SQRE4T15B ENGINE MANAGEMENT SYSTEM

P0106 00	06-164	P1106 00	06-204
P0107 11	06-164	P1106 22	06-204
P0108 12	06-164	P1106 21	06-204
P0111 00	06-164	P1111 00	06-204
P0112 16	06-164	P1122 77	06-204
P0113 17	06-164	P0130 00	06-211
P0234 00	06-170	P0131 16	06-211
P0237 16	06-170	P0132 17	06-211
P0238 17	06-170	P0133 00	06-211
P1130 00	06-176	P0134 00	06-211
P1131 17	06-176	P2195 00	06-211
P1132 16	06-176	P2196 00	06-211
P1133 13	06-176	P0136 00	06-217
P0298 7A	06-176	P0137 16	06-217
P1427 12	06-176	P0138 17	06-217
P1428 11	06-176	P0140 00	06-217
P1429 13	06-176	P2270 00	06-217
P1479 00	06-176	P2271 00	06-217
P023A 00	06-181	P0506 00	06-222
P023B 00	06-181	P0507 00	06-225
P023C 00	06-181	P0219 00	06-228
P1011 01	06-181	P0606 1C	06-230
P1700 00	06-181	P0606 00	06-230
P1703 00	06-181	P0606 16	06-230
P1704 00	06-181	P0606 17	06-230
P1705 00	06-181	P0606 42	06-230
P1706 00	06-181	P0606 45	06-230
P1707 00	06-181	P0606 47	06-230
P1708 00	06-181	P0606 48	06-230
P1709 00	06-181	P0606 49	06-230
P2600 13	06-181	P0606 55	06-230
P2602 11	06-181	P0606 61	06-230
P2603 12	06-181	P0606 62	06-230
P0033 13	06-187	P0606 63	06-230
P0034 11	06-187	P0606 64	06-230
P0035 12	06-187	P0606 67	06-230
P2261 00	06-187	P0606 75	06-230
P0116 00	06-193	P0606 91	06-230
P0117 16	06-193	P0606 92	06-230
P0118 17	06-193	P0606 94	06-230
P0121 29	06-198	P0606 96	06-230
P0122 16	06-198	P0606 97	06-231
P0123 17	06-198	P1100 00	06-231
P0221 29	06-198	P2122 16	06-236
P0222 16	06-198	P2123 17	06-236
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GENERAL INFORMATION

Overview

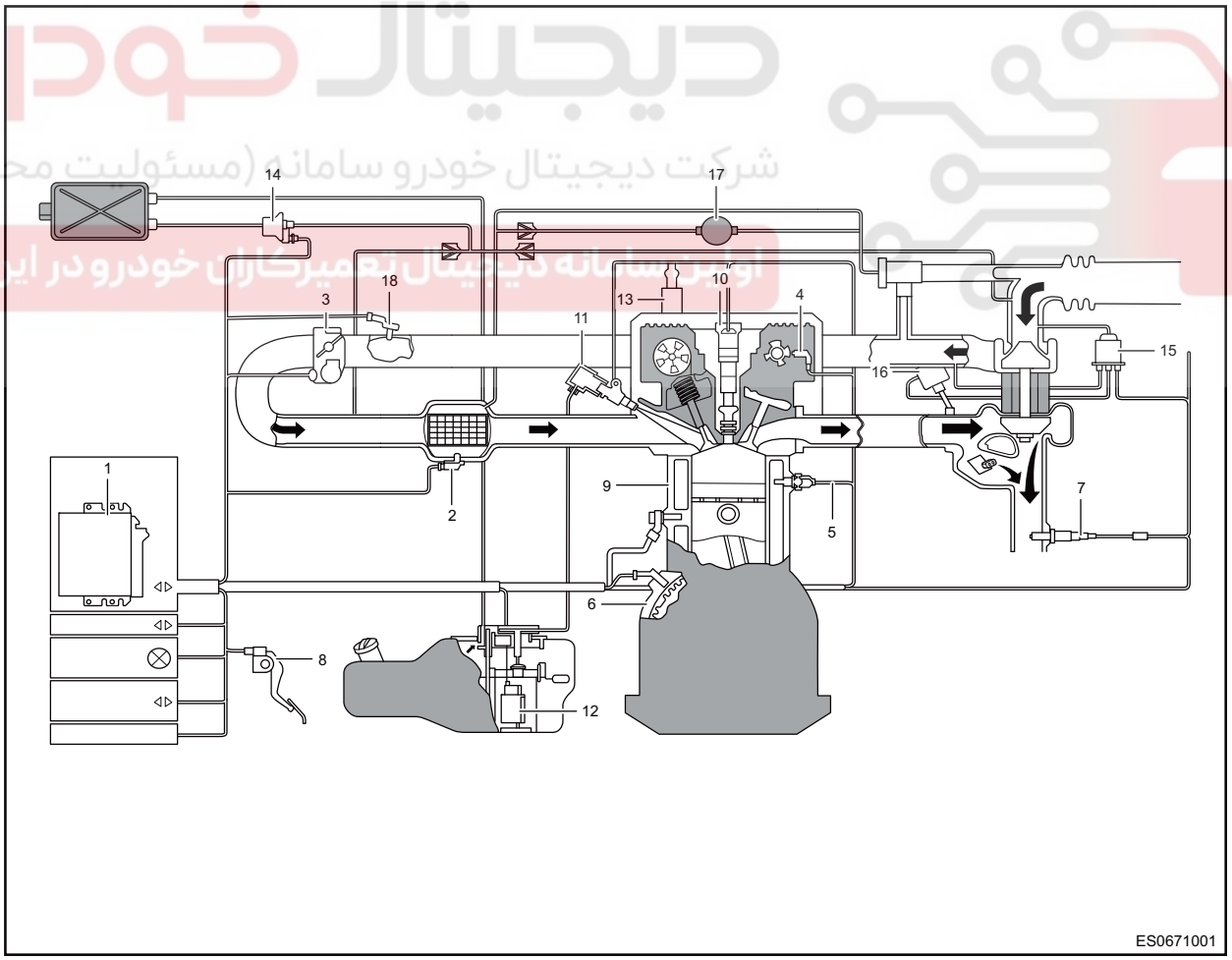
System Basic Principle

Engine of T19 model adopts Bosch ME17.8.8 engine management system. This system mainly consists of Engine Control Module (ECM), sensors and actuators, which controls intake air amount, injection volume and ignition timing, etc. when engine is operating.

In the engine management system, sensors are used as the input part to measure various physical signals (temperature and pressure, etc.), and converts them into corresponding electrical signals; the function of ECU is to receive the input signals from sensors and perform calculation according to set procedure, producing corresponding control signals and outputting them to power drive circuit. The power drive circuit drives each actuator to perform various actions, thus making the engine run according to the preset program. Also, the trouble diagnosis system of ECU monitors each component and control function in this system. Once detecting and confirming a fault, it will store the trouble code. When detecting that fault has been eliminated, it will return to use normal value.

The basic characteristic of ME17.8.8 engine electronic control management system is the use of torque based control strategy. The main purpose of the torque based control strategy is to associate a large number of different control objectives.

Basic Components of Engine Management System



1 - Engine Control Module	2 - Intake Pressure/Temperature Sensor
3 - Electronic Throttle	4 - Camshaft Position Sensor
5 - Coolant Temperature Sensor	6 - Crankshaft Position Sensor
7 - Oxygen Sensor	8 - Electronic Accelerator Pedal
9 - Knock Sensor	10 - Ignition Coil
11 - Fuel Injector	12 - Electric Fuel Pump
13 - VVT Control Valve	14 - Canister Solenoid Valve
15 - Exhaust By-pass Solenoid Valve	16 - Inlet Relief Solenoid Valve
17 - Electrical Water Pump	18 - Boost Pressure Sensor

1. Precautions
   (a) General service requirements
   - Digital multimeter, LED test light, jumper cable and diode test light can be used to perform inspection for engine management system.
   - Use genuine components to perform service work, otherwise appropriate engine management system operation cannot be guaranteed.
   - Only use unleaded gasoline during service.
   - Please observe normative service and diagnostic flowchart to perform service work.
   - Never disassemble components of engine management system during servicing.
   - When holding electronic elements (ECM and sensor etc.) during service, take extra care not to drop them on the ground.
   - Set up a consciousness of environmental protection and dispose of the waste effectively that is produced during servicing.

2. Precautions during service
   (a) Do not causally remove any engine management system component or its connector from its installation position to prevent damaging accidentally, or foreign matter, such as moisture, oil from entering connectors, which will affect the normal operation of engine management system.
   (b) Be sure to turn ENGINE START STOP switch off when disconnecting and connecting connectors. Otherwise electronic elements may be damaged.
   (c) When simulating hot operating condition of malfunction and performing other service work that may cause temperature to rise, never allow ECU temperature to exceed 80°C.
   (d) As the supplying pressure of fuel system is high (approximately 400 kPa), all fuel pipes are high pressure resistant pipe. Fuel pressure in fuel lines is still high even when the engine is not running. Therefore, be careful not to casually remove fuel pipes during service; when it is necessary to service fuel system, discharge pressure in the fuel system before removing fuel pipes. The way to discharge pressure is as follows:
   - Remove fuel pump relay, start engine and idle it until the engine stops running by itself. Then try to start engine 2 - 3 times to ensure fuel pressure is discharged completely. Removal of fuel pipes and replacement of fuel filter should be performed in a well-ventilated area by professional service men.

   (e) Do not energize electric fuel pump when removing it from fuel tank to prevent electric sparks, which will cause a fire.
   (f) Running test for fuel pump is prohibited when it is empty or in water; otherwise it will shorten the service life. Never connect the positive and negative of fuel pump in reverse.
   (g) Do not connect battery with its polarity reversed to prevent damage to electronic elements. This system adopts negative ground.
   (h) Never remove battery cable when engine is running.
   (i) The positive, negative battery cables and ECU must be removed before performing welding on vehicle.
   (j) Do not puncture wire outer coat to detect electric signals input and output by components.

Basic Management Function of Engine

Basic Management Function of Engine

1. System structure based on torque.
2. Cylinder load is determined by intake pressure sensor / air flow sensor.
3. Improved air-fuel mixture control function in static and dynamic conditions.
4. λ closed-loop control.
5. Fuel is injected from each cylinder sequentially.
6. Ignition timing, including cylinder-by-cylinder knock control.
7. Emission control function.
8. Catalytic converter heating.
9. Canister control.
10. Idle control.
11. Limp home.

Additional function

1. Immobilizer function.
2. Communication with torque and external system (example: gear train or vehicle dynamic control).

Diagnosis On-line OBD

1. Complete a series of OBD functions.
2. Management system for diagnostic functions.

Torque structure: ME17.8.8 system based on torque control

In ME17.8.8 torque-based engine management system, all internal and external demands of engine are defined with the torque or efficiency requirements of the engine. By converting the various demands of engine into control variables for torque or efficiency, these variables are then first processed in central torque demand coordinator module. ME17.8.8 system can prioritize these conflicting requirements and execute the most important requirement. Obtain engine control parameters such as required fuel injection time and ignition timing with torque conversion module. The execution of this control variable has no effect on other variables. This is the advantage of the torque-based control system.

Compared with the previous M series engine electronic fuel injection management system, the main features of ME17.8.8 system

- New torque-variable engine functional structure is most compatible with other systems and has strong expandability;
- New modular software structure and hardware structure with strong portability;
- Model-based engine basic characteristic diagram is independent of each other,and simplifies the calibration process;
- Sequential fuel injection with phase sensor is used to improve emissions;
- Anti-theft function is incorporated in system;
- Improve driving performance through centralized coordination of various torque requirements;
- 32 bits CPU, 40 MHz clock frequency;
- System can be expanded as necessary in the future, such as: emission regulations in future and EU V +.

Control Signal: Input/Output Signal of ME17.8.8 System

Main sensor input signal of ECU in ME17.8.8 system include

- Intake pressure / flow signal.
- Electronic accelerator pedal signal.
- Intake temperature signal.
- Throttle rotation angle signal.
- Coolant temperature signal.
- Engine speed signal.
- Phase signal.
- Knock sensor signal.
- Oxygen sensor signal.
- Vehicle speed signal.
- A/C pressure signal.

Required actuator control signals which are generated via ECU from sensor input signals in ME17.8.8 system include

- Electronic throttle opening.
- Injection timing and fuel injection duration.
- Fuel Pump relay.
- Canister control valve opening.
- Ignition coil closing angle and ignition advance angle.
- A/C compressor relay.
- Cooling fan relay.

System Function

Start control

During starting, special calculation methods are used to control the filling, fuel injection and ignition timing. At the beginning of the process, the air in intake manifold is still, and the internal pressure of intake manifold is shown to be ambient pressure.

The specific "injection timing" is designated as the initial injection pulse in a similar process.

The fuel injection is changed according to engine temperature to promote the formation of oil film on intake manifold and cylinder wall, so the mixture should be enriched when the engine reaches a certain speed. Once the engine starts to run, the system starts to reduce the start and thicken immediately, until the start condition ends (600-700min^{-1}) to completely cancel the start and thicken.

Ignition angle is constantly adjusted with starting conditions. It varies with engine temperature, intake air temperature and engine speed.

Heating control of engine warm-up and three-way catalyst

After engine is started at low temperature, cylinder volume, fuel injection and electronic ignition are adjusted to compensate higher engine torque request; And this process continues until temperature raises to proper threshold.

In this stage, rapid heating of three-way catalytic converter is the most important, since rapid transition to operation of three-way catalytic converter can greatly reduce exhaust emissions. Under this working condition, adopt moderate retard ignition advanced angle and use exhaust gas to perform "three-way catalytic converter heating".

Acceleration/deceleration and motored fuel cut-off control

Part of the fuel injected into the intake manifold will not reach the cylinder in time to participate in the subsequent combustion process. Conversely, it forms an oil film on the intake manifold wall. Depending on the increase of load and injection duration, the fuel amount that stored in the oil film will increase sharply.

When the throttle opening increases, some of the injected fuel is absorbed by oil film. Therefore, it is necessary to inject the corresponding fuel amount to compensate and prevent the mixture from becoming lean during acceleration. Once the load factor is reduced, the additional fuel contained in the oil film on intake manifold wall will be released again, so the corresponding injection duration must be reduced during deceleration.

Motored or traction condition indicates that the power provided by engine at the flywheel is negative. In this case, engine friction and pump air loss can be used to slow down the vehicle. When the engine is in motored or traction condition, the fuel is cut off to reduce fuel consumption and exhaust emissions, and more importantly to protect the three-way catalyst.

Once the speed has been reduced to a specific recovery of the fuel supply speed above idle speed, the fuel injection system is resupplied. In fact, the ECU program has a range of recovery speed. They vary according to engine temperature, dynamic change of engine speed, etc., and they are calculated to prevent the speed from falling to the specified minimum threshold.

Once the injection system is resupplied, the system begins to use the initial injection pulse to supply the fuel and rebuild the oil film on the intake manifold wall. After recovery of fuel injection, the torque-based control system increases the engine torque slowly and smoothly (smooth transition).

Idle control

Engine does not provide torque to the flywheel at idle. To ensure stable operation of the engine at as low an idle speed as possible, the closed-loop idle speed control system must maintain the balance between the generated torque and the engine power consumption. The idle speed requires a certain amount of power to meet the load requirements of all aspects. They include internal friction from the engine crankshaft and valve gear and auxiliary components such as the water pump.

ME17.8.8 system uses torque based control strategy to determine engine output torque requested by maintaining required idling speed in all working conditions according to closed loop idle control. This output torque increases as engine speed reduces, and reduces as engine speed increases. System responses to the new "interference factor" through requesting higher torque, such as turning on/off air conditioning compressor or shifting of automatic transmission. When engine temperature is low, torque is also needed to be increased to compensate higher internal friction and/or maintain higher idling speed. The sum of these required output torque will be transmitted to torque coordinator which will process, calculate and obtain corresponding volumetric density, mixture contents and ignition timing.

λ closed-loop control

Exhaust aftertreatment in three-way catalytic converter is an effective method for reducing concentration of harmful substance in exhaust gas. Three-way catalytic converter can reduce hydrocarbon (HC), carbon monoxide (CO) and nitric oxide (NO_2) up to 98% or more, and convert them into water (H_2O), carbon dioxide (CO_2) and nitrogen (N_2). However, such high efficiency can be achieved only within small range of engine excess air coefficient λ=1, λ closed loop control is aimed to ensure mixture concentration within this range.

λ closed loop control system functions only when oxygen sensor is equipped. Oxygen sensor on side of three-way catalytic converter monitors oxygen content in exhaust gas, lean mixture (λ > 1) will generate about 100 mV sensor voltage, and rich mixture (λ < 1) will generate about 900 mV sensor voltage. When λ = 1, sensor voltage will jump. λ closed loop control responses to input signal (λ > 1 = lean mixture, λ < 1 = rich mixture) to correct control variable, a correction factor is generated as a multiplier to correct the fuel injection duration.

Evaporative emission control

Due to external transfer of radiant heat and returned fuel heat, the fuel in fuel tank is heated and forms fuel vapor. Due to limits of evaporative emission regulations, these vapors containing a large amount of HC components are not allowed to be discharged directly into the atmosphere. In system, fuel vapor will be collected in activated carbon canister through guide pipe and enters into engine and participates in the combustion process through purging at the right moment. ECU will control canister control valve to achieve purge gas flow. This control operates only under closed loop working condition of λ closed loop control system.

Knock control

System detects characteristic vibration at moment knock occurs through knock sensor installed in proper position of engine, and converts it into electrical signal to transmit it to ECU for processing. ECU uses special processing method to detect if knock occurs in each combustion cycle in each cylinder. Once knock is detected, knock closed loop control is triggered. After knock danger is eliminated, ignition of affected cylinder will be gradually advanced to predetermined ignition advance angle.

Knock control threshold has good adaptability to different working conditions and different grades of fuel.

System Malfunction Diagnosis Function Introduction

Malfunction information record

Electronic control unit constantly monitors sensors, actuators, related circuits, malfunction indicator light, battery voltage and so on, and even electronic control unit itself. And it performs reliability detection for sensor output signal, actuator drive signal and internal signals (such as λ closed loop control, coolant temperature, knock control, idle speed control and battery voltage control, etc.). Once a certain step failure or untrusted signal value is found, electronic control unit will immediately set malfunction information record in RAM malfunction memory. Malfunction information record is stored in the form of trouble code and displays in the order in which malfunctions occurred.

Frequency of malfunction can be divided into "steady state malfunction" and "intermittent malfunction" (for example, due to a short break of the wire harness or poor contact of the connector).

Malfunction light description and its control strategy

In general, component related to emission or the indication when system failed is an indicator light (MIL) which can be displayed on instrument panel and its shape is complied with standard requirements of regulation.

1. Activation of MIL light follows the below principles:
   (a) ENGINE START STOP switch is turned to ON (not started), and MIL remains on.
   (b) After the engine is started, if there is no malfunction request for turning on MIL in malfunction memory, MIL goes off.
   (c) There is malfunction request for turning on MIL in malfunction memory, or there is request for turning on MIL at outside of ECU, MIL will turn on.
   (d) When there is a MIL flashing request at outside of ECU, or there is a MIL flashing request in misfire cause, or there is malfunction request that flashes MIL as necessary in malfunction memory, MIL will flash at a frequency of 1 Hz.
2. On vehicles equipped with an electronic throttle system, there is EPC indicator light that used to indicate engine electronic control system related faults besides MIL light. EPC indicator light is used to indicate E-GAS system (electronic accelerator and electronic throttle) related faults in general.
3. Activation of EPC indicator light follows the below principles
   (a) ENGINE START STOP switch is turned to ON (not started), and EPC remains on.
   (b) After the engine is started, if there is no malfunction request for turning on EPC indicator light in malfunction memory, EPC indicator light goes off.
   (c) There is malfunction request for turning on EPC in malfunction memory, or there is request for turning on EPC at outside of ECU, EPC will turn on.

Diagnostic tester display

1. Engine Parameter Display
   (a) Engine speed, coolant temperature, throttle opening, ignition advance angle, injection pulse width, intake pressure, intake temperature, vehicle speed, system voltage, injection correction, canister scour rate, idle air control, oxygen sensor waveform;
   (b) Target speed, relative engine load, ambient temperature, ignition closing time, evaporator temperature, intake air flow, fuel consumption amount;
   (c) Throttle valve position sensor signal voltage, coolant temperature sensor signal voltage, intake temperature sensor signal voltage, intake pressure sensor signal voltage, knock sensor terminal 1 signal voltage, knock sensor terminal 2 signal voltage.
2. Electronic Fuel Injection System State Display
   (a) Immobilizer system state, safety state, program state, cooling system state, stable working condition state, dynamic working condition state, emission control state, oxygen sensor state, idling state, malfunction indicator light state, emergency working condition state, A/C system state, automatic transmission/torque request state.
3. Actuator Test Function
   (a) Malfunction light, fuel pump, A/C relay, fan, canister purge valve and throttle opening.
4. Version Information Display
   (a) Frame number (VIN), ECU hardware number, ECU software number.
5. Malfunction Display
   (a) Air flow meter, intake temperature sensor, engine coolant temperature sensor, throttle valve position sensor, oxygen sensor, oxygen sensor heating line, air-fuel ratio correction, fuel injector of each cylinder, fuel pump, knock sensor, speed sensor, phase sensor, canister control valve, cooling fan relay, vehicle speed signal, idle speed, electronic throttle body, system voltage, ECU, A/C compressor relay, evaporator temperature sensor, malfunction light.

System features

- Multi-point sequential injection system.
- New torque-variable engine functional structure is most compatible with other systems and has strong expandability.
- New modular software structure and hardware structure with strong portability.
- Phase sensor signal is adopted (phase sensor).
- Signal plate with 60-2 teeth is used to identify speed signal (speed sensor).
- Electronic throttle body idle speed control is used.
- Realized idle torque closed-loop control.
- Cylinder-by-cylinder independent knock control (knock sensor).
- Equipped with function of heating and protecting catalytic converter.
- Equipped with limp home function, etc.

Control Strategy

A/C control strategy

1. 8 s after engine is started, A/C compressor is allowed to operate. Within 8 s of engine starting, even if the A/C request switch is pressed, A/C compressor will not engaged.
2. When coolant temperature is higher than 115 degrees, A/C is powered off. When coolant temperature is below 113 degrees, A/C control resumes. When coolant temperature is between 106 and 114 degrees, A/C control status does not change.
3. When engine speed exceeds 6520 rpm or below 560 rpm, A/C is powered off. A/C control resumes when engine speed is between 640rpm and 6320 rpm. When the engine speed is in range of 6320-6520rpm and 560 - 640 rpm, A/C maintains the previous state.
4. When the battery voltage is lower than 9.5V, A/C is powered off, and A/C control resumes when battery voltage is higher than 11V; When the battery voltage is higher than 16V, A/C is powered off, and A/C control resumes when battery voltage is lower than 15V.
5. Due to the large A/C engine torque consumption, T19 + E4T15B model has developed an accelerated disconnection A/C strategy. When the accelerator pedal is depressed firmly, A/C will be powered off to ensure dynamic property when overtaking. When the A/C is disconnected for more than a certain period of time or the driver accelerator pedal opening is reduced, A/C will reengaged.

Fan control strategy

1. Fan control strategy when engine is running normally

   Hint:

   - T19 + E4T15B model equipped with a two-speed fan, and ECU judges and control different fan speeds based on water temperature, A/C pressure signal and vehicle speed signal.

   (a) Speed limit thresholds of fan to stop rotation in each state are as follows:
   1. When coolant temperature is higher than 94°C and vehicle speed is lower than 80, low speed fan operates; After coolant temperature is lower than 91°C, low speed fan stops operating.
   2. When coolant temperature is higher than 105°C and vehicle speed is lower than 80, high speed fan operates; After coolant temperature is lower than 102°C, high speed fan stops operating.
   3. When coolant temperature is higher than 110°C and vehicle speed is higher than 80, high speed fan operates; After coolant temperature is lower than 107°C, high speed fan stops operating.

2. Fan control strategy after stalling

   (a) If coolant temperature is higher than 101°C or air temperature in manifold is higher than 70°C after engine stalling, fan will operate at high speed.
   (b) If coolant temperature is lower than 98°C or air temperature in manifold is higher than 67°C, fan stops operating at high speed.
   (c) Fan operates at most 40s after stalling.

Three-way catalytic converter protection control strategy

1. When engine is operating normally, if exhaust pipe model temperature exceeds 880°C, exhaust temperature concentration protection function is activated, and ECU reduces the exhaust temperature by increasing the air-fuel ratio.
2. When exhaust pipe temperature drops below 830°C, concentration protection stops working and the air-fuel ratio returns to normal.
3. When engine is operating normally, if catalytic converter central model temperature exceeds 900°C, catalytic converter protection function is activated and ECU reduces the catalytic converter temperature by increasing the air-fuel ratio.
4. When catalytic converter central temperature drops below 850°C, concentration protection stops operating and air-fuel ratio returns to normal.

Canister solenoid valve control strategy

1. Canister solenoid valve opening conditions
   (a) Engine coolant temperature is higher then 55°C.
   (b) Engine air-fuel ratio control has entered the closed loop.
   (c) Canister solenoid valve trouble-free.
2. Canister solenoid valve scour time control
   (a) Since canister scour and air-fuel ratio self-learning cannot be performed at the same time, Bosch system uses a software to rationally allocate the time for opening canister solenoid valve and air-fuel ratio self-learning time to ensure that the functions are normal. Canister scour and air-fuel ratio self-learning are performed alternately during normal engine operation.
3. Canister solenoid valve opening control
   (a) Openings of canister solenoid valve are different at different engine speeds and loads. ECU calculates the current opening of canister solenoid valve according to the conditions such as engine speed, load, and air-fuel ratio fluctuation.

Oxygen sensor heating logic

- Oxygen sensor must reach a certain temperature in order to work normally, usually at 350°C to 900°C. It is not enough to heat by exhaust temperature only. Therefore, there is a fuse inside oxygen sensor for heating specially. Heating with low power before dew point and heating with high power or even full-power after the dew point. So that the oxygen sensor can reach the operating temperature as soon as possible.
- Dew point mark is an important input for oxygen sensor heating, mainly to protect the oxygen sensor.
- Physical background of dew point. After the engine is started and exhaust system temperature is lower for a certain period of time, water vapor may condense on exhaust system. If the oxygen sensor ceramic body exceeds a certain temperature during this period, and condensation splashes on oxygen sensor ceramic body, condensation may cause the ceramic body to break. Therefore, it is necessary to monitor oxygen sensor temperature and exhaust pipe wall temperature near the oxygen sensor in real time when engine is started. Waste water is always condensing on the exhaust pipe wall in general. When the temperature of exhaust pipe wall reaches a certain value, it will stagnate for a period of time or the rate of rise will be slower due to the condensation of water vapor and overlap of the evaporation process. Temperature at this point is called the dew point temperature. If the wall temperature continues to rise, water vapor in the exhaust will no longer condense and evaporate on exhaust pipe wall.

Knock control strategy

1. Knock control is activated when engine coolant temperature exceeds 40°C and engine load is more than 36%.
2. ECU performs knock control through feedback signal from knock sensor. When knock is detected, ECU delays the ignition angle by a fixed step of -3 degrees, and the maximum delay of ignition angle is 12 degrees. If no new knock is detected for several consecutive combustions, the delayed ignition angle will recover with a step size of 0.75 until the delayed ignition angle is fully recovered or a new knock is detected.
3. If there is a knock sensor failure, ECU will reduce the output ignition angle of the engine to ensure the safety of engine.

Ignition control strategy

1. Ignition coil charging control
   (a) Ignition coil magnetization time determines the ignition energy of the spark plug. Normally the supply voltage is close to 14V when the vehicle is working normally. If the vehicle generator is not working properly, the supply voltage may be much lower than 14 V, and may even drop to 6V or lower. In order to get the same ignition energy, the ECU will change the charging time of primary coil.
2. Ignition advance angle calculation
   (a) Ignition angle control when starting.
   • During the start-up stage of engine, system uses a separated ignition angle MAP to control the starting reliability of engine. When engine is started, system switches to normal ignition angle control mode.
   (b) Ignition advance angle control at idle speed.
   • Engine ignition angle does not operate at the optimum ignition angle when idling, but instead operates at an angle less than the optimal ignition angle. If the engine idle fluctuates or the external impact occurs, ECU can quickly correct the ignition angle to ensure the stability of idle speed.
   (c) Ignition advance angle control during normal driving.
   • When the engine is running at a constant speed, the engine is operate at the maximum ignition angle allowed under this operating condition.
   (d) Acceleration and deceleration process ignition advance angle control
   • In order to ensure the smoothness during acceleration and deceleration, the ECU controls the ignition angle for torque intervention during acceleration and deceleration.

Brake override strategy

1. Prerequisites for activating "brake override" function
   (a) Engine speed is more than 1200 rpm;
   (b) Vehicle speed is more than 10 km/h
   (c) Accelerator pedal opening is greater than 0 and opening changes of accelerator pedal cannot be too rapid (accelerator pedal cannot be depressed rapidly), not that driver intends to accelerate rapidly;
   (d) Brake switch signal is set, that is, ECU gets the action intention to depress the brake pedal;
   (e) Depress the accelerator pedal first,then depress the brake pedal.
2. "Brake override" function activation manifestation
   (a) Accelerator pedal opening does not exceed 6% even if the accelerator pedal is at the lowest mechanical position. The limitation of engine torque output is achieved, and the establishment of brake vacuum is also achieved (throttle opening is reduced and intake manifold vacuum is increased).
3. Condition for "Brake override" function exit
   (a) Accelerator pedal opening is 0 (that is, when the accelerator pedal is released and then depressed again);
   (b) Opening changes of accelerator pedal is rapid (when accelerator pedal is depressed rapidly), that is, driver intends to accelerate rapidly;
   (c) Brake switch signal reset (brake pedal is released).

Idle control strategy

Relationship between water temperature, speed, and altitude are as follows (abscissa is water temperature, and ordinate is altitude)

	-30	-15	-6.8	0	20.3	39.8	80.3	90	110.3
0.5	1200	1100	1100	1050	1050	1050	1050	1050	1050
0.594	1200	1100	1100	1050	1050	1000	1000	1000	1000
0.703	1200	1100	1100	1050	1000	900	900	900	900
0.844	1200	1100	1100	1050	900	850	800	800	800

	-30	-15	-6.8	0	20.3	39.8	80.3	90	110.3
0.953	1200	1100	1100	1050	850	750	700	700	700
1	1200	1100	1100	1050	850	750	700	700	700

Comments

1 stands for plains; 0.9 stands for altitude 1000 m; 0.8 stands for altitude 2000 m; and so on, 0.5 stands for altitude 5000m

- Warm engine normal idle speed 700 ± 50 rpm.
- In order to protect the safety of the engine and the vehicle, the maximum speed of the neutral is limited to 4500rpm and the duration exceeds 40 s and then returns to idling.
- Under normal conditions, the normal idling speed of the warm engine is 700 rpm; it is raised to 880rpm after A/C turning on.

Electronic vacuum pump control strategy

For model equipped with an electronic vacuum pump, to prevents the phenomenon of poor braking effect due to the positive pressure generated in the intake manifold after the turbocharger operates, the specific operating conditions are as follows:

Mode	Pressure when start working (KPa) / absolute pressure	Pressure when stop working (KPa) / absolute pressure	Expected working time (S)
Plain	55%P	40%P	2.8
Highland	50%P	40%P	2.5

Comments

Plain mode: Altitude ⩽ 2000MH or P ⩾ 80KPa
Highland mode: Altitude > 2000MH or P < 80KPa
P: Local ambient pressure

Electrical water pump control strategy

For the models equipped with electrical water pump, to prevent the performance of the turbocharger degradation due to high temperatures after stalling, so the working time of electronic water pump is related to the water temperature at the time of stalling. The specific relationship is shown in the following table:

Water temperature (°C)	60	80	100	120
Duration (S)	60	180	300	400

Oil pump control strategy

1. When the ignition switch is turned to ON for the first time, ECU controls the operation of oil pump. After the oil pump flow reaches the set fuel supply, oil pump stops working. If the engine has not been started, after the engine has been stopped for more than 100 seconds, oil pump will operate again after the ignition switch turned to ON each time and after three consecutive operations, oil pump will no longer operate after ignition switch turned to ON.
2. When ECU detects the engine starting, it will control the operation of oil pump.
3. When the engine is running normally, ECU controls oil pump to work continuously.

Starter protection function

1. When the starting speed is higher than 720rpm, system forcibly disengages the starter and confirm that the start is successful.
2. In order to prevent the engine from starting during operation, when the speed is higher than 50rpm, system considers the engine to be running and does not drag the starter.
3. The maximum time to start and drag according to the water temperature limit to prevent starter from overheat damaging. The maximum working time of the starter is limited as shown in the figure below:

X	-39.8	-20.3	-20	0	20	30
Y	25	15	12	8	6	4

4. Determine the speed of the starter at different water temperatures and voltages by matching the values of the starter disengagement speed (as show below).

	-39.8	-20.3	0	15	45	80.3
8	880	880	880	880	720	720
16	880	880	880	880	720	720
25	880	880	880	880	720	720

Turbocharger control strategy

Turbocharger use exhaust gas that is discharges during engine running to turn the turbo impeller, and then drive compressor impeller to send the air pressed through air filter into cylinder. As more air enters into cylinder, more fuel is allowed to be injected so that more engine power is generated. In addition, the turbocharger can also make the engine get power compensation when it works in highland.

In the electronic control system, the supercharger work must satisfy the following conditions simultaneously:

1. Required boost pressure after engine starting is higher than atmospheric pressure.
2. Boost pressure sensor before throttle does not report an error.
3. Boost control actuator does not report an error.
4. Not trigger the maximum boost failure.
5. Not trigger the limp function.
6. Not trigger the safety fuel-cut function

Relief solenoid valve control strategy

Fresh air passes through the air filter and enters the compressor. After being compressed, it passes through the intercooler to reach the throttle and the throttle is a component that is constantly opening and closing. In addition to high-speed cruising, the accelerator pedal under the driver almost always changes, which creates a problem: Turbocharger operates at full speed when the accelerator pedal is fully depressed, delivering a continuous supply of compressed air to the throttle; At the instant of the driver releasing the accelerator pedal, due to the hysteresis of the turbine operation, compressor is still operating at full speed despite the throttle being closed. As a result, the blocked high-pressure air may cause compressor blade or throttle is damaged by impact. The purpose of the inlet relief solenoid valve is to release the high pressure when release the accelerator pedal, thus protecting the compressor blade and throttle.

In the electronic control system, the inlet relief solenoid valve must satisfy the following conditions simultaneously:

1. Rate of pedal change is less than a certain limit when the accelerator pedal is released.
2. The difference between actual boost pressure and target boost pressure is greater than a certain limit when accelerator pedal is released.
3. The ratio of boost pressure in accelerator pedal steady state is less than a certain limit.

Specifications

Torque Specifications

Description	Torque (N·m)
Coolant Temperature Sensor	14 ± 1
Intake Pressure/Temperature Sensor Fixing Bolt	6 ± 1
Knock Sensor Fixing Bolt	20 ± 5
Crankshaft Position Sensor Fixing Bolt	8 ± 2
Camshaft Position Sensor Fixing Bolt	8 ± 1
VVT Control Valve Fixing Bolt	8 ± 2
ECU Fixing Bolt	8 ± 2

ECU Terminal Definition

ECU Connector

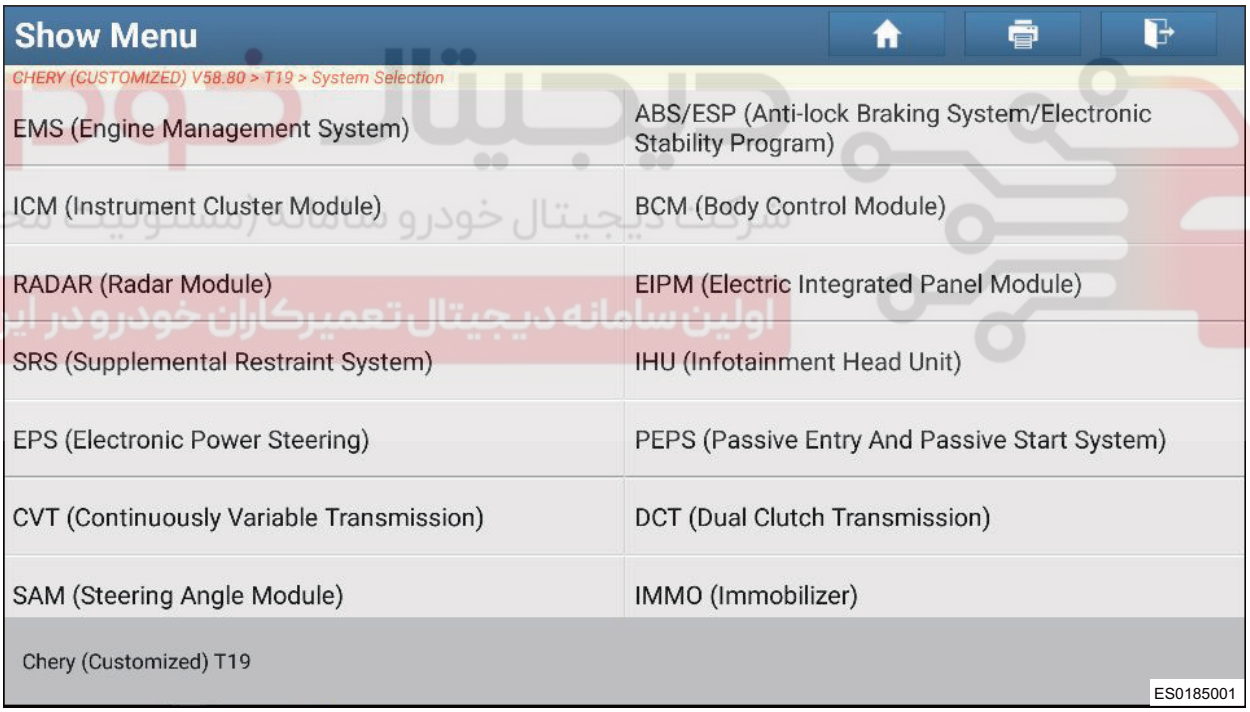
Terminal No.	Description	Terminal No.	Description
1	CAN Bus 1 High	57	-
2	-	58	Starter Control
3	-	59	Power Supply of Electronic Accelerator Pedal Sensor 2
4	-	60	Barometric Pressure Sensor Signal
5	Main Relay	61	-
6	Clutch Top Switch	62	Boost Pressure Sensor Temperature Signal
7	Electronic Accelerator Pedal Sensor 1 Ground	63	ECU Ground 1
8	-	64	ECU Ground 2
9	Cruise Control	65	Waste Control Valve
10	-	66	-
11	-	67	Cylinder 2 Injector
12	Brake Vacuum Sensor Pressure Signal	68	Cylinder 1 Injector
13	KL50 Status	69	Variable Camshaft Timing Valve (Exhaust)
14	-	70	ERCV Valve
15	UBR Noncontinuous Power Supply	71	Variable Camshaft Timing Valve (Intake)
16	UBR Noncontinuous Power Supply	72	Cylinder 3 Injector
17	CAN Bus 1 Low	73	Upstream Oxygen Sensor Heater
18	-	74	Cylinder 4 Injector
19	5 V Power Supply 1	75	Throttle Actuator (+)
20	UBD Continuous Power Supply	76	Ignition Coil 4
21	Oxygen sensor signal	77	Throttle Position Sensor 1
22	-	78	Throttle Position Sensor 2
23	Brake Switch	79	-
24	A/C Compressor Medium-Pressure Switch	80	Upstream Oxygen Sensor
25	Brake Light Switch	81	-
26	-	82	-
27	-	83	-
28	A/C Switch	84	Analog Ground
29	-	85	Intake Pressure/Temperature Sensor (-)
30	Electronic Accelerator Pedal Sensor 2	86	Throttle Position Sensor (-)
31	High Speed Fan Control	87	Throttle Actuator
32	Immobilizer Input	88	-
33	-	89	Knock Sensor B
34	-	90	Knock Sensor A
35	Ignition Switch	91	Intake Pressure/Temperature Sensor Signal
36	Electronic Accelerator Pedal Sensor 2 Ground	92	PWM Electrical Water Pump
37	5V Power Supply of Electronic Accelerator Pedal Sensor 1	93	Phaser Sensor 1
38	-	94	TEV Canister Valve
39	-	95	Intake Phase Sensor Ground
40	-	96	Engine Speed Sensor Signal
41	Fuel Pump Relay	97	Engine Speed Sensor Ground
42	A/C Compressor Relay	98	Phaser Sensor (+5 V)
43	Oxygen Sensor Ground	99	Ignition Coil 2
44	Clutch Bottom Switch	100	Ignition Coil 1
45	Electronic Accelerator Pedal Sensor 1	101	Engine Coolant Temperature Sensor

Terminal No.	Description	Terminal No.	Description
46	Boost pressure sensor	102	Intake Temperature Sensor Signal
47	Analog Ground	103	-
48	Downstream Oxygen Sensor Heater	104	Upstream Oxygen Sensor Signal
49	-	105	Phaser Sensor 2 Signal
50	-	106	-
51	-	107	5 V Power Supply of Throttle
52	-	108	-
53	A/C High/Low Pressure Switch	109	5 V Power Supply of Intake Pressure Sensor
54	Vacuum Pump Control	110	-
55	-	111	ECU Ground 4
56	Low Speed Fan Control	112	ECU Ground 3

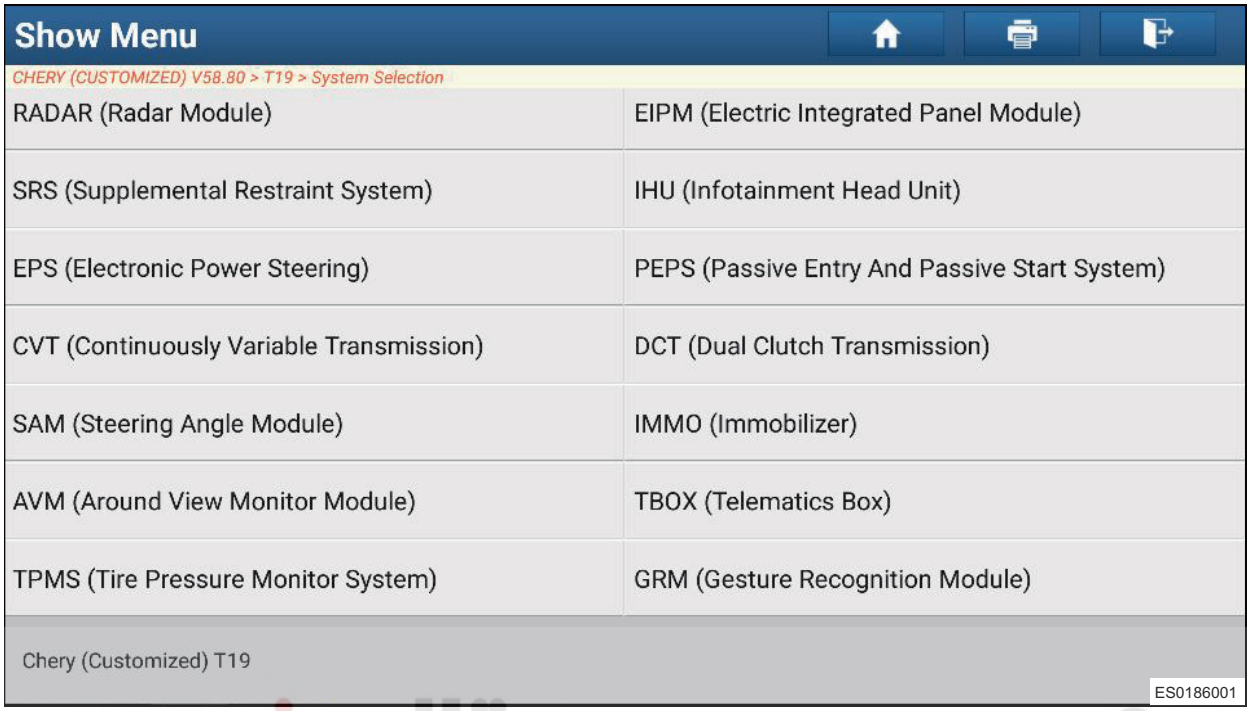
Diagnostic Tester Routine Operation

Diagnostic Tester Screen

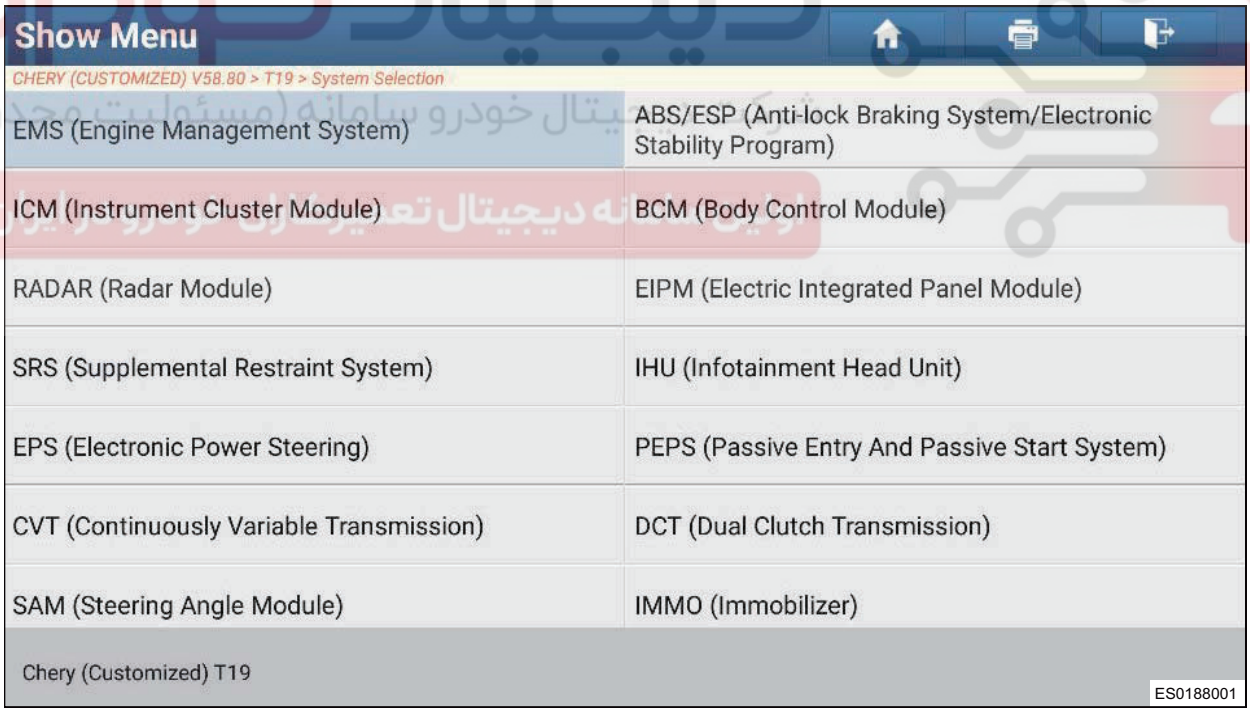
1. Connect the diagnostic tester and enter vehicle selection screen T19.
2. After selecting the model, enter the main screen
   (a) First page of main screen.



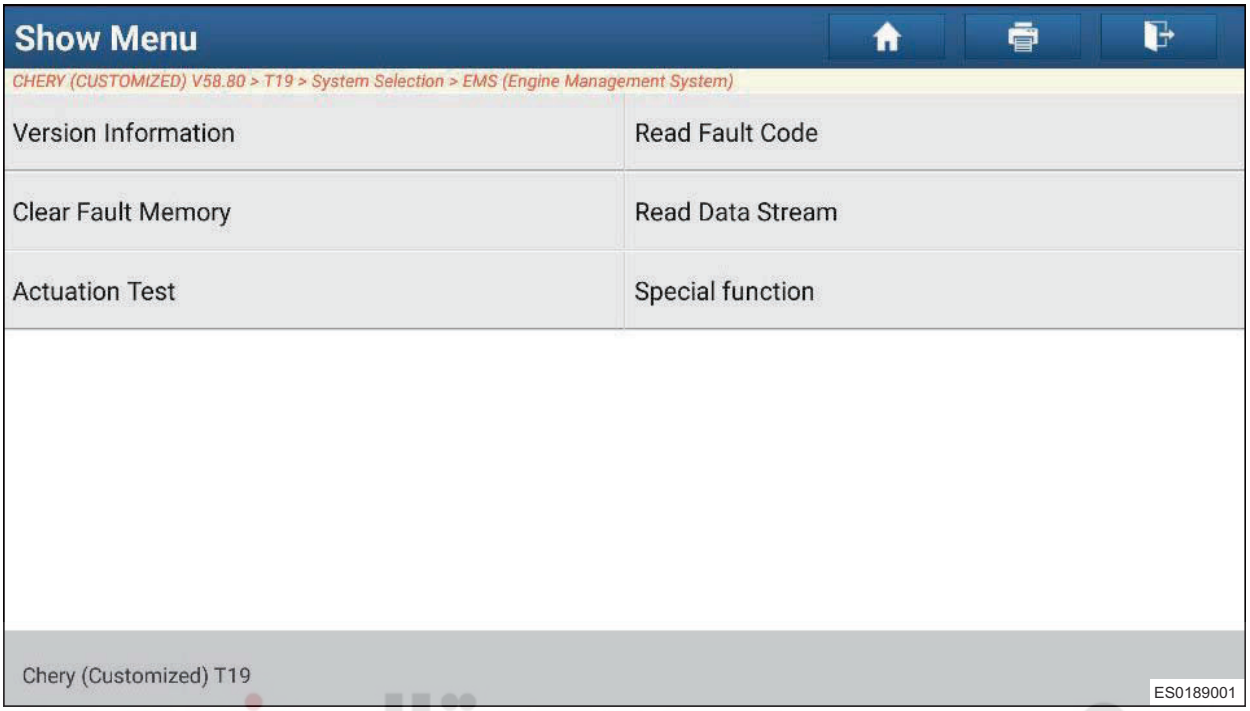
(b) Second page of main screen.



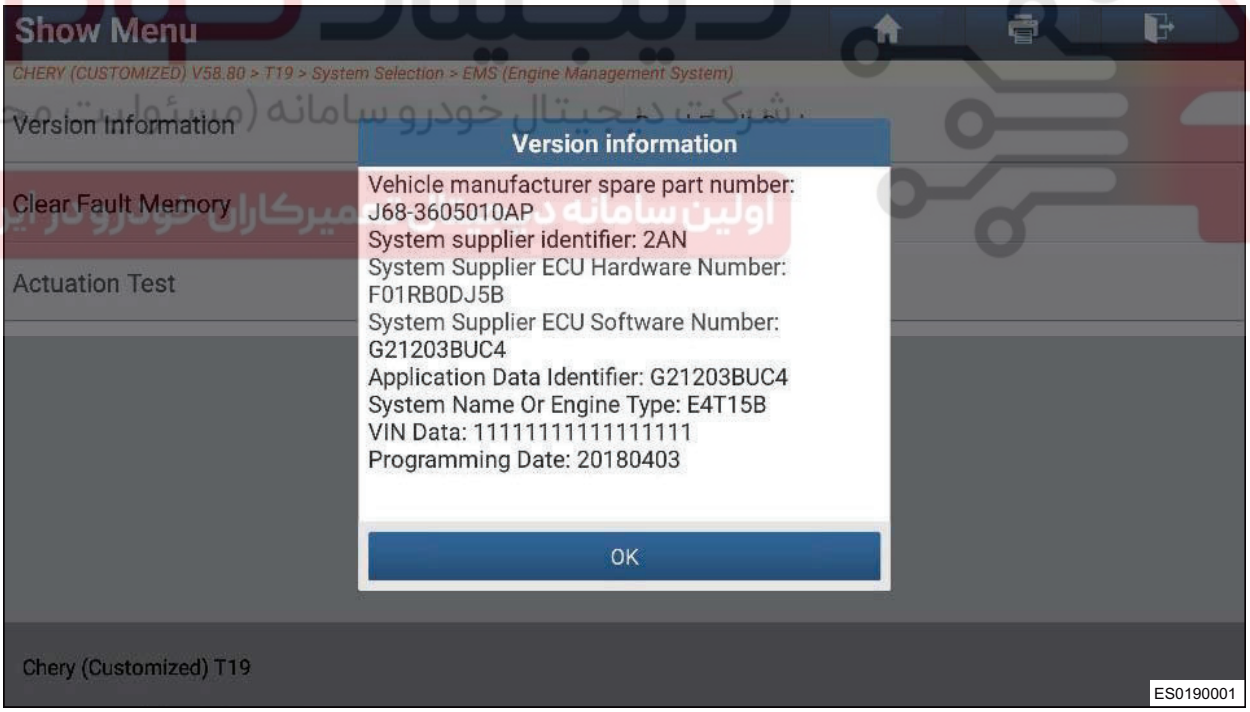
3. Click "Engine Management System" screen



4. Enter the next level of engine management screen

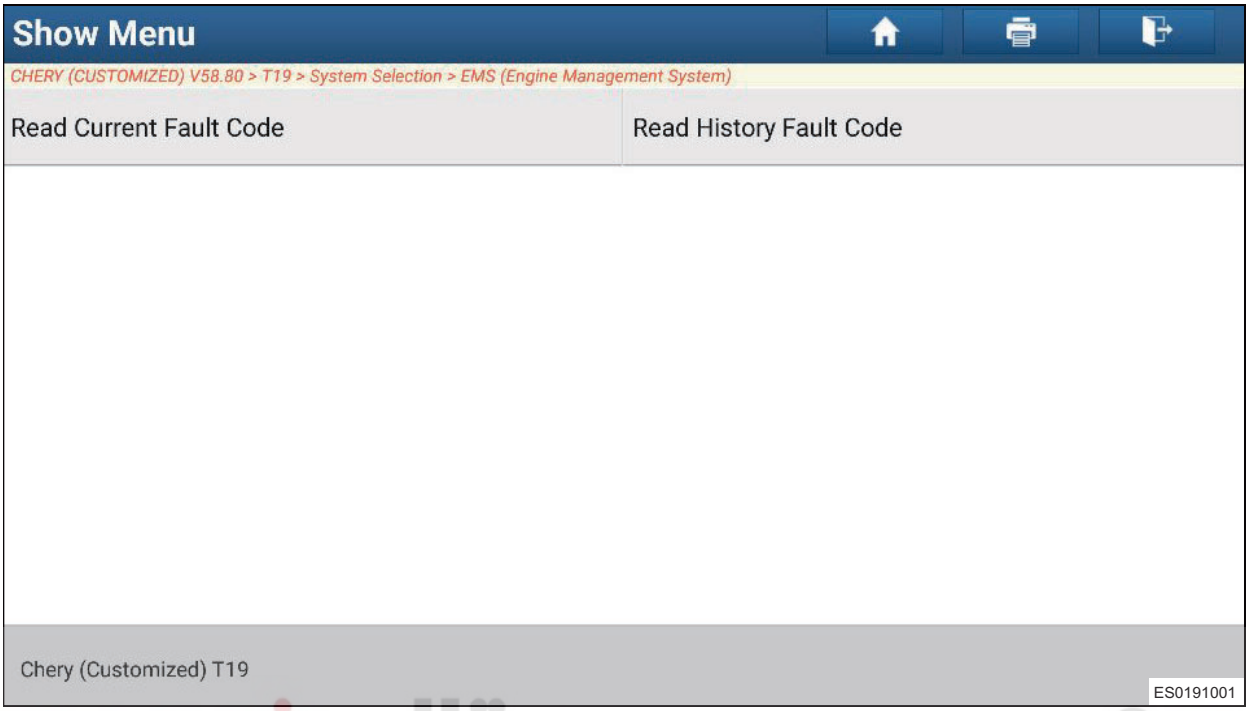


(a) "Version Information" screen.



(b) "Read Fault Code" screen.

(c) "Clear Fault Memory" screen.

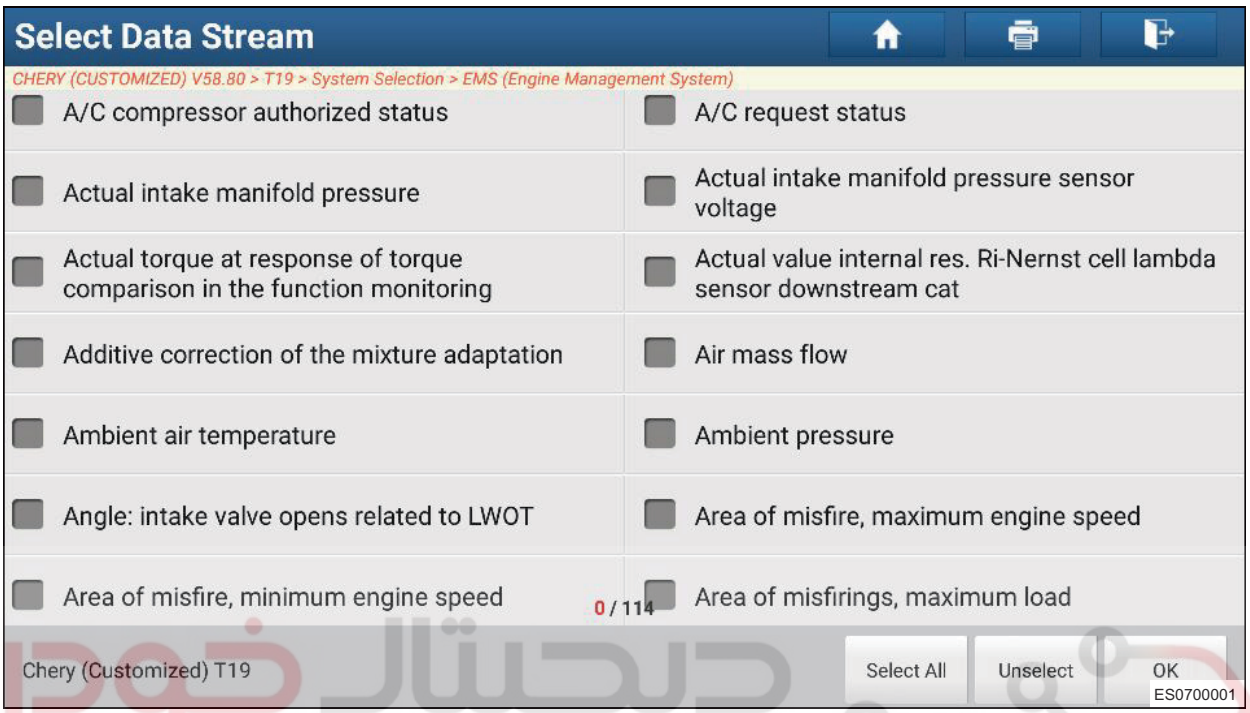


(d) "Special Function" screen.

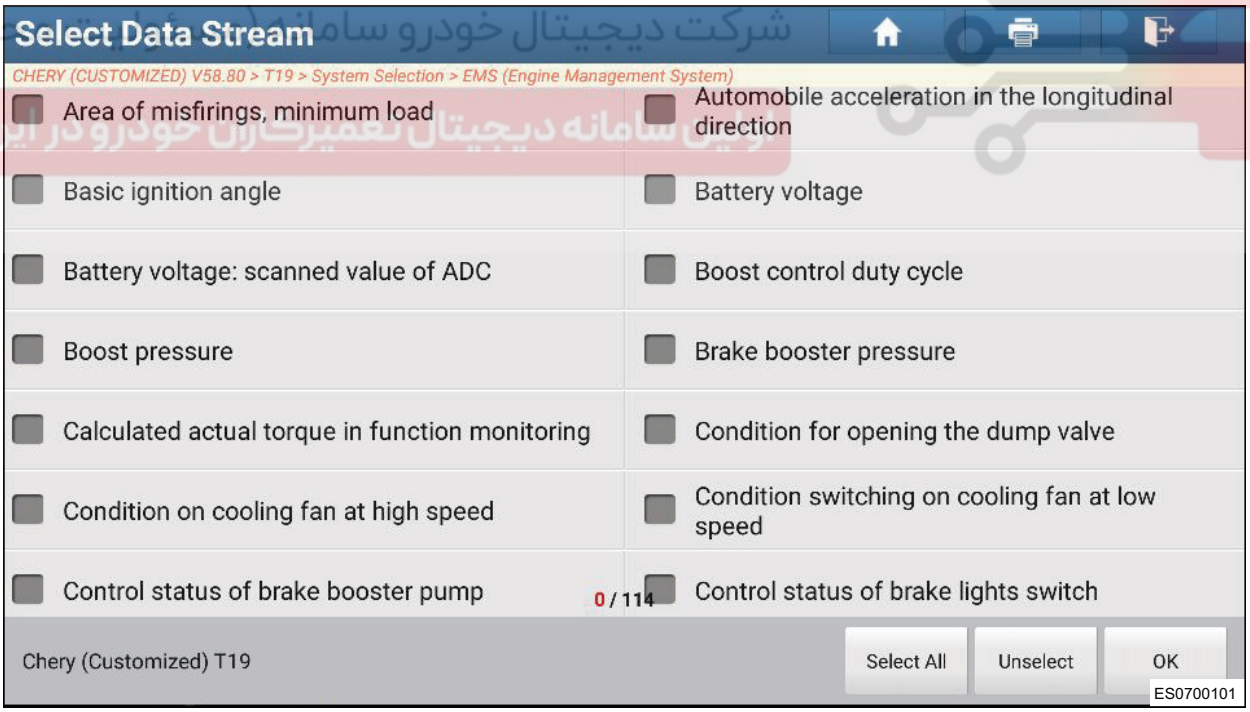
Engine Data Stream

Engine Data Stream Content

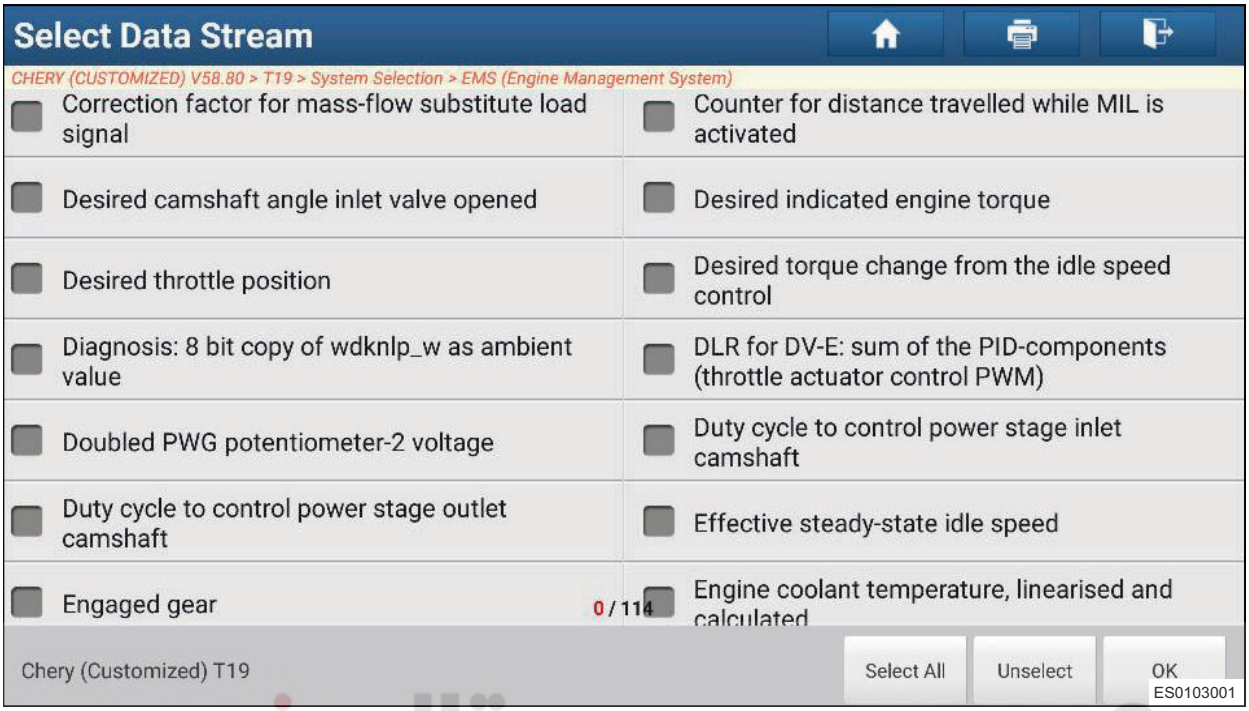
1. Page 1 data stream



2. Page 2 data stream



3. Page 3 data stream



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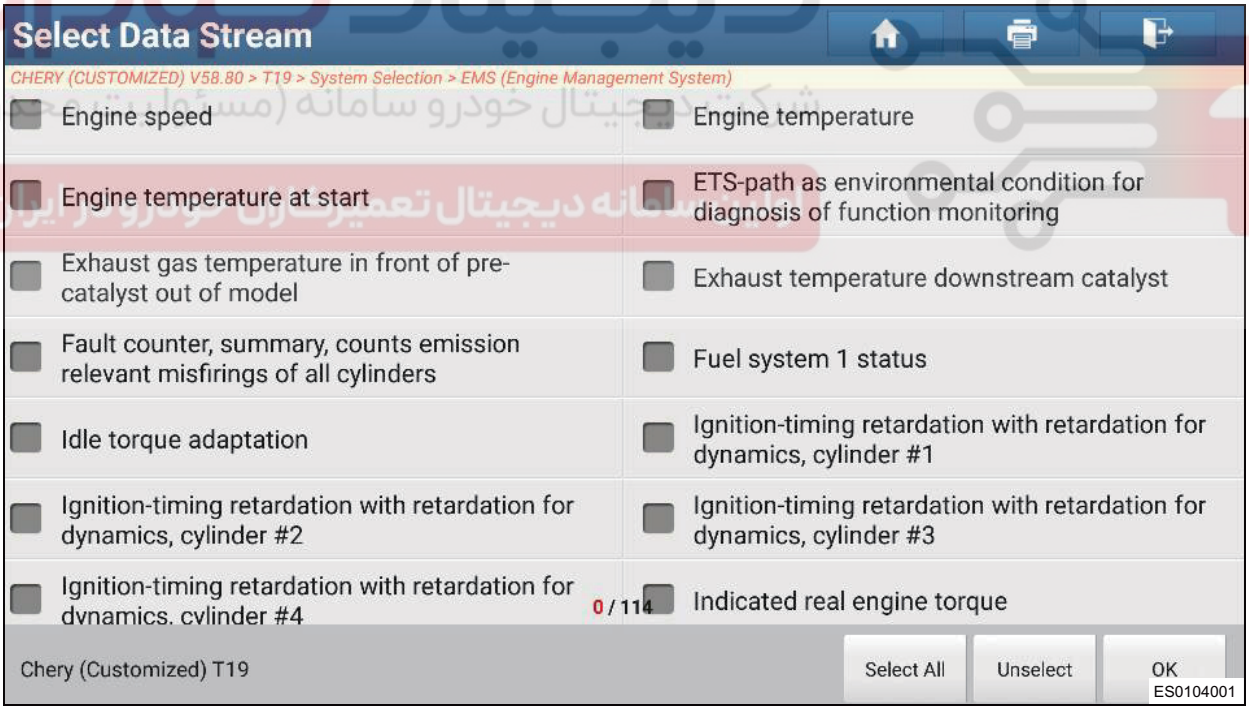
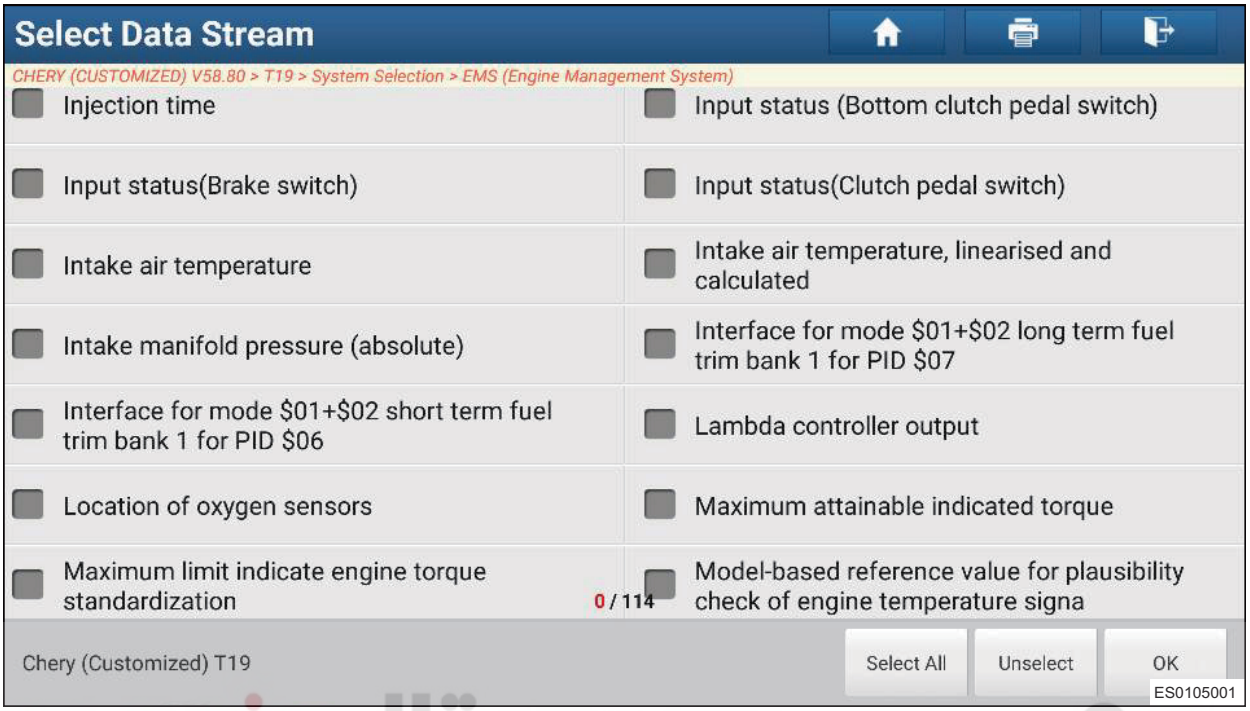
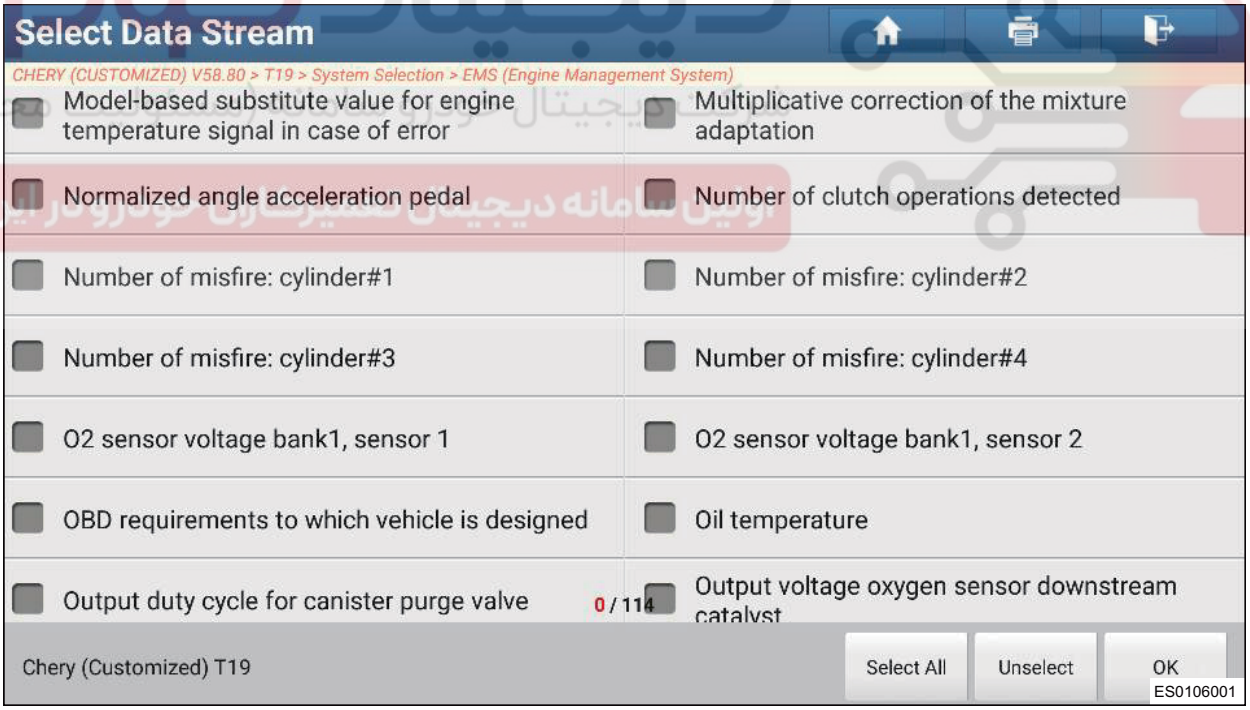


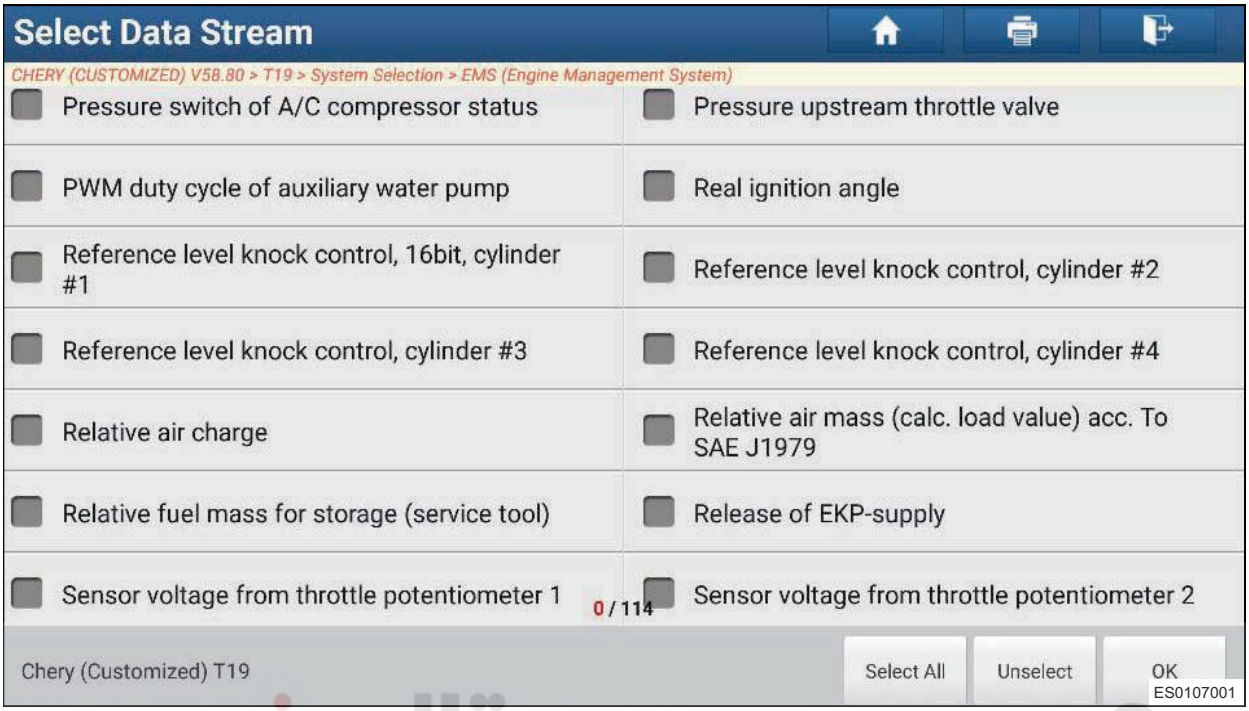
5. Page 5 data stream



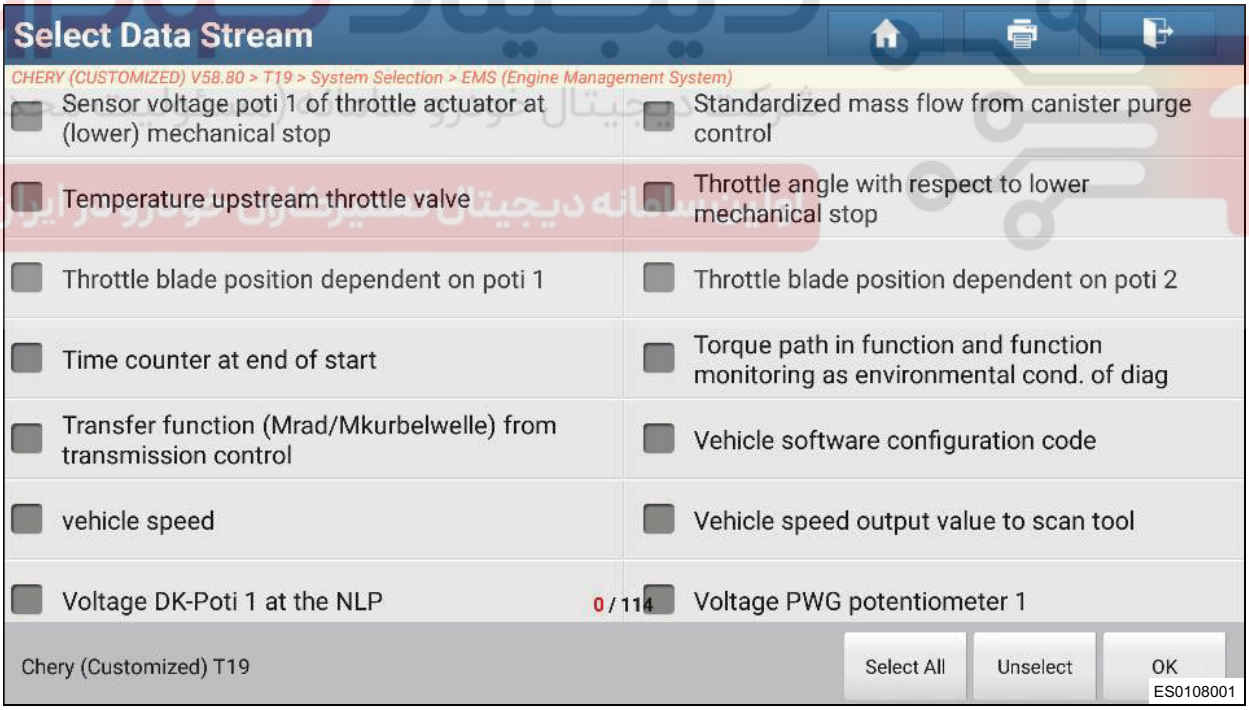
6. Page 6 data stream



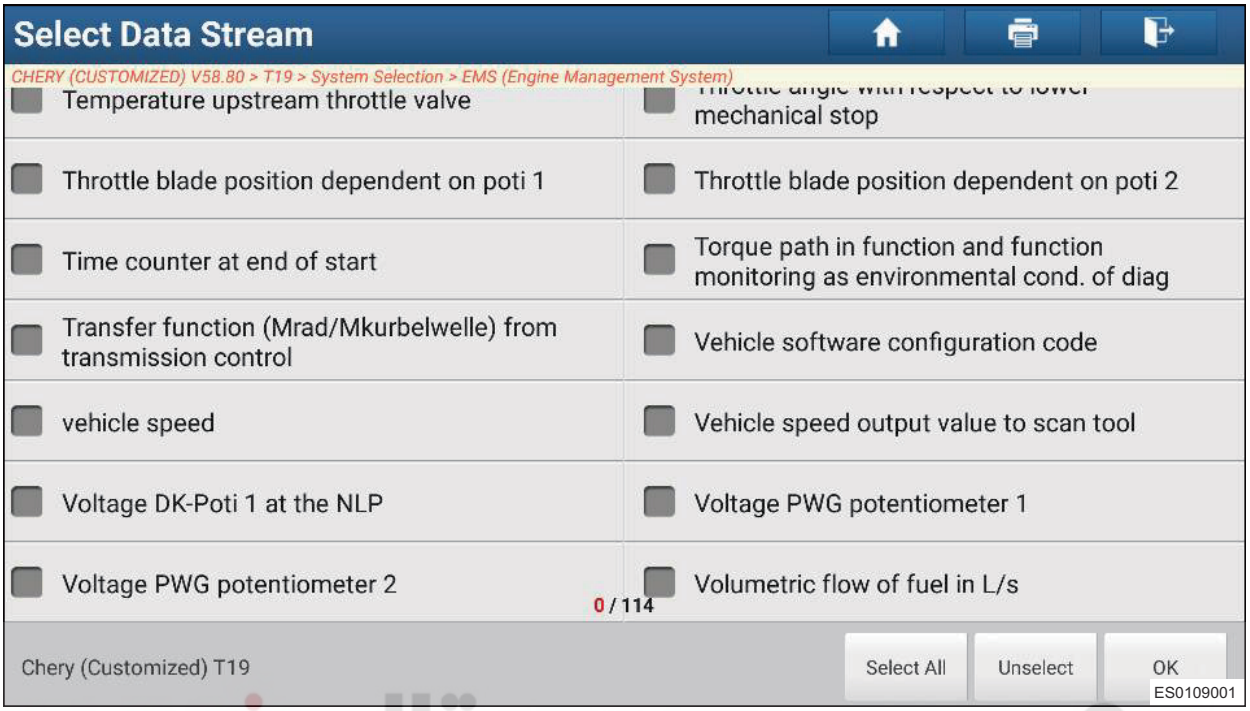
7. Page 7 data stream



8. Page 8 data stream

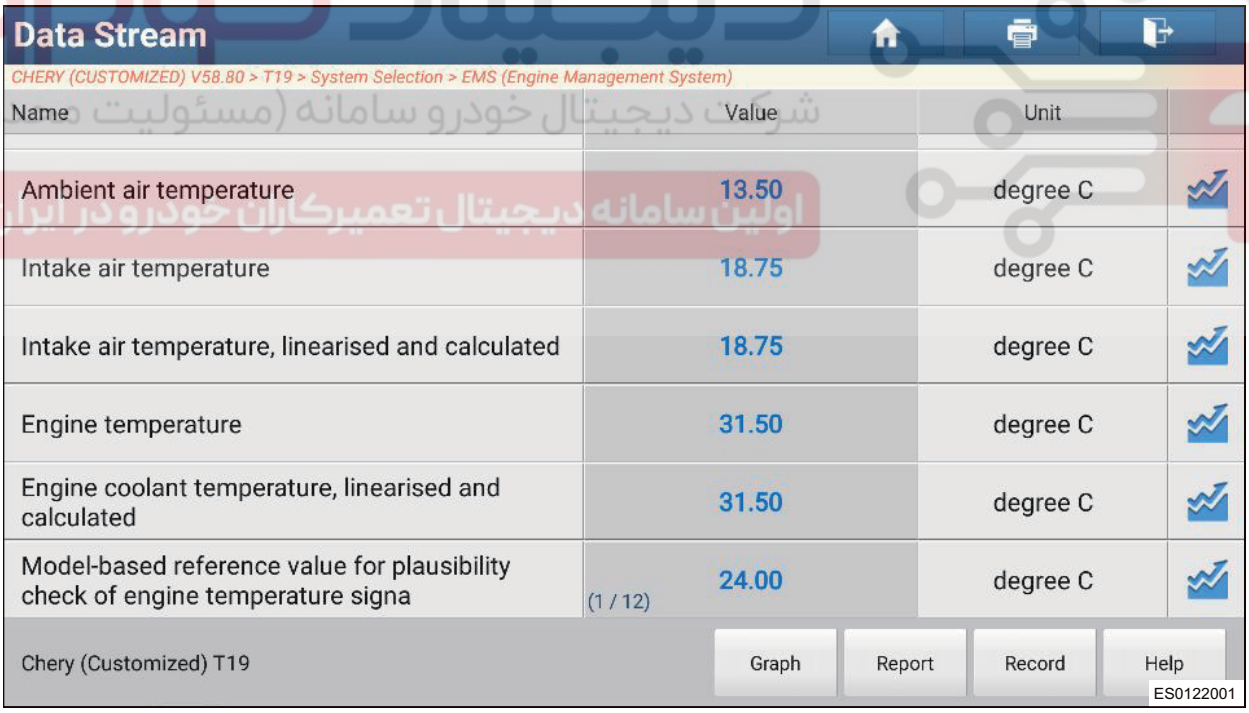


9. Page 9 data stream

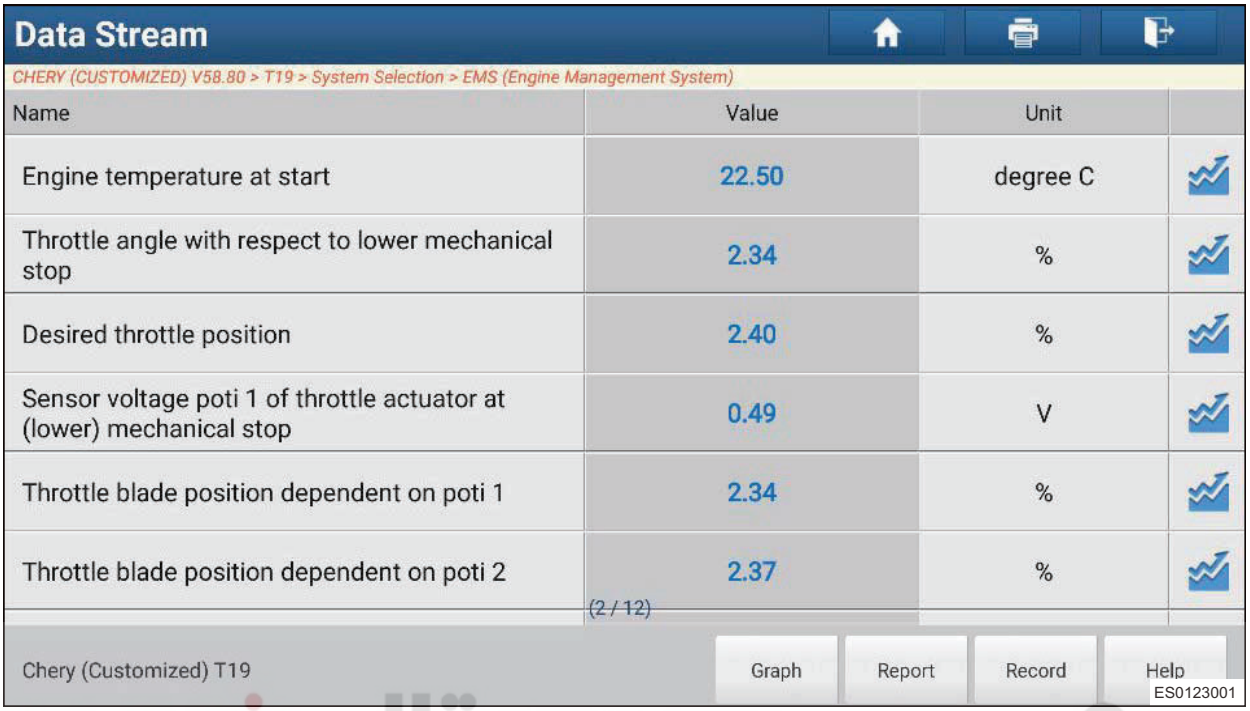


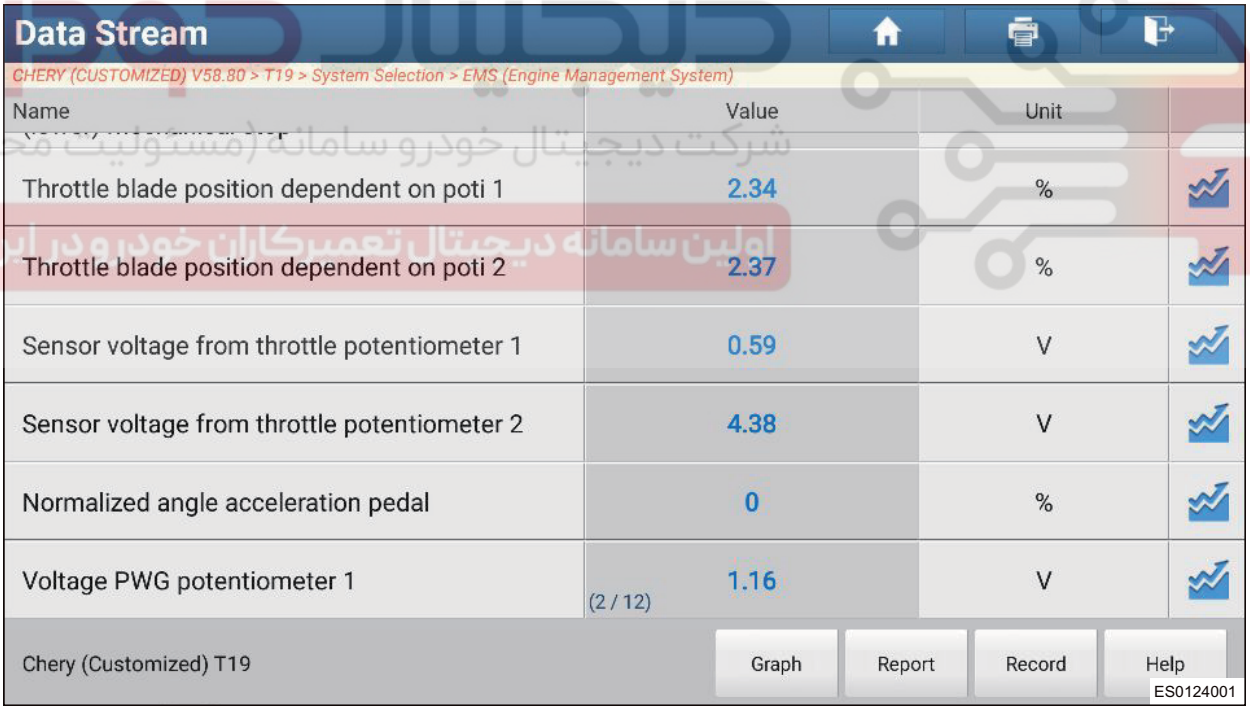
Data Stream in Idling State

1. Page 1 data stream

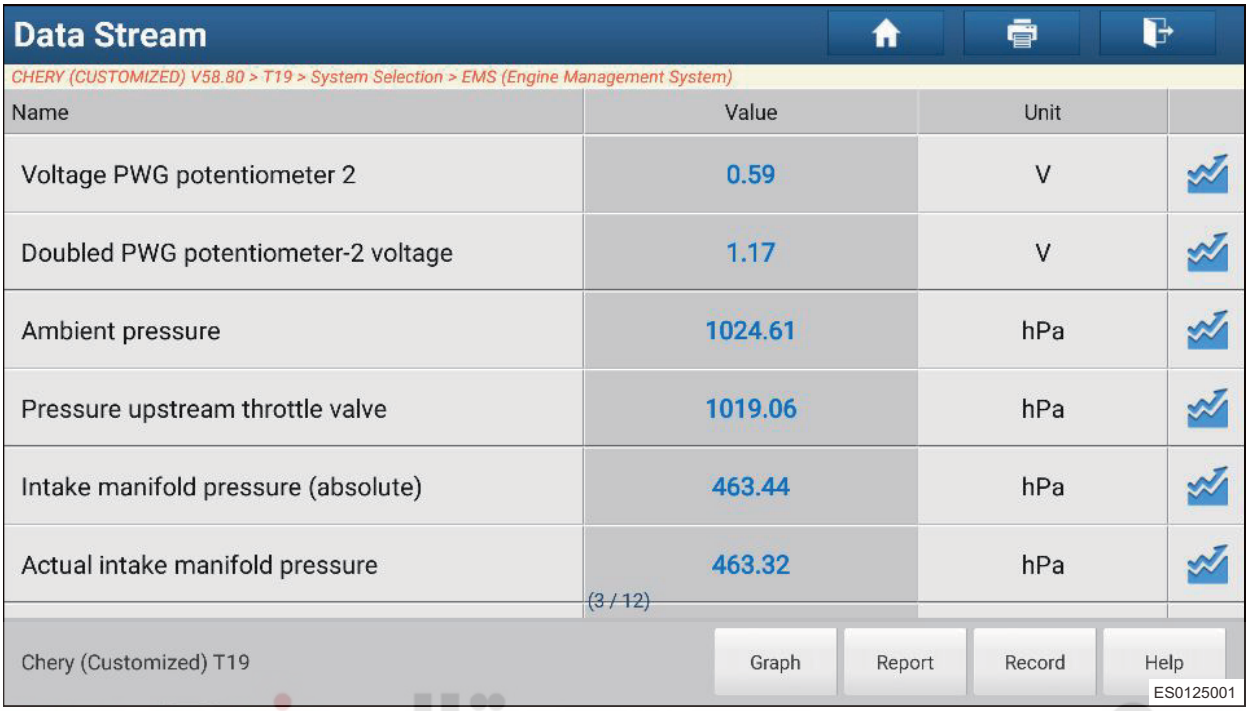


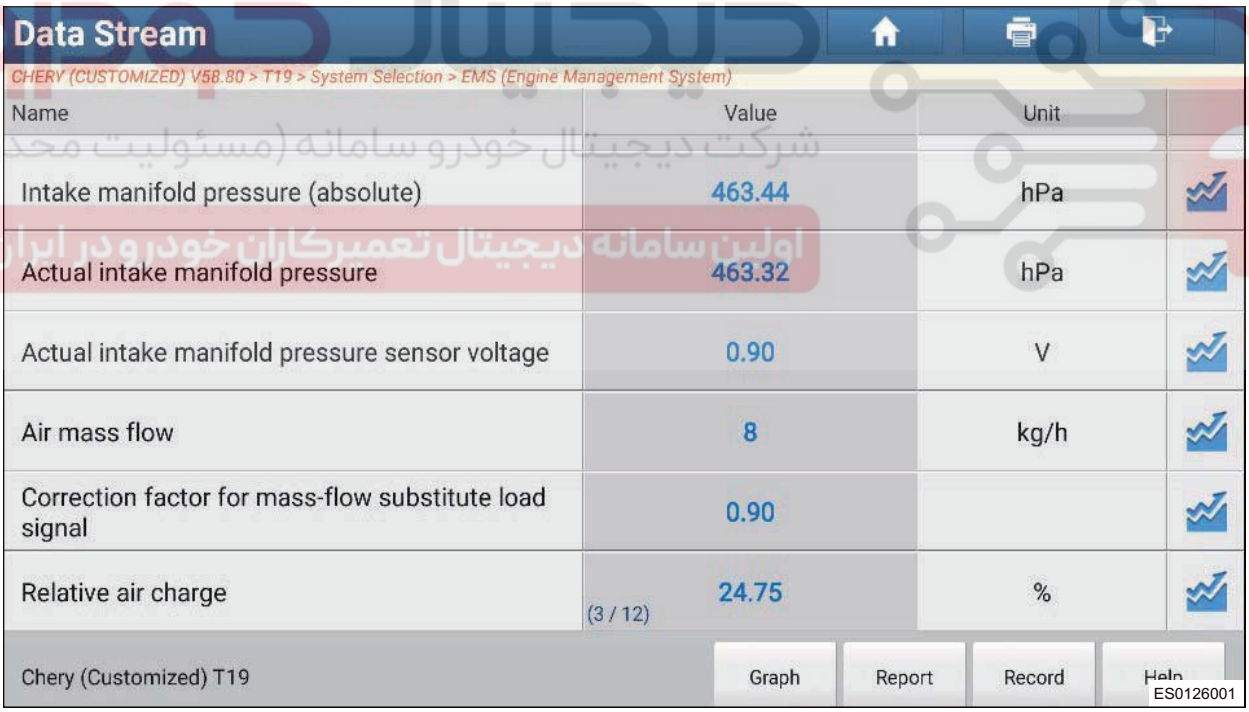
2. Page 2 data stream





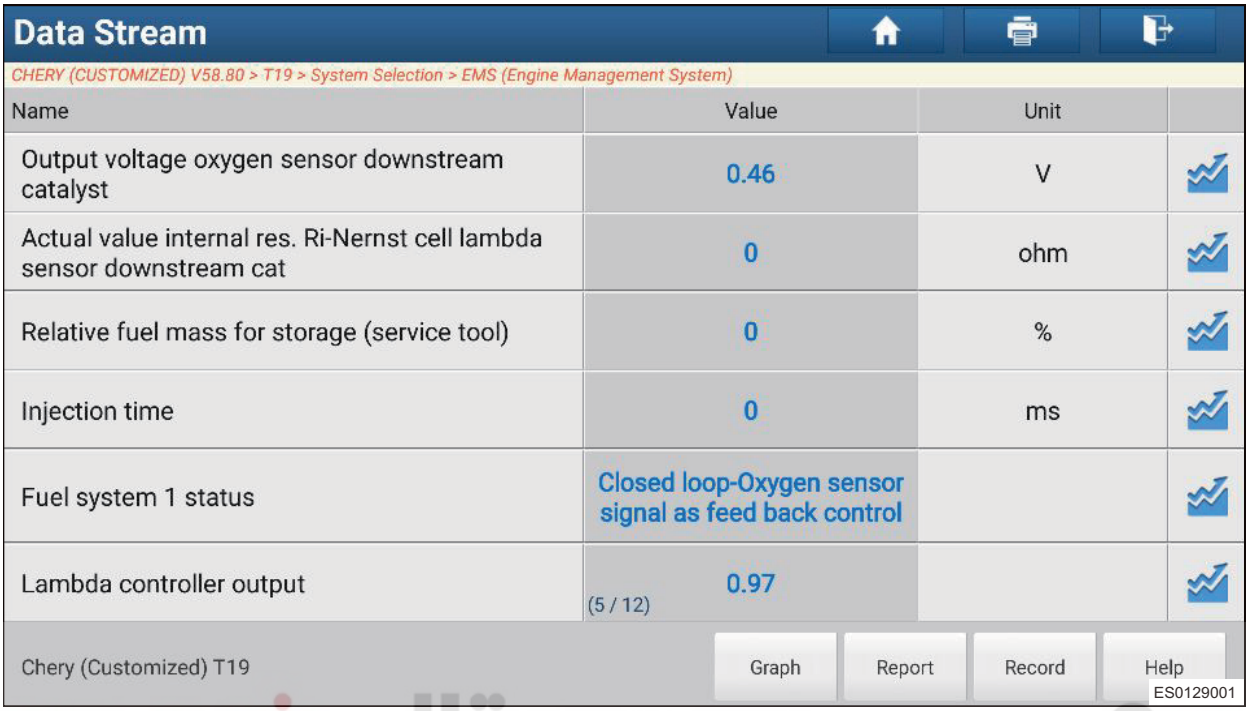
3. Page 3 data stream

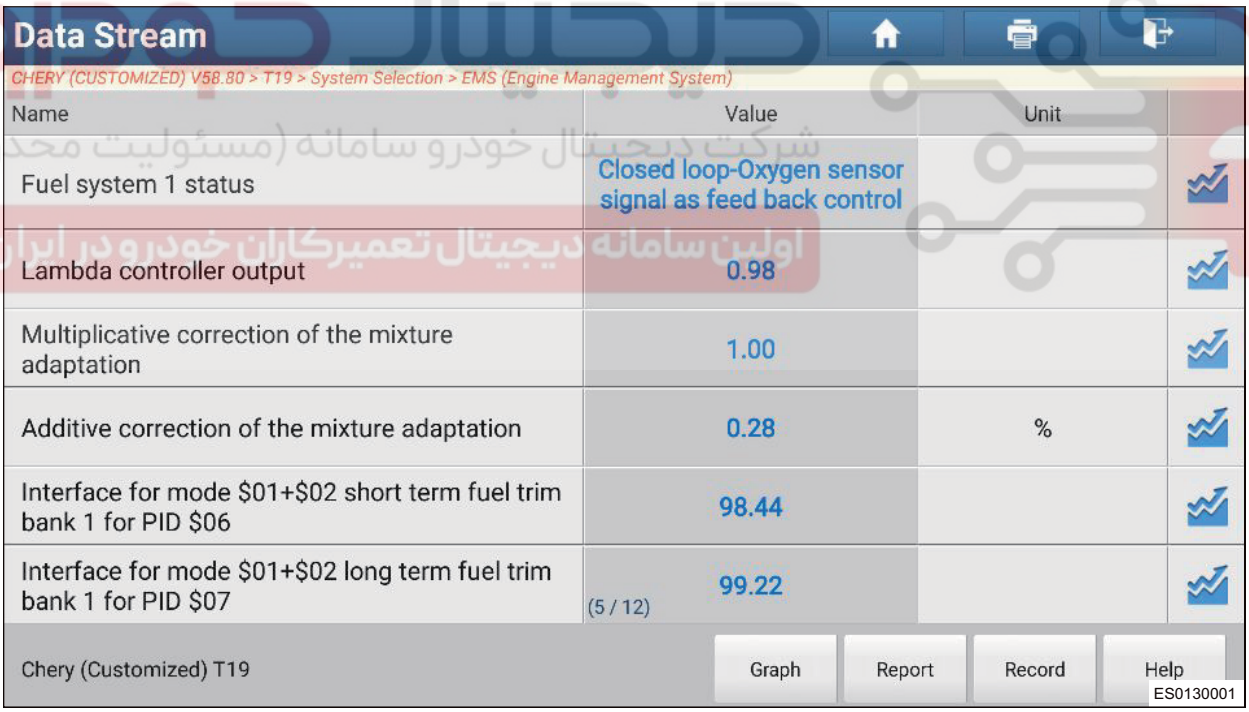




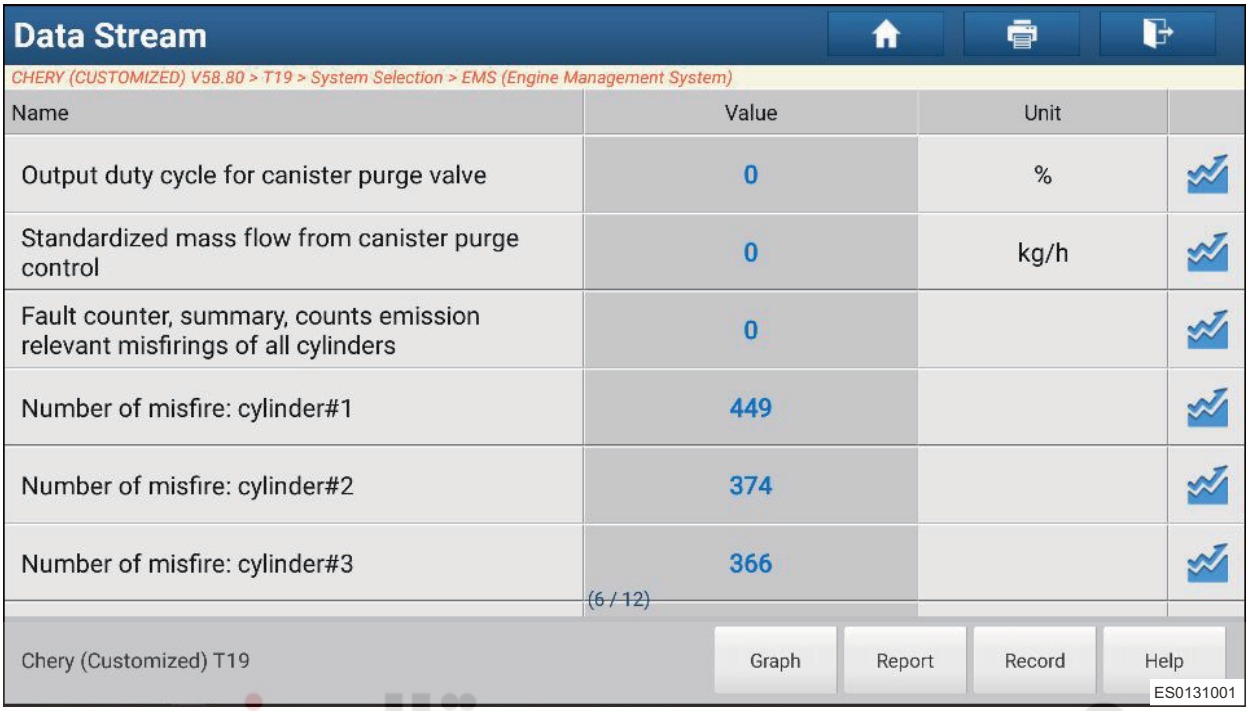
4. Page 4 data stream

5. Page 5 data stream



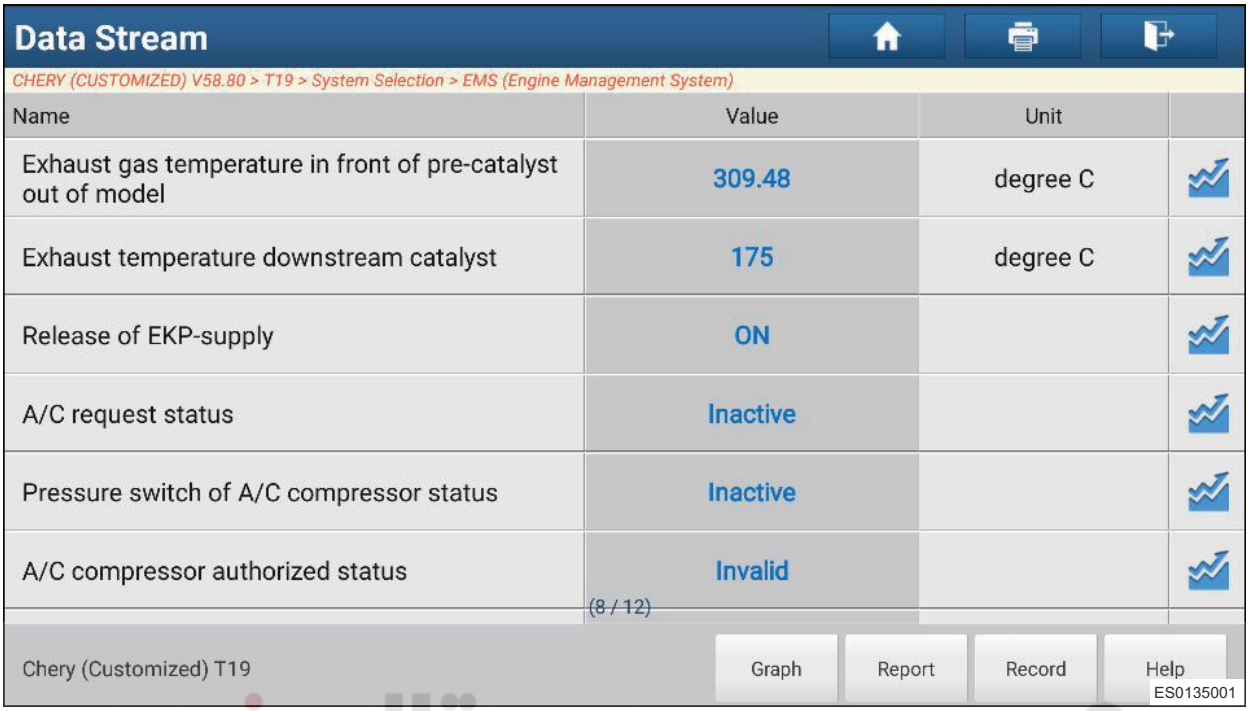


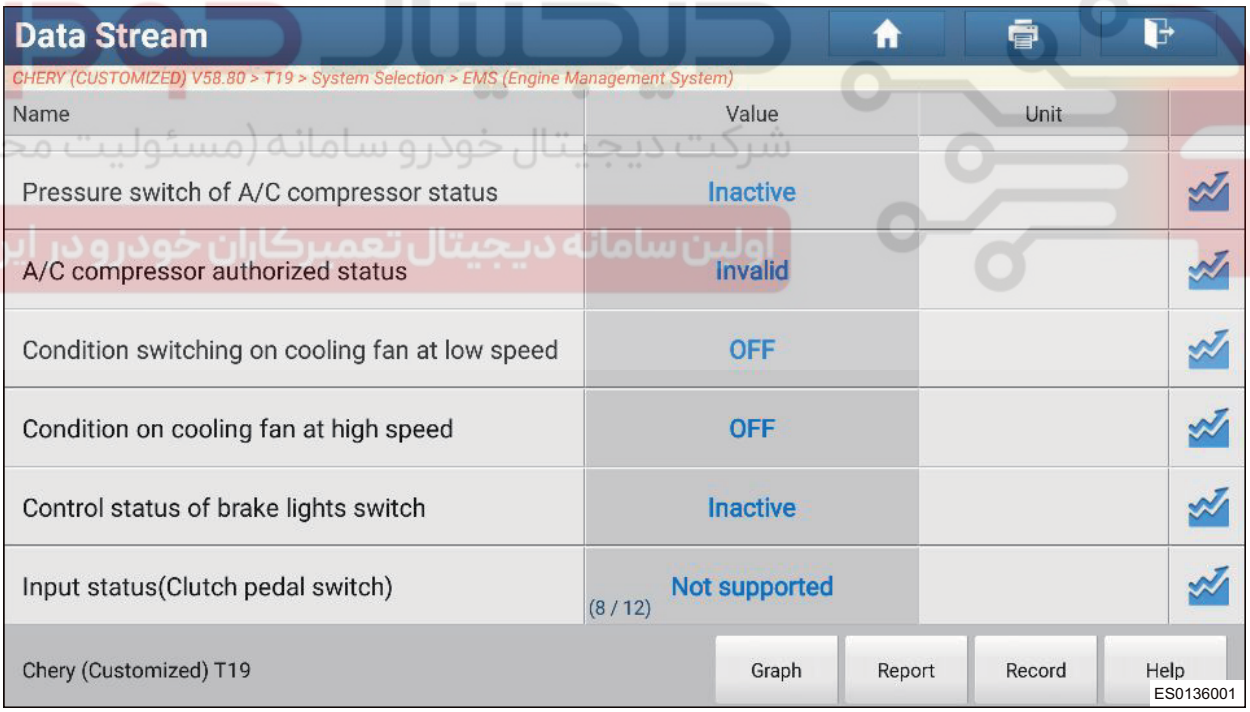
6. Page 6 data stream



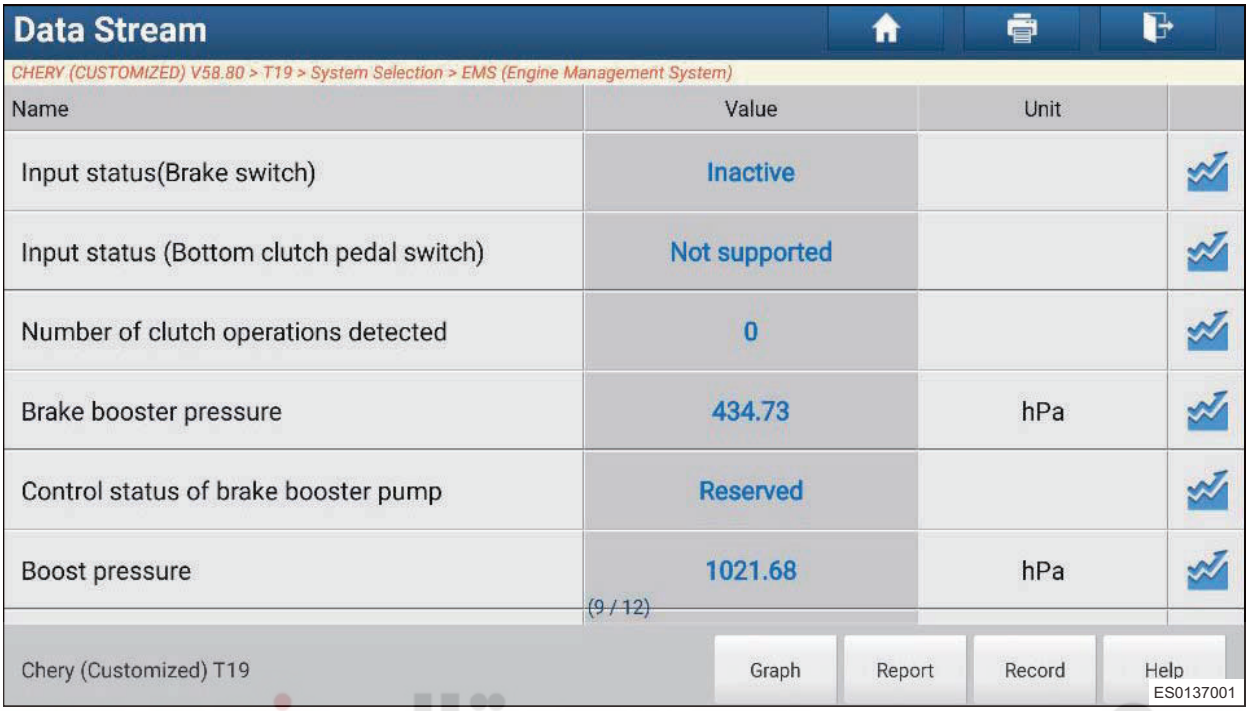
7. Page 7 data stream

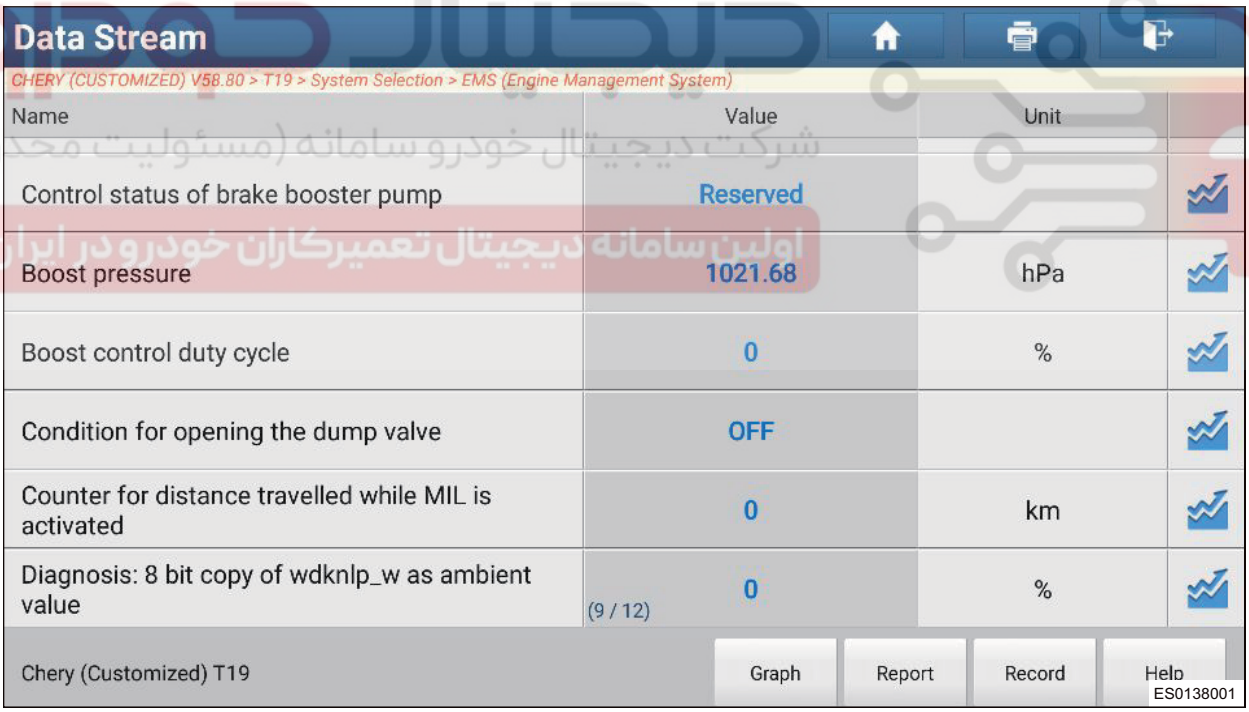
8. Page 8 data stream





9. Page 9 data stream





10. Page 10 data stream

Data Stream

CHERY (CUSTOMIZED) V58.80 > T19 > System Selection > EMS (Engine Management System)

Name	Value	Unit
Voltage DK-Poti 1 at the NLP	0.77	V
Model-based substitute value for engine temperature signal in case of error	39.75	degree C
Time counter at end of start	168.70	s
Volumetric flow of fuel in L/s	0.00	L/s
Maximum limit indicate engine torque standardization	300	Nm
ETS-path as environmental condition for diagnosis of function monitoring	128	

(10 / 12)

Chery (Customized) T19 | Graph | Report | Record | Help

ES0140001

Data Stream

CHERY (CUSTOMIZED) V58.80 > T19 > System Selection > EMS (Engine Management System)

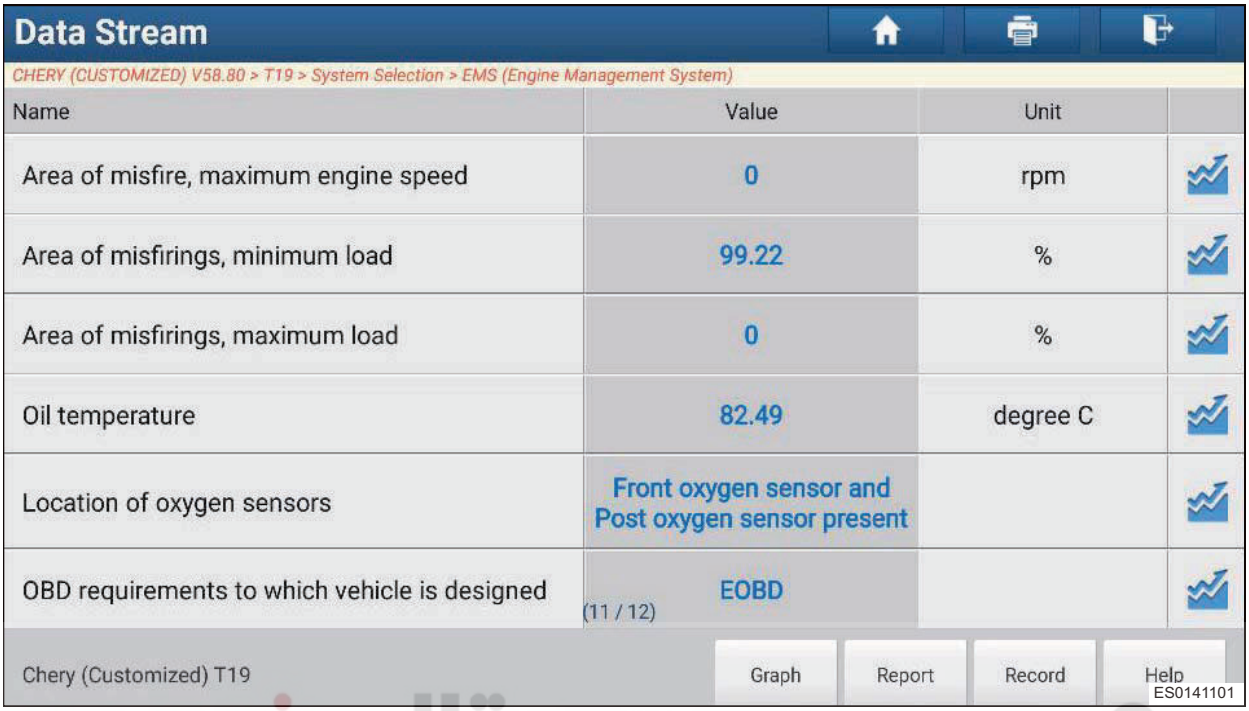
Name	Value	Unit
Maximum limit indicate engine torque standardization	300	Nm
ETS-path as environmental condition for diagnosis of function monitoring	128	
Torque path in function and function monitoring as environmental cond. of diag	32	
Actual torque at response of torque comparison in the function monitoring	3.91	%
Calculated actual torque in function monitoring	4.30	%
Area of misfire, minimum engine speed	10200	rpm

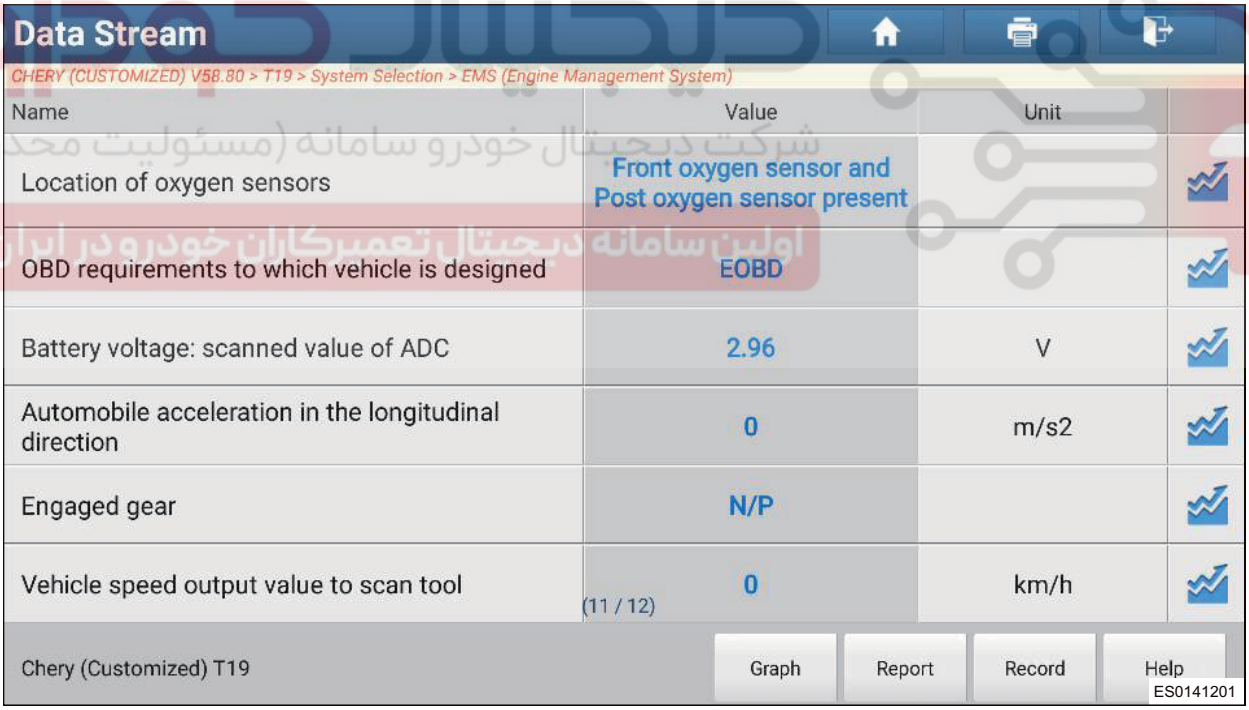
(10 / 12)

Chery (Customized) T19 | Graph | Report | Record | Help

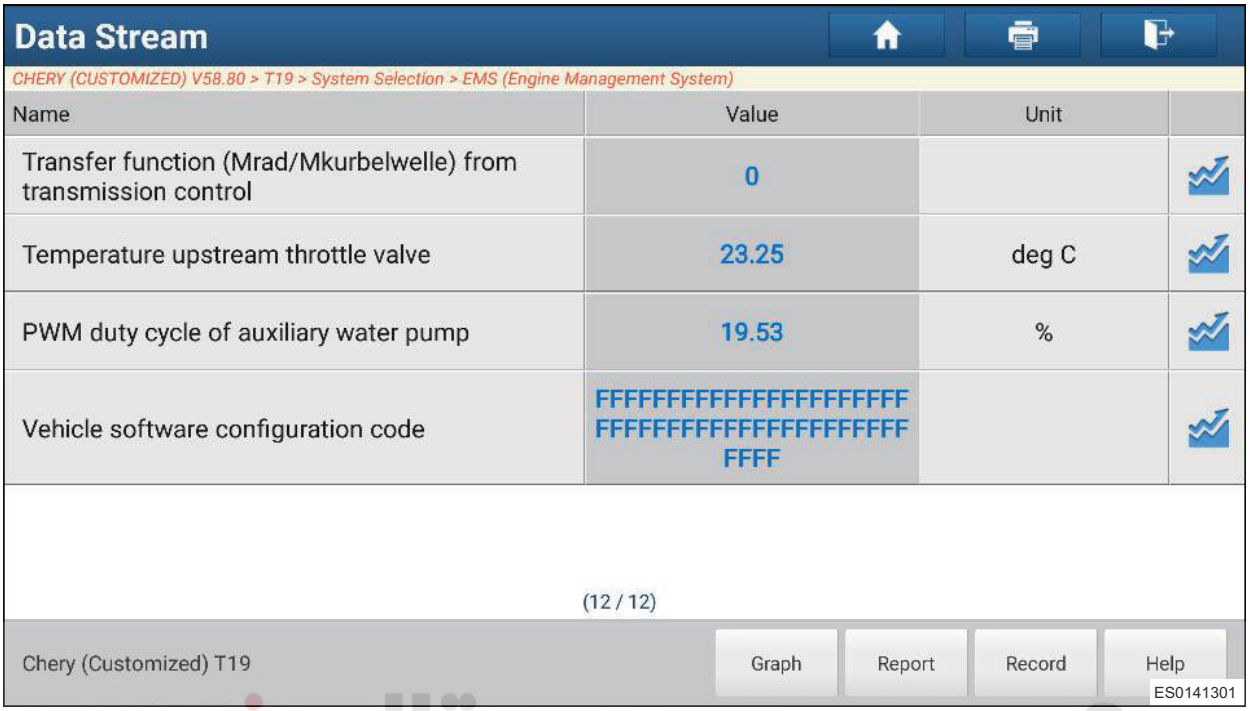
ES0141001

11. Page 11 data stream



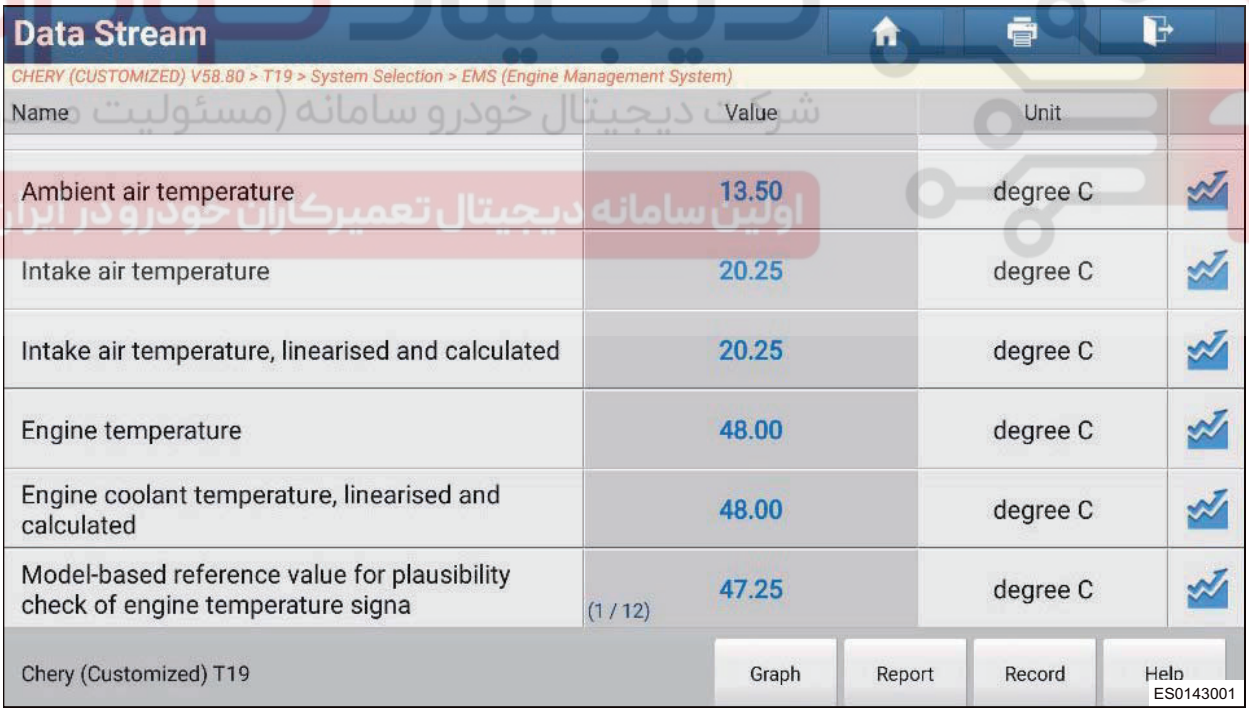


12. Page 12 data stream

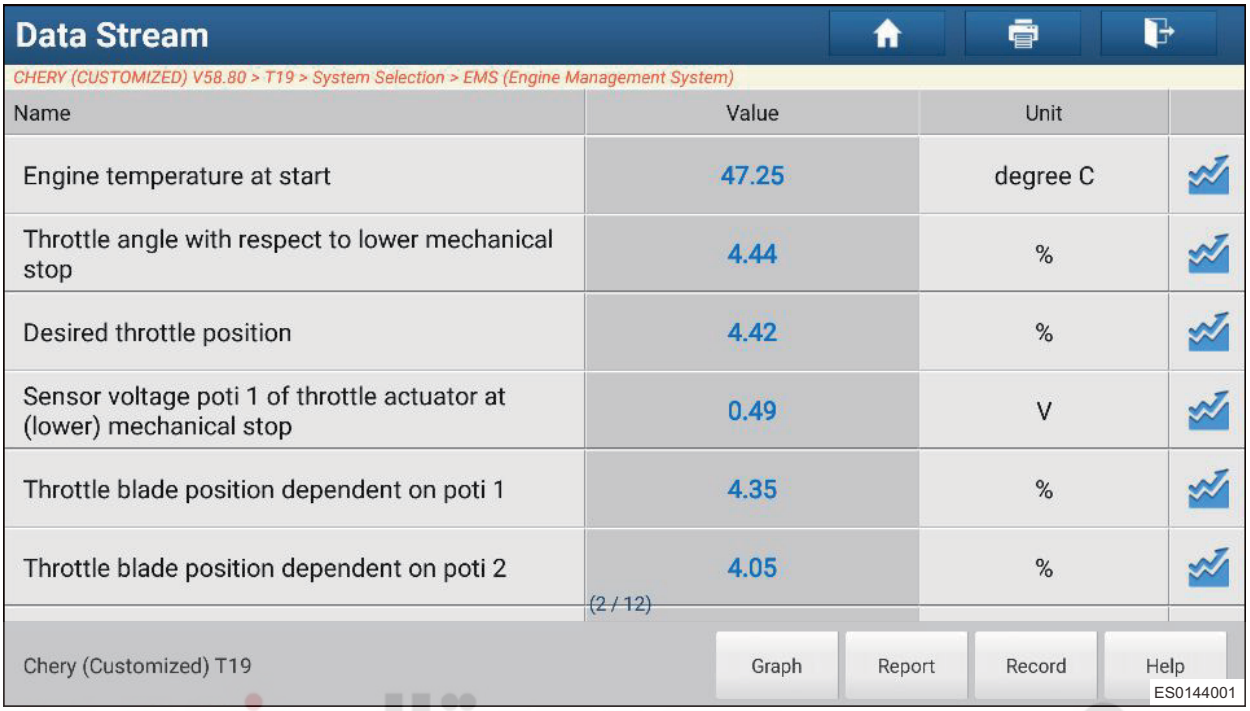


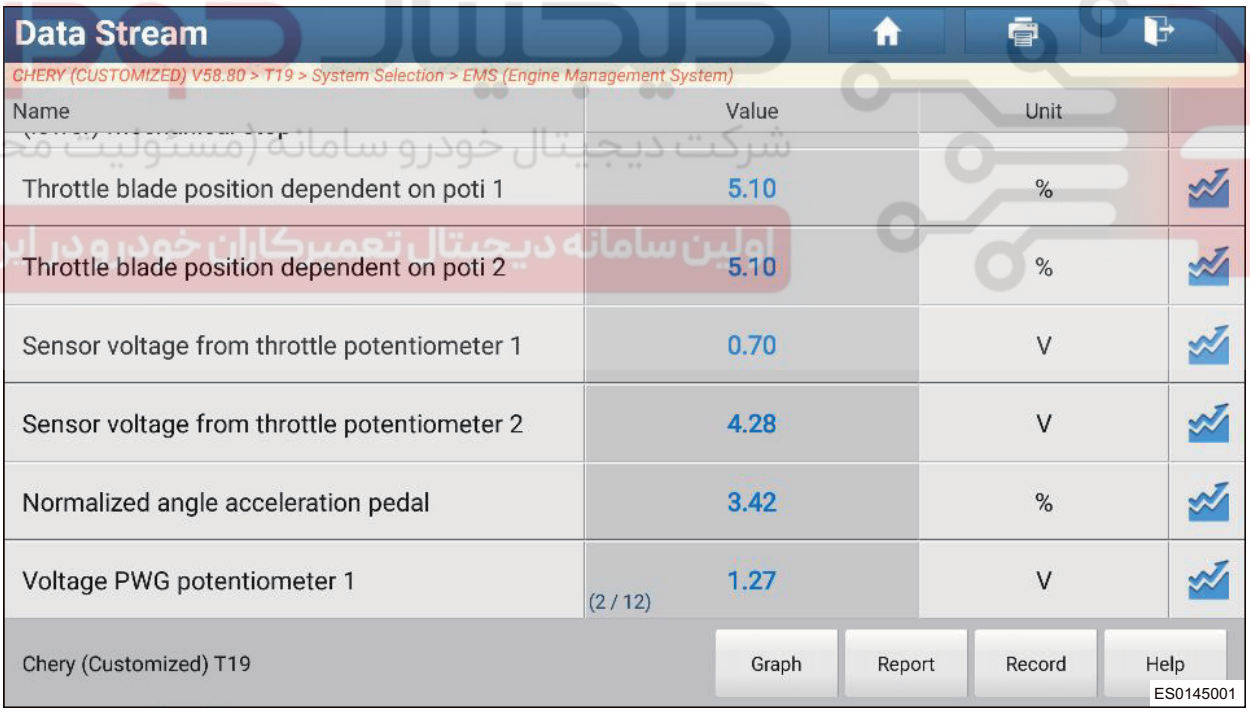
Data Stream under 2000 rpm/h

1. Page 1 data stream

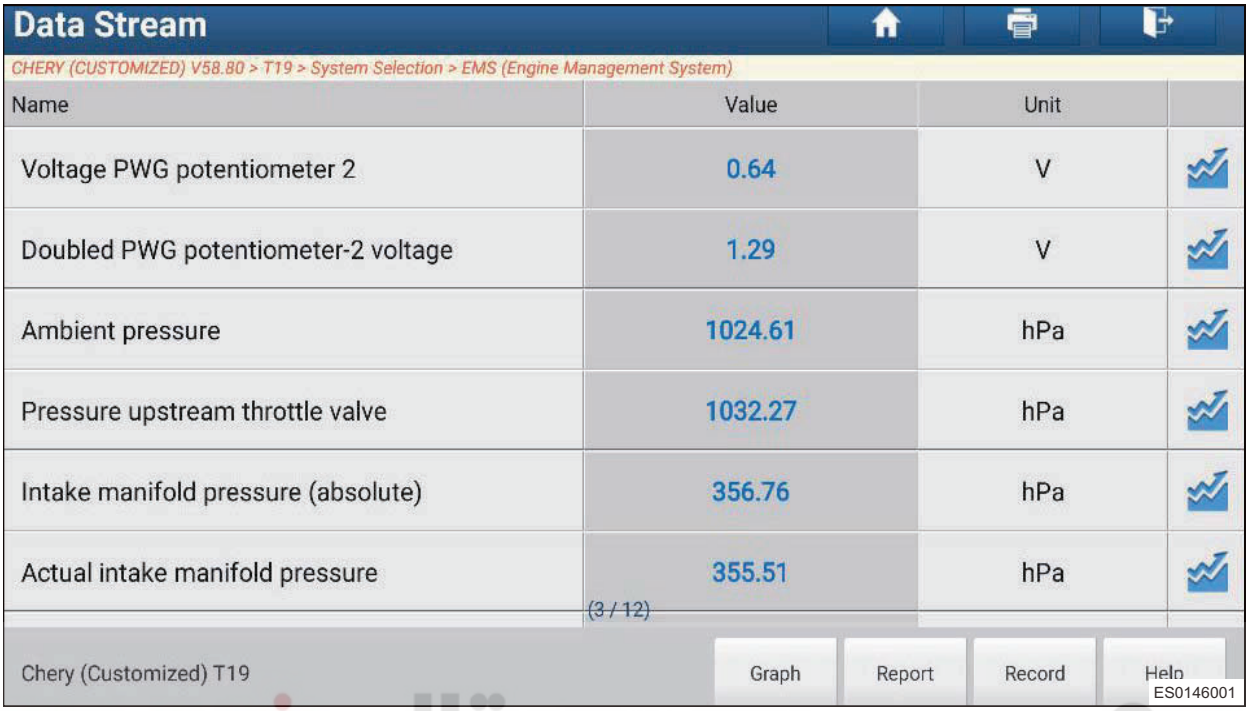


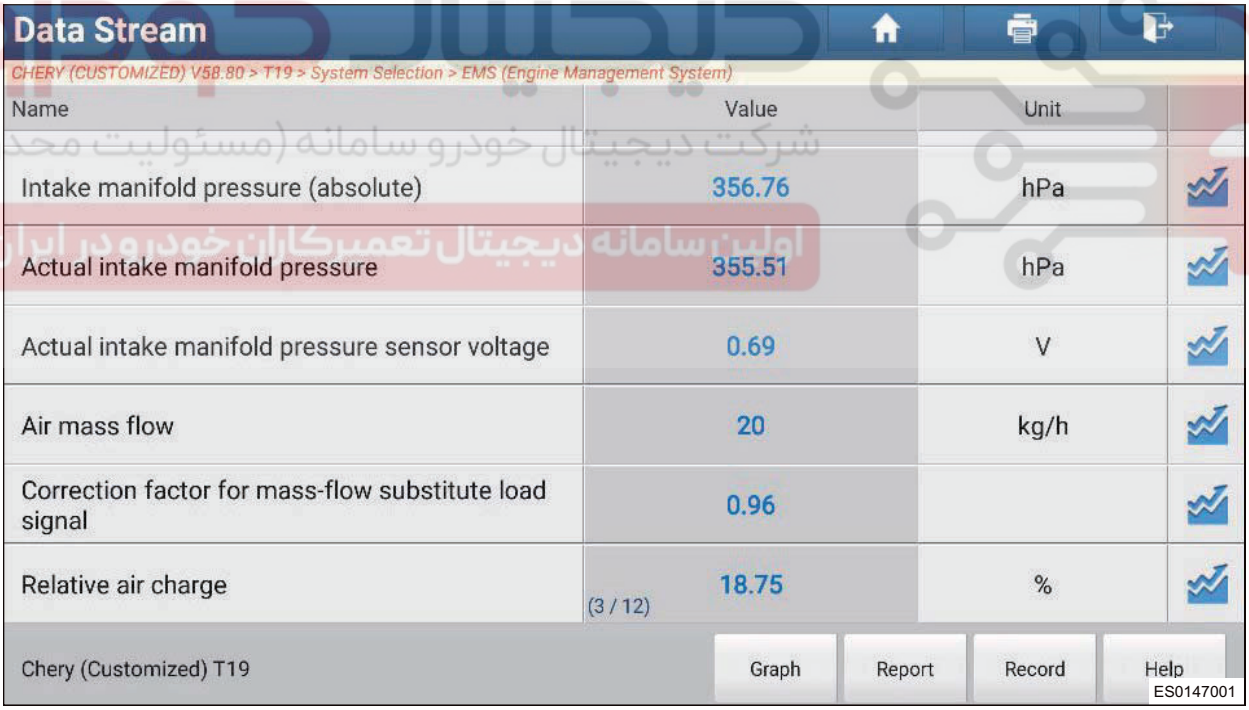
2. Page 2 data stream



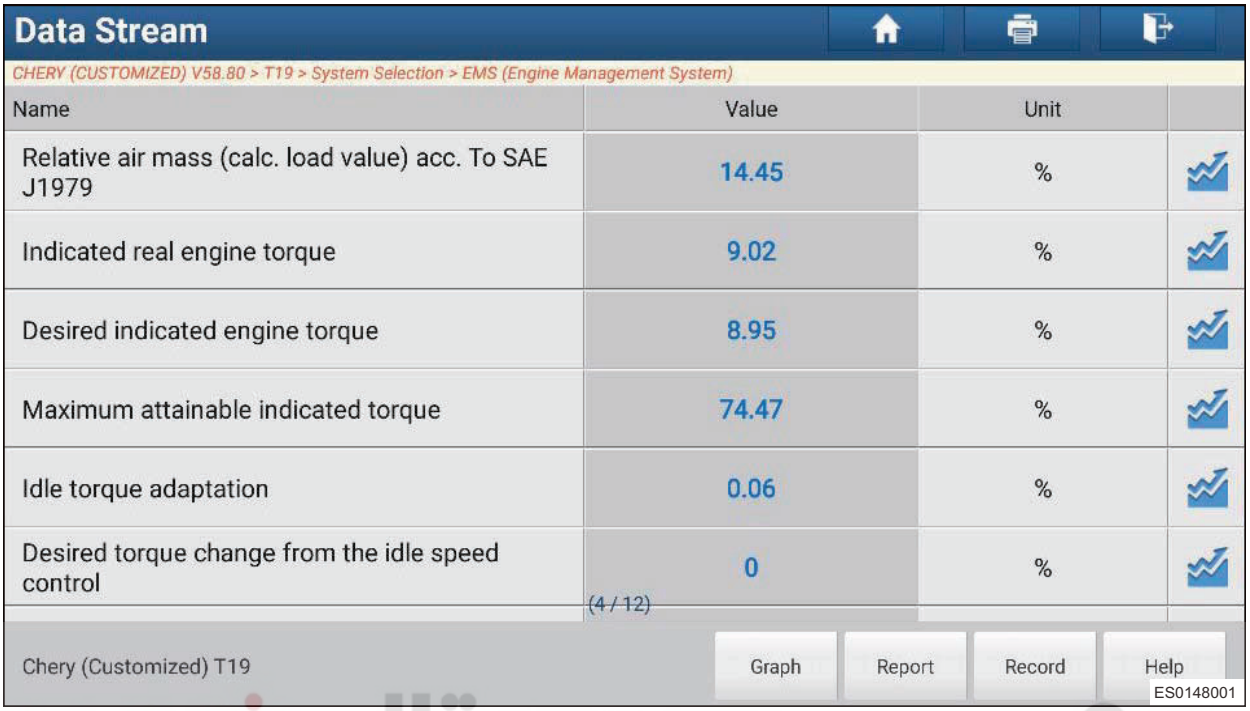


3. Page 3 data stream

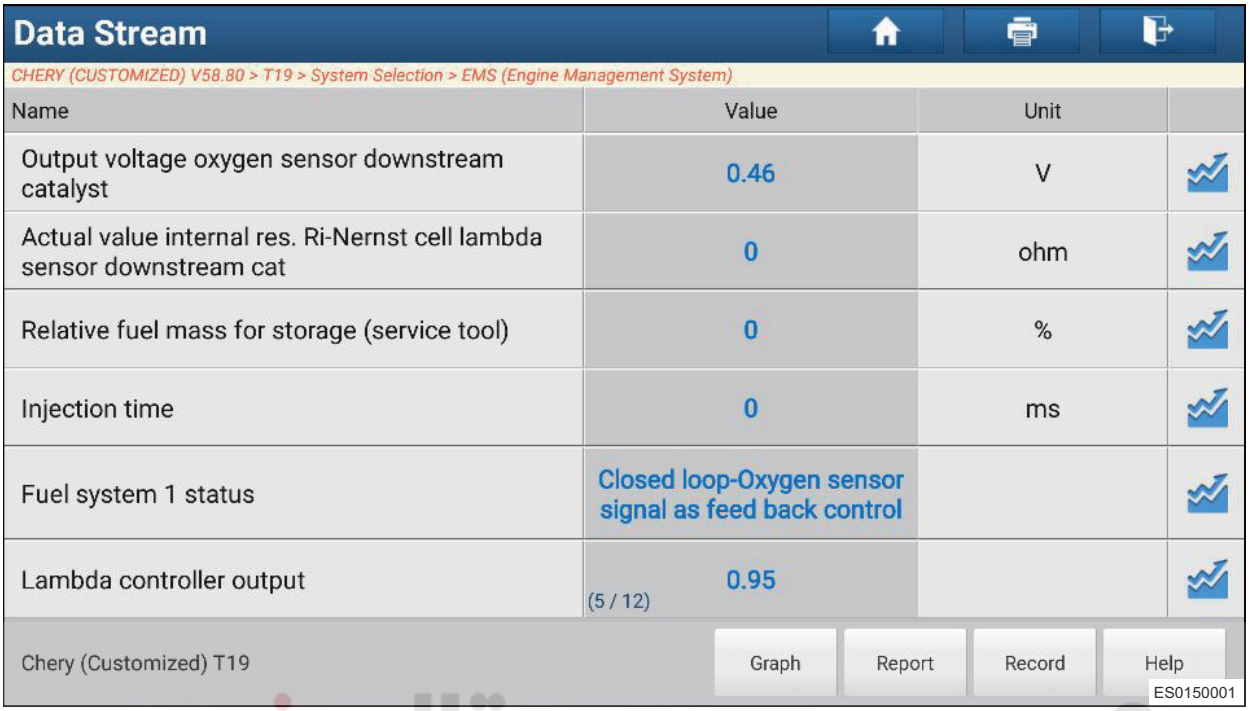




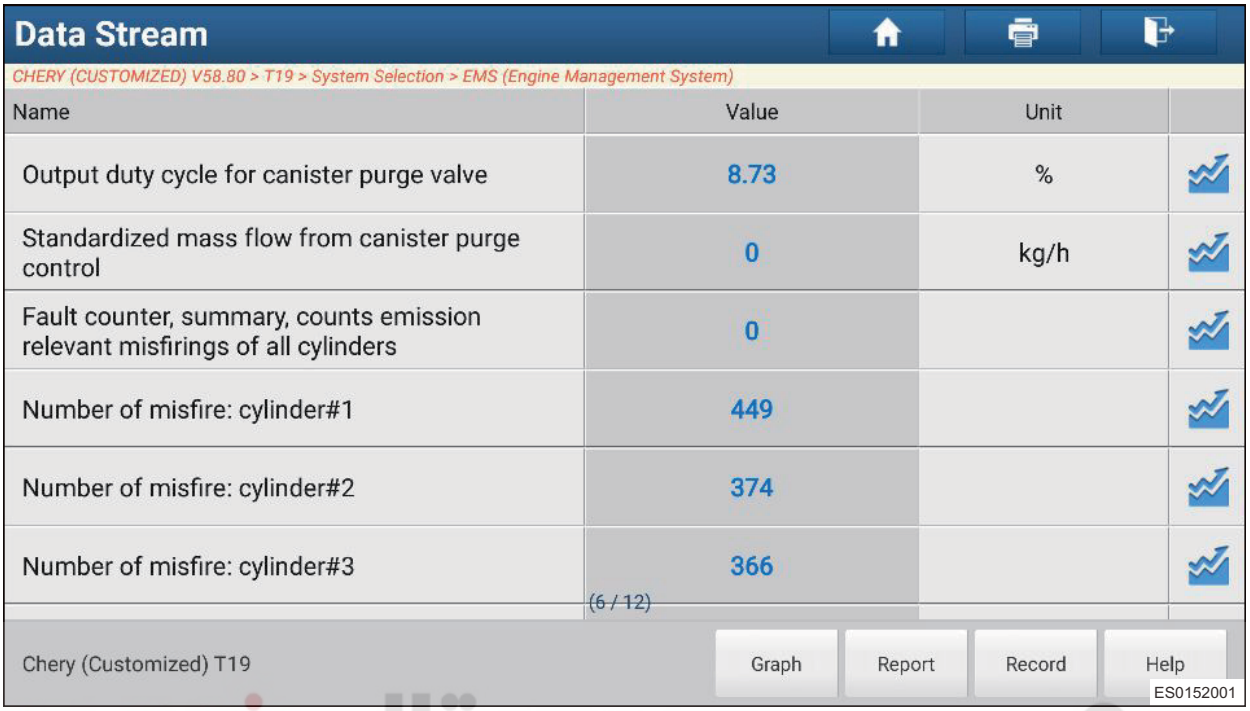
4. Page 4 data stream



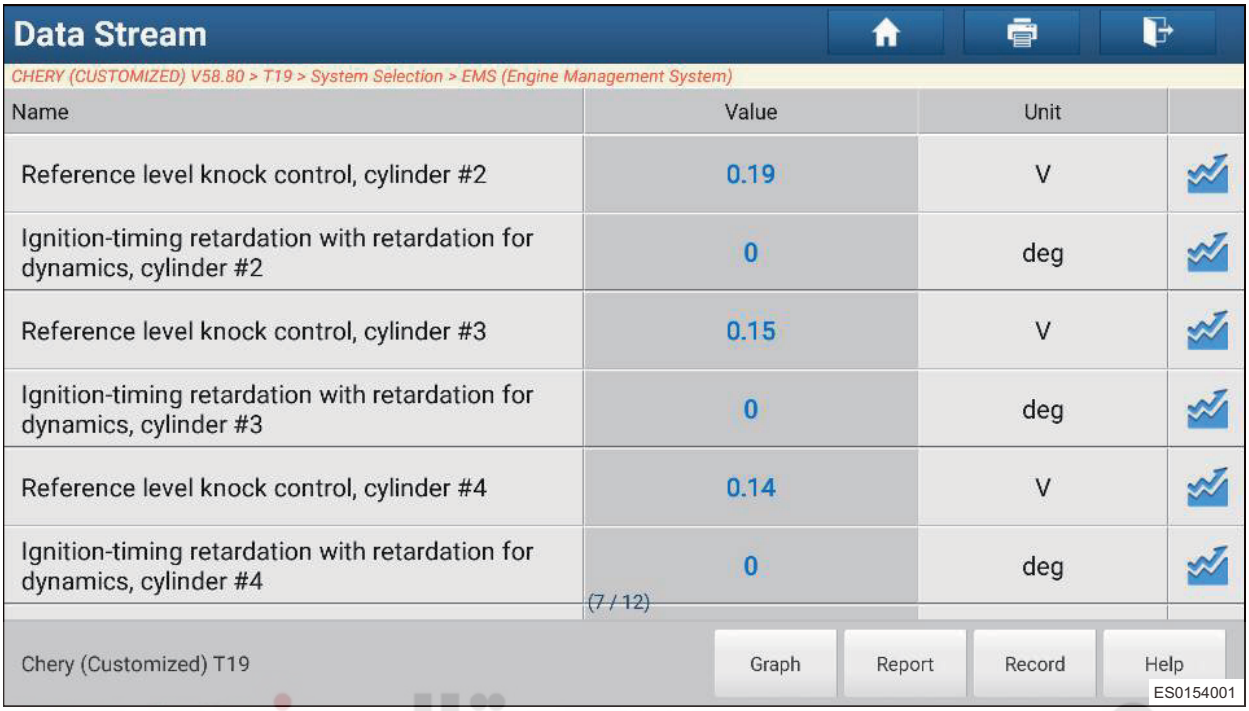
5. Page 5 data stream



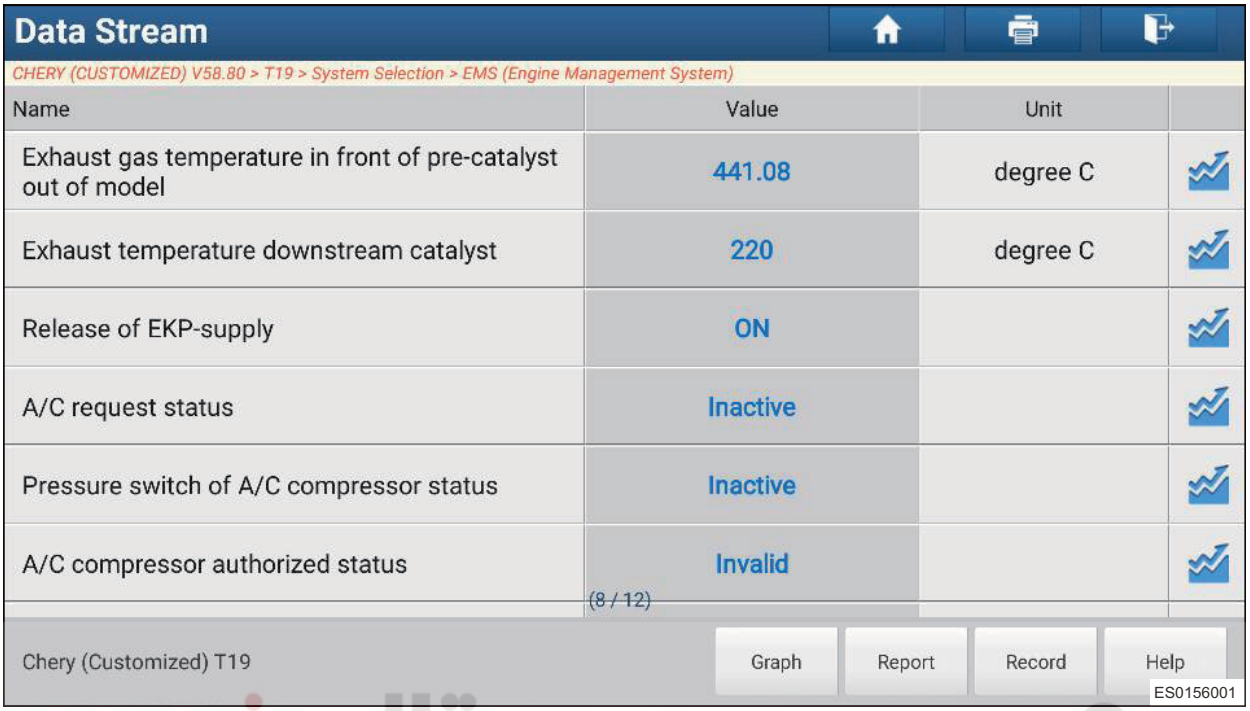
6. Page 6 data stream

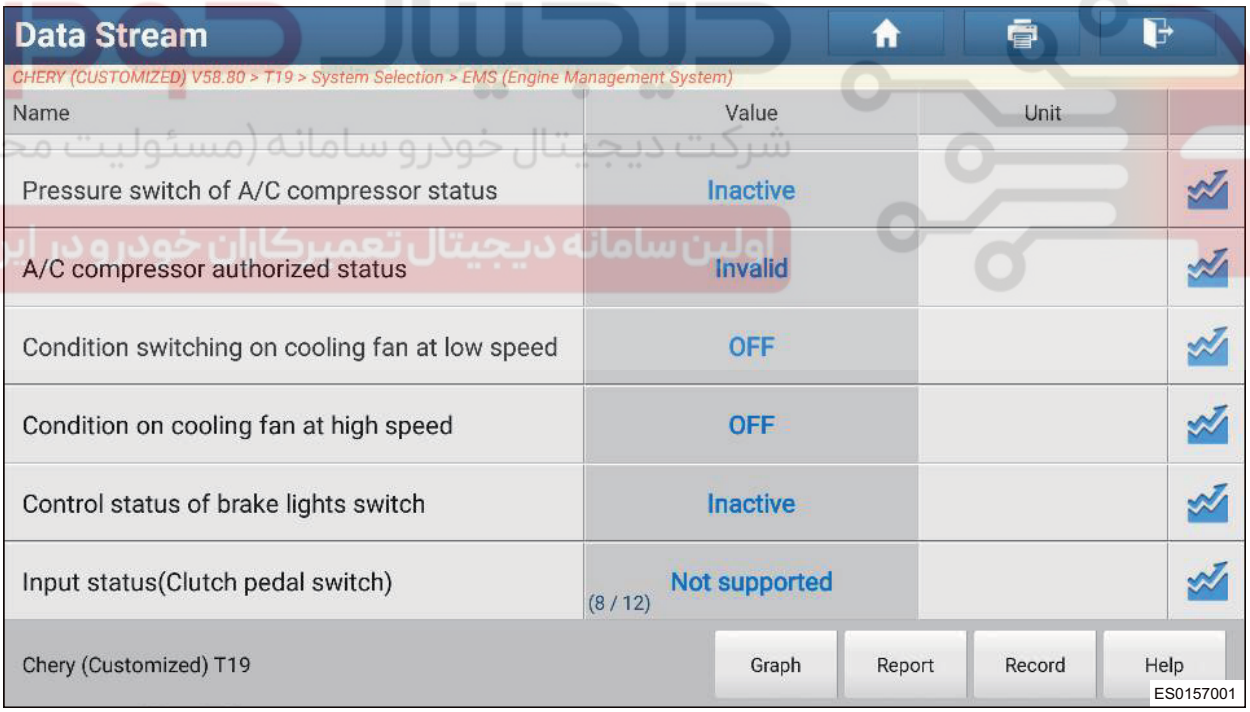


7. Page 7 data stream

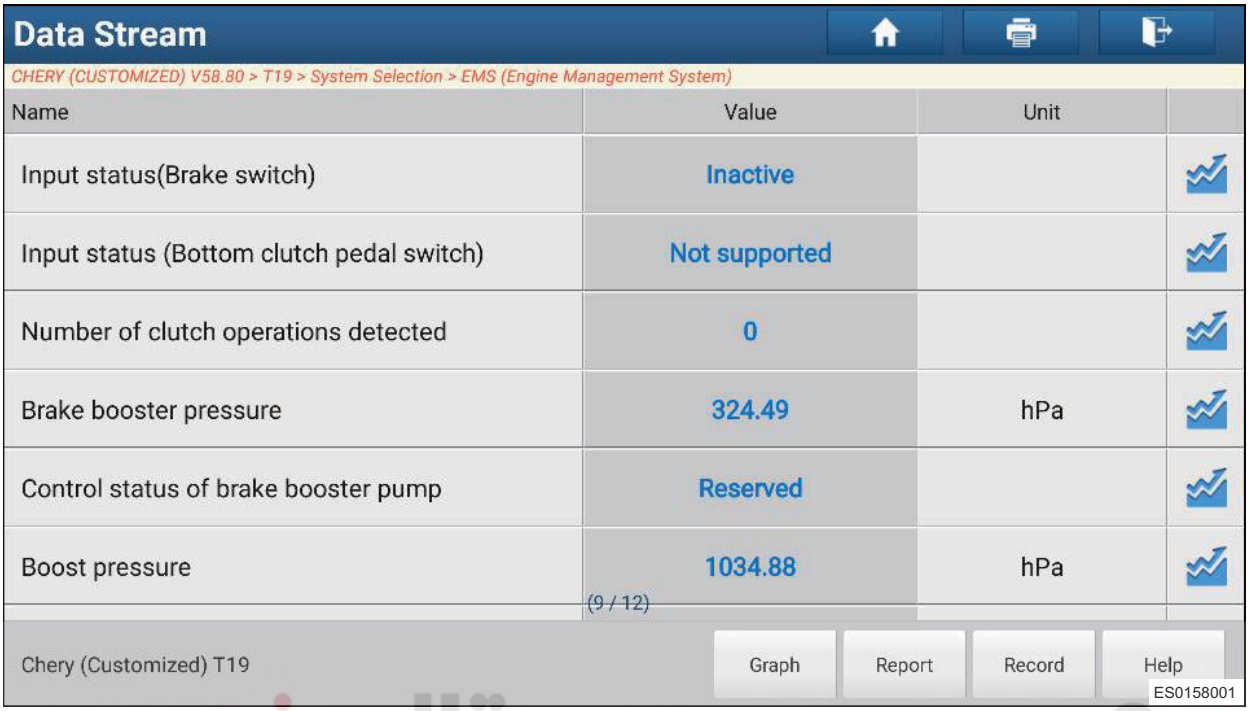


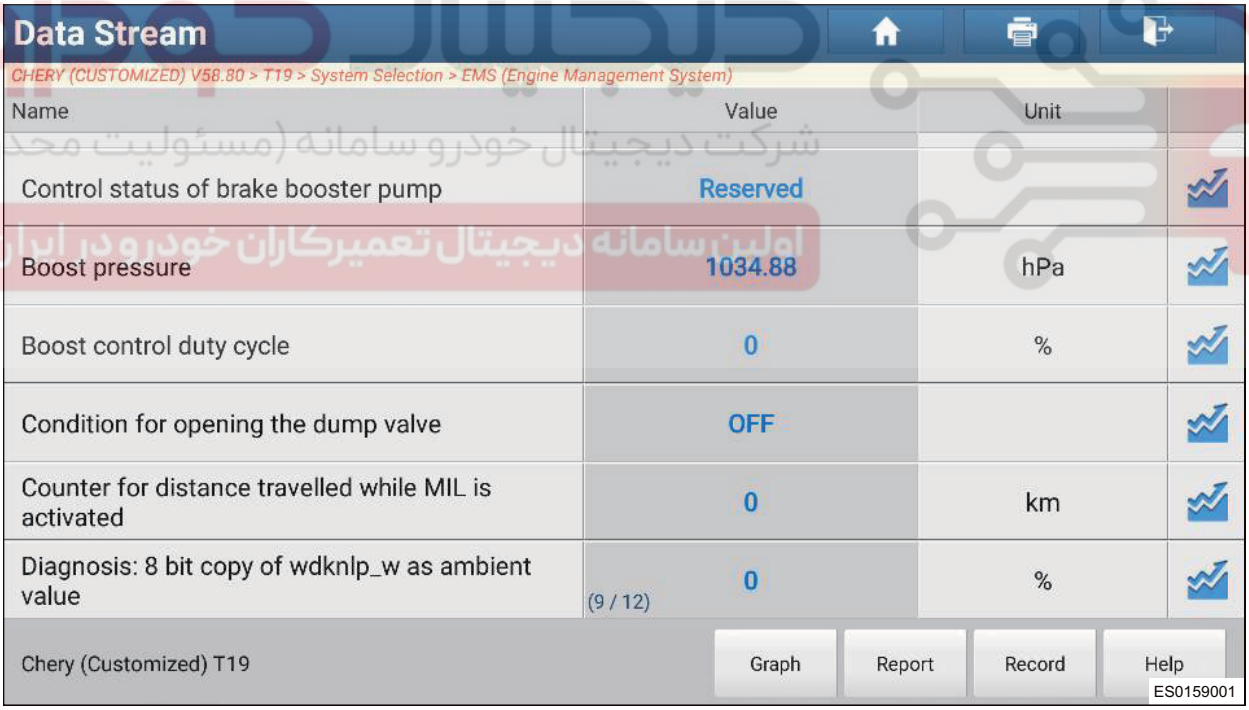
8. Page 8 data stream





9. Page 9 data stream





10. Page 10 data stream

Data Stream

CHERY (CUSTOMIZED) V58.80 > T19 > System Selection > EMS (Engine Management System)

Name	Value	Unit
Voltage DK-Poti 1 at the NLP	0.77	V
Model-based substitute value for engine temperature signal in case of error	59.25	degree C
Time counter at end of start	110.60	s
Volumetric flow of fuel in L/s	0.00	L/s
Maximum limit indicate engine torque standardization	300	Nm
ETS-path as environmental condition for diagnosis of function monitoring	128	

(10 / 12)

Chery (Customized) T19 | Graph | Report | Record | Help

ES0161001

Data Stream

CHERY (CUSTOMIZED) V58.80 > T19 > System Selection > EMS (Engine Management System)

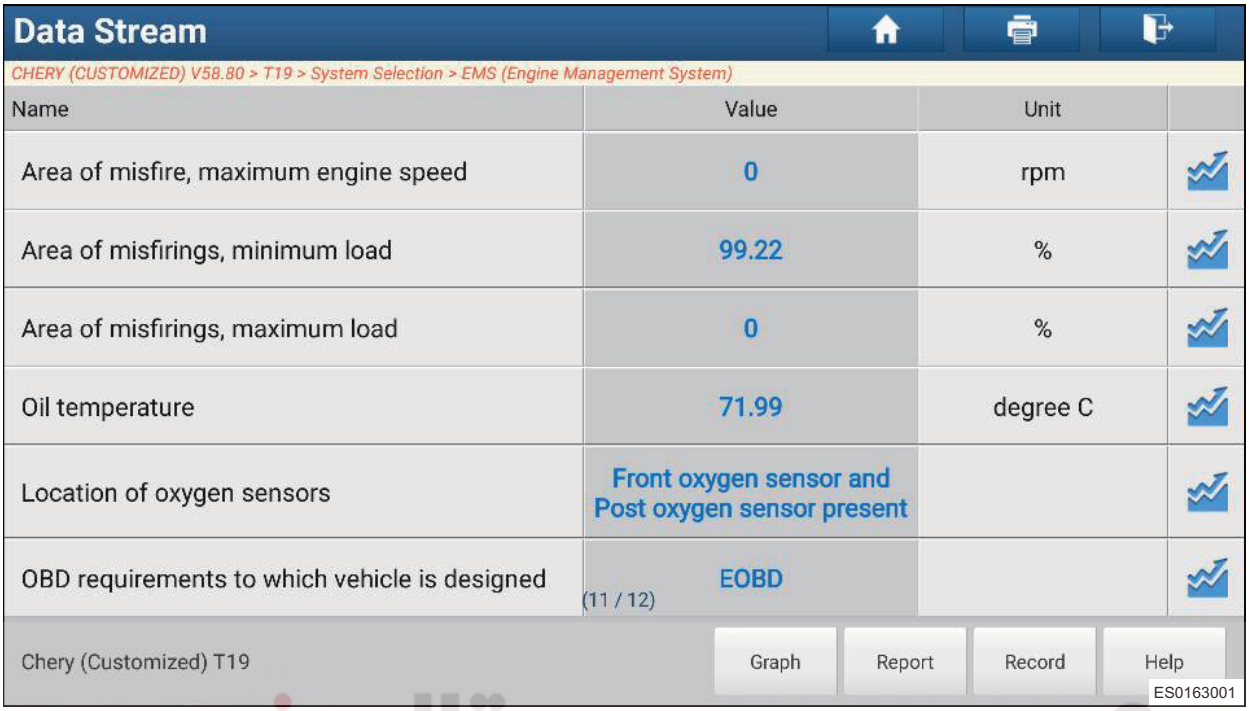
Name	Value	Unit
Maximum limit indicate engine torque standardization	300	Nm
ETS-path as environmental condition for diagnosis of function monitoring	128	
Torque path in function and function monitoring as environmental cond. of diag	32	
Actual torque at response of torque comparison in the function monitoring	7.03	%
Calculated actual torque in function monitoring	7.03	%
Area of misfire, minimum engine speed	10200	rpm

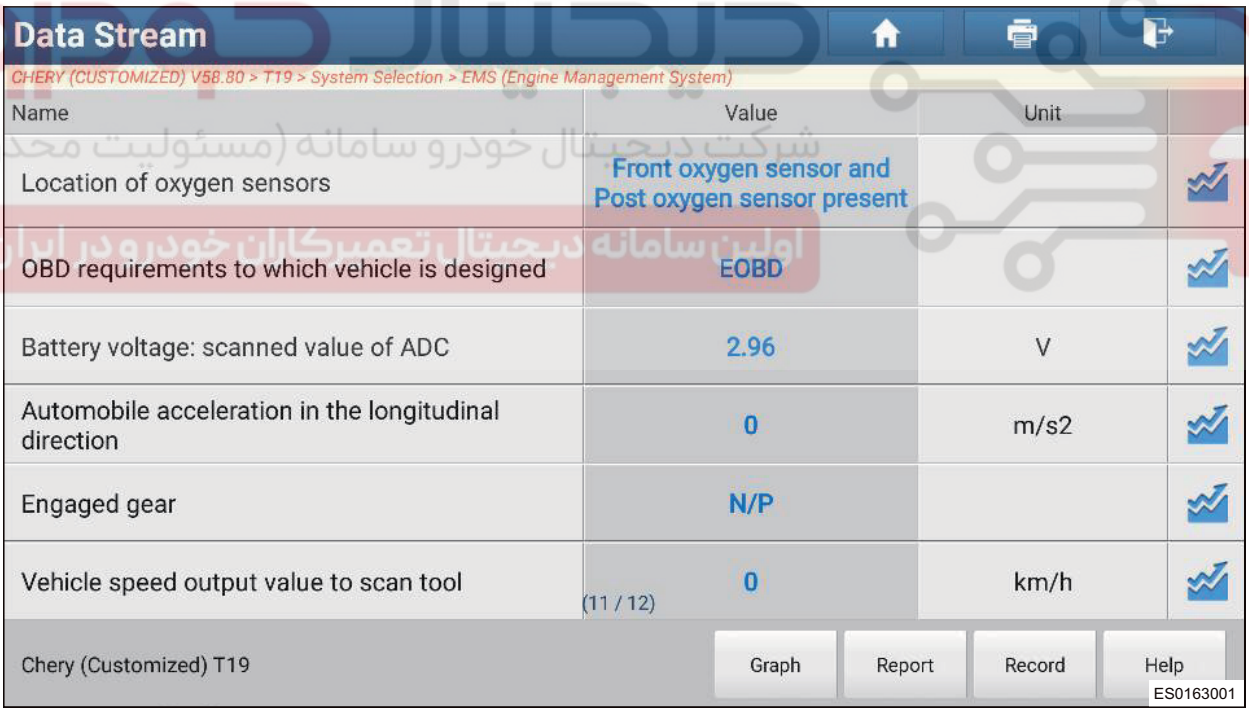
(10 / 12)

Chery (Customized) T19 | Graph | Report | Record | Help

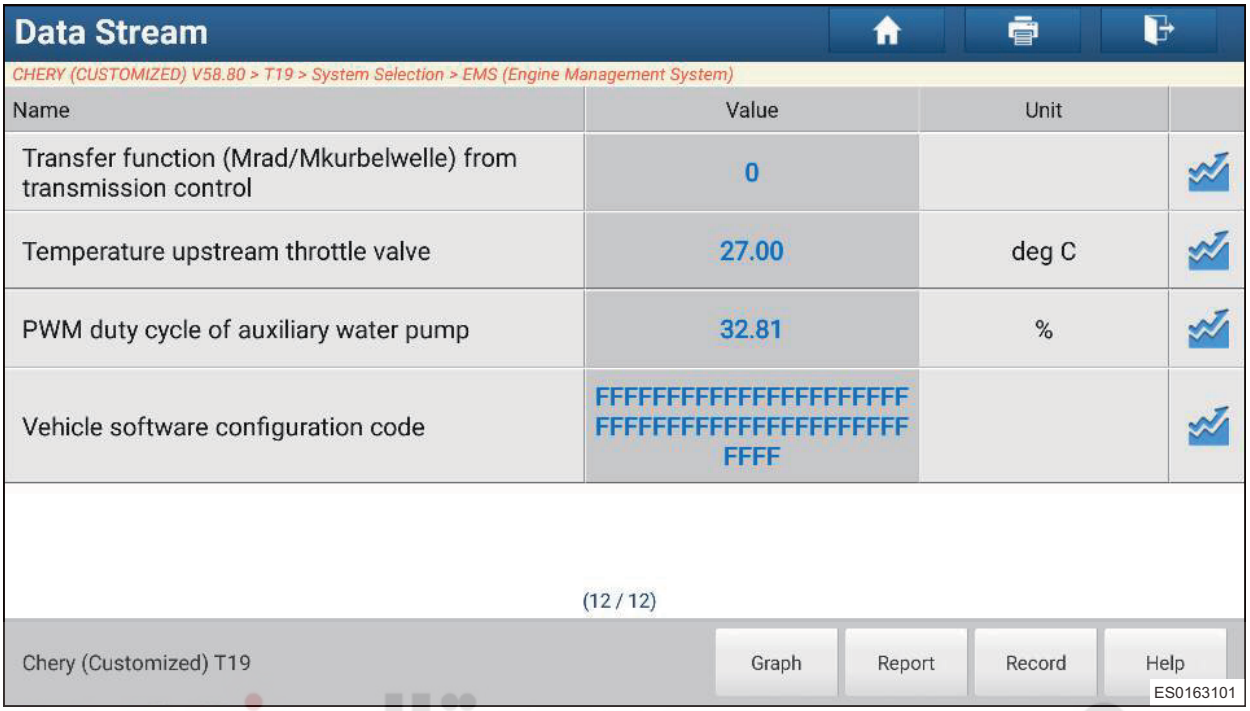
ES0161001

11. Page 11 data stream





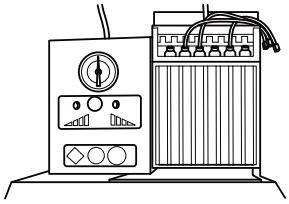
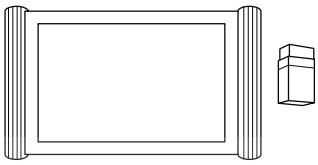
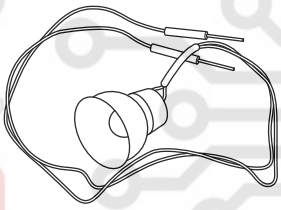
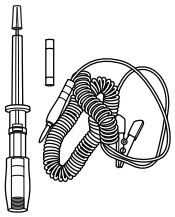
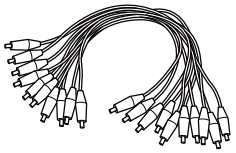
12. Page 12 data stream

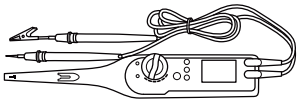
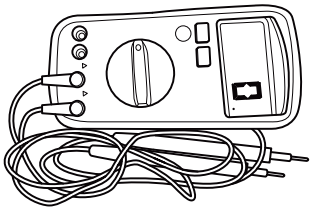
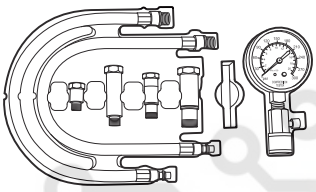
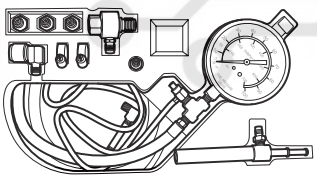


Tools Drawing

Tools Drawing

General Tools

Fuel Injector Cleaning Analyzer	 062
X-431 PAD Diagnostic Tester	 001
21 W Test Lamp	 087
LED Test Light	 960
Jumper Wire	 088

Diode Test Light	 970
Digital Multimeter	 002
Cylinder Pressure Gauge	 044
Fuel Pressure Gauge	 048
Oscilloscope	 061

DTC Operation and Setting Conditions

DTC operation and setting conditions query method and content

1. Use the first five digits of the DTC to query the operation and setting of it
2. The DTC content that can be queried in this section
   (a) Find the DTC definition in DTC chart.
   (b) DTC operating condition.
   (c) DTC setting condition.
   (d) Operation required for DTC setting.
   (e) Conditions for malfunction indicator light off / DTC clearing.

Perform check and repair diagnosis procedure according to DTC

1. The following check and repair has been confirmed as the current steady-state malfunction, otherwise it will lead to a diagnosis error.
2. The "Multimeter" mentioned below refers to a digital multimeter, which prohibits the use of an needle multimeter to check electronic fuel injection system circuit.
3. Check and repair the vehicle with the anti-theft system. If there is "replace a new ECU to check if fault reproduces" in "Subsequent Step" column, be careful to program the ECU after replacement.
4. If the DTC indicates that the voltage of a circuit is too low, it means that the circuit may be shorted to ground. If the DTC indicates that the voltage of a circuit is too high, it means that the circuit may be shorted to power supply; If the DTC is described as a circuit malfunction, it means that there may be open in the circuit or a variety of circuits malfunction

Diagnostic help

1. If DTC cannot be cleared, the malfunction is steady state malfunction.
   If it is intermittent malfunction, the focus of inspection shall be put on whether wiring harness connector is loose.
2. There are no abnormal conditions after performing inspection according to above procedures.
3. During servicing, do not ignore vehicle maintenance condition, cylinder pressure and mechanical ignition timing, etc. that can affect the system.
4. Perform test with new ECU to check if malfunction reoccurs.

Basic definition and conditions of DTC

1. Driving cycle definition
   (a) A driving cycle includes engine starting, operating conditions (which should be detected if there is a malfunction in vehicle) and engine stalling. For specific malfunction, operate vehicle under the specified parameter conditions in "DTC Operating Condition" to complete the required driving cycle for the DTC.
2. Warm-up cycle definition
   (a) Fully run the vehicle so that the engine coolant temperature is at least 22K higher than that of starting and reaches at least 343K (70°C)
3. DTC operating condition
   (a) If it is "none", it can be understood as the operating status of all ECU, including the operation after turning the ENGINE START STOP switch OFF.

Diagnostic Trouble Code (DTC) Chart

Hint:

History trouble code cannot be reported, otherwise it will affect customer for using.

No.	DTC	Description
1	P000A 00	Camshaft Control Slow Response (Inlet)
2	P000A 77	Camshaft Control Target Error (Inlet)
3	P000B 00	Camshaft Control Slow Response (Outlet)
4	P000B 77	Camshaft Control Target Error (Outlet)
5	P0010 13	Control Circuit of Camshaft Control Valve (Inlet)
6	P0012 00	Inlet Camshaft not In Locking Position during Start
7	P0013 13	Control Circuit of Camshaft Control Valve (Outlet)
8	P0015 00	Outlet Camshaft not In Locking Position during Start
9	P0016 29	Npl Error for Alignment between Camshaft (Inlet) and Crankshaft
10	P0016 22	Retard Error for Alignment Between Camshaft (Inlet) and Crankshaft
11	P0016 21	Advance Error For Alignment between Camshaft (Inlet) and Crankshaft
12	P0016 76	Crankshaft Position - Camshaft (Inlet) Installation Error
13	P0016 78	Crankshaft Position - Camshaft (Inlet) Position Error
14	P0017 76	Crankshaft Position - Camshaft (Outlet) Installation Error
15	P0017 78	Crankshaft Position - Camshaft (Outlet) Position Error
16	P0018 29	Npl Error for Alignment between Camshaft (Outlet) and Crankshaft
17	P0018 22	Retard Error for Alignment Between Camshaft (Outlet) and Crankshaft
18	P0018 21	Advance Error For Alignment between Camshaft (Outlet) and Crankshaft
19	P0030 13	O2 Sensor Heater Control Circuit Open (Upstream of the Catalyzer)
20	P0031 11	O2 Sensor Heater Control Circuit Low (Upstream of the Catalyzer)
21	P0032 12	O2 Sensor Heater Control Circuit High (Upstream of the Catalyzer)
22	P0033 13	Dump Valve Control Circuit Open
23	P0034 11	Dump Valve Control Circuit Low
24	P0035 12	Dump Valve Control Circuit High
25	P0036 13	O2 Sensor Heater Control Circuit Open (Downstream of the Catalyzer)
26	P0037 11	O2 Sensor Heater Control Circuit Low (Downstream of the Catalyzer)
27	P0038 12	O2 Sensor Heater Control Circuit High (Downstream of the Catalyzer)
28	P0053 1E	O2 Sensor Heater Resistance too Large (Upstream of the Catalyzer)
29	P0054 1E	O2 Sensor Heater Resistance too Large (Downstream of the Catalyzer)
30	P006D 00	Barometric Pressure Circuit Error
31	P006D 17	Barometric Pressure - Higher than Upper Limit Error
32	P006D 16	Barometric Pressure - Lower than Lower Limit Error
33	P0096 00	Air Temperature Sensor (after Throttle Valve) Circuit Performance Non-plausible
34	P0097 16	Air Temperature Sensor (after Throttle Valve) Circuit Low
35	P0098 17	Air Temperature Sensor (after Throttle Valve) Circuit High
36	P0105 28	Manifold Absolute Pressure Circuit No Change
37	P0106 00	Manifold Abs.Pressure Performance Non-plausible
38	P0107 11	Manifold Abs.Pressure Low Input
39	P0108 12	Manifold Abs.Pressure High Input
40	P0111 00	Intake Air Temp.Circ. Performance Non-plausible
41	P0112 16	Intake Air Temp.Circ. Low Input
42	P0113 17	Intake Air Temp.Circ. High Input

No.	DTC	Description
43	P0116 00	Engine Coolant Temp.Circ. Performance Non-plausible
44	P0117 16	Engine Coolant Temp.Circ. Low Input
45	P0118 17	Engine Coolant Temp.Circ. High Input
46	P0121 29	Throttle Pos.Sensor 1 Circ. Performance Non-plausible
47	P0122 16	Throttle Pos.Sensor 1 Circ. Low Input
48	P0123 17	Throttle Pos.Sensor 1 Circ. High Input
49	P0130 00	O2 Sensor Circ. Malfunction (Upstream of the Catalyzer)
50	P0131 16	O2 Sensor Circ. Low Voltage (Upstream of the Catalyzer)
51	P0132 17	O2 Sensor Circ. High Voltage (Upstream of the Catalyzer)
52	P0133 00	O2 Sensor Circ. Slow Response (Upstream of the Catalyzer)
53	P0134 00	O2 Sensor Circ. No Activity Detected (Upstream of the Catalyzer)
54	P0136 00	O2 Sensor Circ. Malfunction (Downstream of the Catalyzer)
55	P0137 16	O2 Sensor Circ. Low Voltage (Downstream of the Catalyzer)
56	P0138 17	O2 Sensor Circ. High Voltage (Downstream of the Catalyzer)
57	P0140 00	O2 Sensor Circ. No Activity Detected (Downstream of the Catalyzer)
58	P0170 00	Fuel Trim Malfunction
59	P0171 00	Fuel Trim System too Lean
60	P0172 00	Fuel Trim System too Rich
61	P0201 13	Cylinder 1 - Injector Circuit Error
62	P0202 13	Cylinder 2 - Injector Circuit Error
63	P0203 13	Cylinder 3 - Injector Circuit Error
64	P0204 13	Cylinder 4 - Injector Circuit Error
65	P0219 00	Engine Overspeed Condition
66	P0221 29	Throttle Position Sensor 2 Performance Non-plausible
67	P0222 16	Throttle Position Sensor 2 Performance Low Input
68	P0223 17	Throttle Position Sensor 2 Performance High Input
69	P0234 00	Turbu/Super Charger Overboost Condition
70	P0237 16	Turbocharger Boost Sensor (A) Circ. Low Input
71	P0238 17	Turbocharger Boost Sensor (A) Circ. High Input
72	P023A 00	Charge Air Cooler Coolant Pump Control Circuit
73	P023B 00	Charge Air Cooler Coolant Pump Control Circuit Low
74	P023C 00	Charge Air Cooler Coolant Pump Control Circuit High
75	P0243 13	Turbo/Super Charger Wastegate Solenoid Open
76	P0245 11	Turbo/Super Charger Wasteg.Solenoid Low
77	P0246 12	Turbo/Sup.Charger Wasteg.Solenoid High
78	P0261 11	Cylinder 1- Injector Circuit Low
79	P0262 12	Cylinder 1- Injector Circuit High
80	P0264 11	Cylinder 2- Injector Circuit Low
81	P0265 12	Cylinder 2- Injector Circuit High
82	P0267 11	Cylinder 3- Injector Circuit Low
83	P0268 12	Cylinder 3- Injector Circuit High
84	P0270 11	Cylinder 4- Injector Circuit Low
85	P0271 12	Cylinder 4- Injector Circuit High
86	P0299 00	Turbo/Super Charger Underboost
87	P0300 00	Misfire Detected
88	P0300 21	Random/Multiple Cylinder Misfire Detected (Over Emission Limit)
89	P0300 22	Random/Multiple Cylinder Misfire Detected (Harmful to Catalyst)
90	P0300 29	Random/Multiple Cylinder Misfire Detected (During First Statistic Cycle)

No.	DTC	Description
91	P0301 00	Misfire Detected on Cylinder 1
92	P0301 21	Cylinder 1 Misfire Detected (Over Emission Limit)
93	P0301 22	Cylinder 1 Misfire Detected (Harmful to Catalyst)
94	P0301 29	Cylinder 1 Misfire Detected (During First Statistic Cycle)
95	P0302 00	Misfire Detected on Cylinder 2
96	P0302 21	Cylinder 2 Misfire Detected (Over Emission Limit)
97	P0302 22	Cylinder 2 Misfire Detected (Harmful to Catalyst)
98	P0302 29	Cylinder 2 Misfire Detected (During First Statistic Cycle)
99	P0303 00	Misfire Detected on Cylinder 3
100	P0303 21	Cylinder 3 Misfire Detected (Over Emission Limit)
101	P0303 22	Cylinder 3 Misfire Detected (Harmful to Catalyst)
102	P0303 29	Cylinder 3 Misfire (During First Statistic Cycle)
103	P0304 00	Misfire Detected on Cylinder 4
104	P0304 21	Cylinder 4 Misfire Detected (Over Emission Limit)
105	P0304 22	Cylinder 4 Misfire Detected (Harmful to Catalyst)
106	P0304 29	Cylinder 4 Misfire Detected (During First Statistic Cycle)
107	P0321 00	Crankshaft Signal Disturbance
108	P0322 00	EPM - Crankshaft Signal Fault
109	P0327 00	Knock Sensor 1 Circuit Low
110	P0327 14	Knock Sensor 1 Circuit Low
111	P0327 16	Knock Sensor 1 Circ. Low Input
112	P0328 00	Knock Sensor 1 Circuit High
113	P0328 15	Knock Sensor 1 Circuit High
114	P0328 17	Knock Sensor 1 Circ. High Input
115	P0341 00	EPM - Camshaft Signal Fault
116	P0342 00	Camshaft Position Sensor (Inlet) Circuit Low
117	P0343 00	Camshaft Position Sensor (Inlet) Circuit High
118	P0346 00	EPM - Camshaft 2 Signal Fault
119	P0366 00	Camshaft Position Sensor (Outlet) Circuit Performance Non-plausible
120	P0367 00	Camshaft Position Sensor (Outlet) Circuit Low
121	P0368 00	Camshaft Position Sensor (Outlet) Circuit High
122	P0420 00	Catalyst Conversion Insufficient
123	P0444 13	Evaporative Emiss.System Purge Control Valve Circuit Open
124	P0458 16	Evaporative Emission System Purge Control Valve Circuit Low
125	P0458 11	Evaporative Emission System Purge Control Valve Circuit Low
126	P0459 17	Evaporative Emission System Purge Control Valve Circuit High
127	P0459 12	Evaporative Emission System Purge Control Valve Circuit High
128	P0480 13	Cooling Fan 1 Control Circuit Error
129	P0481 13	Cooling Fan 2 Control Circuit Error
130	P0501 00	Vehicle Speed Sensor Signal Fault
131	P0506 00	Idle Control System RPM Lower than Expected
132	P0507 00	Idle Control System RPM Higher than Expected
133	P0532 16	A/C Refrigerant Pressure Sensor Circuit Low
134	P0533 17	A/C Refrigerant Pressure Sensor Circuit High
135	P0537 16	A/C Evaporator Temperature Sensor Circuit Low
136	P0538 17	A/C Evaporator Temperature Sensor Circuit High
137	P0556 00	Brake Booster Pressure Sensor Circuit Performance Non-plausible
138	P0557 16	Brake Booster Pressure Sensor Circuit Low

No.	DTC	Description
139	P0558 17	Brake Booster Pressure Sensor Circuit High
140	P0560 00	Non-plausible Error of Battery Voltage
141	P0562 16	System Voltage Low
142	P0563 17	System Voltage High
143	P0568 1C	Cruise Control
144	P0568 86	Cruise Control
145	P0568 81	Cruise Control
146	P0571 29	Brake Signal Synchronization Error
147	P0571 1C	Brake Light Signal Circuit Error
149	P0601 00	Safety Monitoring Function Error (ECU EEPROM Error)
150	P0604 43	Internal contr.module RAM Error
151	P0605 43	Internal contr.module ROM Error
152	P0606 96	AD Converter Monitoring Error
153	P0606 97	Function Monitoring: Fault of ECU ADC - Test Voltage
154	P0606 47	Monitoring Moduel Feedback Error
155	P0606 17	Reported Over Voltage of VDD5
156	P0606 16	Reported Under Voltage of VDD5
157	P0606 49	Monitoring Moduel Inquiry Error
158	P0606 48	Monitoring Fault Reaction Error
159	P0606 75	Shut off Path Test Error
160	P0606 91	Diagnostic Fault Check to Report
161	P0606 42	Safety Monitoring Function Error (ECU EEPROM Error)
162	P0606 45	Visibility of Software Resets in DSM
163	P0606 94	Torque Monitoring Error in Level 2
164	P0606 92	Engine Speed Monitoring Error in Level 2
165	P0606 64	Load Signal, Wire Harness or ECU Error
166	P0606 61	Ignition Angle Signal, Wiring Harness or ECU Error
167	P0606 67	ECU Fault Reaction Monitoring Error
168	P0606 1C	Throttle Signal, Wiring Harness or ECU Error
169	P0606 55	Morphing Code Monitoring Malfunction
170	P0606 00	Variant Coding Monitoring Error
171	P0606 62	Pedal Signal Unplausibility Error in Level 2
172	P0606 63	Safety Monitoring Function Error (SSM System Monitoring Error)
173	P0615 13	Starter Relay Circuit Open
174	P0616 11	Starter Relay Circuit Low
175	P0617 12	Starter Relay Circuit High
176	P0627 13	Fuel Pump Control Circuit Open
177	P0628 11	Fuel Pump Control Circuit Low
178	P0629 12	Fuel Pump Control Circuit High
179	P0634 48	Over Temperature on Tracker
180	P0634 00	Over Temperature on V5V
181	P0641 00	Error Tracker Output1
182	P0645 13	AC Clutch Relais Circuit Open
183	P0646 11	A/C Clutch Relay Control Circuit Low
184	P0647 12	A/C Clutch Relay Control Circuit High
185	P0650 11	Malfunction Indicator Lamp (MIL) Control Circuit Low
186	P0650 12	Malfunction Indicator Lamp (MIL) Control Circuit High
187	P0650 13	Malfunction Indicator Lamp (MIL) Control Circuit Open

No.	DTC	Description
188	P0651 00	Error Tracker Output2
189	P0659 00	Over Voltage on V6V
190	P0688 91	Power Relay Sense Circuit Non-plausible Error
191	P0688 92	Power Relay Sense Circuit Signal Error
192	P0691 11	Fan 1 Control Circuit Low
193	P0692 12	Fan 1 Control Circuit High
194	P0693 11	Fan 2 Control Circuit Low
195	P0694 12	Fan 2 Control Circuit High
196	P0700 00	Transmission Control System (MIL Request)
200	P1011 01	Diagnosis of Electrical Water Pump Control Circ.Error
201	P1009 7A	Leakage Detection Upstream the Throttle Valve
202	P1100 00	Engine Torque Control Adaption at Limit
203	P1101 00	System Voltage can not Fulfill Throttle Self Learning Condition
204	P1102 00	Throttle Limphome Position Self Learning Error
205	P1102 29	Throttle Lower Mechanic Stop Re-learning Error
206	P1103 00	Throttle Lower Mechanic Stop First Learning Error
207	P1104 00	Throttle Self Learning Condition not Fulfilled
208	P1106 00	Throttle position deviation error
209	P1106 22	Throttle PID Adjustment Max Error
210	P1106 21	Throttle PID Adjustment Min Error
210	P1111 00	Return Spring Check Max Error
211	P1122 77	Torque Limitation when Throttle-valve Error Happen
212	P1130 00	Diagnosis of Brake Booster Pump Malfunction
213	P1131 17	Diagnosis of Brake Booster Pump Control Circuit High
214	P1132 16	Diagnosis of Brake Booster Pump Control Circuit Low
215	P1133 13	Diagnosis of Brake Booster Pump Control Circ.Open
216	P1137 17	Diagnosis of Pressure Sensor in Brake Booster Pump Circuit High
217	P1138 16	Diagnosis of Pressure Sensor in Brake Booster Pump Circuit Low
218	P0298 7A	Diagnosis of Pressure Sensor in Brake Booster Pump Leakage Detection
219	P130A 00	Cylinder Selective Fuel Cutoff Active due To Catalyst Damaging Misfire
220	P1386 00	Diagnostic Fault Check Knock Control Signal Evaluation
221	P1427 12	Diagnosis of Brake Booster Pump Control Circ.High
222	P1428 11	Diagnosis of Brake Booster Pump Control Circ.Low
223	P1429 13	Diagnosis of Brake Booster Pump Control Circ.Open
224	P1479 00	Non-plausible Error for Brake Booster Diagnosis
225	P1614 00	Immo Transferred Transponder Response was Corrupted
226	P1615 00	ECM Status Unknown
227	P1616 00	Authentication not OK
228	P1617 00	No Response from SIM during Challenge Period
229	P1618 00	Fail to Write EOL Confidential Data into EEProm
230	P1619 00	ECM not Programed (Virgin State)
231	P1651 13	Service Vehicle Soon (SVS) Control Circuit
232	P1651 11	Service Vehicle Soon (SVS) Control Circuit low
233	P1651 12	Service Vehicle Soon (SVS) Control Circuit high
234	P1701 00	Power Train State Signal Wire Open
236	P1700 00	Charge Air Cooler Coolant Pump Dry Run
237	P1703 00	Charge Air Cooler Coolant Pump Over Voltage

No.	DTC	Description
238	P1704 00	Charge Air Cooler Coolant Pump Over Current
239	P1705 00	Charge Air Cooler Coolant Pump Over Temperature
240	P1706 00	Charge Air Cooler Coolant Pump Stall
241	P1707 00	Charge Air Cooler Coolant Pump Under Voltage
242	P1708 00	Charge Air Cooler Coolant Pump Feedback Signal Error Circ.High
243	P1709 00	Charge Air Cooler Coolant Pump Feedback Signal Error Circ.Low
244	P2088 11	Control Circuit Low of Camshaft Control Valve (Inlet)
245	P2089 12	Control Circuit High of Camshaft Control Valve (Inlet)
246	P2090 11	Control Circuit Low of Camshaft Control Valve (Outlet)
247	P2091 12	Control Circuit High of Camshaft Control Valve (Outlet)
248	P2106 12	Throttle Power Stage Max Error
249	P2106 19	Throttle Power Stage Min Error
250	P2106 92	Throttle Power Stage Non-plausible Error
251	P2106 13	Throttle Power Stage Signal Error
252	P2106 29	Load Monitoring Error
253	P2122 16	Pedal Pos.Sensor 1 Circ. Low Input
254	P2123 17	Pedal Pos.Sensor 1 Circ. High Input
255	P2127 16	Pedal Pos.Sensor 2 Circ. Low Input
256	P2128 17	Pedal Pos.Sensor 2 Circ. High Input
257	P2138 00	Pedal Movement Check Error
258	P2138 29	Pedal Pos.Sensor 1/2 Unplausible
259	P2177 00	System Too Lean Off Idle
260	P2178 00	System Too Rich Off Idle
261	P2187 00	System Too Lean at Idle
262	P2188 00	System Too Rich at Idle
263	P2195 00	O2 Sensor Signal Stuck Lean (Upstream of the Catalyzer)
264	P2196 00	O2 Sensor Signal Stuck Rich (Upstream of the Catalyzer)
265	P2228 16	Barometric Pressure Low Input
266	P2229 17	Barometric Pressure High Input
267	P2261 00	Dump Valve – Mechanical Error
268	P2270 00	O2 Sensor Signal Stuck Lean (Downstream of the Catalyzer)
269	P2271 00	O2 Sensor Signal Stuck Rich (Downstream of the Catalyzer)
270	P2600 13	Diagnosis of Electrical Water Pump Control Circ.Open
271	P2602 11	Diagnosis of Electrical Water Pump Control Circ.Low
272	P2603 12	Diagnosis of Electrical Water Pump Control Circ.high
273	P3046 13	Starter Relay Open Defect
274	P3050 00	Starter Relay2 Closed Stick Defect
275	P3052 00	Starter Relay1 Closed Stick Defect
276	P3054 00	Engine Blocked/Starter not Engaged
277	P3055 11	Starter State Line S_kl50r Short to Ground
278	P3056 12	Starter State Line S_kl50r Short to UB
279	P3088 93	Starter Damaged or Wire Dropped
280	U0001 88	Error Busoff on CAN-bus
281	U0129 87	Lost Communication With Brake System Control Module
282	U0104 87	Lost Communication with CCU (Cruise Control Module)
283	U0121 87	Lost Communication with ABS
284	U0126 87	Lost Communication with Steering Angle Sensor Module
285	U0140 00	Lost Communication with Body Control Module (Immo)

No.	DTC	Description
286	U0155 87	Lost Communication With Instrument Panel Cluster (IPC) Control Module
287	U0293 87	Lost Communication with HCU
288	U0140 87	Lost Communication with Body Control Module (BCM)
289	U0214 87	Lost Communication with Passive Entry Passive Start (PEPS)
290	U0101 87	Lost Communication with TCM

P000A Camshaft Control Slow Response (Inlet)

1. DTC Operating Condition
   - Camshaft self-learning state has been completed;
   - Engine oil temperature is in range of 40°C - 130°C;
   - Coolant temperature is in range of 40°C - 120°C;
   - Engine speed is in range of 600 and 6000rpm;
   - ECU does not detect VVT intake control valve circuit fault.
2. DTC setting condition
   (a) ECU detects that difference between intake VVT actual angle and target angle is 10° crank angle.
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles.
   - Using diagnostic tester to clear DTCs until all DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Check if operating condition of cam phase regulator is normal (dirt blocked, oil leaked, stuck)	Yes	Next
		No	Perform necessary check, repair and maintenance
2	Check if operating condition of OCV oil control valve is normal	Yes	Diagnostic Help
		No	Perform necessary check, repair and maintenance

P000B Camshaft Control Slow Response (Outlet)

1. DTC operating condition
   - Camshaft self-learning state has been completed;
   - Engine oil temperature is in range of 40°C - 130°C;
   - Coolant temperature is in range of 40°C - 120°C;
   - Engine speed is in range of 600 and 6000rpm;
   - ECU does not detect VVT intake control valve circuit fault.
2. DTC setting condition
   (a) ECU detects that difference between intake VVT actual angle and target angle is 10° crank angle.
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles.
   - Using diagnostic tester to clear DTCs until all DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Check if operating condition of cam phase regulator is normal (dirt blocked, oil leaked, stuck)	Yes	Next
		No	Perform necessary check, repair and maintenance
2	Check if operating condition of OCV oil control valve is normal	Yes	Diagnostic Help
		No	Perform necessary check, repair and maintenance

P0010 Control Circuit of Camshaft Control Valve (Inlet)

1. DTC operating condition
   - Engine is running.
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   (a) ECU detected open circuit in control terminal pin.
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Open circuit in intake VVT control circuit corresponding pin	Yes	Repair, replace wire harness
		No	Next
2	Connector looseness or poor contact	Yes	Reconnect
		No	Next
3	Intake VVT circuit damaged	Yes	Replace VVT actuator
		No	Next
4	Control pin fault of VVT corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0012 Inlet Camshaft not In Locking Position during Start

1. DTC operating condition
   - Camshaft self-learning state has been completed;
   - Engine running start time <1.5 s;
   - Engine oil temperature is in range of -40°C - 130°C;
   - Coolant temperature is in range of 0°C - 105°C;
   - Engine speed is in range of 600 and 6000rpm;
   - ECU does not detect VVT intake control valve circuit fault.
2. DTC setting condition
   (a) ECU detects that difference between intake VVT actual angle and default position angle is 10° crank angle.
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Intake VVT phase regulator and oil control valve operating status (Blocked by dirt, stuck, oil pressure not completely relieved, lock pin invalid, etc.)	Yes	Perform necessary check, repair and maintenance
		No	Diagnostic Help

P0013 Control Circuit of Camshaft Control Valve (Outlet)

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   (a) ECU detected open circuit in control terminal pin.
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Open circuit in exhaust VVT control circuit corresponding pin	Yes	Repair, replace wire harness
		No	Next
2	Connector looseness or poor contact	Yes	Reconnect
		No	Next
3	Exhaust VVT circuit damaged	Yes	Replace VVT actuator
		No	Next
4	Control pin fault of VVT corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0015 Outlet Camshaft Not in Locking Position During Start

1. DTC operating condition
   - Camshaft self-learning state has been completed;
   - Engine running start time <1.5 s;
   - Engine oil temperature is in range of -40°C - 130°C;
   - Coolant temperature is in range of 0°C - 105°C;
   - Engine speed is in range of 600 and 6000rpm;
   - ECU does not detect VVT exhaust control valve circuit fault.
2. DTC setting condition
   (a) ECU detects that difference between exhaust VVT actual angle and VVT default locking angle is 25° crank angle.
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Exhaust VVT phase regulator and oil control valve operating status (Blocked by dirt, stuck, oil pressure not completely relieved, lock pin invalid, etc.)	Yes	Perform necessary check, repair and maintenance
		No	Diagnostic Help

P0016 Npl Error for Alignment between Camshaft (Inlet) and Crankshaft P0018 Npl Error for Alignment between Camshaft (Outlet) and Crankshaft

1. DTC operating condition.
   - Start relative positions self-learning of camshaft and crankshaft (self-learning will be completed about 10 seconds after 1st starting).
2. DTC setting condition
   - ECU detects that deviations between crankshaft and intake camshaft relative crankshaft position self-learning value and intake camshaft relative crankshaft position design value is more than 15°crank angle;
   - ECU detects that deviations between crankshaft & intake camshaft synchronous learning value and reference value is less than -15°crank angle;
   - ECU detects that actual measurement value of crank and camshaft position changes suddenly.
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Check if relative installation position of crankshaft and camshaft is correct	Yes	Next
		No	Reinstall correctly
2	Check drive gear, belt, etc. between crankshaft and camshaft for faults	Yes	Perform necessary check and repair
		No	Diagnostic Help

P0030 O2 Sensor Heater Control Circuit Open (Upstream of the Catalyze)

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 6 V with driver switch off).
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Open circuit in upstream oxygen sensor heater control circuit pin terminal	Yes	Repair wire harness
		No	Next
3	Upstream oxygen sensor heater control circuit power supply terminal is not connected to main relay	Yes	Repair wire harness
		No	Next
4	Sensor is damaged	Yes	Replace sensor
		No	Next
5	Open circuit or internal circuit damage in upstream oxygen sensor heater pin circuit corresponding to ECU terminal	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0031 O2 Sensor Heater Control Circuit Low (Upstream of the Catalyzer)

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to ground (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Upstream oxygen sensor heater control circuit pin terminal is short to ground	Yes	Repair wire harness
		No	Next
2	Upstream oxygen sensor heater control circuit power supply terminal is grounded	Yes	Repair wire harness
		No	Next
3	Upstream oxygen sensor heater pin corresponding to ECU terminal is short to ground	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0032 O2 Sensor Heater Control Circuit High (Upstream of the Catalyzer)

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to power source (it is detected that voltage UCE of output terminal is 12 V with driver switch on)
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Upstream oxygen sensor heater control circuit pin terminal is short to power source	Yes	Repair wire harness
		No	Next
2	Upstream oxygen sensor heater pin corresponding to ECU terminal is short to power source	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0036 O2 Sensor Heater Control Circuit Open (Downstream of the Catalyzer)

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 6 V with driver switch off).
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Open circuit in downstream oxygen sensor heater control pin	Yes	Repair wire harness
		No	Next
3	Downstream oxygen sensor heater circuit power supply terminal is not connected to main relay	Yes	Repair wire harness
		No	Next
4	Sensor is damaged	Yes	Replace sensor
		No	Next
5	Open circuit or internal circuit damage in downstream oxygen sensor heater pin circuit corresponding to ECU terminal	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0037 O2 Sensor Heater Control Circuit Low (Downstream of the Catalyzer)

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to ground (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Downstream oxygen sensor heater control circuit pin terminal is short to ground	Yes	Repair wire harness
		No	Next
2	Downstream oxygen sensor heater control circuit power supply terminal is grounded	Yes	Repair wire harness
		No	Next
3	Downstream oxygen sensor heater pin corresponding to ECU terminal is short to ground	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0038 O2 Sensor Heater Control Circuit High (Downstream of the Catalyzer)

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to power source (it is detected that voltage UCE of output terminal is 12 V with driver switch on)
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Downstream oxygen sensor heater control circuit pin terminal is short to power source	Yes	Repair wire harness
		No	Next
2	Downstream oxygen sensor heater pin corresponding to ECU terminal is short to power source	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0053 O2 Sensor Heater Resistance too Large (Upstream of the Catalyzer) P0054 O2 Sensor Heater Resistance too Large (Downstream of the Catalyzer)

1. DTC operating condition.
   - Exhaust temperature (ECU calculated value) of upstream oxygen sensor (front oxygen) is in range of 300 ~ 550 deg;
   - Battery voltage is between 10 and 16 V steadily;
   - Keep engine fuel supply;
   - Ambient temperature is not less than -7 deg;
   - No high temperature and high resistance failure P0134 (Recommended operating conditions: Vehicle can be operated at a lower vehicle speed (less than 50 km/h) when malfunction is reproduced. If the interval between two starts is short, it takes a long time to diagnose)
2. DTC setting condition
   - ECU detects that internal resistance of upstream oxygen sensor heater exceeds threshold value (different exhaust temperatures correspond to different threshold values, MT is 1840 Ω~13600 Ω and CVT is 1012 Ω~8000 Ω), it indicates that upstream oxygen sensor heater internal resistance (equivalent resistance calculated by ECU) is improper, causing emission level higher than OBD limit
3. Operation required for DTC setting
   (a) Input malfunction memory once malfunction occurs;
   (b) If the fault is detected in 3 consecutive driving cycles, MIL light will come on
   (c) Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information.	/	Next
3	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.4 wire (white, heater power source positive) is 12V.	Yes	Next
		No	Check wire harness and connector
4	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.3 wire (white, heater power source grounded) is 12V.	Yes	Next
		No	Check wire harness and connector
5	Disconnect upstream oxygen sensor wire connector to remove upstream oxygen sensor. Place the oxygen sensor at room temperature to cool it down. Measure if resistance between sensor terminal No.4 interface (white, heater power source positive) and No.3 interface (white, heater power source grounded) is higher than 15 Ω with a multimeter when temperature of oxygen sensor cools down to room temperature ① .	Yes	Replace oxygen sensor
		No	Diagnostic Help

P0112 Intake Air Temp.Circ. Low Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - ECU detects that intake temperature measured value is higher than 129.75°C.
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON" Do not start engine, and observe if "Intake Temperature Sensor Measured Value" in data flow is too high. If value is higher than normal condition, observe maximum intake manifold temperature range. You can also use a multimeter to measure if intake temperature sensor signal terminal voltage is close to or equal to 0 V	Yes	Next
2	Turn ENGINE START STOP switch "OFF", and check if intake manifold temperature sensor signal terminal is short to ground	Yes	Repair wire harness
		No	Next
3	Sensor is damaged	Yes	Replace sensor
		No	Next
4	Intake manifold temperature sensor signal pin terminal corresponding to ECU terminal is short to ground	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0113 Intake Air Temp.Circ. High Input

1. DTC operating condition
   - 240 seconds have elapsed after engine starting;
   - Engine is idling;
   - Engine is not in fuel cut off state.
2. DTC setting condition
   - ECU detects that intake temperature measured value is lower than -39.75°C.
3. Operation required for DTC setting
   (a) After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON" Do not start engine, and observe if "Intake Temperature Sensor Measured Value" in data flow is too low. If value is lower than normal condition, observe minimum intake manifold temperature range. You can also use a multimeter to measure if voltage between intake manifold temperature sensor signal terminal and ground is close to or equal to 5V	Yes	Next

No.	Operation Step	Test Result	Subsequent Step
2	Turn ENGINE START STOP switch OFF"and check if connector is loosen or has poor contact	Yes	Reconnect
		No	Next
3	Check if there is short circuit to power source or open circuit in sensor signal terminal	Yes	Repair wire harness
		No	Next
4	Open circuit in sensor reference ground	Yes	Repair, replace wire harness or sensor
		No	Next
5	Sensor is damaged	Yes	Replace sensor
		No	Next
6	Short circuit to power source, open circuit or internal circuit damage in intake manifold temperature sensor signal pin corresponding to ECU terminal	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0116 Engine Coolant Temp.Circ. Performance Non-plausible

1. DTC operating condition
   - Coolant temperature is lower than 60°C.
2. DTC setting condition
   - ECU detects that difference between coolant measured value and analog value (calculated by iterative algorithm according to intake air volume) is 50°C.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON" Do not start engine, and observe if "Coolant Temperature Sensor Measured Value" in data flow is in proper temperature range	No	Next
2	Turn ENGINE START STOP switch OFF"and check if resistance of coolant temperature sensor signal pin is proper	Yes	Repair wire harness
		No	Next
3	Sensor is damaged	Yes	Replace sensor
		No	Next
4	Malfunction occurs in coolant temperature sensor signal pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0117 Engine Coolant Temp.Circ. Low Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - ECU detects that coolant temperature measured value is 140°C.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON" Do not start engine, and observe if "Coolant Temperature Sensor Measured Value" in data flow is much higher than proper temperature range. You can also use a multimeter to measure if coolant temperature sensor signal terminal voltage is close to or equal to 0 V	Yes	Next
2	Turn ENGINE START STOP switch "OFF"and check if coolant temperature sensor signal terminal is short to ground	Yes	Repair wire harness
		No	Next
3	Sensor is damaged	Yes	Replace sensor
		No	Next
4	Coolant temperature sensor signal pin terminal corresponding to ECU is short to ground	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0118 Engine Coolant Temp.Circ. High Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - ECU detects that coolant temperature measured value is lower than -39.75°C.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON" Do not start engine and observe if "Intake Temperature Sensor Measured Value" in data flow is much lower than current ambient temperature. You can also use a multimeter to measure if voltage between coolant temperature sensor signal terminal and ground is close to or equal to 5 V	Yes	Next
2	Turn ENGINE START STOP switch OFF"and check if connector is loosen or has poor contact	Yes	Reconnect
		No	Next
3	Check if there is short circuit to power source or open circuit in sensor signal terminal	Yes	Repair wire harness
		No	Next

No.	Operation Step	Test Result	Subsequent Step
4	Open circuit in sensor reference ground	Yes	Repair wire harness
		No	Next
5	Sensor is damaged	Yes	Replace sensor
		No	Next
6	Short circuit to power source, open circuit or internal circuit damage in coolant temperature sensor signal pin terminal corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0121 Throttle Pos.Sensor 1 Circ. Performance Non-plausible

1. DTC operating condition
   - Engine speed is 1200 rpm.
2. DTC setting condition
   - ECU detects that opening angles of throttle position sensor 1 and sensor signal 2 exceed a certain threshold value (6%), and opening angle of sensor 1 is improper (compared with virtual 3rd circuit opening angle inside of ECU, deviation of 1st circuit signal is more than 2nd circuit signal)
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect a diagnostic tester and adapter, turn ENGINE START STOP switch to ON; clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Next
		No	Reconnect
2	Check if there is short circuit to power source or open circuit in sensor signal terminal	Yes	Next
		No	End
3	Remove the connector from throttle position sensor on wire harness, check if resistance of throttle circuit 1 signal is in proper range	Yes	Next
		No	Repair or replace wire harness
4	Remove the connector from throttle position sensor on wire harness, check if resistance between throttle circuit 1 signal and other signals is within proper range	Yes	Replace throttle
		No	Repair or replace wire harness
5	Clear DTCs, turn ignition switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Depress accelerator pedal lightly for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P0122 Throttle Pos.Sensor 1 Circ. Low Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - ECU detects that voltage of throttle position sensor 1 signal circuit is less than 0.176 V.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Check if the related wire harnesses are connected properly	Yes	Next
		No	Reconnect
2	Connect a diagnostic tester and adapter, turn ENGINE START STOP switch to ON; clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Next
		No	End
3	Remove the connector from throttle position sensor on wire harness and check if there is open circuit or short circuit to ground in throttle circuit 1 signal	Yes	Repair or replace wire harness
		No	Next
4	Turn ENGINE START STOP switch to ON, check if throttle 5V power source is normal	Yes	Replace throttle
		No	Repair or replace wire harness
5	Clear DTCs, turn ignition switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Depress accelerator pedal lightly for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P0123 Throttle Pos.Sensor 1 Circ. High Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - ECU detects that voltage of throttle position sensor 1 signal circuit is 4.629 V.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Check if the related wire harnesses are connected properly	Yes	Next
		No	Reconnect
2	Connect a diagnostic tester and adapter, turn ENGINE START STOP switch to ON; clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Next
		No	End
3	Remove the connector from throttle position sensor on wire harness and check if there is open circuit or short circuit to ground in throttle circuit 1 signal	Yes	Repair or replace wire harness
		No	Next
4	Turn ENGINE START STOP switch to ON, check if throttle 5V power source is normal	Yes	Replace throttle
		No	Repair or replace wire harness
5	Clear DTCs, turn ignition switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Depress accelerator pedal lightly for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P0130 O2 Sensor Circ. Malfunction (Upstream of the Catalyzer)

1. DTC operating condition
   - Battery voltage is higher than 11V;
   - Engine is running;
   - Upstream oxygen sensor has been heated sufficiently (Time depends on operating conditions, recommended operating conditions: operated at a lower speed (less than 50 km/h) for more than 3 minutes);
   - No fuel injector DTCs P0201, P0202, P0203, P0204;
   - Air-fuel ratio closed loop control effect (enter closed loop mode when 30 seconds after starting generally).
2. DTC setting condition
   - ECU detects that downstream oxygen sensor signal voltage difference between heater on and off is higher than 2V for more than a certain times (4 times);
   - ECU detects that voltage of upstream oxygen sensor signal is between 0.6 and 1.2 V, but downstream oxygen sensor signal voltage is less than 0.1 V for more than a certain times (10 s);
   - ECU detects that voltage of upstream oxygen sensor signal is between 0.06 ~ 0.4 V, but downstream oxygen sensor signal voltage is higher than 0.5 V for more than a certain times (30 s).
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.4 wire (white, heater power source positive) is 12V	Yes	Next
		No	Check wire harness and connector
4	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.3 wire (white, heater power source grounded) is 12V	Yes	Next
		No	Check wire harness and connector
5	Do not disconnect oxygen sensor connector, measure if voltage between upstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45V	Yes	Next
		No	Check wire harness and connector
6	Start and keep vehicle idling until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector, measure if voltage between upstream oxygen sensor wire ECU terminal 2 wire (black, oxygen sensor signal wire) and 1 wire (gray, oxygen sensor signal grounded) is changed in range of 0V-1V.	Yes	Next
		No	Replace oxygen sensor
7	Start and keep vehicle idling until coolant temperature reaches normal value. Disconnect upstream oxygen sensor connector. Measure if oxygen sensor terminal No. 3 wire (white, heater power grounded) and No. 2 wire (black, oxygen sensor signal wire) are short circuit.	Yes	Replace oxygen sensor
		No	Diagnostic Help
8	Connect upstream oxygen sensor connector properly, repeat step 5-6 and check if voltage signal is changed in range of 0.44 V - 0.46 V and 0 V - 1 V respectively.	Yes	End
		No	Diagnostic Help

P0131 O2 Sensor Circ. Low Voltage (Upstream of the Catalyzer)

1. DTC operating condition
   - Battery voltage is higher than 11V;
   - Engine is running;
   - Upstream oxygen sensor has been heated sufficiently [Time depends on operating conditions, recommended operating conditions: operated at a lower speed (less than 50 km/h) for more than 3 minutes];
   - No fuel injector DTCs P0201, P0202, P0203, P0204;
   - Air-fuel ratio closed loop control effect;
   - Carbon canister diagnosis not operated.
2. DTC setting condition
   - ECU detects that upstream oxygen sensor signal voltage is lower than 0.06 V continually for more than a certain time (depending on intake air flow, time varied by different operating conditions).
3. Operation required for DTC setting
   - Input malfunction memory once malfunction occurs;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Do not disconnect oxygen sensor connector, measure if voltage between upstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45V	Yes	Next
		No	Check wire harness and connector
4	Start and keep vehicle idling until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector, measure if voltage between upstream oxygen sensor wire ECU terminal 2 wire (black, oxygen sensor signal wire) and 1 wire (gray, oxygen sensor signal grounded) is changed in range of 0V-1V.	Yes	Next
		No	Replace oxygen sensor
5	Disconnect upstream oxygen sensor connector and measure if sensor terminal 1 wire (gray, oxygen sensor signal grounded) and 2 wire (black, oxygen sensor signal wire) are short circuit with a multimeter.	Yes	Replace oxygen sensor
		No	Diagnostic Help
6	Connect upstream oxygen sensor connector properly, repeat step 3-4 and check if voltage signal is changed in range of 0.44 V- 0.46 V and 0 V - 1 V respectively	Yes	End
		No	Diagnostic Help

P0132 O2 Sensor Circ. High Voltage (Upstream of the Catalyzer)

1. DTC operating condition
   - Battery voltage is higher than 11V;
   - Engine is running;
   - No fuel injector malfunction;
   - Upstream oxygen sensor has been heated sufficiently
2. DTC setting condition
   - ECU detected that upstream oxygen sensor signal voltage is higher than 1.2V continually for more than a certain period of time (5s after heated sufficiently).
3. Operation required for DTC setting
   - Input malfunction memory once malfunction occurs;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.4 wire (white, heater power source positive) is 12V	Yes	Next
		No	Check wire harness and connector
4	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.3 wire (white, heater power source grounded) is 12V	Yes	Next
		No	Check wire harness and connector

No.	Operation Step	Test Result	Subsequent Step
5	Do not disconnect oxygen sensor connector, measure if voltage between upstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45V	Yes	Next
		No	Replace oxygen sensor
6	Start and keep vehicle idling until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector, measure if voltage between upstream oxygen sensor wire ECU terminal B wire (black, oxygen sensor signal wire) and A wire (gray, oxygen sensor signal grounded) is changed in range of 0V-1V.	Yes	Next
		No	Replace oxygen sensor
7	Disconnect upstream oxygen sensor connector and measure if there is short circuit between sensor terminal No. 4 wire (white, heater power source positive) and No. 2 wire (black, oxygen sensor signal wire) with a multimeter.	Yes	Replace oxygen sensor
		No	Next
8	Connect upstream oxygen sensor connector properly, repeat step 5-6 and check if voltage signal is changed in range of 0.44 V - 0.46 V and 0 V - 1 V respectively.	Yes	End
		No	Diagnostic Help

P0133 O2 Sensor Circ. Slow Response (Upstream of the Catalyzer)

1. DTC operating condition
   - Engine speed is: for MT: 1360 - 2520 rpm, for CVT: 1200 - 2220 rpm;
   - Engine load is: for MT: 21.75 - 57.75, for CVT: 24 - 62.25 and it is stable;
   - Temperature of upstream oxygen sensor is higher than 440 deg;
   - Keep engine fuel supply;
   - No high load on carbon canister;
   - Heating diagnosis is completed and no other malfunctions are detected (mainly for fuel supply system malfunction, misfire malfunction (P2177, P2178, P0300~P0304, etc.)) Recommended operating condition: Keep the engine stable at 5th gear (70 km/h) for 5 to 10 minutes, especially for load (accelerator pedal).
2. DTC setting condition
   - ECU detects that upstream oxygen sensor cycle delay time exceeds a certain value (0.9 s), which indicates deterioration for upstream oxygen sensor, causing emission level exceeds OBD limiting value.
3. Operation required for DTC setting
   - Input malfunction memory once malfunction occurs;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next

No.	Operation Step	Test Result	Subsequent Step
3	Replace upstream oxygen sensor and connect wire harness connector properly. Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is between 0.44 V and 0.46 V.	Yes	Next
		No	Replace oxygen sensor
4	Start and keep vehicle idling until coolant temperature reaches normal value. Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is between 0 V and 1 V.	Yes	Diagnostic Help
		No	Replace oxygen sensor

P0134 O2 Sensor Circ. No Activity Detected (Upstream of the Catalyzer)

1. DTC operating condition
   - Battery voltage is higher than 11V;
   - Engine is running;
   - Upstream oxygen sensor has been heated sufficiently;
   - Air-fuel ratio closed loop control effect;
   - No fuel injector malfunction.
2. DTC setting condition
   - ECU detects that upstream oxygen sensor cycle delay time exceeds a certain value (0.9 s), which indicates deterioration for upstream oxygen sensor, causing emission level exceeds OBD limiting value.
3. Operation required for DTC setting
   - ECU detects that voltage of upstream oxygen sensor signal is between 0.4 and 0.6 V for more than a certain period of time (5s after heated sufficiently);
   - (Or) ECU detects that voltage of upstream oxygen sensor and voltage of downstream oxygen sensor are both higher than 0.2V for more than a certain period of time (3.1 s) when the oil is cutting;
   - (Or) When the exhaust temperature is higher than 600 degrees, the internal resistance of the oxygen sensor is greater than 20000 ohm.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.4 wire (white, heater power source positive) is 12V	Yes	Next
		No	Check wire harness and connector
4	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.3 wire (white, heater power source grounded) is 12V	Yes	Next
		No	Check wire harness and connector

No.	Operation Step	Test Result	Subsequent Step
5	Do not disconnect oxygen sensor connector, check connection of No.2 wire (black, oxygen sensor signal wire) for open circuit with a multimeter	Yes	Check wire harness and connector
		No	Next
6	Do not disconnect oxygen sensor connector, check connection of No.1 wire (gray, oxygen sensor signal grounded) for open circuit with a multimeter	Yes	Check wire harness and connector
		No	Next
7	Disconnect upstream oxygen sensor wire connector to remove upstream oxygen sensor. Place the oxygen sensor at room temperature to cool it down. Measure if resistance between sensor terminal No.4 interface (white, heater power source positive) and No.3 interface (white, heater power source grounded) is higher than 15 Ω with a multimeter when temperature of oxygen sensor cools down to room temperature.	Yes	Replace oxygen sensor
		No	Next
8	Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45V	Yes	Next
		No	Replace oxygen sensor
9	Start and keep vehicle idling until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector, measure if voltage between upstream oxygen sensor wire ECU terminal 2 wire (black, oxygen sensor signal wire) and 1 wire (gray, oxygen sensor signal grounded) is changed in range of 0V-1V.	Yes	Next
		No	Replace oxygen sensor
10	Connect upstream oxygen sensor connector properly, repeat steps 8 and 9 and check if voltage signal changes between 0.44 V and 0.46 V, 0 V - 1 V respectively.	Yes	End
		No	Diagnostic Help

- Oxygen sensor resistance measurement must be performed when temperature of oxygen sensor cools down to room temperature, as resistance is related to temperature.

P0136 O2 Sensor Circ. Malfunction (Downstream of the Catalyzer)

1. DTC operating condition
   - Battery voltage is higher than 11V;
   - Engine is running;
   - Upstream oxygen sensor has been heated sufficiently;
   - Exhaust temperature of rear oxygen sensor is lower than 800°C;
   - 2nd air or carbon canister diagnosis not operated.
2. DTC setting condition
   - ECU detects that downstream oxygen sensor signal voltage difference between heater on and off is higher than 2V for more than a certain times (4 times).
3. Operation required for DTC setting
   - Input malfunction memory once malfunction occurs;
   - If the fault is detected in 3 consecutive driving cycles, MIL light will come on
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Do not disconnect oxygen sensor connector and measure if voltage of downstream oxygen sensor wire oxygen sensor terminal No.4 wire (white, heater power source positive) is 12V	Yes	Next
		No	Check wire harness and connector
4	Do not disconnect oxygen sensor connector and measure if voltage of downstream oxygen sensor wire oxygen sensor terminal No.3 wire (white, heater power source grounded) is 12V	Yes	Next
		No	Check wire harness and connector
5	Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECU terminal No.2 wire【black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded】 is about 0.45V	Yes	Next
		No	Check wire harness and connector
6	Start and keep vehicle idling until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is changed in range of 0V - -1V.	Yes	Next
		No	Replace oxygen sensor
7	Start and keep vehicle idling until coolant temperature reaches normal value. Disconnect downstream oxygen sensor connector, measure if oxygen sensor terminal No.3 wire (white, heater power grounded) and No.2 wire (black, oxygen sensor signal wire) are short circuit.	Yes	Replace oxygen sensor
		No	Diagnostic Help
8	Connect downstream oxygen sensor connector properly, repeat steps 5-6 and check if voltage signal changes between 0.44 V and 0.46 V, 0 V and 1 V respectively.	Yes	End
		No	Diagnostic Help

P0137 O2 Sensor Circ. Low Voltage (Downstream of the Catalyzer)

1. DTC operating condition
   - Battery voltage is higher than 11V;
   - Engine is running;
   - Upstream oxygen sensor has been heated sufficiently;
   - Exhaust temperature of rear oxygen sensor is lower than 800°C;
   - 2nd air or carbon canister diagnosis not operated;
   - Rear oxygen closed loop control effect.
2. DTC setting condition
   - ECU detects that downstream oxygen sensor signal voltage is lower than 0.06V continually for more than a certain time (25s during rear oxygen closed loop).
3. Operation required for DTC setting
   - Input malfunction memory once malfunction occurs;
   - If the fault is detected in 3 consecutive driving cycles, MIL light will come on
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45V	Yes	Next
		No	Check wire harness and connector
4	Start and keep vehicle idling until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is changed in range of 0V - -1V.	Yes	Next
		No	Replace oxygen sensor
5	Disconnect downstream oxygen sensor connector and measure if sensor terminal 1 wire (gray, oxygen sensor signal grounded) and 2 wire (black, oxygen sensor signal wire) are short circuit with a multimeter.	Yes	Replace oxygen sensor
		No	Diagnostic Help
6	Connect downstream oxygen sensor connector properly, repeat steps 3-4 and check if voltage signal changes between 0.44 V and 0.46 V, 0 V and 1 V respectively.	Yes	End
		No	Diagnostic Help

P0138 O2 Sensor Circ. High Voltage (Downstream of the Catalyzer)

1. DTC operating condition
   - Battery voltage is higher than 11V;
   - Engine is running;
   - Downstream oxygen sensor has been heated sufficiently;
   - Exhaust temperature of rear oxygen sensor is lower than 800°C;
   - 2nd air or carbon canister diagnosis not operated.
2. DTC setting condition
   - ECU detects that downstream oxygen sensor signal voltage difference between heater on and off is higher than 2V for more than a certain times (4 times).
3. Operation required for DTC setting
   - Input malfunction memory once malfunction occurs;
   - If the fault is detected in 3 consecutive driving cycles, MIL light will come on
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Do not disconnect oxygen sensor connector and measure if voltage of downstream oxygen sensor wire oxygen sensor terminal No.4 wire (white, heater power source positive) is 12V	Yes	Next
		No	Check wire harness and connector
4	Do not disconnect oxygen sensor connector and measure if voltage of downstream oxygen sensor wire oxygen sensor terminal No.3 wire (white, heater power source grounded) is 12V	Yes	Next
		No	Check wire harness and connector

No.	Operation Step	Test Result	Subsequent Step
5	Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45 V	Yes	Next
		No	Check wire harness and connector
6	Start and keep vehicle idling until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is changed in range of 0 V - -1 V.	Yes	Next
		No	Replace oxygen sensor
7	Start and keep vehicle idling until coolant temperature reaches normal value. Disconnect downstream oxygen sensor connector, measure if oxygen sensor terminal No.3 wire (white, heater power grounded) and No.2 wire (black, oxygen sensor signal wire) are short circuit.	Yes	Replace oxygen sensor
		No	Diagnostic Help
8	Connect downstream oxygen sensor connector properly, repeat steps 5-6 and check if voltage signal changes between 0.44 V and 0.46 V, 0 V and 1 V respectively.	Yes	End
		No	Diagnostic Help

P0140 O2 Sensor Circ. No Activity Detected (Downstream of the Catalyzer)

1. DTC operating condition
   - Battery voltage is higher than 11V;
   - Engine is running;
   - Upstream oxygen sensor has been heated sufficiently;
   - Exhaust temperature of rear oxygen is lower than 800deg;
   - 2nd air or carbon canister diagnosis not operated.
2. DTC setting condition
   - ECU detects that voltage of downstream oxygen sensor signal is between 0.4 and 0.5V for more than a certain period of time (600s);
   - (Or) When the exhaust temperature is higher than 600 degrees, the internal resistance of the oxygen sensor is greater than 40000 ohm.
3. Operation required for DTC setting
   - Input malfunction memory once malfunction occurs;
   - If the fault is detected in 3 consecutive driving cycles, MIL light will come on
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Do not disconnect oxygen sensor connector and measure if voltage of downstream oxygen sensor wire oxygen sensor terminal No.4 wire (white, heater power source positive) is 12V	Yes	Next
		No	Check wire harness and connector
4	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.3 wire (white, heater power source grounded) is 12V	Yes	Next
		No	Check wire harness and connector

No.	Operation Step	Test Result	Subsequent Step
5	Do not disconnect oxygen sensor connector, check connection of No.2 wire (black, oxygen sensor signal wire) for open circuit with a multimeter	Yes	Check wire harness and connector
		No	Next
6	Do not disconnect oxygen sensor connector, check connection of No.1 wire (gray, oxygen sensor signal grounded) for open circuit with a multimeter	Yes	Check wire harness and connector
		No	Next
7	Disconnect downstream oxygen sensor wire connector to remove downstream oxygen sensor. Place the oxygen sensor at room temperature to cool it down. Measure if resistance between sensor terminal No.4 interface (white, heater power source positive) and No.3 interface (white, heater power source grounded) is higher than 15 Ω with a multimeter when temperature of oxygen sensor cools down to room temperature.	Yes	Replace oxygen sensor
		No	Next
8	Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45V	Yes	Next
		No	Replace oxygen sensor
9	Start and keep vehicle idling until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is changed in range of 0V - -1V.	Yes	Next
		No	Replace oxygen sensor
10	Connect downstream oxygen sensor connector properly, repeat steps 8 and 9 and check if voltage signal changes between 0.44 V and 0.46 V, 0 V - 1 V respectively.	Yes	End
		No	Diagnostic Help

- Oxygen sensor resistance measurement must be performed when temperature of oxygen sensor cools down to room temperature, as resistance is related to temperature.

P0201 Cylinder 1- Injector Circuit Error P0202 Cylinder 2- Injector Circuit Error P0203 Cylinder 3- Injector Circuit Error P0204 Cylinder 4- Injector Circuit Error

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detected open circuit in control terminal pin.
   - (P0201: The detected voltage UCE of output terminal is 6 V with driver switch off);
   - (P0202: The detected voltage UCE of output terminal is 6 V with driver switch off);
   - (P0203: The detected voltage UCE of output terminal is 6 V with driver switch off);
   - (P0204: The detected voltage UCE of output terminal is 6 V with driver switch off);
3. Operation required for DTC setting
   - If the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Open circuit in corresponding fuel injector circuit	Yes	Repair, replace wire harness or fuel injector
		No	Next
3	Open circuit or fuel injector damage in corresponding fuel injector power supply terminal	Yes	Repair, replace wire harness or fuel injector
		No	Next
4	Open circuit or internal circuit damage in fuel injector control pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0219 Engine Overspeed Condition

1. DTC operating condition
   - None.
2. DTC setting condition
   - The ECU monitored the engine speed > 7000 rpm.
3. Operation required for DTC setting
   - No light comes on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Is the engine speed increased artificially beyond the maximum safe speed?	Yes	Clear DTCs. End.
		No	Next
2	Accelerator pedal is stuck in the position with large opening angel, and cannot return to initial position	Yes	Check and repair accelerator pedal
		No	Next
3	Throttle is stuck in the position with large opening angel, and cannot close	Yes	Check and repair throttle
		No	Next
4	Check if speed sensor and speed calculation are correct	Yes	Correct error
		No	Diagnostic Help

P0221 Throttle Position Sensor 2 Performance Non-plausible

1. DTC operating condition
   - Engine speed is ＞ 1200 rpm.
2. DTC setting condition
   - ECU detected that opening angles of throttle position sensor 1 and sensor signal 2 exceed a certain threshold value (6%), and opening angle of sensor 2 is improper. (Compared with virtual 3rd circuit opening angle inside of ECU, deviation of 1st circuit signal is less than that of 2nd circuit signal).
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Check if the related wire harnesses are connected properly	Yes	Next
		No	Reconnect
2	Connect a diagnostic tester and adapter, turn ignition switch to ON; clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Next
		No	End
3	Depress accelerator pedal slowly until throttle is fully open, observe if value of item "Absolute Throttle Opening Angle" in data flow increases to about 95%-100% as the throttle opening angle increases	Yes	Next
		No	Proceed to step 4
4	Remove the connector from throttle position sensor on wire harness, check if resistance of throttle circuit 2 signal is in proper range	Yes	Repair or replace wire harness
		No	Next
5	Remove the connector from throttle position sensor on wire harness, check if resistance between throttle circuit 2 signal and other signals is within proper range	Yes	Replace throttle
		No	Repair or replace wire harness
6	Clear DTCs, turn ignition switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Depress accelerator pedal lightly for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P0222 Throttle Position Sensor 2 Performance Low Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - ECU detects that voltage of throttle position sensor 2 signal circuit is less than 0.156V.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Check if the related wire harnesses are connected properly	Yes	Next
		No	Reconnect
2	Connect a diagnostic tester and adapter, turn ignition switch to ON; clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Next
		No	End
3	Remove the connector from throttle position sensor on wire harness and check if there is open circuit or short circuit to ground in throttle circuit 2 signal	Yes	Repair or replace wire harness
		No	Next
4	Turn ENGINE START STOP switch to ON, check if throttle 5V power source is normal	Yes	Replace throttle
		No	Repair or replace wire harness
5	Clear DTCs, turn ignition switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Depress accelerator pedal lightly for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P0223 Throttle Position Sensor 2 Performance High Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - ECU detects that voltage of throttle position sensor 2 signal circuit is 4.883V.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Check if the related wire harnesses are connected properly	Yes	Next
		No	Reconnect
2	Connect a diagnostic tester and adapter, turn ignition switch to ON; clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Next
		No	End
3	Remove the connector from throttle position sensor on wire harness, check if throttle 2 circuit signal is short to 5 V power source	Yes	Repair or replace wire harness
		No	Replace throttle
4	Clear DTCs, turn ignition switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Depress accelerator pedal lightly for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P0261 Cylinder 1- Injector Circuit Low P0264 Cylinder 2- Injector Circuit Low P0267 Cylinder 3- Injector Circuit Low P0270 Cylinder 4- Injector Circuit Low

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin short to ground;
   - (P0261: It is detected that voltage UCE of output terminal is 0V with driver switch off);
   - (P0264: It is detected that voltage UCE of output terminal is 0V with driver switch off);
   - (P0267: It is detected that voltage UCE of output terminal is 0V with driver switch off);
   - (P0270: It is detected that voltage UCE of output terminal is 0 V with driver switch off).
3. Operation required for DTC setting
   - If the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Corresponding fuel injector circuit short to ground	Yes	Repair wire harness
		No	Next
2	Corresponding fuel injector circuit power supply terminal short to ground	Yes	Repair wire harness
		No	Next
3	Fuel injector control pin corresponding to ECU short to ground	Yes	Inspect and repair ECU
		No	Diagnostic Help

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

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin short to power supply;
   - (P0262: It is detected that voltage UCE of output terminal is 12 V with driver switch on);
   - (P0265: It is detected that voltage UCE of output terminal is 12 V with driver switch on);
   - (P0268: It is detected that voltage UCE of output terminal is 12 V with driver switch on);
   - (P0271: It is detected that voltage UCE of output terminal is 12 V with driver switch on).
3. Operation required for DTC setting
   - If the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Corresponding fuel injector circuit short to power source	Yes	Repair wire harness
		No	Next
2	Fuel injector control pin corresponding to ECU short to power source	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0300 Misfire Detected

1. DTC operating condition
   - Engine speed is in range of 560-6000 rpm steadily;
   - Intake temperature is not less than -28°C;
   - Engine load is not less than zero torque (MIN) load line;
   - Keep engine fuel supply;
   - Faulty circuit is not detected;
   - Torque intervention is not activated (torque intervention is activated when there are torque requirements for driveability, TCU and ESP).
2. DTC setting condition
   - ECU detects that changes of crankshaft acceleration caused by misfire, it indicates that misfire is sufficient to cause emission level exceeds OBD limiting value or causing damage to catalytic converter.
3. Operation required for DTC setting
   - Input malfunction memory once malfunction occurs;
   - For misfire fault which will cause damage to catalytic converter, MIL light will flash immediately to inform driver;

- For the misfire fault that may cause the deterioration of emission, if the relative level of misfire is fully detected in 3 consecutive driving cycles, then MIL light will come on;
- Diagnostic tester will be visible.

4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Check if there is any DTC related to injector	Yes	Go to corresponding fuel injector DTCs
		No	Go to single cylinder misfire fault DTCs which had been output

P0301 Misfire Detected on Cylinder 1 P0302 Misfire Detected on Cylinder 2 P0303 Misfire Detected on Cylinder 3 P0304 Misfire Detected on Cylinder 4

1. DTC operating condition
   - Engine speed is in range of 560-6000 rpm steadily;
   - Intake temperature is not less than -28°C;
   - Engine load is not less than zero torque (MIN) load line;
   - Keep engine fuel supply;
   - Faulty circuit is not detected;
   - Torque intervention is not activated (torque intervention is activated when there are torque requirements for driveability, TCU and ESP).
2. DTC setting condition
   - ECU detects that changes of crankshaft acceleration caused by misfire, it indicates that misfire is sufficient to cause emission level exceeds OBD limiting value or causing damage to catalytic converter.
3. Operation required for DTC setting
   - Input malfunction memory once malfunction occurs;
   - For misfire fault which will cause damage to catalytic converter, MIL light will flash immediately to inform driver;
   - For the misfire fault that may cause the deterioration of emission, if the relative level of misfire is fully detected in 3 consecutive driving cycles, then MIL light will come on;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Check if there is any DTC related to corresponding cylinder and injector	Yes	Go to DTCs related to corresponding cylinder injector
		No	Next
2	Connector looseness or disengagement	Yes	Reconnect
		No	Next
3	Check if there is open circuit or short circuit to power source in ignition coil signal terminal	Yes	Repair or replace wire harness
		No	Next
4	Check if there is open circuit or short circuit to ground in ignition coil power supply terminal	Yes	Repair or replace wire harness
		No	Next
5	Check if there is open circuit or short circuit to power source in ignition coil grounded terminal	Yes	Repair or replace wire harness
		No	Next

No.	Operation Step	Test Result	Subsequent Step
6	Check ignition coil for malfunction	Yes	Replace ignition coil
		No	Next
7	Check if spark plug is abnormal	Yes	Replace spark plug
		No	Next
8	Open circuit or internal circuit damage in ignition coil control pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0322 EPM - Crankshaft Signal Fault

1. DTC operating condition
   - Start vehicle.
2. DTC setting condition
   - ECU detects that rotation speed is abnormal for several times (about 20 times, it only means cranking instead of starting for 20 times).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs. After the DTCs are cleared, the fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or disengagement	Yes	Reconnect
		No	Next
2	Open circuit in speed sensor signal terminal	Yes	Repair or replace wire harness or sensor
		No	Next
3	Sensor signal terminal pin is short to power source or ground, or short circuit between pins	Yes	Repair wire harness
		No	Next
4	Sensor is damaged	Yes	Replace sensor
		No	Next
5	Pin corresponding to speed sensor signal on ECU fault	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0327 Knock Sensor 1 Circuit Low

1. DTC operating condition
   - Load is greater than 40%;
   - Coolant temperature is higher than 40°C;
   - Speed is more than 2600 rpm;
   - Cylinder 1 identification is valid.
2. DTC setting condition
   - Knock identification reference voltage in 30 consecutive cycles is lower than threshold value, threshold value is 0.2 ~ 0.8V. Threshold values vary with different rotation speeds.
3. Operation required for DTC setting
   - Ignition angle is delayed by 7.5 deg within safety angle;
   - After 3 driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Knock identification reference voltage in 30 consecutive cycles is higher than threshold value;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect or replace connector
		No	Next
2	Check if there is short circuit to ground or open circuit in knock sensor signal terminal	Yes	Repair wire harness
		No	Next
3	Knock sensor connecting wire is non-standard shielding wire, is subjected to electromagnetic interference	Yes	Use standard shielding wire
		No	Next
4	Knock sensor damaged	Yes	Replace sensor
		No	Next
5	Knock sensor pin or circuit corresponding to ECU terminal damaged	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0328 Knock Sensor 1 Circuit High

1. DTC operating condition
   - Load is greater than 40%;
   - Coolant temperature is higher than 40°C;
   - Speed is more than 2600 rpm;
   - Cylinder 1 identification is valid.
2. DTC setting condition
   - Knock identification reference voltage in 30 consecutive cycles is higher than threshold value which is 15~150 V. Threshold values vary with different rotation speeds.
3. Operation required for DTC setting
   - Ignition angle is delayed by 7.5 deg within safety angle;
   - After 3 driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Knock identification reference voltage in 30 consecutive cycles is higher than threshold value;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Check if knock sensor signal terminal is short to power source	Yes	Repair wire harness
		No	Next
2	Knock sensor pin or circuit corresponding to ECU terminal damaged	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0341 EPM - Camshaft Signal Fault

1. DTC operating condition
   - Start vehicle.
2. DTC setting condition
   - ECU detects that intake phase sensor signal is abnormal for several times (about 10 times).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next

No.	Operation Step	Test Result	Subsequent Step
2	Check if there is external interference on wire	Yes	Shielded wire
		No	Next
3	Relative installation position between phase sensor and its signal plate do not not meet the installation requirements (such as too far, misaligned, etc.)	Yes	Reinstall
		No	Next
4	Phase signal plate teeth mechanical malfunction	Yes	Replace phase signal plate
		No	Diagnostic Help

P0346 EPM - Camshaft 2 Signal Fault

1. DTC operating condition
   - Start vehicle.
2. DTC setting condition
   - ECU detects that intake phase sensor signal is abnormal for several times (about 10 times).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Check if there is external interference on wire	Yes	Shielded wire
		No	Next
3	Relative installation position between phase sensor and its signal plate do not not meet the installation requirements (such as too far, misaligned, etc.)	Yes	Reinstall
		No	Next
4	Phase signal plate teeth mechanical malfunction	Yes	Replace phase signal plate
		No	Diagnostic Help

P0420 Catalyst Conversion Insufficient

1. DTC operating condition
   - Engine speed is in range of 1360 and 2520 rpm;
   - Engine load is in range of 22.5 and 48%/(for MT: 21.75 - 57.75, for CVT: 24 - 60) steadily;
   - Catalytic converter temperature is in range of 500 - 720 deg steadily;
   - Ambient temperature is not less than -10°C;
   - Keep engine fuel supply;
   - No high load on carbon canister;
   - Oxygen sensor and misfire malfunctions are not detected (A: P0140, P2177, P2178, P0300 ~ P0304, etc.)
2. DTC setting condition
   - ECU detects that aging coefficient of catalytic converter exceeds a certain value (0.2), which indicates deterioration for catalytic converter, causing emission level exceeds OBD limiting value.
3. Operation required for DTC setting
   - Input malfunction memory once malfunction occurs;
   - If the fault is detected in 3 consecutive driving cycles, MIL light will come on
   - Diagnostic tester will be visible.

4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Check exhaust system for leakage, gasket for damage	Yes	Repair leaking area
		No	Next
4	Replace the catalytic converter. Check if malfunction reappears after returning vehicle to customer	Yes	Diagnostic Help
		No	End

P0444 Evaporativ Emiss.System Purge Control Valve Circuit Open

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 6 V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Open circuit in canister control valve signal terminal pin	Yes	Repair wire harness
		No	Next
3	Open circuit in canister control valve power supply terminal pin	Yes	Repair wire harness
		No	Next
4	Canister solenoid valve damaged	Yes	Replace canister solenoid valve
		No	Next
5	Open circuit or internal circuit damage in canister control terminal pin corresponding to ECU terminal	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0458 Evaporative Emission System Purge Control Valve Circuit Low

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to ground (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.

4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Canister control valve signal terminal short to ground	Yes	Repair wire harness
		No	Next
2	Canister control valve power supply terminal pin short to ground	Yes	Repair wire harness
		No	Next
3	Canister control terminal pin corresponding to ECU terminal short to ground	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0459 Evaporative Emission System Purge Control Valve Circuit High

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to power source (it is detected that voltage UCE of output terminal is 12 V with driver switch on)
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Canister control valve signal terminal short to power source	Yes	Repair wire harness
		No	Next
2	Canister control terminal pin corresponding to ECU terminal short to power source	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0480 Cooling Fan 1 Control Circuit Error

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 6 V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next

No.	Operation Step	Test Result	Subsequent Step
2	Open circuit in cooling fan relay circuit signal terminal	Yes	Repair wire harness
		No	Next
3	Cooling fan relay malfunction (fuse blown or damaged)	Yes	Repair wire harness
		No	Next
4	Open circuit or internal circuit damage in cooling fan relay pin corresponding to ECU terminal	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0501 Vehicle Speed Sensor Signal Fault

1. DTC operating condition
   - Fuel cut-off signal activation (coast and fuel cut-off for 5 seconds or more when vehicle speed is more than 20 km/h);
   - Coolant temperature is 64.5°C;
   - Engine speed is between 1520 rpm and 4000 rpm.
2. DTC setting condition
   - Malfunction is output when vehicle speed signal is lower than 5 km/h.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Sensor installation location is improper or separation	Yes	Reinstall
		No	Next
2	Sensor connector looseness or poor contact	Yes	Reconnect
		No	Next
3	Check if there is short circuit to ground or open circuit in vehicle speed signal terminal	Yes	Repair wire harness
		No	Next
4	Vehicle speed sensor is damaged	Yes	Replace sensor
		No	Next
5	Short circuit to ground, open circuit or internal circuit damage in vehicle speed sensor pin corresponding to ECU terminal	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0506 Idle Control System RPM Lower than Expected

1. DTC operating condition
   - Carbon canister is not in high scour rate;
   - Engine is idling;
   - Vehicle speed sensor has been inspected and has no fault with P0501 (coast the vehicle and cut off fuel for 5 seconds or more after vehicle speed is more than 20 km/h);
   - Vehicle speed is 0;
   - Plateau correction factor is higher than 0.703 (it meas that not at high altitude area);
2. DTC setting condition
   - Difference between static target idle speed and actual speed is less than 200 rpm;
   - Idle control integral part reaches minimum value (idle control function is normal).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;

- Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Check if electronic throttle is stuck in smaller opening position due to ice or oil	Yes	Repair or replace electronic throttle
		No	Next
2	Check if intake manifold is blocked, fuel injector is blocked, exhaust resistance is too large, oil supply pressure is too low	Yes	Perform necessary repair
		No	Diagnostic Help

P0507 Idle Control System RPM Higher than Expected

1. DTC operating condition
   - Carbon canister is not in high scour rate;
   - Engine is idling;
   - Vehicle speed sensor has been inspected and has no fault (coast the vehicle and cut off the fuel for 5 seconds or more when vehicle speed is more than 20 km/h);
   - Vehicle speed is 0;
   - Plateau correction factor is higher than 0.703;
2. DTC setting condition
   - Difference between static target idle speed and actual speed is 100 rpm;
   - Idle control integral part reaches maximum value;
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Check if electronic throttle is stuck in larger open position due to ice or oil	Yes	Repair or replace electronic throttle
		No	Next
2	Check if system is air leaked, fuel injector is leaked, fuel supply pressure is too high	Yes	Perform necessary repair
		No	Diagnostic Help

P0532 A/C Refrigerant Pressure Sensor Circuit Low

1. DTC operating condition
   - Starting is completed.
2. DTC setting condition
   - A/C pressure sensor signal voltage is lower than 0.1 V.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect the diagnostic tester and start vehicle. Use a multimeter to measure if sensor signal terminal voltage is close to or equal to 0 V	Yes	Next
		No	Repair wire harness
2	Turn ignition switch "OFF", check if sensor signal terminal is short to ground	Yes	Next
		No	Replace sensor
3	Sensor is damaged	Yes	Next
		No	Inspect and repair ECU

No.	Operation Step	Test Result	Subsequent Step
4	Sensor signal pin terminal corresponding to ECU short to ground	Yes	Diagnostic Help
		No	Diagnostic Help

P0560 Non-plausible Error of Battery Voltage

1. DTC operating condition
   - None.
2. DTC setting condition
   - ECU detects that ADC value of battery voltage is lower than 2.5 V.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "OFF". Measure battery voltage with a multimeter and check if it is too low	Yes	Next
2	Check if there are open circuits in all pins on ECU which connected with battery or main relay	Yes	Repair wire harness
		No	Next
3	Check engine wire grounded point for malfunction	Yes	Repair wire harness
		No	Next
4	Battery electric leakage or damage	Yes	Replace battery
		No	Next
5	Alternator malfunction	Yes	Repair alternator
		No	Diagnostic Help

P0562 System Voltage Low

1. DTC operating condition
   - More than 180 second has elapsed after starting;
2. DTC setting condition
   - ECU detects that ADC value of battery voltage is lower than 10.02 V.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "OFF". Measure battery voltage with a multimeter and check if it is too low	Yes	Next
2	Check if there are open circuits in all pins on ECU which are connected with battery or main relay	Yes	Repair wire harness
		No	Next
3	Check engine wire grounded point for malfunction	Yes	Repair wire harness
		No	Next
4	Alternator regulator malfunction	Yes	Repair regulator
		No	Next
5	Battery electric leakage or damage	Yes	Replace battery
		No	Next

No.	Operation Step	Test Result	Subsequent Step
6	Alternator malfunction	Yes	Repair alternator
		No	Diagnostic Help

P0563 System Voltage High

1. DTC operating condition
   - Vehicle speed ＞ 25km/h;
   - More than 180 second has elapsed after starting.
2. DTC setting condition
   - ECU detects that ADC value of battery voltage is higher than 17.02 V.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "OFF". Measure battery voltage with a multimeter and check if it is too high	Yes	Next
2	Check engine wire grounded point for malfunction	Yes	Repair wire harness
		No	Next
3	Alternator regulator malfunction, motor power generation cannot be controlled effectively	Yes	Repair regulator
		No	Diagnostic Help

P0571 Brake Signal Synchronization Error or Brake Light Signal Circuit Error

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - E two brake signal of double circuits is out of synchronization for more than 1 second and 20 consecutive times;
   - Brake light voltage signal is improper [brake light signal voltage exceeds ECU calculated model voltage range (not fixed value)]
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Check if connection of brake pedal wire is normal	Yes	Next
		No	Reconnect
2	Check if there is open circuit, short circuit to ground or short circuit to power source in brake signal of double circuits	Yes	Repair or replace wire harness
		No	Next
3	Connect the diagnostic tester and adapter	/	Next
4	Turn ENGINE START STOP switch to ON and use 2 multimeters to measure if voltages between brake switch signal and ground, brake light signal and ground are 12 V and 0 V separately without brake pedal depressed.	Yes	Next
		No	Adjust pedal travel or replace brake pedal

No.	Operation Step	Test Result	Subsequent Step
5	Depress brake pedal slowly to observe if voltages of 2 multimeters change at about the same time	Yes	Next
		No	Adjust pedal travel or replace brake pedal
6	Clear DTCs, start and keep engine idling. Depress brake pedal continuously for 25 times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P0604 Internal Contr.module RAM Error

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - ECU detects internal malfunction in RAM.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and adapter, turn ENGINE START STOP switch to ON	/	Next
2	Clear DTCs and confirm if this malfunction is a stable state malfunction again	Yes	Next
		No	End
3	Replace with new ECU to check if malfunction reoccurs	/	Next
4	Turn ENGINE START STOP switch to ON, and wait for 1 minute to finish the throttle self-learning. Then start engine and depress accelerator pedal for several times in neutral to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P0605 Internal Contr.module ROM Error

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - ECU detects internal malfunction in ROM.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;

- Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and adapter, turn ENGINE START STOP switch to ON	/	Next
2	Clear DTCs and confirm if this malfunction is a stable state malfunction again	Yes	Next
		No	End
3	Replace with new ECU to check if malfunction reoccurs	/	Next
4	Turn ENGINE START STOP switch to ON, and wait for 1 minute to finish the throttle self-learning. Then start engine and depress accelerator pedal for several times in neutral to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P0606 Safety Monitoring Fuel Cutoff Error

1. DTC operating condition
   (a) Ignition switch ON (Internal subdivision faults of corresponding ECU) :
   - Throttle body signal, wire harness or ECU malfunction;
   - Morphing code monitoring malfunction;
   - 2nd layer accelerator pedal signal reasonable malfunction;
   - Close path test malfunction;
   - AD converter monitoring malfunction.

   (b) Engine is running (Internal subdivision faults of corresponding ECU):
   - Safe monitoring oil cut-off malfunction;
   - Monitoring module feedback malfunction;
   - Monitoring wrongly responds malfunction;
   - Monitoring module inquiry malfunction;
   - Ignition angle signal, wire harness or ECU malfunction;
   - Load signal, wire harness or ECU malfunction;
   - ECU wrongly responds monitoring malfunction;
   - 2nd layer engine speed monitoring malfunction.

   (c) Engine speed is 1200rpm (Internal subdivision faults of corresponding ECU):
   - 2nd layer torque monitoring malfunction.
2. DTC setting condition
   - ECU monitors internal faults (ECU internal faults) - except for subdivision DTCs: other subdivision DTCs except for throttle body signal, wire or ECU faults;
   - ECU monitors internal faults (throttle body signal, wire or ECU faults) - subdivision DTCs: throttle body signal, wire or ECU faults.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and adapter, turn ENGINE START STOP switch to ON	/	Next

No.	Operation Step	Test Result	Subsequent Step
2	Clear DTCs and confirm if this malfunction is a stable state malfunction again	Yes	Next
		No	End
3	Replace with new ECU to check if malfunction reoccurs	/	Next
4	Turn ENGINE START STOP switch to ON, and wait for 1 minute to finish the throttle self-learning. Then start engine and depress accelerator pedal for several times in neutral to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P0627 Fuel Pump Control Circuit Open

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detected open circuit in control terminal pin.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Open circuit in fuel pump relay control circuit	Yes	Repair wire harness
		No	Next
3	Open circuit in fuel pump relay control circuit power supply terminal	Yes	Repair wire harness
		No	Next
4	Fuel pump relay fuse blown or damaged	Yes	Repair relay
		No	Next
5	Open circuit or internal circuit damage in fuel pump control pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0628 Fuel Pump Control Circuit Low

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to ground (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Fuel pump relay control circuit is short to ground	Yes	Repair wire harness
		No	Next
5	Fuel pump control pin corresponding to ECU terminal short to ground	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0629 Fuel Pump Control Circuit High

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to power source (it is detected that voltage UCE of output terminal is 12 V with driver switch on)
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Fuel pump relay control circuit short to power source	Yes	Repair wire harness
		No	Next
5	Fuel pump control pin corresponding to ECU terminal short to power source	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0645 AC Clutch Relais Circuit Open

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 6 V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Open circuit in A/C compressor relay control circuit	Yes	Repair wire harness
		No	Next
3	Open circuit or short circuit to ground in A/C compressor relay control circuit	Yes	Repair wire harness
		No	Next
4	A/C compressor relay fuse blown or damaged	Yes	Repair relay
		No	Next
5	Open circuit or internal circuit damage in A/C compressor control pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0646 A/C Clutch Relay Control Circuit Low

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to ground (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Short circuit to ground or open circuit in A/C compressor relay control circuit	Yes	Repair wire harness
		No	Next
3	Open circuit or short circuit to ground in A/C compressor relay control circuit	Yes	Repair wire harness
		No	Next
4	A/C compressor relay fuse blown or damaged	Yes	Repair relay
		No	Next
5	Short circuit to ground, open circuit or internal circuit damage in A/C compressor control pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0647 A/C Clutch Relay Control Circuit High

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to power source (it is detected that voltage UCE of output terminal is 12 V with driver switch on)
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	A/C compressor relay circuit short to power source	Yes	Repair wire harness
		No	Next
2	A/C compressor relay pin corresponding to ECU terminal short to power source	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0688 Power Relay Sense Circuit Non-plausible Error

1. DTC operating condition
   - Battery voltage is normal (internal subdivision faults of corresponding ECU: improper output voltage of main relay);
   - Battery voltage is normal and main relay close test command (internal subdivision faults of corresponding ECU: output voltage signal faults of main relay)
2. DTC setting condition
   - ECU detects that voltage ADC (analog signal converts to digital signal value) behind main relay is lower than 3 V (internal subdivision faults of corresponding ECU: output voltage improper of main relay)
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on;
   - ECU detects that voltage ADC (analog signal converts to digital signal value) behind main relay is 3V (internal subdivision faults of corresponding ECU: output voltage signal faults of main relay).
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Main relay looseness	Yes	Reconnect
		No	Next
2	Relay fuse blown or damaged	Yes	Repair, replace main relay
		No	Next
3	Battery voltage is too low due to electric leakage, insufficient electrolyte, damage, etc.	Yes	Charge or repair, replace battery
		No	Next
4	Alternator or regulator damaged	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0691 Fan 1 Control Circuit Low

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to ground (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Short circuit to ground or open circuit in cooling fan relay circuit signal terminal	Yes	Repair wire harness
		No	Next
3	Cooling fan relay circuit malfunction (fuse blown or damaged)	Yes	Repair wire harness
		No	Next
4	Short circuit to ground, open circuit or internal circuit damage in cooling fan relay pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0692 Fan 1 Control Circuit High

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to power source (it is detected that voltage UCE of output terminal is 12 V with driver switch on)
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Cooling fan relay control circuit short to power source	Yes	Repair wire harness
		No	Next
2	Cooling fan relay control pin corresponding to ECU terminal short to power source	Yes	Inspect and repair ECU
		No	Diagnostic Help

P1101 System Voltage can not Fulfill Throttle Self Learning Condition

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - Battery voltage is lower than 10V during throttle self-learning.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Measure if battery voltage is lower than 10V	Yes	Recharge or replace battery
		No	Next
2	Connect diagnostic tester and adapter, turn ENGINE START STOP switch to ON	/	Next
3	Clear DTCs, turn ENGINE START STOP switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Observe if DTCs are reproduced	Yes	Recharge or replace battery
		No	System is normal

P1102 Throttle Limphome Position Self Learning Error

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - Improper throttle limp position (limp position exceeds [1.8% - 13%]) signal is detected when throttle self-learning (Internal subdivision faults of corresponding ECU: throttle limp position self-learning fault).
   - Improper throttle mechanism bottom dead center signal is detected when throttle self-learning is performed again. [Voltage of signal 1 is out of range (0.212~0.865V) and voltage of signal 2 are out of range (4.142~4.841V) at bottom dead center] (Internal subdivision faults of corresponding ECU: throttle mechanism bottom dead center self-learning again fault).

3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and adapter, turn ENGINE START STOP switch to ON	/	Next
2	Clear DTCs	/	Next
3	Turn ignition switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P1103 Throttle Lower Mechanic Stop First Learning Error

1. DTC operating condition
   - Ignition switch ON;
   - Initial ECU self-learning.
2. DTC setting condition
   - Improper throttle lower limit position 【Voltage of signal 1 is out of range (0.212~0.865V) and voltage of signal 2 are out of range (4.142~4.841V) at bottom dead center】 is detected when initial ECU self-learning is performed.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and adapter, turn ENGINE START STOP switch to ON	/	Next
2	Clear DTCs	/	Next
3	Turn ENGINE START STOP switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Observe if DTCs are reproduced	Yes	Next
		No	End
4	Check if the following self-learning conditions are met at the same time, as follows: Engine intake temperature is 5°C, 100.5°C > engine coolant temperature 5°C Engine speed <= 250 rpm Vehicle speed = 0. Battery voltage is 10 V Accelerator pedal opening angle < 14.9%	Yes	Next
		No	To meet all self-learning conditions
5	Clear DTCs, then turn ENGINE START STOP switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Observe if DTCs are reproduced	Yes	Next
		No	End
6	Remove the connector from throttle position sensor on wire harness, check if there is open circuit or short circuit between each signal of throttle	Yes	Repair or replace wire harness
		No	Replace throttle

No.	Operation Step	Test Result	Subsequent Step
7	Clear DTCs, turn ENGINE START STOP switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Depress accelerator pedal lightly for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P1104 Throttle Self Learning Condition not Fulfilled

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - Other conditions of throttle (DVE) self-learning do not meet, all conditions as follow:
     - Engine coolant temperature is 5°C < 100°C;
     - Intake temperature is 5°C;
     - Accelerator pedal opening angle is 0;
     - Vehicle speed is 0;
     - Engine speed is 0;
     - Connection of wire is proper, DVE and ECU is normal.
3. Operation required for DTC setting
   - Items that no malfunction are come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and adapter, turn ENGINE START STOP switch to ON	None	Next
2	Clear DTCs	None	Next
3	Turn ENGINE START STOP switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Then depress accelerator pedal lightly for several times to observe if DTCs are reproduced	Yes	Next
		No	End
4	Check if the following self-learning conditions are met at the same time, as follows: Engine intake temperature is 5°C, 100.5°C > engine coolant temperature 5°C Engine speed <= 250 rpm Vehicle speed = 0. Battery voltage is 10 V Accelerator pedal opening angle < 14.9%	Yes	Next
		No	To meet all self-learning conditions
5	Clear DTCs, turn ENGINE START STOP switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Depress accelerator pedal lightly for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P1106 Throttle Position Deviation Error

1. DTC operating condition
   - Engine is running (starting is completed).
2. DTC setting condition
   - Throttle actual opening angle and target opening angle are out of limit (difference exceeds 4~50 % according to different opening angle);
   - Throttle body PID regulation parameter is less than threshold value (throttle PID control duty radio signal is higher than 80%, and control motor negative direction);
   - Throttle body PID regulation parameter is more than threshold value (throttle PID control duty radio signal is higher than 80%, and control motor positive direction).

3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and adapter, turn ENGINE START STOP switch to ON	/	Next
2	Clear DTCs, depress accelerator pedal quickly and slowly separately for several times to observe if DTCs are reproduced	Yes	Step 4
		No	Next
3	Start engine and depress accelerator pedal for several times in neutral to observe if faults are reproduced	Yes	Next
		No	End
4	Remove the connector from throttle position sensor on wire harness, check if there is open circuit in ground signal or power source signal of throttle motor; check if there is short circuit between ground signal and power source signal of motor	Yes	Repair or replace wire harness
		No	Replace throttle
5	Clear DTCs, turn ENGINE START STOP switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Depress accelerator pedal lightly for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P1111 Return Spring Check Max Error

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - When the throttle body is powered off, valve plate cannot return limp position (throttle powered off position) in time.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and adapter, turn ENGINE START STOP switch to ON	None	Next
2	Clear DTCs	None	Next

No.	Operation Step	Test Result	Subsequent Step
3	Turn ignition switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Observe if DTCs are reproduced	Yes	Next
		No	End
4	Check if throttle valve plate is stuck	Yes	Clean or replace throttle
		No	Next
5	Remove the connector from throttle position sensor on wire harness, check if there is open circuit in ground signal or power source signal of throttle motor; check if there is short circuit between ground signal and power source signal of motor	Yes	Repair or replace wire harness
		No	Replace throttle
6	Clear DTCs, turn ENGINE START STOP switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Depress accelerator pedal lightly for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P1615 ECM Status Unknown P1616 Authentication not OK P1617 No Response from SIM during Challenge Period P1618 Fail to Write EOL Confidtional Data into EEProm P1619 ECM not Programed (Virgin State)

1. DTC operating condition
   - None.
2. DTC setting condition
   - P1615 - ECU detects eeprom state error (chip fault in general);
   - P1616 - ECU detects that authentication reply of immobilizer is incorrect and anti-theft authentication fails;
   - P1617 - ECU detects anti-theft authentication communication error or no response from immobilizer;
   - P1618 - ECU detects that key written fails when anti-theft matching;
   - P1619 - ECU detects that ECU does not perform anti-theft matching.
3. Operation required for DTC setting
   - P1615 - Fault occurs and is confirmed immediately, ECU does not illuminate any light;
   - P1617 - ECU does not illuminate any light (anti-theft malfunction light is illuminated by theft deterrent system);
   - P1617 - ECU does not illuminate any light (anti-theft malfunction light is illuminated by theft deterrent system);
   - P1619 - Fault occurs and be confirmed immediately. ECU does not illuminate any light (anti-theft malfunction light is illuminated by theft deterrent system).
   - P1619 - Fault occurs and be confirmed immediately. ECU does not illuminate any light (anti-theft malfunction light is illuminated by theft deterrent system).
4. Conditions for malfunction indicator light off / DTC clearing
   - P1615 - After fault is repaired, fault is deleted;
   - P1617 - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - P1617 - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - P1618 - After fault is repaired, fault is deleted;
   - P1619 - After fault is repaired, fault is deleted.

No.	Operation Step	Test Result	Subsequent Step
1	Immobilizer connector looseness or separation	Yes	Reconnect
		No	Next
2	Immobilizer circuit fault	Yes	Repair wire harness
		No	Next

No.	Operation Step	Test Result	Subsequent Step
3	If ECU has been replaced, check if anti-theft authentication code is incorrect or not updated	Yes	Refresh anti-theft code
		No	Next
4	Immobilizer fault	Yes	Check immobilizer
		No	Next
5	Anti-theft module circuit fault corresponding to ECU terminal	Yes	Inspect and repair ECU
		No	Diagnostic Help

P2088 Control Circuit Low of Camshaft Control Valve (Inlet)

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to ground (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Intake VVT control solenoid valve signal terminal short to ground	Yes	Repair wire harness
		No	Next
2	Intake VVT control solenoid valve power supply terminal short to ground	Yes	Repair wire harness
		No	Next
3	Intake VVT control solenoid valve signal terminal pin corresponding to ECU short to ground	Yes	Inspect and repair ECU
		No	Diagnostic Help

P2089 Control Circuit High of Camshaft Control Valve (Inlet)

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to power source (it is detected that voltage UCE of output terminal is 12 V with driver switch on)
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Intake VVT control solenoid valve signal terminal short to power source	Yes	Repair wire harness
		No	Next
2	Intake VVT control solenoid valve signal terminal pin corresponding to ECU terminal short to power source	Yes	Inspect and repair ECU
		No	Diagnostic Help

P2090 Control Circuit Low of Camshaft Control Valve (Outlet)

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to ground (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Exhaust VVT control solenoid valve signal terminal short to ground	Yes	Repair wire harness
		No	Next
2	Exhaust VVT control solenoid valve power supply terminal short to ground	Yes	Repair wire harness
		No	Next
3	Exhaust VVT control solenoid valve signal terminal pin corresponding to ECU short to ground	Yes	Inspect and repair ECU
		No	Diagnostic Help

P2091 Control Circuit High of Camshaft Control Valve (Outlet)

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to power source (it is detected that voltage UCE of output terminal is 12 V with driver switch on)
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Exhaust VVT control solenoid valve signal terminal short to power source	Yes	Repair wire harness
		No	Next
2	Exhaust VVT control solenoid valve signal terminal pin corresponding to ECU terminal short to power source	Yes	Inspect and repair ECU
		No	Diagnostic Help

P2106 Throttle Power Stage Non-plausible Error

1. DTC operating condition
   - Engine is running (starting is completed) Internal subdivision faults of corresponding ECU is:
     - Improper electronic throttle drive level faults;
     - Maximum electronic throttle drive level malfunction (shour circuit);
     - Electronic throttle drive level signal malfunction (open circuit);
     - Minimum electronic throttle drive level malfunction (overheat or overcurrent).
   - Engine speed is higher than 1200rpm (Internal subdivision faults of corresponding ECU: load monitoring faults)
2. DTC setting condition
   - Electronic throttle drive level malfunction (ECU internal drive chip feedback fault condition);
     - (Internal subdivision faults of corresponding ECU: Improper electronic throttle drive level faults.
   - Short circuit between positive and negative of electronic throttle drive level (short circuit between positive and negative of ECU internal drive chip feedback chip);
     - Internal subdivision DTCs of corresponding ECU: Maximum electronic throttle drive level faults (short circuit).
   - There is open circuit between positive and negative terminals of electronic throttle drive level (there is open circuit between positive and negative terminals of ECU internal drive chip feedback chip);
     - Internal subdivision DTCs of corresponding ECU: Electronic throttle drive level signal faults (open circuit).
   - ECU monitors and detects that load signal is improper (load signal exceeds load monitoring signal calculated by ECU internal model);
     - (Internal subdivision DTCs of corresponding ECU: load monitoring faults).
   - Electronic throttle drive overheating or overcurrent.
     - Internal subdivision DTCs of corresponding ECU: Minimum electronic throttle drive level faults (overheating or overcurrent).
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and adapter, turn ENGINE START STOP switch to ON	/	Next
2	Clear DTCs	/	Next
3	Turn ENGINE START STOP switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning. Observe if DTCs are reproduced	Yes	Next
		No	End
4	Replace with new ECU to check if malfunction reoccurs	Next	
5	Turn ENGINE START STOP switch to ON, and wait for 1 minute to finish the throttle self-learning. Then start engine and depress accelerator pedal for several times in neutral to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P2122 Pedal Pos.Sensor 1 Circ. Low Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - Voltage of 1st signal circuit is less than lower limit threshold value 0.586V.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Check if wire harnesses are connected properly	Yes	Next
		No	Reconnect
2	Connect a diagnostic tester and adapter, turn ignition switch to ON; clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Next
		No	End
3	Remove the connector from electronic accelerator pedal position sensor on wire harness key, check if there is open circuit or short circuit to ground in accelerator pedal circuit 1 signal	Yes	Repair or replace wire harness
		No	Replace accelerator pedal
4	Turn ENGINE START STOP switch to ON, clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P2123 Pedal Pos.Sensor 1 Circ. High Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - Voltage of circuit 1 signal circuit is more than upper limit threshold value 4.824 V
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Check if the related wire harnesses are connected properly	Yes	Next
		No	Reconnect
2	Connect a diagnostic tester and adapter, turn ignition switch to ON; clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Next
		No	End
3	Remove the connector from throttle position sensor on wire harness, check if accelerator pedal circuit 1 signal is short to 5V power source	Yes	Repair or replace wire harness
		No	Replace accelerator pedal
4	Turn ENGINE START STOP switch to ON, clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P2127 Pedal Pos.Sensor 2 Circ. Low Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - Voltage of 2nd circuit signal is less than lower limit threshold value 0.43V.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Check if wire harnesses are connected properly	Yes	Next
		No	Reconnect
2	Connect a diagnostic tester and adapter, turn ignition switch to ON; clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Next
		No	End
3	Remove the connector from electronic accelerator pedal position sensor on wire harness key, check if there is open circuit or short circuit to ground in accelerator pedal circuit 2 signal	Yes	Repair or replace wire harness
		No	Replace accelerator pedal
4	Turn ENGINE START STOP switch to ON, clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P2128 Pedal Pos.Sensor 2 Circ. High Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - Voltage of 2nd signal circuit is more than upper limit threshold value 4.961 V.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Check if wire harnesses are connected properly	Yes	Next
		No	Reconnect
2	Connect a diagnostic tester and adapter, turn ignition switch to ON; clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Next
		No	End
3	Remove the connector from throttle position sensor on wire harness, check if accelerator pedal circuit 2 signal is short to 5V power source	Yes	Repair or replace wire harness
		No	Replace accelerator pedal
4	Turn ENGINE START STOP switch to ON, clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P2138 Pedal Movement Check Error

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - One circuit signal is at the idle point (signal 1 is less than 0.88V), signal of another circuit is far away idle point (twice of the signal 2 value is 0.92V). Data will vary with different items;
     - Internal subdivision faults of corresponding ECU: Accelerator pedal movement inspection faults.
   - Voltage signal deviation of 1st circuit and 2nd circuit exceeds a certain range (difference between signal 1 and twice of signal 2 value is out of range 0.03 V - 1.15 V according to voltage).
     - Internal subdivision faults of corresponding ECU: Improper electronic accelerator pedal position sensor signal.
3. Operation required for DTC setting
   - No light comes on;
     - Internal subdivision faults of corresponding ECU: Accelerator pedal movement inspection faults.
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.

- Internal subdivision faults of corresponding ECU: Improper electronic accelerator pedal position sensor signal.

4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs until all DTCs are cleared;
     - Internal subdivision faults of corresponding ECU: Accelerator pedal movement inspection faults.
   - After fault is repaired, SVS light will go off immediately;
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.
     - Internal subdivision faults of corresponding ECU: Improper electronic accelerator pedal position sensor signal.

No.	Operation Step	Test Result	Subsequent Step
1	Check if the related wire harnesses are connected properly	Yes	Next
		No	Reconnect
2	Connect diagnostic tester and adapter, turn ENGINE START STOP switch to ON	/	Next
3	Clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Next
		No	End
4	Remove the connector from electronic accelerator pedal sensor on wire harness key, check if resistance of accelerator pedal circuit 1 signal or circuit 2 signal is in proper range	Yes	Next
		No	Repair or replace wire harness
5	Remove the connector from electronic accelerator pedal sensor on wire harness key, check if resistance between accelerator pedal circuit 1 signal or circuit 2 signal and other signals is in proper range	Yes	Repair or replace wire harness
		No	Replace accelerator pedal
6	Turn ENGINE START STOP switch to ON, clear DTCs, quickly and slowly depress accelerator pedal separately for several times to observe if DTCs are reproduced	Yes	Diagnostic Help
		No	End

P2177 System Too Lean Off Idle

1. DTC operating condition
   - Air-fuel ratio self-learning is enable;
   - Engine speed is between 1440 and 4000 rpm/(for MT: 1440 - 3320 rpm, for CVT: 1440 - 2720 rpm);
   - Engine load is between 18 and 70.5%/(for MT: 18 - 57.75, for CVT: 24.75 - 69.75);
   - Engine intake air flow is in range of 18-140kg/h/ (MT: 24-110kg/h, CVT: (22-110kg/h); (Recommended operating condition: Drive vehicle at 4th (60 km/h) or 5th (70 km/h) for 0.5 ~ 1 hour until fault is output. Specific time depends on the oil-gas load of canister, longer at summer in general).
2. DTC setting condition
   - ECU detects that air-fuel radio closed loop control self-learning value exceeds 1.23.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.

4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.4 wire (white, heater power source positive) is 12V	Yes	Next
		No	Check wire harness and connector
4	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.3 wire (white, heater power source grounded) is 12V	Yes	Next
		No	Check wire harness and connector
5	Puncture wire harness connector near ECU terminal No. 4 wire insulation layer (white, heater power source positive) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 3 wire insulation layer (white, heater power source grounded) with black pole of multimeter. Check if voltage between two ends is about 12 V	Yes	Next
		No	Check relay fuse
6	Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45V	Yes	Next
		No	Replace oxygen sensor
7	Start and keep vehicle idling until coolant temperature reaches normal value. Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is between 0 V and 1 V.	Yes	Next
		No	Replace oxygen sensor
8	Disconnect upstream oxygen sensor connector and measure if sensor terminal 1 connector (gray, oxygen sensor signal grounded) and 2 connector (black, oxygen sensor signal wire) are short circuit with a multimeter	Yes	Replace oxygen sensor
		No	Next
9	Connect upstream oxygen sensor connector properly, repeat step 6-7 and check if voltage signal is changed in range of 0.44 V- 0.46 V and 0 V - 1 V respectively	Yes	End
		No	Diagnostic Help

P2178 System Too Rich Off Idle

1. DTC operating condition
   - Air-fuel ratio self-learning is enable.
   - Engine speed is between 1440 and 4000 rpm/(for MT: 1440 - 3320 rpm, for CVT: 1440 - 2720 rpm);
   - Engine load is between 18 and 70.5%/(for MT: 18 - 57.75, for CVT: 24.75 - 69.75);
   - Engine intake air flow is in range of 18-140kg/h/ (MT: 24-110kg/h, CVT: (22-110kg/h); (Recommended operating condition: Drive vehicle at 4th (60 km/h) or 5th (70 km/h) for 0.5 ~ 1 hour until fault is output. Specific time depends on the oil-gas load of canister, longer at summer in general).
2. DTC setting condition
   - ECU detects that air-fuel radio closed loop control self-learning value is less than 0.77.

3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After one fault is detected in 3 consecutive driving cycles, MIL light will come on, and SVS light will go off;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Check if fuel supply system is abnormal. Check if injector valve leaks, injection pressure is abnormal, canister valve is stuck or check if there is any other fault	Yes	Troubleshooting
		No	Next
4	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.4 wire (white, heater power source positive) is 12V	Yes	Next
		No	Check wire harness and connector
5	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.3 wire (white, heater power source grounded) is 12V	Yes	Next
		No	Check wire harness and connector
6	Puncture wire harness connector near ECU terminal No. 4 wire insulation layer (white, heater power source positive) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 3 wire insulation layer (white, heater power source grounded) with black pole of multimeter. Check if voltage between two ends is about 12 V	Yes	Next
		No	Check relay fuse
7	Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45V	Yes	Next
		No	Replace oxygen sensor
8	Start and keep vehicle idling until coolant temperature reaches normal value. Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is between 0 V and 1 V.	Yes	Next
		No	Replace oxygen sensor
9	Disconnect upstream oxygen sensor connector and measure if sensor terminal 1 connector (gray, oxygen sensor signal grounded) and 2 connector (black, oxygen sensor signal wire) are short circuit with a multimeter	Yes	Replace oxygen sensor
		No	Next
10	Connect upstream oxygen sensor connector properly, repeat step 6-7 and check if voltage signal is changed in range of 0.44 V- 0.46 V and 0 V - 1 V respectively	Yes	End
		No	Diagnostic Help

P2187 System Too Lean at Idle

1. DTC operating condition
   - Air-fuel ratio self-learning is enable;
   - Engine speed is less than 920 rpm;
   - Engine intake air flow is less than a certain value (MT：10kg/h， CVT：12kg/h); (Perform operation between the 4th (60 km/h) or 5th (70 km/h) and the parking idling alternately for 5-10 minutes respectively. After above operation is performed for 30 minutes respectively, perform parking idling until fault is output).
2. DTC setting condition
   - ECU detects that air-fuel radio closed loop control self-learning value exceeds a certain value (8%).
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - If the fault is detected in 3 consecutive driving cycles, MIL light will come on
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.4 wire (white, heater power source positive) is 12V	Yes	Next
		No	Check wire harness and connector
4	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.3 wire (white, heater power source grounded) is 12V	Yes	Next
		No	Check wire harness and connector
5	Puncture wire harness connector near ECU terminal No. 4 wire insulation layer (white, heater power source positive) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 3 wire insulation layer (white, heater power source grounded) with black pole of multimeter. Check if voltage between two ends is about 12 V	Yes	Next
		No	Check relay fuse
6	Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45V	Yes	Next
		No	Replace oxygen sensor
7	Start and keep vehicle idling until coolant temperature reaches normal value. Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is between 0 V and 1 V.	Yes	Next
		No	Replace oxygen sensor

8	Disconnect upstream oxygen sensor connector and measure if sensor terminal 1 connector (gray, oxygen sensor signal grounded) and 2 connector (black, oxygen sensor signal wire) are short circuit with a multimeter	Yes	Replace oxygen sensor
		No	Next
9	Connect upstream oxygen sensor connector properly, repeat step 6-7 and check if voltage signal is changed in range of 0.44 V- 0.46 V and 0 V - 1 V respectively	Yes	End
		No	Diagnostic Help

P2188 System Too Rich at Idle

1. DTC operating condition
   - Air-fuel ratio self-learning is enable;
   - Engine speed is less than 920 rpm;
   - Engine intake air flow is less than a certain value (MT：10kg/h， CVT：12kg/h); (Perform operation between the 4th (60 km/h) or 5th (70 km/h) and the parking idling alternately for 5-10 minutes respectively. After above operation is performed for 30 minutes respectively, perform parking idling until fault is output).
2. DTC setting condition
   - ECU detects that air-fuel radio closed loop control self-learning value is less than a certain value (-8%).
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on;
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Check if fuel supply system is abnormal. Check if injector valve leaks, injection pressure is abnormal, canister valve is stuck or check if there is any other fault	Yes	Troubleshooting
		No	Next
4	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.4 wire (white, heater power source positive) is 12V	Yes	Next
		No	Check wire harness and connector
5	Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.3 wire (white, heater power source grounded) is 12V	Yes	Next
		No	Check wire harness and connector
6	Puncture wire harness connector near ECU terminal No. 4 wire insulation layer (white, heater power source positive) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 3 wire insulation layer (white, heater power source grounded) with black pole of multimeter. Check if voltage between two ends is about 12 V	Yes	Next
		No	Check relay fuse

No.	Operation Step	Test Result	Subsequent Step
7	Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECU terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45V	Yes	Next
		No	Replace oxygen sensor
8	Start and keep vehicle idling until coolant temperature reaches normal value. Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is between 0 V and 1 V.	Yes	Next
		No	Replace oxygen sensor
9	Disconnect upstream oxygen sensor connector and measure if sensor terminal 1 connector (gray, oxygen sensor signal grounded) and 2 connector (black, oxygen sensor signal wire) are short circuit with a multimeter	Yes	Replace oxygen sensor
		No	Next
10	Connect upstream oxygen sensor connector properly, repeat step 6-7 and check if voltage signal is changed in range of 0.44 V- 0.46 V and 0 V - 1 V respectively	Yes	End
		No	Diagnostic Help

P2195 O2 Sensor Signal Stuck Lean (Upstream of the Catalyzer)

1. DTC operating condition.
   - Engine speed is in a certain range(for MT: 1120 - 3120 rpm , for CVT: 1400 - 2320 rpm);
   - Engine load is in range of 20.25 - 69.75% steadily;
   - Temperature of upstream oxygen sensor is higher than 500 deg;
   - Rear oxygen closed loop control effect; [Recommended operating condition: After vehicle is driving at a low speed (lower than 50 km/h) for 10 minutes, drive vehicle at 5th (70 km/h) for 5-10 minutes steadily].
2. DTC setting condition
   - ECU detects that rear oxygen control integration (an integration compensation of rear oxygen closed loop control) exceeds a certain value (0.95 s), it indicates unilateral deterioration for upstream oxygen sensor (indicates a response of one direction), causing emission level exceeds OBD limiting value.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - If the fault is detected in 3 consecutive driving cycles, MIL light will come on
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Check exhaust system for leakage, gasket for damage	Yes	Repair leaking area
		No	Next

No.	Operation Step	Test Result	Subsequent Step
4	Upstream oxygen sensor: Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is in range of 0.44 V - 0.46 V	Yes	Next
		No	Replace oxygen sensor
5	Downstream oxygen sensor: Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is in range of 0.44 V - 0.46 V	Yes	Next
		No	Replace oxygen sensor
6	Start and keep vehicle idling until coolant temperature reaches normal value. Upstream oxygen sensor: Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage changes in range of 0 V - 1 V	Yes	Next
		No	Replace oxygen sensor
7	Start and keep vehicle idling until coolant temperature reaches normal value. Downstream oxygen sensor: Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage changes in range of 0 V - 1 V	Yes	Next
		No	Replace oxygen sensor
8	Clear DTCs. Check if malfunction reappears after returning vehicle to customer	Yes	Next
		No	End
9	Replace the catalytic converter, and check according to above steps 3-7. Clear DTCs. Check if malfunction reappears after returning vehicle to customer	Yes	Diagnostic Help
		No	End

P2196 O2 Sensor Signal Stuck Rich (Upstream of the Catalyzer)

1. DTC operating condition
   - Engine speed is in a certain range(for MT: 1120 - 3120 rpm , for CVT: 1400 - 2320 rpm);
   - Engine load is in range of 20.25 - 69.75% steadily;
   - Temperature of upstream oxygen sensor is higher than 500 deg;
   - Rear oxygen closed loop control effect; [Recommended operating condition: After vehicle is driving at a low speed (lower than 50 km/h) for 10 minutes, drive vehicle at 5th (70 km/h) for 5-10 minutes steadily].
2. DTC setting condition
   - ECU detects that rear oxygen control integration (an integration compensation of rear oxygen closed loop control) exceeds a certain value (0.95 s), it indicates unilateral deterioration for upstream oxygen sensor (indicates a response of one direction), causing emission level exceeds OBD limiting value.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;

- If the fault is detected in 3 consecutive driving cycles, MIL light will come on
- Diagnostic tester will be visible.

4. Conditions for malfunction indicator light off / DTC clearing

- Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
- Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
- Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Check exhaust system for leakage, gasket for damage	Yes	Repair leaking area
		No	Next
4	Upstream oxygen sensor: Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is in range of 0.44 V - 0.46 V	Yes	Next
		No	Replace oxygen sensor
5	Downstream oxygen sensor: Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is in range of 0.44 V - 0.46 V	Yes	Next
		No	Replace oxygen sensor
6	Start and keep vehicle idling until coolant temperature reaches normal value. Upstream oxygen sensor: Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage changes in range of 0 V - 1 V	Yes	Next
		No	Replace oxygen sensor
7	Start and keep vehicle idling until coolant temperature reaches normal value. Downstream oxygen sensor: Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage changes in range of 0 V - 1 V	Yes	Next
		No	Replace oxygen sensor
8	Clear DTCs. Check if malfunction reappears after returning vehicle to customer	Yes	Next
		No	End
9	Replace the catalytic converter, and check according to above steps 3-7. Clear DTCs. Check if malfunction reappears after returning vehicle to customer	Yes	Diagnostic Help
		No	End

P2270 O2 Sensor Signal Stuck Lean (Downstream of the Catalyzer)

1. DTC operating condition
   - Rear oxygen closed loop control effect for more than a certain period of time;
   - Diagnostic enrichment for more than a certain period of time; [Recommended operating condition: After vehicle is driving at a low speed (lower than 50 km/h) for 10 minutes, drive vehicle at 5th (70 km/h) for 5-10 minutes steadily].
2. DTC setting condition
   - ECU detects that rear oxygen sensor voltage is less than 0.582V continually.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - If the fault is detected in 3 consecutive driving cycles, MIL light will come on
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Check exhaust system for leakage, gasket for damage	Yes	Repair leaking area
		No	Next
4	Downstream oxygen sensor: Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is in range of 0.44 V - 0.46 V	Yes	Next
		No	Replace oxygen sensor
5	Start and keep vehicle idling until coolant temperature reaches normal value. Downstream oxygen sensor: Puncture wire harness connector near ECU terminal No. B wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. A wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage changes in range of 0 V - 1 V	Yes	Next
		No	Replace oxygen sensor
6	Start and keep vehicle idling until coolant temperature reaches normal value. Depress and release accelerator pedal frequently and alternately for 90 s, at the same time, puncture downstream oxygen sensor wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is beyond ① range of 0.55 V - 0.65 V	Yes	End
		No	Diagnostic Help

- Beyond range of 0.55 V - 0.65 V means: Detected voltage was once higher than 0.55 V - 0.65 V and also was once lower than 0.55 V - 0.65 V.

P2271 O2 Sensor Signal Stuck Rich (Downstream of the Catalyzer)

1. DTC operating condition
   - Rear oxygen closed loop control effect for more than a certain period of time;
   - Diagnostic enrichment for more than a certain period of time; [Recommended operating condition: After vehicle is driving at a low speed (lower than 50 km/h) for 10 minutes, drive vehicle at 5th (70 km/h) for 5-10 minutes steadily].
2. DTC setting condition
   - ECU detects that rear oxygen sensor voltage is higher than 0.681 V continually.
3. Operation required for DTC setting
   - Once the fault is confirmed, SVS light will come on immediately, and the system will enter the fault memory;
   - If the fault is detected in 3 consecutive driving cycles, MIL light will come on
   - Diagnostic tester will be visible.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Read and store fault freeze frame information	/	Next
3	Check exhaust system for leakage, gasket for damage	Yes	Repair leaking area
		No	Next
4	Downstream oxygen sensor: Puncture wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is in range of 0.44 V - 0.46 V	Yes	Next
		No	Replace oxygen sensor
5	Start and keep vehicle idling until coolant temperature reaches normal value. Downstream oxygen sensor: Puncture wire harness connector near ECU terminal No. B wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. A wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage changes in range of 0 V - 1 V	Yes	Next
		No	Replace oxygen sensor
6	Start and keep vehicle idling until coolant temperature reaches normal value. Depress and release accelerator pedal frequently and alternately for 90 s, at the same time, puncture downstream oxygen sensor wire harness connector near ECU terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECU terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is beyond ② range of 0.55 V - 0.65 V	Yes	End
		No	Diagnostic Help

- Beyond range of 0.55 V - 0.65 V means: Detected voltage was once higher than 0.55 V - 0.65 V and also was once lower than 0.55 V - 0.65 V.

U0001 Error Busoff on CAN-bus

1. DTC operating condition
   - Ignition switch ON for more than 0.5s;
   - Battery voltage is in range of 9~16 V
2. DTC setting condition
   - CAN controller detects CAN hardware fault.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	CAN bus connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Short circuit to power source / ground or open circuit in CAN bus connector pin	Yes	Repair wire harness
		No	Next
3	There is wire harness signal interference	Yes	Shielded wire
		No	Next
4	Short circuit to power source / ground, open circuit or internal circuit damage in CAN bus connector pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

U0101 Lost Communication with TCM

1. DTC operating condition
   - ECU does not detect CAN line BUSOFF fault;
   - Engine is running.
2. DTC setting condition
   - ECU detects that information from TCU control module is missing.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	TCU connector looseness or poor contact	Yes	Reconnect
		No	Next
2	There is wire harness signal interference	Yes	Shielded wire
		No	Next
3	Transmission line between TCU and ECU damaged or interrupted	Yes	Repair wire harness
		No	Next
4	Check if there is CAN hardware circuit fault	Yes	Refer to repair procedures of U0001
		No	Next
5	TCU is damaged and signal cannot be transmitted to ECU normally	Yes	Consult the TCU supplier
		No	Diagnostic Help

U0129 Lost Communication With Brake System Control Module

1. DTC operating condition
   - ECU does not detect CAN line BUSOFF fault;
   - Engine is running.
2. DTC setting condition
   - ECU detects that information from ABS control module is missing.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	ABS connector looseness or separation	Yes	Reconnect
		No	Next
2	There is wire harness signal interference	Yes	Shielded wire
		No	Next
3	Transmission line between ABS and ECU is damaged or interrupted	Yes	Repair wire harness
		No	Next
4	Check if there is CAN hardware circuit fault	Yes	Refer to repair procedures of U0001
		No	Next
5	ABS is damaged and signal cannot be transmitted to ECU normally	Yes	Consult the ABS supplier
		No	Diagnostic Help

U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module

1. DTC operating condition
   - ECU does not detect CAN line BUSOFF fault;
   - Engine is running.
2. DTC setting condition
   - ECU detects that information from IPC control module is missing.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	IPC connector looseness or separation	Yes	Reconnect
		No	Next
2	There is wire harness signal interference	Yes	Shielded wire
		No	Next
3	Transmission line between IPC and ECU damaged or interrupted	Yes	Repair wire harness
		No	Next
4	Check if there is CAN hardware circuit fault	Yes	Refer to repair procedures of U0001
		No	Next
5	IPC is damaged and signal cannot be transmitted to ECU normally	Yes	Consult the IPC supplier
		No	Diagnostic Help

P0033 Dump Valve Control Circuit Open

1. DTC operating condition
   - Battery voltage is in range of 8 ~ 18 V;
   - Engine is running.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 6 V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or disengagement	Yes	Reconnect
		No	Next
2	Open circuit in supercharging discharge control valve circuit pin	Yes	Repair wire harness
		No	Next
3	Open circuit in supercharging discharge control valve power supply terminal	Yes	Repair wire harness
		No	Next
4	Open circuit or internal circuit damage in supercharging discharge control valve pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0034 Dump Valve Control Circuit Low

1. DTC operating condition
   - Battery voltage is in range of 8 ~ 18 V;
   - Engine is running.
2. DTC setting condition
   - ECU detects short circuit to ground in control terminal pin (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or disengagement	Yes	Reconnect
		No	Next
2	Supercharging discharge control valve circuit pin short to ground	Yes	Repair wire harness
		No	Next
3	Supercharging discharge control valve power supply terminal short to ground	Yes	Repair wire harness
		No	Next
4	Supercharging discharge control valve pin corresponding to ECU terminal short to ground	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0035 Dump Valve Control Circuit High

1. DTC operating condition.
   - Battery voltage is in range of 8 ~ 18 V;
   - Engine is running.
2. DTC setting condition
   - ECU detects short circuit to ground in control terminal pin (it is detected that voltage UCE of output terminal is 12 V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or disengagement	Yes	Reconnect
		No	Next
2	Supercharging discharge control valve circuit pin short to power source	Yes	Repair wire harness
		No	Next
3	Supercharging discharge control valve pin corresponding to ECU terminal short to power source	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0105 Manifolt Absolut Pressure Circuit No Change

1. DTC operating condition
   - Engine speed ＞ 800 rpm.
2. DTC setting condition
   - ECU detects that pressure value of intake manifold drops below 20 hpa.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Do not start engine, and observe if "Intake Pressure" item in data flow is seriously deviated from ambient pressure by about 101 kpa (specific value is related to current pressure)	Yes	Repair or replace sensor
		No	Next
3	Turn ENGINE START STOP switch "OFF", and check if there is any freeze, oil stain, etc. on measurement terminal, which will affect normal measurement	Yes	Repair or replace sensor
		No	Next
4	Check if intake pressure sensor installation position is incorrect, intake pipe is disconnected or seriously leaked	Yes	Repair intake pipe, sensor
		No	Diagnostic Help

P0106 Manifold Abs.Pressure Performance Non-plausible

1. DTC operating condition
   - Engine is running.
2. DTC setting condition
   - ECU detected that intake temperature value is not within upper and lower limit range. (Maximum and minimum reasonable threshold pressure), the upper and lower limits of intake manifold pressure are variables, non-fixed values.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Do not start engine, and observe if "Intake Pressure" item in data flow is seriously deviated from ambient pressure by about 101 kpa (specific value is related to current pressure)	Yes	Repair or replace sensor
		No	Next
3	Turn ENGINE START STOP switch "OFF", and check if there is any freeze, oil stain, etc. on measurement terminal, which will affect normal measurement	Yes	Repair or replace sensor
		No	Next
4	Check if intake pressure sensor installation position is incorrect, intake pipe is disconnected or seriously leaked	Yes	Repair intake pipe, sensor
		No	Diagnostic Help

P0107 Manifold Abs.Pressure Low Input

1. DTC operating condition
   - More than 1 second has elapsed after engine starting.
2. DTC setting condition
   - ECU detects that voltage value of intake manifold pressure sensor is less than 0.195 V.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect the diagnostic tester and start vehicle. Use a multimeter to measure if sensor signal terminal voltage is close to or equal to 0 V	Yes	Next
2	Turn ignition switch "OFF", check if sensor signal terminal is short to ground	Yes	Repair wire harness
		No	Next
3	Sensor is damaged	Yes	Replace sensor
		No	Next
4	Sensor signal pin terminal corresponding to ECU short to ground	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0108 Manifold Abs.Pressure High Input

1. DTC operating condition
   - More than 1 second has elapsed after engine starting.
2. DTC setting condition
   - ECU detected that voltage value of intake manifold pressure sensor is more than 4.88 V.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON" Do not start engine, and observe if "Intake Temperature Sensor Measured Value" in data flow is too low. If value is lower than normal condition, observe minimum intake manifold temperature range. You can also use a multimeter to measure if voltage between intake manifold temperature sensor signal terminal and ground is close to or equal to 5V	Yes	Next
2	Turn ENGINE START STOP switch OFF"and check if connector is loosen or has poor contact	Yes	Reconnect
		No	Next
3	Check if there is short circuit to power source or open circuit in sensor signal terminal	Yes	Repair wire harness
		No	Next
4	Open circuit in sensor reference ground	Yes	Repair, replace wire harness or sensor
		No	Next
5	Sensor is damaged	Yes	Replace sensor
		No	Next
6	Short circuit to power source, open circuit or internal circuit damage in intake manifold temperature sensor signal pin corresponding to ECU terminal	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0111 Intake Air Temp.Circ. Performance Non-plausible

1. DTC operating condition
   - More than 1 second has elapsed after engine starting.
2. DTC setting condition
   - ECU detected that intake temperature value is not within upper and lower limit range.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Do not start engine, observe if "Intake Temperature" item in data flow seriously deviated from actual temperature (value changes with current atmospheric pressure)	Yes	Repair, replace sensor
		No	Next

3	Turn ENGINE START STOP switch "OFF", and check if there is any freeze, oil stain, etc. on measurement terminal, which will affect normal measurement	Yes	Repair, replace sensor
		No	Next
4	Check if installation position of intake temperature sensor is incorrect	Yes	Repair sensor
		No	Diagnostic Help

P0481 Cooling Fan 2 Control Circuit Error

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 6 V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Short circuit to ground or open circuit in cooling fan relay circuit signal terminal	Yes	Repair wire harness
		No	Next
3	Cooling fan relay circuit malfunction (fuse blown or damaged)	Yes	Repair wire harness
		No	Next
4	Short circuit to ground, open circuit or internal circuit damage in cooling fan relay pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0693 Fan 2 Control Circuit Low

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to ground (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Short circuit to ground or open circuit in cooling fan relay circuit signal terminal	Yes	Repair wire harness
		No	Next
3	Cooling fan relay circuit malfunction (fuse blown or damaged)	Yes	Repair wire harness
		No	Next

No.	Operation Step	Test Result	Subsequent Step
4	Short circuit to ground, open circuit or internal circuit damage in cooling fan relay pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0234 Turbu/Super Charger Overboost Condition

1. DTC operating condition
   - Pressure before throttle valid;
   - No fault in ambient pressure sensor.
2. DTC setting condition
   - Actual boost pressure is higher than target pressure value excessively (high about 300 ~ 650 hPa).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Turbocharger relief solenoid damaged	Yes	Replace relief solenoid
		No	Next
2	Exhaust by-pass solenoid valve damaged (normally closed state)	Yes	Replace exhaust gas valve
		No	Diagnostic Help

P0237 Turbocharger Boost Sensor (A) Circ. Low Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - Boost pressure sensor measurement voltage is lower than 0.097V for more than 2 seconds.
3. Operation required for DTC setting
   - As long as one fault is detected in each driving cycle which meets DTC operating condition, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Sensor signal terminal pin short to ground	Yes	Repair wire harness
2	Sensor power supply terminal pin short to ground	No	Next
		Yes	Repair wire harness
3	Offset or damage to characteristics such as sensor resistance	No	Next
		Yes	Replace sensor
4	Sensor signal terminal pin corresponding to ECU short to ground	No	Next
		Yes	Inspect and repair ECU

P0238 Turbocharger Boost Sensor (A) Circ. High Input

1. DTC operating condition.
   - Ignition switch ON.
2. DTC setting condition
   - Boost pressure sensor measurement voltage is lower than 0.097V for more than 2 seconds.
3. Operation required for DTC setting
   - As long as one fault is detected in each driving cycle which meets DTC operating condition, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or disengagement	Yes	Reconnect
2	Short circuit to power source or open circuit in sensor signal terminal pin	No	Next
		Yes	Repair wire harness
3	Open circuit in sensor power supply terminal and ground terminal pin	No	Next
		Yes	Repair wire harness
4	Offset or damage to characteristics such as sensor resistance	No	Next
		Yes	Replace sensor
5	Short circuit to power source, open circuit or internal circuit damage in sensor signal terminal pin corresponding to ECU terminal	No	Next
		Yes	Inspect and repair ECU

P0243 Turbo/Super Charger Wastegate Solonoid Open

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 6 V with driver switch off).
3. Operation required for DTC setting
   - As long as one fault is detected in each driving cycle which meets DTC operating condition, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or disengagement	Yes	Reconnect
		No	Next
2	Open circuit in exhaust gas control valve drive circuit pin	Yes	Repair wire harness
		No	Next
3	Open circuit in exhaust gas control valve power supply terminal	Yes	Repair wire harness
		No	Next
4	Open circuit or internal circuit damage in drive pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0245 Turbo/Super Charger Wasteg.Solonoid Low

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects short circuit to ground in control terminal pin (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   - As long as one fault is detected in each driving cycle which meets DTC operating condition, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Exhaust gas control valve drive circuit pin short to ground	Yes	Repair wire harness
		No	Next
3	Short circuit to ground or internal circuit damage in drive pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0246 Turbo/Sup.Charger Wasteg.Solonoid High

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects short circuit to ground in control terminal pin (it is detected that voltage UCE of output terminal is 12 V with driver switch off).
3. Operation required for DTC setting
   - As long as one fault is detected in each driving cycle which meets DTC operating condition, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Exhaust gas control valve drive circuit pin short to power source	Yes	Repair wire harness
		No	Next
3	Short circuit to power source or internal circuit damage in drive pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0694 Fan 2 Control Circuit High

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to power source (it is detected that voltage UCE of output terminal is 12 V with driver switch on)
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Cooling fan relay control circuit short to power source	Yes	Repair wire harness
		No	Next
2	Cooling fan relay control pin corresponding to ECU terminal short to power source	Yes	Inspect and repair ECU
		No	Diagnostic Help

U0140 Lost Communication With Body Control Module (Immo)

1. DTC operating condition
   - ECU does not detect CAN line BUSOFF fault;
   - Engine is running.
2. DTC setting condition
   - ECU detects that information from BCM control module is missing.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles, MIL light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault is detected to be repaired successfully in 3 consecutive driving cycles, MIL light will go off;
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	BCM connector looseness or disengagement	Yes	Repair wire harness
		No	Next
2	There is wire harness signal interference	Yes	Shielded wire
		No	Next
3	Transmission line between BCM and ECU damaged or interrupted	Yes	Repair wire harness
		No	Next
4	Check if there is CAN hardware circuit fault	Yes	Refer to repair procedures of U0001
		No	Next
5	BCM is damaged and signal cannot be transmitted to ECU normally	Yes	Consult the BCM supplier
		No	Diagnostic Help

P0615 Starter Relay Circuit Open

1. DTC operating condition
   - Starting signal is sent (sent from key or PEPS);
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detected open circuit in control terminal pin.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Short circuit to ground, open circuit in starter control relay circuit signal terminal	Yes	Repair wire harness
		No	Next
3	Starter control relay circuit fault (fuse blown or damaged)	Yes	Repair wire harness
		No	Next
4	Short circuit to ground, open circuit or internal circuit damage in relay pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0616 Starter Relay Circuit Low

1. DTC operating condition.
   - Starting signal is sent (sent from key or PEPS);
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to ground (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Short circuit to ground or open circuit in starter control relay circuit signal terminal	Yes	Repair wire harness
		No	Next
3	Starter control relay circuit fault (fuse blown or damaged)	Yes	Repair wire harness
		No	Next
4	Short circuit to ground, open circuit or internal circuit damage in relay pin corresponding to ECU	Yes	Inspect and repair ECU
		No	Diagnostic Help

P0617 Starter Relay Circuit High

1. DTC operating condition
   - Starting signal is sent (sent from key or PEPS);
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - Control terminal pin is short to power source (it is detected that voltage UCE of output terminal is 12 V with driver switch on)
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Starter control relay control circuit short to power source	Yes	Repair wire harness
		No	Next
2	Relay control pin corresponding to ECU terminal short to power source	Yes	Inspect and repair ECU
		No	Diagnostic Help

P2261 Dump Valve - Mechanical Error

1. DTC operating condition
   - Surge is detected;
   - Discharge valve is opened;
   - Release accelerator pedal suddenly.
2. DTC setting condition
   - Discharge valve is stuck in OFF position.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Discharge control valve wire harness interrupted	Yes	Repair wire harness
		No	Next
2	Discharge control valve damaged	Yes	Replace discharge valve
		No	Diagnostic Help
3	Discharge control valve pin or circuit corresponding to ECU is damaged	Yes	Inspect and repair ECU
		No	Diagnostic Help

P2228 Barometric Pressure Low Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - Ambient pressure sensor voltage is lower than 0.195V.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Do not start engine, observe if "Ambient Pressure Value" item in data flow deviated from normal value (current pressure should be equal to atmospheric pressure)	Yes	Replace with new ECU to check if malfunction reoccurs
		No	Next
3	Start engine and drive vehicle at normal environment, observe if "Ambient Pressure Value" item in data flow deviated from normal value (current pressure should be equal to atmospheric pressure)	Yes	Replace ECU to perform real-vehicle check
		No	Diagnostic Help

P2229 Barometric Pressure High Input

1. DTC operating condition
   - Ignition switch ON.
2. DTC setting condition
   - Ambient pressure sensor voltage is higher than 4.883V.
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connect diagnostic tester and turn ENGINE START STOP switch to "ON"	/	Next
2	Do not start engine, observe if "Ambient Pressure Value" item in data flow deviated from normal value (current pressure should be equal to atmospheric pressure)	Yes	Replace with new ECU to check if malfunction reoccurs
		No	Next
3	Start engine and drive vehicle at normal environment, observe if "Ambient Pressure Value" item in data flow deviated from normal value (current pressure should be equal to atmospheric pressure)	Yes	Replace ECU to perform real-vehicle check
		No	Diagnostic Help

P2600 Diagnosis of Electrical Water Pump Control Circ.Open

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 6 V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Short circuit to ground, open circuit in electrical water pump control relay circuit signal terminal	Yes	Repair wire harness
		No	Next
3	Electrical water pump control relay circuit fault (fuse blown or damaged)	Yes	Repair wire harness
		No	Next
4	Short circuit to ground, open circuit or internal circuit damage in relay pin corresponding to ECU	Yes	Replace with new ECU to check if malfunction reoccurs
		No	Diagnostic Help

P2602 Diagnosis of Electrical Water Pump Control Circ.Low

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Short circuit to ground or open circuit in electrical water pump control relay circuit signal terminal	Yes	Repair wire harness
		No	Next
3	Electrical water pump control relay circuit fault (fuse blown or damaged)	Yes	Repair wire harness
		No	Next
4	Short circuit to ground, open circuit or internal circuit damage in relay pin corresponding to ECU	Yes	Replace with new ECU to check if malfunction reoccurs
		No	Diagnostic Help

P2603 Diagnosis of Electrical Water Pump Control Circ.high

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 12V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Electrical water pump relay control circuit short to power source	Yes	Repair wire harness
		No	Next
2	Relay control pin corresponding to ECU terminal short to power source	Yes	Inspect and repair ECU

P1427 Diagnosis of Brake Booster Pump Control Circ.High

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 12V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Brake vacuum booster pump control valve circuit pin short to power source	Yes	Repair wire harness
		No	Next
3	Brake vacuum booster pump control valve power supply terminal short to ground	Yes	Repair wire harness
		No	Next
4	Brake vacuum booster pump control valve pin corresponding to ECU terminal short to power source	Yes	Replace with new ECU to check if malfunction reoccurs
		No	Diagnostic Help

P1428 Diagnosis of Brake Booster Pump Control Circ.Low

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 0V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or poor contact	Yes	Reconnect
		No	Next
2	Brake vacuum booster pump control valve circuit pin short to ground	Yes	Repair wire harness
		No	Next
3	Brake vacuum booster pump control valve power supply terminal short to ground	Yes	Repair wire harness
		No	Next
4	Brake vacuum booster pump control valve pin corresponding to ECU terminal short to ground	Yes	Replace with new ECU to check if malfunction reoccurs
		No	Diagnostic Help

P1429 Diagnosis of Brake Booster Pump Control Circ.Open

1. DTC operating condition
   - Engine is running;
   - Battery voltage is in range of 8~18 V.
2. DTC setting condition
   - ECU detects open circuit in control terminal pin (it is detected that voltage UCE of output terminal is 6 V with driver switch off).
3. Operation required for DTC setting
   - After the fault is detected in 3 consecutive driving cycles and is confirmed, no light will come on.
4. Conditions for malfunction indicator light off / DTC clearing
   - Fault will be deleted after 40 consecutive trouble-free warm-up cycles;
   - Using diagnostic tester to clear DTCs, malfunction light will go off and DTCs are cleared.

No.	Operation Step	Test Result	Subsequent Step
1	Connector looseness or disengagement	Yes	Reconnect
		No	Next
2	Open in brake vacuum booster pump control valve circuit pin	Yes	Repair wire harness
		No	Next
3	Open circuit in brake vacuum booster pump control valve power supply terminal	Yes	Repair wire harness
		No	Next
4	Open circuit or internal circuit damage in brake vacuum booster pump control valve pin corresponding to ECU	Yes	Replace with new ECU to check if malfunction reoccurs
		No	Diagnostic Help

DIAGNOSIS & TESTING

Diagnosis Content

DTC Confirmation Procedure

- Turn ignition switch to OFF.
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up to normal operating temperature, and then select Read DTC.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Perform check and repair diagnosis procedure according to DTC

Caution:

- The following check and repair has been confirmed as the current steady-state malfunction, otherwise it will lead to a diagnosis error.
- The "Multimeter" mentioned below refers to a digital multimeter, which prohibits the use of an needle multimeter to check electronic fuel injection system circuit.
- Check and repair the vehicle with the anti-theft system. If there is "replace a new ECU to check if fault reproduces" in "Subsequent Step" column, be careful to program the ECU after replacement.
- If the DTC indicates that the voltage of a circuit is too low, it means that the circuit may be shorted to ground. If the DTC indicates that the voltage of a circuit is too high, it means that the circuit may be shorted to power supply; If the DTC is described as a circuit malfunction, it means that there may be open in the circuit or a variety of circuits malfunction.

Diagnostic steps

1. If DTC cannot be cleared, the malfunction is steady state malfunction;
2. If it is intermittent malfunction, the focus of inspection shall be put on whether wiring harness connector is loose.
3. There are no abnormal conditions after performing inspection according to above procedures;
4. During servicing, do not ignore vehicle maintenance condition, cylinder pressure and mechanical ignition timing, etc. that can affect the system.
5. Perform test with new ECU to check if malfunction reoccurs.

Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the following:

- Check if connector is loose.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect sensors and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Use data recorder and/or oscilloscope to help diagnose intermittent malfunctions.
- Remove the Engine Control Module (ECM) from malfunctioning vehicle and install it to a new vehicle to perform a test. If DTC cannot be cleared, ECU is malfunctioning. If DTC can be cleared, reinstall ECU to original vehicle.

Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) can increase resistance which will change the way in which a circuit works.

Electrical control circuits are very sensitive to proper grounding. A loose or corroded ground point can seriously affect control circuit. Check ground points as follows:

1. Remove ground bolt or nut.
2. Check all contact surfaces for tarnish, dirt and rust, etc.
3. Clean as necessary to ensure that contact is in good condition.
4. Reinstall ground bolt or nut securely.
5. Check if add-on accessories interfere with ground circuit.
6. If several wire harnesses are crimped into one ground terminal, check for proper crimps. Make sure that all wires are clean, securely fastened and good contacted without crimping any excessive insulation coat.

Throttle Self-learning

Perform throttle self-learning in the following conditions:

- Battery is removed and negative battery cable is disconnected.
- Replace with new ECU to check if malfunction reoccurs
- ECU is disconnected and reconnected.
- Throttle is replaced or cleaned.

Throttle self-learning conditions:

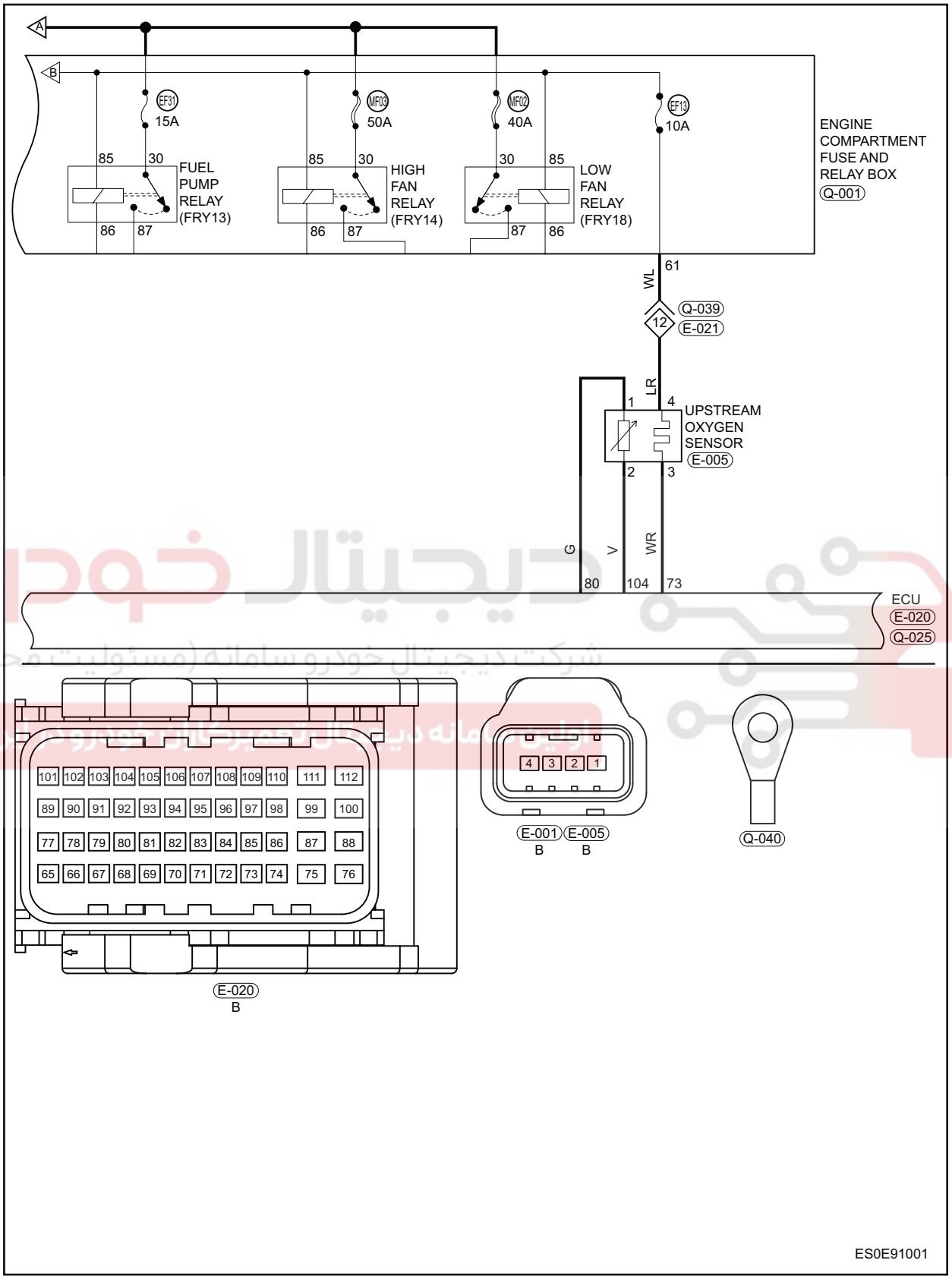
- Engine intake temperature > 5°C
- 100.5°C > engine coolant temperature > 5°C
- Engine speed ⩽ 250 rpm
- Vehicle speed = 0 km/h
- Battery voltage > 10 V
- Accelerator pedal opening angle < 14.9%

Throttle self-learning procedures:

Turn ignition switch to ON and then turn to OFF after waiting for 15 seconds. After self-learning is completed, start the vehicle and check for proper operation.

DTC	P0030 13	O2 Sensor Heater Control Circuit Open (Upstream of the Catalyzer)
DTC	P0031 11	O2 Sensor Heater Control Circuit Low (Upstream of the Catalyzer)
DTC	P0132 12	O2 Sensor Heater Control Circuit High (Upstream of the Catalyzer)
DTC	P0053 1E	O2 Sensor Heater Resistance too Large (Upstream of the Catalyzer)

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0030 13	O2 Sensor Heater Control Circuit Open (Upstream of the Catalyzer)	ENGINE START STOP switch ON, engine running	• Upstream Oxygen Sensor • Wire harness or connector • Fuse • ECU
P0031 11	O2 Sensor Heater Control Circuit Low (Upstream of the Catalyzer)		
P0132 12	O2 Sensor Heater Control Circuit High (Upstream of the Catalyzer)		
P0053 1E	O2 Sensor Heater Resistance too Large (Upstream of the Catalyzer)		

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Confirmation Procedure

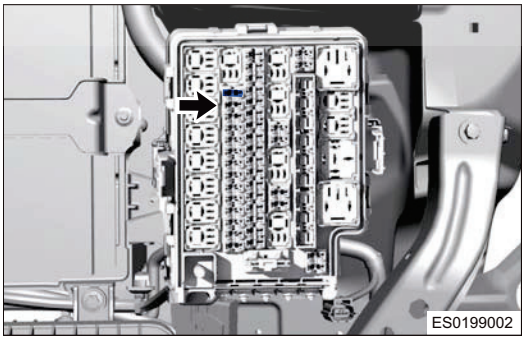
Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up to normal operating temperature, and then select Read DTC.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Procedure

1	**Check fuse EF13**

(a) Check if fuse EF13 is blown or no power.



Result

Proceed to
OK
NG

NG → **Replace fuse or check the cause for no power**

OK

2	**Check upstream oxygen sensor connector**

(a) Check if upstream oxygen sensor is connected infirmly or loose.

OK

Upstream oxygen sensor connector is installed normally

Result

Proceed to
OK
NG

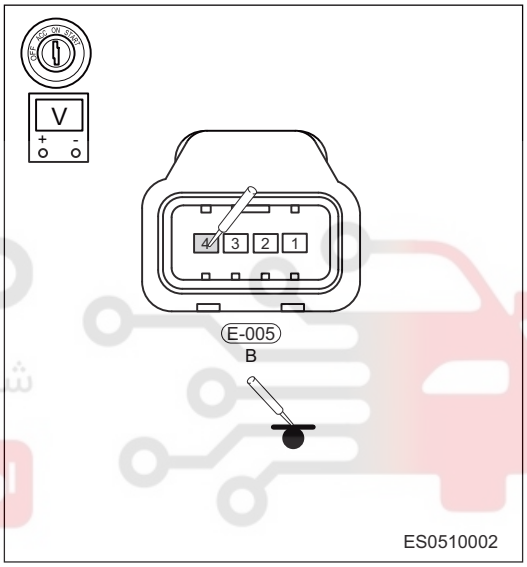
NG → **Reinstall or repair, replace connector**

OK

3 Check upstream oxygen sensor heater power supply voltage

(a) Turn ignition switch to ON.
(b) Measure voltage of terminal 4 of upstream oxygen sensor connector E-005 (using a digital multimeter) (online detection).

Multimeter Connection	Condition	Specified Condition
E-005 (4) - Body ground	ENGINE START STOP switch ON	Not less than 12 V



Result

Proceed to
OK
NG

NG → **Check wire harness between E-005 (4) and terminal 61 engine compartment fuse and relay box**

OK

4 Check upstream oxygen sensor heater voltage

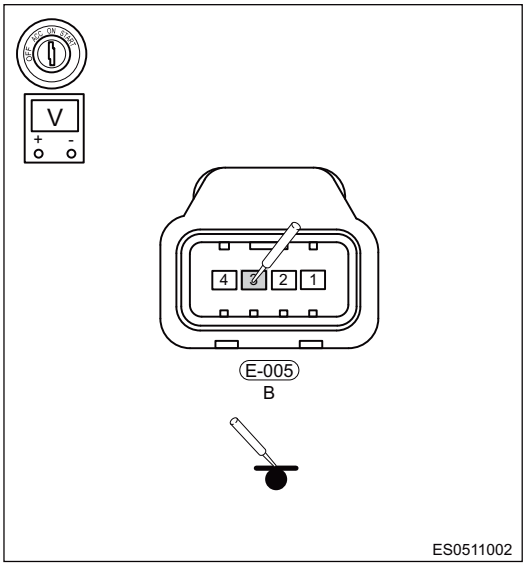
(a) Turn ignition switch to ON.

(b) Measure voltage of terminal 3 of upstream oxygen sensor connector E-005 (using a digital multimeter) (online detection).

Multimeter Connection	Condition	Specified Condition
E-005 (3) - Body ground	ENGINE START STOP switch ON	Not less than 12 V

Result

Proceed to
OK
NG



OK → **Go to step 6**

NG

5 Check upstream oxygen sensor heating resistance

(a) Turn ignition switch to ON, start engine and idle it for about 3 minutes.
(b) Check heating resistance between terminals 3 and 4 of upstream oxygen sensor E-005.

Multimeter Connection	Condition	Specified Condition
E-005 (3) - E-005 (4)	At room temperature	Not more than 15 Ω

Result

Proceed to
OK
NG

NG → **Replace upstream oxygen sensor**

OK

6 Check upstream oxygen sensor heater heating wire harness

(a) Turn ignition switch to OFF. Disconnect the negative battery cable.
(b) Disconnect upstream oxygen sensor connector and ECU connector E-020.
(c) Check heating wire harness between upstream oxygen sensor connector E-005 (3) and ECU connector E-020 (73).

Multimeter Connection	Condition	Specified Condition
E-005 (3) - E-020 (73)	Always	Resistance ⩽ 1Ω

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness**

OK

7	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, clear DTCs.
(d) Check if DTC P0030 13, P0031 11, P0032 12 or P0053 1E still exists.

OK

No same DTC is output

Result

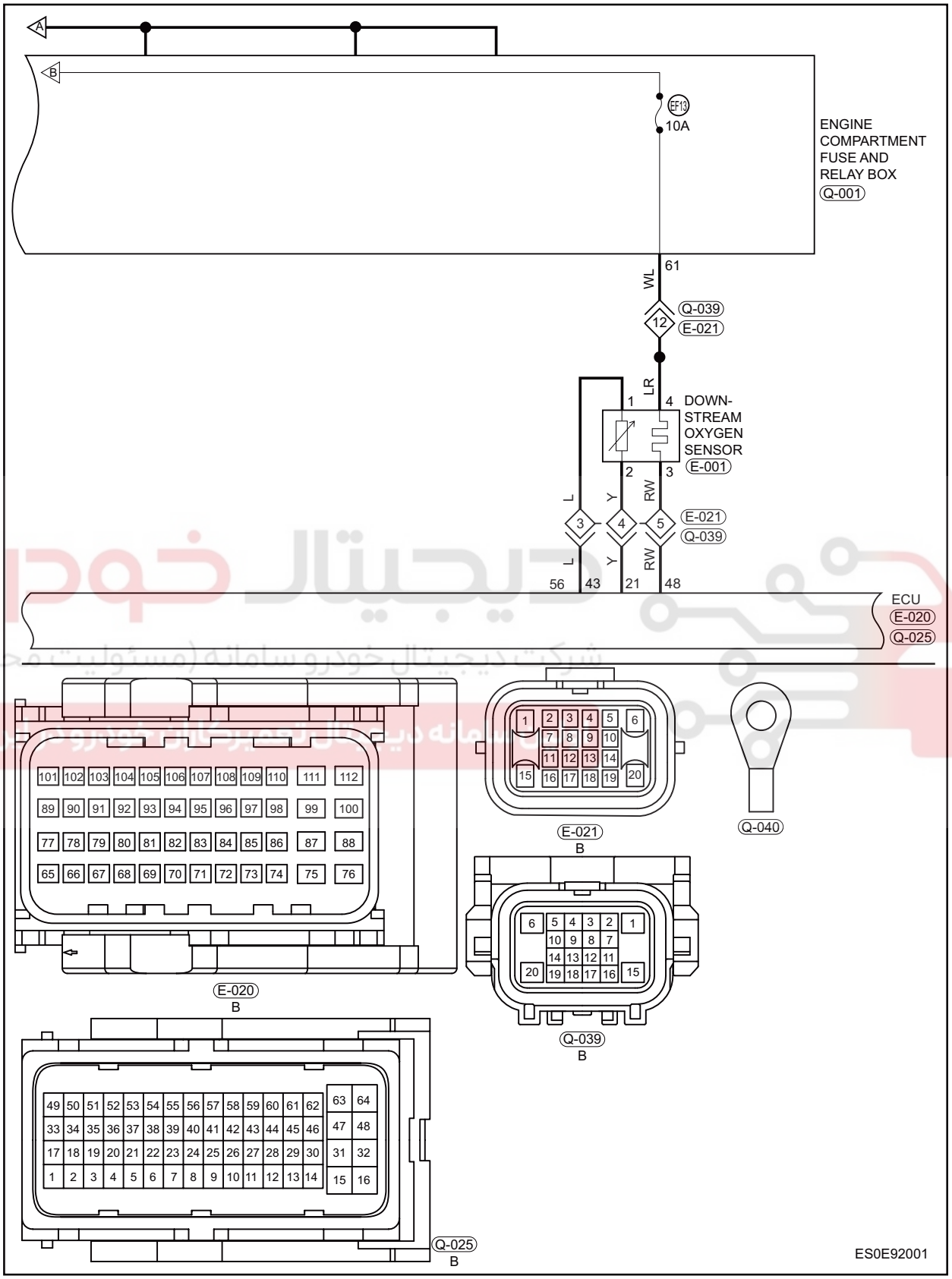
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace ECU to perform real-vehicle check**

DTC	P0036 13	O2 Sensor Heater Control Circuit Open (Downstream of the Catalyzer)
DTC	P0037 11	O2 Sensor Heater Control Circuit Low (Downstream of the Catalyzer)
DTC	P0038 12	O2 Sensor Heater Control Circuit High (Downstream of the Catalyzer)
DTC	P0054 1E	O2 Sensor Heater Resistance too Large (Downstream of the Catalyzer)

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0036 13	O2 Sensor Heater Control Circuit Open (Downstream of the Catalyzer)	Ignition switch ON, engine running	• Downstream Oxygen Sensor • Wire harness or connector • Fuse • ECU
P0037 11	O2 Sensor Heater Control Circuit Low (Downstream of the Catalyzer)		
P0038 12	O2 Sensor Heater Control Circuit High (Downstream of the Catalyzer)		
P0054 1E	O2 Sensor Heater Resistance too Large (Downstream of the Catalyzer)		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up to normal operating temperature, and then select Read DTC.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

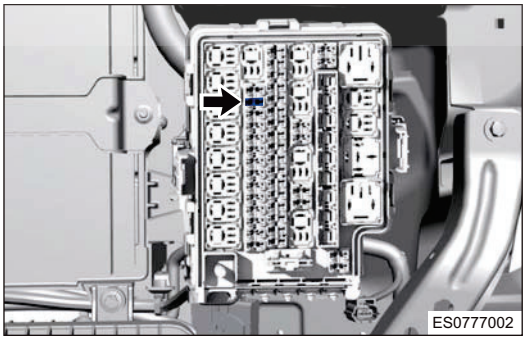
Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check fuse EF13**

(a) Check if fuse EF13 is blown or no power.



Result

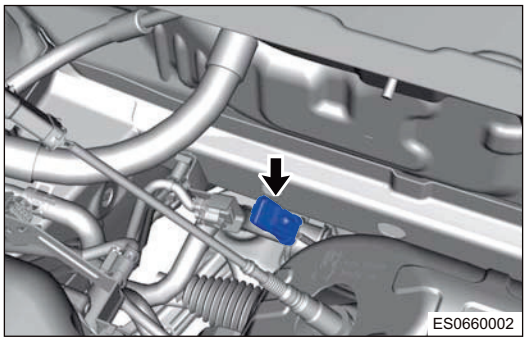
Proceed to
OK
NG

NG → **Replace fuse or check the cause for no power**

OK

2	Check downstream oxygen sensor connector

(a) Check if downstream oxygen sensor is connected infirmly or loose.



OK

Downstream oxygen sensor connector is installed normally

Result

Proceed to
OK
NG

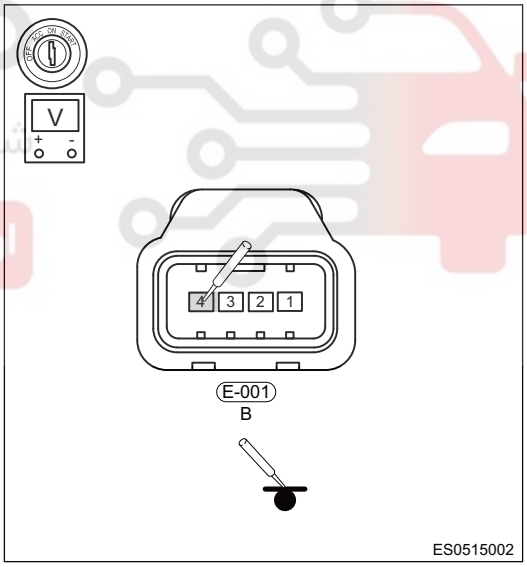
NG → **Reinstall or repair, replace connector**

OK

3	Check downstream oxygen sensor heater power supply voltage

(a) Turn ignition switch to ON.

(b) Measure voltage of terminal 4 of downstream oxygen sensor connector E-001 (using a digital multimeter) (online detection).



Multimeter Connection	Condition	Specified Condition
E-001 (4) - Body ground	ENGINE START STOP switch ON	Not less than 12 V

OK

Voltage between downstream oxygen sensor connector and body ground is normal

Result

Proceed to
OK
NG

NG → **Check wire harness between E-001 (4) and engine compartment fuse and relay box**

OK

4	Check downstream oxygen sensor heater voltage

(a) Turn ignition switch to ON.

(b) Measure voltage of terminal 3 of downstream oxygen sensor connector E-001 (using a digital multimeter) (online detection).

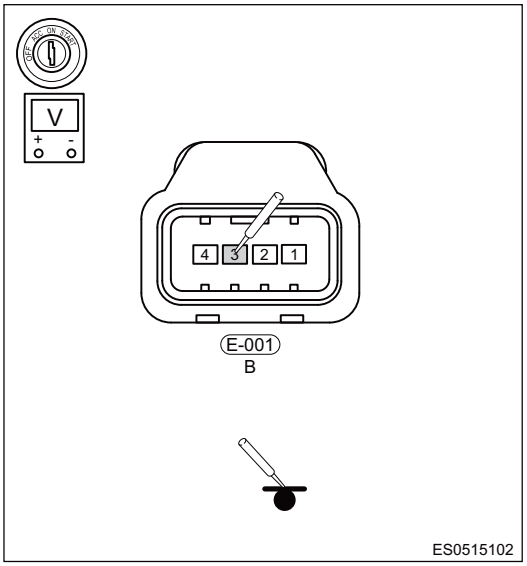
Multimeter Connection	Condition	Specified Condition
E-001 (3) - Body ground	ENGINE START STOP switch ON	Not less than 12 V

OK

Voltage between terminal 3 of downstream oxygen sensor and body ground is normal

Result

Proceed to
OK
NG



OK → **Go to step 6**

NG

5 Check downstream oxygen sensor heating resistance

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the downstream oxygen sensor connector.
(d) Check heating resistance between terminals 3 and 4 of downstream oxygen sensor E-001.

Multimeter Connection	Condition	Specified Condition
E-001 (3) - E-001 (4)	At room temperature	Not more than 15 Ω

OK

Voltage between downstream oxygen sensor connector and body ground is normal

Result

Proceed to
OK
NG

NG → **Replace oxygen sensor**

OK

6 Check downstream oxygen sensor heater heating wire harness

(a) Turn ignition switch to OFF. Disconnect the negative battery cable.
(b) Disconnect downstream oxygen sensor connector and ECU connector Q-025.
(c) Check heating wire harness between downstream oxygen sensor connector E-001 (3) and ECU connector Q-025 (48).

Multimeter Connection	Condition	Specified Condition
E-001 (3) - Q-025 (48)	Always	Resistance ⩽ 1Ω

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness**

OK

7	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC still exists.

OK

No same DTC is output

Result

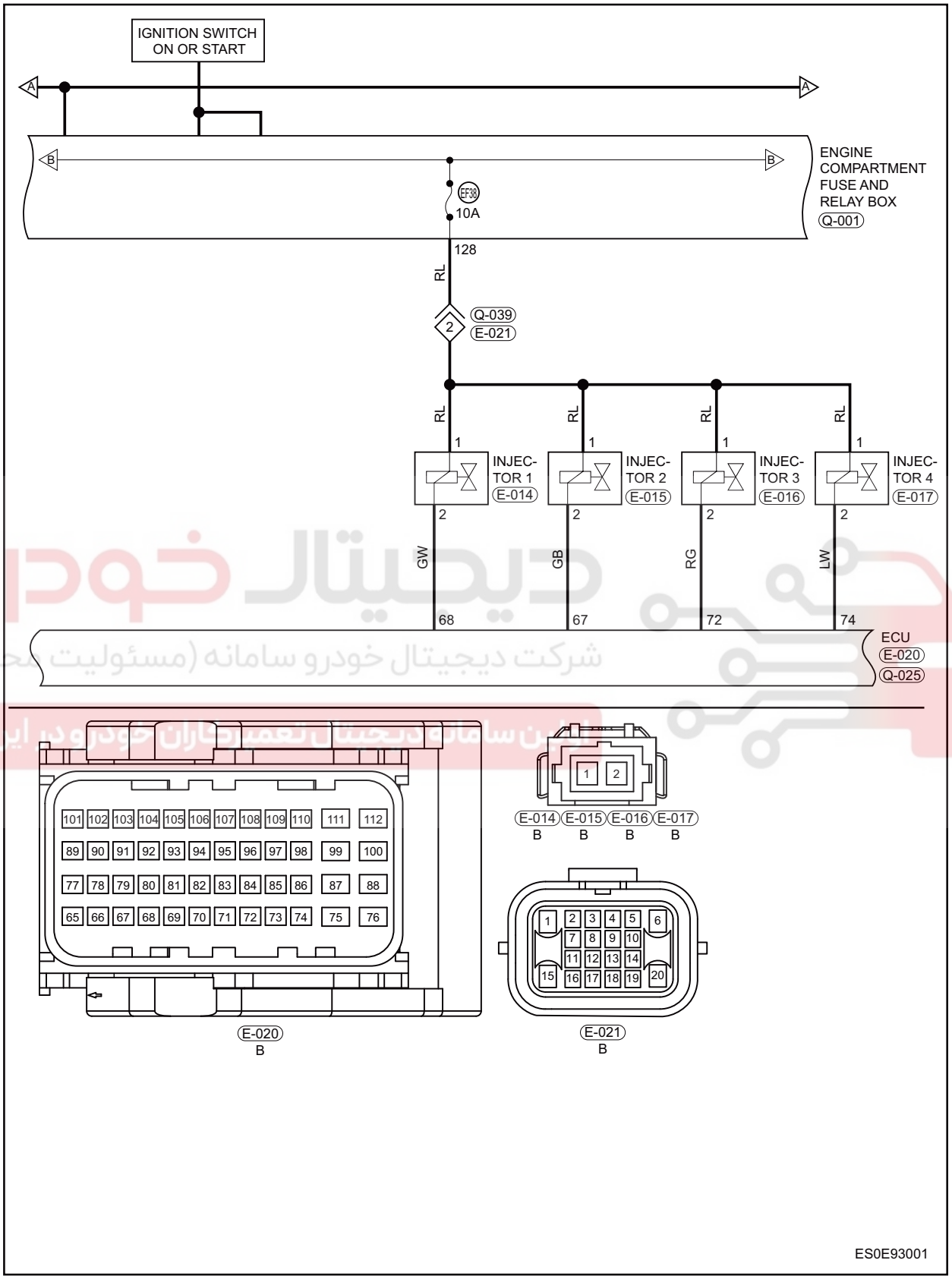
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0201 13	Cylinder 1 - Injector Circuit Error
DTC	P0202 13	Cylinder 2 - Injector Circuit Error
DTC	P0203 13	Cylinder 3 - Injector Circuit Error
DTC	P0204 13	Cylinder 4 - Injector Circuit Error
DTC	P0261 11	Cylinder 1- Injector Circuit Low
DTC	P0262 12	Cylinder 1- Injector Circuit High
DTC	P0264 11	Cylinder 2- Injector Circuit Low
DTC	P0265 12	Cylinder 2- Injector Circuit High
DTC	P0267 11	Cylinder 3- Injector Circuit Low
DTC	P0268 12	Cylinder 3- Injector Circuit High
DTC	P0270 11	Cylinder 4- Injector Circuit Low
DTC	P0271 12	Cylinder 4- Injector Circuit High

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0201 13	Cylinder 1 - Injector Circuit Error	ENGINE START STOP switch ON, engine running	• Fuel Injector • Wire harness or connector • ECU
P0202 13	Cylinder 2 - Injector Circuit Error		
P0203 13	Cylinder 3 - Injector Circuit Error		
P0204 13	Cylinder 4 - Injector Circuit Error		
P0261 11	Cylinder 1- Injector Circuit Low		
P0262 12	Cylinder 1- Injector Circuit High		
P0264 11	Cylinder 2- Injector Circuit Low		
P0265 12	Cylinder 2- Injector Circuit High		
P0267 11	Cylinder 3- Injector Circuit Low		
P0268 12	Cylinder 3- Injector Circuit High		
P0270 11	Cylinder 4- Injector Circuit Low		
P0271 12	Cylinder 4- Injector Circuit High		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

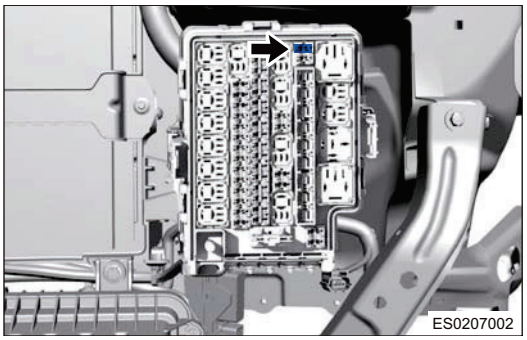
Procedure

1	Check engine compartment fuse EF38

(a) Check if fuse EF38 (10A) is blown or no power.

Result

Proceed to
OK
NG

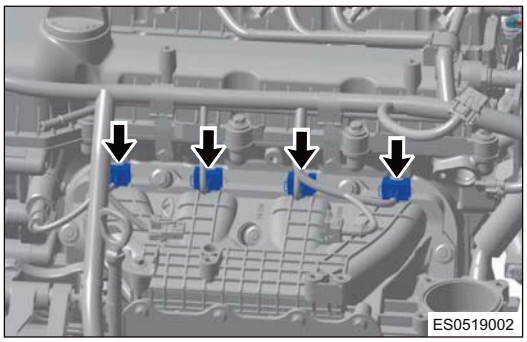


NG → **Replace fuse or check the cause for no power**

OK

2	Check injector connector

(a) Check if injector connectors of cylinders 1, 2, 3 4 are connected infirmly, damaged or cracked.



Result

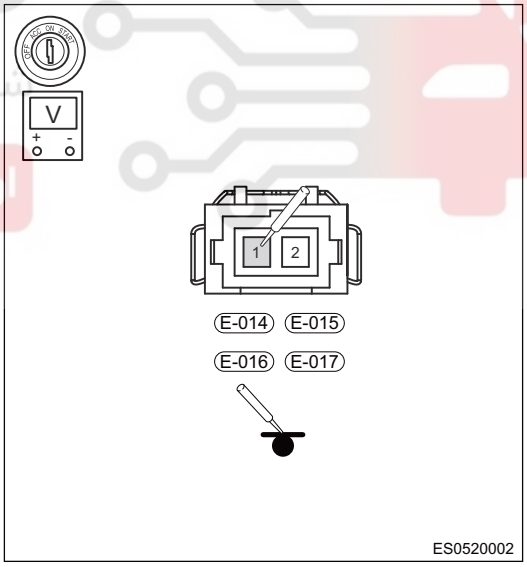
Proceed to
OK
NG

NG → **Reconnect or replace connector**

OK

3	Check injector power supply voltage

(a) Turn ignition switch to ON.
(b) Measure voltage between injector connector terminals of cylinders 1, 2, 3 4 and body ground (using a digital multimeter).



Multimeter Connection	Condition	Specified Condition
E-014 (1), E-015 (1), E-016 (1), E-017 (1) - Body ground	Ignition switch ON	Not less than 12 V

OK
Voltage between injector connector terminals of cylinders 1, 2, 3 4 and body ground is normal

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness between injector and engine compartment fuse and relay box**

OK

4	Check ECU terminal voltage corresponding to injector

(a) Start the engine.
(b) Connect LED test light to injector connector in parallel, check if LED test light blinks.

Blink

ECU control terminal corresponding to injector is normal

Result

Proceed to
OK
NG

OK → **Go to step 6**

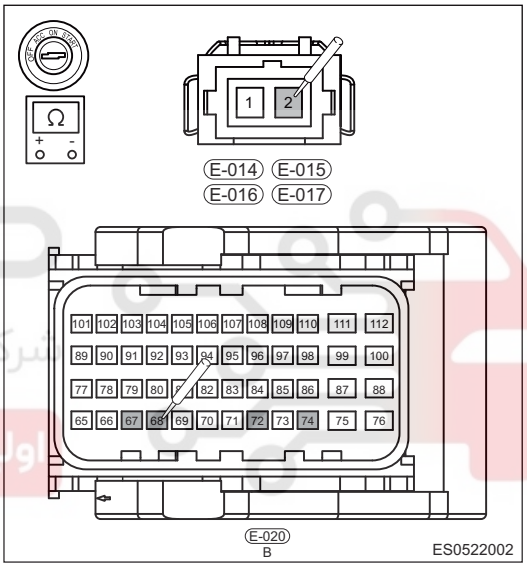
NG

5 Check injector control circuit

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect ECU connector E-020 and 4 injector connectors.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-014 (2) - E-020 (68)	Always	Resistance ⩽ 1Ω
E-015 (2) - E-020 (67)		
E-016 (2) - E-020 (72)		
E-017 (2) - E-020 (74)		



OK

Continuity between each terminal of ECU connector is normal

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector (injector - ECU)**

OK

6 Check injector

(a) Remove the injector.
(b) Check injector for damage or blockage.
(c) Measure injector resistance, check for a short or open circuit in injector.

Result

Proceed to
OK
NG

NG → **Clean or replace injector**

OK

7	Reconfirm DTCs

(a) Using diagnostic tester, read ECU DTC.
(b) Check if DTC P0201 13, P0202 13, P0203 13, P0204 13, P0261 11, P0262 12, P0264 11, P0265 12, P0267 11, P0268 12, P0270 11, P0271 12 still exists.

OK

No same DTC is output

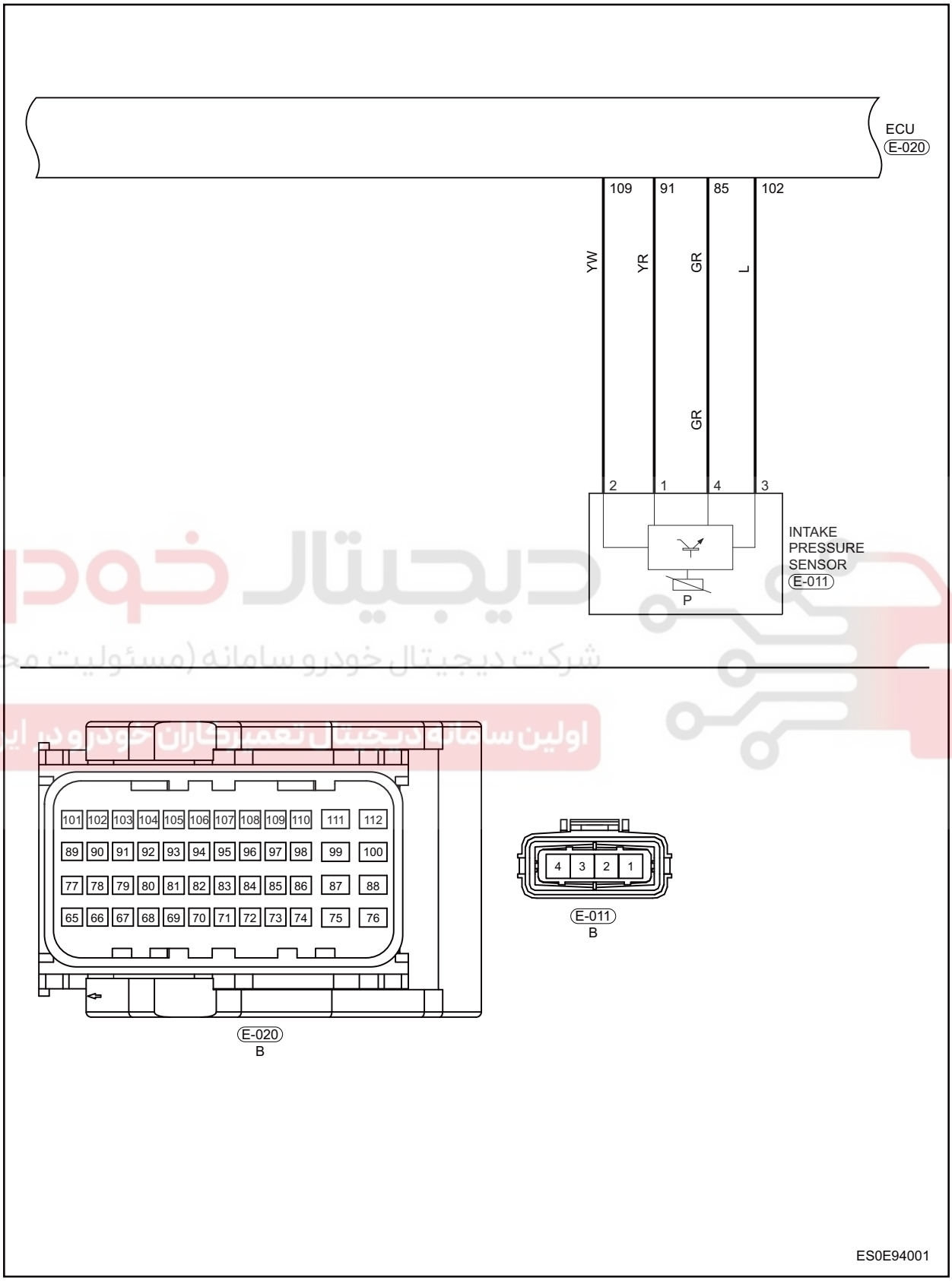
Result

Proceed to
OK
NG

OK	System operates normally
NG	Replace with a new ECU to check if fault reoccurs

DTC	P0105 28	Manifold Absolute Pressure Circuit No Change
DTC	P0106 00	Manifold Abs.Pressure Performance Non-plausible
DTC	P0107 11	Manifold Abs.Pressure Low Input
DTC	P0108 12	Manifold Abs.Pressure High Input
DTC	P0111 00	Intake Air Temp.Circ. Performance Non-plausible
DTC	P0112 16	Intake Air Temp.Circ. Low Input
DTC	P0113 17	Intake Air Temp.Circ. High Input

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0105 28	Manifold Absolute Pressure Circuit No Change	ENGINE START STOP switch ON, engine running	• Intake Pressure/Temperature Sensor • Wire harness or connector • ECU
P0106 00	Manifold Abs.Pressure Performance Non-plausible		
P0107 11	Manifold Abs.Pressure Low Input		
P0108 12	Manifold Abs.Pressure High Input		
P0111 00	Intake Air Temp.Circ. Performance Non-plausible		
P0112 16	Intake Air Temp.Circ. Low Input		
P0113 17	Intake Air Temp.Circ. High Input		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

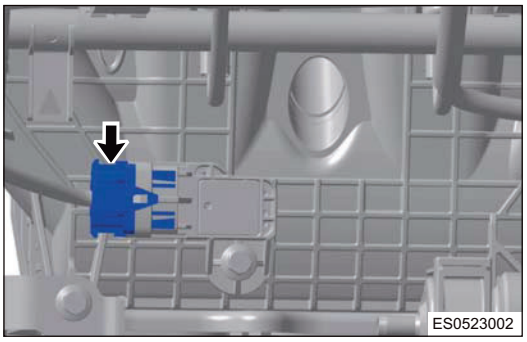
Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Check installation of intake pressure/temperature sensor

(a) Check intake pressure/temperature sensor connector (arrow) for poor contact or looseness.



Result

Proceed to
OK
NG

NG → **Reinstall or repair or replace intake pressure/temperature sensor**

OK

2	Check intake pressure/temperature sensor power supply voltage

(a) Turn ignition switch to ON.

(b) Intake pressure/temperature sensor connector E-011 (using a digital multimeter)(online detection).

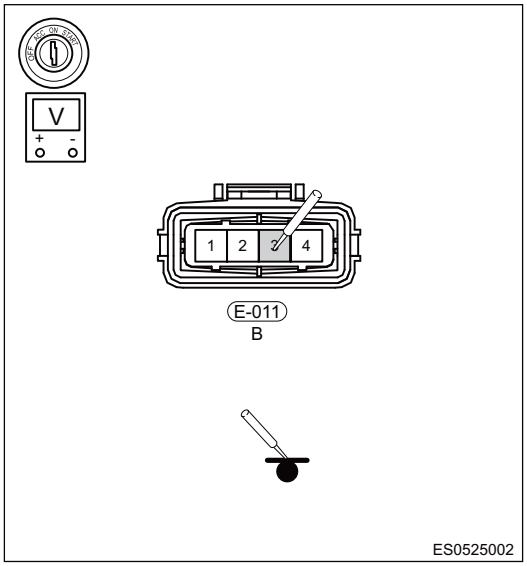
Multimeter Connection	Condition	Specified Condition
E-011 (3) - Body ground	ENGINE START STOP switch ON	5 V

OK

Intake pressure/temperature sensor power supply voltage is normal

Result

Proceed to
OK
NG



NG → **Check and repair wire harness between intake pressure/temperature sensor power supply and ECU**

OK

3 Check intake pressure/temperature sensor pressure signal voltage

(a) Turn ignition switch to ON and start engine.
(b) Measure voltage between terminal 4 of connector E-011 and body ground (using a digital multimeter).

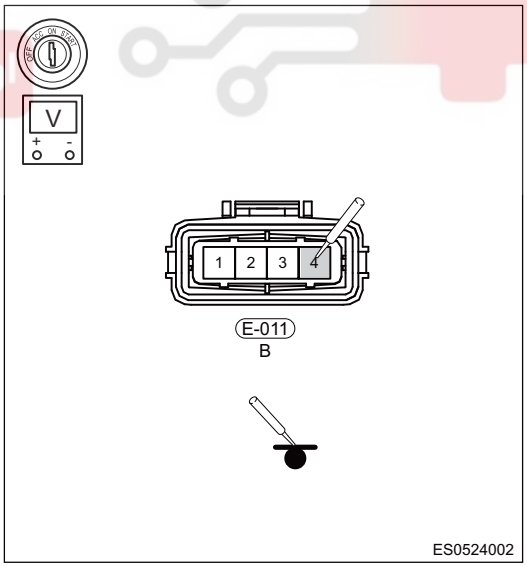
Multimeter Connection	Condition	Specified Condition
E-011 (4) - Body ground	Idle	Voltage is about 1.3V (value changes with model)
	Rapidly depress accelerator pedal	Maximum instantaneous voltage is about 4 V (value changes with model)

OK

Intake pressure/temperature sensor voltage is normal

Result

Proceed to
OK
NG



NG → **Check wire harness or connector or replace sensor to test vehicle**

OK

4	Check intake pressure/temperature sensor signal circuit

(a) Turn off ignition switch and disconnect the negative battery cable.
(b) Disconnect the intake pressure/temperature sensor and ECU connectors.
(c) Measure wire harness between connector E-011 (2, 4) and ECU E-020 (85, 109).

Multimeter Connection	Condition	Specified Condition
E-011 (2) - E-020 (85)	Always	Resistance ⩽ 1Ω
E-011 (4) - E-020 (109)	Always	Resistance ⩽ 1Ω

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness**

OK

5	Read data flow of intake pressure/temperature sensor

(a) Turn ignition switch to ON and do not start engine.
(b) Observe if "Intake Pressure" item in data flow seriously deviated from ambient pressure by about 101 kpa (value changes with current atmospheric pressure).

OK

Intake pressure/temperature sensor voltage is normal

Result

Proceed to
OK
NG

NG → **Reinstall or replace intake pressure/ temperature sensor**

OK

6	Check intake pressure/temperature sensor

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the intake pressure/temperature sensor connector (arrow).
(d) Check sensor connection part for debris, ice, oil and damage.

OK

Intake pressure/temperature sensor itself has no malfunction

Result

Proceed to
OK
NG

NG → **Replace intake pressure/temperature sensor**

OK

7	Check intake system

(a) Check if intake pressure/temperature sensor installation position is incorrect, intake pipe is disconnected or seriously leaked.

OK

Intake pressure/temperature sensor itself has no malfunction

Result

Proceed to
OK
NG

NG → **Repair faulty components of intake system**

OK

8	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Refer to "DTC Confirmation Procedure".
(e) Check if DTC P0105 28, P0106 00, P0107 11 or P0108 12 still exists.

OK

No same DTC is output

Result

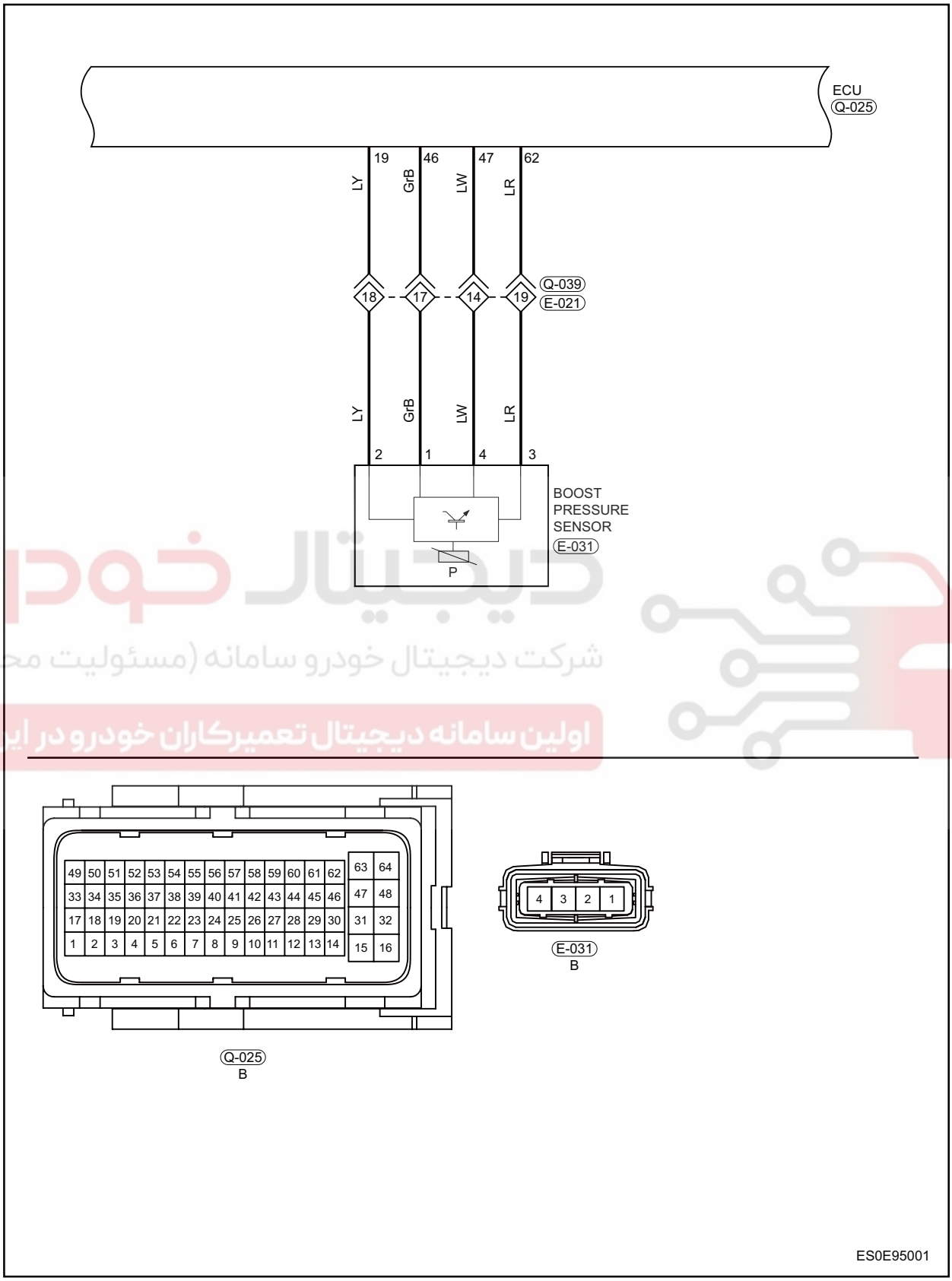
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0234 00	Turbu/Super Charger Overboost Condition
DTC	P0237 16	Turbocharger Boost Sensor (A) Circ. Low Input
DTC	P0238 17	Turbocharger Boost Sensor (A) Circ. High Input

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0234 00	Turbu/Super Charger Overboost Condition	ENGINE START STOP switch ON, engine running	• Boost pressure/temperature sensor • Wire harness or connector • ECU
P0237 16	Turbocharger Boost Sensor (A) Circ. Low Input		
P0238 17	Turbocharger Boost Sensor (A) Circ. High Input		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check turbocharger assembly pipe**

(a) Check if boost pressure sensor is installed in place.
(b) Check each turbocharger assembly pipe for cracks or disconnection.

OK

Boost pressure sensor power supply is normal

Result

Proceed to
OK
NG

NG → **Check and repair wire harness between boost pressure sensor and ECU**

OK

2	**Check boost pressure/temperature sensor power supply circuit voltage**

(a) Turn ignition switch to ON and start engine.

(b) Measure voltage between connector terminal and body ground (using a digital multimeter).

Voltage Inspection

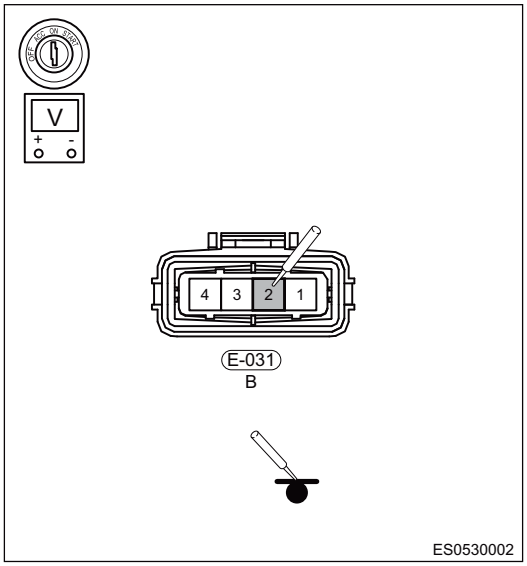
Multimeter Connection	Condition	Specified Condition
E-031 (2) - Body ground	ENGINE START STOP switch ON	5 V

OK

Boost pressure sensor power supply is normal

Result

Proceed to
OK
NG



NG → **Check and repair wire harness between boost pressure sensor and ECU**

OK

3 Check boost pressure/temperature sensor signal circuit

(a) Turn ignition switch to ON and start engine.

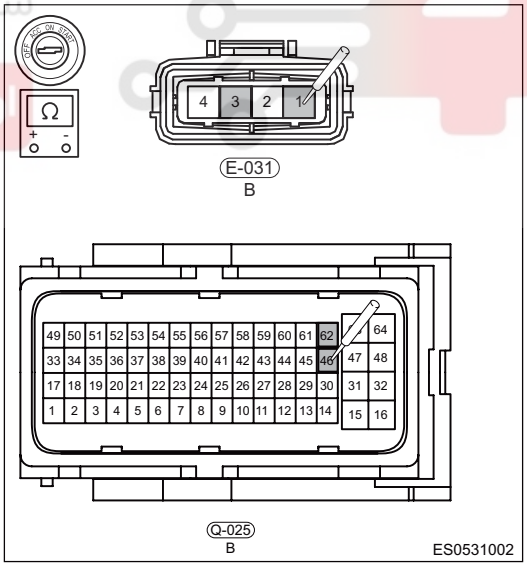
(b) Measure wire harness between terminal 4 of connector E-017 and ECU.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-031 (1) - Q-025 (46)	Always	Resistance ⩽ 1Ω
E-031 (3) - Q-025 (62)	Always	Resistance ⩽ 1Ω

Result

Proceed to
OK
NG



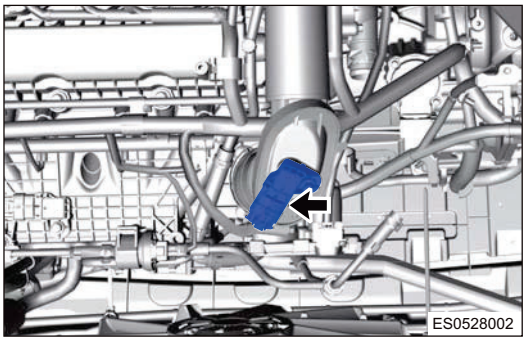
NG → **Check and repair wire harness between boost pressure sensor and ECU**

OK

4 Check boost pressure/temperature sensor

(a) Turn ignition switch to OFF.

(b) Disconnect the negative battery cable.
(c) Disconnect the boost pressure/temperature sensor connector E-031 (arrow).



(d) Check sensor connection part for debris and damage.

OK

Boost pressure/temperature sensor itself has no malfunction

Result

Proceed to
OK
NG

NG → **Clean or replace boost pressure/ temperature sensor**

OK →

5	Check ERCV relief solenoid valve

(a) Remove the ERCV relief solenoid valve connector.
(b) Check ERCV relief solenoid valve for damage or poor connection.

OK

Exhaust by-pass solenoid valve itself has no malfunction

Result

Proceed to
OK
NG

NG → **Clean or replace ERCV relief solenoid valve**

OK →

6	Check exhaust by-pass solenoid valve

(a) Remove the exhaust by-pass solenoid valve connector.
(b) Check exhaust by-pass solenoid valve for damage or poor connection.

OK

Exhaust by-pass solenoid valve itself has no malfunction

Result

Proceed to
OK

Proceed to
NG

NG → **Clean or replace exhaust by-pass solenoid valve**

OK

7	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0234 00, P0237 16 or P0238 17 still exists.

OK

No same DTC is output

Result

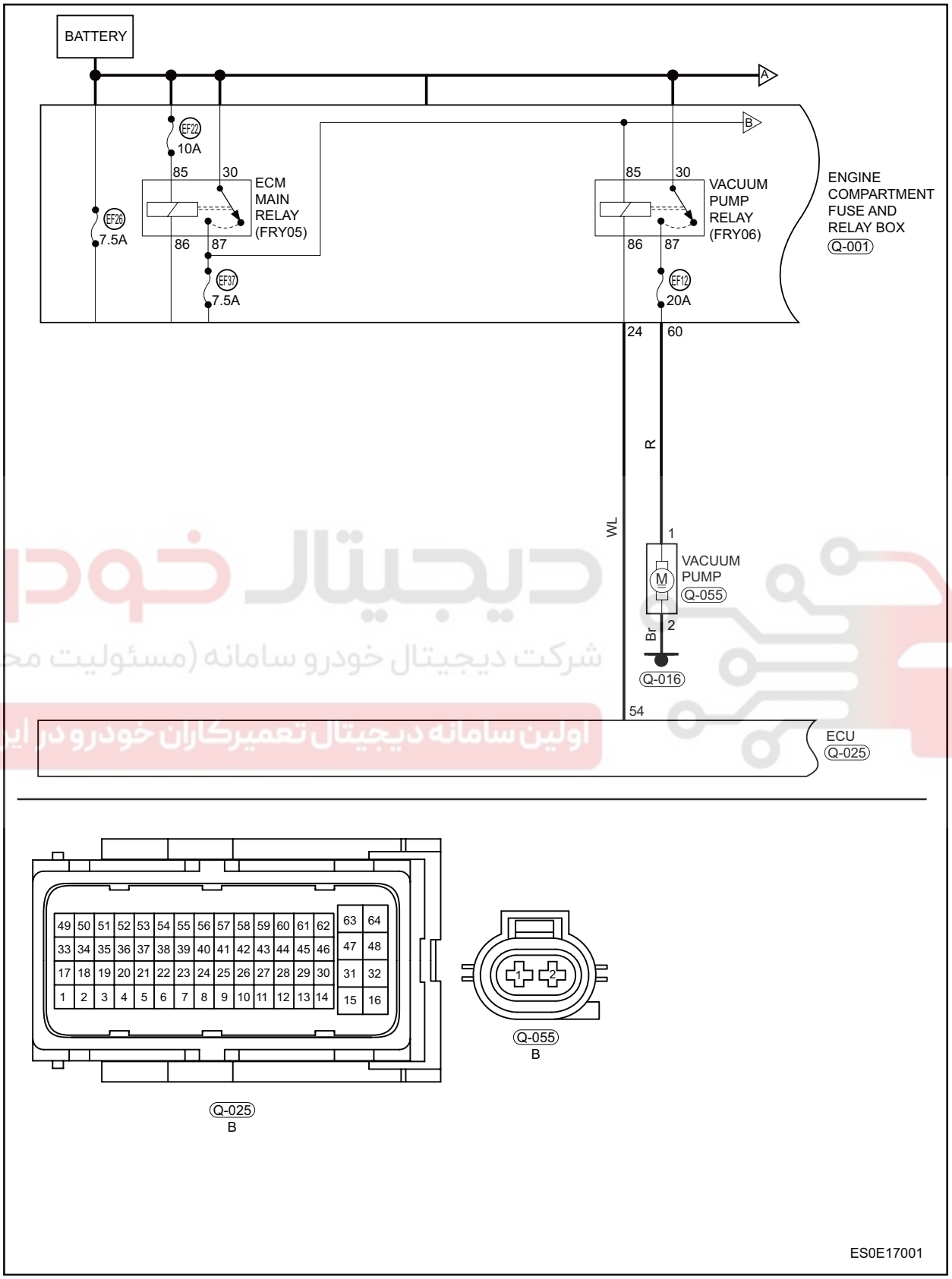
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P1130 00	Diagnosis of Brake Booster Pump Malfunction
DTC	P1131 17	Diagnosis of Brake Booster Pump Control Circuit High
DTC	P1132 16	Diagnosis of Brake Booster Pump Control Circuit Low
DTC	P1133 13	Diagnosis of Brake Booster Pump Control Circ.Open
DTC	P0298 7A	Diagnosis of Pressure Sensor in Brake Booster Pump Leakage Detection
DTC	P1427 12	Diagnosis of Brake Booster Pump Control Circ.High
DTC	P1428 11	Diagnosis of Brake Booster Pump Control Circ.Low
DTC	P1429 13	Diagnosis of Brake Booster Pump Control Circ.Open
DTC	P1479 00	Non-plausible Error for Brake Booster Diagnosis

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P1130 00	Diagnosis of Brake Booster Pump Malfunction	ENGINE START STOP switch ON, engine running	• Brake vacuum booster pump relay • Wire harness or connector • Battery • ECU
P1131 17	Diagnosis of Brake Booster Pump Control Circuit High		
P1132 16	Diagnosis of Brake Booster Pump Control Circuit Low		
P1133 13	Diagnosis of Brake Booster Pump Control Circ.Open		
P0298 7A	Diagnosis of Pressure Sensor in Brake Booster Pump Leakage Detection		
P1427 12	Diagnosis of Brake Booster Pump Control Circ.High		
P1428 11	Diagnosis of Brake Booster Pump Control Circ.Low		
P1429 13	Diagnosis of Brake Booster Pump Control Circ.Open		
P1479 00	Non-plausible Error for Brake Booster Diagnosis		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check battery voltage**

(a) Check if battery terminals are corroded or loose.
(b) Check battery voltage with a digital multimeter.

OK

Not less than 12 V

Result

Proceed to
OK
NG

NG → **Check and repair battery**

OK

2	Check brake vacuum booster pump fuse and relay

(a) Check if brake vacuum booster pump fuse EF12 (20 A) is blown or no power.
(b) Unplug brake vacuum booster pump relay, check if relay terminal is corroded or broken.
(c) Directly apply battery voltage to relay control terminal, check if relay closes.

Result

Proceed to
OK
NG

NG → **Replace fuse or relay or check the cause for no power**

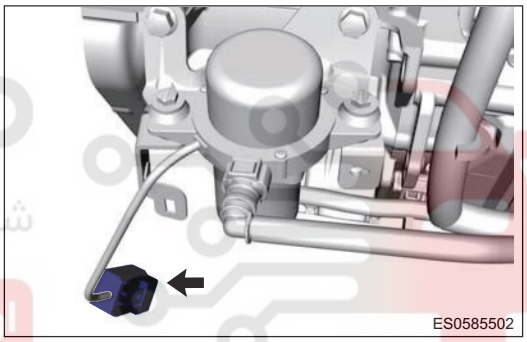
OK →

3	Check brake vacuum booster pump connector

(a) Check brake vacuum booster pump connector Q-055 (arrow) is poor connection or contact.

OK

Brake vacuum booster pump connector is normal



Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector**

OK →

4	Check brake vacuum booster pump relay power supply voltage

(a) Turn ignition switch to ON.
(b) Measure voltage between terminals 30, 85 of brake vacuum booster pump relay and body ground (using a digital multimeter).

Voltage Inspection

Multimeter Connection	Condition	Specified Condition
Brake vacuum booster pump relay (30, 85) - Body ground	Ignition switch ON	Not less than 12 V

OK

Brake vacuum booster pump relay power supply voltage is normal

Result

Proceed to
OK

Proceed to
NG

NG → Check and repair battery or other causes for abnormal voltage

OK

5 Check vacuum pump power supply terminal voltage

(a) Disconnect the vacuum pump connector.
(b) Measure the vacuum pump Q-055 (1) terminal voltage.
Check for Open

Multimeter Connection	Condition	Specified Condition
Q-055 (1) - Ground	Ignition switch ON	Not less than 12 V

Result

Proceed to
OK
NG

NG → Repair or replace wire harness between vacuum pump and engine compartment fuse and relay box

OK

6 Replace brake vacuum pump, reconfirm DTCs

(a) Using diagnostic tester, read ECU DTC.
(b) Check if DTC P1427 12, P1428 11, P1429 13 or P1479 00 still exists.

OK
No same DTC is output

Result

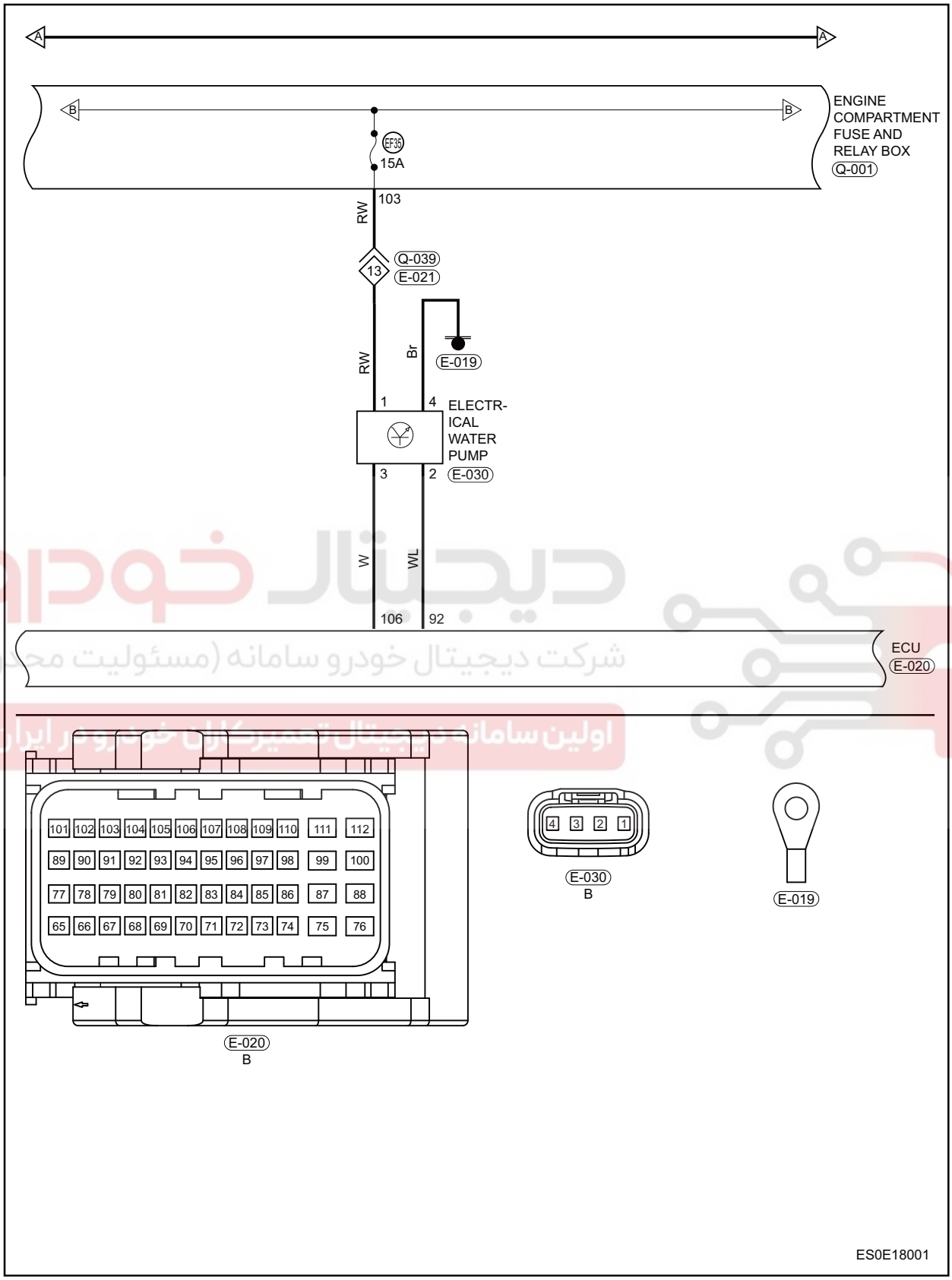
Proceed to
OK
NG

OK → System operates normally

NG → Replace with a new ECU to check if fault reoccurs

DTC	P023A 00	Charge Air Cooler Coolant Pump Control Circuit
DTC	P023B 00	Charge Air Cooler Coolant Pump Control Circuit Low
DTC	P023C 00	Charge Air Cooler Coolant Pump Control Circuit High
DTC	P1011 01	Diagnosis of Electrical Water Pump Control Circ.Error
DTC	P1700 00	Charge Air Cooler Coolant Pump Dry Run
DTC	P1703 00	Charge Air Cooler Coolant Pump Over Voltage
DTC	P1704 00	Charge Air Cooler Coolant Pump Over Current
DTC	P1705 00	Charge Air Cooler Coolant Pump Over Temperature
DTC	P1706 00	Charge Air Cooler Coolant Pump Stall
DTC	P1707 00	Charge Air Cooler Coolant Pump Under Voltage
DTC	P1708 00	Charge Air Cooler Coolant Pump Feedback Signal Error Circ.High
DTC	P1709 00	Charge Air Cooler Coolant Pump Feedback Signal Error Circ.Low
DTC	P2600 13	Diagnosis of Electrical Water Pump Control Circ.Open
DTC	P2602 11	Diagnosis of Electrical Water Pump Control Circ.Low
DTC	P2603 12	Diagnosis of Electrical Water Pump Control Circ.high

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P023A 00	Charge Air Cooler Coolant Pump Control Circuit	ENGINE START STOP switch ON, engine running	• Electrical Water Pump • Wire harness or connector • Battery • ECU
P023B 00	Charge Air Cooler Coolant Pump Control Circuit Low		
P023C 00	Charge Air Cooler Coolant Pump Control Circuit High		
P1011 01	Diagnosis of Electrical Water Pump Control Circ.Error		
P1700 00	Charge Air Cooler Coolant Pump Dry Run		
P1703 00	Charge Air Cooler Coolant Pump Over Voltage		
P1704 00	Charge Air Cooler Coolant Pump Over Current		
P1705 00	Charge Air Cooler Coolant Pump Over Temperature		
P1706 00	Charge Air Cooler Coolant Pump Stall		
P1707 00	Charge Air Cooler Coolant Pump Under Voltage		
P1708 00	Charge Air Cooler Coolant Pump Feedback Signal Error Circ.High		
P1709 00	Charge Air Cooler Coolant Pump Feedback Signal Error Circ.Low		
P2600 13	Diagnosis of Electrical Water Pump Control Circ.Open		
P2602 11	Diagnosis of Electrical Water Pump Control Circ.Low		
P2603 12	Diagnosis of Electrical Water Pump Control Circ.high		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check battery voltage**

(a) Check if battery terminals are corroded or loose.
(b) Check battery voltage with a digital multimeter.

OK

Not less than 12 V

Result

Proceed to
OK
NG

NG → **Check and repair battery**

OK →

2 Check electrical water pump fuse

(a) Check if electrical water pump fuse EF35 (15 A) is blown or no power.

Result

Proceed to
OK
NG

NG → **Replace electrical water pump fuse or check the cause for no power**

OK →

3 Check electrical water pump power supply

(a) Turn ignition switch to ON.

(b) Measure voltage between electrical water pump connector terminal and body ground (using a digital multimeter or 21 W test light) (online detection).

Voltage Inspection

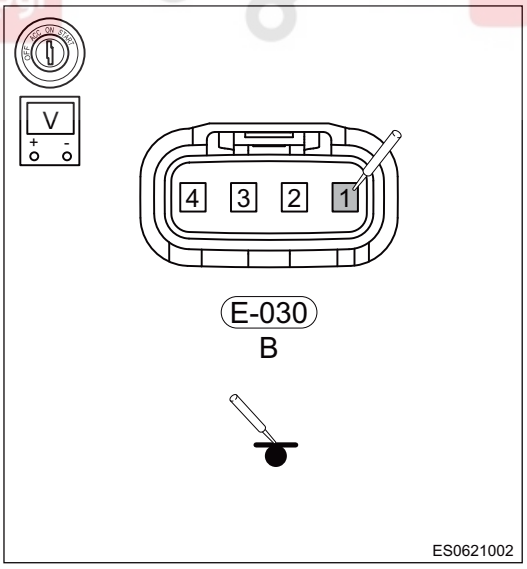
Multimeter Connection	Condition	Specified Condition
E-030 (1) - Body ground	Always	Not less than 12 V

OK

Electrical water pump power supply is normal

Result

Proceed to
OK
NG

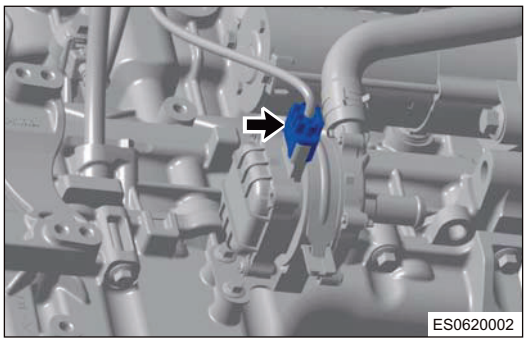


NG → **Repair or replace wire harness between terminal 4 of electrical water pump and engine compartment fuse and relay box**

OK

4	Check electrical water pump connector

(a) Check if electrical water pump connector E-030 (arrow) is connected infirmly, damaged or cracked.



Result

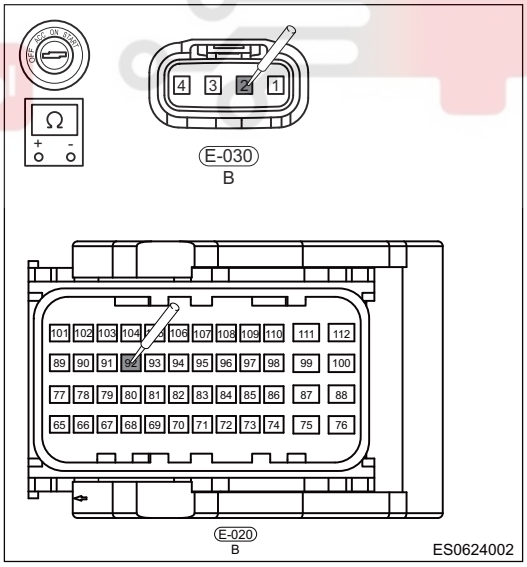
Proceed to
OK
NG

NG → **Repair or replace electrical water pump connector**

OK

5	Check electrical water pump relay control circuit

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect ECU connector E-029 and electrical water pump connector E-011.
(d) Check wire harness between ECU connector terminal and electrical water pump connector.



Check for Open

Multimeter Connection	Condition	Specified Condition
E-020 (92) - E-030 (2)	Always	Resistance ⩽ 1Ω

Check for Short

Multimeter Connection	Condition	Specified Condition
E-020 (92) or E-030 (2) - Body ground	Always	Resistance ∞
B-020 (92) or E-030 (2) - Battery positive	Always	Resistance ∞

OK
Electrical water pump relay control circuit is normal

Result

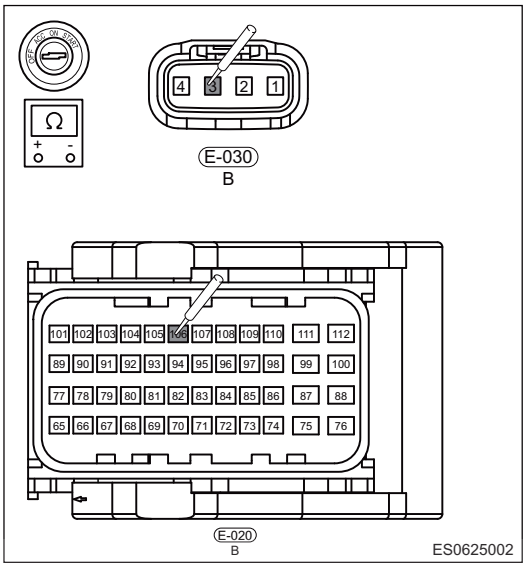
Proceed to
OK
NG

NG → **Repair or replace wire harness or connector (ECU - electrical water pump)**

OK

6	Check electrical water pump signal feedback circuit

(a) Check wire harness between ECU connector terminal and electrical water pump connector.



Check for Open

Multimeter Connection	Condition	Specified Condition
E-020 (106) - E-030 (3)	Always	Resistance ⩽ 1Ω

Check for Short

Multimeter Connection	Condition	Specified Condition
E-020 (106) or E-030 (3) - Body ground	Always	Resistance ∞

OK

Electrical water pump signal feedback circuit is normal

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector (ECU - electrical water pump)**

OK →

7	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P023A 00, P023B 00, P023C 00, P1700 00, P1703 00, P1704 00, P1705 00, P1706 00, P1707 00, P1708 00, P1709 00 still exists.

OK

No same DTC is output

Result

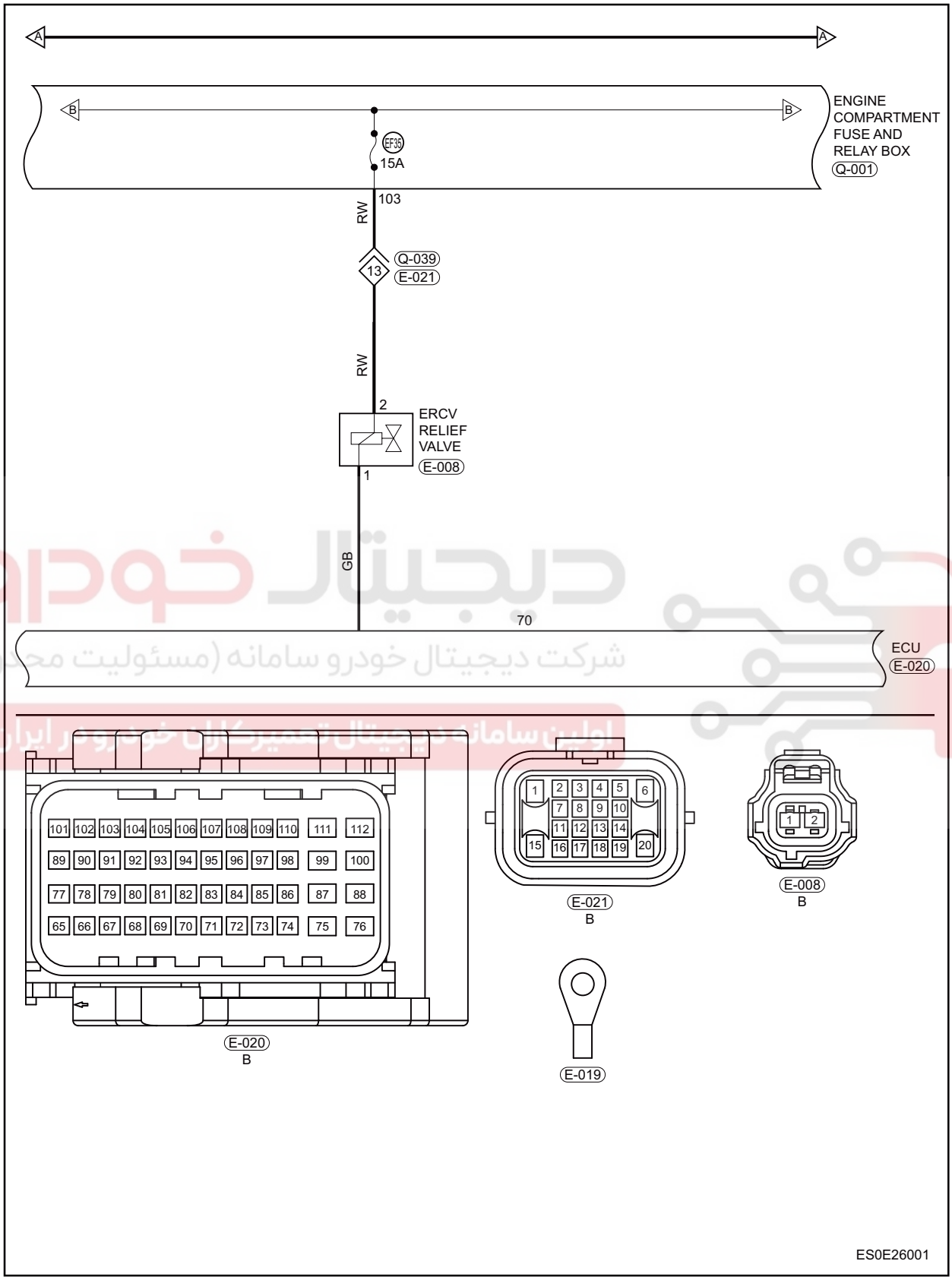
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0033 13	Dump Valve Control Circuit Open
DTC	P0034 11	Dump Valve Control Circuit Low
DTC	P0035 12	Dump Valve Control Circuit High
DTC	P2261 00	Dump Valve - Mechanical Error

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0033 13	Dump Valve Control Circuit Open	ENGINE START STOP switch ON, engine running	• ERCV relief solenoid valve • Wire harness or connector • ECU
P0034 11	Dump Valve Control Circuit Low		
P0035 12	Dump Valve Control Circuit High		
P2261 00	Dump Valve - Mechanical Error		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1 Check ERCV relief solenoid valve fuse EF35

(a) Check if fuse EF35 is blown or no power.

Result

Proceed to
OK
NG

NG → **Replace fuse or check the cause for no power**

OK

2 Check ERCV relief solenoid valve connector

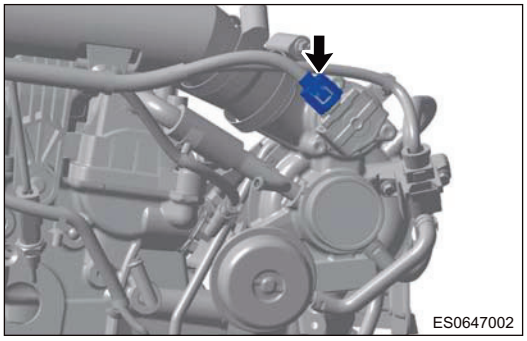
(a) Check if ERCV relief solenoid valve connector E-008 (arrow) is infirmly connected or poorly contacted.

OK

ERCV relief solenoid valve connector is normal

Result

Proceed to
OK
NG



NG → **Repair or replace connector**

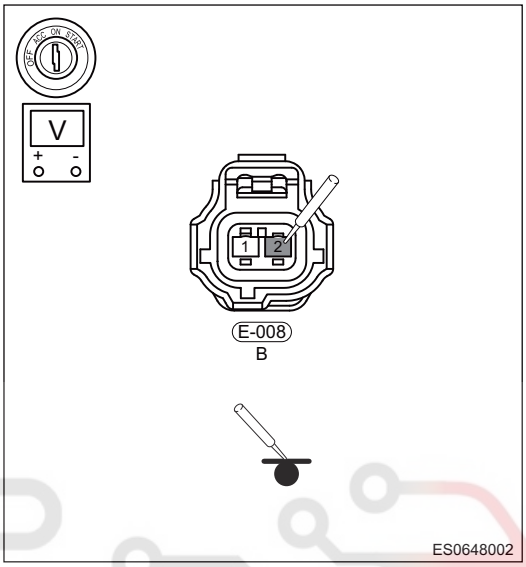
OK

3	Check ERCV relief solenoid valve power supply voltage

(a) Turn ignition switch to ON.
(b) Measure voltage between ERCV relief solenoid valve connector terminal and body ground (using a digital multimeter).

Voltage Inspection

Multimeter Connection	Condition	Specified Condition
E-008 (2) - Body ground	ENGINE START STOP switch ON	Not less than 12 V



OK
ERCV relief solenoid valve power supply voltage is normal

Result

Proceed to
OK
NG

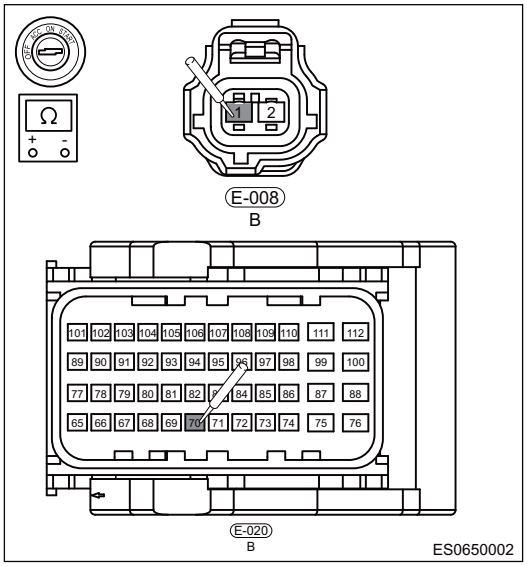
NG → **Repair or replace wire harness between ERCV relief solenoid valve and engine compartment fuse and relay box**

OK

4	Check ERCV relief solenoid valve control circuit

(a) Turn ENGINE START STOP switch to OFF
(b) Disconnect the negative battery cable.
(c) Disconnect the ECU wire harness connector E-029.

(d) Check wire harness between ERCV relief solenoid valve connector terminal and ECM connector terminal.



Check for Open

Multimeter Connection	Condition	Specified Condition
E-008 (1) - E-020 (70)	Always	Resistance ⩽ 1Ω

Check for Short

Multimeter Connection	Condition	Specified Condition
E-008 (1) or E-020 (70) - Ground	Always	Resistance ∞
E-008 (1) or E-020 (70) - Battery positive	Always	Resistance ∞

OK

Wire harness between ERCV relief solenoid valve connector terminal and ECU connector terminal is normal

Result

Proceed to
OK
NG

NG → **Replace wire harness or connector (ERCV relief solenoid valve - ECU)**

OK

5	Check ERCV relief solenoid valve mechanical fault

(a) Remove ERCV relief solenoid valve, and check ERCV relief solenoid valve for sticking.

OK

ERCV relief solenoid valve is normal

Result

Proceed to
OK
NG

NG → **Repair or replace ERCV relief solenoid valve**

OK

6	Check ERCV relief solenoid valve

(a) Remove the ERCV relief solenoid valve.

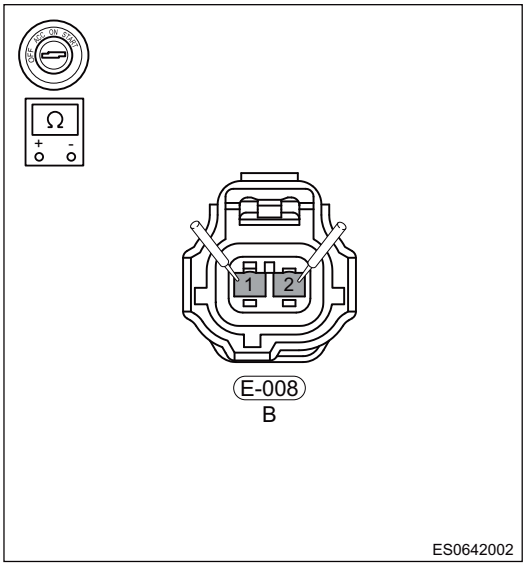
(b) Measure resistance of ERCV relief solenoid valve, to determine if there is internal short or open.

OK

ERCV relief solenoid valve is normal

Result

Proceed to
OK
NG



NG → **Replace ERCV relief solenoid valve**

OK

7	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0033 13, P0034 11, P0035 12, P2261 00 still exists.

OK

No same DTC is output

Result

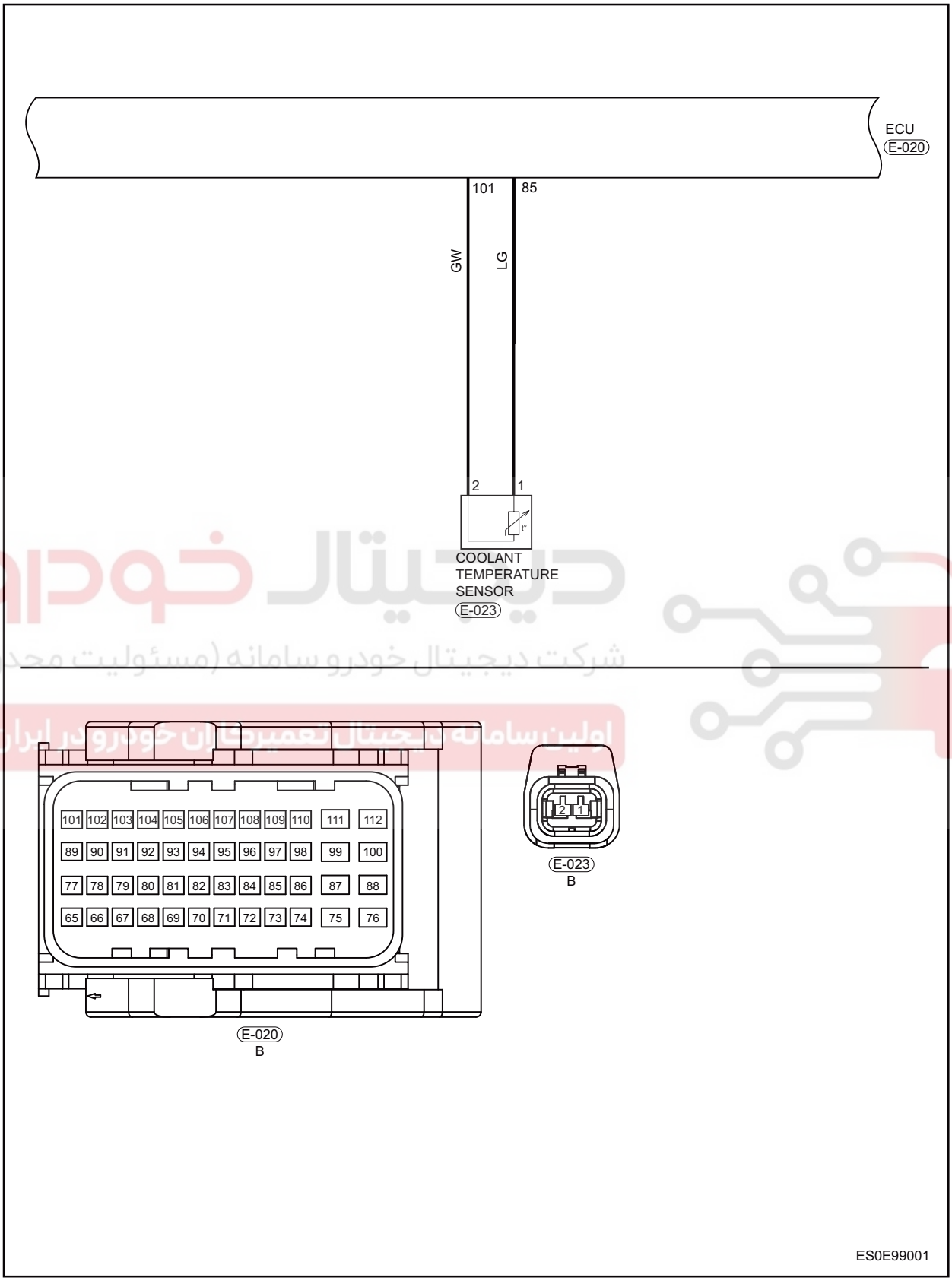
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0116 00	Engine Coolant Temp.Circ. Performance Non-plausible
DTC	P0117 16	Engine Coolant Temp.Circ. Low Input
DTC	P0118 17	Engine Coolant Temp.Circ. High Input

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0116 00	Engine Coolant Temp.Circ. Performance Non-plausible	ENGINE START STOP switch ON, engine running	• Engine coolant temperature sensor • Wire harness or connector • ECU
P0117 16	Engine Coolant Temp.Circ. Low Input		
P0118 17	Engine Coolant Temp.Circ. High Input		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check engine coolant temperature sensor power supply voltage**

(a) Turn ignition switch to ON.

(b) Measure voltage between engine coolant temperature sensor terminal and body ground (using a digital multimeter).

Voltage Inspection

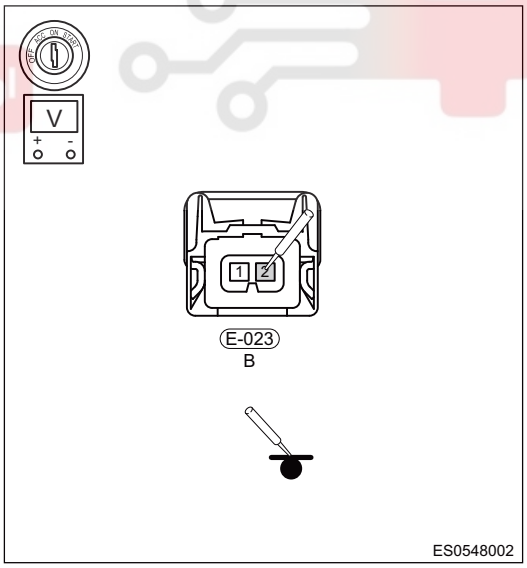
Multimeter Connection	Condition	Specified Condition
E-023 (2) - Body ground	ENGINE START STOP switch ON	5 V

OK

Engine coolant temperature sensor voltage is normal

Result

Proceed to
OK
NG



NG → **Check and repair wire harness between coolant temperature sensor and ECU**

OK →

2	**Read data flow of coolant temperature sensor**

(a) Connect diagnostic tester, turn ignition switch to ON.

(b) Do not start engine, read "Coolant Temperature Sensor Measured Value" and check if it is within the normal range.

OK

Data flow of coolant temperature sensor is normal

Result

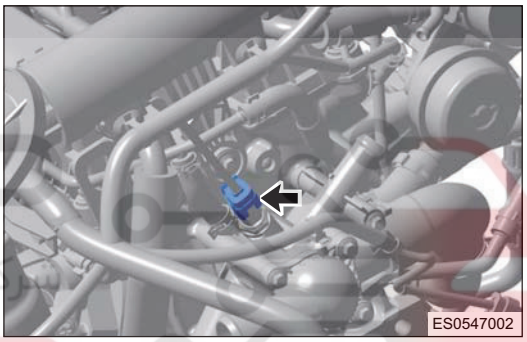
Proceed to
OK
NG

OK → **End**

NG

3	Check engine coolant temperature sensor

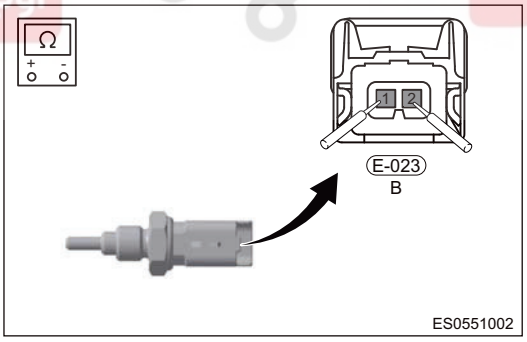
(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the engine coolant temperature sensor connector E-023 (arrow).



(d) Remove the engine coolant temperature sensor.
(e) Measure resistance of engine coolant temperature sensor.

Check for Open

Multimeter Connection	Specified Condition
Terminal 1 - Terminal 2	Resistance is 2.5 kΩ ± 5% at normal temperature (20°C), 300 Ω - 400 Ω in boiled water (80°C) (value changes with boiled water temperature)



Result

Proceed to
OK
NG

NG → **Clean or replace engine coolant temperature sensor**

OK

4	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON

(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0116 00, P0117 16, P0118 17 still exists.

OK

No same DTC is output

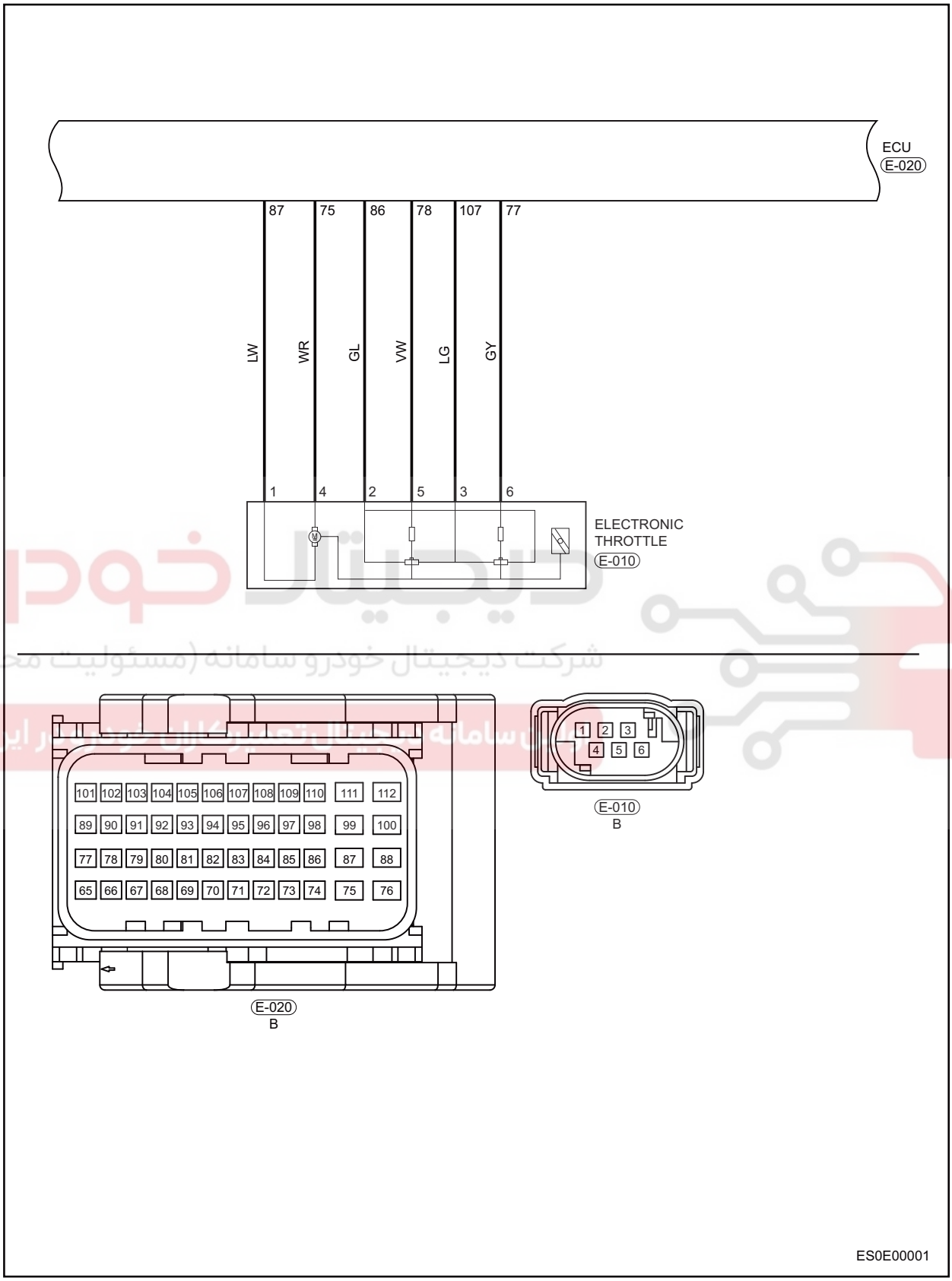
Result

Proceed to
OK
NG

OK	**System operates normally**
NG	**Replace ECU to perform real-vehicle check**

DTC	P0121 29	Throttle Pos.Sensor 1 Circ. Performance Non-plausible
DTC	P0122 16	Throttle Pos.Sensor 1 Circ. Low Input
DTC	P0123 17	Throttle Pos.Sensor 1 Circ. High Input
DTC	P0221 29	Throttle Position Sensor 2 Performance Non-plausible
DTC	P0222 16	Throttle Position Sensor 2 Performance Low Input
DTC	P0223 17	Throttle Position Sensor 2 Performance High Input

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0121 29	Throttle Pos.Sensor 1 Circ. Performance Non-plausible	ENGINE START STOP switch ON, engine running	• Throttle position sensor 1 • Throttle Position Sensor 2 • Wire harness or connector • ECU
P0122 16	Throttle Pos.Sensor 1 Circ. Low Input		
P0123 17	Throttle Pos.Sensor 1 Circ. High Input		
P0221 29	Throttle Position Sensor 2 Performance Non-plausible		
P0222 16	Throttle Position Sensor 2 Performance Low Input		
P0223 17	Throttle Position Sensor 2 Performance High Input		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check installation of electronic throttle connector**

(a) Check electronic throttle connector for poor contact or improper installation.

Result

Proceed to
OK
NG

NG → **Reconnect electronic throttle connector**

OK →

2	**Check throttle position sensor power supply voltage**

(a) Turn ignition switch to ON.

(b) Measure voltage between electronic throttle connector E-010 (3) terminal and body ground (using a digital multimeter) (online detection).

Voltage Inspection

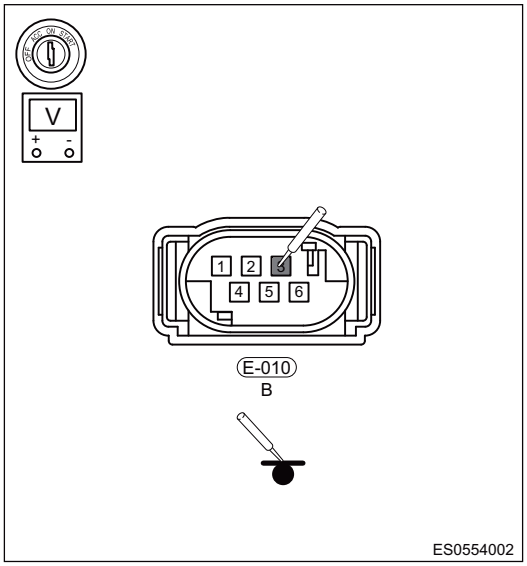
Multimeter Connection	Condition	Specified Condition
E-010 (3) - Body ground	ENGINE START STOP switch ON	5 V

OK

Throttle position sensor power supply voltage is normal

Result

Proceed to
OK
NG



NG → **Check and repair power supply wire harness between throttle and ECU**

OK

3 Check throttle position sensor signal voltage

(a) Turn ignition switch to ON.

(b) Measure the throttle position sensor signal voltage (using a digital multimeter) (online detection).

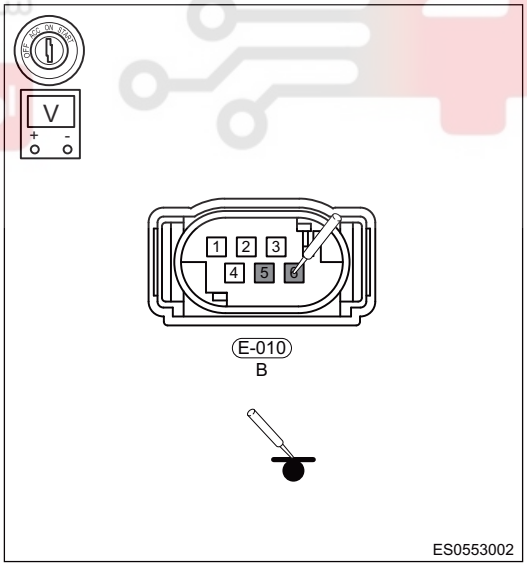
Multimeter Connection	Condition	Specified Condition
E-010 (6) - Body ground	Ignition switch ON, idling	0.74 V
	ENGINE START STOP switch ON, throttle fully opened	4.24 V
E-010 (5) - Body ground	Ignition switch ON, idling	4.24 V
	ENGINE START STOP switch ON, throttle fully opened	0.36V

OK

Throttle position sensor voltage is normal

Result

Proceed to
OK
NG



NG → **Check and repair signal wire harness between throttle and ECU**

OK

4	Clear and read DTCs again

(a) Connect diagnostic tester, and then turn ignition switch to ON.
(b) Clear DTCs, and then slowly and quickly depress the accelerator pedal several times.
(c) Read DTCs again.

OK

DTCs do not recur, diagnosis is completed

Result

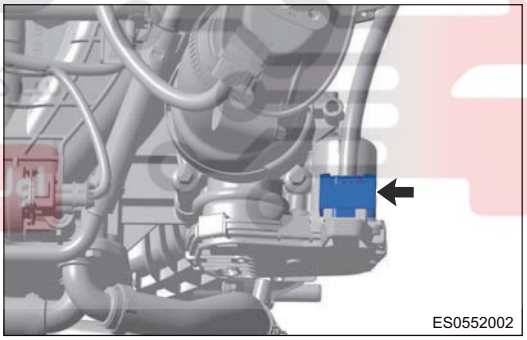
Proceed to
OK
NG

OK → **OK**
End

NG →

5	Check electronic throttle

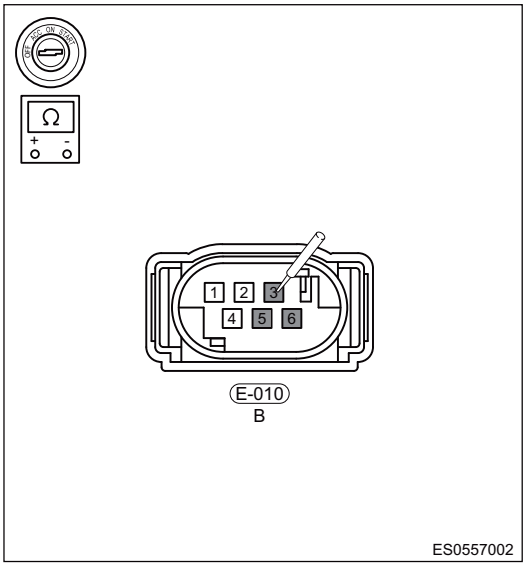
(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the electronic throttle connector E-010 (arrow).



(d) Check electronic throttle for carbon deposits and foreign matter accumulation inside.
(e) Check if electronic throttle valve body is stuck.
(f) Check the resistance of electronic throttle.

Throttle Inspection

Multimeter Connection	Condition	Specified Condition
Terminal 5 - Terminal 3	Throttle turned	Resistance between terminals 5 and 3 increases as throttle valve opens
Terminal 6 - Terminal 3		Resistance between terminals 6 and 3 decreases as throttle valve opens
Terminal 5 - Terminal 3 and Terminal 6 -Terminal 3	On same position of valve at normal temperature	Sum of resistance in two groups is 1.9 kΩ ± 0.2 kΩ



OK

Each throttle position sensor terminal resistance is normal

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector (electronic throttle - ECU)**

OK

6	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0121 29, 0122 16, 0123 17, 0221 29, 0222 16 or P0223 17 still exists.

OK

No same DTC is output

Result

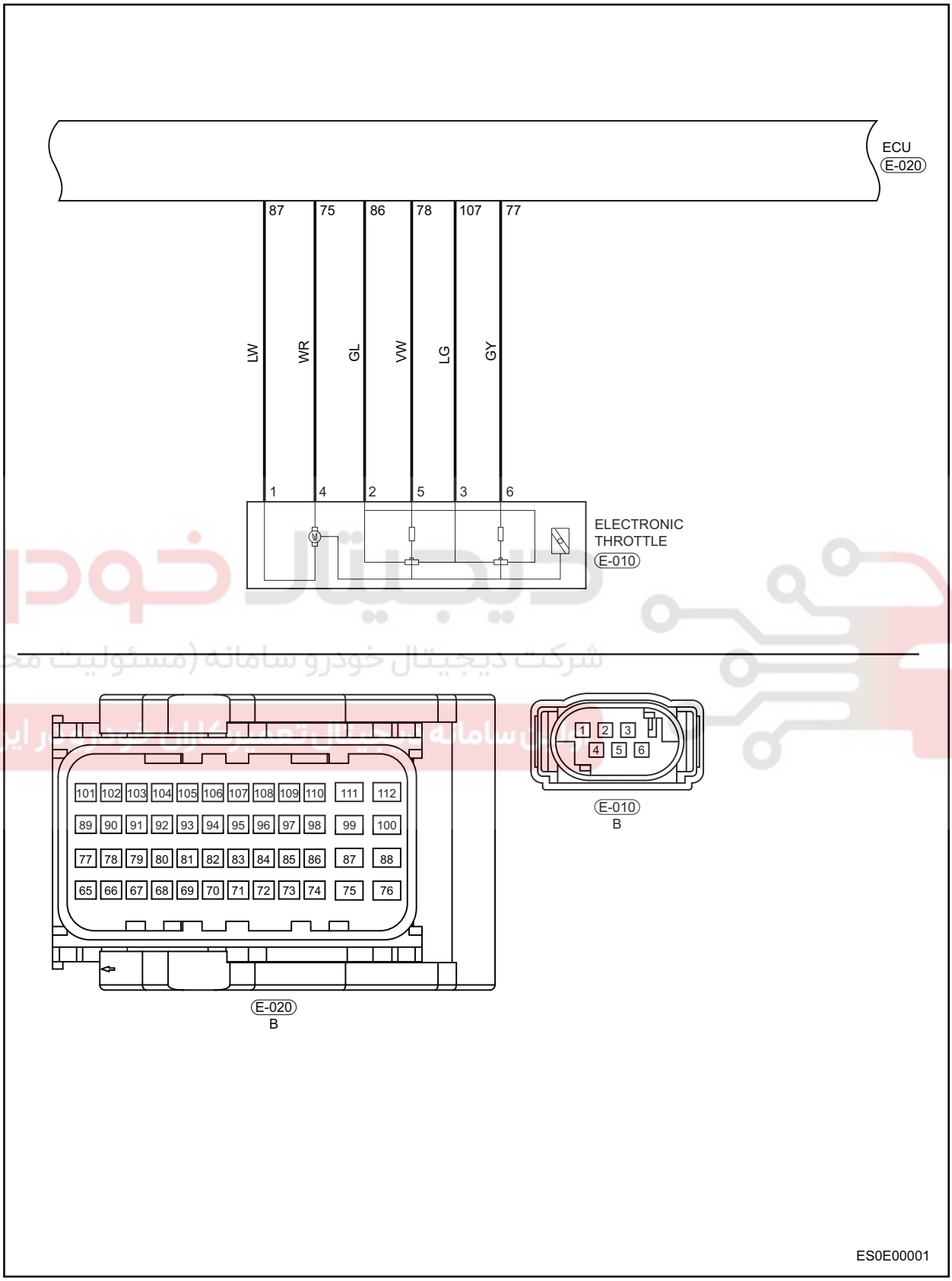
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P1102 00	Throttle Limphome Position Self Learning Error
DTC	P1102 29	Throttle Lower Mechanic Stop Re-learning Error
DTC	P1103 00	Throttle Lower Mechanic Stop First Learning Error
DTC	P1104 00	Throttle Self Learning Condition not Fulfilled
DTC	P1106 00	Throttle Position Deviation Error
DTC	P1106 22	Throttle PID Adjustment Max Error
DTC	P1106 21	Throttle PID Adjustment Min Error
DTC	P1111 00	Return Spring Check Max Error
DTC	P1122 77	Torque Limitation when Throttle-valve Error Happen

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P1102 00	Throttle Limphome Position Self Learning Error	ENGINE START STOP switch ON, engine running	• Throttle position sensor 1 • Throttle Position Sensor 2 • Wire harness or connector • ECU
P1102 29	Throttle Lower Mechanic Stop Re-learning Error		
P1103 00	Throttle Lower Mechanic Stop First Learning Error		
P1104 00	Throttle Self Learning Condition not Fulfilled		
P1106 00	Throttle Position Deviation Error		
P1106 21	Throttle PID Adjustment Min Error		
P1106 22	Throttle PID Adjustment Max Error		
P1111 00	Return Spring Check Max Error		
P1122 77	Torque Limitation when Throttle-valve Error Happen		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Do electronic throttle self-learning

(a) Connect diagnostic tester, clear DTCs, turn ignition switch to OFF and then to ON, and wait for 1 minute.

(b) Perform electronic throttle self-learning.

OK

Throttle self-learning is finished

Result

Proceed to
OK
NG

OK → **Check electronic throttle signal voltage**

NG

2	Check if conditions of throttle self-learning are met

(a) Check if conditions of throttle self-learning are met
- Engine intake temperature is 5°C.
- 100.5°C > engine coolant temperature > 5°C.
- Engine speed ⩽ 250 rpm.
- Vehicle speed = 0.
- Battery voltage is 10 V.
- Accelerator pedal opening angle < 14.9%.

OK

Throttle self-learning is finished

Result

Proceed to
OK
NG

NG → **Find and repair faulty components**

OK

3	Perform electronic throttle self-learning

(a) Connect diagnostic tester, clear DTCs, turn ignition switch to OFF and then to ON, and wait for 1 minute.

(b) Perform electronic throttle self-learning, after self-learning is finished, slightly depress accelerator pedal several times, observe if DTCs appear again.

OK

Throttle self-learning is finished

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector (electronic throttle - ECU)**

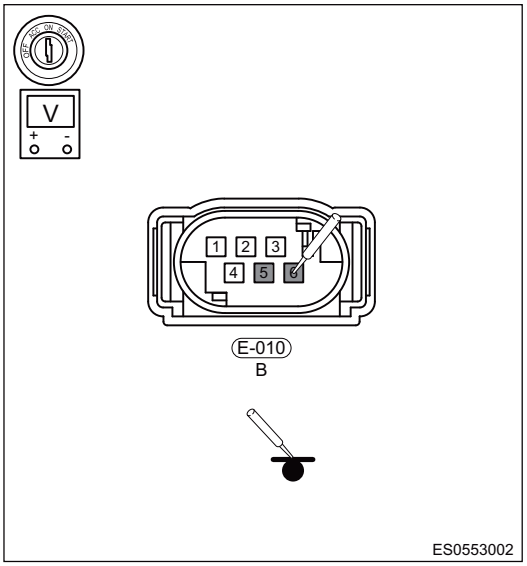
OK

4	Check throttle position sensor signal voltage

(a) Turn ignition switch to ON.

(b) Measure the throttle position sensor signal voltage (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
E-010 (6) - Body ground	Ignition switch ON, idling	0.74 V
	ENGINE START STOP switch ON, throttle fully opened	4.24 V
E-026 (5) - Body ground	Ignition switch ON, idling	4.24 V
	ENGINE START STOP switch ON, throttle fully opened	0.36 V



OK

Throttle position sensor voltage is normal

Result

Proceed to
OK
NG

06

NG → **Check and repair signal wire harness between electronic throttle and ECU**

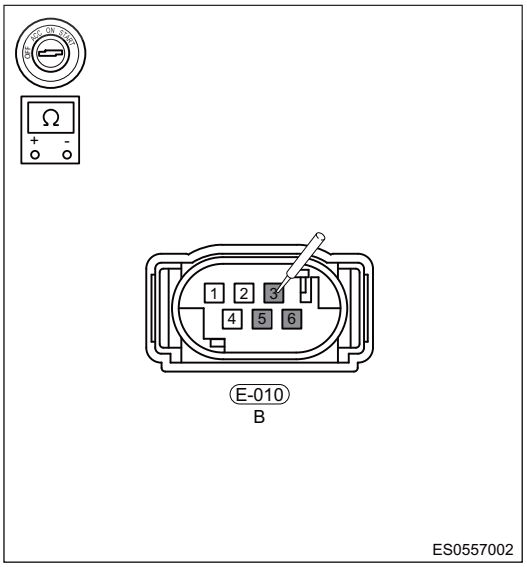
OK

5 Check electronic throttle

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the electronic throttle connector E-010 (arrow).
(d) Check electronic throttle for carbon deposits and foreign matter accumulation inside.
(e) Check if electronic throttle valve body is stuck.
(f) Check the resistance of electronic throttle.

Throttle Inspection

Multimeter Connection	Condition	Specified Condition
Terminal 5 - Terminal 3	Throttle turned	Resistance between terminals 6 and 2 increases as throttle valve opens
Terminal 6 - Terminal 3		Resistance between terminals 6 and 3 decreases as throttle valve opens
Terminal 5 - Terminal 3 and Terminal 6 -Terminal 3	On same position of valve at normal temperature	Sum of resistance in two groups is 1.9 kΩ ± 0.2 kΩ



OK

Each throttle position sensor terminal resistance is normal

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector (electronic throttle - ECU)**

OK

6	Check throttle position sensor actuator motor wire harness

(a) Check the throttle position sensor actuator motor wire harness.

Result

Proceed to
OK
NG

NG → **Check and repair actuator motor wire harness between electronic throttle and ECU**

OK

7	Perform electronic throttle self-learning again

(a) Install throttle assembly, connect throttle connector and ECU connector securely.
(b) Connect the negative battery cable.
(c) Connect diagnostic tester, clear DTCs, turn ignition switch to OFF and then to ON, and wait for 1 minute.
(d) Perform electronic throttle self-learning.

OK

Throttle self-learning is finished

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector (electronic throttle - ECU)**

OK

8	Reconfirm DTCs

(a) Slowly and quickly depress the accelerator pedal several times, and then read DTCs again to check if malfunction reoccurs.
(b) Check if DTC P1102 00, P1102 29, P1103 00, P1104 00, P1106 00, P1106 21, P1106 22, P1111 00, P1122 77 still exists.

OK

No same DTC is output

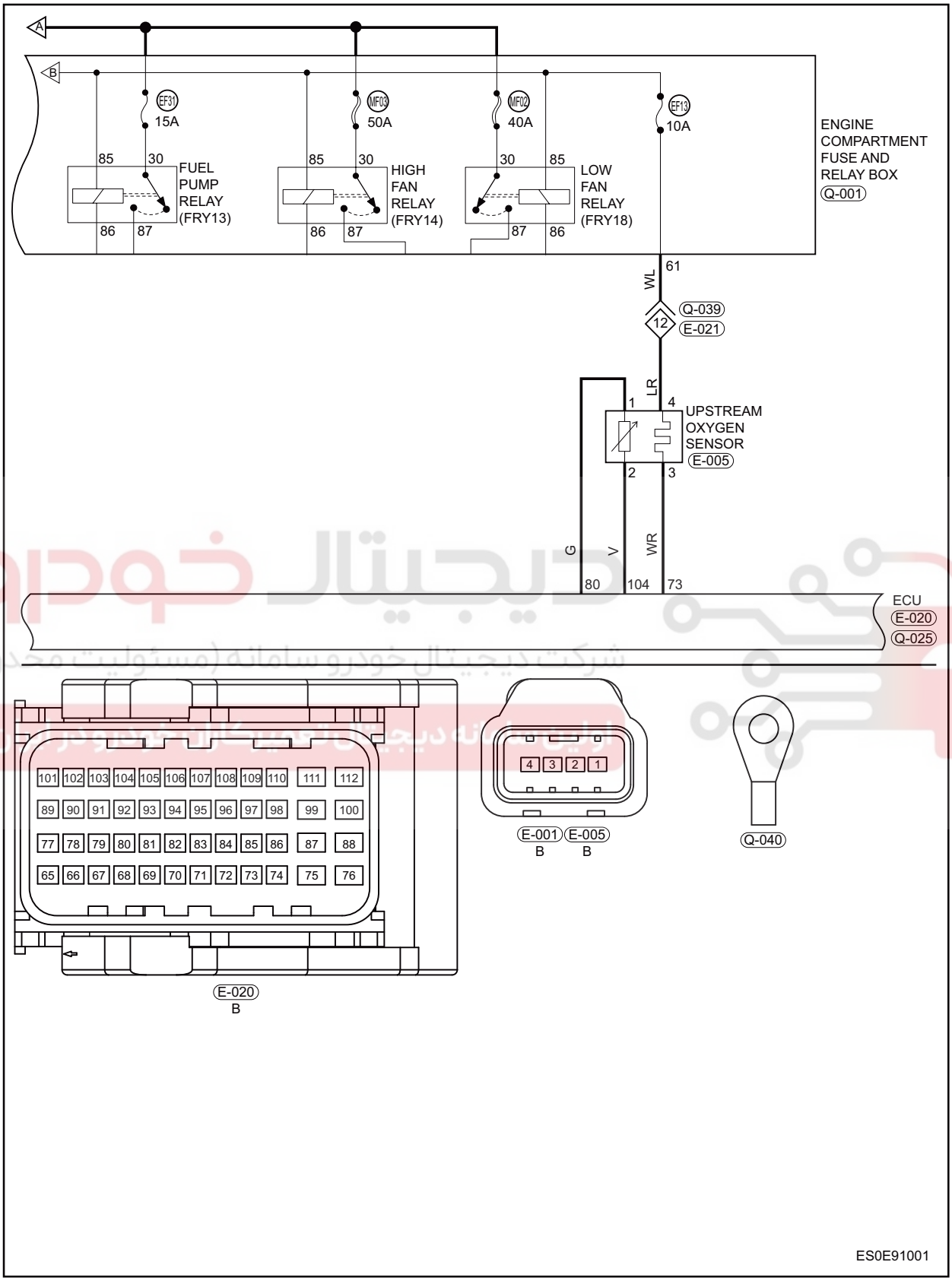
Result

Proceed to
OK
NG

OK	System operates normally
NG	End

DTC	P0130 00	O2 Sensor Circ. Malfunction (Upstream of the Catalyzer)
DTC	P0131 16	O2 Sensor Circ. Low Voltage (Upstream of the Catalyzer)
DTC	P0132 17	O2 Sensor Circ. High Voltage (Upstream of the Catalyzer)
DTC	P0133 00	O2 Sensor Circ. Slow Response (Upstream of the Catalyzer)
DTC	P0134 00	O2 Sensor Circ. No Activity Detected (Upstream of the Catalyzer)
DTC	P2195 00	O2 Sensor Signal Stuck Lean (Upstream of the Catalyzer)
DTC	P2196 00	O2 Sensor Signal Stuck Rich (Upstream of the Catalyzer)

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0130 00	O2 Sensor Circ. Malfunction (Upstream of the Catalyzer)	Ignition switch ON, engine running	• Upstream Oxygen Sensor • Wire harness or connector • ECU
P0131 16	O2 Sensor Circ. Low Voltage (Upstream of the Catalyzer)		
P0132 17	O2 Sensor Circ. High Voltage (Upstream of the Catalyzer)		
P0133 00	O2 Sensor Circ. Slow Response (Upstream of the Catalyzer)		
P0134 00	O2 Sensor Circ. No Activity Detected (Upstream of the Catalyzer)		
P2195 00	O2 Sensor Signal Stuck Lean (Upstream of the Catalyzer)		
P2196 00	O2 Sensor Signal Stuck Rich (Upstream of the Catalyzer)		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check fuse EF13**

(a) Check if fuse EF13 is blown or no power.

Result

Proceed to
OK
NG

NG → **Replace fuse or check the cause for no power**

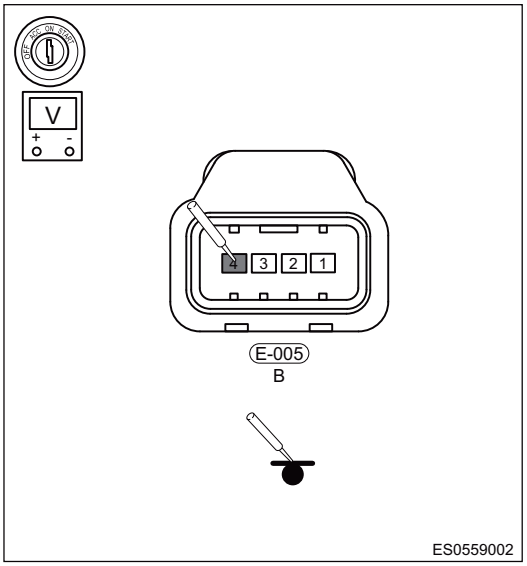
OK

2	**Check upstream oxygen sensor power supply voltage**

(a) Turn ENGINE START STOP switch to ON.

(b) Measure voltage between terminal 4 of connector E-005 and ground (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
E-005 (4) - Body ground	ON	Not less than 12 V



OK

Upstream oxygen sensor power supply voltage is normal

Result

Proceed to
OK
NG

NG → **Check and repair wire harness between upstream oxygen sensor power supply and engine compartment fuse and relay box**

OK

3	**Check voltage between upstream oxygen sensor signal wire and ground wire**

(a) Turn ignition switch to ON.
(b) Measure voltage between terminals 2 and 1 of connector E-005 (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
E-005 (2) - E-005 (1)	ON	Approximately 0.45 V

OK

Upstream oxygen sensor signal is normal

Result

Proceed to
OK
NG

NG → **Check and repair wire harness or connector**

OK

4	**Check voltage between upstream oxygen sensor signal wire and ground wire with engine running**

(a) Turn ignition switch to ON, start engine and idle it until engine coolant temperature is normal.

(b) Measure voltage between terminals 2 and 1 of connector E-005 (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
E-005 (2) - E-005 (1)	Engine running	Fluctuates rapidly between 0.1 and 1 V (coolant temperature is normal)

Result

Proceed to
OK
NG

NG → **Repair or replace upstream oxygen sensor**

OK → 06

5	Check for short between upstream oxygen sensor heater control circuit and signal circuit with engine running

(a) Start engine and idle it until engine coolant temperature is normal, and leave the vehicle in idle state.
(b) Stop engine and disconnect upstream oxygen sensor connector.
(c) Check for short between terminals 3 and 2 of connector E-005.

Multimeter Connection	Condition	Specified Condition
E-005 (2) - E-005 (3)	Engine running	No short circuit

Result

Proceed to
OK
NG

NG → **Replace upstream oxygen sensor**

OK →

6	Check the upstream oxygen sensor

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Remove the upstream oxygen sensor.
(d) Check upstream oxygen sensor for the following problems.
- Moisture enters the internal of sensor, temperature changes greatly or probe is broken or deteriorated.

OK

Upstream oxygen sensor is normal

Result

Proceed to
OK
NG

NG → **Repair or replace upstream oxygen sensor**

OK

7	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC still exists.

OK

No same DTC is output

Result

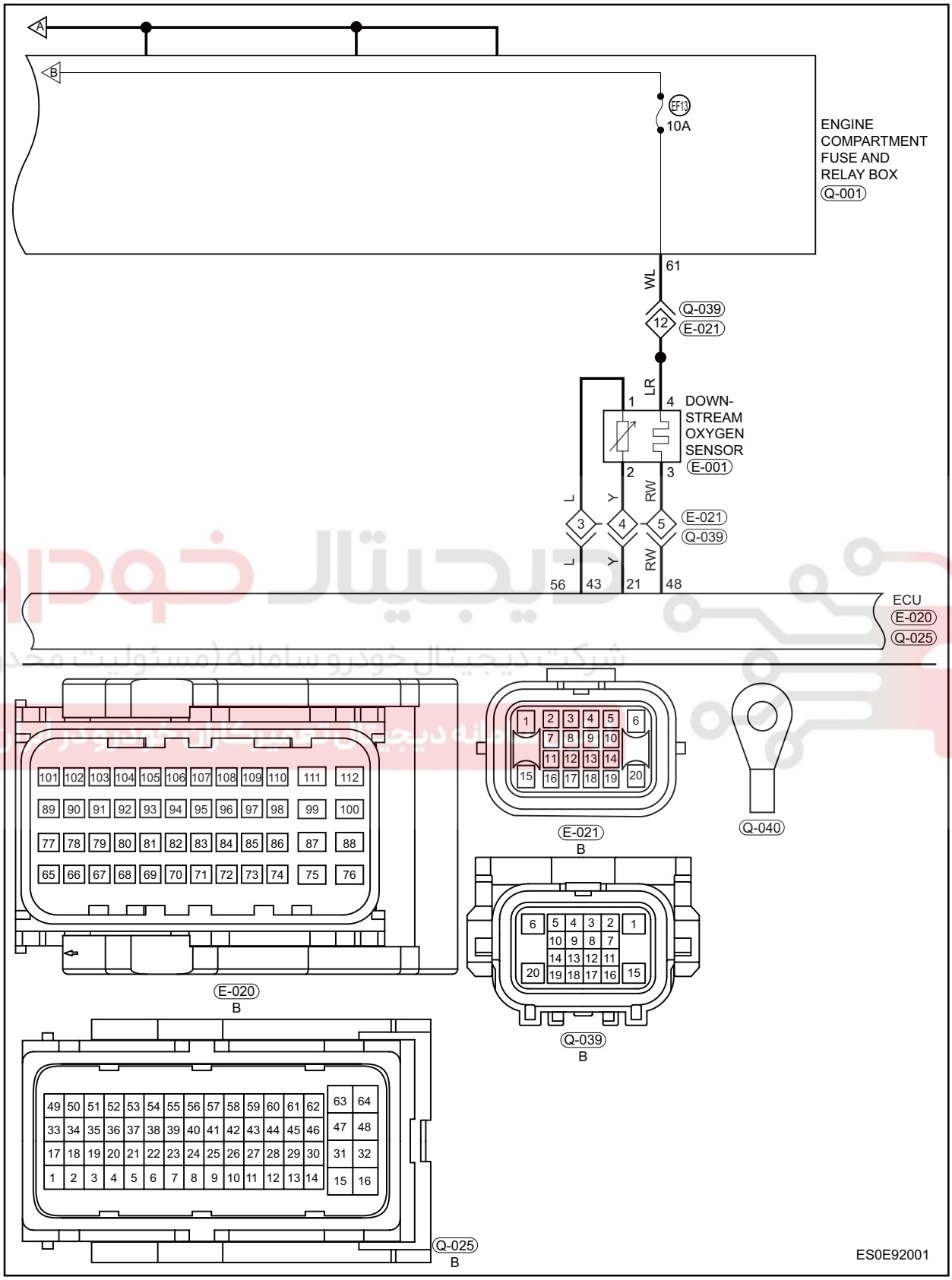
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0136 00	O2 Sensor Circ. Malfunction (Downstream of the Catalyzer)
DTC	P0137 16	O2 Sensor Circ. Low Voltage (Downstream of the Catalyzer)
DTC	P0138 17	O2 Sensor Circ. High Voltage (Downstream of the Catalyzer)
DTC	P0140 00	O2 Sensor Circ. No Activity Detected (Downstream of the Catalyzer)
DTC	P2270 00	O2 Sensor Signal Stuck Lean (Downstream of the Catalyzer)
DTC	P2271 00	O2 Sensor Signal Stuck Rich (Downstream of the Catalyzer)

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0136 00	O2 Sensor Circ. Malfunction (Downstream of the Catalyzer)	Ignition switch ON, engine running	• Downstream Oxygen Sensor • Wire harness or connector • ECU
P0137 16	O2 Sensor Circ. Low Voltage (Downstream of the Catalyzer)		
P0138 17	O2 Sensor Circ. High Voltage (Downstream of the Catalyzer)		
P0140 00	O2 Sensor Circ. No Activity Detected (Downstream of the Catalyzer)		
P2270 00	O2 Sensor Signal Stuck Lean (Downstream of the Catalyzer)		
P2271 00	O2 Sensor Signal Stuck Rich (Downstream of the Catalyzer)		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

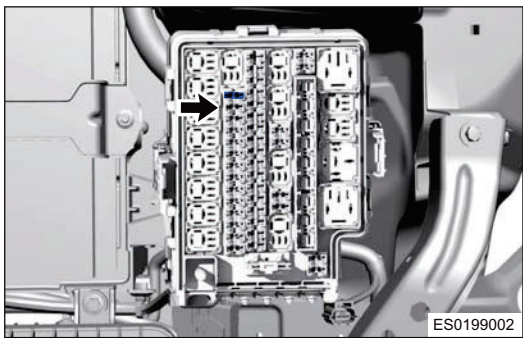
Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check fuse EF13**

(a) Check if fuse EF13 is blown or no power.



Result

Proceed to
OK
NG

NG → **Replace fuse or check the cause for no power**

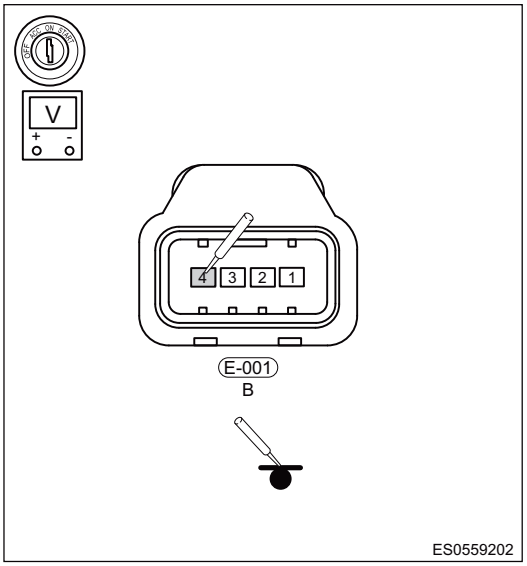
OK

2	**Check downstream oxygen sensor power supply voltage**

(a) Turn ENGINE START STOP switch to ON.

(b) Measure voltage between terminal 4 of connector E-001 and ground (using a digital multimeter) (online detection).

Multimeter Connection	Condition	Specified Condition
E-001 (4) - Body ground	ON	Not less than 12 V



OK

Downstream oxygen sensor power supply voltage is normal

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector**

OK ↓

3 Check voltage between downstream oxygen sensor signal wire and ground wire

(a) Turn ignition switch to ON.
(b) Measure voltage between terminals 2 and 1 of connector E-001 (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
E-001 (2) - E-001 (1)	ON	0.45 V

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector**

OK ↓

4 Check voltage between downstream oxygen sensor signal wire and ground wire with engine running

(a) Start engine and idle it until engine coolant temperature is normal.
(b) Measure voltage between terminals 2 and 1 of connector E-001 (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
E-001 (2) - E-001 (1)	Engine running	Fluctuates rapidly between 0.1 and 1 V (coolant temperature is normal)

Result

Proceed to
OK
NG

NG → **Repair or replace downstream oxygen sensor**

OK

5 Check for short between downstream oxygen sensor heater control circuit and signal circuit with engine running

(a) Start engine and idle it until engine coolant temperature is normal.
(b) Stop engine and disconnect downstream oxygen sensor connector.
(c) Check for short between terminals 3 and 2 of connector E-001.

Multimeter Connection	Condition	Specified Condition
E-001 (2) - E-001 (3)	Always	No short circuit

Result

Proceed to
OK
NG

NG → **Repair or replace downstream oxygen sensor**

OK

6 Reconfirm DTCs

(a) Turn ignition switch to ON.
(b) Using diagnostic tester, read ECU DTC.
(c) Check if P0136 00, P0137 16, P0138 17, P0140 00, P2270 00, P2271 00 still exists.

OK

No same DTC is output

Result

Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0506 00	Idle Control System RPM Lower than Expected

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0506 00	Idle Control System RPM Lower than Expected	• Carbon canister is not in high scour rate; • Engine is idling; • Vehicle speed sensor has been inspected and has no fault, P0501 (coast and fuel cut-off for 5 seconds or more when vehicle speed is more than 20 km/h); • Vehicle speed is 0;	• Throttle • Intake system • Fuel Injector • Fuel pump

Confirmation Procedure

Confirm that battery voltage is no less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Check electronic throttle

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Remove the electronic throttle assembly.
(d) Check if electronic throttle is stuck in smaller open position due to ice or oil.

OK

Electronic throttle is normal

Result

Proceed to
OK
NG

NG → **Repair or replace electronic throttle assembly**

OK ↓

2	Check intake system for blockage

(a) Check intake system for blockage.

OK

Intake system is normal

Result

Proceed to
OK
NG

NG → **Repair or replace components that result in intake system blockage and air intake volume reduction**

OK →

3	Check injector for blockage

(a) Check injector for blockage.

OK

Injector is normal

Result

Proceed to
OK
NG

NG → **Replace or clean injector**

OK →

4	Check for excessive exhaust resistance

(a) Check for excessive exhaust resistance.

OK

Exhaust system is normal

Result

Proceed to
OK
NG

NG → **Repair or replace faulty exhaust system components**

OK →

5	Check for low fuel pressure

(a) Check for low fuel pressure.

OK

Fuel pressure is normal

Result

Proceed to
OK
NG

NG → **Repair or replace faulty fuel system components**

OK →

6 Check for weak spark plug ignition

(a) Check for weak spark plug ignition.

OK

Spark plug ignition is normal

Result

Proceed to
OK
NG

NG → **Replace spark plug**

OK →

7 Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0506 00 still exists.

OK

No same DTC is output

Result

Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0507 00	Idle Control System RPM Higher than Expected

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0507 00	Idle Control System RPM Higher than Expected	• Carbon canister is not in high scour rate; • Engine is idling; • Vehicle speed sensor has been inspected and has no fault, P0501 (coast and fuel cut-off for 5 seconds or more when vehicle speed is more than 20 km/h); • Vehicle speed is 0;	• Throttle • Intake system • Fuel Injector • Fuel pump

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Check electronic throttle

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Remove the electronic throttle assembly.
(d) Check if electronic throttle is stuck in larger open position due to ice or oil.

OK

Electronic throttle is normal

Result

Proceed to
OK
NG

NG → **Repair or replace electronic throttle assembly**

OK

2	Check intake system for air leakage

(a) Check intake system for air leakage.

OK
Intake manifold is normal
Result

Proceed to
OK
NG

NG → **Repair or replace faulty intake system components**

OK →

3	Check injector for oil dripping

(a) Check injector for oil dripping.
OK
Injector is normal
Result

Proceed to
OK
NG

NG → **Replace or clean injector**

OK →

4	Check for hight fuel pressure

(a) Check for hight fuel pressure.
OK
Fuel pressure is normal
Result

Proceed to
OK
NG

NG → **Repair or replace faulty fuel system components**

OK →

5	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Refer to "DTC Confirmation Procedure".
(e) Check if DTC P0507 00 still exists.

OK

No same DTC is output

Result

Proceed to
OK
NG

OK	System operates normally
NG	Replace with a new ECU to check if fault reoccurs

DTC	P0219 00	Engine Overspeed Condition

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0219 00	Engine Overspeed Condition	/	• Throttle • Accelerator pedal • Speed Sensor • ECU

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Check electronic throttle

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Remove the electronic throttle assembly.
(d) Check if electronic throttle is stuck in larger open position due to ice or oil.

OK

Electronic throttle is normal

Result

Proceed to
OK
NG

NG → **Repair or replace electronic throttle assembly**

OK

2	Check accelerator pedal

(a) Remove the·accelerator pedal assembly.
(b) Check if accelerator pedal is stuck in larger open position.

OK

Accelerator pedal is normal

Result

Proceed to
OK
NG

NG → **Repair or replace accelerator pedal assembly**

OK

3 Check speed sensor for malfunction

(a) Check speed sensor for malfunction.

OK

Speed sensor is normal

Result

Proceed to
OK
NG

NG → **Repair or replace speed sensor**

OK

4 Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0219 00 still exists.

OK

No same DTC is output

Result

Proceed to
OK
NG

OK → **System operates normally**

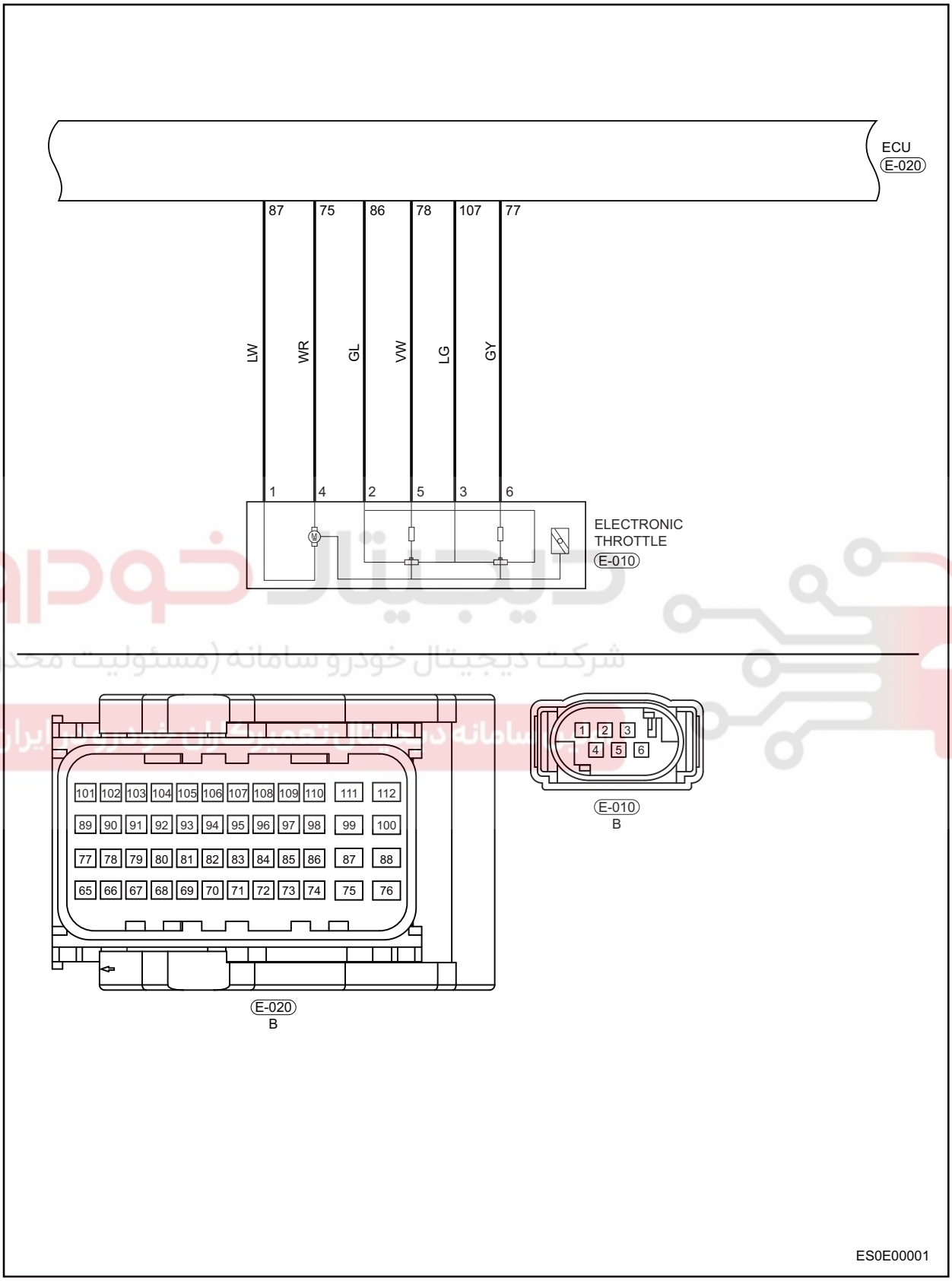
NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0606 1C	Throttle Signal, Wiring Harness or ECU Error
DTC	P0606 00	Safety Monitoring Fuel Cutoff Error
DTC	P0606 16	Reported Under Voltage of VDD5
DTC	P0606 17	Reported Over Voltage of VDD5
DTC	P0606 42	Safety Monitoring Function Error (ECU EEPROM Error)
DTC	P0606 45	Visibility of Software Resets in DSM
DTC	P0606 47	Monitoring Moduel Feedback Error
DTC	P0606 48	Monitoring Fault Reaction Error
DTC	P0606 49	Monitoring Moduel Inquiry Error
DTC	P0606 55	Variant Coding Monitoring Error
DTC	P0606 61	Ignition Angle Signal, Wiring Harness or ECU Error
DTC	P0606 62	Pedal Signal Unplausibility Error in Level 2
DTC	P0606 63	Safety Monitoring Function Error (SSM System Monitoring Error)
DTC	P0606 64	Laod Signal, Wiring Harness or ECU Error
DTC	P0606 67	ECU Fault Reaction Monitoring Error
DTC	P0606 75	Shut Off Path Test Error
DTC	P0606 91	Diagnostic Fault Check to Report
DTC	P0606 92	Engine Speed Monitoring Error in Level 2
DTC	P0606 94	Torque Monitoring Error in Level 2
DTC	P0606 96	AD Converter Monitoring Error

DTC	P0606 97	Function Monitoring: Fault of ECU ADC - Test Voltage

DTC	P1100 00	Engine Torque Control Adaption at Limit

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0606 1C	Throttle Signal, Wiring Harness or ECU Error	ENGINE START STOP switch ON, engine running	• Throttle • Low battery voltage • Throttle mechanical fault • Wire harness or connector • ECU
P0606 00	Safety Monitoring Fuel Cutoff Error		
P0606 16	Reported Under Voltage of VDD5		
P0606 17	Reported Over Voltage of VDD5		
P0606 42	Safety Monitoring Function Error (ECU EEPROM Error)		
P0606 45	Visibility of Software Resets in DSM		
P0606 47	Monitoring Moduel Feedback Error		
P0606 48	Monitoring Fault Reaction Error		
P0606 49	Monitoring Moduel Inquiry Error		
P0606 55	Variant Coding Monitoring Error		
P0606 61	Ignition Angle Signal, Wiring Harness or ECU Error		
P0606 62	Pedal Signal Unplausibility Error in Level 2		
P0606 63	Safety Monitoring Function Error (SSM System Monitoring Error)		
P0606 64	Laod Signal, Wiring Harness or ECU Error		
P0606 67	ECU Fault Reaction Monitoring Error		
P0606 75	Shut Off Path Test Error		
P0606 91	Diagnostic Fault Check to Report		
P0606 92	Engine Speed Monitoring Error in Level 2		
P0606 94	Torque Monitoring Error in Level 2		
P0606 96	AD Converter Monitoring Error		
P0606 97	Function Monitoring: Fault of ECU ADC - Test Voltage		
P1100 00	Engine Torque Control Adaption at Limit		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:
- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Clear and read DTCs again

(a) Connect diagnostic tester and clear DTCs.
(b) Start and run engine for a while, and then read DTCs again to check if DTCs appear.

OK

Each throttle position sensor terminal resistance is normal

Result

Proceed to
OK
NG

OK → **Check throttle position sensor actuator motor wire harness**

NG

2	Perform electronic throttle self-learning.

(a) Install throttle assembly, connect throttle connector and ECU connector securely.
(b) Connect the negative battery cable.
(c) Connect diagnostic tester, clear DTCs, turn ignition switch to OFF and then to ON, and wait for 1 minute.
(d) Perform electronic throttle self-learning.

OK

Throttle self-learning is finished

Result

Proceed to
OK
NG

NG → **Replace with new ECU to perform real-vehicle test**

OK

3	Reconfirm DTCs

(a) Turn ignition switch to OFF and then to ON, and wait for 1 minute to finish the electronic throttle self-learning.
(b) Slowly and quickly depress the accelerator pedal several times, and then read DTCs again to check if DTC P1102 00, P1102 29, P1103 00, P1104 00, P1106 00, P1106 21, P1106 22, P1111 00 or P1122 77 still exists.

OK

No same DTC is output

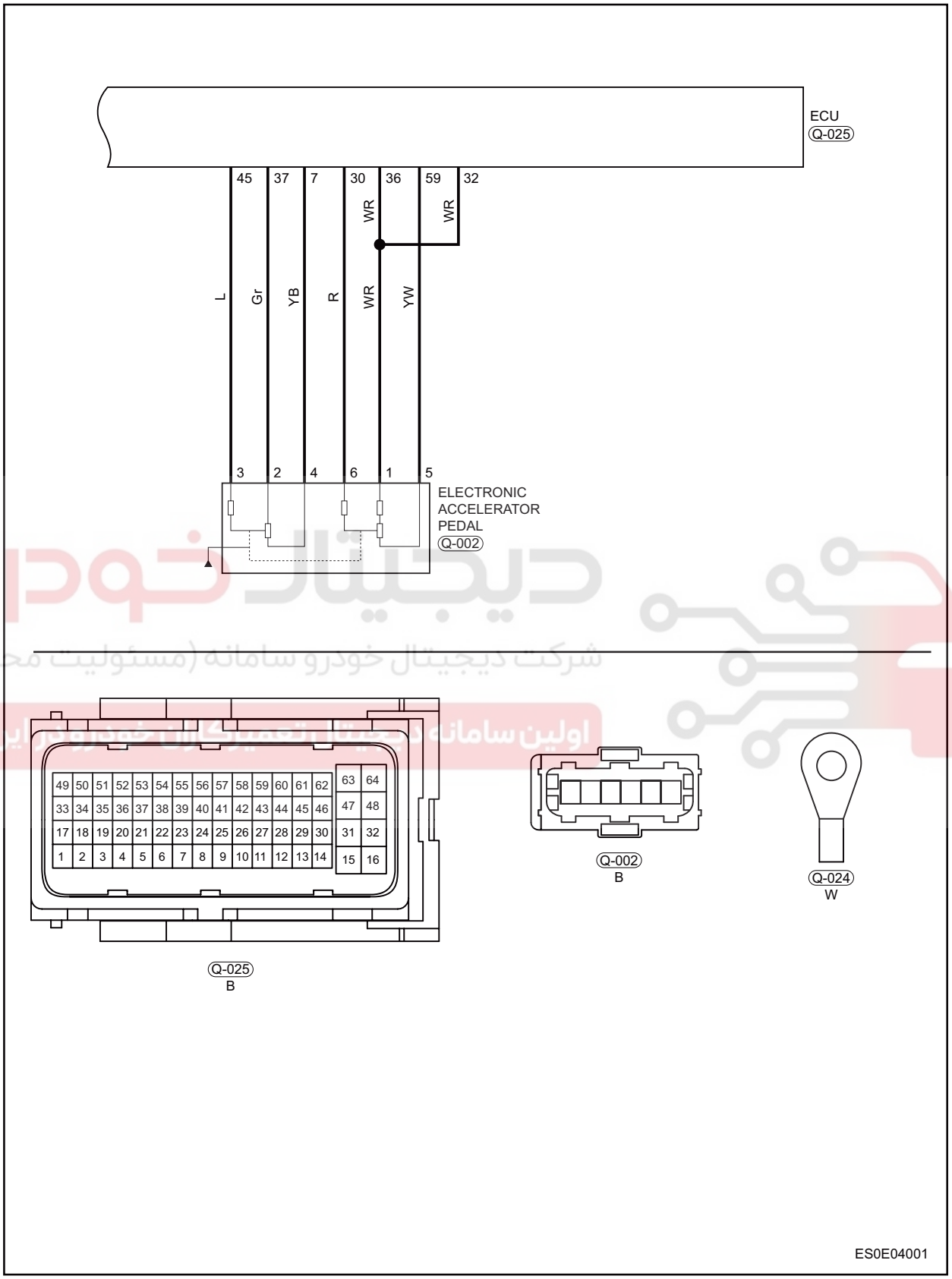
Result

Proceed to
OK
NG

OK	End
NG	Seek help from manufacturer

DTC	P2122 16	Pedal Pos.Sensor 1 Circ. Low Input
DTC	P2123 17	Pedal Pos.Sensor 1 Circ. High Input
DTC	P2127 16	Pedal Pos.Sensor 2 Circ. Low Input
DTC	P2128 17	Pedal Pos.Sensor 2 Circ. High Input
DTC	P2138 00	Pedal Movement Check Error
DTC	P2138 29	Pedal Pos.Sensor 1/2 Unplausible

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P2122 16	Pedal Pos.Sensor 1 Circ. Low Input	ENGINE START STOP switch ON, engine running	• Accelerator pedal position sensor • Wire harness or connector • ECU
P2123 17	Pedal Pos.Sensor 1 Circ. High Input		
P2127 16	Pedal Pos.Sensor 2 Circ. Low Input		
P2128 17	Pedal Pos.Sensor 2 Circ. High Input		
P2138 00	Pedal Movement Check Error		
P2138 29	Pedal Pos.Sensor 1/2 Unplausible		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1 Check electronic accelerator pedal position sensor

(a) Check if electronic accelerator pedal position sensor is connected normally.

Result

Proceed to
OK
NG

NG → **Reinstall or repair, replace connector**

OK

2 Clear and read DTCs again

(a) Connect diagnostic tester, and then turn ignition switch to ON.
(b) Clear DTCs, and then slowly and quickly depress the accelerator pedal several times.
(c) Read DTCs again.

OK

DTCs do not recur, diagnosis is completed

Result

Proceed to
OK

Proceed to
NG

OK → End

NG

3	Read data flow of accelerator pedal voltage signal

(a) Turn ignition switch to ON.
(b) Connect diagnostic tester connector, read data flow of accelerator pedal 1 and 2 voltage signal.
(c) Then slowly depress the accelerator pedal, observe if the voltage values displayed on two digital multimeters change with the depression amount of accelerator pedal.

OK

Voltage values displayed on two digital multimeters are changed

Result

Proceed to
OK
NG

NG → Repair or replace wiring harness corresponding to unchanged voltage signal

OK

4	Replace electronic accelerator pedal, reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if P2122 16, P2123 17, P2127 16, P2128 17, P2138 00 or P2138 29 still exists.

OK

No same DTC is output

Result

Proceed to
OK
NG

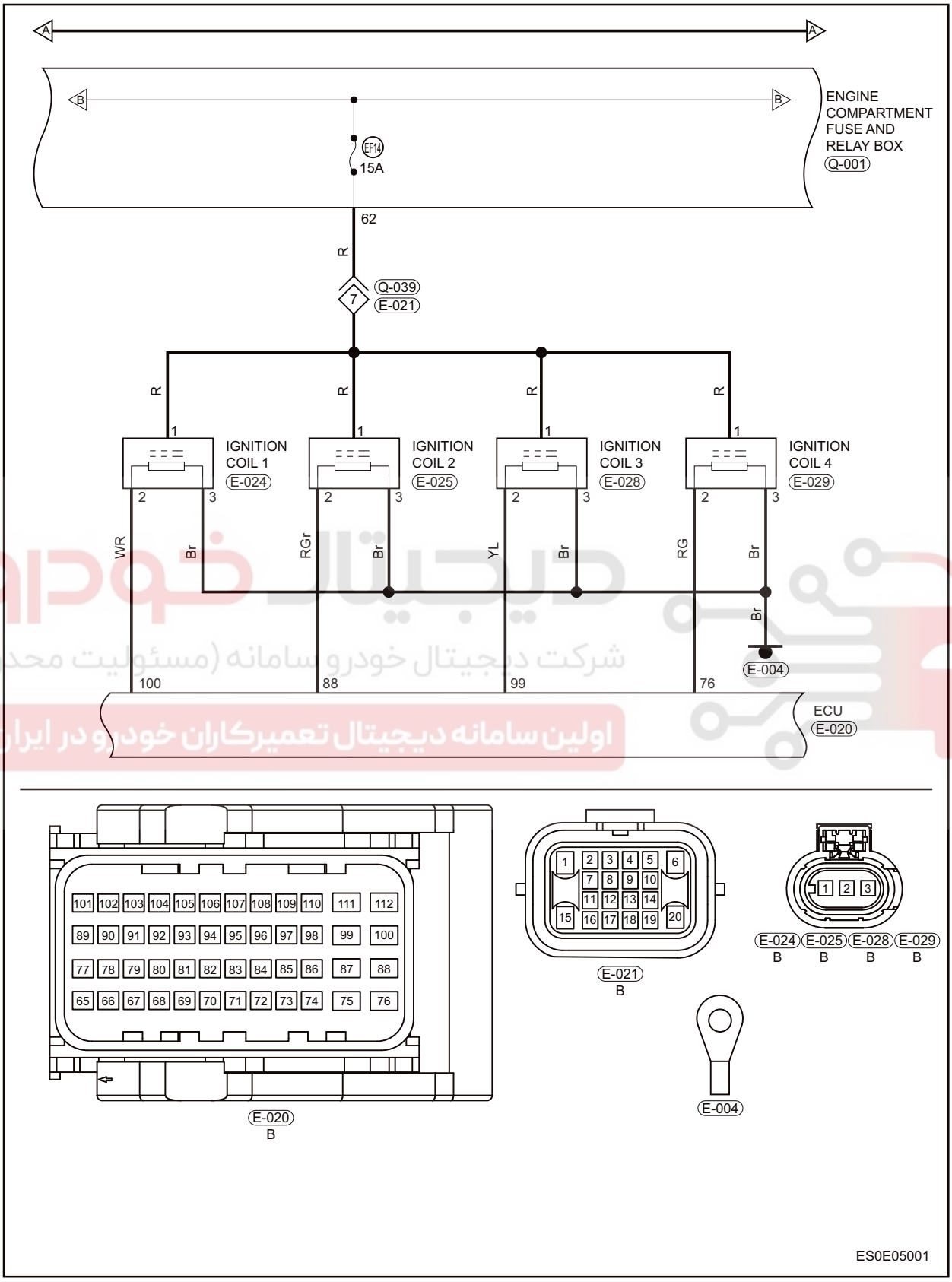
OK → System operates normally

NG → Replace with a new ECU to check if fault reoccurs

DTC	P0300 00	Misfire Detected
DTC	P0300 21	Random/Multiple Cylinder Misfire Detected (Over Emission Limit)
DTC	P0300 22	Random/Multiple Cylinder Misfire Detected (Harmful to Catalyst)
DTC	P0300 29	Random/Multiple Cylinder Misfire Detected (During First Statistic Cycle)
DTC	P0301 00	Misfire Detected on Cylinder 1
DTC	P0301 21	Cylinder 1 Misfire Detected (Over Emission Limit)
DTC	P0301 22	Cylinder 1 Misfire Detected (Harmful to Catalyst)
DTC	P0301 29	Cylinder 1 Misfire Detected (During First Statistic Cycle)
DTC	P0302 00	Misfire Detected on Cylinder 2
DTC	P0302 21	Cylinder 2 Misfire Detected (Over Emission Limit)
DTC	P0302 22	Cylinder 2 Misfire Detected (Harmful to Catalyst)
DTC	P0302 29	Cylinder 2 Misfire Detected (During First Statistic Cycle)
DTC	P0303 00	Misfire Detected on Cylinder 3
DTC	P0303 21	Cylinder 3 Misfire Detected (Over Emission Limit)
DTC	P0303 22	Cylinder 3 Misfire Detected (Harmful to Catalyst)
DTC	P0303 29	Cylinder 3 Misfire (During First Statistic Cycle)
DTC	P0304 00	Misfire Detected on Cylinder 4
DTC	P0304 21	Cylinder 4 Misfire Detected (Over Emission Limit)
DTC	P0304 22	Cylinder 4 Misfire Detected (Harmful to Catalyst)

DTC	P0304 29	Cylinder 4 Misfire Detected (During First Statistic Cycle)

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0300 00	Misfire Detected	ENGINE START STOP switch ON, engine running	• Ignition coil • Wire harness or connector • Engine mechanical • ECU
P0300 21	Random/Multiple Cylinder Misfire Detected (Over Emission Limit)		
P0300 22	Random/Multiple Cylinder Misfire Detected (Harmful to Catalyst)		
P0300 29	Random/Multiple Cylinder Misfire Detected (During First Statistic Cycle)		
P0301 00	Misfire Detected on Cylinder 1		
P0301 21	Cylinder 1 Misfire Detected (Over Emission Limit)		
P0301 22	Cylinder 1 Misfire Detected (Harmful to Catalyst)		
P0301 29	Cylinder 1 Misfire Detected (During First Statistic Cycle)		
P0302 00	Misfire Detected on Cylinder 2		
P0302 21	Cylinder 2 Misfire Detected (Over Emission Limit)		
P0302 22	Cylinder 2 Misfire Detected (Harmful to Catalyst)		
P0302 29	Cylinder 2 Misfire Detected (During First Statistic Cycle)		
P0303 00	Misfire Detected on Cylinder 3		
P0303 21	Cylinder 3 Misfire Detected (Over Emission Limit)		
P0303 22	Cylinder 3 Misfire Detected (Harmful to Catalyst)		
P0303 29	Cylinder 3 Misfire (During First Statistic Cycle)		
P0304 00	Misfire Detected on Cylinder 4		
P0304 21	Cylinder 4 Misfire Detected (Over Emission Limit)		
P0304 22	Cylinder 4 Misfire Detected (Harmful to Catalyst)		
P0304 29	Cylinder 4 Misfire Detected (During First Statistic Cycle)		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Check if there is any DTC related to corresponding cylinder and injector

(a) Turn ignition switch to ON.
(b) Connect diagnostic tester, check if there is any DTC related to corresponding cylinder injector.

OK
There is no DTC related to corresponding cylinder and injector

Result

Proceed to
OK
NG

NG → **Troubleshooting DTC related to corresponding cylinder injector**

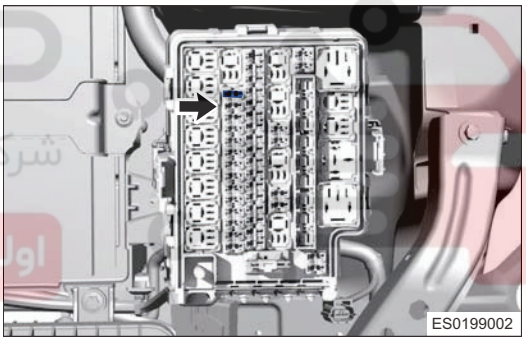
OK

2	Check fuse EF14

(a) Check if fuse EF14 is blown or no power.

Result

Proceed to
OK
NG



NG → **Replace fuse or check the cause for no power**

OK

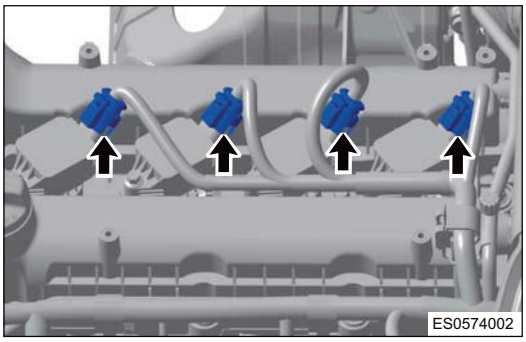
3	Check ignition coil connector

(a) Check ignition coil connector for poor contact or improper installation (arrow).

OK
Ignition coil connector is normal

Result

Proceed to
OK
NG



NG → **Reinstall or repair, replace connector**

OK

4	Check ignition coil power supply voltage

(a) Turn ignition switch to ON.
(b) Using a digital multimeter, measure voltage between ignition coil and ground.

Voltage Inspection

Multimeter Connection	Condition	Specified Condition
E-024 (1) - Ground point E-004	Ignition switch ON	Not less than 12 V
E-025 (1) - Ground point E-004		
E-028 (1) - Ground point E-004		
E-029 (1) - Ground point E-004		

Result

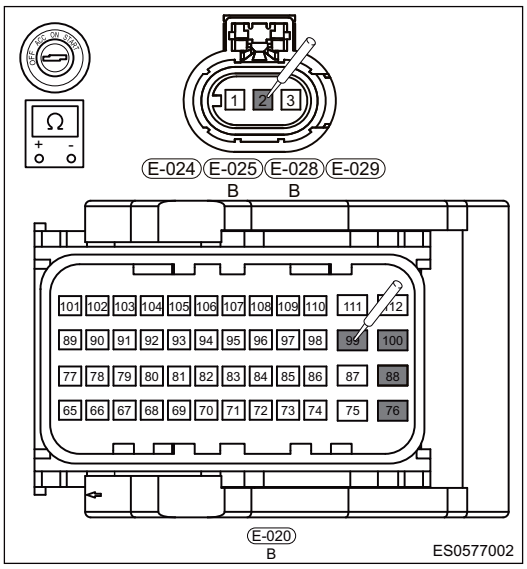
Proceed to
OK
NG

NG → **Replace wire harness or connector (ignition coil - engine compartment fuse and relay box)**

OK

5	Check ignition coil control circuit

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect ECU connector E-020 and 4 ignition coil connectors.
(d) Check wire harness between ignition coil connector terminal and ECU connector terminal.



Check for Open

Multimeter Connection	Condition	Specified Condition
E-024 (2) - E-020 (100)	Always	Resistance ⩽ 1Ω
E-025 (2) - E-020 (88)		
E-028 (2) - E-020 (99)		
E-029 (2) - E-020 (76)		

Check for Short

Multimeter Connection	Condition	Specified Condition
E-024 (2), E-025 (2), E-028 (2), E-029 (2) or E-020 (100, 99, 76, 88) - Body ground	Always	Resistance ∞

OK

Continuity between ignition coil connector terminal and ECU connector terminal is normal

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector (ignition coil - ECU)**

OK →

6	Check appearance of ignition coil

(a) Remove the ignition coil.
(b) Check appearance of ignition coil for cracks or bumps.

OK

Ignition coil itself has no malfunction

Result

Proceed to
OK
NG

NG → **Replace ignition coil**

OK →

7	Inspection of spark plug

(a) Remove the spark plug.
(b) Check spark plug for electricity leakage, air leakage and clearance.

OK

Spark plug is normal

Result

Proceed to
OK
NG

NG → **Repair or replace spark plug**

OK →

8	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0300 00, P0301 00, P0302 00, P0303 00, P0304 00 still exists.

OK

No same DTC is output

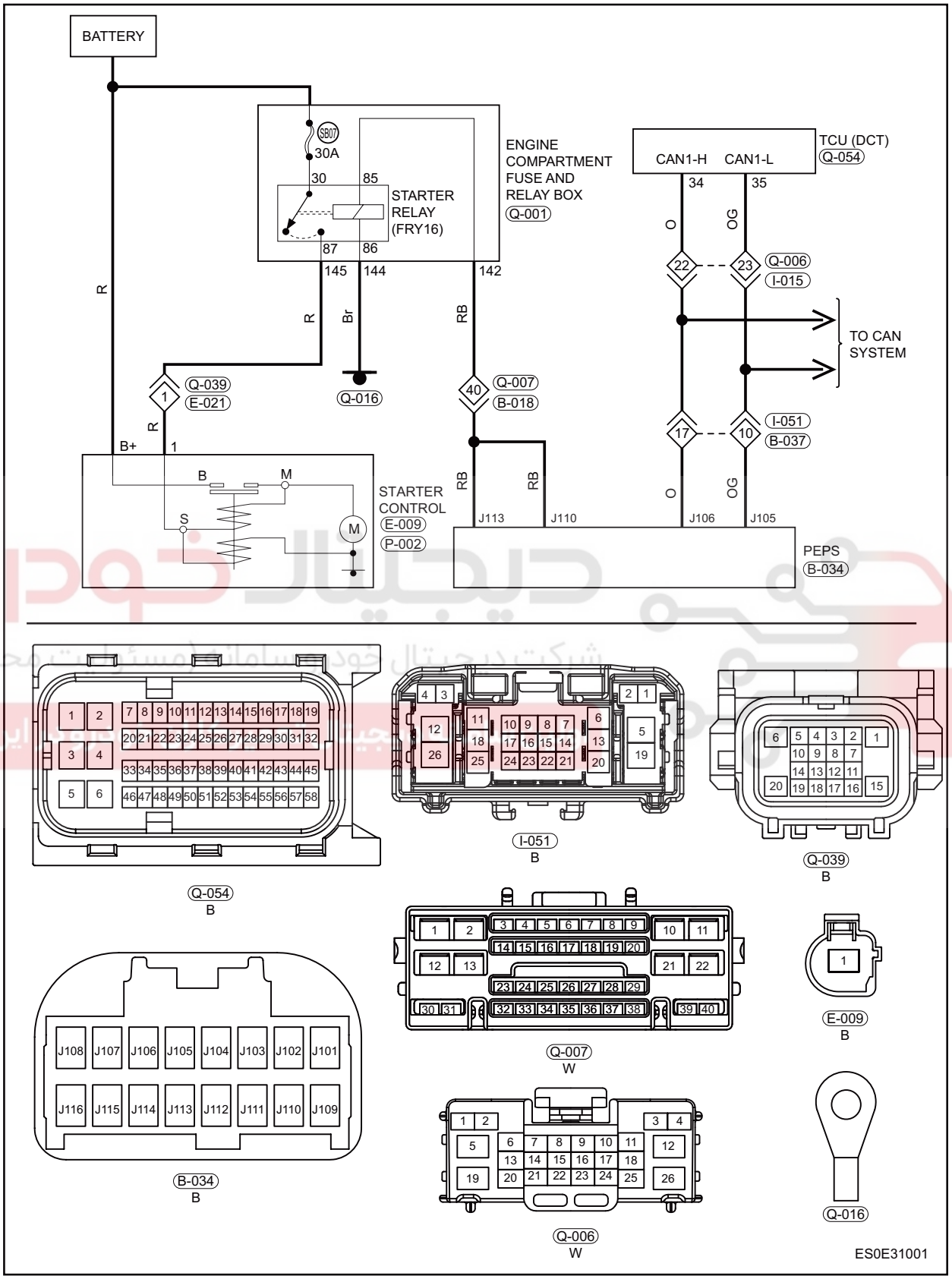
Result

Proceed to
OK
NG

OK	System operates normally
NG	Replace with a new ECU to check if fault reoccurs

DTC	P0615 13	Starter Relay Circuit Open
DTC	P0616 11	Starter Relay Circuit Low
DTC	P0617 12	Starter Relay Circuit High
DTC	P3046 13	Starter Relay Open Defect
DTC	P3050 00	Starter Relay2 Closed Stick Defect
DTC	P3052 00	Starter Relay1 Closed Stick Defect
DTC	P3054 00	Engine Blocked/Starter not Engaged
DTC	P3055 11	Starter State Line S_kl50r Short to Ground
DTC	P3056 12	Starter State Line S_kl50r Short to UB
DTC	P3088 93	Starter Damaged or Wire Dropped

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0615 13	Starter Relay Circuit Open	ENGINE START STOP switch ON, engine running	• Starter • Starter relay • Wire harness or connector • ECU
P0616 11	Starter Relay Circuit Low		
P0617 12	Starter Relay Circuit High		
P3046 13	Starter Relay Open Defect		
P3050 00	Starter Relay2 Closed Stick Defect		
P3052 00	Starter Relay1 Closed Stick Defect		
P3054 00	Engine Blocked/Starter not Engaged		
P3055 11	Starter State Line S_kl50r Short to Ground		
P3056 12	Starter State Line S_kl50r Short to UB		
P3088 93	Starter Damaged or Wire Dropped		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Check fuse SB07

(a) Check if fuse SB07 (30) is blown or no power.

Result

Proceed to
OK
NG

NG → **Replace fuse or check the cause for no power**

OK

2	Check starter relay

(a) Unplug the starter relay.
(b) Check the starter relay.

OK

Starter relay is normal

Result

Proceed to
OK
NG

NG → **Repair or replace relay**

OK

3 Check starter connector

(a) Check starter connector for poor contact or improper installation.

Result

Proceed to
OK
NG

NG → **Reinstall or repair, replace connector**

OK

4 Check starter relay signal circuit

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect PEPS module connector J1.
(d) Check wire harness between terminal on engine compartment fuse and relay box corresponding to starter relay and PEPS module connector J1 terminal.

Check for Open

Multimeter Connection	Condition	Specified Condition
J1-(10) Engine Compartment Fuse and Relay Box (142)	Always	Resistance ⩽ 1Ω
J1-(13) - Engine Compartment Fuse and Relay Box (142)		

Check for Short

Multimeter Connection	Condition	Specified Condition
J1-(13), Engine Compartment Fuse and Relay Box (142), J1-(10), Engine Compartment Fuse and Relay Box (142) - Body ground	Always	Resistance ∞

Result

Proceed to
OK
NG

NG → **Replace wire harness or connector**

OK

5	Starter control relay power supply circuit malfunction

(a) Unplug fuse SB07 and starter relay from engine compartment fuse and relay box.
(b) Check wire harness between engine compartment fuse and relay box and starter E-009.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-009 (1) - Engine compartment fuse and relay box (145)	Always	Resistance ⩽ 1Ω

Check for Short

Multimeter Connection	Condition	Specified Condition
E-009 (1), engine compartment fuse and relay box (145) - Body ground	Always	Resistance ∞

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector**

OK

6	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Refer to "DTC Confirmation Procedure".
(e) Check if DTC P0615 13, P0617 12 still exists.

OK

No same DTC is output

Result

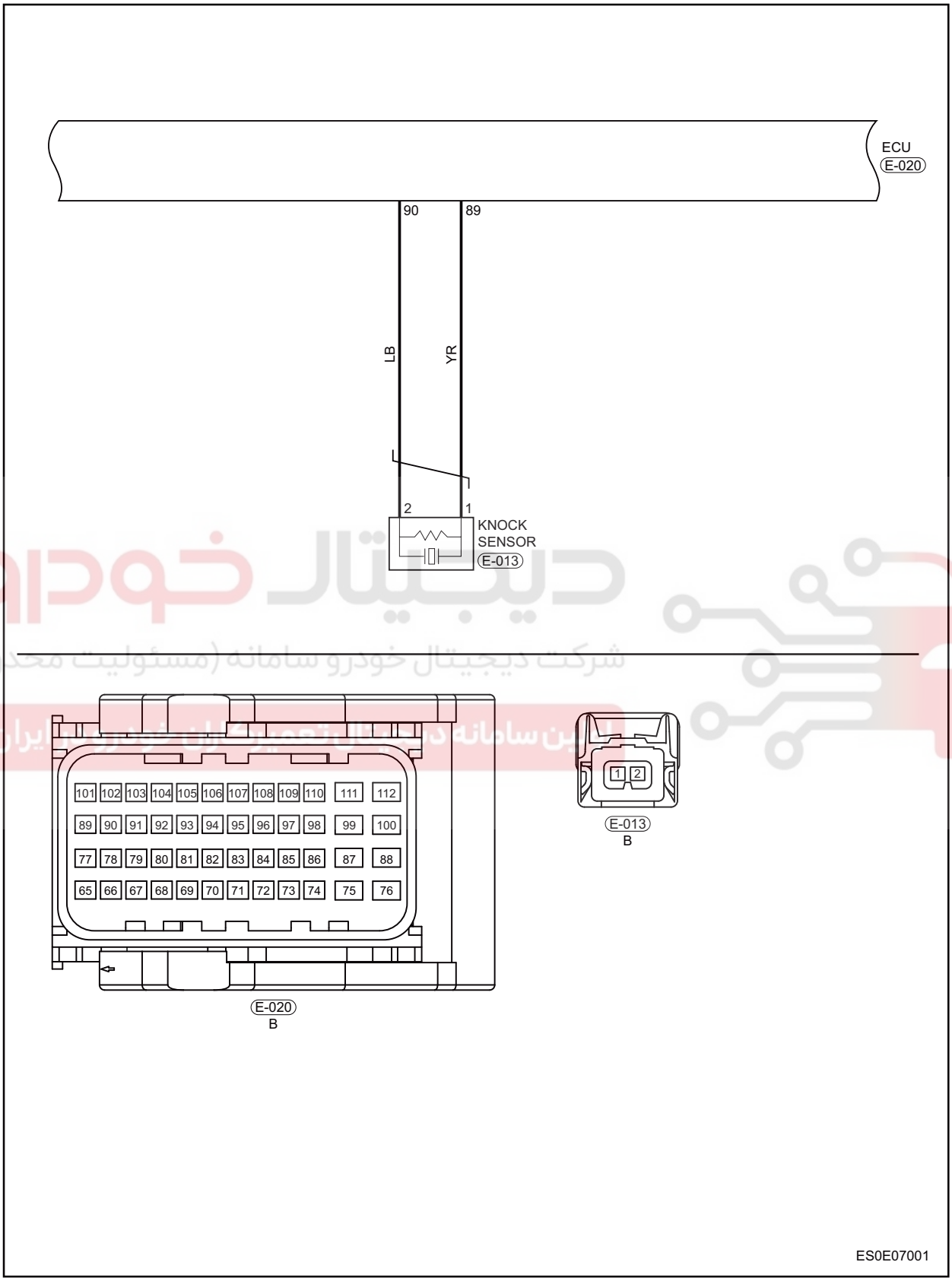
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0327 00	Knock Sensor 1 Circuit Low
DTC	P0327 14	Knock Sensor 1 Circuit Low
DTC	P0327 16	Knock Sensor 1 Circ. Low Input
DTC	P0328 00	Knock Sensor 1 Circuit High
DTC	P0328 15	Knock Sensor 1 Circuit High
DTC	P0328 17	Knock Sensor 1 Circ. High Input

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0327 00	Knock Sensor 1 Circuit Low	Load is greater than 40%; Coolant temperature is higher than 40°C; Speed is more than 2600 rpm; Cylinder 1 identification is valid	• Knock sensor • Wire harness or connector • ECU
P0327 14	Knock Sensor 1 Circuit Low		
P0327 16	Knock Sensor 1 Circ. Low Input		
P0328 00	Knock Sensor 1 Circuit High		
P0328 15	Knock Sensor 1 Circuit High		
P0328 17	Knock Sensor 1 Circ. High Input		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check knock sensor connector**

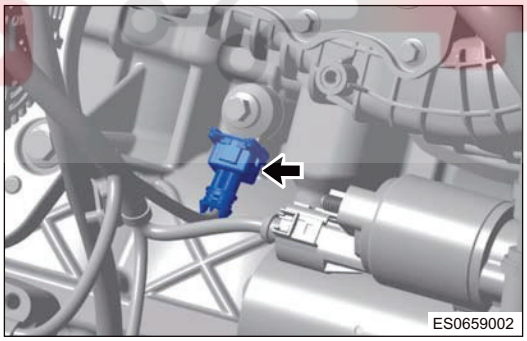
(a) Check knock sensor connector E-013 (arrow) for poor connection, cracks or damage.

OK

Knock sensor connector is normal

Result

Proceed to
OK
NG



NG → **Repair or replace wire harness or connector**

OK

2	**Check knock sensor signal circuit**

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the ECU wire harness connector E-020.

(d) Check wire harness between terminals of connector E-020 and connector E-013.

Check for Open

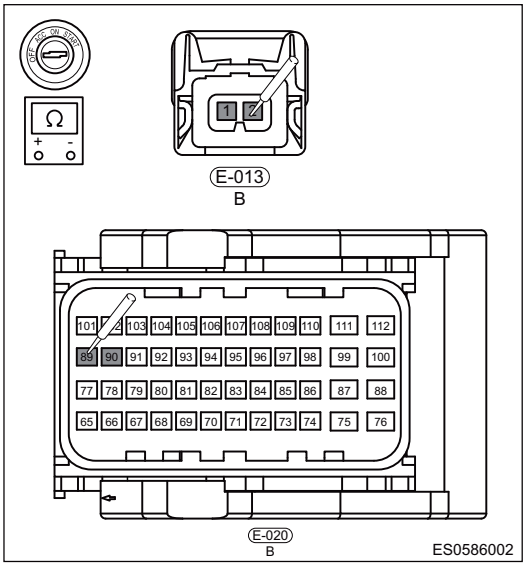
Multimeter Connection	Condition	Specified Condition
E-020 (90) - E-013 (1)	Always	Resistance ⩽ 1Ω
E-020 (89) - E-013 (2)		

Check for Short

Multimeter Connection	Condition	Specified Condition
E-020 (90, 89) or E-013 (1, 2) - Body ground	Always	Resistance ∞

Result

Proceed to
OK
NG



NG → **Replace wire harness or connector (knock sensor - ECU)**

OK

3 Check installation of knock sensor

(a) Remove the knock sensor.
(b) Check installation area of knock sensor, and check for damage, foreign matter, excessive movement or magnetic field nearby etc. that cause signal incorrectness.

OK

Knock sensor is installed normally

Result

Proceed to
OK
NG

NG → **Clean installation area or replace knock sensor**

OK

4 Check knock sensor signal

(a) Install the knock sensor.
(b) Connect the negative battery cable.
(c) ENGINE START STOP switch ON
(d) Slightly tap around the knock sensor with a rubber hammer, and measure if voltage is generated between 2 terminals of knock sensor with multimeter (mV) at the same time.

OK

Voltage is generated by knock sensor

Result

Proceed to
OK
NG

NG → **Replace knock sensor**

OK →

5	Reconfirm DTCs

(a) Using diagnostic tester, read ECU DTC.
(b) Refer to "DTC Confirmation Procedure".
(c) Check if DTC P0327 00, P0327 14, P0327 16, P0328 00, P0328 15 still exists.

OK

No same DTC is output

Result

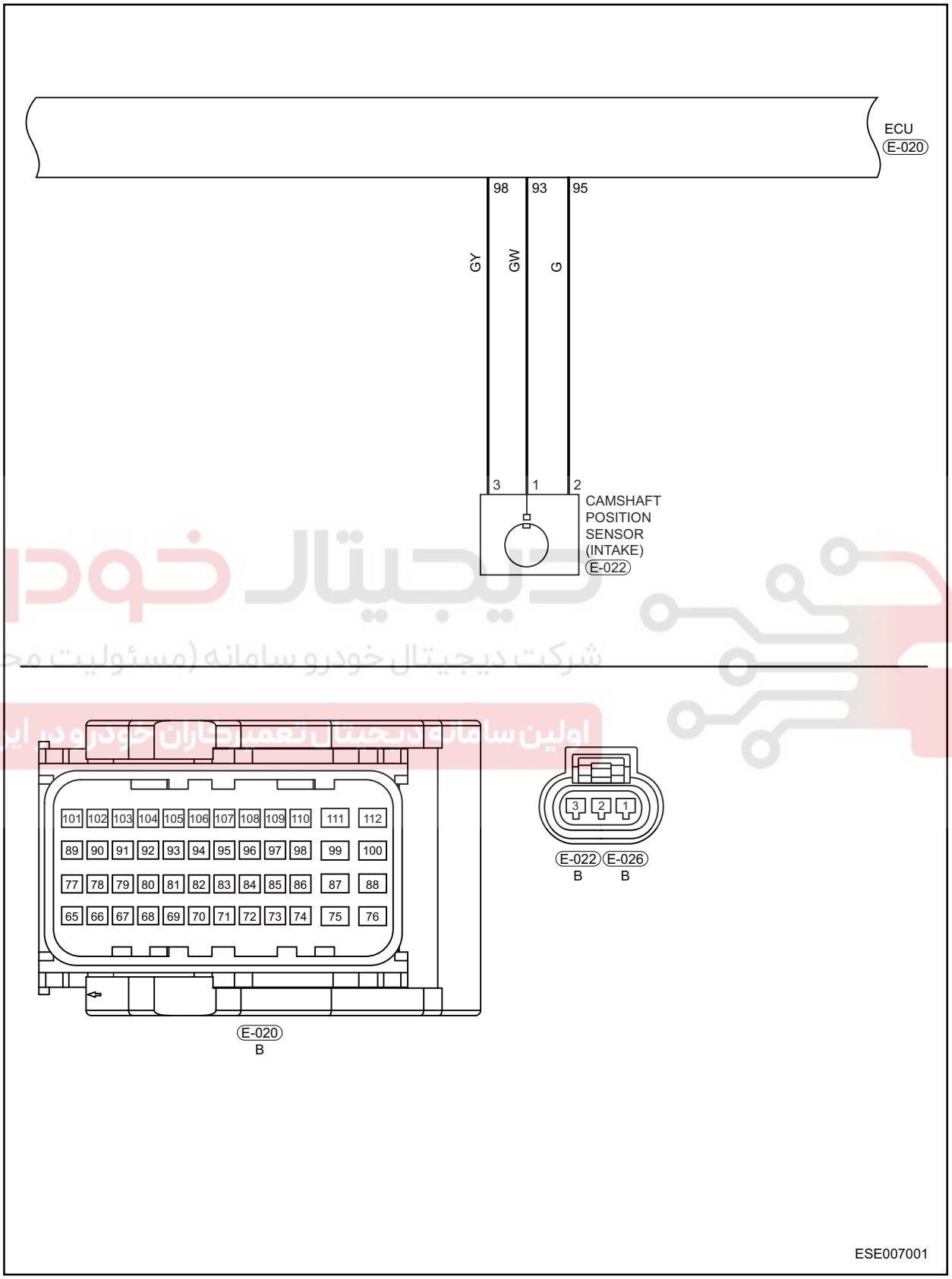
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0016 21	Advance Error For Alignment between Camshaft (Inlet) and Crankshaft
DTC	P0016 22	Retard Error for Alignment Between Camshaft (Inlet) and Crankshaft
DTC	P0016 29	Npl Error for Alignment between Camshaft (Inlet) and Crankshaft
DTC	P0341 00	EPM - Camshaft Signal Fault
DTC	P0342 00	Camshaft Position Sensor (Inlet) Circuit Low
DTC	P0343 00	Camshaft Position Sensor (Inlet) Circuit High
DTC	P0016 76	Crankshaft Position – Camshaft (Inlet) Installation Error
DTC	P0016 78	Crankshaft Position – Camshaft (Inlet) Position Error

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0016 21	Advance Error For Alignment between Camshaft (Inlet) and Crankshaft	ENGINE START STOP switch ON, engine running	• Camshaft position sensor • Incorrect installation position of camshaft position sensor • Engine mechanical fault • Wire harness or connector • ECU
P0016 22	Retard Error for Alignment Between Camshaft (Inlet) and Crankshaft		
P0016 29	Npl Error for Alignment between Camshaft (Inlet) and Crankshaft		
P0341 00	EPM - Camshaft Signal Fault		
P0342 00	Camshaft Position Sensor (Inlet) Circuit Low		
P0343 00	Camshaft Position Sensor (Inlet) Circuit High		
P0016 76	Crankshaft Position - Camshaft (Inlet) Installation Error		
P0016 78	Crankshaft Position - Camshaft (Inlet) Position Error		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Check installation of intake camshaft position sensor

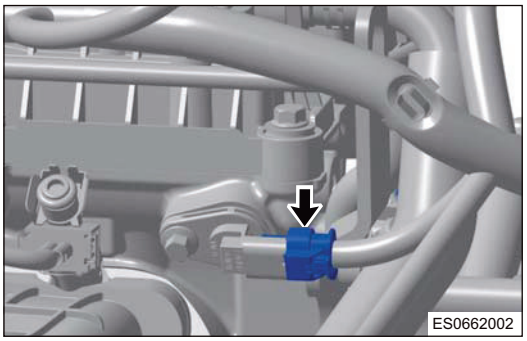
(a) Check intake camshaft position sensor connector E-022 (arrow) for poor connection or contact.

OK

Intake camshaft position sensor is installed normally

Result

Proceed to
OK
NG

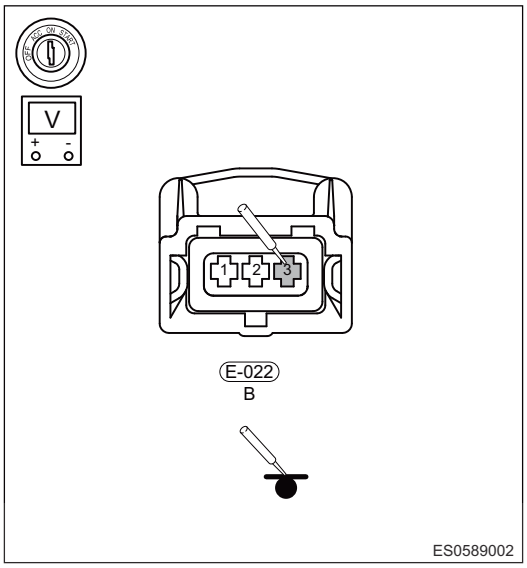


NG → Reconnect connector

OK

2	Check intake camshaft position sensor power supply voltage

(a) Turn ignition switch to ON.
(b) Measure voltage between terminal 3 of intake camshaft position sensor connector E-022 and ground (using a digital multimeter or 21 W test light).



Voltage Inspection

Multimeter Connection	Condition	Specified Condition
E022 (3) - Body ground	ENGINE START STOP switch ON	5 V

OK
Intake camshaft position sensor power supply voltage is normal

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness**

OK

3	Check intake camshaft position sensor signal circuit

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect intake camshaft position sensor connector E-022 and ECU connector E-020.
(d) Check intake camshaft position sensor connector E-022 (2) and ECU connector E-020 (93).
Check for Open

Multimeter Connection	Condition	Specified Condition
E - 020 (93)	Always	Resistance ⩽ 1Ω

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness**

OK

4	Check if relative installation position between intake camshaft position sensor and its signal plate is as specified

(a) Remove the intake camshaft position sensor.
(b) Obverse if installation of intake camshaft position sensor signal plate is proper.

OK

Relative installation position between intake camshaft position sensor and its signal plate is normal

Result

Proceed to
OK
NG

NG → **Install intake camshaft position sensor to proper position as specified**

OK →

5	Check for mechanical fault

(a) Check if the oil level and oil quality are normal.
(b) Check drive gear, belt between crankshaft and camshaft for malfunctions.
(c) Check and clean intake camshaft position sensor and installation area, and check for damage, foreign matter or excessive movement, etc. that cause signal incorrectness.
(d) Check intake camshaft ring gear for damage or foreign matter (such as debris), etc. that cause signal incorrectness.

OK

Intake camshaft gear ring is normal

Result

Proceed to
OK
NG

NG → **Repair or replace malfunctioning components**

OK →

6	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0341 00, P0342 00, P0343 00, P0016 76, P0016 78 still exists.

OK

No same DTC is output

Result

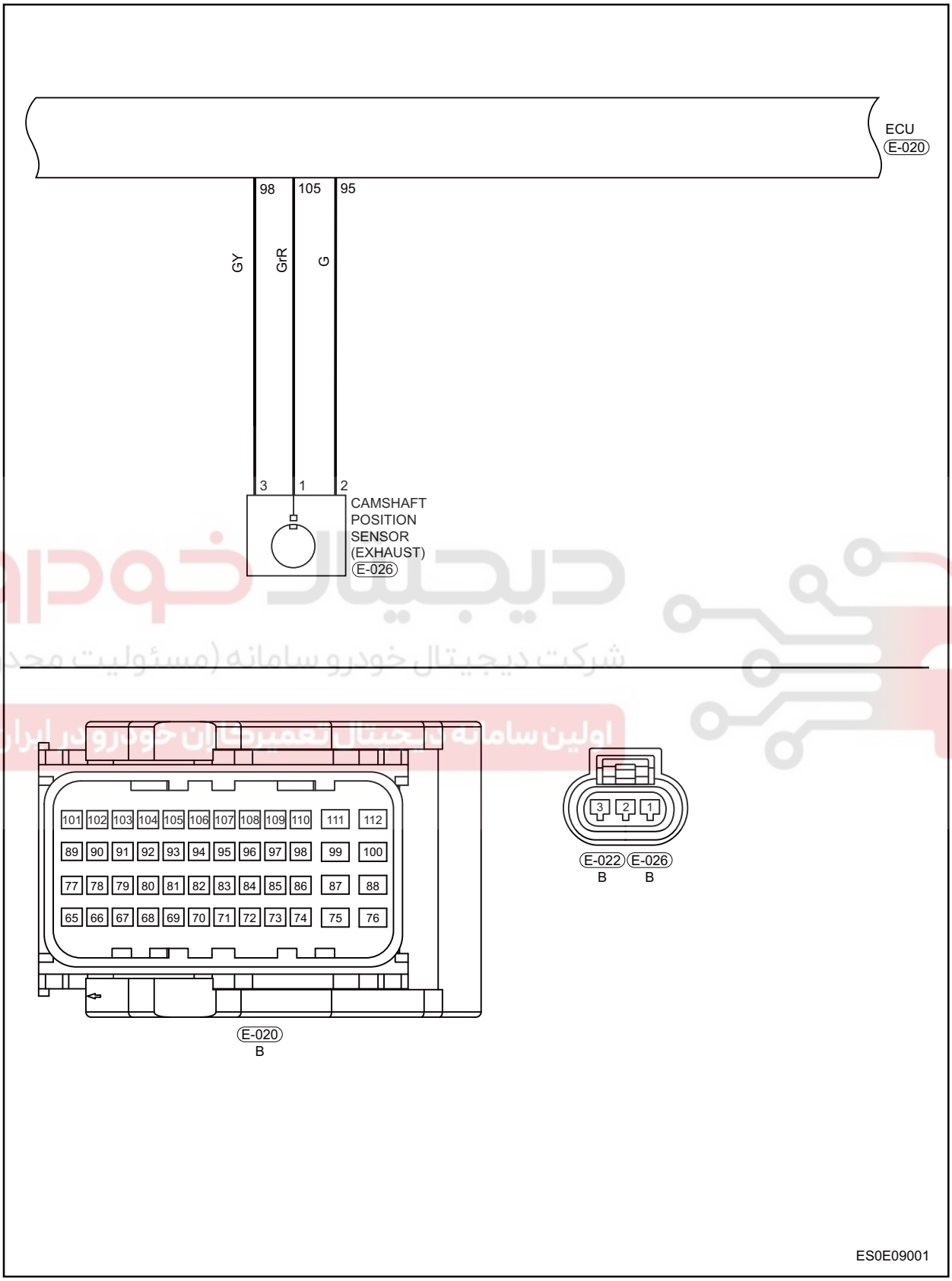
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0018 21	Advance Error For Alignment between Camshaft (Outlet) and Crankshaft
DTC	P0018 22	Retard Error for Alignment Between Camshaft (Outlet) and Crankshaft
DTC	P0018 29	Npl Error for Alignment between Camshaft (Outlet) and Crankshaft
DTC	P0017 76	Crankshaft Position - Camshaft (Outlet) Installation Error
DTC	P0017 78	Crankshaft Position - Camshaft (Outlet) Position Error
DTC	P0346 00	EPM - Camshaft 2 Signal Fault
DTC	P0366 00	Camshaft Position Sensor (Outlet) Circuit Performance Non-plausible
DTC	P0367 00	Camshaft Position Sensor (Outlet) Circuit Low
DTC	P0368 00	Camshaft Position Sensor (Outlet) Circuit High

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0018 21	Advance Error For Alignment between Camshaft (Outlet) and Crankshaft	Ignition switch ON, engine running	• Camshaft position sensor • Incorrect installation position of camshaft position sensor • Engine mechanical fault • Wire harness or connector • ECU
P0018 22	Retard Error for Alignment Between Camshaft (Outlet) and Crankshaft		
P0018 29	Npl Error for Alignment between Camshaft (Outlet) and Crankshaft		
P0017 76	Crankshaft Position - Camshaft (Outlet) Installation Error		
P0017 78	Crankshaft Position - Camshaft (Outlet) Position Error		
P0346 00	EPM - Camshaft 2 Signal Fault		
P0366 00	Camshaft Position Sensor (Outlet) Circuit Performance Non-plausible		
P0367 00	Camshaft Position Sensor (Outlet) Circuit Low		
P0368 00	Camshaft Position Sensor (Outlet) Circuit High		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Check installation of exhaust camshaft position sensor

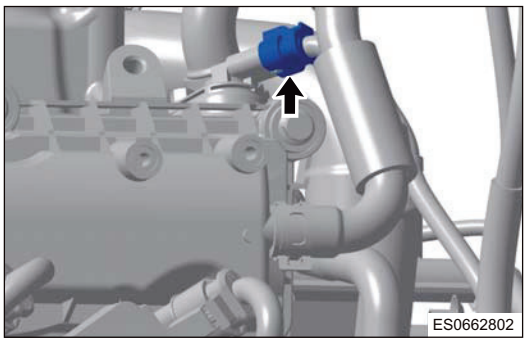
(a) Check exhaust camshaft position sensor connector E-026 (arrow) for poor connection or contact.

OK

Exhaust camshaft position sensor is installed normally

Result

Proceed to
OK
NG



NG → Reconnect connector

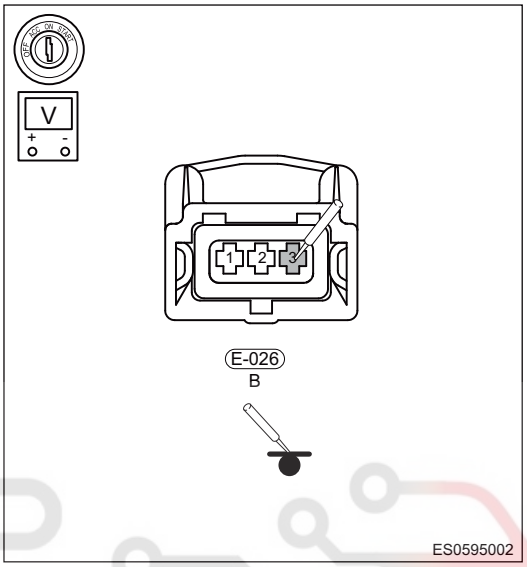
OK

2 Check exhaust camshaft position sensor power supply voltage

(a) Turn ignition switch to ON.
(b) Measure voltage between terminal 3 of exhaust camshaft position sensor connector E-026 and ground (using a digital multimeter).

Voltage Inspection

Multimeter Connection	Condition	Specified Condition
E026 (3) - Body ground	ENGINE START STOP switch ON	5 V



OK
Exhaust camshaft position sensor power supply voltage is normal

Result

Proceed to
OK
NG

NG → Check and repair wire harness between exhaust camshaft position sensor power supply terminal and ECU

OK

3 Check exhaust camshaft position sensor signal circuit

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect intake camshaft position sensor connector E-026 and ECU connector E-020.
(d) Check intake camshaft position sensor connector E-026 (2) and ECU connector E-020 (105).

Check for Open

Multimeter Connection	Condition	Specified Condition
E026 (2) - E-020 (105)	Always	Resistance ⩽ 1Ω

Result

Proceed to
OK
NG

NG → Repair or replace wire harness

OK

4	Check if relative installation position between exhaust camshaft position sensor and its signal plate is as specified

(a) Remove the exhaust camshaft position sensor.
(b) Obverse if installation of exhaust camshaft position sensor signal plate is proper.

OK

Relative installation position between exhaust camshaft position sensor and its signal plate is normal

Result

Proceed to
OK
NG

NG → **Install exhaust camshaft position sensor to proper position as specified**

OK

5	Check for mechanical fault

(a) Check drive gear, belt between crankshaft and camshaft for malfunctions.
(b) Check and clean exhaust camshaft position sensor and installation area, and check for damage, foreign matter or excessive movement, etc. that cause signal incorrectness.
(c) Check exhaust camshaft ring gear for damage or foreign matter (such as debris), etc. that cause signal incorrectness.

OK

Exhaust camshaft gear ring is normal

Result

Proceed to
OK
NG

NG → **Repair or replace malfunctioning components**

OK

6	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0017 76, P0017 78, P0366 00, P0367 00 or P0368 00 still exists.

OK

No same DTC is output

Result

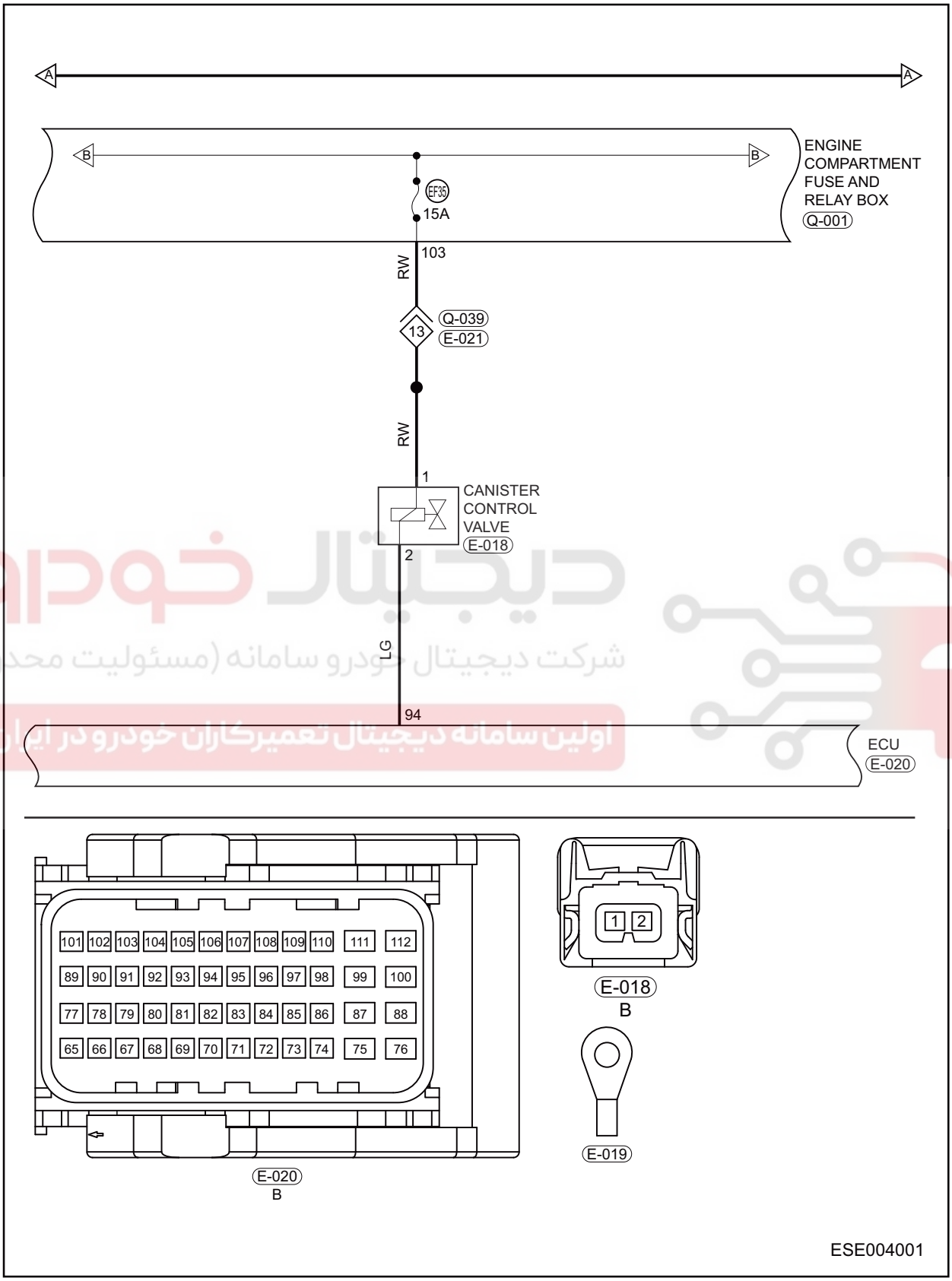
Proceed to
OK

Proceed to
NG

OK	System operates normally
NG	Replace with a new ECU to check if fault reoccurs

DTC	P0444 13	Evaporative Emiss.System Purge Control Valve Circuit Open
DTC	P0458 11	Evaporative Emission System Purge Control Valve Circuit Low
DTC	P0458 16	Evaporative Emission System Purge Control Valve Circuit Low
DTC	P0459 17	Evaporative Emission System Purge Control Valve Circuit High
DTC	P0459 12	Evaporative Emission System Purge Control Valve Circuit High

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0444 13	Evaporative Emiss.System Purge Control Valve Circuit Open	ENGINE START STOP switch ON, engine running	• Canister solenoid valve • Wire harness or connector • ECU
P0458 11	Evaporative Emission System Purge Control Valve Circuit Low		
P0458 19	Evaporative Emission System Purge Control Valve Circuit Low		
P0459 17	Evaporative Emission System Purge Control Valve Circuit High		
P0459 12	Evaporative Emission System Purge Control Valve Circuit High		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

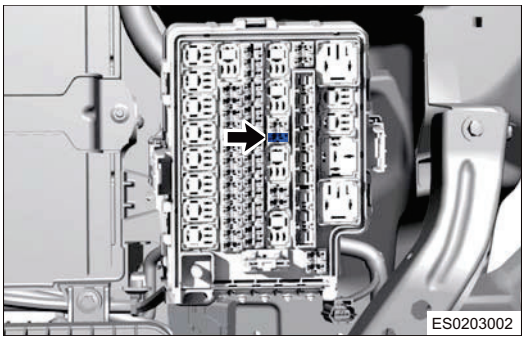
Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check canister solenoid valve fuse EF35**

(a) Check if fuse EF35 is blown or no power.



Result

Proceed to
OK
NG

NG → **Replace fuse or check the cause for no power**

OK

2	**Check canister solenoid valve connector**

(a) Check canister solenoid valve connector E-018 (arrow) for poor connection or contact.

OK

Canister solenoid valve connector is normal

Result

Proceed to
OK
NG

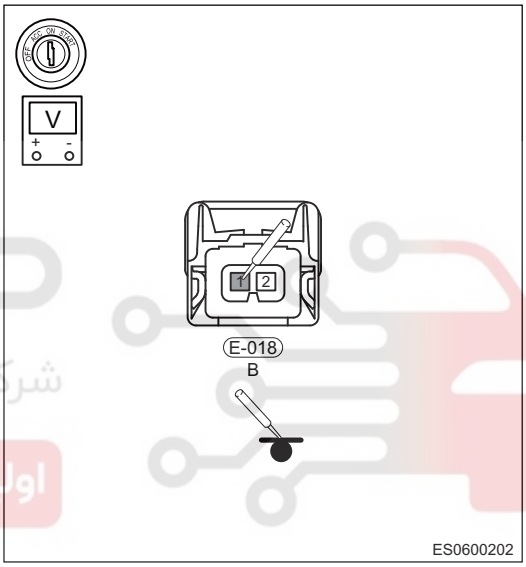
NG → **Repair or replace connector**

OK

3 Check canister solenoid valve power supply voltage

(a) Turn ignition switch to ON.

(b) Measure voltage between canister solenoid valve connector terminal and body ground (using a digital multimeter).



Voltage Inspection

Multimeter Connection	Condition	Specified Condition
E-018 (1) - Body ground	ENGINE START STOP switch ON	Not less than 12 V

OK

Canister solenoid valve power supply voltage is normal

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness between canister solenoid valve and engine compartment fuse and relay box**

OK

4 Check canister solenoid valve control circuit

(a) Disconnect the ECU wire harness connector E-020.

(b) Check wire harness between canister solenoid valve connector terminal and ECU connector terminal.

Check for Open

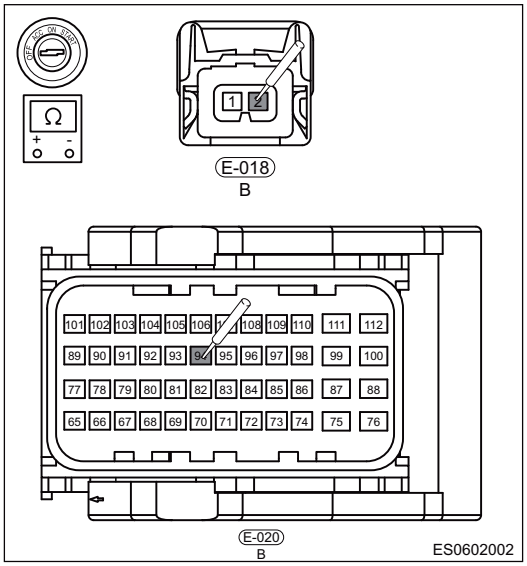
Multimeter Connection	Condition	Specified Condition
E-020 (94) - E-018 (2)	Always	Resistance ⩽ 1Ω

OK

Continuity between canister solenoid valve connector terminal and ECU connector terminal is normal

Result

Proceed to
OK
NG



NG → **Replace wire harness or connector (canister solenoid valve - ECU)**

OK

5 Check canister solenoid valve

(a) With battery voltage applied between terminals 1 and 2, valve should open when air is sucked into the valve; with battery voltage not applied, valve should close when air is not sucked into the valve.

OK

Canister solenoid valve is normal

Result

Proceed to
OK
NG

NG → **Replace canister solenoid valve**

OK

6 Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0444 13, P0458 11, P0459 12 still exists.

OK

No same DTC is output

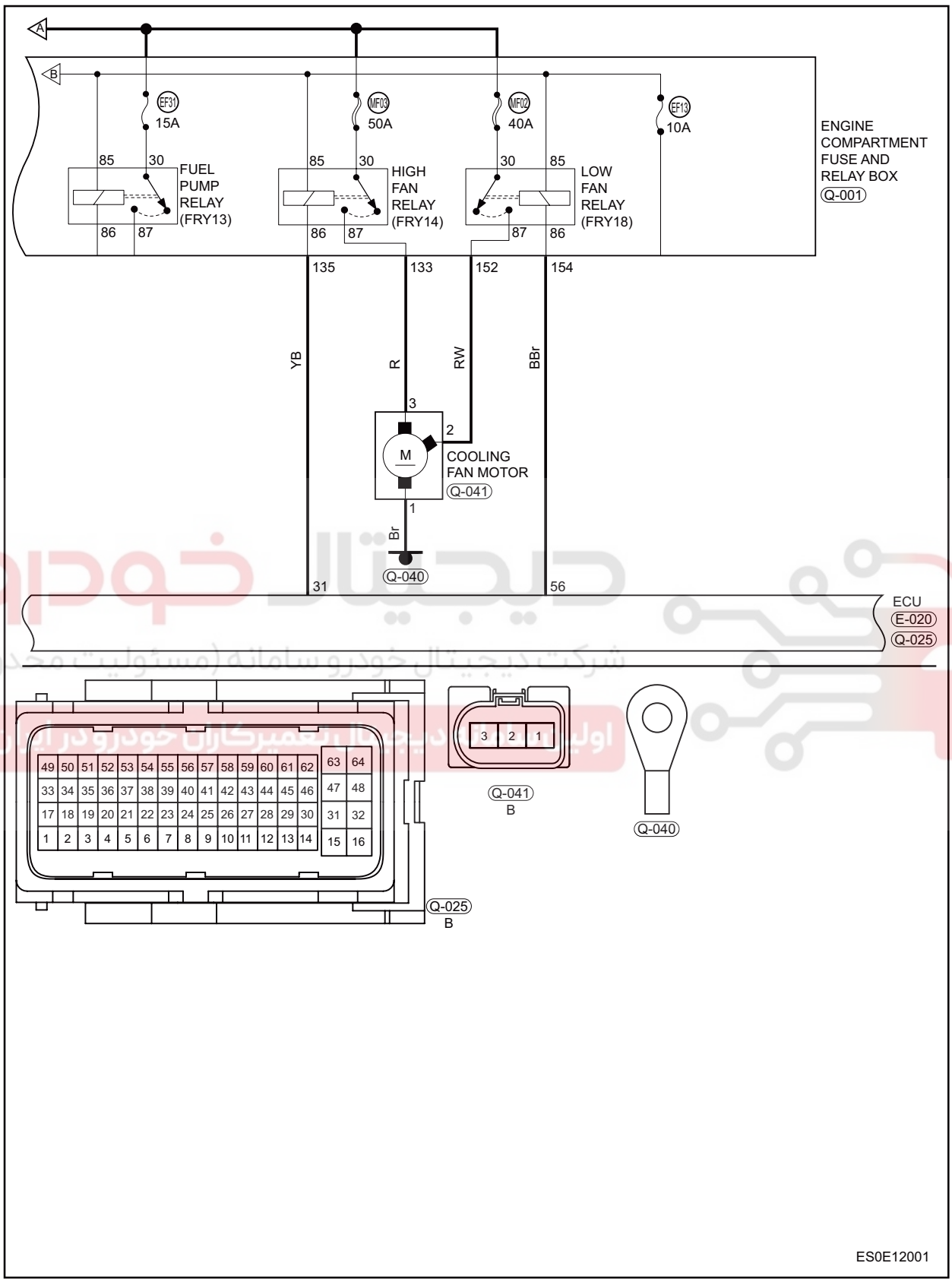
Result

Proceed to
OK
NG

OK	System operates normally
NG	Replace with a new ECU to check if fault reoccurs

DTC	P0480 13	Cooling Fan 1 Control Circuit Error
DTC	P0481 13	Cooling Fan 2 Control Circuit Error
DTC	P0691 11	Fan 1 Control Circuit Low
DTC	P0692 12	Fan 1 Control Circuit High
DTC	P0693 11	Fan 2 Control Circuit Low
DTC	P0694 12	Fan 2 Control Circuit High

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0480 13	Cooling Fan 1 Control Circuit Error	ENGINE START STOP switch ON, engine running	• Wire harness connector • Cooling fan control relay • ECU
P0481 13	Cooling Fan 2 Control Circuit Error		
P0691 11	Fan 1 Control Circuit Low		
P0692 12	Fan 1 Control Circuit High		
P0693 11	Fan 2 Control Circuit Low		
P0694 12	Fan 2 Control Circuit High		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check cooling fan fuse**

(a) Check if cooling fan fuses MF03 and MF02 are blown or no power.

Result

Proceed to
OK
NG

NG → **Replace fuse or check the cause for no power**

OK

2	**Check cooling fan control relay power supply voltage**

(a) Turn ignition switch to ON.

(b) Measure voltage of cooling fan high and low speed control relay connector terminal (using a digital multimeter).

Voltage Inspection

Multimeter Connection	Condition	Specified Condition
Relay (30) - Body ground	Always	Not less than 12 V
Relay (85) - Body ground	Ignition switch ON	Not less than 12 V

OK

Cooling fan control relay connector terminal voltage is normal.

Result

Proceed to
OK
NG

NG → **Repair or replace engine compartment fuse and relay box**

OK

3 Check cooling fan control circuit

(a) Turn ENGINE START STOP switch to OFF
(b) Disconnect the cooling fan motor connector.
(c) Disconnect the cooling fan ECU connector Q-025.
(d) Check the cooling fan control circuit.
Disconnect inspection

Multimeter Connection	Condition	Specified Condition
Q-025 (31) - Q-001 (135)	Always	Resistance ⩽ 1Ω
Q-025 (56) - Q-001 (154)	Always	Resistance ⩽ 1Ω

(e) Check cooling fan ECU corresponding terminal for short circuit to ground.
Check for Short

Multimeter Connection	Condition	Specified Condition
Q-001 (154 or 135) - Body ground	Always	Resistance ∞
Q-025 (56 or 31) - Body ground	Always	Resistance ∞

Result

Proceed to
OK
NG

NG → **Repair or replace ECU**

OK

4 Check circuit between cooling fan and engine compartment fuse and relay box

(a) Disconnect the cooling fan connector Q-041.
(b) Check circuit between cooling fan and engine compartment fuse and relay box.
Check for Open

Multimeter Connection	Condition	Specified Condition
Q-041 (3) - Q-001 (133)	Always	Resistance ⩽ 1Ω
Q-041 (2) - Q-001 (152)	Always	Resistance ⩽ 1Ω

(c) Check circuit between cooling fan and engine compartment fuse and relay box for short circuit to ground.

Check for Short

Multimeter Connection	Condition	Specified Condition
Q-041 (3 or 2) - Body ground	Always	Resistance ∞
Q-001 (133 or 152) - Body ground	Always	Resistance ∞

Result

Proceed to
OK
NG

NG → **Repair or replace ECU**

OK

5 Check cooling fan motor

(a) Directly apply battery voltage to cooling fan motor, check if cooling fan motor operates (do not run the motor in dry state or water for a long time).

Result

Proceed to
OK
NG

NG → **Repair or replace cooling fan motor**

OK

6 Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0480 13, P0481 13, P0691 11, P0692 12, P0693 11, P0694 12 still exists.

OK

No same DTC is output

Result

Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0420 00	Catalyst Conversion Insufficient

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0420 00	Catalyst Conversion Insufficient	ENGINE START STOP switch ON, engine running	• Three-way catalytic converter • Leakage in exhaust system • Upstream Oxygen Sensor • Downstream Oxygen Sensor • ECU

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Check for any other DTCs output (in addition to DTC P0420 00)

(a) Connect diagnostic tester to diagnostic interface.
(b) Turn ignition switch to ON, start engine and warm it up to normal operating temperature, and then select Read DTC.

Display (DTC Output)	Proceed to
Other DTCs	A
P0420 00	B

Other DTCs are displayed
Proceed to A

P0420 00 is displayed
Proceed to B

Result

Proceed to
A
B

A	Go to DTC chart, and perform troubleshooting for other DTCs first
B	Next

2	Read datastream

(a) Using diagnostic tester, select Read Datastream.

(b) Check datastream below.

Item	OK (Idling)	If it is NG, proceed to
Upstream Oxygen Sensor Voltage	Quickly fluctuates between 0.1 to 1V	A
Downstream oxygen sensor voltage	Fluctuates slightly at about 0.45 V	B
Average Injection Pulse Width	Approximately 2.15 ms	C

Upstream oxygen sensor voltage is normal
Upstream oxygen sensor is normal
Average injection pulse width is normal
Injector, fuel pressure and other causes for abnormal injection pulse width is normal
Downstream oxygen sensor voltage
Exhaust system is normal
Result

Proceed to
A
B
C

A → **Replace upstream oxygen sensor**

B → **Check injector, fuel pressure and other causes for abnormal injection pulse width**

C → **Next**

3	Check exhaust system

(a) Turn ignition switch to ON and start engine.
(b) Check exhaust system for leakage.
OK
Exhaust system is normal
Result

Proceed to
OK
NG

NG → **Repair exhaust system**

OK

4	Check downstream oxygen sensor

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check the downstream oxygen sensor.
OK
Downstream oxygen sensor is normal, replace three-way catalytic converter, go to next step

Result

Proceed to
OK
NG

NG → **Replace downstream oxygen sensor**

OK →

5	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Refer to "DTC Confirmation Procedure".
(e) Check if DTC P0420 00 still exists.

OK

No same DTC is output

Result

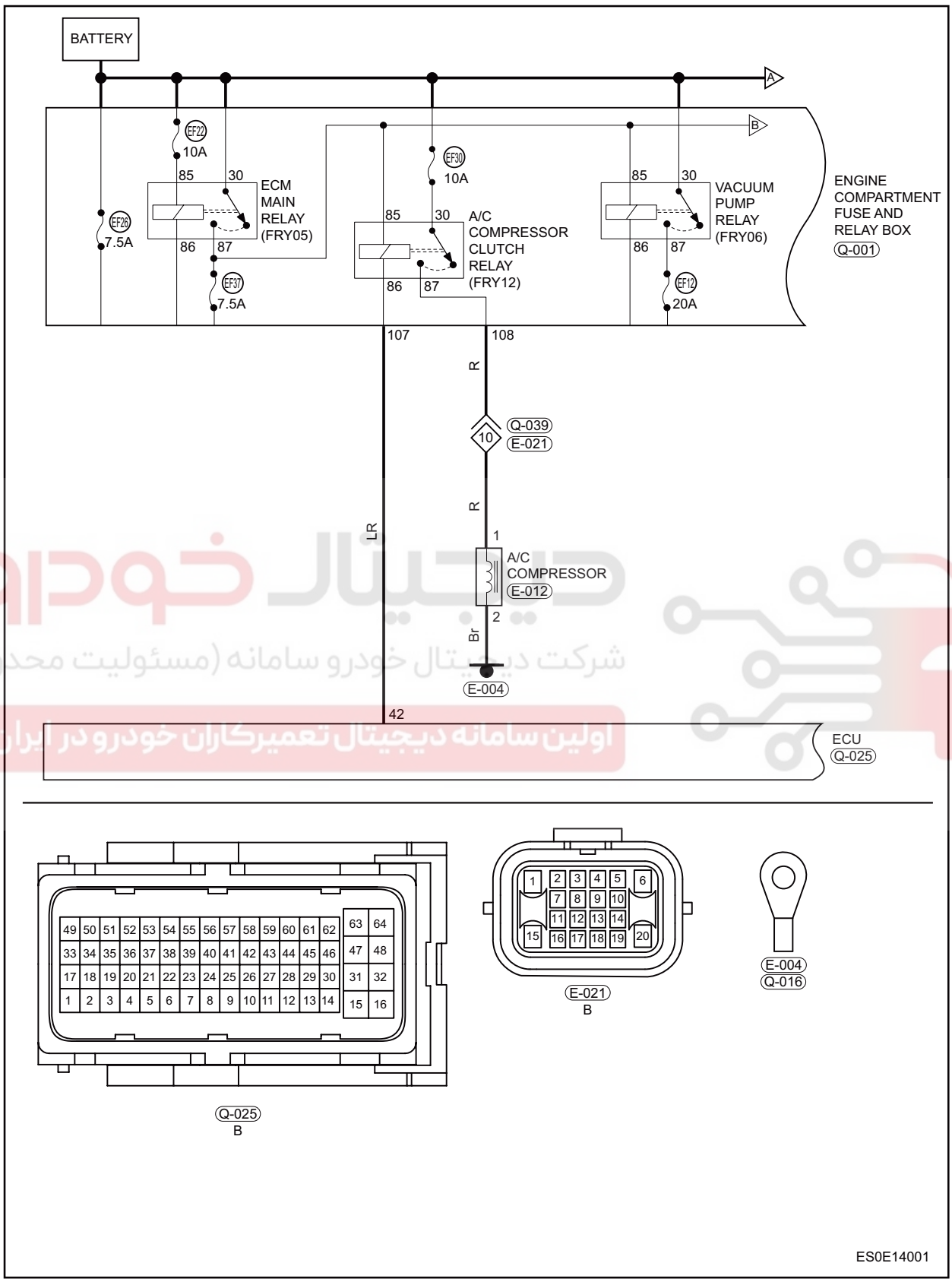
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0645 13	AC Clutch Relais Circuit Open
DTC	P0646 11	A/C Clutch Relay Control Circuit Low
DTC	P0647 12	A/C Clutch Relay Control Circuit High

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0645 13	AC Clutch Relais Circuit Open	ENGINE START STOP switch ON, engine running	• A/C compressor relay • Wire harness or connector • Battery • ECU
P0646 11	A/C Clutch Relay Control Circuit Low		
P0647 12	A/C Clutch Relay Control Circuit High		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Check battery voltage

(a) Check if battery terminals are corroded or loose.
(b) Check battery voltage with a digital multimeter.

OK

Not less than 12 V

Result

Proceed to
OK
NG

NG → **Check and repair battery**

OK

2	Check A/C compressor relay and fuse

(a) Check if fuse EF30 (10 A) is blown or no power.
(b) Check if relay terminal is corroded or broken.
(c) Directly apply battery voltage to 2 relay control terminals, check if relay closes.
(d) Turn ignition switch to ON.
(e) Measure voltage between engine compartment fuse and relay box terminal and body ground (using a digital multimeter).

Voltage Inspection

Multimeter Connection	Condition	Specified Condition
Engine compartment fuse and relay box (108) - Body ground	ENGINE START STOP switch ON	Not less than 12 V

OK

A/C compressor relay and fuse are normal

Result

Proceed to
OK
NG

NG → **Repair or replace fuse or relay or check the cause for no power**

OK →

3	Check A/C compressor clutch connector

(a) Check if A/C compressor clutch connector is loose or poorly contacted.

Result

Proceed to
OK
NG

NG → **Repair or replace connector**

OK →

4	Check A/C compressor control circuit

(a) Disconnect the ECM connector Q-025.

(b) Check wire harness between ECM connector terminal and engine compartment fuse and relay box terminal.

Check for Open

Multimeter Connection	Condition	Specified Condition
Q-001 (107) - Q-025 (42)	Always	Resistance ⩽ 1Ω

Check for Short

Multimeter Connection	Condition	Specified Condition
Q-001 (107) or Q-025 (42) - Body ground	Always	Resistance ∞

OK

A/C compressor relay control circuit is normal

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector (ECU - engine compartment fuse and relay box)**

OK

5	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0645 13, P0646 11, P0647 12 still exists.

OK

No same DTC is output

Result

Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0560 00	Non-plausible Error of Battery Voltage

DTC	P0562 16	System Voltage Low

DTC	P0563 17	System Voltage High

DTC	P1101 00	System Voltage can not Fulfill Throttle Self Learning Condition

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0560 00	Non-plausible Error of Battery Voltage	Ignition switch ON, engine running	• Fuse • Wire harness or connector • Battery • Battery terminal • ECU
P0562 16	System Voltage Low		
P0563 17	System Voltage High		
P1101 00	System Voltage can not Fulfill Throttle Self Learning Condition		

06

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Check battery voltage

(a) Check if battery voltage is normal.

OK

Not less than 12 V

(b) Check if battery terminals are loose or corroded.

Result

Proceed to
OK
NG

NG → **Check and repair battery**

OK

2	Check generating capacity of alternator

(a) Check if generating capacity of alternator is normal.

Result

Proceed to
OK
NG

NG → **Repair or replace alternator regulator or alternator**

OK

3	Check fuse

(a) Check if fuses EF07 (7.5 A) and RF26 (7.5 A) are blown or no power.

Result

Proceed to
OK
NG

NG → **Replace fuse or check the cause for no power**

OK

4	Check the ECU ground point

(a) Disconnect ECU ground points GQ-042 and GE-019.
(b) Check the ECU ground points GQ-042 and GE-019.

OK

Ground point is normal

Result

Proceed to
OK
NG

NG → **Repair or replace ground wire harness or ground point**

OK

5	Check the ECU connector

(a) Disconnect the ECU connector Q-025.
(b) Check the ECM connector.

OK

ECM connector is normal

Result

Proceed to
OK
NG

NG → **Repair or replace with new ECU to check if malfunction reoccurs**

OK →

6	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0560 00, P0562 16, P0563 17, P1101 00 still exists.

OK

No same DTC is output

Result

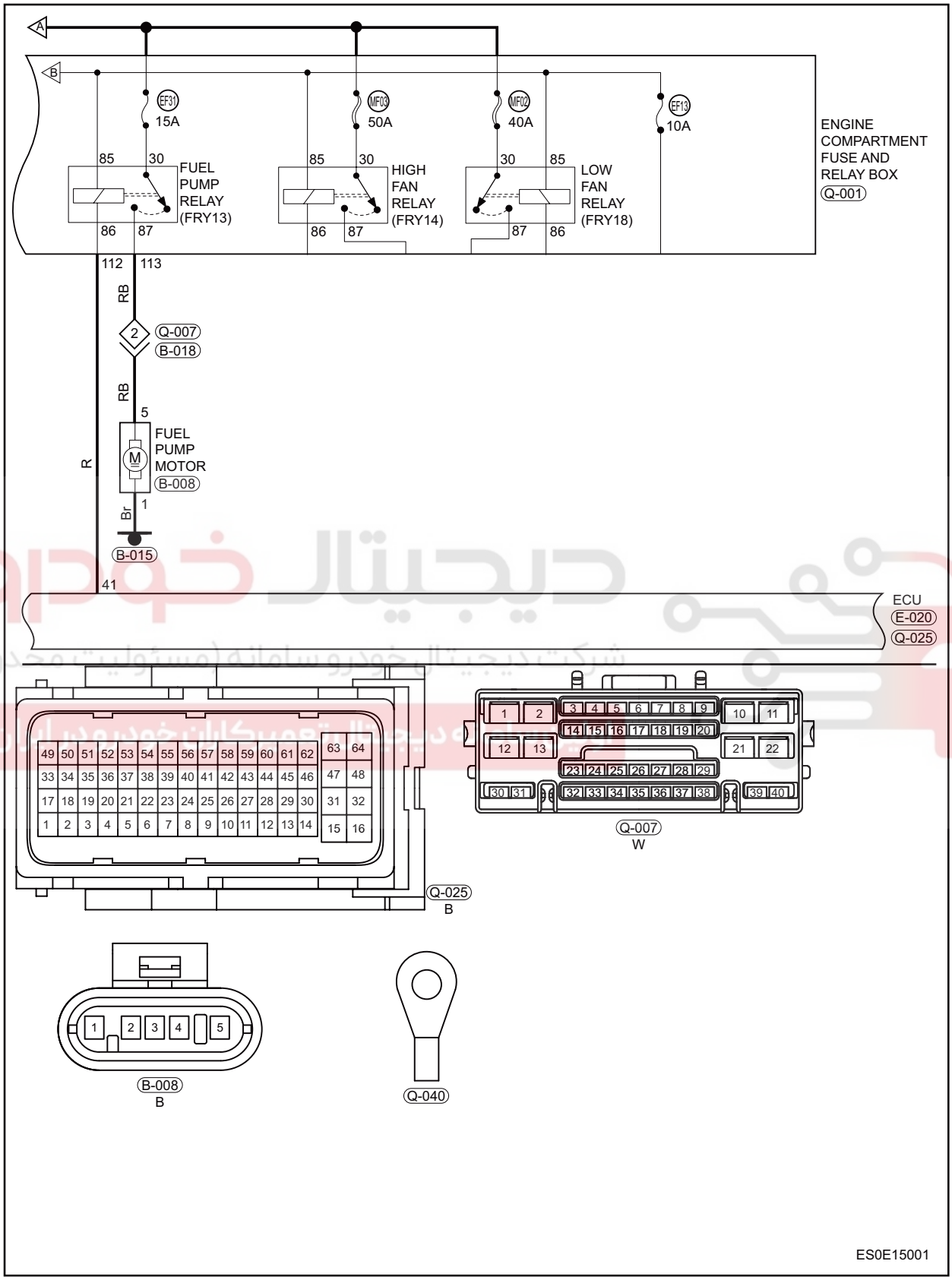
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0627 13	Fuel Pump Control Circuit Open
DTC	P0628 11	Fuel Pump Control Circuit Low
DTC	P0629 12	Fuel Pump Control Circuit High

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0627 13	Fuel Pump Control Circuit Open	Ignition switch ON, engine running	• Fuel Pump relay • Wire harness or connector • Battery • ECU
P0628 11	Fuel Pump Control Circuit Low		
P0629 12	Fuel Pump Control Circuit High		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Check battery voltage

(a) Check if battery terminals are corroded or loose.
(b) Check battery voltage with a digital multimeter.

OK

Not less than 12 V

Result

Proceed to
OK
NG

NG → **Check and repair battery**

OK →

2	Check fuel pump relay and fuse

(a) Check if fuel pump fuse EF31 (15 A) is blown or no power.
(b) Check if relay terminal is corroded or broken.
(c) Directly apply battery voltage to 2 relay control terminals, check if relay closes.
(d) Turn ignition switch to ON.
(e) Measure voltage between engine compartment fuse and relay box terminal and body ground (using a digital multimeter).

Voltage Inspection

Multimeter Connection	Condition	Specified Condition
Relay FRY13 (30) - Body ground	Always	Not less than 12 V

Multimeter Connection	Condition	Specified Condition
Relay FRY13 (85) - Body ground	ENGINE START STOP switch ON	Not less than 12 V

OK

Fuel pump relay and fuse are normal

Result

Proceed to
OK
NG

NG → **Repair or replace fuse or relay**

OK

3 Check fuel pump circuit voltage

(a) Turn ignition switch to ON.
(b) Check the fuel pump relay terminal voltage.

Voltage Inspection

Multimeter Connection	Condition	Specified Condition
Fuel pump B-008 (5) - Body ground	Ignition switch ON	Not less than 12 V

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness**

OK

4 Check fuel pump connector

(a) Check if fuel pump connector is infirmly connected or poorly contacted.

Result

Proceed to
OK
NG

NG → **Repair or replace connector**

OK

5 Check fuel pump relay control circuit

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the ECU connector Q-025.

(d) Check wire harness between ECM connector terminal and engine compartment fuse and relay box terminal.
Check for Open

Multimeter Connection	Condition	Specified Condition
Q-001 (112) - Q-025 (41)	Always	Resistance ⩽ 1Ω

Check for Short

Multimeter Connection	Condition	Specified Condition
Q-001 (112) or Q-025 (41) - Body ground	Always	Resistance ∞

OK
Fuel pump relay control circuit is normal
Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector (ECU - engine compartment fuse and relay box)**

OK

6 Check fuel pump

(a) Directly apply battery voltage to fuel pump, check if fuel pump operates (do not run the motor in dry state or water for a long time).
Result

Proceed to
OK
NG

NG → **Repair or replace fuel pump**

OK

7 Reconfirm DTCs

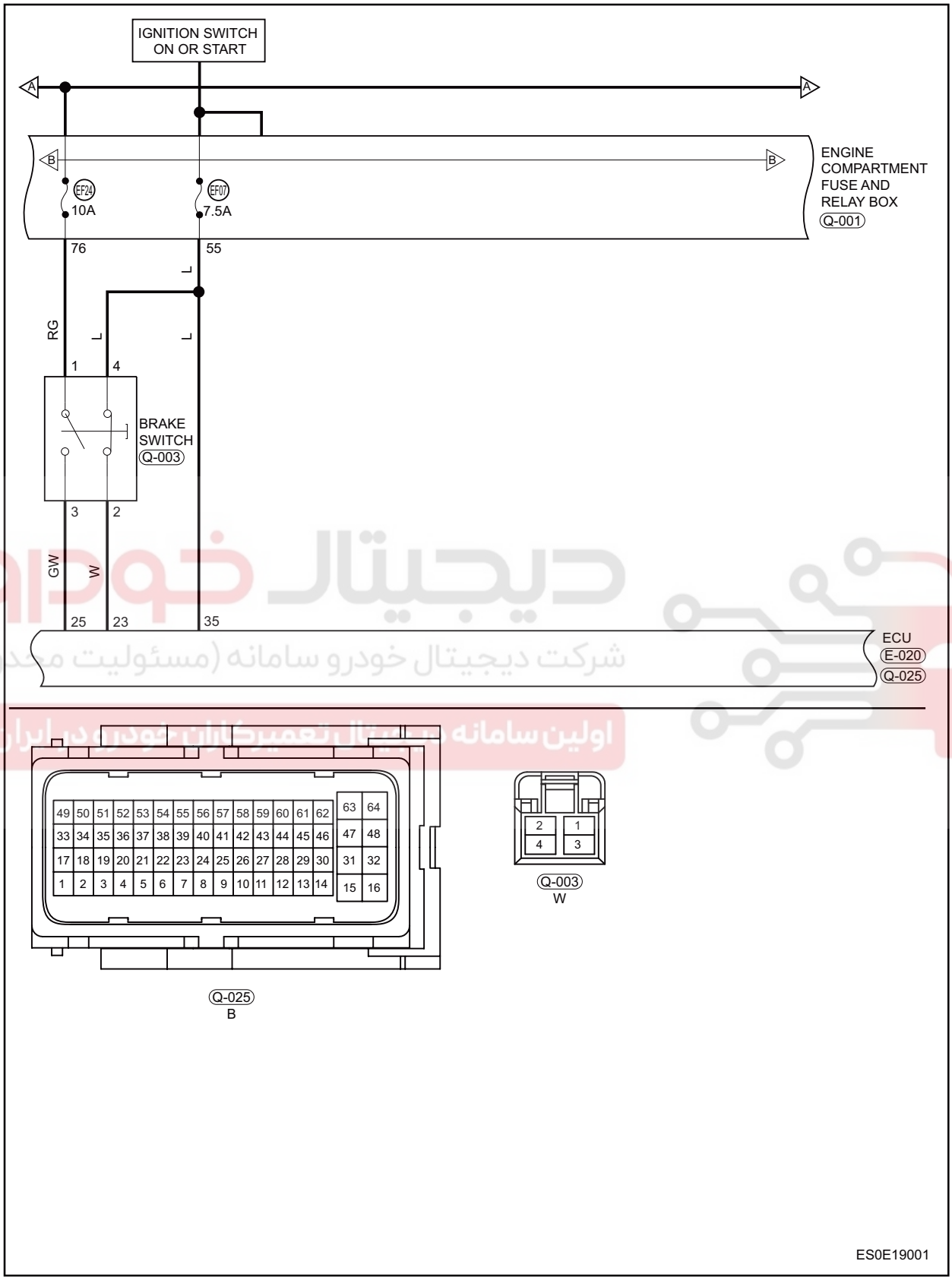
(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P0627 13, P0628 11, P0629 12 still exists.
OK
No same DTC is output
Result

Proceed to
OK
NG

OK	System operates normally
NG	Replace with a new ECU to check if fault reoccurs

DTC	P0571 29	Brake Signal Synchronization Error
DTC	P0571 1C	Brake Light Signal Circuit Error

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0571 29	Brake Signal Synchronization Error	ENGINE START STOP switch ON	• Fuse • Brake switch • Wire harness or connector • ECU
P0571 1C	Brake Light Signal Circuit Error		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

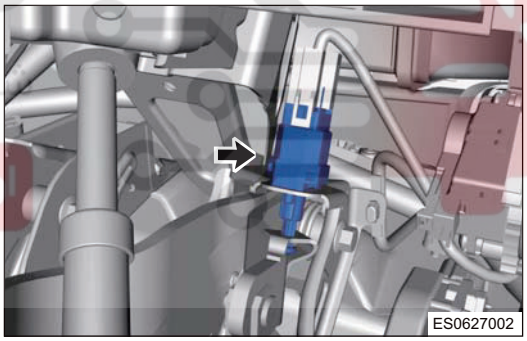
Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1 Check brake switch and brake pedal connector

(a) Check if brake pedal connector (arrow) and brake switch connector are connected infirmly, damaged or cracked.



Result

Proceed to
OK
NG

NG → **Repair or replace connector**

OK

2 Check brake switch signal circuit

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect brake switch connector Q-003 and ECU connector Q-025.
Check for Open

Multimeter Connection	Condition	Specified Condition
Q-003 (3) - Q-025 (25)	Always	Resistance ⩽ 1Ω

Result

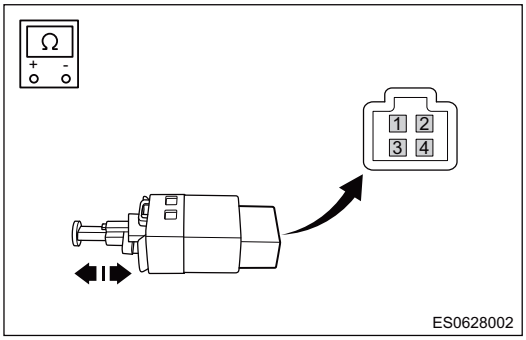
Proceed to
OK
NG

NG → **Repair or replace wire harness**

OK

3	Check brake switch

(a) Remove the brake switch.



(b) Check the brake switch.

Multimeter Connection	Condition	Specified Condition
Terminal 1 - Terminal 3	Brake pedal depressed (switch pin released)	Resistance ⩽ 1 Ω
Terminal 4 - Terminal 2		Resistance ∞
Terminal 1 - Terminal 3	Brake pedal released (switch pin pushed)	Resistance ∞
Terminal 4 - Terminal 2		Resistance ⩽ 1 Ω

OK

Brake switch is normal

Result

Proceed to
OK
NG

NG → **Replace brake switch**

OK

4	Check pedal travel

(a) Connect the diagnostic tester connector.
(b) Connect negative battery cable, and turn ignition switch to ON.
(c) Using 2 multimeters, separately measure voltage between brake switch signal and ground, brake light signal and ground without brake pedal depressed.

Voltage Inspection

Multimeter Connection	Condition	Specified Condition
Q-003 (4) - Ground	Brake pedal not depressed	12 V
Q-003 (3) - Ground	Brake pedal not depressed	0 V

Result

Proceed to
OK

Proceed to
NG

NG → Adjust pedal travel or replace brake pedal

OK

5 Check pedal travel again

(a) Using 2 multimeters, separately measure voltage between brake switch signal and ground, brake light signal and ground with brake pedal depressed slightly.
Voltage Inspection

Multimeter Connection	Condition	Specified Condition
Q-003 (4) - Ground	Brake pedal depressed slightly	Voltage of two circuit changes simultaneously
Q-003 (3) - Ground	Brake pedal depressed slightly	

Result

Proceed to
OK
NG

NG → Adjust pedal travel or replace brake pedal

OK

6 Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read and clear DTCs.
(d) Depress brake pedal 25 times continuously, observe if DTCs appear again.
(e) Check if DTC P0571 29, P0571 1C still exists.

OK
No same DTC is output

Result

Proceed to
OK
NG

OK → System operates normally

NG → Replace with a new ECU to check if fault reoccurs

DTC	P0601 00	Safety Monitoring Function Error (ECU EEPROM Error)

DTC	P0604 43	Electronic Control Unit RAM Malfunction

DTC	P0605 43	Electronic Control Unit ROM Malfunction

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0601 00	Safety Monitoring Function Error (ECU EEPROM Error)	ENGINE START STOP switch ON	• Wire harness or connector • ECU
P0604 43	Electronic Control Unit RAM Malfunction		
P0605 43	Electronic Control Unit ROM Malfunction		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Clear and read DTCs again

(a) Turn ignition switch to ON.

(b) Clear DTCs, start and run engine for a period of time, and read DTCs again.

OK

DTCs do not recur

Result

Proceed to
OK
NG

NG → **Replace with new ECU to perform real-vehicle test**

OK →

2	Check electronic throttle connector

(a) Check electronic throttle connector for poor contact or improper installation.

Result

Proceed to
OK
NG

NG → **Reinstall or repair, replace connector**

OK

3	Perform electronic throttle self-learning

(a) Connect diagnostic tester, clear DTCs, turn ignition switch to OFF and then to ON, and wait for 1 minute.
(b) Perform electronic throttle self-learning.

OK

Throttle self-learning is finished

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness or connector (electronic throttle - ECU)**

OK

4	Reconfirm DTCs

(a) Using diagnostic tester, read ECU DTC.
(b) Check if DTC P0601 00, 0604 43, 0605 43 still exists.

OK

No same DTC is output

Result

Proceed to
OK
NG

OK → **No same DTC is output**
End

NG

5	Perform throttle self-learning again

(a) Turn ignition switch to ON.
(b) Finish throttle self-learning after waiting for 1 minute.
(c) Start the engine, and depress the accelerator pedal several times with shift lever in N.
(d) Read DTCs again, observe if DTCs appear again.

OK

No same DTC is output

Result

Proceed to
OK
NG

OK	System operates normally
NG	End

DTC	P1614 00	Immo Transferred Transponder Response was Corrupted

DTC	P1615 00	ECM Status Unknown

DTC	P1616 00	Authentication not OK

DTC	P1617 00	No Response from SIM during Challenge Period

DTC	P1618 00	Fail to Write EOL Confidential Data into EEProm

DTC	P1619 00	ECM not Programed (Virgin State)

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P1614 00	Immo Transferred Transponder Response was Corrupted	/	• Immobilizer module • ECU • Wire harness or connector
P1615 00	ECM Status Unknown		
P1616 00	Authentication not OK		
P1617 00	No Response from SIM during Challenge Period		
P1618 00	Fail to Write EOL Confidential Data into EEProm		
P1619 00	ECM not Programed (Virgin State)		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	Check immobilizer connector

(a) Check if immobilizer connector is connected infirmly.

Result

Proceed to
OK
NG

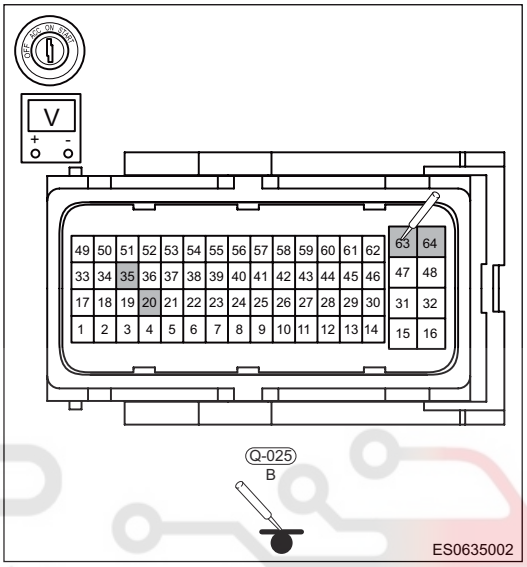
NG → **Repair or replace connector**

OK

2 Check ECM circuit

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check ECU power supply and ground
Voltage Inspection (using a digital multimeter or 21 W test light).

Multimeter Connection	Condition	Specified Condition
Q-025 (20, 35) - Body ground	Ignition switch ON	Not less than 12 V
Q-025 (63, 64) - Body ground		0 V



OK
ECU power supply voltage and ground is normal

Result

Proceed to
OK
NG

NG → **Repair or replace connector and ground**

OK

3 Read SK codes in ECU

(a) Connect the diagnostic tester.
(b) Turn ignition switch to ON.
(c) Read SK codes in ECU

OK
SK codes in ECM can be read normally

Result

Proceed to
OK
NG

NG → **Program ECU again**

OK

4 Check if SK codes in ECU and immobilizer module are the same

(a) Check if SK codes in ECU and immobilizer module are the same.

OK
SK codes in ECU and immobilizer module are the same
Result

Proceed to
OK
NG

NG → **Program ECU again after resetting ECU**

OK →

5	Rematch immobilizer system

(a) Check if information in immobilizer module can be read.
OK
Matched immobilizer system operates normally
Result

Proceed to
OK
NG

NG → **Replace a new immobilizer module and match it**

OK →

6	Check if SK codes in ECU and immobilizer module are the same again

(a) Check if SK codes in ECM and immobilizer module are the same again.
OK
SK codes in ECU and immobilizer module are the same
Result

Proceed to
OK
NG

NG → **Replace with new ECU to check if malfunction reoccurs, and program it again**

OK →

7	Reconfirm DTCs

(a) Using diagnostic tester, read ECU DTC.
(b) Refer to "DTC Confirmation Procedure".
(c) Check if P1614 00, P1615 00, P1616 00, P1617 00, P1618 00 or P1619 00 still exists.
OK
No same DTC is output

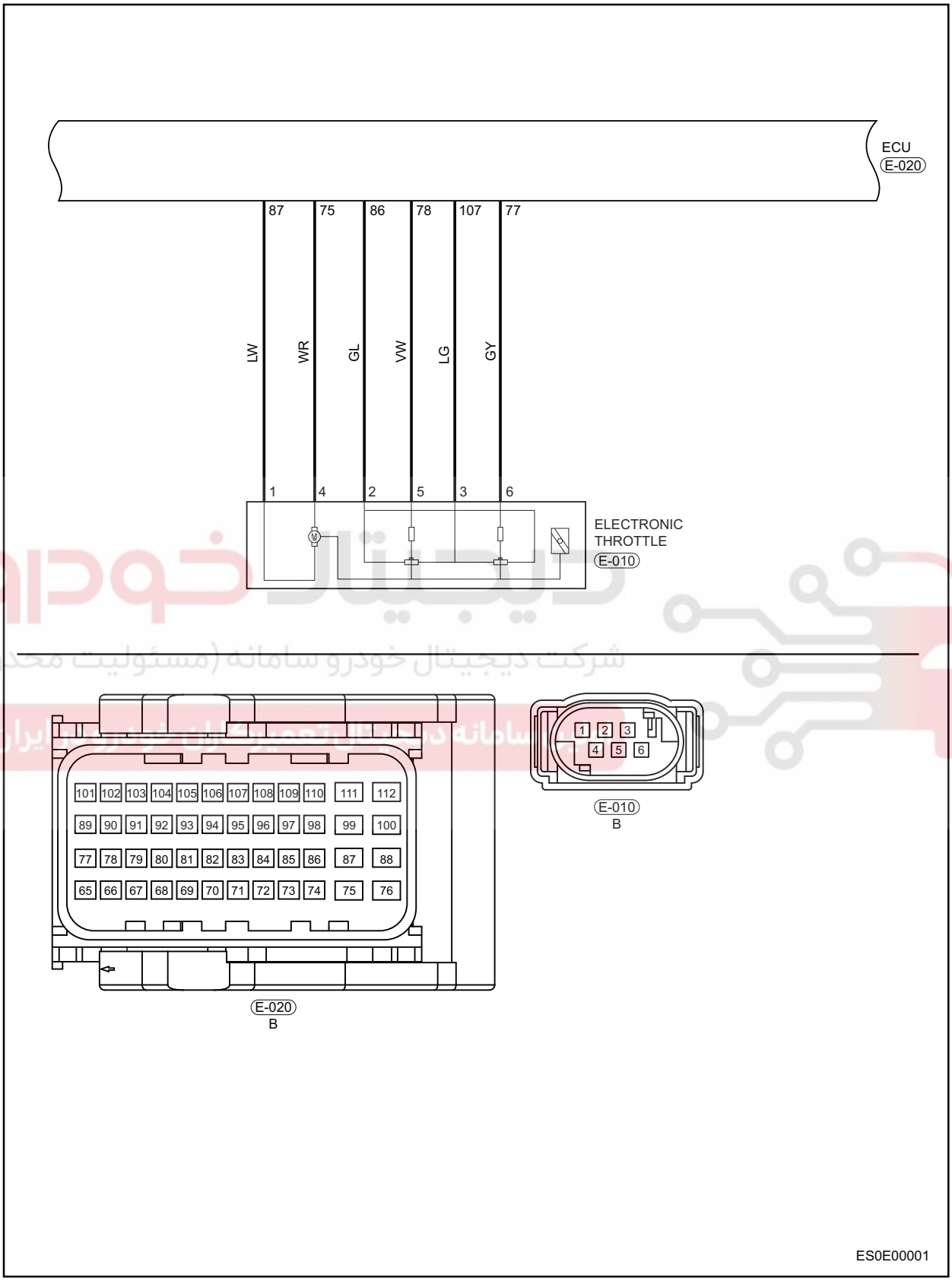
Result

Proceed to
OK
NG

OK	System operates normally
NG	Replace with a new ECU to check if fault reoccurs

DTC	P2106 12	Throttle Power Stage Max Error
DTC	P2106 19	Throttle Power Stage Min Error
DTC	P2106 92	Throttle Power Stage Non-plausible Error
DTC	P2106 13	Throttle Power Stage Signal Error
DTC	P2106 29	Load Monitoring Error

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P2106 12	Throttle Power Stage Max Error	ENGINE START STOP switch ON, engine running Engine speed is 1200 rpm	• Throttle position sensor 1 • Throttle Position Sensor 2 • Wire harness or connector • ECU
P2106 13	Throttle Power Stage Signal Error		
P2106 19	Throttle Power Stage Min Error		
P2106 29	Load Monitoring Error		
P2106 92	Throttle Power Stage Non-plausible Error		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Clear and read DTCs again**

(a) Connect diagnostic tester and adapter, turn ignition switch to ON, and then clear DTCs.
(b) Turn ignition switch to OFF and then to ON, and wait for 1 minute to finish the throttle self-learning.
(c) Run engine, slightly depress accelerator pedal several times, and read DTCs again.

OK

DTCs are cleared

Result

Proceed to
OK
NG

NG → **Repair or replace with new ECU to perform real-vehicle test**

OK

2	**Reconfirm DTCs**

(a) Using diagnostic tester, read ECU DTC.
(b) Check if DTC P2106 12, P2106 13, P2106 19, P2106 29, P2106 92 still exists.

OK

No same DTC is output

Result

Proceed to
OK
NG

OK → End

NG

3	Perform electronic throttle self-learning again

(a) Turn ENGINE START STOP switch to ON.
(b) Wait for about 1 minute to finish throttle self-learning, and then start the engine.
(c) Depress accelerator pedal several times with shift level in N, and read DTCs again.

OK

DTCs do not recur

Result

Proceed to
OK
NG

OK → System operates normally

NG → End

DTC	U0129 87	Lost Communication With Brake System Control Module
DTC	U0001 88	Error Busoff on CAN-bus
DTC	U0104 87	Lost Communication with CCU (Cruise Control Module)
DTC	U0121 87	Lost Communication with ABS
DTC	U0126 87	Lost Communication with Steering Angle Sensor Module
DTC	U0140 00	Lost Communication With Body Control Module (Immo)
DTC	U0155 87	Lost Communication With Instrument Panel Cluster (IPC) Control Module
DTC	U0293 87	Lost Communication with HCU
DTC	U0140 87	Lost Communication with Body Control Module (BCM)
DTC	U0214 87	Lost Communication with Passive Entry Passive Start (PEPS)
DTC	U0101 87	Lost Communication with TCM

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
U0129 87	Lost Communication With Brake System Control Module	• ECU does not detect CAN line BUSOFF fault; • Engine is running	• Connector or wire harness • ABS malfunction • CAN bus hardware circuit malfunction
U0001 88	Error Busoff on CAN-bus		
U0104 87	Lost Communication with CCU (Cruise Control Module)		
U0121 87	Lost Communication with ABS		
U0126 87	Lost Communication with Steering Angle Sensor Module		
U0140 00	Lost Communication with Body Control Module (Immo)		
U0155 87	Lost Communication With Instrument Panel Cluster (IPC) Control Module		
U0293 87	Lost Communication with HCU		
U0140 87	Lost Communication with Body Control Module (BCM)		
U0214 87	Lost Communication with Passive Entry Passive Start (PEPS)		
U0101 87	Lost Communication with TCM		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Diagnosis

1	**(Refer to CAN system)**

DTC	P0688 91	Power Relay Sense Circuit Non-plausible Error

DTC	P0688 92	Power Relay Sense Circuit Signal Error

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0688 91	Power Relay Sense Circuit Non-plausible Error	ENGINE START STOP switch ON, engine running	• Main Relay • Wire harness or connector • Battery • ECU
P0688 92	Power Relay Sense Circuit Signal Error		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Procedure

1	Check battery voltage

(a) Check if battery terminals are corroded or loose.
(b) Check battery voltage with a digital multimeter.

OK

Not less than 12 V

Result

Proceed to
OK
NG

NG → **Check and repair battery**

OK ↓

2	Check ECU fuse

(a) Check if ECM fuses EF22 (10 A), EF07 (7.5 A), EF26 (7.5 A) are blown or no power.
(b) Check if main relay terminal is corroded or broken.
(c) Unplug main relay, directly apply battery voltage to main relay control terminal, check if main relay closes.

OK

Close

Result

Proceed to
OK

Proceed to
NG

NG → Check the cause for fuse no power or repair or replace fuse or relay

OK

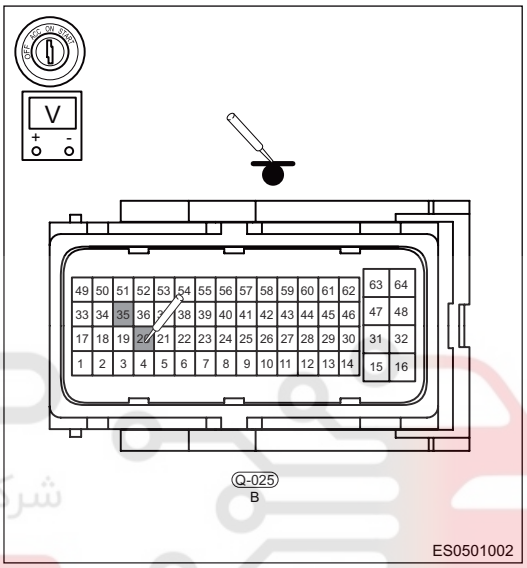
3 Check ECU power supply circuit voltage

(a) Turn ENGINE START STOP switch to ON.
(b) Measure voltage between terminal 20 of ECU connector Q-025 and body ground (using a digital multimeter or 21 W test light).

Multimeter Connection	Condition	Specified Condition
Q-025 (20) - Body ground	Always	Not less than 12 V
Q-025 (35) - Body ground	ENGINE START STOP switch ACC	Not less than 12 V

Result

Proceed to
OK
NG



NG → Repair or replace wire harness

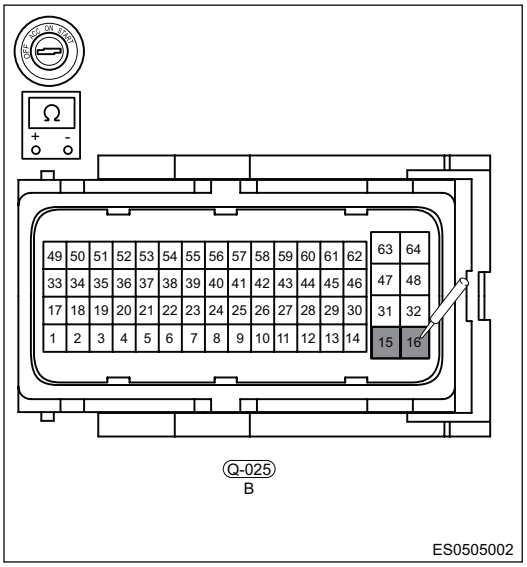
OK

4 Check ECU wire harness (ECU - engine compartment fuse and relay box)

(a) Check wire harness between ECU connector terminals 15, 16 and fuse box terminals.

Check for Open

Multimeter Connection	Specified Condition
Q-025 (15, 16) - Engine compartment fuse and relay box (127)	Resistance ⩽ 1Ω



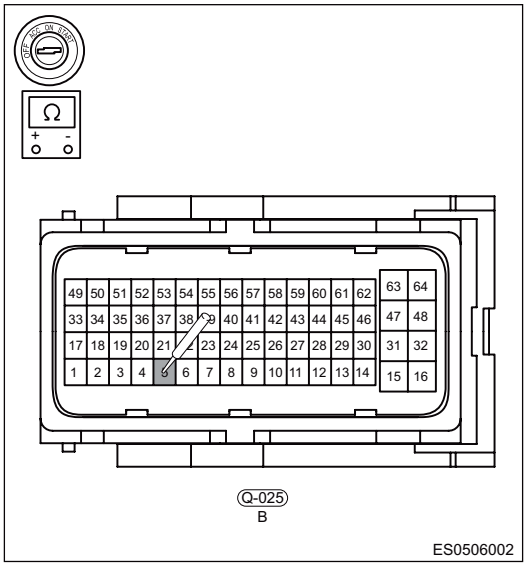
(b) Check wire harness between connector terminal 5 and fuse box terminal.

Check for Open

Multimeter Connection	Specified Condition
Engine compartment fuse and relay box (20) - Q-025 (5)	Resistance ⩽ 1Ω

Result

Proceed to
OK
NG



NG → **Replace fuse or main relay**

OK

5 Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Refer to "DTC Confirmation Procedure".
(e) Check if DTC still exists.

OK

No same DTC is output

Result

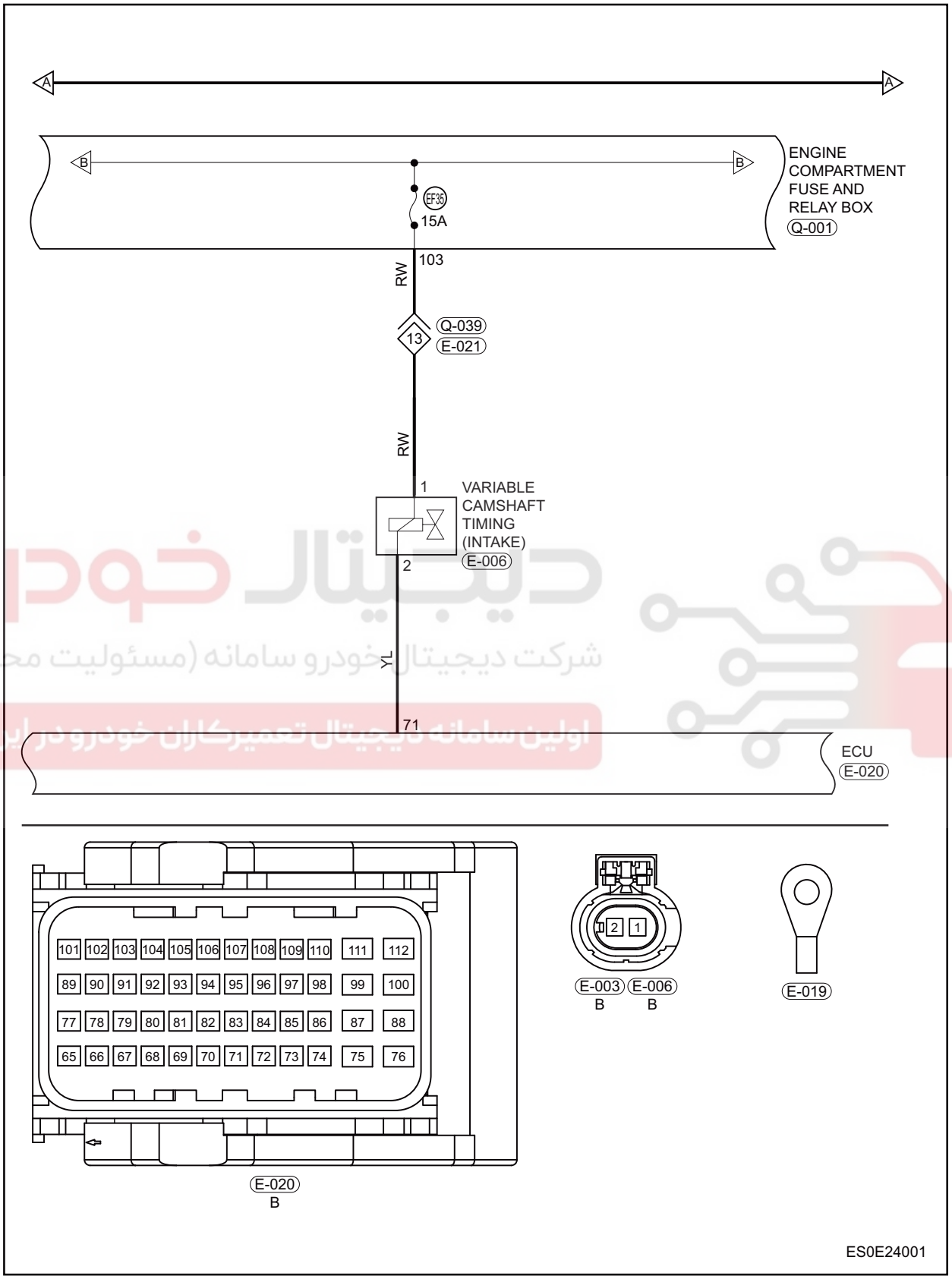
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P000A 00	Camshaft Control Slow Response (Inlet)
DTC	P000A 77	Camshaft Control Target Error (Inlet)
DTC	P0010 13	Control Circuit of Camshaft Control Valve (Inlet)
DTC	P0012 00	Inlet Camshaft not In Locking Position during Start
DTC	P2088 11	Control Circuit Low of Camshaft Control Valve (Inlet)
DTC	P2089 12	Control Circuit High of Camshaft Control Valve (Inlet)

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P000A 00	Camshaft Control Slow Response (Inlet)	ENGINE START STOP switch ON, engine running	• VVT Solenoid Valve • Wire harness or connector • ECU
P000A 77	Camshaft Control Target Error (Inlet)		
P0010 13	Control Circuit of Camshaft Control Valve (Inlet)		
P0012 00	Inlet Camshaft not In Locking Position during Start		
P2088 11	Control Circuit Low of Camshaft Control Valve (Inlet)		
P2089 12	Control Circuit High of Camshaft Control Valve (Inlet)		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check intake VVT control valve fuse EF35**

(a) Check if fuse EF35 is blown or no power.

Result

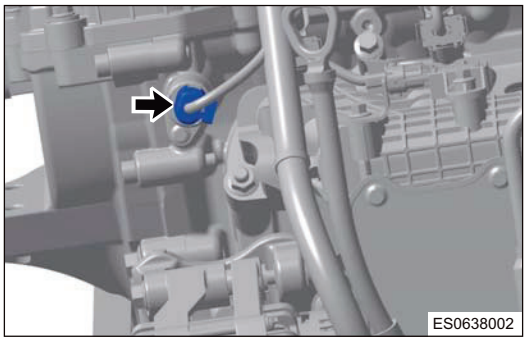
Proceed to
OK
NG

NG → **Replace fuse or check the cause for no power**

OK

2	Check intake VVT control valve connector

(a) Check if intake VVT control valve connector E-006 (arrow) is infirmly connected or poorly contacted.



OK

Intake VVT control valve connector is normal

Result

Proceed to
OK
NG

NG → **Repair or replace connector**

OK

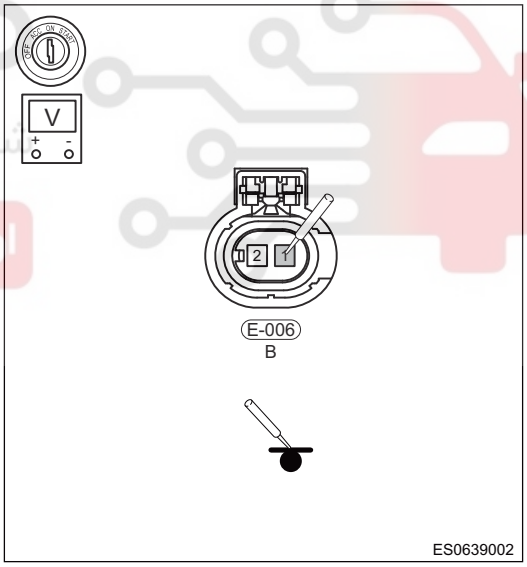
3	Check intake VVT control valve power supply voltage

(a) ENGINE START STOP switch ON

(b) Measure voltage between intake VVT control valve connector terminal and body ground (using a digital multimeter).

Voltage Inspection

Multimeter Connection	Condition	Specified Condition
E-006 (1) - Body ground	ENGINE START STOP switch ON	Not less than 12 V



OK

Intake VVT control valve power supply voltage is normal

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness between intake VVT control valve and engine compartment fuse and relay box**

OK

4	Check wire harness between intake VVT control valve and ECU

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect intake VVT control valve and ECU connectors.

(d) Check wire harness between intake VVT control valve E-006 (2) terminal and ECU.

Check for Open

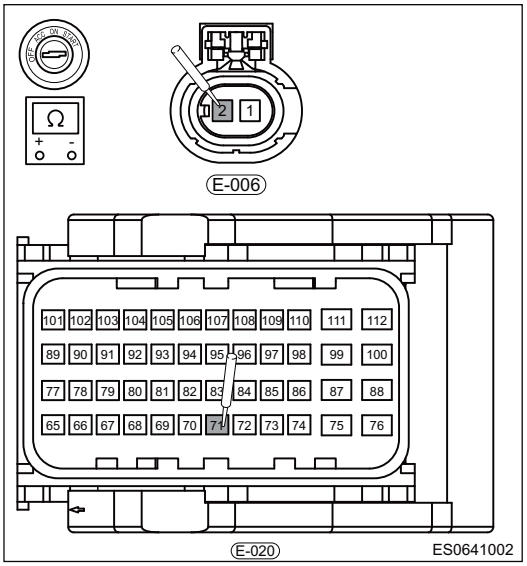
Multimeter Connection	Condition	Specified Condition
E-006 (2) - E-020 (71)	Always	Resistance ⩽ 1Ω

Check for Short

Multimeter Connection	Condition	Specified Condition
E-020 (71) or E-006 (2) - Body ground	Always	Resistance ∞
B-020 (71) or B-006 (2) - Battery positive	Always	Resistance ∞

Result

Proceed to
OK
NG



NG → **Repair or replace wire harness between intake VVT control valve and ECU**

OK →

5 Check intake VVT control valve mechanical fault

(a) Remove intake VVT control valve, and check if connector is damaged or cracked.
(b) Check intake VVT control valve for blockage, oil leakage or seizing.

OK

Intake VVT control valve is normal

Result

Proceed to
OK
NG

NG → **Repair or replace VVT control valve**

OK →

6 Check intake VVT control valve

(a) Remove the intake VVT control valve.

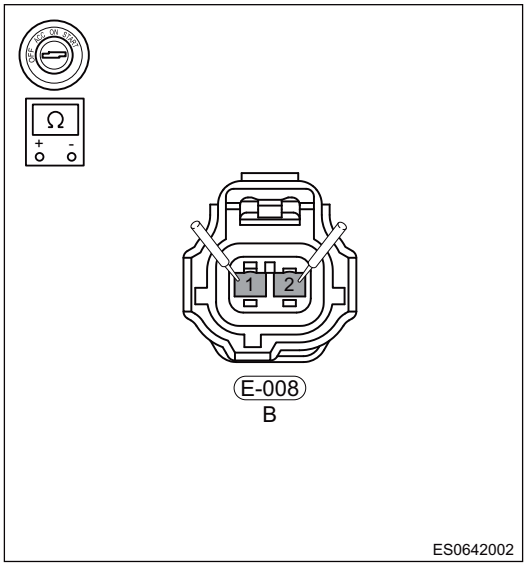
(b) When battery voltage is applied between terminals 1 and 2, control valve should move quickly.

OK

Intake VVT control valve is normal

Result

Proceed to
OK
NG



NG → **Replace intake VVT control valve**

OK

7	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Refer to "DTC Confirmation Procedure".
(e) Check if DTC still exists.

OK

No same DTC is output

Result

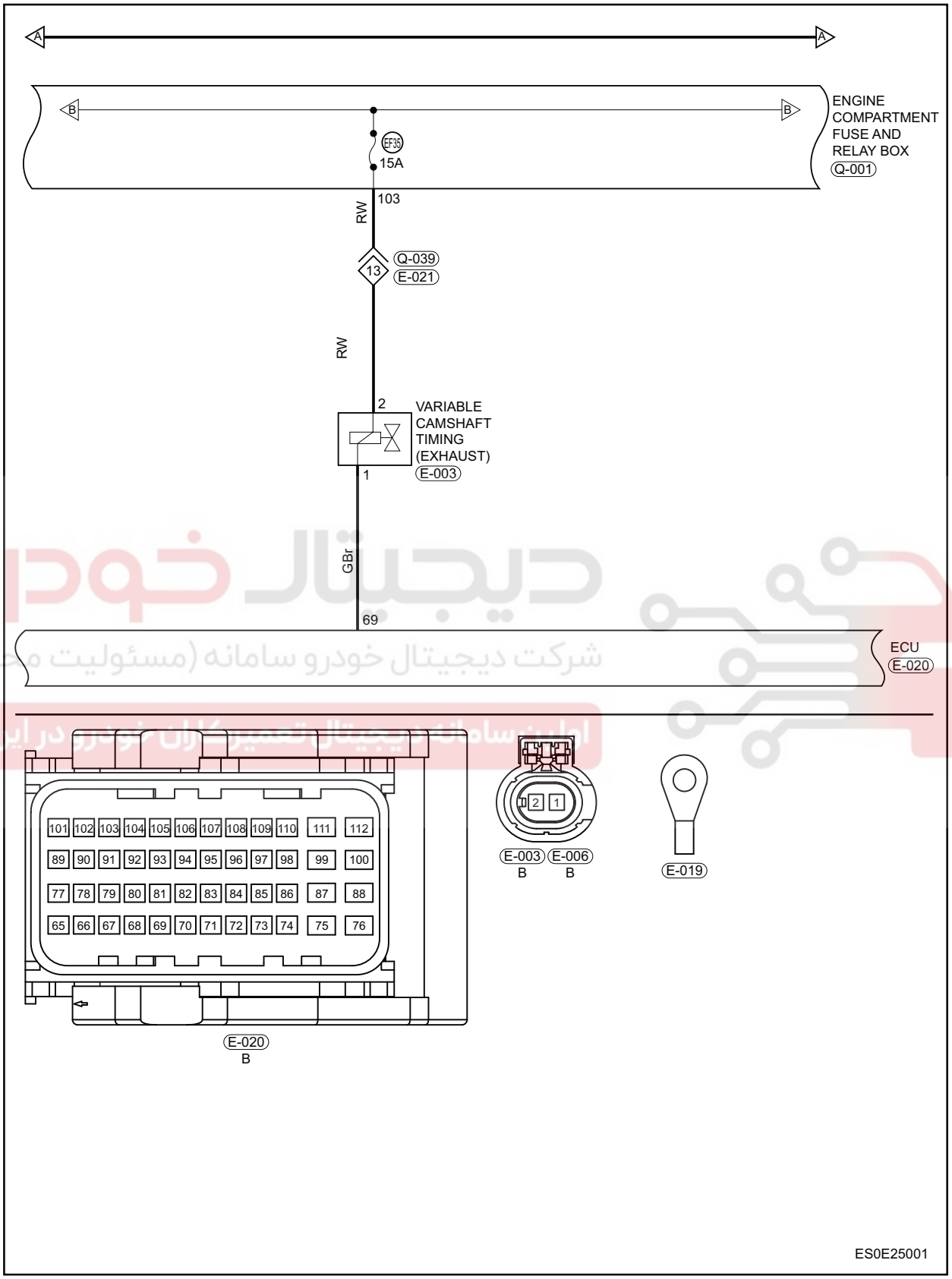
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P000B 00	Camshaft Control Slow Response (Outlet)
DTC	P000B 77	Camshaft Control Target Error (Outlet)
DTC	P0013 13	Control Circuit of Camshaft Control Valve (Outlet)
DTC	P0015 00	Outlet Camshaft not In Locking Position during Start
DTC	P2090 11	Control Circuit Low of Camshaft Control Valve (Outlet)
DTC	P2091 12	Control Circuit High of Camshaft Control Valve (Outlet)

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P000B 00	Camshaft Control Slow Response (Outlet)	ENGINE START STOP switch ON, engine running	• VVT Solenoid Valve • Wire harness or connector • ECU
P000B 77	Camshaft Control Target Error (Outlet)		
P0013 13	Control Circuit of Camshaft Control Valve (Outlet)		
P0015 00	Outlet Camshaft not In Locking Position during Start		
P2090 11	Control Circuit Low of Camshaft Control Valve (Outlet)		
P2091 12	Control Circuit High of Camshaft Control Valve (Outlet)		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check exhaust VVT control valve fuse EF35**

(a) Check if fuse EF35 is blown or no power.

Result

Proceed to
OK
NG

NG → **Replace fuse or check the cause for no power**

OK

2	**Check exhaust VVT control valve connector**

(a) Check if exhaust VVT control valve connector E-003 is infirmly connected or poorly contacted.

OK

Exhaust VVT control valve connector is normal

Result

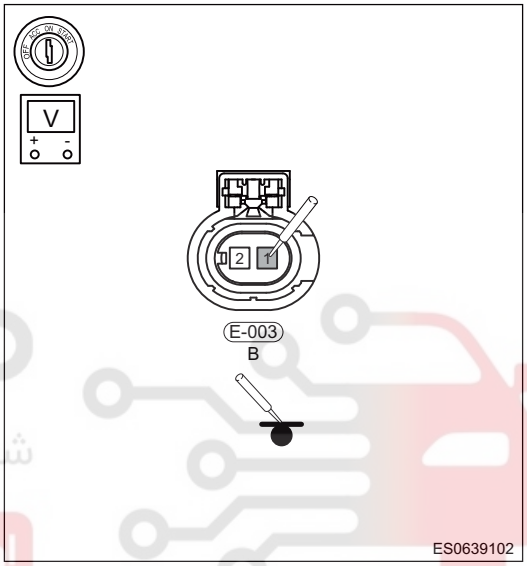
Proceed to
OK
NG

NG → **Repair or replace connector**

OK

3 Check exhaust VVT control valve power supply voltage

(a) ENGINE START STOP switch ON
(b) Measure voltage between exhaust VVT control valve connector terminal and body ground (using a digital multimeter).



Voltage Inspection

Multimeter Connection	Condition	Specified Condition
E-003 (1) - Body ground	ENGINE START STOP switch ON	Not less than 12 V

OK
Exhaust VVT control valve power supply voltage is normal

Result

Proceed to
OK
NG

NG → **Repair or replace wire harness between exhaust VVT control valve and engine compartment fuse and relay box**

OK

4 Check exhaust VVT control valve control circuit

(a) Turn ENGINE START STOP switch to OFF
(b) Disconnect the negative battery cable.
(c) Disconnect ECU connector E-020 and exhaust VVT control valve connector E-003.

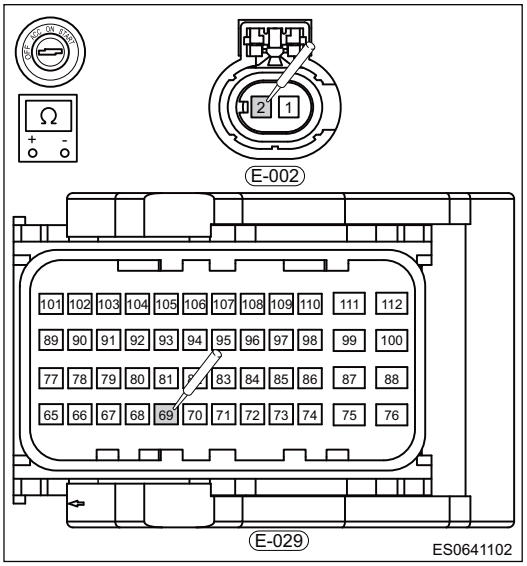
(d) Check wire harness between exhaust VVT control valve connector terminal and ECU connector terminal.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-020 (69) - E-003 (2)	Always	Resistance ⩽ 1Ω

Check for Short

Multimeter Connection	Condition	Specified Condition
E-020 (69) or E-003 (2) - Body ground	Always	Resistance ∞



OK

Wire harness between exhaust VVT control valve connector terminal and ECM connector terminal is normal

Result

Proceed to
OK
NG

NG → **Replace wire harness or connector (exhaust VVT control valve - ECU)**

OK →

5	Check exhaust VVT control valve mechanical fault

(a) Remove exhaust VVT control valve, and check if connector is cracked or damaged.
(b) Check exhaust VVT control valve for blockage, oil leakage or seizing.

OK

Exhaust VVT control valve is normal

Result

Proceed to
OK
NG

NG → **Repair or replace VVT control valve**

OK →

6	Check exhaust VVT control valve

(a) Remove the exhaust VVT control valve.

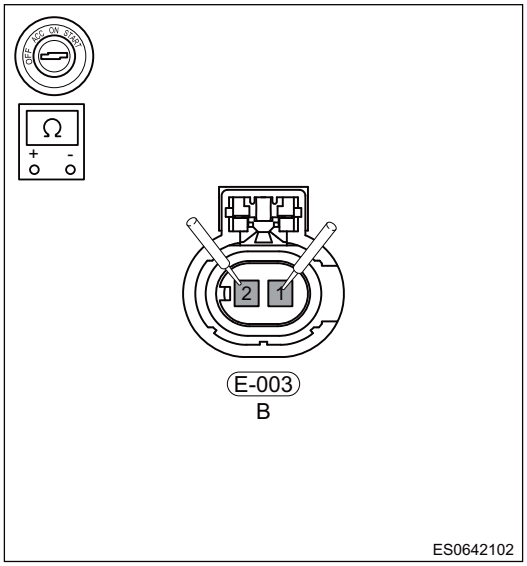
(b) When battery voltage is applied between terminals 1 and 2, control valve should move quickly.

OK

Exhaust VVT control valve is normal

Result

Proceed to
OK
NG



NG → **Replace exhaust VVT control valve**

OK

7	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Check if DTC P000B 00, P000B 77, P0013 13, P0015 00, P2090 11 or P2090 12 still exists.

OK

No same DTC is output

Result

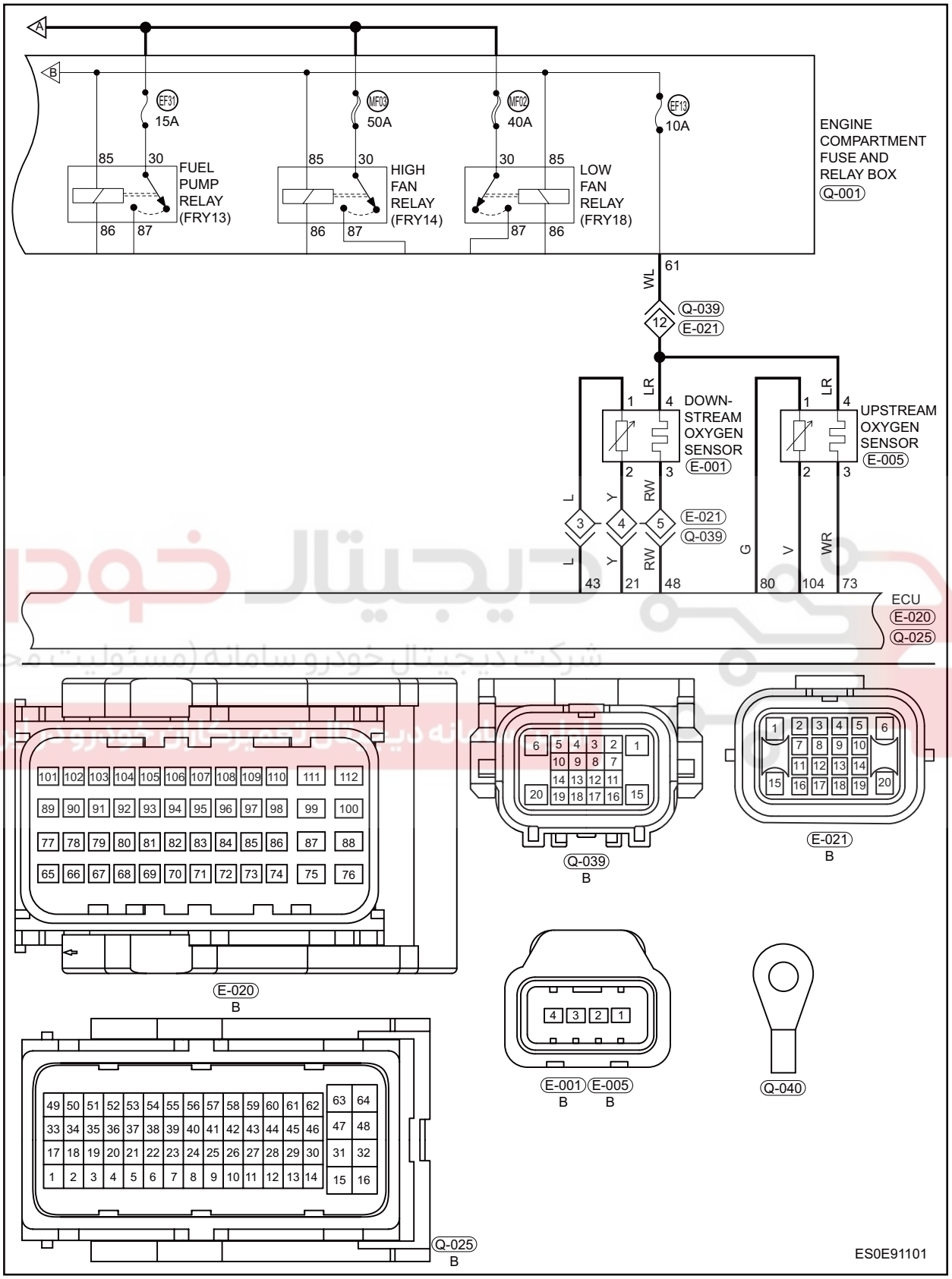
Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

DTC	P0170 00	Fuel Trim Malfunction
DTC	P0171 00	Fuel Trim System too Lean
DTC	P0172 00	Fuel Trim System too Rich
DTC	P2177 00	System Too Lean Off Idle
DTC	P2178 00	System Too Rich Off Idle
DTC	P2187 00	System Too Lean at Idle
DTC	P2188 00	System Too Rich at Idle

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
P0170 00	Fuel Trim Malfunction	• Air-fuel ratio self-learning is enable • Engine speed is between 1400 and 4000 rpm/ (1440 - 3320 rpm, for CVT: 1440 - 2720 rpm); • Engine load is between 18 and 70.5%/(for MT: 18 - 57.75, for CVT: 24.75 - 69.75); • Engine intake flow is between 8 and 140 kg/h/ (for MT: 24 - 110 kg/h, for CVT: 22 - 110 kg/h);	• Oxygen Sensor • Wire harness or connector • Fuel system components • Carbon canister • ECU
P0171 00	Fuel Trim System too Lean		
P0172 00	Fuel Trim System too Rich		
P2177 00	System Too Lean Off Idle		
P2178 00	System Too Rich Off Idle		
P2187 00	System Too Lean at Idle		
P2188 00	System Too Rich at Idle		

Confirmation Procedure

Confirm that battery voltage is no less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF
- Connect diagnostic tester (the latest software) to diagnostic interface.
- ENGINE START STOP switch ON
- Using diagnostic tester, record and clear DTCs.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction is intermittent.

Caution:

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Procedure

1	**Check fuse EF13**

(a) Check if fuse EF13 is blown or no power.

Result

Proceed to
OK
NG

NG → **Replace fuse or check the cause for no power**

OK

2	**Check upstream oxygen sensor power supply voltage**

(a) Turn ENGINE START STOP switch to ON.

(b) Measure voltage between terminal 4 of connector E-005 and ground (using a digital multimeter or 21 W test light).

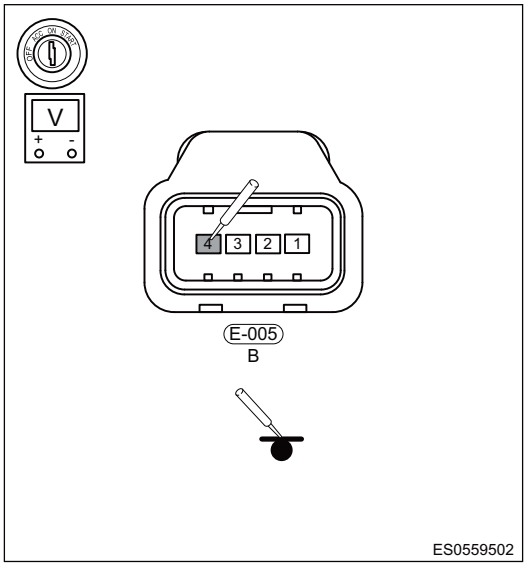
Multimeter Connection	Condition	Specified Condition
E-005 (4) - Body ground	ON	Not less than 12 V

OK

Upstream oxygen sensor power supply voltage is normal

Result

Proceed to
OK
NG



NG → **End**

OK

3 Check upstream oxygen sensor heater control circuit voltage

(a) Turn ENGINE START STOP switch to ON.

(b) Measure voltage between terminal 3 of connector E-005 and ground (using a digital multimeter or 21 W test light).

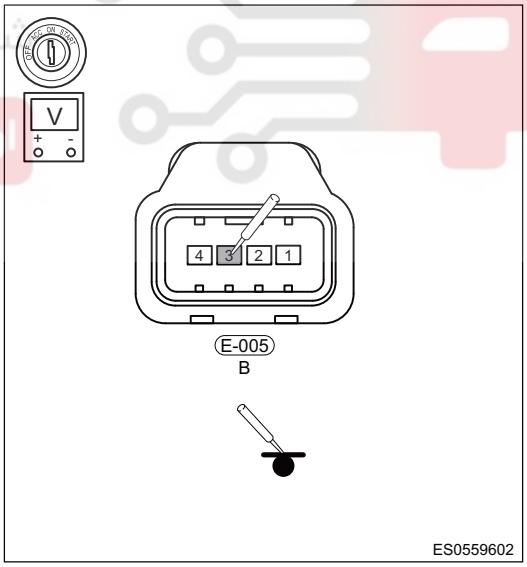
Multimeter Connection	Condition	Specified Condition
E-005 (3) - Body ground	ON	Not less than 12 V

OK

Upstream oxygen sensor power supply voltage is normal

Result

Proceed to
OK
NG



NG → **Wire harness**

OK

4 Check voltage between downstream oxygen sensor signal wire and ground wire

(a) Turn ENGINE START STOP switch to ON.

(b) Measure voltage between terminals 2 and 1 of connector E-001 (using a digital multimeter or 21 W test light).

Multimeter Connection	Condition	Specified Condition
E-001 (2) - E-001 (1)	Engine running	Not less than 12 V

OK

Voltage between downstream oxygen sensor signal and ground wire is normal

Result

Proceed to
OK
NG

NG → **Check relay box fuse**

OK →

5	Check voltage between downstream oxygen sensor power source and heater control circuit

(a) Turn ENGINE START STOP switch to ON.
(b) Measure voltage between terminals 4 and 3 of connector E-001 (using a digital multimeter or 21 W test light).

Multimeter Connection	Condition	Specified Condition
E-001 (4) - E-001 (3)	Engine running	0.45 V

OK

Voltage between downstream oxygen sensor power source and heater control circuit

Result

Proceed to
OK
NG

NG → **End**

OK →

6	Check voltage between downstream oxygen sensor signal wire and ground wire with engine running

(a) Turn ENGINE START STOP switch to ON, start engine and idle it until engine coolant temperature is normal.
(b) Measure voltage between terminals 2 and 1 of connector E-001.

Multimeter Connection	Condition	Specified Condition
E-001 (2) - E-001 (1)	Engine running	Fluctuates rapidly between 0.1 and 0.9V (coolant temperature is normal)

OK

Upstream oxygen sensor signal is normal

Result

Proceed to
OK
NG

NG → **End**

OK

7	Check for short between upstream oxygen sensor heater control circuit and signal circuit with engine running

(a) Turn ENGINE START STOP switch to ON, start engine and idle it until engine coolant temperature is normal, and leave the vehicle in idle state.
(b) Turn ENGINE START STOP switch to OFF.
(c) Disconnect the negative battery cable.
(d) Disconnect the upstream oxygen sensor connector E-005.
(e) Check for short between terminals 3 and 2 of connector E-005.

Multimeter Connection	Condition	Specified Condition
E-005 (2) - E-005 (3)	Engine running	Resistance ⩽ 1 Ω

OK
Upstream oxygen sensor signal is normal

Result

Proceed to
OK
NG

NG → **Replace upstream oxygen sensor**

OK

8	Check ECU ground point

(a) Disconnect ECU ground points GQ-042 and GE-019.
(b) Check the ECU ground points GQ-042 and GE-019.

OK
Ground point is normal

Result

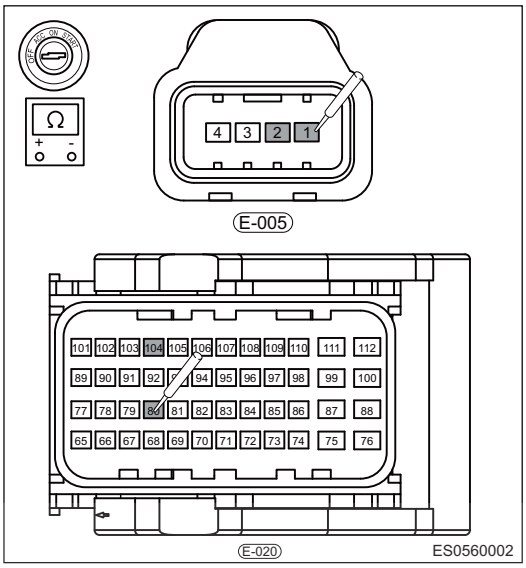
Proceed to
OK
NG

NG → **Repair or replace ground wire harness or ground point**

OK

9	Check upstream oxygen sensor signal circuit

(a) Disconnect the upstream oxygen sensor connector E-005.
(b) Check wire harness between upstream oxygen sensor connector terminal and ECU connector terminal.



Check for Open

Multimeter Connection	Condition	Specified Condition
E-005 (2) - E-020 (104) or E-005 (1) - E-020 (80)	Always	Resistance ⩽ 1Ω

Check for Short

Multimeter Connection	Condition	Specified Condition
E-005 (2) or E-020 (104) - Body ground or battery positive	Always	Resistance ∞
E-005 (1) or E-020 (80) - Body ground or battery positive		

OK
Upstream oxygen sensor signal circuit is normal

Result

Proceed to
OK
NG

NG → **Replace wire harness or connector (upstream oxygen sensor - ECU)**

OK →

10	Check for fuel system malfunction

(a) Check each component and supplying pressure of fuel system for malfunctions.

OK
Each component of fuel system is normal

Result

Proceed to
OK
NG

NG → **Repair or replace faulty fuel system components**

OK →

11	Check if malfunction is caused by canister solenoid valve

(a) Check canister solenoid valve for sticking or other malfunctions.

OK

Canister solenoid valve operates normally

Result

Proceed to
OK
NG

NG → **Repair or replace canister solenoid valve**

OK →

12	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) ENGINE START STOP switch ON
(c) Using diagnostic tester, read ECU DTC.
(d) Refer to "DTC Confirmation Procedure".
(e) Check if DTC still exists.

OK

No same DTC is output

Result

Proceed to
OK
NG

OK → **System operates normally**

NG → **Replace with a new ECU to check if fault reoccurs**

Diagnosis Process of Electronic Fuel Injection system According to Trouble Symptom

Fuel pressure test

1. Fuel Pressure Specifications

SQRE4T15B	Pressure (kpa)
Fuel Rail Fuel Pressure (ENGINE START STOP switch ON)	400 (When power is on, pressure of fuel supply system is kept at 400 kPa - key (ON). For the new vehicle, after it is added with a certain fuel, make sure that measured fuel pressure on fuel rail at 13 s can reach 90% or higher of rated pressure.)
Fuel Rail Fuel Pressure (Engine Idling)	400
Fuel Rail Fuel Pressure (ENGINE START STOP switch OFF)	400 (Turn off oil pump after it runs for 5 minutes, test changes of pressure in oil outlet of oil pump within 48 hours, the pressure should be not less than 100 kPa; When system pressure is 80%, turn power and oil outlet off, the maximum pressure will not drop more than 10% in 1min.)

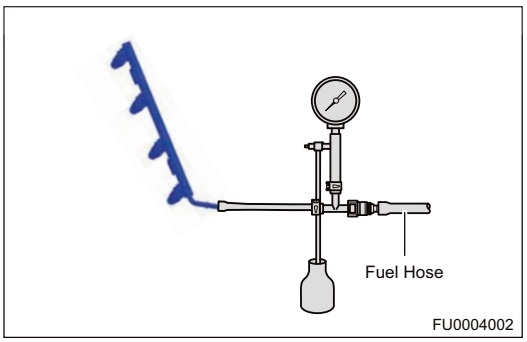
Caution:

- When operating the fuel supply system, work area should be in good ventilation and keep fire sources or open flames away from the work area, in which fire extinguisher should be equipped.
- Before operating the fuel supply system, please touch the vehicle body to discharge static electricity; failure to do so will cause a fire, even result in an explosion.
- Before removing and installing fuel pipes, release the fuel supply system pressure.

Warning:

- Make sure that battery voltage is not less than 12 V.
- The service life of fuel filter assembly should be within 30000 km.
- Fuel amount is at least 25% of fuel tank capacity.
- Make sure that fuel supply system lines are securely connected, preventing the fuel supply system from leaking.

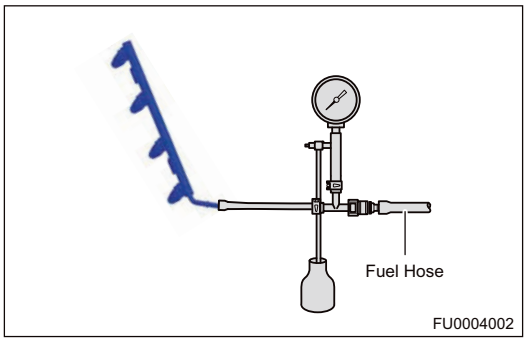
2. Check fuel pressure process
   (a) Fuel system pressure release.
   (b) Remove the engine trim cover.
   (c) Disconnect the inlet pipe II connector and connect the fuel supply system pressure tester between inlet pipe II and fuel rail.



   (d) Start engine and run it at idle, and then read the value on pressure tester.
   Warning:
   - Standard pressure at idle should be 400 kPa.
   - If measured pressure value is lower than 380 kPa or higher than 420 kPa, check vehicle fuel supply line for leakage or kink, check fuel filter or injector for blockage, function of electric fuel pump for abnormality.
   - Replace fuel filter, injector or electric fuel pump assembly if necessary.

3. Fuel flow test method

(a) Disconnect the inlet pipe II connector and connect the fuel supply system pressure tester between inlet pipe II and fuel rail.



(b) Start engine, increase engine speed (such as throttle fully opens), if the pressure of pressure gauge is lower than 0.1 Mpa (100 kPa) of system pressure, flow is insufficient.

(c) If flow is insufficient, fuel filter blockage, line blockage or bend, fuel pump wear or mesh blockage may be the problem cause.

Hint:

- Replace the fuel filter firstly if necessary. If line is blocked or bend, repair or replace it and retest flow, if it is eligible, the problem is eliminated. If it is ineligible, replace fuel pump and wash impurities in fuel tank.

Diagnosis Process of Electronic Fuel Injection system According to Trouble Symptom

1. Perform primary inspection first before starting the procedure for troubleshooting based on the engine problem symptoms

(a) Confirm that engine malfunction indicator operates normally;

(b) Using diagnostic tester, check that no error messages are recorded;

(c) Confirm that malfunction complained by customer is present, and confirm the condition under which malfunction occurs.

2. Then, perform appearance inspection

(a) Check fuel line for leakage;

(b) Check if vacuum line is broken or twisted, and if connection is correct;

(c) Check intake line for blockage, air leakage, crush or damage;

(d) Check if high-voltage cable of ignition system is broken or deteriorated, and if ignition sequence is correct;

(e) Check if wire harness ground points are clean and secure;

(f) Check each sensor or actuator connector for looseness or poor contact.

Caution:

If above conditions exist, repair the trouble areas first. Otherwise it will affect the repair work for following trouble diagnosis.

3. Diagnostic Help

- Confirm that there are no trouble records for engine;
- Confirm that the trouble conditions exist;
- There are no abnormal conditions after performing inspection according to above procedures;
- During service, do not ignore vehicle maintenance condition, cylinder pressure, mechanical ignition timing and fuel condition, etc. that can affect the system;
- Replace ECU and perform real-vehicle check and test.

If trouble symptom can be eliminated, trouble area is in ECU; if trouble symptom still exists, reuse the original ECU, repeat the procedures, and perform service again.

Problem Symptoms Table

Symptom	Suspected Area
Engine Does Not Crank or Cranks Slowly While Starting	• Battery • Starter motor • Wire harness or ENGINE START STOP switch • Starter relay • ECU, TCM • Gear switch (CVT) • Engine mechanical
Engine cranks normally but cannot start successfully while starting	• No fuel in tank • Fuel pump • Fuel injector • Engine speed sensor • Ignition coil • Engine immobilizer • ECU • Engine mechanical
Difficult to Start With Hot Engine	• Water in fuel • Fuel pump • Coolant Temperature Sensor • Engine speed sensor • Ignition coil • Camshaft position sensor • Fuel Injector • Engine mechanical
Difficult to start with cold engine	• Fuel quality • Fuel pump • Coolant Temperature Sensor • Fuel Injector • Ignition coil • Electronic throttle body • Engine mechanical
Engine speed is normal, but it is difficult to start at anytime	• Fuel quality • Fuel pump • Coolant Temperature Sensor • Fuel Injector • Ignition coil • Electronic throttle body • Intake passage • Ignition timing • Spark plug • Engine mechanical
Engine starts normally, but idles roughly at anytime	• Fuel quality • Fuel pump • Coolant Temperature Sensor • Fuel Injector • Electronic throttle body • Intake passage • Ignition timing • Spark plug • Engine mechanical
Engine starts normally, but idles roughly during warming up	• Fuel quality • Coolant Temperature Sensor • Electronic throttle body • Intake passage • Spark plug • Engine mechanical
Engine starts normally, but idles roughly after warming up	• Fuel quality • Coolant Temperature Sensor • Electronic throttle body • Intake passage • Spark plug • Engine mechanical

Symptom	Suspected Area
Engine Starts Normally, But Idles Roughly Or Stalls With Part Load (For Example, A/C Is ON)	• A/C system • Fuel Injector
Engine starts normally, but idle speed is too high	• Throttle • Vacuum tube • Coolant Temperature Sensor • Ignition timing
Low engine speed or stalls when accelerating	• Water in fuel • Intake pressure/temperature sensor • Intake pipe • Exhaust pipe • Ignition timing • Throttle position sensor • Fuel injector • Spark plug
Slow response when accelerating	• Water in fuel • Intake pressure/temperature sensor • Intake pipe • Exhaust pipe • Ignition timing • Throttle position sensor • Fuel injector • Spark plug
Lack of Power and Poor Performance When Accelerating	• Fuel quality • Intake pressure/temperature sensor • Electronic throttle body • Intake passage • Spark plug • Ignition coil • Ignition timing • Exhaust passage • Fuel Injector

Engine Does Not Crank or Cranks Slowly While Starting

1. Check voltage between two battery posts when engine starts
   - OK: Voltage is 13.5 to 14.8 V

   NG

   Replace the battery

   OK
2. Check voltage of starter motor positive post
   (a) Ignition switch remains in START position and check the voltage of starter motor positive post.
   - OK: Voltage is 13.5 to 14.8 V

   NG

   Repair or replace starter relay, wire harness or ECU

   OK
3. Check operation of starter motor
   (a) Remove the starter.
   (b) Check if there is an open circuit or if it is stuck due to poor lubrication.

   NG

   Repair or replace starter

   OK
4. Check engine lubricant and gear oil
   (a) If malfunction only occurs in winter, check if starter motor resistance is too strong because of improper engine lubricant and gear oil selection.

   NG

   Replace lubricant with appropriate number

   OK

5. Check engine internal mechanical resistance
   (a) Check if engine internal mechanical resistance is too strong, causing starter motor not to run or run slowly.
   NG
   Check and repair engine internal resistance malfunction
   OK
   Go to Diagnostic Help

Engine cranks normally but cannot start successfully while starting

1. Engine cranks normally but cannot start successfully while starting
   (a) Check fuel pressure.
   NG
   Repair or replace fuel system
   OK
2. Using diagnostic tester, observe if any speed signal is output
   (a) Connect diagnostic tester, start engine and select Read Datastream.
   (b) Observe if any speed signal is output.
   NG
   Check crankshaft position sensor wire harness
   OK
3. Check ignition system
   (a) Measure compression of misfiring cylinder
   NG
   Check engine to confirm cause of low compression
   OK
4. Check pressure of cylinder
   (a) Measure compression of misfiring cylinder
   NG
   Check engine to confirm cause of low compression
   OK

Difficult to Start With Hot Engine

1. Check fuel pressure
   (a) Check fuel pressure.
   NG
   Repair or replace fuel system
   OK
2. Check ignition system
   (a) Remove ignition coil and spark plug of one cylinder, and ground spark plug housing. Start engine, and check if spark is generated.
   - OK: Spark is generated

   NG
   Check ignition system
   OK
3. Disconnect coolant temperature sensor connector, start engine and observe if engine starts successfully at this time
   NG
   Check engine to confirm cause of low compression
   OK

4. Check pressure of cylinder
   (a) Measure compression of misfiring cylinder
   NG
   Check engine to confirm cause of low compression
   OK
5. Check fuel condition
   (a) Observe if trouble occurs just after fuel is filled.
   NG
   Replace fuel
   OK
   Go to Diagnostic Help

Difficult to Start With Cold Engine

1. Check fuel pressure
   (a) Check fuel pressure.
   NG
   Repair or replace fuel system
   OK
2. Check ignition system
   (a) Remove ignition coil and spark plug of one cylinder, and ground spark plug housing. Start engine, and check if spark is generated.
   - OK: Spark is generated

   NG
   Check ignition system
   OK
3. Disconnect coolant temperature sensor connector, start engine and observe if engine starts successfully at this time
   NG
   Check engine to confirm cause of low compression
   OK
4. Depress accelerator pedal slightly, and observe if it is easy to start
   NG
   Clean or replace throttle
   OK
5. Check injector for leakage or blockage
   NG
   Clean or replace injector nozzle
   OK
6. Check fuel condition
   (a) Observe if trouble occurs just after fuel is filled.
   NG
   Replace fuel
   OK
7. Check pressure of cylinder
   (a) Measure compression of misfiring cylinder
   NG
   Check engine to confirm cause of low compression
   OK
   Go to Diagnostic Help

Engine speed is normal, but it is difficult to start at anytime

1. Check air filter for blockage, and intake pipe for air leakage

NG

Check and repair intake system

OK

2. Check fuel pressure

(a) Check fuel pressure.

NG

Repair or replace fuel system

OK

3. Inspection of spark plug

(a) Check the spark plug of each cylinder, and observe if the type and gap are as specified.

NG

Replace spark plug

OK

4. Check ignition system

(a) Remove ignition coil and spark plug of one cylinder, and ground spark plug housing. Start engine, and check if spark is generated.

- OK: Spark is generated

NG

Replace ignition system

OK

5. Disconnect coolant temperature sensor connector, start engine and observe if engine starts successfully at this time

NG

Check and repair circuit or replace sensor

OK

6. Depress accelerator pedal slightly, and observe if it is easy to start

NG

Clean or replace throttle

OK

7. Check injector for leakage or blockage

NG

Clean or replace injector nozzle

OK

8. Check fuel condition

(a) Observe if trouble occurs just after fuel is filled.

NG

Replace fuel

OK

9. Check pressure of cylinder

(a) Measure compression of misfiring cylinder

NG

Check engine to confirm cause of low compression

OK

Go to Diagnostic Help

10. Check engine ignition sequence and ignition timing

(a) Check if engine ignition sequence and ignition timing are as specified.

NG

Check and repair ignition timing

OK

Go to Diagnostic Help

Engine starts normally, but idles roughly at anytime

1. Check air filter for blockage, and intake pipe for air leakage

NG

Check and repair intake system

OK

2. Check if throttle is stuck

NG

Repair or replace throttle

OK

3. Inspection of spark plug

(a) Check the spark plug of each cylinder, and observe if the type and gap are as specified.

NG

Repair or replace spark plug

OK

4. Check throttle for carbon deposits

NG

Clean throttle

OK

5. Check injector for leakage or blockage

NG

Clean or replace injector

OK

6. Check fuel condition

(a) Observe if trouble occurs just after fuel is filled.

NG

Replace fuel

OK

7. Check pressure of cylinder

(a) Measure compression of misfiring cylinder

NG

Check engine to confirm cause of low compression

OK

Go to Diagnostic Help

8. Check engine ignition sequence and ignition timing

(a) Check if engine ignition sequence and ignition timing are as specified.

NG

Check and repair ignition timing

OK

Go to Diagnostic Help

Engine Starts Normally, But Idles Roughly During Warming Up

1. Check air filter for blockage, and intake pipe for air leakage

NG

Check and repair intake system

OK

2. Inspection of spark plug

(a) Check the spark plug of each cylinder, and observe if the type and gap are as specified.

NG

Repair or replace spark plug

OK

3. Check throttle for carbon deposits

NG

Clean throttle

OK

4. Unplug coolant temperature sensor connector, start engine and observe if engine idles normally during warming up

NG

Check and repair circuit or replace sensor

OK

5. Check injector for leakage or blockage

NG

Clean or replace injector

OK

6. Check fuel condition

(a) Observe if trouble occurs just after fuel is filled.

NG

Replace fuel

OK

7. Check pressure of cylinder

(a) Measure compression of misfiring cylinder

NG

Check engine to confirm cause of low compression

OK

Go to Diagnostic Help

Engine Starts Normally, But Idles Roughly After Warming Up

1. Check air filter for blockage, and intake pipe for air leakage

NG

Check and repair intake system

OK

2. Inspection of spark plug

(a) Check the spark plug of each cylinder, and observe if the type and gap are as specified.

NG

Repair or replace spark plug

OK

3. Unplug coolant temperature sensor connector, start engine and observe if engine idles normally during warming up

NG
Check and repair circuit or replace sensor
OK

4. Check injector for leakage or blockage

NG
Clean or replace injector
OK

5. Check fuel condition

(a) Observe if trouble occurs just after fuel is filled.

NG
Replace fuel
OK

6. Check pressure of cylinder

(a) Measure compression of misfiring cylinder

NG
Check engine to confirm cause of low compression

OK
Go to Diagnostic Help

Engine Starts Normally, But Idles Roughly Or Stalls With Part Load (For Example, A/C Is ON)

1. Check throttle for carbon deposits

NG
Clean throttle
OK

2. Observe if engine output increases when A/C is turned on. In other words, observe changes of ignition advance angle, injection pulse width and intake air volume using diagnostic tester

NG
Next
OK

3. Check if A/C compressor pump resistance increases

NG
Check and repair or replace A/C system
OK

4. Observe if engine speed increases when A/C is turned on

NG
Replace ECU to perform real-vehicle check
OK

5. Check injector for leakage or blockage

NG
Clean or replace injector

OK
Go to Diagnostic Help

Engine Starts Normally, But Idle Speed Is Too High

1. Check if accelerator pedal is stuck

NG
Adjust or replace accelerator pedal
OK

2. Check intake system and connected vacuum pipe for air leakage
   NG
   Check and repair intake system
   OK
3. Check throttle for carbon deposits
   NG
   Clean or replace throttle
   OK
4. Disconnect coolant temperature sensor connector, start engine and observe if engine idle is normal
   NG
   Check and repair circuit or replace sensor
   OK
5. Check engine ignition timing
   NG
   Check and repair ignition timing
   OK
   Go to Diagnostic Help

Low Engine Speed Or Stalls When Accelerating

1. Check air filter for blockage, and intake pipe for air leakage
   NG
   Check and repair intake system
   OK
2. Check fuel pressure
   (a) Check fuel pressure.
   NG
   Repair or replace fuel system
   OK
3. Inspection of spark plug
   (a) Check the spark plug of each cylinder, and observe if the type and gap are as specified.
   NG
   Replace spark plug
   OK
4. Check throttle for carbon deposits
   NG
   Clean throttle
   OK
5. Check intake pressure/temperature sensor, throttle position sensor and circuit
   NG
   Check and repair circuit or replace sensor
   OK
6. Check injector for leakage or blockage
   NG
   Clean or replace injector
   OK
7. Check fuel condition

(a) Observe if trouble occurs just after fuel is filled.

NG

Replace fuel

NG

8. Check engine ignition sequence and ignition timing

(a) Check if engine ignition sequence and ignition timing are as specified.

NG

Check and repair ignition timing

OK

9. Check exhaust system

(a) Check exhaust system for leakage or blockage.

NG

Check and repair ignition timing

OK

Go to Diagnostic Help

Slow Response When Accelerating

1. Check air filter for blockage, and intake pipe for air leakage

NG

Check and repair intake system

OK

2. Check fuel pressure

(a) Check fuel pressure.

NG

Repair or replace fuel system

OK

3. Inspection of spark plug

(a) Check the spark plug of each cylinder, and observe if the type and gap are as specified.

NG

Replace spark plug

OK

4. Check throttle for carbon deposits

NG

Clean throttle

OK

5. Check intake pressure/temperature sensor, throttle position sensor and circuit

NG

Check and repair circuit or replace sensor

OK

6. Check injector for leakage or blockage

NG

Clean or replace injector

OK

7. Check fuel condition

(a) Observe if trouble occurs just after fuel is filled.

NG

Replace fuel

NG

8. Check engine ignition sequence and ignition timing

(a) Check if engine ignition sequence and ignition timing are as specified.

NG

Check and repair ignition timing

OK

9. Check exhaust system

(a) Check exhaust system for leakage or blockage.

NG

Check and repair ignition timing

OK

Go to Diagnostic Help

Lack Of Power And Poor Performance When Accelerating

1. Check if malfunctions that clutch slipping, low tire inflation pressure, brake dragging, incorrect tire size, and incorrect four-wheel alignment are present

NG

Check and repair faulty components

OK

2. Check air filter for blockage, and intake pipe for air leakage

NG

Check and repair intake system

OK

3. Check fuel pressure

(a) Check fuel pressure.

NG

Repair or replace fuel system

OK

4. Inspection of spark plug

(a) Check the spark plug of each cylinder, and observe if the type and gap are as specified.

NG

Replace spark plug

OK

5. Check ignition system

(a) Remove ignition coil and spark plug of one cylinder, and ground spark plug housing. Start engine, and check if spark is generated.

- OK: Spark is generated

NG

Check and repair ignition system

OK

6. Check throttle for carbon deposits

NG

Clean throttle

OK

7. Check intake pressure/temperature sensor, throttle position sensor and circuit

NG

Check and repair circuit or replace sensor

OK

8. Check injector for leakage or blockage

NG
Clean or replace injector
OK

9. Check fuel condition
   (a) Observe if trouble occurs just after fuel is filled.
   NG
   Replace fuel
   NG

10. Check engine ignition sequence and ignition timing
   (a) Check if engine ignition sequence and ignition timing are as specified.
   NG
   Check and repair ignition timing
   OK

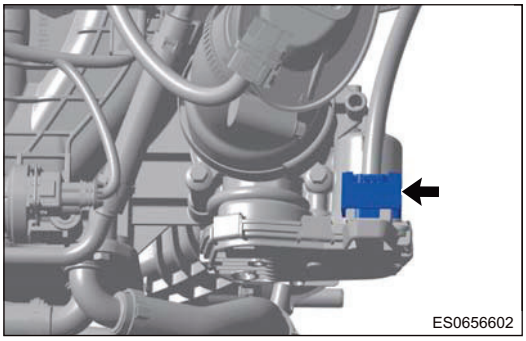
11. Check exhaust system
   (a) Check exhaust system for leakage or blockage.
   NG
   Check and repair ignition timing
   OK
   Go to Diagnostic Help

ON-VEHICLE SERVICE

Electronic Throttle Body

Function

Electronic throttle body is a critical part for engine intake system in EGAS system. Its main function is to control intake air volume by adjusting intake passage area according to driver's driving intention to meet intake requirements in different engine operating conditions, and send back position signals of throttle valve plate to control unit to achieve accurate control.



1 - Motor Negative	2 - Sensor Ground
3 - Sensor Power Supply	4 - Motor Positive
5 - Signal 2	6 - Signal 1

Operation

Electric throttle body consists of four parts: drive module, train module, executive module and feedback module, and all components are integrated into the same throttle valve housing. Throttle feedback module uses two redundant structures. When malfunction occurs, throttle valve plate will stop at the limp home position (above mechanical bottom dead center) determined by mechanical way. Electronic throttle body performs control only by corresponding electronic control unit or electronic test circuit. In principle, it is necessary to ensure that the throttle valve plate does not operate dynamically to the mechanical dead center.

Throttle Self-learning

Perform throttle body self-learning once after installing electronic throttle body (turn ENGINE START STOP switch to ON and then turn to OFF after waiting for 15 seconds, and then perform ignition normally). Start vehicle and observe if it operates normally after self-learning is finished.

Common Problem Symptoms and Judgment Methods

Common problem symptoms caused by electronic throttle body itself are: lack of power when accelerating, seizure or frequent return of throttle valve plate. EPC light comes on (use diagnostic tester to read related electronic throttle DTCs), vehicle speed does not increase even if accelerator pedal is fully depressed.

1. General problem causes
   - ECU detects incorrectly due to improper harness or sensor operation, and electronic throttle is forcibly controlled in small opening condition;
   - Internal components (such as magnetic steel) are cracked due to dropping or hitting during use or repair;
   - Vibration level at engine manifold is out of specified range;
   - Excessive carbon deposit in electronic throttle body due to use of engine or vehicle.
2. Repair precaution
   - Never hit electronic throttle body during service, and never use it after dropping;
   - It can be verified by simply measuring resistance change of terminals and crossover test if malfunction occurs caused by electronic throttle body.
3. Simple detection method for electronic throttle body malfunction
   (a) Judgment methods for specific mechanical damage
   - Valve plate should be in default position with power off and can rotate smoothly when flipping it by hand. If catching occurs, it indicates that internal components may be damaged.

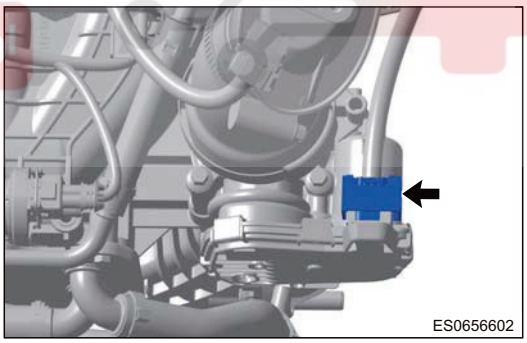
(b) Perform the simple measurement for throttle internal sensor in following steps:

Step	Operation	Test Value	Test Result	Subsequent Step
1	Turn digital multimeter to ohm band (remove connector), connect two probes to terminals 6 and 2 respectively, flip valve plate by hand, and resistance should change continuously.	/	Yes	Next
		/	No	Replace throttle body
2	Connect two probes to terminals 5 and 2 respectively, flip valve plate by hand, and resistance should change continuously. (valve plate is in the same position at normal temperature, the sum of two resistance values in steps 1 and 2 is usually 1.9 kΩ ± 0.2 kΩ).	/	Yes	Next
		/	No	Replace throttle body
3	Directly measure resistance of copper windings on DC motor between terminals 1 and 4. It is usually between 2.0 and 2.5 Ω at normal temperature, this value does not change with the valve plate opening.	/	Yes	Check wire harness or diagnostic help
		/	No	Replace throttle body

4. DTC troubleshooting
   (a) If DTC P0121, P0122, P0123, P221, P222 or P223 is output, refer to methods in previous DIAGNOSIS & TESTING section to perform test.
   (b) If DTC P0606 or P2106 is output, it indicates that electronic throttle is not malfunctioning, perform ECU and throttle self-learning again, and do not replace electronic throttle.
   (c) If it is other malfunction related to electronic throttle, unplug and plug connector again, remove carbon on throttle, to confirm that there is no foreign matter during valve plate opening or closing. Perform other related inspection.

Removal

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the electronic throttle
   (a) Disconnect electronic throttle connector, remove 4 fixing bolts and throttle.



Caution:
- Before removing throttle, make sure the ENGINE START STOP switch is turned to OFF and always keep vehicle power off, otherwise it will cause idling problems.
- Do not remove the electrified electronic throttle body.
- Do not remove the electronic throttle body until the vehicle is cooled to room temperature to prevent the overheating antifreeze from wetting the black cap and connectors etc.
- During the removal, the mounting bolts shall be removed diagonally and the force shall be uniform and vertical. The upper and lower mounting surfaces shall not be damaged, and also ensure that the electronic throttle body does not drop or hit.
- The power of return spring inside electronic throttle body is greater, be careful not to clamp your hand during pushing valve plate slightly.

5. Disconnect electronic throttle connector, remove 4 fixing bolts and throttle.

Installation

1. Installation is in the reverse order of removal.

Absolute Brake Vacuum Sensor

Description

Absolute brake vacuum sensor is installed on gasket of vacuum booster, which is separated from outside atmosphere by the gasket.

1 - Sensor Voltage Signal Output	2 - Ground
3 - to 5 V Power Supply	

Installation Position

Installation Position

Pressure sensor is installed on gasket of vacuum booster, which is separated from outside atmosphere by the gasket.

Caution:

Installation Precautions

1. Always make sure the O-ring is not damaged during installation. Apply a light coat of oil (such as 5W20) to O-ring surface before installation, and do not use silicon grease.
2. Press sensor detecting sleeve into installation hole manually during installation, and do not install sensor with striking tool.
3. Tightening torque during installation: 4 ~ 7 N·m is recommended.
4. Connect wire harness with specified matched connector.

Operation

Absolute pressure sensing element consists of a piece of silicon chip. Print a piece of pressure diaphragm on silicon chip. There are 4 piezoresistors on pressure diaphragm, and the 4 piezoresistors form a Wheatstone bridge as strain element. Except for the pressure diaphragm, silicon chip is also integrated with signal processing circuit and temperature compensating circuit. Reference vacuum chamber is integrated into silicon chip, and absolute pressure in reference space is near zero. This will form a microelectronic mechanical system. The pressure to be measured acts on side which can sense pressure on silicon film from top side. Thickness of silicon chip is only several micrometer (μm), so the silicon chip will deform mechanically as pressure changes, and 4 piezoresistors will also deform, thus changing the resistance. Voltage signal linearly related to the pressure is generated after processing by signal processing circuit of silicon chip.

Common Problem Symptoms and Judgment Methods

Problem symptom: vacuum booster does not operate properly.

1. General problem causes
   - Chip is damaged due to abnormal high voltage or reverse large current during operation;
   - Pressure component is damaged during service;
   - Chip is corroded and damaged due to external environment;
   - Sensor itself malfunction.
2. Precautions during service
   - Do not impact pressure component with high pressure gas during service;
   - Check if alternator output voltage and current are normal when there is a fault and replacing sensor.

3. Simple detection method for intake pressure/temperature sensor malfunction

Step	Operation	Test Value	Test Result	Subsequent Step
1	Pressure sensor part: connect intake pressure/ temperature sensor wire harness connector, turn ENGINE START STOP switch to ON, the voltage between terminals 2 and 3 of intake pressure/ temperature sensor wire harness should be 5 ± 0.5 V;	5 ± 0.5 V	Yes	Next
			No	Check for continuity and ground of wire harness
2	Pressure sensor part: Measure resistance between terminals 1 and 2, terminals 1 and 3 of pressure sensor	Resistance between terminals 1 and 2, terminals 1 and 3 is 1.5 ± 0.5 kΩ	Yes	Check ECU control unit
			No	Replace sensor

VVT Control Valve

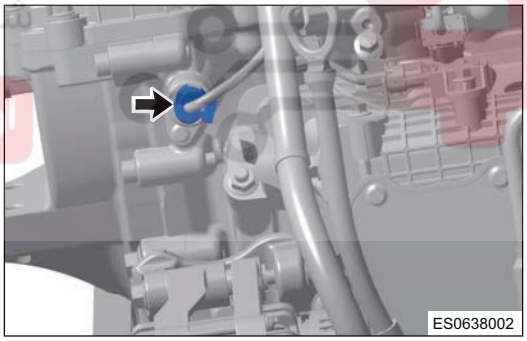
Operation

Hint:

- There are two VVT control valves which are located in front of intake and exhaust camshaft.
- ECU controls VVT solenoid valves depending on engine conditions, changes the flowing direction of oil in phasers to advance or retard camshaft, thus changing the timing of intake valve and exhaust valve.

Removal

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the intake VVT control valve.
   (a) Disconnect intake VVT control valve connector (arrow), and then remove intake VVT control valve fixing bolt.
   Tightening torque
   8 ± 2 N·m



5. Remove the exhaust VVT control valve.
   (a) Disconnect exhaust VVT control valve connector, and then remove exhaust VVT control valve fixing bolt.
   Tightening torque
   8 ± 2 N·m

Installation

1. Installation is in the reverse order of removal.

Coolant Temperature Sensor

Description

Coolant temperature sensor is a negative temperature coefficient sensor, which is installed on engine thermostat seat.

Coolant temperature sensor terminal: sensor has 2 terminals, and they can be interchanged.

Installation Position

Coolant temperature sensor is installed on engine thermostat seat.

Operation

NTC thermistor packaged inside temperature sensor is used for coolant temperature sensor, its resistance changes in accordance with ambient temperature, thus accurately reflecting the small changes in outside temperature. The temperature of contact medium can be reflected by measuring its output resistance, and the signals from both terminals of resistor are output to ECU. Engine load can be obtained by ECU according to output signal of the sensor, thus judging the engine operating condition.

Installation Precautions

1. Uniformly apply anaerobic seal gum to threads before installation.
2. Pre-tighten it manually when installation, so as to avoid sensor thread damage caused by wrong tooth of thread. Tighten it with socket wrench after manual pre-tightening, and the tightening torque is 15 ± 1 N·m.
3. If the coolant temperature sensor is installed with level wrench, make sure that the wrench is perpendicular to the axis of sensor during installation, to avoid damage to coolant temperature sensor due to excessive lateral force.

Common Problem Symptoms and Judgment Methods

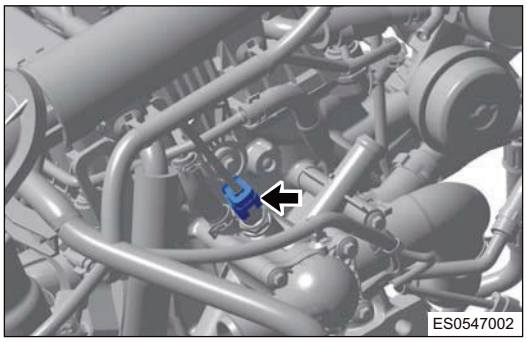
Common problem symptoms related to this sensor: abnormal water temperature indication, difficult to start, fan constantly runs, etc.

1. General problem causes
   - Abnormal high voltage or reverse large current during operation;
   - Sensor housing is damaged, water enters inside during service.
2. Precautions during service: check if alternator output voltage and current are normal when there is a fault and replacing sensor.
3. Simple detection method for oxygen sensor malfunction
   (a) Disconnect wire harness connector (remove connector), turn digital multimeter to ohm band, connect two probes to two terminals of sensor respectively, rated resistance is 2.5 KΩ ± 5% at 20°C, blow air to sensor with a hair dryer (be careful not to get too close), obverse the changes of resistance, it should decrease with the increase of temperature.

Step	Operation	Test Value	Test Result	Subsequent Step
1	Remove coolant temperature sensor wire harness connector, use a multimeter to measure if resistance between two terminals of sensor is normal	The resistance between the two terminals is determined according to ambient temperature near sensor when testing, and refer to temperature characteristic curve graph below for details.	Yes	Next
			No	Replace coolant temperature sensor
2	Remove coolant temperature sensor wire harness connector, turn ENGINE START STOP switch to ON, measure the voltage between two terminals of coolant temperature sensor wire harness	5 ± 0.5 V	Yes	Diagnostic Help
			No	Check for continuity and ground of wire harness

Removal

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Disconnect the negative battery cable.
   Caution:
   - Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.
3. Remove the engine trim cover.
4. Disconnect coolant temperature sensor connector and remove coolant temperature sensor.
   Tightening torque
   14 ± 1 N·m



Installation

1. Installation is in the reverse order of removal.

Knock sensor

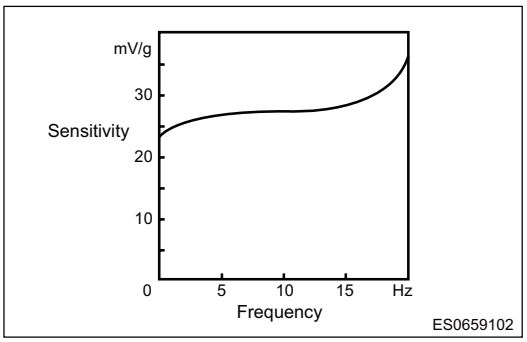
Description

Knock sensor is installed on cylinder block. It is used to detect engine vibration caused by detonation.

1 - Signal Wire	2 - Signal Wire
3 - Grounded Shielded Wire	

Installation Position

It is installed between cylinder 2 and cylinder 3.



Operation

Knock sensor is installed on cylinder block, and used to detect engine vibration caused by detonation. You can install one or more.

The sensitive element of knock sensor is a piezoelectric ceramic. Vibration of engine cylinder block is transferred to the piezoelectric ceramic through a mass block in the sensor. Due to the pressure generated by vibration of mass block, the piezoelectric ceramic generates a voltage at both electrode faces, and converts the vibration signal to an AC voltage signal to output it. As intensity of vibration increases, knock sensor output voltage increases accordingly.

Because frequency of vibration signal caused by engine knocking is far more than that of normal engine vibration signal, Engine Control Module (ECM) can distinguish between knock or non-knock signals by processing these signals from knock sensor.

Knock sensor frequency response characteristic curve diagram

Installation Precautions

Tighten knock sensor to cylinder block through the hole on middle of knock sensor with bolt, and tightening torque is 20 ± 5 N·m. Be careful not to allow liquids such as oil, coolant, brake fluid and water to contact the sensor for a long periods of time. Do not use any type of gasket during installation. The sensor must be pressed against the cylinder block with its metal surface.

Common Problem Symptoms and Judgment Methods

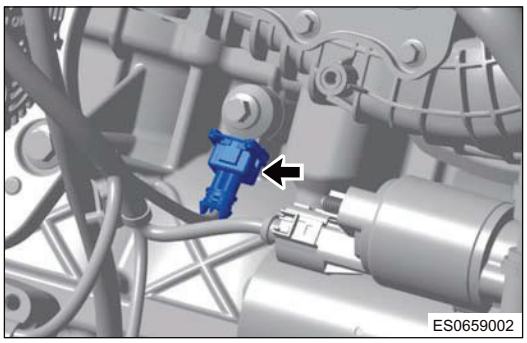
1. Problem symptom: poor acceleration, etc.
2. General problem causes
   - Liquids such as oil, coolant, brake fluid and water contacted with sensor will cause corrosion to the sensor.
3. Simple detection method for knock sensor malfunction

Step	Operation	Test Value	Test Result	Subsequent Step
1	Turn multimeter to ohm band, measure resistance between terminals 1 and 2 of knock sensor, it should be more than 1 MΩ at normal temperature	/	Yes	Next
		/	No	Replace knock sensor
2	Turn multimeter to mV band, use a small hammer to tap near knock sensor, there should be a voltage signal	/	Yes	Check wire harness or diagnostic help
		/	No	Replace sensor

Removal

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Disconnect the negative battery cable.
3. Disconnect knock sensor connector, and remove knock sensor.

   Tightening torque
   20 ± 5 N·m



Installation

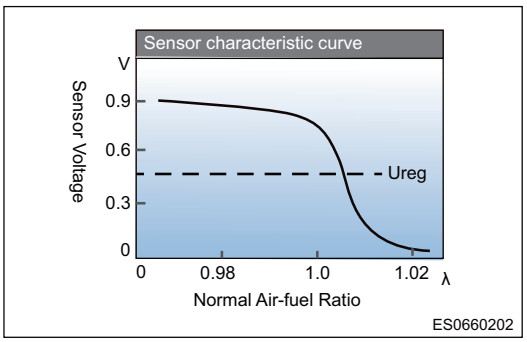
1. Installation is in the reverse order of removal.

   Caution:
   - Never install any kinds of gasket and washer between sensor and engine block. Only the metal part of sensor can contact with engine block directly.
   - Be careful not to allow liquids such as oil, coolant and brake fluid to contact the sensor for a long periods of time.
   - DO NOT apply lubricant, grease or seal gum when installing knock sensor. Keep engine block clean and dry, and never allow any foreign matter (such as oil) on the installation area of knock sensor.
   - Never tap knock sensor when installing it.

Oxygen Sensor

Description

This vehicle is equipped with upstream oxygen sensor and downstream oxygen sensor. Oxygen sensors continually monitor the oxygen concentration in exhaust gas.



Operation

Oxygen sensors monitor oxygen content and convert it into voltage. Sensor generates low voltage when oxygen content is high, and high voltage when oxygen content is low. Therefore, sensor can control injection volume by closed-loop.

Oxygen sensor is equipped with a heating element that keeps sensor at proper operating temperature under all operating conditions.

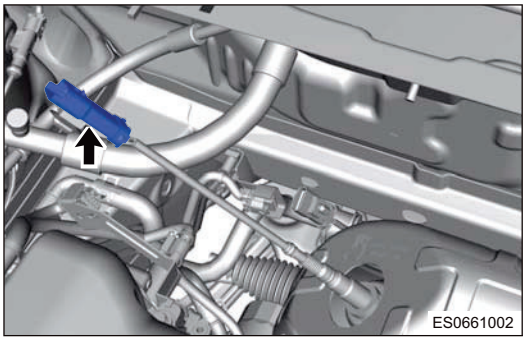
Proper air-fuel ratio.

Installation Position

Upstream oxygen sensor is installed on front of exhaust manifold three-way catalytic converter, and downstream oxygen sensor is installed behind the three-way catalytic converter.

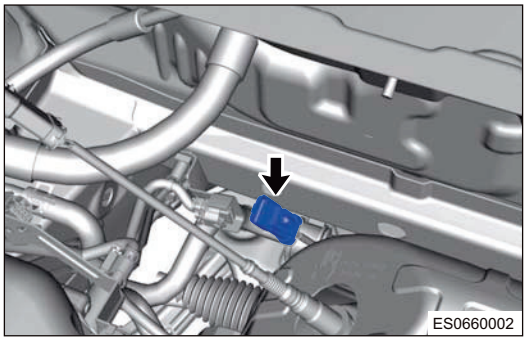
Installation Precautions

1. Applying detergent, oily liquid or volatile solid to the oxygen sensor connector is prohibited.
2. Tightening torque for oxygen sensor is 40 to 60 N·m. The new sensor has been applied with grease during installation without application. The specified grease must be used during reassembly of oxygen sensor: BOSCH material number 5964080112 (120 g/can) or 5964080145 (450 g/can). Use of other grease will lead to oxygen sensor poisoning.
3. The oxygen sensor wire harness must not be twisted, taut, or attached to objects with sharp edge or high temperature.
4. Oxygen sensors must not be thrown at will, and avoid any impact or strike.



Upstream Oxygen Sensor

Input signal from upstream heated oxygen sensor informs Engine Control Module (ECM) of the oxygen content in exhaust gas. Based on this input signal, Engine Control Module (ECM) adjusts air-fuel ratio finely by adjusting injector pulse width.



Downstream Oxygen Sensor

Downstream heated oxygen sensor signal is used to detect the catalytic converter deterioration. As converter deteriorates, signal from downstream oxygen sensor begins to match signal from upstream oxygen sensor except for a slight delay. By comparing the signals from upstream heated oxygen sensor to the signal from downstream oxygen sensor, Engine Control Module (ECM) calculates the efficiency of catalytic converter.

Common Problem Symptoms and Judgment Methods

1. Problem symptoms: poor engine idle, poor acceleration, emissions exceeding, excessive fuel consumption, etc.
2. Main problem causes:
   - Poor wire harness: connector terminal looseness, rust, terminal uneven; or wire breakage, poor connection, etc., resulting in oxygen sensor signal failure and oxygen sensor heating failure displayed on diagnostic tester;
   - Mechanical shock (such as flying rock) damage to the sensor;
   - Moisture, condensation or contaminants enters inside the sensor, causing the sensor failure or poor signal;
   - Post-combustion of exhaust pipe due to the misfire, causing the oxygen sensor sensing element to be burned;
   - Oxygen sensor "poisoning" (such as Pb, S, Br, Si or Mn).
3. Simple detection method for oxygen sensor malfunction

Step	Operation	Test Value	Test Result	Subsequent Step
1	Visually check oxygen sensor wire harness for obvious damage, broken, and oxygen sensor for mechanical damage (such as dents caused by impact), sensor wire harness male and female terminal for rust, terminal for level	/	Yes	Replace oxygen sensor
		/	No	Next
2	Turn ENGINE START STOP switch to OFF, disconnect and reconnect faulty oxygen sensor connector, clear DTCs, check if the fault still exists according to dynamic test cycle of this DTC (refer to "Maintenance Flow According to DTC" below)	/	Yes	Next
		/	No	End, track user usage later
3	Turn ENGINE START STOP switch to OFF, disconnect the oxygen sensor connector, measure the resistance between heating + (terminal D) and heating - (terminal C) of oxygen sensor connector (two white wires), check if the resistance is between 5 and 25 Ω	5 ~ 25 Ω	Yes	Next
			No	Replace oxygen sensor

Step	Operation	Test Value	Test Result	Subsequent Step
4	Start vehicle, idle engine for about 3 to 4 minutes, use diagnostic tester to measure the upstream oxygen sensor signal voltage, check if voltage rapidly fluctuates between 0.1 V and 0.9 V (upper limit is 0.9, it may be 0.7 - 0.8) (fluctuation number within one minute ⩾ 6 times)	/	Yes	Check wire harness or diagnostic help
			No	Replace oxygen sensor
5	Start vehicle, idle engine for about 3 to 4 minutes, use diagnostic tester to measure the downstream oxygen sensor signal voltage, check if voltage fluctuates around 0.6 V (it may be a value between 0.4 and 0.8 V)	/	Yes	Replace oxygen sensor
			No	Check wire harness or diagnostic help

If there are no problems in the above troubleshooting items, it can be determined that there is no malfunction in oxygen sensor, it is necessary to troubleshoot the other parts, and the corresponding vehicle wire harness should be mainly inspected.

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Removal

1. Refer to Emission Control System

Caution:

- Applying detergent, oily liquid or volatile liquid to the oxygen sensor connector is prohibited.
- The oxygen sensor wire harness must not be twisted, taut, or attached to objects with sharp edge or high temperature.

Installation

1. Refer to Emission Control System

Caution:

- Applying detergent, oily liquid or volatile liquid to the oxygen sensor connector is prohibited.
- The oxygen sensor wire harness must not be twisted, taut, or attached to objects with sharp edge or high temperature.

Camshaft Position Sensor

Description

There are two camshaft position sensors, which are installed on cylinder head behind camshaft.

1 - Ground Wire	2 - Output Signal Wire
3 - to 5 V Power Supply	

Operation

Camshaft position sensor is a Hall type sensor. A phaser is installed on camshaft. When phaser is in high teeth, the applicable circuit outputs high voltage; when phaser is in missing teeth, the applicable circuit outputs low voltage. As a result, the crankshaft phase information is provided to Engine Control Module (ECM), so that the compression top dead center and exhaust top dead center of crankshaft can be distinguished.

Installation Precautions

1. The sensor must always be in the original packaging material before installation or test.
2. Take out the sensor from packaging material, check the sensor and ensure that it must not be damaged or contaminated.
3. Apply mineral oil to phase sensor O-ring, then press the sensor (do not tap with tool) and tighten with fixing bolt. Tightening torque is 8 N·m±1 N·m.
4. Never repair the sensor.

Caution:

- The sensor contains strong magnet. Since most electronic storage devices (such as disk, tape.) are sensitive to magnetic fields, they must be stored separately from the permanent magnets. Users with cardiac pacemakers should take precautions before operation.

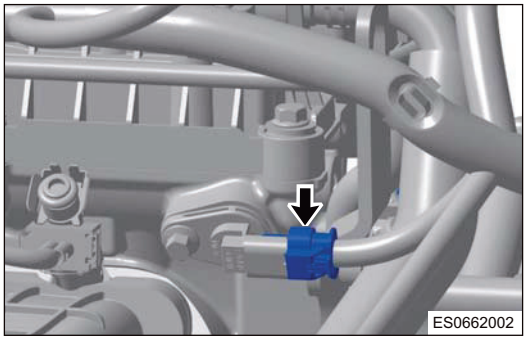
Common Problem Symptoms and Judgment Methods

1. Problem symptoms: difficult to start engine, engine speed limited, etc section

Removal

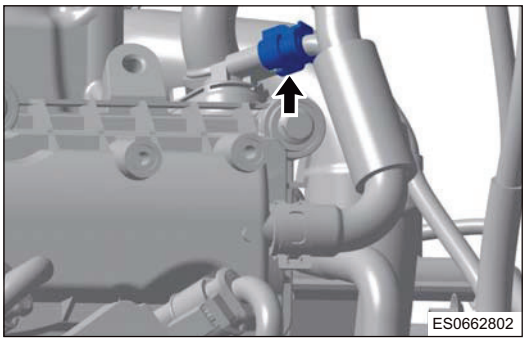
1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the intake camshaft position sensor connector.
   (a) Disconnect intake camshaft position sensor connector (arrow) and remove camshaft position sensor fixing bolt.

   Tightening torque
   8 ± 1 N·m



5. Remove the exhaust camshaft position sensor connector.
   (a) Disconnect exhaust camshaft position sensor connector (arrow) and remove exhaust camshaft position sensor fixing bolt.

   Tightening torque
   8 ± 1 N·m



Installation

1. Installation is in the reverse order of removal.
   Caution:
   - Sensor should be pressed into mounting hole. Never use tools (such as a hammer) to strike sensor into mounting hole forcibly.

Engine Speed Sensor

Description

Crankshaft position sensor is installed on clutch case, against flywheel teeth. It is used to detect the speed and position of crankshaft.

1 - Positive Power Supply Wire	2 - Output Signal Wire
3 - Ground Wire	

Operation

Crankshaft position sensor is Hall sensor. When crankshaft rotates, it drives flywheel to rotate. Flywheel teeth will change the magnetic field intensity of sensor, change of magnetic flux causes sensor output signal voltage change, which is output to Engine Control Module (ECM). And output signal can indicate the speed and position of crankshaft.

Installation Precautions

1. The sensor must always be in the original packaging material before installation or test.
2. Take out the sensor from packaging material, check the sensor and ensure that it must not be damaged or contaminated.
3. Press the sensor (do not tap with tool), and then secure it with fixing bolt and gasket. Tightening torque is 8 ± 2 N·m.
4. Never repair the sensor.

Caution:

- The sensor contains strong magnet. Since most electronic storage devices (such as disk, tape.) are sensitive to magnetic fields, they must be stored separately from the permanent magnets. Users with cardiac pacemakers should take precautions before operation.

Common Problem Symptoms and Judgment Methods

1. Problem symptoms: engine cannot start
2. Repair precaution
   - Never repair the sensor.
   - Press in crankshaft position sensor rather than tapping during service.
3. Simple detection method for fuel rail injector assembly malfunction

Step	Operation	Test Value	Test Result	Subsequent Step
1	Turn ENGINE START STOP switch to ON, and do not start engine, turn digital multimeter to DC voltage band, connect two probes to terminals 3, 1 of sensor wire harness connector respectively, make sure that power supply voltage is 5 V	/	Yes	Next
			No	Troubleshoot power supply problems
2	Connect connector, start engine, measure voltage waveform between terminals 1 and 2 of sensor with an oscilloscope, and waveform is shown in following illustration	/	Yes	Check wire harness or diagnostic help
		/	No	Replace sensor

Removal

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the crankshaft position sensor.
   (a) Disconnect crankshaft position sensor connector (arrow), and remove crankshaft position sensor fixing bolt.
   Tightening torque
   8 ± 2 N·m

Installation

1. Installation is in the reverse order of removal.

   Caution:

   - Ensure that the sensor is clean and the sensor is allowed to be removed from the package before it is installed in the engine or test bench. Users with cardiac pacemakers should take precautions before operation.
   - The sensor is only allowed to be pressed into installation hole by press-in. It is not allowed to install the sensor with a tapping tool (such as hammer).

   Warning:

   If the engine speed sensor falls, never pick it up to install and it need to return to factory for testing.

Fuel Rail Injector Assembly

Operation

Fuel distribution pipe assembly is installed to intake manifold or cylinder head to store or distribute fuel. Fuel distribution pipe assembly consists of fuel distribution pipe and fuel injector etc. Fuel distribution pipe is connected to fuel supply pipe through pipe joint to receive the fuel from fuel tank. Fuel injector sprays fuel into the intake passage accurately under the control of ECU electric pulse.

Fuel requirements

Fuel distribution pipe assembly can only use fuel that specified in accordance with National Standard GB 17930-2006 Unleaded Gasoline for Motor Vehicle and GB 18351-2004 Alcohol Gasoline for Motor Vehicle of People's Republic of China, and the National Environmental Protection Standards GWKB 1-1999 Hazardous Materials Control Standard for Motor Vehicle Gasoline.

Caution:

- Excessive storage of gasoline can cause it to oxidize and deteriorate, which may cause the injector to become clogged or even damaged.

Installation Precautions

1. Removal precautions

   Caution:

   - If it is necessary to remove the fuel rail assembly, unplug the fuel injector connector, remove fuel rail assembly mounting screw, and remove the wire harness from wire harness clamp; then grasp the injector with both hands and gently remove the fuel rail assembly from intake manifold, and the O-ring should not remain in cylinder head.
   - Clean the dirt on the outer surface of fuel rail assembly to prevent the dirt from being introduced into the fuel rail assembly during reassembly, resulting in damage to other components.
   - If the injector O ring is damaged during reassembly, never use it.

2. Installation Precautions

   Caution:

   - Make sure the fuel distribution pipe assembly is intact, undamaged, or uncontaminated, and there are no cracks, scars, grooves, burrs and rust on tube joint surface before use. Do not install fuel distribution pipe assembly that does not meet the requirement.
   - Lubricate the lower O-ring of injector with clean lubricant before assembly.
   - Fuel injector should be prevented from being subjected to excessive impact during assembly, and tighten the mounting bolt until fuel injector is installed in place.
   - If it is necessary to secure wire harness, avoid deformation or damage of wire harnesses bracket caused by excessive shock to fuel distribution pipe assembly during installation.
   - When removing fuel distribution pipe assembly from engine and reinstalling it, it is necessary to replace the injector lower o-ring.
   - When the temperature is below zero, try to avoid installation or maintenance of fuel distribution pipe assembly, so as to avoid fuel leakage.
   - For after-sale maintenance, it is only allowed to replace the assembly.

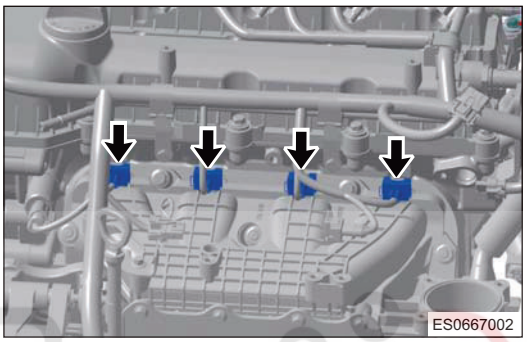
Common Problem Symptoms and Judgment Methods

1. Problem symptoms: fuel leaks into engine compartment, which may cause vehicle burning in severe case.
2. Repair precaution
   - Weld cracking of fuel distribution pipe;
   - Aging of injector o-ring;
   - Poor connection between fuel pipe and fuel distribution pipe assembly.

3. Simple detection method for injector malfunction
   Remove fuel distribution pipe assembly from engine, apply compressed air of 4.5 bar from inlet port, place the injector connector upward, and immerse the fuel distribution pipe assembly into water so that the injection end of the injector does not contact with water. Observe if there is air bubble in the fuel rail injector assembly.
   If there are air bubbles in the fuel rail, there is a risk of fuel rail leakage.

Removal

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the fuel rail injector assembly.
   (a) Disconnect 4 injector connectors (arrow), and remove fixing bolts from fuel rail injector assembly.
   Tightening torque
   8 ± 2 N·m



Installation

1. Installation is in the reverse order of removal.

Intake Pressure/Temperature Sensor

Description

Intake pressure/temperature sensor consists of intake manifold absolute pressure sensor and intake temperature sensor, which are installed on intake manifold.

1 - Ground Wire	2 - Intake Temperature Output Signal Wire
3 - to 5 V Power Supply	4 - Intake Pressure Output Signal Wire

Installation Position

Intake pressure/temperature sensor consists of intake manifold absolute pressure sensor and intake temperature sensor, which are installed on intake manifold.

Same as intake pressure/temperature sensor, boost pressure sensor is install on intercooler outlet pipe.

Operation

Intake manifold absolute pressure sensing element consists of a piece of silicon chip. Print a piece of pressure diaphragm on silicon chip. There are 4 piezoresistors on pressure diaphragm, and the 4 piezoresistors form a Wheatstone bridge as strain element. Except for the pressure diaphragm, silicon chip is also integrated with signal processing circuit and temperature compensating circuit. Reference vacuum chamber is integrated into silicon chip, and absolute pressure in reference space is near zero. This will form a microelectronic mechanical system. Intake manifold absolute pressure to be measured acts on side which can sense pressure on silicon film from top side. Thickness of silicon chip is only several micrometer (μm), so the silicon chip will deform mechanically as intake manifold absolute pressure changes, and 4 piezoresistors will also deform, thus changing the resistance. Voltage signal linearly related to the pressure is generated after processing by signal processing circuit of silicon chip. Intake temperature sensing element is a negative temperature coefficient (NTC) resistor, whose resistance changes with the intake temperature. This sensor sends a voltage of intake temperature change to controller.

In other words, pressure sensing element and temperature sensing element are integrated into intake pressure/temperature sensor, which are used to detect actual intake pressure and temperature in intake manifold during engine running, and engine electronic control unit module calculates instantaneous intake air volume of engine quickly based on data provided by intake pressure/temperature sensor and signals from other sensors of engine electronic control system.

Installation Precautions

1. The sensor is designed to be installed on the plane of intake manifold of engine. The pressure connecting pipe protrudes into the intake manifold, sealing the atmosphere with an O-ring.
2. If it is installed to the vehicle in a suitable way (if extracting pressure from intake manifold, pressure connecting pipe will tilt downward, etc.), thus ensuring that no condensation will form on the pressure sensitive element.
3. Drilling and fixing on intake manifold must be performed in accordance with the delivery drawings to ensure long-term sealing and be able to withstand erosion of media.
4. The reliable contact of the connector electrical connection is related to the material quality and dimension accuracy of the matching connector on the wire harness, expect for the influence of component connector.

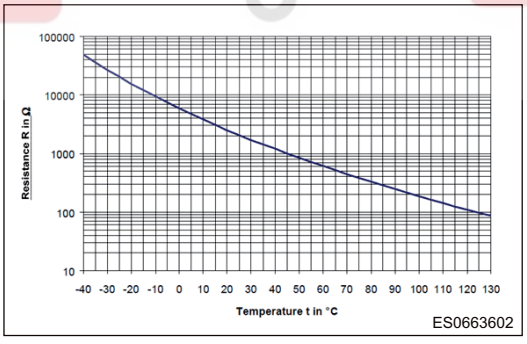
Common Problem Symptoms and Judgment Methods

1. Common problem symptoms related to this sensor: flameout, poor engine idle, etc.
2. General problem causes
   - Abnormal high voltage or reverse large current during operation;
   - Pressure chip is damaged during service.
3. Precautions during service
   - Never impact vacuum element with high pressure gas during service;
   - Check if alternator output voltage and current are normal when there is a fault and replacing sensor.

4. Simple detection method for intake pressure/temperature sensor malfunction

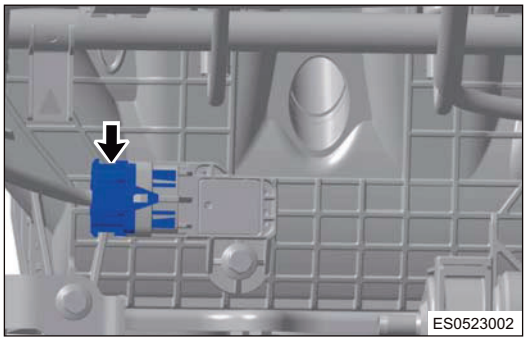
Step	Operation	Test Value	Test Result	Subsequent Step
1	Temperature sensor part: Remove intake pressure/temperature sensor wire harness connector, and measure resistance of terminals 1 and 2 of sensor separately with a multimeter; Measurement can also be performed by simulating. Specific operations are to send wind to the sensor with blow drier (be careful that blow drier shouldn't be too close to the sensor) and observe the changes of sensor resistance. The resistance should reduce at the moment.	The resistance of terminals 1 and 2 are determined according to ambient temperature near the sensor at the time of test. (rated resistance is 2.5 kΩ ± 5% at 20°C, and refer to temperature-resistance characteristic curve below for details;)	Yes	Next
			No	Replace intake pressure/temperature sensor
2	Pressure sensor part: measure resistance between terminals 1 and 4, terminals 3 and 4 of intake pressure/temperature sensor	Resistance between terminals 1 and 4, terminals 3 and 4 is 1.5 ± 0.5 kΩ	Yes	Next
			No	Replace intake pressure/temperature sensor
3	Pressure sensor part: Connect intake pressure/temperature sensor wire harness connector, turn ENGINE START STOP switch to ON, the voltage between terminals 1 and 3 of intake pressure/temperature sensor wire harness should be 5 ± 0.5 V; Under idling status, measure voltage of terminal 4 of sensor with a multimeter, the voltage should be about 0.7 V (value changes with model); under unloaded status, slowly open the throttle, the voltage of terminal 4 has not changed too much; quickly open the throttle, the voltage of terminal 4 can reach about 4 V instantaneously (value changes with model), and then drops to about 1.8 V (value changes with model).	/	Yes	Diagnostic Help
			No	Check for continuity and ground of wire harness

5. Temperature - resistance curve of intake pressure/ temperature sensor



Removal

1. Disconnect the intake pressure/temperature sensor connector.



2. Remove fixing bolt and intake pressure/temperature sensor.

Installation

1. Installation is in the reverse order of removal.

Ignition Coil

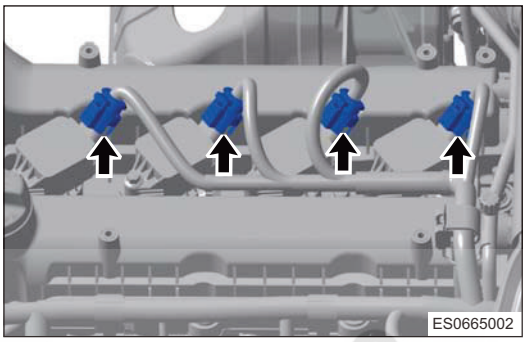
Description

Caution:

- The primary and secondary winding of ignition coil has a dangerous voltage, confirm the installation environment during operation to avoid unnecessary loss caused by electricity leakage.

Ignition coil converts low voltage of primary winding into high voltage of secondary winding, and discharges spark plug electrode to produce sparks which will ignite the combustible air-fuel mixture in cylinder.

1 - Positive Power Supply Wire	2 - ECU Control Signal
3 - Ground Wire	



Operation

Ignition coil consists of primary winding, secondary winding, iron core and housing etc. The primary and secondary windings form an induced circuit. An instant induced voltage generated by turning primary circuit switch on and off, and an instant high voltage generated by secondary circuit will cause spark plugs to discharge, thus igniting the combustible air-fuel mixture. The primary winding will energize when its ground passage is on through an Engine Control Module (ECM) signal. If Engine Control Module (ECM) cuts off the control signal to primary winding circuit, it will stop energizing and a high voltage will be induced in the secondary winding.

Technical Characteristic Parameters

1. The following data are measured at room temperature (25 ± 5°C)

Measurement	Measured Value			Unit
	Minimum	Representative	Maximum	
Primary resistance	0.50	0.57	0.64	Ω
Secondary resistance	8.36	9.5	10.64	kΩ

2. Test conditions for following data: rated voltage is 14 V, wire resistance is 0.15 ± 0.05 Ω, energizing time is 2.8 ± 0.025 ms

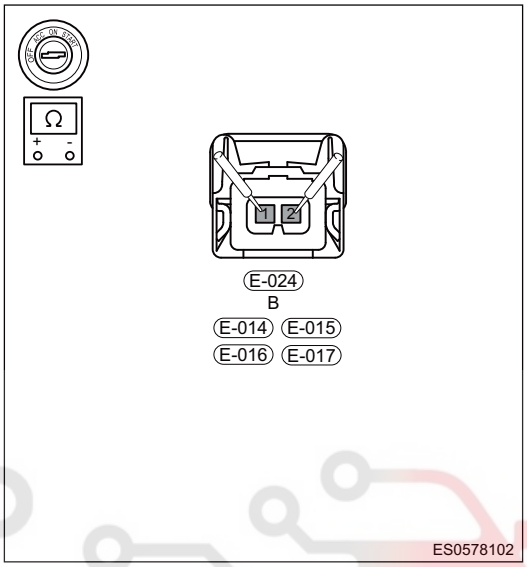
Measurement	Measured Value			Unit
	Minimum	Representative	Maximum	
Primary current	8.0	8.5	9.0	A
Secondary voltage (load of 50 pF)	30	/	/	kV

Application Guide

Ignition coil is installed on the engine and secured with fixing bolt, the tightening torque is 8 ~ 10 N·m. Make sure that the connection between high-voltage connecting rod, ignition wire and ignition coil high-voltage terminal, spark plug is reliable, or it may cause high-voltage leakage, resulting in poor ignition.

Problem Symptoms and Judgment Methods

1. Problem symptoms: engine jitter, engine cannot start normally, misfire, etc.
2. General problem causes: burned due to excessive current, damaged by external force, etc
3. Service precautions: It is prohibited to use high-voltage cable to perform ignition spark test during repair; otherwise it may cause damage to electronic controller
4. Simple measurement method
   - Turn digital multimeter to ohm band (remove connector), connect two probes to two terminals of primary winding respectively, the resistance should be 0.5 ~ 0.64 Ω at normal temperature.
   - When connecting to secondary winding, the resistance is 8.36 ~ 10.64 kΩ.

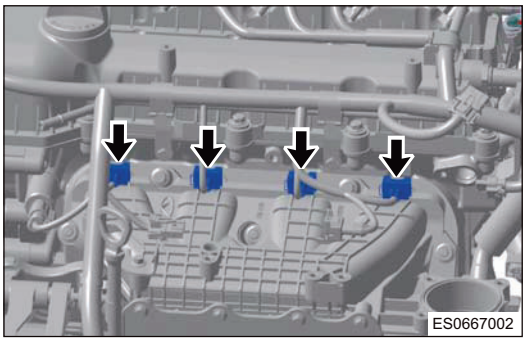


Fuel Injector

Description

Fuel injector is located on the cylinder head near intake valve, and nozzle end is located directly above the intake port.

1 - Positive Power Supply Wire	2 - ECU Control Ground



Operation

In the non-operating condition, the injector spring presses the needle valve set against the valve seat and seals the fuel injection port. When the ECU drives the fuel injector to operate, the electromagnetic coil energizes and generates electromagnetic force, and the needle valve set is sucked up, and separated from valve seat set, and the fuel is atomized and sprayed through the orifice plate. When the injection pulse is cut off, the pressure of return spring returns and closes the needle valve.

Problem Symptoms and Judgment Methods

1. Problem symptoms: poor engine idle, poor acceleration, engine cannot start (different to start), etc.

   Caution:
   - A failure phenomenon is that injector body surface is wet after the vehicle is running for a while, customer will misunderstand that "leakage" occurs in injector, in fact, it is the phenomenon of thermal diffusion of lubricant (applied to injector O-ring) on the injector body. It does not affect the use of injector. This phenomenon will not occur again after drying.

2. General problem causes

   (a) Lack of maintenance. Since the fuel added to fuel tank last time is stored too long, and it is more than 2 months, fuel colloidal material is produced due to fuel oxidation, so that abnormal injection or no fuel injection due to accumulation of colloidal material in fuel injector, resulting in injector failure.

   Caution:
   - If the customer does not drive the vehicle frequently, it is suggested to store a small amount of fuel in the tank. The purpose is to consume the fuel in the tank in time, try to avoid fuel deterioration in tank.

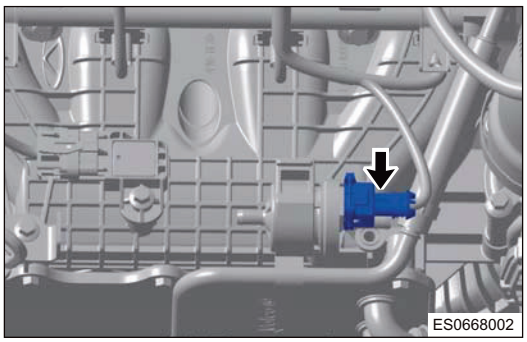
3. Simple detection method for injector malfunction

   (a) Check if the injector itself is malfunctioning.
   (b) Check the cause of fuel leakage in the injector.
   (c) Check if the fuel injector is leaked oil.
   (d) Check if the fuel leakage is caused by fuel rail.
   (e) Turn digital multimeter to ohm band (remove connector), connect two probes to two terminals of fuel injector respectively, the rated resistance should be 12 ± 1 Ω at 20°C. Resistance is 12 ± 3 Ω at normal temperature.

Canister Solenoid Valve

Description

Canister solenoid valve opens when power is on, and closes when power is off.
Canister solenoid valve terminal: two terminals in total, and can be interchanged.



Operation

Canister solenoid valve consists of solenoid coil, armature, valve and other parts. Air volume through canister solenoid valve is related to the electric pulse duty ratio output from ECU to canister solenoid valve and the pressure difference between canister solenoid valve inlet and outlet. When there is no electric pulse, canister solenoid valve closes.

Installation Precautions

- The canister solenoid valve and sheath should be installed properly before assembly; assemble the canister solenoid valve and sheath according to the assembly position illustration.
- Secure the assembled assembly on canister solenoid valve bracket.
- Connect inlet port to canister, and outlet port to intake manifold according to airflow arrow on canister control valve housing.
- After installation, check if the airflow direction arrow on canister solenoid valve housing is the same direction as the airflow direction.

Problem Symptoms and Judgment Methods

1. Problem symptoms: normal open, function failure, etc.
2. General problem causes: rust or poor sealing due to foreign matter enters into the valve.
3. Simple detection method for canister solenoid valve malfunction

Step	Operation	Test Value	Test Result	Subsequent Step
1	Remove the canister solenoid valve, blow air to canister solenoid valve in direction of airflow arrow on solenoid valve housing, check if the canister solenoid valve is ventilated	Ventilation or not	Yes	Canister solenoid valve fault, replace it
			No	Next
2	Apply 12 V battery voltage to two terminals of canister solenoid valve, and blow air to canister solenoid valve in direction of airflow arrow on solenoid valve housing, check if the canister solenoid valve is ventilated	Ventilation or not	Yes	Next
			No	Perform this inspection with a new canister solenoid valve, the testing equipment failure has been eliminated. If the fault does not recur, the canister solenoid valve is faulty, replace it

Step	Operation	Test Value	Test Result	Subsequent Step
3	If there is obvious black substance in connecting pipe between canister solenoid valve and canister	Is there any black substance	Yes	If solenoid valve is faulty due to black particles inside the valve body and it is necessary to replace the solenoid valve, mainly check the canister for carbon dust leakage
			No	Next
4	Remove canister solenoid valve wire harness connector, and measure resistance of coil	26 ± 4 Ω	Yes	Next
			No	Perform this inspection with a new canister solenoid valve, the testing equipment failure has been eliminated. If the fault does not recur, the canister solenoid valve is faulty, replace it
5	Connect diagnostic tester, and read DTCs	• P0444 • P0458 • P0459 Others	Yes	Disconnect and reconnect connector, check if there is still current DTC related to canister solenoid valve. If trouble is eliminated, it is most likely that poor connection may occurs. Focus on wire harness and connector inspection

DTC definition:

- 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

Repair Precautions

- Airflow direction must be in accordance with the regulations during installation.
- If solenoid valve is faulty due to black particles inside the valve body, it is necessary to replace solenoid valve and check the canister condition.
- Try to avoid water, oil and other liquids entering into the valve during service.

Installation

1. Installation

   Caution:

   - Airflow direction must be in accordance with the regulations during installation.
   - If canister solenoid valve is faulty due to black particles inside the valve body, check the canister condition when canister solenoid valve needs to be replaced.
   - Try to avoid water, oil and other liquids into the canister solenoid valve during servicing.

Engine Control Module (ECM)

Function

1 way of ignition signal (KL.15)
1 way of wakeup signal (ACC_WAKEUP)
1 way of continuous power supply voltage (UBD)
2 ways of non-continuous power supply voltage (UBR)
7 ways of external voltage of 5 V
2 sets of CAN communication interface (CAN2 is only used for calibration)
1 way of K line communication
1 way of LIN communication (optional)
1 way of crankshaft position sensor signal input
1 way of knock signal input
12 ways of digital signal input port (included brake switch signal, brake light signal, 1 way of camshaft signal, clutch switch signal, clutch bottom switch signal, A/C switch signal, A/C medium pressure switch signal, neutral switch, electronic load signal, starter condition signal, power steering input switch signal, immobilizer code signal), and there are another 7 ways reserved
14 ways of analog signal input port (included DSS/HFM signal, intake temperature, engine coolant temperature, boost pressure/temperature, boost pressure signal, 2 ways of oxygen sensor signal, 2 ways of pedal position signal, 2 ways of electronic throttle position signal, 1 way of exhaust valve position feedback signal, atmospheric pressure signal, etc, two of them are used as digital ports, and there are another 3 ways reserved
4 ways of injector drive control output
4 ways of ignition drive control output (3 ways of output control can be selected)
2 ways of electronic throttle motor drive control output
2 ways of exhaust solenoid valve motor drive control output
1 way of main relay control output
1 way of oil pump relay control output
1 way of canister control output
2 ways of upstream and downstream oxygen sensor heating control output
2 ways of high and low speed fan relay control output
1 way of A/C compressor relay control output
1 way of engine speed output
1 way of VVT control output (intake side)
2 ways of 4.5 A output reserved
3 ways of 3A output reserved
4 ways of 0.6 A small signal output reserved

Description

Engine Control Module (ECM), mounted on the engine compartment left rail wheel house assembly, can be removed only as a unit for replacement.

Operation

Engine Control Module (ECM) is a pre-programmed microprocessor digital computer, which is used to adjust ignition timing, air-fuel ratio, emission control device, speed control, A/C compressor and idle speed etc. Engine Control Module (ECM) enables the program to suit ever-changing operation conditions.

Installation Position

ECU bracket is integrated and welded to drain channel inner bracket, and ECU is secured with 4 fixing bolts, the tightening torque is 8 ± 2 N·m.

Installation Precautions

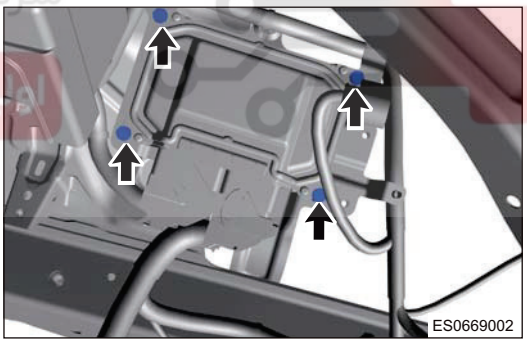
- Pay attention to static electricity protection during installation.
- Take care to protect connector terminals.
- Avoid water stains entering the connector during installation.

Common Problem Symptoms and Judgment Methods

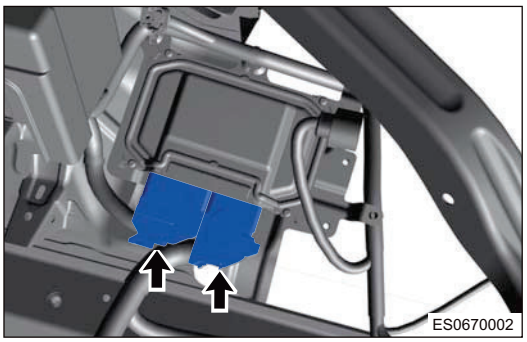
1. Problem symptoms: Engine idles roughly, poor acceleration, engine cannot start, too high idle speed, exhaust exceeding, different to start, A/C failure, injector control failure, stalls, etc.
2. General problem causes
   - ECU internal parts are burned and faulty due to the electrical overload of external device;
   - Circuit board is rusted due to water enters ECU
3. Repair precaution
   - Do not remove ECU casually during service;
   - Disconnect the negative battery cable for more than 1 minute before ECU removal.
   - Remove ECU before performing welding operation, and the removed ECU should be stored;
   - Do not install any wire on ECU connecting wire.
4. Simple measurement method
   (a) Connect ECU connector, turn ENGINE START STOP switch to ON, use diagnostic tester to read engine DTCs and datastream or record;
   (b) Remove ECU connector, check if ECU and its connecting wire are in good condition, mainly check if ECU power supply wire and ground wire are normal;
   (c) Check if the external sensor is operating properly, output signal is reliable and its circuit is in good condition;
   (d) Check if the actuator is operating properly and its circuit is in good condition;
   (e) Perform test with new ECU to check if malfunction reoccurs.

Removal

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Disconnect the negative battery cable.
3. Remove the Engine Control Module (ECU).
   (a) Remove 4 fixing bolts (arrow) from ECU.



   (b) Disconnect the ECU wire harness connectors (arrow), and remove ECU.
   Tightening torque
   8 ± 2 N·m



Installation

1. Installation is in the reverse order of removal.

   Caution:
   - Pay attention to static electricity protection during installation.
   - Take care to protect connector terminals.
   - To prevent water droplets from accumulating on connector joint, face it down.

Common Electronic Fuel Injection Data and Reference Range

Common electronic fuel injection data and reference range

These data are actual vehicles detected, for reference only.

Operation condition: Engine idling after warm-up		
Datastream Name	**Value Range**	**Description and Note**
Engine coolant temperature	It is usually at about 80 ~ 96°C	Engine coolant temperature after warm-up, which is detected by engine coolant temperature sensor
Engine speed	At about 650 ~ 850 rpm	Engine idling speed after warm-up (refer to Engine Speed Maintenance)
Ambient pressure	About 1013 hpa	Plain area
Battery voltage	About 13 V ~ 15 V	When the headlight and other electrical loads are turned on, it may be lower than 13V
Intake temperature	It is as same as environment temperature during cold start	It is higher than current temperature and varies with environment temperature
Accelerator pedal opening	0 ~ 100%	During idling, accelerator pedal opening is 0
Actual torque	It is about 11% ~ 17% at normal idling	The torque that actually produced in engine combustion should be mostly equal to target torque
Target torque	It is about 11% ~ 17% at normal idling	After turning on A/C and other loads, engine target torque and target demand torque will be increased
Relative load	It is about 10% ~ 25% at idling	The relative air charge amount of engine cylinder, which will be increased after turning on A/C and other loads, and slightly reduced on highland area
Rear oxygen signal voltage	Fresh catalyst rear oxygen voltage should be between 0.58 ~ 0.75 V	Fresh catalytic converter rear oxygen voltage should be between 0.58 ~ 0.75V and change slowly. If the voltage continues to fluctuate and amplitude is close to front oxygen, it means three-way catalytic converter fails
Target throttle opening	It is about 0% ~ 8% at normal idling	It will be increased after turning on A/C
Throttle opening	It is about 0% ~ 8% at normal idling	Actual throttle body opening at idling should be equal to target throttle body opening
Gear position	For the model with manual transmission, the gear position signal is 0	/
Actual ignition angle	It is about 3 ~ 5 deg. at normal idling	If there is interference from outside, the ignition angle may fluctuate to maintain stable idling
Intake manifold pressure	It is about 300 ~ 500 hpa at idling without load	It will be increased after turning on A/C and other loads, and is slightly reduced on high altitude area
Temperature when engine starts	It is usually real-time temperature (not warm-up start)	If the standing time of vehicle before start is long enough, the coolant temperature value is approximately equal to ambient temperature
Front oxygen signal voltage	After warm up the engine is normally changed from 0.05 V ~ 0.9 V and jumping back and forth	Experience valve: more than 5 times within 10s

Operation condition: Engine idling after warm-up		
Datastream Name	**Value Range**	**Description and Note**
Idling torque self-learning value	Usually -5% ~ 10%	The higher the engine idle torque self-learning value, the greater the engine idle torque consumption, the lower the valve, the smaller the engine idle torque consumption
Control duty ratio of canister control valve	It is about 0% ~ 40% at idling	/
Intake air volume	It is about 5 kg/h ~ 12 kg/h at idling	Turn the A/C on and other loads will increase the amount of air intake
Throttle pressure	/	Slightly less than ambient pressure
Oxygen sensor closed loop adjustment	Between 0.75 ~ 1.25	The output adjustment according to the oxygen sensor signal feedback
Air-fuel mixture multiplication self-learning value	Between 0.75 ~ 1.25	Air-fuel ratio self-learning is value
Air-fuel mixture addition self-learning value	It is usually at about -7.5% ~ 7.5	Air-fuel ratio addition self-learning value

Electronic Fuel Injection System Diagnostic Tester Functional Requirements

1. Self-diagnostic
   (a) Mainly include: Read the DTC and clean the DTC;
2. System parameter display
   (a) Mainly include: Coolant temperature, intake temperature, throttle opening, engine speed, ignition angle, air-fuel radio short term correct, air-fuel radio long term addition and multiplication correct, intake pressure, intake flow, oxygen sensor signal, system voltage, torque demand value, etc.
3. System condition
   (a) Mainly include: It displays 10 conditions such as program condition, cooling system, stable condition, dynamic condition, emission control, oxygen sensor, idle speed, malfunction indicator, emergency condition, A/C, etc.
4. Actuator test
   (a) Mainly include: malfunction indicator, fuel pump, A/C relay, fun control, ignition test, single cylinder with fuel cut-off, etc. 6 functions test
5. System initialization reset (adaptive reset)
   (a) After the engine stalling, initialization command is sent and system resets the previous self-adaption.
6. Odometer
   (a) Mainly include: Display of vehicle driving distance and driving time.
7. Edition information
   (a) Mainly include: Display of vehicle identification number (selectable), ECU hardware number, ECU software number.