

2.0L ENGINE CONTROLS

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ON-VEHICLE SERVICE

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ELECTRONIC ENGINE CONTROLS - 2.0L ENGINE CONTROLS

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دیجیتال خودرو

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اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



GENERAL INFORMATION

Description

The Engine Control Module (ECM) utilizes integrated circuitry and information carried on the Controller Area Network (CAN) data bus along with many hard wired inputs to monitor many sensors and switches inputs throughout the vehicle. In response to those inputs, the internal circuitry and programming of the ECM allow it to control and integrate many electronic functions and features of the vehicle through both hard wired outputs and the transmission of electronic message outputs to other electronic modules in the vehicle over the CAN data bus.

The following are the input and output components monitored by the ECM. The monitored functions include components from the engine, ignition, transaxle, air conditioning, or any other ECM supported subsystem.

ECM Inputs

- Brake Switch Sensor
- A/C Pressure Switch
- Camshaft Position (CMP) Sensor
- Crankshaft Position (CKP) Sensor
- Engine Coolant Temperature (ECT) Sensor
- Intake Air Temperature (IAT) Sensor
- Air Flow Sensor
- Throttle Position Sensor (integral with Electronic Throttle Control Actuator)
- Power Steering Switch
- Accelerator Pedal Position (APP) Sensor
- Knock Sensor
- Oxygen Sensor (Upstream & Downstream)
- Clutch Pedal Switch (manual transaxle only)

ECM Outputs

- Canister Control Valve
- Fuel Injectors
- Fuel Pump Relay
- Electronic Throttle Control Actuator
- Ignition Coil
- A/C Compressor
- Cooling Fan
- Oxygen Sensor heating coil (Upstream & Downstream)

Operation

The ECM monitors components and circuits and tests them in various ways depending on the hardware, function, and type of signal. For example, analog inputs such as throttle position or engine coolant temperature are typically checked for opens, shorts and out-of-range values. This type of monitoring is carried out continuously. Some digital inputs like vehicle speed or crankshaft position rely on rationality checks - checking to see if the input value makes sense at the current engine operating conditions. These types of tests may require monitoring several components and can only be carried out under appropriate test conditions.

The ECM is a pre-programmed, microprocessor-based digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, certain transmission features, speed control, air conditioning compressor clutch engagement and idle speed. The ECM can adapt its programming to meet changing operating conditions.

GENERAL INFORMATION

Electronic Engine Control Input & Output Device Failure Modes

NUMBER	ITEM	FAILURE MODE	CORRECTION
1	CKP	- Engine is hard to start. - The engine RPM will be limited after the engine starts. - The highest RPM is less than 3800. - Excessive exhaust emissions. - No ignition signal to the ECM. - The tachometer does not work. - Rough engine operation.	Replace
2	CMP	- The fuel injector ON time may vary from 720 degrees to 360 degrees. - The sensor output is not correct, the MIL light will turn on when with the second revolution after the engine starts. - Engine is hard to start. - The highest RPM is less than 4000.	Replace
3	APPS	- The MIL light will turn on. - Poor acceleration. - The engine RPM will be limited after the engine starts.	Replace
4	ECT	- Engine hard to start when cold. - Engine hard to start when hot. - Poor driving capability. - If the sensor circuit is shorted to power, the engine will run under the default values. - The temperature gauge indicates too high. - The temperature gauge indicates too low. - The cooling fan operates continuously on high speed. - The high temperature warning lamp will flash when the IP indicates low temperature.	Replace
5	MAF	- The cooling fan will operate for approximately 60 seconds on high speed after the ignition switch is turned off. - Poor acceleration. - Poor driving capability.	Replace
6	O ₂ Sensor	- Poor fuel economy. - Excessive exhaust emissions. - Sluggish acceleration. - Poor driving capability.	Replace
7	Knock Sensor	- The engine produces an engine knock. - Overheated engine. - Excessive exhaust emissions. - Poor fuel economy. - Lack of engine power. - Internal engine damage.	Replace
8	ECM	- Unstable engine idle. - Poor acceleration. - Unable to start. - High engine idle. - The engine exhaust exceeds emission standards. - Engine is hard to start. - Air conditioner does not operate. - Fuel injector control failure. - Engine stalls out.	Replace
9	Ignition Coil	- Unstable idle. - Lack of engine power. - Poor fuel economy. - Excessive exhaust emissions. - Weak spark.	Replace

GENERAL INFORMATION

NUMBER	ITEM	FAILURE MODE	CORRECTION
10	Fuel Injector	• Unstable idle. • Lack of engine power. • Poor acceleration. • Engine will not start. • Plugged injector.	Replace
11	TPS	• Poor acceleration. • The MIL light will turn on.	Replace
12	EVAP	• The engine base fuel closed-loop control self-learning will be shut off. • The engine idle air control self-learning will be shut off. • Unstable idle or high idle.	Replace
13	Fuel Pump	• Noisy fuel pump operation. • Poor acceleration. • Engine will not start.	Replace
14	MAP	• Poor acceleration. • Unstable idle. • Rough engine operation.	Replace
15	IAT	• Intake air temperature will be equal to the coolant temperature.	Replace
16	Cooling Fan	• High engine temperature. • Poor air conditioner performance.	Replace
17	Accelerator Sensor	• Misfire • Poor driving capability. • Rough engine operation.	Replace

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Specifications

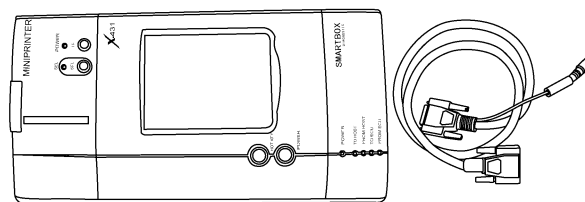
Torque Specifications

DESCRIPTION	TORQUE (N·m)
Engine Coolant Temperature Sensor	20
Knock Sensor	20
Oxygen Sensors	45
Crankshaft Position Sensor	10
Camshaft Position Sensor	7
Air Flow Sensor	5
Engine Control Module	10
Accelerator Pedal Position Sensor	11
Electronic Throttle Control Actuator	10
Vehicle Speed Sensor	10

GENERAL INFORMATION

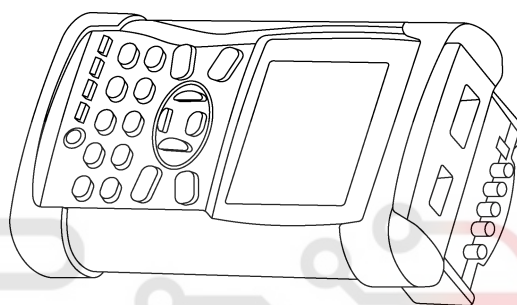
Special Tools

Diagnostic Scan Tool
X-431



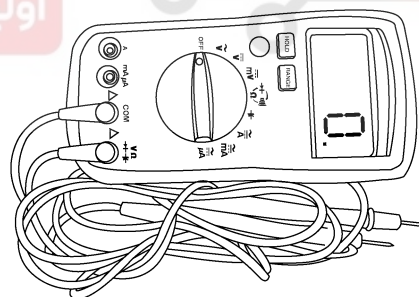
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Engine Analyzer
KES-200



ltsmd030069

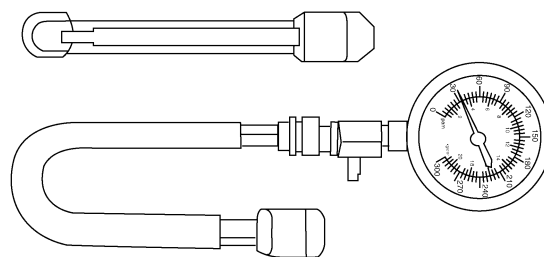
Digital Multimeter
Fluke 15B & 17B



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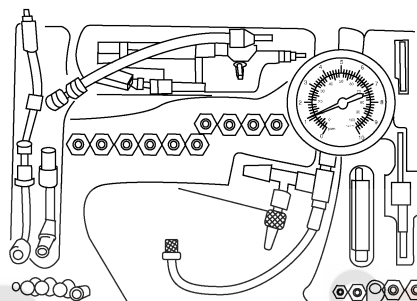
GENERAL INFORMATION

Compression Gauge



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Fuel Pressure Gauge



besm030008

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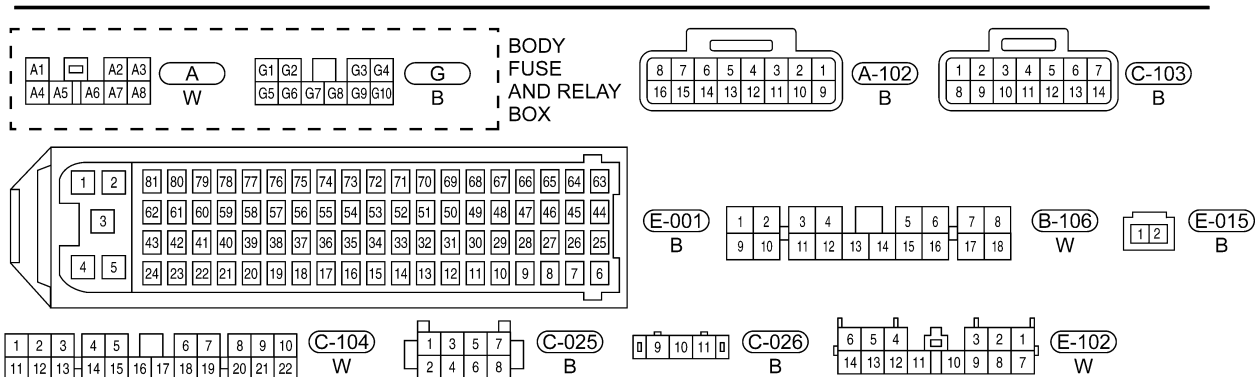
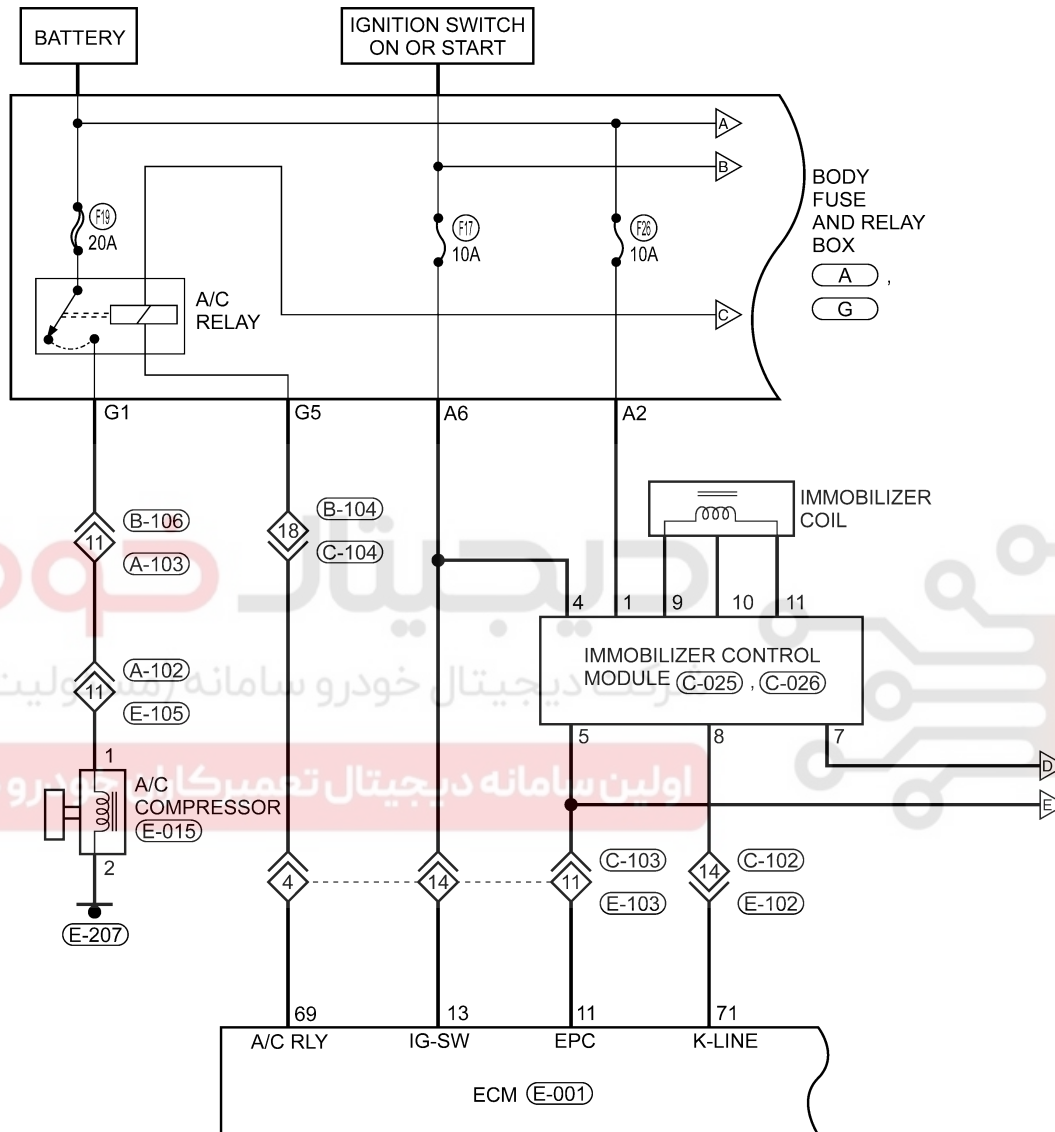
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GENERAL INFORMATION

Electrical Schematics

Electronic Engine Controls (Page 1 of 11)

ENGINE CONTROL SYSTEM - WITH ACTECO 2.0L WITH DP0 SYSTEM

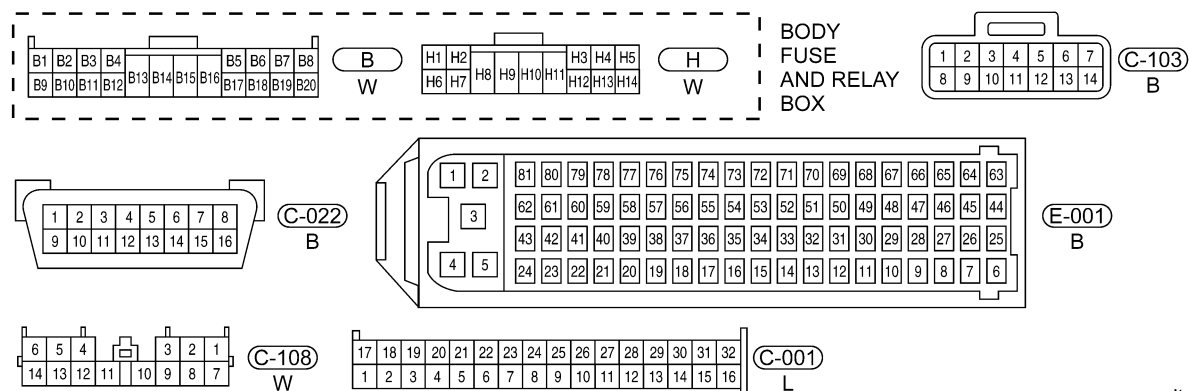
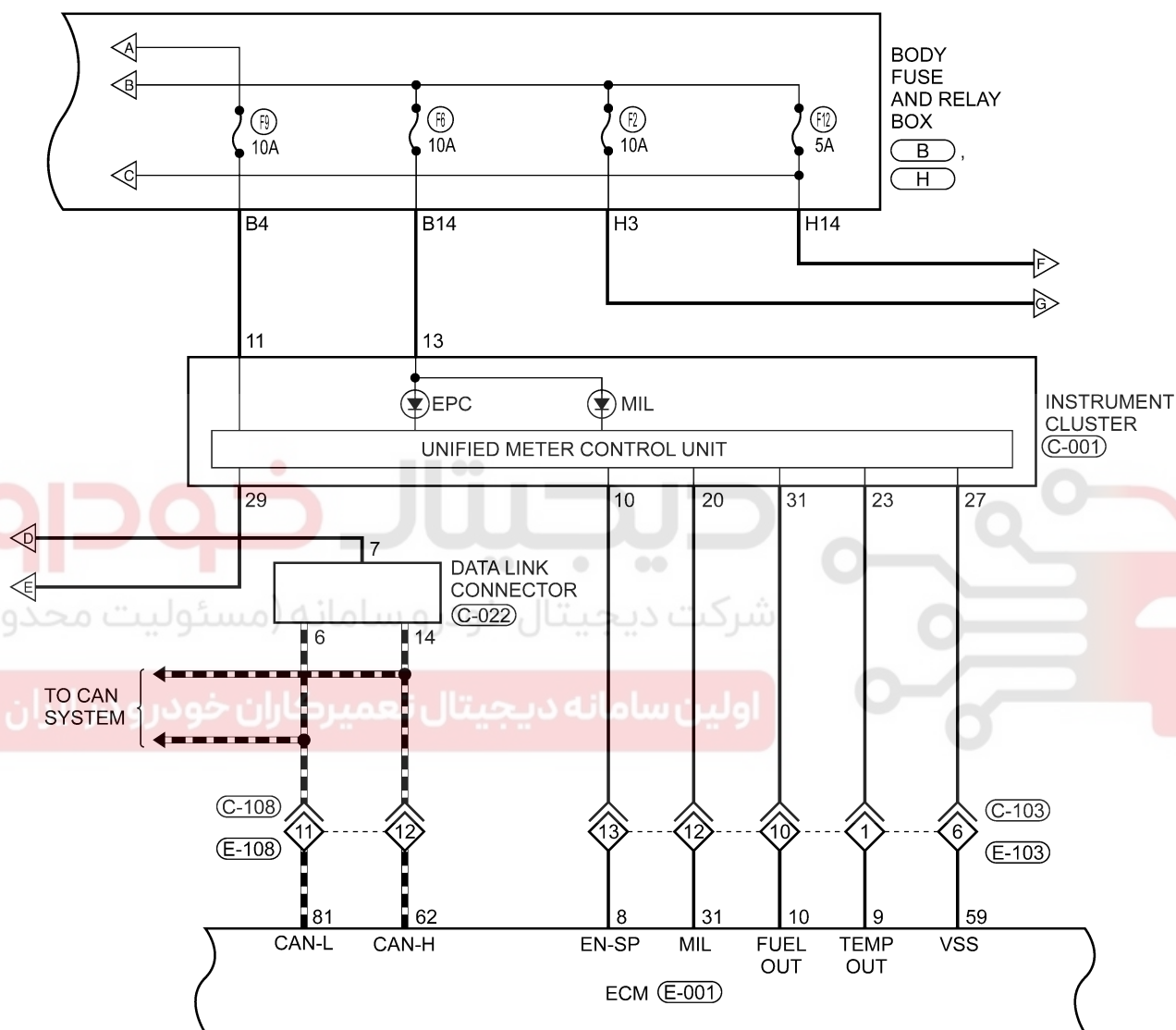


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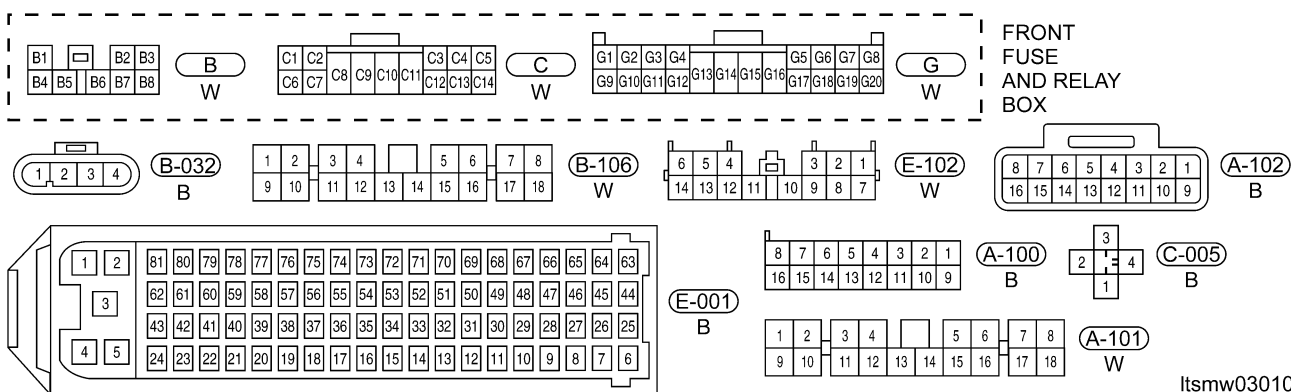
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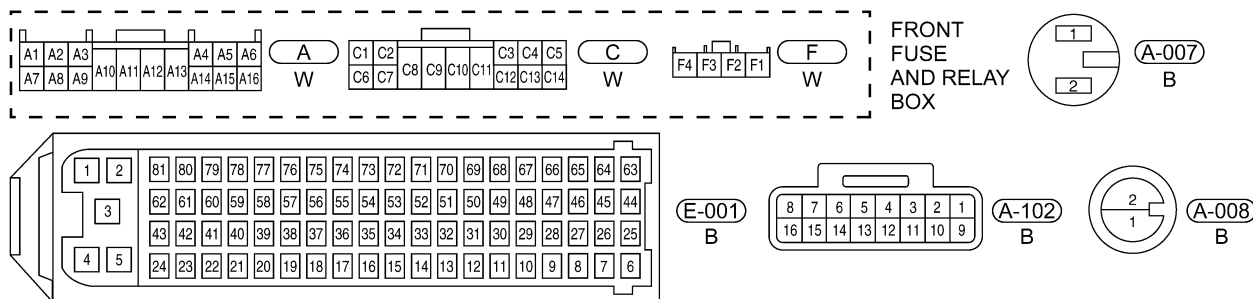
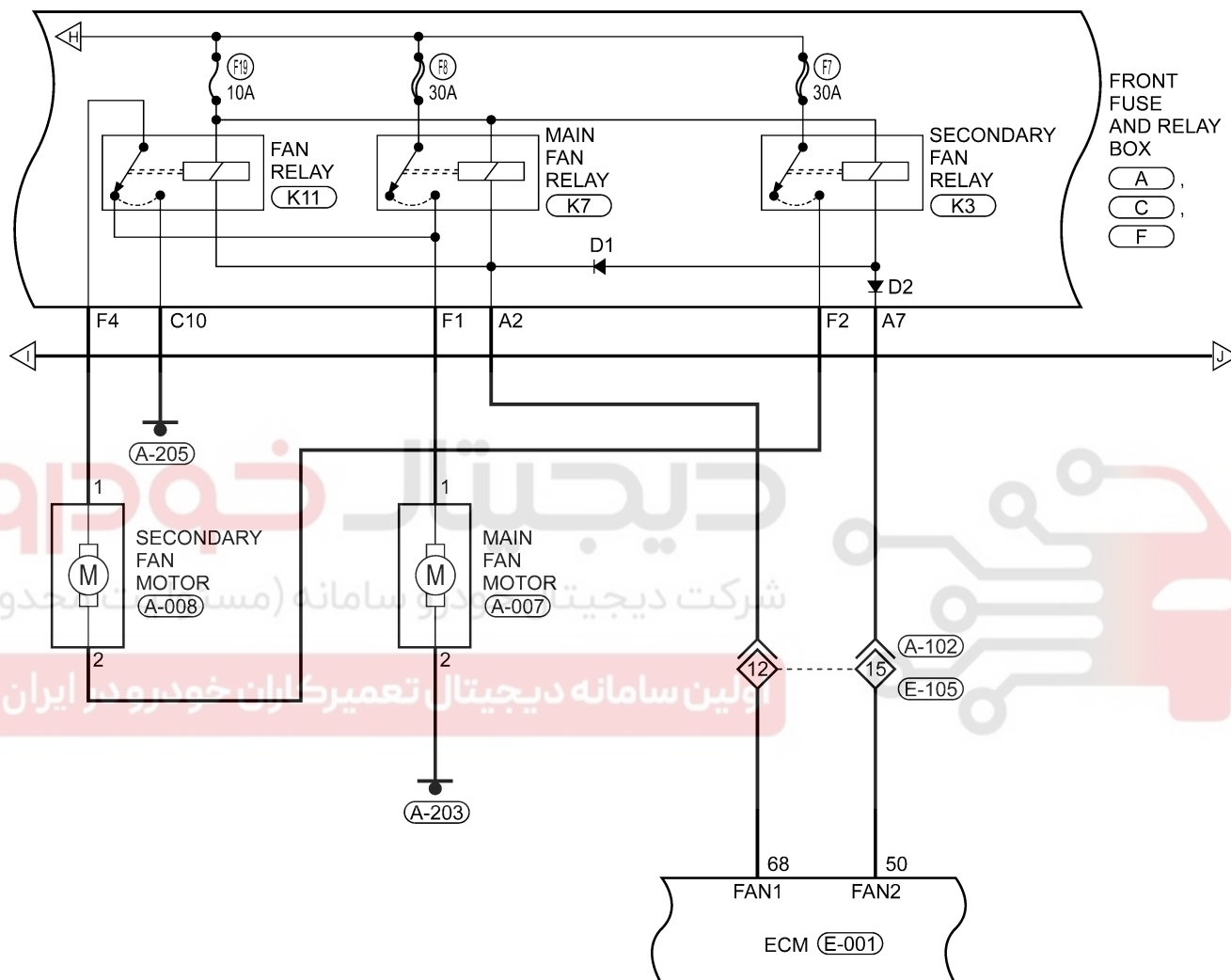


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GENERAL INFORMATION

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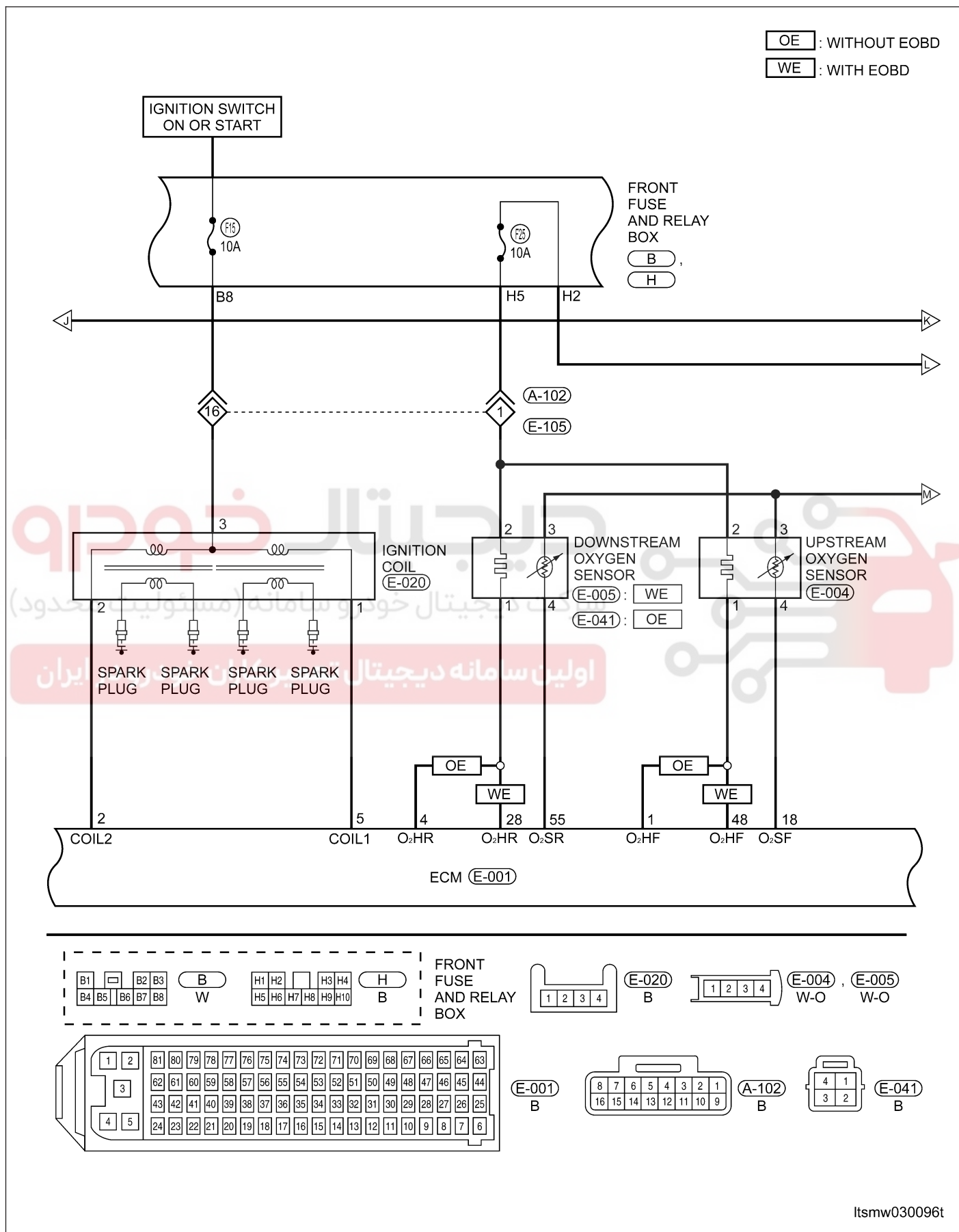
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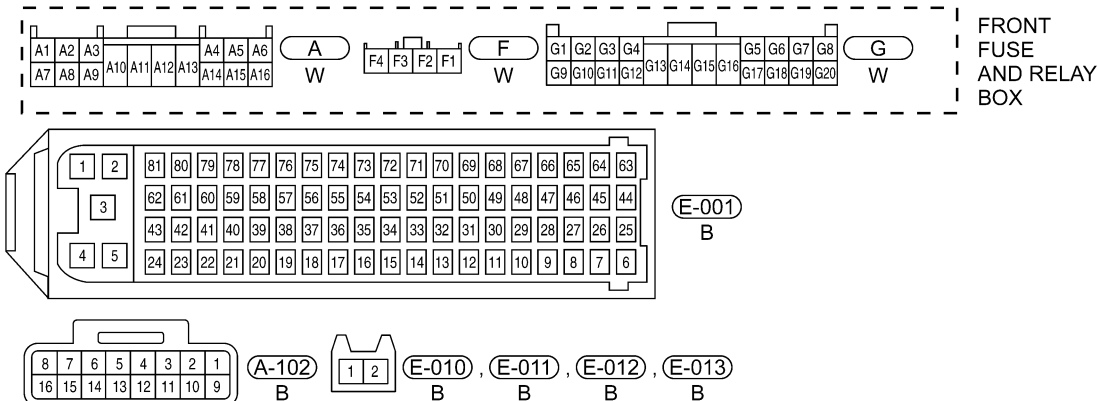
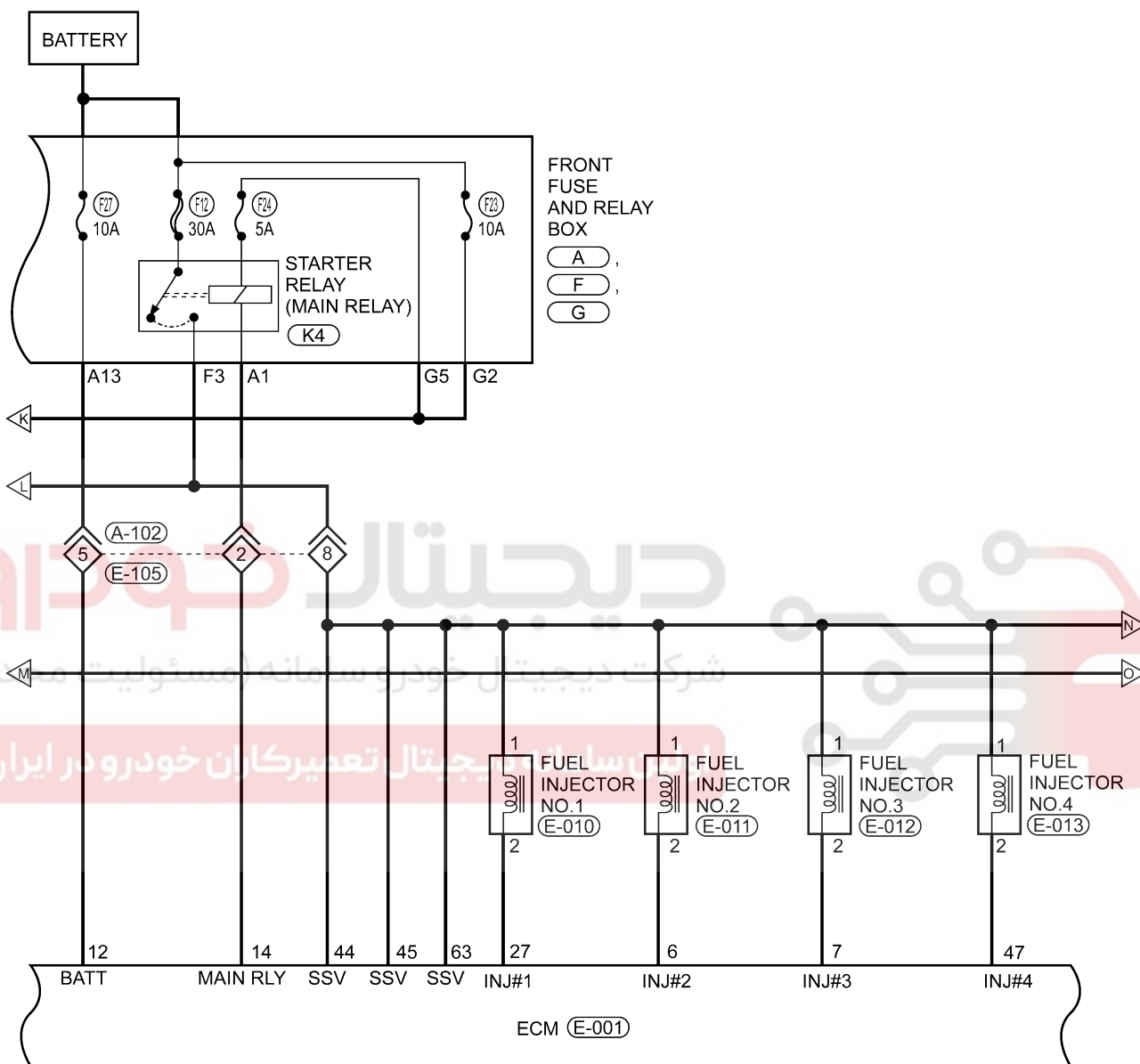


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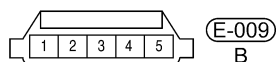
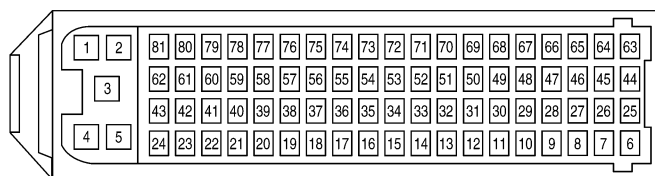
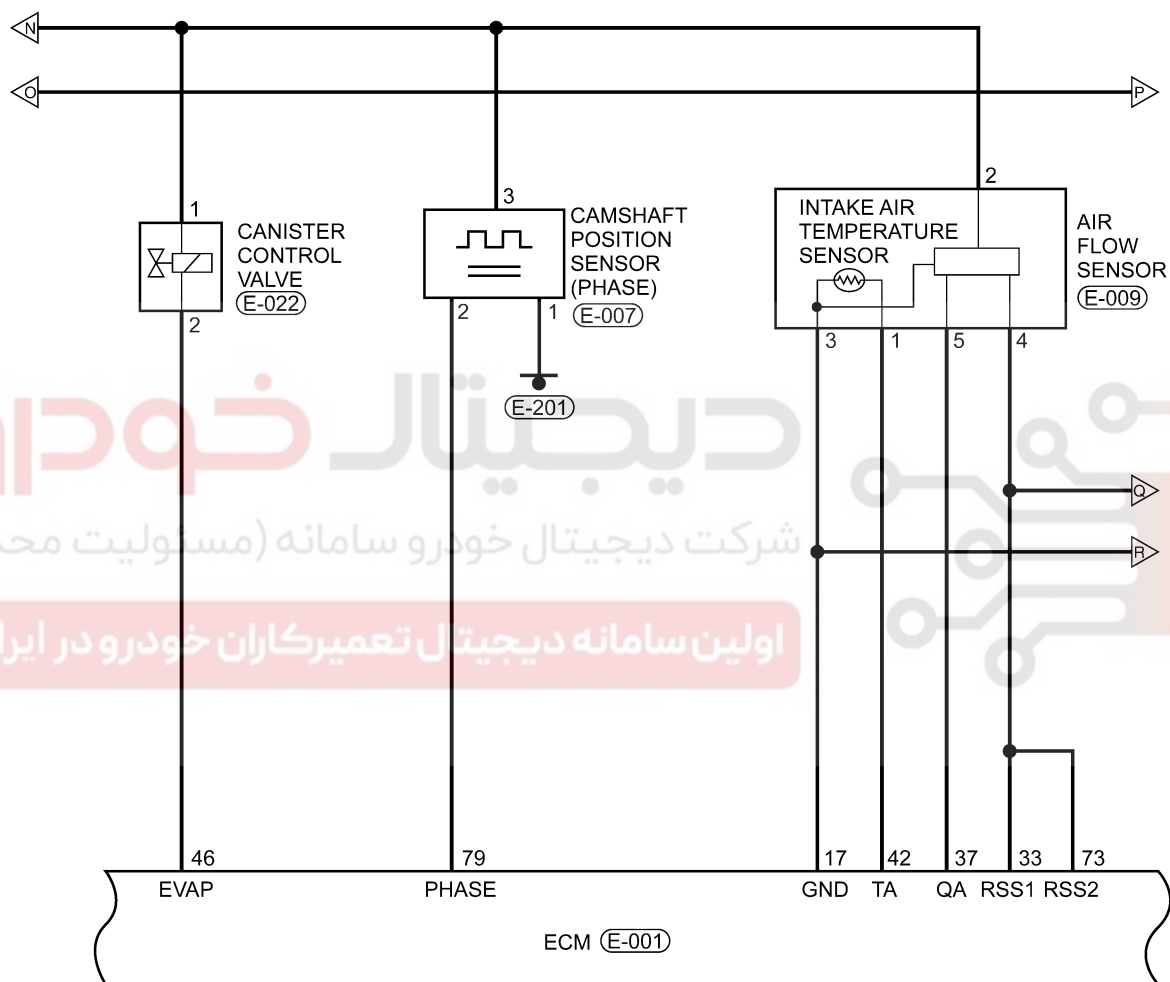
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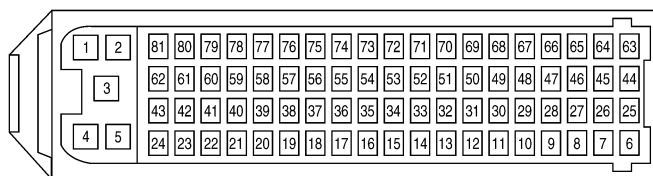
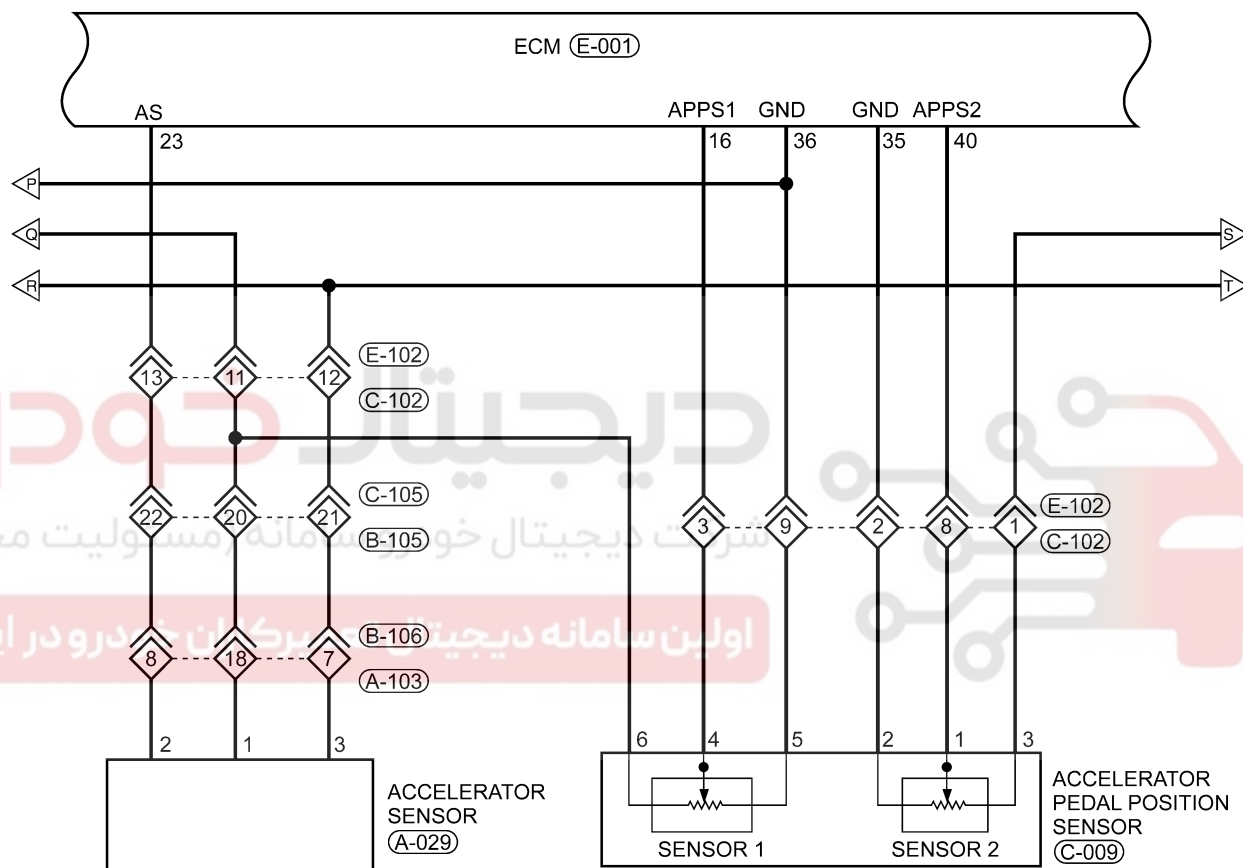
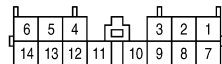
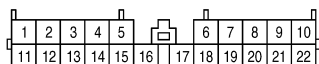
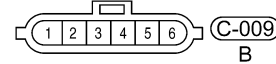
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BE-022
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GENERAL INFORMATION

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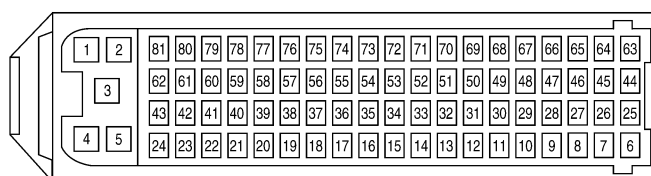
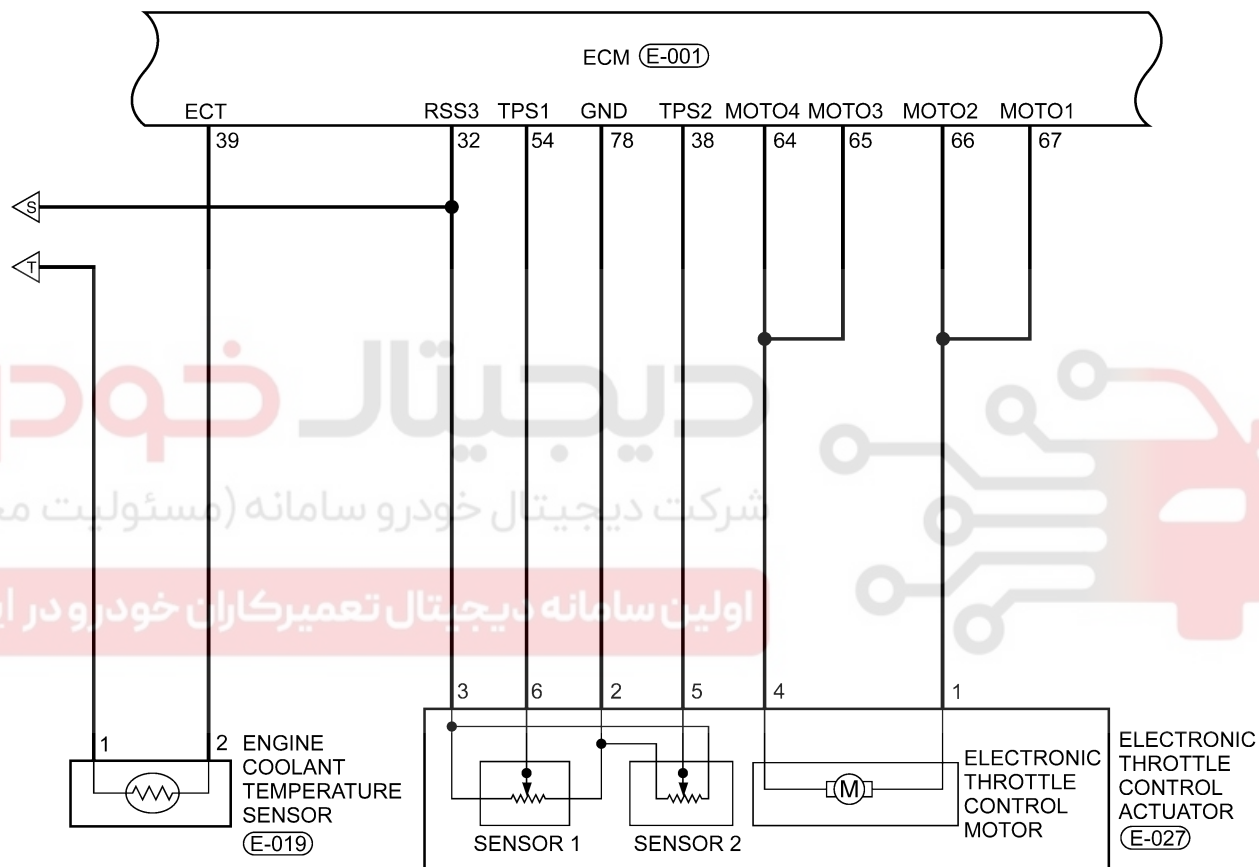
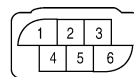
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WC-105
WB-106
WA-029
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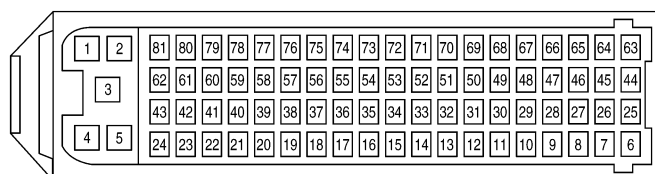
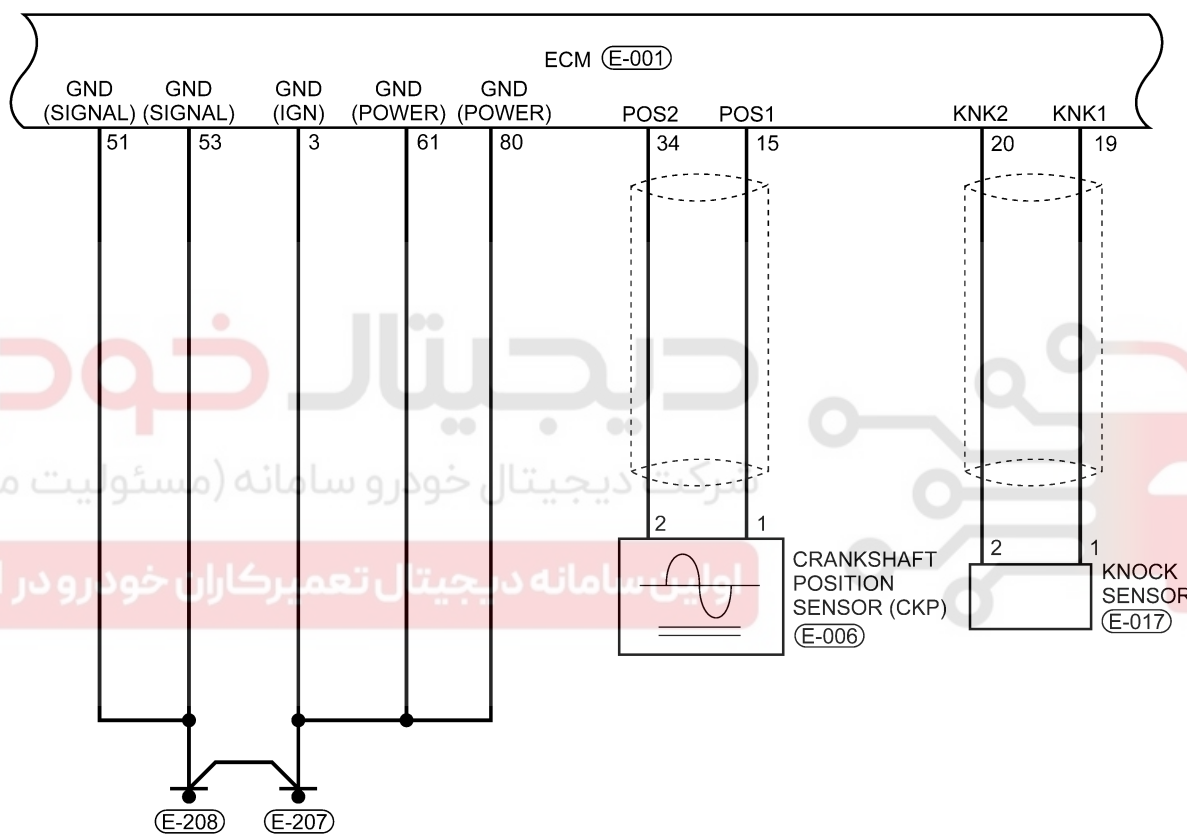
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GENERAL INFORMATION

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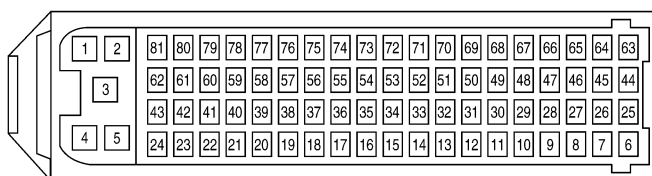
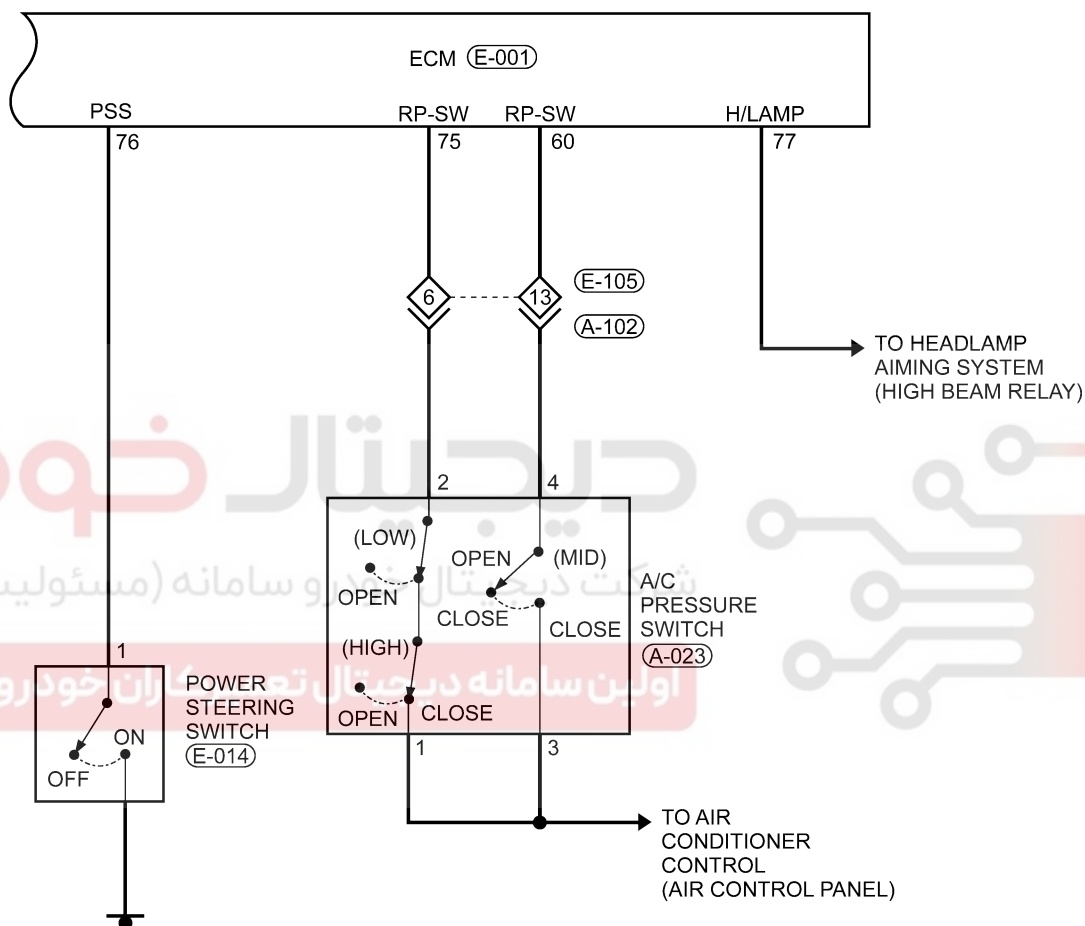
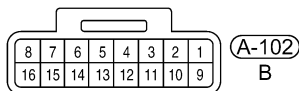
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GENERAL INFORMATION

Electronic Engine Controls (Page 11 of 11)

E-001
B① E-014
WA-023
BA-102
B

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GENERAL INFORMATION

ECM Connector Pin-Out Table

ECM PIN-OUT TABLE

PIN	CIRCUIT IDENTIFICATION	PIN	CIRCUIT IDENTIFICATION
1	(With EOBD)	42	Intake Air Temperature Sensor
	Upstream Oxygen Sensor Heater (Without EOBD)		
2	Ignition Coil 2	43	-
3	GND (Ignition)	44	Switched Supply Voltage
4	(With EOBD)	45	Switched Supply Voltage
	Downstream Oxygen Sensor Heater (Without EOBD)		
5	Ignition Coil 1	46	Canister Control Valve
6	Injector 2	47	Injector 4
7	Injector 3	48	Upstream Oxygen Sensor Heater (With EOBD)
			(Without EOBD)
8	Engine Speed Output	49	-
9	Coolant Temperature Output	50	Fan Relay Control
10	Fuel Consumption Output	51	GND (Signal)
11	EPC Lamp	52	-
12	Continuous Supply Voltage	53	GND (Signal)
13	Ignition Switch	54	Electronic Throttle Control Actuator
14	EMS Relay (Main Relay)	55	Downstream Oxygen Sensor
15	Crankshaft Position Sensor	56	-
16	Accelerator Position Sensor	57	-
17	Sensor (GND)	58	Brake Switch
18	Upstream Oxygen Sensor	59	-
19	Knock Sensor 1	60	A/C Middle Pressure Switch
20	Knock Sensor 2	61	GND (Power)
21	Brake Switch	62	CAN-H
22	-	63	Switched Supply Voltage
23	Accelerator Sensor	64	Electronic Throttle Control Actuator
24	-	65	Electronic Throttle Control Actuator
25	-	66	Electronic Throttle Control Actuator
26	-	67	Electronic Throttle Control Actuator
27	Injector 1	68	Fan Relay Control 2
28	Downstream Oxygen Sensor Heater (With EOBD)	69	Air Compressor Relay
	(Without EOBD)		
29	-	70	Fuel Pump Relay
30	-	71	Diagnostic Link K
31	MIL Lamp	72	-
32	Regulated Sensor Supply 3	73	Regulated Sensor Supply 2
33	Regulated Sensor Supply 1	74	-
34	Crankshaft Position Sensor	75	A/C Stand By

GENERAL INFORMATION

PIN	CIRCUIT IDENTIFICATION	PIN	CIRCUIT IDENTIFICATION
35	Sensor (GND)	76	Power Steering Switch
36	Sensor (GND)	77	Headlamp Switch
37	Air Flow Sensor	78	Sensor (GND)
38	Electronic Throttle Control Actuator (Position Sensor)	79	Camshaft Position Sensor
39	Engine Coolant Temperature Sensor	80	GND (Power)
40	Accelerator Pedal Position Sensor	81	CAN-L
41	-		

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DIAGNOSIS & TESTING

Diagnostic Help

1. Confirm that the malfunction is current and carry-out the diagnostic tests and repair procedures.
2. If the Diagnostic Trouble Code (DTC) cannot be deleted, it is a current fault.
3. Use a digital multimeter to perform voltage readings on the Electronic Fuel Injection (EFI) system.
4. Program the vehicle Immobilizer control module whenever the Engine Control Module (ECM) is replaced.
5. The scan tool connects to the Data Link Connector (DLC) and communicates with the ECM.
6. If the failure is intermittent perform the following:
 - Check for loose connectors.
 - Look for any chafed, pierced, pinched, or partially broken wires.
 - Monitor the scan tool data relative to this circuit and wiggle test the wiring and connectors.
 - Look for the data to change or for the DTC to reset during the wiggle test.
 - Look for broken, bent, pushed out or corroded terminals.
 - Inspect the sensor and mounting area for any condition that would result in an incorrect signal, such as damage or foreign material.
7. Remove the ECM from the troubled vehicle and install in a new vehicle and test. If the DTC can not be deleted, the ECM is malfunctioning. If the DTC can be deleted, return the ECM to the original vehicle.

03

Ground Inspection

Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This added resistance can alter the way a circuit works.

Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can effect the circuit. Perform the following when inspecting a ground connection:

1. Remove the ground bolt or screw.
2. Inspect all mating surface for tarnish, dirt, rust, etc.
3. Clean as required to assure good contact.
4. Reinstall bolt or screw securely.
5. Inspect for "add-on" accessories which may be interfering with the ground circuit.
6. If several wires are crimped into one ground eyelet terminal, check for proper crimps. Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are crimped to one eyelet, make sure no excess wire insulation has been crimped creating a bad ground.

Electronic Throttle Control Actuator Self-Learning Operation Introduction

EPC Lamp Control Strategy

The EPC lamp will be on for a few seconds and turn off after the ignition switch is turned on and the engine is not running. After the engine started, the EPC lamp will go off if the DTC is not existent in ECM. If the internal self-check failed, the EPC lamp will continue to light.

Electronic Throttle Control Actuator Self-Learning Condition

- Engine stopped and the ignition switch is on.
- Vehicle speed is 0 km/h.
- The Engine Coolant Temperature (ECT) is between 5.25°C and 100.5°C.
- The intake air temperature is more than 5.25°C.
- The accelerator pedal fully released.
- Battery voltage is more than 12 V.

Electronic Throttle Control Actuator Self-Learning Operating Procedure

Turn the ignition switch on for 10 seconds, then turn the ignition switch off. During the procedure, do not operate any other components.

DIAGNOSIS & TESTING

Self-Learning Components

Perform the self-learning process when the following repairs have been made:

- Replaced the ECM
- ECM which was disconnected and reconnected
- Replaced the Accelerator Pedal
- Replaced the Electronic Throttle Control Actuator

Self-Learning Operating Procedure

Turn the ignition switch on for 10 seconds, then turn the ignition switch off. During the procedure, do not operate any other components.

Self-Learning Condition

The self-learning condition as the "Electronic Throttle Control Actuator Self-Learning Condition".

CAUTION:

Make sure that the Electronic Throttle Control Actuator self-learning process lasts for at least 10 seconds according to the Electronic Throttle Control Actuator self-learning condition. If the self-learning process fails, the engine can't be started or the EPC lamp will be on. If this condition occurs, perform the Self-Learning operating again after the DTCs be erased in ECM.

Diagnostic Tools

- Scan Tool X-431
- Engine Analyzer KES-200
- Digital Multimeter
- Jumper Wire

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شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

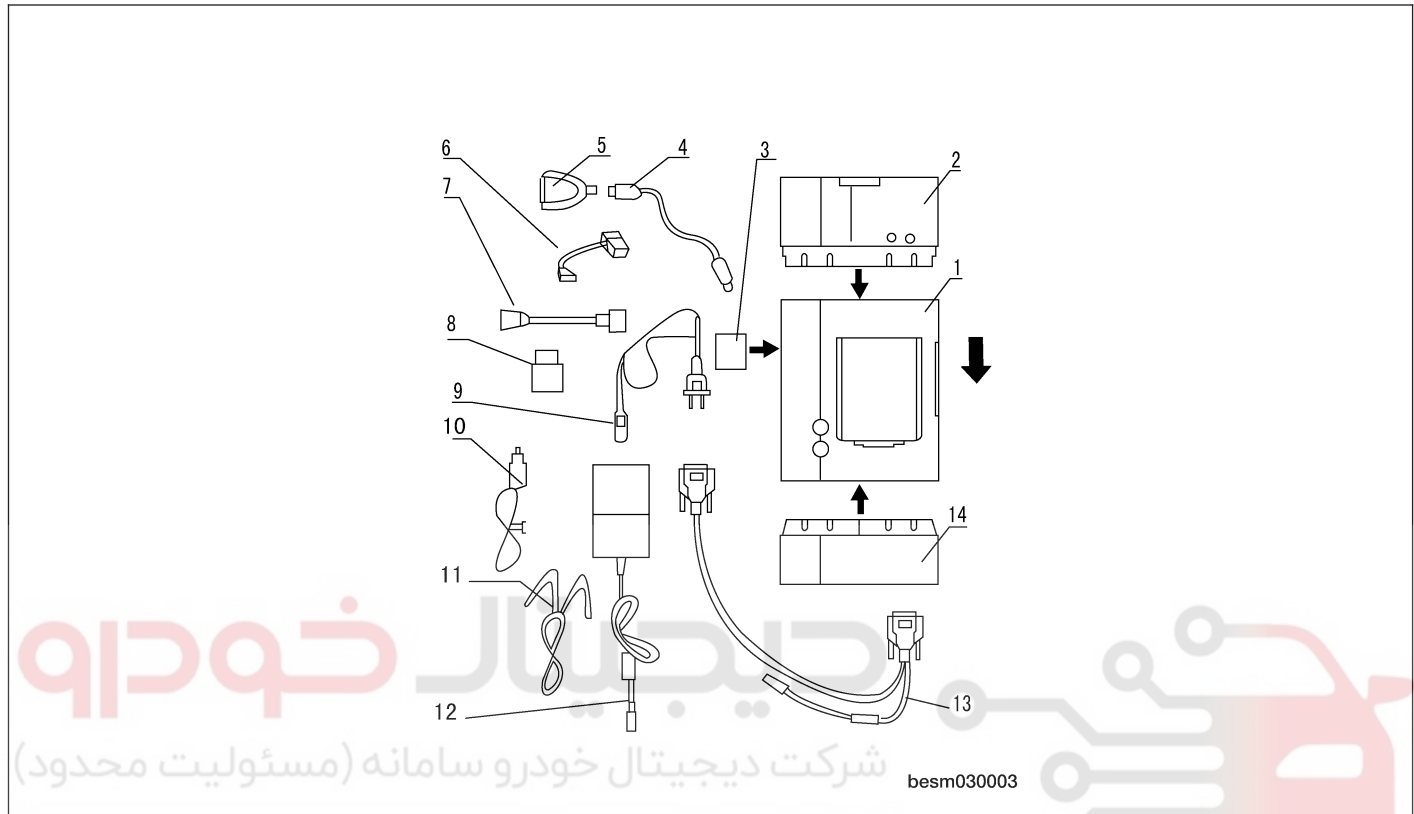


DIAGNOSIS & TESTING

Hardware Requirements

The hardware configuration of X-431 is as follows:

Diagnostic Scan Tool Configuration



03

ITEM	NAME	DESCRIPTION
1	X-431 Main Unit	To Display Operational Buttons, Test Results, Help Information, etc.
2	Mini-Printer	To Print Test Results. (Optional)
3	CF Card	To Store Diagnostic Software and Data
4	USB Cable	To Connect CF Card Reader/Writer and Computer
5	CF Card Reader/Writer	To Read or Write Data On The CF Card
6	Mitsubishi-12+16 Pin Connector	To Diagnose Mitsubishi Electronic Control Systems On Chery B11 Series
7	Fiat-3 Pin Connector	To Diagnose Vehicles With Fiat-3 Pin Diagnostic Connector

ITEM	NAME	DESCRIPTION
8	Smart OBDII-16 Pin Connector	To Diagnose Other Systems Of Vehicle With OBDII-16 Pin Diagnostic Connector
9	Power Cord	To Connect AC 100-240 V Outlet and Power Adapter
10	Cigarette Lighter Cable	To Get Power From Vehicle Cigarette Lighter
11	Battery Cable W/Two Clips	To Get Power From Vehicle Battery
12	Power Adapter	To Convert 100-240 V AC Power Into 12 V DC Power
13	Main Cable	To Connect The Diagnostic Connector and Smartbox
14	Smartbox	To Perform Vehicle Diagnosis

DIAGNOSIS & TESTING

Diagnostic Trouble Code (DTC) List

DTC	DTC DEFINITION
P000A	"A" Camshaft Position Slow Response
P000B	"B" Camshaft Position Slow Response
P0010	"A" Camshaft Position Actuator Circuit/Open
P0011	"A" Camshaft Position - Timing Over - Advanced or System Performance
P0012	"A" Camshaft Position - Timing Over - Retarded
P0013	"B" Camshaft Position - Actual Circuit/Open
P0014	"B" Camshaft Position - Timing Over - Advanced or System Performance
P0015	"B" Camshaft Position - Timing Over - Retarded
P0016	Crankshaft - Camshaft Position Correlation
P0030	O ₂ Sensor Heater Control Circuit (Bank 1 Sensor 1)
P0031	O ₂ Sensor Heater Control Circuit (Bank 1 Sensor 1) Low
P0032	O ₂ Sensor Heater Control Circuit (Bank 1 Sensor 1) High
P0036	O ₂ Sensor Heater Control Circuit (Bank 1 Sensor 2)
P0037	O ₂ Sensor Heater Control Circuit (Bank 1 Sensor 2) Low
P0038	O ₂ Sensor Heater Control Circuit (Bank 1 Sensor 2) High
P0053	O ₂ Sensor Heater Resistance (Bank 1 Sensor 1)
P0054	O ₂ Sensor Heater Resistance (Bank 1 Sensor 2)
P0101	Mass or Volume Air Flow Circuit Range/Performance
P0102	Mass or Volume Air Flow Circuit Low Input
P0103	Mass or Volume Air Flow Circuit High Input
P0112	Intake Air Temperature Circuit Low Input
P0113	Intake Air Temperature Circuit High Input
P0116	Engine Coolant Temperature Circuit Range/Performance
P0117	Engine Coolant Temperature Circuit Low Input
P0118	Engine Coolant Temperature Circuit High Input
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance
P0122	Throttle/Pedal Position Sensor A Circuit Low Input
P0123	Throttle/Pedal Position Sensor A Circuit High Input
P0130	O ₂ Sensor Circuit Bank 1 - Sensor 1 Malfunction
P0131	O ₂ Sensor Circuit Bank 1 - Sensor 1 Low Voltage
P0132	O ₂ Sensor Circuit Bank 1 - Sensor 1 High Voltage
P0133	O ₂ Sensor Circuit Bank 1 - Sensor 1 Slow Response
P0134	O ₂ Sensor Circuit Bank 1 - Sensor 1 No Activity Detected
P0136	O ₂ Sensor Circuit Bank 1 - Sensor 2 Malfunction
P0137	O ₂ Sensor Circuit Bank 1 - Sensor 2 Low Voltage
P0138	O ₂ Sensor Circuit Bank 1 - Sensor 2 High Voltage
P0140	O ₂ Sensor Circuit Bank 1 - Sensor 2 No Activity Detected
P0170	Fuel Trim, Bank 1 Malfunction
P0171	Fuel Trim, Bank 1 System too Lean
P0172	Fuel Trim, Bank 1 too Rich
P0201	Cylinder 1 - Injector Circuit
P0202	Cylinder 2 - Injector Circuit

DIAGNOSIS & TESTING

DTC	DTC DEFINITION
P0203	Cylinder 3 - Injector Circuit
P0204	Cylinder 4 - Injector Circuit
P0219	Engine Overspeed Condition
P0221	Throttle/Pedal Position Sensor/Switch B Range/Performance
P0222	Throttle/Pedal Position Sensor/Switch B Low Input
P0223	Throttle/Pedal Position Sensor/Switch B High Input
P0261	Cylinder 1 - Injector Circuit Low
P0262	Cylinder 1 - Injector Circuit High
P0264	Cylinder 2 - Injector Circuit Low
P0265	Cylinder 2 - Injector Circuit High
P0267	Cylinder 3 - Injector Circuit Low
P0268	Cylinder 3 - Injector Circuit High
P0270	Cylinder 4 - Injector Circuit Low
P0271	Cylinder 4 - Injector Circuit High
P0300	Random/Multiple Cylinder Misfire Detected
P0301	Cylinder 1 Misfire Detected
P0302	Cylinder 2 Misfire Detected
P0303	Cylinder 3 Misfire Detected
P0304	Cylinder 4 Misfire Detected
P0318	Rough Road Sensor "A" Signal Circuit
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal
P0324	Knock Control System Error
P0327	Knock Sensor 1 Circuit Low Input
P0328	Knock Sensor 1 Circuit High Input
P0340	Camshaft Position Sensor Circuit
P0341	Camshaft Position Sensor Circuit Range/Performance
P0342	Camshaft Position Sensor Circuit Low Input
P0343	Camshaft Position Sensor Circuit High Input
P0420	Catalyst System, Bank 1 Efficiency Below Threshold
P0444	Evaporative Emission System Purge Control Valve Circuit Open
P0458	Evaporative Emission System Purge Control Valve Circuit Low
P0459	Evaporative Emission System Purge Control Valve Circuit High
P0480	Cooling Fan 1 Control Circuit
P0481	Cooling Fan 2 Control Circuit
P0501	Vehicle Speed Sensor Range/Performance
P0506	Idle Control System RPM Lower than Expected
P0507	Idle Control System RPM High than Expected
P0508	Idle Air Control System Circuit Low
P0509	Idle Air Control System Circuit High
P0511	Idle Air Control Circuit
P0532	A/C Refrigerant Pressure Sensor Circuit Low Input
P0533	A/C Refrigerant Pressure Sensor Circuit High Input

DIAGNOSIS & TESTING

DTC	DTC DEFINITION
P0537	A/C Evaporator Temperature Sensor Circuit Low
P0538	A/C Evaporator Temperature Sensor Circuit High
P0560	System Voltage Malfunction
P0562	System Voltage Low Voltage
P0563	System Voltage High Voltage
P0571	Brake Switch "A" Circuit
P0601	Internal Control Module EEPROM Error
P0602	Control Module Programming Error
P0604	Internal Control Module Random Access Memory (RAM) Error
P0605	Internal Control Module ROM Test Error
P0606	ECM Processor
P0627	Fuel Pump "A" Control Circuit Open
P0628	Fuel Pump "A" Control Circuit Low
P0629	Fuel Pump "A" Control Circuit High
P0645	A/C Clutch Relay Circuit
P0646	A/C Clutch Relay Control Circuit Low
P0647	A/C Clutch Relay Control Circuit High
P0650	Malfunction Indicator Lamp Control Circuit
P0688	EMC/ECM Power Relay Sense Circuit Open
P0691	Cooling Fan 1 Control Circuit Low
P0692	Cooling Fan 1 Control Circuit High
P0693	Cooling Fan 2 Control Circuit Low
P0694	Cooling Fan 2 Control Circuit High
P0700	Transmission Control System Malfunction
P0704	Clutch Switch Input Circuit
P1297	Manufacturer Controlled Computer And Auxiliary Outputs
P1336	Engine Torque Control Adaptation at Limit
P1545	Throttle Position Control Malfunction
P1558	Throttle Actuator Electrical Malfunction
P1559	Idle Speed Control Throttle Position Adaptation Malfunction
P1564	Idle Speed Control Throttle Position Low Voltage during Adaptation
P1565	Idle Speed Control Throttle Position Lower Limit not Attained
P1568	Idle Speed Control Throttle Position Mechanical Malfunction
P1579	Idle Speed Control Throttle Position Adaptation not Started
P1604	Internal Control Module Driver Error
P1610	Manufacture Controlled Computer and Auxiliary Outputs
P1611	Manufacture Controlled Computer and Auxiliary Outputs
P1612	Manufacture Controlled Computer and Auxiliary Outputs
P1613	Manufacture Controlled Computer and Auxiliary Outputs
P1614	Manufacture Controlled Computer and Auxiliary Outputs
P1651	Manufacture Controlled Computer and Auxiliary Outputs
P2106	Throttle Actuator Control System Forced Limited Power
P2122	Throttle/Pedal Position Sensor/Switch D Circuit Low Input

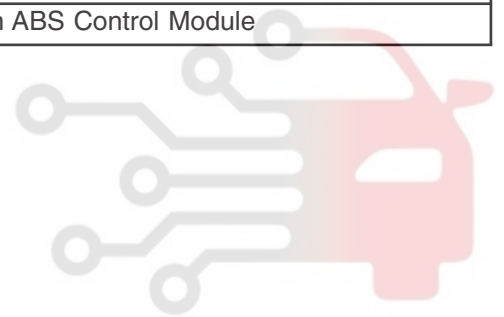
DIAGNOSIS & TESTING

DTC	DTC DEFINITION
P2123	Throttle/Pedal Position Sensor/Switch D Circuit High Input
P2127	Throttle/Pedal Position Sensor/Switch E Circuit Low Input
P2128	Throttle/Pedal Position Sensor/Switch E Circuit High Input
P2138	Accelerator Pedal Position Sensor Signal Correlation Error
P2177	System Too Lean off Idle
P2178	System Too Rich off Idle
P2187	System Too Lean at Idle
P2188	System Too Rich at Idle
P2195	O ₂ Sensor Signal Stuck Lean; Bank 1 Sensor 1
P2196	O ₂ Sensor Signal Stuck Rich; Bank 1 Sensor 1
P2270	O ₂ Sensor Signal Stuck Lean; Bank 1 Sensor 2
P2271	O ₂ Sensor Signal Stuck Rich; Bank 1 Sensor 2
U0001	High Speed CAN Defective
U0101	Lost Communication with ECM
U0104	Lost Communication with Cruise Control Module
U0121	Lost Communication with Anti-Lock Brake System (ABS) Control Module
U0155	Lost Communication with Instrument Panel Cluster Control Module
U0415	Invalid Data Received from ABS Control Module

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

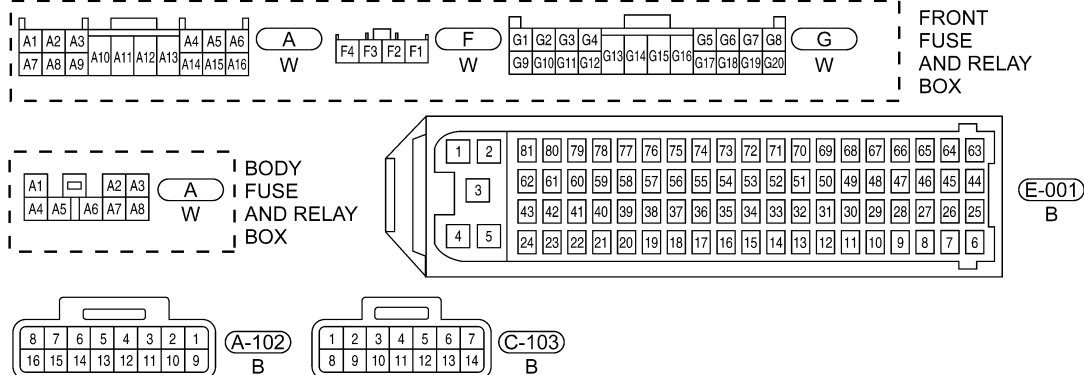
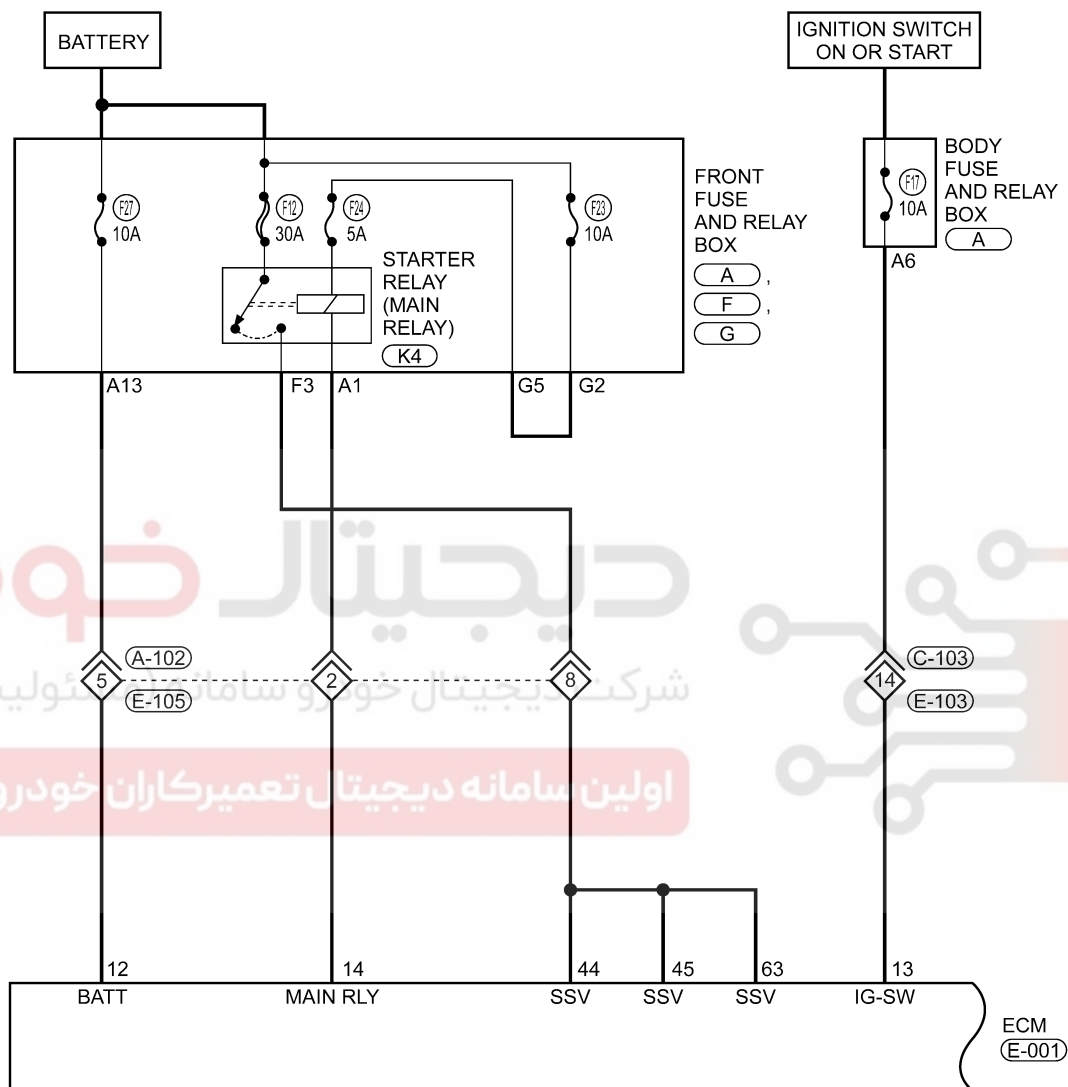


DIAGNOSIS & TESTING

ECM Power Supply and Ground Circuit Test

Power Supply And Ground Circuit Diagnostic Check

EEC - 2.0L - PWR - 01



Itsmw030023t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM Power Supply Circuits

TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
12	Battery	-	Battery Voltage (11 - 14 V)
13	Ignition switch	Ignition switch: ON	Battery Voltage (11 - 14 V)
		Ignition switch: OFF	Approximately 0 V
14	ECM main relay	- Ignition switch: OFF - More than a few seconds after turning ignition switch OFF	Battery Voltage (11 - 14 V)
44	Power supply for ECM	Ignition switch: ON	Battery Voltage (11 - 14 V)
45			
63			

03

دیجیتال خودرو

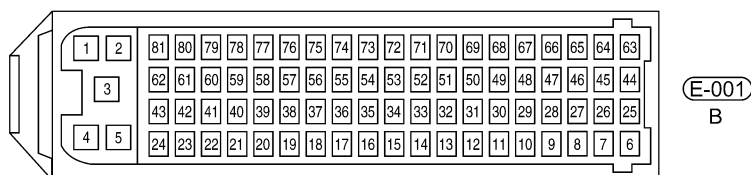
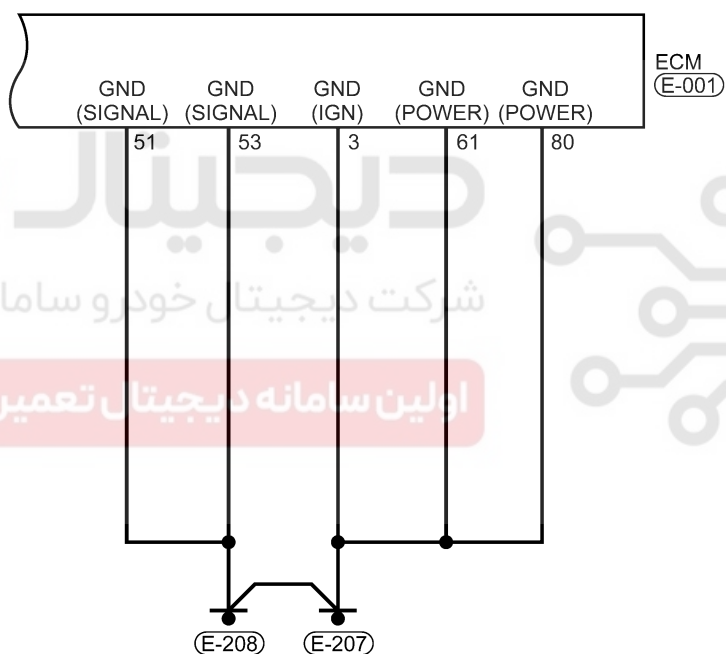
شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



DIAGNOSIS & TESTING

EEC - 2.0L - PWR - 02



Itsmw030024t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
3	ECM ground (IGN)	Ignition switch: ON	Approximately 0 V
51	ECM ground (Signal)	Ignition switch: ON	Approximately 0 V
53	ECM ground (Signal)	Ignition switch: ON	Approximately 0 V
61	ECM ground (Power)	Ignition switch: ON	Approximately 0 V
80	ECM ground (Power)	Ignition switch: ON	Approximately 0 V

03

Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- Start engine then select view data stream.
- If the data stream is detected, the condition is intermittent (See Diagnosis & Testing Diagnostic Help in Section 03 Electronic Engine Controls).
- If data stream is not detected, go to Diagnostic Procedure - Step 1.

1. INSPECTION START

- Start engine.

Is engine running?

Yes >> Go to step 7.

No >> Go to step 2.

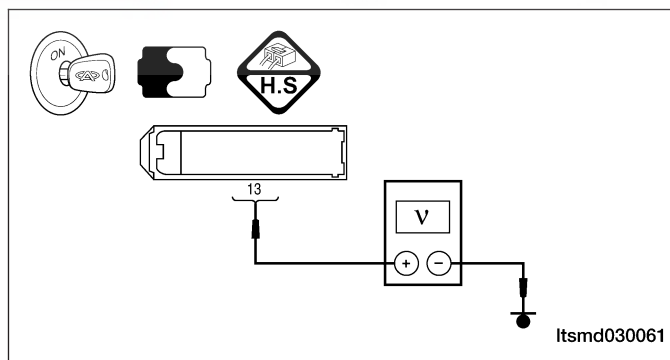
2. CHECK ECM POWER SUPPLY CIRCUIT - (1)

- Turn ignition switch off and then on.
- Check voltage between ECM terminal 13 and ground.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to step 4.

No >> Go to step 3.



DIAGNOSIS & TESTING

3. DETECT MALFUNCTIONING PART

- Check the following:
 - Harness connectors C-103, E-103, terminal 14
 - Front fuse and relay box connector A
 - Fuse 17
- Check harness for open or short between ECM and fuse.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace malfunctioning part.

4. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten one ground screw on the body.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace ground connections.

5. CHECK ECM GROUND CIRCUIT FOR AN OPEN OR SHORT

- Disconnect ECM harness connector.
- Check harness continuity between ECM terminals 3, 51, 53, 61, 80 and ground.
- Continuity should exist.
- Check harness for short to power.

Is the check result normal?

Yes >> Go to step 7.

No >> Go to the next step.

6. DETECT MALFUNCTIONING PART

- Check harness for open or short between ECM terminals 3, 51, 53, 61, 80 and ground.
- Check harness for an open or short to power in harness or connectors.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open or short to power in harness or connectors.

DIAGNOSIS & TESTING

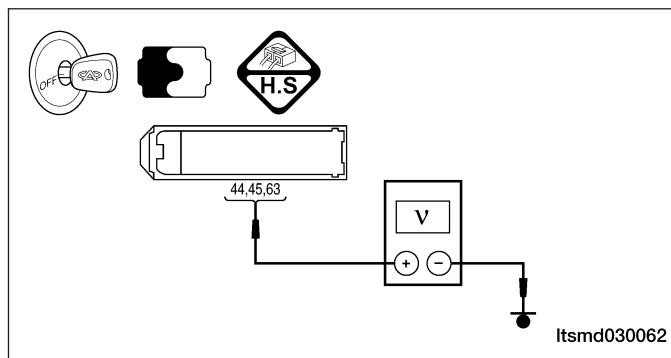
7. CHECK ECM POWER SUPPLY CIRCUIT - (2)

- Turn ignition switch on and then off.
- Check voltage between ECM terminals 44, 45, 63 and ground.
- Voltage: Turn the ignition switch on and battery voltage should exist. Turning the ignition switch OFF, battery voltage will exist for a few seconds, then drop to approximately 0 V.

Is the check result normal?

Yes >> Check the starting system.

No >> Go to the next step.



03

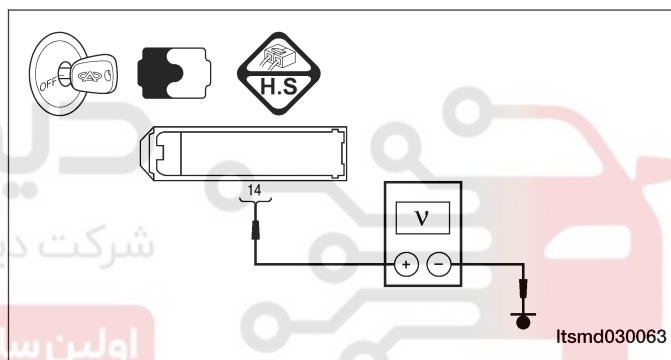
8. CHECK THE STARTER RELAY CONTROL CIRCUIT

- Turn ignition switch OFF. Wait for at least 10 seconds.
- Check voltage between ECM terminal 14 and ground.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Go to step 10.



9. CHECK ECM POWER SUPPLY CIRCUIT - (3)

- Disconnect ECM harness connector.
- Disconnect front fuse and relay box harness connector F.
- Check harness continuity between ECM terminals 44, 45, 63 and front fuse and relay box terminal F3.
- Continuity should exist.
- Check harness for short to ground and short to power.

Is the check result normal?

Yes >> Go to step 12.

No >> Repair circuit for an open or short to power or short to ground in harness or connectors.

DIAGNOSIS & TESTING

10. CHECK STARTER RELAY CONTROL CIRCUIT

- Disconnect ECM harness connector.
- Disconnect front fuse and relay box harness connector A.
- Check harness continuity between ECM terminal 14 and front fuse and relay box terminal A1.
- Check harness continuity between front fuse and relay box terminal G2 and G5.
- Continuity should exist.
- Also check harness for short to ground and short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open or short to ground or short to power in harness or connectors.

11. CHECK FUSE

- Disconnect fuse 23 (10A), fuse 24 (5A) in front fuse and relay box.
- Check fuses.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace fuse 23 or 24.

12. CHECK FRONT FUSE AND RELAY BOX

- Check the front fuse and relay box for damage.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace front fuse and relay box.

13. REPLACE AND PROGRAM ECM

- Replace the ECM.

NOTE :

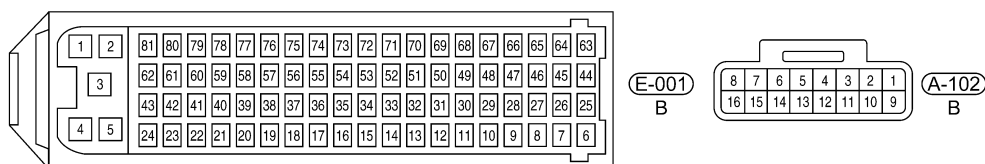
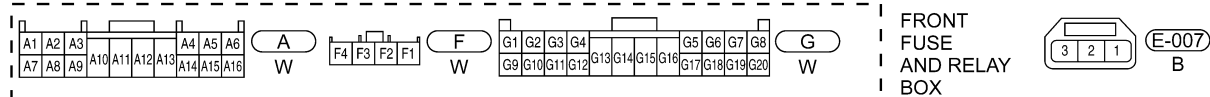
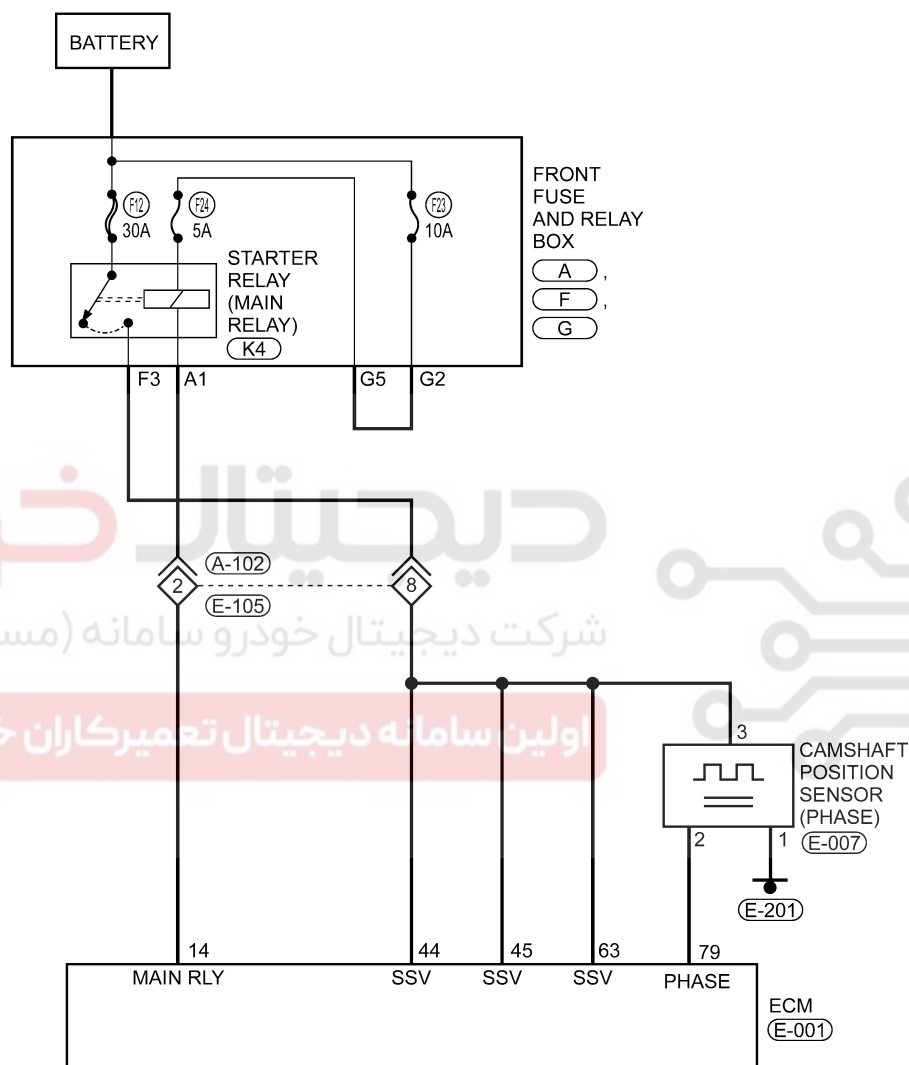
The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

Diagnostic Trouble Code (DTC) Tests

P0016 - Camshaft Position-Crankshaft Position Correlation Error

03

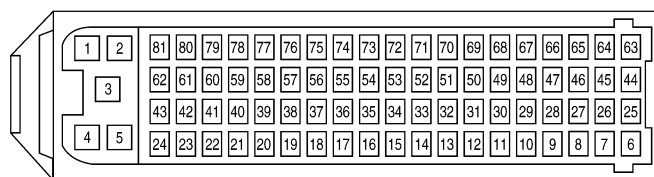
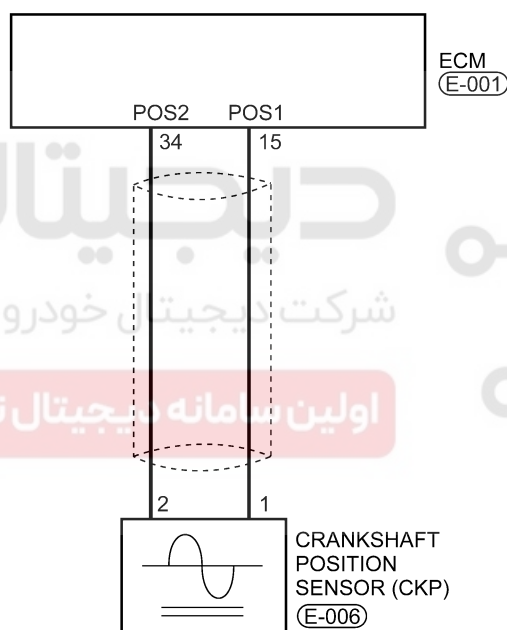
EEC - 2.0L - PHASE - 01



Itsrmw030032t

DIAGNOSIS & TESTING

EEC - 2.0L - POS - 01

E-001
BE-006
B

Itsmw030027t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
15	Crankshaft Position (CKP) sensor	- Ignition switch: ON - Engine: Not cranking	3 V
34			
79	Camshaft Position (CMP) sensor	- Ignition switch: ON - Engine: Not cranking	11 V

03

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0016	Camshaft position-Crankshaft position correlation error	Engine is running	ECM detects that the CMP sensor is out of phase with CKP sensor.	- Crankshaft Position (CKP) sensor - Camshaft Position (CMP) sensor - Harness or connectors - Crankshaft signal plate - Camshaft signal plate - Timing misalignment - ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Connect the X-431 scan tool to the diagnostic connector (DLC) - use the most current software available, press the POWER key to start the X-431.
- Turn ignition switch on and record and erase DTC.
- Start engine and warm it up to the normal operating temperature.
- With the scan tool, select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

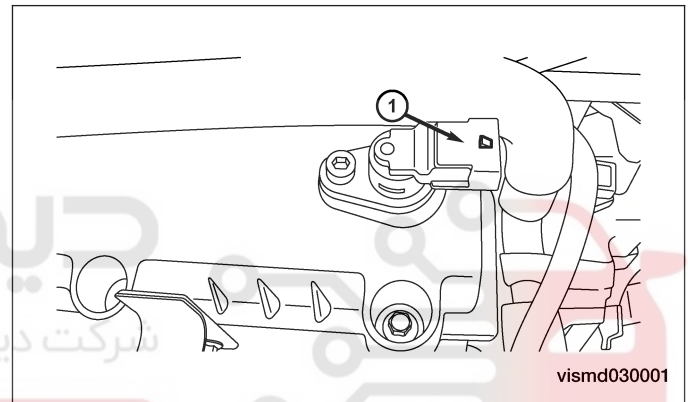
2. CHECK CMP SENSOR ELECTRICAL CONNECTOR

- Disconnect the CMP sensor electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



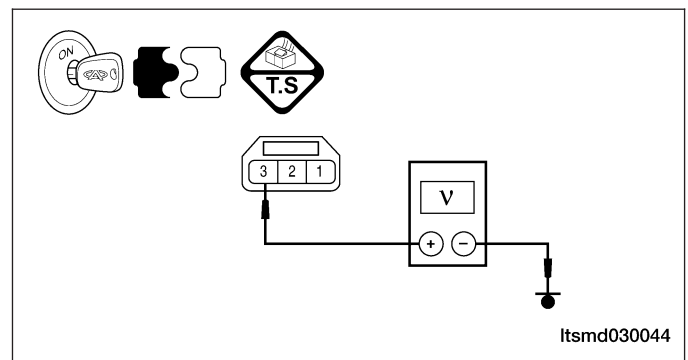
3. CHECK CMP SENSOR POWER SUPPLY CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch on.
- Check CMP sensor supply voltage between sensor connector E-007, terminal 3 and ground in the sensor electrical connector.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.



DIAGNOSIS & TESTING

4. DETECT MALFUNCTIONING PART

- Check the following:
 - Harness connectors A-102, E-105
 - Front fuse and relay box F3
 - Fuse 22, Fuse 12
 - Check harness for open or short between CMP sensor and fuse.
- With the X-431 scan tool, read ECM DTCs.

Is DTC P0016 still present?

Yes >> Go to the next step.

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

03

5. CHECK CMP SENSOR GROUND CIRCUIT FOR AN OPEN AND SHORT

- Turn ignition switch off.
- Check harness continuity between CMP sensor terminal 1 and ground.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open or short to power in harness or connectors.

6. CHECK CMP SENSOR INPUT SIGNAL CIRCUIT FOR AN OPEN AND SHORT

- Turn ignition switch on.
- Check voltage between CMP sensor terminal 2 and ground.
- 11 V should exist.

Is the check result normal?

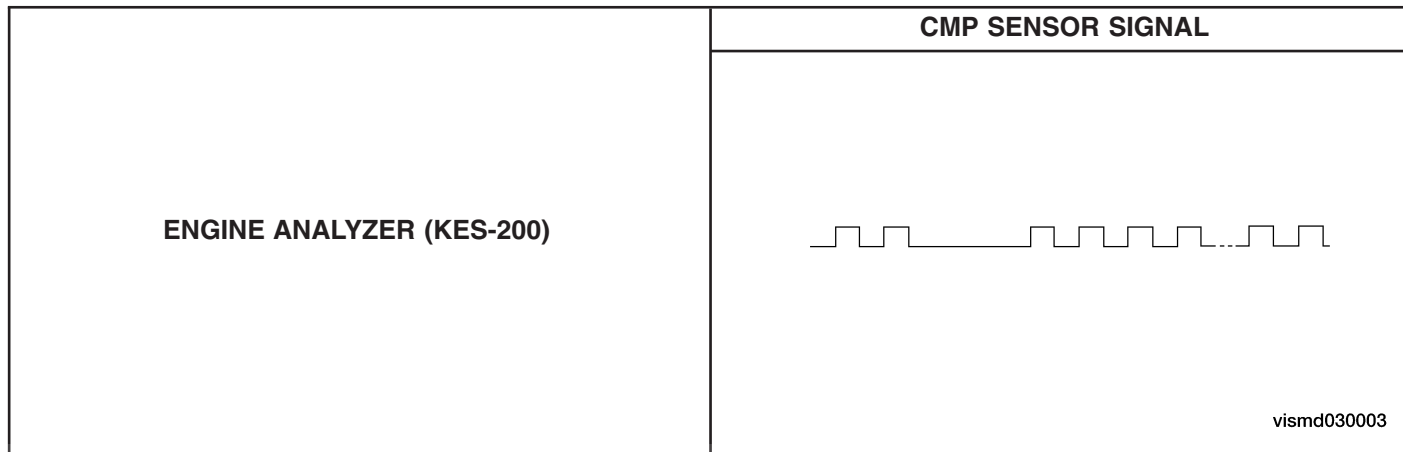
Yes >> Go to the next step.

No >> Repair or replace circuit for an open or short to power or short to ground in harness or connectors.
If circuit is normal, go to the next step.

DIAGNOSIS & TESTING

7. CHECK CMP SENSOR SIGNAL

- Turn ignition switch off.
- Connect CMP sensor connector.
- Check signal voltage between CMP sensor terminal 2 and ground when engine is running.
- Approximately 6 V square wave signal should exist.



Is the CMP output signal normal?

Yes >> Go to step 10.

No >> Go to the next step.

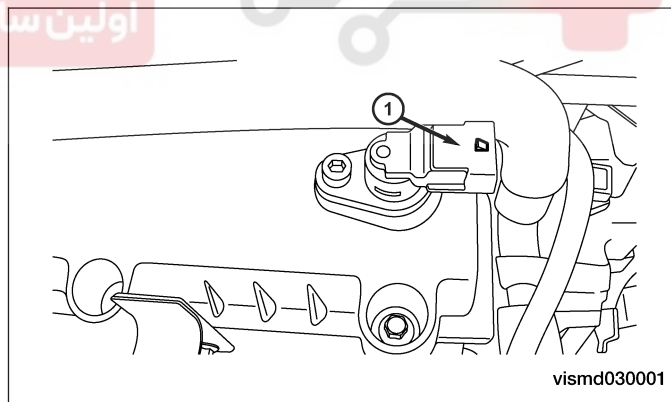
8. CHECK CMP SENSOR

- Remove the CMP sensor (1).
- Inspect and clean the CMP sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Is the mounting area OK?

Yes >> Go to the next step.

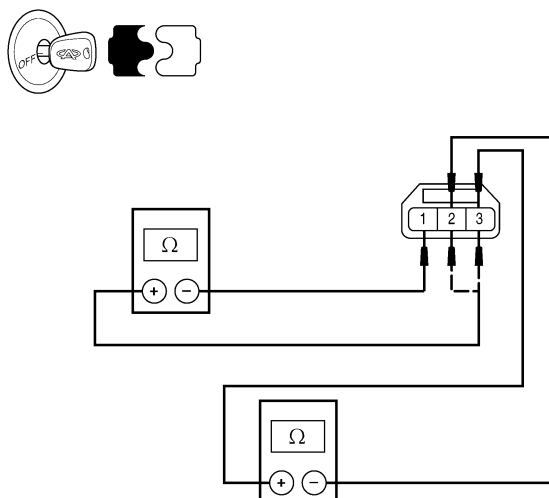
No >> Repair or replace the sensor as necessary.



DIAGNOSIS & TESTING

9. CHECK CMP SENSOR RESISTANCE

- Check the resistance of the CMP sensor, component side.

TERMINAL NO.	RESISTANCE Ω (25°C)	
1 & 2	Except 0 or ∞	
1 & 3		
2 & 3		

Itsmd030045

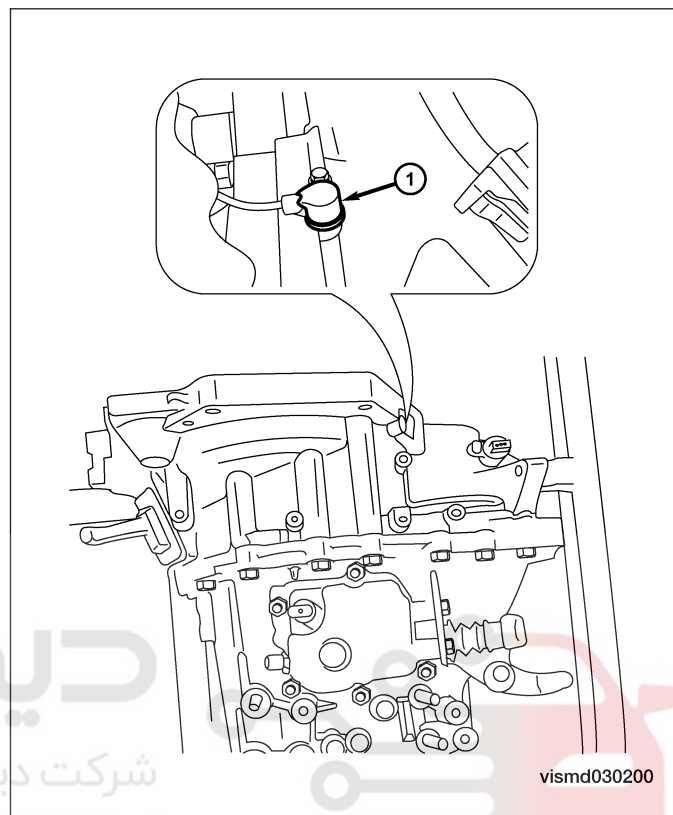
03

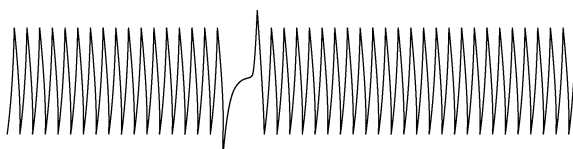
Is the check result normal?

- Yes** >> Replace the CMP sensor with a known good CMP sensor.
 Monitor the CMP sensor signal on the KES-200 screen.
 – If the CMP sensor signals were normal, the system is OK.
 – If the CMP sensor signals were still irregular or missing, go to step 14.
- No** >> Eliminate any condition that would result in an incorrect signal.

10. CHECK CKP SENSOR SIGNAL

- Check signal between CKP sensor (1) terminal 1 or 2 and ground when engine is running.



	CKP SENSOR SIGNAL
ENGINE ANALYZER (KES-200)	 vismd030002

Is the CKP output signal normal?

Yes >> Go to step 12.

No >> Go to the next step.

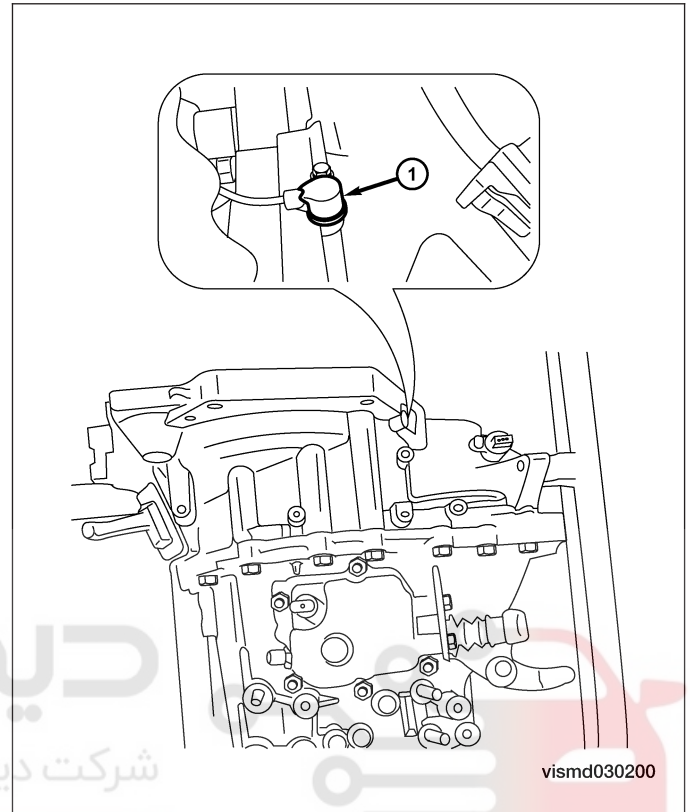
11. CHECK CKP SENSOR ELECTRICAL CONNECTOR

- Disconnect the CKP sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



03

12. CHECK CKP SENSOR

- Remove the CKP sensor.
- Inspect and clean the CKP sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Is the mounting area OK?

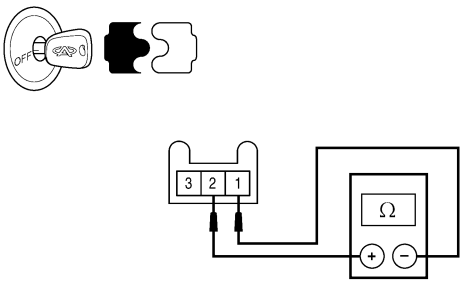
Yes >> Go to the next step.

No >> Repair or replace the sensor as necessary.

DIAGNOSIS & TESTING

13. CHECK CKP SENSOR RESISTANCE

- Check the resistance of the CKP sensor, component side.

TERMINAL NO.	RESISTANCE Ω (25°C)	
1 & 2	Approximately 860 Ω	

Itsmd030049

Is the check result normal?

- Yes** >> Replace the CKP sensor with a known good CKP sensor.
Monitor the CKP sensor signal on the KES-200 screen.
- If the CKP sensor signals were normal, the system is OK.
 - If the CKP sensor signals were still irregular or missing, go to step 15.

- No** >> Replace the CKP sensor.

14. CHECK CAMSHAFT AND CAMSHAFT SIGNAL PLATE

- Remove the cylinder head cover and timing belt cover (See timing belt removal and installation in Section 02 engine).
- Check the installed clearance (See CMP sensor Removal & Installation in Section 03 Electronic Engine Controls).
- 0.8 - 1.2 mm should exist.
- Check the camshaft and camshaft signal plate for any condition that would result in an incorrect signal, such as damage, become flexible, foreign material when rotate the camshaft.

Were any problems found?

- Yes** >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.
Reinstall CMP sensor.

- No** >> Go to step 17.

15. CHECK THE CRANKSHAFT AND CRANKSHAFT SIGNAL PLATE

- Check the installed clearance (See CKP sensor Removal & Installation in Section 08 Transaxle & Transfer Case).
- 0.8 - 1.2 mm should exist.
- Check the crankshaft and camshaft signal plate for any condition that would result in an incorrect signal, such as damage, become flexible, foreign material when rotate the camshaft.

Were any problems found?

- Yes** >> Remove debris and clean the signal plate of crankshaft rear end or replace crankshaft.
Reinstall the CKP sensor.

- No** >> Go to the next step.

16. CHECK TIMING

- Check for timing misalignment.

Is the timing misaligned?

Yes >> Align the engine timing belt (See Timing Belt Removal & Installation in Section 02 Engine).

No >> Go to the next step.

17. CHECK DTC

03

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0016 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

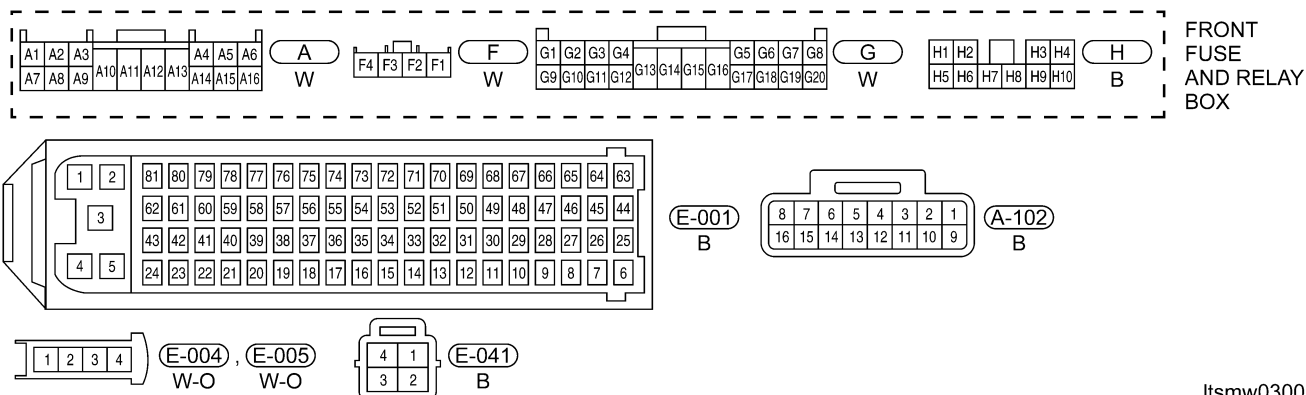
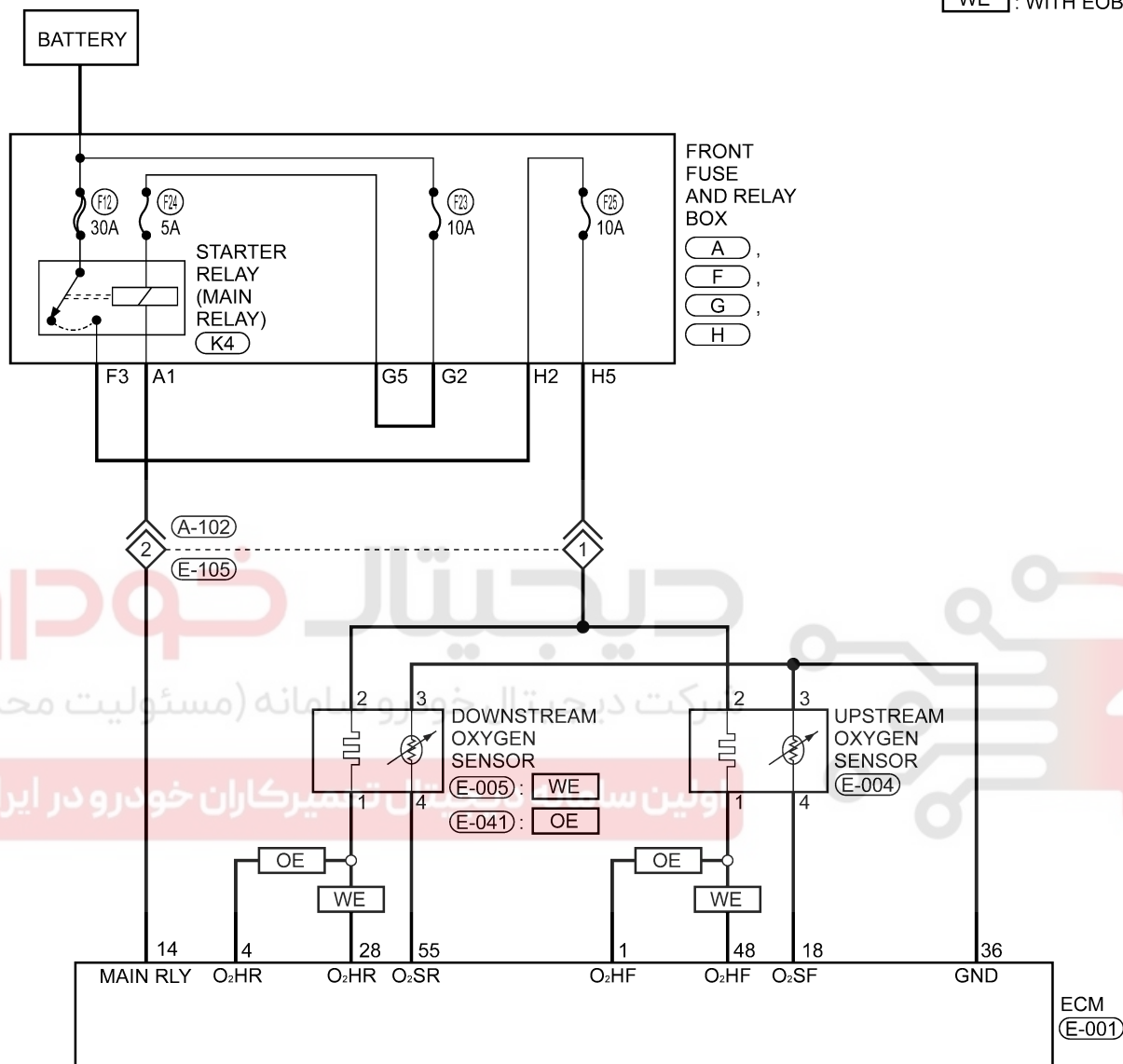


DIAGNOSIS & TESTING

P0031 - O₂ Sensor 1 Heater Control Circuit LowEEC - 2.0L - O₂S - 01

OE : WITHOUT EOBD

WE : WITH EOBD



DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
18	Upstream oxygen sensor	- Engine is running - Warm-up condition - Keep the engine speed 2000 RPM	Approximately 0.1 - 0.9 V (change 5 - 8 times in 10 seconds periodically)
28	Downstream oxygen sensor heating	-	-
36	Sensor (GND)	- Warm-up condition - Idle speed	Approximately 0 V
48	Upstream oxygen sensor heating	-	-
55	Downstream oxygen sensor	- Engine is running - Warm-up condition - Keep the engine speed 2000 RPM	Approximately 100 mV

03

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	POSSIBLE CAUSE
P0031	O ₂ sensor 1 heater control circuit low	Engine is running	- Fuel quality - Upstream O₂ sensor - Harness or connectors - ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on and record and erase DTC.
- Start engine and warm it up to the normal operating temperature.
- Turn ignition switch off and wait at least 10 seconds.
- Start engine and keep the engine speed 2000 RPM for at least 1 minute.
- Let engine idle for 2 minutes, select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-20 7 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

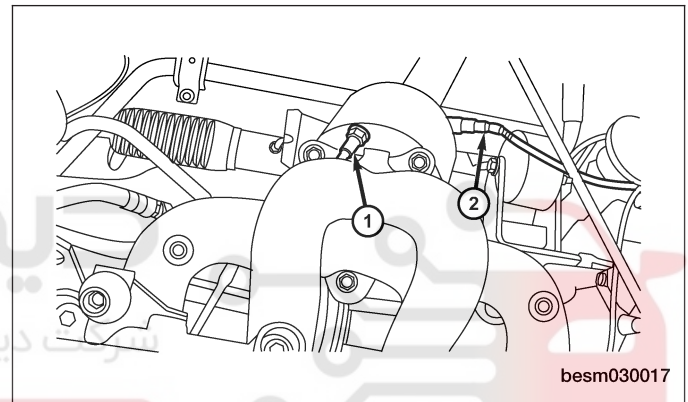
2. CHECK UPSTREAM O₂ SENSOR ELECTRICAL CONNECTOR

- Disconnect the upstream O₂ sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

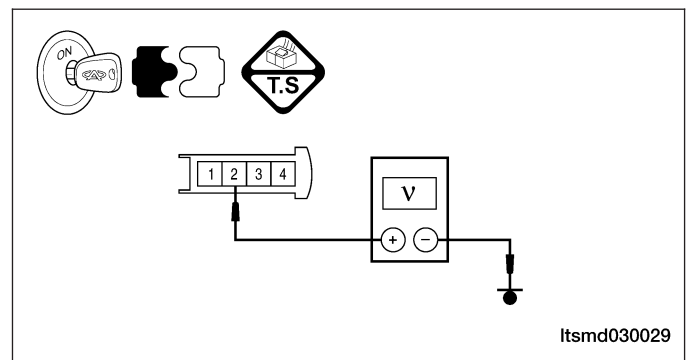
3. CHECK UPSTREAM O₂ SENSOR POWER SUPPLY CIRCUIT

- Turn ignition switch on.
- Check supply voltage between O₂ sensor terminal 2 and ground in the O₂ sensor electrical connector E-005.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to Step 5.

No >> Go to the next step.



DIAGNOSIS & TESTING

4. DETECT MALFUNCTIONING PART

- Check the following:
 - Harness connectors A-102, E-105
 - Front fuse and relay box H2, H5
 - Fuse 25, fuse 12, fuse 23, fuse 24
- Check harness for an open or short between O₂ sensor and fuse.
- Repair or replace malfunctioning part.
- With the X-431, select view DTC.

Is DTC P0031 still present?

Yes >> Go to the next step.

No >> The system is normal now.

03

5. CHECK O₂ SENSOR HEATER CONTROL CIRCUIT FOR OPEN OR SHORT

- Turn ignition switch off.
- Disconnect ECM connector.
- Check harness continuity between ECM terminal and O₂ sensor terminal.

COMPONENT	ECM	UPSTREAM O ₂ SENSOR
TERMINAL	• 48 (With EOBD) • 1 (Without EOBD)	1

- Continuity should exist.
- Check harness for short to ground.

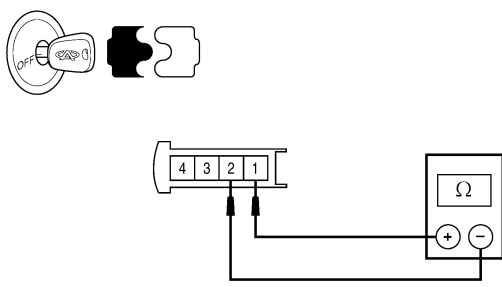
Is the check result normal?

Yes >> Go to the next step.

No >> Repair the circuit for an open or short in harness or connectors.

6. CHECK O₂ SENSOR HEATER

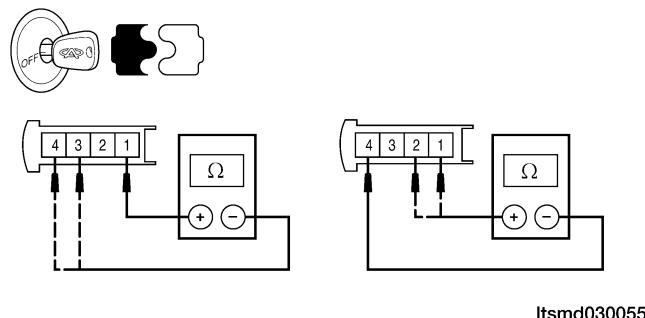
- Check resistance between O₂ sensor heater terminals.

TERMINAL NO.	RESISTANCE	
1 and 2 (including cable and connector)	Approximately 9 Ω	

Itsmd030030

DIAGNOSIS & TESTING

- Check resistance between O₂ sensor terminals.

TERMINAL NO.	RESISTANCE	
1 & 3 and 1 & 4	∞ Ω (Continuity should not exist)	
4 & 1 and 4 & 2		

Is the check result normal?

Yes >> Go to the next step.

No >> Replace O₂ sensor.

7. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0031 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.

Reassemble the vehicle and road test to verify the customers complaint is repaired.

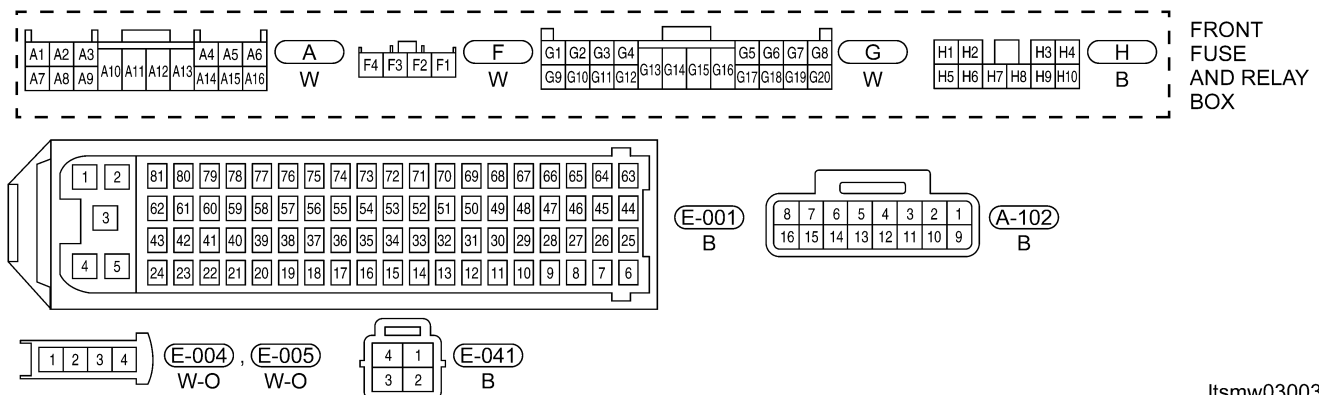
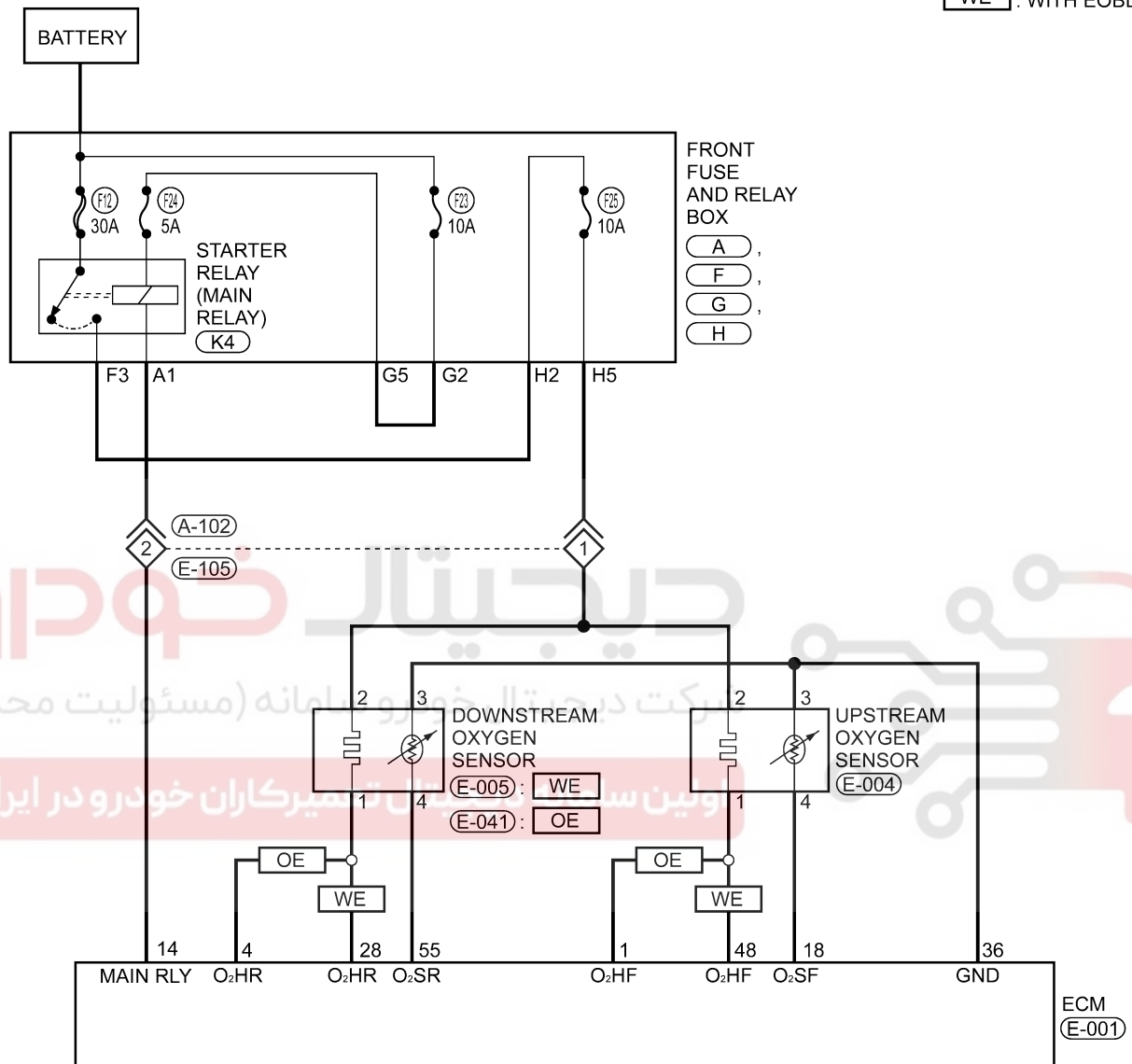
DIAGNOSIS & TESTING

P0032 - O₂ Sensor 1 Heater Control Circuit High

EEC - 2.0L - O₂S - 01

OE : WITHOUT EOBD

WE : WITH EOBD



DIAGNOSIS & TESTING

Specification data are reference values and are measured between each terminal and ground.

ECM TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
18	Upstream oxygen sensor	- Engine is running - Warm-up condition	Approximately 0.1 - 0.9 V (change 5 - 8 times in 10 seconds periodically)
28	Downstream oxygen sensor heating (with EOBD)	-	-
36	Sensor (GND)	- Warm-up condition - Idle speed	Approximately 0 V
48	Upstream oxygen sensor heating (without EOBD)	-	-
55	Downstream oxygen sensor	- Engine is running - Warm-up condition	Approximately 100 mV

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	POSSIBLE CAUSE
P0032	O ₂ sensor 1 heater control circuit high	Engine is running	- Upstream Oxygen Sensor - Harness or connectors - ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on and record and erase DTC.
- Start engine and warm it up to the normal operating temperature.
- Turn ignition switch off and wait at least 10 seconds.
- Start engine and keep the engine speed 2000 RPM for at least 1 minute.
- Let engine idle for 2 minutes, select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground connections.

03

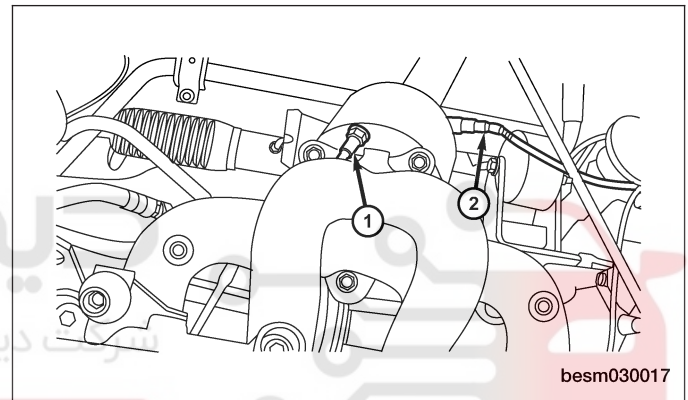
2. CHECK UPSTREAM O₂ SENSOR ELECTRICAL CONNECTOR

- Disconnect the upstream O₂ sensor (1) electrical connector E-004.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

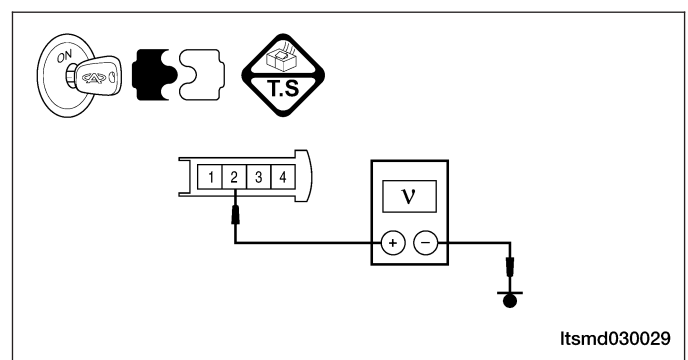
3. CHECK UPSTREAM O₂ SENSOR POWER SUPPLY CIRCUIT

- Turn ignition switch on.
- Check supply voltage between upstream O₂ sensor terminal 2 and ground in the O₂ sensor electrical connector E-004.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to Step 5.

No >> Go to the next step.



DIAGNOSIS & TESTING

4. DETECT MALFUNCTIONING PART

- Check the following:
 - Harness connectors A-102, E-105
 - Front fuse and relay box H2, H5
 - Fuse 25, Fuse 12, Fuse 23, Fuse 24
- Check harness for open or short between O₂ sensor and fuse.
- Repair or replace malfunctioning part.
- With the X-431, select view DTC.

Is DTC P0032 still present?

Yes >> Go to the next step.

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

5. CHECK O₂ SENSOR HEATER CONTROL CIRCUIT FOR A SHORT

- Turn ignition switch off.
- Disconnect ECM connector.
- Check harness continuity between ECM terminal and O₂ sensor terminal.

COMPONENT	ECM	UPSTREAM O ₂ SENSOR
TERMINAL	• 48 (With EOBD) • 1 (Without EOBD)	1

- Continuity should exist.
- Check harness short to power supply circuit.

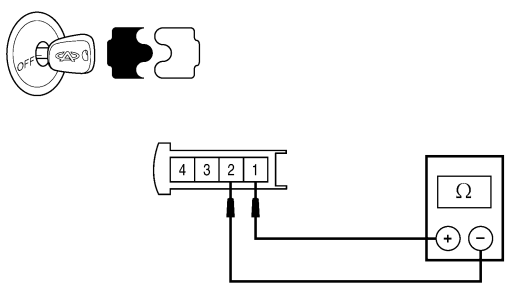
Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for a short to power in harness or connectors.

6. CHECK THE O₂ SENSOR HEATER

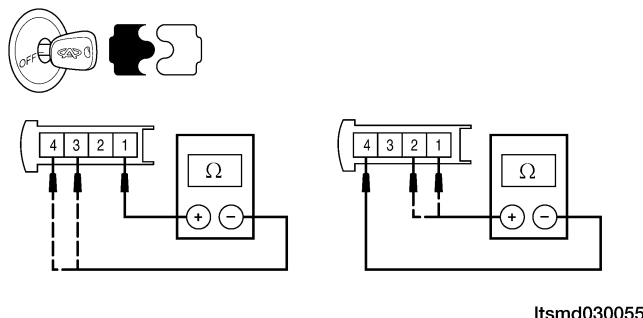
- Check resistance between O₂ sensor heater terminals.

TERMINAL NO.	RESISTANCE	
1 & 2 (including cable and connector)	Approximately 9 Ω	

Itsmd030030

DIAGNOSIS & TESTING

- Check resistance between O₂ sensor terminals.

TERMINAL NO.	RESISTANCE	
1 & 3 and 1 & 4	$\infty \Omega$ (Continuity should not exist)	
4 & 1 and 4 & 2		

03

Is the check result normal?

Yes >> Go to the next step.

No >> Replace O₂ sensor.

7. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0032 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

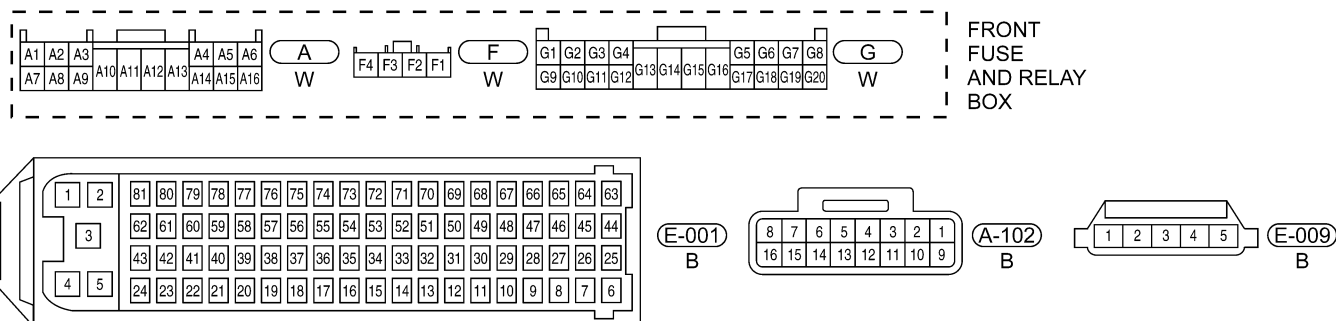
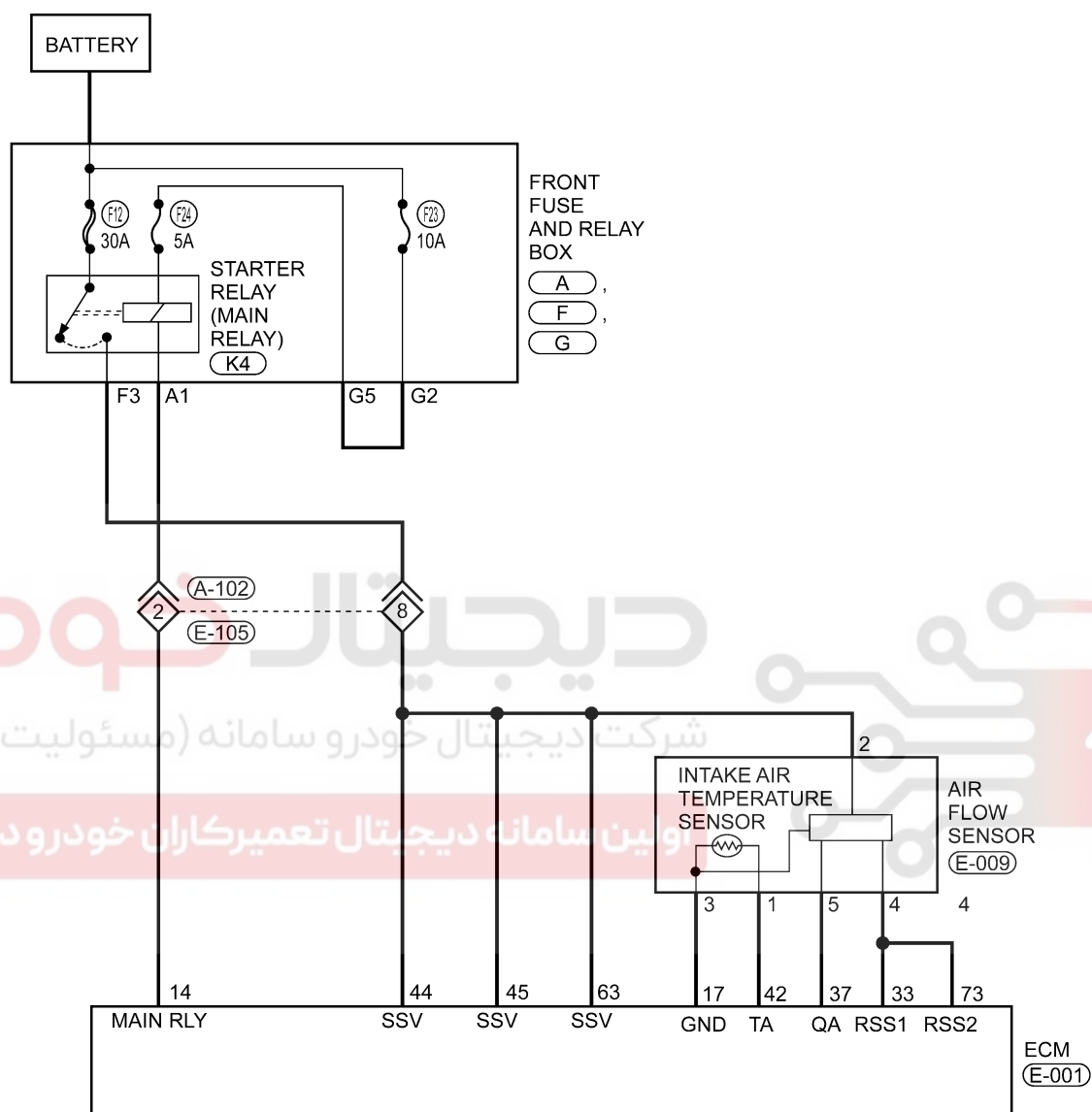
No >> The system is now operating properly.

Reassemble the vehicle and road test to verify the customers complaint is repaired.

DIAGNOSIS & TESTING

P0102 - Mass Or Volume Air Flow Circuit Low Input

EEC - 2.0L - MAF - 01



Itsmw030033t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
17	Sensor (GND)	• Engine is running • Warm-up condition: 78°C • Idle: 795 RPM • IAT: 36°C • IAT signal: 1.88 V	Approximately 0 V
33	Regulated sensor supply		5 V
37	Air flow sensor		Approximately 322 kg/h
			Approximately 1.39 V

03

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0102	Mass or Volume Air Flow (MAF) circuit low input	Ignition switch on or engine is running	ECM detected that the input signal is out of the acceptable range.	• MAF sensor • Intake air leaks • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature, then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

DIAGNOSIS & TESTING**2. CHECK INTAKE SYSTEM**

- Check the following for proper connection.
 - Air duct
 - Vacuum hoses
 - Intake air passage between air duct and manifold

Is the check result normal?

Yes >> Go to the next step.

No >> Reconnect the connectors or replace the malfunctioning part.

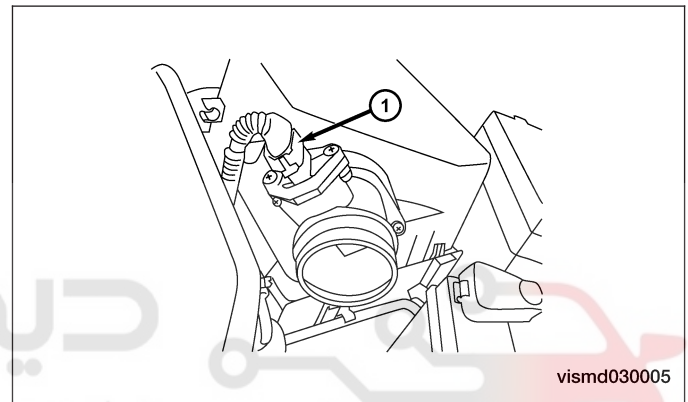
3. CHECK MAF SENSOR ELECTRICAL CONNECTOR

- Disconnect the MAF sensor electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

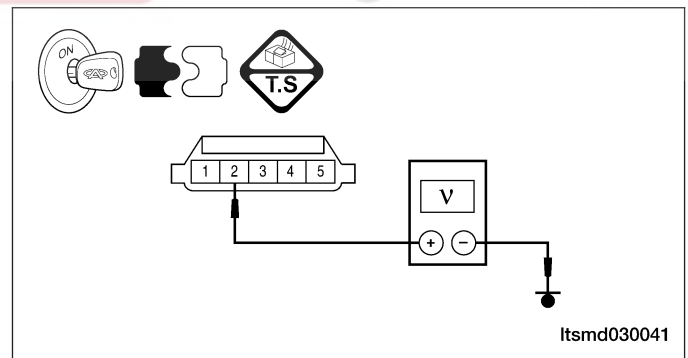
**4. CHECK THE MAF SENSOR POWER SUPPLY CIRCUIT**

- Turn ignition switch on.
- Check voltage between MAF sensor terminal 2 and ground in the MAF sensor electrical connector E-009.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to step 6.

No >> Go to the next step.



DIAGNOSIS & TESTING

5. DETECT MALFUNCTIONING PART

- Check the following parts:
 - Relay
 - Fuse 23, fuse 24, fuse 12
 - Harness connectors A-102, E-105
- Check harness for an open or short between MAF sensor and fuse.
- Repair an open circuit or short to ground in harness or connectors.
- With the X-431, view DTC in ECM.

Is DTC P0102 present?

Yes >> Go to the next step.

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

6. CHECK MAF SENSOR REFERENCE VOLTAGE

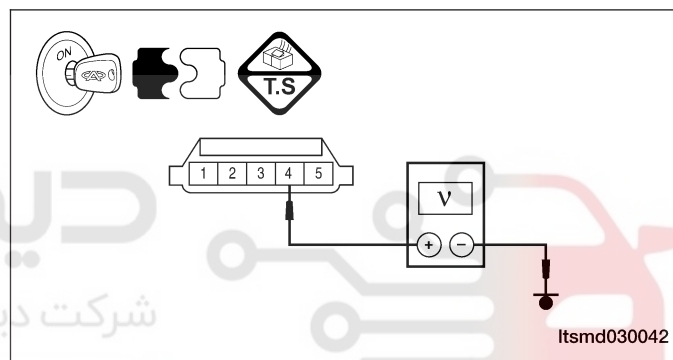
- Check voltage between MAF sensor terminal 4 and ground in the MAF sensor electrical connector E-009.
- 5 V should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair the circuit for an open or short to ground in harness or connectors.
If circuit is normal, replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM
(See ECM Removal & Installation in Section 03 Electronic Engine Controls).



7. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch off.
- Disconnect ECM harness connector.
- Check harness continuity between MAF sensor terminal 3 and ECM terminal 17.
- Continuity should exist.
- Check harness for short to ground.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace open circuit or short to ground in harness or connectors.

8. CHECK THE MAF SENSOR OUTPUT SIGNAL CIRCUIT FOR AN OPEN OR SHORT

- Check harness continuity between MAF sensor terminal 5 and ECM terminal 37.
- Continuity should exist.
- Check harness for a short to ground or power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open or short to ground in harness or connectors.

DIAGNOSIS & TESTING

9. CHECK MAF SENSOR SIGNAL

- Install all removed parts.
- Start engine.
- Check MAF sensor signal with the X-431.

ECM TERMINAL NO.	ITEM	CONDITION	DATA																																																					
37	Air flow sensor	• Engine is running • ECT: 78°C • Idle: 795 RPM • IAT: 36°C • IAT signal voltage: 1.88 V	Approximately 322 kg/h	<table><tr><td colspan="4">DATA STREAM</td></tr><tr><td colspan="2">Engine speed</td><td colspan="2">RPM</td></tr><tr><td colspan="2">Target speed</td><td colspan="2">RPM</td></tr><tr><td colspan="2">Injection pulse</td><td colspan="2">ms</td></tr><tr><td colspan="2">Spark advance</td><td colspan="2">Gr.</td></tr><tr><td colspan="2">Intake manifold pressure</td><td colspan="2">mmHg</td></tr><tr><td colspan="2">Intake air temperature</td><td colspan="2">°C</td></tr><tr><td colspan="2">Coolant temperature</td><td colspan="2">°C</td></tr><tr><td colspan="2">Throttle position</td><td colspan="2">Gr.</td></tr><tr><td colspan="2">PAGE UP</td><td>PAGE DOWN</td><td>GRAPHIC-1</td></tr><tr><td colspan="2">HOME</td><td>BACK</td><td>PRINT</td></tr><tr><td colspan="2">HOME</td><td>BACK</td><td>PRINT</td></tr><tr><td colspan="2">Start</td><td></td><td> </td></tr></table>	DATA STREAM				Engine speed		RPM		Target speed		RPM		Injection pulse		ms		Spark advance		Gr.		Intake manifold pressure		mmHg		Intake air temperature		°C		Coolant temperature		°C		Throttle position		Gr.		PAGE UP		PAGE DOWN	GRAPHIC-1	HOME		BACK	PRINT	HOME		BACK	PRINT	Start			
			DATA STREAM																																																					
Engine speed		RPM																																																						
Target speed		RPM																																																						
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HOME		BACK	PRINT																																																					
Start																																																								
			Approximately 1.39 V																																																					

Itsmd030001t

- If without the X-431, check voltage between MAF sensor terminal 5 and ground.

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)	
37	Air flow sensor	• Engine is running • ECT: 78°C • Idle: 795 RPM • IAT: 36°C • IAT signal: 1.88 V	Approximately 1.39 V	Itsmd030043

- If the signal voltage is out of specification, proceed with the following.
- Check for the causes of uneven air flow through the MAF sensor.
 - Crushed air ducts
 - Air cleaner seal
 - Uneven dirt of air cleaner element
- If the parts malfunctioning, repair or replace them.
- If the parts OK, clean the MAF sensor, then check the signal of the MAF sensor.

Is the signal voltage of MAF normal?

Yes >> Go to the next step.

No >> Replace MAF sensor.

10. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0102 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

03

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

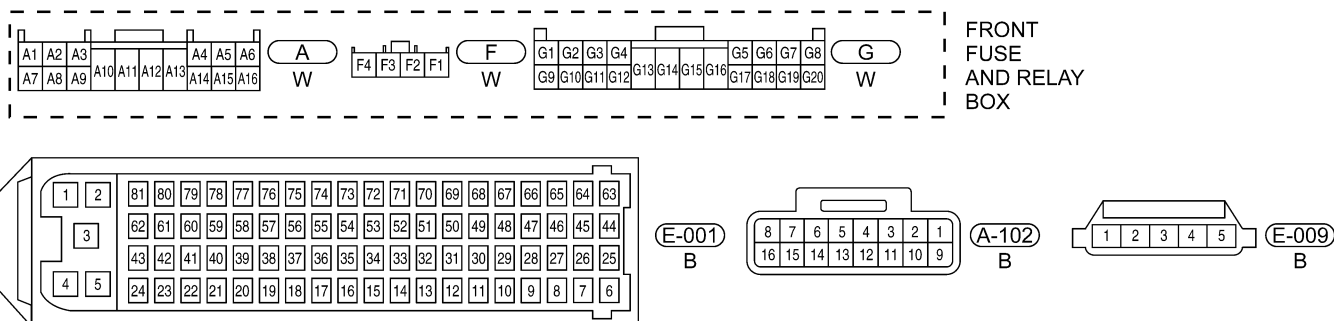
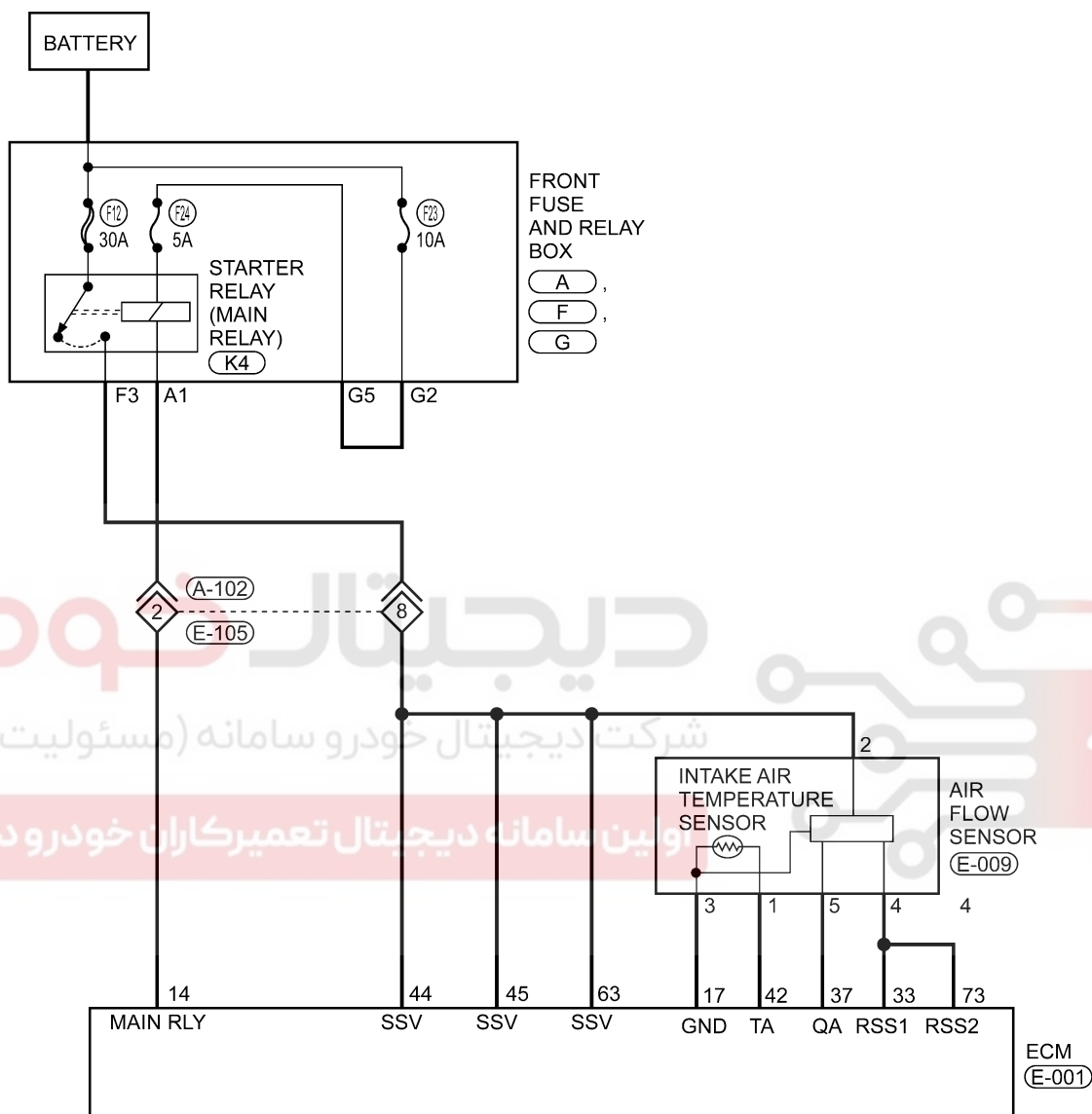
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



DIAGNOSIS & TESTING

P0103 - Mass Or Volume Air Flow Circuit High Input

EEC - 2.0L - MAF - 01



ltsmw030033t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA
17	Sensor (GND)	Ignition switch on	Approximately 0 V
33	Regulated sensor supply 1		5 V
37	Air flow sensor	• Engine is running • Warm-up condition ECT: 78°C • Idle: 795 RPM • IAT: 36°C • IAT signal: 1.88 V	• Approximately 322 kg/h • Approximately 1.39 V
		• Engine is running • Warm-up condition ECT: 52°C • Idle: 910 RPM • IAT: 30°C • IAT signal: 2.17 V	• Approximately 420 kg/h • 1.52 V

03

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0103	Mass or Volume Air Flow (MAF) circuit high input	Ignition switch on or engine is running	ECM detected that the input signal is out of the acceptable range.	• MAF sensor • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature, then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING**Diagnostic Procedure****1. CHECK GROUND CONNECTIONS**

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

2. CHECK INTAKE SYSTEM

- Check the following for connection:
 - Air cleaner
 - Intake air duct

Is the check result normal?

Yes >> Go to the next step.

No >> Clean or replace the components.

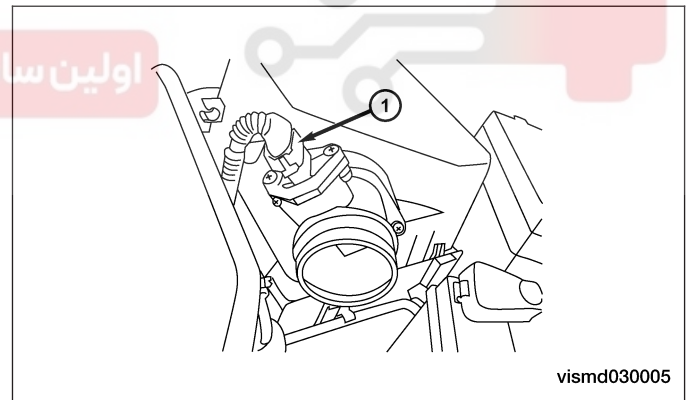
3. CHECK MAF SENSOR ELECTRICAL CONNECTOR

- Disconnect the MAF sensor electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



DIAGNOSIS & TESTING

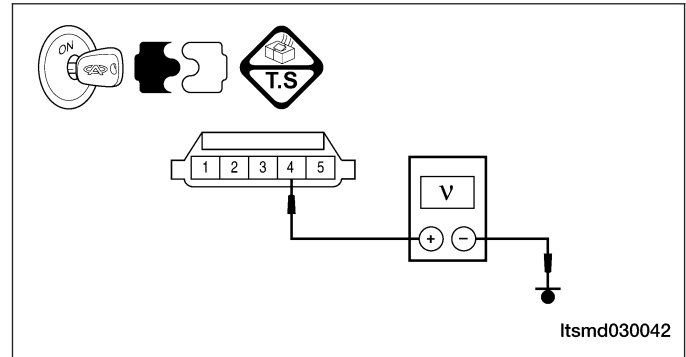
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

- Turn ignition switch on.
- Check voltage between MAF sensor terminal 4 and ground in the MAF sensor electrical connector E-009.
- 5 V should exist.

Is the check result normal?

Yes >> Go to step 6.

No >> Go to the next step.



03

5. DETECT MALFUNCTIONING PART

- Check harness for short to power between air flow sensor and ECM.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for a short to power in harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR SHORT

- Turn ignition switch off.
- Disconnect ECM harness connector.
- Check harness continuity between MAF sensor terminal 3 and ECM terminal 17.
- Continuity should exist.
- Check harness for short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for short to power in harness or connectors.

7. CHECK MAF SENSOR OUTPUT SIGNAL CIRCUIT

- Check harness continuity between MAF sensor terminal 5 and ECM terminal 37.
- Continuity should exist.
- Check harness for short to power.

Is the check result normal?

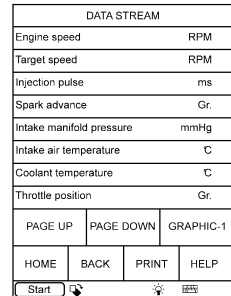
Yes >> Go to the next step.

No >> Repair or replace circuit for short to power in harness or connectors.

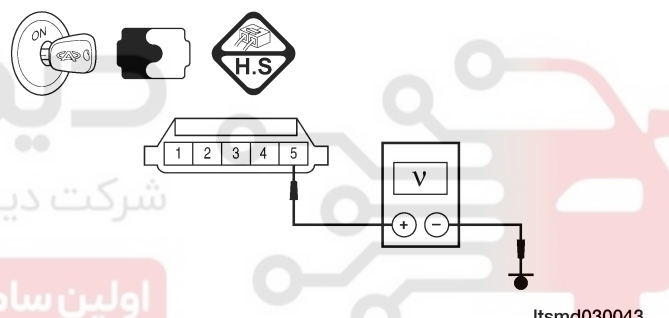
DIAGNOSIS & TESTING

8. CHECK MAF SENSOR

- Install all removed parts.
- Check MAF signal in data stream with the X-431.

ECM TERMINAL NO.	ITEM	CONDITION	DATA	
37	Air flow sensor	• Engine is running • ECT: 78°C • Idle: 795 RPM • IAT: 36°C • IAT signal: 1.88 V	Approximately 322 kg/h Approximately 1.39 V	 Itsmd030001t

- If without the X-431, check voltage between MAF sensor terminal 5 and ground.

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)	
37 (MAF sensor connector terminal 5)	Air flow sensor	• Engine is running • ECT: 78°C • Idle: 795 RPM • IAT: 36°C • IAT signal: 1.88 V	Approximately 1.39 V	 Itsmd030043

Is the signal voltage of MAF normal?

Yes >> Go to the next step.

No >> Replace MAF sensor.

9. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- See DTC Confirmation Procedure.

Is DTC P0103 still present?

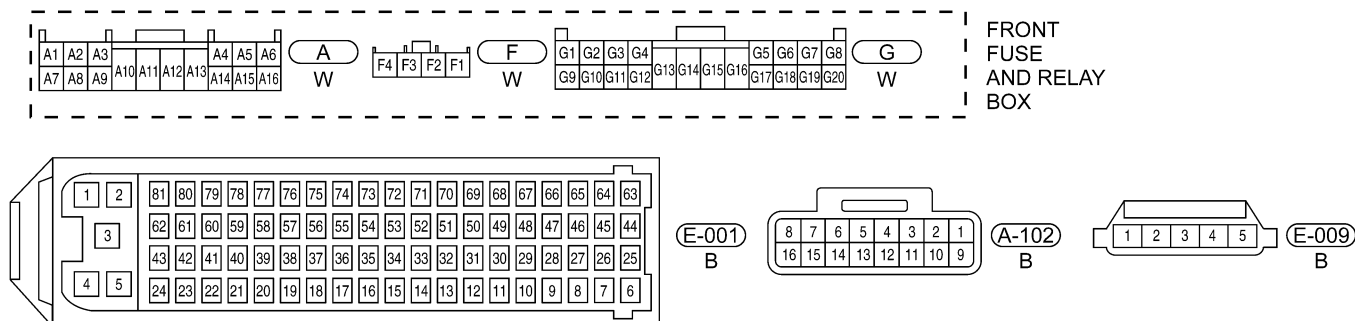
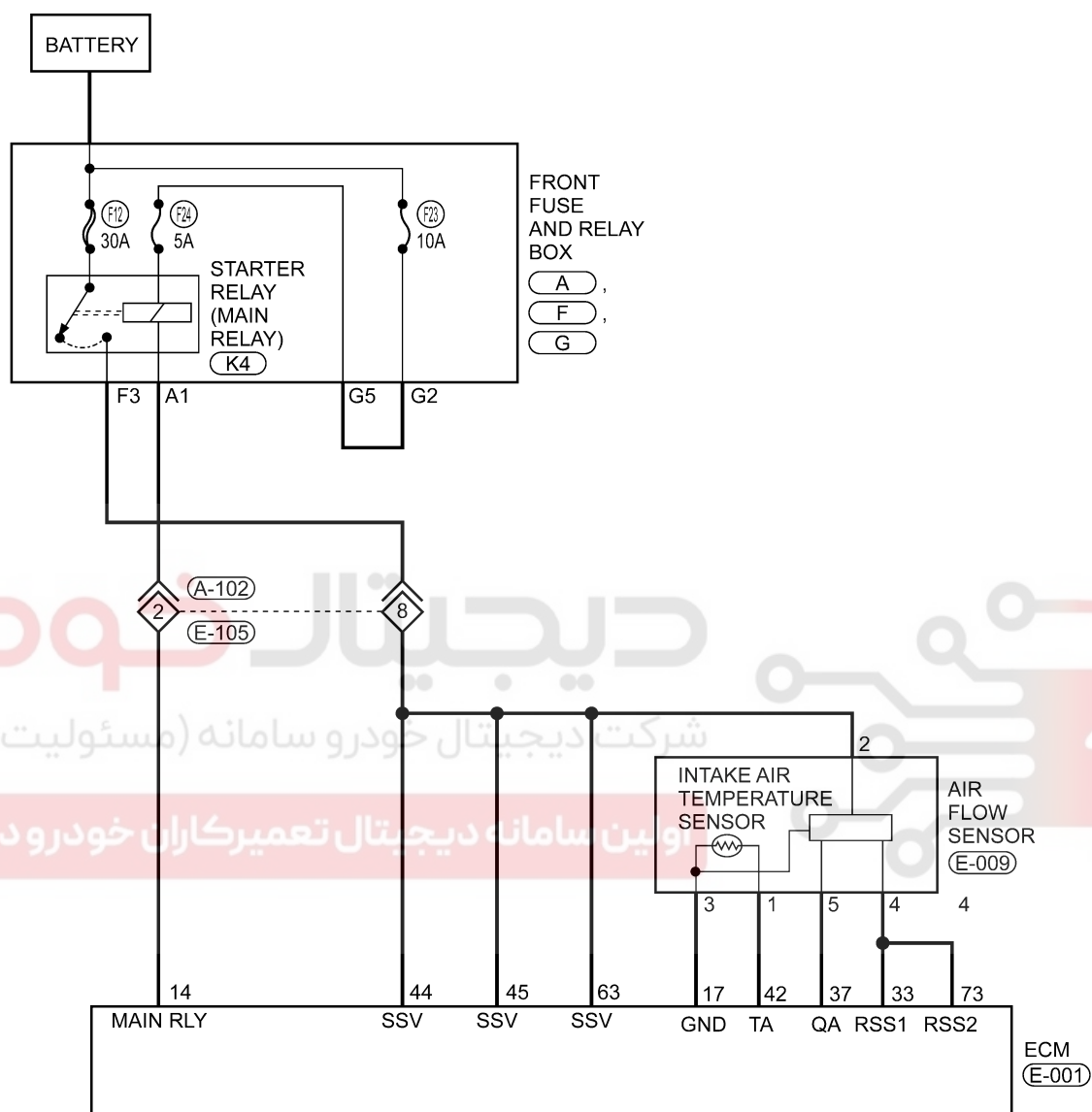
Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0112 - Intake Air Temperature Circuit Low Input

EEC - 2.0L - MAF - 01



DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
17	Sensor (GND)	Ignition switch: ON		0 V
42	Intake Air Temperature (IAT) sensor	Ignition switch: ON	IAT: 36°C	Approximately 1.88 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0112	Intake Air Temperature (IAT) circuit low input	• Ignition switch: ON • Engine: Running	Output signal is wrong or out of acceptable range.	• IAT sensor • Harness or connectors • Engine temperature • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature, then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground connections.

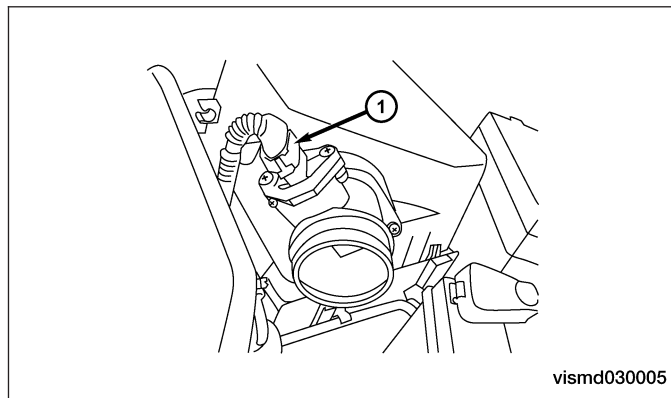
2. CHECK IAT SENSOR ELECTRICAL CONNECTOR

- Disconnect the IAT sensor (IAT sensor is built-into) electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



03

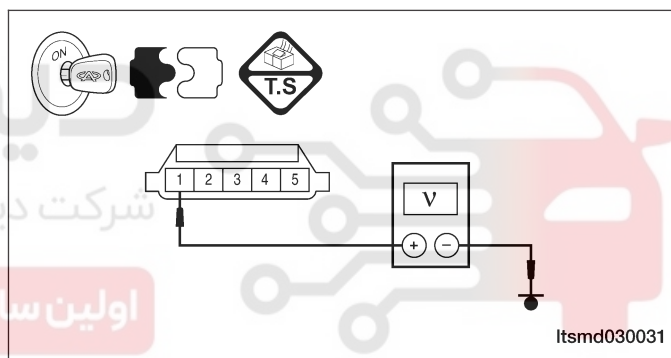
3. CHECK IAT SENSOR SIGNAL CIRCUIT

- Turn ignition switch on.
- Check reference voltage between IAT sensor terminal 1 and ground in the IAT sensor electrical connector E-009.
- 5 V should exist.

Is the check result normal?

Yes >> Go to Step 5.

No >> Go to the next step.



4. DETECT MALFUNCTIONING PART

- Turn ignition switch off.
- Disconnect ECM harness connector.
- Check harness for short to ground between IAT connector terminal 1 and ECM connector E-001, terminal 42.

Is the check result normal?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> Repair or replace the circuit for short to ground in harness or connectors.

DIAGNOSIS & TESTING

5. CHECK IAT SENSOR

- Connect IAT sensor connector.
- Connect ECM connector.
- Turn ignition switch on.
- Check signal between IAT sensor terminal 1 and ground under the following conditions:

TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
42	IAT sensor	Ignition switch on	IAT: 36°C	1.88 V

Is the check result normal?

Yes >> Go to the next step.

No >> Replace IAT sensor.

6. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0112 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

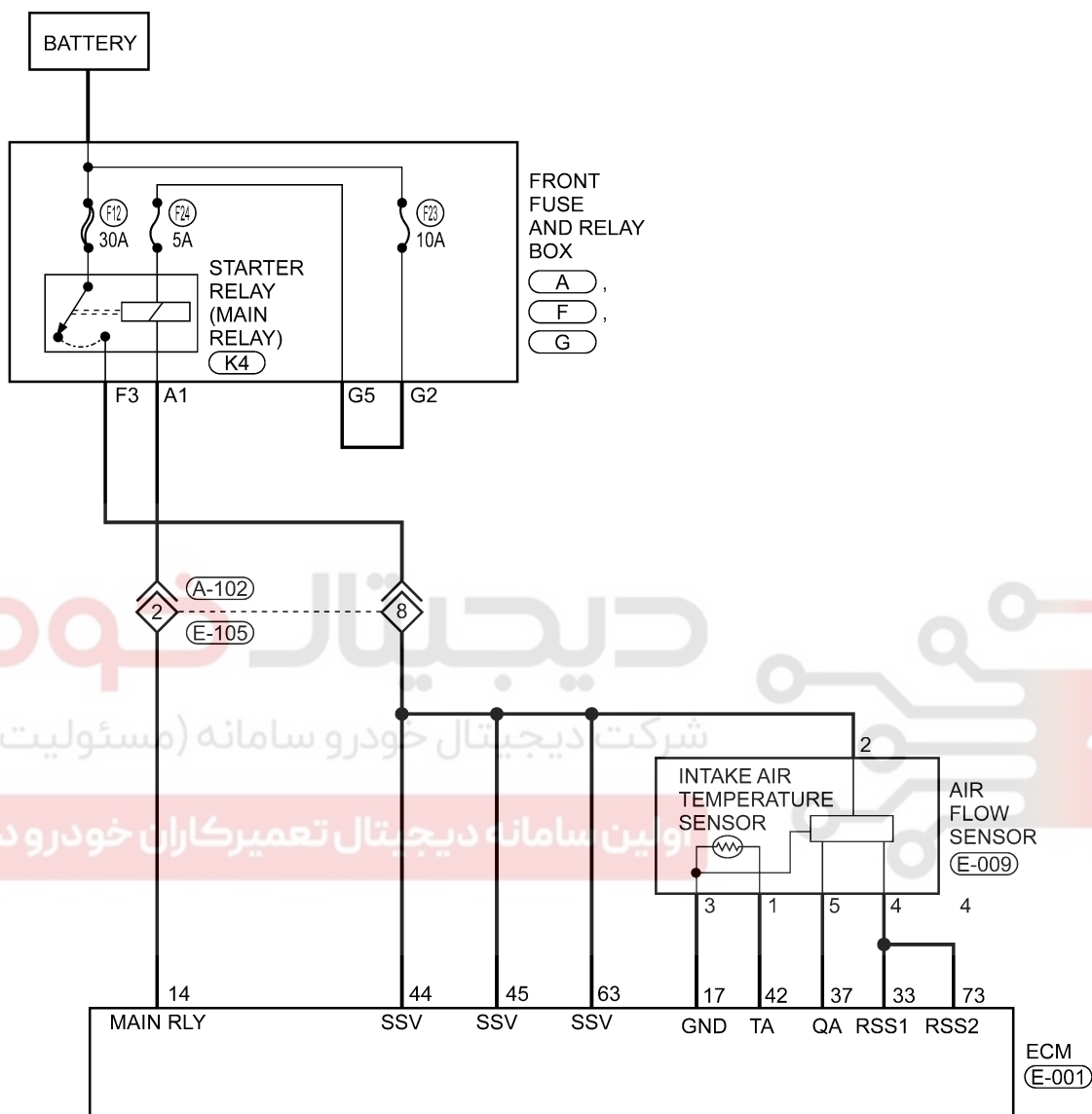
No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

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DIAGNOSIS & TESTING

P0113 - Intake Air Temperature Circuit High Input

EEC - 2.0L - MAF - 01



03

ltsmw030033t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
17	Sensor (GND)	Ignition switch: ON		0 V
42	Intake Air Temperature (IAT) sensor	Ignition switch: ON	IAT: 36°C	Approximately 1.88 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0113	Intake air temperature circuit high input	• Ignition switch: ON • Engine: Running	Output signal is wrong or out of acceptable range.	• IAT sensor • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature, then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground connections.

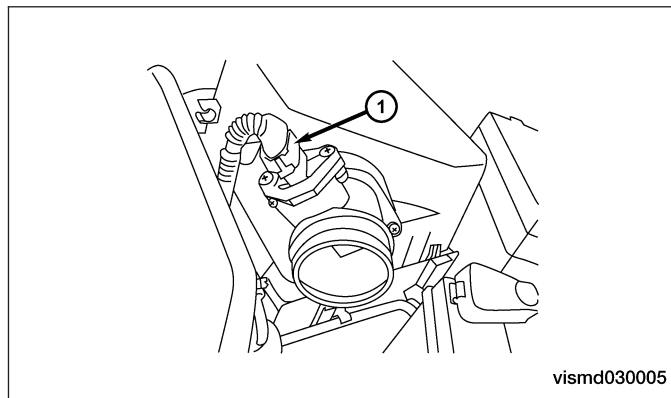
2. CHECK IAT SENSOR ELECTRICAL CONNECTOR

- Disconnect the IAT sensor (IAT sensor is built-into electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



03

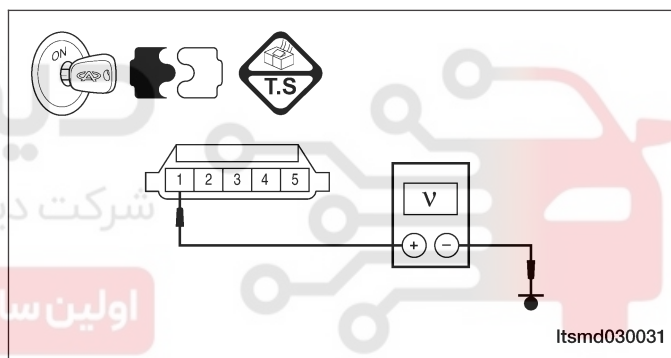
3. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR SIGNAL CIRCUIT

- Turn ignition switch on.
- Check supply voltage between IAT sensor terminal 1 and ground in the IAT sensor electrical connector E-009.
- 5 V should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open or short to power in harness or connectors.
If circuit is normal, go to the next step.



4. CHECK IAT SENSOR GROUND CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch off.
- Disconnect ECM harness connector.
- Check harness continuity between following terminals.

IAT SENSOR TERMINAL	ECM TERMINAL	
3	17	Diagram showing the IAT sensor ground circuit test setup. The ignition switch is turned OFF. A continuity tester (Ω) is connected between terminal 3 of the IAT sensor electrical connector and terminal 17 of the ECM harness connector. The diagram also shows a warning symbol for T.S. (Temperature Sensor). itsmd030067

DIAGNOSIS & TESTING

- Continuity should exist.
- Check harness for short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open or short to power in harness or connectors.

5. CHECK IAT SENSOR

- Connect IAT sensor connector.
- Connect ECM connector.
- Turn ignition switch on.
- Check signal between air flow sensor terminal 1 and ground under the following conditions:

TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
42	IAT sensor	Ignition switch on	IAT: 36°C	Approximately 1.88 V

Is the check result normal?

Yes >> Go to the next step.

No >> Replace IAT sensor.

6. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0113 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

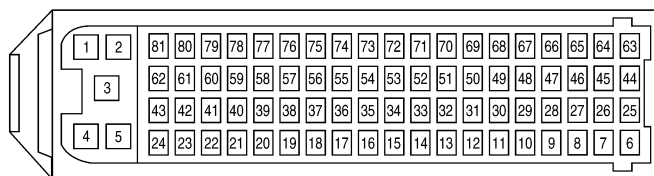
No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

DIAGNOSIS & TESTING

P0117 - Engine Coolant Temperature Circuit Low Input

EEC - 2.0L - ECT - 01

03

E-001
BE-019
B

ltsmw030034t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
39	Engine Coolant Temperature (ECT) sensor	Ignition switch: ON	ECT: 59°C	Approximately 1.89 V
			ECT: 78°C	Approximately 1.25 V
			ECT: 90°C	Approximately 0.94 V
17	Sensor (GND)		-	Approximately 0 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0117	Engine coolant temperature circuit low input	• Ignition switch: ON • Engine: Running	Signal output is below minimum acceptable range for a few seconds continuously.	• ECT sensor • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature, then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

- Before performing this DTC diagnostic procedure, verify that the engine coolant temperature is normal.

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

DIAGNOSIS & TESTING

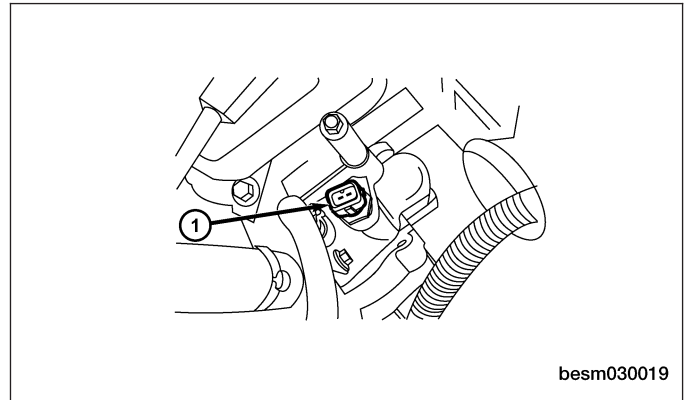
2. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR ELECTRICAL CONNECTOR

- Disconnect the ECT sensor electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



03

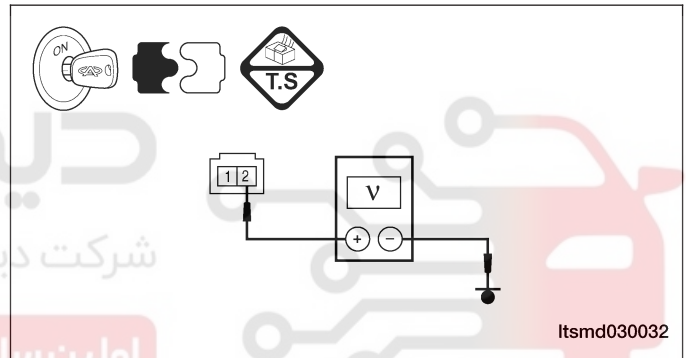
3. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR SIGNAL CIRCUIT FOR A SHORT

- Turn ignition switch on.
- Check reference voltage between ECT sensor terminal 2 and ground in the sensor electrical connector E-019.
- 4.5 - 4.9 V should exist.

Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.



4. DETECT MALFUNCTIONING PART

- Turn ignition switch off.
- Disconnect ECM harness connector.
- Check harness for a short to ground between ECT sensor connector terminal 2 and ECM connector E-001, terminal 39.

Is the check result normal?

Yes >> Replace the ECM.

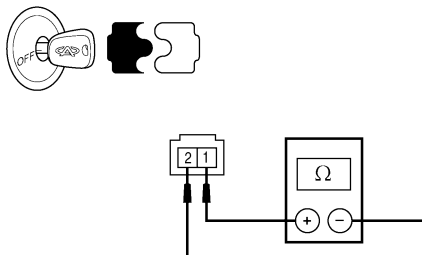
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> Repair or replace circuit for a short in harness or connectors.

DIAGNOSIS & TESTING

5. CHECK ECT SENSOR

- Check resistance between ECT sensor terminal 1 and 2.

ECT°C	RESISTANCE KΩ	
10°C	8.62 - 10.28	
20°C	2.37 - 2.63	
80°C	0.299 - 0.345	

Itsmd030034

- Connect ECT sensor connector.
- Connect ECM connector.
- Turn ignition switch on.
- Check sensor output signal.

TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
39	ECT sensor	ECT: 59°C	Approximately 1.89 V
		ECT: 78°C	Approximately 1.25 V
		ECT: 90°C	Approximately 0.94 V
17	Sensor (GND)	-	Approximately 0 V

Is the check result normal?

Yes >> Go to the next step.

No >> Replace ECT sensor.

6. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0117 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

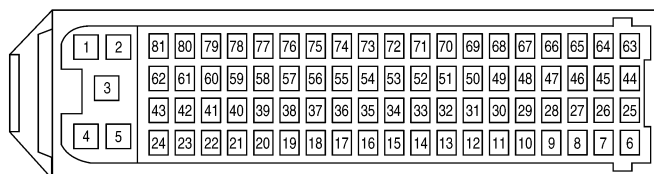
No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

DIAGNOSIS & TESTING

P0118 - Engine Coolant Temperature Circuit High Input

EEC - 2.0L - ECT - 01

03



Itsmw030034t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
39	Engine Coolant Temperature (ECT) sensor	Ignition switch: ON	ECT: 59°C	Approximately 1.89 V
			ECT: 78°C	Approximately 1.25 V
			ECT: 90°C	Approximately 0.94 V
17	Sensor (GND)		-	Approximately 0 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0118	Engine coolant temperature circuit high input	• Ignition switch: ON • Engine: Running	Signal output is above maximum acceptable range for a few seconds continuously.	• ECT • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature, then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground connections.

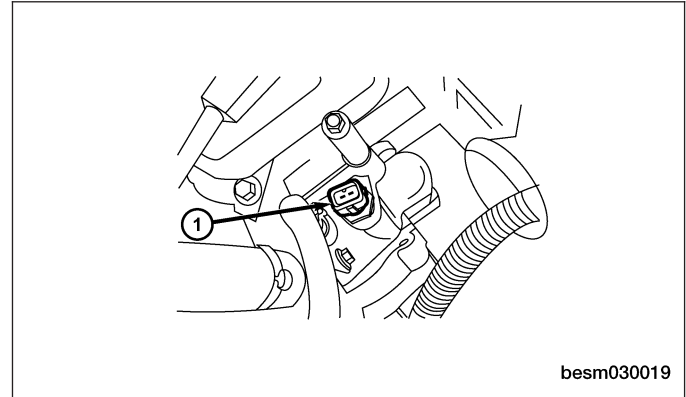
2. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR ELECTRICAL CONNECTOR

- Disconnect the ECT sensor electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



03

3. CHECK THE ECT SENSOR SIGNAL CIRCUIT FOR A SHORT

- Turn ignition switch on.
- Check ECT sensor reference voltage between sensor terminal 2 and ground in the sensor electrical connector E-019.
- 4.5 - 4.9 V should exist.

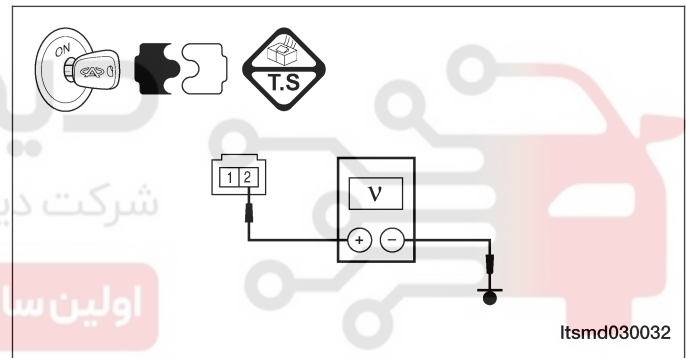
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace harness for an open or short to power between ECT connector terminal 2 and ECM connector E-001, terminal 39.

If harness is normal, replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).



4. CHECK ECT SENSOR GROUND CIRCUIT FOR AN OPEN AND SHORT

- Turn ignition switch off.
- Check harness continuity between following terminals.

ECT SENSOR TERMINAL	ECM TERMINAL	CONTINUITY	Itsmd030033
1	17	Yes	

DIAGNOSIS & TESTING

- Continuity should exist.
- Check harness for short to power.

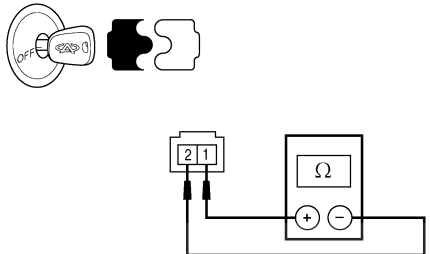
Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open or short to power in harness or connectors.

5. CHECK ECT SENSOR

- Check resistance between ECT sensor terminal 1 and 2.

ECT°C	RESISTANCE KΩ	
-10°C	8.62 - 10.28	
20°C	2.37 - 2.63	
80°C	0.299 - 0.345	

Itsmd030034

- Connect ECT sensor connector.
- Connect ECM connector.
- Turn ignition switch on.
- Check sensor signal output.

TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
39	ECT sensor	Ignition switch: ON	ECT: 59°C
			ECT: 78°C
			ECT: 90°C
17	Sensor (GND)	-	Approximately 0 V

Is the check result normal?

Yes >> Go to the next step.

No >> Replace ECT sensor.

6. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0118 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

03

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

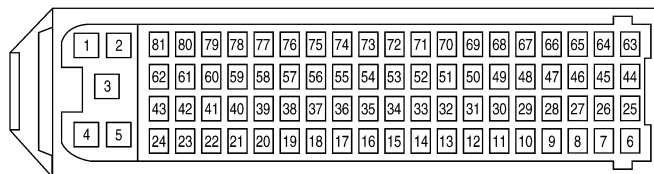
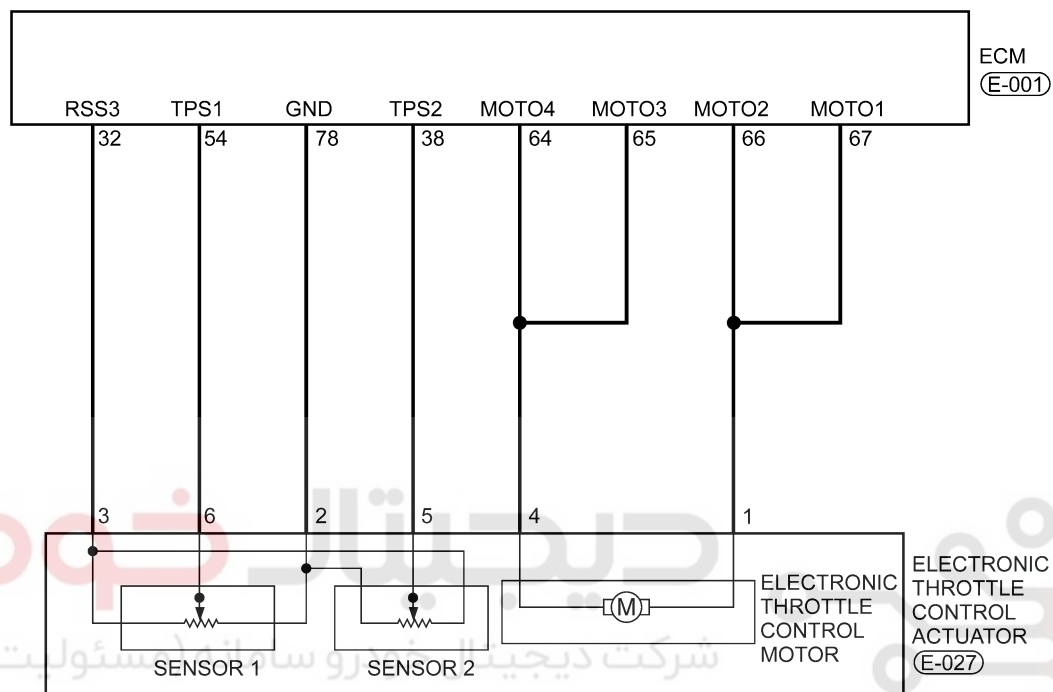
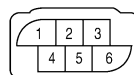
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



DIAGNOSIS & TESTING

P0122 - Throttle Position Sensor A Circuit Low Input

EEC - 2.0L - TPS - 01

E-001
BE-027
B

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)	
32	Regulated sensor supply	Ignition switch: ON	-	Approximately 5 V	
38	Electronic throttle control actuator (position sensor)		• Engine stopped • Accelerator pedal: Fully released	4.24 V	
			• Engine stopped • Accelerator pedal: Fully depressed	0.72 V	
54	Electronic throttle control actuator		• Engine stopped • Accelerator pedal: Fully released	0.74 V	
			• Engine stopped • Accelerator pedal: Fully depressed	4.62 V	
64	Motor 4			-	12 V or 0 V
65	Motor 3				
66	Motor 2				12 V or 0 V
67	Motor 1				
78	Sensor (GND)				

03

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0122	Throttle position sensor A circuit low input	• Ignition switch: ON • Engine: Running	Signal output is below minimum acceptable range for a few seconds continuously.	• TPS or misalignment • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature, then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING**Diagnostic Procedure****1. CHECK GROUND CONNECTIONS**

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

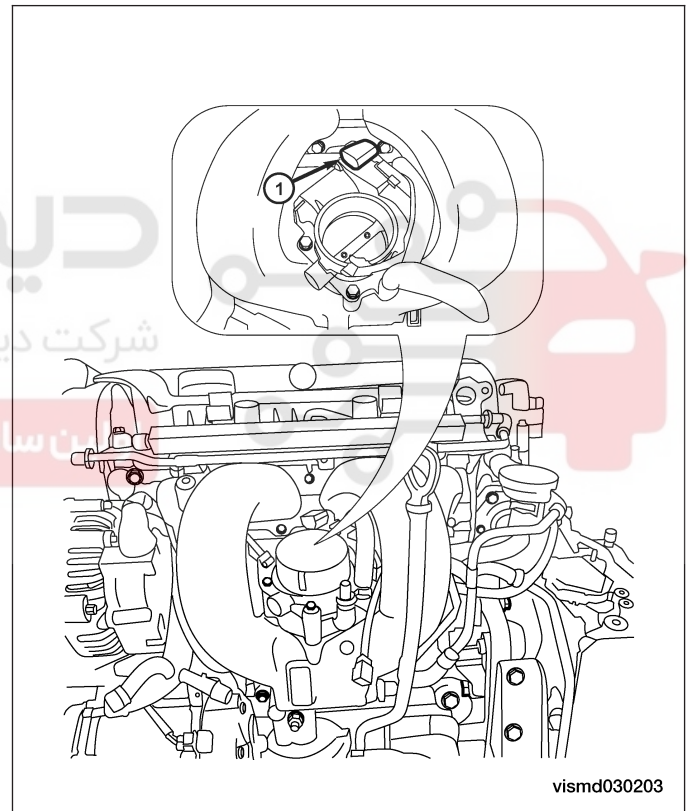
2. CHECK TPS SENSOR ELECTRICAL CONNECTOR

- Disconnect the TPS electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



DIAGNOSIS & TESTING

3. CHECK THE TPS POWER SUPPLY CIRCUIT

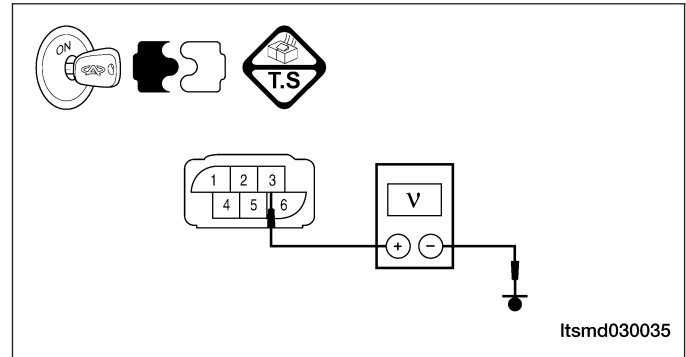
- Turn ignition switch on.
- Check throttle position sensor supply voltage between sensor terminal 3 and ground in the sensor electrical connector E-027.
- 5.0 V should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open or short to ground in harness or connectors.
If harness is normal, replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).



03

4. CHECK TPS SIGNAL CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch off.
- Disconnect ECM harness connector.
- Check harness continuity between following terminals.

TPS TERMINAL	ECM TERMINAL
6	54
5	38

- Continuity should exist.
- Check harness for a short to power.

Is the check result normal?

Yes >> Go to step 6.

No >> Go to the next step.

5. DETECT MALFUNCTIONING PART

- Check harness for an open or a short to ground between TPS connector terminal 2 and ECM connector E-001, terminal 78.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace harness or connectors.

DIAGNOSIS & TESTING

6. CHECK TPS RESISTANCE

- Check resistance between TPS terminal 2 and terminal 3.
- $2\text{ k}\Omega \pm 20\%$ (20°C) should exist.
- Check the resistance between TPS terminal 6 and terminal 2 while moving the throttle.
- The resistance should be a linear change.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace TPS.
Perform TPS self-learning.

7. CHECK THE TPS

- Turn ignition switch off.
- Connect ECM connector.
- Connect TPS connector.
- Turn ignition switch on.
- Check voltage between TPS terminal 3 and ground under the following conditions:

TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
32	Regulated sensor supply 2	Ignition switch: ON	-	Approximately 5 V
38	Electronic throttle control actuator (position sensor)		• Engine stopped • Accelerator pedal: Fully released	4.24 V
			• Engine stopped • Accelerator pedal: Fully pressed	0.72 V
54	Electronic throttle control actuator (position sensor)		• Engine stopped • Accelerator pedal: Fully released	0.74 V
			• Engine stopped • Accelerator pedal: Fully depressed	4.62 V
64	Motor 4		-	12 V or 0 V
65	Motor 3			
66	Motor 2			Approximately 0 V
67	Motor 1			
78	Sensor (GND)			

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the TPS.
Perform the TPS self-learning.

8. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0122 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

03

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

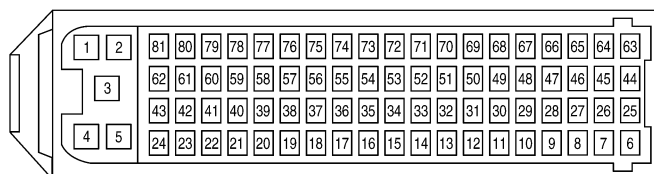
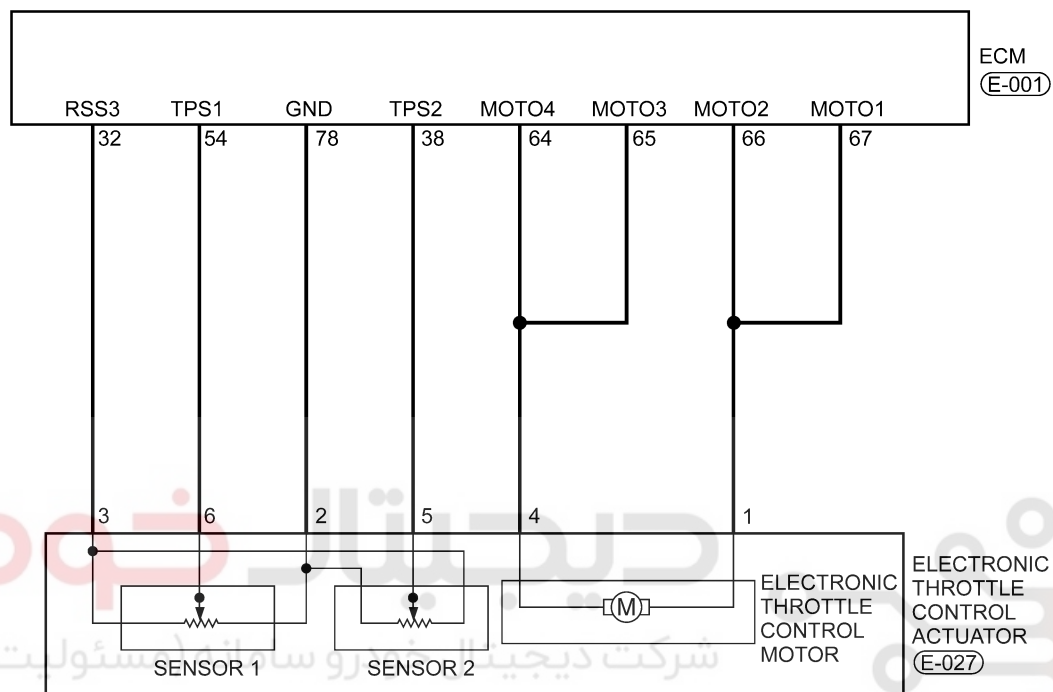
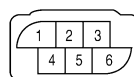
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



DIAGNOSIS & TESTING

P0123 - Throttle Position Sensor A Circuit High Input

EEC - 2.0L - TPS - 01

E-001
BE-027
B

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
32	Regulated sensor supply 2	Ignition switch: ON	-	Approximately 5 V
38	Electronic throttle control actuator (position sensor)		• Engine stopped • Accelerator pedal: Fully released	4.24 V
			• Engine stopped • Accelerator pedal: Fully depressed	0.72 V
54	Electronic throttle control actuator		• Engine stopped • Accelerator pedal: Fully released	0.74 V
			• Engine stopped • Accelerator pedal: Fully depressed	4.62 V
64	Motor 4			12 V or 0 V
65	Motor 3			
66	Motor 2			12 V or 0 V
67	Motor 1			
78	Sensor (GND)			Approximately 0 V

03

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0123	Throttle position sensor A circuit high input	• Ignition switch: ON • Engine: Running	Signal output is above maximum acceptable range for a few seconds continuously.	• TPS or misalignment • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature, then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING**Diagnostic Procedure****1. CHECK GROUND CONNECTIONS**

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

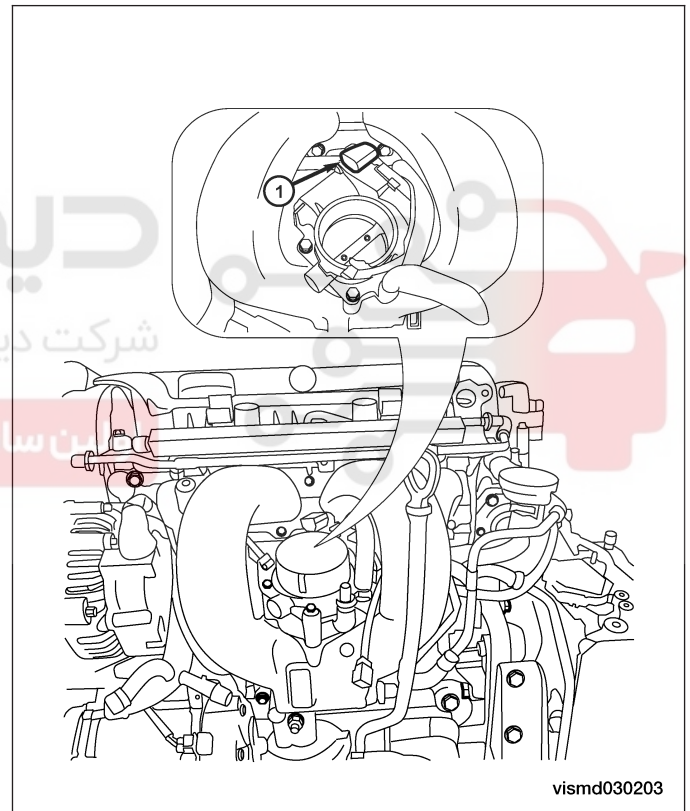
2. CHECK TPS SENSOR ELECTRICAL CONNECTOR

- Disconnect the TPS electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



DIAGNOSIS & TESTING

3. CHECK THE TPS POWER SUPPLY CIRCUIT

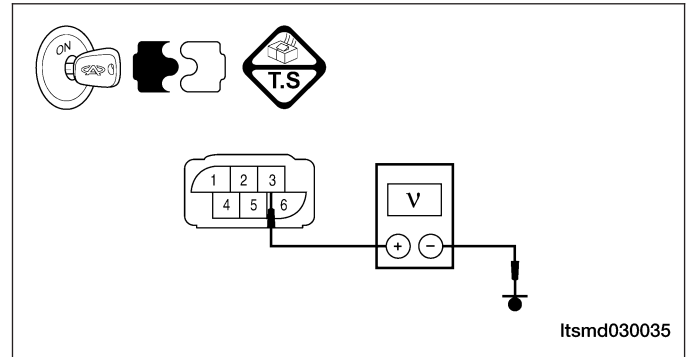
- Turn ignition switch on.
- Check supply voltage between TPS terminal 3 and ground in the TPS electrical connector E-027.
- 5 V should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for a short to power in harness or connectors.
If harness is normal, replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM
(See ECM Removal & Installation in Section 03 Electronic Engine Controls).



03

4. CHECK TPS SIGNAL CIRCUIT FOR A SHORT

- Turn ignition switch off.
- Disconnect ECM harness connector.
- Check harness for short to power.

Is the check result normal?

Yes >> Go to step 6.

No >> Go to the next step.

5. CHECK THE TPS GROUND CIRCUIT FOR AN OPEN OR SHORT

- Check harness continuity between following terminals.

TPS TERMINAL	ECM TERMINAL	
2	78	

- Continuity should exist.
- Check harness for short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair open circuit or short to power in harness or connectors.

DIAGNOSIS & TESTING

6. CHECK THE TPS RESISTANCE

- Check resistance between the TPS terminal 2 and terminal 3.
- $2\text{ k}\Omega \pm 20\%$ (20°C) should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the TPS.
Perform the TPS self-learning.

7. CHECK THE TPS

- Turn ignition switch off.
- Connect ECM connector.
- Connect TPS connector.
- Turn ignition switch on.
- Check voltage between TPS terminal 3 and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
32	Regulated sensor supply 2		-	Approximately 5 V
38	Electronic throttle control actuator (position sensor)		• Engine stopped • Accelerator pedal: Fully released	4.24 V
			• Engine stopped • Accelerator pedal: Fully depressed	0.72 V
54	Electronic throttle control actuator	Ignition switch: ON	• Engine stopped • Accelerator pedal: Fully released	0.74 V
			• Engine stopped • Accelerator pedal: Fully depressed	4.62 V
64	Motor 4		-	12 V or 0 V
65	Motor 3			
66	Motor 2			12 V or 0 V
67	Motor 1			
78	Sensor (GND)			Approximately 0 V

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the TPS.
Perform TPS self-learning.

8. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0123 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

03

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

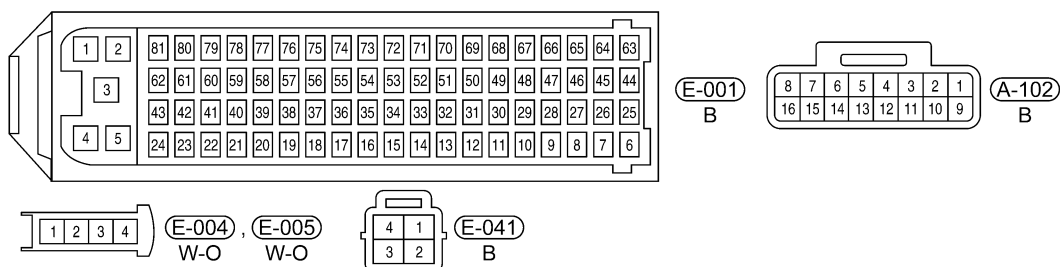
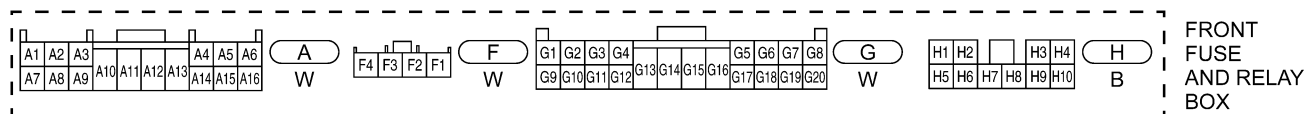
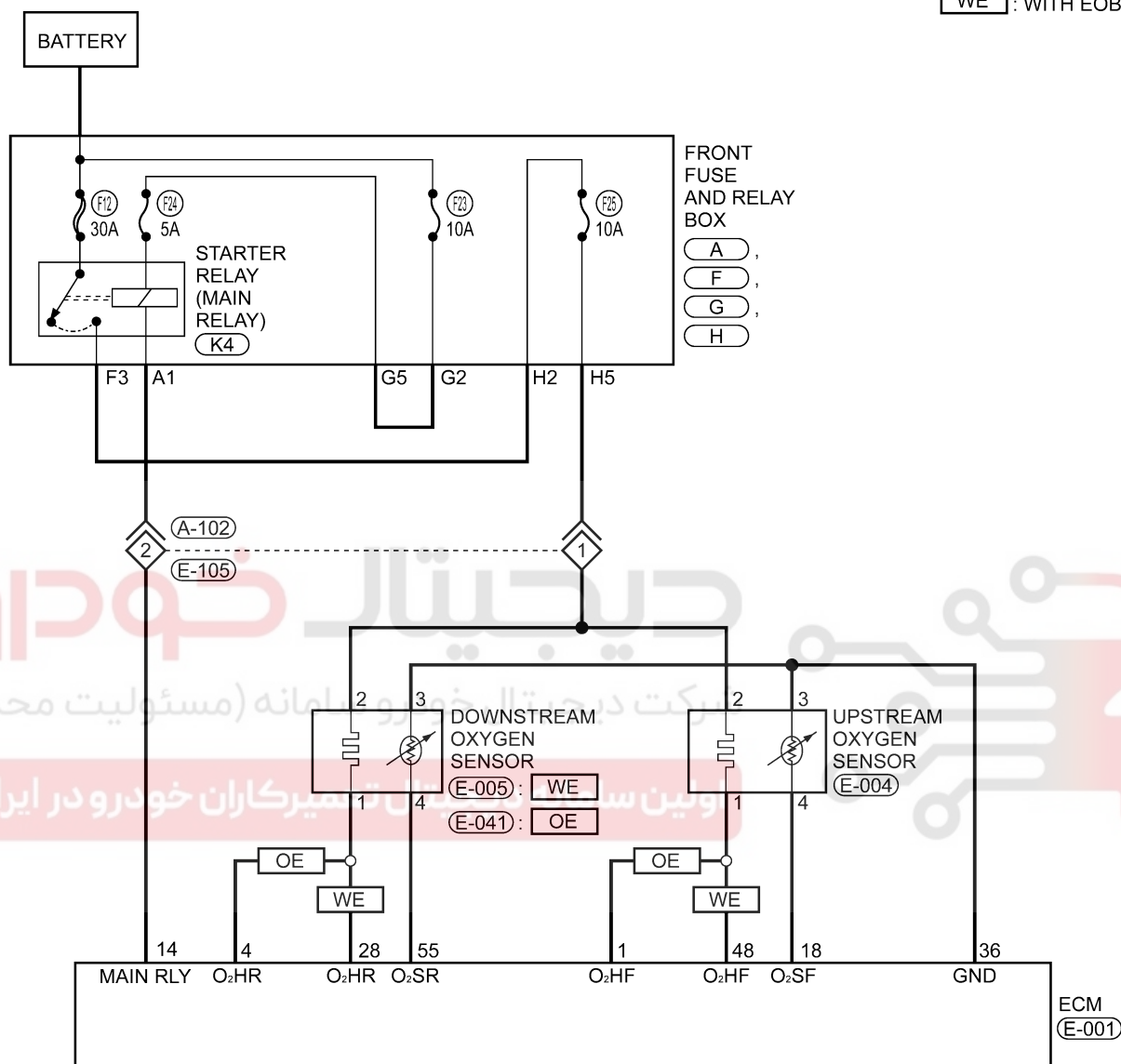


DIAGNOSIS & TESTING

P0132 - O₂ Sensor Circuit 1 High VoltageEEC - 2.0L - O₂S - 01

OE : WITHOUT EOBD

WE : WITH EOBD



Itsmw030036t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
18	Upstream oxygen sensor	- Engine is running - Warm-up condition	Approximately 0.1 - 0.9 V (change 5 - 8 times in 10 seconds periodically)
28	Downstream oxygen sensor heating (with EOBD)	-	-
36	Oxygen sensor signal ground	- Warm-up condition - Idle	Approximately 0 V
48	Upstream oxygen sensor heating (with EOBD)	-	-
55	Downstream oxygen sensor	- Engine is running - Warm-up condition	Approximately 100 mV

03

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	POSSIBLE CAUSE
P0132	O ₂ sensor 1 (upstream) circuit high voltage	Engine is running	- Fuel quality - Oxygen Sensor 1 (upstream) - Harness or connectors - ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it up to the normal operating temperature.
- Turn ignition switch off and wait at least 10 seconds.
- Start engine and keep the engine speed 2000 RPM for at least 1 minute.
- Let engine idle for 2 minutes.
- Select view data stream and DTC.
- If DTC is detected, go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnosis & Testing Diagnostic Help in Section 03 Electronic Engine Controls).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING**Diagnostic Procedure****1. CHECK GROUND CONNECTIONS**

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

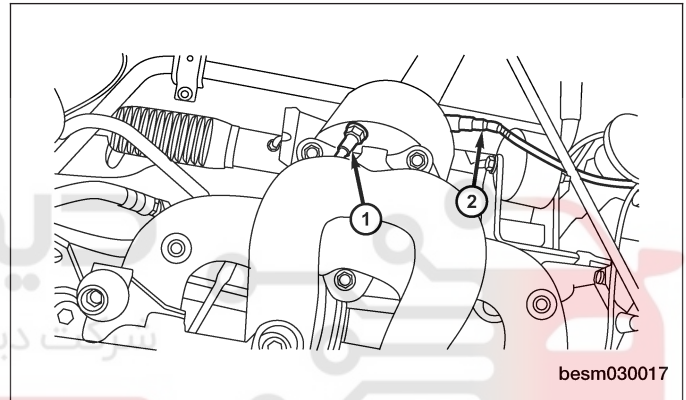
2. CHECK O₂ SENSOR ELECTRICAL CONNECTOR

- Disconnect the O₂ sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

**3. CHECK O₂ SENSOR GROUND CIRCUIT**

- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 18 and O₂ sensor terminal 4.
- Continuity should exist.
- Check harness for an open and short to power supply circuit.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open or short to power in harness or connectors.

4. CHECK O₂ SENSOR INPUT SIGNAL CIRCUIT FOR AN OPEN AND SHORT

- Check harness continuity between ECM terminal and O₂ sensor terminal as follows.

COMPONENT	ECM	UPSTREAM O ₂ SENSOR
TERMINAL	18	4

DIAGNOSIS & TESTING

- Continuity should exist.
- Check harness short to power supply circuit.

Is the check result normal?

Yes >> Go to the next step.

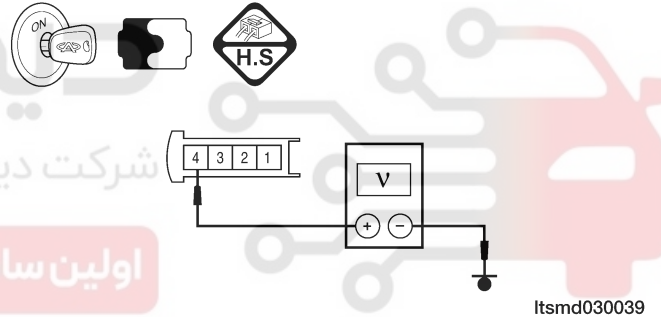
No >> Repair or replace circuit for an open or short to power in harness or connectors.

5. CHECK O₂ SENSOR

03

- Connect O₂ sensor connector.
- Connect ECM connector.
- If with the X-431, refer to data stream value.
- If without the X-431, as following procedure:
 - Start engine and warm it up to normal operating temperature 350°C.
 - Turn ignition switch off.
 - Start engine and keep the engine speed between 3,500 and 4,000 RPM for at least 1 minute.
 - Let engine idle for 1 minute.
 - Set digital multimeter probes between ECM terminal 4 and ground.

CHECK ITEM	CHECK CONTENT		NORMAL VALUE
Oxygen sensor	• Warm-up condition • Become lean while decelerate	Decelerate from 4,000 RPM suddenly	Below 100 mV
	• Warm-up condition • Become rich while accelerate	Accelerate suddenly	Approximately 600 - 900 mV
	• Warm-up condition • Check with O ₂ sensor signal	Idle	100 - 900 mV
		2500 RPM	Approximately 600 - 900 mV



Is the check result normal?

Yes >> Go to the next step.

No >> Replace O₂ sensor.

6. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0132 still present?

Yes >> Replace the ECM.

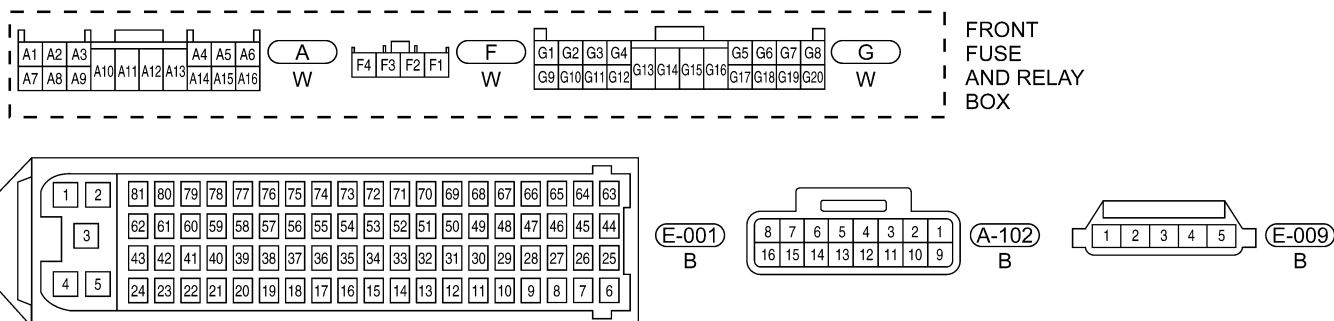
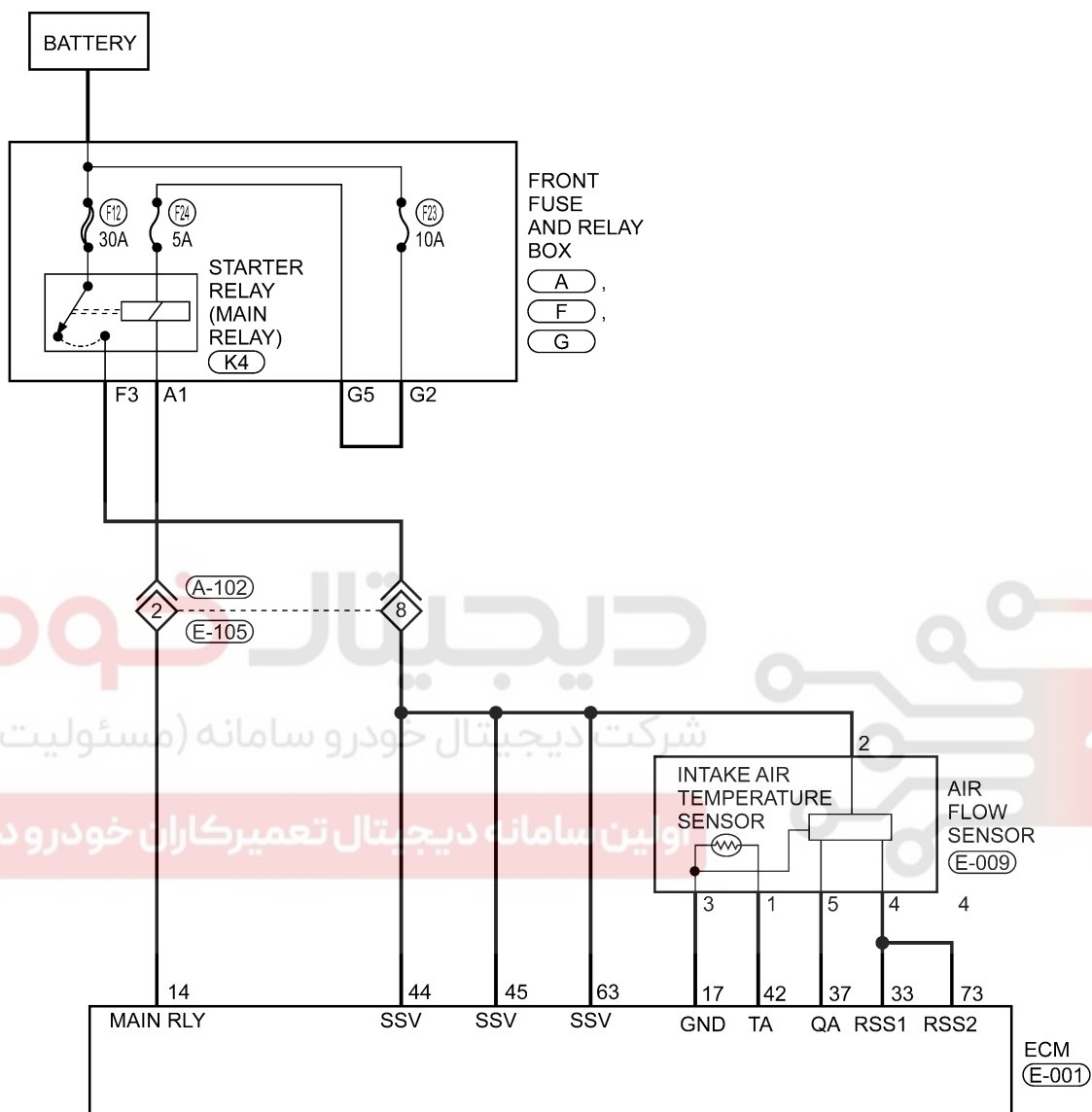
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

DIAGNOSIS & TESTING

P0171 - Fuel Trim System Too Lean

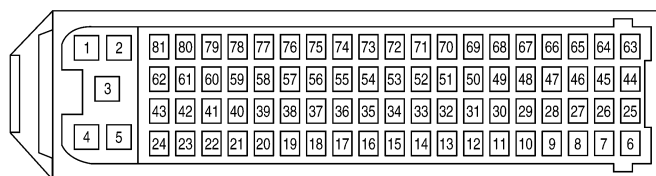
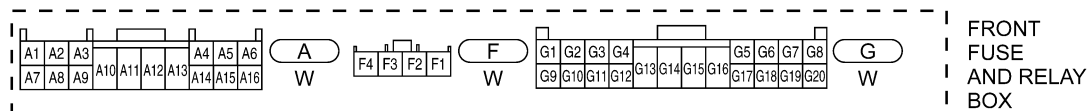
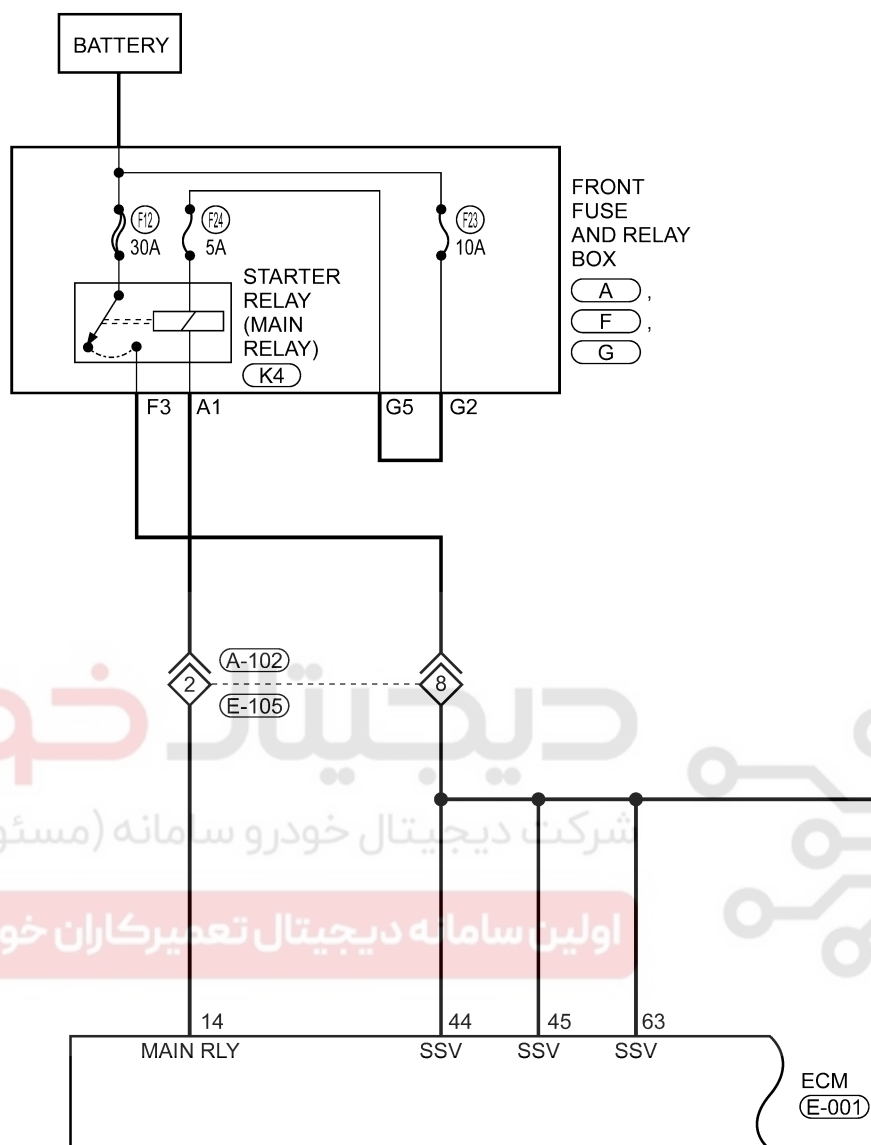
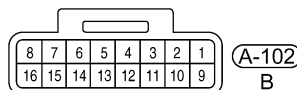
EEC - 2.0L - MAF - 01



ltsmw030033t

DIAGNOSIS & TESTING

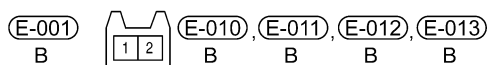
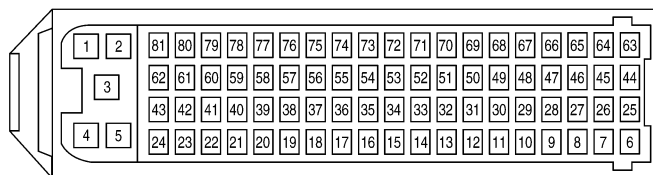
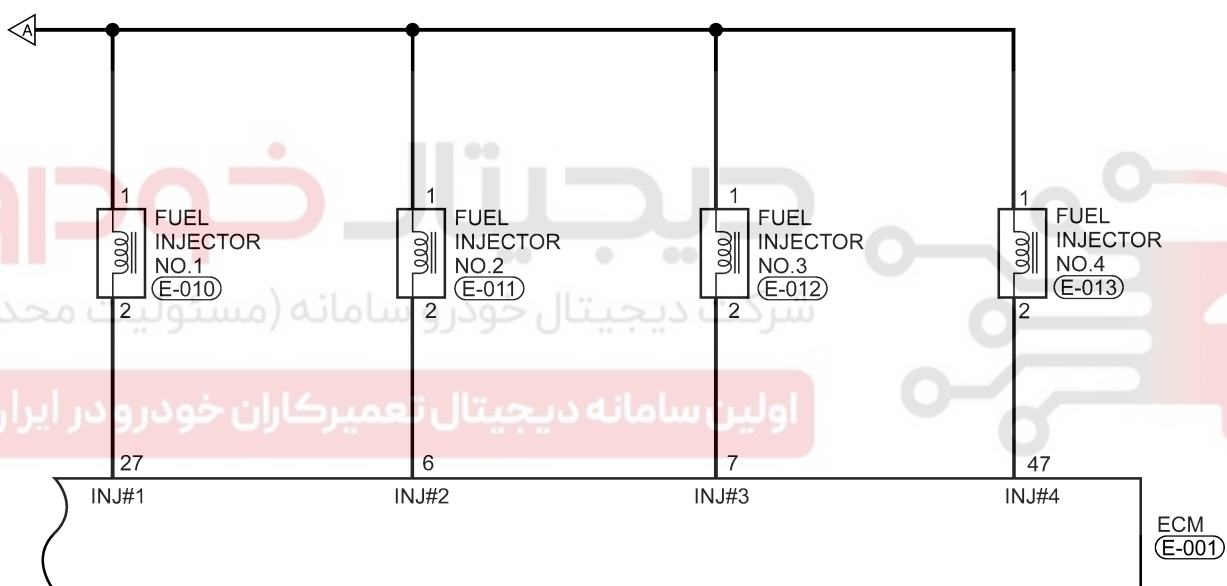
EEC - 2.0L - INJ - 01

E-001
BFRONT
FUSE
AND RELAY
BOX

Itsmw030029t

DIAGNOSIS & TESTING

EEC - 2.0L - INJ - 02



Itsmw030030t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
6	Injector 2	• Engine is running • Warm-up condition • Idle • Accelerate suddenly	Voltage: 11 - 14 V
7	Injector 3		
27	Injector 1		
47	Injector 4		

03

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
17	Sensor (GND)	• Engine is running • Warm-up condition: 78°C • Idle: 795 RPM • IAT: 36°C • IAT signal: 1.88 V	0 V
33	Regulated sensor supply 1		Approximately 5 V
37	Air flow sensor		Approximately 322 kg/h
			Approximately 1.39 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0171	Fuel trim system too lean	Engine is running	The amount of mixture ratio compensation is too large (The mixture ratio is too lean).	• Intake air leaks • Air flow sensor • Fuel injector • Exhaust gas leaks • Incorrect fuel pressure • lack of fuel • Incorrect PCV hose connection • Upstream O₂ sensor • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature, then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING

Diagnostic Procedure

1. CHECK EXHAUST GAS LEAK

- Start engine and run it at idle.
- Listen for exhaust gas leak before the three way catalyst.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK

- Turn ignition switch on.
- Listen for intake air leak after the air flow sensor.
- Check PCV hose connector.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace.

3. CHECK ECM CONTROL SIGNAL IN DATA STREAM

- With the X-431, select view data stream.

MONITOR ITEM	CONDITION	DATA
Injector pulse	• Engine: warm up • Shift: P or N • Air conditioning: off • No load Idle	Approximately 2.5 ms

Is the check result normal?

Yes >> Go to step 7.

No >> Go to the next step.

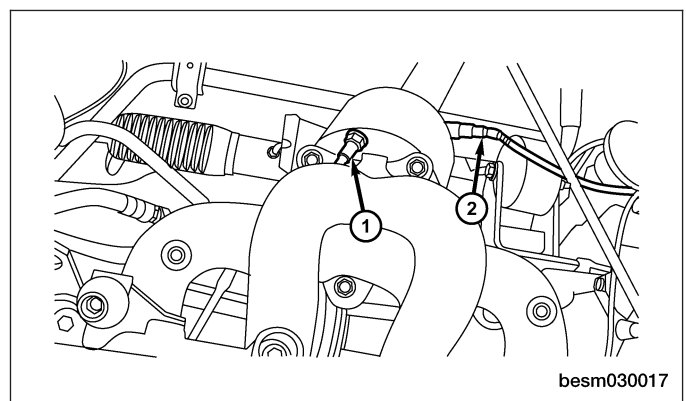
4. CHECK UPSTREAM O₂ SENSOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the upstream O₂ sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



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DIAGNOSIS & TESTING

5. CHECK UPSTREAM O₂ SENSOR SIGNAL CIRCUIT

- Disconnect ECM harness connector.
- Check harness continuity between the following terminals.

UPSTREAM O ₂ SENSOR	ECM TERMINAL	O ₂ SENSOR TERMINAL
O ₂ sensor 1	36	3
	18	4

- Continuity should exist.
- Also check harness for short to ground.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open or short to ground in harness or connectors.

6. CHECK AIR FLOW SENSOR SIGNAL

- Check air flow in data stream.

TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
37	Air flow sensor	• Engine is running • ECT: 78°C • Idle: 795 RPM • IAT: 36°C • IAT signal: 1.88 V	Approximately 322 kg/h
			Approximately 1.39 V

Is the check result normal?

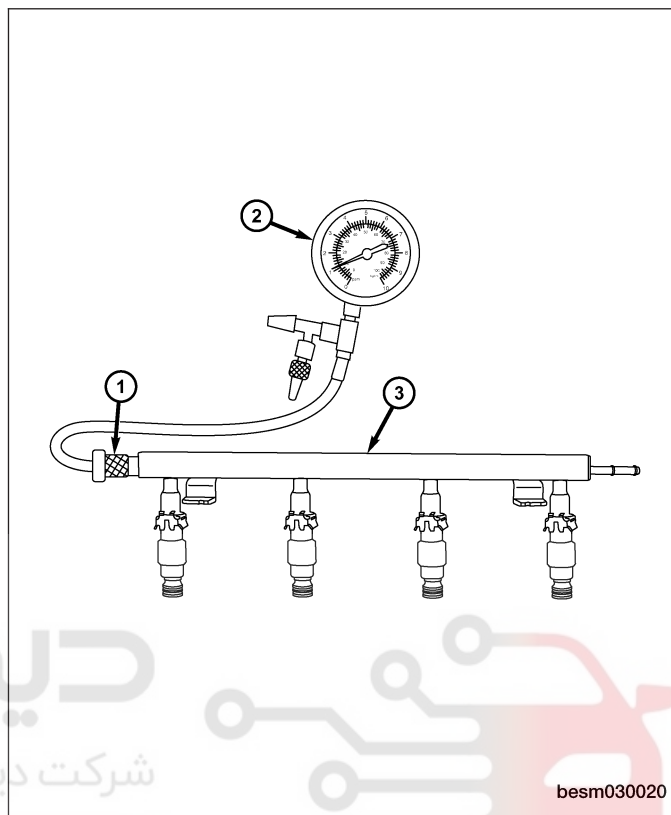
Yes >> Go to the next step.

No >> Check connectors for rusted terminals or loose connectors in the air flow sensor circuit or ground.

DIAGNOSIS & TESTING

7. CHECK FUEL PRESSURE

- Release fuel pressure to zero.
- Install fuel pressure gauge (2) and check fuel pressure.



besm030020

- Observe the following fuel pressures when testing (See Fuel Pressure Test in Section 04 Fuel Delivery).

FUEL PRESSURES	
Key On	400 kPa (4.0 bar)
Key Off	380 kPa (3.8 bar) in 10 minutes
Engine Idle	400 kPa (4.0 bar) - 420 kPa (4.2 bar)

Is the check result normal?

Yes >> Go to step 9.

No >> Go to the next step.

8. DETECT MALFUNCTIONING PART

- Check the following:
 - Fuel pump and circuit.
 - Fuel pressure regulator.
 - Fuel lines.
 - Fuel filter for clogging.

Is the check result normal?

Yes >> If with the X-431, go to the next step.
If without the X-431, go to step 10.

No >> Repair or Replace malfunctioning part.

DIAGNOSIS & TESTING

9. PERFORM ACTUATE TEST FUNCTION

- Start engine.
- Select "ACTIVE TEST" menu.
- Perform injector active test.
- Make sure that each test produces a momentary engine speed drop.

Is the check result normal?

Yes >> Go to step 12.

No >> Go to the next step.

03

10. CHECK FUNCTION OF INJECTOR

- Listen to each injector operating sound.
- Operating sound should exist.

Is the check result normal?

Yes >> Go to step 12.

No >> Go to the next step.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

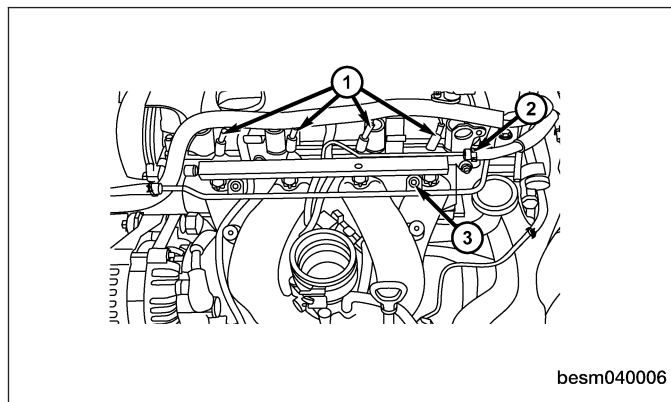
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



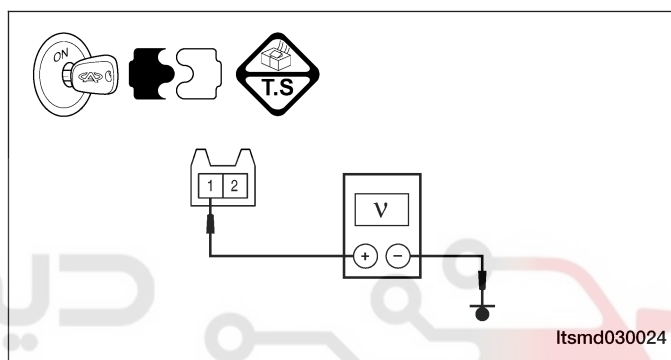
DIAGNOSIS & TESTING

11. CHECK INJECTOR POWER SUPPLY CIRCUIT AND CONTROL CIRCUIT

- Turn ignition switch off.
- Disconnect injector harness connector (1).



- Turn ignition switch on.
- Check injector supply voltage between sensor terminal and ground in the electrical connector.



- Battery voltage should exist.
- Turn ignition switch off
- Disconnect ECM harness connector.
- Check harness continuity between following terminals.

INJECTOR NO.	ECM TERMINAL	INJECTOR TERMINAL
1	27	2
2	6	2
3	7	2
4	47	2

Diagram showing the continuity measurement setup. A multimeter (Ω) is connected between the ECM terminal (1) and the injector terminal (2). The ignition switch is turned OFF. The diagram is labeled Itsmd030025.

- Continuity should exist.
- Check harness for short to power.

Is the check result normal?

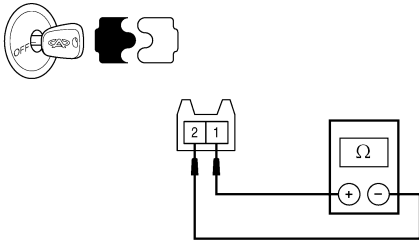
Yes >> Go to the next step.

No >> Repair or replace circuit for an open or short to power or short to ground in harness or connectors.

DIAGNOSIS & TESTING

12. CHECK INJECTOR RESISTANCE

- Disconnect injector harness connectors (See Fuel Pressure Test in Section 04 Fuel Delivery).
- Check the resistance of the injectors.

INJECTOR NO.	INJECTOR TERMINAL	RESISTANCE (APPROXIMATELY) Ω (20°C)	
1	1 & 2	16	
2	1 & 2		
3	1 & 2		
4	1 & 2		

03

Is the check result normal?

Yes >> Go to the next step.

No >> Replace injector.
Go to step 14.

13. CHECK INJECTOR

- Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- Remove fuel delivery rail with injectors (See Fuel Injector Rail Removal & Installation 1.6L/1.8L/2.0L in Section 04 Fuel Delivery).

NOTE :

Be careful not to drop the fuel injectors when removing the fuel delivery rail.

- Keep fuel hose and all injectors connected to injector rail.
- Disconnect all ignition coil harness connectors.
- Prepare pans or saucers under each injector.
- Crank engine for about 3 seconds.
- Fuel should be sprayed evenly for each injector.

Is the check result normal?

Yes >> Go to next step.

No >> Clean or replace the defective fuel injector.

14. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- See DTC Confirmation Procedure.

Is DTC P0171 still present?

Yes >> Replace the ECM.

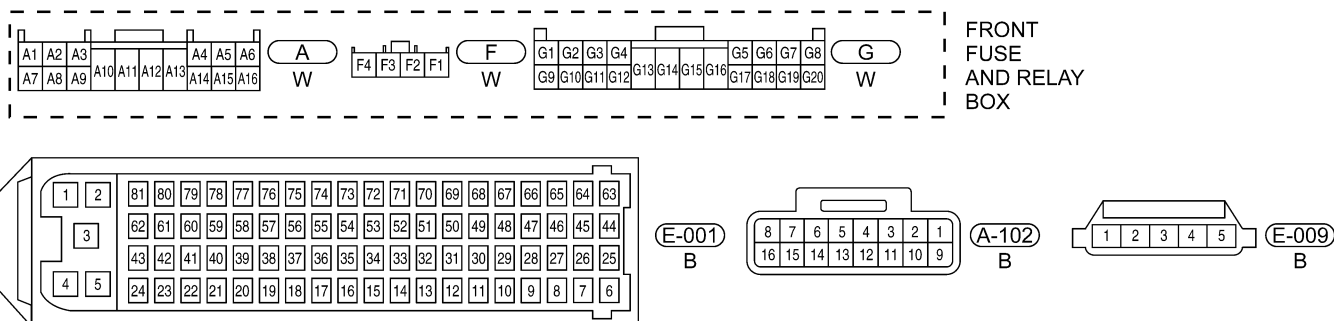
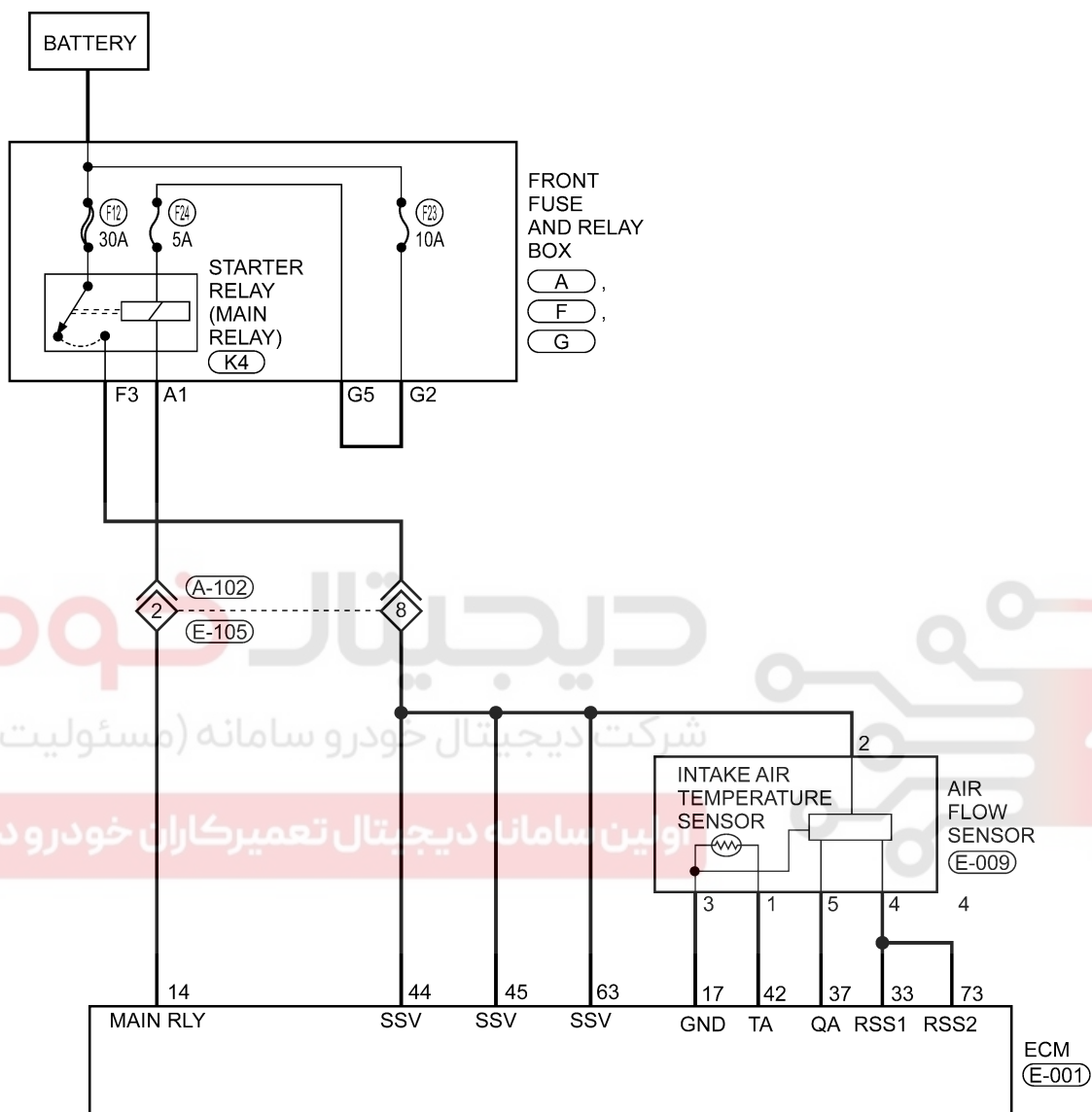
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

DIAGNOSIS & TESTING

P0172 - Fuel Trim System Too Rich

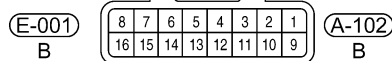
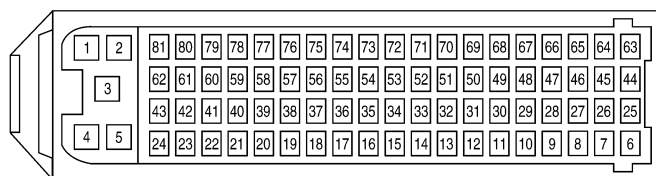
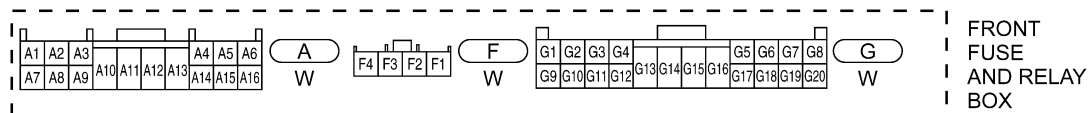
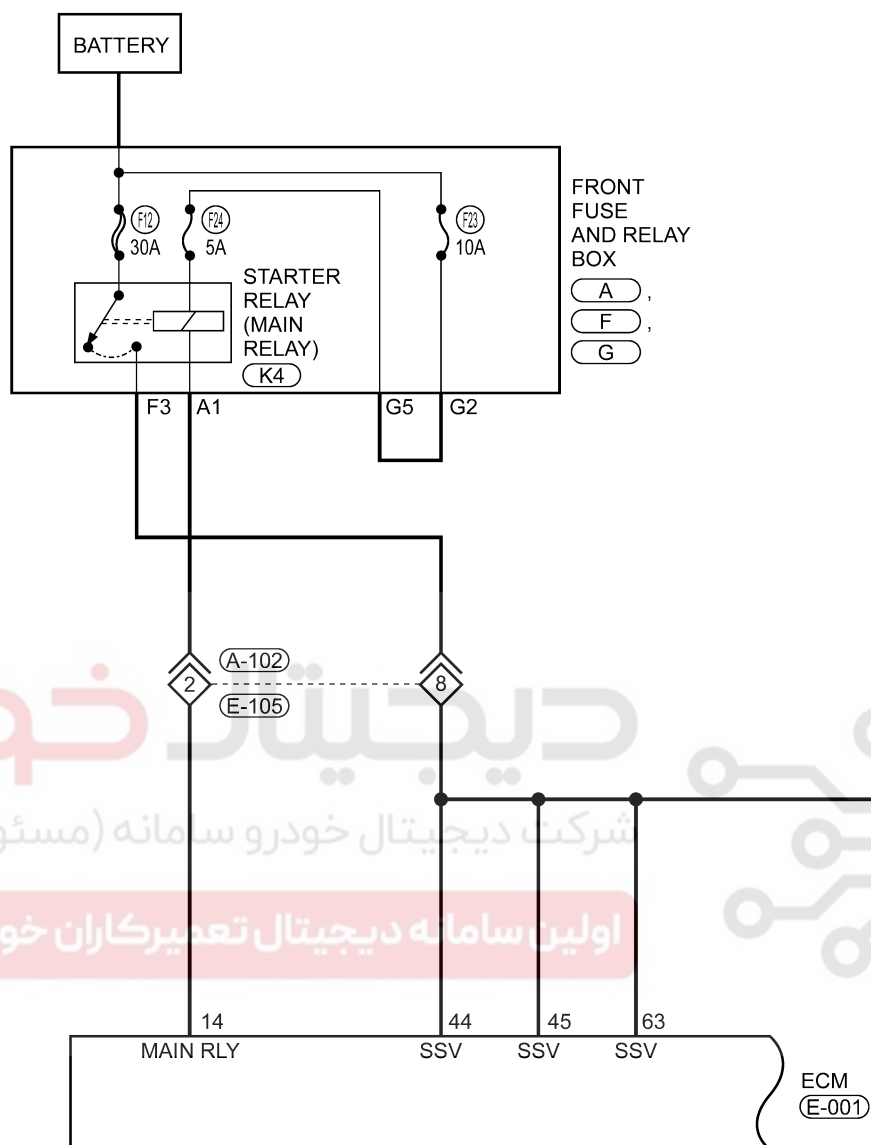
EEC - 2.0L - MAF - 01



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DIAGNOSIS & TESTING

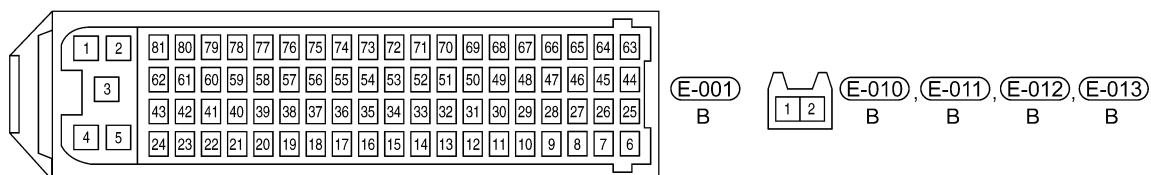
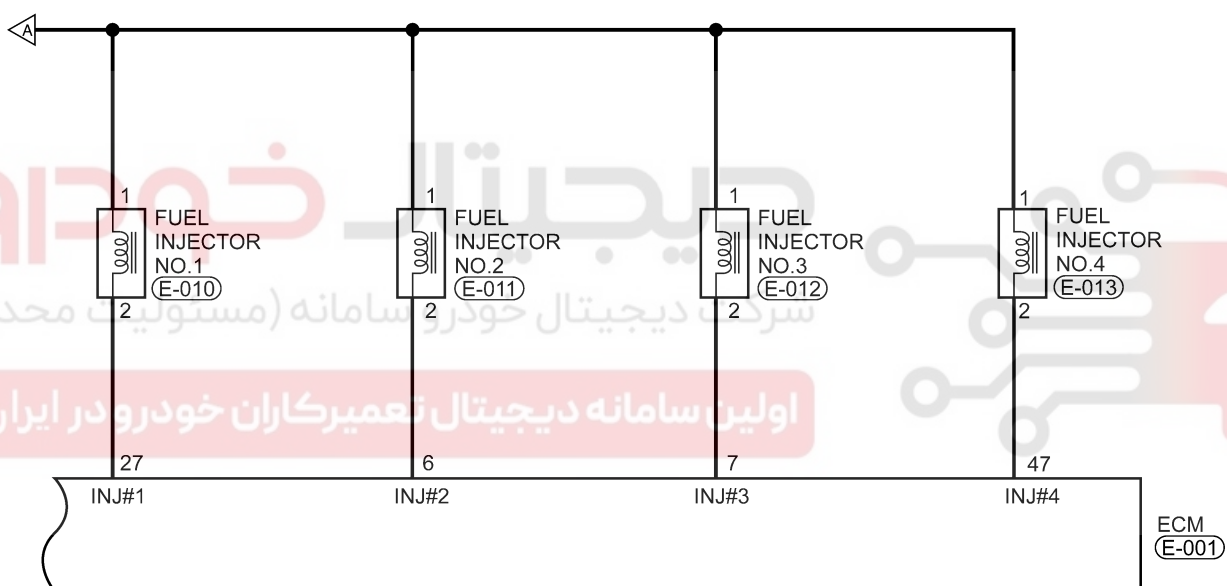
EEC - 2.0L - INJ - 01



Itsmw030029t

DIAGNOSIS & TESTING

EEC - 2.0L - INJ - 02



Itsmw030030t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
6	Injector 2	• Engine is running • Warm-up condition • Idle • Accelerate suddenly	Voltage: 11 - 14 V
7	Injector 3		
27	Injector 1		
47	Injector 4		

03

ECM TERMINAL NO.	ITEM	CONDITION	DATA
17	Sensor (GND)	• Engine is running • ECT: 78°C • Idle: 795 RPM • IAT: 36°C • IAT signal: 1.88 V	0 V
33	Regulated sensor supply 1		5 V
37	Air flow sensor		322 kg/h
			1.39 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NUMBER	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0172	Fuel trim system too rich	Engine is running	The amount of mixture ratio compensation is too large (The mixture ratio is too rich).	• MAF sensor • Fuel injector • Exhaust gas leaks • Incorrect fuel pressure • Upstream O₂ sensor • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature, then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING

Diagnostic Procedure

1. CHECK EXHAUST GAS LEAK

- Start engine and run it at idle.
- Listen exhaust gas leak before three way catalyst.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace.

2. CHECK ECM CONTROL SIGNAL IN DATA STREAM

- With the X-431, select view data stream.

REFERENCE DATA			
MONITOR ITEM	CONDITION		DATA
Injector pulse	• Engine: warm up • Shift: P or N • Air condition: Off • No load	Idle	Approximately 2.5 ms

Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.

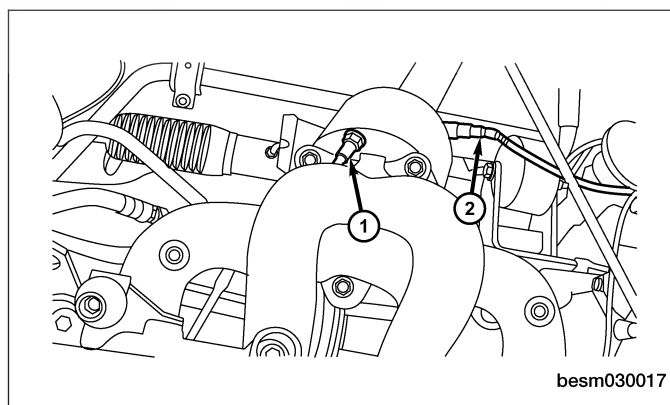
3. CHECK UPSTREAM O₂ SENSOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the upstream O₂ sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

4. CHECK UPSTREAM O₂ SENSOR SIGNAL CIRCUIT

- Disconnect ECM harness connector.
- Check harness continuity between the following terminals.

UPSTREAM O ₂ SENSOR	ECM TERMINAL	O ₂ SENSOR TERMINAL
O ₂ sensor 1	36	3
	18	4

DIAGNOSIS & TESTING

- Continuity should exist.
- Also check harness for short to power.

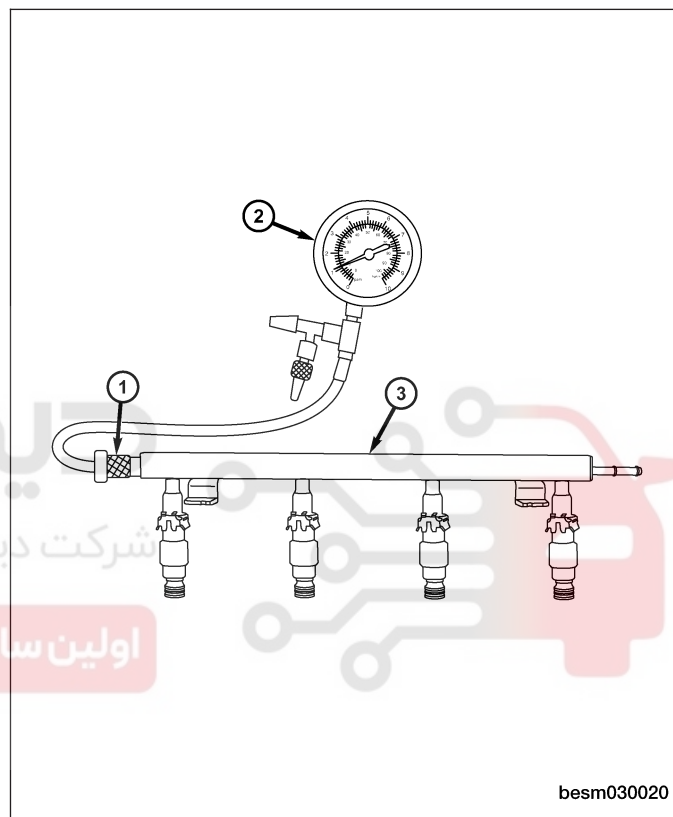
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open or short to power in harness or connectors.

5. CHECK FUEL PRESSURE

- Release fuel pressure to zero.
- Install fuel pressure gauge (2) and check fuel pressure.



- Observe the following fuel pressures when testing (See Fuel Pressure Test in Section 04 Fuel Delivery)

FUEL PRESSURES	
Key On	400 kPa (4 bar)
Key Off	380 kPa (3.8 bar) in 10 minutes
Engine Idle	400 kPa (4.0 bar) - 420 kPa (4.2 bar)

Is the check result normal?

Yes >> Go to step 7.

No >> Go to the next step.

DIAGNOSIS & TESTING

6. DETECT MALFUNCTIONING PART

- Check the following:
 - Fuel pump and circuit
 - Fuel pressure regulator

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace malfunctioning part.

7. CHECK MAF SENSOR

- Turn ignition switch off.
- Install all removed parts.
- Check air flow in data stream.

MAF SENSOR SIGNAL			
TERMINAL NO.	ITEM	CONDITION	DATA
37	Air flow sensor	• Engine is running • ECT: 78°C • Idle: 795 RPM • IAT: 36°C • IAT signal: 1.88 V	322 kg/h
			1.39 V

Is the check result normal?

Yes >> If with the X-431, go to the next step.
If without the X-431, go to step 9.

No >> Check connectors for damaged or air flow signal circuit for short to power.

8. PERFORM ACTIVE TEST FUNCTION

- Start engine.
- Select "ACTIVE TEST" menu.
- Perform injector active test.
- Make sure that each test produces a momentary engine speed drop.

Is the check result normal?

Yes >> Go to step 11.

No >> Go to the next step.

9. CHECK FUNCTION OF INJECTOR

- Listen to each injector operating sound.
- Operating sound should exist.

Is the check result normal?

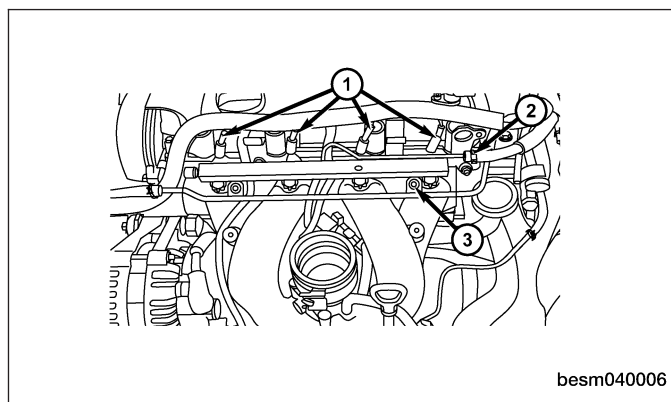
Yes >> Go to step 11.

No >> Go to the next step.

DIAGNOSIS & TESTING

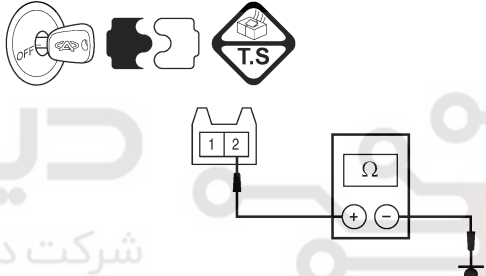
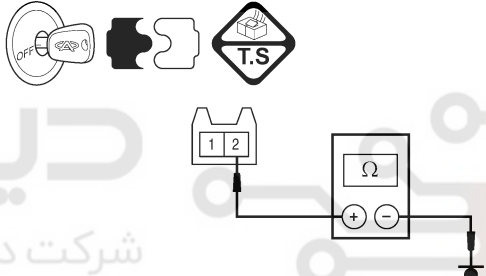
10. CHECK INJECTOR CONTROL CIRCUIT

- Turn ignition switch off.
- Disconnect injector harness connector (1).



03

- Disconnect ECM harness connector.
- check harness for short to ground between following terminals.
- Continuity should not exist.

INJECTOR NO.	ECM TERMINAL	INJECTOR TERMINAL	
1	27	2	
2	6	2	
3	7	2	
4	47	2	

Itsmd030040

Is the check result normal?

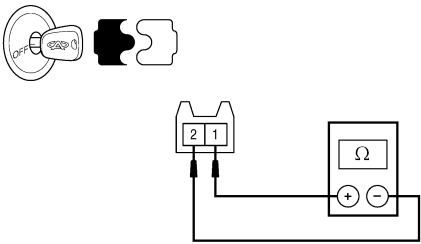
Yes >> Go to the next step.

No >> Repair or replace the circuit for short to ground in harness or connectors.

11. CHECK INJECTOR RESISTANCE

- Disconnect injector harness connectors (See Fuel Pressure Test in Section 04 Fuel Delivery).
- Check the fuel injector resistance as shown in the following:

INJECTOR RESISTANCE		
INJECTOR NO.	INJECTOR TERMINAL	RESISTANCE (APPROXIMATELY) Ω (20°C)
1	1 & 2	11 - 16
2	1 & 2	
3	1 & 2	
4	1 & 2	



The diagram illustrates the procedure for testing injector resistance. At the top, a key icon is shown next to a connector icon. Below, a circuit diagram shows a multimeter connected to terminals 1 and 2 of the injector harness connector. The multimeter is labeled with a resistance symbol (Ω) and polarity (+ and -) terminals.

Itsmd030027

DIAGNOSIS & TESTING

Is the check result normal?

Yes >> Go to the next step.

No >> Replace injector.
Go to step 14.

12. CHECK INJECTOR

WARNING!

Confirm that the engine is cooled down and there are no fire hazards near the vehicle.

- Remove fuel delivery rail with injectors (See Fuel Injector Rail Removal & Installation 1.6L/1.8L/2.0L in Section 04 Fuel Delivery).

NOTE :

Be careful not to drop the fuel injectors when removing the fuel delivery rail.

- Keep fuel hose and all injectors connected to injector rail.
- Disconnect all injector harness connectors.
- Disconnect all ignition coil harness connectors.
- Prepare pans or saucers under each injector.
- Crank engine for about 3 seconds.
- Make sure fuel does not drip from injector.

Is the check result normal?

Yes >> Go to next step.

No >> Replace any leaking injectors as necessary. Always replace the O-ring seal when replacing the fuel injector .

13. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0172 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

DIAGNOSIS & TESTING

P0201 - Cylinder 1 - Injector Circuit

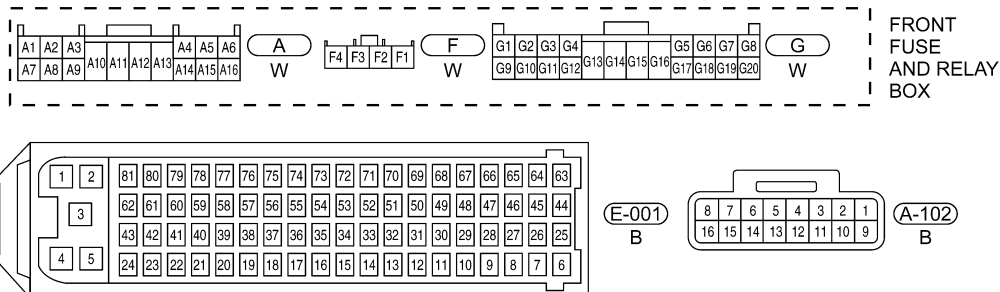
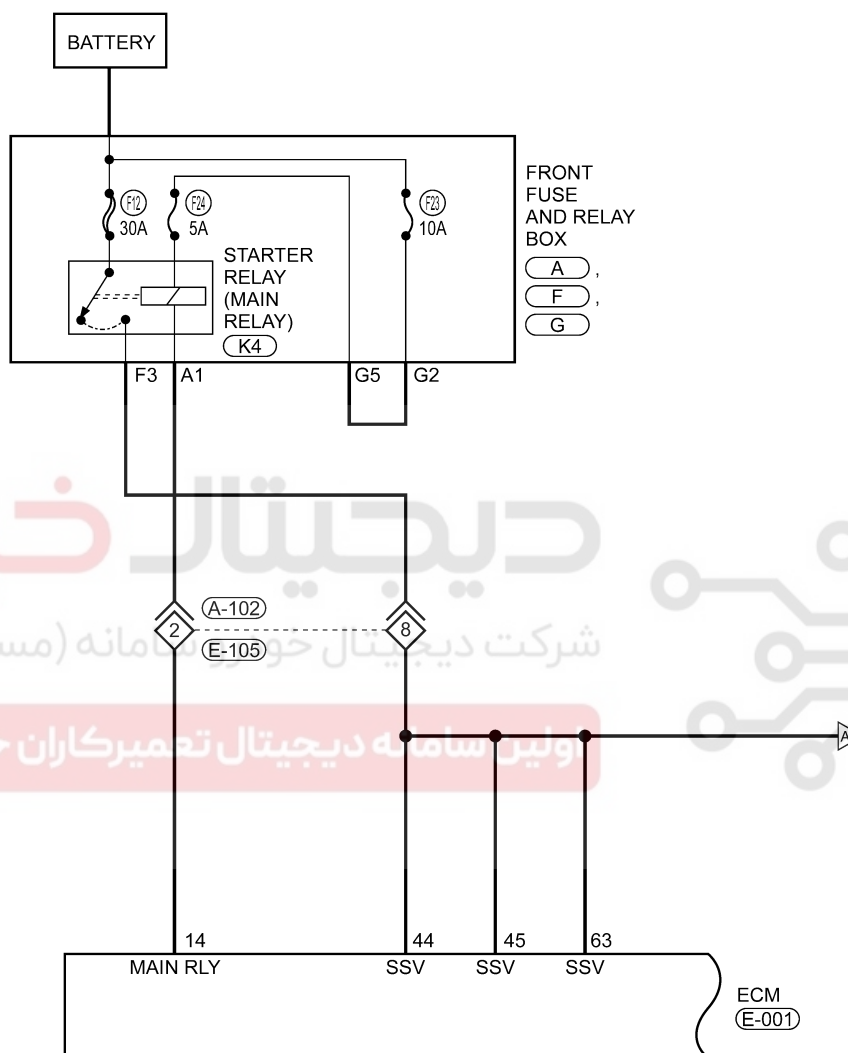
P0202 - Cylinder 2 - Injector Circuit

P0203 - Cylinder 3 - Injector Circuit

P0204 - Cylinder 4 - Injector Circuit

EEC - 2.0L - INJ - 01

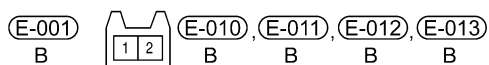
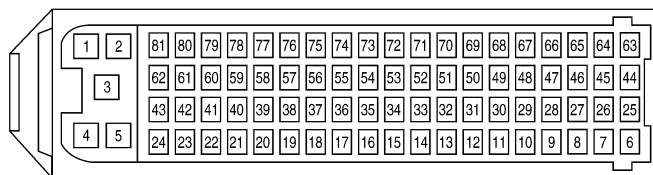
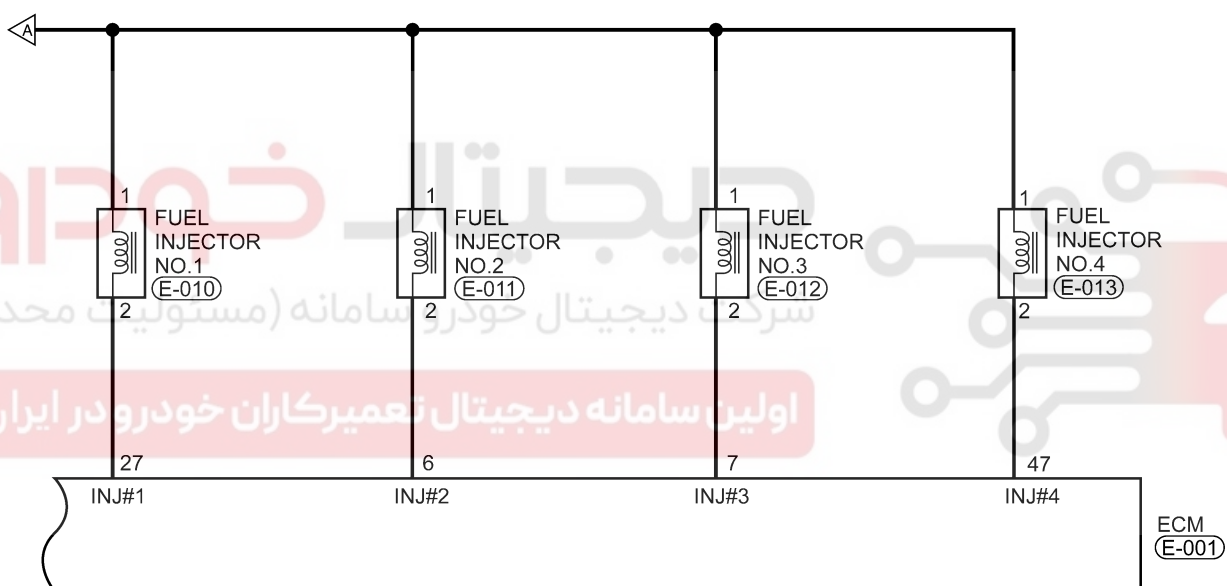
03



Itsmw030029t

DIAGNOSIS & TESTING

EEC - 2.0L - INJ - 02



Itsmw030030t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
6	Injector 2	• Engine is running • Warm-up condition • Idle • Accelerate suddenly	Voltage: 11 - 14 V
7	Injector 3		
27	Injector 1		
47	Injector 4		

03**On Board Diagnostic Logic**

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	POSSIBLE CAUSE
P0201	Cylinder 1 - Injector Circuit	Engine is running	• Injector • Harness or connectors • ECM
P0202	Cylinder 2 - Injector Circuit		
P0203	Cylinder 3 - Injector Circuit		
P0204	Cylinder 4 - Injector Circuit		

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature then select view DTC.
- If DTC is detected, go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnosis & Testing Diagnostic Help in Section 03 Electronic Engine Controls).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure**1. CHECK GROUND CONNECTIONS**

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

DIAGNOSIS & TESTING**2. INSPECTION START**

- Start engine.

Is any cylinder ignited?

Yes >> If with the X-431, go to the next step.
If without the X-431, go to step 4.

No >> Go to step 5.

3. PERFORM ACTIVE TEST FUNCTION

- Start engine.
- Select "ACTIVE TEST" menu.
- Perform injector active test.
- Make sure that each test produces a momentary engine speed drop.

Is the check result normal?

Yes >> Go to step 11.

No >> Go to step 5.

4. CHECK FUNCTION OF INJECTORS

- Listen to injectors for operating sound one by one.

Does a clicking noise exist for all injectors?

Yes >> Go to step 11.

No >> Go to the next step.

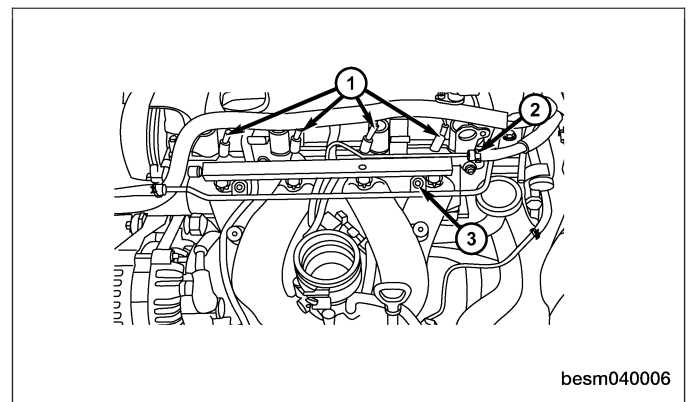
5. CHECK INJECTOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the injector electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



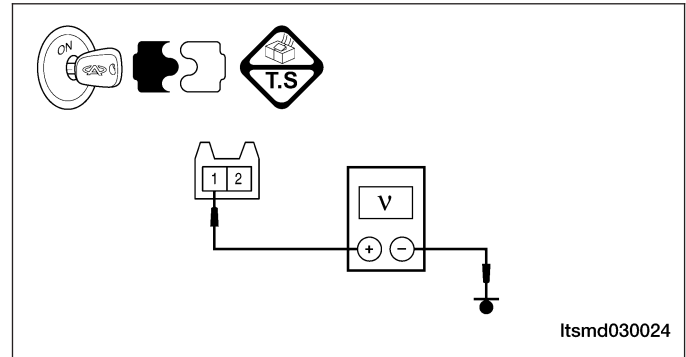
6. CHECK INJECTOR POWER SUPPLY CIRCUIT FOR OPEN

- Turn ignition switch on.
- Check injector supply voltage between sensor terminal and ground in the electrical connector.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to step 8.

No >> Go to the next step.



03

7. DETECT MALFUNCTIONING PART

- Check the following:
 - Harness connectors A-102, E-105
 - Front fuse and relay box F3
 - Fuse 12, fuse 23, fuse 24
 - Check harness for an open or short to ground between injector and fuse.

Is the check result normal?

Yes >> With the X-431, check the system, If OK, go to the next step.

No >> Repair or replace malfunctioning part.

8. CHECK INJECTOR CONTROL CIRCUITS FOR AN OPEN

- Check injector control circuit voltage.
- 3.6 V should exist.

Is the check result normal?

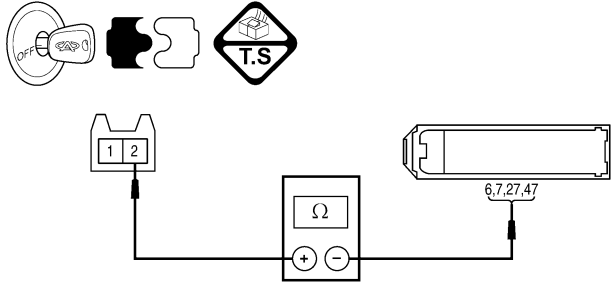
Yes >> Go to step 10.

No >> Go to the next step.

DIAGNOSIS & TESTING

9. DETECT MALFUNCTIONING PART

- Turn ignition switch off.
- Disconnect ECM harness connector.
- Check harness continuity between following terminals.

INJECTOR NO.	ECM TERMINAL	INJECTOR TERMINAL	 Itsmd030025
1	27	2	
2	6	2	
3	7	2	
4	47	2	

- Continuity should exist.

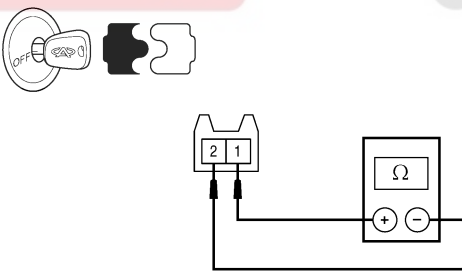
Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open in harness or connectors.

10. CHECK INJECTOR RESISTANCE

- Check resistance as table shown.
- Check the fuel injector resistance as shown in the following:

INJECTOR NO.	INJECTOR TERMINAL	RESISTANCE (APPROXIMATELY) Ω (20°C)	
1	1 & 2	11 - 16	
2	1 & 2		
3	1 & 2		
4	1 & 2		

Itsmd030027

- Also check sensor signal output.
- Connect ECM connector.
- Connect injector connector.
- Check the fuel injector voltage as shown in the following:

TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
6	Injector 2	• Engine is running • Idle • Warm-up condition • Accelerate suddenly	Voltage: 11 - 14 V
7	Injector 3		
27	Injector 1		
47	Injector 4		

Is the check result normal?

Yes >> Go to the next step.

No >> Replace injector.

11. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- See "DTC Confirmation Procedure".

Is DTC P0201, P0202, P0203 or P0204 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

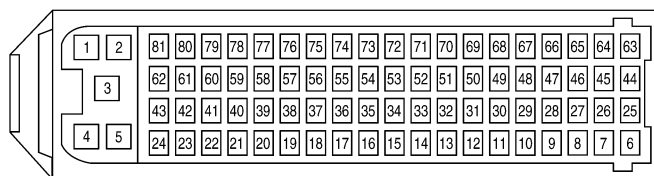
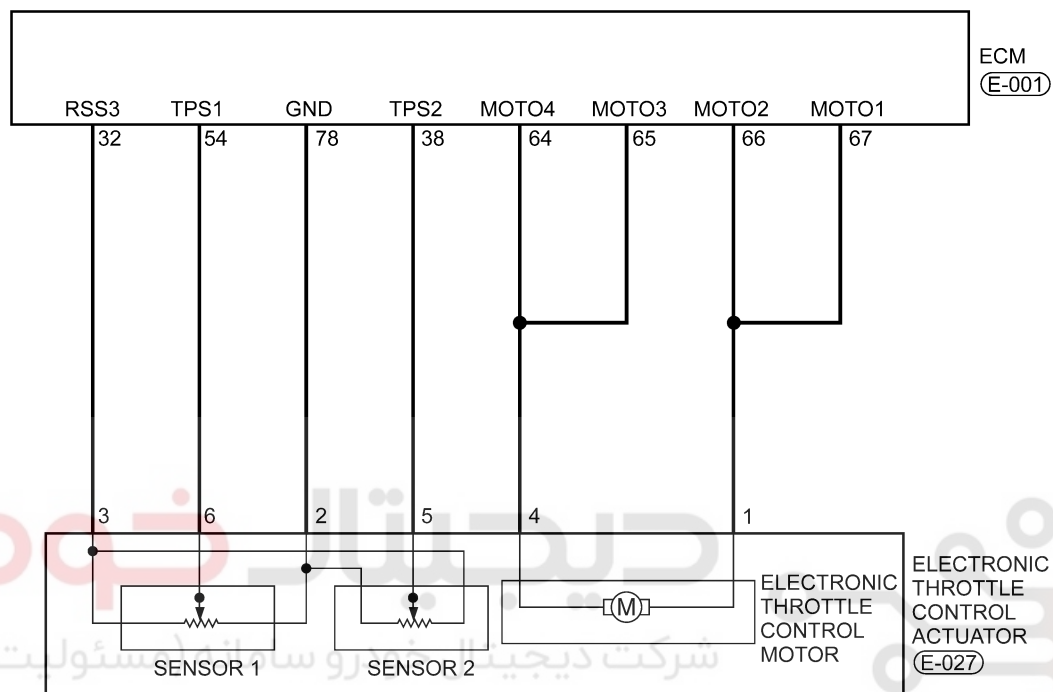
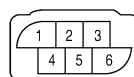
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



DIAGNOSIS & TESTING

P0221 - Throttle Position Sensor B Performance

EEC - 2.0L - TPS - 01

E-001
BE-027
B

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
32	Regulated sensor supply 2	Ignition switch: ON	-	Approximately 5 V
38	Electronic throttle control actuator (Position sensor)		• Engine stopped • Accelerator pedal: Fully released	4.24 V
			• Engine stopped • Accelerator pedal: Fully depressed	0.72 V
54	Electronic throttle control actuator		• Engine stopped • Accelerator pedal: Fully released	0.74 V
			• Engine stopped • Accelerator pedal: Fully depressed	4.62 V
64	Motor 4			12 V or 0 V
65	Motor 3			
66	Motor 2			0 V or 12 V
67	Motor 1			
78	Sensor (GND)	Approximately 0 V		

03

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0221	Throttle position sensor B performance	• Ignition switch: ON • Engine: Running	Rationally incorrect voltage is sent to ECM compared with the signals from TPS1 and TPS2.	• Electronic throttle control actuator (TPS1 and TPS2) • Harness or connectors • Accelerator pedal position sensor 2 • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature then select view DTC.
- If DTC is detected, go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnosis & Testing Diagnostic Help in Section 03 Electronic Engine Controls).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING**Diagnostic Procedure****1. CHECK GROUND CONNECTIONS**

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

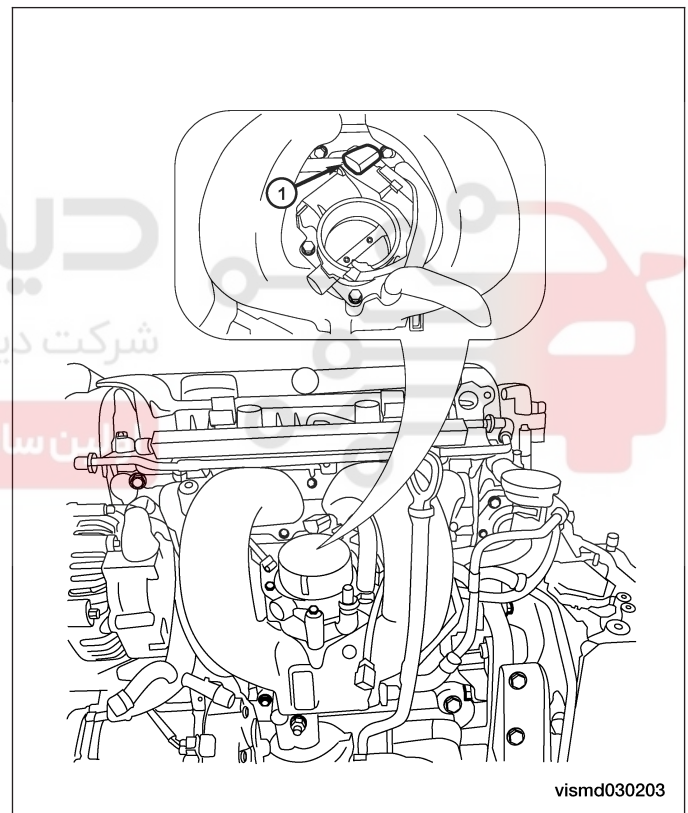
2. CHECK TPS ELECTRICAL CONNECTOR

- Disconnect the TPS electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



DIAGNOSIS & TESTING

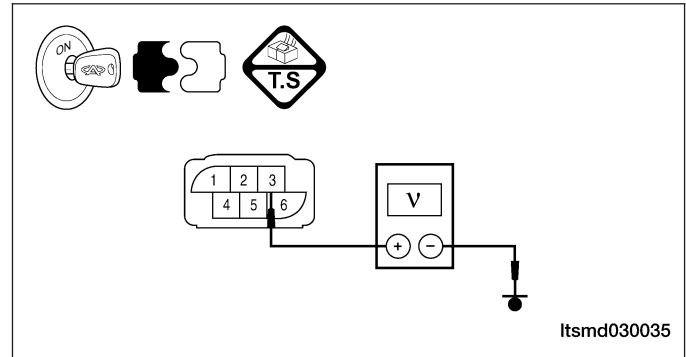
3. CHECK THE TPS POWER SUPPLY CIRCUIT

- Turn ignition switch on.
- Check supply voltage between TPS terminal 3 and ground in the TPS electrical connector E-027.
- Approximately 5.0 V should exist.

Is the check result normal?

Yes >> Go to step 8.

No >> Go to the next step.



03

4. CHECK THE TPS POWER SUPPLY CIRCUIT

- Turn ignition switch off.
- Disconnect ECM harness connector.
- Check harness continuity between TPS terminal 3 and ECM terminal 32.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open.

5. CHECK THE TPS AND THE ACCELERATOR PEDAL POSITION (APP) SENSOR POWER SUPPLY CIRCUIT

- Check harness for short to power and short to ground between following terminals.

ECM TERMINAL	TPS TERMINAL
32	TPS terminal 3
32	APP sensor terminal 3
33	APP sensor terminal 6

Is the check result normal?

Yes >> Go to the next step.

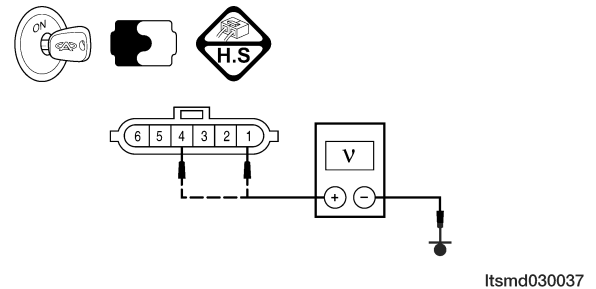
No >> Repair circuit for short to ground or short to power in harness or connectors.

DIAGNOSIS & TESTING

6. CHECK APP SENSOR

- Connect all harness connectors disconnected.
- Turn ignition switch on.
- Check voltage between ECM terminals 16 (APP sensor 1 signal), 40 (APP sensor 2 signal) and ground under the following conditions:

ECM TERMINAL NO.	APP SENSOR TERMINAL	ITEM	CONDITION	DATA (DC VOLTAGE)
16	APP sensor terminal 4	Accelerator pedal position sensor 1	• Engine stopped • Accelerator pedal: Fully released	0.72 - 0.74 V
			• Engine stopped • Accelerator pedal: Fully depressed	3.95 V
40	APP sensor terminal 1	Accelerator pedal position sensor 2	• Engine stopped • Accelerator pedal: Fully released	0.36 - 0.37 V
			• Engine stopped • Accelerator pedal: Fully depressed	1.97 V



Is the check result normal?

Yes >> Go to step 10.

No >> Replace the Accelerator Pedal Assembly (See Accelerator Pedal Position Sensor Removal & Installation in Section 03 Electronic Engine Controls).

7. CHECK THE TPS SIGNAL CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch off.
- Disconnect ECM harness connector.
- Check harness continuity between TPS terminal 5 and ECM terminal 38.
- Continuity should exist.
- Also check harness for short to power and short to ground.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open or short to power or short to ground in harness or connectors.

DIAGNOSIS & TESTING

8. CHECK THE TPS GROUND CIRCUIT FOR AN OPEN OR SHORT

- Check harness continuity between electronic throttle control actuator terminal 2 and ECM terminal 78.
- Continuity should exist.
- Also check harness for short to power and short to ground.

Is the check result normal?

Yes >> Go to the next step.

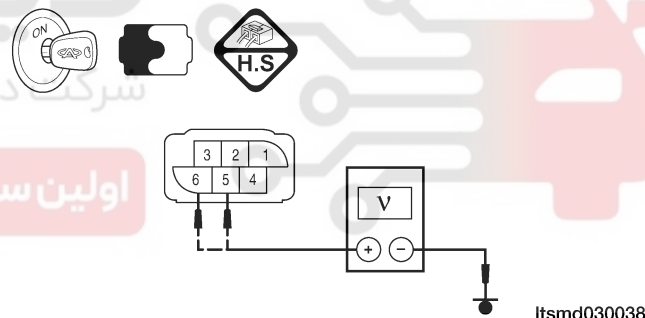
No >> Repair or replace circuit for an open or short to power or short to ground in harness or connectors.

03

9. CHECK TPS

- Connect all harness connectors disconnected.
- Turn ignition switch on.
- Check voltage between ECM terminals 54 (TPS1 signal), 38 (TPS2 signal) and ground under the following conditions:

TPS TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
5	Throttle Position Sensor 2 (TPS2)	• Engine stopped • Accelerator pedal: Fully released	4.24 V
		• Engine stopped • Accelerator pedal: Fully depressed	0.72 V
6	Throttle Position Sensor 1 (TPS1)	Ignition switch: ON	• Engine stopped • Accelerator pedal: Fully released
		• Engine stopped • Accelerator pedal: Fully depressed	4.62 V



Is the check result normal?

Yes >> Go to the next step.

No >> Replace the Electronic Throttle Control Actuator (See Electronic Throttle Control Actuator Removal & Installation in Section 03 Electronic Engine Controls).

10. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0221 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



DIAGNOSIS & TESTING

P0261 - Cylinder 1 Injector Circuit Low

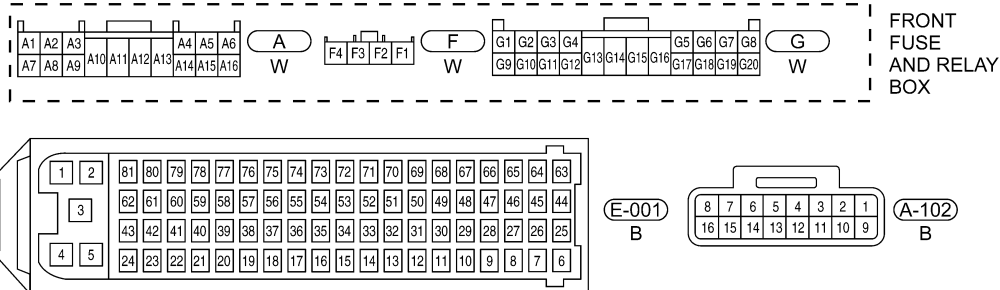
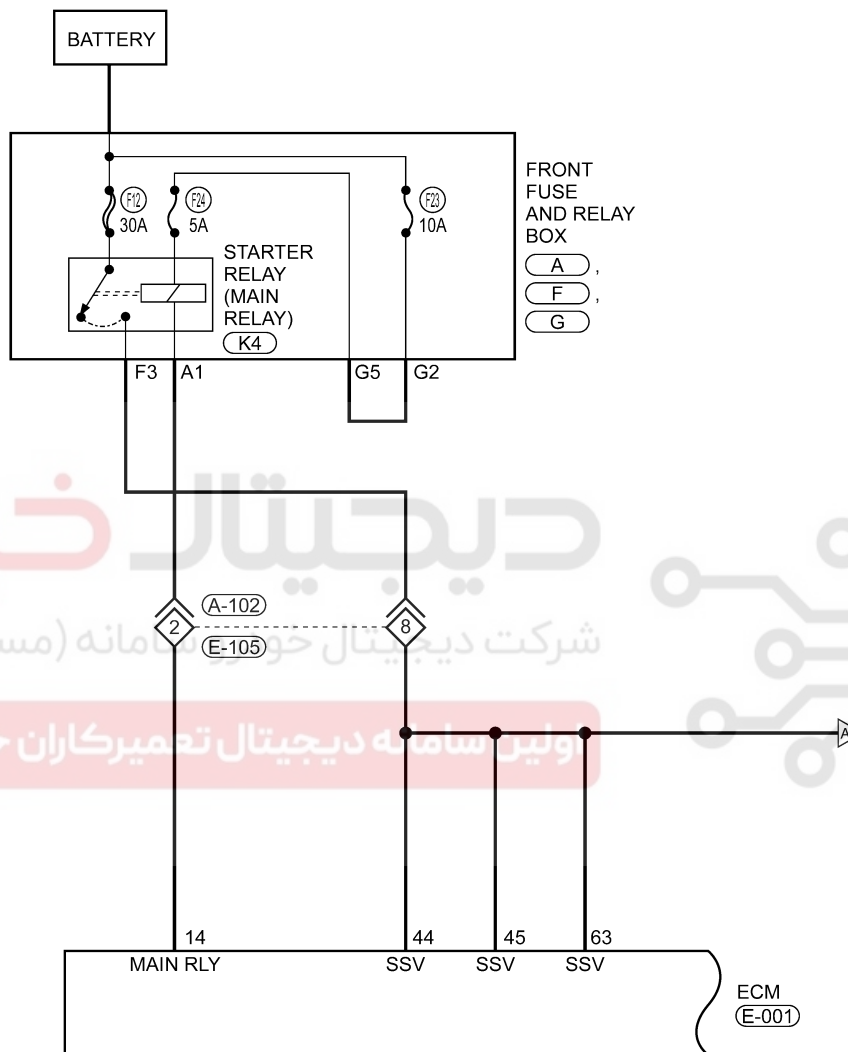
P0264 - Cylinder 2 Injector Circuit Low

P0267 - Cylinder 3 Injector Circuit Low

P0270 - Cylinder 4 Injector Circuit Low

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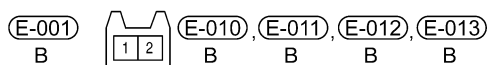
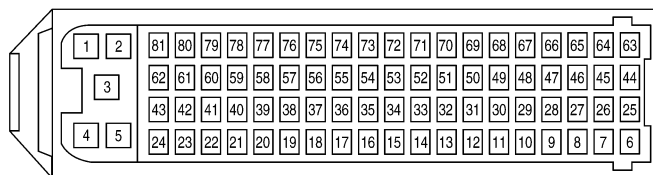
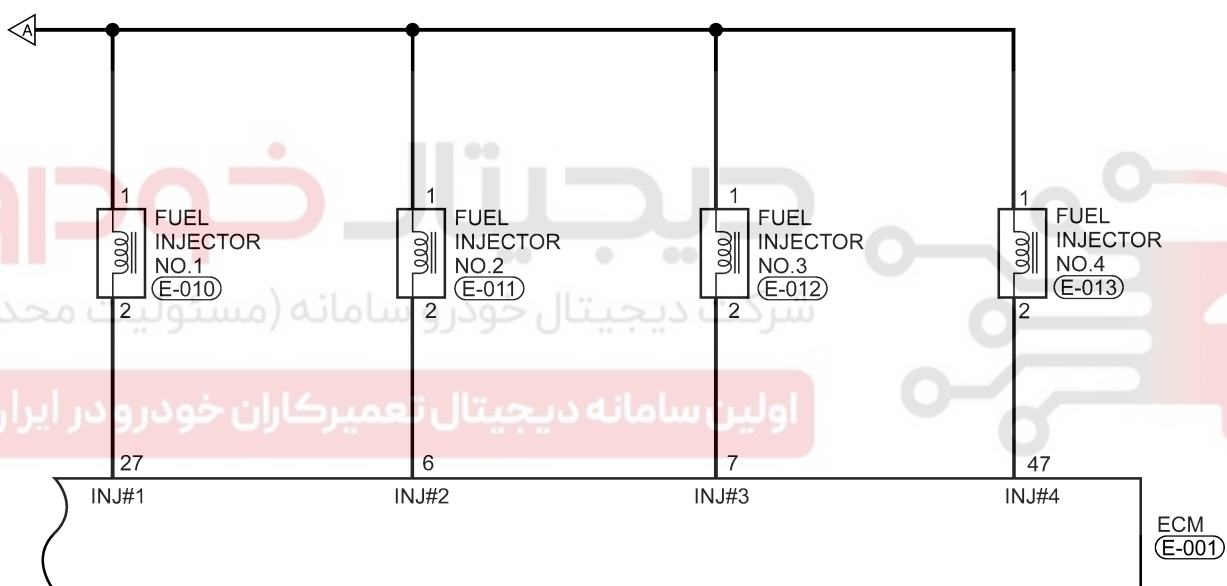
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DIAGNOSIS & TESTING

EEC - 2.0L - INJ - 02



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DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
6	Injector 2	• Engine is running • Warm-up condition • Idle • Accelerate suddenly	Voltage: 11 - 14 V
7	Injector 3		
27	Injector 1		
47	Injector 4		

03

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	POSSIBLE CAUSE
P0261	Cylinder 1 - Injector Circuit Low	Engine is running	• Injector • Harness or connectors • ECM
P0264	Cylinder 2 - Injector Circuit Low		
P0267	Cylinder 3 - Injector Circuit Low		
P0270	Cylinder 4 - Injector Circuit Low		

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature then select view DTC.
- If DTC is detected, go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnosis & Testing Diagnostic Help in Section 03 Electronic Engine Controls).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

DIAGNOSIS & TESTING**2. INSPECTION START**

- Start the engine.

Is any cylinder ignited?

Yes >> If with the X-431, go to the next step.
If without the X-431, go to step 4.

No >> Go to step 5.

3. PERFORM ACTIVE TEST FUNCTION

- Select "ACTIVE TEST" menu.
- Perform injector active test.
- Make sure that each test produces a momentary engine speed drop.

Is the check result normal?

Yes >> Go to step 10.

No >> Go to step 5.

4. CHECK FUNCTION OF INJECTOR

- Listen to injector operating sound one by one.

Do all injectors clicking noise exist?

Yes >> Go to step 10.

No >> Go to the next step.

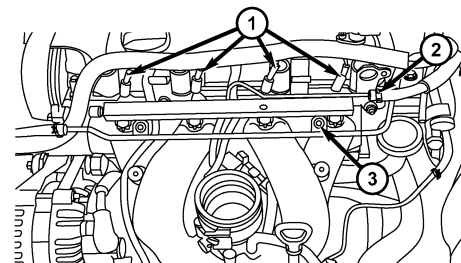
5. CHECK INJECTOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the injector electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



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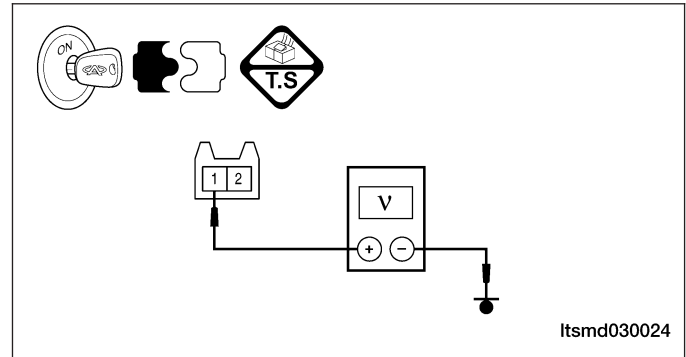
6. CHECK INJECTOR POWER SUPPLY CIRCUIT FOR AN OPEN

- Turn ignition switch on.
- Check injector supply voltage between sensor terminal and ground in the electrical connector.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to step 8.

No >> Go to the next step.



03

7. DETECT MALFUNCTIONING PART

- Check the following:
 - Harness connectors A-102, E-105
 - Front fuse and relay box F3
 - Fuse 12, fuse 23, fuse 24
 - Harness for shorted between injector and fuse

Is the check result normal?

Yes >> Go to the next step.

No >> Repair malfunctioning part.

8. CHECK INJECTOR CONTROL CIRCUITS FOR A SHORT

- Check injector control circuit voltage.
- 3.6 V should exist.

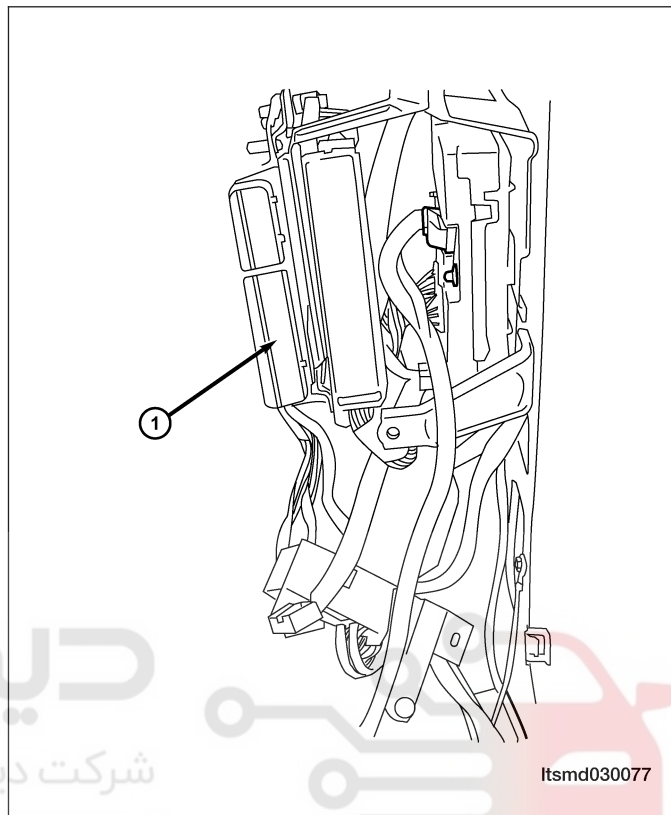
Is the check result normal?

Yes >> Go to step 10.

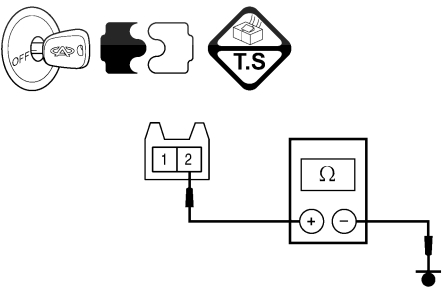
No >> Go to the next step.

9. DETECT MALFUNCTIONING PART

- Turn ignition switch off.
- Disconnect ECM harness connector (1).



- Check for harness continuity between the following terminals.
- Continuity should not exist.

INJECTOR NO.	INJECTOR TERMINAL	GROUND	
1	2	Ground	
2	2		
3	2		
4	2		

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Is the check result normal?

Yes >> Replace the ECM.

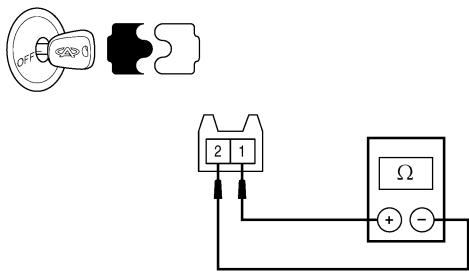
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> Repair circuit for a short in harness or connectors.

DIAGNOSIS & TESTING

10. CHECK INJECTOR RESISTANCE

- Check resistance as table shown.
- Check the fuel injector resistance as shown in the following:

INJECTOR NO.	INJECTOR TERMINAL	RESISTANCE (APPROXIMATELY) Ω (20°C)	
1	1 & 2	11 - 16	
2	1 & 2		
3	1 & 2		
4	1 & 2		

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- Connect ECM connector.
- Connect injector connector.
- Check the fuel injector voltage as shown in the following:

TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
6	Injector 2	• Engine is running • Warm-up condition • Idle • Accelerate suddenly	Voltage: 11 - 14 V
7	Injector 3		
27	Injector 1		
47	Injector 4		

Is the check result normal?

Yes >> Go to the next step.

No >> Replace injector.

11. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- See "DTC Confirmation Procedure".

Is DTC P0261, P0264, P0267 or P0270 still present?

Yes >> Replace the ECM.

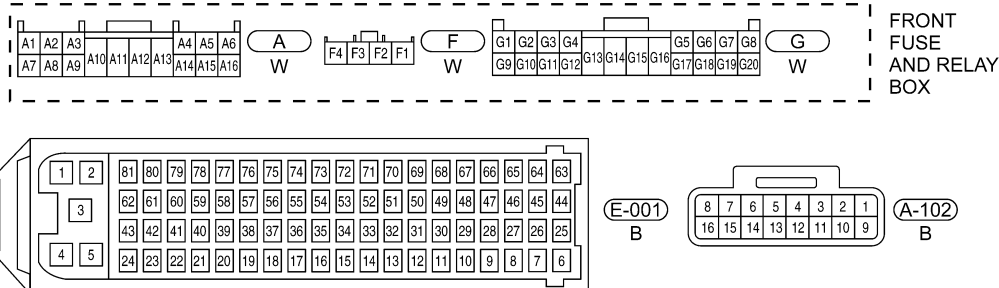
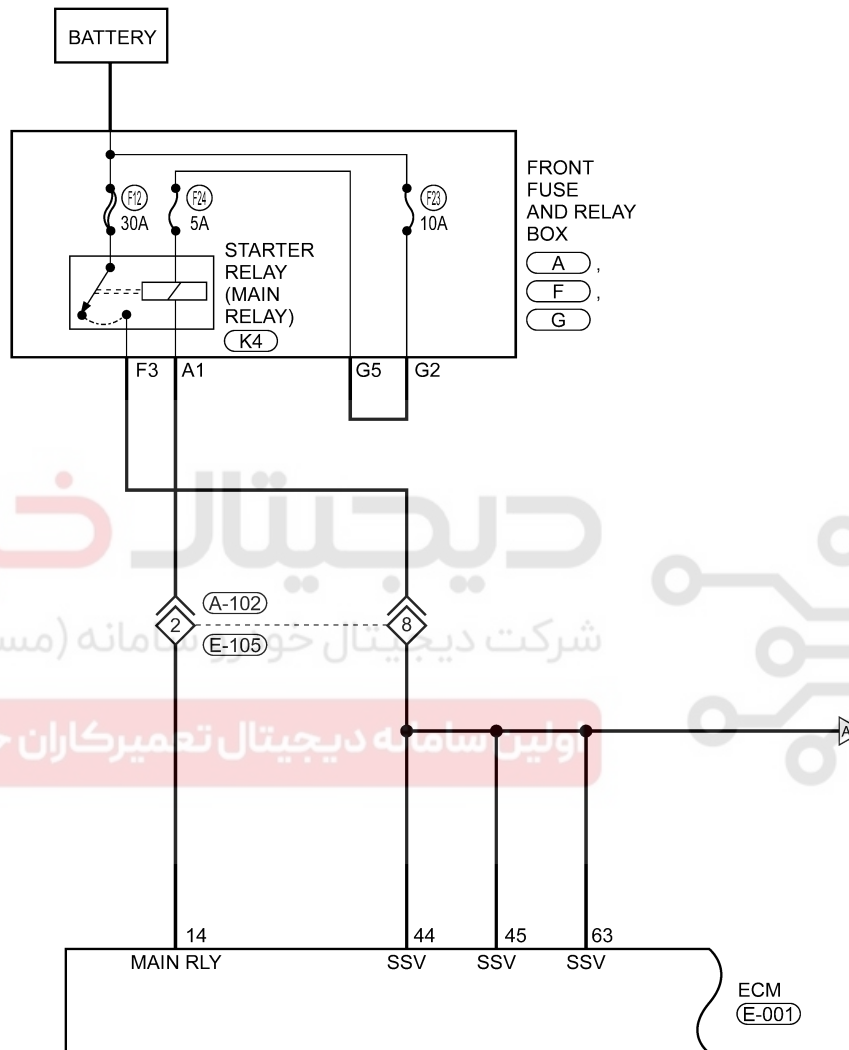
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

DIAGNOSIS & TESTING

P0262 - Cylinder 1 Injector Circuit High
P0265 - Cylinder 2 Injector Circuit High
P0268 - Cylinder 3 Injector Circuit High
P0271 - Cylinder 4 Injector Circuit High

EEC - 2.0L - INJ - 01

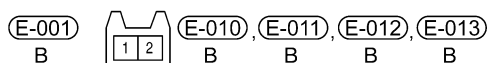
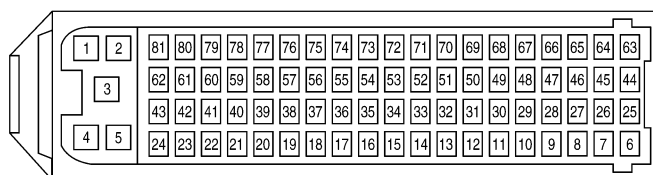
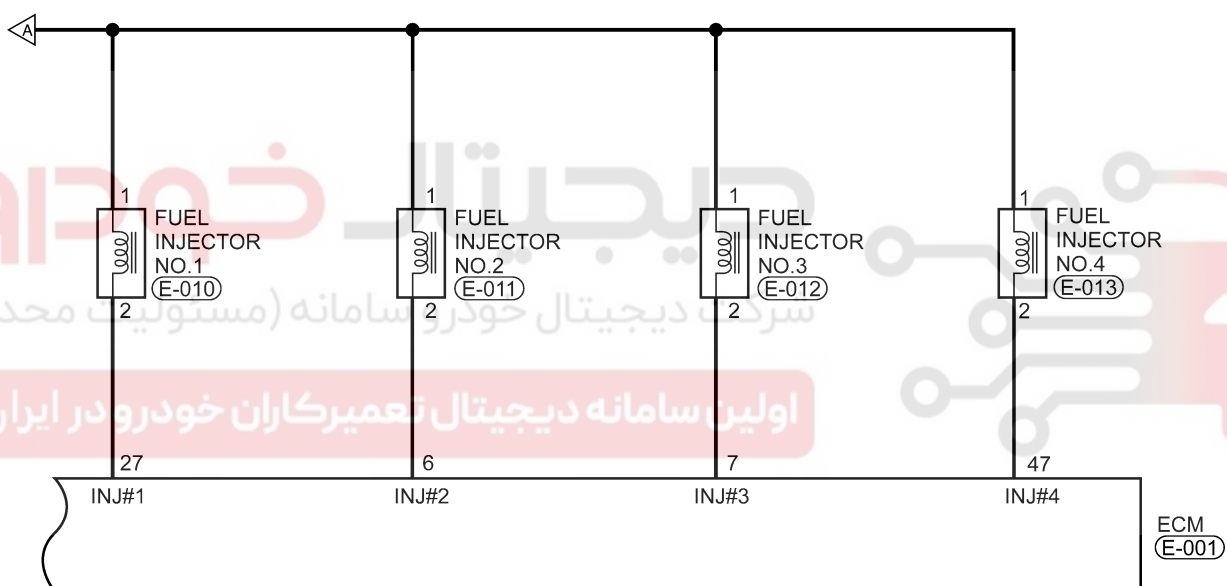


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DIAGNOSIS & TESTING

EEC - 2.0L - INJ - 02

03



Itsmw030030t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
6	Injector 2	• Engine is running • Warm-up condition • Idle • Accelerate suddenly	Voltage: 11 V - 14 V
7	Injector 3		
27	Injector 1		
47	Injector 4		

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	POSSIBLE CAUSE
P0262	Cylinder 1 - Injector Circuit High	Engine is running	• Injector • Harness or connectors • ECM
P0265	Cylinder 2 - Injector Circuit High		
P0268	Cylinder 3 - Injector Circuit High		
P0271	Cylinder 4 - Injector Circuit High		

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature then select view DTC.
- If DTC is detected, go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnosis & Testing Diagnostic Help in Section 03 Electronic Engine Controls).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

DIAGNOSIS & TESTING

2. INSPECTION START

- Start the engine.

Is any cylinder ignited?

Yes >> If with the X-431, go to the next step.
If without the X-431, go to step 4.

No >> Go to step 5.

3. PERFORM ACTIVE TEST FUNCTION

- Start engine.
- Select "ACTIVE TEST" menu.
- Perform injector active test.
- Make sure that each test produces a momentary engine speed drop.

Is the check result normal?

Yes >> Go to step 10.

No >> Go to step 5.

4. CHECK FUNCTION OF INJECTOR

- Listen to injector operating sound one by one.

Do all injectors clicking noise exist?

Yes >> Go to step 10.

No >> Go to the next step.

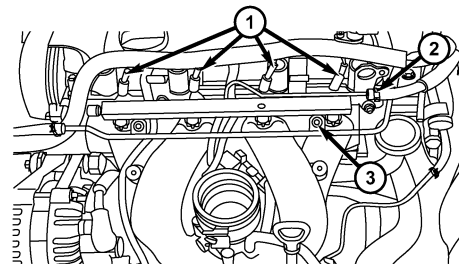
5. CHECK INJECTOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the injector electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



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DIAGNOSIS & TESTING

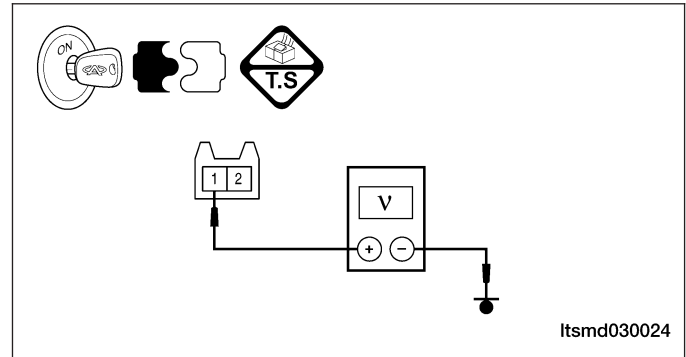
6. CHECK INJECTOR POWER SUPPLY CIRCUIT FOR SHORTED

- Turn ignition switch on.
- Check injector supply voltage between sensor terminal and ground in the electrical connector.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to step 8.

No >> Go to the next step.



7. DETECT MALFUNCTIONING PART

- Check the following:
 - Harness connectors A-102, E-105
 - Front fuse and relay box F3
 - Fuse 12, fuse 23, fuse 24
 - Harness for an open or short between injector and fuse

Is the check result normal?

Yes >> With the X-431, check the system, If OK, go to the next step.

No >> Repair malfunctioning part.

8. CHECK INJECTOR CONTROL CIRCUITS FOR A SHORT

- Check injector control circuit voltage.
- 3.6 V should exist.

Is the check result normal?

Yes >> Go to step 10.

No >> Go to the next step.

9. DETECT MALFUNCTIONING PART

- Turn ignition switch off.
- Disconnect ECM harness connector.
- Check if the injector control circuits short to power supply circuits.
- Check the following.
- Voltage should not exist.

INJECTOR NO.	POWER SUPPLY CIRCUIT	INJECTOR TERMINAL
1	Power supply circuit	2
2		2
3		2
4		2

DIAGNOSIS & TESTING

Is the check result normal?

Yes >> Replace the ECM.

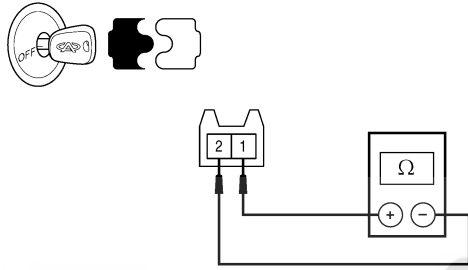
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> Repair circuit for a short in harness or connectors.

10. CHECK INJECTOR RESISTANCE

03

- Check resistance as table shown.
- Check the fuel injector resistance as shown in the following:

INJECTOR NO.	INJECTOR TERMINAL	RESISTANCE (APPROXIMATELY) Ω (20°C)	
1	1 & 2	11 - 16	
2	1 & 2		
3	1 & 2		
4	1 & 2		

- Connect ECM connector.
- Connect injector connector.
- Check the fuel injector voltage as shown in the following:

TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
6	Injector 2	• Engine is running • Warm-up condition • Idle • Accelerate suddenly	Voltage: 11 V - 14 V
7	Injector 3		
27	Injector 1		
47	Injector 4		

Is the check result normal?

Yes >> Go to the next step.

No >> Replace injector.

11. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- See "DTC Confirmation Procedure".

Is DTC P0262, P0265, P0268 or P0271 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

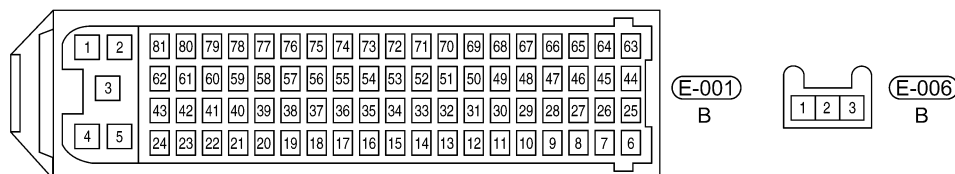
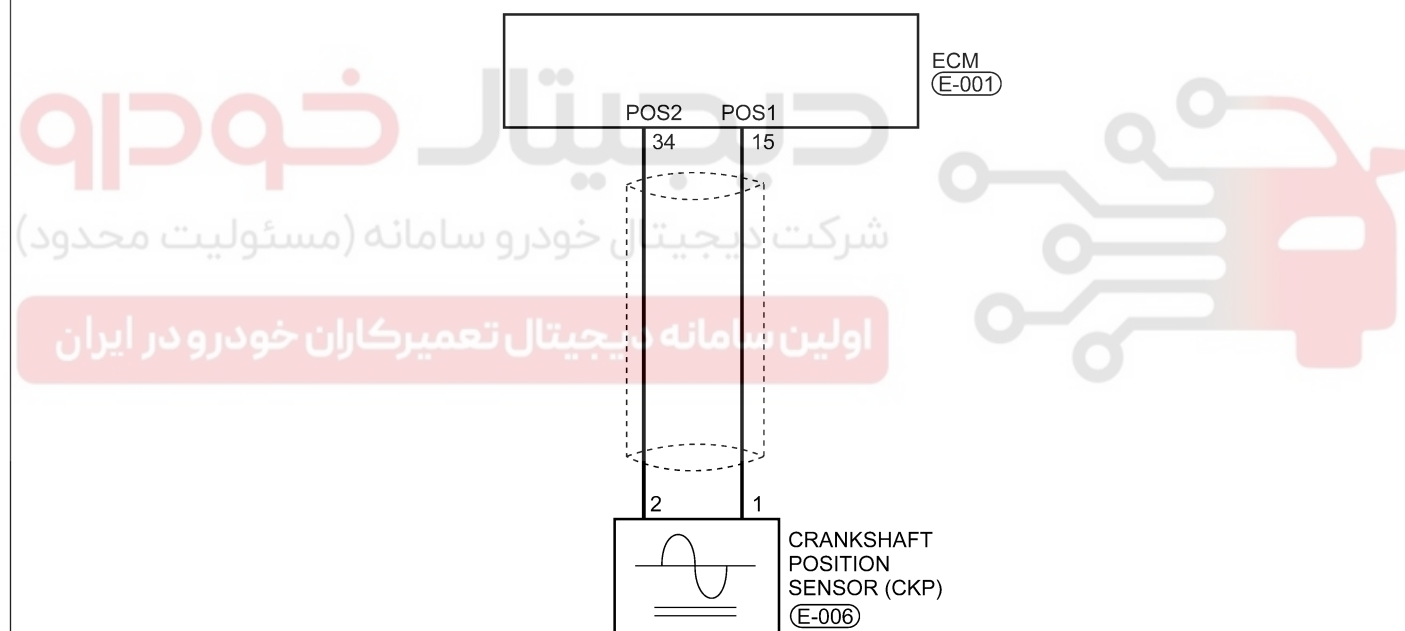


DIAGNOSIS & TESTING

P0321 - Distributor Engine Speed In Phase Circuit Performance

EEC - 2.0L - POS - 01

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DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
15	Crankshaft Position (CKP) sensor	- Ignition switch: ON - Engine: Not cranking	3 V
34			

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0321	Distributor engine speed in phase circuit performance	Engine is running	ECM detected that the input signal is out of the acceptable range.	- CKP - Crankshaft signal plate - Harness or connectors - ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature then select view DTC.
- If DTC is detected, go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnosis & Testing Diagnostic Help in Section 03 Electronic Engine Controls).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure**1. CHECK GROUND CONNECTIONS**

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

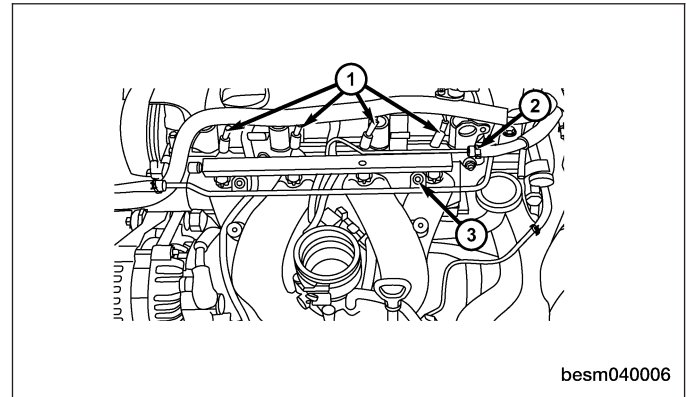
2. CHECK CKP SENSOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the CKP sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



03

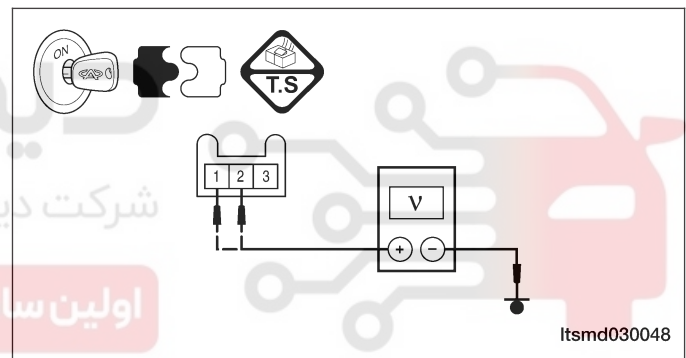
3. CHECK CKP SENSOR REFERENCE VOLTAGE

- Turn ignition switch on.
- Check CKP sensor supply voltage between sensor connector E-006, terminal 1 and ground, terminal 2 and ground in the sensor electrical connector.
- 3 V should exist.

Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.



4. DETECT MALFUNCTIONING PART

- Check the following:
 - Harness for an open or short between CKP sensor and ECM.

Is the check result normal?

Yes >> Replace the ECM.

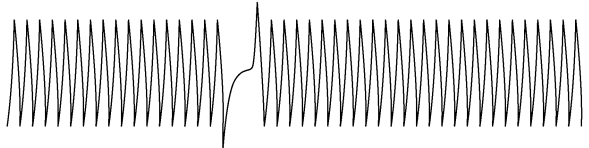
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> Repair circuit for an open or short in harness or connectors.

DIAGNOSIS & TESTING

5. CHECK CKP SENSOR SIGNAL WAVE PATTERN

- Connect ECM connector.
- Connect CKP sensor connector.
- Check sensor output signal when engine is running.

ENGINE ANALYZER (KES-200)	CKP SENSOR SIGNAL
	
	vismd030002

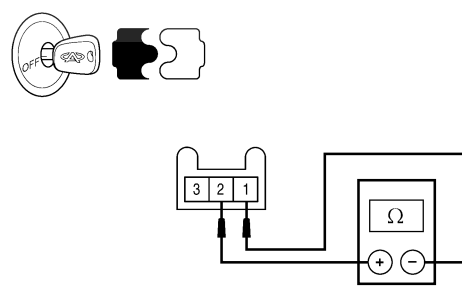
Is the CKP sensor output signal normal?

Yes >> Go to step 9.

No >> Go to the next step.

6. CHECK CKP SENSOR

- Check resistance as table shown.
- Remove the sensor.
- Visually check the sensor for chipping.

TERMINAL NO.	RESISTANCE Ω (25°C)	
1 & 2	Approximately 860 Ω	ltsmd030049

Is the check result normal?

- Yes** >> Replace the CKP sensor with a known good CKP sensor.
Monitor the CKP sensor signal on the KES-200 screen.
- If the CKP sensor signals were normal, the system is OK.
 - If the CKP sensor signals were still irregular or missing, go to step 7.

No >> Replace CKP sensor.

DIAGNOSIS & TESTING

7. CHECK INSTALLED CLEARANCE

- Check the installed clearance (See CKP sensor Removal & Installation in Section 08 Transaxle & Transfer Case).
- 0.8 - 1.2 mm should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Reinstall CKP sensor.

03

8. CHECK GEAR TOOTH

- Visually check for chipping signal plate gear tooth.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the signal plate

9. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0321 still present?

Yes >> Replace the ECM.

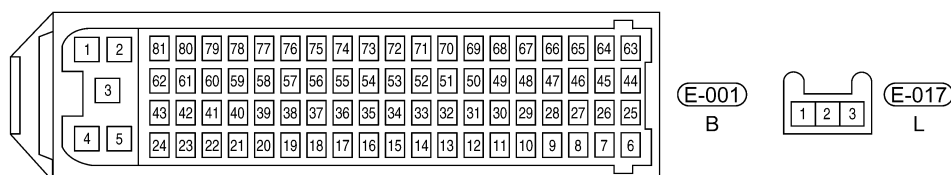
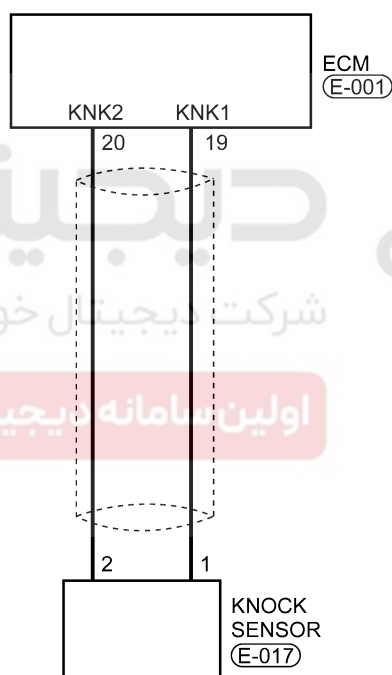
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

DIAGNOSIS & TESTING

P0324 - Knock Control System Error

EEC - 2.0L - KS - 01



DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	TEST METHOD	DATA (AVERAGE DC VOLTAGE)
19	Knock sensor 1	• Test Method 1: Knock at cylinder with rubber hammer • Test Method 2: Knock at sensor slightly	Output signal voltage should exist.
20	Knock sensor 2		

03**On Board Diagnostic Logic**

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC SET CONDITION	POSSIBLE CAUSE
P0324	Knock control system error	ECM detected that the input signal is out of the acceptable range.	• Knock sensor • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Run engine for a while then select view DTC.
- If DTC is detected, go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnosis & Testing Diagnostic Help in Section 03 Electronic Engine Controls).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure**1. CHECK GROUND CONNECTIONS**

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

DIAGNOSIS & TESTING

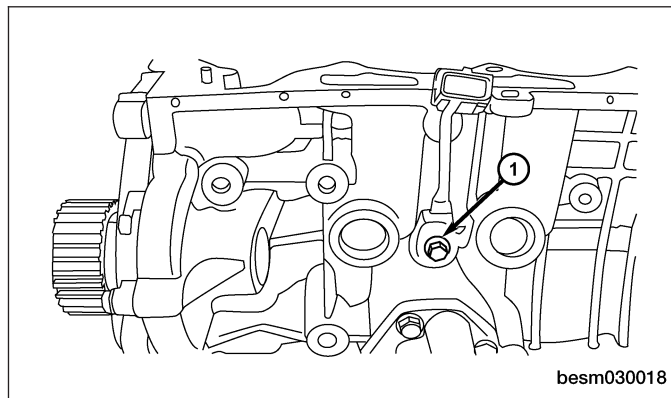
2. CHECK KNOCK SENSOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the knock sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



3. CHECK KNOCK SENSOR RESISTANCE

- Check resistance between knock sensor connector E-017, terminal 1 and terminal 2.
- The resistance should be above 1 MΩ.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace knock sensor.

4. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT

- Disconnect ECM harness connector.
- Check harness continuity between sensor connector E-017, terminal 1 and ECM terminal 19,, sensor terminal 2 and ECM terminal 20.

ECM TERMINAL	KNOCK SENSOR TERMINAL	Itsmd030050
19	1	
20	2	

DIAGNOSIS & TESTING

- continuity should exist.
- Also check harness for short to ground and short to power.

Is the check result normal?

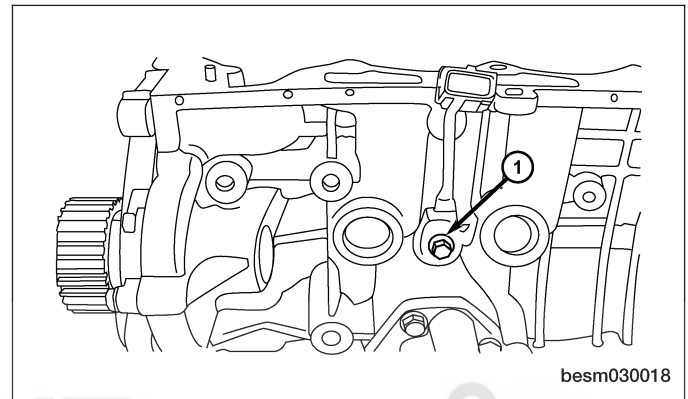
Yes >> Go to step 5.

No >> Repair circuit for an open or short in harness or connectors.

5. CHECK KNOCK SENSOR SIGNAL

03

- Connect knock sensor connector.
- Check knock sensor (1) output signal as table shown.



- Set digital multimeter to the voltage range.

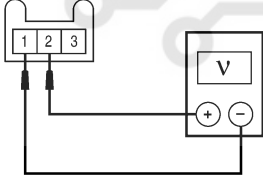
KNOCK SENSOR TERMINAL NO.	TEST METHOD	
1 & 2	Test Method 1: Knock at cylinder with rubber hammer	
	Test Method 2: Knock at sensor slightly	

Diagram showing the wiring for testing the knock sensor signal. A multimeter is connected to terminals 1 and 2 of the sensor connector. The multimeter display shows 'V'. The diagram is labeled 'ltsmd030051'.

- Output signal voltage should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace knock sensor.

6. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0324 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

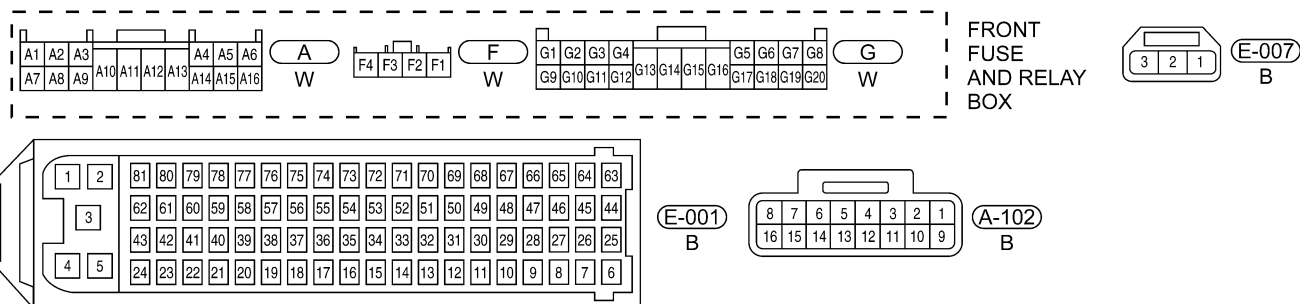
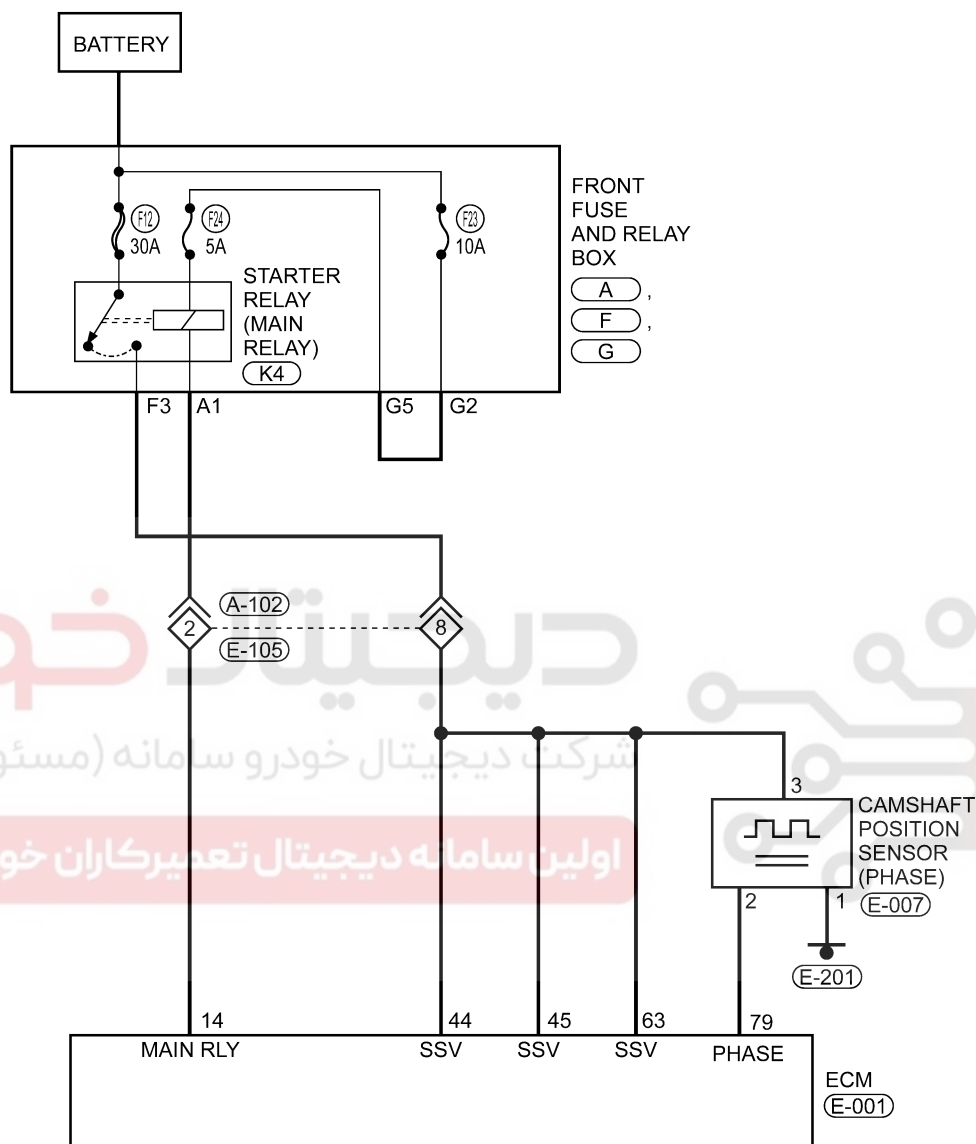
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



DIAGNOSIS & TESTING

P0343 - Camshaft Position Sensor Circuit High Input

EEC - 2.0L - PHASE - 01



DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
79	Camshaft Position (CMP) sensor	- Ignition switch: ON - Engine: Not cranking	11 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0343	Camshaft Position (CMP) sensor circuit high input	Engine is running	ECM detected that the input signal is out of the acceptable range.	- CMP sensor - Camshaft - Harness or connectors - ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Run engine for a while then select view DTC.
- If DTC is detected, go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnosis & Testing Diagnostic Help in Section 03 Electronic Engine Controls).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure**1. CHECK GROUND CONNECTIONS**

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

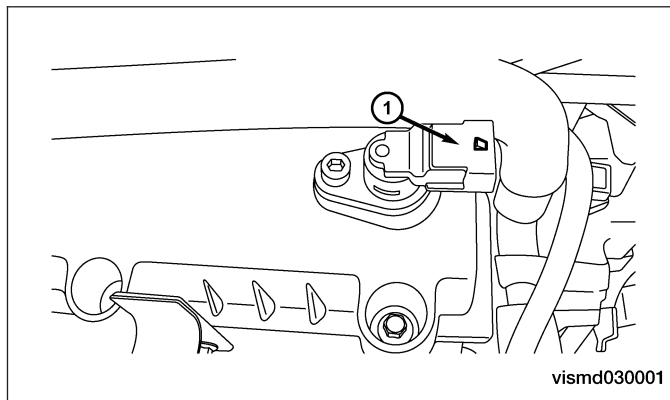
2. CHECK THE CMP SENSOR ELECTRICAL CONNECTOR

- Disconnect the CMP sensor electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



03

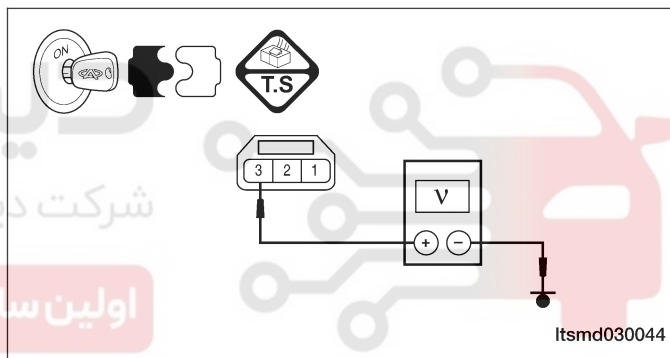
3. CHECK THE CMP SENSOR POWER SUPPLY CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch on.
- Check CMP sensor supply voltage between sensor connector E-007, terminal 3 and ground in the sensor electrical connector.
- 12 V should exist.

Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.



4. DETECT MALFUNCTIONING PART

- Check the following:
 - Harness connectors A-102, E-105
 - Front fuse and relay box F3
 - Fuse 12, fuse 23, fuse 24
 - Harness for an open or short between CMP sensor and fuse

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace malfunctioning part.

DIAGNOSIS & TESTING

5. CHECK THE CMP SENSOR GROUND CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch off.
- Check harness continuity between CMP sensor terminal 1 and ground.
- Continuity should exist.
- Also check harness for a short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open or short to power in harness or connectors.

6. CHECK THE CMP SENSOR SIGNAL CIRCUIT FOR AN OPEN OR SHORT TO POWER

- Turn ignition switch on.
- Check voltage between CMP sensor terminal 2 and ground.
- 10 V should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open or short to power in harness or connectors.
If circuit is normal, go to the next step.

7. CHECK CMP SENSOR SIGNAL

- Connect CMP sensor connector.
- Check signal voltage between CMP sensor terminal 2 and ground when engine is running.
- Approximately 6 V square wave signal should exist.

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ENGINE ANALYZER (KES-200)	 vismd030003

Is the CMP output signal normal?

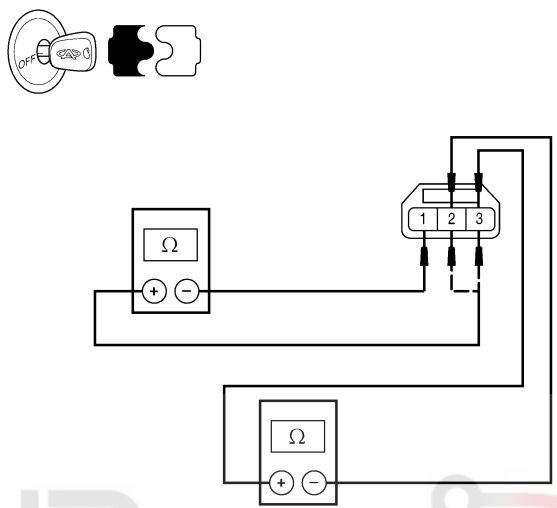
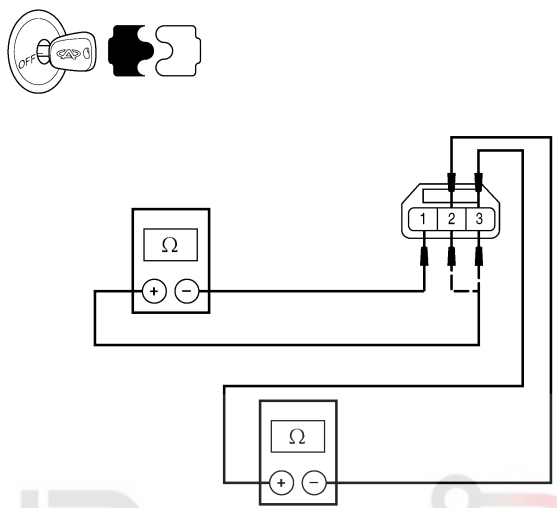
Yes >> Go to step 10.

No >> Go to the next step.

DIAGNOSIS & TESTING

8. CHECK THE CMP SENSOR

- Turn ignition switch off.
- Disconnect CMP sensor connector.
- Check resistance as table shown.
- Remove the sensor.
- Visually check and clean the sensor for chipping.

TERMINAL NO.	RESISTANCE Ω (25°C)	
1 & 2	Except 0 or ∞	
1 & 3		
2 & 3		

03

Is the check result normal?

Yes >> Replace the CMP sensor with a known good CMP sensor. Monitor the CMP sensor signal on the KES-200 screen.

- If the CMP sensor signals were normal, the system is OK.
- If the CMP sensor signals were still irregular or missing, go to step 9.

No >> Replace CMP sensor.

9. CHECK INSTALLED CLEARANCE

- Check the installed clearance (See CMP Sensor Removal & Installation in Section 03 Electronic Engine Controls).
- 0.8 - 1.2 mm should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Reinstall CMP sensor.

DIAGNOSIS & TESTING

10. CHECK CAMSHAFT

- Check the following:
 - Accumulation of debris to the signal plate of camshaft rear end
 - Chipping signal plate of camshaft rear end

Is the check result normal?

Yes >> Go to the next step.

No >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.

11. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0343 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

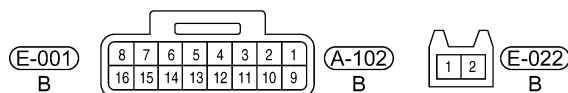
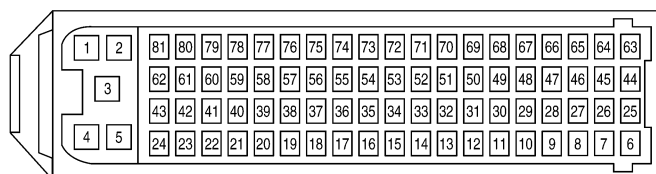
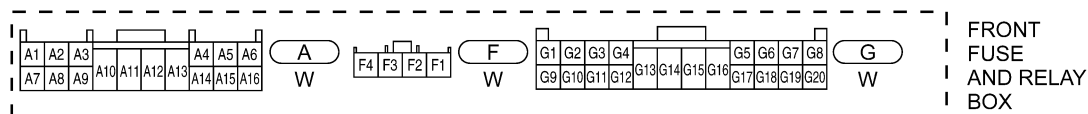
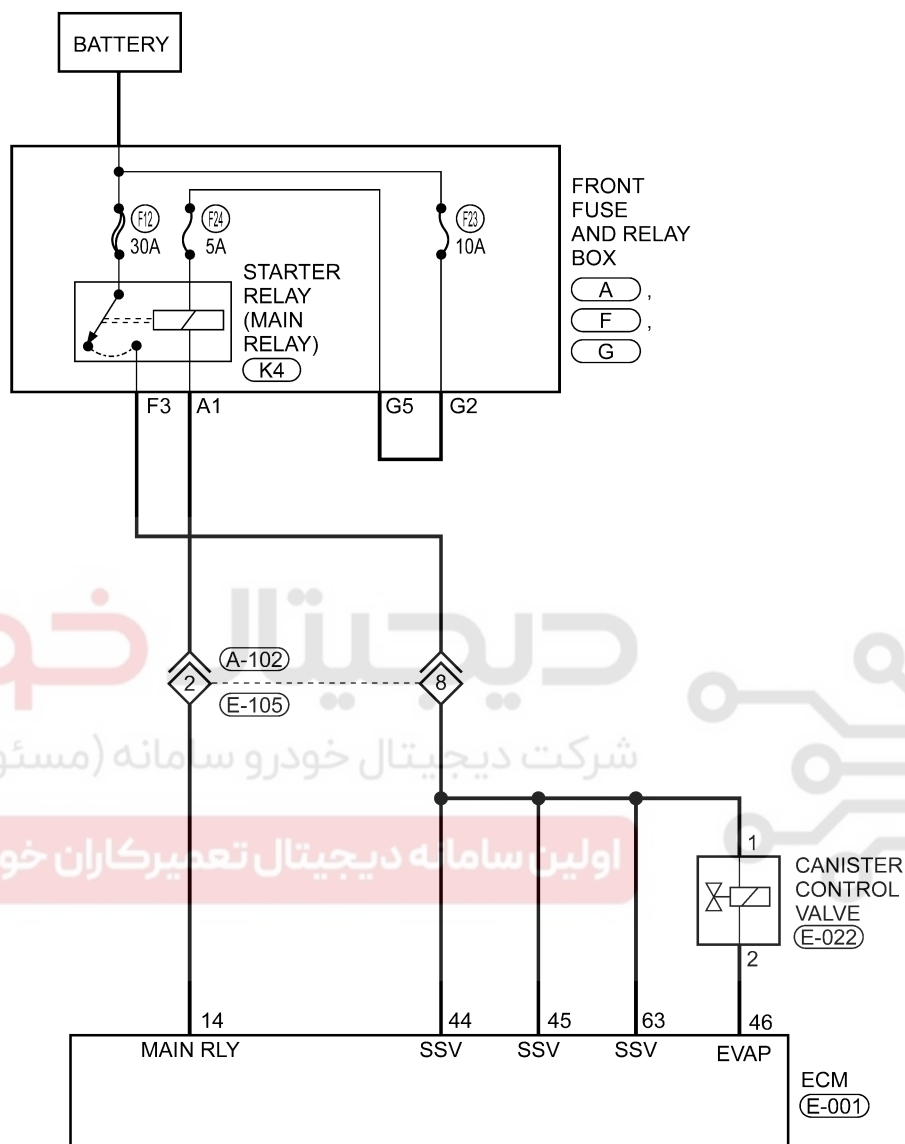
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



DIAGNOSIS & TESTING

P0444 - Evaporative Emission System Purge Control Valve Circuit Open

EEC - 2.0L - EVAP - 01



Itsmw030031t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	X-431 DATA STREAM
46	Canister control valve	Engine is running	0 % - 99.9 %

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0444	Evaporative emission system purge control valve circuit open	Engine is running	ECM detected that the improper voltage signal is sent to ECM.	• EVAP canister control valve • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it up to the normal operating temperature then select view DTC.
- If DTC is detected, go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnosis & Testing Diagnostic Help in Section 03 Electronic Engine Controls).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure**1. CHECK GROUND CONNECTIONS**

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

DIAGNOSIS & TESTING**2. CHECK EVAP CANISTER CONTROL VALVE ACTION**

- Start engine and warm it up to the normal operating temperature then select view DTC.
- Touch the EVAP canister valve body, raise engine speed up to 2,000 RPM.
- If the scan tool X-431 with the "ACTIVE TEST" function of the EVAP canister valve, touch the EVAP canister valve body, perform the action test.
- Slight vibration and concussion should exist.

Is the check result normal?

Yes >> Go to step 8.

No >> Go to the next step.

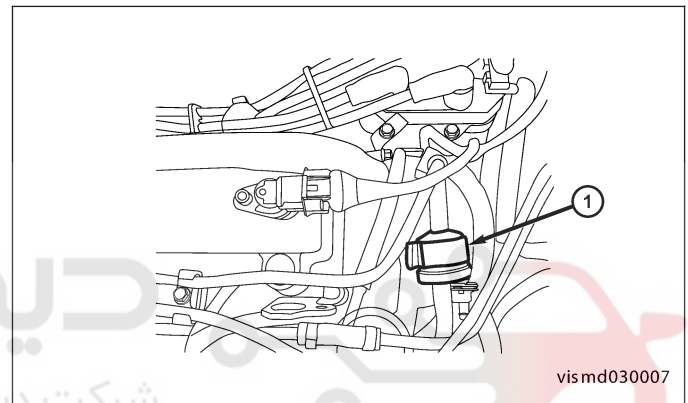
03**3. CHECK THE EVAP CANISTER CONTROL VALVE ELECTRICAL CONNECTOR**

- Turn ignition switch off.
- Disconnect the EVAP canister control valve (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

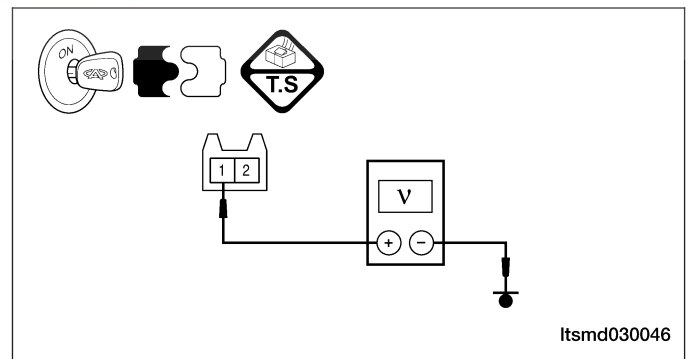
**4. CHECK EVAP CANISTER CONTROL VALVE POWER SUPPLY CIRCUIT**

- Turn ignition switch on.
- Check supply voltage between EVAP canister control valve terminal 1 and ground.
- 12 V should exist.

Is the check result normal?

Yes >> Go to step 7.

No >> Go to the next step.



DIAGNOSIS & TESTING

5. DETECT MALFUNCTIONING PART

- Check the following:
 - Harness connectors A-102, E-105
 - Front fuse and relay box
 - Fuse 23, fuse 24, fuse 12
 - Harness between EVAP canister control valve and fuse

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace malfunctioning part.

6. CHECK EVAP CANISTER CONTROL VALVE CONTROL CIRCUIT FOR AN OPEN

- Check voltage between EVAP canister control valve terminal 2 and ground.
- Approximately 3.6 V should exist.

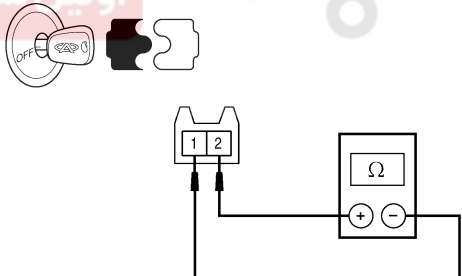
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open in harness or connectors.
If harness is normal, go to the next step.

7. CHECK EVAP CANISTER CONTROL VALVE

- Turn ignition switch off.
- Remove EVAP canister control valve.
- Check resistance between EVAP canister terminal 1 and 2 as shown in table.

EVAP CANISTER CONTROL VALVE TERMINAL NO.	RESISTANCE Ω (20°C)	
1 - 2	Approximately 26 Ω	

Itsmd030047

- Check air passage continuity and operation when apply 12 V current supply voltage between terminal 1 and 2.
- The check results should match specification.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace EVAP canister control valve.

8. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0444 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

03

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



DIAGNOSIS & TESTING**P0506 - Idle Control System RPM Lower Than Expected****On Board Diagnostic Logic**

- Self-diagnosis detection logic.
- If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0506	Idle control system RPM lower than expected	• Engine is running • With the engine idling in drive, the brake applied, engine run time below a calibrated minimum value, and no VSS, MAF/MAP, ECT, TPS, ETC, Crankshaft Position sensor, fuel system, or injector DTCs present.	ECM detected that the idle speed is less than the acceptable range.	• Electronic throttle control actuator • Intake air leak • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it up to the normal operating temperature then select view DTC.
- If DTC is detected, go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnosis & Testing Diagnostic Help in Section 03 Electronic Engine Controls).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK INTAKE AIR LEAK

- Start engine and let it idle.
- Listen for an intake air leak after the mass air flow sensor.

Is the check result normal?

Yes >> Go to the next step.

No >> Discover air leak location and repair.

03

2. CHECK THE ELECTRIC THROTTLE CONTROL ACTUATOR

- Check the electronic throttle open degree.
- Check the electronic throttle clearance.

Is the check result normal?

Yes >> Go to the next step.

No >> Clean or replace as necessary.

3. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0506 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

DIAGNOSIS & TESTING**P0604 - Internal Controller Module Random Access Memory (RAM) Error****P0605 - Internal Controller Module ROM Test Error****P0606 - ECM Processor****On Board Diagnostic Logic**

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	POSSIBLE CAUSE
P0604	Internal controller module Random Access Memory (RAM) error	ECM detected an internal failure	ECM
P0605	Internal controller module ROM test error		
P0606	ECM processor		

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE : شرکت دیجیتال خودرو سامانه (مسئولیت محد)

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

DIAGNOSIS & TESTING

Diagnostic Procedure

1. CHECK DTC

- Perform DTC confirmation procedure.

Is DTC P0604, P0605 or P0606 present?

Yes >> Go to the next step.

No >> The DTC condition is intermittent (See Diagnostic Help in Section 03 Electronic Engine Controls).

2. CHECK ECM POWER SUPPLY AND GROUND

- Check if the ECM supply voltage circuit, ground circuit open, high resistance or short circuits existing.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for open or short in harness and connectors.

3. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is the check result normal?

Yes >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

No >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

DIAGNOSIS & TESTING**P0602 - ECM Programming Error****On Board Diagnostic Logic**

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	POSSIBLE CAUSE
P0602	ECM programming error	ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



DIAGNOSIS & TESTING

Diagnostic Procedure

1. CHECK DTC

- Perform DTC confirmation procedure.

Is DTC P0602 present?

Yes >> Go to the next step.

No >> The DTC condition is intermittent (See Diagnostic Help in Section 03 Electronic Engine Controls).

2. CHECK THE ECM POWER SUPPLY AND GROUND

- Check if the ECM supply voltage circuit, ground circuit open, high resistance or short circuits existing.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open or short in harness and connectors.

3. MATCH ECM

With the scan tool X-431, match ECM before replace it (See ECM Removal & Installation in Section 03 Electronic Engine Controls), and view the DTC with the X-431.

Is DTC P0602 setting again?

Yes >> Go to the next step.
Refer to Technical Bulletin that issued.

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

4. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- See DTC Confirmation Procedure.

Is DTC P0602 still present?

Yes >> Replace the ECM.

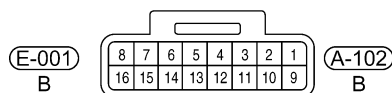
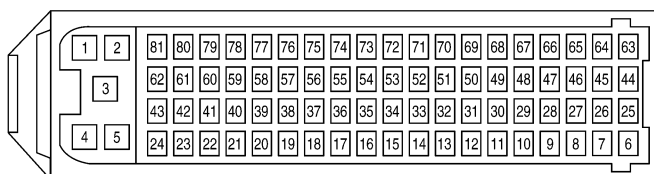
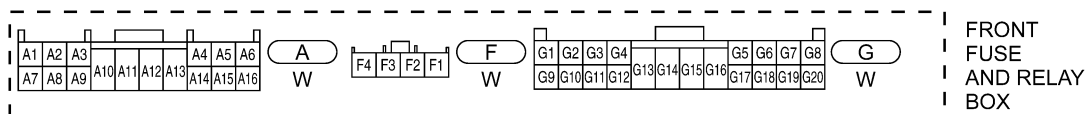
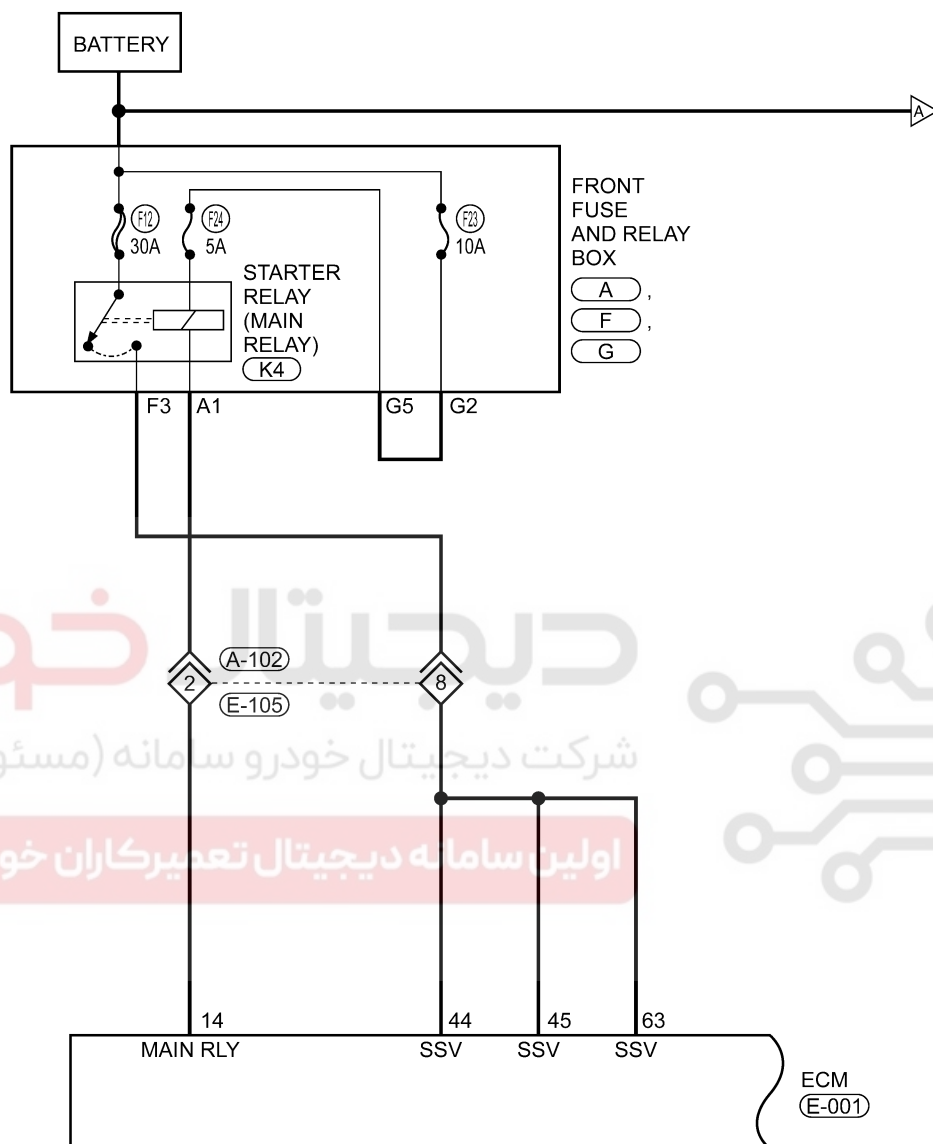
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

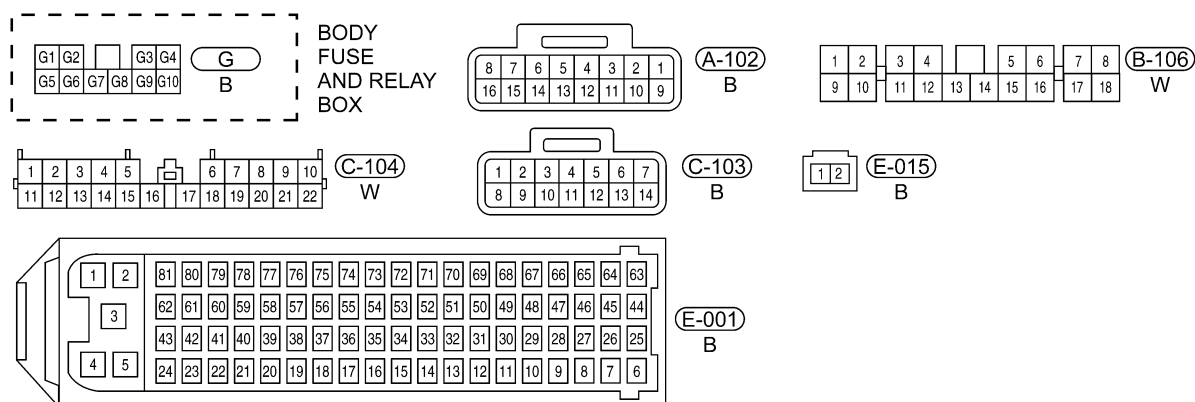
DIAGNOSIS & TESTING

P0645 - A/C Clutch Relay Circuit

EEC - 2.0L - A/C - 01



03



Itsmw030064t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
69	Air Condition (A/C) relay control signal	- After engine is started for 5 seconds, A/C can be turned on. - If IAT above 140.3 , A/C will be shut off. - If ECT is above 140.3°C, A/C will be shut off. If ECT is below 111.8°C, A/C will be resume. - If A/C high pressure is above 20 bar, A/C will be shut off. If A/C high pressure is below 19.5 bar, A/C will be resume. - If evaporator temperature is below 1.5°C, A/C will be shut off. If evaporator temperature is above 4.5°C, A/C will be resume. - If system voltage is below 8.04 V, A/C will be shut off. If system voltage is above 10.01 V, A/C will be resume.	0 V or 12 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0645	A/C clutch relay circuit	Engine is running	ECM detected that the input signal is out of the acceptable range.	- Fuse - A/C relay - Harness or connectors - ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature.
- Turn A/C switch on, then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

03

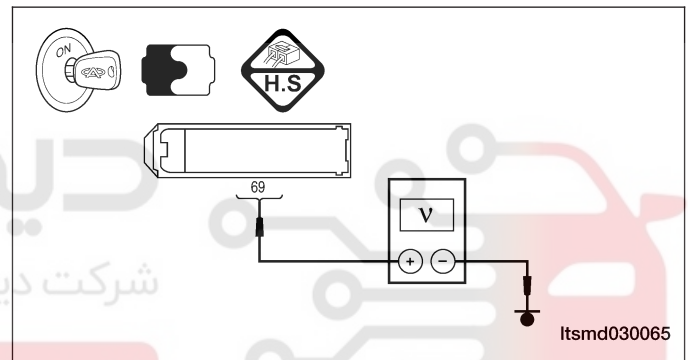
2. CHECK AIR CONDITION CLUTCH RELAY CONTROL CIRCUIT POWER SUPPLY CIRCUIT FOR OPEN

- Turn ignition switch on.
- Turn A/C switch off.
- Check A/C clutch relay control circuit supply voltage between ECM terminal 69 and ground in the ECM electrical connector E-001.
- 12 V should exist.

Is the check result normal?

Yes >> Go to step 4.

No >> Go to the next step.



3. DETECT MALFUNCTIONING PART

- Check the following:
 - Fuse 12
 - A/C relay
 - Body fuse and relay box G5
 - Harness connectors C-103, E-103, B-104, C-104
 - Harness for open between ECM terminal 69 and fuse 12

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace malfunctioning part.

4. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P0645 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

دیجیتال خودرو

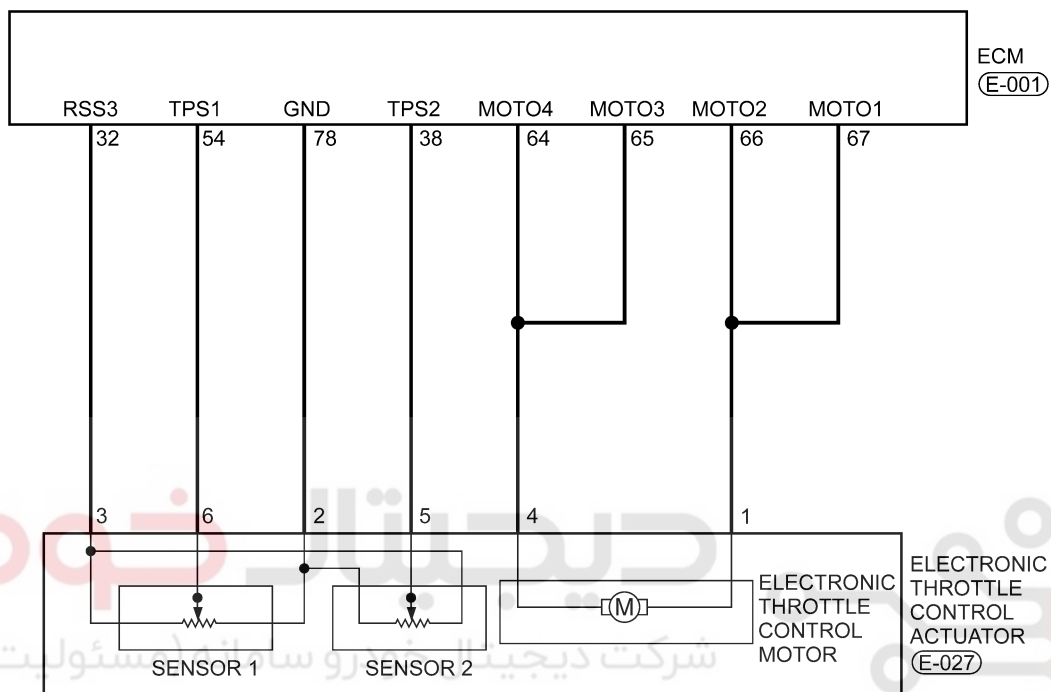
شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



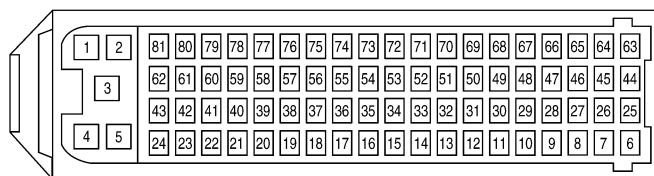
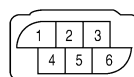
P1545 - Throttle Position Control Performance

EEC - 2.0L - TPS - 01



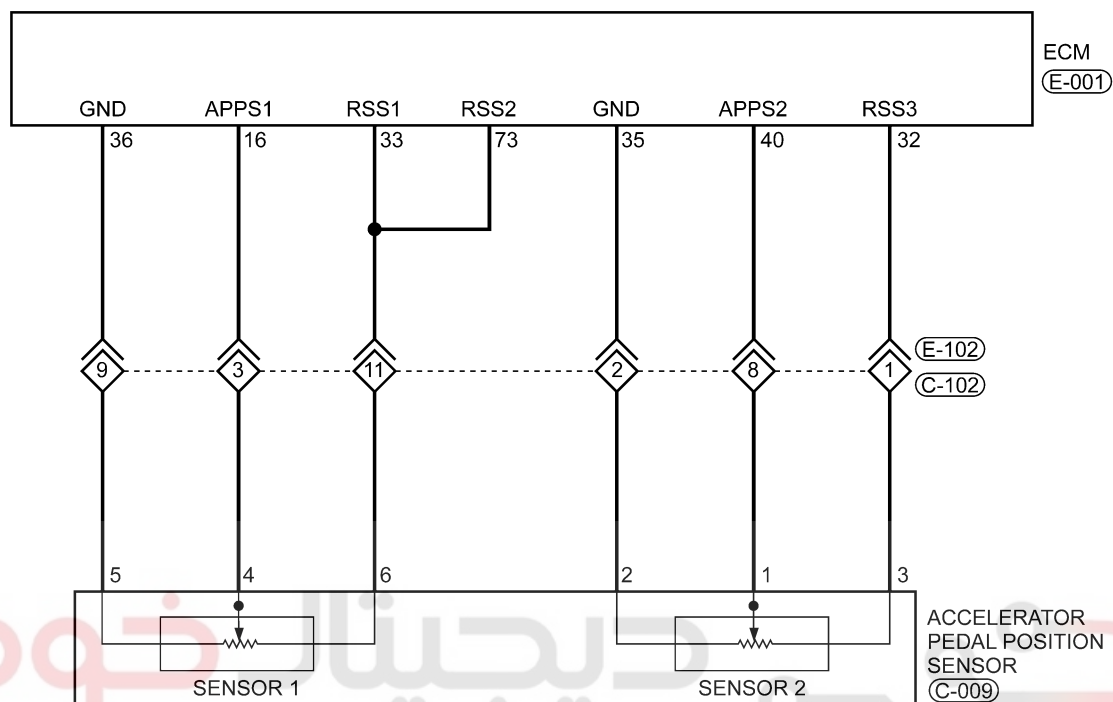
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اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

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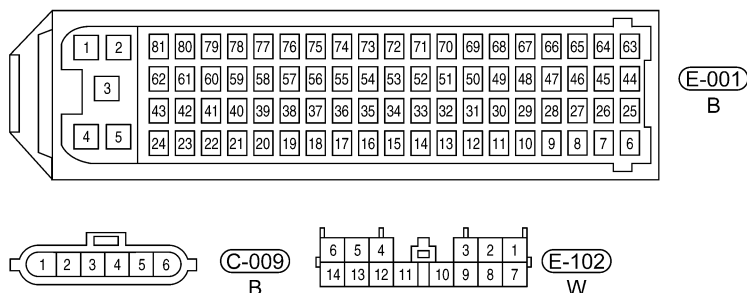
DIAGNOSIS & TESTING

EEC - 2.0L - APS - 01



شرکت دیجیتال خودرو (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



Itsmw030026t

DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
32	Regulated sensor supply 2	Ignition switch: ON -	-	Approximately 5 V
38	Electronic throttle control actuator (position sensor)		• Engine stopped • Accelerator pedal: Fully released	4.24 V
			• Engine stopped • Accelerator pedal: Fully depressed	0.72 V
54	Electronic throttle control actuator		• Engine stopped • Accelerator pedal: Fully released	0.74 V
			• Engine stopped • Accelerator pedal: Fully depressed	4.62 V
64	Motor 4		-	12 or 0 V
65	Motor 3			
66	Motor 2			12 or 0 V
67	Motor 1			
78	Sensor (GND)			Approximately 0 V

03

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P1545	Throttle position control performance	• Ignition switch: ON • Engine: Running	Rationally incorrect voltage is sent to ECM compared with the signals from TPS1 and TPS2.	• Electronic throttle control actuator (TPS1 and TPS2) • Harness or connectors • Accelerator pedal position sensor 2 • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature, then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING**Diagnostic Procedure****1. CHECK GROUND CONNECTIONS**

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

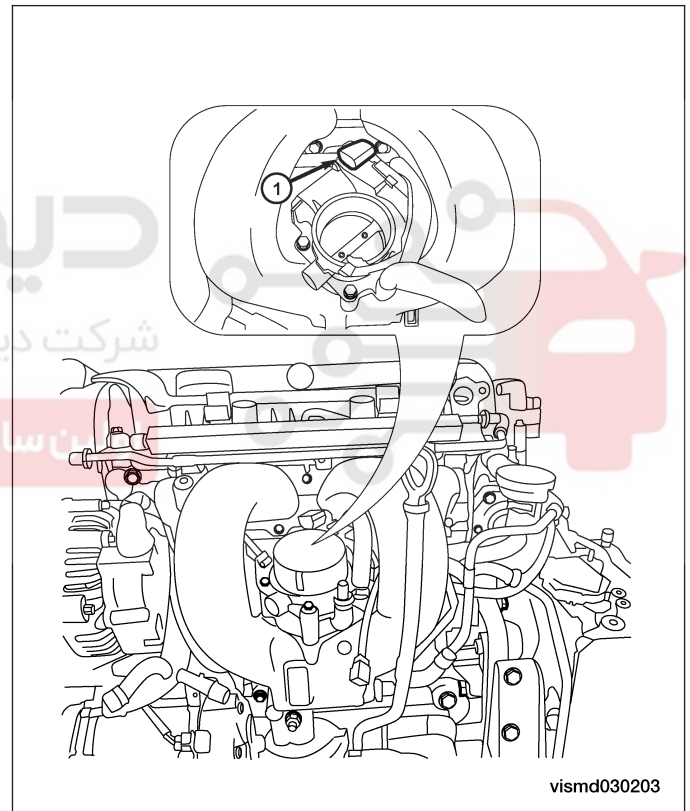
2. CHECK THE TPS ELECTRICAL CONNECTOR

- Disconnect the TPS electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



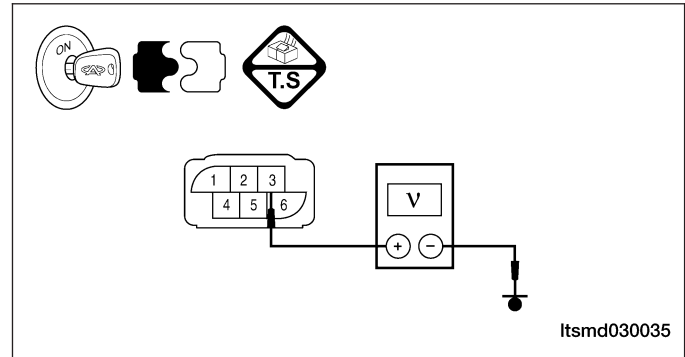
3. CHECK THE TPS POWER SUPPLY CIRCUIT - (1)

- Turn ignition switch on.
- Check TPS supply voltage between sensor terminal 3 and ground in the sensor electrical connector E-027.
- Approximately 5 V should exist.

Is the check result normal?

Yes >> Go to step 8.

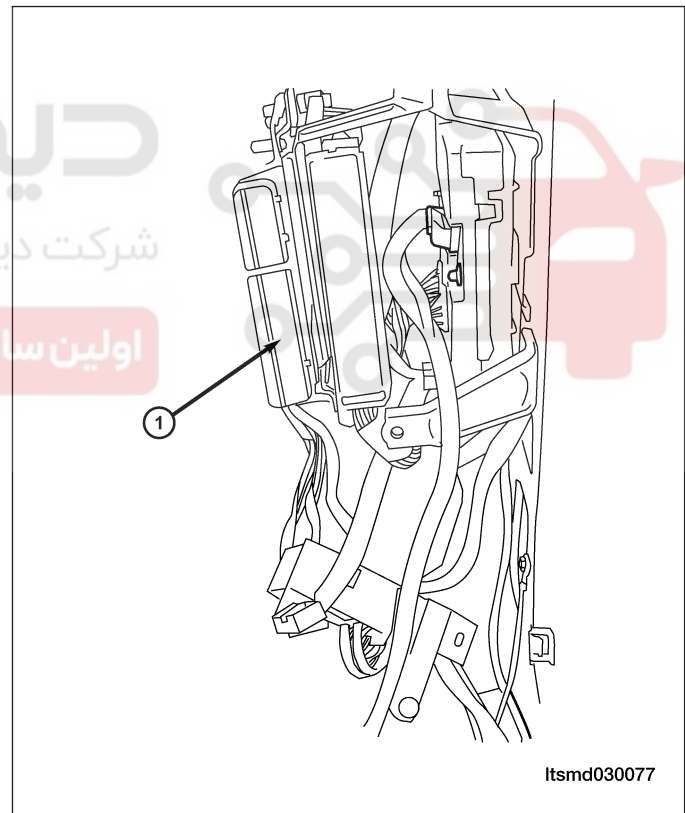
No >> Go to the next step.



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4. CHECK THE TPS POWER SUPPLY CIRCUIT - (2)

- Disconnect ECM harness connector (1).



- Turn ignition switch off.
- Check harness continuity between TPS terminal 3 and ECM terminal 32.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open.

DIAGNOSIS & TESTING

5. CHECK THE TPS POWER SUPPLY CIRCUIT - (3)

- Check harness for short to power and short to ground, between following terminals.

ECM TERMINAL	TPS TERMINAL
32	TPS terminal 3
32	APP sensor terminal 3
33	APP sensor terminal 6

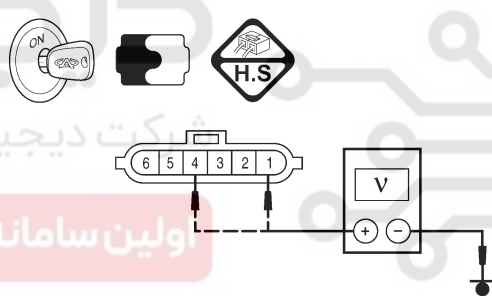
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for a short to ground or short to power in harness or connectors.

6. CHECK THE APP SENSOR

- Connect all harness connectors disconnected.
- Turn ignition switch on.
- Check voltage between ECM terminals 16 (APP sensor 1) and ground, terminal 40 (APP sensor 2) and ground under the following conditions:

ECM TERMINAL	APP SENSOR TERMINAL	
16	APP sensor terminal 4	
40	APP sensor terminal 1	

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TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
16	Accelerator pedal position sensor	Turn ignition switch on	• Engine stopped • Accelerator pedal: Fully released	0.72 - 0.74 V
			• Engine stopped • Accelerator pedal: Fully depressed	3.95 V
40	Accelerator pedal position sensor		• Engine stopped • Accelerator pedal: Fully released	0.36 - 0.37 V
			• Engine stopped • Accelerator pedal: Fully depressed	1.97 V

Is the check result normal?

Yes >> Go to step 10.

No >> Replace the Accelerator Pedal Assembly (See Accelerator Pedal Position Sensor Removal & Installation in Section 03 Electronic Engine Controls).

7. CHECK THE TPS SIGNAL CIRCUIT FOR OPEN AND SHORT

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- Turn ignition switch off.
- Disconnect ECM harness connector.
- Check harness continuity between electronic throttle control actuator terminal 5 and ECM terminal 38, electronic throttle control actuator terminal 6 and ECM terminal 54.
- Continuity should exist.
- Also check harness for short to power and short to ground.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open or short to power or short to ground in harness or connectors.

8. CHECK THE TPS GROUND CIRCUIT FOR AN OPEN AND SHORT

- Check harness continuity between electronic throttle control actuator terminal 2 and ECM terminal 78.
- Continuity should exist.
- Also check harness for short to power and short to ground.

Is the check result normal?

Yes >> Go to the next step.

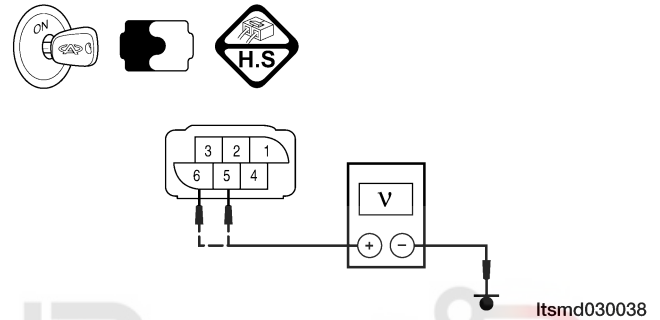
No >> Repair circuit for an open or short to power in harness or connectors.

DIAGNOSIS & TESTING

9. CHECK TPS

- Connect all harness connectors disconnected.
- Turn ignition switch on.
- Check voltage between ECM terminals 54 (TPS1) and ground, terminal 38 (TPS2) and ground under the following conditions:

TPS TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
5	Electronic throttle control actuator (TPS2)	• Engine stopped • Accelerator pedal: Fully released	4.24 V
		• Engine stopped • Accelerator pedal: Fully depressed	0.72 V
6	Electronic throttle control actuator (TPS1)	• Engine stopped • Accelerator pedal: Fully released	0.74 V
		• Engine stopped • Accelerator pedal: Fully depressed	4.62 V



Is the check result normal?

Yes >> Go to the next step.

No >> Replace electronic throttle control actuator, and perform throttle valve position learning.

10. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- See DTC Confirmation Procedure.

Is DTC P1545 still present?

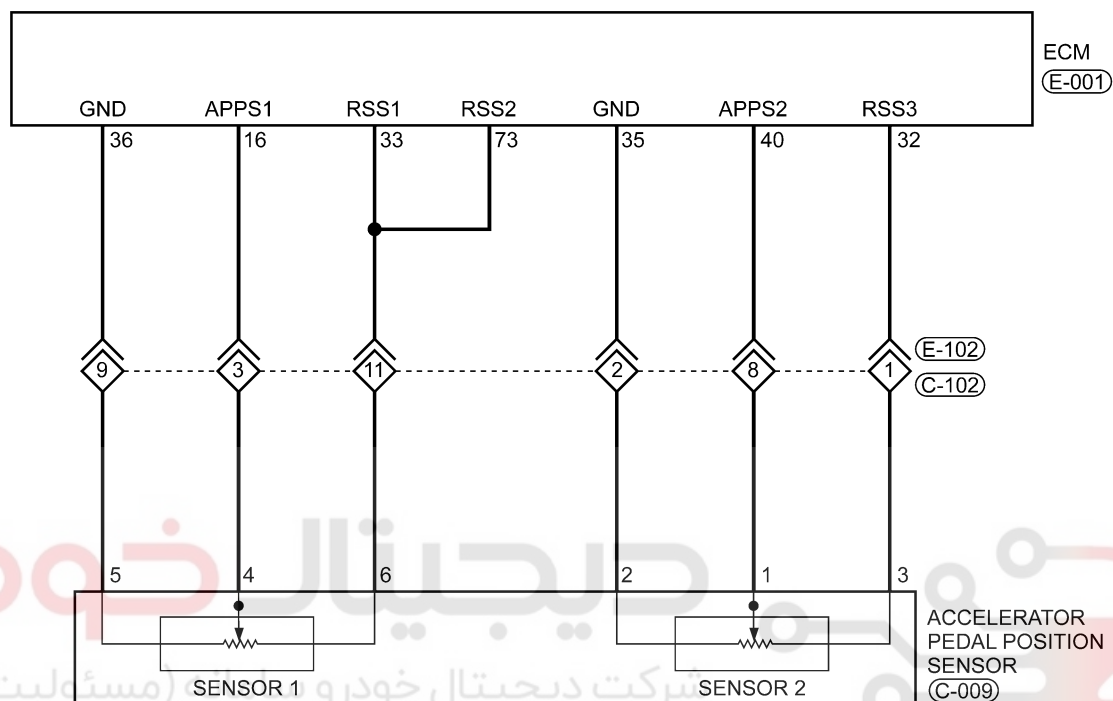
Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

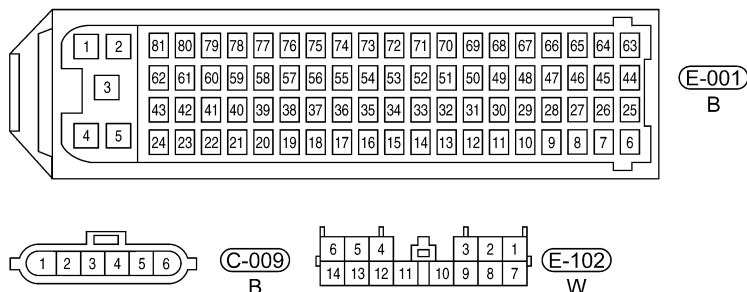
P2138 - Pedal Position Sensor Performance

EEC - 2.0L - APS - 01



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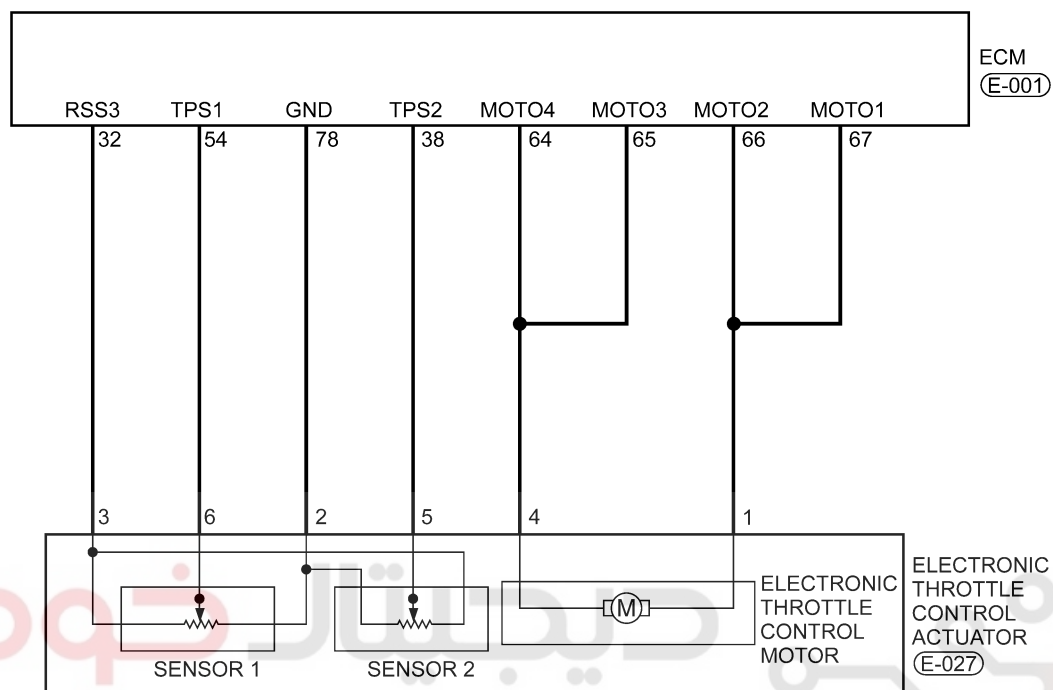
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



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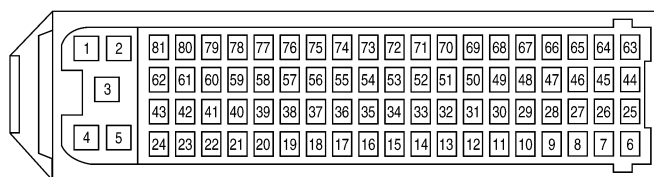
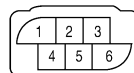
DIAGNOSIS & TESTING

EEC - 2.0L - TPS - 01



شرکت دیجیتال خودرو (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

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DIAGNOSIS & TESTING

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
32	Regulated sensor supply 2	Ignition switch: ON	-	Approximately 5 V
33	Regulated sensor supply 1		-	Approximately 5 V
16	Accelerator pedal position sensor		• Engine stopped • Accelerator pedal: Fully released	0.72 - 0.74 V
			• Engine stopped • Accelerator pedal: Fully depressed	3.95 V
40	Accelerator pedal position sensor		• Engine stopped • Accelerator pedal: Fully released	0.36 - 0.37 V
			• Engine stopped • Accelerator pedal: Fully depressed	1.97 V
35	Sensor (GND)		-	Approximately 0 V
36	Sensor (GND)		-	Approximately 0 V

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On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P2138	Accelerator pedal position sensor performance	• Ignition switch: ON • Engine: Running	Rationally incorrect voltage is sent to ECM compared with the signals from Accelerator Pedal Position (APP) sensor 1 and APP sensor 2.	• Accelerator pedal position sensor 1 and 2 • Harness or connectors • Electronic throttle control actuator (TPS1 and TPS2) • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

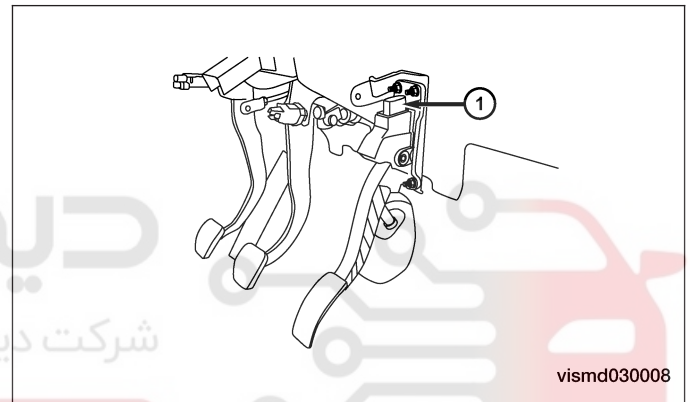
2. CHECK THE ACCELERATOR PEDAL POSITION (APP) SENSOR ELECTRICAL CONNECTOR

- Disconnect the APP sensor electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



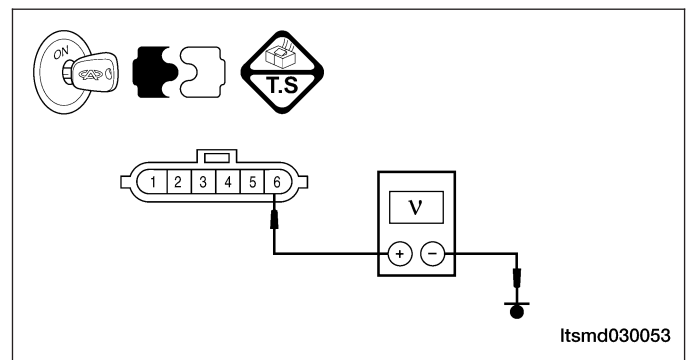
3. CHECK THE ACCELERATOR PEDAL POSITION (APP) SENSOR 1 POWER SUPPLY CIRCUIT

- Turn ignition switch on.
- Check APP sensor 1 supply voltage between sensor terminal 6 and ground in the sensor electrical connector C-009.
- Approximately 5 V should exist.

Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.



DIAGNOSIS & TESTING

4. DETECT MALFUNCTIONING PART

- Check the following:
 - Harness connectors E-102, C-102
 - Harness open and short between APP sensor 1 and ECM

Is the check result normal?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> Repair or replace malfunctioning part.

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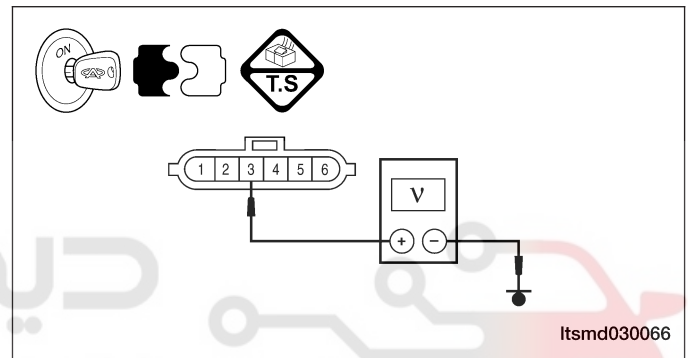
5. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT

- Check APP sensor supply voltage between sensor terminal 3 and ground in the sensor electrical connector C-009.
- Approximately 5 V should exist.

Is the check result normal?

Yes >> Go to step 7.

No >> Go to the next step.



6. DETECT MALFUNCTIONING PART

- Check the following:
 - Harness connectors E-102, C-102
 - Harness open and short between APP sensor 2 and ECM

Is the check result normal?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> Repair or replace malfunctioning part.

7. CHECK TPS POWER SUPPLY CIRCUIT

- Check harness for short to power and short to ground, between following terminals.

Check TPS Power Supply

ECM TERMINAL	TPS TERMINAL
32	3

Is the check result normal?

Yes >> Go to the next step.

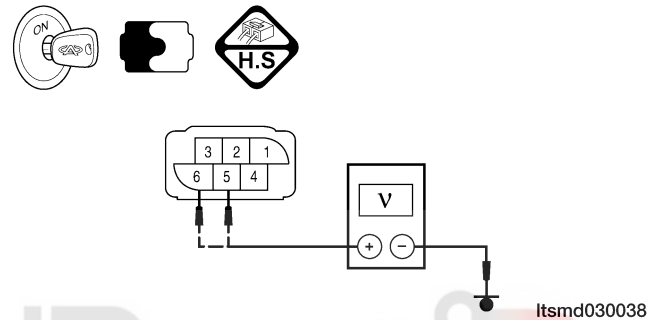
No >> Repair circuit for a short to ground or short to power in harness or connectors.

DIAGNOSIS & TESTING

8. CHECK TPS

- Connect all harness connectors disconnected.
- Turn ignition switch on.
- Check voltage between ECM terminals 54 (TPS1) and ground, terminal 38 (TPS2) and ground under the following conditions:

TPS TERMINAL NO.	ITEM	CONDITION	VOLTAGE (DC VOLTAGE)
5	Electronic throttle control actuator (TPS2)	• Engine stopped • Accelerator pedal: Fully released	4.24 V
		• Engine stopped • Accelerator pedal: Fully depressed	0.72 V
6	Electronic throttle control actuator (TPS1)	• Engine stopped • Accelerator pedal: Fully released	0.74 V
		• Engine stopped • Accelerator pedal: Fully depressed	4.62 V



Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace TPS circuits for open or short.
If the TPS circuits are normal, replace electronic throttle control actuator. Perform throttle valve position self-learning.

9. CHECK APP SENSOR GROUND CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch off.
- Disconnect ECM harness connector.
- Check harness continuity between APP sensor terminal 2 and ECM terminal 35, APP sensor terminal 5 and ECM terminal 36.
- Continuity should exist.
- Also check harness for short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open or short to power in harness or connectors.

DIAGNOSIS & TESTING

10. CHECK APP SENSOR CIRCUIT FOR AN OPEN OR SHORT

- Check harness continuity between APP sensor 1 terminal 4 and ECM terminal 16, APP sensor 2 terminal 1 and ECM terminal 40.
- Continuity should exist.
- Also check harness for short to power and short to ground.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open or short to power or short to ground in harness or connectors.

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11. CHECK APP SENSOR

- Connect all harness connectors disconnected.
- Turn ignition switch on.
- Check voltage between ECM terminals 16 (APP sensor 1 signal), 40 (APP sensor 2 signal) and ground under the following conditions:

TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
16	Accelerator Pedal Position sensor	• Engine stopped • Accelerator pedal: Fully released	0.72 - 0.74 V
		• Engine stopped • Accelerator pedal: Fully depressed	3.95 V
40	Accelerator Pedal Position sensor	• Engine stopped • Accelerator pedal: Fully released	0.36 - 0.37 V
		• Engine stopped • Accelerator pedal: Fully depressed	1.97 V

Is the check result normal?

Yes >> Go to the next step.

No >> Replace accelerator pedal assembly.
Perform Accelerator pedal position self-learning.

12. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

Is DTC P2138 still present?

Yes >> Replace the ECM.

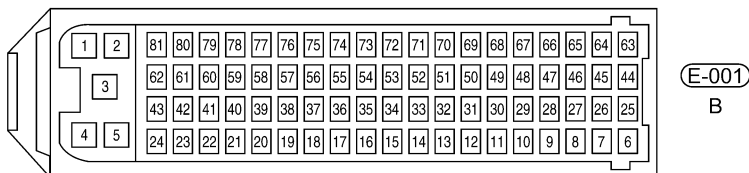
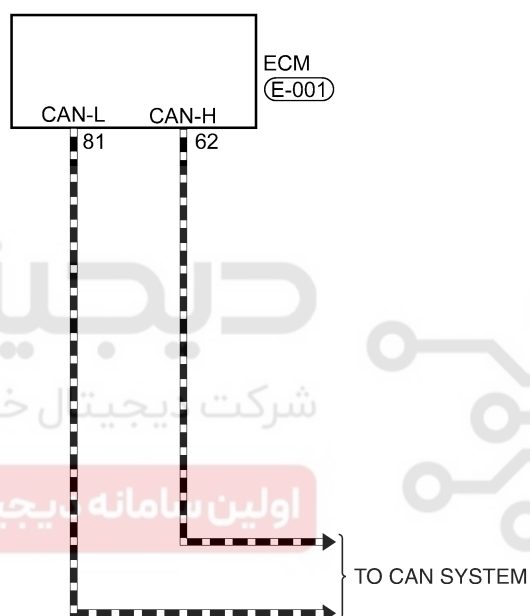
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

DIAGNOSIS & TESTING

U0001 - High Speed CAN Defective

EEC - 2.0L - CAN - 01



DIAGNOSIS & TESTING**On Board Diagnostic Logic**

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
U0001	High speed CAN defective	With the ignition switch on	ECM detected that lost communication over the CAN BUS circuit. The circuit is continuously monitored.	• Harness or connectors • TCM • ECM

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DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Cycle ignition switch several times then select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

- Ensure that the battery is fully charged.
- Before performing any DTC diagnostic procedures, verify the ECM power and ground circuits are properly connected.
- Before performing the diagnostic procedure, settle all other ECM DTCs first.

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

DIAGNOSIS & TESTING

Diagnostic Procedure**1. CHECK GROUND CONNECTIONS**

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-207 and E-208 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness (With 2.0L Engine) in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

2. CHECK DTC

- Turn ignition switch on.
- With the scan tool, select view ECM CAN DTC and data stream.

Is DTC U0001 present?

Yes >> Go to the next step.

No >> The conditions that caused this code to set are not present at this time. See Diagnostic Help in Section 03 Electronic Engine Controls.
Erase all codes and test drive the vehicle to verify the repair is complete.

3. CHECK THE OTHER MODULES CAN DTC

- With the scan tool X-431, enter all the other CAN communication modules such as TCM, CAN converter module.
- Read the CAN DTC.

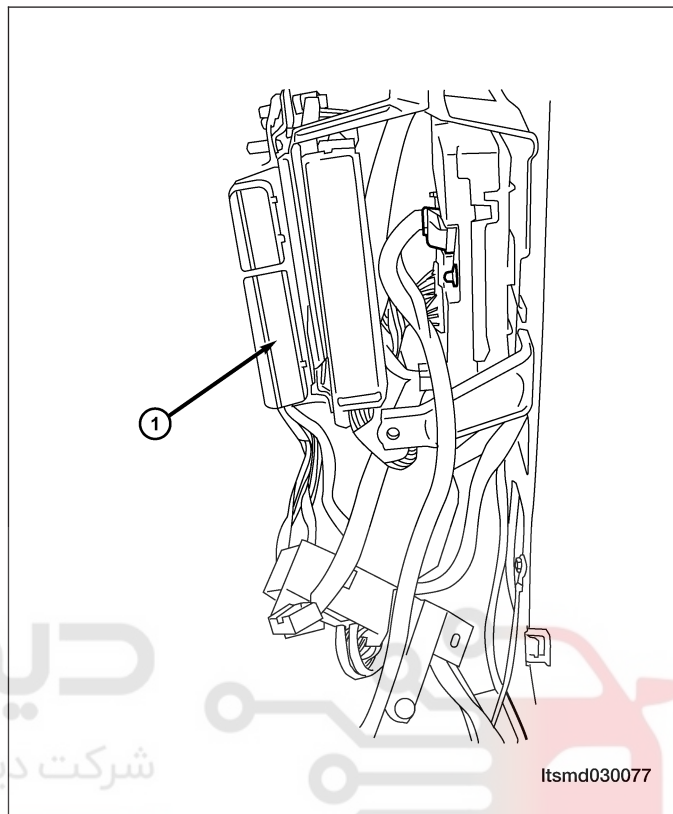
Were other modules CAN DTCs found?

Yes >> If all of the other modules have the same DTC "CAN Communication", go to the next step.
If all of the other modules have the DTC "Lost communication with ECM", and do not have the "CAN Communication", Replace and program the ECM module.

No >> Go to step 8.

4. CHECK CAN-BUS LINE TERMINAL RESISTANCE IN ECM

- Turn ignition switch off.
- Disconnect battery positive cable.
- Disconnect ECM connector (1).



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- Check resistance between ECM connector terminal 62 and 81.

ECM CONNECTOR TERMINAL (CAN-H)	ECM CONNECTOR TERMINAL (CAN-L)	RESISTANCE	
62	81	123 Ω	

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the ECM.

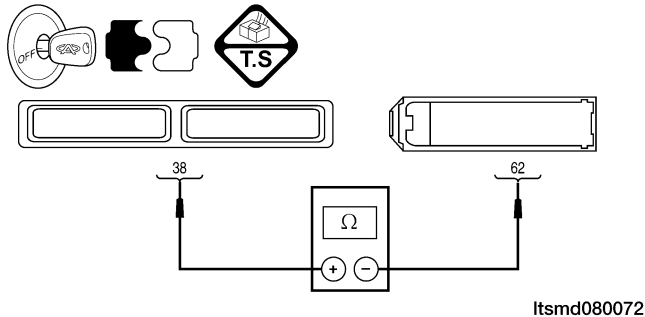
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

The problem caused by ECM internal error.

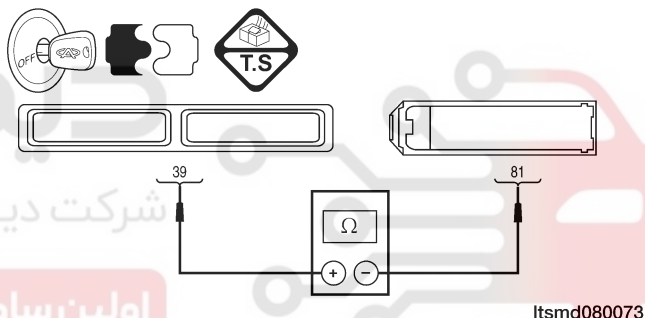
DIAGNOSIS & TESTING

5. CHECK THE CAN-BUS LINE

- Disconnect TCM and CAN converter connectors (See Transaxle Control Module Remove & Installation in Section 08 Transaxle).
- Check harness (CAN-H) continuity between following terminals.

CAN	TCM CONNECTOR TERMINAL	ECM CONNECTOR TERMINAL	CONTINUITY	
CAN-H	38	62	Yes	

- Check harness (CAN-L) continuity between following terminals.

CAN	TCM CONNECTOR TERMINAL	ECM CONNECTOR TERMINAL	CONTINUITY	
CAN-L	39	81	Yes	

- Also check harness for short to ground and short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the CAN-Bus line.

DIAGNOSIS & TESTING

6. CHECK CAN-BUS LINE

- Connect battery positive cable.
- Connect TCM and ECM connectors (See Transaxle Control Module Remove & Installation in Section 08 Trans-axle).
- Turn ignition switch on.
- Check CAN-Bus voltage between following terminals.

CAN-H

- 0.025 V should exist while not activate communication.
- 0.65 V should exist while activate communication.

CAN-L

- 11 V should exist while not activate communication.
- 4.65 V should exist while activate communication.



Is the check result normal and DTC U0001 not present?

Yes >> Replace the CAN converter.
The problem caused by the CAN converter internal error.

No >> Go to the next step.

7. CHECK CAN-BUS LINE

- Turn ignition switch off.
- Connect CAN converter.
- Disconnect TCM connectors (See Transaxle Control Module Remove & Installation in Section 08 Transaxle).
- Turn ignition switch on.
- Check CAN-Bus voltage as the standard value.

Is the check result normal and DTC U0001 not present?

Yes >> Replace TCM.
The problem caused by TCM internal error.

No >> Go to the next step.

DIAGNOSIS & TESTING

8. CHECK ECM ELECTRICAL CONNECTOR

- Inspect the ECM electrical connector pins for proper fit or any chafed, pierced, pinched, or partially broken wires.
- With the X-431 scan tool, read ECM DTC.

Is the check result normal and DTC U0001 not present?

Yes >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

No >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

The problem caused by ECM internal error.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



ON-VEHICLE SERVICE

Engine Coolant Temperature (ECT) Sensor

Description

The Engine Coolant Temperature (ECT) sensor threads into the coolant outlet connector. The ECT is a negative thermal coefficient sensor.

Operation

The ECT provides an input to the Engine Control Module (ECM). As temperature increases, resistance of the sensor decreases. As coolant temperature varies, the ECT sensor resistance changes resulting in a different voltage value at the ECT sensor signal circuit. The ECM uses the input to control air-fuel mixture, timing, A/C compressor and radiator fan on/off times.

03

Removal & Installation

1. Disconnect the negative battery cable.
2. Drain the cooling system (See Cooling System Draining Procedure in Section 06 Cooling System).

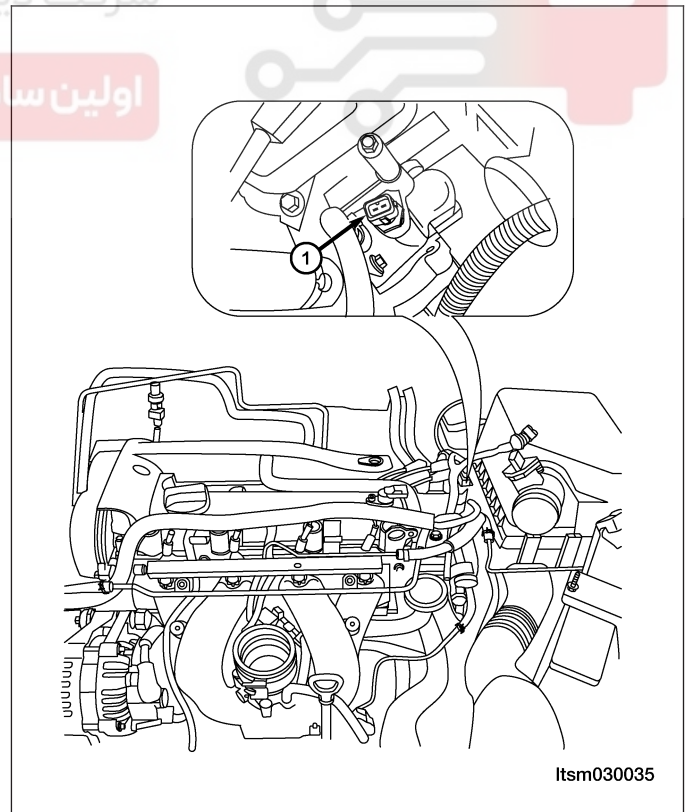
WARNING!

Never remove the pressure relief cap under any conditions while the engine is operating or hot. Failure to follow these instructions could result in personal injury or damage to the cooling system or engine. To avoid having scalding hot coolant or steam blow out of the cooling system, use extreme care when removing the pressure relief cap. Wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly one turn (counterclockwise). Step back while the pressure is released from the cooling system. When you are certain all the pressure has been released, (with a cloth) turn and remove the pressure relief cap. Failure to follow these instructions may result in serious personal injury.

3. Disconnect the coolant temperature sensor electrical connector.

CAUTION:
Remove the coolant temperature sensor when the engine is cold.

4. Remove the engine coolant temperature sensor (1).
(Tighten: Engine coolant temperature sensor to 20 N·m)



5. Discard the O-ring.

6. Installation is in the reverse order of removal.

NOTE :

After installing the engine coolant temperature sensor, check the coolant level.

Knock Sensor

Description

The knock sensor is attached to the cylinder block. The knock sensor is designed to detect engine vibration that is caused by detonation.

Operation

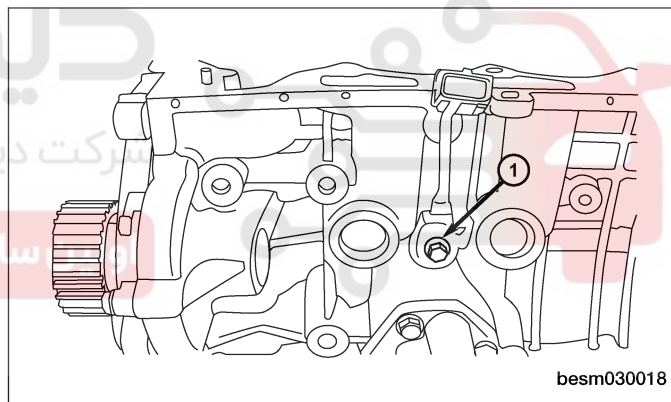
When the knock sensor detects a knock in one of the cylinders, it sends an input signal to the Engine Control Module (ECM). In response, the ECM retards ignition timing for all cylinders by a specified amount.

The knock sensor contains a piezoelectric material which constantly vibrates and sends an input voltage (signal) to the ECM while the engine operates. As the intensity of the vibration increases, the knock sensor output voltage also increases.

The ECM ignores knock sensor input during engine idle conditions. Once the engine speed exceeds a specified value, knock retard is allowed.

Removal & Installation

1. Disconnect and isolate the negative battery cable.
2. Disconnect the knock sensor electrical connector.
3. Remove the knock sensor retaining bolt (1) and remove the knock sensor.
(Tighten: Knock sensor retaining bolt to 20 N·m)



4. Installation is in the reverse order of removal.

Oxygen Sensor

Description

This vehicle is equipped with two oxygen sensors (upstream oxygen sensor & downstream oxygen sensor). The oxygen sensors are located before and after the three way catalyst. The oxygen sensors continually monitor the oxygen level in the exhaust gas. The sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 volt in richer conditions to 0 volt in leaner conditions.

Operation

The O₂ sensors produce voltages from 0 to 1 volt, depending upon the oxygen content of the exhaust gas. When a large amount of oxygen is present (caused by a lean air/fuel mixture, can be caused by misfire and exhaust leaks), the sensors produces a low voltage. When there is a lesser amount of oxygen present (caused by a rich air/fuel mixture, can be caused by internal engine problems) it produces a higher voltage. By monitoring the oxygen content and converting it to electrical voltage, the sensors act as a rich-lean switch.

The oxygen sensors are equipped with a heating element that keeps the sensors at proper operating temperature during all operating modes. Maintaining correct sensor temperature at all times allows the system to enter into closed loop operation sooner. Also, it allows the system to remain in closed loop operation during periods of extended idle.

Upstream Oxygen Sensor

The input from the upstream heated oxygen sensor tells the Engine Control Module (ECM) the oxygen content of the exhaust gas. Based on this input, the ECM fine tunes the air-fuel ratio by adjusting injector pulse width.

Downstream Oxygen Sensor

The downstream heated oxygen sensor signal is used to detect catalytic converter deterioration. As the converter deteriorates, the signal from the downstream sensor begins to match the upstream sensor signal except for a slight time delay. By comparing the downstream heated oxygen sensor signal to the signal from the upstream sensor, the ECM calculates catalytic converter efficiency. This calculation is also used to establish the upstream O₂ goal voltage (switching point).

03

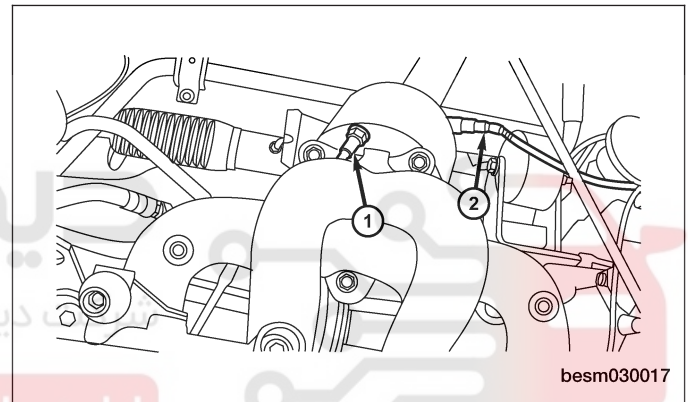
Removal & Installation - Upstream Oxygen Sensor

1. Disconnect the negative battery cable.
2. Disconnect the oxygen sensor electrical connector.

CAUTION:

Remove the oxygen sensor after the exhaust pipe has cooled.

3. Remove the upstream oxygen sensor (1).
(Tighten: Upstream oxygen sensor to 45 N·m)



4. Installation is in the reverse order of removal.

Installation Notes:

- Before installing the oxygen sensor, coat the threads with rust inhibiting lubricant.

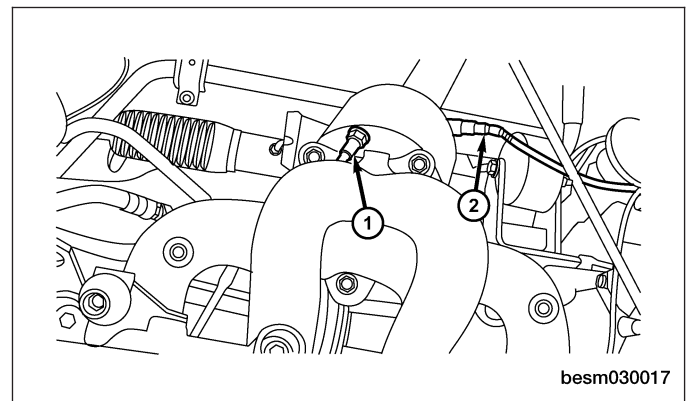
Removal & Installation - Downstream Oxygen Sensor

1. Disconnect the negative battery cable.
2. Disconnect the oxygen sensor electrical connector.

CAUTION:

Remove the oxygen sensor after the exhaust pipe has cooled.

3. Remove the downstream oxygen sensor (2).
(Tighten: Downstream oxygen sensor to 45 N·m)



4. Installation is in the reverse order of removal.

Installation Notes:

- Before installing the oxygen sensor, coat the threads with rust inhibiting lubricant.

Crankshaft Position (CKP) Sensor**Description**

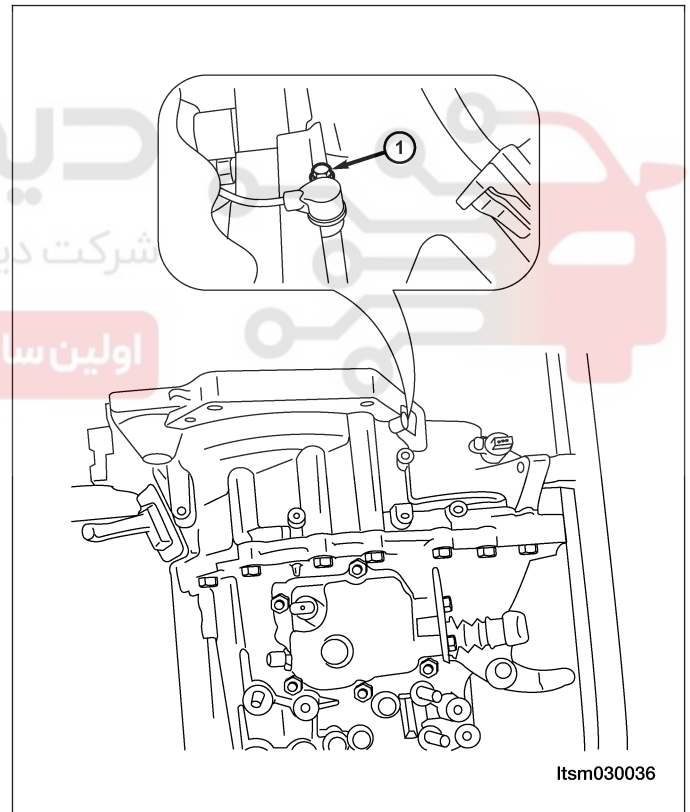
The Crankshaft Position (CKP) sensor is located on the flywheel shell facing the gear teeth of the signal plate. It detects the fluctuation of the engine revolution. The sensor consists of a permanent magnet and Induction coil.

Operation

When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change. The changing gap causes the magnetic field near the sensor to change. Due to the changing magnetic field, the voltage from the sensor changes. The Engine Control Module (ECM) receives the voltage signal and detects the fluctuation of the engine revolution.

Removal & Installation

1. Disconnect and isolate the negative battery cable.
2. Disconnect the CKP sensor electrical connector.
3. Remove the CKP sensor retaining bolt (1) and remove the CKP sensor.
(Tighten: Crankshaft position sensor retaining bolt to 10 N·m)



4. Installation is in the reverse order of removal.

Camshaft Position (CMP) Sensor

Description

The Camshaft Position (CMP) sensor senses the protrusion of inlet valve cam sprocket to identify a particular cylinder. The CMP sensor senses the piston position. When the Crankshaft Position (CKP) sensor becomes inoperative, the CMP sensor provides various controls of engine parts instead, utilizing timing of cylinder identification signals. The sensor consists of a permanent magnet and Hall IC.

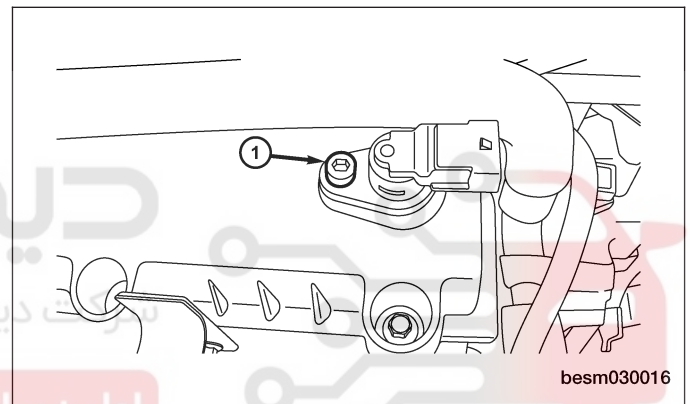
Operation

When engine is running, the high and low parts of the teeth cause the gap with the sensor to change. The changing gap causes the magnetic field near the sensor to change. Due to the changing magnetic field, the voltage from the sensor changes. The Engine Control Module (ECM) detects the voltage signal and identify piston position and cylinder timing.

03

Removal & Installation

1. Disconnect the negative battery cable.
2. Disconnect the CMP sensor electrical connector.
3. Remove the CMP sensor retaining bolt (1).
(Tighten: Camshaft position sensor retaining bolt to 7 N·m)
4. Remove CMP sensor.
5. Pull sensor up out of the cylinder head cover.
6. Installation is in the reverse order of removal.



Air Flow Sensor

Description

The air flow sensor is placed in the air intake hose. The air flow sensor measures the intake flow rate by measuring a part of the entire intake flow. The air flow sensor converts the amount of air drawn into the engine into a voltage signal. The Engine Control Module (ECM) needs to know intake air volume to calculate engine load. This is necessary to determine how much fuel to inject.

Operation

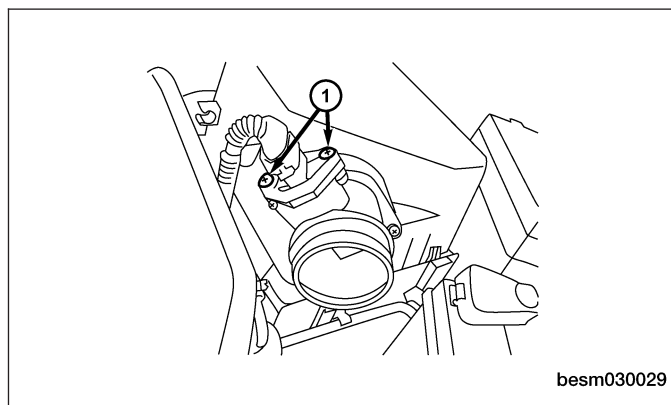
The air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss. Therefore, the electric current supplied to the hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this voltage signal change.

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Disconnect the air flow sensor electrical connector.

ON-VEHICLE SERVICE

4. Remove the air flow sensor retaining bolts (1).
(Tighten: Air flow sensor retaining bolts to 5 N·m)



5. Pull sensor up and take out of the air cleaner case.
6. Installation is in the reverse order of removal.

Accelerator Sensor**Description**

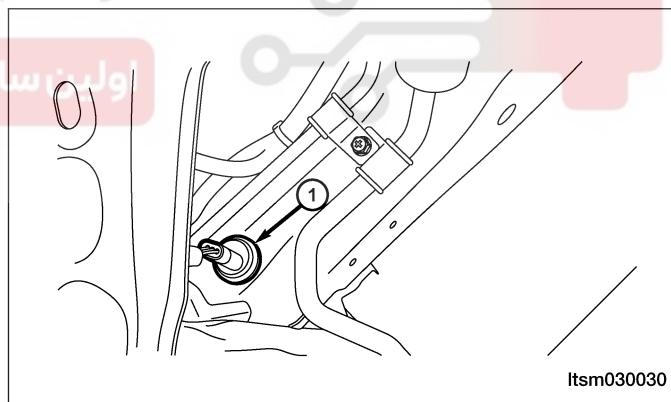
The accelerator sensor is located on the right front crossbeam.

Operation

The accelerator sensor monitors the road conditions. It sends a signal to the ECM, the ECM determines if a possible misfire condition exists.

Removal & Installation

1. Disconnect the negative battery cable.
2. Disconnect the accelerator sensor connect.
3. Remove the accelerator sensor (1).



4. Installation is in the reverse order of removal.

Speed Control System**Description**

The Speed Control System allows a driver to keep the vehicle at a predetermined speed without depressing the accelerator pedal. The driver can set vehicle speed in advance between approximately 25 km/h and 130 km/h.

ECM controls throttle angle of electronic throttle control actuator to regulate engine speed.

If any malfunction occurs in the Speed Control System, it automatically deactivates the system and the cruise indicator flashes.

Operation

Set Operation

- Press CRUISE combination switch (ON/OFF switch). The CRUISE indicator in instrument cluster illuminates.
- When vehicle speed reaches a desired speed between approximately 25 km/h and 130 km/h, press SET switch.

Speed Operation

- If the vehicle speed has been increased by during cruise control driving, the SET switch is pressed and then Speed Control System will keep the new set speed.
- If the RESUME/ACC switch is pressed (less than 0.5 seconds) during cruise control operation, the cruising speed is higher than the original speed of 2 km/h.
- If the DEC switch is pressed (less than 0.5 seconds) during cruise control operation, the cruising speed is less than the original speed of 2 km/h.

Cancel Operation

- When any of following conditions exist, cruise operation will be canceled.
 - OFF switch is pressed
 - Brake pedal is depressed
 - If any malfunction occurs in Speed Control System, it automatically deactivates control.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

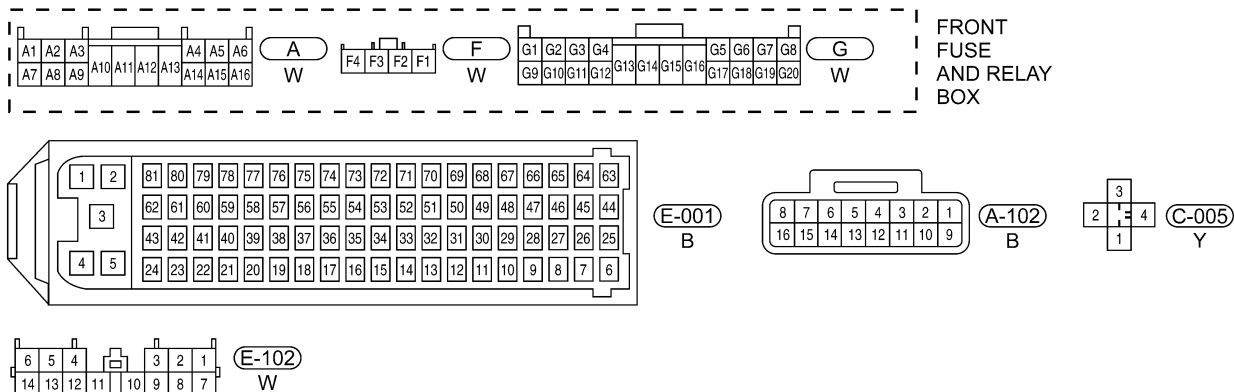
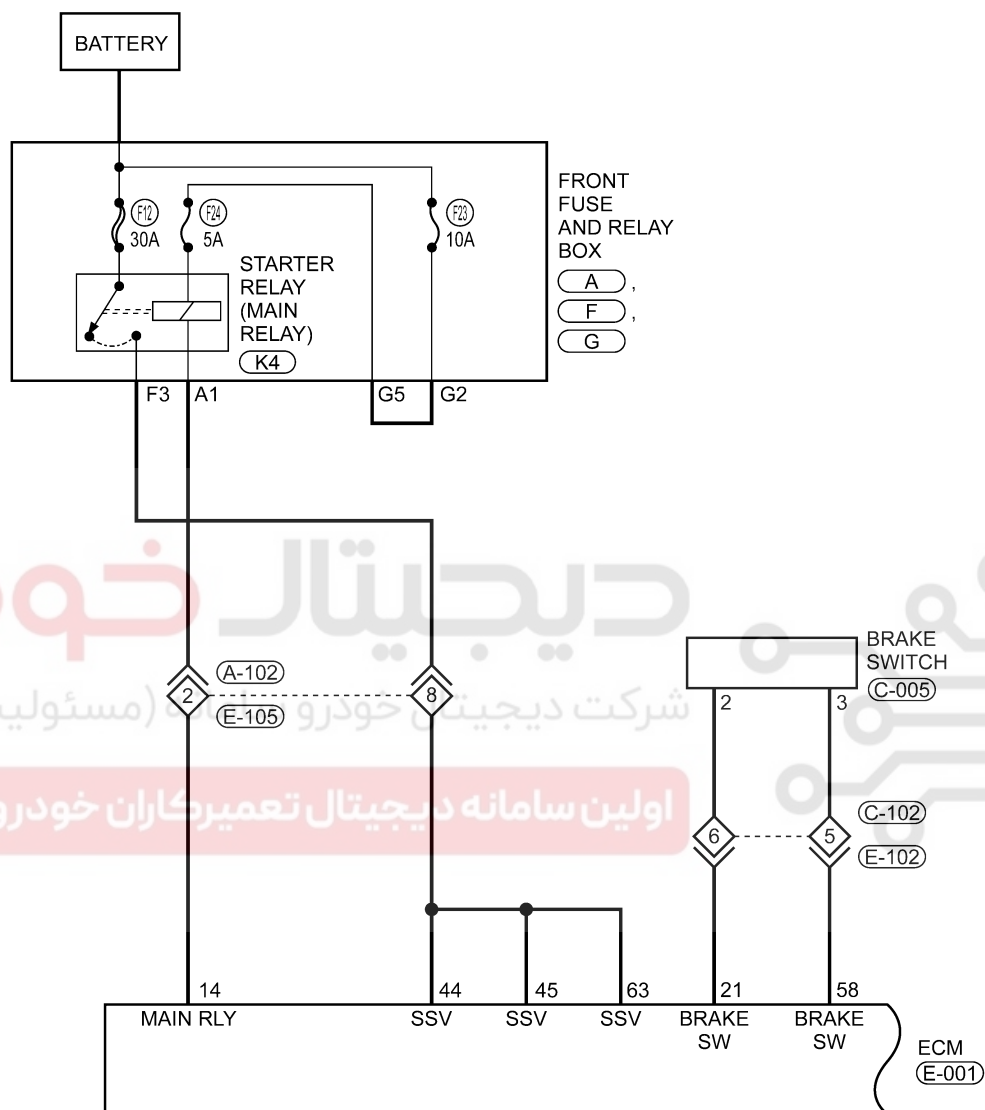
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



Electrical Schematics

Speed Control System (page 1 of 4)

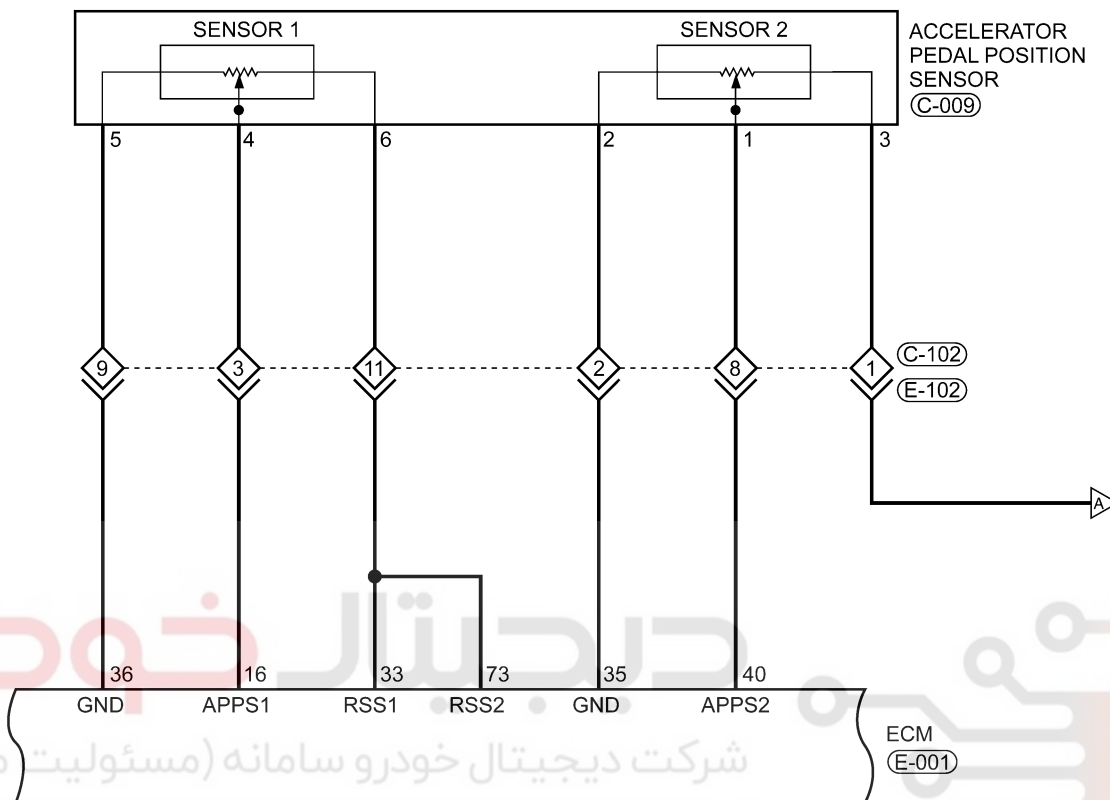
SPEED CONTROL - WITH DP0 TRANSMISSION



Itsmw030060t

Speed Control System (page 2 of 4)

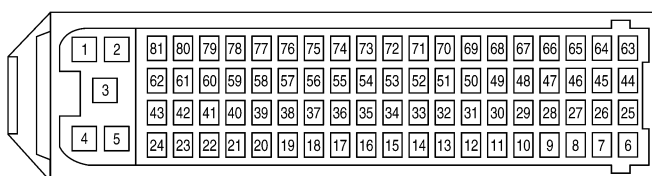
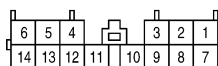
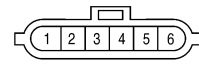
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درجیتال خودرو

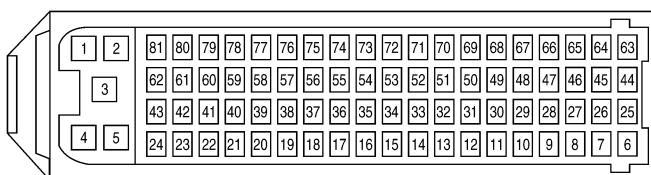
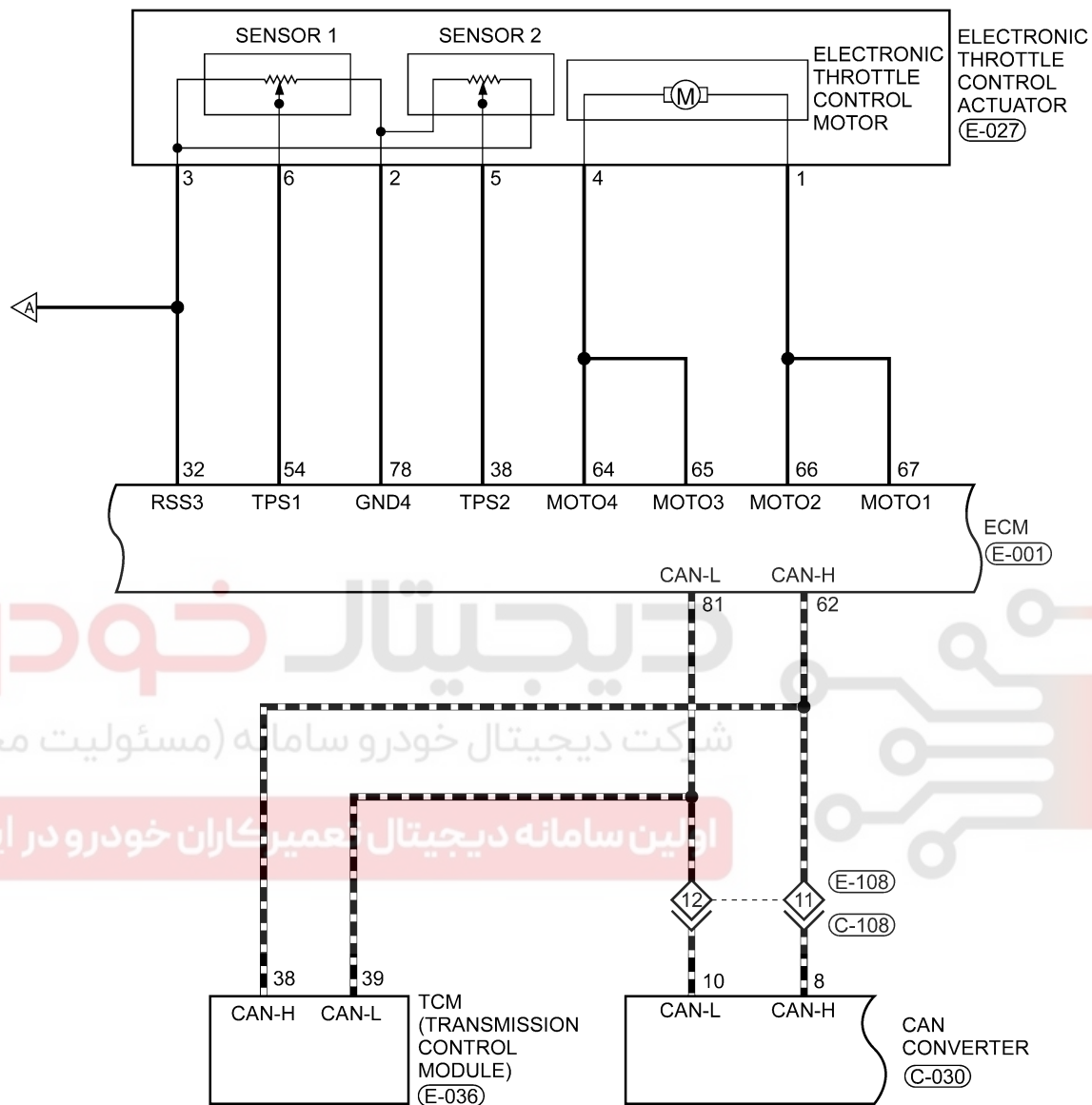
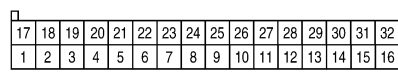
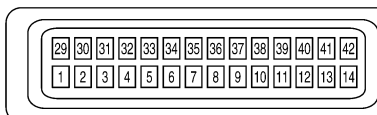
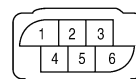
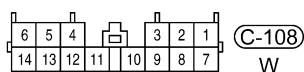
شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

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BE-102
WC-009
B

ON-VEHICLE SERVICE

Speed Control System (page 3 of 4)

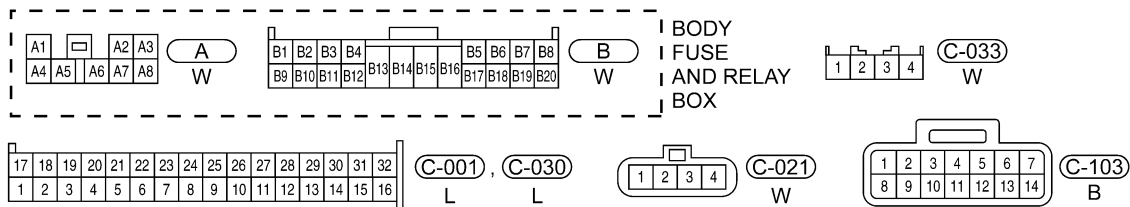
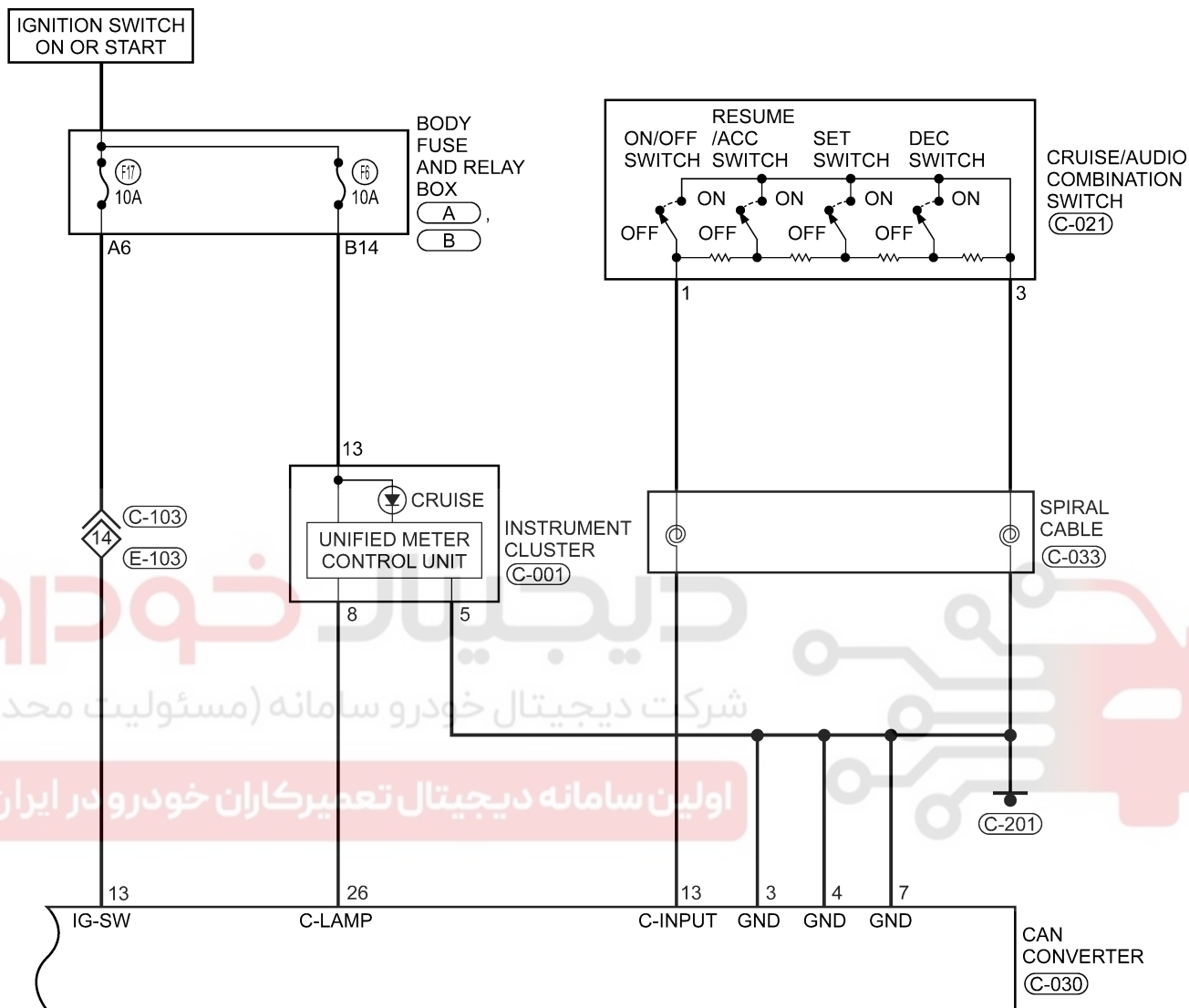
E-001
BC-030
LE-036
GRE-027
BC-108
W

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ON-VEHICLE SERVICE

Speed Control System (page 4 of 4)

03



ltsmw030062t

Accelerator Pedal Position (APP) Sensor

Description

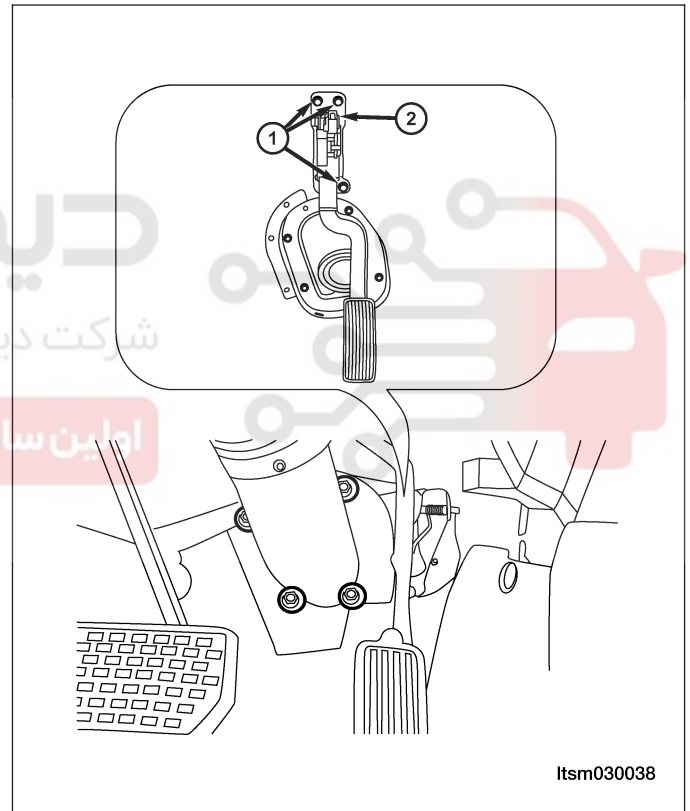
The Accelerator Pedal Position (APP) sensor is located inside the accelerator pedal. The accelerator pedal position sensor cannot be disassembled by itself. The accelerator pedal must be replaced as a unit.

Operation

The Accelerator Pedal Position (APP) sensor on the accelerator pedal works according to the Hall principal. The sensor is integrated into the pedal lever axis. It consists of a shaft with a ring magnet. This rotates in a printed circuit board with a stator in the fixed Hall elements. This produces a change in the voltage. The APP sensor is supplied with 5 V from the Engine Control Module (ECM). The information regarding accelerator position is supplied to the ECM by means of two voltages.

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the instrument panel lower trim panel.
3. Disconnect the APP sensor electrical connector (2).
4. Remove the three APP sensor mounting bolts (1).
(Tighten: APP sensor mounting bolts to 11 N·m)
5. Remove the APP sensor with the pedal.
6. Installation is in the reverse order of removal.



Itsm030038

Electronic Throttle Control Actuator

Description

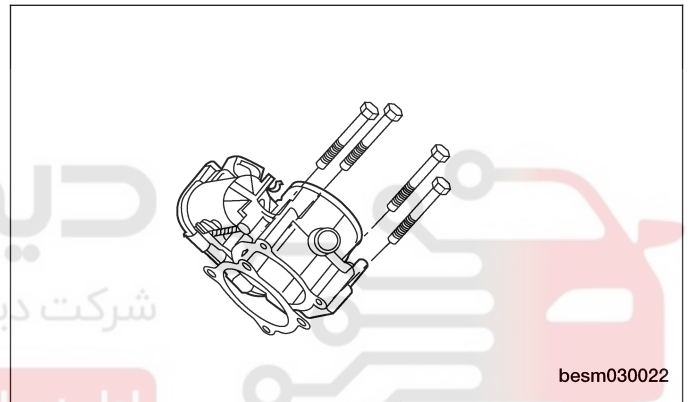
The throttle body is located on the intake manifold. It controls air into the intake manifold. The Electronic Throttle Control Actuator consists of a throttle control motor and the throttle position sensor. The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The throttle position sensor detects the throttle valve position.

Operation

Filtered air from the air cleaner enters the intake manifold through the throttle body. A throttle valve (plate) is used to supply air for idle and driving conditions. The throttle position sensor is part the throttle body. The throttle position sensor signal is used by the ECM to determine throttle position. The ECM controls the electronic throttle control to meter air into the engine. This regulates engine power. The vehicle is in sense a "Drive by Wire" system.

Removal & Installation

1. Remove the engine cover.
2. Disconnect the negative battery cable.
3. Disconnect the electronic throttle control actuator connector.
4. Remove two hoses on electronic throttle control actuator.
5. Remove four electronic throttle control actuator mounting bolts.
(Tighten: Electronic throttle control actuator bolts to 10 N·m)
6. Remove the throttle control actuator carefully.
7. Installation is in the reverse order of removal.



Engine Control Module (ECM)

Description

The Engine Control Module (ECM) for this model is serviced only as a complete unit.

Operation

The ECM is a pre-programmed, microprocessor-based digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, certain transmission features, speed control, air conditioning compressor clutch engagement and idle speed. The ECM can adapt its programming to meet changing operating conditions.

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the glove box (See Instrument Panel Removal & Installation in Section 15 Body).
3. Disconnect the ECM electrical connector.
4. Remove the ECM retaining bolts (1).
(Tighten: ECM retaining bolts to 10 N·m)
5. Remove the ECM.
6. Installation is in the reverse order of removal.

Installation Notes:

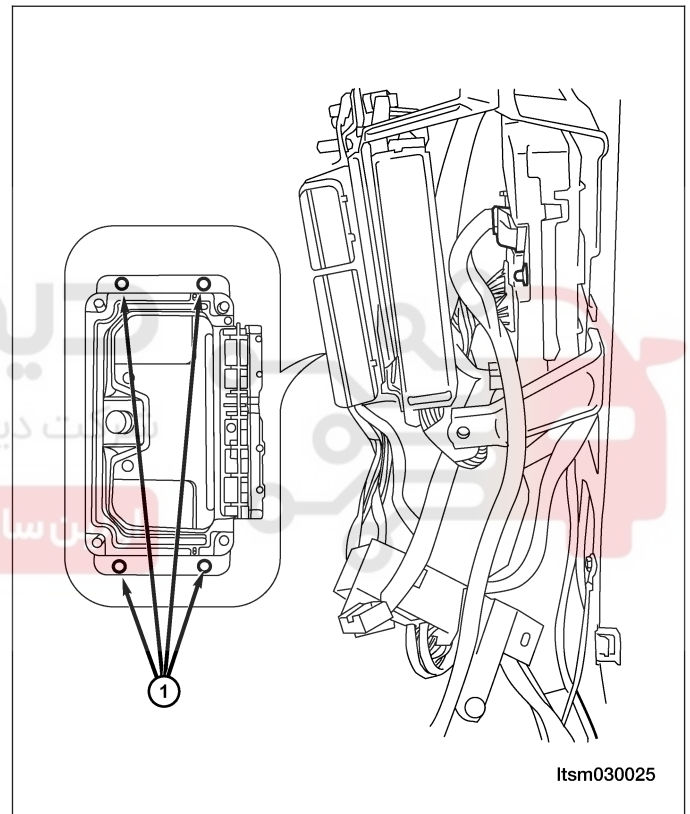
NOTE :

The Immobilizer control module must be matched to the new ECM before the vehicle will start.

Matching Immobilizer Control Module to New Engine Control Module (ECM)

Perform the following to match the Immobilizer control module to the new ECM:

- With the X-431 scan tool, choose T11 series.
- Choose "immobilize".
- Choose "input code".
- Input the safety code.
- Click the small keyboard.
- Click "OK".
- Choose "Immobilizer adapt".
- Choose "read Immobilizer to ECM" immediately.
- Click "OK".



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