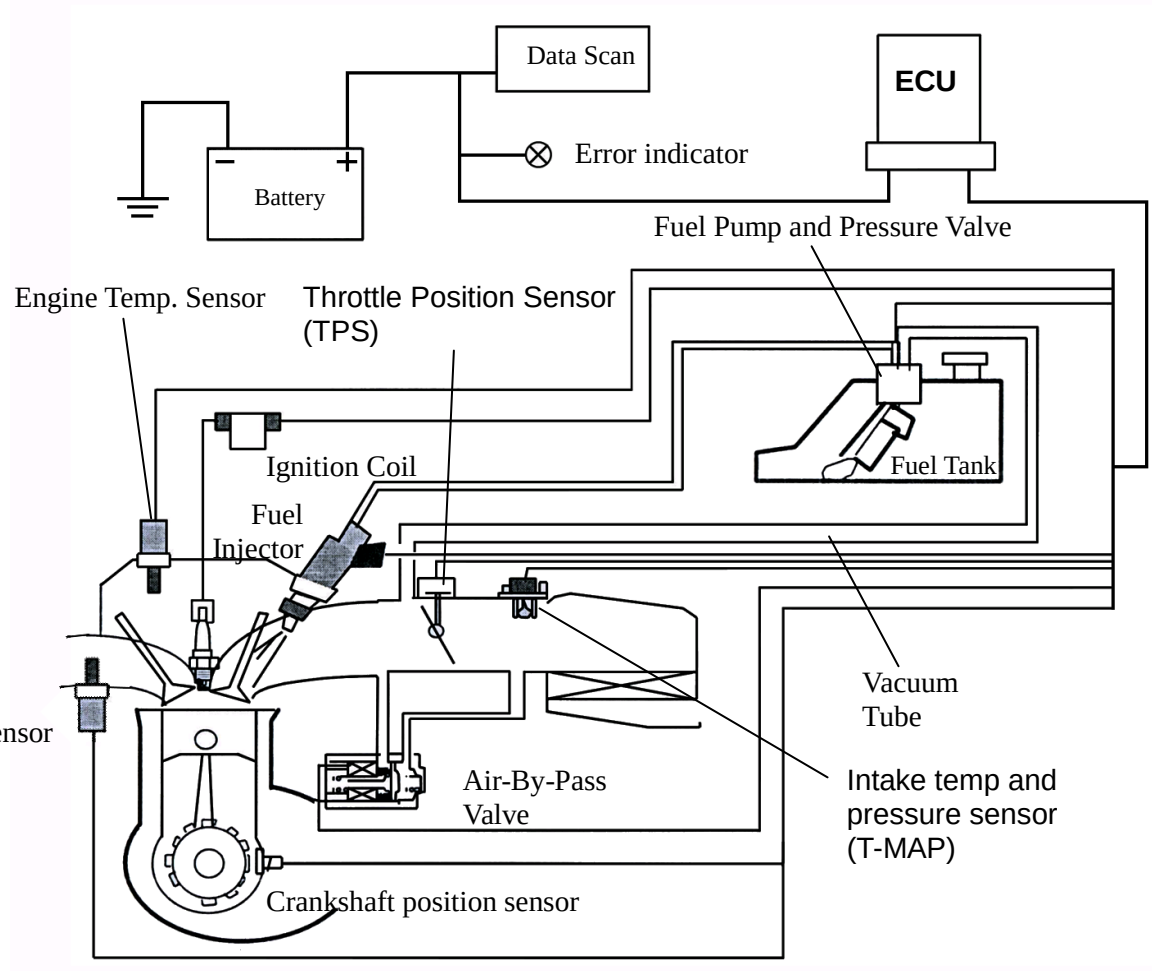
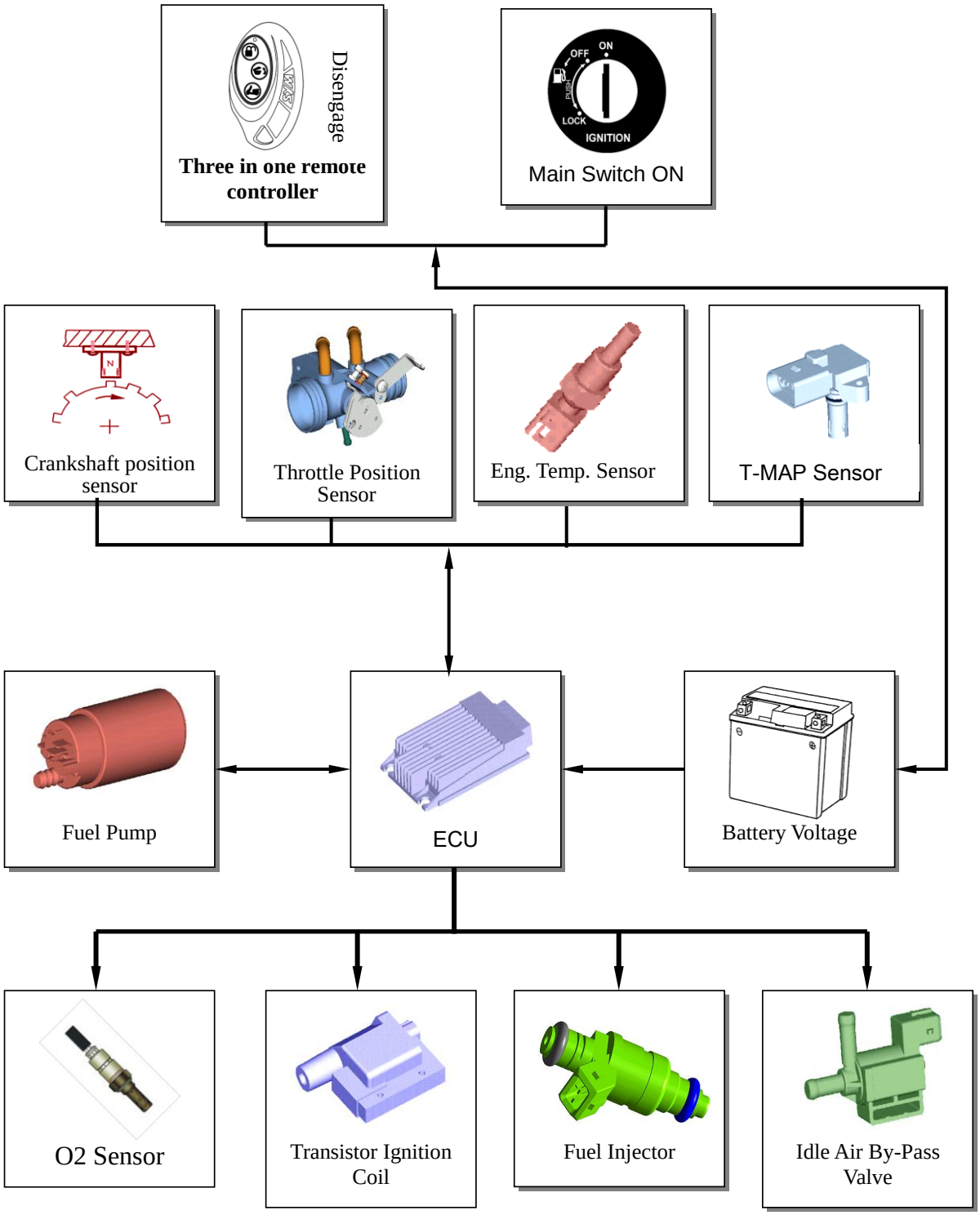


1. EFI Mechanism Illustration



2. The Fuel Injection System Introduction

Based on 4-stroke SOHC engine, displacement 125 c.c. Electronically controlled fuel injection, fuel vapor absorbed by carbon canisters. The engine burns off the blow-by fuel-gas in the crankcase through the fuel-air separating device. The O2 sensor enhances the efficiency of the catalyzer, by dynamically controlling the Fuel/Air ratio.

Electronic Fuel Injection Device

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

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

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

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

1. The quantity of fuel injected is decided according the condition of the engine. The engine RPM, and throttle position determines the fuel quantity and injection time-length. This throttle-controlled fuel injection is better responding and more accurate.
2. The quantity of fuel injection, and the determination of injection time length, are all controlled by 8 bit microcomputer.
3. The pressure regulating valve maintains a 2.5 bar pressure difference between inlet pipe and fuel pipe, raising the accuracy of fuel injection.
4. By measuring the air pressure of inlet pipe, this system gives the vehicle better accommodation to the environment.
5. Idle air by-pass system supplies fuel and air to stabilize the idle running, and cold starting.
6. O2 sensor feeds back the signal to minimize the exhaust pollution.

3. Electronic Fuel Injection Components & Operation Principle Introduction

Electronic Fuel injection system consists of fuel supply devices: fuel tank, fuel pump, filter, and pressure regulating valve, and fuel controller devices: fuel injector, and ECU.

The fuel is pumped from electrical fuel pump in the fuel tank, to the injector on the inlet pipe. The pressure-regulating valve keeps the pressure around 2.5bar.

The signals from ECU enable the injector to spray fuel into the combusting chamber once each two crankshaft-revolutions. The excessive fuel flows back to the fuel tank through the pressure-regulating valve. Fuel pump is placed within the tank to reduce the working noise, and the complicity of fuel pipes.

As a whole, electrically controlled ignition and fuel injection system effectively reduce fuel consumption rate and exhaust pollution. The design is better environmental friendly.

4. Precautions In Operation

General information

⚠ Warning

Gasoline is a low ignition point and explosive materials, so always work in a well-ventilated place and strictly prohibit flame when working with gasoline.

⚠ Cautions

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

Specification

Item	
Idle RPM	1660±100 rpm
Throttle handle free play	2~6 mm

Torque value

Engine Temperature sensor：0.74~0.88 kgf-m。

O2 Sensor：3.6~4.6 kgf-m。

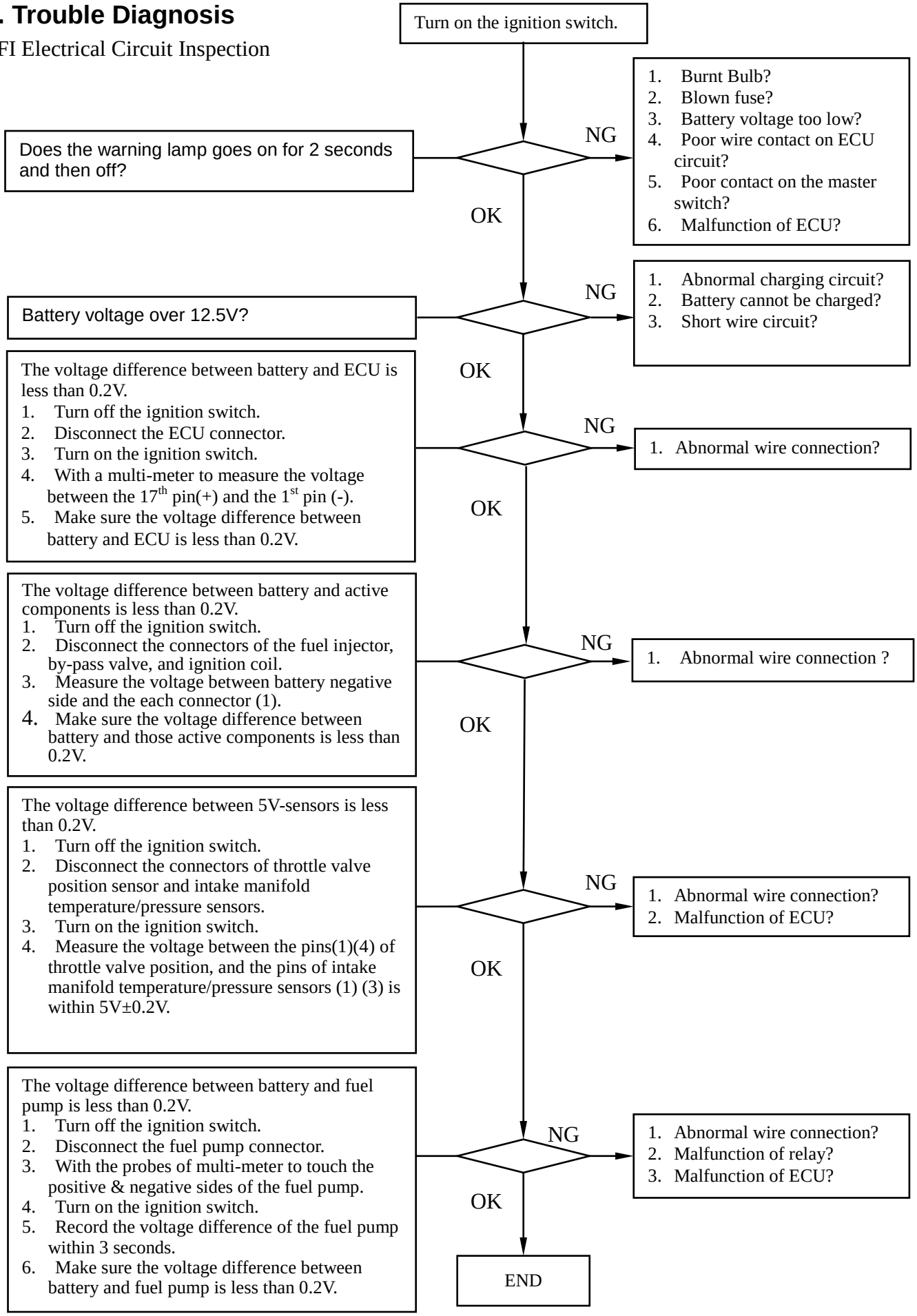
TOOL

Special Tools

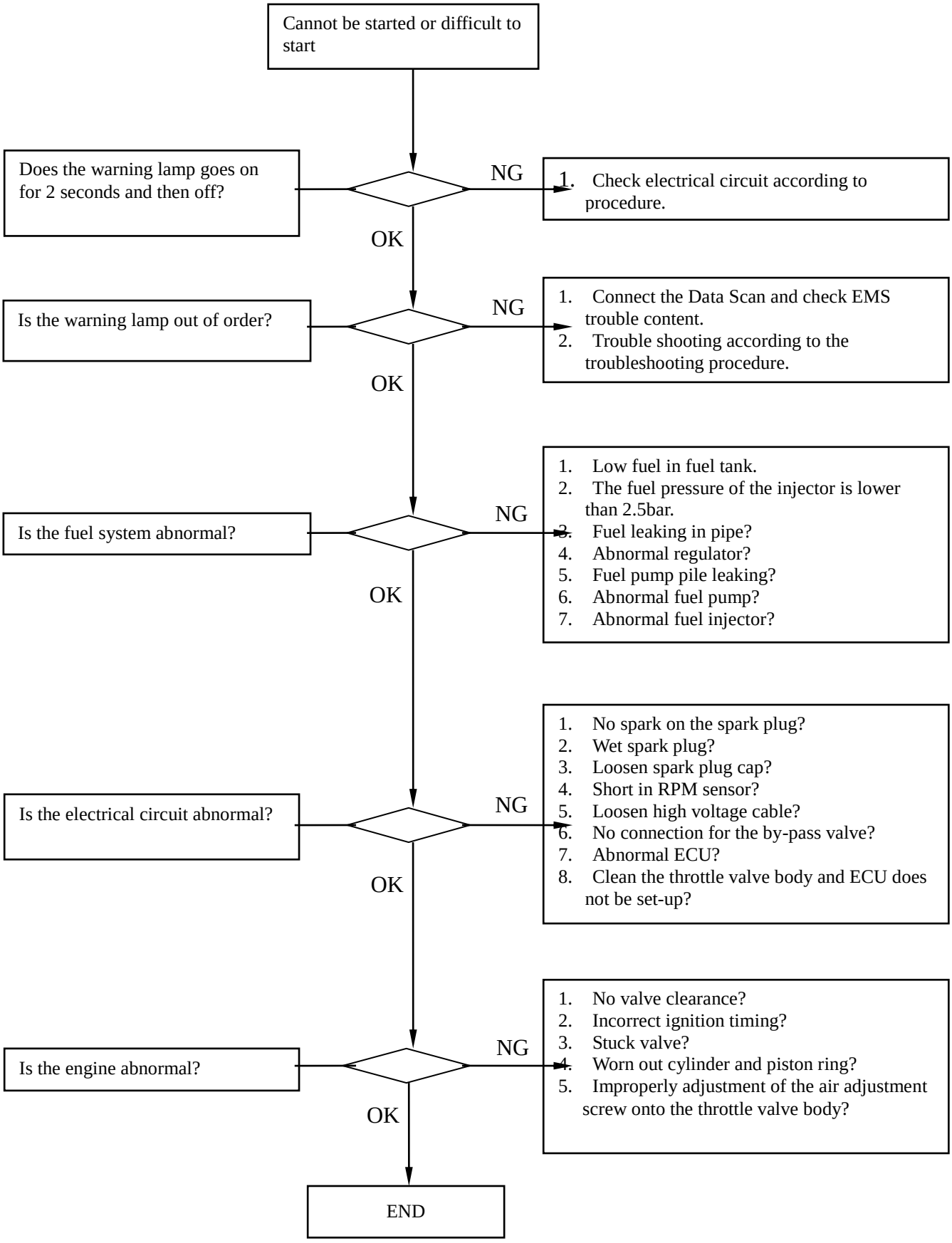
Vacuum/air pressure pump
Injection system diagnostic (Data Scan)

5. Trouble Diagnosis

EFI Electrical Circuit Inspection

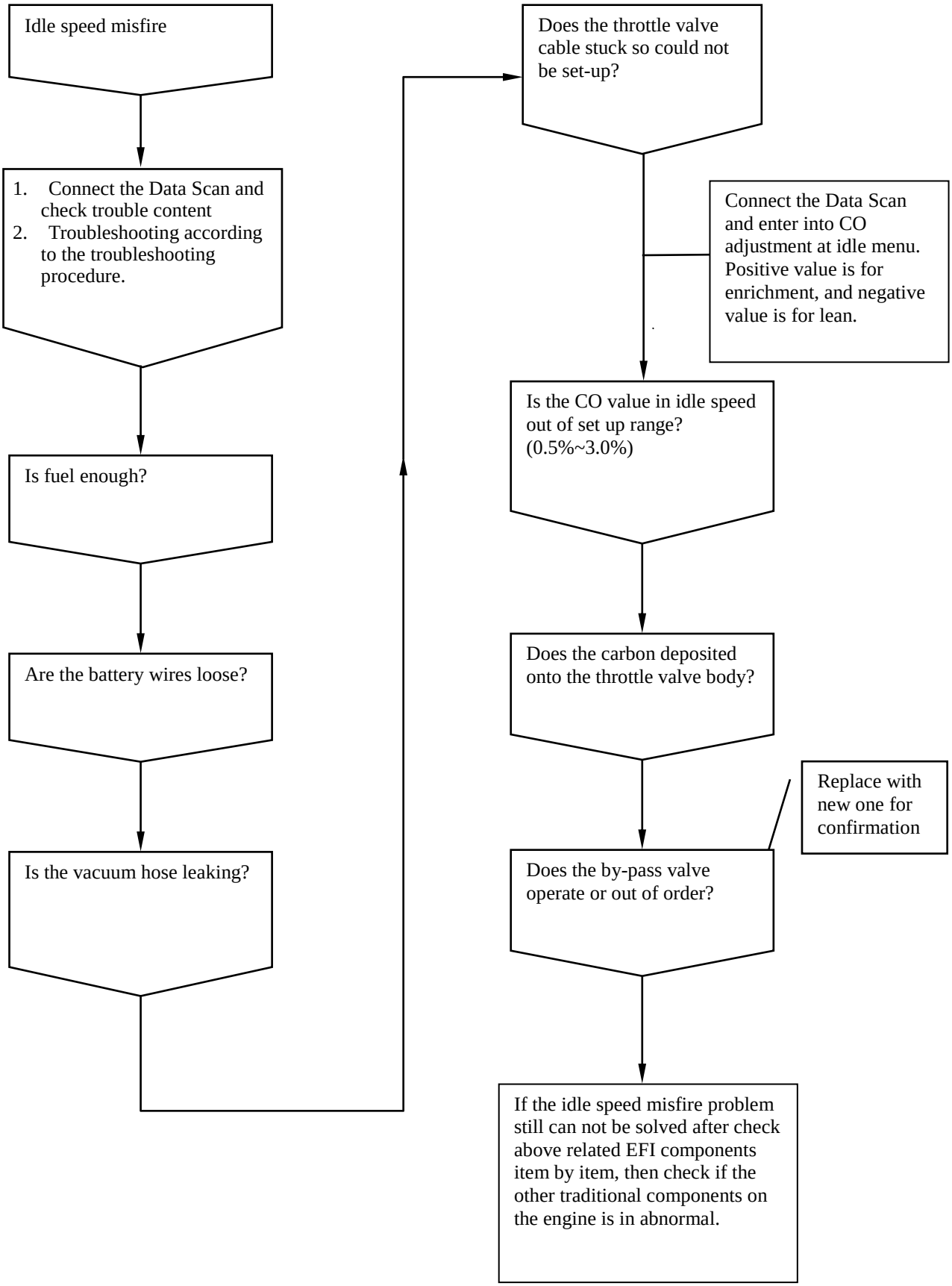


Engine cannot be started or difficult to start.



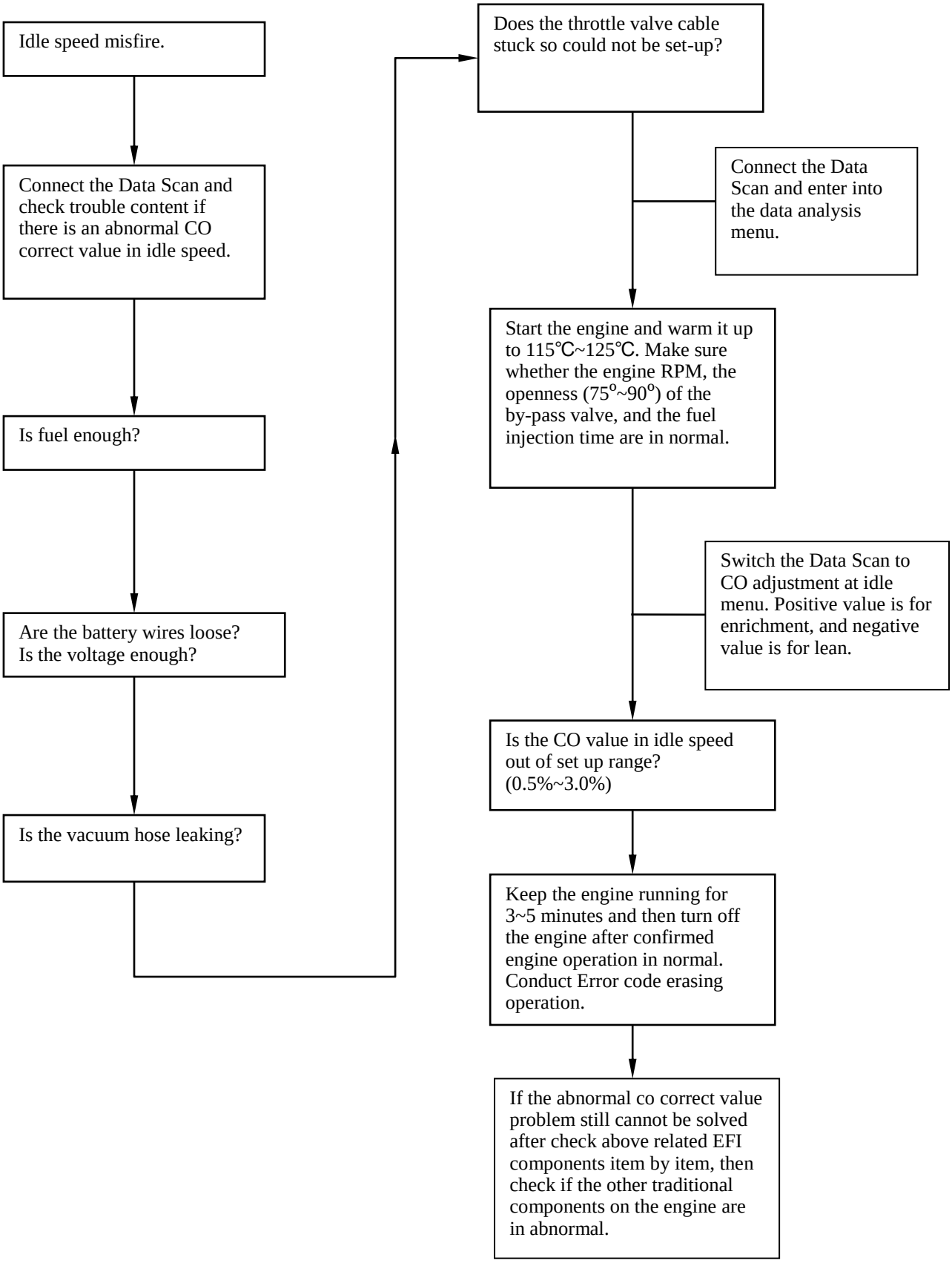
4、Fuel Injection System

Diagnosis Of Idle Speed Misfire



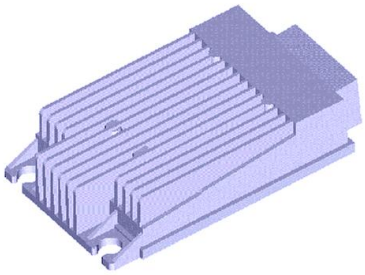
Abnormal CO Value

Usually if the system has O2 sensor, we don't have to adjust the CO value. If the CO value still goes abnormal, please check O2 sensor first, to see if any malfunction occurred.



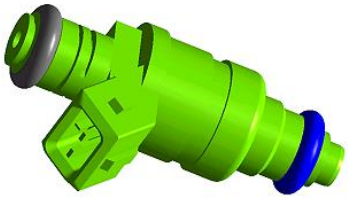
4、Fuel Injection System

6. Components Description Of EFI



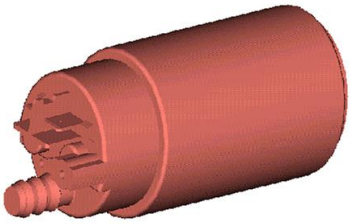
ECU (Electronic Control Unit):

1. Powered by DC 8~16V, and has 22 terminals connector on the unit.
2. The hardware component consists of an 8-bite computer that is its control center. It contains the functional circuit interface of engine condition sensing and the driving actuator for the by-pas valve, fuel injector, and fuel pump, as well as transistor ignition coil.
3. Its major software is a monitor strategy operation program that includes with controlling strategy, MAP and self-diagnosis programs.



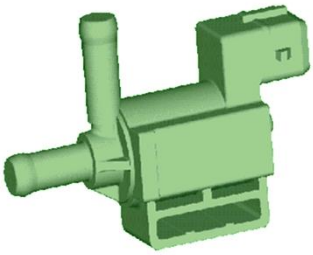
Fuel Injector:

4. Powered by DC 8~16V, and has 2 terminals connector on the injector.
5. Its major component is the solenoid valve of high resistance driven by electronic current.
6. The two terminals are connected to power source and ground respective. It is controlled by ECU to decide the injection timing, and the injector pulse width. Working with 4-valve engine, the unique 2-hole designed injector can provide each intake valve with suitable fuel quantity to reduce HC emission.



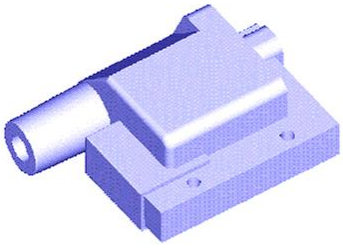
Fuel Pump:

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



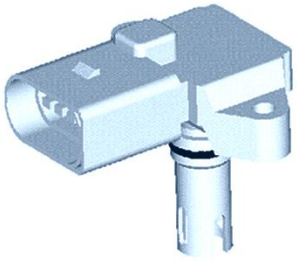
By-pass Valve for Idle :

11. Powered by DC 8~16V, and has 2 terminals connector on the pump.
12. The two terminals are connected to power source and ground respective. The ECU is to control and manage the operation of by-pass valve through electrical power.
13. Its major component is the solenoid valve of high resistance driven by electric current.
14. By means of signals from all sensors, ECU outputs a signal to control the opening angle of the valve so that can adjust air flowing to the intake manifold through the by-pass valve, and then correct the idle speed to have engine in normal operation.



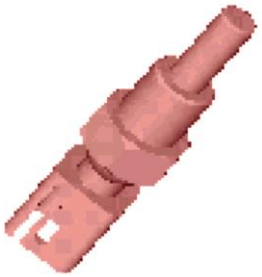
Transistor Ignition Coil:

15. Powered by DC 8~16V, and has 2 terminals connector on the coil.
16. The two terminals are connected to power source and ground respective. Its major component is the high transferring rate transformer.
17. Its ignition timing is controlled by computer program. From the signals of ignition timing, crank position sensor, throttle valve position sensor, and engine temperature sensor as well as intake temperature sensor, and correspondence with engine speed, then the ECU decides the ignition timing properly by means of controlling of primary current in ON & OFF operation to create the secondary voltage of 25000~30000V. And then, the voltage trigged the spark plug ignition. Such kind of ignition system not only can enhance engine performance to max. but also increase fuel consumption efficiency and improve emission quality.



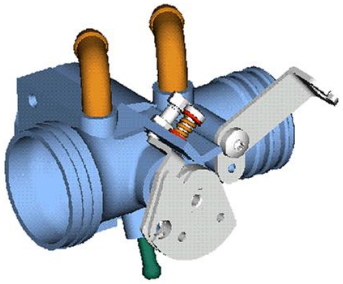
Intake temperature and pressure sensor:

18. Powered by 5V DC from ECU. It has 4 terminals on the sensor. One terminal is for power, and 2 terminals are for signal output. And, the rest one is for ground.
19. The major component of the intake pressure sensor is a variable transistor IC. Its reference voltage is DC 5V, and output voltage range is DC 0~5V.
20. It is a sensor of combination by both sensing pressure and temperature, and can measure the absolute pressure and temperature in intake process. It also conducts fuel injection quantity correction based on environmental temperature and position level.



Engine temperature sensor:

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

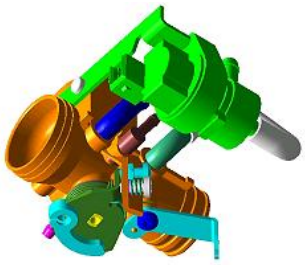


Throttle Valve Position sensor:

24. Powered by 5V DC from ECU, and has 3-terminal connector on the sensor. One terminal is for power, and one for voltage output, and then the last one is for ground.
25. Its major component is a highly variable resistor. The input voltage range: 5V DC.
26. It is located on the side of throttle body. By means of the throttle valve rotation to cause voltage change in linear, it provides ECU with current throttle valve openness information. And also, the ECU conducts the most properly fuel injection and ignition timing according to the signal.

Throttle Body:

27. The throttle body is the air flow adjustment mechanism of the fuel injection. (Its function is likely the carburetor.)
28. The throttle valve shaft is to turn the throttle valve position sensor in synchronously so the ECU that can detect the throttle valve openness in time.
29. The idle speed air by-pass valve controls the pipe in the throttle body. ECU adjusts the idle speed air by-pass valve, and airflow is adjusted by so, which stabilizes idle speed.

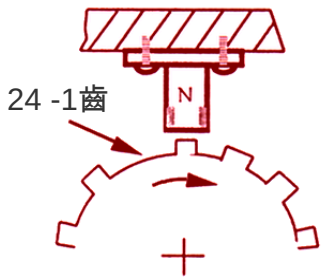


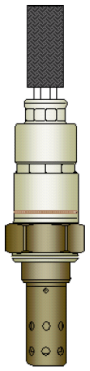
24-1 tooth

Crank position/rpm sensor:

30. It does not need power supply, and has 2-signal terminals connector on the sensor.
31. Its major component is the magnetic pickup coil, and its output voltage range is ±0.8~100V.
32. The air gap between the sensor and flywheel must have .07~1.1mm.

- By cutting the magnetic field, the magnetic sensor sends an inductive voltage that is created with the rotation gear (24-1 tooth) on the flywheel, and the pulse will be sent to the ECU. Then, the ECU calculates current engine speed and crank position based on the voltage so that controls fuel injection quantity and ignition timing properly





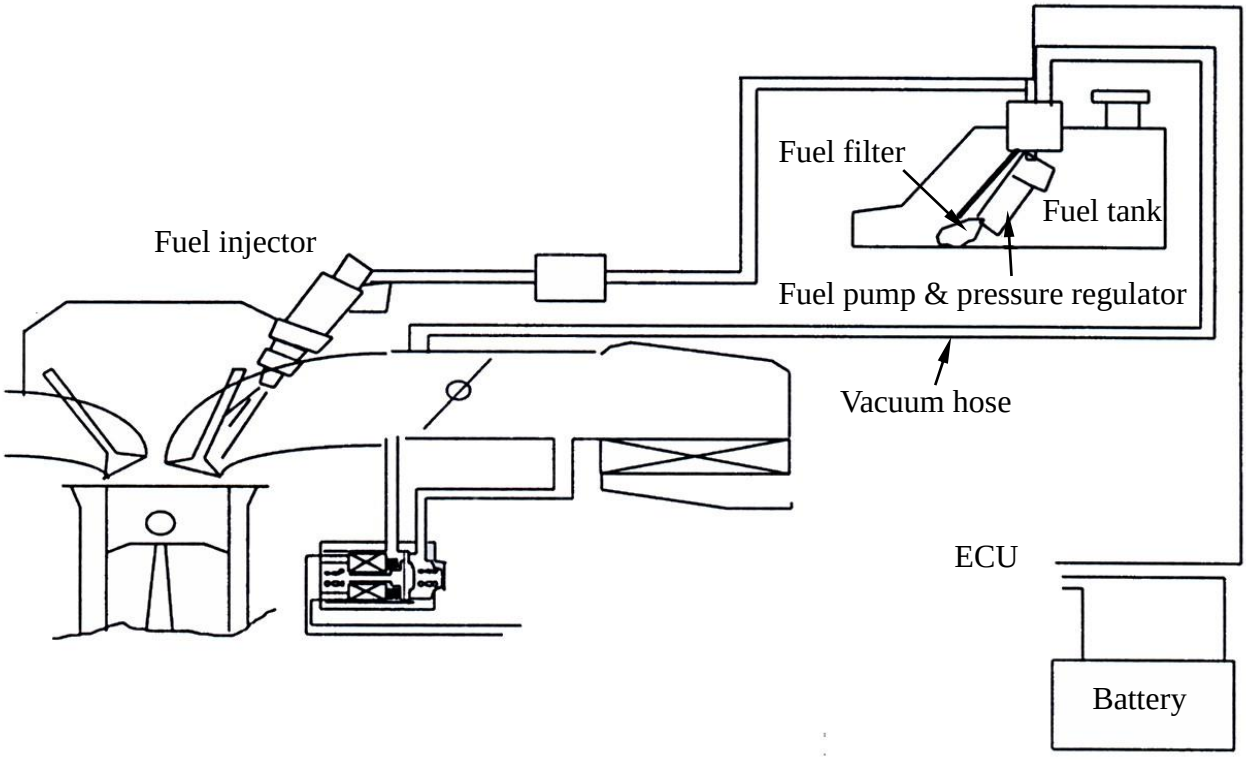
O2 sensor：

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

Troubleshooting on O2 sensor:

NO	Diagnostic Error Code	Malfunction explanation		Cause	Countermeasure
1	P0136	Bad wire connection on O2 sensor.	ECU disconnected from O2 sensor	Coupler damaged or not connected properly.	Connect it tight, or exchange if necessary
			O2 sensor terminals rusty	Coupler wet or pin rusty	Check the water seal, or replace the electric wires.
			Signal wire short	The wire thread is torn and grounded.	Wrap with waterproof tape, or exchange a new part.
			Thread worn or torn	Abnormal pulling force	Rearrange the wire to prevent the abnormal pulling force.
2	PO141	O2 sensor heater abnormal		The heater coil shorted or disconnected.	Check wire connections between ECU and O2 sensor. Replace if necessary
3	PO171	Fuel ratio too rich or too lean	Fuel ratio too lean	Not enough fuel in the tank	Refill the tank
				Fuel supply system congested	Check the Fuel supply system
				Exhaust pipe leaks	Exchange if necessary
			Fuel ratio too rich	Fuel injector leaks	Check or replace if necessary.
				O2 sensor abnormal	Exchange if necessary.
4		Excessive grey deposit.		Fuel additives or oil consumptions deteriorate the O2 sensor.	Exchange if necessary
5		Carbon deposit or engine oil attached.		Fuel ratio too rich, exhaust pipe leaks, engine oil consumption.	Check the relative parts, exchange if necessary
6		Shiny deposit		Contaminated by lead, the platinum or the catalyzer is deteriorated.	Exchange if necessary, or use unleaded gasoline.

7. Fuel Lines



System Description:

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

Injector

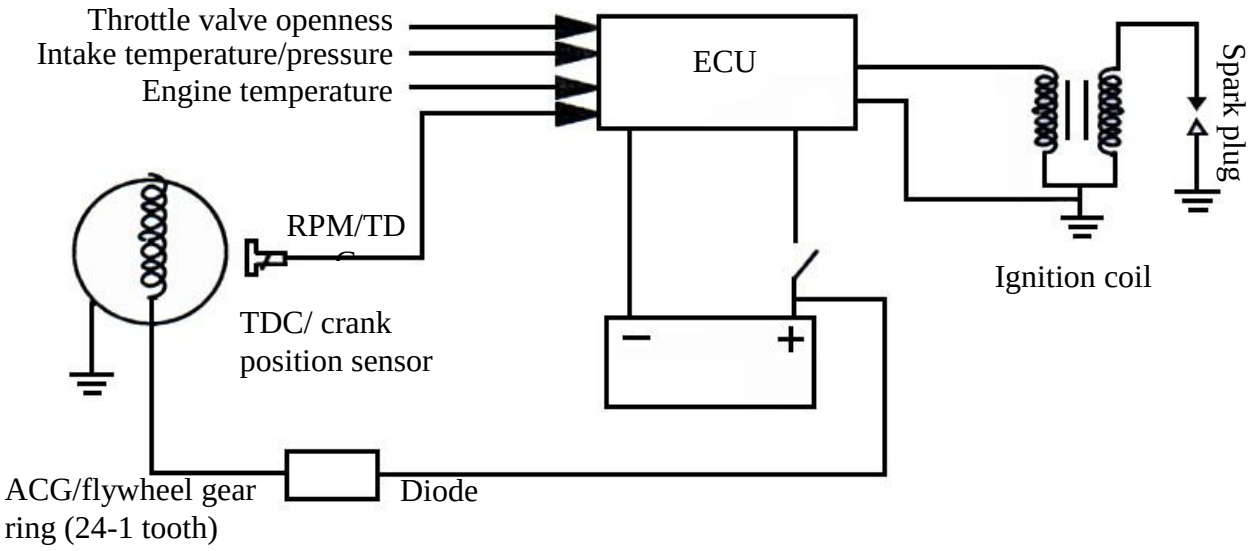
The double-hole injector provides each intake valve a fuel jet. This can reduce the pollution of HC. The shortened version of fuel pump plate makes its size more compact, and sturdier against shocks. ECU signal controls the regulator to maintain 2.5 bars between the fuel pressure and the air pressure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

Fuel Pump

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

4、Fuel Injection System

8. Ignition System



1. Principle of operation:

The engine is equipped with a computerized ignition control system that collects signals from TDC/crankshaft position sensor; throttle position sensor, temperature sensor, and intake temperature as well as pressure sensor. Then, correspondence with engine RPM, this 8-bite microcomputer in the system controls ignition timing properly. The secondary coil creates 25000~30000V high voltage to ignite the spark plug by means of the transistor operation of the primary current entry from the ECU. This can maximize engine performance and also decrease fuel consumption.

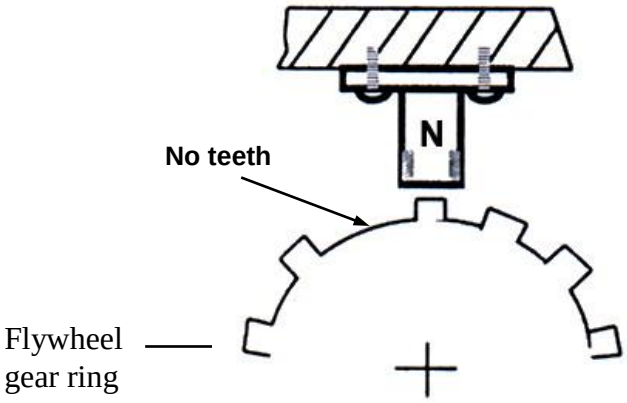
三. Specification

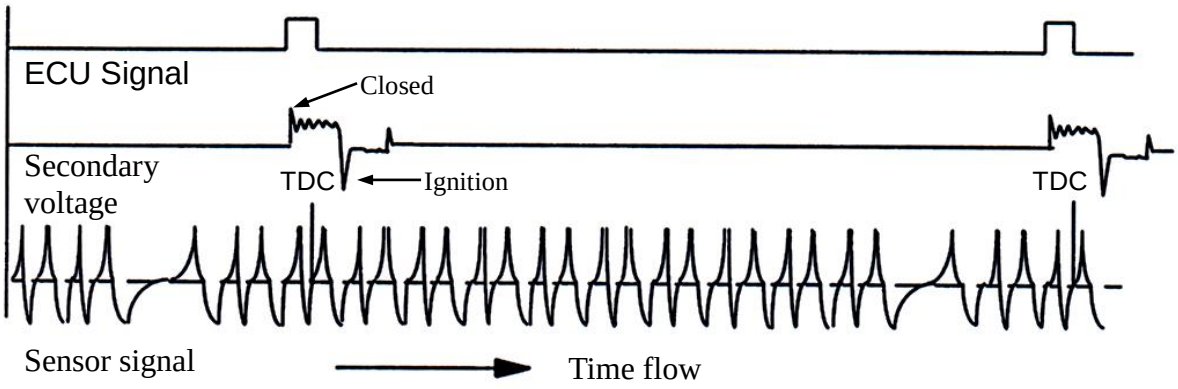
1. Ignition timing: BTDC 5~13°/1600RPM
2. Spark plug: NGK CR7E
   Gap: 0.8mm
3. A.C.G. Pulse generator coil:
   120±10% Ω (G/W-LY)
4. Ignition coil:
   Primary circuit: 0.63 ± 0.03 Ω (20℃)
5. Battery：TTZ10S 8.6Ah
   Capacity：12 v 8.6Ah

9. Crank Position Sensor

The magnetic field type sensor generates a voltage signal to calculate engine speed with ACG gear ring (24-1 tooth).

There is one tooth in every 15 degree on the gear ring. But, one of the teeth is blank for the TDC calculating base.





Description:

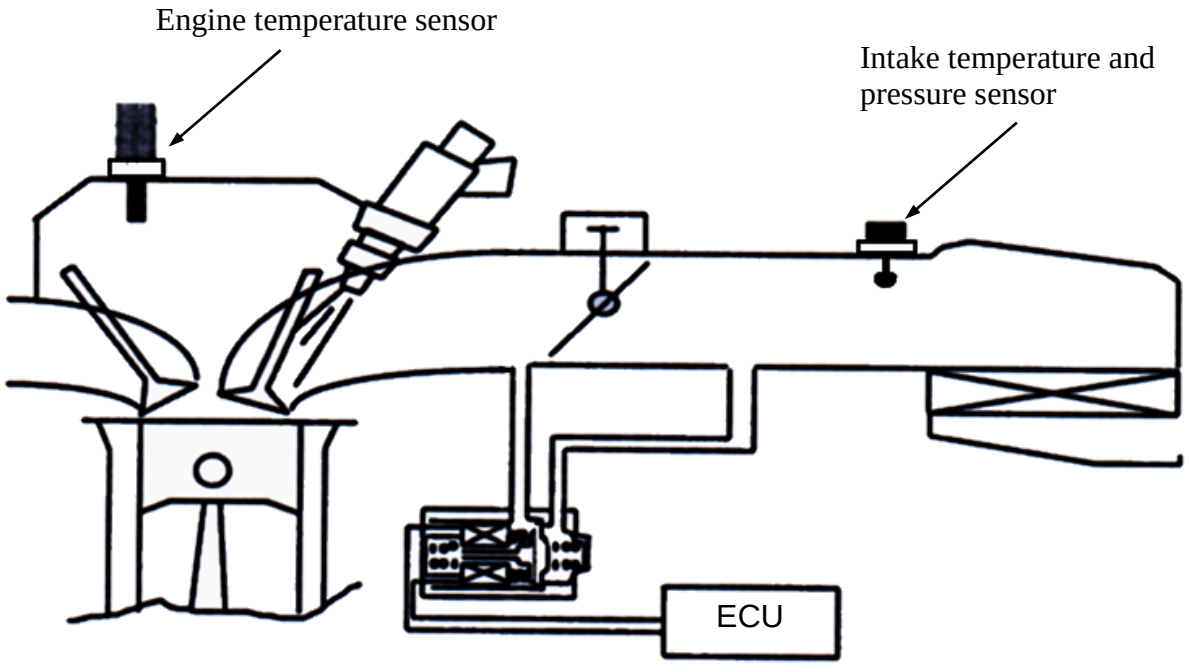
ECU receives all sensors' signals to control the throttle valve openness with PWM, and adjust airflow through the by-pass valve of the intake manifold. It can adjust idle speed for a stably running engine.

1. When engine cold starting---the by-pass valve open for a while to increase airflow and to stabilize engine idle speed within initial starting.

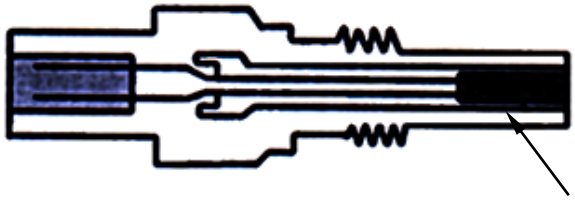
2. Warm-up---when engine oil is in low temperature condition, the by-pass valve adjusts airflow according to engine temperature (engine oil temperature), and raises idle speed.

3. Speed decreasing--- ECU controls the by-pass valve in correspondence with throttle operation, to provide inlet pipe with proper airflow quantity. Such operation will smooth the engine rpm reduction process, preventing the engine from stalling, excessive negative pressure, and also reduce HC emission.

10. Temperature Sensors

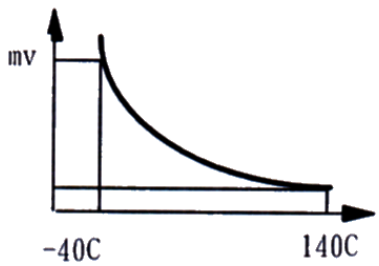


Engine oil temperature sensor: According to the semiconductor's characteristic, the sensor detects the temperature of engine oil and metal parts and then send a voltage signal to the ECU. On this base, the ECU can correct fuel injection and ignition timing.

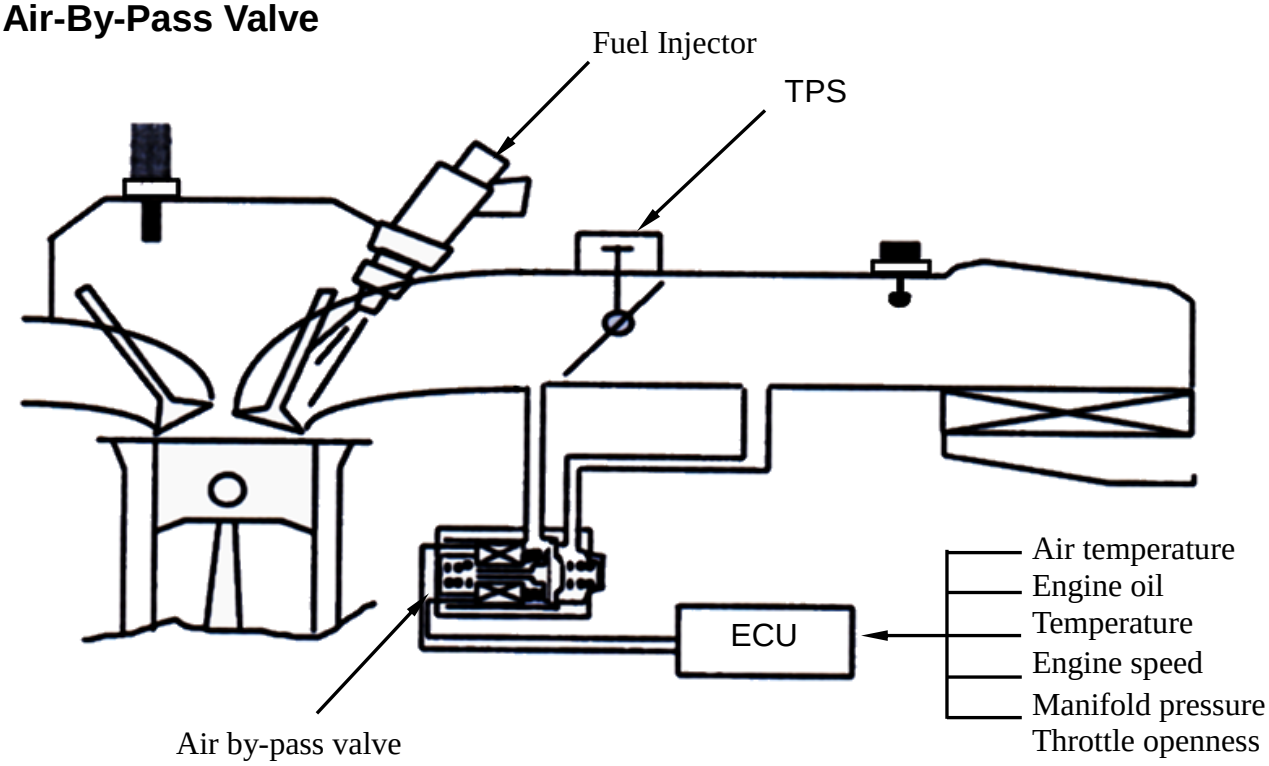


NTC-Negative Temperature Coefficient Resistor

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



11. Air-By-Pass Valve



Description:

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

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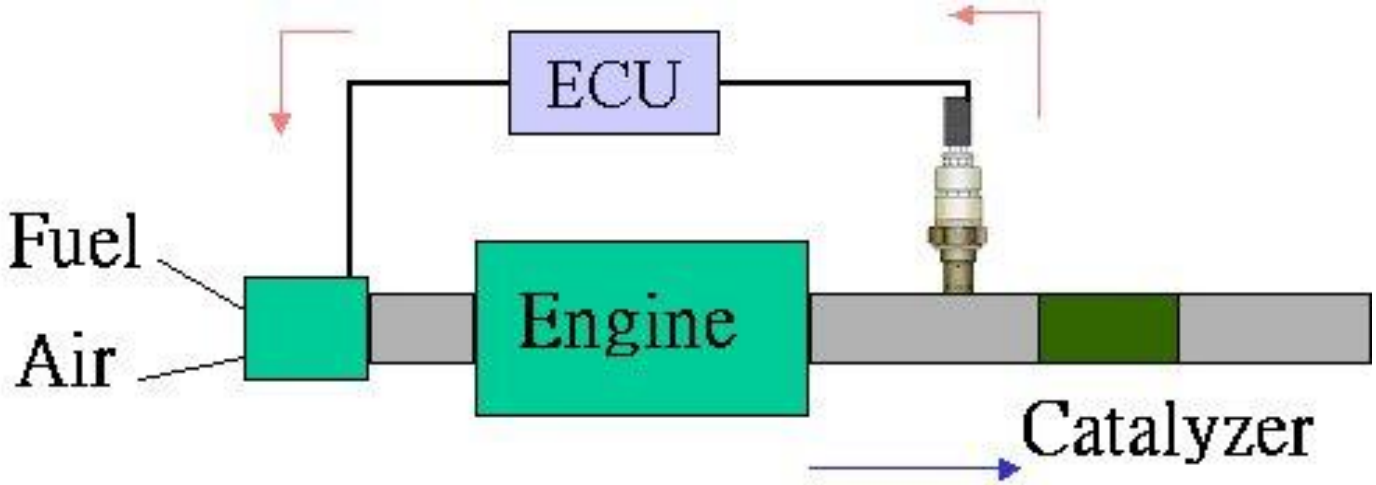
3. Speed decreasing--- ECU controls the by-pass valve in correspondence with throttle operation, to provide inlet pipe with proper airflow quantity. Such operation will smooth the engine rpm reduction process, preventing the engine from stalling, excessive negative pressure, and also reduce HC emission.

12. O2 sensor



1. O2 sensor feedback the signal to ECU, the signal is the base of air/fuel ratio adjustment toward the optimized value of 14.6. This is the close-loop system.
2. When A/F ratio is 14.6, the exhaust pollution like CO, HC, NOx conversion rate will be optimized.
3. The heating coil resistance <200K ohm (30—45kohm)

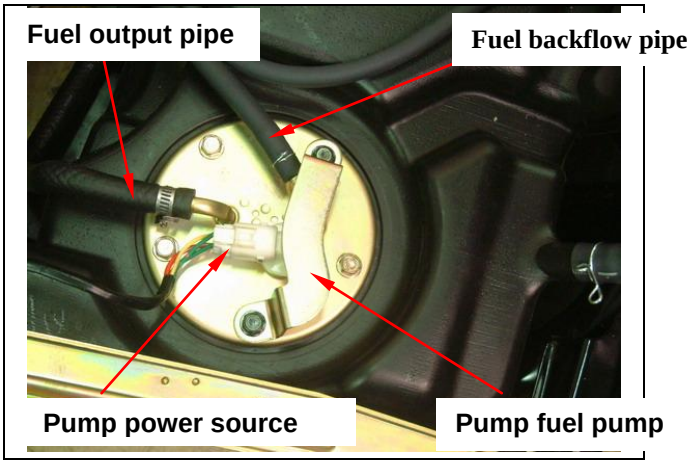
13. Fuel Tank

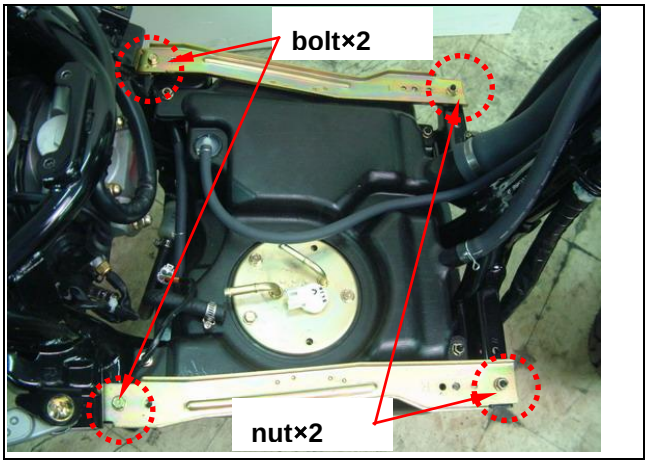
Removal of fuel pump/ pressure control valve/ fuel gauge

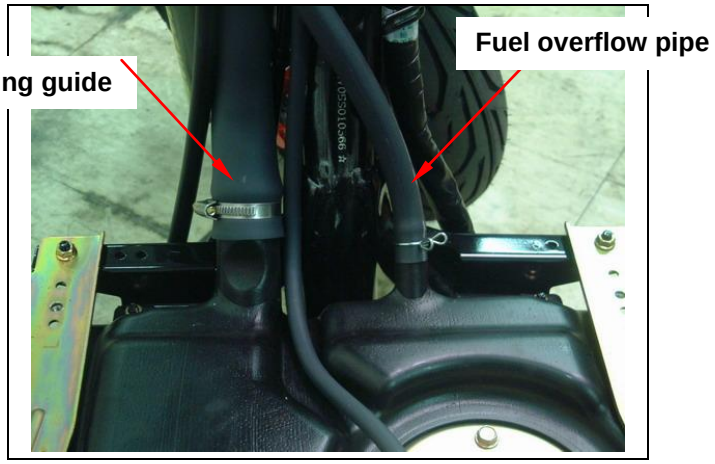
Remove the front fender
Remove the front luggage box
Remove Right/Left body cover
Open the seat
Remove the luggage box
Remove the rear carrier
Remove the Right/Left cover
Remove the pedal
(Please refer to chapter 12th for the detailed removal procedure.)
Disconnect the fuel pump wire coupler.

Remove the pump fuel pump plate (screw× 2)

Remove the right/left foot pedal(bolt×4)







Remove the fuel-filling guide.
Remove the fuel tank

⚠ Caution

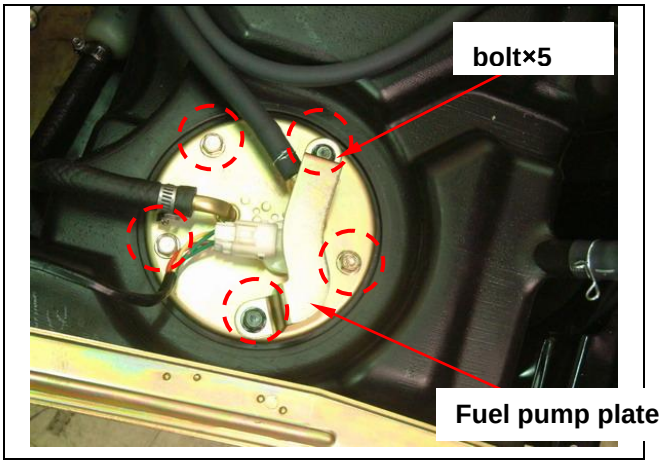
Check the fuel tank for crack or leakage; change if necessary.

Fuel Tank assemble:

Install them in reverse procedure of removal

Fuel pump / Fuel gauge removal

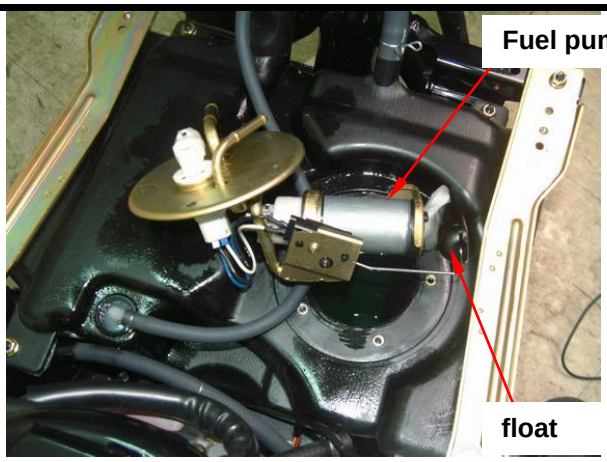
Remove the fuel pump plate and the bolts around the pump (bolt×5)



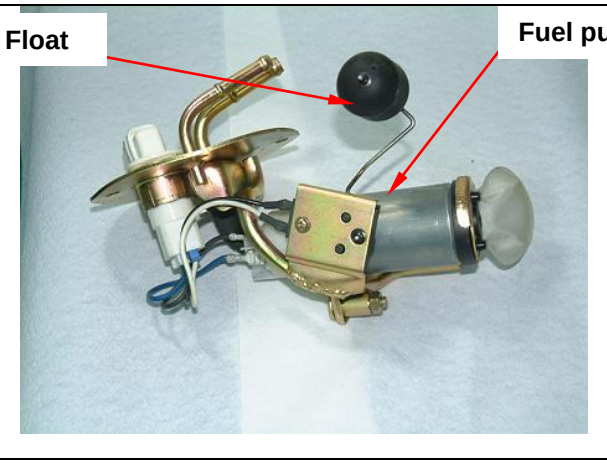
Remove the fuel pump assembly

⚠ Caution

Check if the seal is broken. Change if necessary



Remove the rubber seal

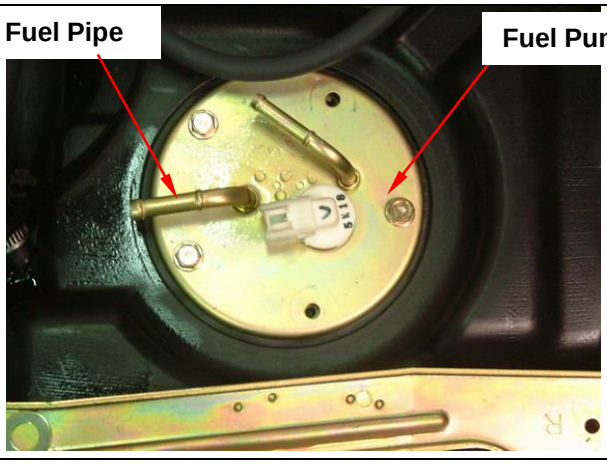


Fuel pump and gauge assemble

Install them in reverse procedure of removal

⚠ Caution

1. Do not bend the fuel gauge floating arm.
- Do not fill out too much fuel in the tank.
- Pay attention to the fuel pump assemble, the fuel output pipe must be facing backward

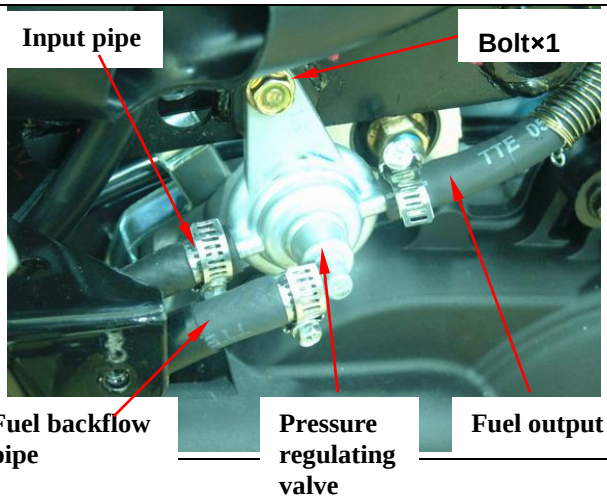


14. Pressure regulating Valve

Remove the left body cover (Refer to the Chapter 13th section 10th)

Remove the Valve assembly (bolt×1)

The valve must be intact and no leakage.

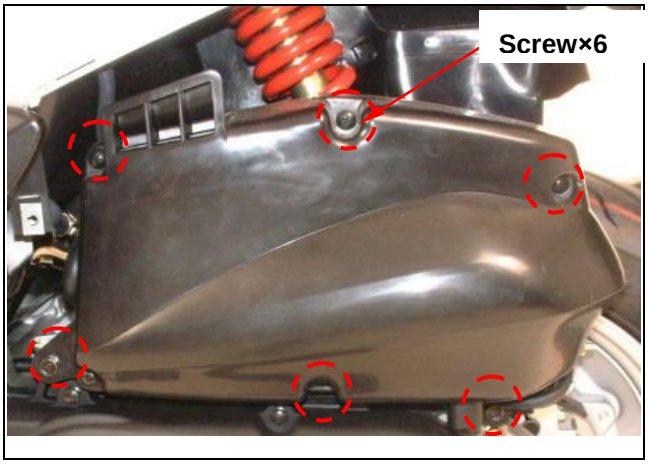


⚠ Caution

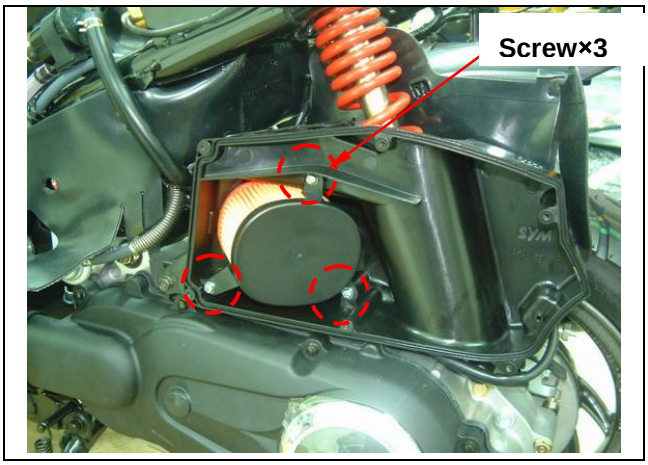
- Check the output/input/backflow pipes connecters to see if there's leakage. The strainers of the pipes must be tightened.
- Make sure the output fuel pressure reaches 2.5 bars
- Check the backflow pipe to see if excessive fuel pressure is released.

15. Air Cleaner

Remove the air cleaner cover. (Screw x 6)



Remove the air cleaner assembly (Screw×3)。



⚠ Caution

The air cleaner is paper-base; please blow it clean with compressed air. Don't use water or other solvent

Installation:

Install the air cleaner in reverse procedure of removal.

Application of fuel injection system diagnostics

Open the front luggage cover.

Connect the ECU connector and then turn on the main switch.

Operate the diagnostic according to its operation instruction.

16. Trouble Diagnosis & Solutions Of EFI

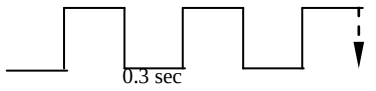
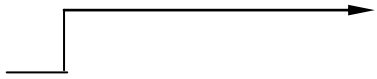
Readings of Error Code through flash indicator

When the engine might have problem and also no diagnostic to determine, the problem can be judged by reading the flash times of CHK lamp on the odometer. And then, we can know the solution priority lamp of the tester operation message table, or the FLASH CODE. Then we can try to fix the problem.

Here are the two descriptions for the two ways:

To show "the solution priority"

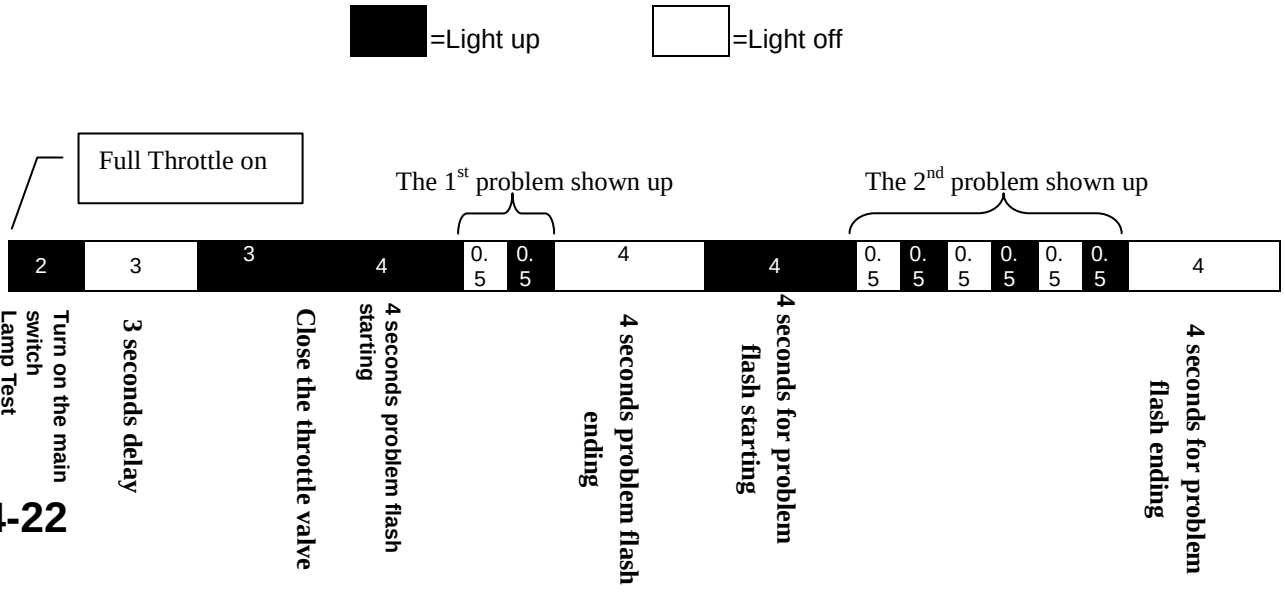
Turn the KEY ON directly, and the CHK lamp goes up for 2 seconds. Then, the CHK lamp will lit up by 3 types for showing the priority of problem solution so that reminds the rider to have the motorcycle conduct troubleshooting.
The 1st Priority: the CHK lamp lit up by every 0.3 second.
The 2nd Priority: the CHK lamp lit up continuously.
The 3rd Priority: the CHK lamp is not lit up.

Priority	Lit up types
1	ON / OFF 
2	ON / OFF 
3	ON / OFF

To show "FLASH CODE":

Before turning the KEY ON, wide open the throttle valve. Then, turn the KEY ON, the CHK lamp lit up for 2 seconds and off. But, the CHK lamp will light up again after 3 seconds. In the means time, close the throttle valve. Finally, it is to determine what problem occurred based on the flash time of CHK lamp.

Before show up, CHK lamp will light up for 4 seconds first. Then, according to the lamp flash times (every 0.5 second), the problem will be determined by comparing with the operation message table. If there has the 2nd problem in the system, the CHK lamp will have flash operation again after its lit up for 4 seconds.



17. Error Code Message and Solution Operation

DTC Code	Solution Priority	Flash code	Message	Solution Operation
P0217	**1**	**1**	Engine temperature overheat	1. Stopping the motorcycle immediately, and solve it with priority 2. Check if the lubricant system for abnormal? 3. Is the ignition or fuel supply system in normal? 4. Has the engine shown burnt? 5. Make sure if the engine temperature sensor is in normal. 6. Make sure if the connector is in normal.
P0335	**2**	**2**	Crank position sensor	1. Check if the connection of the crank position sensor is open-circuit. 2. Check if the air gap between the sensor and gear tooth is within specification. 3. Check if the crank rotation is run-out. 4. Check if the sensor is in normal according to the new component replacement procedure.
P1120	**2**	**3**	Poor contact of the throttle valve sensor	1. Connect the diagnostic and reset the throttle valve position. Make sure if the idle speed position is within standard range. 2. Make sure if the wire circuit of the throttle valve position sensor is loosen or short. 3. Check if the openness of idle speed by-pass valve is within specification. (40~100%) 4. Adjust the idle speed CO value to specified range. (0.5%~2.0%) 5. If this problem symptom still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P1121	**2**	**4**	Application malfunction of the throttle position sensor	1. Make sure if the wire circuit of the throttle valve position sensor is loosen or short. 2. If this problem symptom still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P1122	**2**	**5**	Rotation speed malfunction of the throttle position sensor	1. Make sure if the wire circuit of the throttle valve position sensor is loosen or short. 2. If this problem still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P0560	**1**	**6**	Abnormal battery voltage warning	1. Make sure if the battery voltage is too low or high (below 10V or exceed 16V) 2. Make sure if the ACG generator charging system circuit is short or abnormal. 3. Check if the 15th terminal on the ECU to battery positive post is short. 4. Make sure if the battery is in normal. Replace it with new if the battery is out or order.
P0110	**2**	**7**	Abnormal intake temperature sensor	1. Make sure if the sensor's resistor is in normal (20℃ 2353~2544**Ω**). 2. Make sure if the sensor's wire is in open-circuit (the 22nd terminal on ECU). 3. Make sure if the sensor is normal according to the new component replacement procedure.
P0410	**2**	**8**	Abnormal air by-pass valve	1. Make sure if the sensor's resistor is open or short circuit. 2. Make sure if the sensor's wire is in open-circuit (the 13th terminal on ECU) 3. Make sure if the by-pass valve is normal according to the new component replacement procedure

DTC Code	Solution Priority	Flash code	Message	Solution Operation
P0505	**2**	**9**	Application range abnormal of the air by-pass valve	1. Check if the openness of idle speed by-pass valve is within specification. (40~100%) 2. Make sure if the idle speed valve openness is in normal. (Stuck or poor adjustment of air screw) 3. Make sure if the intake manifold is leaking.
P0251	**2**	**10**	Abnormal fuel injector	1. Make sure if the fuel injector resistance is within specification. (14.5 Ω , 20℃) 2. Check if the connector or wire is in open-circuit. (The 3rd terminal of ECU) 3. Make sure if the fuel injector power supplied is normal. (12~15V)
P0350	**2**	**11**	Abnormal ignition circuit	1. Make sure if the ignition coil resistor is within specification. (0.63 Ω , 23℃) 2. Make sure if the connector or wire is in open-circuit. (The 12th terminal of ECU) 3. Make sure if the ignition coil's power supplied is in normal. (12~15V) 4. Make sure if the ignition coils are normal according to the new component replacement procedure.
P0230	**2**	**12**	Abnormal fuel pump relay	1. Make sure if the connector or wire is in open-circuit. 2. Replace with new relay to make sure if this abnormal is disappeared.
P0219	**2**	**13**	Engine over-RPM	1. Engine speed exceed safety limit. Decreasing the speed and then the DTC code disappeared. 2. Check if the CVT belt is broken.
P1560	**2**	**14**	Abnormal 5V driving voltage	1. Make sure if the 18th terminal of ECU is 5V. 2. Make sure if the sensor's power voltage is 5V. (The 16th & 18th terminals) Replace the ECU and confirm again.
P0700	**2**	**15**	Too high RPM when starting engine	1. If the engine RPM exceeds 3000rpm as starting, in order to prevent run-away accident, the ECU will decrease engine speed or stop the engine. 2. Rider should avoid to starting engine with WOT suddenly.
P0115	**2**	**16**	Abnormal engine temperature sensor	1. Check if acceleration cable is stuck. Re-set the idle 1. Make sure if the sensor's resistor is within specification. (25℃, 10319~11981Ω) 2. Make sure if the sensor's wire is in open-circuit. (9th terminal of ECU) 3. Make sure if the sensor is normal according to the new component replacement procedure.
P0650	**3**	**18**	Abnormal warning lamp	1. Check if the warning lamp is burnt. 2. Check if the warning lamp circuit is open. (4th terminal of ECU)
P0105	**2**	**20/21**	Abnormal MAP sensor	1. Check if the sensor's voltage is within specification. (101kpa, 3.925V) 2. Check if the sensor circuit is open. (the 8th terminal of ECU) 3. Make sure if the sensor is normal according to the new component replacement procedure.

DTC Code	Solution Priority	Flash code	Message	Solution Operation
P0136	**2**		O2 sensor wire abnormal	1. Check if the connector pins between O2 sensor and ECU are rusted or not 2. Check if the signal wire is short.
P0141	**2**		O2 sensor heating coil damaged	1. Check if the O2 sensor heating coil is damaged
P0171	**2**		Oil supply too lean or too rich.	1. Make sure if the fuel is enough in the tank 2. Check if the fuel system and the exhaust pipe is leaking 3. Check the injector and the O2 sensor for malfunctions.

18. EFi Component Malfunction Check& Replacement Procedure (PI Engine)

PI (Port Injection) → Intake manifold injection engine

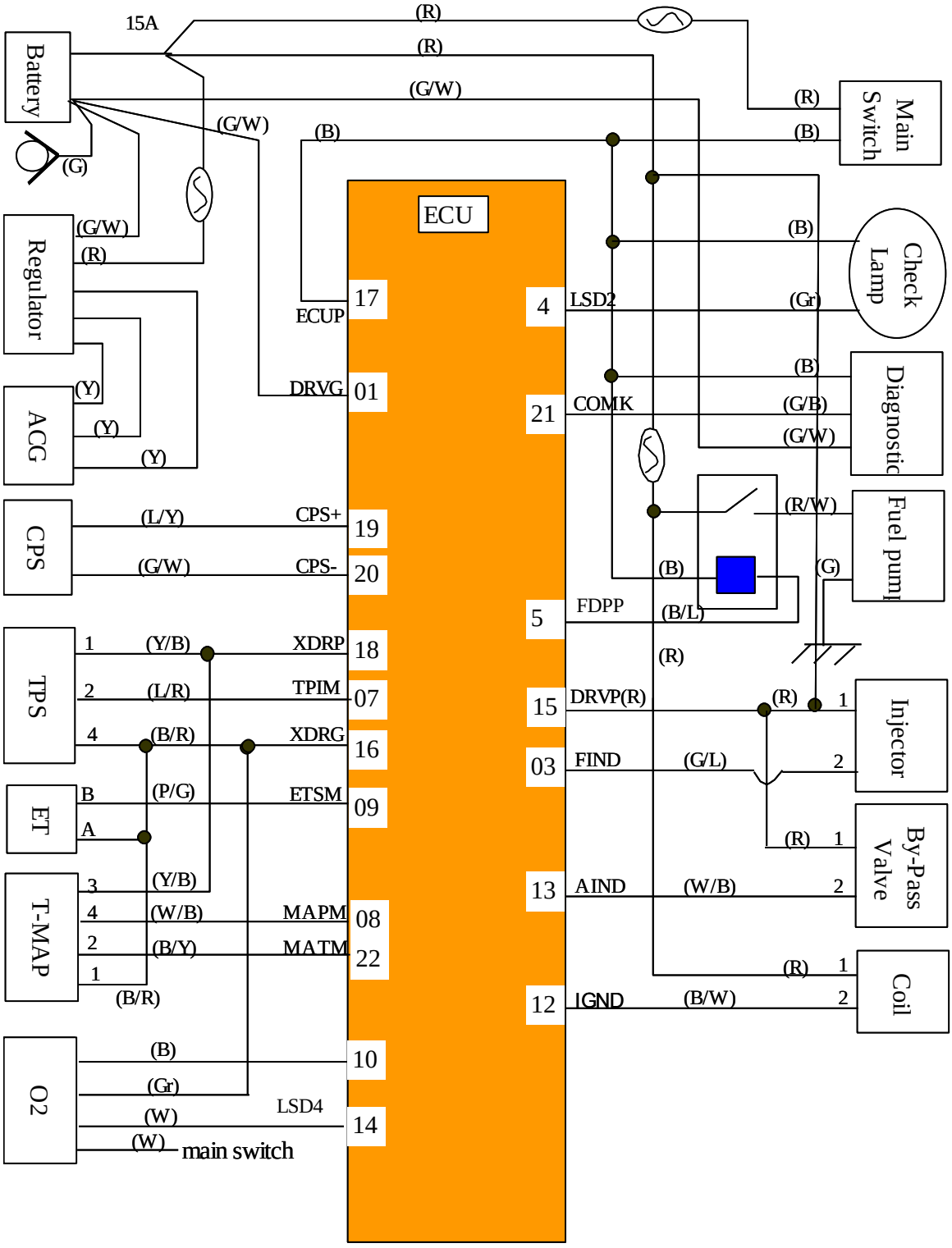
Item	Parts No. Parts Name	Service schedule	Inspection Method	Adjustment & replacement procedure
1	390-002 Ignition coil	At least 20000km life-expectancy Check it every 3000km	1. Use Data Scan diagnostic to check if the ignition coil has malfunction. 2. Erase the DTC codes and replace with new coil and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

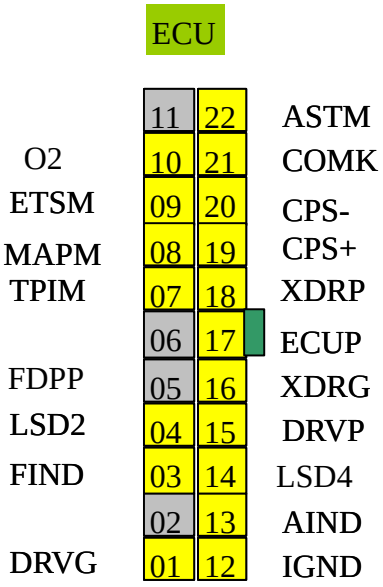
4	366-005 Engine temperature sensor	At least 20000km life-expectancy Check it every 3000km.	1. Is there any DTC code on the Data Scan diagnostic? 2. Engine temperature has to reach to environmental temperature after engine stopped for a while. 3. Erase the DTC codes and replace with new one and confirm again. If the DTC codes disappear, then the sensor is abnormal. Replace it with new one. 4. If the DTC codes still exist, check if wire connector and sensor's resistance are in normal range	1. If the sensor has to be changed, erase the DTC codes with the Data Scan diagnostic 2. Turn off ignition switch, and remove connector. 3. Remove the sensor with tools. 4. Engine temp. Sensor tighten torque is 0.74~0.88kg-m. 5. Connect the coupler, and the Data Scan. Then, turn on ignition switch. 6. Check if the DTC codes disappear. 7. The value of stopped engine temperature should approximate the environmental temperature.
5	366-008 Intake temperature/ pressure sensor	At least 20000km life-expectancy Check every 3000km	1. Connect the Data Scan for inspection. The engine intake temperature and pressure should approximate environmental temperature and atmosphere pressure. (Execute this task after engine is stopped for a while) 2. If the DTC codes of intake temperature or pressure shown on the Data Scan, replace the pressure sensor with new one. Check if the DTC codes are disappearing. If not, check the connector wires for short-circuit. Replace the connector if necessary. 3. If the DTC codes still exist, replace the ECU. But if the DTC codes disappear, install the original pressure sensor and check it again. If the original sensor doesn't trigger the DTC error code, replace the ECU with new one.	Replacement procedure for T-MAP (intake temperature/pressure sensor) 1. Turn off the ignition switch. 2. Disconnect the connector of intake temperature/pressure sensor. Replace the sensor with new one. 3. Connect the connector with Data Scan diagnostic. 4. Turn on the ignition switch, and check if the intake temperature/ pressure readings close to environmental temperature and atmosphere pressure. Erase the DTC codes, and make sure the problem is solved.

Item	Parts No. Parts Name	Service schedule	Inspection Method	Adjustment & replacement procedure
6	308-008 Throttle body	At least 20000km life-expectancy Check every 3000km	1. Please refer to idle speed adjustment section for the idle speed CO adjustment. 2. Connect the Data Scan and check if the throttle position DTC code appears. 3. If the code appears, replace the throttle body to make sure the code can be erased. 4. If the code disappears, replace the throttle body. If the code still exists, replace the ECU with new one.	The throttle body replacement procedure: 1. Install a new throttle body 2. Make sure there is no leaking. 3. Connect the Data Scan and read the carbon-accumulated time. 4. Reset the time with the Data Scan. 5. Reset the throttle position data with the Data Scan. 6. Throttle valve WOT set up. Turn off ignition switch, and WOT the throttle valve and hold. Turn on the ignition switch and hold WOT position for 2 seconds. Then release the throttle valve. Please refer to the idle speed adjustment section for the idle speed CO if necessary.
7	337-004 Fuel injector	At least 20000km life-expectancy Check every 3000km	1. Check if the fuel injector DTC code appears. 2. If the code appears, replace a new fuel injector for confirmation. If the code can be erased, then, replace the fuel injector. 3. If the code still is there after changing a new injector, check if connector wire is short. 4. If the code still exists, replace the ECU with new one. If the code can be erased after changing the ECU, this ECU has to be replaced.	Confirmation or replacement procedure for the fuel injector: 1. Erase the DTC code with the Data Scan. 2. Turn off ignition switch and disconnect the fuel injector coupler. 3. Connect to a new fuel injector. 4. Connect the Data Scan, and turn on the ignition switch. 5. Make sure the DTC code had been cleared. 6. Please refer to idle speed adjustment section for idle speed CO value confirmation. (Firstly, make sure if the fuel injector DTC code had been clear, and then install a new fuel injector.)
8	325-002 ECU	At least 20000km life-expectancy Check every 3000km	1. Connect the Data Scan. 2. Record the ECU service time.	ECU replacement procedure: 1. Connect the Data Scan onto the original ECU. 2. Record the ECU service time. 3. Turn off the ignition switch. 4. Replace the ECU with new one. 5. Re-set the ECU service time. 6. Clean the carbon deposition around the throttle body. 7. Please refer to idle speed adjustment section for idle speed CO value confirmation.

Item	Parts No. Parts Name	Service schedule	Inspection Method	Adjustment & replacement procedure
9	Idle speed CO Adjustment	Check for new motorcycle and every 3000km.	1. Warm up the motorcycle by running it in 50km/hr for 5 minutes. 2. Connect the Data Scan. 3. Record the idle speed CO value, and engine rpm 4. In o2 sensor closed-loop system, the CO value should be kept in normal range. If the CO value goes wild, please check the O2 sensor, engine, injector, and the fuel system for malfunction.	1. Warm up the motorcycle by running it in 50km/hr for 5 minutes. 2. Connect the Data Scan. 3. Record the idle speed CO value, rpm. 4. Use the Data Scan to adjust the idle speed CO value to be 0.5%~2.0%. 5. Record the idle speed CO value, rpm and CO variant value. 6. (The engine temperature has to be in 115℃~140℃, and intake temperature to be in 25℃~40℃ as adjusting.) 7. Perform ECU learning
10	OZA591-BA1 O2 sensor	Check on new system and every 3000km	1. Use a Data Scan diagnostic to check if there's any DTC code. 2. Stop the engine for a while, and let the engine temperature return to the environmental temperature. 3. Clear the DTC code and replace a new sensor. If the DTC code disappeared, the O2 sensor should be replaced. 4. If the DTC code remains, check the wire coupler for loose. And also check the sensor for abnormal resistance.	1. If O2 sensor should be exchanged, the DTC code in ECU must be erased first. 2. Turn off the ignition switch, and remove the coupler. 3. Use the correct tool to remove the sensor. 4. The tightening torque of the O2 sensor is 3.6 to 4.6kgf-m。 5. Connect the coupler, and the ECU. Turn on the ignition switch. 6. Confirm the DTC code disappeared. 7. Perform ECU learning

ECU Connector Pin





ECU learning

Perform timing:

a. After exchanging ECU, Air by-pass valve, O2 sensor, throttle body.
b. After cleaning the throttle body or the air by-pass valve.
c. After disassembling and rebuilding the engine. Or after adjusting the tappet clearance.
d. After adjusting the idle CO value.

Method:

a. Warm the engine by driving the scooter by 50km/h for 5 minutes. ,The engine temperature should be around 90℃--120℃ (The standard engine temperature depends on different models or conditions.)
b. Maintain idle for 3—5 Minutes

Reset/Zeroing of the Throttle Position Sensor

Perform timing:

a. After exchanging the ECU or the Throttle body.
b. After adjusting the air screw (Only if necessary)

Method:

a. Connect the ECU
b. Turn on the ignition switch, and enter the reset/zeroing menu. Then press enter.
c. Turn off the ignition switch, hold the throttle on WOT position.
d. Turn on the ignition switch under WOT position.
e. Hold WOT position for 2 or 3 seconds, and release the throttle.
f. Turn on and off the switch for one time.
g. Make sure the throttle openness are on zero and 100% WOT position.

NOTES: