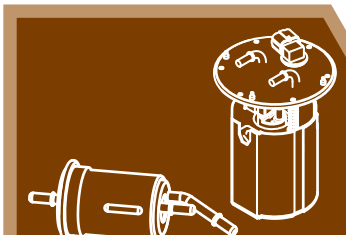
TIBA

Injection repair manual

Code:TBARM2C/1/1



In the name of God

TIBA

Injection repair manual

Contents

PREFACE

This manual is prepared by the engineers of SAIPA automotive manufacturing group to help the engineers and technicians of the TIBA vehicle. It is recommended that the repairmen and technicians carefully study this book and follow its repair instructions. by doing so, the time will be saved and the quality of repairing will be increased.
Finally, it is requested from all the readers to kindly submit their invaluable comments about this book to the management of SAIPA YADAK company engineering department.
it is necessary to mention that any revision and copying of this manual are copyrighted by the SAIPA YADAK company.

Chapter one

Fuel injection system components

General information

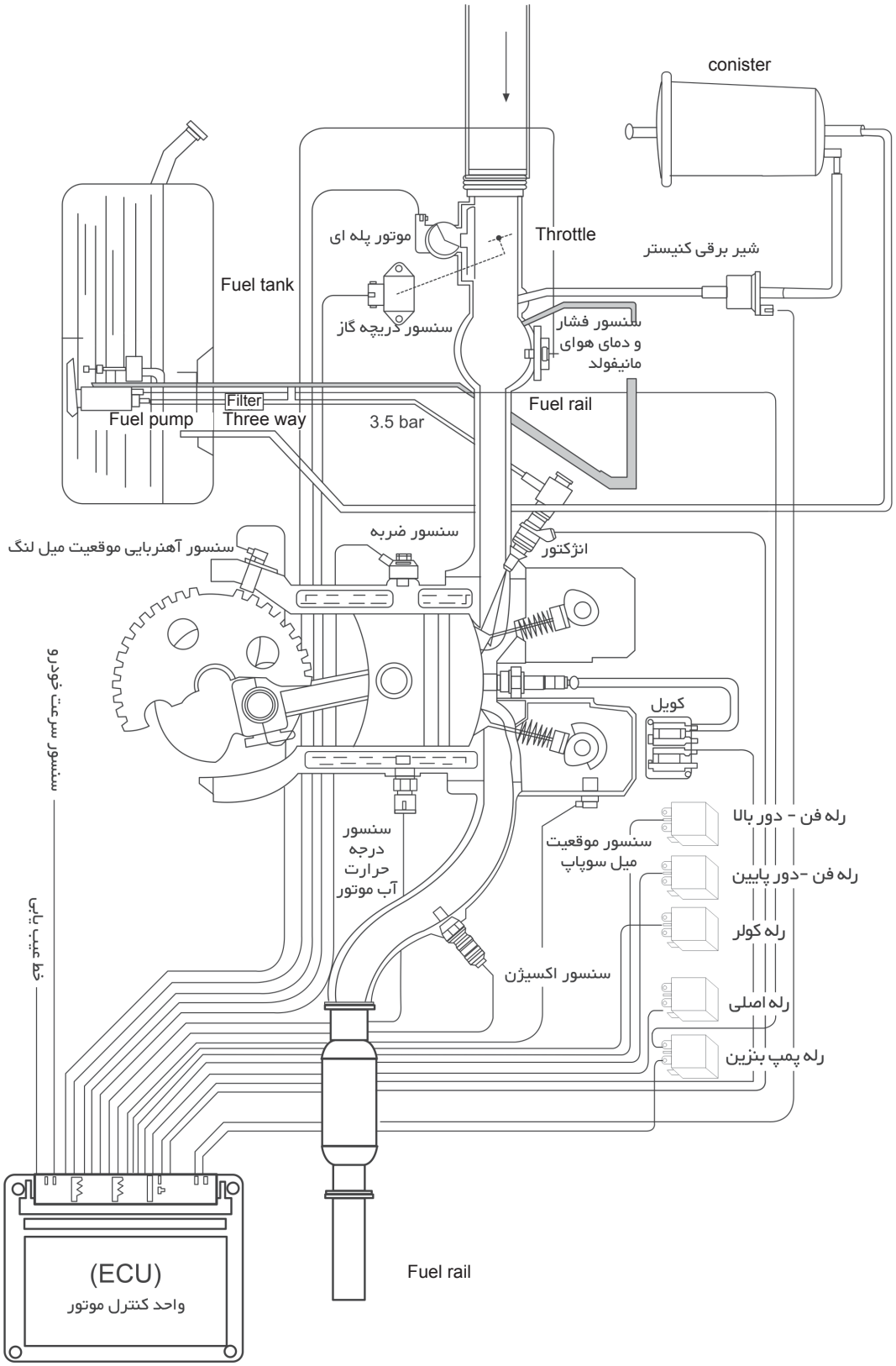
Item \ Engine model			Standard Gasoline engine
Idling speed			850 rpm
Fuel tank capacity (liter)			41
Main Relay	Resistance at 20ºC (68ºF) Ω		85 ±10%
Engine coolant temperature sensor	Resistance (KΩ)	- 20ºC(- 4ºF)	11.72 ~ 19.54
		20ºC(68ºF)	2.22 ~ 2.82
		80ºC(176ºF)	0.30 ~ 0.357
Fuel Delivery system			
Max. Fuel pump pressure Kpa (kg/cm2 , Psi)			4.5 ~ 6.5 (0.046~0.066 , 0.653~ 0.943)
Fuel Filter type			Paper filler
Injector	Type		Electromagnetic
	Injection port Numbers		8
	Resistance at 20ºC(68ºF)(Ω)		12 ± 0.6
Regulating pressure	Kpa (kg/cm^2 , Psi)		3.5 ± 0.05 bar
Intake air system			
Air filter			Dry , paper type
Throttle body	Type		Vertical thrust
	Throttle valve diameter (mm)		48
Catalyst converter			
Type			CC(closed coupled catalyst)
Model			3- Way
Volume (CC)			1580
Precious charged metal (gr/dm3)			1.765
Precious metal ratios PT:PD:RH			0:5:1
Main material amount			0.1651 mm
CPSI cell density			600

System Description

Injection pressure rises by fuel pump inside the fuel tank and after adjusting the pressure at proper amount, the fuel is injected into all the cylinders by the injectors.
The fuel delivery system consists of injectors, fuel pump rail, ECU, and so on.
The injectors are actuated by ECU to inject the specified amount of the fuel into the combustion chamber.
The main fuel delivery system of TIBA can be divided into four parts:
1 -Fuel delivery
2 - Intake air system
3 - Spark system
4 - Electric control unit (ECU) which receives the information from the sensors to actuate the actuators.

System Components description

No	Section	Components	
1	Fuel delivery system	- Fuel tank assembly - Electric fuel pump - Fuel filter - Fuel delivery lines - Fuel rail - Injectors	
2	Intake air system	- Air filter - Intake air and its inlet pipes to the engine - Surge tank - Throttle valve - Intake air manifold system assembly - Resonator	
3	Spark system	- Spark plugs - Spar plug wires	
4	Electronic control unit(ECU), sensors and actuators	* ECU Sensors: - Camshaft position sensor - Intake air pressure sensor - Vehicle speed sensor - Throttle valve angle sensor - Oxygen sensor - Knock sensor - Coolant temperature sensor - Engine rpm and crankshaft position sensor - Fuel level sensor	Actuators: - Injectors - Stepper motor idling - Canister electric valve - Coil - Main relay - A/C relay - Fuel pump relay - Fan relay (low speed) - Fan relay (high speed) - Engine rpm signal - Fuel level signal - Defect detector warning lamp - Water temperature warning lamp



FS001

Parts list

Based on the following list, the locations of actuators and sensors are specified in the next page diagram.

1 - Camshaft position sensor
2 - Intake air pressure sensor
3 - Vehicle speed sensor
4 - Throttle valve sensor
5 - Oxygen sensor
6 - Knock sensor
7 - Coolant temperature sensor
8 - Engine rpm and crankshaft position sensor
9 - Fuel level sensor
10 - Injector
11 - Stepper motor idling
12 - Canister electric valve
13 - Ignition Coil
14 - Main relay
15 - A/C relay
16 - Fuel pump relay
17 - Fan relay (low speed)
18 - Fan relay (High speed)
19 - Defect detector warning lamp
20 - Water temperature warning lamp
21 - Engine rpm signal
22 - Fuel level signal

The next page figures indicate the schematic view of the Electronic control unit (ECU) including the sensors and actuators. As shown in the figure, the ECU unit receives the data concerning with the engine condition and performance from the transmitted signals through the sensors and analyzes them in its central processing unit, using the processed data, it sends the suitable orders based on the special calibration algorithm of the vehicle.

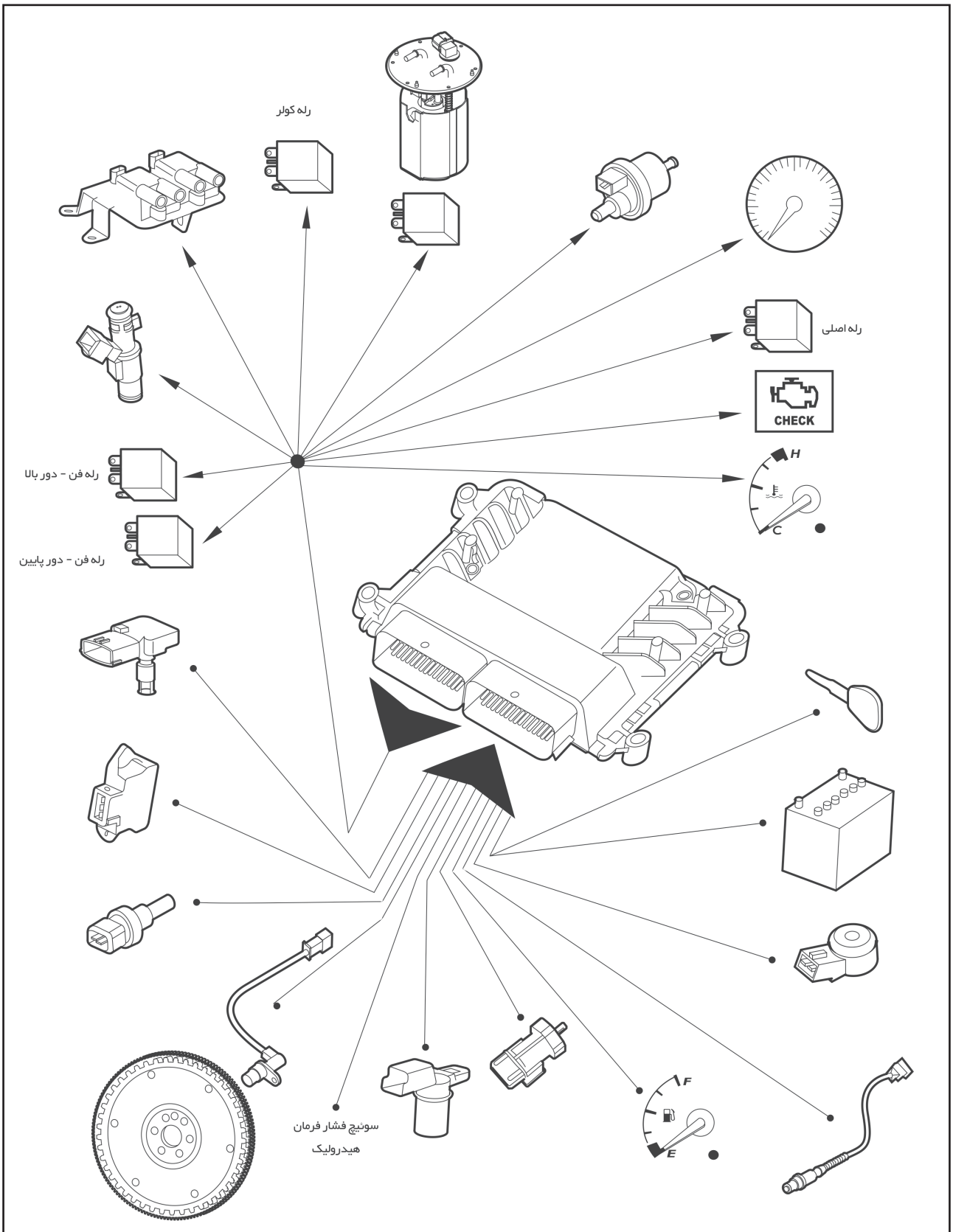
*** Sensors and input data of SIEMENS injector system:**

- Camshaft position sensor
- Intake air manifold pressure and inlet air temperature sensor
- Vehicle speed sensor
- Throttling valve sensor
- Oxygen sensor
- Knock sensor
- Coolant temperature sensor
- Engine rpm and crankshaft position sensor
- Fuel level sensor
- Battery voltage actuators

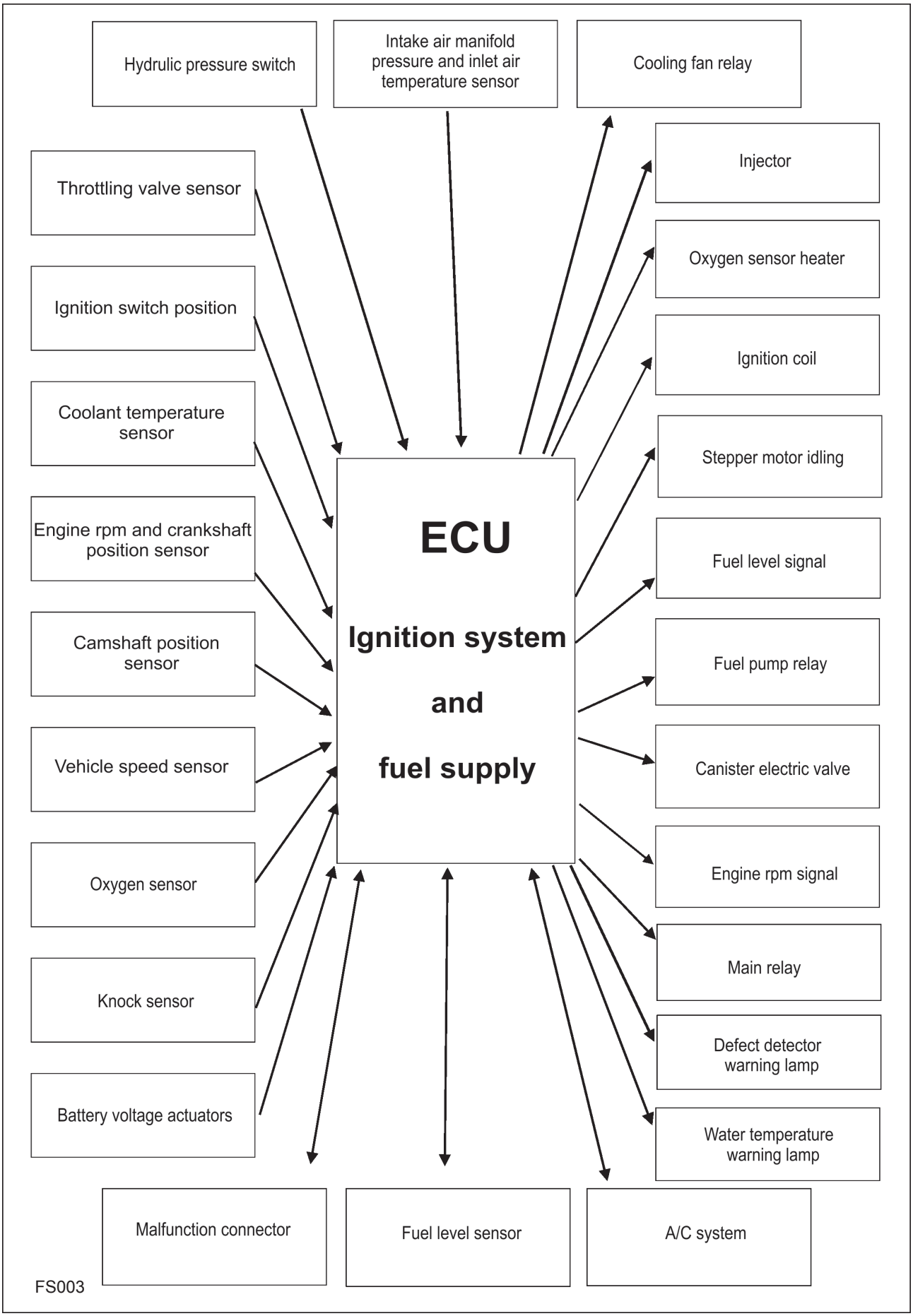
* Output data of SIEMENS injector system:

- Injector
- Stepper motor idling
- Canister electric valve
- Ignition Coil
- Main relay
- A/C relay
- Fuel pump relay
- Fan relay (Low speed)
- Fan relay (High speed)
- Malfunction indicator lamp (MIL)
- Water temperature warning lamp
- Engine rpm signal
- Fuel level signal

It is necessary to mention that the ECU is only able to process digital data. Therefore, there are A/D circuits inside the ECU to convert the analog signals as in MAP sensor to digital one. On the other hand, after processing the signals by ECU, the actuators digital orders are converted to analog by D/A circuits.



FS002

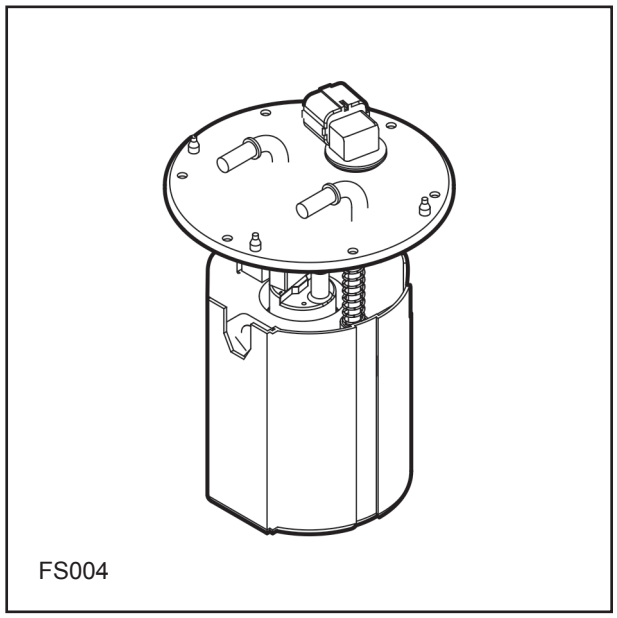


Fuel delivery system

The fuel delivery system used in the TIBA vehicle is a kind of «Multi point fuel injection» (MPFI) which consists of:

1 - Fuel pump

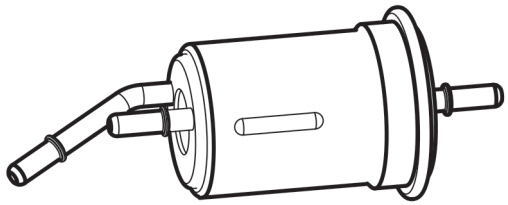
The fuel pump is driven by a DC electrical motor. When the switch is ON, The main relay is activated by the battery voltage and the fuel pump is operated for three or five seconds.
The fuel pressure is adjusted by the regulator and the fuel will flow inside the fuel delivery system which supplies the fuel in to the injectors with specified pressure.
The fuel is pumped by the pump blades. The fuel pump is floated inside the fuel tank to absorb its noise and to prevent from bubble formation which causes the electrical motor to become hot when it is OFF. The fuel pump valve in one-way and this provides enough fuel pressure to start the engine and to prevent fuel vaporization inside the fuel lines at high temperature.



FS004

Fuel filter

The fuel filter is located beside the fuel tank underneath of the vehicle. The fuel passes through this filter and it absorbs the dirt to prevent the injector needles from clogging. There is also a filter inside the fuel tank on the fuel pump.

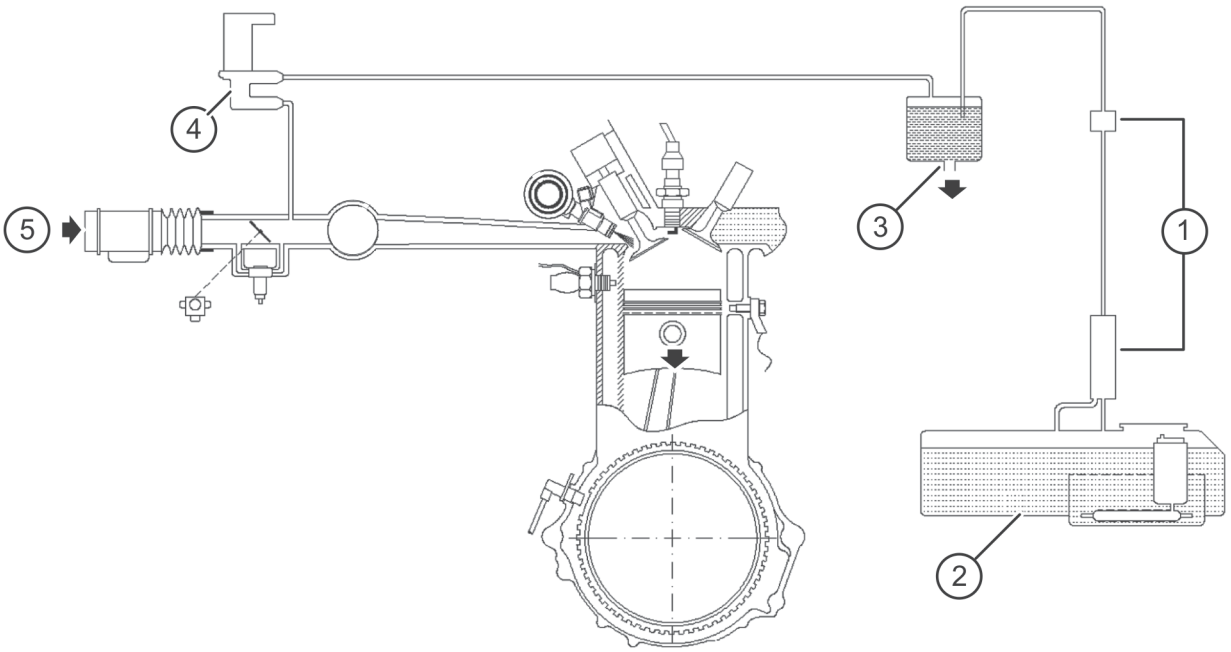


FS005

3 - Fuel delivery hoses

In the fuel delivery system, the fuel hoses are drawn from the fuel tank to the engine. The fuel enters through a rubber hose into the fuel rail. The rubber hoses are connected using clamps.

Note: *The fuel hoses are fuel and corrosion resistance and they cannot be replaced by regular hoses.*



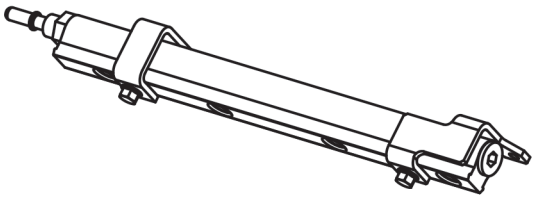
FS006

Parts list

1 - Vapor separator assembly
2 - Fuel tank
3 - Canister
4 - Canister electric valve
5 - Air intake

4 - Fuel rail

A fuel rail consists of an aluminum or polymer hollow cylinder with one end closed and the other end delivers the fuel into the injectors. The fuel rail is installed inside air intake runners on which four injectors with their inlet and outlet hoses are installed.

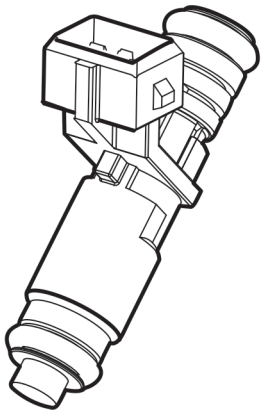


FS007

5 - Injectors

Injectors consist of a needle valve and a solenoid. The electronically controlled unit (ECU) controls the injectors at different conditions by sending electric pulses. By applying a voltage to the injector, the solenoid is magnetized to open the injector for fuel reception.

When the electric current flows into the injector, the solenoid opens the injection valve and the fuel is sprayed at the back of the intake valve due to the pressure difference circuses the fuel delivery line. The injection time is determined by ECU. When a voltage is applied to the injectors the injector needle valve opens to allow the fuel to enter into the cylinder. When there is no electric current, the needle valve closes.



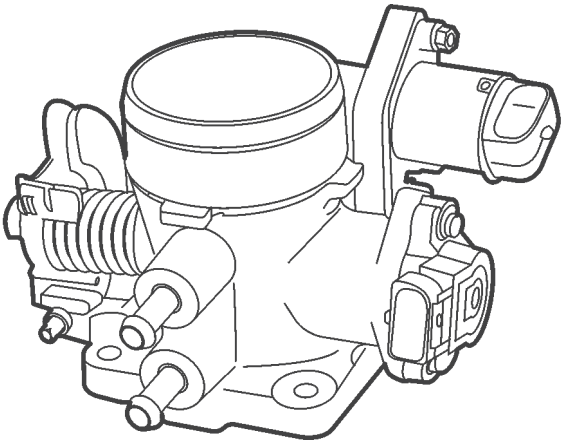
FS008

Air intake system

1 - Throttle assembly

1-1 - Throttle body

On the throttle body the throttle valve, stepper motor, and the throttle valve sensor are installed.

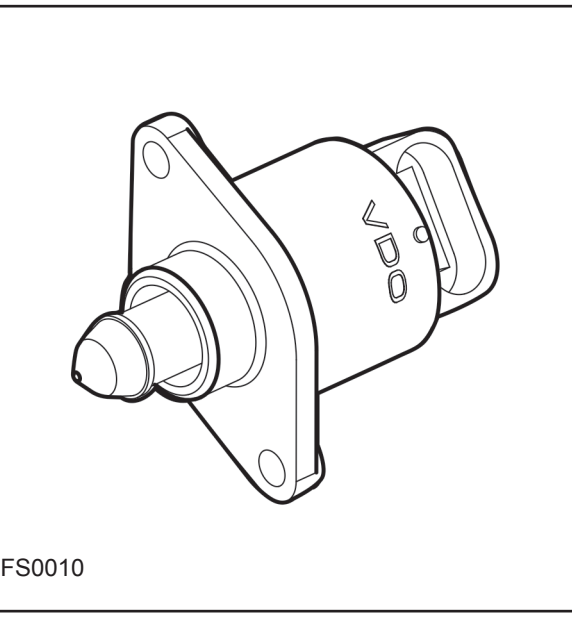


FS009

1-2 - Stepper motor

This solenoid valve provides the required air for different idling conditions such as partial or full engine load and acceleration. When the throttle valve is closed, the throttle valve sensor sends the signal to the ECU. At this line the electric idle valve opens by the ECU signal and the following items are controlled:

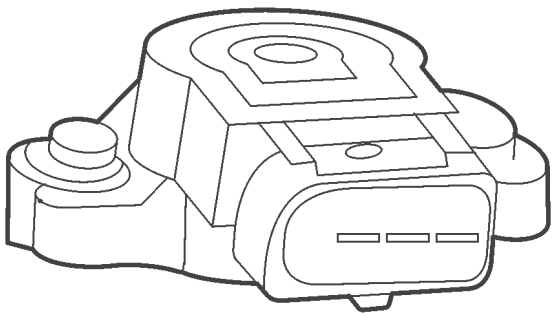
- Choking when the engine is cold and the throttle valve is closed.
- Idle adjustment when engine overloading such as using A/C and so on.
- Adjustment of air-fuel ration in idling condition.
- Preventing the quick air flow cut off at high vehicle speeds when the driver suddenly releases the accelerator pedal.



FS0010

1-3 - Throttle position sensor

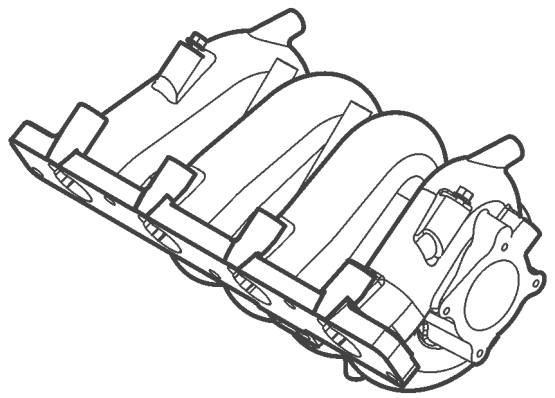
This potentiometer sends the instantaneous throttle valve position to the ECU to control different idle conditions of the engine and the acceleration or deceleration conditions of the vehicle. The voltage supply amount of this sensor is 5 volts which is provided by ECU.



FS0011

2 - Intake manifold

The intake manifold system of the TIBA consists of air manifold, fuel rail surge tank, injectors, throttle valve, air pressure and air inlet temperature sensor, brake booster hoses, canister valve, and water temperature sensor.



FS0012

Double ignition coil

1 - Ignition coil

Double ignition coil system

The ignition coil system in the SIEMENS injector kit is a kind of double ignition coil which includes the following components:

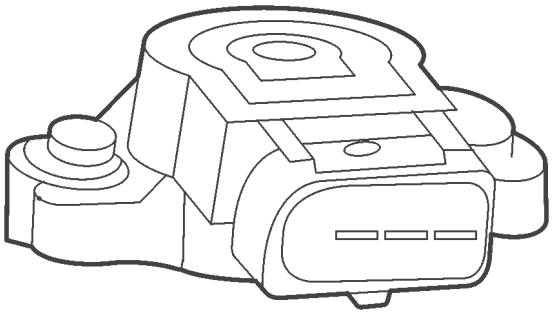
- Ignition coil

The ignition coil provides the ignition voltage for the spark plugs. This consists of two separate ignition coils connected to the spark plugs by four wires. In this system the ignition occurs simultaneously in the cylinders 1-4 and 2-3. In other words, the spark plugs act simultaneously in the two cylinders, one ignition step and the other one in the exhaust step. The ignition time and the dwell time period are controlled based on the data sent by the ECU.

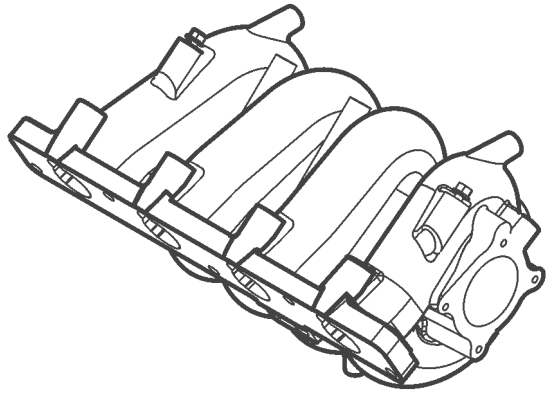
The ignition coil of this system is installed by a bracket on the cylinder head.

2 - High tension leads

The spark plug high tension leads are responsible for delivering the current from the ignition coil to the spark plugs for igniting the air/ fuel mixture in the cylinder. These leads are noise- resistance.



FS0011



FS0012

Electronically controlled unit (ECU)

The performance of engine management system in SIEMENSE injector system is controlled by the ECU unit. Using the received data from the sensors, the unit controls the injection time and its duration, idling condition of the engine, engine knocking, and the pollution resulted from the fuel vapors. In additions, the electric fuel pump performance and the diagnostic system are controlled by ECU unit.

The ECU unit operates based on the specified algorithm prepared by the manufacturer of the vehicle and engine. It is called calibration program.

The parameters used by ECU unit are:

- Engine rpm
- Throttle position
- Engine coolant temperature
- Vehicle speed
- Camshaft position
- Fuel / air mixture ratio
- Engine knock
- A/C performance
- Battery voltage

The ECU unit controls the following parameters:

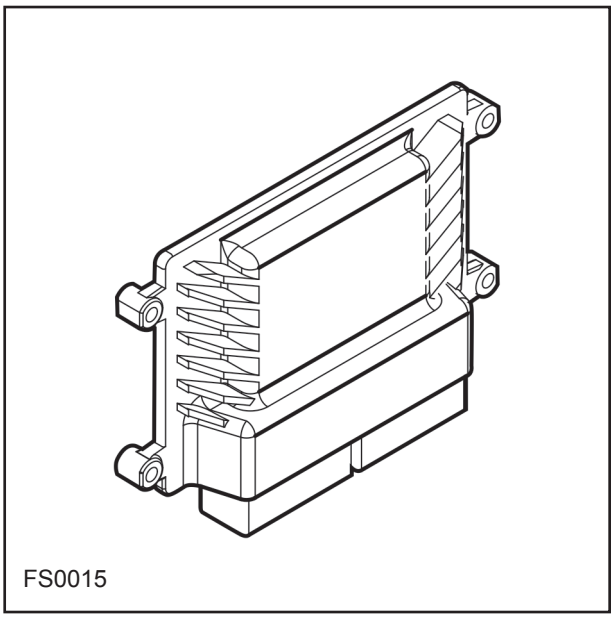
- The amount of sprayed fuel and its spray time.
- Ignition time and its duration
- Engine idle rpm
- Fuel pump performance
- Canister electric valve performance
- Fuel cut off to prevent the engine rpm increase
- Defect detector system (MILLAMP)

In addition, the data sent the ECU unit is used to display the following parameters:

- Engine rpm
- Water temperature warning lamp
- Vehicle level
- Malfunction indicator lamp (MIL)

General specifications of the ECU unit of TIBA vehicle

On the TIBA vehicle equipped by an immobilizer system, two types of ECU unit with the following technical numbers are used:
Gasoline Fuel: TN030 – 23717
CNG: TN030 – 23719
It should be noticed the technical number of the ECU unit when replacing.


FS0015

The ECU unit performance in different conditions
- Function in starting engine:
When starting the engine, the ECU unit actuates the injectors by sending pluses, and the injectors periodically spray fuel in uniform Pattern. The spray amount of fuel is adjusted by the engine rpm, the engine coolant temperature, and the inlet air temperature and pressure. The excess air amount is adjusted by stepper motor based on the engine performance parameters.
After starting the engine, the idle engine rpm is determined by the engine coolant temperature.
- Performance in different rpm's
When the instantaneous variation of the engine condition such as accelerating and decelerating, the fuel injection time of the injectors are determined based on the following parameters:
- Engine rpm
- Throttle valve position (by throttle position sensor)
- Inlet air pressure (by intake air pressure sensor)
- Engine coolant temperature (engine coolant temperature sensor)
*** Fuel spray performance of injectors**
a) When reducing the vehicle speed by releasing the accelerator, the ECU unit cuts off the fuel spray of the injectors due to the following reasons:

- Reduction of fuel consumption
- Reduction of exhaust gas emission.

b) To prevent the excessive increase of the engine rpm at 5500 rpm by cutting off the fuel injectors.

* Performance in restarting fuel injection after cutting off the fuel spray, the fuel spray restores when the engine rpm reaches at the specified amount to prevent the engine to turn off.

* ECU unit memory

Two types of memories are used in the ECU unit:

a) Permanent memory

b) Temporary memory

a) The permanent ECU memory is not deleted by disconnecting the battery. In this memory the engine calibration data are stored. Those data are used by the ECU unit to process the data received from the different sensors

b) The temporary memory is deleted within a specified period of time after disconnection the battery.

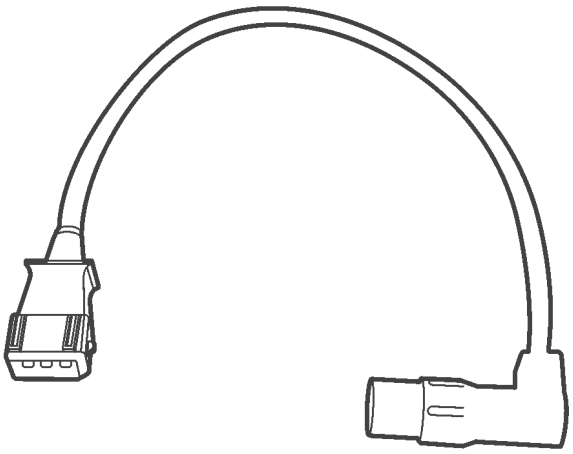
* SENSORS

Sensors are used for measuring the engine performance parameters of the vehicle. The description of their performance and locations are as follows:

1 - Crankshaft and engine sensor

This sensor is installed on the clutch housing and is used to send the engine speed and the TDC position of cylinders 1 and 4 to ECU unit.

The ring gear of the crankshaft passes through the electromagnetic sensor to generate a suitable voltage. The data of this sensor are used by the ECU unit to calculate different parameters such as fuel injection, ignition time, and so on.



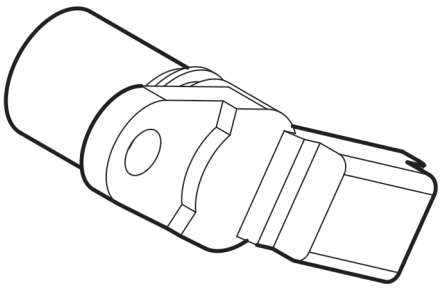
FS0016

2 - Camshaft position sensor

This sensor determines the TDC position of cylinder 1 independent of the one measured by the engine speed sensor.

It is important to mention that this sensor is different from the sensor used in pride and its position is displaced. Therefore, it is not possible to use the pride camshaft sensor instead of the one in the TIBA. However, this sensor can be used in the pride.

To distinguish the old sensor from the new one, a white mark is printed on the new sensor.



FS0017

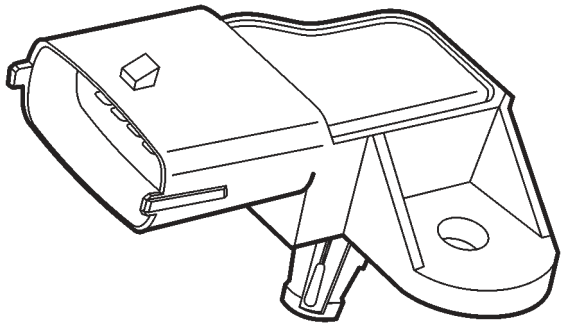
3 - Manifold pressure and intake air temperature sensor.

This sensor is installed at the top of intake air manifold surge tank. It measures inlet air temperature and pressure continuously and sends the data to the ECU unit. The voltage of this sensor is supplied by the ECU unit.

The return voltage from the sensor is measured in proportional to the pressure increase by the piezoelectric. The ECU unit uses these data to compute the following items:

- Measuring air flow into the engine
- Adjusting the air/ fuel ratio based on the engine load and ambient pressure.
- Spark advance

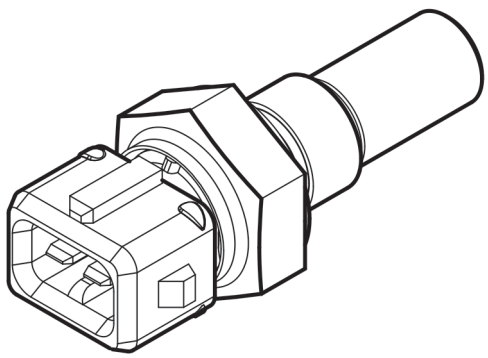
The resistance used in the air intake sensors is an NTC type. Its resistance increases as the temperature increases. The ECU unit uses this sensor data to compute the air mass flow into the engine.



FS0018

4 - Coolant temperature sensor

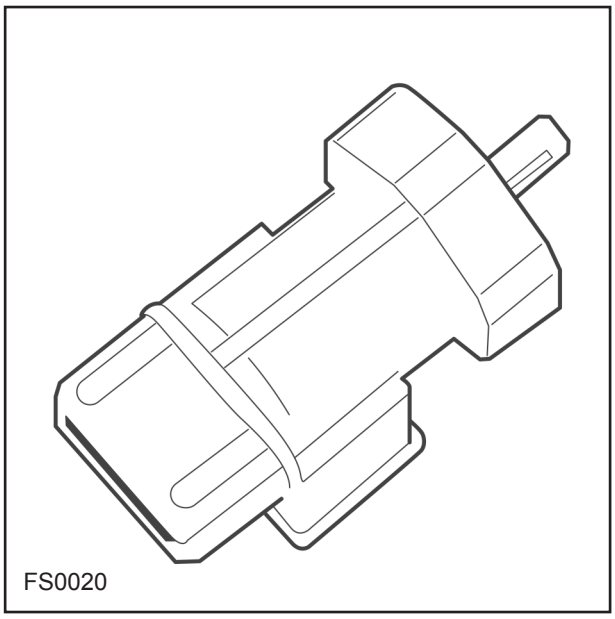
This sensor measures the coolant temperature in the cylinder head and sends it to the ECU unit to turn on the fan to reduce the coolant temperature if required.



FS0019

5 - Vehicle speed sensor

This sensor is installed on the speedometer driven gear. It sends a signal proportional to the speed of the gearbox output shaft to measure the vehicle speed.


FS0020

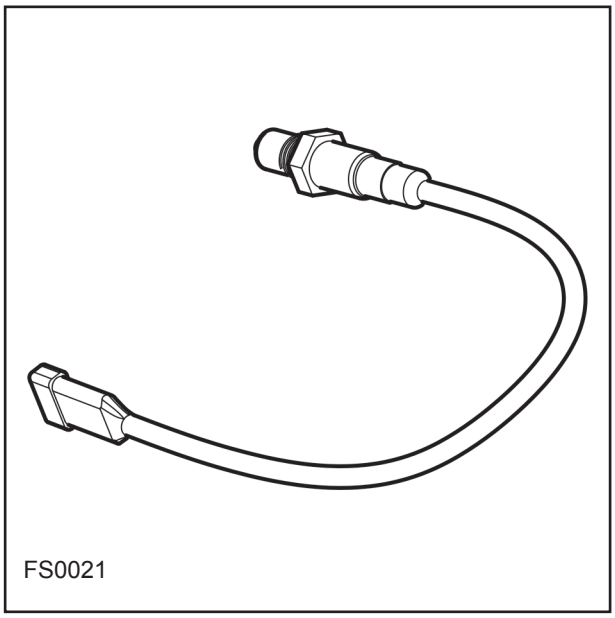
6 - Oxygen sensor

This sensor is installed on the exhaust manifold between the engine and catalyst. This sensor measures the air/fuel ratio and sends it to the ECU unit for calculating following items:

- Fuel/air mixture ration
- Fuel/air ration adjustment for efficient engine performance
- The functions concerning with the efficient fuel/air ratio for the catalyst converter suitable performance are stored in the ECU unit. The ECU unit receives the lean or rich fuel/air mixture ratio from the Oxygen sensor as a voltage between 0 and 1. The ECU unit uses the fuel/air mixture ratio data and the functions stored in its memory to adjust the fuel/air ratio to reach an efficient catalyst converter performance.

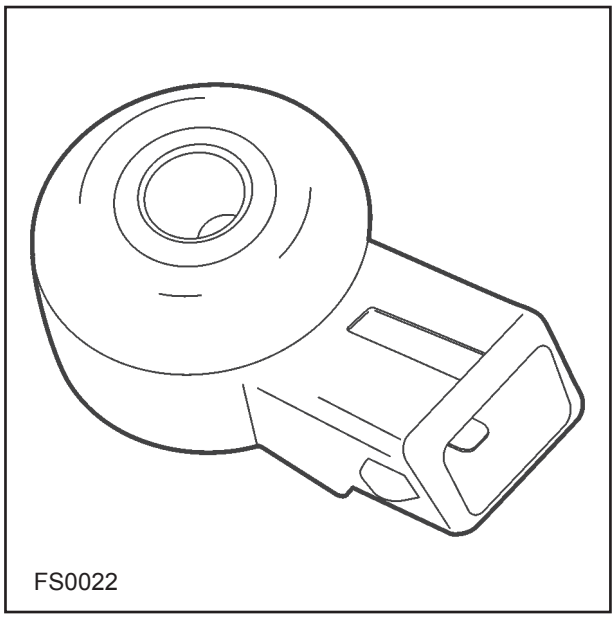
Lean mixture: The transmitted voltage from the oxygen sensor less than 0.5.volt.

Reach mixture: The transmitted voltage from the oxygen sensor more than 0.5 volt.


FS0021

7 - Knock sensor

The knock amount inside the engine is measured by the knock sensor and the measured data are sent to the ECU unit. The knock occurs when earlier ignition of fuel/air mixture in the cylinder and causes vibration. If knock occurs inside the cylinder of the engine, the ECU unit receives signal from the knock sensor and reduces the spark advance and the engine knock.
At the same time, the fuel /air ratio increases.



FS0022

*** Actuators**

The actuators operate the ECU unit commands based on the data of sensors.
1 - Main relay
This relay is responsible to supply the required electric current to the injector system at different engine working conditions such as switch on, off, and the engine running conditions. The main relay is connected to the main wiring harness and operates based on the following three steps:

a) Switch OFF:

In switch off position, 12 - Volt is supplied to the ECU unit for storing the data in the ECU memory.

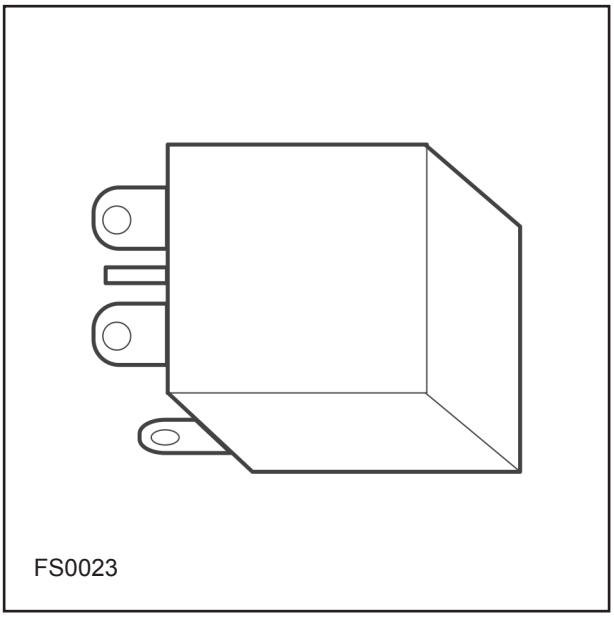
b) Switch ON:

In switch ON position, 12 - Volt is supplied to the following components for 2-3 seconds:

- ECU
- Injectors
- Double coil
- Canister electric valve
- Oxygen sensor heater resistance

c) Running engine

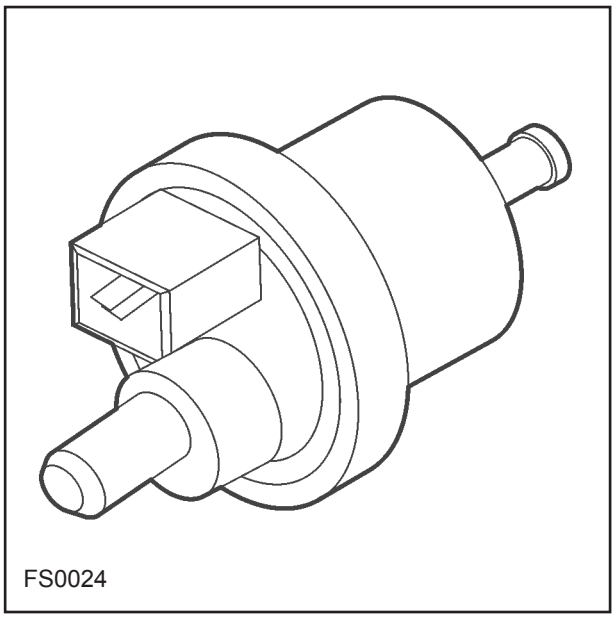
When running engine, the voltage is supplied to the system components continuously.
2 - Fuel pump relay
The battery voltage supplied to the fuel pump by a signal from the ECU unit operates the fuel pump relay.



FS0023

3 - Canister electric valve

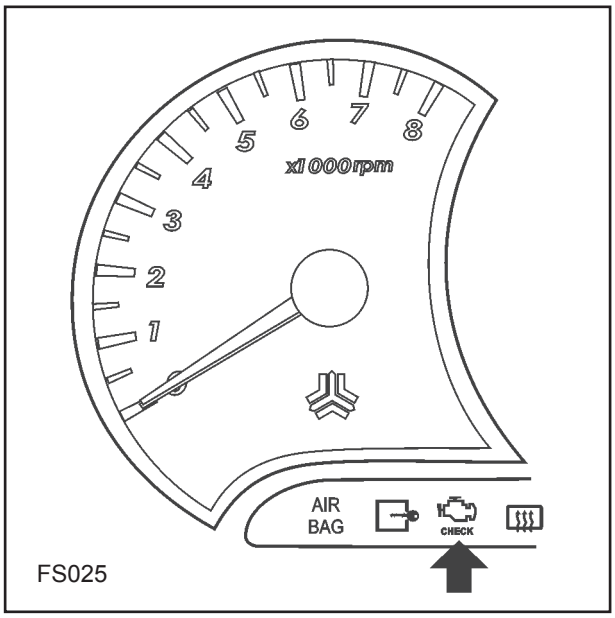
This solenoid is controlled by the ECU unit. The received electric pulses from the ECU unit generate an electromagnetic field in the electric valve coil and lifts up its core. This connects the inlet channel to the outlet channel. When starting the engine, solenoid is excited to send the gasoline vapors accumulated in the canister into the air in take.



FS0024

4 - Malfunction Indicator Lamp (MIL)

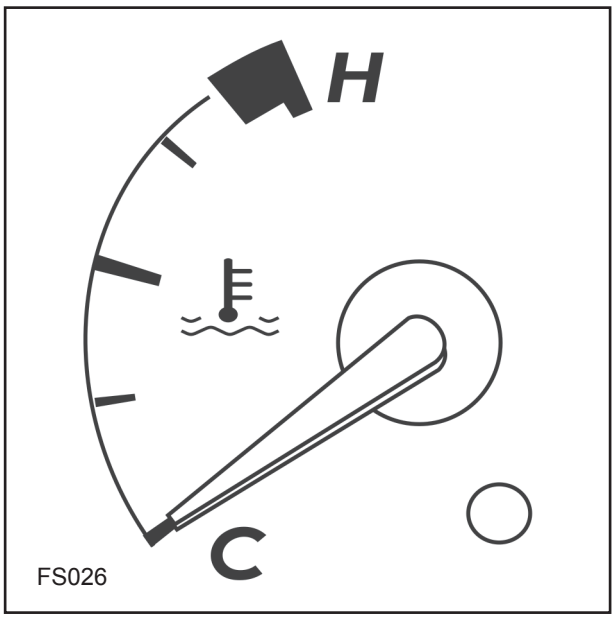
This indicator lamp is installed in the speedometer panel. When detection of any malfunction in the injection system by the ECU unit, the lamp turns on to warn the driver the defect occurrence.



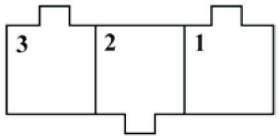
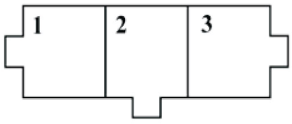
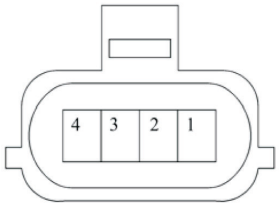
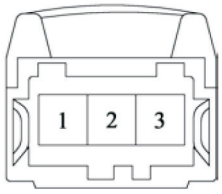
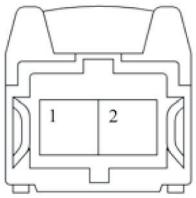
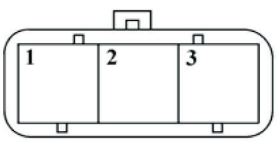
FS025

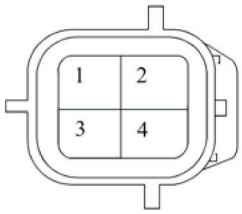
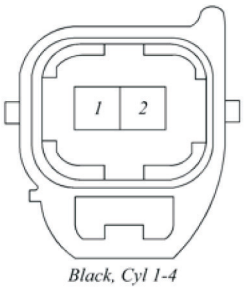
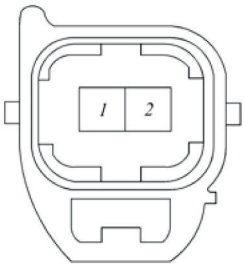
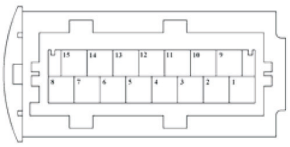
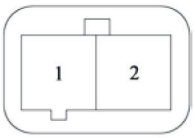
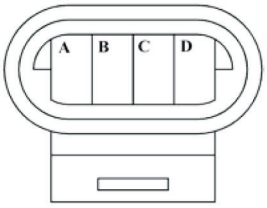
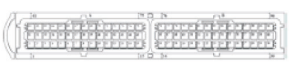
5 - Hot water warning lamp

This warning lamp is located in the dashboard panel and it indicates the average engine coolant temperature received from the water temperature sensors.



FS026

Part	Wiring harness shape	Number of supports	Support Function
Malfunction detector connector		16	4 GND 5 GND 6 12+V
Engine speed sensor		3	1 SIG A 2 SIG A 3 GND
Vehicle speed sensor		3	1 GND 2 +Ve 3 SIG
Air intake pressure and temperature sensor		4	1 MAP 2 5+V 3 ATS 4 GND
Throttle position sensor		3	1 GND 2 +Ve 3 SIG
Water temperature sensor		2	1 SIG 2 -Ve
Knock sensor		2	1 SIG 2 GND
Camshaft position sensor		3	1 GND 2 SIG 3 +Ve

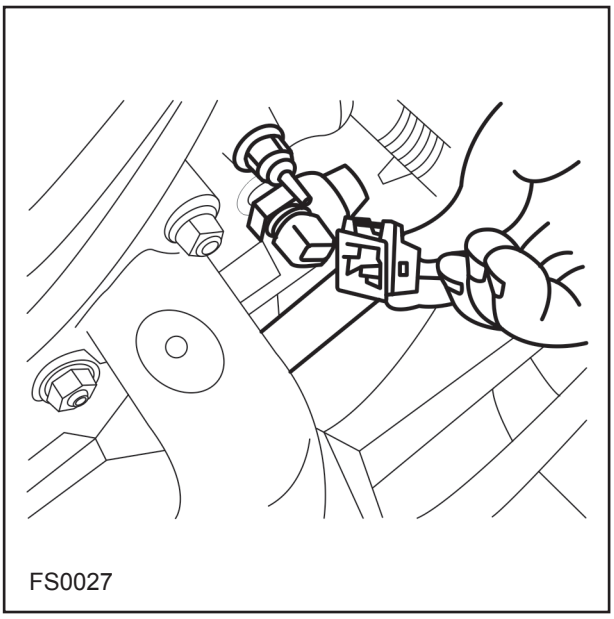
Part	Wiring harness shape	Number of supports	Support Function
Oxygen sensor		4	1 +Ve 2 -Ve 3 GND 4 SIG
Ignition coil	 Black, Cyl 1-4	2	1 + 12V 2 SIG
	 Gray, Cyl 2-3	2	1 + 12V 2 SIG
Injector		2	1 SIG 2 +12V
Main relay		4	Refer to the figure
Canister purge valve		2	1 SIG 2 +12V
Stepper motor		4	1 A 2 B 3 C 4 D
ECU (SIEMENS)		90	Refer to the figure

CHAPTER TWO

Disassembling and assembling parts and inspections

*** Disassembling and assembling water sensor**

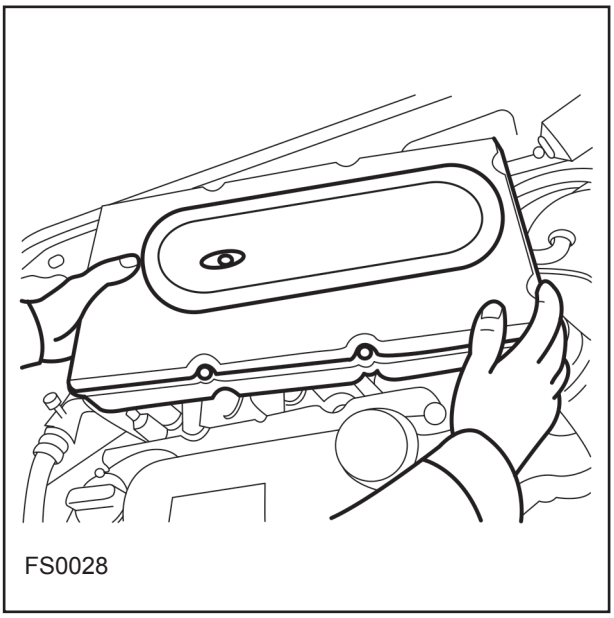
1- Disconnect the negative terminal of the battery.
2- Pull out gently the sensor connector.
3- Remove the sensor by a special sensor.


FS0027

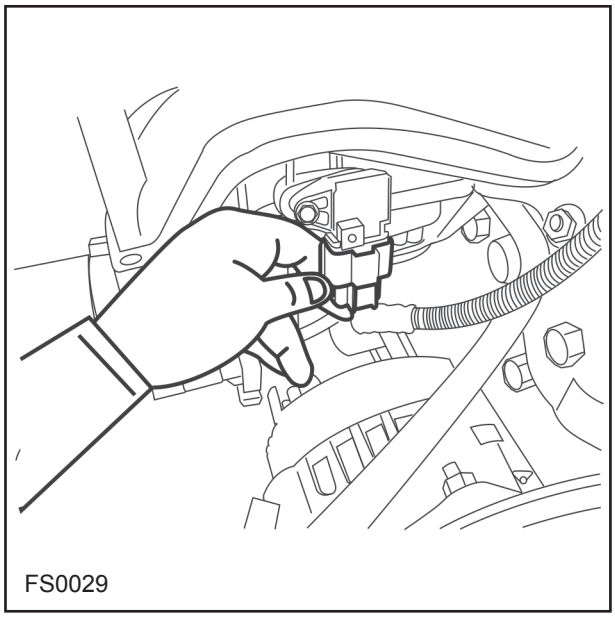
To assemble do the reverse.
The required tightening torque:
25-40N.m (2.5~4kg.m).

*** Disassembling and assembling of air intake pressure and inlet air temperature sensor**

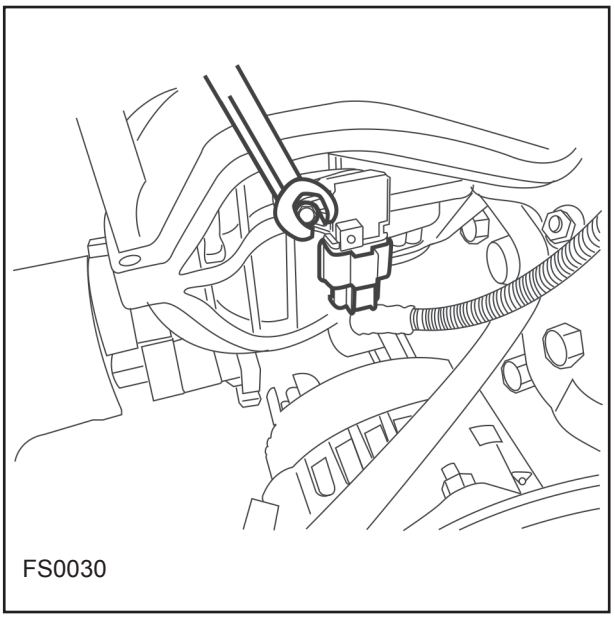
1- Disconnect the negative terminal of the battery.
2- Pull up the air cleaner assembly and remove its three pins from the engine.


FS0028

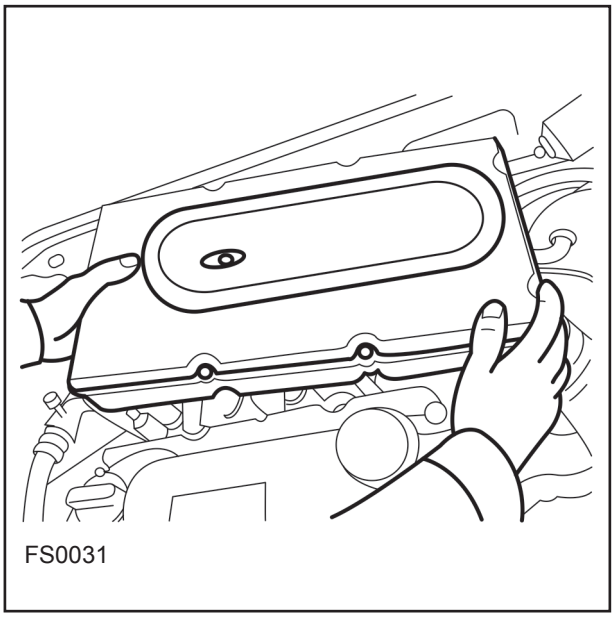
3- Remove the intake air pressure and inlet air temperature sensor by pulling out its pin.


FS0029

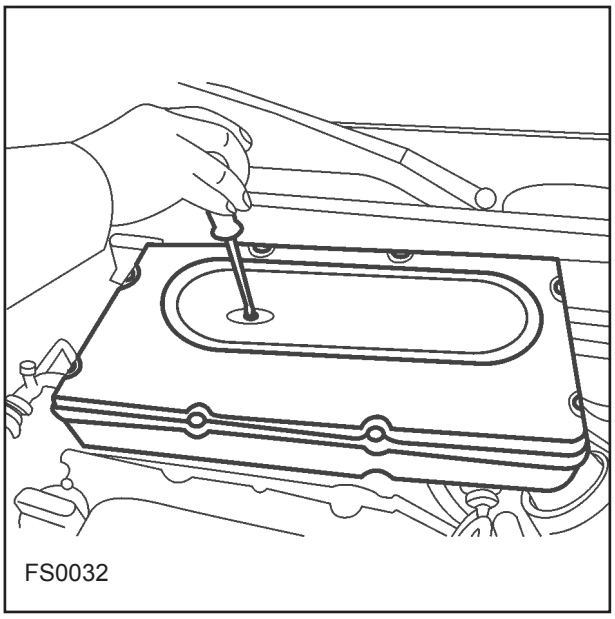
4 - The sensor is installed by a screw on the air intake. Remove it to detatch the sensor. To assemble do the reverse.
The required tightening torque:
8-11 N.m (0.8~1.1Kg.m)


FS0030

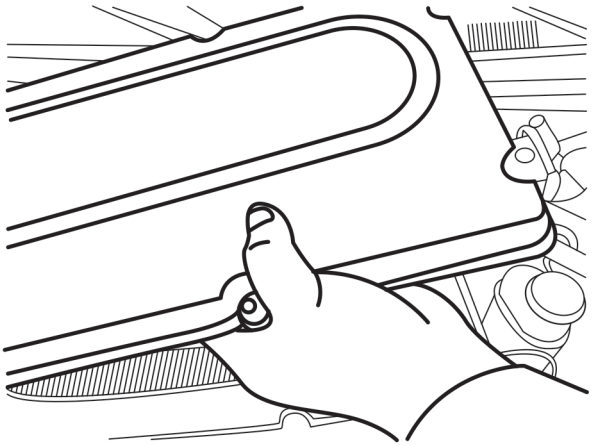
*** Disassembling and assembling air filter and air intake assembly.**
1- Disconnect the negative terminal of the battery.
2- Pull up the air cleaner assembly to detatch it from the three pins installed on the engine.


FS0031

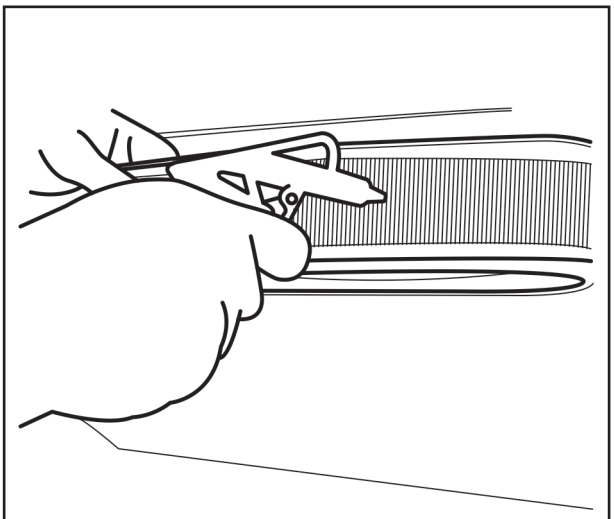
3- Remove the nine screws of the air cleaner cover.
The required tightening torque:
10 N.m (1Kg.m)


FS0032

4- Remove the air cleaner cover


FS0040

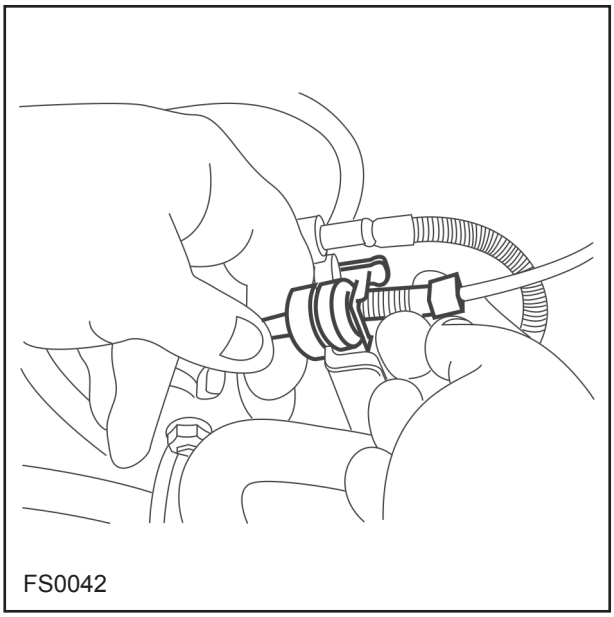
5- In case of slight dust in the air filter, clean the air filter. Otherwise, replace the filter.


FS0041

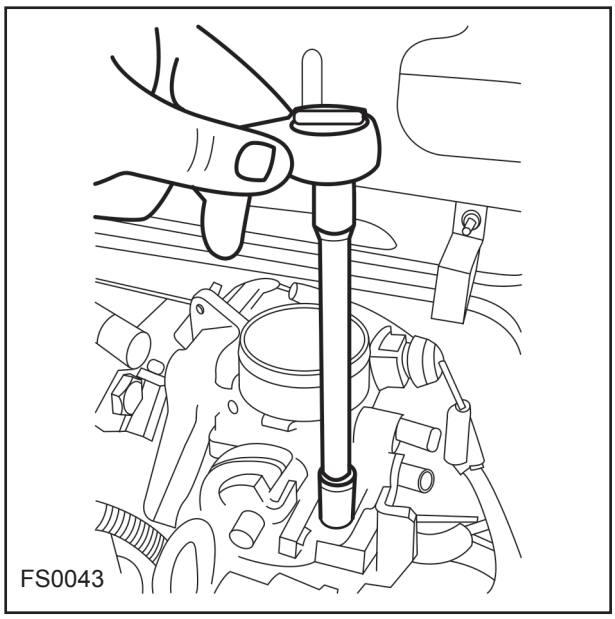
To assemble do the reverse.

*** Disassembling and assembling throttle body**

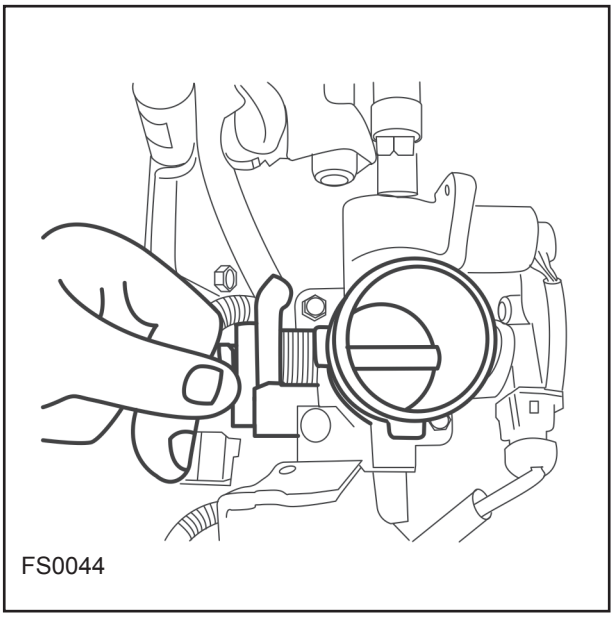
1- Disconnect the negative terminal of the battery.
2- Pull up the air cleaner assembly to detatch it from the three pins on the engine.
3- Detatch the accelerator wire from the accelerator lever mechanism.


FS0042

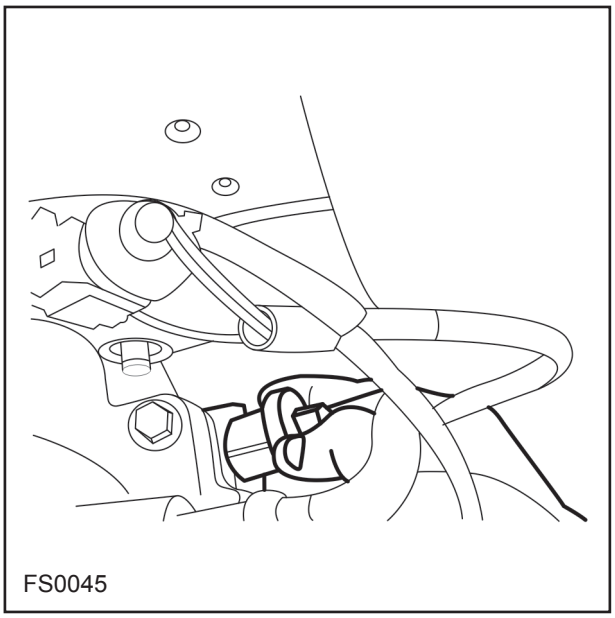
4- Disassemble the throttle body by removing its bolts to assemble do the reverse.
To assemble do the reverse.
The required tightening torque:
8-11N.m (0.8~1.1Kg.m)


FS0043

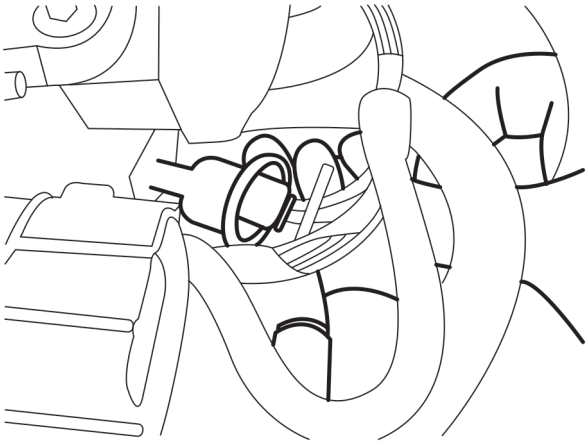
*** Throttle body inspection**
Check the throttle valve for its soft motion and the complete opening and closing positions. Adjust the accelerator wire sag.


FS0044

***Assembling and disassembling of canister purge valve**
1- Disconnect the negative terminal of the battery.


FS0045

2- By pulling out the pin, detatch the canister purge valve. To assemble do the reverse.

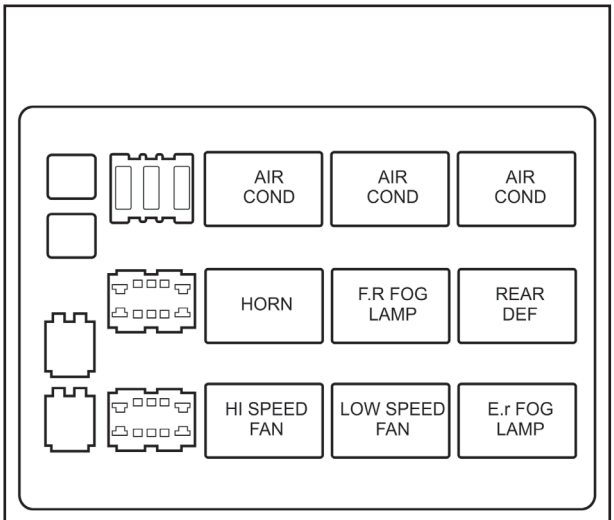


FS0046

*** Disassembling and assembling main relay**

1- Disconnect the negative terminal of the battery.

2- First remove the nut of the relay support and then detatch its socket to remove the relay.



FS0047

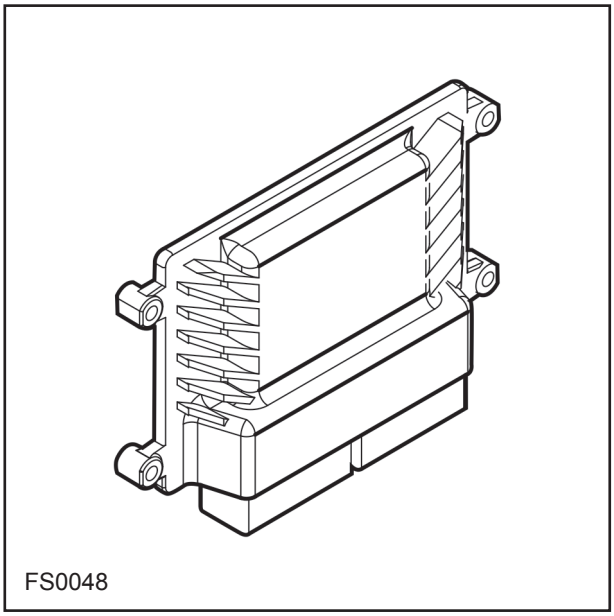
To assemble do the reverse.

***Disassembling and assembling the ECU unit.**

Disconnect the negative terminal of the battery.

The ECU unit is located under the dashboard at the left hand side. By remove in it screws and pulling down, the ECU unit can be detatched.

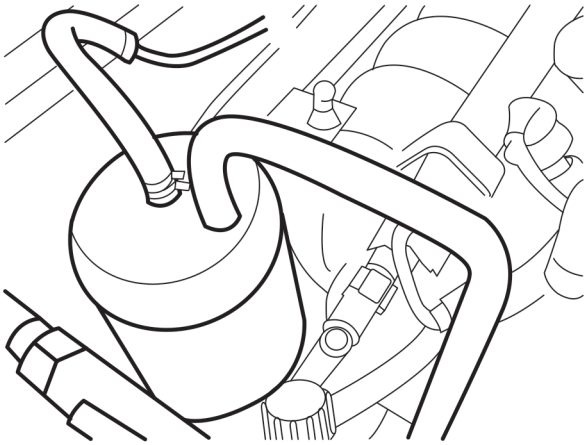
To assemble do the reverse. Be careful when assembling the connector.



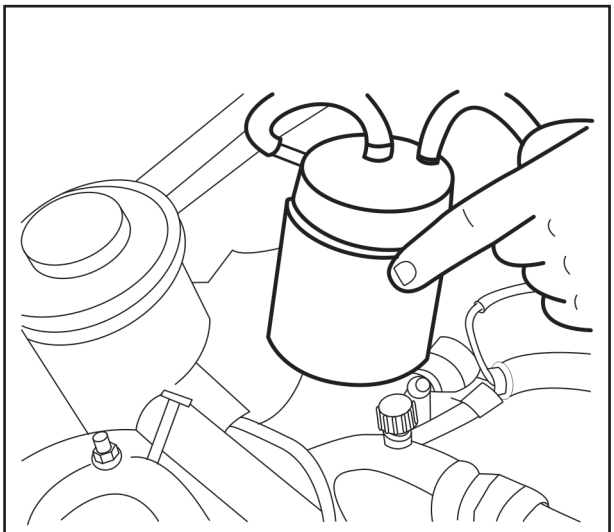
FS0048

*Disassembling and assembling canister

1- Disconnect the negative cable of the battery.
2- Disassemble the air cleaner assembly

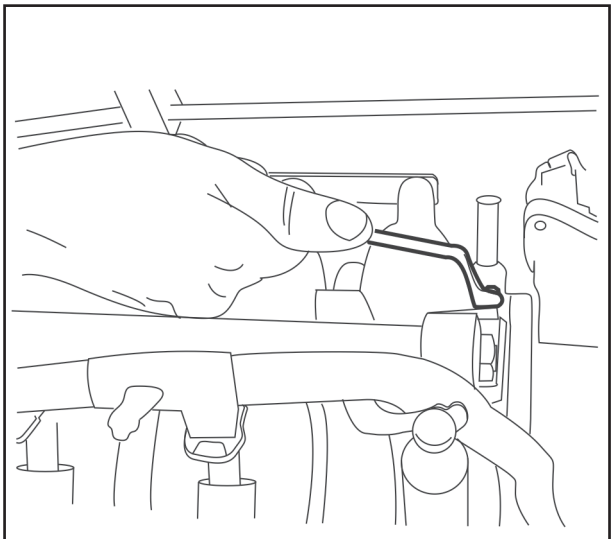

FS0049

3- Detatch the canister by removing its hoses
To assemble do the reverse.


FS0050

*Disassembling and assembling injectors

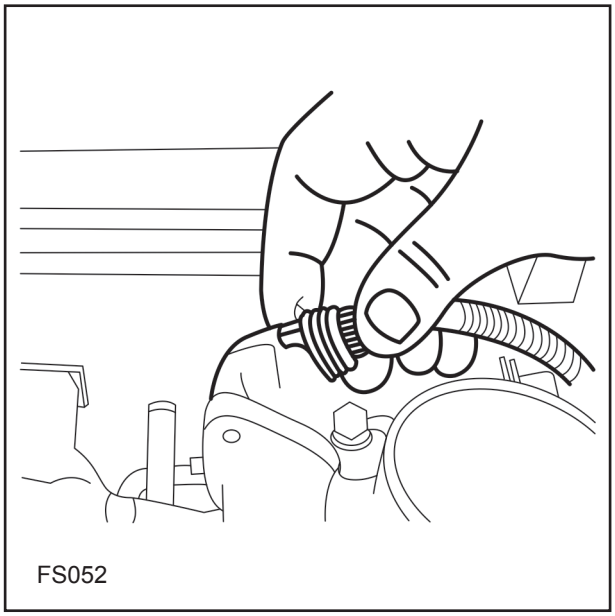
1- Disconnect the negative terminal of the battery.
2- Remove the fuel rail screws and detatch it.
3- Release the injectors connecting pins to the fuel rail to remove the injectors.
To assemble do the reverse.


FS0051

***Disassembling and assembling stepper motor**

1- Disconnect the negative terminal of the battery.

2- Pull out the stepper motor socket by removing its pin.

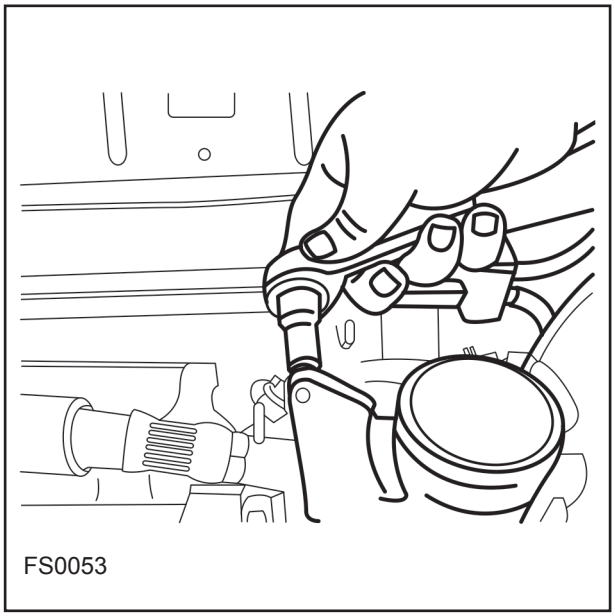


FS052

3- The sensor by removing its screws its screws from the throttle valve body.

The required torque of tightening:

8-11N.m (0.8~1.1 Kg.m)



FS0053

***Disassembling and assembling Oxygen sensor**

1- Disconnect the negative terminal of the battery.

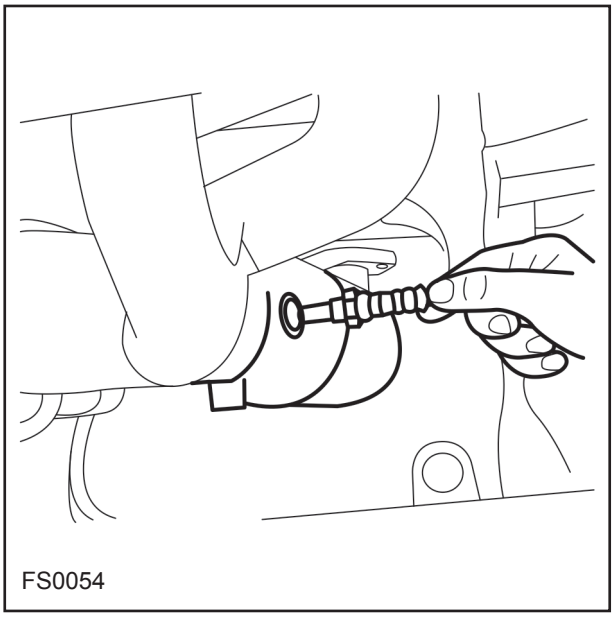
2- Detatch the oxygen sensor by removing its pin.

3- Disassemble the oxygen sensor by a special tool.

To assemble do the reverse.

The required torque of tightening:

4-6 N.m (0.4-0.6Kg.m)



FS0054

CHAPTER THREE

Troubleshooting procedure of TIBA vehicle with SIEMENS Injection system

Introduction

This chapter explains the troubleshooting procedure of the TIBA vehicle with SIEMENS injection system. It includes all the possible malfunctions which occur in the injection system and their step by step trouble shooting procedure. Before doing any thing, take into account the following points:

1- It is assumed that the operator is fully aware of all the sensors and actuators of the SIEMENS injection system.

2- The BOB word means break out box which is an inter-connector providing easy access to the ECU pins. In case of not presence of the BOB, a needle can be used for the required test by inserting it into the wire to be tested.

3- Be Patient in trouble shooting of the injection system and follow the required steps carefully. If the trouble is removed at step, stop the other remaining steps.

4- Use multi-meter in detection of each part malfunction. The operator must know how to work with the multi-meter.

5- Do not apply 12 volts power to the sensors or actuators at all.

6- When the vehicle switch is ON or it is running, do not disconnect the ECU connector at all.

7- The ECU connector includes two sections of A and B. To find the corresponding pin in the ECU connector wiring harness, carefully look at the connector figure indicated in the next page using the specified mark related to the specified pin.

8- When intention the ignition or compression system, disconnect the injector connectors.

9- When any trouble occurs in the system and the malfunction indicator device is not able to detect the defect, this is stored in the error memory. If the trouble is removed, the error memory will not be deleted, until it is deleted by the device. Therefore, be careful to delete the error after any troubleshooting.

10- When the electrical investigation of the vehicle, consider the following two points:

10-1- The battery must be fully charged.

10-2-DO not use any voltage power higher than 16 volts.

Check the nominal signal for S231 vehicle in complete warning of engine (normal temperature)

No.	Name	Engine in idling condition, A/C OFF	Engine in idling condition , A/C ON	Description
1	VB (Battery voltage)	13.8V(13.2~14.2V)	13.4V (13.2~13.5V)	Battery and alternator nominal
2	Tco (Coolant temperature)	71~92ºC	71~92ºC	Based on the A/C fan
3	Tps (throttling positions)	0.0º (0.0-0.5)	0.0º (0.0-0.5)	—
4	MAP (Manifold air pressure)	350 mbar (300~400 mbar)	430 mbar (370~490 Mbar)	Valve clearance for green engine
5	N (engine rpm)	850 rpm (800~900 rpm)	900 rpm (850~950 rpm)	—
6	Ignition advance	6ºCRK (3.0~12.0ºCRK)	6ºCRK (2.6~12.4ºCRK)	—
7	Spray time	3.1 ms (2.5~3.5 ms)	4.2 ms (3.5~5.0 ms)	—
8	Stepper motor	23 step (20~35 step)	38 step (35~50 step)	Depends on how clean is the throttling valve
9	Dowell time	3.8 ms (4.1~3.6 ms)	4.0 ms (4.1~3.9 ms)	—

* Fuel delivery system tests and inspections

*** Fuel filter inspection**

Fuel filter is installed beside the fuel tank.

Note: *To prevent fuel spilling out, first disconnect the inlet fuel hose and then close it. When installing, make sure that the fuel filter to be instilled in the proper fuel flow direction.*

*** Fuel pump inspection**

1- Disconnect the outlet hose from the fuel rail and connect the fuel pressure gage.

2- The engine in idling condition, measure the pressure and replace the fuel pump if necessary.

- The standard pressure: 3.5 bar

3- Disconnect the outlet hose from the fuel rail and put its end into a pot.

4- Start the engine and measure the pumped fuel amount for a minute.

*** Injector inspection**

1- Warm up the engine and keep it idling.

2- Inspect the injector operation noise using a screw driver or any suitable device.

3- If the injector is not working, inspect the wiring harness and ECU terminal voltage **based on the following steps:**

- Resistance

1- Detatch the injector from the engine.

2- Using an ohm-meter, measure the resistance of the injectors.

3- If the injector resistance is not suitable, replace it

- Resistance amount: 12 ±Ω5%

*** Fuel leakage test and its volume**

1- This test is carried out by a special test device such as ASNU.

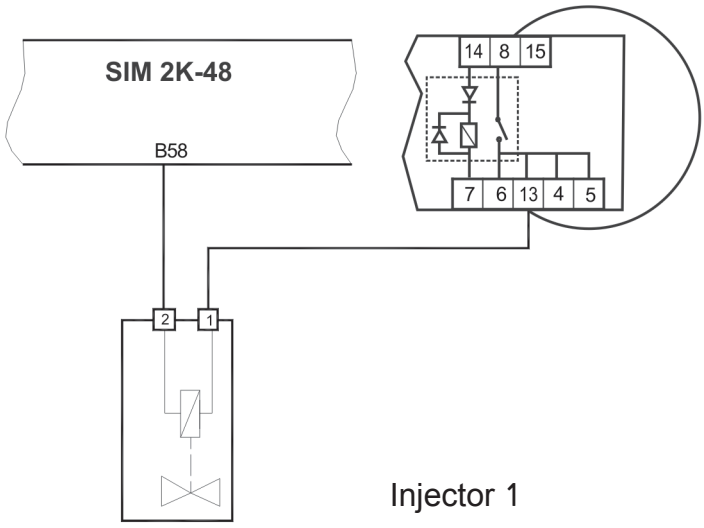
Note: *When working on fuel, be careful not to expose it to spark or flame.*

2- Leakage of a drop from the injector after a minute is acceptable.

Injector flow rate at 300 Kpa	Static	1.63 gr/s
	Dynamic	3.6 gr/s

Injector 1

Step	Inspection		Action
1	- Detatch the ECU connector - Detatch the main relay from the related connector - Using a wire connect terminals 4 and 8 of the main relay Connect BOB Using a wire connect terminals B58 and B28		
2	Does injector 1 work properly?	Yes	Replace the ECU and repeat the test. If the trouble is not solved go to step 3.
		No	Go to step 3.
3	Detatch the related connector and measure the resistance between its terminals using an ohm-meter.		
4	Does the resistance amount stay between 11.4 and 12.6Ω ?	Yes	Check the wire connections for any short connection or disconnection.
		No	Replace the injector and repeat the above steps. If the trouble is not removed, there should be some short connection or disconnection in the wires.

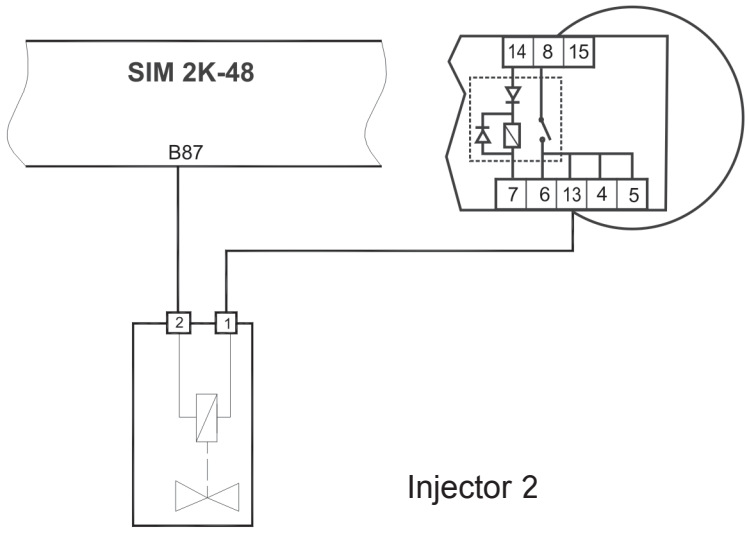


Injector 1

FS0055

Injector 2

Step	Inspection		Action
1	- Detatch the ECU connector - Detatch the main relay from the related connector - Using a wire connect terminals 4 and 8 of the main relay Connect BOB Using a wire connect terminals B58 and B28		
2	Does injector 2 work properly?	Yes	Replace the ECU and repeat the test. If the trouble is not solved go to step 3.
		No	Go to step 3.
3	Detatch the related connector and measure the resistance between its terminals using an ohm-meter.		
4	Does the resistance amount stay between 11.4 and 12.6Ω ?	Yes	Check the wire connections for any short connection or disconnection.
		No	Replace the injector and repeat the above steps. If the trouble is not removed, there should be some short connection or disconnection in the wires.

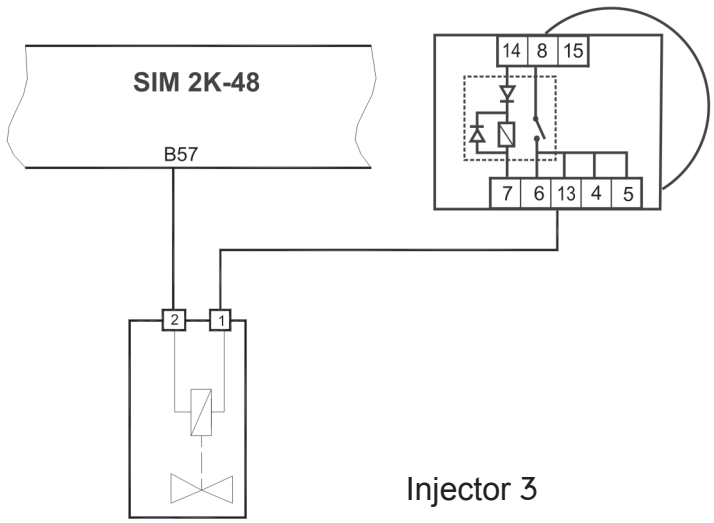


Injector 2

FS0056

Injector 3

Step	Inspection		Action
1	- Detatch the ECU connector - Detatch the main relay from the related connector - Using a wire connect terminals 4 and 8 of the main relay Connect BOB Using a wire connect terminals B58 and B28		
2	Does injector 3 work properly?	Yes	Replace the ECU and repeat the test. If the trouble is not solved go to step 3.
		No	Go to step 3.
3	Detatch the related connector and measure the resistance between its terminals using an ohm-meter.		
4	Does the resistance amount stay between 11.4 and 12.6Ω ?	Yes	Check the wire connections for any short connection or disconnection.
		No	Replace the injector and repeat the above steps. If the trouble is not removed, there should be some short connection or disconnection in the wires.

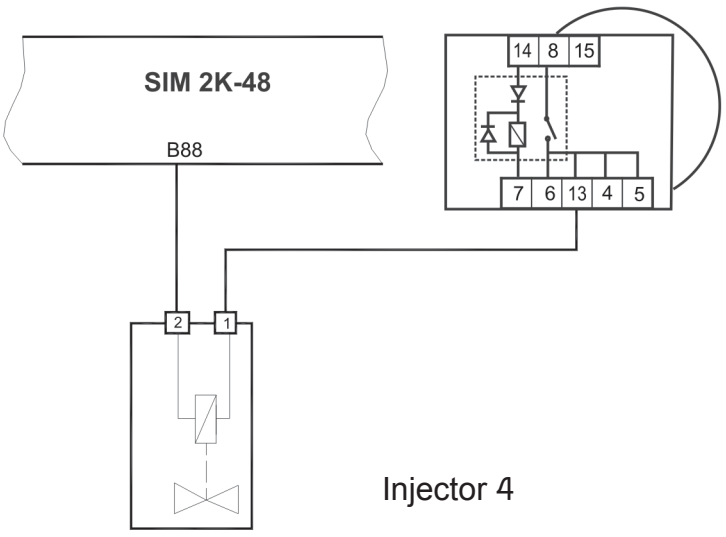


Injector 3

FS0057

Injector 4

Step	Inspection		Action
1	- Detatch the ECU connector - Detatch the main relay from the related connector - Using a wire connect terminals 4 and 8 of the main relay Connect BOB Using a wire connect terminals B58 and B28		
2	Does injector 3 work properly?	Yes	Replace the ECU and repeat the test. If the trouble is not solved go to step 3.
		No	Go to step 3.
3	Detatch the related connector and measure the resistance between its terminals using an ohm-meter.		
4	Does the resistance amount stay between 11.4 and 12.6Ω ?	Yes	Check the wire connections for any short connection or disconnection.
		No	Replace the injector and repeat the above steps. If the trouble is not removed, there should be some short connection or disconnection in the wires.

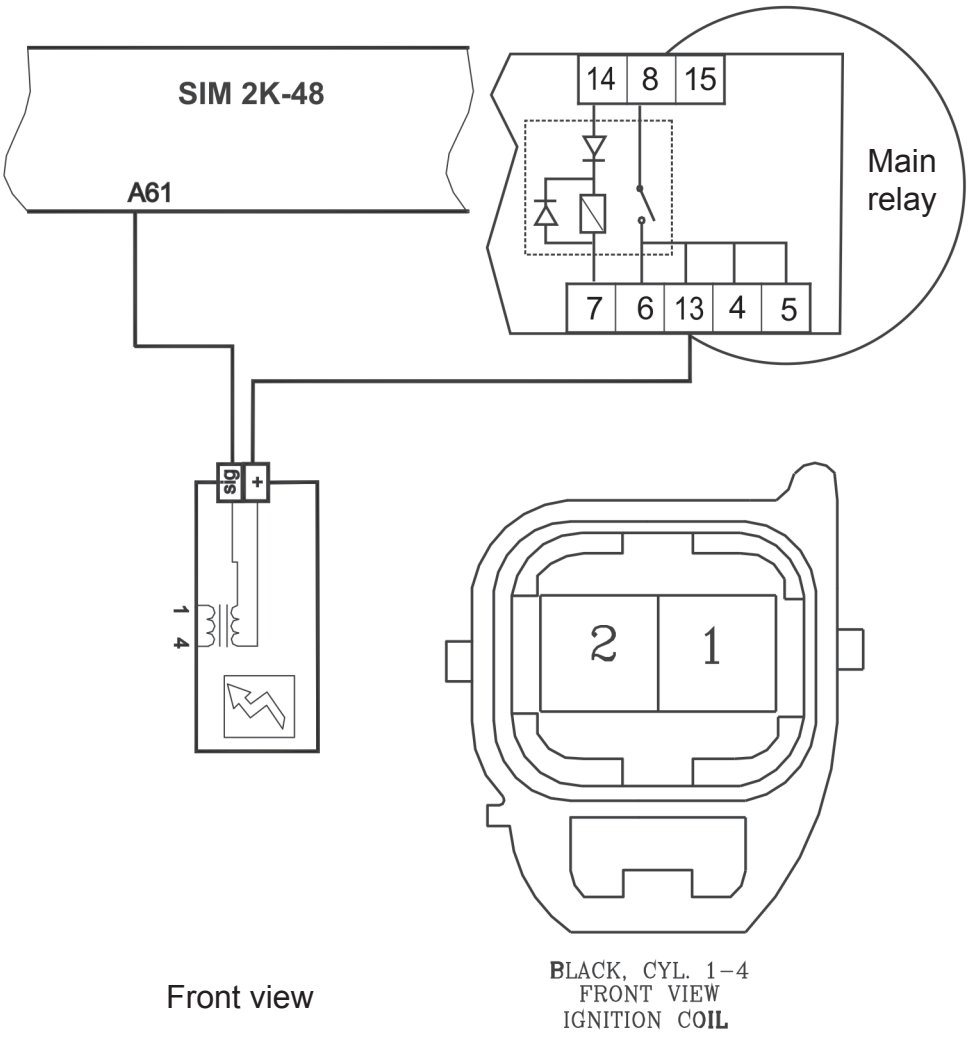


Injector 4

FS0058

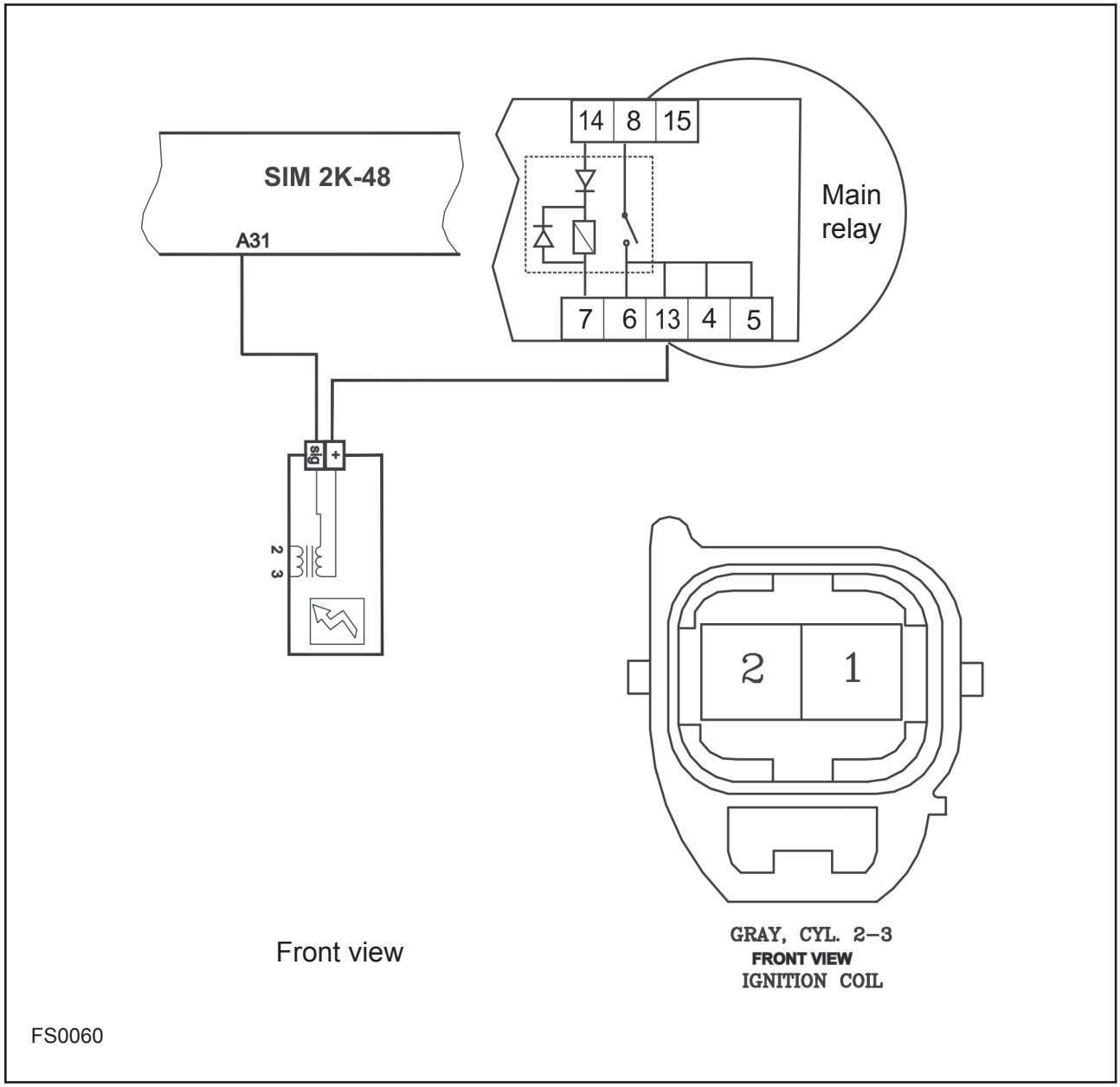
Injector Coils 1 and 4

Step	Inspection		Action
1	- Connect the BOB - Detatch the ECU from the related connector - Detatch the main relay from the connector - using a wire connects the main relay terminals 4 and 8 to terminal 8.		
2	Measure the voltage between black connector 2 of the ignition coil and B28. is the voltage 12 volts?	Yes	Go to step 3.
		No	Check the battery connection
3	Measure the voltage between terminals A61 and B28. Is the voltage 12 Volts?	Yes	Go to step 4
4		No	Check the ignition coil wire connections to the ECU and main relay.
	Replace the ignition coil and repeat the above mentioned test. If the trouble is not solved, replace the ECU.		



Injector Coils 2 and 3

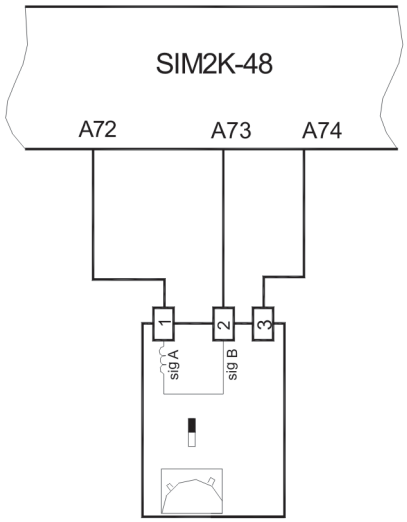
Step	Inspection		Action
1	- Connect the BOB - Detatch the ECU from the related connector - Detatch the main relay from the connector - using a wire connects the main relay terminals 4 and 8 to terminal 8.		
2	Measure the voltage between black connector 2 of the ignition coil and B28. is the voltage 12 volts?	Yes	Go to step 3.
		No	Check the battery connection
3	Measure the voltage between terminals A61 and B28. Is the voltage 12 Volts?	Yes	Go to step 4
		No	Check the ignition coil wire connections to the ECU and main relay.
4	Replace the ignition coil and repeat the above mentioned test. If the trouble is not solved, replace the ECU.		



FS0060

Injector Coils 2 and 3

Step	Inspection		Action
1	First check the sensor for its proper connection to the wire harness	**Yes**	Detatch the connector and reconnect it.
		No	Go to the next step.
2	Detatch the connector and measure the resistance between terminals 1 and 2 of the sensor		
3	Is the resistance between 300 and 420 Ω ?	**Yes**	Turn the switch off and then install BOB
		No	Replace the sensor and retest the system
4	Using an ohm-meter, measure the resistance between terminals 1 and A72. Is the resistance less than 1Ω?	**Yes**	Go to step 5
		No	Check the ECU connector wire for any possible disconnection.
5	Using an ohm-meter, measure the resistance between terminals 2 and A73.	**Yes**	Go to step 6
		No	Check the ECU connector wire for any possible disconnection.
6	Using an ohmmeter, measure the resistance between terminals 3 and A74. Is the resistance less than 1Ω?	**Yes**	Go to step 7.
		No	Check the ECU connector wire for any possible disconnection
7	Replace the ECU and retest the system		



FS0061

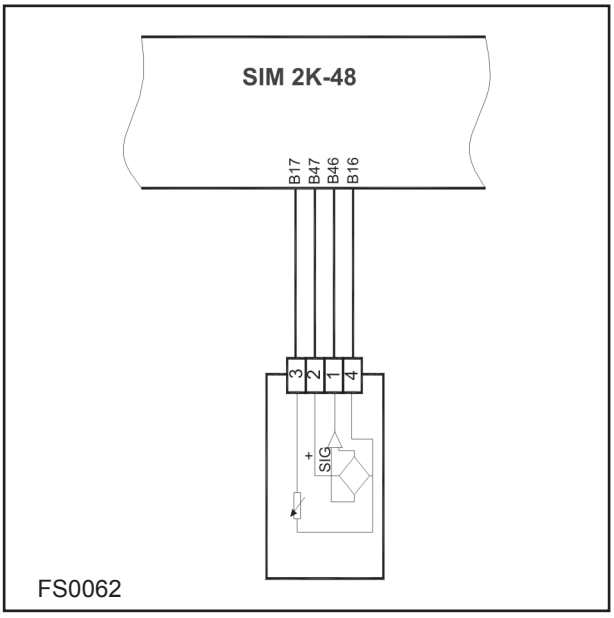
Engine rpm sensor

Manifold air pressure sensor

Step	Inspection		Action
1	Check the sensor for its proper installation on the manifold. The turn the switch in ON position and measure the voltage between terminals B16 and B47. Is the voltage 5 volts?	Yes	Go to the next step.
		No	Check the voltages of the battery, switch, and ECU power supply for setting. If the trouble is not removed, go to the next step.
2	Detatch the sensor from the manifold and connect it to the vacuum pump. In different negative pressures, measure the voltage between terminals B16 and B46, and BOB using a volt meter. Is the measured voltage in accordance with table 1?	Yes	Go to the next step
		No	Go to step 6
3	Detatch the connector from the sensor and turn the switch off. Check the ECU and sensor wires and measure the resistance between terminal 4 and B16 connectors using an ohm-meter. Is the resistance less than 1 Ω?	Yes	Go to the next step.
		No	Check the ECU connector for the possible short- circuit or disconnection.
4	Using an ohmmeter, measure the resistance between terminals 2 and B47. Is the resistance less than 1 Ω ?	Yes	Go to step 7.
		No	Check the ECU connector wire for any possible disconnection
5	Using an ohmmeter, measure the resistance between terminal 1 and B46. Is the resistance less than 1 Ω?	Yes	Go to the next step
		No	Check the ECU wire for any possible disconnection
6	Replace the sensor and if the trouble is not solved, replace the ECU		

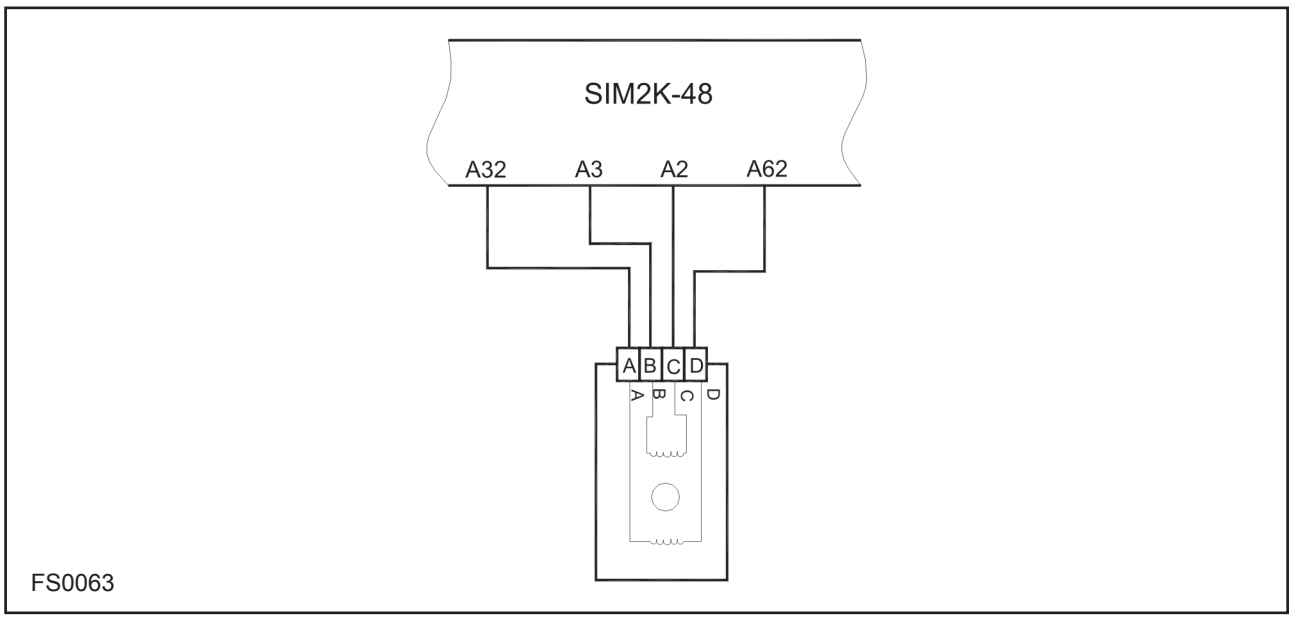
Table (1)

Voltage (V)	Absolute pressure (Kpa)
0.4	10
0.8	20
1/21	30
1/61	40
2.02	50
2.49	60
2.83	70
3.23	80
3.64	90
100	4.04



Stepper motor

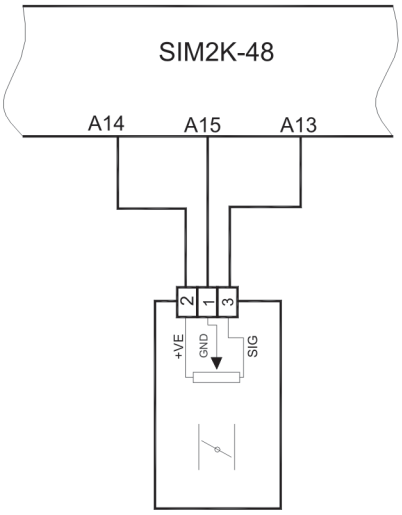
Step	Inspection		Action
1	- Connect the BOB. - Detatch the ECU connector		
2	Using an ohmmeter, measure the resistance between terminals A3 and A2 and name it as R1. Is that resistance between 47 and 59Ω?		Go to the next step
			Detatch the stepper motor from its connector, and measure the resistance between terminals C and B, name it as R2. If R1=R2, go to step 4. Otherwise, there is disconnection in the wire. Therefore, check the wire.
3	Using an ohmmeter, measure the resistance between terminals A32 and A62 and name it as R3. Is this resistance between 47 and 59Ω?		Go to the next step.
			Detatch the stepper motor from its connector and measure the resistance between A and D, name it as R4. If R3=R4, go to step 4. Otherwise, there is disconnection in the wire. Therefore, cheek the wire.
4	Replace the stepper motor and retest the system. If the trouble is not solved, replace the ECU and retest the system.		



FS0063

Throttling position sensor (TPS)

Step	Inspection		Action
1	Detatch the sensor and turn on the switch		
2	Using a voltmeter, measure the voltage between terminals 2 and 3 of TPS. Is the voltage 5 volt?	Yes	Go to be next step.
		No	Measure the voltages of the battery, switch, and ECU power supply for setting. If the trouble is removed, go to the next step
3	Connect the sensor to its connector and then connect the BOB.		
4	Measure the voltage between terminals A/3 and A/5 and call it as V2. When the accelerator pedal is not pressed down it should be between 0.5 and 0.8 volt. Is the measured voltage in this range?	Yes	Go to the next step
		No	Go to step 6
5	The V2 voltage when pressing down the accelerator pedal should be between 0.5 and 4.5 volt. Is that in this range?	Yes	Go to step 8
		No	Go to the next step.
6	Detatch the sensor from the connector again.		
7	Using an ohm-meter, check the sensor wires to the ECU for their proper connection and no presence of any disconnection. If the trouble is not removed, go to the next step.		
8	- Measure the resistance between sensor terminals 2 and 3 and call it as R1 - Measure the resistance between sensor terminals 1 and 3 and call it as R2.		
9	Is the R1 stays between 3.2 and 4.8KΩ?	Yes	Go to the next step
		No	Go to step 11.
10	Is the R2 stays between 1.35 and 1.65 kΩ?	Yes	Go to the next step 12.
		No	Go to the next step
11	Replace the throttling body and retest the system. If the trouble is not solved, go to the next step.		
12	Replace the ECU and retest the system.		

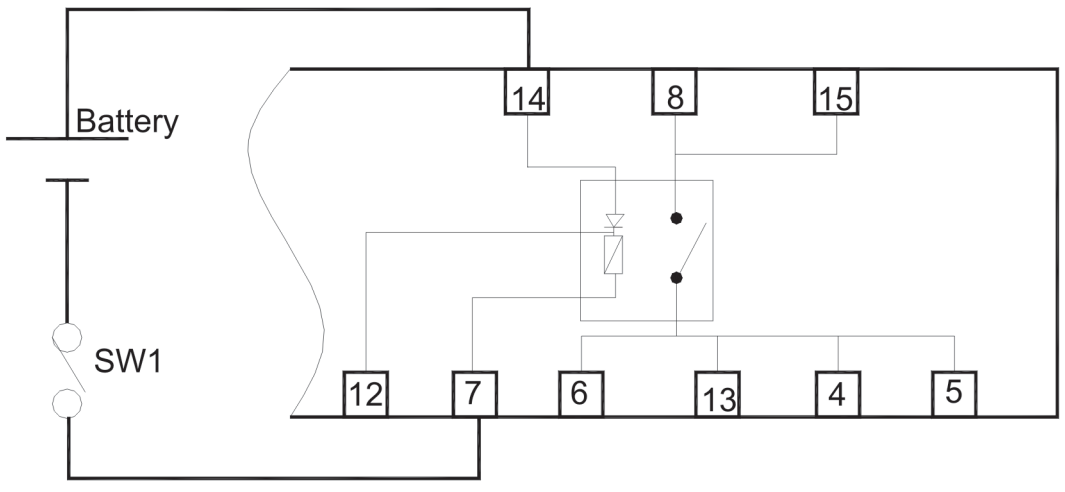


FS0064

Throttling position sensor (TPS)

Main relay

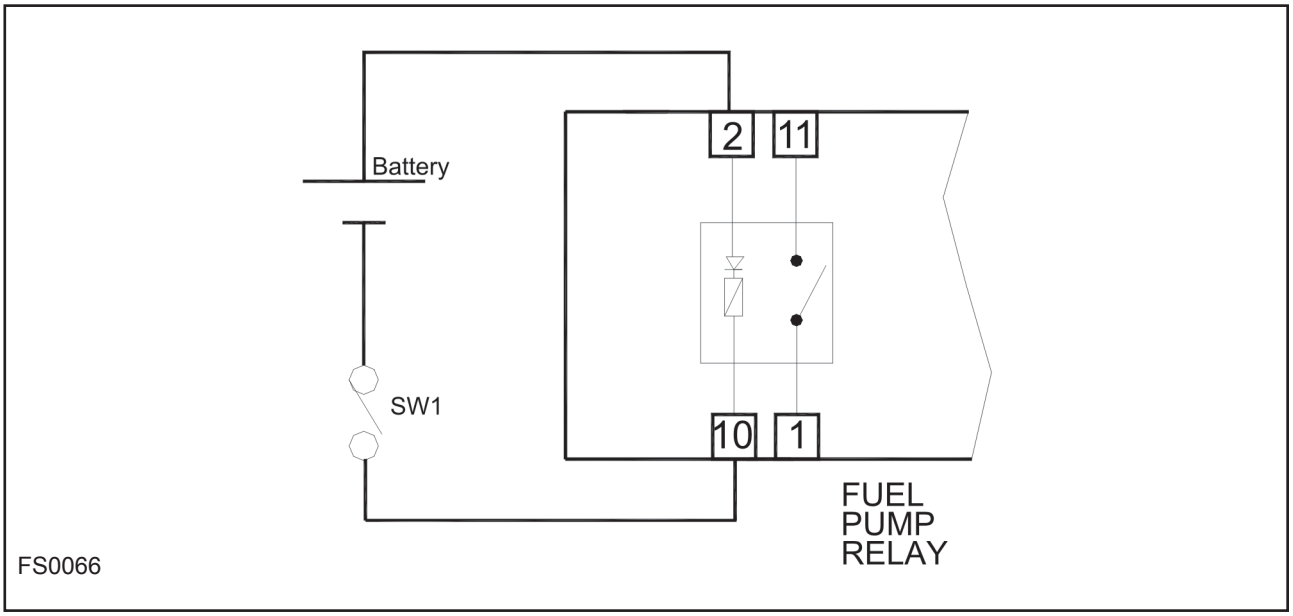
Step	Inspection		Action
1	First, detatch the main relay and then connect terminal 14 or A of the relay to the positive terminal of the battery and terminal 7 or D to the negative terminal of the battery. Now, using an ohm-meter, measure the resistance between terminals 8 and 4 (B,C) . Is this resistance less than 1 Ω?	Yes	The relay is okay
		No	Replace the relay



FS0065

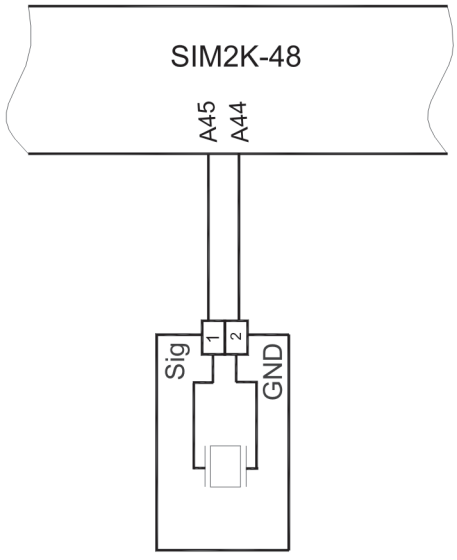
Fuel pump relay

Step	Inspection		Action
1	First, detatch the fuel pump relay and then connect terminal 2 or A of the relay to the negative terminal of the battery and terminal 10 or D the positive terminal of the battery. Now, using an ohm-meter, measure the resistance between terminals 1 and 11 (B,C). Is this resistance less than 1Ω?	Yes	The relay is okay
		No	Replace the relay



Knock sensor

Step	Inspection		Action
1	First, detatch the fuel pump relay and then connect terminal 2 or A of the relay to the negative terminal of the battery and terminal 10 or D the positive terminal of the battery. Now, using an ohm-meter, measure the resistance between terminals 1 and 11 (B,C). Is this resistance less than 1Ω?	Yes	The relay is okay
		No	Replace the relay
2	Using an ohm-meter, measure the resistance between terminals 2 and A44. Is this resistance less than 1Ω?	Yes	Go to the next step
		No	Check the connector wire to the ECU for any possible short-circuit or disconnection
3	Replace the ECU and retest the system		



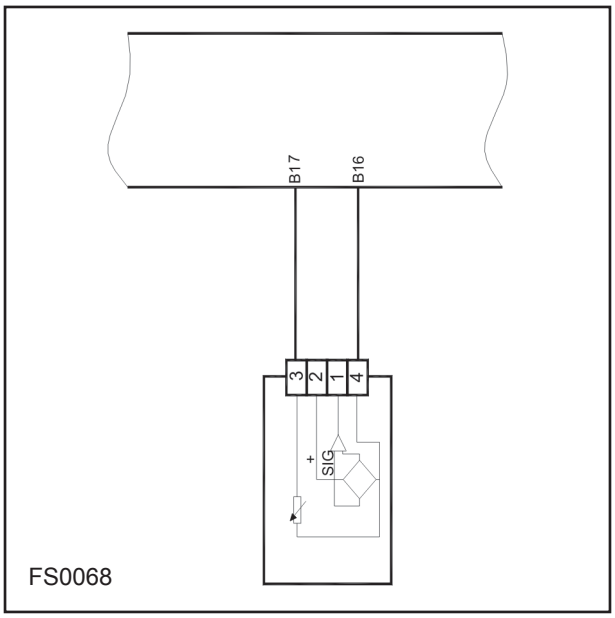
FS0067

Air temperature sensor

Step	Inspection		Action
1	First, detatch the connector from the sensor. Then measure the resistance between terminals 3 and 4 of the sensor. (Air temperature and manifold air pressure sensors come in one part installed on the intake air manifold). Is this resistance in accordance with table 2?	Yes	Go to the next step
		No	Replace the sensor and if the trouble is not removed, go to the next step
2	Set the switch in ON position and using terminals 2 and 4. Is this voltage 5 volt?	Yes	Go to the next step
		No	Check voltages of the battery, switch, and ECU power supply for setting. If the trouble is not solved, go to the next step.
3	Turn off the switch and check the ECU and sensor wires. Measure the resistance between the terminals 4 and B16 using an ohm-meter. Is this resistance less than 1Ω?	Yes	Go to the next step
		No	Check the ECU connector wire for any possible disconnection or short-circuit
4	Using an ohm-meter, measure the resistance between terminals 2 and A44. Is this resistance less than 1Ω?	Yes	Go to the next step
		No	Check the connector wire to the ECU for any possible short-circuit or disconnection or short circuit.
5	Replace the ECU and retest the system.		

Table (2)

Resistance (Ω)	Air temperature (°C)
5886	0
3791	10
2509	20
1715	30
1200	40
850	50
612	60
446	70
329	80
246	90
186	100



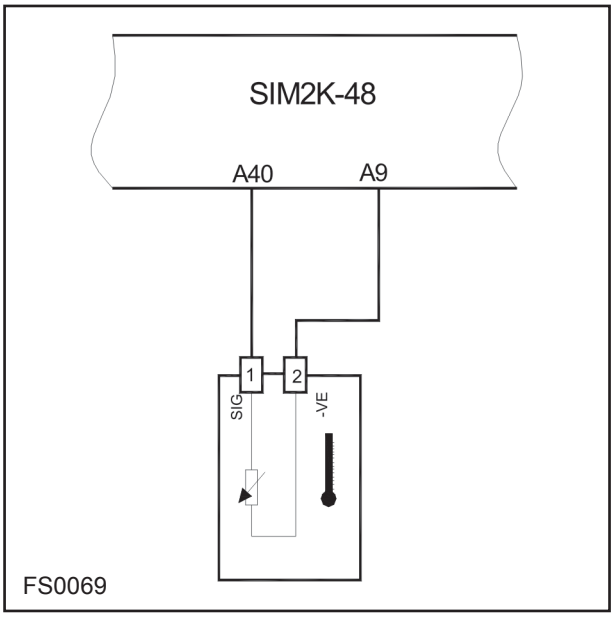
FS0068

Water temperature sensor

Step	Inspection		Action
1	First, detatch the connector from the sensor and Then measure the resistance between terminals 1 and 2 of the sensor using an ohm-meter. Is this resistance in accordance with table 3?	Yes	Go to the next step
		No	Replace the sensor. if the trouble is not removed, go to the next step
2	Set the switch in ON position. Measure the voltage between terminals 1 and 2. Is this voltage 5 volt?	Yes	Go to the next step
		No	Check voltages of the battery, switch, and ECU power supply for setting. If the trouble is not solved, go to the next step.
3	Turn off the switch and check the ECU and sensor wires by measuring the resistance between terminals 1 and A40. Is this resistance less than 1Ω?	Yes	Go to the next step
		No	Check the ECU connector wire for any possible disconnection or short-circuit
4	Using an ohm-meter, measure the resistance between terminals 2 and A9. Is this resistance less than 1Ω?	Yes	Go to the next step
		No	Check the ECU connector wire for any possible disconnection.
5	Replace the ECU and retest the system.		

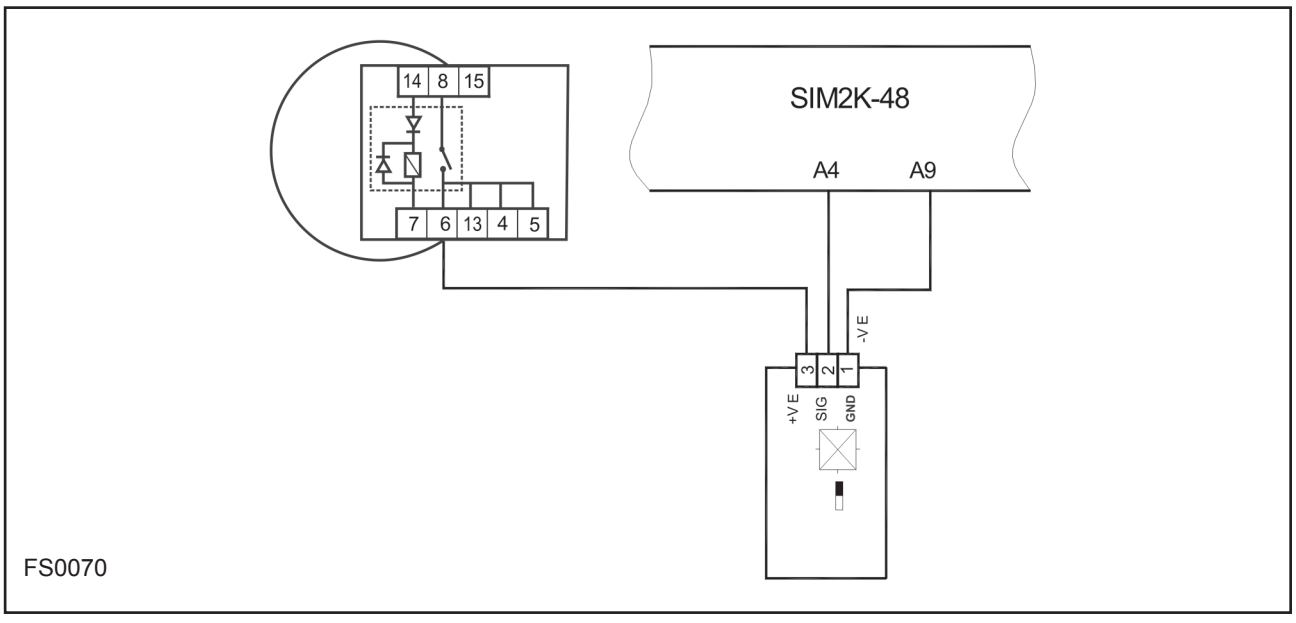
Table (3)

Resistance (Ω)	Air temperature (°C)
5958	0
3820	10
2509	20
1686	30
1157	40
810	50
577	60
419	70
309	80
231	90
175	100



Camshaft position sensor

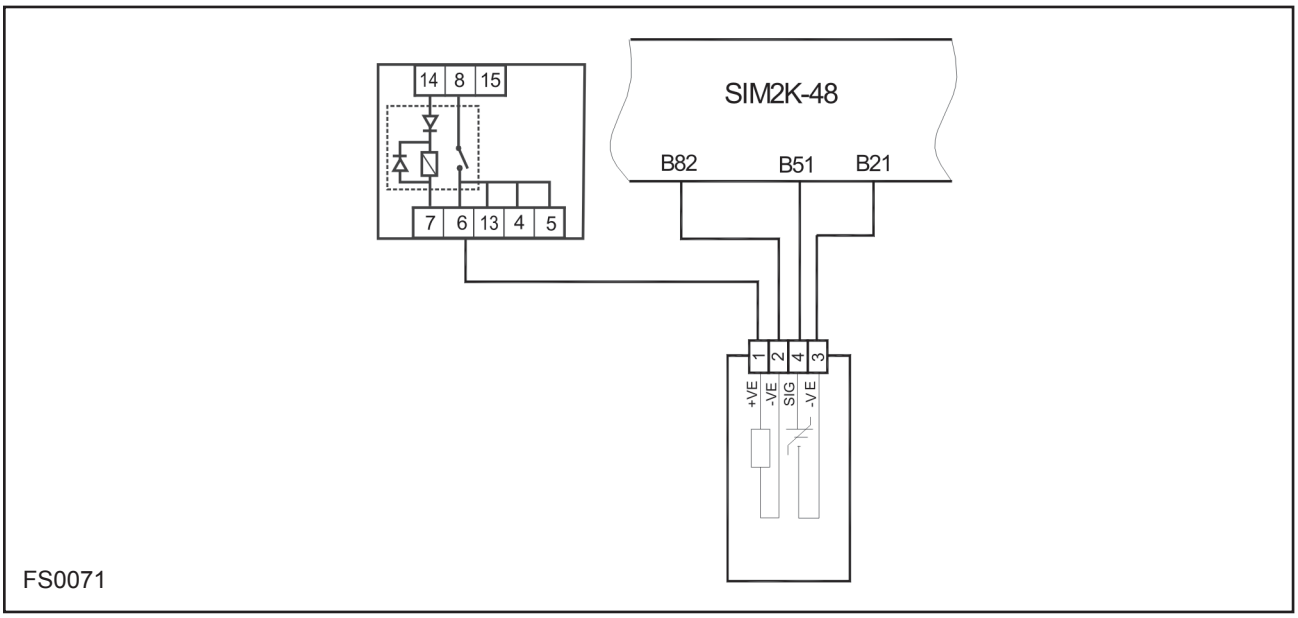
Step	Inspection		Action
1	Is the gap between the sensor and camshaft less than 2.2mm?	Yes	Go to the next step
		No	Check the installation position of the sensor for setting. If the trouble is not solved, go to the next step.
2	Detatch the connector from the sensor and turn on the switch. Measure the voltage between terminals 1 and 3. Is this voltage equal to the battery voltage?	Yes	Go to the next step
		No	Check voltages of the battery, switch, and ECU power supply for setting. If the trouble is not solved, go to the next step.
3	Turn off the switch and check the ECU and sensor wires for any possible disconnection and short-circuit. Is there any problem in the resistance between terminals 2 and A4?	Yes	Go to the next step
		No	End
4	Replace the sensor. If the trouble is not removed, go to the next step.		
5	Replace the ECU and retest the system.		



FS0070

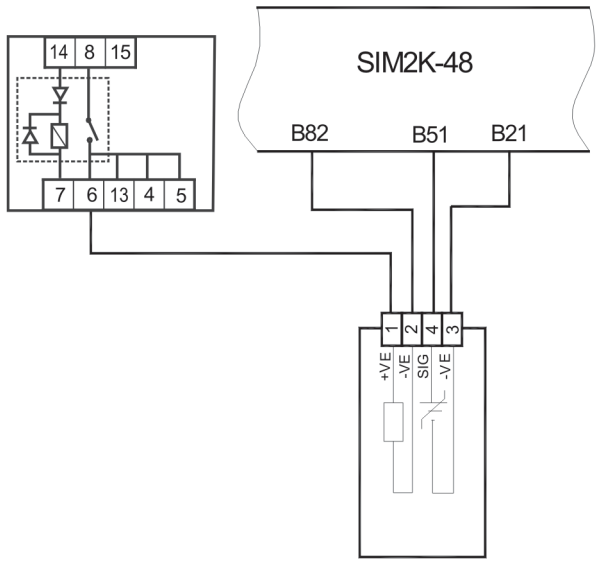
Oxygen sensor heater

Step	Inspection		Action
1	Turn off the switch and detatch the oxygen sensor connector. Measure the resistance between the sensor heater terminals 1 and 2(at 23ºC)	Yes	Go to step 3.
		No	Go to step 2.
2	Replace the sensor, delete the error memory, and retest the system. Is there still any trouble?	Yes	Go to sep 1
		No	End
3	Using an ohm meter, check the electrical connection of the ECU and oxygen sensor. This includes the connection between terminals B82 of the ECU and 2 and main relay pin to the sensor connector. Is there still any trouble?	Yes	Replace the ECU and retest the system
		No	End



Oxygen sensor

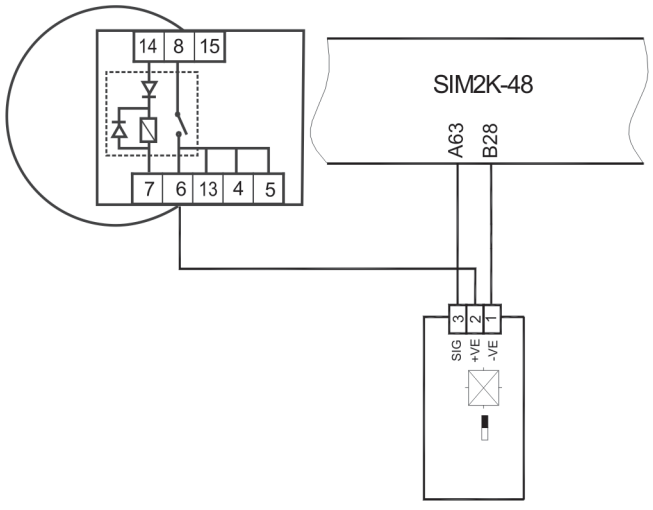
Step	Inspection		Action
1	Is the oxygen sensor installed properly in the exhaust manifold?	Yes	Go to step 3
		No	Go to step 2.
2	Reinstall the sensor and seal it properly. Delete the error memory. Is there any trouble still?	Yes	Go to sep 3
		No	End
3	Turn off the switch and disconnect the oxygen sensor.		
4	Using an ohm-meter , check the electrical connection between the ECU and oxygen sensor(terminals B21 of the ECU and 3, B51 and 4)	Yes	Go to step 5
		No	End
5	Replace the sensor and retest the system. Is there still any trouble?	Yes	Replace the ECU and retest the system
		No	End



FS0072

Vehicle speed sensor

Step	Inspection		Action
1	First, check if the speedometer functions properly.	Yes	Go to the next step
		No	Check the connection to transmission and the connector cable to the sensor
2	Detatch the connector from the sensor and set the switch in ON position. Measure the voltage between terminals 1 and 2 using a voltmeter. Is the measured voltage equal to the battery voltage?	Yes	Go to the next step
		No	Check the wires for any possible disconnection or short-circuit.
3	Turn off the switch and check the connector wire between the ECU and the sensor. Measure the resistance between terminals 3 and A63. Using an ohm-meter. Is this resistance less than 1Ω?	Yes	Go to the next step
		No	Check the wire of the connector and ECU for any possible disconnection or short circuit.
4	Using an ohm-meter, measure the resistance between terminals 2 and 3. Is this resistance between 12 and 18KΩ?	Yes	Go to the next step
		No	Replace the ECU and retest the system.
5	Replace the ECU and retest the system.		

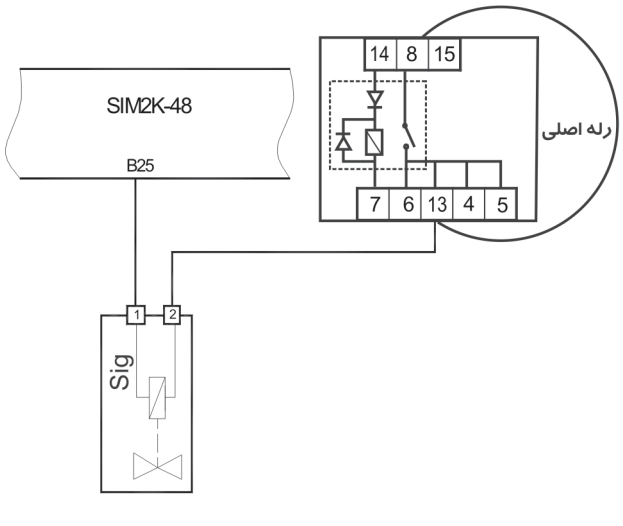


FS0073

VSS SENSOR

Canister electric valve

Step	Inspection		Action
1	Disconnect the purge valve connector and measure the resistance between the two pins (at 23ºC). Is this resistance between 23 and 29Ω?	Yes	Go to step 3
		No	Go to step 2.
2	Replace the valve and retest. Is the trouble still there?	Yes	Go to sep 1
		No	End
3	Turn the switch ON.		
4	Check the battery voltage. Is it 12 volts?	Yes	Turn off the switch and go to step 6.
		No	Go to step 5
5	Check the voltages of the ECU, switch, and power supply wires. Delete the error memory and retest the system. Is the trouble still there?	Yes	Go to step 3
		No	End
6	Using an ohm-meter, check the proper electric connection between the ECU and purge valve (from terminal 1 to B25). Is the trouble still there?	Yes	Replace the ECU and retest the system.
		No	End



FS0074

PURGE VALVE

Low speed fan

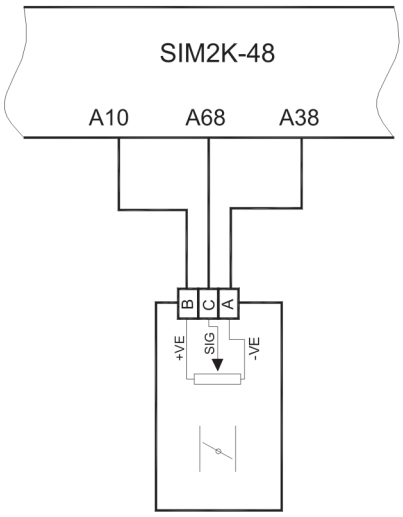
Step	Inspection		Action
1	Detatch the ECU connector and using a wire connect terminal B50 of the ECU to the body. Is the fan working at low speed?	Yes	Replace the ECU and retest.
		No	Go to step 3
2	Take two wires and connect one ends to the battery terminals and the other ends to the fan terminals. Is the fan working at high speed?	Yes	Disconnect the wires and go to step3.
		No	Replace the fan and retest.
3	Replace the low speed relay and retest step1. Is the fan working at low speed?	Yes	Turn off the switch and go to step 6.
		No	Go to step 5
4	Replace the main wiring harness and repeat the test of step1. Is there any trouble?	Yes	Replace the ECU and retest the system.
		No	End

High speed fan

Step	Inspection		Action
1	Detatch the ECU connector and connect terminal B20 of the ECU to the body using a wire. Is the fan working at low speed?	Yes	Replace the ECU and retest.
		No	Go to step 3
2	Take two wires and connect their one ends to the battery terminals and the other ends to the fan terminals. Is the fan working at high speed	Yes	Detatch the wires and go step 3
		No	Replace the fan and retest it
3	Replace the low speed relay and repeat step 1. Is the fan working at low speed?	Yes	Replace the relay and retest
		No	Go to the next step.
4	Replace the main wiring harness and repeat step 1. Is there still any trouble?	Yes	Replace the ECU and retest the system
		No	End

Gas pressure sensor

Step	Inspection		Action
1	Detatch the connector from the sensor and turn the switch off. Measure the voltage between terminal A and B terminals. Is the voltage equal to 5 volt?	Yes	Go to the next step.
		No	Check the wires of the connector for any possible disconnection or short circuit.
2	Turn off the switch and check the ECU and sensor wires for any possible disconnection and short-circuit. Is there any problem in the resistance between terminals C and A68? Is this resistance less than 1Ω	Yes	Go to the next step.
		No	Check the ECU wire for any possible disconnection
3	Measure the resistance between terminal A and A38 terminals. Is this resistance less than 1Ω	Yes	Go to the next step.
		No	Check the ECU wire for any possible disconnection
4	Measure the resistance between terminal B and A10 terminals. Is this resistance less than 1Ω	Yes	Go to the next step.
		No	Check the ECU wire for any possible disconnection
5	Replace the ECU and retest the system.		

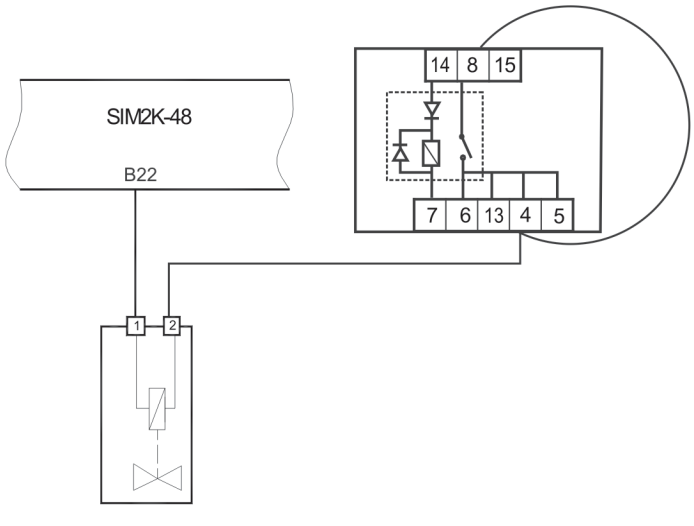


FS0075

CNG PRESSURE SEN

Shot off valve 1

Step	Inspection		Action
1	Detatch the connector from the shot off valve 1 and measure the resistance between terminals. Is the resistance less than 20Ω(at 23ºC)?	Yes	Go to the 3 step
		No	Go to the 2 step
2	Replace the shot off valve and retest the system. Is there any trouble?	Yes	Go to the 1 step
		No	End
3	Turn off the switch		
4	Check the battery voltage. Is the battery voltage 12V?	Yes	Turn off the switch and go to 6 step
		No	Go to the 5 step
5	Check the voltages of the ECU, switch, and power supply wires. Delete the error memory and retest the system. Is the trouble still there?	Yes	Go to the 3 step
		No	End
6	Using an ohm-meter, check the proper electric connection between the ECU and shot off valve1 (from terminal to B22). Is the trouble still there?	Yes	Replace the ECU and retest the system. End
		No	End

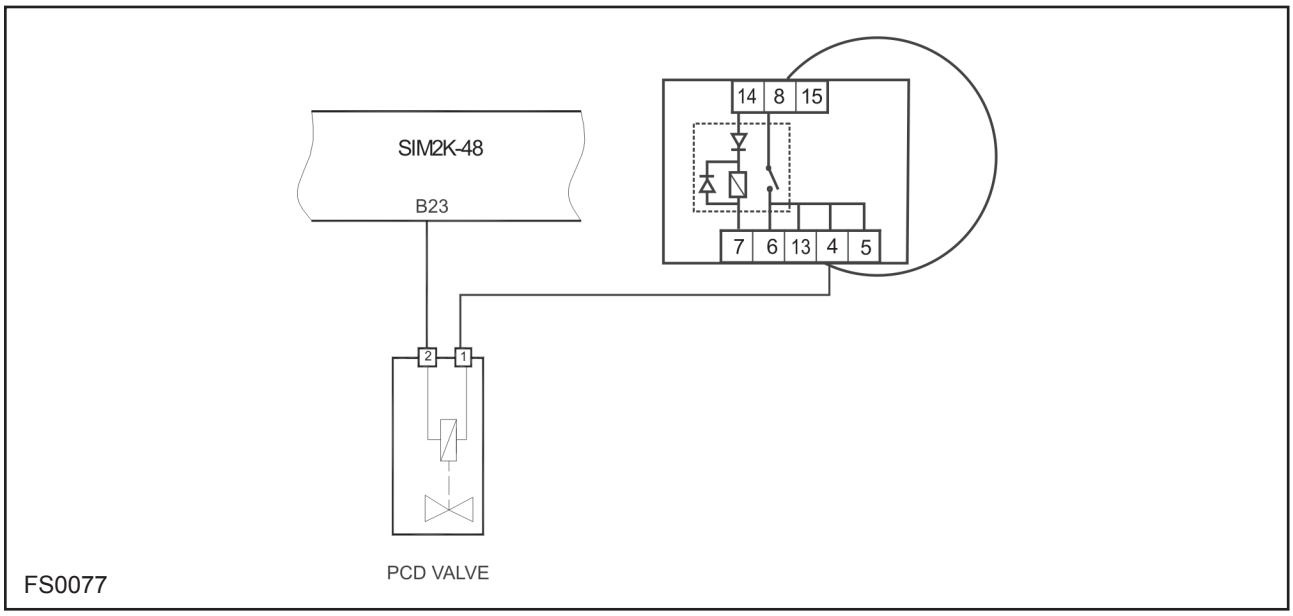


SHOT OFF VALVE 1

FS0076

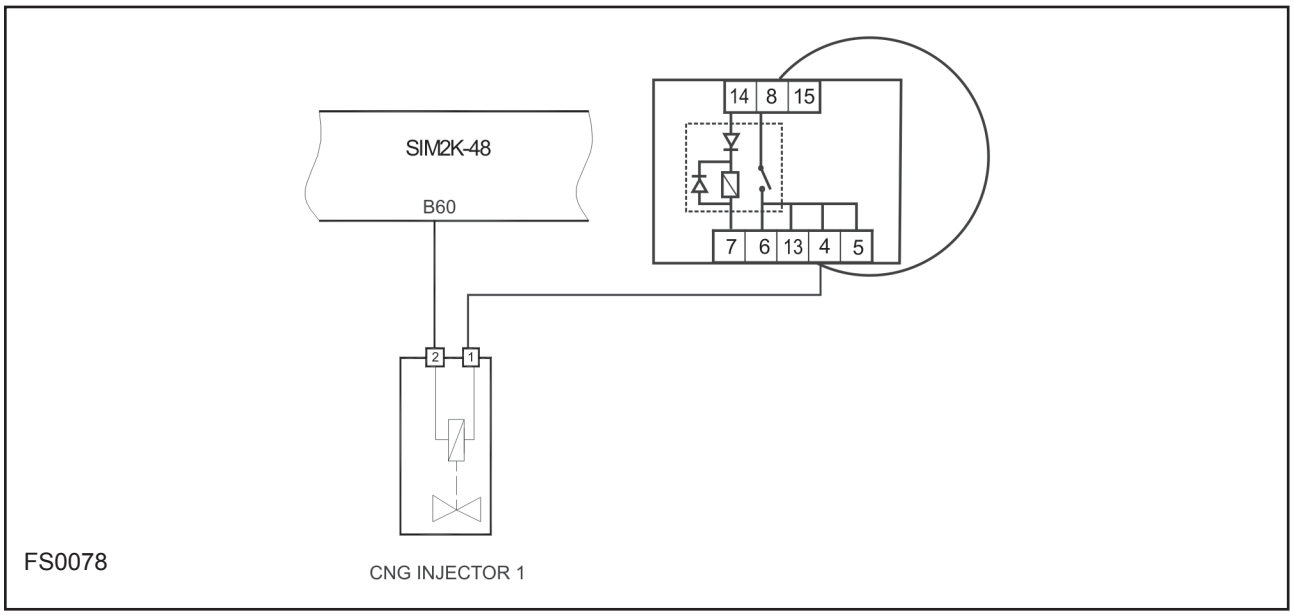
PCD valve

Step	Inspection		Action
1	Detatch the connector from the PCD valve and measure the resistance between terminals. Is the resistance less than 20Ω(at 23ºC)?	Yes	Go to the 3 step
		No	Go to the 2 step
2	Replace the PCD valve and retest the system. Is there any trouble?	Yes	Go to the 1 step
		No	End
3	Turn off the switch		
4	Check the battery voltage. Is the battery voltage 12V?	Yes	Turn off the switch and go to 6 step
		No	Go to the 5 step
5	Check the voltages of the ECU, switch, and power supply wires. Delete the error memory and retest the system. Is the trouble still there?	Yes	Go to the 3 step
		No	End
6	Using an ohm-meter, check the proper electric connection between the ECU and PCD valve (from terminal to B23). Is the trouble still there?	Yes	Replace the ECU and retest the system. End
		No	End



CNG injector 1

Step	Inspection		Action
1	- Detatch the ECU connector - Detatch the main relay from the related connector - Using a wire connects terminals 4 and 8(B ,C) of the main relay Connect BOB Using a wire connect terminals B60 and B28		
2	Does CNG injector 1 work properly?	Yes	- Detatch the main relay from the related connector
		No	- Using a wire connects terminals 4 and 8(B ,C) of the main relay
3	Connect BOB		
4	Does the resistance amount stay less than 10Ω ?	Yes	Using a wire connect terminals B60 and B28
		No	Replace the injector and repeat the above steps. If the trouble is not removed, there should be some short connection or disconnection in the wires.

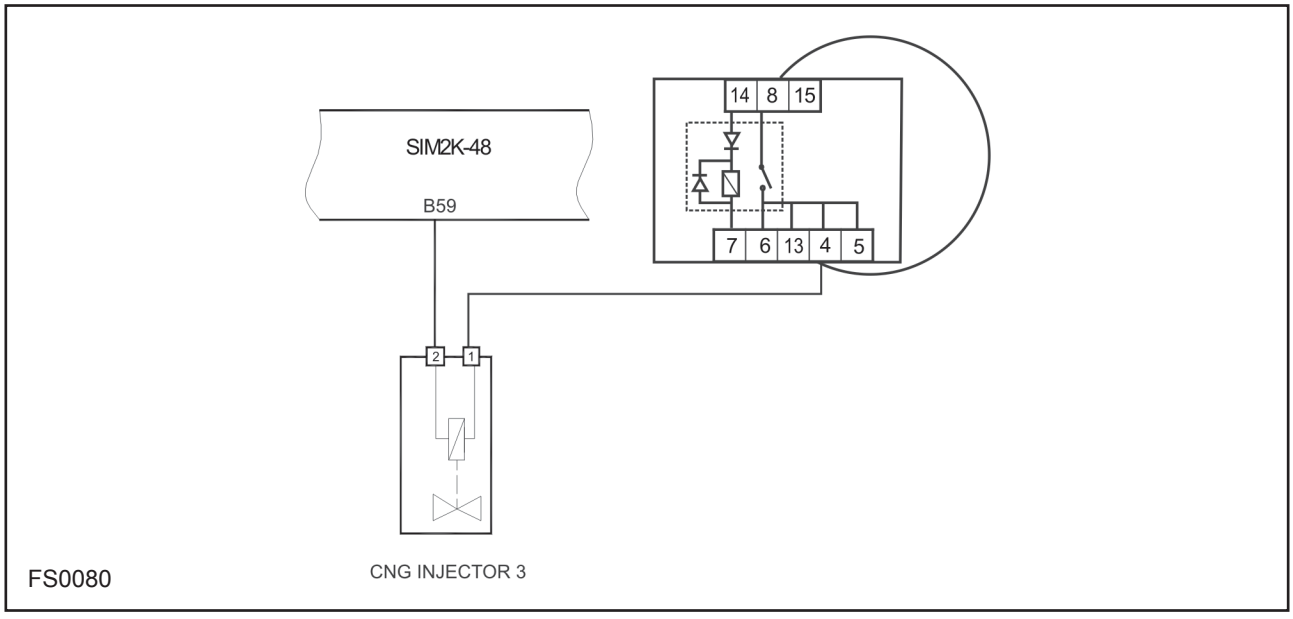


CNG injector 2

Step	Inspection		Action
1	- Detatch the ECU connector - Detatch the main relay from the related connector - Using a wire connects terminals 4 and 8(B ,C) of the main relay Connect BOB Using a wire connect terminals B89 and B28		
2	Does CNG injector 2 work properly?	Yes	Replace the ECU and repeat the test. If the trouble is not solved go to step 3.
		No	Go to step 3.
3	Detatch the related connector and measure the resistance between its terminals using an ohm-meter.		
4	Does the resistance amount stay less than 10Ω ?	Yes	Check the wire connections for any short connection or disconnection.
		No	Replace the injector and repeat the above steps. If the trouble is not removed, there should be some short connection or disconnection in the wires.

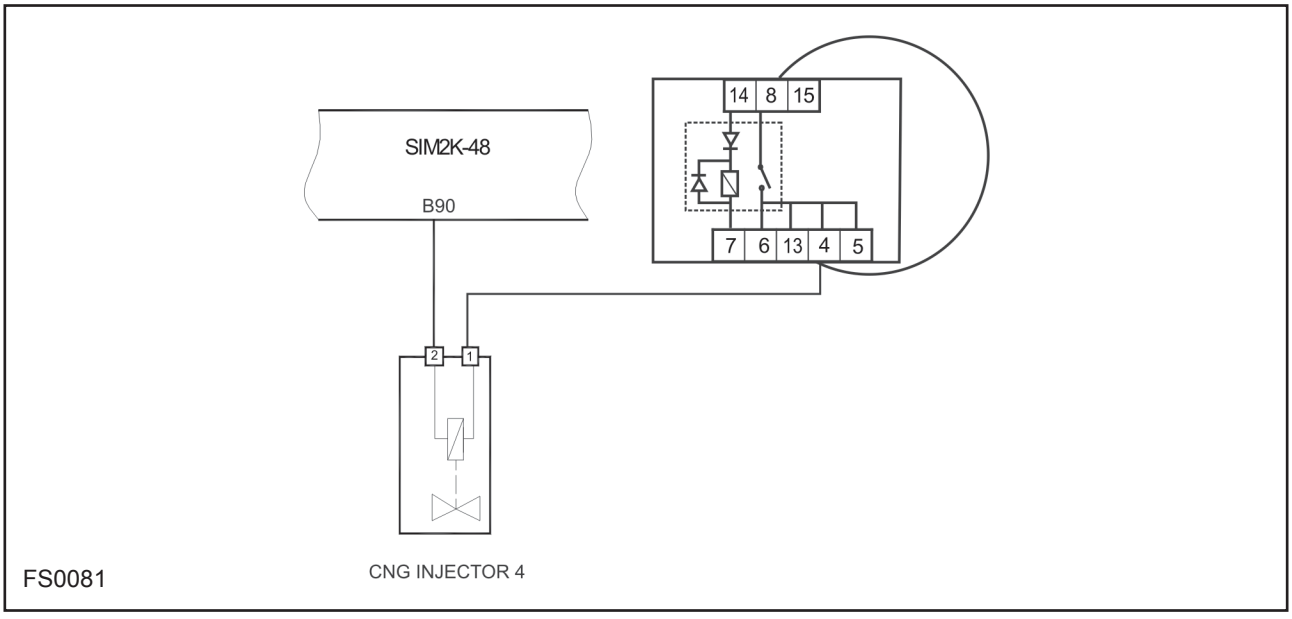
CNG injector 3

Step	Inspection		Action
1	- Detatch the ECU connector - Detatch the main relay from the related connector - Using a wire connects terminals 4 and 8(B ,C) of the main relay Connect BOB Using a wire connect terminals B59 and B28		
2	Does CNG injector 2 work properly?	Yes	Replace the ECU and repeat the test. If the trouble is not solved go to step 3.
		No	Go to step 3.
3	Detatch the related connector and measure the resistance between its terminals using an ohm-meter.		
4	Does the resistance amount stay less than 10Ω ?	Yes	Check the wire connections for any short connection or disconnection.
		No	Replace the injector and repeat the above steps. If the trouble is not removed, there should be some short connection or disconnection in the wires.



CNG injector 4

Step	Inspection		Action
1	- Detatch the ECU connector - Detatch the main relay from the related connector - Using a wire connects terminals 4 and 8(B ,C) of the main relay Connect BOB Using a wire connect terminals B59 and B28		
2	Does CNG injector 2 work properly?	Yes	Replace the ECU and repeat the test. If the trouble is not solved go to step 3.
		No	Go to step 3.
3	Detatch the related connector and measure the resistance between its terminals using an ohm-meter.		
4	Does the resistance amount stay less than 10Ω ?	Yes	Check the wire connections for any short connection or disconnection.
		No	Replace the injector and repeat the above steps. If the trouble is not removed, there should be some short connection or disconnection in the wires.

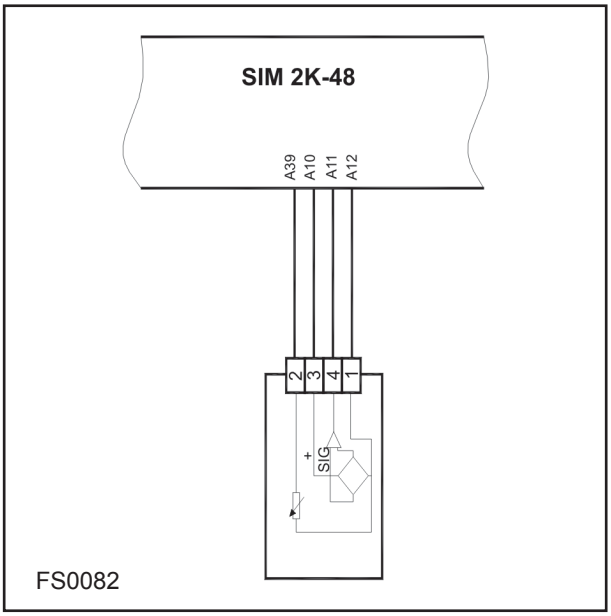


FS0081

Gas rail pressure sensor

Step	Inspection		Action
1	Check the properly of sensor installation. Next turn on measure the resistance between terminals A10 and A12. Using an ohm-meter. Is this resistance less than 5Ω?	Yes	Go to next step
		No	Check voltages of the battery, switch, and ECU power supply for setting. If the trouble is not solved, go to the next step.
2	Detatch the sensor and install a vacuum pump then measure absolute pressure and voltage between terminals A10 and A12. Are those voltages according to following table?	Yes	Go to 6 step
		No	Go to next step
3	Detatch the connector from the sensor and turn on the switch. Check connection between ECU and sensor. Measure the resistance between terminals 4 and A11 connector. Is less than 1 Ω?	Yes	Go to next step
		No	Check the ECU wire for any possible disconnection
4	Measure the resistance between terminals 3 and A10 connector. Is less than 1 Ω?	Yes	Go to next step
		No	Check the ECU wire for any possible disconnection
5	Measure the resistance between terminals 1 and A12 connector. Is less than 1 Ω?	Yes	Go to next step
		No	Check the ECU wire for any possible disconnection
6	Replace the sensor and retest system. If system does not work properly replace ECU.		

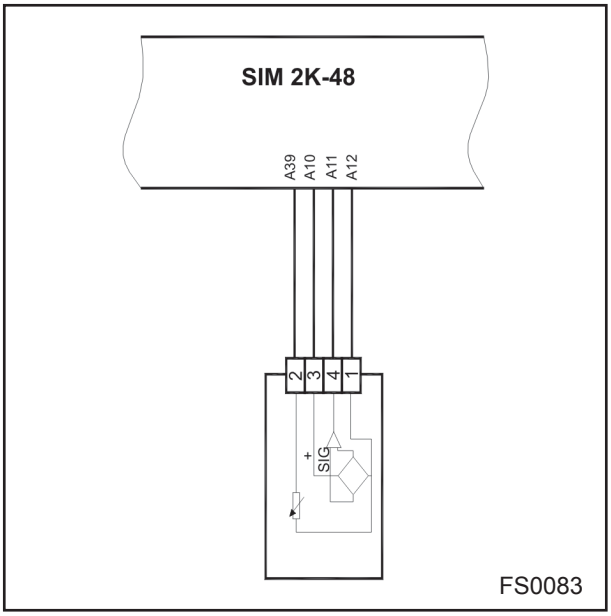
Voltage(V)	Absolute pressure(kpa)
0.568	50
1.22	100
1.88	150
2.53	200
3.189	250
3.84	300



Gas rail temperature sensor

Step	Inspection		Action
1	Detatch the connector from sensor and measure the resistance between terminals 1 and 2 connector. (Gas rail temperature sensor and Gas rail pressure sensor are attached on common base beside the injector assembly) are those resistances according to following table?	Yes	Go to next step
		No	Replace the sensor and If system does not work properly go to next step
2	Turn on the switch and measure the voltage between terminals 3 and 1? Is this voltage equal to1V?	Yes	Go to next step
		No	Check voltages of the battery, switch, and ECU power supply for setting. If the trouble is not solved, go to the next step.
3	Turn off the switch and check the ECU and sensor wires for any possible disconnection and short-circuit. Is there any problem in the resistance between terminals 2 and A39? Is this resistance less than 1Ω	Yes	Go to next step
		No	Check the ECU wire for any possible disconnection
4	Measure resistance between terminals 1 and A12? Is this resistance less than 1Ω	Yes	Go to next step
		No	Check the ECU wire for any possible disconnection
5	Replace the ECU and retest system.		

Resistance(Ω)	Air temperature(°C)
5774	0
3714	10
2448	20
1671	30
1150	40
817	50
583	60
426	70
316	80
238	90
183	100



Comments and suggestions

First & last name: Date:

Name of authorized agency: Tel No. :

Comments:

Signature:.....

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