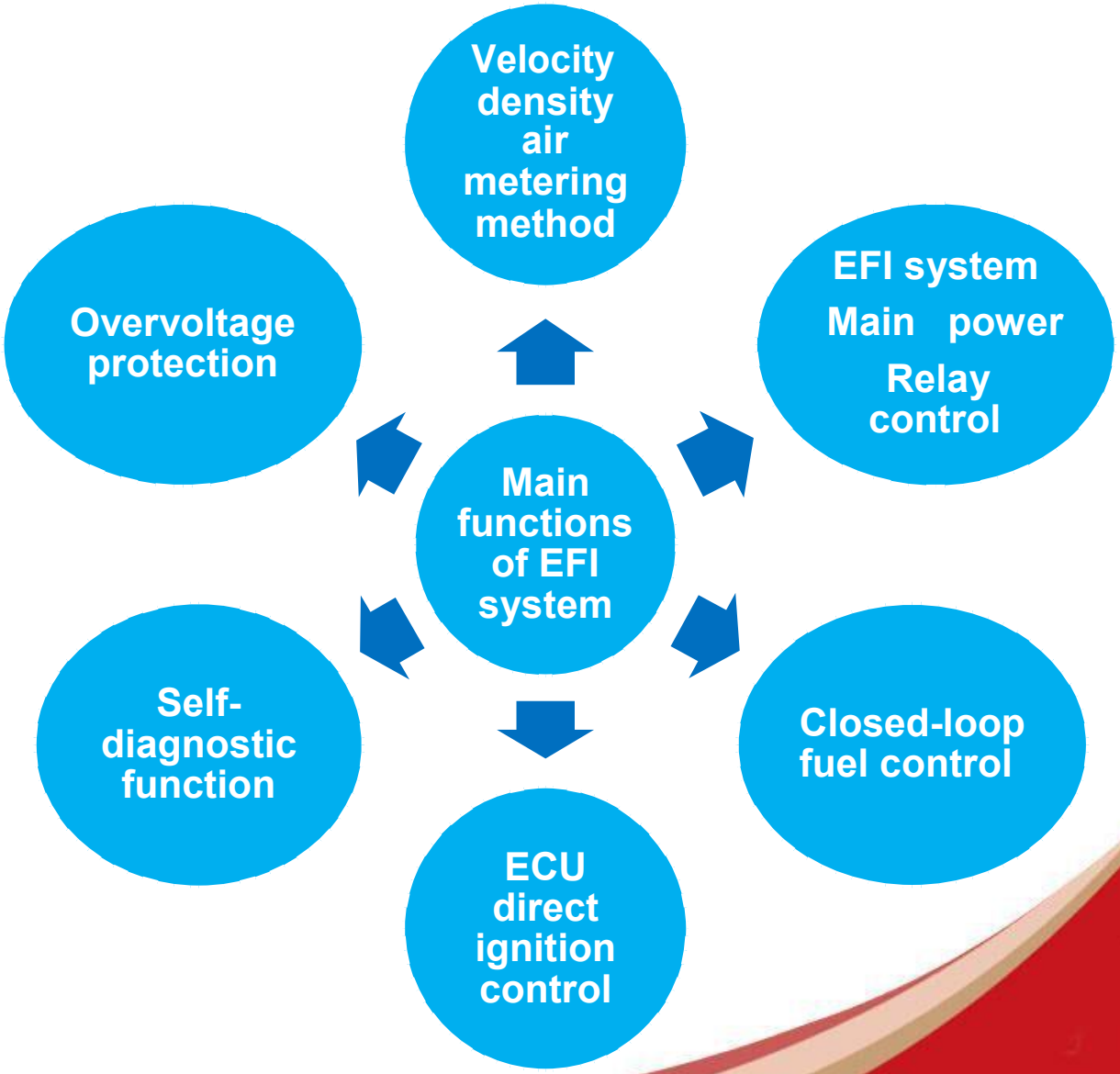
I. Working Principles of EFI System

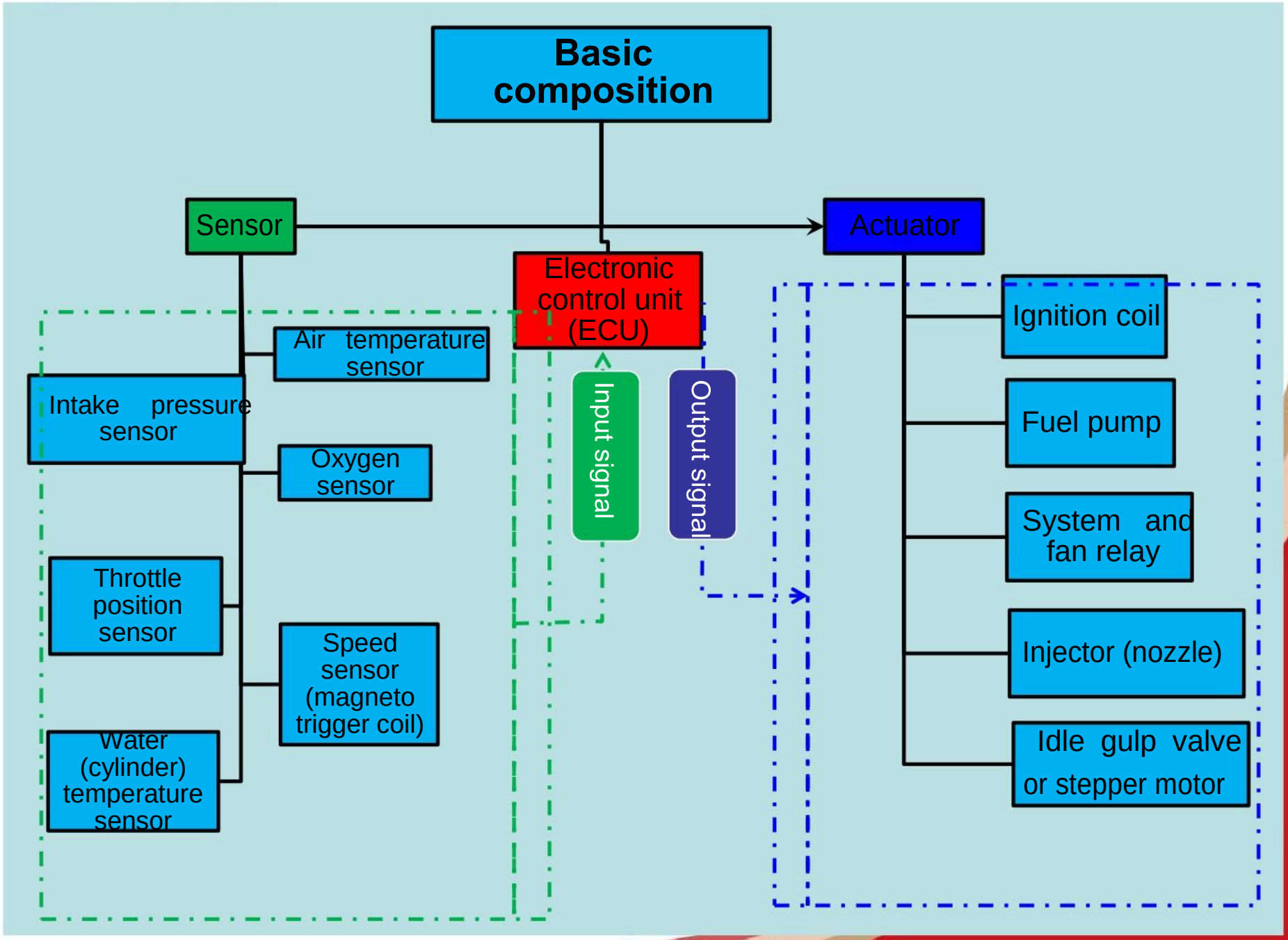
EFI system is to use a variety of sensors to convert air volume taken into the engine, coolant temperature, engine speed, acceleration and deceleration, and other work conditions into electrical signals, and enter them into the electronic control unit (ECU). The ECU will accurately compare these information with the stored information, output the control signal after calculation to accurately control the fuel injection amount, and control the ignition advance angle and gulp of idle air, thereby greatly improving the engine performance.

Schematic Diagram



Functional Framework




Basic composition
Sensor
Electronic control unit (ECU)
Actuator
Air temperature sensor
Intake pressure sensor
Oxygen sensor
Throttle position sensor
Speed sensor (magneto trigger coil)
Water (cylinder) temperature sensor
Input signal
Output signal
Ignition coil
Fuel pump
System and fan relay
Injector (nozzle)
Idle gulp valve or stepper motor

- Fuel-efficient
- Easy to start
- Excellent performance
- Long service life
- Pollutant emission reduced by 40%
- All-weather high adaptivity
- Automatic fault detection
- Closed-loop control of whole motorcycle

II. Introduction to Parts (LF200-3B as example)

Intake pressure sensor

Throttle body assembly

Cylinder temperature sensor

Oxygen sensor

ECU

Fuel pump (pressure: 250Kpa)

Injector

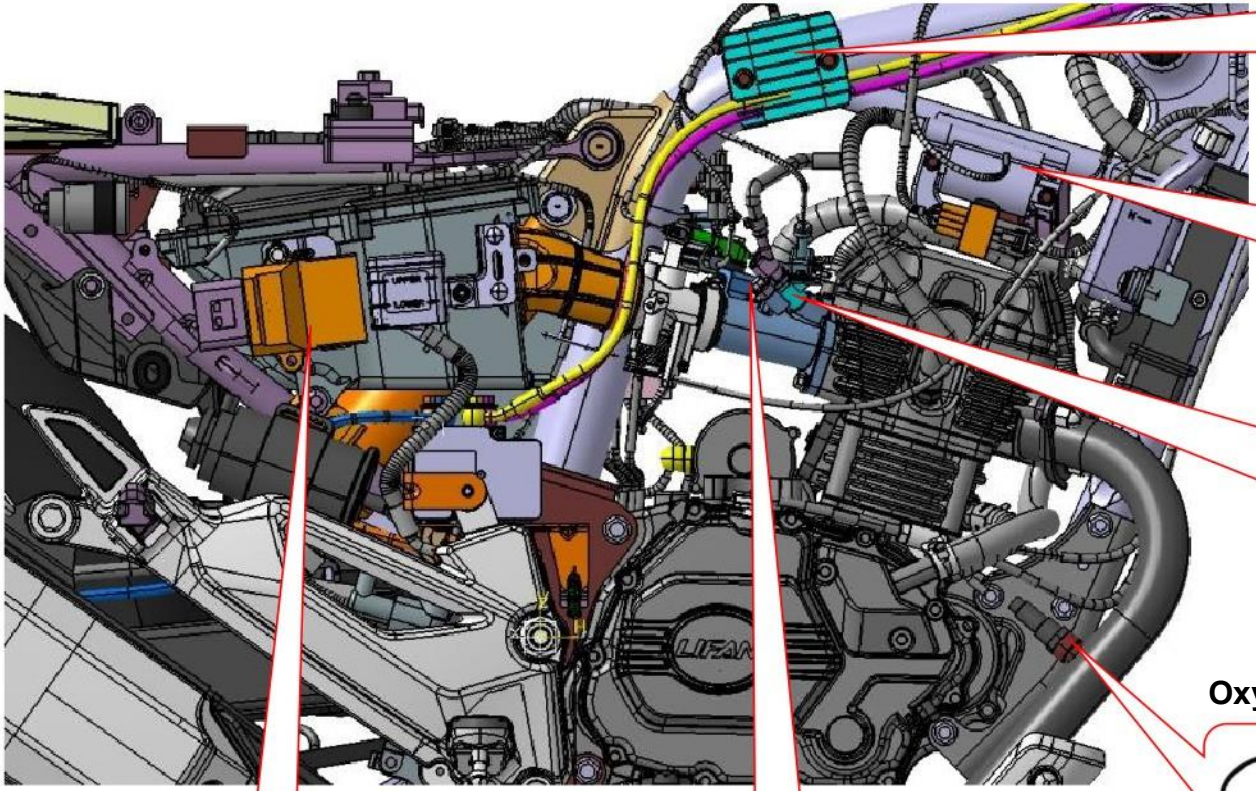
Carbon Canister solenoid valve

Fuel rail

Air temperature sensor

Relay

Examples of Installation Positions of LF200-3B EFI Parts



Rectifier

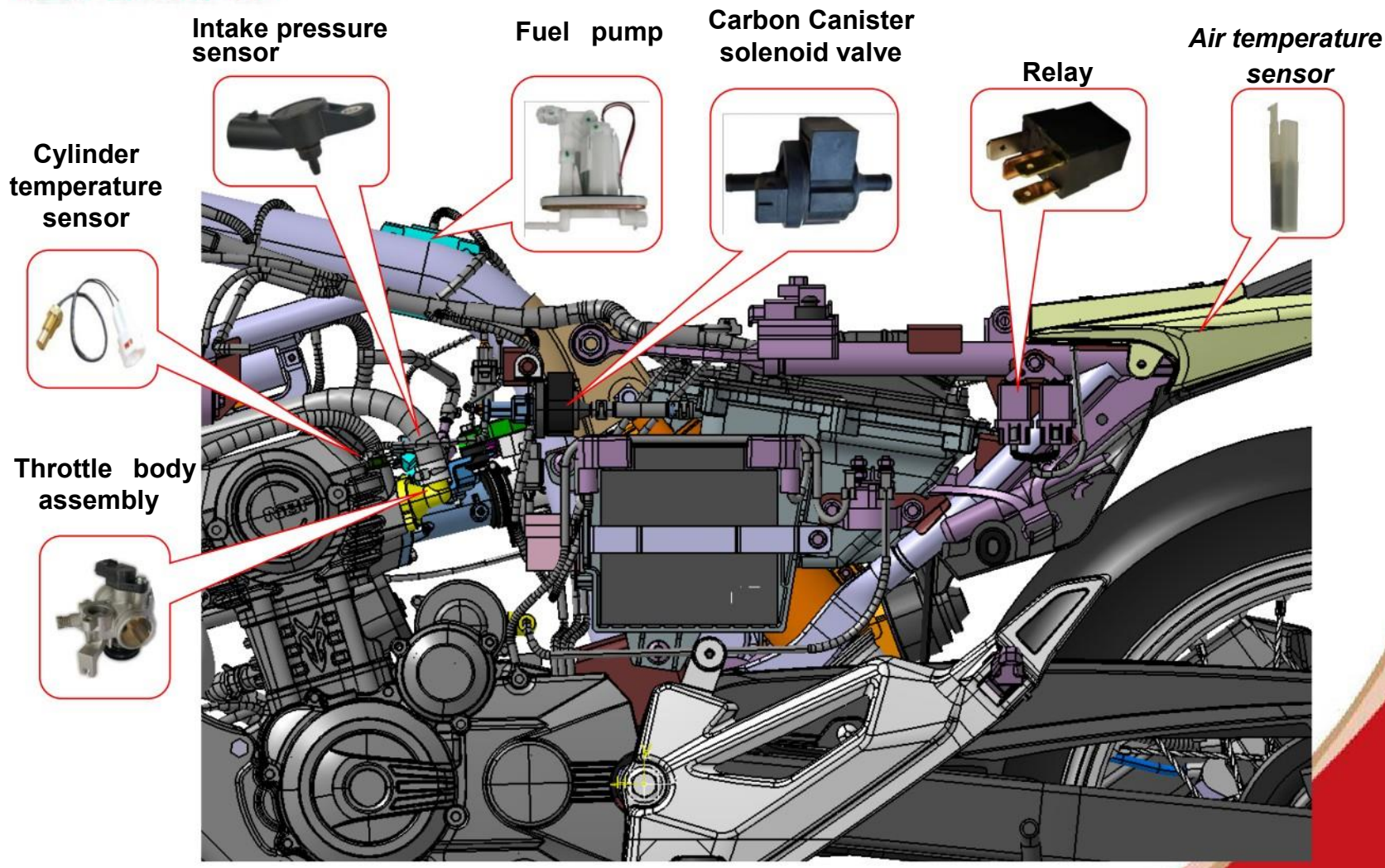
Ignition coil

Injectors

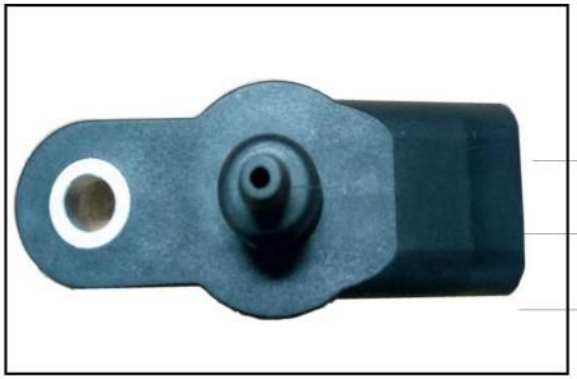
Oxygen sensor

ECU

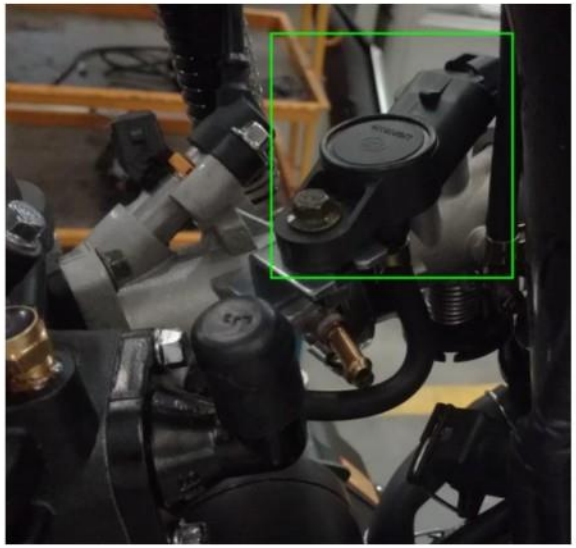
Fuel rail


Intake pressure sensor
Fuel pump
Carbon Canister solenoid valve
Relay
Air temperature sensor
Cylinder temperature sensor
Throttle body assembly

1. Intake pressure sensor



Pins:
1 --- 5V power supply
2 --- Output pressure signal
3 --- Sensor signal ground



Function: It is used to measure the absolute pressure of the intake pipe and provide load information to the engine.

Installation position: it is directly installed on the intake manifold, throttle body and motorcycle frame, as shown in the picture on the right:

Characteristic Parameters

Item	Reference Value
Pressure test range (KPa)	15~115
Operating temperature (℃)	-40~125
Operating power voltage (V)	5.0
1: At atmospheric pressure, the signal output voltage of the pressure sensor is close to the power supply voltage (5V). 2: Default initial value: about 10.6Kpa when the engine is not started, and about 30Kpa in low-altitude idle state. 3: No idle speed, failure of throttle-up, etc.	

1. Connecting tube is blocked, ruptured or disconnected;
2. The sensor is in short or open circuit;
3. The sensor gets wet and cannot run;
4. The sensor is in mechanical failure.

2. Throttle position sensor

Pins:
1 --- Output angle signal
2 --- Sensor signal ground
3 --- 5V power supply

It is prohibited to twist the screw at will.

Function: It is used to detect the opening degree of the throttle. When the opening degree is different, the resistance signal fed back by the sensor to the ECU is also different, and the system will judge the real-time load and working condition of the engine according to the signal value and variation rate outputted by the sensor.

Installation position: it is directly installed on the throttle body, as shown in the picture on the right:

Special Tips : The sensor is installed on the throttle body, adjusted for the initial value, and fastened with M5 bolts which shall not be screwed at will (As shown by the arrow in the picture on the right). Rotate the throttle shaft to confirm that the shaft can rotate easily and flexibly and 0.5 to 4.8V voltage is outputted along with shaft rotation after the sensor is powered on. The outputvoltage is initially set as 0.58 to 0.65V before delivery.

The reference range is 0 to 80% (idle throttle opening is 0 or 0.39%).

Characteristic parameters:

Item	Reference Value
Rated voltage (V)	5
Storage temperature range (℃)	-40~120
Operating temperature range (℃)	-40~120
Full-scale resistance (KΩ)	5

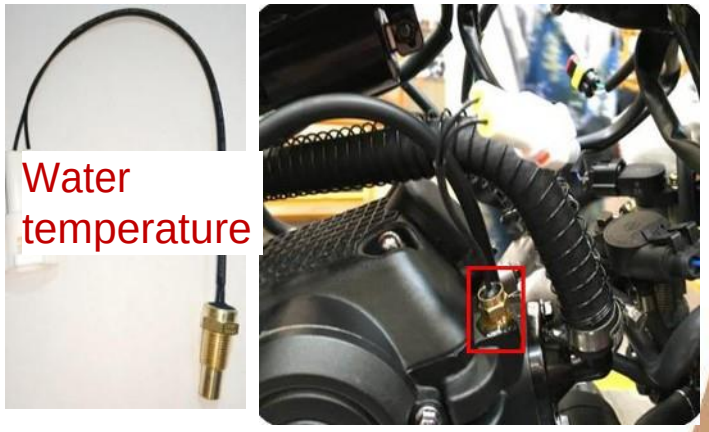
Fault mode and overhaul method:

S/N	Fault Mode	Faults Description	Inspection Method	Maintenance Methods
1	The sensor is in short or open circuit.	Slow or no response of throttle, failure of throttle-up, unstable idle speed, no idle speed, etc.	Check whether the plug is loose and plugged in correctly.	Reinstall in place.
2	The sensor gets wet and cannot run.		Pull out the plug to check.	Clean and prevent water from entering.
3	The sensor is in mechanical failure.		Replace and test it.	Replace it.

3. Water (cylinder) temperature sensor

Function: it is used to detect the operating temperature of the engine; the ECU will provide the best control scheme for the engine according to different temperatures.

Installation position: it is generally installed on the cylinder head or block for air-cooled motorcycles; or installed on the engine water passage or the thermostat valve for water-cooled motorcycles.

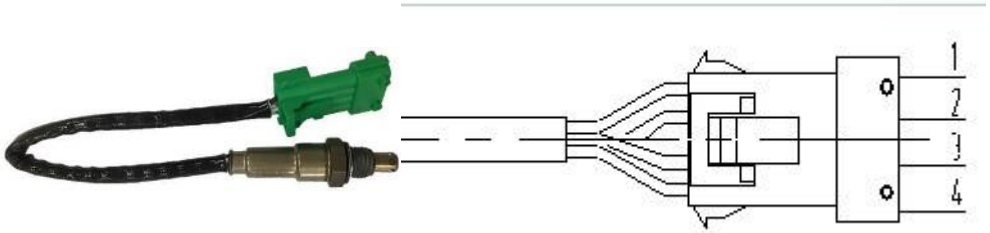


Characteristic Parameters:

Item	Reference Value
Storage temperature (℃)	-40~130
Operating temperature (℃)	-40~200
Rated resistance at 20 ℃ (KΩ)	2.5 ±5%

The mounting hole is 13mm deep, and the thread is M10×1.5.

4. Oxygen sensor



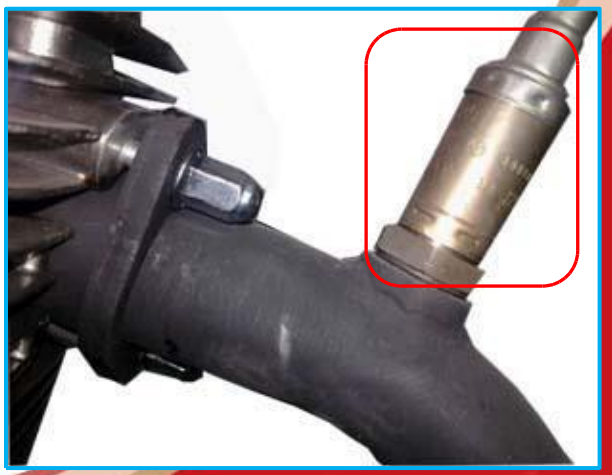
1: sensor signal (black)
2: sensor ground (gray)
3: anode of electric heater (white)
4: cathode of electric heater (white)

Function: it is used to detect the oxygen content in the exhaust gas and feed back the air-fuel ratio to the ECU to provide the best control scheme for the engine.

Installation position: it is installed at the muffler interface elbow, and should be securely sealed with installation seat.

Characteristic parameters:

Item	Reference Value
Storage temperature (℃)	-40~100
Operating temperature of probe tube end (℃)	200~850
Connection plug temperature (℃)	<120
Maximum allowable operating temperature of probe tube when the heater is turned on (℃)	930
Rated voltage (V)	12
Continuous operating voltage (V)	12~14
Test voltage (V)	13



Fault mode and overhaul method:

S/N	Fault Mode	Faults Description	Inspection Method	Maintenance Methods
1	Heating element failure	Unstable idle speed, poor fuel injection, high fuel consumption, rapid slowdown when stabilizing the throttle, and spark plug burnout, etc.	Connect the diagnosis tester to the diagnosis interface to start the engine. The oxygen sensor value is greatly changed from 0.01V to 0.99V. If the frequency of the change is > 6 times/10 seconds, there may be no fault. If the value has no change or the frequency of the change is too low, there may be a fault	Replace it.
2	Sensing element failure			Replace it.
3	Ceramic tube rupture			Replace it.
4	Short or open heating circuit			Replace it.
5	Short or open sensing circuit			Replace it.
Notes: 1. It is 0V for the short circuit of oxygen sensor. 2. It is 0.44V for open circuit of oxygen sensor. 3. When the engine is not started, the parameter is 0.42 to 0.44V. 2. The ceramic tube inside the oxygen sensor is very brittle, and it shall be gently handled in disassembling process.				

Failure determination and inspection methods

• Unplug the oxygen sensor and measure the resistance between 3 and 4 (white line) terminals of the oxygen sensor with a digital multimeter.
Standard value: 7±2Ω
• If the resistance is inconsistent with the standard value, replace the oxygen sensor.

5. Electronic control unit (EFI controller, referred to as ECU)

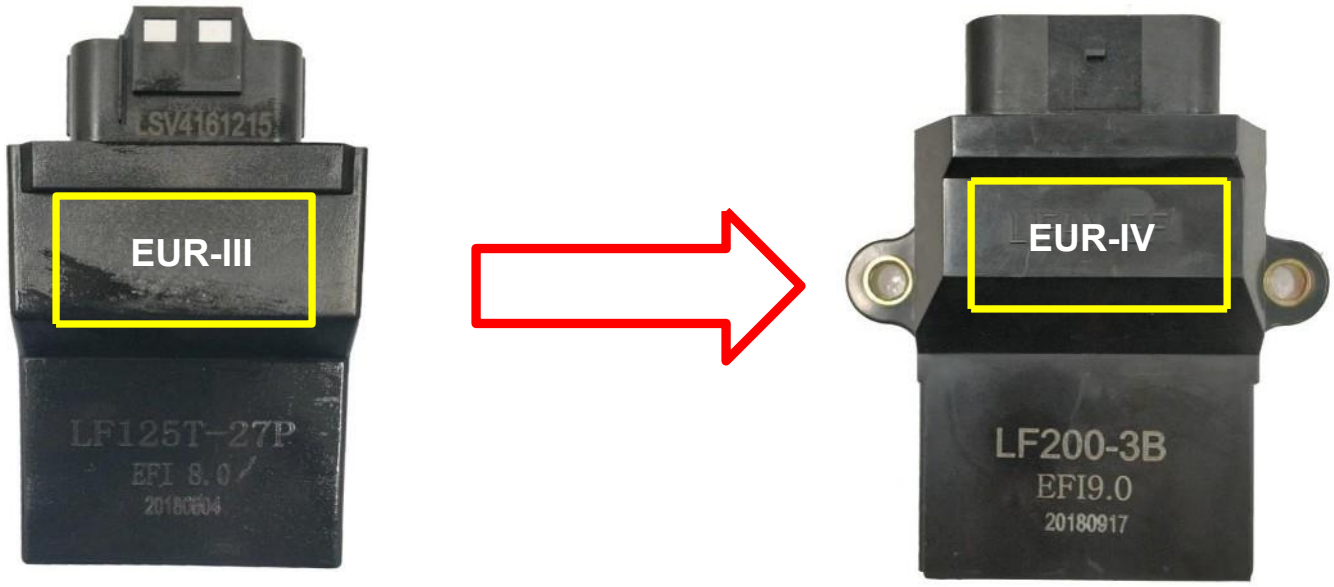
Function: store the optimal ignition and injection time under various working conditions of the engine; receive the signals collected by various sensors; determine the fuel injection amount required by the engine running; process various information to realize ignition control, start control, idle speed control, etc. It is connected with meter to provide speed and temperature signals, and it can be connected to the diagnosis tester for fault diagnosis.

Installation position: it is installed under the seat, close to the taillight position. The ECU is a precision electronic component and shall be kept far away from the ignition coil, to prevent interference with the signal.

Characteristic parameters:

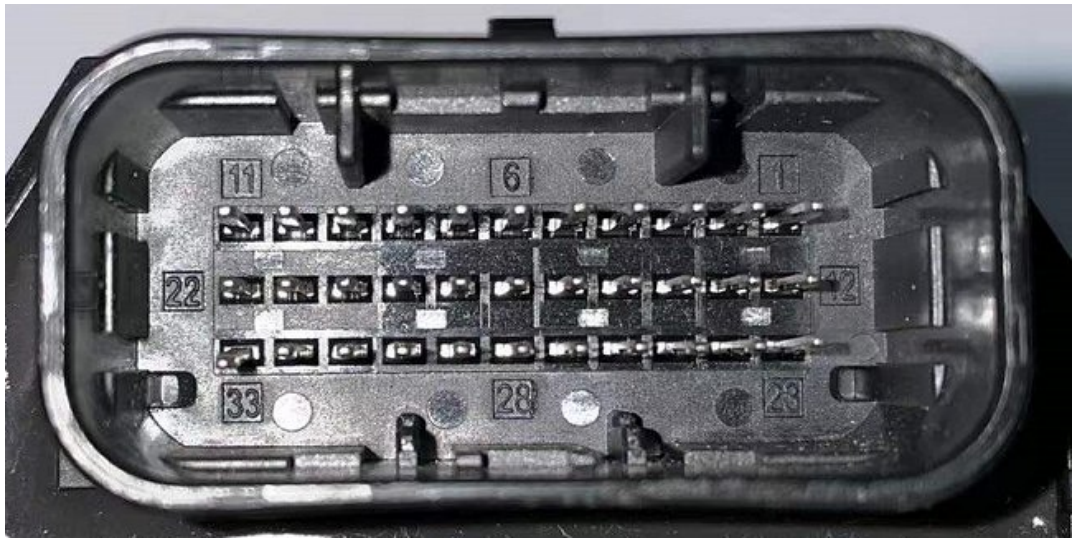
Item	Reference Value
Battery voltage range (V) under normal operation	9~15
Operating temperature (℃)	-30~80
Storage temperature (°C)	-40~90

Comparison of EUR-III and EUR-IV ECUs



Note: Different models of ECUs are not interchangeable due to different internal software parameters.

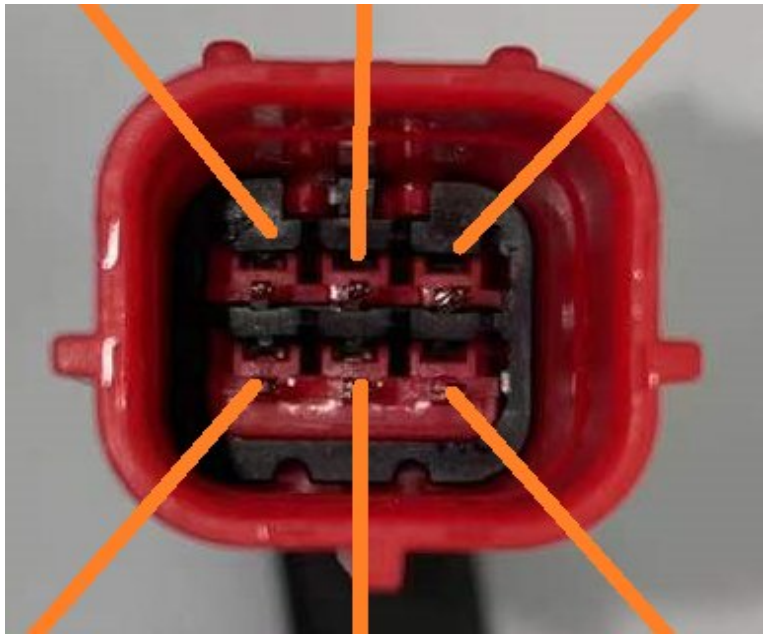
Lifan EFI 9 Euro 4 ECU



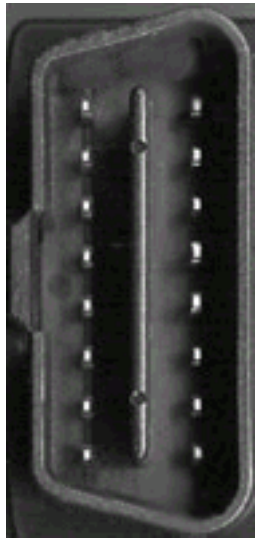
11	Fuel Pump Relay	Rev B	5V voltage Output	Pressure Sensor	Throttle Position	5	Water Temperature Indicator	Oxygen Heater	2	1
Empty	Blue / Yellow	Blue / White	Blue / Red	Red / Blue	Yellow / BLACK	Empty	Green / Blue	Brown / Yellow	Empty	Empty
Power Supply of Swiching Key	Idle Valve	Rev A	Analog Ground Wire	Cylinder Temperature Sensor	Shut-Off Switch	16	15	Fan contorl	13	Ignition
BLACK	Blue	Green / White	Green / BLACK	BLACK	BLACK / White	Empty	Empty	Not defined	Empty	BLACK / Yellow
K-line	Fault Indicator	Injector	Electronic Ground	Air Temperature Sensor	Oxygen Sensor Signal	27	26	Speed Output	24	Power ground Wire
Pink	Brown / Red	Brown / White	Green	Yellow / Red	White	Empty	Empty	Brown / Blue	Empty	Green

ECU plug: Taobao Part Number DJ73327-0.6-21

Diagnostic Plug



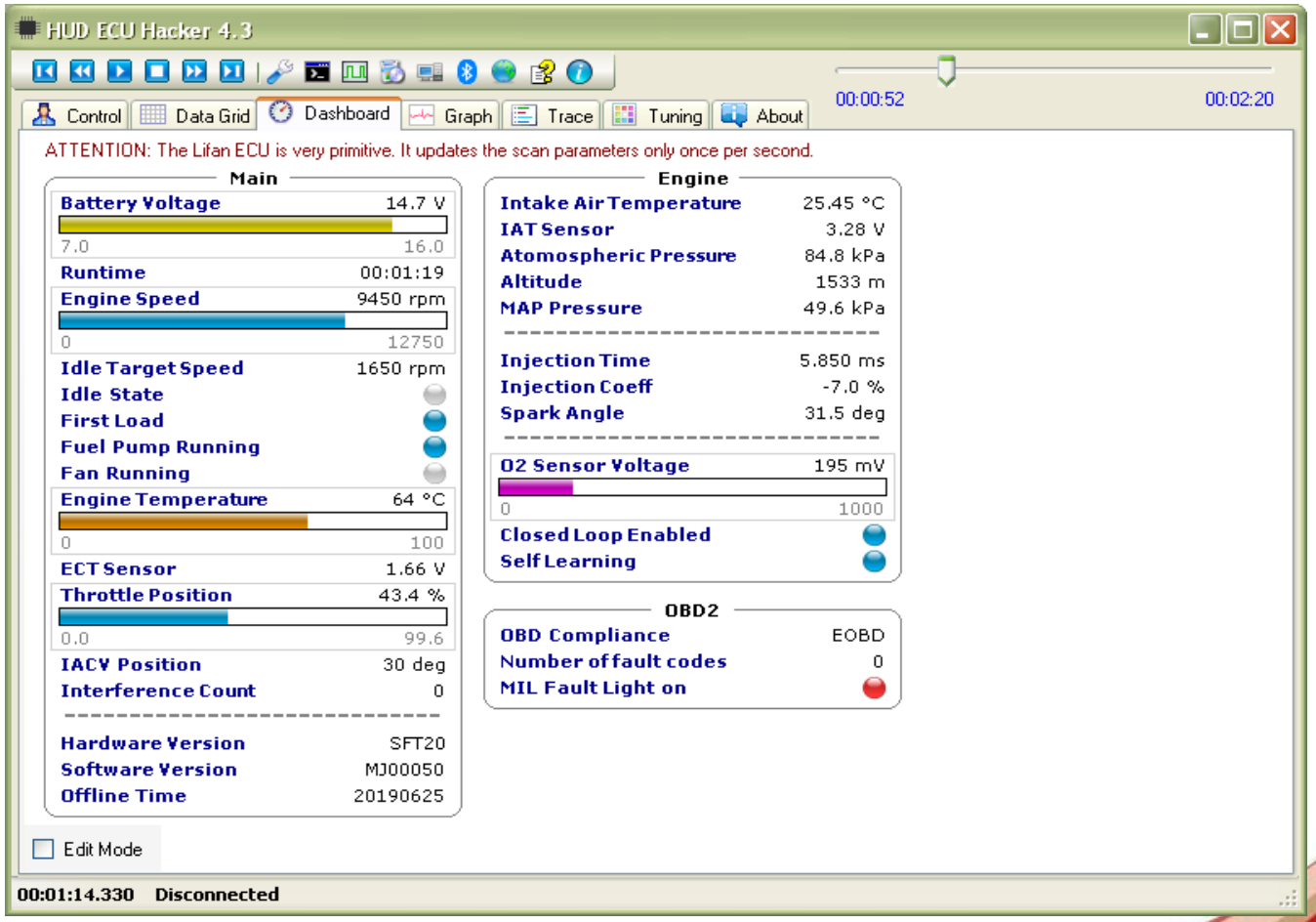
SAE J1962 Plug



Diagnostic plug: Taobao Part Number DJ7069Y-0.6-11

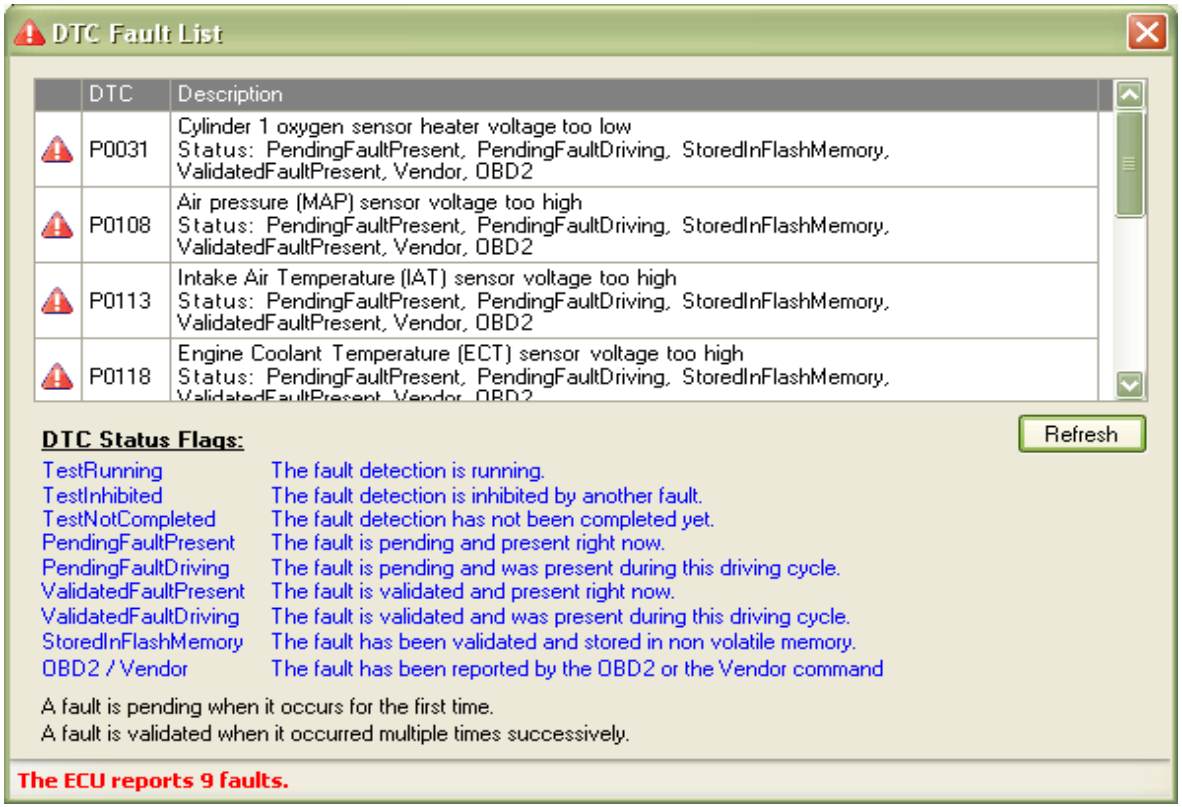
Scanning the ECU with HUD ECU Hacker

Download HUD ECU Hacker at https://netcult.ch/elmue/HUD ECU Hacker



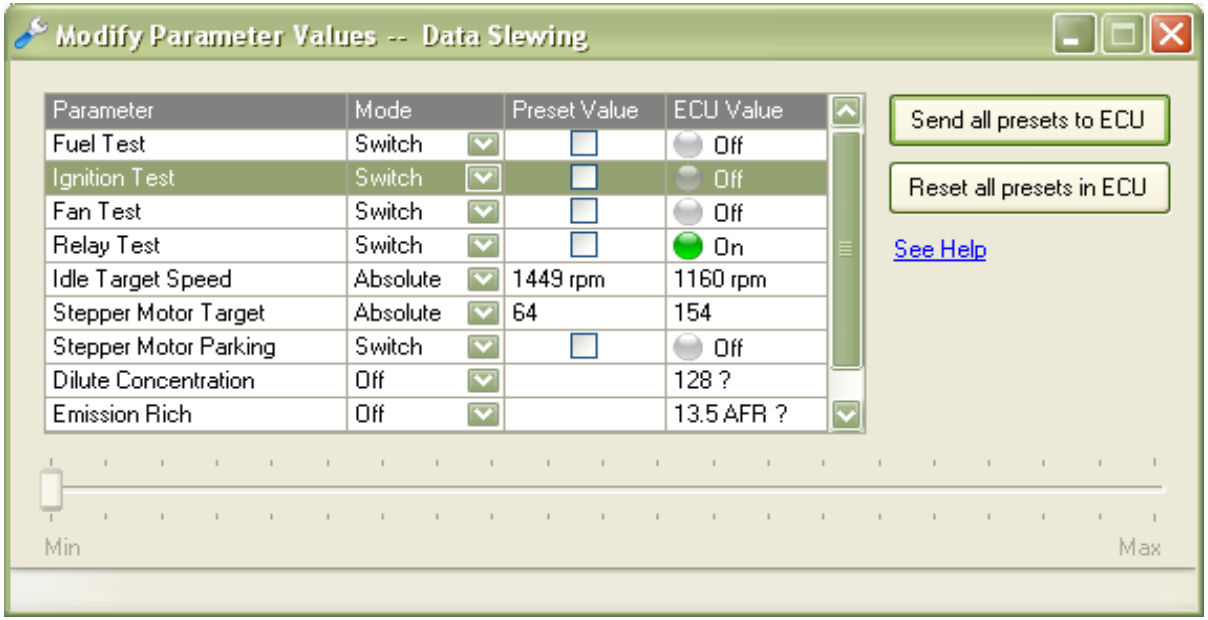
Display Fault Codes

In the pane "Contol" click "Show Fault Codes" to see all errors in the ECU



Data Slewing

Data Slewing allows to test some of the parts in the motorbike



Hold the mouse over a parameter to see the description

Fault mode and overhaul method

S/N	Fault mode	Faults description	Inspection Method	Maintenance Methods
1	Plugged unstably or not in place	The EFI system has no reaction; turn on the key but the fuel pump has not action.	Inspect if the plug is loose or plugged in place.	Reinstall it as per the installation position.
2	Damaged	The associated component does not work.	Replace the ECU and test it.	Replace it.
3	Watering and short circuit of the plug	Rush-out, easy flameout, failure of throttle-up, no idle speed, etc.	Inspect whether the pin is corroded.	Clean and waterproof it.

With a protection circuit inside, the ECU is not easily damaged. The reasons for the damage usually include the following:

- The rectifier fails and the ECU burns out.
- When replacing the ECU, the power supply voltage when measuring the idle speed should be less than 14.5V. Increase the engine speed to more than 2,000 rpm and the power supply voltage should be less than 14.5V to determine the failure of the generator voltage regulator.

Note: the ecu shall not be threw, and the power supply shall be cut off when the ECU is plugged.

6. Fuel pump (also known as oil pump)

Function: it is used to provide constant-pressure fuel to the system.
Installation position: the built-in fuel bottom-mounted pump is installed at the bottom of the fuel tank; the built-in top-mounted fuel pump is installed at the top of the fuel tank. In any case, the flatness of the installation surface of the fuel tank should be ≤ 0.3mm, and no fuel leakage be found after installation.

Characteristic parameters:

Item	Reference Value
Operating voltage (V)	8~15
Fuel system pressure (KPa)	250/300/330
Environment temperature (℃)	-40~80
Permissible operating fuel temperature (℃)	-30~70

Running condition: After the ignition switch is turned on, the fuel pump will work for 3 seconds. If the ECU does not detect a valid missing tooth speed signal, the fuel pump stops working. When the engine starts running, the ECU detects at least two valid missing tooth signals, and the fuel pump starts working.

Closing condition: After speed signal is lost, the fuel pump stops working.

Fault mode and overhaul method:

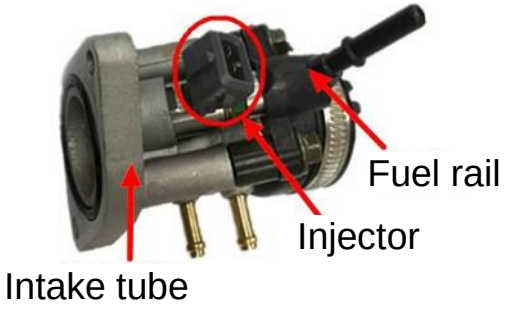
S/N	Fault Mode	Faults Description	Inspection Method	Maintenance Methods
1	Filter screen blockage	Start failure, failure of throttle-up, etc.	Use a pressure gauge to check whether the fuel pressure is normal.	Clean the filter.
2	Failure of fuel pressure regulator			Replace it.
3	Higher or lower fuel pressure			Replace it.
4	Failure of fuel pump to work		After turning on the key, if not hearing the operation sound of the fuel pump, directly power on the fuel pump. If not rotating, the fuel pump is broken.	Replace it.

Precautions for operation:

* If the motorcycle is parked for a long time (more than 30 days), especially in summer, make sure to drain the fuel to avoid the fuel deterioration and damage to the fuel pump.
* It is strictly forbidden to operate the fuel pump without fuel.
* There shall be a sufficient amount of fuel in the fuel tank, generally > 3.5 L.
* The fuel pump pressure varies with the specific model and displacement of the motorcycle.

7. Injector (also known as nozzle)

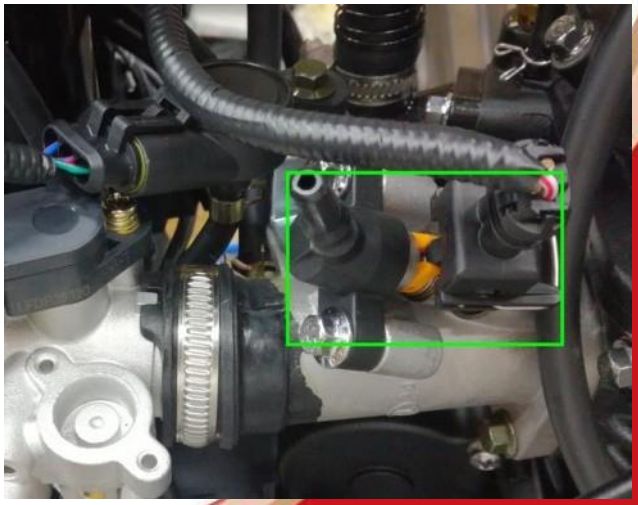
Function: According to the ECU's instructions, timely inject a certain amount of fuel into the engine intake duct.



Installation position: It is installed on the intake duct, with a linear distance from the intake valve of 70 to 120 (mm).

Characteristic parameters:

Item	Reference Value
Operating voltage (V)	8~16
Operating fuel pressure (KPa)	250-450
Continuous operating temperature (℃)	-40~110
Resistance range at 20 ℃ (Ω)	12~16



Note: The injectors for different motorcycle models with different specifications are not interchangeable.

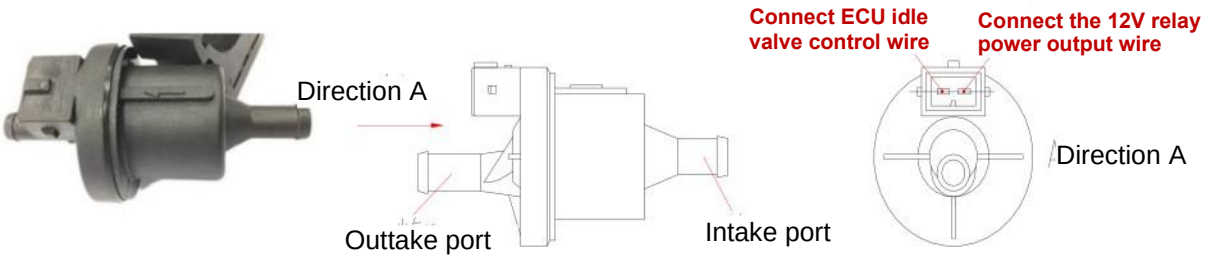
Fault mode and overhaul method:

S/N	Fault Mode	Faults Description	Inspection Method	Maintenance Methods
1	Loose plug	Start failure, failure of throttle-up, etc.	Inspect it.	Re-plug it.
2	Injector blockage		Inspect whether it enable to inject fuel.	Clean it.
3	Poor performance and damage of seal ring		Inspect it.	Reassemble or replace it.
4	Open or short circuit		After turning on the key, if not hearing the operation sound of the fuel pump, directly power on the fuel pump. If not working, the fuel pump is broken.	Replace it.
Note: If the engine is not started normally when the electric start button is pressed, it is normal to stop the fuel injection after the injector injects the fuel for 3 to 5 times in order to avoid excessive injection.				

Precautions:

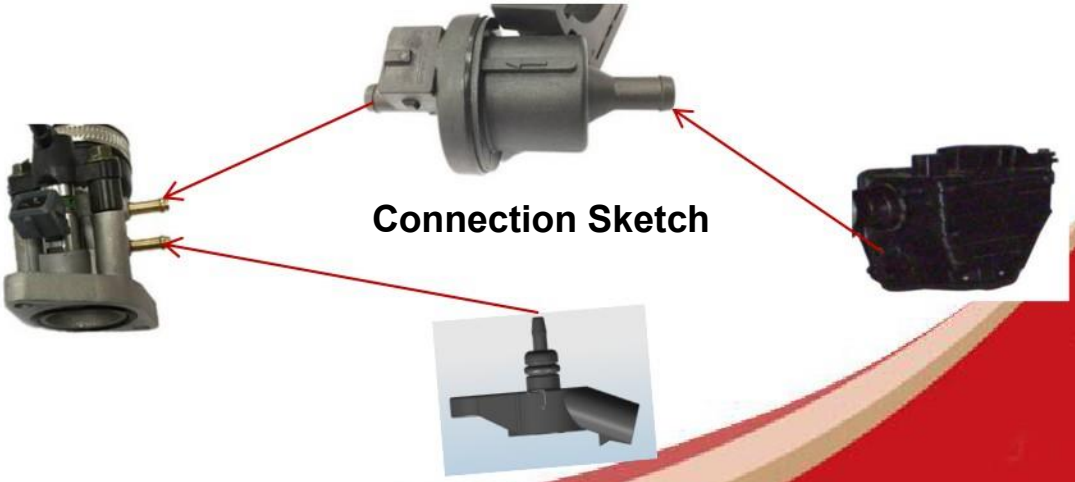
* If the motorcycle is parked for a long time (more than 30 days), especially summer, make sure to drain the fuel to avoid the fuel deterioration to block the injector.
* For motorcycles stored in warehouse or not used for a long time, first remove the high-pressure fuel tube to remove the gasoline in the tube. Before the engine starts, switch the ignition lock for 3 to 5 times to remove the air in the oil circuit to ensure the normal operation of the engine.

8. Idle air gulp valve (TEV)



Function: it is used to control the flow rate of the bypass intake duct of throttle valve body to adjust the amount of air into the engine, thereby controlling the idle speed of the engine.

Installation position: it is installed on the engine or the frame, and the specific position is not fixed.



Characteristic Parameters:

Item	Reference Value
Rated voltage (V)	13.5
Operating voltage (V)	9~15
Resistance at 20 ℃ (Ω)	24-28
Permissible operating temperature (℃)	-30~120
Permissible storage temperature (℃)	-40~130
Opening of idle gulp valve (TEV)	30 to 45 (degrees)

Fault mode and overhaul method:

S/N	Fault Mode	Faults Description	Inspection Method	Maintenance Methods
1	Tube blockage or leakage.	Unstable idle speed, no idle speed, high idle speed, easy flameout, etc.	Add air and test it	Unblock or replace it
2	Idling actuator blockage.		Add air and test it	Unblock or replace it
3	Open or short circuit of electromagnetic coil.		Add air and test it	Reinstall in place.
4	Failure under vibration of idling actuator.		Add air and test it	Replace it.

Idle gulp valve (TEV) opening adjustment method (premise that the altitude is less than 1,000m)

When the cylinder head temperature reaches (90±3) ℃, if the TEV opening is not between 30 and 45 (degrees), it shall be adjusted by the following method:

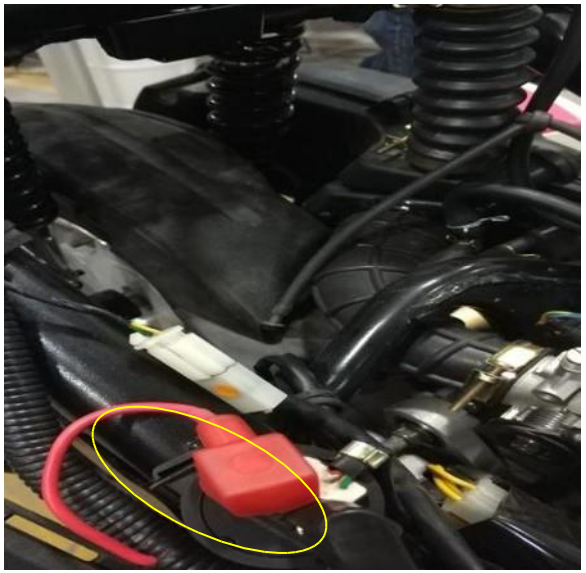
1. If the TEV opening value is larger: rotate the idle gulp bolt counterclockwise for 1/4 round, throttle up the engine for 3 times, and observe whether it returns to the normal range after 15 seconds; repeat above steps until reaching to the standard value.

2. If the TEV opening value is smaller: rotate the idle gulp bolt clockwise for 1/4 round, throttle up the engine for 3 times, and observe whether it returns to the normal range after 15 seconds; repeat above steps until reaching to the standard value.

9. Air temperature sensor

Function: it is used to detect the atmospheric temperature; the ECU will provide the best control scheme for the engine according to different temperatures.

Installation position: it is installed on the main cable next to the air filter.



Characteristic parameters:

Item	Reference Value
Storage temperature (℃)	-40~130
Operating temperature (℃)	-40~130
Rated resistance at 20 ℃ (KΩ)	2.5 ±5%

Fault mode and overhaul method:

S/N	Fault Mode	Faults Description	Inspection Methods	Maintenance Methods
1	Resistor damage	Difficulty in cold start, unstable idle speed, high fuel consumption, etc.	1. Inspect whether the deviation between the temperature measured by the diagnosis tester and the actual ambient temperature is too large. 2. Use a multimeter to measure the sensor resistance and inspect whether it is within the reference range.	Replace it.
2	Open or short circuit of the sensor			Check the plug connector or replace it.

10. Speed sensor (trigger coil)

Function: it is used to detect the rotational position and speed of the crankshaft; the ECU will provide the best control scheme for the engine according to different rotational positions and speeds.

Installation position: it is installed inside the left crankcase cover of the engine, in the same position as the non-EFI motorcycle.

Characteristic Parameters:

Item	Reference Value
Operating temperature (℃)	-40~150
Working clearance	0.50-0.90mm

Fault mode and overhaul method

S/N	Fault Mode	Faults Description	Inspection Methods	Maintenance Methods
1	The plug is loose and not in place.	Difficult to start, poor throttle-up, easy flameout, explosive sound of combustible mixture, etc.	Inspect it.	Re-plug it.
2	The clearance between the sensor and the rotor boss is too large.		Measure it with a tool.	Re-adjust it within the correct range.
3	The sensor has iron scraps.		Inspect it.	Clean off
4	Lead wire of the sensor is broken.		Inspect it.	Repair it
5	The sensor is in open or short circuit.		Inspect it.	Inspect and plug in.
6	The relative position of the rotor to the crankshaft is incorrect or displaced.		Inspect it.	Reinstall or repair it.

Failure determination and inspection methods

•Read the engine speed value with the fault diagnosis tester, and read the engine speed change when starting the motorcycle. After the motorcycle is started normally, the engine speed is displayed. If not meet the requirements, proceed to the next step.

•Unplug the rotate speed sensor (trigger coil) and measure the resistance of the trigger coil with a digital multimeter to check whether it is within the reference range.

•If the resistance is inconsistent with the standard value, replace the sensor.

11. Ignition coil

Function: it is used to provide a high voltage to the spark plug for ignition.

Installation position: it is installed on the frame, and the specific position is not fixed.

Characteristic parameters:

Item	Reference Value
Operating voltage (V)	6-16
Primary resistance (Ω)	4±10%
Secondary resistance (KΩ)	12±10%

Fault mode and overhaul method:

S/N	Fault mode	Faults description	Inspection Method	Maintenance Methods
1	Loose plug and poor contact	Start failure, poor throttle-up, easy flameout, coasting with flameout, rush-out in driving, etc.	Inspect it.	Re-plug it.
2	Ignition coil burnout		Measure the resistance with a multimeter	Replace it.
3	Short or open circuit		Measure the resistance with a multimeter	Replace it.

Ignition coil detection and failure determination:

• Remove the high-voltage wire and spark plug, insert the spark plug into the high-voltage wire for grounding, and then start the engine to test the ignition.

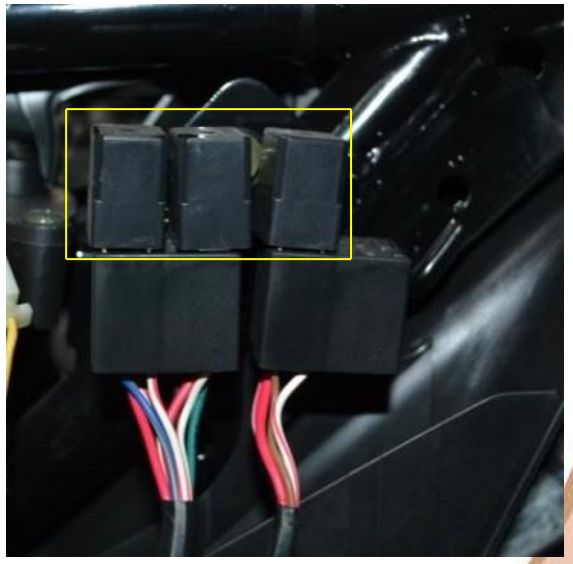
(Note: inspect the ignition performance of the ignition coil by Bluetooth diagnosis tester.)

• Check the resistance of the ignition coil with the ohms range of a digital multimeter. If the resistance is inconsistent with the reference value, replace the ignition coil.

12. Main relay and fuel pump relay

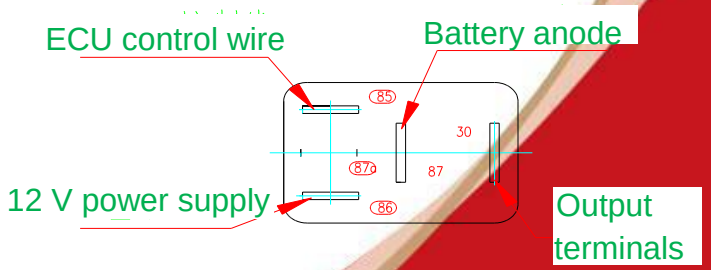
Function: It is used to control the power-on/off of the working circuit via electromagnet.

Installation position: it is installed on the frame, and the specific position is not fixed.



Characteristic parameters:

Item	Reference Value
Rated voltage (V)	12
Operating voltage range (V)	10-16
Coil resistance (Ω)	96±10%



Fault mode and overhaul method:

S/N	Fault Mode	Faults Description	Inspection Methods	Maintenance Methods
1	Loose plug and poor contact	The EFI system has no response, the fuel pump fails to work, etc.	Inspect the plug.	Re-plug it.
2	Short or open circuit		Detect it with a multimeter.	Replace it.
3	Failure		Replace the accessories and test.	Replace it.

Detection and failure determination:

1. Use the lead wire to directly connect the power supply anode and output terminals of the relay for testing. If the EFI system and the fuel pump work normally, it indicates that the relay may be faulty. If the faults of the EFI system and the fuel pump are not eliminated, it indicates that the relay is not faulty.

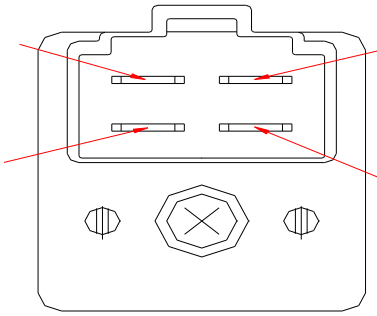
2. Replace the relay for testing. If the fault still exists, find out other causes; if the fault is eliminated, it indicates that the relay is faulty.

3. Use a multimeter to measure whether the voltage and coil resistance are within the reference range.

☆☆☆ Physical photo of relay of GIII motorcycle

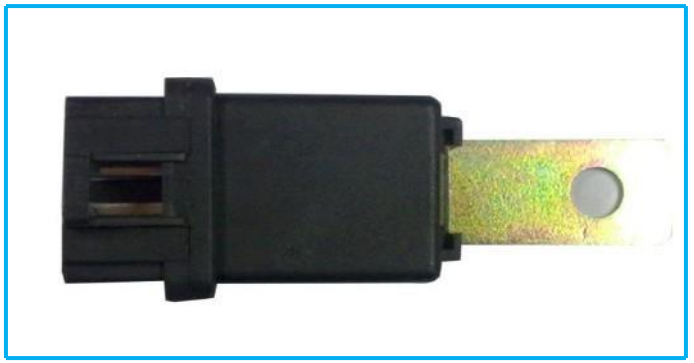
ECU - fuel pump relay control wire

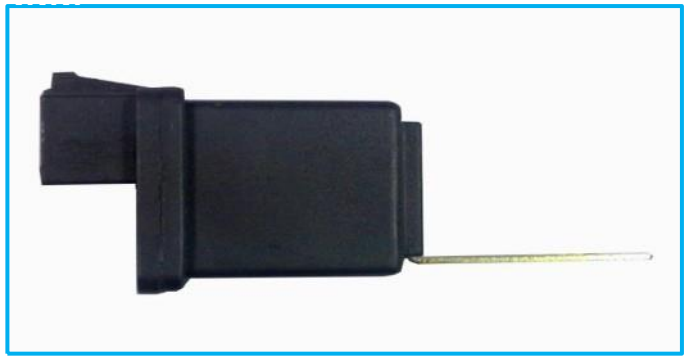
Battery anode



Connected in series to the relay coil power cord (12V) after stop switch

Relay power outputted to fuel pump, fuel injector and other actuators





The fault modes and inspection methods are the same as applied on National-IV relay.

13. Other EFI parts

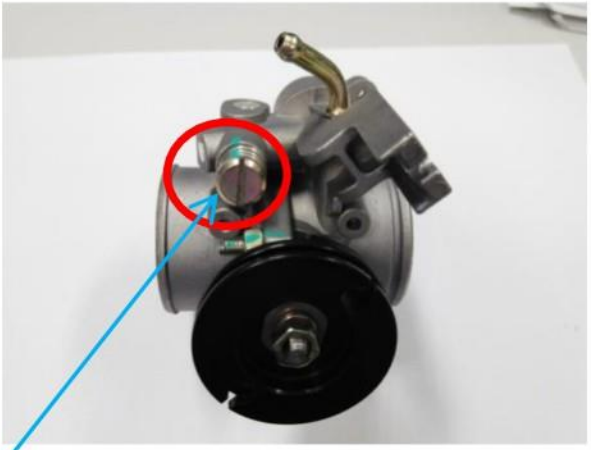
Throttle body assembly
(National-IV)

Intake manifold assembly

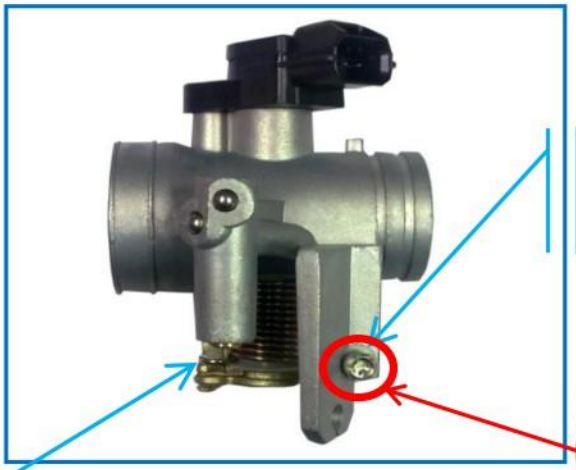
Carbon canister

Connected to the fuel tank

Adjustment of idle gulp bolt of the throttle



Idle gulp adjusting bolt



Throttle stop screw

Throttle stop screw is a key performance control part, and never allowed to adjust without permission.

Idle gulp adjusting bolt

Adjustment methods: 1. When the idle gulp bolt is adjusted clockwise, the TEV opening value is increased, but the air amount injected in idle state is reduced, i.e. the speed is reduced; 2. when the idle gulp bolt is adjusted counterclockwise, the TEV opening value is decreased, but the air amount injected in idle state is increased, i.e. the speed is increased; it is recommended to adjust 1/4 round, and then adjust after 15 seconds of observation.

IV. Commissioning of EFI Motorcycle

All the motorcycles are commissioned before delivery to optimize all the parameters. If the individual motorcycle need to be commissioned after assembly, the procedures are described as follows:

1. Fuel addition: Add a sufficient amount of gasoline to the motorcycle, In principle, not less than 3.5L gasoline for street bikes, and not less than 1.5L gasoline for cubs and scooters.

2. Self-inspection: Turn on the flameout switch and turn on the key switch. If you hear the sound of fuel pump operation and see that the fault indicator is always on, you can basically judge that the motorcycle is not faulty, and you can proceed to the next step and exhaust the motorcycle. If you do not hear the sound of fuel pump operation, the fuel pump wire may be faulty and need to be repaired. If the fault indicator is on and flashes at a certain frequency, it indicates that there is a fault at present, and the fault can be eliminated by connecting the diagnosis tester.

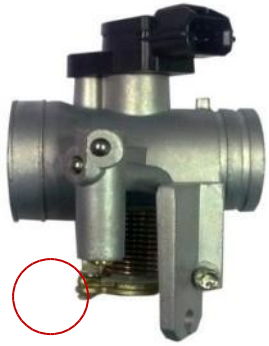
3. Air exhaust: In the case of power-on (the flameout switch is in the open position), turn the ignition lock key on for 5 seconds, turn off and wait for 3 seconds, then turn it on again, and repeat the steps for 3 to 5 times to exhaust the air in the fuel tube.

4. View of raw data: If the motorcycle is equipped with an EFI diagnosis tester, connect the diagnosis tester to check the engine status. At this time, the TEV opening value is 0, the oxygen sensor voltage is (0.42 to 0.45)V, and the data is normal before the motorcycle is started.

5. Start: Press the "Start" button to start the motorcycle. If it is not started for the first time, it can be restarted for 3 to 5 times. If still not started, further check on the motorcycle for faults is needed.

6. Rough adjustment of idle speed: If there is no idle speed after startup, you can adjust the idle speed by adjusting the idle gulp bolt on the valve body (as shown below). Instruction: rotate the bolt for 1/8 round counterclockwise and repeat above steps until there is an idle speed.

Valve body D34



Valve body D28

7. View of operating parameters: View the parameters of the diagnosis tester. At this time, the engine speed is about 1,500-2,400 rpm, and the TEV opening is between 300 and 750, (related to the external temperature and the bypass ventilation volume); as for the oxygen sensor parameters, after 40 seconds, the voltage is between 0.01 and 0.99V, which fluctuates greatly with the demarcation point of 0.44V. Otherwise, inspect the oxygen sensor circuit or replace the oxygen sensor. As the cylinder head temperature is increased, the TEV opening is decreased continuously and the rotational speed is also reduced, which is maintained at (1,600±100 rpm for scooters) / (1300±100 rpm for other models).

8. Adjustment target: When the cylinder head temperature reaches (90±3) ℃, the TEV opening is between (30 to 45), the ignition advance angle is from (-0.2 to 6) degrees, and the rotational speed is (1,600±100) rpm for scooters, (1,500±100) rpm for three-wheelers, and (1,300±100) rpm for other models. If the cylinder head temperature reaches (90±3) ℃ and the TEV opening is higher than 45 degrees, we should adjust the idle gulp bolt for 1/8 round counterclockwise, add the fuel for no less than 3 times, wait for 15 seconds, then observe the TEV opening until the standard is reached; if the cylinder head temperature is lower than (90±3) ℃, and the TEV opening is less than 45 degrees, we should adjust the idle gulp bolt for 1/8 round clockwise, add the fuel for no less than 3 times, wait for 15 seconds, then observe the TEV opening until it is adjusted to the standard value.

9. View of fan status: The fan of the water-cooled will start working when cylinder temperature is > 91 ℃ and will stop working until cylinder temperature drops to 87 ℃.

10. Clear the faults: After commissioning, the previous faults shall be cleared regardless of whether there was a fault.

The commissioned motorcycle should meet the following conditions:

1. It can be started normally without throttling up the engine;

2. The idle speed is stable, with a fluctuation range of:

1,600±50rpm for scooters, 1300±50 rpm for two-wheelers, and 1500±100rpm for three-wheelers

3. It will not flame out in case of rapid throttle-up, and can return to idling state when releasing the throttle;

4. Throttle up and released smoothly.

(2) Adjustment of technical parameters (applicable to all models)

Generally the EFI parts of EFI motorcycle are not prone to failure. When malfunction occurs, use the EFI diagnosis tester to detect the relevant parameters of the motorcycle. If not within the specified range, they should be adjusted. The specific parameters and adjustment methods are described as follows:

Item	Reference Range	Faults & Commissioning Methods	Remarks
Idle speed	1,300±50 (rpm) (1600±50) (rpm)	1. If higher: rotate the idle gulp bolt clockwise for 1/4 round, throttle up the engine for 3 times, and observe the condition after 15 seconds; repeat above steps until returning to the reference range. 2. If lower: rotate the idle gulp bolt counterclockwise for 1/4 round, throttle up the engine for 3 times, and observe the condition after 15 seconds; repeat above steps until returning to the reference range.	After an adjustment, wait for 15 seconds, and use the diagnosis tester to observe whether the idle speed is back to the reference range.
TEV opening (Idle gulp valve)	30 - 45 (°)	1. If larger: rotate the idle gulp bolt counterclockwise for 1/4 round, throttle up the engine for 3 times, and observe the condition after 15 seconds; repeat above steps until returning to the reference range; the optimum value is 30 degrees. 2. If smaller: rotate the idle gulp bolt clockwise for 1/4 round, throttle up the engine for 3 times, and observe the condition after 15 seconds; repeat above steps until returning to the reference range; the optimum value is 30 degrees.	The cylinder head temperature should be up to (90 ±3) ℃ when determining whether the opening is larger or smaller.
Ignition advance angle	-0.2 to (+6.0) °	1. If larger: rotate the idle gulp bolt counterclockwise for 1/4 round, throttle up the engine for 3 times, and observe the condition after 15 seconds; repeat above steps until reaching to the standard value. 2. If smaller: rotate the idle gulp bolt clockwise for 1/4 round, throttle up the engine for 3 times, and observe the condition after 15 seconds; repeat above steps until reaching to the standard value.	It is regarded as normal if it deflects off the normal range occasionally and stabilize the idle speed is stabilized.

Item	Reference Range	Faults & Commissioning Methods	Remarks
Injection time	2.5 to 3.5 msec	1. If longer: the injection hole may be blocked, the oxygen sensor may continually alarm for lower oxygen concentration, the pressure in fuel pump is not enough, the battery voltage is insufficient, or the muffler pad or oxygen sensor seat is leaking. 2. If shorter: the oxygen sensor may continually alarm for higher oxygen concentration (oxygen sensor fault), or the pressure of fuel pump is higher than the normal value.	Operating condition: thermal engine idling
Oxygen sensor	Drastically fluctuate from 0.01 to 0.99V (after the engine normally works for 40 seconds)	1. Keep the air/fuel mixture thiner in the combustion chamber below 0.44V. 2. Keep the air/fuel mixture thicker in the combustion chamber above 0.6V.	0V: short circuit of oxygen sensor 0.44V: open circuit of oxygen sensor
Water (cylinder) temperature sensor	The temperature is raised as the engine runs for longer, but the maximum temperature shall not exceed 120 ℃.	1. When the engine temperature is greatly increased but the temperature of the water (cylinder) temperature sensor is slightly changed, there may be a fault; 2. When the temperature continually shown by the water temperature sensor is not changed or higher than the actual temperature, there may be a fault. 3. The reading of water (cylinder) temperature sensor is abnormal, and the fan often rotates or does not work.	Replace water temperature sensor.
Air temperature sensor	Changed along with air temperature.	If the temperature shown is significantly deviated from the actual temperature, there may be a fault.	Replace air temperature sensor.
Throttle position sensor	0-82%	1. Unstable idle speed, and slow response to acceleration. 2. 0 or 0.39% opening as indicated by idle condition.	The screws used to install the sensor cannot be rotated at will.
Pressure sensor	Idle speed: about 30Kpa	1. No idle speed and slow acceleration response 2. Magneto speed sensor failure, connecting hose leak, and poor wiring contact, etc.	The atmospheric pressure value is calculated according to actual local altitude.
Battery voltage	13.5-14.5V	1. Inspect charging device and wiring when the voltage is lower. 2. Inspect the regulator when the voltage is higher.	Detected it in a stable idling state.

Attention:

If the altitude is higher than 1,000 m, the TEV opening value is no longer referred to;

1. Adjust it with reference to the target idle speed and ignition advance angle (-0.2 to 6);

2. It can also be judged by throttle up or releasing the throttle. When the cylinder head temperature reaches (90±3) ℃: throttle up or release when it is kept stable at 4,000 rpm for 15 seconds, and then find out whether the speed returns to the target idle speed by hearing the engine sound. If there is slow release of throttle, adjust the idle gulp bolt clockwise. If the motorcycle flames out, adjust the idle gulp bolt counterclockwise.

Idle speed of the scooter: 1,600±100r/min

Idle speed of the two-wheeled motorcycle: 1,300±100r/min

Idle speed of the tricycle: 1,500±100r/min

(III) Common fault cases

Faults Description	Causes	Troubleshooting Methods
High idle speed	The negative-pressure switch cover of carbon canister is damaged or leaking.	Inspect and replace it.
	The intake amount from idle gulp bolt is too high.	Adjust it.
	There is air leakage at the intake tube or O-ring seal.	Inspect and repair it.
	There is rupture or air leakage at the connection hose of desorption tube, idle gulp valve and negative pressure tube.	Replace the abnormal nose.
Rush-out in driving	The spark plug cap poorly contacts with spark plug or gets wet.	Inspect and repair
	There is air leakage at the oxygen sensor seat.	Inspect and repair
	Oxygen sensor fails.	Replace it.
	Idle gulp valve (TEV) opening and idling air gulp are abnormal.	Adjust it.
	There is air leakage at the muffler gasket.	Repair it.

Faults Description	Causes	Troubleshooting Methods
Failure of ignition coil	There is a failure at the engine speed sensor (trigger coil).	Replace it.
	There is too large clearance between the engine speed sensor (trigger coil) and the rotor boss.	Adjust it.
	Main cable is in poor contact with ignition coil patch cord.	Inspect and adjust it.
	The ECU is in poor contact with main cable or fails.	Inspect or replace it.
	The engine speed sensor is in poor contact with the main cable connector.	Inspect and repair

Pay Special Attentions to:

1. Special EFI parts for different models are not interchangeable.
2. According to the needs of different models, choose (injector, fuel pump, throttle body assembly and fuel rail) of different specifications.

Injector

Fuel pump

Throttle body assembly

Fuel rail

Description:

When the EFI motorcycle fails, please refer to the carburetor vehicle maintenance method to check the following aspects:

1. Check whether the fuel is sufficient (≥ 3.5 L & high quality) and whether the fuel injection is normal.

2. Check whether the ignition of the ignition system is normal.

3. Check whether the engine cylinder pressure is normal.

4. Check whether the engine intake system is unblocked.