ENGINE ELECTRONIC CONTROL SYSTEM

Warnings and Precautions

Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

1. Digital multimeter can only be used to perform inspection for electronic injection system.
2. Use genuine components to perform service work, otherwise appropriate electronic injection system operation cannot be guaranteed.
3. Only use unleaded gasoline during service.
4. Please observe normative service and diagnostic flowchart to perform service work.
5. Never disassemble or remove components of electronic injection system during service.
6. When holding electronic elements (electronic control unit, sensor etc.), take extra care not to drop them on the ground.
7. Set up a consciousness of environmental protection and dispose of waste effectively that is produced during service.
8. Never use an needle multimeter to check electronic fuel injection system circuit.
9. Never use high power test light to measure when testing each pin voltage signal of sensor.
10. It is recommended that the measurement status when testing each pin voltage signal of sensor is on-line measurement.
11. It is recommended to use voltage drop method when measuring sensor, actuator connecting wire harness.
12. Do not causally remove any electronic injection 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 electronic injection system.
13. Be sure to turn ignition switch off when disconnecting and connecting connectors. Otherwise electronic elements may be damaged.
14. When simulating hot operating condition of malfunction and performing other service work that may cause temperature to rise, never allow temperature of electronic control unit to exceed 80℃.
15. As the supplying pressure of electronic injection system is high, high pressure resistant fuel pipes are adopted for all fuel lines. 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: After removing fuel pump controller power supply fuse, start engine and idle it until the engine stops running by itself. Removal of fuel pipes should be performed in a well-ventilated area by professional service men.
16. Do not energize electric fuel pump when removing it from fuel tank to prevent electric sparks, which will cause a fire.
17. It is not allowed to perform running test for fuel pump under dry state or in water. Otherwise service life will be reduced. In addition, do not inversely connect fuel pump positive and negative poles.
18. When performing inspection to ignition system, perform spark jump test only when necessary and make sure that the test time is as short as possible. Do not open the throttle during detection, otherwise a large amount of unburned gasoline will enter the exhaust pipe, thus damaging the three-way catalytic converter.
19. Since the adjustment of idle speed is completely completed by electronic injection system, manual adjustment is not required. Throttle limit screw of throttle body has been adjusted properly at the factory, and users are not allowed to change its original position at will.
20. Do not connect battery with its polarity reversed to prevent damage to electronic elements. This system adopts negative ground.

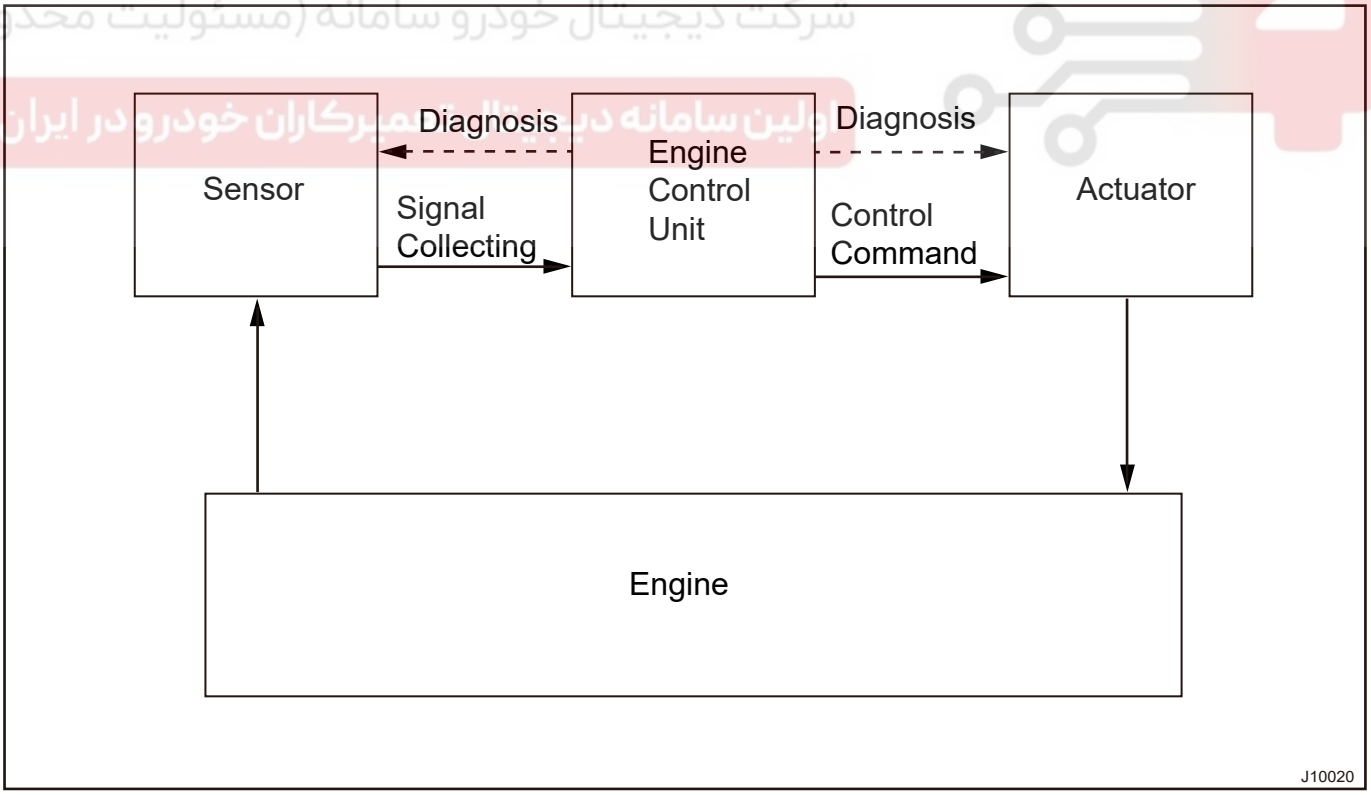
21. Never remove battery cable when engine is running.
22. The positive, negative battery cable wires and electronic control unit must be removed before performing welding on vehicle.
23. Do not puncture wire outer coat to detect electric signals input and output by components.

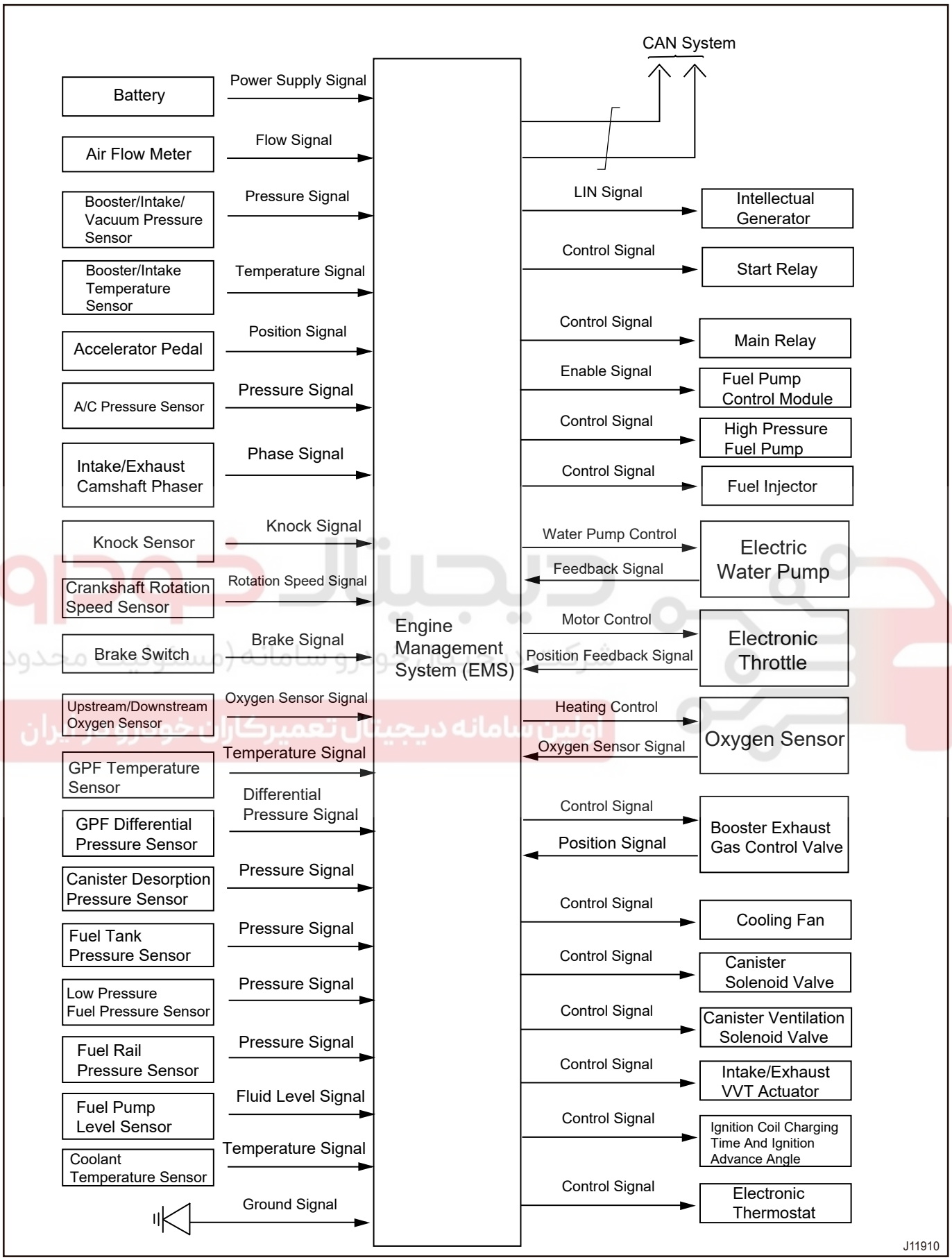
System Overview

System Description

Engine Management 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 ECM 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 ECM 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.UAES GDI (Gasoline Direct Injection) system is a torque control-based system developed on the MG1US008 ECM platform. Its main purpose is to link a large number of different control objectives together and convert various engine requirements into torque or efficiency control variables.MG1US008 system can prioritize these requirements and execute the highest priority requirement. Obtain engine control variables such as intake air volume, injection volume, ignition timing. The execution of each control variable has no effect on other variables. This is the advantage of the torque-based control system.

System Schematic Diagram





System Function Description

MG1US008-Motronic 0 engine management system is an electronically controlled gasoline engine control system, which provides many control features related to the operator and vehicle or equipment. The system adopts a combination of open loop and closed loop (feedback) control to provide various control signals for engine operation. The basic functions of the system include: start control, warm-up and three-way catalytic converter heating control, acceleration/deceleration and motored fuel cut-off control, idle control, λ closed loop control, air-fuel mixture control function, evaporative emission control, knock control, OBD diagnostic control, etc. In addition, additional functions include engine control anti-theft function, start and stop control, fan control, A/C control, VVT control, turbocharger control and so on.

Start control

1. 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 electronic throttle specifies a fixed opening parameter based on the current starting temperature. The fuel injection mode and injection volume is changed according to engine temperature to promote better mixing of oil and air in the cylinder. In order to form a reliable combustible mixture near the spark plug, the mixture must be enriched before the engine reaches a certain speed. Once the engine starts to run, the system starts to gradually reduce the fuel injection volume immediately, until the start condition ends 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. High-pressure start is usually used. In failure mode or extremely low temperature, low-voltage start is used.

Heating control of engine warm-up and three-way catalytic converter

1. For a period of time after the engine has been started at low temperature, additional injections are still required to be supplied, there may be several times depending on the operating conditions, and cylinder filling amount and ignition angle are adjusted to compensate for the higher torque requirements of engine; And this process continues until temperature rises to a 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 operating condition, use exhaust gas to perform "three-way catalytic converter heating" by adopting methods of appropriate fuel injection mode (multiple injections) and a moderate delay in the ignition advance angle.

Acceleration/deceleration and motored fuel cut-off control

1. In fact, a small part of the fuel injected into the cylinder will not be combusted in time. Conversely, it forms a layer of oil film on the cylinder wall or piston. When the throttle opening increases, a small part of the injected fuel is absorbed by the 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 will be released again, so the corresponding injection duration must be reduced during deceleration.
2. 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 wheel drag 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 set recovery of the fuel supply speed above idle speed, the fuel injection system is resupplied. In fact, the ECM program has a range of recovery speed. They vary according to dynamic changes of parameters such as engine temperature, gear position and engine speed, and prevent the speed from falling to the specified minimum threshold by calculation. Once the injection system is resupplied, the system begins to use the initial injection pulse to supply the fuel. After recovery of fuel injection, the torque-based control system increases the engine torque slowly and smoothly (smooth transition).

Idle control

1. 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. MG1US008 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.

Closed-loop control

1. 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_x) 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 l = 1, l closed loop control is aimed to ensure mixture concentration within this range. l 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 (l1) will generate about 100 mV sensor voltage, and rich mixture (l < 1) will generate about 800mV sensor voltage. When l = 1, sensor voltage will jump. l loop control responses to input signal (l1 = lean mixture, l < 1 = rich mixture) to correct control variable, a correction factor is generated as a multiplier to correct the fuel injection duration.

Evaporative emission control

1. 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 scour at the right moment. Flow rate of scour airflow is realized by ECM controlling canister control valve. This control operates only under closed loop working condition of l closed loop control system.

Knock control

1. 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 ECM for processing. ECM 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.

OBD Trouble Diagnosis

1. 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 rationality detection for sensor output signal, actuator drive signal and internal signals (such as l closed loop control, coolant temperature, knock control, idle speed control and battery voltage control, etc.). Once a certain step failure or unreasonable 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.

Stop and start

1. When the vehicle needs to stop at traffic lights or under other conditions, the intelligent start and stop function will turn off engine. When start-off etc. is detected, engine will start automatically. This function can improve the fuel economy of vehicle, reduce the emission pollution, and also reduce idling noise while waiting. When the idle start and stop system operates normally, the engine stops automatically when vehicle runs in idling when the following conditions are met and it will start automatically when

starting is required. Idle start and stop system operation does not affect the safety of driver and the normal operation of other systems on vehicle (A/C system, brake system, audio system, etc. are not affected). In some cases, the idle start and stop system will be disabled temporarily for safety and comfort of driving, which is normal. After the start and stop conditions are met, the start and stop function will be recovered automatically).

2. Idle start and stop system automatic stop activation condition:
   a.The engine hood is closed.
   b.The vehicle has been stopped firmly.
   c.It is not in high attitude area.
   d.Accelerator pedal is fully released.
   e.Driver door is closed.
   f.Driver seat belt is fastened.
   g.The vehicle is not in emergency brake.
   h.The battery power requirements are met.
   i.Transmission is in D/M position.
   j.When the vehicle is not parked on a steep slope.
   k.The steering wheel rotation angle is not excessively large.
   l.After the vehicle is started or turned with a large angle, the vehicle speed reaches above 8 km/h.
   m.Air conditioning comfort permits (for example: defogging, cooling and heating requirements are met).
3. Idle start and stop system automatic start activation condition:
   a.Driver door is closed.
   b.Driver seat belt is fastened.
   c.The engine hood is closed.
   d.Transmission range is in neutral for MT model.
   e.When the above conditions are met and any of following conditions is met, the engine will start automatically:
   f.When shift handle is shift to R, the engine starts.
   g.When the steering wheel angle is over 30°, the engine starts.
   h.When clutch pedal and accelerator pedal are depressed for MT model.
   i.When shift handle is in N and brake pedal is not depressed, the engine starts when shifting to D.
   j.When transmission is in N and brake pedal is not depressed, the engine starts when brake pedal is depressed.
   k.When transmission is in P and brake pedal is not depressed, the engine starts when brake pedal is depressed.
   l.When transmission is in D/M and brake pedal is not released after engine stops, the engine starts when brake pedal is depressed.

   Hint:
   When AUTO HOLD function is activated, the engine will not start after brake pedal is released. Then depress the brake pedal to start the engine.

Introduction to National VI OBD Diagnostic Control

Catalytic Converter Monitor

1. The catalytic converter is equipped with two main components of cerium oxide and precious metals (-platinum, rhodium, palladium). The former is a container for storing and releasing oxygen and is used to oxidize CO and HC in the concentrated gas mixture, while the latter is a catalyst to promote oxidation and reduction reactions. Under the premise that the aging speed of the two is basically the same, because the damage degree of precious metals cannot be accurately assessed, and the aging degree of cerium oxide can be expressed by the amount of oxygen storage, research shows that there is a nonlinear relationship between the conversion efficiency and oxygen storage capacity of catalytic converter. The oxygen storage capacity of the catalytic converter, that is, the oxidation capacity of the catalytic converter, decreases over time. Therefore, the current catalytic converter diagnosis strategy is realized by evaluating the oxygen storage capacity of catalytic converter.
2. During the measurement of oxygen storage, first use the concentrated gas mixture to completely empty the residual oxygen in catalytic converter, and the oxygen in the catalytic converter is

considered to be completely empty when the downstream oxygen indicator is rich, and then the lean mixture is used to oxygenate the catalytic converter, and the downstream oxygen indicator is lean, the catalytic converter is considered to be full of oxygen. Through this process, the oxygen storage capacity of the catalytic converter can be calculated to evaluate the conversion capacity of the catalytic converter. Before the decrease of catalytic converter conversion capacity causes the emission of non-methane hydrocarbons + nitrogen oxides (NMHC＋NOx) in the exhaust pollutants of the vehicle to exceed the OBD threshold, The OBD system alarms and illuminates MIL light.

3. The catalytic converter is monitored by directly measuring the oxygen storage capacity during the transition process of the gas mixture from rich to lean. In this process, the upstream oxygen sensor accurately controls the air-fuel ratio, and the downstream oxygen sensor is used to measure the oxygen storage capacity of the catalytic converter.

Overview of Misfire Monitoring

1. The basic principle of engine misfire monitoring is based on calculating the crankshaft acceleration during each individual combustion process.
2. In order to calculate the crankshaft acceleration, a toothed sensor signal wheel with a reference mark is installed on the crankshaft. The sensor signal wheel is divided into several segments, the segment number is equal to half of cylinder number in an engine with even number of cylinder, and the cylinder number is the number of cylinders in an engine with odd-number of cylinder. Each time the combustion pushes the crankshaft to accelerate rotation and generate a certain crankshaft acceleration. The engine speed sensor is used to calculate the time for crankshaft to rotate around each segment window, and the crankshaft acceleration corresponding to each cylinder can be calculated from the relative segment time.
3. When a cylinder is unburned or not fully burned, it will take longer for the corresponding segment window to pass the crankshaft position sensor, the corresponding segment window acceleration will exceed the matching threshold, and the system will diagnose a misfire.

Evaporation System Monitoring (Dual Lines, DTEV + DTESK)

Evaporation system monitor includes two parts:

1. Monitor the desorption flow of evaporation system. When the desorption flow from the fuel evaporation system to the engine cannot be monitored, the OBD system should detect a fault, that is, the desorption flow monitor. Related faults: P0497 (EVAP System Low Purge Flow) P04F0 (EVAP System High Pressure Purge).
2. Monitor the integrity of the entire evaporation system except for the lines and connectors between canister valve and the intake manifold to prevent fuel vapor from leaking into the atmosphere, that is, leakage monitor. Related faults: P2422 (EVAP System Vent Valve Stuck Closed), P0455 (EVAP System Leak Detected (Large Leak)), P0442 (EVAP System Leak Detected (Small Leak)).
3. Pressure sensor-based desorption flow monitoring (DTEV) and fuel tank pressure sensor-based leakage monitoring (DTESK).
    - DTEV actively controls the opening and closing of the canister valve, and detects the desorption flow of the evaporation system according to the pressure fluctuations in desorption line during the canister valve opening; DTESK controls the canister valve and canister vent valve to create the vacuum degree, and detects the leakage of evaporation system based on the vacuum attenuation gradient. The system can also monitor the canister valve and canister vent valve. The canister vent valve is used to control the communication between evaporation system and atmosphere, and the canister valve is used to control the communication between evaporation system and engine intake line. If the system leaks, it is recommended to use a smoke-type leak detector for troubleshooting.

Fuel System Monitoring

1. Adaptive feedback monitoring based on upstream oxygen
    - P2177 (System Too Lean Off Idle Bank 1)
    - P2178 (System Too Rich Off Idle Bank 1)
    - P2187 (System Too Lean at Idle Bank 1)
    - P2188 (System Too Rich at Idle Bank 1)

- The fuel injection time of the injector is mainly calculated according to the engine load signal, additive correction factor of mixture adaptive feedback, the multiplicative correction factor of mixture adaptive feedback and the mixture closed-loop adjustment factor.
- Considering that different fault sources have different effects on engine operating conditions and have different meanings for mixture correction, the system divides the self-learning region of mixture according to engine speed and load and carries out corresponding correction. Therefore, adaptive feedback learning is divided into two types: (1) Additive self-learning (such as air leakage in intake manifold); (2) Multiplicative self-learning (such as fuel pressure signal error). The corresponding fault types are also divided into: additive self-learning over-limit fault (P2187/P2188) and multiplicative self-learning over-limit fault (P2177/P2178).
- Under idling conditions, the additive self-learning plays the main role of fuel correction, while under relatively high speed and load conditions, the multiplicative self-learning plays the main role of fuel correction.
- Additive self-learning is carried out under idling conditions, and multiplicative self-learning is carried out under relatively high speed and load conditions. Only when the engine is running to corresponding self-learning operating area, the corresponding self-learning of mixture will be activated.

2. Fuel correction monitoring based on downstream oxygen
   - P2097 (Post Catalyst Fuel Trim System Too Rich Bank 1)
   - P2096 (Post Catalyst Fuel Trim System Too Lean Bank 1)
   - Downstream oxygen closed loop correction principle
   - There are two main functions and meanings of installing the downstream oxygen sensor behind the catalytic converter: One is to monitor the failure of catalytic converter according to the signal of downstream oxygen sensor; the other is to further correct the closed-loop adjustment deviation of upstream oxygen according to the signal feedback of downstream oxygen sensor to ensure that the mixture lambda is always within the catalytic converter optimal conversion window.
   - For closed-loop adjustment based on downstream oxygen, the principle is to compare the downstream oxygen voltage signal with the target voltage under steady condition. If the downstream oxygen voltage deviates from the target voltage, the system will perform self-learning correction according to the degree of deviation and determine fault based on the self-learning value.

Exhaust Sensor Monitoring

The exhaust sensor system monitors the working status of upstream oxygen sensor and upstream oxygen sensor, including oxygen sensor circuit monitoring, heating performance monitoring, responsive monitoring, and upstream oxygen sensor characteristic deviation monitoring.Oxygen sensor circuit monitoring (upstream and downstream oxygen sensors)Oxygen sensor heating monitoring (upstream and downstream oxygen sensors)Upstream oxygen sensor responsive monitoringUpstream oxygen sensor characteristic deviation monitoringDownstream oxygen sensor aging monitoring

1. Upstream oxygen sensor responsive monitoring
   - P0133 (O2 Sensor Circuit Slow Response Bank 1 Sensor 1)
   - Aging and pollution will cause the responsiveness of the oxygen sensor to become sluggish, and a upstream oxygen sensor signal with a slower dynamic response will cause emissions to deteriorate. The system response monitoring function can monitor the symmetry response failure of upstream oxygen sensor when the monitoring conditions are met.
   - The system monitors the responsiveness of upstream oxygen sensor by adjusting the required air-fuel ratio. When the air-fuel ratio changes, it performs fault monitoring by comparing the reversed actual oxygen sensor signal and the target oxygen sensor signal.
2. Upstream oxygen sensor characteristic deviation monitoring
   - The measured air-fuel ratio signal deviates from the actual value when the characteristics of upstream oxygen sensor deviate. The deviation of the positive or lean side can cause the measured value of the excess air coefficient to be too large (lean). The deviation of the negative or rich side can cause the measured value of the excess air coefficient to be too small (rich). The

system monitors the characteristic deviation of upstream oxygen sensor through the fuel self-learning integral value in closed-loop control of downstream oxygen. When the characteristic of upstream oxygen sensor is deviation, the air-fuel ratio indication will be lean or rich, which will cause the downstream oxygen self-learning integral value is too large or too small.

- Malfunction detection standard
- P2195 O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1
- P2196 O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1
- When the characteristics of upstream oxygen sensor deviate to the lean side, the upstream oxygen signal will always be lean compared to the actual air-fuel ratio, which leads to the enrichment of upstream oxygen closed-loop control, the mixture will be rich, and downstream oxygen signal will continue to be high and deviate from the target voltage level. At this time, the closed-loop correction factor of downstream oxygen closed-loop control based on the downstream oxygen signal will be corrected by feedback. When the self-learning integral value of correction factor exceeds the upper fault threshold, the system will report P2195 (Lean Side Fault (Lean Side Deviation Fault).

3. Upstream oxygen sensor voltage range monitoring
   - If the upstream oxygen sensor is installed incorrectly, the sensor is likely to be in communication with atmosphere and cannot accurately reflect the oxygen concentration in exhaust gas. Generally, when the oxygen sensor is placed in a mixture with an air-fuel ratio around 1.0, its output voltage is much lower than the output voltage when upstream oxygen sensor is in the air. When upstream oxygen sensor is not correctly installed in the exhaust system, it will be report the fault.
   - P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1
   - Generally, when the oxygen sensor is placed in a mixture with an air-fuel ratio around 1.0, its output voltage is much lower than the output voltage when upstream oxygen sensor is in the air. When upstream oxygen sensor is not correctly installed in the exhaust system, it will report P2414. Since an empty fuel tank may lead to misdiagnosis, it is necessary to add an empty fuel tank verification before fault confirmation.
4. Downstream oxygen sensor aging monitoring
   - Downstream oxygen sensor signal continues to be rich
   - P2271 O2 Sensor Signal Biased&Stuck Rich Bank 1 Sensor 2
   - When downstream oxygen sensor signal is always rich, under the action of fuel cut-off condition or the active adjustment of the air-fuel ratio, when the downstream oxygen voltage still cannot drop to the setting threshold after a certain period of time (considering the oxygen storage factor of catalytic converter), it will report P2271.
   - Downstream oxygen sensor signal continues to be lean
   - P2270 O2 Sensor Signal Biased&Stuck Lean Bank 1 Sensor 2
   - When downstream oxygen sensor signal is always lean, under the action of purging oxygen condition or the active adjustment of the air-fuel ratio, when the downstream oxygen voltage still cannot rise to the setting threshold after a certain period of time (considering the oxygen storage factor of catalytic converter), it will report P2270.
   - Responsive monitoring of downstream oxygen sensor under fuel cut-off conditions
   - P013A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2
   - In the fuel cut-off condition that meets the diagnostic conditions, when the output voltage time constant of downstream oxygen sensor exceeds the setting threshold, it will report P013A.
5. Downstream oxygen sensor circuit monitoring
   - Downstream oxygen sensor signal circuit short to power supply
   - P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2
   - When all monitoring conditions are met, if the output voltage of oxygen sensor is greater than threshold, it will report P0138.
   - Downstream oxygen sensor signal circuit short to ground
   - P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2

- When all monitoring conditions are met, if the output voltage of oxygen sensor is less than threshold, it will report P0137.
- Downstream oxygen sensor signal circuit open
- P0136 O2 Sensor Circuit Bank 1 Sensor 2
- When all monitoring conditions are met, if the output voltage of downstream oxygen sensor stays within the set threshold interval, it will report P0136.
- Unreasonable monitoring of downstream oxygen sensor signal
- P2232 O2 Sensor Signal Circuit Shorted to Heater Circuit Bank 1 Sensor 2
- When all monitoring conditions are met, if downstream oxygen sensor signal circuit is coupled with heating line, it will report P2232.

6. Upstream Oxygen Sensor Heating Monitoring
   - When the exhaust temperature is not enough to heat the oxygen sensor to a suitable working temperature, the internal heating circuit of oxygen sensor can auxiliary heating. When the heating circuit of oxygen sensor fails, the oxygen sensor will not work reliably and needs to be monitored for failure.
   - P0053 HO2S Heater Resistance Bank 1 Sensor 2
   - After engine is started, if the temperature of upstream oxygen ceramic body cannot exceed the setting threshold within a certain period of time, it will report P0053.
   - When the heating control circuit is heated at full-power and temperature of upstream oxygen ceramic body cannot exceed the setting threshold, it will report P0053.
7. Downstream Oxygen Sensor Heating Monitoring
   - P0054 HO2S Heater Resistance Bank 1 Sensor 2
   - Under high temperature exhaust and circuit heating, the internal resistance of two-point oxygen sensor decreases and the temperature increases. If the circuit heating of oxygen sensor fails, the internal resistance of oxygen sensor is higher than the normal value. Nernst internal resistance monitoring of oxygen sensor.
   - When the Nernst internal resistance of oxygen sensor is higher than the normal value, it will report P0054.

Engine Cooling Monitoring

1. Engine coolant temperature (ETC) sensor monitoring
   - The engine coolant temperature sensor measures the engine coolant temperature, and its monitoring includes circuit monitoring, various signal rationality monitoring, and cold start rationality monitoring.
2. Thermostat monitoring
   - The system uses a thermal management module to control the temperature of engine coolant, so the thermal management module is required to monitor in accordance with the thermostat monitoring specification. The cooling system is equipped with an engine coolant temperature sensor (ECT sensor) in the small circulation water circuit, which is used to measure the water temperature of small circulation water circuit, and a coolant temperature sensor (ECT sensor 2) is installed in the large circulation water circuit, which is used to measure the water temperature of large circulation water circuit. In the normal state of thermal management module, when the coolant does not reach the regulating temperature, the large circulation water circuit of cooling system is in the closed state, the coolant flows in the small circulation, and the ECT sensor 2 is cold coolant. When the coolant reaches the regulating temperature, the large circulation water circuit of cooling system is in an open state, and the hot coolant flows to the radiator to dissipate heat, and the ECT sensor 2 is the hot coolant that passes through the radiator to dissipate heat. When the thermal management module is stuck in the fully open position, the coolant flows to the radiator to dissipate heat, and the ECT sensor 2 always senses the hot coolant that passes through the radiator to dissipate heat.
   - P0128 Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

- If the water temperature of small circulation water circuit is higher than the threshold, the thermal management module is determined to be normal; if the water temperature of small circulation water circuit is lower than the threshold and the water temperature of large circulation water circuit reaches a certain threshold, it is determined that the thermostat is stuck in the fully open position, and the performance of thermostat module is considered unreasonable.

Cold Start Emission Reduction Strategy Monitoring (CSERS)

1. System Overview
   - The cold start emission reduction strategy is generally catalytic converter heating, that is, by increasing the engine idle speed, delayed ignition angle, adjusting the variable valve timing, multiple injections and other strategies to achieve the goal of quick ignition of catalytic converter during the warm-up. Cold start emission reduction strategy diagnosis is not a diagnosis of a specific function, but a monitoring and diagnosis of the above strategies, and corresponding diagnosis of key engine parameters corresponding to these strategies.
   - Before the failure or deterioration of cold start emission reduction strategy relevant parts or components causes the vehicle emissions to exceed OBD threshold, the OBD system should detect a failure. If the failure of strategy does not lead to emission exceeding the OBD threshold, the corresponding faults should be diagnosed when the function control reaches the adjustment limit. The strategy corresponding to the cold start emission reduction strategy of this project is to increase engine idle speed, delay ignition angle, adjust variable valve timing, perform multiple injection, and increase high pressure fuel rail pressure. Details are as follows:
2. Engine idle speed control monitoring in catalytic converter heating
   - P050A 21 (Cold Start Idle Control System Performance)
   - P050A 22 (Cold Start Idle Control System Performance)
   - P050D (Cold Start Rough Idle)
   - Similar to the normal phase (catalytic converter heating does not work), the engine idle speed control and diagnosis principle is the same in catalytic converter heating. The idle speed uses PID to adjust the engine torque to achieve the actual idle speed consistent with the target idle speed; Idle speed diagnosis is a corresponding diagnosis based on the difference between the target speed and actual speed, and the performance of actual idle speed.
3. Ignition angle efficiency monitoring when catalytic converter is heated
   - P050B 00 (Cold Start Ignition Timing Performance)
   - P050B 20 (Cold Start Ignition Timing Performance)
   - The important measures of delaying the ignition angle and the quick ignition of catalytic converter are used to shorten the ignition time of catalytic converter, thereby greatly reducing exhaust emissions. This diagnostic function monitors the ignition angle efficiency during catalytic converter heating. The diagnostic principle diagram is as follows, by calculating the deviation of actual ignition angle efficiency and target ignition angle efficiency, considering that the catalytic converter heating is a process, the system obtains the average efficiency difference of the entire catalytic converter heating process, and compares it with the matching threshold at the corresponding operating point.
   - Theoretically, only when the actual ignition angle is greater than the set optimal ignition angle (-ignition angle delayed when the catalytic converter is heated in the normal state), that is, the ignition angle is not delayed or delayed not enough, the quick ignition of catalytic converter will be adversely affected, therefore, the system only performs the diagnosis, that is, when the average deviation between actual ignition angle efficiency and target ignition angle efficiency is greater than the setting threshold (ignition angle is not delayed or delayed not enough), and the duration exceeds the setting threshold, it will report P050B 00 (it will report P050B 20 when part load).
4. Variable Valve Timing Monitoring when Catalytic Converter Heating
   - P052A (Cold Start “A” Camshaft Position Timing Over-Advanced Bank 1)
   - P054A (Cold Start “B” Camshaft Position Timing Over-Advanced Bank 1)

- The diagnostic method of variable valve timing in catalytic converter heating is to monitor the effective difference between actual position and the expected position of intake and exhaust VVT, and detect the accuracy and timeliness of required valve timing.
- If the catalytic converter heating is activated after the engine is cold-started, and all the secondary factors are satisfied, the VVT diagnosis is performed by comparing the target camshaft angle with the actual camshaft angle.
- If the deviation between expected angle and actual angle is greater than the matching fault threshold within the specified time, the fault will be detected and the P052A/P054A will be confirmed. The fault threshold is obtained based on the engine speed and oil temperature at this time.
- When the deviation between expected angle and actual angle is within the specified range, and the camshaft phase adjustment range exceeds the threshold, no fault diagnosis is completed.

5. Multi-injection Monitoring when Catalytic Converter Heating
   - P05EC (Cold Start Injection Timing Performance)
   - One of the advantages of a direct injection engine is that it can effectively carry out multiple injections such as two injections, especially by activating the multiple injection mode, greatly delays the ignition angle to achieves the quick ignition of catalytic converter during the heating process, thus effectively reduce emission pollution. Therefore, just as the ignition angle is an important factor in the catalytic converter heating, the fuel injection pulse width and fuel injection phase corresponding to multiple injections are all important control parameters, that is, corresponding diagnosis is required.
   - Monitor the injection pulse width, injection angle, and injection times of the multiple injection control parameters. When the absolute value of difference between expected value and actual value exceeds the setting threshold, it will report P05EC.
6. High Pressure Oil Passage Pressure Monitoring When Catalytic Converter Heating
   - P053F 21 (Cold Start Fuel Pressure Performance)
   - P053F 22 (Cold Start Fuel Pressure Performance)
   - In the catalytic converter heating process of high pressure direct injection engine, it can reduce the emission pollution by increasing the high pressure oil passage pressure, that is, it is also an important control parameter for cold start to reduce the emission pollution, so effective diagnosis is required. Diagnosis principle for this part is the same as the high pressure oil passage diagnosis when the catalytic converter heating, that is, the expected pressure is compared with the actual pressure, and the corresponding fault is reported when the difference exceeds the setting threshold.

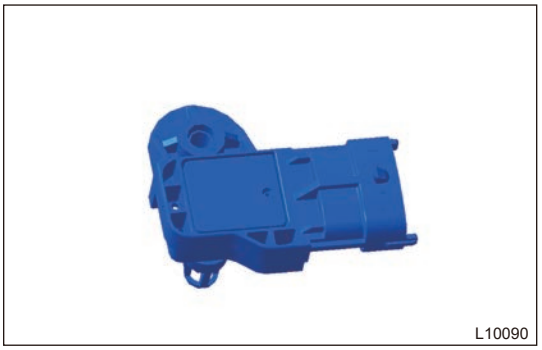
Gasoline Particulate Filter (GPF) Monitoring

1. Gasoline particulate filter (GPF) is installed on engine exhaust pipe to trap particulate in exhaust gas. According to the provisions of the National VI Emission Regulation J.4.13.2.1, it is necessary to monitor the GPF to remove the failure.
2. When the particulate trapped in GPF is too much, causing GPF back pressure is too high, it will cause the engine exhaust back pressure to rise, which will affect the engine power performance. Therefore, it is necessary to monitor the fault of high GPF back pressure.
3. In order to realize the monitoring of GPF removal and high back pressure failure, it is necessary to install a differential pressure sensor on GPF to measure the pressure drop generated when the exhaust gas flows through GPF.

System Components Description

Intake Pressure Sensor

Intake manifold absolute pressure sensing element consists of a piece of silicon chip. Etch 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. Active surface of the silicon chip is subjected to a pressure close to zero, and its surface is subjected to the absolute pressure of the intake manifold to be measured. Thickness of silicon chip is only several micrometer, 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 transfers a voltage of intake temperature change to controller.


L10090

1. Pressure sensor limit parameter

Parameters	Value		
	Minimum	Representative	Maximum
Power supply voltage	/	/	16V
Pressure	/	/	500 kpa
Operating temperature	-40˚C	/	+130˚C

2. Pressure sensor characteristic parameters

Parameters		Value		
		Minimum	Representative	Maximum
Pressure measurement range		10 kpa	/	300 kpa
Operating temperature		-40˚C	/	130˚C
Power supply voltage		4.75V	5.0V	5.25V
Power supply current when U_S = 5.0 V		/	/	12.5mA
Output terminal load current		-1.0mA	/	0.5mA
Load resistance to voltage U_S or ground	Pull-up resistor	5 kΩ	/	/
	Pull-down resistor	10 kΩ	/	/
Response time $t_{10/90}$		/	/	1.0 ms
Weight		/	24g	/

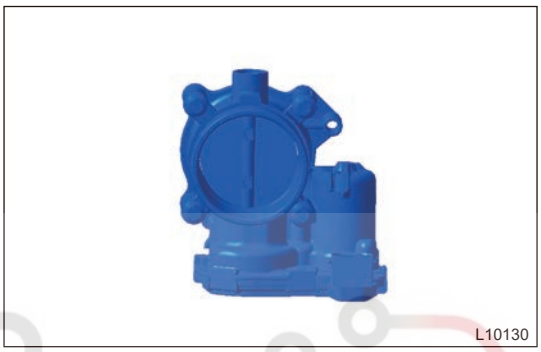
3. Temperature sensor limit parameters

- Storage temperature: -40/+130℃;
- The maximum power at 25℃: 100 mW.

4. Temperature sensor characteristic parameters
   - Operating temperature: -40/+130°C;
   - Rated voltage: Pull-up resistor (power is 1 kW) operates at 5 V or operates at a constant current of £1mA;
   - Rated resistance at 20°C: 2.5 kW ± 5%;

Electronic Throttle Body

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.DVE 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 (NLP) determined by mechanical way, which is located above mechanical bottom dead center. DVE 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.


L10130

1. Basic performance parameters:

Test Item	Potentiometer Voltage				Response Time (ms)		Return Time (ms)
	Mechanical Bottom Dead Center (%)		Mechanical Top Dead Center (%)				
	IP1S	IP2S	IP1S	IP2S	Open	Close	
Parameter range	10 ± 4	90 ± 4	93 ± 4	7 ± 4	⩽ 100	⩽ 100	⩽ 300

Knock sensor

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 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 A/C voltage signal to output it. Because intensity of vibration signal caused by engine knocking is far more than that of normal engine vibration signal, ECM can distinguish between knock or non-knock signals by processing these signals from knock sensor.


J12860

1. Limit data

Quantity	Value		
	Minimum	Representative	Maximum
Operating temperature	-40˚C	/	130˚C

2. Characteristic data (cable type)

Quantity		Value
Sensitivity of new sensor to 7 kHz signal		23.6~35.4 mV/g
Sensitivity of new sensor to 19kHz signal		28.3~42.4 mV/g
Linearity between 5 and 15 kHz		±10% of 5 kHz (based on 10m/s^2)
Main resonance frequency		＞30 kHz
Impedance	Resistance (terminal and copper bush)	＞1 MΩ
	Capacitance (probe)	1150 ± 200 pF
Leakage resistance (resistance between two output terminals of sensor)		4.9 ± 20% MΩ
Variation in sensitivity due to temperature (9 kHz)		⩽ -0.04 mV/g°C

Coolant Temperature Sensor

Temperature sensor function is used to monitor engine coolant temperature, On the one hand, it makes the electronic system judge the engine operating condition by outputting resistance signal; On the other hand, it also outputs signals to relevant instrument cluster, so that operators can directly judge the engine operating condition through visual inspection. Coolant temperature sensor encapsulates NTC thermistor in temperature sensor, its resistance varies in accordance with ambient temperature, so that the small change of outside temperature can be measured accurately and timely. Temperature of contact medium can be reflected by measuring its output resistance.


P10130

1. Limit data

Quantity	Value
Rated voltage	Operates with ECM connected, standard operating condition is 5 V (power of pull-up resistor is 1 kW)
Rated resistance at 20°C	2.5 ± 5% kΩ
Operating temperature range	-40 ~ +130˚C
Vibration level	⩽ 600 m/s^2

2. Characteristic data

Temperature (℃)	Resistance (Ω)
-40	45313
-30	26114
-20	15462
-10	9397
0	5896
10	3792
20	2500
30	1707
40	1175
50	833.9
60	595.5
70	435.7
80	322.5
90	243.2
100	186.6
110	144.2
120	112.7
130	89.30

Speed Sensor

Speed sensor is a component of the engine management system. This sensor is installed on engine block, which used to detect crankshaft position and speed. Rotation of the signal plate causes the magnetic field at the induction point inside the speed sensor to alternate. The alternating magnetic field is induced by the differential Hall chip, and the induced alternating magnetic signal is converted into an electrical signal by the internal processing circuit of the sensor and output.

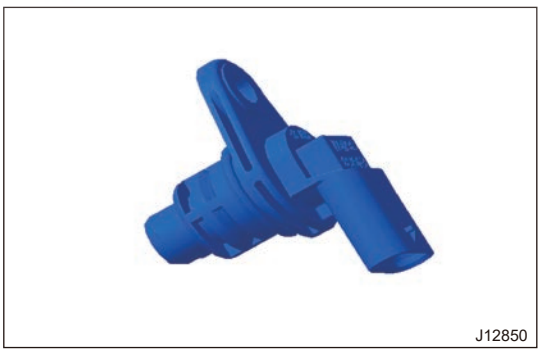
1. Technical Characteristic Parameters

Parameter	Minimum	Representative	Maximum
Storage temperature	-40 ℃	/	+80 ℃
Speed range	20 rpm	/	8000 rpm
Air clearance	0.2 mm	1.0 mm	1.8 mm
Phase accuracy (falling edge of 800 rpm)	-1 deg	/	+1 deg

Parameter	Minimum	Representative	Maximum
Operating temperature (plug area)	-40 ˚C	/	+150 ˚C
Operating temperature (sensor)	-40 ˚C	/	+150 ˚C
Power supply voltage range	4.75 V	5.0 V	16 V
Power supply current	/	4.2 mA	10 mA
Output signal rising time (Low - High)	/	/	25 us
Output signal falling time (High - Low)	/	/	1 us
Output signal power supply voltage	/	/	18 V
Output current	/	/	20 mA
Output signal low voltage	/	/	0.5 V
Output signal high voltage	$U_{S,0}$—0.5 V	$U_{S,0}$—0.3 V	/
Power-on time	/	/	250 ms
n: Repeated accuracy at 800 rpm	-0.1 deg	+0.1 deg	/

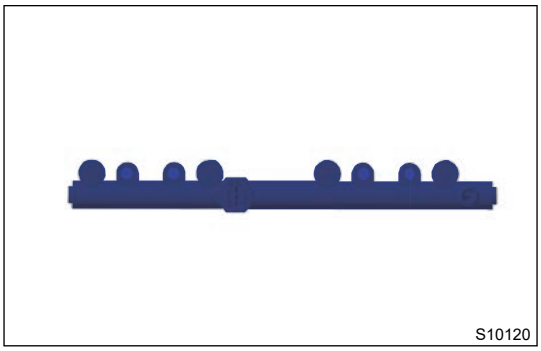
Camshaft Position Sensor

Camshaft position sensor is a Hall type sensor. A phaser is installed on camshaft. When phaser is in high teeth, the applicable circuit outputs low voltage; when phaser is in missing teeth, the applicable circuit outputs high 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.



High Pressure Fuel Distribution Pipe Assembly

The high pressure fuel distribution pipe assembly is integrated with high pressure fuel distribution pipe (fuel rail), high pressure fuel injector and high pressure sensor. Its operation principle is to optimize design through structure of high pressure fuel distribution pipe, the accurate fuel rail pressure signal feedback can uniformly and precisely distribute fuel for engine through injector.

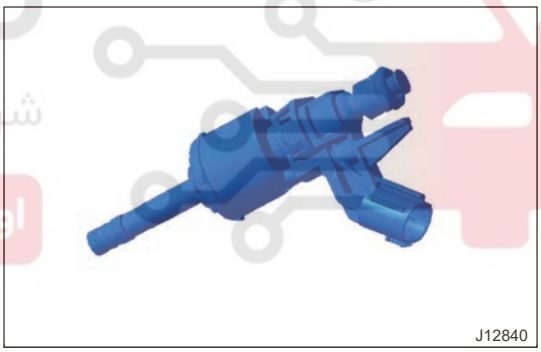


1. Technical Characteristic Parameters

Items	Target Specifications
System Pressure	35 MPa
Target Life	10/160,000 y/km
Temperature Condition	-40 ~ 130 ˚C

High Pressure Fuel Injector

Operation principle of solenoid valve type high pressure fuel injector: When the electricity is applied, electromagnetic coil generates magnetic force, and the needle valve set is sucked up, and separated from valve seat, so that fuel is injected. When the power is off, compression spring returns and needle valve set moves downwards, so that it contacts valve seat eventually to seal the fuel.



1. Technical Characteristic Parameters

Electronic Control Fuel Injection	High pressure direct injection system
Fuel Entering Direction	Injector axial
System Pressure	35 Mpa
Maximum Operating Voltage	65 V
Target Life	240,000 kilometers, up to 15 years

Ignition Coil

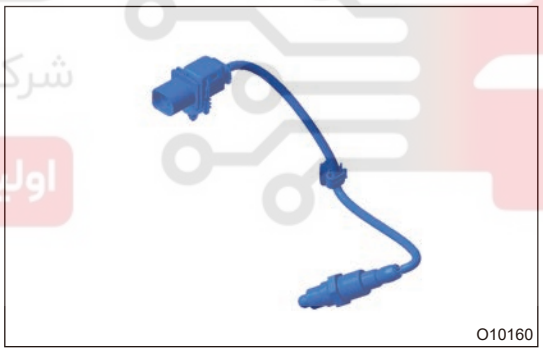
Ignition coil consists of primary winding, secondary winding, iron core and housing etc. When the ground passage of a primary winding is on, this primary winding is charged. If ECM cuts off the primary winding circuit, the charging will be suspended, and a high voltage will be induced in the secondary winding at same time, cause spark plugs to discharge.

1. Technical Parameters

Primary Current	8.5A X (1 ± 8%)
Secondary Voltage	⩾ 37 KV (40 pF ± 5 pF of load)
Load (Zener Diode)	1000 ± 20V
Ignition Energy	⩾ 90mJ

Upstream Oxygen Sensor

LSU oxygen sensor is much more advanced than LSH and LSF in function. It is a ceramic body principle and a “micro pump” for oxygen ion transportation. Pump provides enough oxygen to the electrodes on the contact side of the exhaust to maintain a constant voltage on both sides, about 450mV. Electric energy consumption of the pump is converted into the excess air coefficient by the electronic controller, output current is almost linear with λ. λ = 0.65 ~ ∞, so it is also called linear oxygen sensor. It can not only determine whether λ is greater than 1 or less than 1, but also measure in the thin and thick areas The specific value of λ can be determined, so the excess air coefficient in a wide range (broadband) can be measured, and the continuous control of λ < 1 to λ > 1 can be realized.



1. Characteristic data

Description	New	After Platform Test
λ signal when λ = 1.7	1.70 ± 0.077	1.70 ± 0.132
λ signal when λ = 0.8	0.80 ± 0.012	0.80 ± 0.020

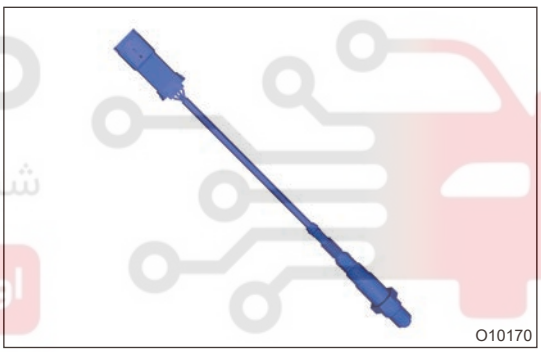
2. Sensor electrical data

Description		Value
Resistance between housing and each flat insert pieces	Room temperature, 800V DC	⩾ 10 MΩ
Power supply voltage on connector	Rated Voltage	6.8 V
	Continuous operating voltage	⩽ 12 V

Description		Value
	Maximum system power supply voltage	⩽ 16.5 V
	Short time voltage peak value within 60 ms (10 times in life cycle, ceramic temperature ⩾ 20℃)	⩽ 28 V
	Minimum system power supply voltage	⩾ 9.8 V
Heating power for 6.8V of operating voltage		8.1 W

Downstream oxygen sensor

Sensing element of LSF oxygen sensor is a ceramic planar body with pores, and the outside of ceramic body is surrounded by engine exhaust, and the inside is ventilated. Sensing ceramic body wall is a type of solid electrolyte with heating electrodes inside. Operation of oxygen sensor is realized by converting the concentration difference of oxygen ions inside and outside the sensing ceramic body into voltage signals for output. When the temperature of sensing ceramic body reaches 350 ℃, it will have the characteristics of solid electrolyte. Oxygen ions can freely pass through it due to special material of ceramic body. It is precisely by taking advantage of this characteristic, it converts the concentration difference into the potential difference, thus forming the electrical signal output. If the gas mixture is rich, oxygen ion concentration difference in and out of the ceramic is high, electric potential difference is high, a large number of oxygen ions move from the inside to the outside, and the output voltage is higher (approximately 800mV-1000mV); If the mixture concentration is too lean, oxygen ion concentration difference in and out of the ceramic is low, electric potential difference is low, only a small amount of oxygen ion moves from the inside to the outside, and the output voltage is lower (approximately 100mV). Signal voltage changes abruptly at about the theoretical equivalent air fuel ratio (λ=1).



1. Characteristic data

Description	New		After 500 Hours of Platform Test	
Exhaust temperature when characteristic data is established	350°C	850°C	350°C	850°C
When l=0.97 (CO=1%): Sensing element voltage (mV)	800 ± 55	700 ± 55	800 ± 60	700 ± 60

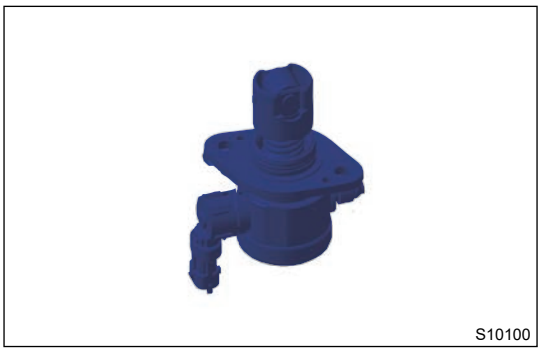
Description	New		After 500 Hours of Platform Test	
When I=1.10: Sensing element voltage (mV)	50 ± 30	50 ± 30	50 ± 40	50 ± 40
Sensing element internal resistance (kΩ)	⩽ 0.5	⩽ 0.25	⩽ 1	⩽ 0.5
Response Time (ms) (600 mV to 300 mV)	< 250	< 250	< 400	< 250
Response Time (ms) (300mV to 600mV)	< 100	< 60	< 200	< 60

2. Sensor electrical data

Description		Value
Between heating circuit and signal circuit	Room temperature, 800V DC	⩾ 30
Power supply voltage on connector	Rated Voltage	12 V
	Continuous operating voltage	12 to 14 V
	Operating voltage which can be maintained 1% of the total life at most (exhaust temperature ⩽ 850°C)	15 V
	Operating voltage which can be maintained 75 seconds at most (exhaust temperature ⩽ 350°C)	18 V
	Test voltage	13 V
Heating power for 13 V of operating voltage, and 350°C of exhaust temperature		7 W
Short time heating current at 13 V of operating voltage and -40˚C of ambient temperature		⩽2.1 A

High Pressure Fuel Pump

High pressure fuel pump is an element specially used for direct injection engine. It functions to increase the system pressure and provide high pressure fuel for the fuel rail assembly. High pressure fuel pump supplies fuel for system as demands, thus providing a better fuel economy. It is made of stainless steel material and has a wide fuel application; also, it has the advantages of light weight, small volume, zero evaporative emission, etc. At present, high pressure fuel pump of the main vehicle factory widely used in the world adopts the single plunger pump design of integrated voltage regulator, flow control valve, relief valve, its working principle is through cam drive high pressure pump plunger movement up and down to achieve fuel absorption and fuel discharge. ECM controls high pressure fuel flow via flow control valve according to the set control program through pressure sensor on fuel rail, thus performing closed loop control for pressure in high pressure fuel rail. Regulator functions to suppress the pressure pulsation at the low pressure end and improve the stability of system. Pressure relief valve will open when high pressure fuel rail pressure exceeds the safety limit, so as to protect the system.

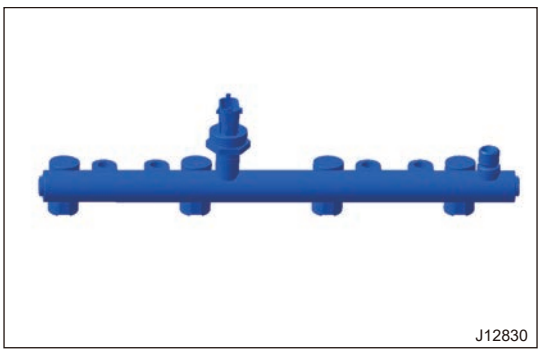

S10100

1. Characteristic parameters

Items	Target Specifications
Mass	Approx. 0.83 kg
Oil outlet pressure	2-20 MPa
Maximum oil inlet pressure	9.0 bar
Relief valve opening pressure	35 MPa system: 39.9-41.4 for new parts, 36.5-42.4 MPa for durable parts
Driving voltage	10.8-16 V
Control type	Applied to ECM, which adopts current control

High Pressure Fuel Rail Pressure Sensor

Oil pressure acts on metal diaphragm of pressure sensor to deform the diaphragm. There is a Wheatstone bridge composed of 4 metal strain gauge on diaphragm. The deformation of diaphragm causes a change in the resistance of strain gauge. After the signal processing of peripheral circuit, form the voltage signal that is linearly related to the pressure.


J12830

1. Limit data

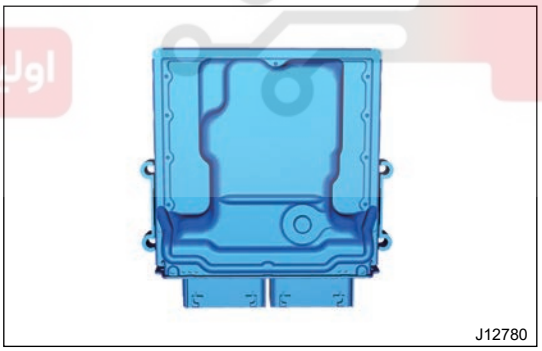
Parameter	Value		
	Minimum	Representative	Maximum
Power supply voltage (MAX. 1h)	/	/	18 V
Pressure	/	/	32 Mpa
Burst pressure	/	/	375 Mpa
Operating temperature	/	/	150 ˚C

2. Characteristic data

Parameter	Value		
	Minimum	Representative	Maximum
Pressure measurement range	0 Mpa	/	42 Mpa
Operating temperature	-40 ˚C	/	140 ˚C
Power supply voltage	4.75 V	5.0 V	5.25 V
Power supply current when U_S = 5.0 V	9 mA	12 mA	15 mA
Response time $t_{10/90}$	/	/	1.0 mS

Electronic Controller Unit

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.

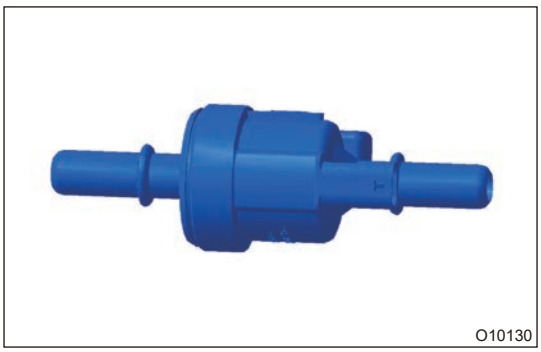


1. Limit data

Quantity		Value	
		Minimum	Maximum
Battery voltage	Normal operation	10.8 V	16 V
	Limit function	6.5 to 9 V	16 to 28 V
Limits and time for withstanding battery overvoltage	24 V	Keep starting some functions	60 s

Canister Solenoid Valve

Canister control valve consists of solenoid coil, armature, valve body and other parts.Air volume through canister control valve is related to the electric pulse duty ratio output from ECM to canister control valve and the differential pressure between canister control valve inlet and outlet. When there is no electric pulse, canister control valve closes.

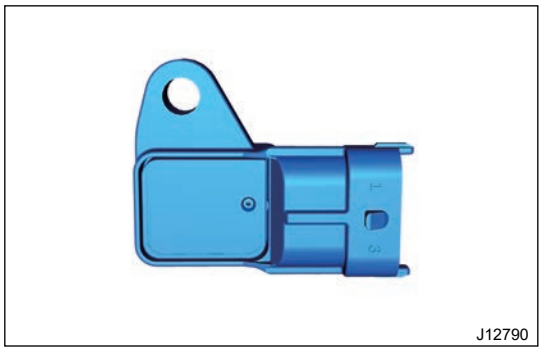


1. Technical Characteristic Parameters

Quantity	Value		
	Minimum	Representative	Maximum
Rated Voltage	10 V	13.5 V	16 V
Resistance at +20°C	14 Ω	16 Ω	18 Ω
Current under rated voltage		0.85 A	
Frequency of control pulse	5 Hz	/	30 Hz
Rate of flow when differential pressure is 700 mbar and duty ratio is 100%	6 m^3/h	6.5 m^3/h	7 m^3/h
Permitted operating temperature	-40°C	/	140 °C
Allowable differential pressure between inlet and outlet	/	/	-800 mbar
Permitted vibration acceleration marked on products	/	/	300 m/s^2
Leakage amount when differential pressure is 700 mbar	/	/	33 mL/min

Brake Vacuum Pressure Sensor

Absolute pressure sensing element consists of a piece of silicon chip. Etch 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. Active surface of the silicon chip is subjected to a pressure close to zero, and its surface is subjected to the absolute pressure of the intake manifold to be measured. Thickness of silicon chip is only several micrometer, so the silicon chip will deform mechanically as line 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.



1. Limit parameters

Parameter	Value		
	Minimum	Representative	Maximum
Power supply voltage	/	/	16 V
Pressure	/	/	500 kpa
Operating temperature	-40°C	/	+130 ˚C

2. Characteristic parameters

Parameter		Value		
		Minimum	Representative	Maximum
Pressure measurement range		20 kpa	/	115 kpa
Operating temperature		-40°C	/	130 ˚C
Power supply voltage		4.75 V	5.0 V	5.25 V
Power supply current when U_S = 5.0 V		/	/	12.5 mA
Output terminal load current		-1.0 mA	/	0.5 mA
Load resistance to voltage U_S or ground	Pull-up resistor	5 kΩ	/	/
	Pull-down resistor	10 kΩ	/	/
Response time $t_{10/90}$		/	/	1.0 ms
Weight		/	17 g	/

GPF temperature sensor

The temperature sensor uses Pt200 type thermal-sensitive platinum resistor sensing element as the temperature sensing element. The outside of the sensing element is encapsulated by a stainless steel shell with high temperature resistance and corrosion resistance. The sensing element and the stainless steel shell are filled with heat conduction materials to facilitate the timely transfer of exhaust gas heat to the surface of sensing element. During operation, the sensor head is placed inside the engine exhaust pipe, and the high temperature airflow transmits heat to the sensing element, so that the temperature of the sensing element interior platinum resistor changes accordingly, and the resistance value of platinum resistor varies with the temperature. Through a specific monitoring circuit, the engine controller (ECM) monitors the resistance signal output by the sensor to calculate the corresponding exhaust gas temperature signal.

1. Signal Accuracy

   Signal accuracies of sensor (new parts) are shown as follows:

Temperature Range	Signal Accuracy
-40˚C ~ 300˚C	± 2.5˚C
301˚C ~ 900˚C	± 1.0 % of temperature in ˚C
901 ˚C ~ 950 ˚C	± 2.0 % of temperature in ˚C

   Signal accuracies of sensor (deteriorated parts) are shown as follows:

Temperature Range	Signal Accuracy
10 ˚C	± 3.8 Ω (± 5˚C)
650 ˚C	± 8 Ω (± 13 ˚C)

2. Dynamic response performance

   Dynamic response performance of the exhaust temperature sensor is based on the change speed of output signal when the ambient temperature changes abruptly, which should meet the requirements of the following table

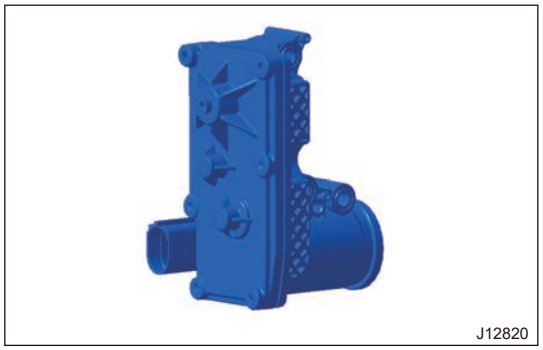
Temperature Jump	Air-flow Velocity	Response Time
300 ˚C	11 m/s	＜ 12 s

GPF differential pressure sensor

Differential pressure sensor (double membrane) unit consists of housing, two same LGA (Land Grid Array) sensing element modules, cover plate, sealing glue, connecting glue, bonding wire and other sub components. The values measured by sensor are upstream gas absolute pressure and downstream gas absolute pressure of GPF.Differential pressure sensor (double membrane) unit consists of housing, two same LGA (Land Grid Array) sensing element modules, cover plate, sealing glue, connecting glue, bonding wire and other sub components. The values measured by sensor are upstream gas absolute pressure and downstream gas absolute pressure of GPF. Sensing element module of differential pressure sensor (LPS4-2ABS) consists of a piece of silicon chip. Etch 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. Silicon chip will deform mechanically as emission gas pressure changes, and 4 piezoresistors will also deform, thus changing the resistance. Output the information in SENT signal format to ECM after processing by signal processing circuit of silicon chip.

Electronic control actuator

Electronic control actuator is used to drive exhaust gas by-pass valve of turbocharger. Its main function is to adjust waste gate opening angle and control rotation speed of turbocharger according to driver’ s driving intention, so as to control intake air demand when the intake air amount meets different engine operating conditions, and feed back the position signal of waste gate to control unit to realize accurate control.Electronic control actuator consists of four parts: drive module, train module, executive module and feedback module, and all sub components of drive module, train module and feedback module are integrated into the same housing. Feedback module contains non-contact type sensors, which can accurately feedback the valve position according to Hall principle. Electronic control actuator performs control only by corresponding electronic control unit or electronic test circuit. In principle, it is necessary to ensure that the actuator connecting rod does not operate dynamically to the mechanical dead center.

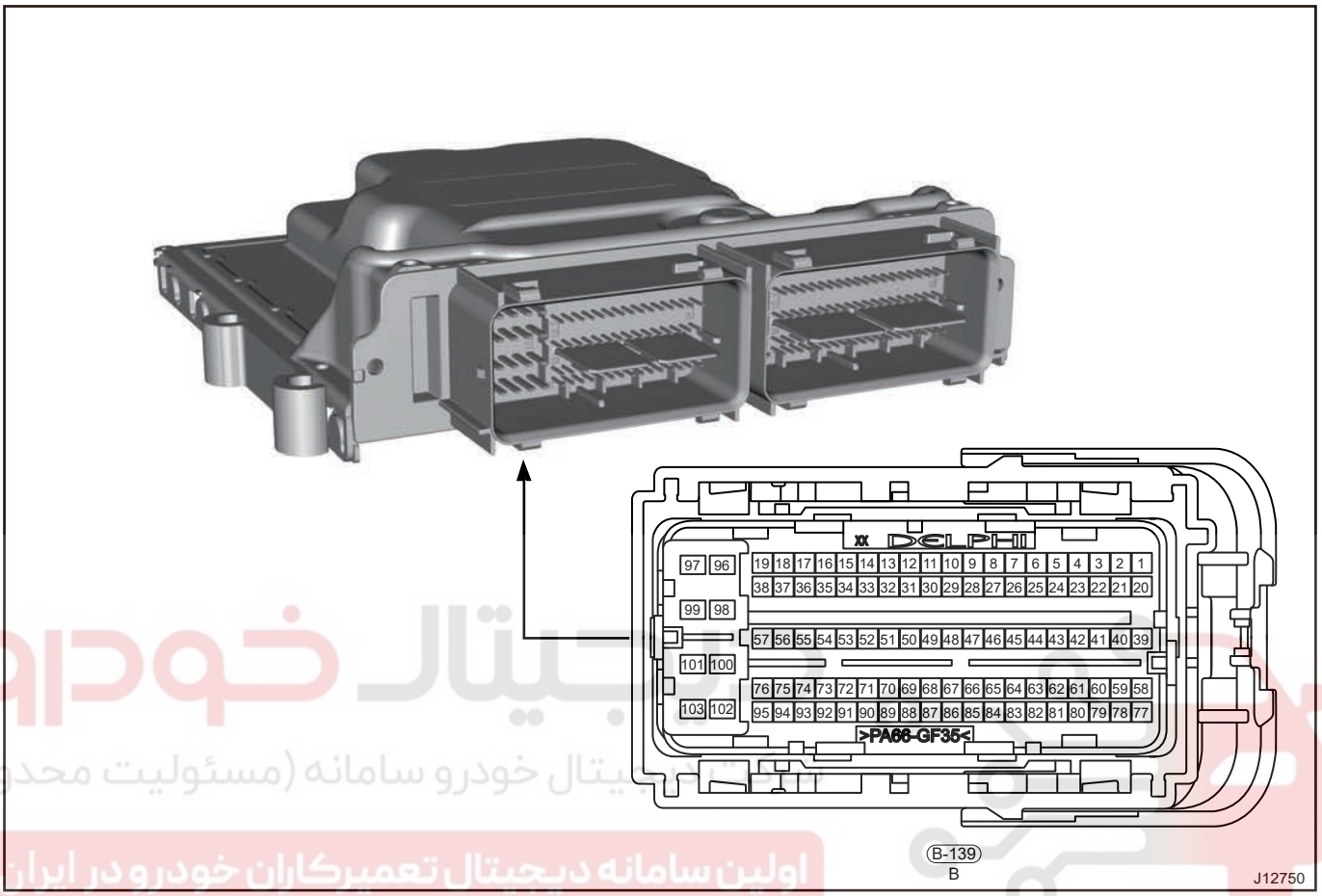


1. Technical Characteristic Parameters

Test Item	Potentiometer Voltage		Response Time (ms)		Driving Torque (New Parts) (Nm)
	Mechanical Top Dead Center (%)	Mechanical Bottom Dead Center (%)	Open	Close	
Parameter range	5 +/- 2.2	95 +/- 2.2	⩽ 200	⩽ 200	⩾ 0.8

System Circuit Diagram

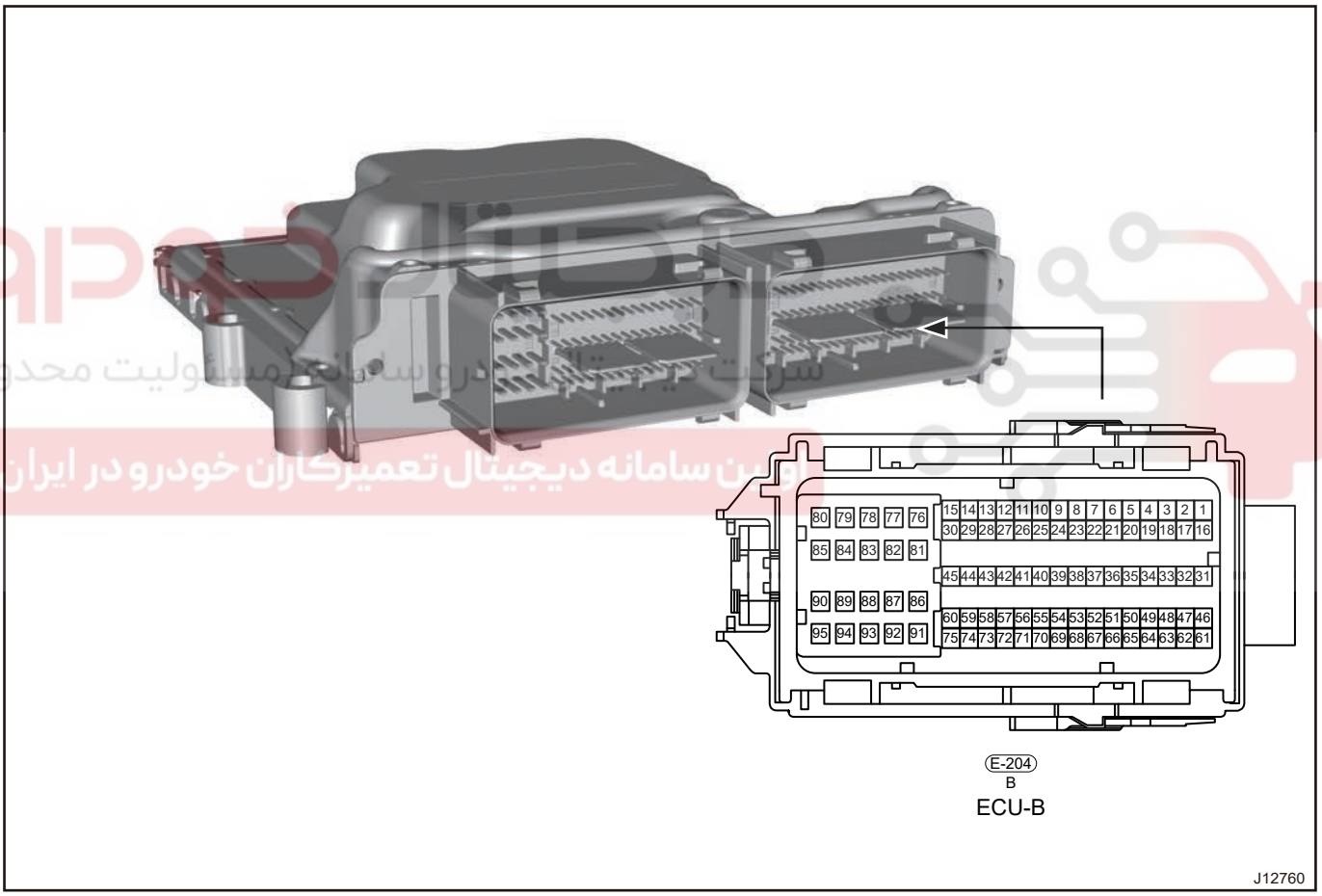
Module Terminal Definition



Pin	Definition	Pin	Definition
1	Starter Control LSD	53	—
2	—	54	—
3	—	55	Brake Light Switch Signal
4	—	56	Brake Switch
5	Starter Control HSD	57	Starter State Feedback Signal
6	Main relay	58	Activated Charcoal Canister Cut-off Valve
7	Crankshaft Heating Valve	59	Variable Oil Pump
8	Downstream Oxygen Sensor	60	Electronic thermostat
9	Analog Sensor Ground 5	61	Downstream Oxygen Sensor Heater
10	Analog Sensor Ground 6	62	Upstream Oxygen Sensor Heater
11	Analog Sensor Ground 7	63	Continuous Power Supply
12	Analog Sensor Ground 8	64	Refresh and Body CAN Low

Pin	Definition	Pin	Definition
13	Accelerator Pedal Sensor 1 Ground	65	Refresh and Body CAN High
14	Analog Sensor Power Supply 1	66	Upstream Oxygen IA
15	Accelerator Pedal Position Sensor 1 Power Supply	67	Upstream Oxygen VN
16	Accelerator Pedal Position Sensor 2 Power Supply	68	—
17	Sensor Power Supply (5 V)	69	—
18	Sensor Power Supply (5 V)	70	—
19	—	71	—
20	—	72	—
21	Electronic Vacuum Pump	73	—
22	—	74	—
23	DECOS Relay	75	—
24	A/C Compressor Relay	76	—
25	Pressure Discharge Control Valve	77	—
26	Fuel Control Enable Signal	78	—
27	Vacuum Pressure Sensor	79	—
28	Oxygen Sensor Ground	80	—
29	Accelerator Pedal Sensor 2 Ground	81	—
30	—	82	—
31	Accelerator Pedal Position Sensor 1	83	—
32	—	84	—
33	—	85	—
34	A/C Pressure Sensor	86	—
35	—	87	—
36	—	88	—
37	—	89	—
38	—	90	—
39	PWM Cooling Fan	91	—
40	Variable Valve Timing Valve (Exhaust)	92	—
41	Variable Valve Timing Valve (Intake)	93	—
42	Canister control valve	94	—
43	—	95	—

Pin	Definition	Pin	Definition
44	—	96	ECM Ground 4
45	—	97	ECM Ground 3
46	Ignition Switch	98	ECM Ground 2
47	LIN Bus	99	ECM Ground 1
48	Upstream Oxygen IP	100	Main Relay Power Supply 1
49	Upstream Oxygen VM	101	Main Relay Power Supply 2
50	—	102	Main Relay Power Supply 3
51	Accelerator Pedal Position Sensor 2	103	Main Relay Power Supply 4
52	GPF Front Temperature Sensor		



Pin	Definition	Pin	Definition
1	Sensor Power Supply 7 (5 V)	49	—
2	Sensor Power Supply 8 (5 V)	50	—
3	Sensor Power Supply 11 (5 V)	51	—
4	—	52	—
5	Digital Sensor Ground 2	53	—

Pin	Definition	Pin	Definition
6	Analog Sensor Ground 1	54	Electronic Waste Gate Position Signal
7	Analog Sensor Ground 2	55	—
8	Analog Sensor Ground 3	56	—
9	Analog Sensor Ground 4	57	Engine Speed Sensor Signal
10	Exhaust Phase Sensor Ground	58	—
11	Intake Phase Sensor Ground	59	—
12	2nd Cylinder Ignition	60	—
13	4th Cylinder Ignition	61	—
14	1st Cylinder Ignition	62	—
15	3rd Cylinder Ignition	63	—
16	Sensor Power Supply (5 V)	64	—
17	Intake Phase Sensor Power Supply 2	65	—
18	Speed Sensor Power Supply	66	—
19	—	67	—
20	Speed Sensor Ground	68	—
21	Conductive PCV Tube	69	—
22	Engine Coolant Temperature Sensor Signal 1	70	—
23	—	71	—
24	Cruise Control	72	—
25	Low Pressure Fuel Rail Pressure Sensor	73	—
26	Charcoal Canister Desorption Pressure Sensor	74	—
27	Boost Pressure Sensor Signal	75	—
28	Intake Pressure Sensor Signal	76	4th Cylinder Injector+
29	Boost Temperature Sensor Signal	77	4th Cylinder Injector-
30	Intake Phase Sensor Signal	78	1st Cylinder Injector-
31	Fuel Tank Pressure Sensor	79	3rd Cylinder Injector+
32	—	80	2nd Cylinder Injector+
33	—	81	Electronic Wastegate Control-
34	Electronic Throttle Feedback Signal 2	82	Electronic Waste Gate Control+

Pin	Definition	Pin	Definition
35	Engine Coolant Temperature Sensor Signal 2	83	1st Cylinder Injector+
36	High Pressure Fuel Rail Sensor Signal	84	3rd Cylinder Injector-
37	—	85	2nd Cylinder Injector-
38	Manifold Temperature Sensor Signal	86	Electronic Throttle Control-
39	—	87	—
40	Electronic Throttle Feedback Signal 1	88	—
41	Dual-mode GPF Differential Pressure Sensor (SENT 2)	89	—
42	Dual-mode GPF Differential Pressure Sensor (SENT 1)	90	Fuel Pressure Control Valve-
43	—	91	Electronic Throttle Control+
44	—	92	—
45	Exhaust Phase Sensor Signal	93	—
46	Knock Sensor (+)	94	—
47	Knock Sensor (-)	95	Fuel Pressure Control Valve+
48	—		

Diagnosis & Testing

Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Possible Cause
Engine does not crank or cranks slowly while starting	Battery
	Starter
	Wire harness or ENGINE START STOP switch
	Starter relay
	ECM, TCU
	Engine mechanical
Engine cranks normally but cannot start successfully while starting	No fuel in tank
	Fuel pump
	Fuel injector
	Engine speed sensor

Symptom	Possible Cause
	Ignition coil
	Engine immobilizer
	ECU
	Engine mechanical
Difficult to start with hot engine	Engine speed sensor
	Ignition coil
	Fuel pump
	Coolant temperature sensor
	Engine mechanical
	Camshaft sensor
Difficult to start with cold engine	Fuel pump
	Coolant temperature sensor
	Fuel injector
	Ignition coil
	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
	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

Symptom	Possible Cause
	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
Engine starts normally, but idles roughly or stalls with part load (for example, A/C is ON)	Electronic throttle
	Generator
Engine starts normally, but idle speed is too high	Electronic throttle body
	Intake pipe air leaked
	Coolant temperature sensor
Low engine speed or stalls when accelerating	Intake pressure sensor
	Intake pipe
	Exhaust pipe
	Ignition timing
	Throttle position sensor
	Fuel injector
	Spark Plug
Slow response when accelerating	Intake Pressure Sensor
	Intake pipe
	Exhaust pipe
	Ignition timing
	Throttle position sensor
	Fuel injector
	Spark Plug
Lack of power and poor performance when accelerating	Intake Pressure Sensor
	Intake pipe
	Exhaust pipe
	Ignition timing
	Throttle position sensor

Symptom	Possible Cause
	Fuel injector
	Spark Plug

Diagnosis Procedure

Hint:
Use following procedures to troubleshoot the control system.

1	**Vehicle brought to workshop**

Next

2	**Examine vehicle and check basic items**

Check system power supply voltage, and check that fuse, wire harness and connector are connected normally.

OK

Standard voltage: Not less than 12 V.

Result

NG → **Check and replace malfunctioning parts**

OK

3	**Using a diagnostic tester, read related DTC and data stream information**

Result

Result	Go to
No DTC	A
DTC occurs	B

A → **Perform troubleshooting procedure without DTCs according to malfunction symptom**

B

4	**Troubleshoot according to DTCs troubleshooting procedure**

Result

Result	Go to
Problem is not resolved	A
Problem is resolved	B

A → **Return to procedure 1 and troubleshoot the process again**

B

5	**According to airbag system malfunction repair completion inspection and delivery, confirm that malfunction is resolved**

Result

Result	Go to
Delivery inspection is failed	A
Delivery inspection is qualified	B

A → **Return to procedure 1 and troubleshoot the process again**

B

6	**Finished**

DTC Confirmation Procedure

Confirm that battery voltage is normal before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ENGINE START STOP switch to ON.
- Use the diagnostic tester to record and clear DTCs stored in engine system.
- Turn ENGINE START STOP switch to OFF and wait for several seconds.
- Turn ENGINE START STOP switch to “ON”, and then select read DTC.
- If DTC is detected, it indicates current malfunction. Go to inspection procedure - Step 1.
- If no DTC is detected, malfunction indicated by the DTC is intermittent.

Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggling test.
- Look for broken, bent, protruded or corroded terminals.
- Check engine system components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

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) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the 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 any additional accessories interfere with ground circuit.
6. If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P000A00	"A" Camshaft Position Slow Response Bank 1	The actual position of VVT has poor follow-up to the target position	1. Insufficient OCV oil valve pressure 2. OCV oil valve is blocked or leaking	1. Check if operating condition of cam phase regulator is normal (dirt blockage, oil leakage, sticking) 2. Check if operating condition of OCV oil control valve is normal
P003C00	“A" Camshaft Profile Control Performance/ Stuck Off Bank 1	The actual position of VVT cannot be moved to the vicinity of the target position	1. Insufficient OCV oil valve pressure 2. OCV oil valve is blocked or leaking	1. Check if operating condition of cam phase regulator is normal (dirt blockage, oil leakage, sticking) 2. Check if operating condition of OCV oil control valve is normal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P000B00	“B" Camshaft Position Slow Response Bank 1	The actual position of VVT has poor follow-up to the target position	1. Insufficient OCV oil valve pressure 2. OCV oil valve is blocked or leaking	1. Check if operating condition of cam phase regulator is normal (dirt blockage, oil leakage, sticking) 2. Check if operating condition of OCV oil control valve is normal
P005A00	“B" Camshaft Profile Control Performance/ Stuck Off Bank 1	The actual position of VVT cannot be moved to the vicinity of the target position	1. Insufficient OCV oil valve pressure 2. OCV oil valve is blocked or leaking	1. Check if operating condition of cam phase regulator is normal (dirt blockage, oil leakage, sticking) 2. Check if operating condition of OCV oil control valve is normal
P001000	“A” Camshaft Position Actuator Control Circuit Open Bank 1	Drive channel self-diagnosis is malfunctioning	1. Open circuit in intake VVT control circuit corresponding pin 2. Connector looseness or open 3. Actuator side circuit is damaged	1. Open circuit in intake VVT control circuit corresponding pin 2. Connector looseness or poor contact 3. Intake VVT circuit is damaged 4. ECM control pin corresponding to VVT is malfunctioning
P001300	“B” Camshaft Position Actuator Control Circuit Open Bank 1	Drive channel self-diagnosis is malfunctioning	1. Open circuit in exhaust VVT control circuit corresponding pin 2. Connector looseness or open 3. Actuator side circuit is damaged	1. Open circuit in exhaust VVT control circuit corresponding pin 2. Connector looseness or poor contact 3. Intake VVT circuit is damaged 4. ECM control pin corresponding to VVT is malfunctioning
P001676	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Relative position self-learning deviation absolute value of intake camshaft and crankshaft is greater than 20 degrees of crankshaft angle	1. Installation deviation	1. Check if relative installation position of crankshaft and intake camshaft is correct
P001678	Crankshaft Position - Camshaft Position Correlation	Absolute value of offset deviation between intake camshaft and crankshaft is greater than 15 degrees of crankshaft angle	1. Intake camshaft is aging and twisted	1. Check whether the position of intake camshaft has a large deviation from the installation

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Bank 1 Sensor A			
P001776	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B	Relative position self-learning deviation absolute value of exhaust camshaft and crankshaft is greater than 20 degrees of crankshaft angle	1. Installation deviation	1. Check if relative installation position of crankshaft and exhaust camshaft is correct
P001778	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B	Absolute value of offset deviation between exhaust camshaft and crankshaft is greater than 15 degrees of crankshaft angle	1. Exhaust camshaft is aging and twisted	1. Check if exhaust camshaft position has a large deviation from that during installation.
P003000	HO2S Heater Control Circuit Bank 1 Sensor 1	Drive channel self-diagnosis is malfunctioning	1. Connector looseness or poor contact 2. Open circuit in upstream oxygen sensor heater control circuit pin terminal 3. Upstream oxygen sensor heater control circuit power supply terminal is not connected to main relay 4. Sensor is damaged 5. Open circuit or internal circuit damage in upstream oxygen sensor heater pin circuit corresponding to ECM terminal	1. Check connector for looseness or poor contact 2. Check for open circuit in upstream oxygen sensor heater control circuit pin terminal 3. Check if upstream oxygen sensor heater control circuit power supply terminal is not connected to main relay 4. Check if sensor is damaged 5. Check for open circuit or internal circuit damage in upstream oxygen sensor heater pin circuit corresponding to ECM terminal
P003100	HO2S Heater Control Circuit Low Bank 1 Sensor 1	Drive channel self-diagnosis is malfunctioning	1. Upstream oxygen sensor heater control circuit pin terminal is short to ground 2. Upstream	1. Check if upstream oxygen sensor heater control circuit pin terminal is short to ground 2. Check if upstream oxygen sensor heater control circuit power supply

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			oxygen sensor heater control circuit power supply terminal is grounded 3. Upstream oxygen sensor heater pin corresponding to ECM terminal is short to ground	terminal is grounded 3. Check if upstream oxygen sensor heater pin corresponding to ECM terminal is short to ground
P003200	HO2S Heater Control Circuit High Bank 1 Sensor 1	Drive channel self-diagnosis is malfunctioning	1. Upstream oxygen sensor heater control circuit pin terminal is short to power supply 2. Upstream oxygen sensor heater pin corresponding to ECM terminal is short to power supply	1. Check if upstream oxygen sensor heater control circuit pin terminal is short to power supply 2. Check if upstream oxygen sensor heater pin corresponding to ECM terminal is short to power supply
P003313	Boost Discharge Control Valve Drive Circuit Open	Drive channel self-diagnosis is malfunctioning	1. Connector looseness or poor contact 2. Open circuit in boost discharge control valve drive circuit pin 3. Open circuit or internal circuit damage in boost discharge control valve drive circuit pin corresponding to ECM terminal	1. Check connector for looseness or poor contact 2. Check for open circuit in boost discharge control valve drive circuit pin 3. Check for open circuit or internal circuit damage in boost discharge control valve drive circuit pin corresponding to ECM terminal
P003411	Boost Discharge Control Valve Drive Circuit Short to Ground	Drive channel self-diagnosis is malfunctioning	1. Short circuit to ground in boost discharge control valve drive circuit 2.	1. Check for short circuit to ground in boost discharge control valve drive circuit 2. Check for short circuit to ground in boost discharge control

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			Short circuit to ground in boost discharge control valve drive circuit corresponding to ECM terminal	valve drive circuit corresponding to ECM terminal
P003512	Boost Discharge Control Valve Drive Circuit Short to Power Supply	Drive channel self-diagnosis is malfunctioning	1. Short circuit to power supply in boost discharge control valve drive circuit 2. Short circuit to power supply in boost discharge control valve drive circuit corresponding to ECM terminal	1. Check for short circuit to power supply in boost discharge control valve drive circuit 2. Check for short circuit to power supply in boost discharge control valve drive circuit corresponding to ECM terminal
P003600	HO2S Heater Control Circuit Bank 1 Sensor 2	Drive channel self-diagnosis is malfunctioning	1. Connector looseness or poor contact 2. Open circuit in downstream oxygen sensor heater control pin 3. Downstream oxygen sensor heater power supply terminal is not connected to main relay 4. Sensor is damaged 5. Open circuit or internal circuit damage in downstream oxygen sensor heater pin corresponding to ECM terminal	1. Check connector for looseness or poor contact 2. Check for open circuit in downstream oxygen sensor heater control pin 3. Check if downstream oxygen sensor heater power supply terminal is not connected to main relay 4. Check if sensor is damaged 5. Check for open circuit or internal circuit damage in downstream oxygen sensor heater pin corresponding to ECM terminal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P003700	HO2S Heater Control Circuit Low Bank 1 Sensor 2	Drive channel self-diagnosis is malfunctioning	1. Downstream oxygen sensor heater control circuit pin terminal is short to ground 2. Downstream oxygen sensor heater control circuit power supply terminal is grounded 3. Downstream oxygen sensor heater pin corresponding to ECM terminal is short to ground	1. Check if downstream oxygen sensor heater control circuit pin terminal is short to ground 2. Check if downstream oxygen sensor heater control circuit power supply terminal is grounded 3. Check if downstream oxygen sensor heater pin corresponding to ECM terminal is short to ground
P003800	HO2S Heater Control Circuit High Bank 1 Sensor 2	Drive channel self-diagnosis is malfunctioning	1. Downstream oxygen sensor heater control circuit pin terminal is short to power supply 2. Downstream oxygen sensor heater pin corresponding to ECM terminal is short to power supply	1. Check if downstream oxygen sensor heater control circuit pin terminal is short to power supply 2. Check if downstream oxygen sensor heater pin corresponding to ECM terminal is short to power supply
P003A22	Turbocharger/ Supercharger Boost Control "A" Position Exceeded Learning Limit	The zero point voltage learned for the first time exceeds the upper limit	1. Actuator status is inconsistent with SPEC 2. Closed position of actuator is blocked by foreign objects	1. Push the turbocharger to closed position manually, read position voltage to check if it is out of the range of SPEC 2. Check for foreign matter near turbocharger closed position
P003A21	Turbocharger/ Supercharger Boost Control "A" Position	The zero point voltage learned for the first time exceeds the lower limit	1. Actuator status is inconsistent with SPEC 2. Closed	1. Push the turbocharger to closed position manually, read position voltage to check if it is out of the range of SPEC 2.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Exceeded Learning Limit		position of actuator is blocked by foreign objects	Check for foreign matter near turbocharger closed position
P003A72	Turbocharger/ Supercharger Boost Control "A" Position Exceeded Learning Limit	The zero point voltage learned exceeds the upper limit	1. Actuator status is inconsistent with SPEC 2. Closed position of actuator is blocked by foreign objects	1. Push the turbocharger to closed position manually, read position voltage to check if it is out of the range of SPEC 2. Check for foreign matter near turbocharger closed position
P003A73	Turbocharger/ Supercharger Boost Control "A" Position Exceeded Learning Limit	The zero point voltage learned exceeds the lower limit	1. Actuator status is inconsistent with SPEC 2. Closed position of actuator is blocked by foreign objects	1. Push the turbocharger to closed position manually, read position voltage to check if it is out of the range of SPEC 2. Check for foreign matter near turbocharger closed position
P024477	Turbocharger/ Supercharger Wastegate Actuator "A" Range/ Performance	The deviation between target position of turbocharger electronic waste gate and actual position exceeds the threshold	1. Actuator status is inconsistent with SPEC 2. Closed position of actuator is blocked by foreign objects	1. Check if electronic waste gate is stuck 2. Check if wire harness and connector are aging
P024437	Turbocharger/ Supercharger Wastegate Actuator "A" Range/ Performance	The duty ratio of turbocharger electronic waste gate control exceeds the limit	1. Actuator status is inconsistent with SPEC 2. Closed position of actuator is blocked by foreign objects	1. Check if electronic waste gate is stuck 2. Check if wire harness and connector are aging
P256400	Turbocharger Boost Control Position Sensor "A" Circuit Low	The voltage of turbocharger electronic waste gate position sensor is below the limit	1. Sensor circuit short to ground 2. Pin corresponding to ECM short to ground	1. Check if electronic waste gate position sensor wire harness is short to ground
P256500	Turbocharger Boost Control Position Sensor "A" Circuit High	The voltage of turbocharger electronic waste gate position	1. Sensor circuit short to power supply or open 2. Pin	Check electronic waste gate position sensor wire harness for short to power supply

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		sensor is higher than the limit	corresponding to ECM short to power supply or open	
P170300	Communication Failure of Supercharger Wastegate Control Circuit	Communication failure of supercharger wastegate control circuit SPI	1. Communicati-on failure of supercharger wastegate control circuit SPI	1. Check electronic waste gate control circuit for problem
P005300	HO2S Heater Resistance Bank 1 Sensor 1	Current internal resistance value is higher than the threshold value of corresponding working condition	1. Heating circuit failure 2. Oxygen sensor resistor deteriorated	1. Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire harness oxygen sensor terminal No.1 wire (white, heater power supply positive) is 12 V. 2. Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire harness oxygen sensor terminal No.2 wire (white, heater power supply grounded) is 12 V. 3. 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.1 interface (white, heater power supply positive) and No.2 interface (white, heater power supply grounded) is higher than 15 Ω with a multimeter when temperature of oxygen sensor cools down to room temperature. (Oxygen sensor resistance measurement must be performed when temperature of oxygen sensor cools down to room temperature, as

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				resistance is related to temperature.)
P005400	HO2S Heater Resistance Bank 1 Sensor 2	Current internal resistance value is higher than the threshold value of corresponding working condition	1. Heating circuit failure 2. Oxygen sensor resistor deteriorated	1. Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire harness oxygen sensor terminal No.1 wire (white, heater power supply positive) is 12 V. 2. Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire harness oxygen sensor terminal No.2 wire (white, heater power supply grounded) is 12 V. 3. 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.1 interface (white, heater power supply positive) and No.2 interface (white, heater power supply grounded) is higher than 15 Ω with a multimeter when temperature of oxygen sensor cools down to room temperature. (Oxygen sensor resistance measurement must be performed when temperature of oxygen sensor cools down to room temperature, as resistance is related to temperature.)
P222900	Barometric Pressure Sensor "A" Circuit High	The sensor sends fault information by itself	1. The built-in ambient pressure sensor in ECM fails	1. Check if ambient pressure sensor signal valve is too high or low
P222800	Barometric Pressure Sensor "A"			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Circuit Low Problem			
P222722	Barometric Pressure Sensor "A" Circuit Range/ Performance	The sensor sends fault information by itself	1. The built-in ambient pressure sensor in ECM fails	1. Check if ambient pressure sensor signal valve is significantly different from the current atmospheric pressure
P222721	Barometric Pressure Sensor "A" Circuit Range/ Performance			
P222785	Barometric Pressure Measurement System - Multiple Sensor Correlation Bank 1			
P222784	Barometric Pressure Measurement System - Multiple Sensor Correlation Bank 1			
P120200	Barometric Pressure Sensor "A" Circuit Range/ Performance			
P120300	Barometric Pressure Sensor "A" Circuit Range/ Performance			
P008985	Fuel Pressure Regulator 1 Performance- Pressure Too Low	PID control deviation of high pressure oil supply is higher than 5MPa	1. Oil passage is leaked 2. Insufficient fuel 3. Low pressure oil pump is damaged 4. The working capacity of high pressure oil pump is reduced	1. Check if oil passage is leaked 2. Check if fuel is insufficient 3. Check if low pressure oil pump is damaged 4. Check if the working capacity of high pressure oil pump is reduced

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P008984	Fuel Pressure Regulator 1 Performance-Pressure Too High	PID control deviation of high pressure oil supply is lower than -5MPa	1. High pressure oil pump control failure 2. Pressure relief valve blocked	1. Check if high pressure oil pump control is normal 2. Check relief valve for blockage or abnormal operation
P008700	Fuel Rail/ System Pressure - Too Low	High pressure fuel rail pressure control deviation is lower than -3MPa	1. Oil passage is leaked 2. Insufficient fuel 3. Low pressure oil pump is damaged 4. The working capacity of high pressure oil pump is reduced	1. Check if oil passage is leaked 2. Check if fuel is insufficient 3. Check if low pressure oil pump is damaged 4. Check if the working capacity of high pressure oil pump is reduced
P008800	Fuel Rail/ System Pressure - Too High	High pressure fuel rail pressure control deviation is higher than 3MPa	1. High pressure oil pump control failure 2. Pressure relief valve blocked	1. Check if high pressure oil pump control is normal 2. Check relief valve for blockage or abnormal operation
P009000	Short Circuit in High Side and Low Side Control Circuit of Flow Control Valve	Drive channel self-diagnosis is malfunctioning	1. Short circuit in high side and low side control circuits of flow control valve	1. Check for short circuit in high side and low side control circuits of flow control valve
P009626	Intake Air Temp.Circ. Performance Non-plausible	The measured value of boost temperature sensor remains unchanged	1. Sensor aging deviation	1. Connect diagnostic tester, turn ignition 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 boost temperature range. You can also use a multimeter to measure if boost temperature sensor signal terminal voltage is close to or equal to 0 V. 2. Sensor aging deviation
P009800	Intake Air Temperature Sensor 2 Circuit High Bank 1	Temperature sensor voltage is higher than 4.9 V	1. Boost temperature sensor signal terminal is	1. Connect diagnostic tester, turn ignition switch to “ON”. Do not start engine, and observe if

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			short to power supply or open 2. Open circuit in sensor reference ground 3. Short circuit to power supply, open circuit or internal circuit damage in boost temperature sensor signal pin corresponding to ECM terminal 4. Sensor is damaged	“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 boost temperature sensor signal terminal and ground is close to or equal to 5 V. 2. Turn ignition switch to “OFF”, check connector for looseness or poor contact 3. Check if sensor signal terminal is short to power supply or open 4. Check if sensor reference ground is open 5. Check if sensor is damaged 6. Check for short circuit to power supply, open circuit or internal circuit damage in boost temperature sensor signal pin corresponding to ECM
P009700	Intake Air Temperature Sensor 2 Circuit Low Bank 1	Temperature sensor voltage is lower than 0.1 V	1. Boost temperature sensor signal terminal is short to ground 2. Short circuit to ground in boost temperature sensor signal pin corresponding to ECM terminal	1. Connect diagnostic tester, turn ignition 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 boost temperature sensor signal terminal and ground is close to or equal to 5 V. 2. Turn ignition switch to “OFF”, check connector for looseness or poor contact 3. Check if sensor signal terminal is short to ground 4. Check if boost temperature sensor signal pin

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				corresponding to ECM terminal is short to ground
P009900	Intake Air Temperature Sensor 2 Circuit Intermittent Bank 1	Boost temperature sensor voltage discontinuity is higher than 4.9 V	1. Boost temperature sensor signal terminal is poor contact 2. Connector looseness 3. Poor contact in boost temperature sensor signal pin corresponding to ECM terminal	1. Connect diagnostic tester, turn ignition 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 boost temperature range. You can also use a multimeter to measure if voltage between boost temperature sensor signal terminal and ground is close to or equal to 5 V. 2. Turn ignition switch to “OFF”, check connector for looseness or poor contact 3. Check sensor signal terminal for poor contact 4. Check boost temperature sensor signal pin corresponding to ECM terminal for poor contact
P01062A	Manifold Absolute Pressure Sensor Circuit Range/ Performance	The difference between intake pressure value and initial pressure value at startup is always less than 20 hPa	1. Sensor is icing and oily 2. Incorrect installation position of sensor 3. Intake line is detached or seriously air leaked	1. 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). 2. Turn ignition switch to “OFF”, check if there is any freeze, oil stain, etc. on measurement terminal of sensor, which will affect normal measurement. 3. Check if intake pressure sensor installation position is incorrect, intake line is detached or seriously air leaked.
P010622	Manifold Absolute Pressure Sensor Circuit	The intake pressure value exceeds the reasonableness threshold	1. Sensor is icing and oily 2. Sensor is aging 3. Intake	1. Do not start engine, and observe if “Intake Pressure” item in data flow is seriously deviated

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Range/ Performance		line is detached or seriously air leaked	from ambient pressure by about 101 kpa (specific value is related to current pressure). 2. Turn ignition switch to “OFF”, check if there is any freeze, oil stain, etc. on measurement terminal of sensor, which will affect normal measurement. 3. Check if intake pressure sensor installation position is incorrect, intake line is detached or seriously air leaked.
P010621	Manifold Absolute Pressure Sensor Circuit Range/ Performance			
P120000	Manifold Absolute Pressure Sensor Circuit Range/ Performance			
P120100	Manifold Absolute Pressure Sensor Circuit Range/ Performance			
P00C721	Intake Air Pressure Measurement System - Multiple Sensor Correlation Bank 1			
P00C722	Intake Air Pressure Measurement System - Multiple Sensor Correlation Bank 1			
P120400	Turbocharger/ Supercharger Boost Sensor "A" Circuit Range/ Performance	The boost pressure value exceeds the reasonableness threshold	1. Sensor is icing and oily 2. Sensor is aging 3. Intake line is detached or seriously air leaked	1. Turn ignition switch to “OFF”, check if there is any freeze, oil stain, etc. on measurement terminal of sensor, which will affect normal measurement. 2. Check if boost pressure sensor installation position is incorrect, intake line is detached or seriously air leaked.
P120500	Turbocharger/ Supercharger Boost Sensor "A" Circuit Range/ Performance			
P023622	Turbocharger/ Supercharger Boost Sensor "A" Circuit			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Range/ Performance			
P023621	Turbocharger/ Supercharger Boost Sensor "A" Circuit Range/ Performance			
P010700	Intake Manifold Pressure Sensor Circuit Voltage Too Low	Sensor voltage is lower than the threshold	1. Intake pressure sensor signal terminal is short to ground 2. 5 V reference voltage of sensor is open 3. Short circuit to ground in intake pressure sensor signal pin corresponding to ECM terminal	1. Connect diagnostic tester, turn ignition switch to “ON”. Do not start engine, use a multimeter to measure if voltage of intake manifold pressure sensor signal terminal is close to or equal to 0 V. 2. Turn ignition switch to “OFF”, check if pressure sensor signal terminal is short to ground 3. Check if sensor 5 V reference voltage terminal is open 4. Check if intake pressure sensor signal pin terminal corresponding to ECM terminal is short to ground
P010800	Intake Manifold Pressure Sensor (-Electric) Circuit Short to Battery	Sensor voltage is higher than the threshold	1. Intake manifold pressure sensor signal terminal is short to power supply or open 2. Sensor reference ground terminal is open 3. Short circuit to power supply or open circuit in intake pressure sensor signal pin terminal corresponding to ECM terminal 4. Sensor is damaged	1. Connect diagnostic tester, turn ignition switch to “ON”. Do not start engine, use a multimeter to measure if voltage between intake manifold pressure sensor signal terminal and ground is close to or equal to 5 V. 2. Turn ignition switch to “OFF”, check connector for looseness or poor contact 3. Check if intake manifold pressure sensor signal terminal is short to power supply or open 4. Check if sensor reference ground terminal is open 5. Check if sensor is damaged 6. Check for short circuit to power supply, open circuit or internal circuit damage in intake pressure sensor signal pin terminal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				corresponding to ECM terminal
P011126	Intake Air Temp.Circ. Performance Non-plausible	No fluctuations in intake temperature sensor measured value	1. Intake manifold temperature sensor signal end circuit interference 2. Sensor is damaged	1. Check whether there is interference or contact resistance in signal end circuit of intake manifold temperature sensor 2. Check if sensor is damaged
P011200	Intake Air Temp.Circ. Low Input	Temperature sensor voltage is lower than 0.1 V	1. Intake manifold temperature sensor signal terminal short to ground 2. Sensor is damaged	1. Use a multimeter to measure if intake temperature sensor signal terminal voltage is close to or equal to 0 V. 2. Turn ignition switch “OFF”, and check if intake manifold temperature sensor signal terminal is short to ground. 3. Check if sensor is damaged 4. Check if intake manifold temperature sensor signal pin corresponding to ECM terminal is short to ground.
P011300	Intake Air Temp.Circ. High Input	Temperature sensor voltage is higher than 4.9 V	1. Intake manifold temperature sensor signal terminal is short to power supply or open 2. Open circuit in sensor reference ground 3. Short circuit to power supply, open circuit or internal circuit damage in intake manifold temperature sensor signal pin corresponding to ECM terminal 4. Sensor is damaged	1. Use a multimeter to measure if voltage between intake manifold temperature sensor signal terminal and ground is close to or equal to 5 V. 2. Turn ignition switch to “OFF”, check connector for looseness or poor contact 3. Check if sensor signal terminal is short to power supply or open 4. Check if sensor reference ground is open 5. Check if sensor is damaged 6. Check for short circuit to power supply, open circuit or internal circuit damage in intake manifold temperature sensor signal pin corresponding to ECM terminal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P011400	Poor Contact in Intake Manifold Temperature Sensor Circuit	Temperature sensor voltage discontinuity is higher than 4.9 V	1. Intake manifold temperature sensor signal terminal is poor contact 2. Connector looseness 3. Poor contact in intake manifold temperature sensor signal pin corresponding to ECM terminal	1. Use a multimeter to measure if voltage between intake manifold temperature sensor signal terminal and ground is close to or equal to 5 V. 2. Turn ignition switch to “OFF”, check connector for looseness or poor contact 3. Check sensor signal terminal for poor contact 4. Check intake manifold temperature sensor signal pin corresponding to ECM terminal for poor contact
P00CE23	Intake Air Temperature Sensor 2 Multiple Check Bank1	The intake air temperature sensor deviates too much from the average model during cold start	1. Internal resistance of intake air temperature sensor is unreasonable	1. Check wire harness for contact resistance 2. Check if internal resistance value of sensor greatly deviates from the normal value
P138024	Intake Air Temperature Sensor 2 Multiple Check Bank1			
P138023	Intake Air Temperature Sensor 2 Multiple Check Bank1			
P011623	Coolant Temperature Sensor 1 Signal Not Plausible	Coolant temperature sensor 1 signal is less than 30℃ of lowest model value	1. Internal resistance of coolant temperature sensor is unreasonable	1. Check wire harness for contact resistance 2. Check if internal resistance value of sensor greatly deviates from the normal value
P011626	Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	Coolant temperature sensor 1 signal remains unchanged		
P050C24	Cold Start Engine Coolant Temperature Performance	Deviation of coolant temperature sensor 1 cold start and the model value is too large		
P050C23	Cold Start Engine Coolant Temperature Performance	Deviation of coolant temperature sensor 1 cold start and the model value is too large		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P011700	Engine Coolant Temperature Sensor 1 Circuit Low	Coolant temperature sensor 1 voltage is lower than 0.09 V	1. Coolant temperature sensor signal terminal is short to ground 2. Short circuit to ground in coolant temperature sensor 1 signal pin corresponding to ECM terminal 3. Sensor is damaged	1. Connect diagnostic tester, turn ignition 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 1 signal terminal voltage is close to or equal to 0 V. 2. Turn ignition switch to “OFF”, check if coolant temperature sensor 1 signal terminal is short to ground 3. Check if sensor is damaged 4. Check if coolant temperature sensor 1 signal pin terminal corresponding to ECM is short to ground
P011800	Engine Coolant Temperature Sensor 1 Circuit High	Coolant temperature sensor 1 voltage is higher than 4.9 V	1. Connector looseness or poor contact 2. Short circuit to power supply or open in coolant temperature sensor signal terminal 3. Short circuit to power supply or open in coolant temperature sensor signal pin corresponding to ECM terminal 4. Sensor is damaged	1. Connect diagnostic tester, turn ignition 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 1 signal terminal and ground is close to or equal to 5 V. 2. Turn ignition switch to “OFF”, check connector for looseness or poor contact 3. Check if sensor signal terminal is short to power supply or open 4. Check if sensor reference ground is open 5. Check if sensor is damaged 6. Check for short circuit to power supply, open circuit or internal circuit damage in

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				coolant temperature sensor signal pin corresponding to ECM terminal
P011900	Engine Coolant Temperature Sensor 1 Circuit Intermittent	Coolant temperature sensor voltage jumps	1. Coolant temperature sensor signal terminal circuit is in poor contact	1. Check signal terminal circuit of coolant temperature sensor for poor contact
P012800	Coolant Thermostat (- Coolant Temperature Below Thermostat Regulating Temperature)	Coolant temperature below thermostat regulating temperature	1. Thermostat normally open 2. Coolant temperature sensor measurement value offset	1. Check if thermostat is normally open or damaged 2. Check for short to power supply, open circuit or internal circuit damage in coolant temperature sensor signal pin corresponding to ECM terminal
P013100	O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Upstream oxygen sensor signal line IA, IP, UN, VM signal is zero	1. The signal circuit voltage of upstream oxygen sensor is too low (APE IPE RE circuit is short to ground)	1. Start vehicle, idle it and slightly change accelerator pedal opening for a period of time, pierce wire harness connector with red tip of a multimeter to close to red (IP), yellow (VM), green (IA), and black (UN) wire insulation layer of ECM terminal, connect black tip to ground, and check if voltage is short. 2. Replace LSU oxygen sensor, check if failure will continue to be reported. 3. Check for abnormality in LSU processing circuit in ECM.
P013200	O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Upstream oxygen sensor signal line IA, IP, UN, VM signal is always high	1. Upstream oxygen sensor signal circuit voltage is too high (APE IPE RE wire is short to power supply)	1. Start the vehicle, keep it idling and slightly change the accelerator pedal to run for a period of time, puncture the red (IP), yellow (VM), green (IA), and black (UN) wire insulation layer of wire harness connector near ECM terminal with the red probe of a multimeter, ground the black probe, and check whether the voltage is always high

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				and has small changes. 2. Replace LSU oxygen sensor, check if failure will continue to be reported. 3. Check for abnormality in LSU processing circuit in ECM.
P013300	O2 Sensor Circuit Slow Response Bank 1 Sensor 1	The dynamic factor of upstream oxygen sensor is less than the threshold	1. The oxygen sensor is aging and the response becomes slow	1. Check intake system and exhaust system for air leakage. 2. Replace upstream LSU oxygen sensor, return vehicle to the customer, and check whether fault reappears.
P013600	O2 Sensor Circuit Bank 1 Sensor 2	The voltage range of downstream oxygen sensor exceeds the limit	1. Oxygen sensor signal wire is short to heating power supply ground wire 2. Oxygen sensor is damaged	1. Do not disconnect oxygen sensor connector and measure if voltage of downstream oxygen sensor wire harness oxygen sensor terminal No.1 wire (white, heater power supply positive) is 12 V. 2. Do not disconnect oxygen sensor connector and measure if voltage of downstream oxygen sensor wire harness oxygen sensor terminal No.2 wire (white, heater power supply grounded) is 12 V. 3. Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECM terminal No.4 wire (black, oxygen sensor signal wire) and No.3 wire (gray, oxygen sensor signal grounded) is about 0.45 V. 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 ECM terminal No.4 wire (black, oxygen sensor signal wire) and No.3 wire (gray, oxygen sensor signal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				grounded) is changed between 0 V and 1 V. 5. Start and keep vehicle idling until coolant temperature reaches normal value. Disconnect downstream oxygen sensor connector, and check for short circuit between oxygen sensor terminal No.2 wire (white, heater power grounded) and No.4 wire (black, oxygen sensor signal wire). 6. 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.
P013700	O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	The downstream oxygen sensor voltage range is less than 0.06 V	1. Downstream oxygen sensor signal circuit is short to ground	1. Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECM terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45 V. 2. 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 ECM terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is changed between 0 V and 1 V. 3. Disconnect downstream oxygen sensor connector and measure if sensor terminal No.1 wire (gray, oxygen sensor signal grounded) and No.2 wire

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				(black, oxygen sensor signal wire) are short circuit with a multimeter. 4. 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.
P013800	O2 Sensor Circuit High Voltage Bank 1 Sensor 2	The downstream oxygen sensor voltage range is higher than 1.2 V	1. Downstream oxygen sensor signal circuit is short to power supply	1. Do not disconnect oxygen sensor connector and measure if voltage of downstream oxygen sensor wire harness oxygen sensor terminal No.4 wire (white, heater power supply positive) is 12 V. 2. Do not disconnect oxygen sensor connector and measure if voltage of downstream oxygen sensor wire harness oxygen sensor terminal No.3 wire (white, heater power supply grounded) is 12 V. 3. Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECM terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45 V. 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 ECM terminal No.2 wire (black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is changed between 0 V and 1 V. 5. Disconnect downstream oxygen sensor connector and measure if there is

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				short circuit between sensor terminal No.4 wire (white, heater power supply positive) and No.2 wire (black, oxygen sensor signal wire) with a multimeter. 6. 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.
P019200	Fuel Rail Pressure Sensor Circuit Short to Ground	Fuel rail pressure sensor circuit voltage is lower than 0.2 V	1. Fuel rail pressure sensor circuit short to ground 2. Fuel rail pressure sensor pin corresponding to ECM short to ground	1. Check if sensor signal terminal is short to ground 2. Check if sensor is damaged 3. Check for short circuit to power supply, open circuit or internal circuit damage in fuel rail pressure sensor signal pin corresponding to ECM terminal
P019300	Fuel Rail Pressure Sensor Circuit Short to Power Supply	Fuel rail pressure sensor circuit voltage is higher than 4.8 V	1. Fuel rail pressure sensor circuit short to power supply 2. Fuel rail pressure sensor pin corresponding to ECM short to power supply	1. Check if sensor signal terminal is short to power supply or open 2. Check if sensor is damaged 3. Check for short circuit to power supply, open circuit or internal circuit damage in fuel rail pressure sensor signal pin corresponding to ECM terminal
P019400	Fuel Rail Pressure Sensor Circuit Intermittent/ Erratic Bank 1	The maximum fluctuation value of fuel rail pressure sensor signal voltage before and after fuel injection is lower than the threshold	1. Fuel rail pressure sensor is damaged 2. Injector is blocked or damaged 3. High pressure fuel rail is abnormal	1. Replace the fuel rail pressure sensor, start vehicle for 10 minutes and check if the fault reappears 2. Replace the fuel injector, start vehicle for 10 minutes and check if the fault reappears 3. Check if high pressure fuel rail system is abnormal 4. Repair or replace the corresponding components, start vehicle for 10 minutes and check if the fault reappears

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P020113	Cylinder 1 Fuel Injector Control Circuit Open	Drive channel self-diagnosis is malfunctioning	1. Connector looseness or poor contact 2. Open circuit in fuel injector 3. Open circuit in fuel injector power supply terminal or fuel injector damage 4. Open circuit or internal circuit damage in injector control pin corresponding to ECM	1. Check connector for looseness or poor contact 2. Check for open circuit in corresponding fuel injector circuit 3. Check for open circuit in corresponding fuel injector power supply terminal or fuel injector damage 4. Check for open circuit or internal circuit damage in injector control pin corresponding to ECM
P020213	Cylinder 2 Fuel Injector Control Circuit Open			
P020313	Cylinder 3 Fuel Injector Control Circuit Open			
P020413	Cylinder 4 Fuel Injector Control Circuit Open			
P230112	Ignition Coil “A” Primary Control Circuit High	Drive channel self-diagnosis is malfunctioning	1. Short circuit to power supply in ignition coil circuit 2. Short circuit to power supply in ignition coil power supply terminal 3. Short to power supply in ignition coil control pin corresponding to ECM	1. Check for short circuit to power supply in corresponding ignition coil circuit 2. Check for short circuit to power supply in ignition coil control pin corresponding to ECM
P230412	Ignition Coil “B” Primary Control Circuit High			
P230712	Ignition Coil “C” Primary Control Circuit High			
P231012	Ignition Coil “D” Primary Control Circuit High			
P230011	Ignition Coil “A” Primary Control Circuit Low	Drive channel self-diagnosis is malfunctioning	1. Connector is short to ground 2. Short circuit to ground in ignition coil circuit 3. Short circuit to ground in ignition coil control pin corresponding to ECM	1. Check if connector is short to ground 2. Check for short circuit to ground in corresponding ignition coil circuit 3. Check for short circuit to ground in ignition coil control pin corresponding to ECM
P230311	Ignition Coil “B” Primary Control Circuit Low			
P230611	Ignition Coil “C” Primary Control Circuit Low			
P230911	Ignition Coil “D” Primary			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Control Circuit Low			
P026200	Cylinder 1 Fuel Injector Control Circuit Short to Power Supply	Drive channel self-diagnosis is malfunctioning	1. Injector circuit is short to power supply 2. Injector power supply terminal is short to power supply 3. Short to power supply in injector control pin corresponding to ECM	1. Check for short circuit to power supply in corresponding injector circuit 2. Check for short circuit to power supply in injector control pin corresponding to ECM
P026800	Cylinder 3 Fuel Injector Control Circuit Short to Power Supply			
P027100	Cylinder 4 Fuel Injector Control Circuit Short to Power Supply			
P026500	Cylinder 2 Fuel Injector Control Circuit Short to Power Supply			
P025100	Flow Control Valve Positive or Negative Control Circuit Open	Hardware circuit self-diagnostic	1. Open circuit in positive or negative control circuit of flow control valve 2. Open circuit in positive or negative control circuit of flow control valve corresponding to ECM	1. Check for open circuit in actuator terminal 2. Check for open circuit or internal circuit damage in actuator pin corresponding to ECM terminal
P025400	Flow Control Valve High Side Control Circuit Voltage Too High or Too Low	Hardware circuit self-diagnostic	1. flow control valve high side control circuit short to power supply or ground 2. Short to power supply or ground in high side control valve circuit corresponding to ECM	1. Check for short circuit to power supply or ground in actuator terminal 2. Check for short circuit to power supply or ground in actuator pin corresponding to ECM terminal
P025900	Injection Pump Fuel Metering Control "A"	Hardware circuit self-diagnostic	1. Flow control valve low side control circuit short to power	1. Check for short circuit to power supply or ground in actuator terminal 2. Check for short circuit to

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Low (Cam/ Rotor/Injector)		supply or ground 2. Short to power supply or ground in low side control valve circuit corresponding to ECM	power supply or ground in actuator pin corresponding to ECM terminal
P030000	Random/ Multiple Cylinder Misfire Detected	Misfire counter exceeds threshold	1) Injector circuit failure 1) Ignition coil circuit failure 1) Injector control pin or ignition coil pin corresponding to ECM failure	1. Check for DTCs related to injector in corresponding cylinder 2. Check connector for looseness or disengagement 3. Check for open circuit or short circuit to ground or power supply in ignition coil signal terminal 4. Check for open circuit or short circuit to ground in ignition coil power supply terminal 5. Check for open circuit or short circuit to power supply in ignition coil grounded terminal 6. Check ignition coil itself for fault 7. Check if spark plug is abnormal 8. Check for open circuit or internal circuit damage in ignition coil control pin corresponding to ECM
P030100	Cylinder 1 Misfire Detected			
P030200	Cylinder 2 Misfire Detected			
P030300	Cylinder 3 Misfire Detected			
P030400	Cylinder 4 Misfire Detected			
P036300	Cylinder Selective Fuel Cutoff Active due to Catalyst Damaging Misfire			
P033900	Crankshaft Position Sensor “A” Circuit Intermittent	Speed sensor signal failure counter exceeds the threshold	1. Connector looseness or disengageme- nt 2. Open circuit in signal terminal 3. Sensor damage	1. Check connector for looseness or poor contact 2. Check for open circuit in speed sensor signal terminal 3. Check for sensor signal terminal pin is short to power supply or ground, or short circuit between pins. 4. Check if sensor is damaged 5. Check pin corresponding to speed sensor signal on ECM for fault
P261700	Crankshaft Position Signal Output Circuit Open			
P032700	Knock Sensor Signal Short to Ground (A)	/	/	1. Check connector for looseness or poor contact 2. Check knock sensor signal terminal pin for short circuit to ground or

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P032714	Knock Sensor Signal Short to Ground (B)	/	/	open circuit 3. Replace the knock sensor, reconnect it, and check whether the fault is eliminated 4. Check for short circuit to ground or open circuit in knock sensor signal terminal pin corresponding to ECM terminal
P032800	Knock Sensor Signal Short to Power Supply (A)	/	/	1. Check connector for looseness or poor contact 2. Check knock sensor signal terminal pin for short circuit to power supply 3. Replace the knock sensor, reconnect it, and check whether the fault is eliminated 4. Check for short circuit to power supply in knock sensor signal terminal pin corresponding to ECM terminal
P032815	Knock Sensor Signal Short to Power Supply (B)	/	/	
P032500	Knock Sensor Signal Circuit Voltage Too Low	The average value of knock sensor port voltage is less than 0.7 V	1. Connector looseness or disengageme-nt 2. Open circuit in signal terminal 3. Sensor damage	1. Check connector for looseness or poor contact 2. Check for short circuit to ground or open circuit in knock sensor signal terminal 3. Check if knock sensor connecting wire harness is non-standard shielding wire and is subjected to electromagnetic interference 4. Check if knock sensor is damaged 5. Check for damage in knock sensor pin or circuit corresponding to ECM terminal
P151000	Knock Control System Failure	The number of window length errors is higher than 4, and the number of non-measurement window output is higher than 28	1. Sensor is damaged 2. ECM is damaged	1. Check if knock sensor is damaged 2. Check if ECM is damaged
P032600	Knock/ Combustion Vibration Sensor 1 Circuit	Knock background noise is greater than the maximum noise signal threshold	1. Sensor is damaged 2. ECM is damaged 3.	1. Check if knock sensor is damaged 2. Check if ECM is damaged 3. Check if engine is abnormal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Bank 1 or Single Sensor		Engine is abnormal	
P034100	Camshaft Position Sensor "A" Circuit Range/ Performance Bank 1 or Single Sensor	Sensor signal failure counter of intake camshaft phase sensor exceeds the threshold	1. Connector looseness or disengageme-nt 2. Relative installation position between intake phase sensor and its signal plate do not meet the installation requirements 3. Intake phase signal plate teeth mechanical malfunction	1. Check connector for looseness or poor contact 2. Check wire harness for external interference 3. Check if relative installation position between intake phase sensor and its signal plate does not meet the installation requirements (such as too far, misaligned, etc.) 4. Check for mechanical malfunction in intake phase signal plate teeth
P034200	Camshaft Position Sensor “A" Circuit Low Bank 1 or Single Sensor	Sensor signal failure counter of intake camshaft phase sensor exceeds the threshold	1. Intake phase sensor power supply failure 2. Intake phase sensor signal terminal is short to ground 3. Intake phase sensor signal terminal ECM pin is short to ground	1. Unplug connector from intake phase sensor on wire harness, and use a multimeter to check if the voltage between power supply terminal and ground terminal pin of phase sensor is about 12 V. 2. Check if the voltage between intake phase sensor signal terminal pin and ground terminal pin is 0 V 3. Check if intake phase sensor power supply terminal pin is open or short to ground, and if ground terminal pin is in poor contact 4. Check if intake phase sensor signal terminal pin is short to ground 5. Check if intake phase sensor signal terminal pin corresponding to ECM is short to ground
P034300	Camshaft Position Sensor “A" Circuit High Bank 1 or Single Sensor	Sensor signal failure counter of intake camshaft phase sensor exceeds the threshold	1. Intake phase sensor ground terminal failure 2. Intake phase sensor signal terminal	1. Unplug connector from intake phase sensor on wire harness, and use a multimeter to check if the voltage between power supply terminal and ground terminal pin of

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			is short to power supply 3. Intake phase sensor signal terminal ECM pin is short to power supply	phase sensor is about 12 V. 2. Check if the voltage between intake phase sensor signal terminal pin and ground terminal pin is 12 V 3. Check if intake phase sensor ground terminal pin is open or short to power supply 4. Check if intake phase sensor signal terminal pin is short to power supply or open 5. Check for short circuit to power supply, open circuit or internal circuit damage in intake phase sensor signal terminal pin corresponding to ECM
P035113	Ignition Coil "A" Primary Control Circuit Failure	Drive channel self-diagnosis is malfunctioning	1. Short circuit to ground or open circuit in ignition coil circuit 2. Short circuit to ground or open circuit in ignition coil control pin corresponding to ECM	1. Check for short circuit to ground or open circuit in ignition coil circuit 2. Check for short circuit to ground or open circuit in ignition coil control pin corresponding to ECM
P035213	Ignition Coil "B" Primary Control Circuit Failure			
P035313	Ignition Coil "C" Primary Control Circuit Failure			
P035413	Ignition Coil "D" Primary Control Circuit Failure			
P036600	Exhaust Camshaft Phaser Sensor Signal Improper	Sensor signal failure counter of exhaust camshaft phase sensor exceeds the threshold	1. Connector looseness or disengageme-nt 2. Relative installation position between exhaust phase sensor and its signal plate do not meet the installation requirements 3. Exhaust phase signal plate teeth mechanical malfunction	1. Check connector for looseness or poor contact 2. Check wire harness for external interference 3. Check if relative installation position between intake phase sensor and its signal plate does not meet the installation requirements (such as too far, misaligned, etc.) 4. Check for mechanical malfunction in exhaust phase signal plate teeth

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P036700	Camshaft Position Sensor “B” Circuit Low (Bank1)	Sensor signal failure counter of exhaust camshaft phase sensor exceeds the threshold	1. Exhaust phase sensor power supply failure 2. Exhaust phase sensor signal terminal is short to ground 3. Exhaust phase sensor signal terminal ECM pin is short to ground	1. Unplug connector from exhaust phase sensor on wire harness, and use a multimeter to check if the voltage between power supply terminal and ground terminal pin of phase sensor is about 12 V. 2. Check if the voltage between exhaust phase sensor signal terminal pin and ground terminal pin is 0 V 3. Check for open circuit or short circuit to ground in exhaust phase sensor power supply terminal pin, and check if ground terminal pin is in poor contact 4. Check for short circuit to ground in exhaust phase sensor signal terminal pin 5. Check for short circuit to ground in exhaust phase sensor signal terminal pin corresponding to ECM
P036800	Camshaft Position Sensor "B" Circuit High (Bank1)	Sensor signal failure counter of exhaust camshaft phase sensor exceeds the threshold	1. Exhaust phase sensor ground terminal failure 2. Exhaust phase sensor signal terminal is short to power supply 3. Exhaust phase sensor signal terminal ECM pin is short to power supply	1. Unplug connector from exhaust phase sensor on wire harness, and use a multimeter to check if the voltage between power supply terminal and ground terminal pin of phase sensor is about 12 V. 2. Check if the voltage between signal terminal and power supply terminal pin of exhaust phase sensor is 12 V 3. Check if exhaust phase sensor ground terminal pin is open or short to power supply 4. Check if exhaust phase sensor signal terminal pin is short to power supply or open 5. Check for short circuit to power supply, open circuit or internal circuit damage in exhaust phase sensor signal terminal pin corresponding to ECM

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P06DA13	Secondary Oil Pump Drive Circuit Open	Drive channel self-diagnosis is malfunctioning	1. Connector looseness or poor contact 2. Secondary oil pump drive circuit pin is open 3. Open circuit or internal circuit damage in secondary oil pump drive circuit pin corresponding to ECM terminal	1. Check connector for looseness or poor contact 2. Check if secondary oil pump drive circuit pin is open 3. Check for open circuit or internal circuit damage in secondary oil pump drive circuit pin corresponding to ECM terminal
P06DB11	Secondary Oil Pump Drive Circuit Short to Ground	Drive channel self-diagnosis is malfunctioning	1. Short to ground in secondary oil pump drive circuit 2. Short to ground in secondary oil pump drive circuit corresponding to ECM terminal	1. Check for short circuit to ground in secondary oil pump drive circuit pin 2. Check for short circuit to ground in secondary oil pump drive circuit pin corresponding to ECM terminal
P06DC12	Secondary Oil Pump Drive Circuit Short to Power Supply	Drive channel self-diagnosis is malfunctioning	1. Secondary oil pump drive circuit short to power supply 2. Short to power supply in secondary oil pump drive circuit corresponding to ECM terminal	1. Check for short circuit to power supply in secondary oil pump drive circuit pin 2. Check for short circuit to power supply in secondary oil pump drive circuit pin corresponding to ECM terminal
P042000	Catalyst System Efficiency Below Threshold Bank 1	The calculated oxygen storage capacity of catalytic converter is lower than the threshold	1. Check exhaust system for leakage, gasket for damage 2. Catalytic converter is aging	1. Check exhaust system for air leakage, gasket for damage. 2. Replace the catalytic converter, return vehicle to the customer, and check whether fault reappears.
P044413	Evaporative Emission System Purge	Drive channel self-diagnosis is malfunctioning	1. Connector looseness or poor contact 2.	1. Check connector for looseness or poor contact 2. Check for open circuit

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Control Valve Circuit Open		Canister control valve circuit is open 3. Canister control valve circuit corresponding to ECM terminal is open	in canister control valve signal terminal pin 3. Check for open circuit in canister control valve power supply terminal pin 4. Check if canister control valve is damaged 5. Check for open circuit or internal circuit damage in canister control terminal pin corresponding to ECM terminal
P045811	Evaporative Emission System Purge Control Valve Circuit Low	Drive channel self-diagnosis is malfunctioning	1. Canister control valve signal terminal is short to ground 2. Canister control terminal pin corresponding to ECM terminal is short to ground	1. Check if canister control valve signal terminal is short to ground 2. Check if canister control valve power supply terminal pin is short to ground 3. Check if canister control terminal pin corresponding to ECM terminal is short to ground
P045912	Evaporative Emission System Purge Control Valve Circuit High	Drive channel self-diagnosis is malfunctioning	1. Canister control valve signal terminal is short to power supply 2. Canister control terminal pin corresponding to ECM terminal is short to power supply	1. Canister control valve signal terminal is short to power supply 2. Canister control terminal pin corresponding to ECM terminal is short to power supply
P050600	Idle Control System RPM Lower Than Expected	Idle speed control speed is lower than the target idle speed 100r/min	1. Electronic throttle is stuck in a position with a small opening. 2. Intake manifold is air leaked, injector is blocked, exhaust resistance is too large, oil supply	1. Check if electronic throttle is stuck in smaller opening position due to ice or oil. 2. Check if intake manifold is air leaked, fuel injector is blocked, exhaust resistance is too large, oil supply pressure is too low
P050A21	Cold Start Idle Control System Performance			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			pressure is too low	
P050700	Idle Control System RPM Higher than Expected	Idle speed control speed is higher than the target idle speed 200r/min	1. Electronic throttle is stuck in a position with a large opening 2. Check if system is air leaked, injector is leaked, oil supply pressure is too high	1. Check if electronic throttle is stuck in larger open position due to ice or oil. 2. Check if system is air leaked, fuel injector is leaked, oil supply pressure is too high
P050500	Unreasonable Engine Idling-large Fluctuation	Idle control speed fluctuates too much		
P050A22	Cold Start Idle Control System Performance	Idle control speed is higher than the target idle 200r/min during the heating process of catalytic converter		
P050D00	Cold Start Rough Idle	Engine idle fluctuates too much during the heating process of catalytic converter		
P056200	System Voltage Low	Power supply voltage is lower than 6 V	1. Open circuits in all pins on ECM which are connected with battery or main relay 2. Battery electric leakage or damage	1. Connect diagnostic tester, turn ignition switch “OFF” . Measure battery voltage with a multimeter and check if it is too low. 2. Check for open circuits in all pins on ECM which are connected with battery or main relay 3. Check engine wire grounded point for malfunction 4. Check if regulator is invalid 5. Check battery for electric leakage or damage 6. Check generator for malfunction
P056300	System Battery Voltage High	Power supply voltage is higher than 20 V	1. Engine wire harness ground point is malfunction 2. Generator regulator malfunction, motor power generation cannot be controlled effectively	1. Connect diagnostic tester, turn ignition switch “OFF” . Measure battery voltage with a multimeter and check if it is too high 2. Check engine wire harness ground point for malfunction 3. Generator regulator malfunction, motor power generation cannot be controlled effectively

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P061513	Starter Relay Control Circuit Error	Drive channel self-diagnosis is malfunctioning	1. Connector looseness or poor contact 2. Starter relay control high terminal is open 3. Starter control high terminal pin corresponding to ECM terminal is open or damaged	1. Connector looseness or poor contact 2. Starter relay control high terminal is open 3. Starter relay 1 fuse is blown or damaged 4. Starter control high terminal pin corresponding to ECM terminal is open or damaged
P061611	Starter Relay “A” High Circuit Low	Drive channel self-diagnosis is malfunctioning	1. Starter control circuit high terminal is short to ground 2. Starter control high terminal pin corresponding to ECM is short to ground	1. Starter control circuit high terminal is short to ground 2. Starter control high terminal pin corresponding to ECM is short to ground
P061712	Starter Relay “A” Circuit High	Drive channel self-diagnosis is malfunctioning	1. Starter control circuit high terminal is short to power supply 2. Starter control high terminal pin corresponding to ECM is short to power supply	1. Starter control circuit high terminal is short to power supply 2. Starter control high terminal pin corresponding to ECM is short to power supply
P055700	Brake Booster Pressure Sensor Circuit Low	Sensor voltage is lower than the threshold	1. Brake vacuum sensor signal terminal is short to ground 2. 5 V reference voltage of sensor is open 3. Short circuit to ground in brake vacuum sensor signal pin corresponding	1. Connect diagnostic tester, turn ignition switch to “ON”. Do not start engine, use a multimeter to measure if voltage of brake vacuum sensor signal terminal is close to or equal to 0 V. 2. Turn ignition switch to “OFF”, check if brake vacuum sensor signal terminal is short to ground. 3. Check if sensor 5 V reference voltage terminal is open 4. Check if brake vacuum

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			to ECM terminal	sensor signal pin terminal corresponding to ECM terminal is short to ground
P055800	Brake Booster Pressure Sensor Circuit High	Sensor voltage is higher than the threshold	1. Brake vacuum sensor signal terminal is short to power supply or open 2. Brake vacuum sensor reference ground terminal is open 3. Short circuit to power supply or open circuit in brake vacuum sensor signal pin terminal corresponding to ECM terminal 4. Sensor is damaged	1. Connect diagnostic tester, turn ignition switch to “ON”. Do not start engine, use a multimeter to measure if voltage between brake vacuum sensor signal terminal and ground is close to or equal to 5 V. 2. Turn ignition switch to “OFF”, check connector for looseness or poor contact 3. Check if brake vacuum sensor signal terminal is short to power supply or open 4. Check if sensor reference ground terminal is open 5. Check if sensor is damaged 6. Check for short circuit to power supply, open circuit or internal circuit damage in brake vacuum sensor signal pin corresponding to ECM terminal
P064513	A/C Clutch Relay Circuit Open	Drive channel self-diagnosis is malfunctioning	1. Connector looseness or poor contact 2. Open circuit in A/C compressor relay control circuit 3. Open circuit or short circuit to ground in A/C compressor relay control circuit power supply terminal 4. A/C compressor relay fuse is blown or damaged 5. Open circuit or internal circuit damage in A/C compressor	1. Connector looseness or poor contact 2. Open circuit in A/C compressor relay control circuit 3. Open circuit or short circuit to ground in A/C compressor relay control circuit power supply terminal 4. A/C compressor relay fuse is blown or damaged 5. Open circuit or internal circuit damage in A/C compressor control pin corresponding to ECM

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			control pin corresponding to ECM	
P064611	A/C Compressor Relay Circuit Low	Drive channel self-diagnosis is malfunctioning	1. A/C compressor relay control circuit is short to ground 2. A/C compressor relay pin corresponding to ECM terminal is short to ground	1. A/C compressor relay control circuit is short to ground 2. A/C compressor relay pin corresponding to ECM terminal is short to ground
P064712	A/C Compressor Relay Control Circuit High	Drive channel self-diagnosis is malfunctioning	1. A/C compressor relay circuit is short to power supply 2. A/C compressor relay pin corresponding to ECM terminal is short to power supply	1. A/C compressor relay circuit is short to power supply 2. A/C compressor relay pin corresponding to ECM terminal is short to power supply
P208800	“A" Camshaft Position Actuator Control Circuit Low Bank 1	Drive channel self-diagnosis is malfunctioning	1. Intake VVT control solenoid valve signal terminal is short to ground 2. Intake VVT control solenoid valve power supply terminal is short to ground 3. Intake VVT control solenoid valve signal terminal pin corresponding to ECM is short to ground	1. Intake VVT control solenoid valve signal terminal is short to ground 2. Intake VVT control solenoid valve power supply terminal is short to ground 3. Intake VVT control solenoid valve signal terminal pin corresponding to ECM is short to ground
P208900	“A" Camshaft Position Actuator Control Circuit High Bank 1	Drive channel self-diagnosis is malfunctioning	1. Intake VVT control solenoid valve signal terminal is short to	1. Intake VVT control solenoid valve signal terminal is short to power supply 2. Intake VVT control solenoid valve

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			power supply 2. Intake VVT control solenoid valve signal terminal pin corresponding to ECM terminal is short to power supply	signal terminal pin corresponding to ECM terminal is short to power supply
P209000	“B" Camshaft Position Actuator Control Circuit Low Bank 1	Drive channel self-diagnosis is malfunctioning	1. Exhaust VVT control solenoid valve signal terminal is short to ground 2. Exhaust VVT control solenoid valve power supply terminal is short to ground 3. Exhaust VVT control solenoid valve signal terminal pin corresponding to ECM is short to ground	1. Exhaust VVT control solenoid valve signal terminal is short to ground 2. Exhaust VVT control solenoid valve power supply terminal is short to ground 3. Exhaust VVT control solenoid valve signal terminal pin corresponding to ECM is short to ground
P209100	“B" Camshaft Position Actuator Control Circuit High Bank 1	Drive channel self-diagnosis is malfunctioning	1. Exhaust VVT control solenoid valve signal terminal is short to power supply 2. Exhaust VVT control solenoid valve signal terminal pin corresponding to ECM terminal is short to power supply	1. Exhaust VVT control solenoid valve signal terminal is short to power supply 2. Exhaust VVT control solenoid valve signal terminal pin corresponding to ECM terminal is short to power supply
P217700	System Too Lean Off Idle Bank 1	Self-learning factor exceeds the threshold	1. Oil system hardware leakage or blockage 2. Intake pipe	1. Connect fuel pressure gauge (the connection position is the front end of fuel distribution pipe assembly inlet pipe), start

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P217800	System Too Rich Off Idle Bank 1		failure 3. Oxygen sensor wire harness connector circuit failure 4. Oxygen sensor failure	engine and check if fuel pressure is normal when fuel pressure is under idling conditions and when fuel pressure regulator vacuum tube is removed. 2. Check fuel injector for leakage or blockage with special tool. 3. Check fuel condition and ask customer if specified number of gasoline is filled. After refueling, does the vehicle work abnormally? 4. If intake pipe is blocked, leaking, squashed or damaged; if canister control valve is stuck; if valve clearance is abnormal; if throttle body is contaminated, causing the air passage to be blocked. 5. Check if ignition coil, cylinder wire, and spark plug work abnormally. 6. Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire harness oxygen sensor terminal No.1 wire (white, heater power supply positive) is 12 V. 7. Do not disconnect oxygen sensor connector and measure if voltage of upstream oxygen sensor wire harness oxygen sensor terminal No.2 wire (white, heater power supply grounded) is 12 V. 8. Puncture wire harness connector near ECM terminal No.1 wire insulation layer (white, heater power source positive) with red pole of multimeter, and puncture wire harness connector near ECM terminal No.2 wire insulation layer (- white, heater power
P218700	System Too Lean at Idle Bank 1			
P218800	System Too Lean at Idle Bank 1			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				source grounded) with black pole of multimeter. Check if voltage between two ends is about 12 V 9. Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECM terminal No.4 wire (black, oxygen sensor signal wire) and No.3 wire (gray, oxygen sensor signal grounded) is about 0.45 V. 10. Start and keep vehicle idling until coolant temperature reaches normal value. Puncture wire harness connector near ECM terminal No.4 wire insulation layer (- black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM terminal No.3 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is between 0 V and 1 V. 11. Disconnect upstream oxygen sensor connector and check for short circuit between sensor terminal No.3 connector (gray, oxygen sensor signal grounded) and No.4 connector (- black, oxygen sensor signal wire) with a multimeter. 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.
P219500	O2 Sensor Signal Biased/ Stuck Lean	Downstream oxygen control integral value exceeds the upper limit	1. Air leakage in exhaust system 2.	1. Check intake system and exhaust system for air leakage. 2. Replace

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Bank 1 Sensor 1		Oxygen sensor is aging	upstream LSU oxygen sensor, return vehicle to the customer, and check whether fault reappears.
P219600	O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 1	Downstream oxygen control integral value exceeds the lower limit	1. Air leakage in exhaust system 2. Oxygen sensor is aging	1. Check intake system and exhaust system for air leakage. 2. Replace upstream LSU oxygen sensor, return vehicle to the customer, and check whether fault reappears.
P227000	O2 Sensor Signal Biased&Stuck Lean Bank 1 Sensor 2	Downstream oxygen voltage continues to be high	1. Air leakage in exhaust system 2. Oxygen sensor is aging	1. Check exhaust system for air leakage, gasket for damage. 2. Downstream oxygen sensor: Puncture wire harness connector near ECM terminal No.2 wire insulation layer (- black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM 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. 3. Start and keep vehicle idling until coolant temperature reaches normal value. downstream oxygen sensor: Puncture wire harness connector near ECM terminal No.2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM 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. 4. Start and keep vehicle idling until coolant temperature reaches normal value. Depress and release

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				accelerator pedal frequently and alternately for 90 s, at the same time, puncture downstream oxygen sensor wire harness connector near ECM terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage changes in range of 0.55 V - 0.65 V.
P227100	O2 Sensor Signal Biased&Stuck Rich Bank 1 Sensor 2	Downstream oxygen voltage continues to be low	1. Air leakage in exhaust system 2. Oxygen sensor is aging	1. Check exhaust system for air leakage, gasket for damage. 2. Downstream oxygen sensor: Puncture wire harness connector near ECM terminal No.2 wire insulation layer (-black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM 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. 3. Start and keep vehicle idling until coolant temperature reaches normal value. downstream oxygen sensor: Puncture wire harness connector near ECM terminal No.2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM terminal No.1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				of multimeter. Check if voltage changes in range of 0 V - 1 V. 4. 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 ECM terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM terminal No. 1 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage changes in range of 0.55 V - 0.65 V.
P023400	Turbocharger Boost Pressure Too High	The boost pressure is higher than the target pressure plus a certain offset	1. Turbocharger relief valve is damaged 2. Exhaust gas by-pass valve is damaged (- normally closed)	1. Turbocharger relief valve is damaged 2. Exhaust gas by-pass valve is damaged (- normally closed)
P023700	Turbocharger/ Supercharger Boost Sensor "A" Circuit Low	Boost pressure sensor voltage is lower than 0.15 V	1. Sensor signal terminal pin is short to ground 2. Short to ground in sensor signal terminal pin corresponding to ECM	1. Check if sensor signal terminal pin is short to ground 2. Check if sensor power supply terminal pin is short to ground 3. Check for offset or damage to sensor resistance and other characteristics 4. Check if sensor signal terminal pin corresponding to ECM is short to ground
P023800	Turbocharger/ Supercharger Boost Sensor "A" Circuit High	Boost pressure sensor voltage is higher than 4.85 V	1. Sensor signal terminal pin is short to power supply or open 2.	1. Check connector for looseness or disengagement 2. Check if sensor signal terminal pin is short to power

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			Connector looseness or disengageme-nt 3. Short circuit to power supply or open in sensor signal terminal pin corresponding to ECM	supply or open 3. Check if sensor power supply terminal and ground terminal pins are open 4. Check for offset or damage to sensor resistance and other characteristics 5. Check for short circuit to power supply, open circuit or internal circuit damage in sensor signal terminal pin corresponding to ECM
P024300	Booster Exhaust Gas Control Circuit Open	Drive channel self-diagnosis is malfunctioning	1. Control valve drive circuit is open 2. Connector looseness or disengageme-nt 3. Pin corresponding to ECM is open	1. Check connector for looseness or disengagement 2. Check if exhaust gas control valve drive circuit pin is open 3. Check if exhaust gas control valve power supply terminal is open 4. Check for open circuit or internal circuit damage in drive pin corresponding to ECM
P024600	Booster Exhaust Gas Control Circuit Voltage Too High or Too Low	Drive channel self-diagnosis is malfunctioning	1. Connector looseness or poor contact 2. Exhaust gas control valve drive circuit pin is short to power or ground 3. Short to power supply or ground in drive circuit pin corresponding to ECM	1. Connector looseness or poor contact 2. Exhaust gas control valve drive circuit pin is short to power or ground 3. Short to power supply or short to ground or internal circuit damage in drive pin corresponding to ECM
P029900	Turbocharger Boost Pressure Too Low	The actual boost pressure is the target boost pressure minus a certain offset	1. The line between compressor outlet and throttle valve is leaking 2. Leakage between turbine and exhaust pipe 3. Failure of waste gate	1. There is air leakage in line between compressor outlet and throttle 2. There is air leakage in line between turbine and exhaust pipe 3. Exhaust manifold leaks or is blocked 4. Air filter is dirty 5. Exhaust by-pass valve or discharge valve is failed and it is in normally open status 6. Working

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			valve or discharge valve 4. Turbocharger damaged 5. Working parts such as compressor impeller are dirty or damaged 6. Exhaust manifold is leaking or blocked 7. Air filter dirty	parts such as compressor impeller are dirty or damaged 7. Turbocharger is damaged
P226100	Turbocharger/ Supercharger Bypass Valve "A" - Mechanical	Number of pressure fluctuations front of throttle is greater than a certain threshold	1. Discharge control valve wire harness interrupted 2. Discharge control valve is damaged 3. Discharge control valve pin corresponding to ECM terminal is damaged	1. Discharge control valve wire harness interrupted 2. Discharge control valve is damaged 3. Discharge control valve pin corresponding to ECM terminal is damaged
P224300	O2 Sensor Negative Current Control Circuit Open Bank 1 Sensor 1	After the heating control of oxygen sensor starts, the internal resistance of LSU is unreasonably high	1. Upstream oxygen sensor RE wire is open	1. Check for poor contact in pin corresponding to black wire at oxygen sensor connector 2. Check for continuity of oxygen sensor wire harness to check if the line is open 3. Check for abnormal pin at connector between wire harness and ECM, which may result in poor contact 4. Clear DTC, start and keep vehicle idling until coolant temperature reaches normal value. Check if malfunction is reported again. 5. Check for abnormality in LSU oxygen sensor processing circuit in ECM

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P225100	O2 Sensor Negative Current Control Circuit Open Bank 1 Sensor 1	After the heating control of oxygen sensor starts, the internal resistance of LSU and signal terminal voltage is remains 1.5 V	1. Upstream oxygen sensor IPE wire is open	1. Check for poor contact in pin corresponding to yellow wire at oxygen sensor connector 2. Check for continuity of oxygen sensor wire harness to check if the line is open 3. Check for abnormal pin at connector between wire harness and ECM, which may result in poor contact 4. Clear DTC, start and keep vehicle idling until coolant temperature reaches normal value. Check if malfunction is reported again. 5. Check for abnormality in LSU oxygen sensor processing circuit in ECM
P241400	O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	LSU is sensing lean, no circuit failure and target air-fuel ratio is lean	1. Expose LSU in the air or LSU connector is in poor connection	1. Check if oxygen sensor is not installed correctly, installed outside the exhaust manifold and exposed into air 2. Check the regulating resistance in oxygen sensor connector for failure or infinity 3. Check if resistance between IA and IP circuit in oxygen sensor processing circuit inside of ECM is infinite
P019128	Fuel Rail Pressure Sensor Circuit Bank 1-Negative Offset	After fully cold soaking, the start fuel rail pressure is higher than the threshold, and the oil passage self-learning failure is reported in this driving cycle.	1. Fuel rail pressure sensor internal circuit and wire harness are deteriorated	1. Check whether there is gas in the fuel rail, causing the rail pressure to fail to build up quickly. 2. Replace the fuel rail pressure sensor, return the vehicle to customer, and check whether the fault will be reported again.
P019129	Fuel Rail Pressure Sensor Circuit Bank 1-Positive Offset	After fully cold soaking, the start fuel rail pressure is lower than the threshold, and the oil passage self-learning failure is reported in this driving cycle.	1. Fuel rail pressure sensor internal circuit and wire harness are deteriorated	1. Check whether there is a large contact resistance at the connector of fuel rail pressure sensor or in the wire harness. 2. Replace the fuel rail pressure sensor, return the vehicle to customer,

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				and check whether the fault will be reported again.
U012287	Lost Communication With ESP (-Electronic Stability Program)	ECM receiving ESP information timed out	1. ESP connector looseness or disengageme-nt 2. Transmission line between ESP and ECM damaged or interrupted 3. ESP is damaged and signal cannot be transmitted to ECM normally	1. Check ESP connector for looseness or disengagement 2. Check if there is wire harness signal interference 3. Check if transmission line between ESP and ECM is damaged or interrupted 4. Check if there is CAN hardware circuit fault 5. Check if ESP is damaged and signal cannot be transmitted to ECM normally
U014687	Lost Communication With GW (Gateway)	ECM receiving GW information timed out	1. GW connector looseness or disengageme-nt 2. Transmission line between GW and ECM damaged or interrupted 3. GW is damaged and signal cannot be transmitted to ECM normally	1. Check GW connector for looseness or disengagement 2. Check if there is wire harness signal interference 3. Check if transmission line between GW and ECM is damaged or interrupted 4. Check if there is CAN hardware circuit fault 5. Check if GW is damaged and signal cannot be transmitted to ECM normally
U012687	Lost Communication With SAS (-Steering Angle)	ECM receiving SAS information timed out	1. SAS connector looseness or disengageme-nt 2. Transmission line between SAS and ECM damaged or interrupted 3. SAS is damaged and signal cannot be transmitted to ECM normally	1. Check SAS connector for looseness or disengagement 2. Check if there is wire harness signal interference 3. Check if transmission line between SAS and ECM is damaged or interrupted 4. Check if there is SAS hardware circuit fault 5. Check if SAS is damaged and signal cannot be transmitted to ECM normally

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U010187	Lost Communication With TCM (-Transmission Controller)	ECM receiving TCM information timed out	1. TCM connector looseness or disengageme-nt 2. Transmission line between TCM and ECM damaged or interrupted 3. TCM is damaged and signal cannot be transmitted to ECM normally	1. Check TCM connector for looseness or disengagement 2. Check if there is wire harness signal interference 3. Check if transmission line between TCM and ECM is damaged or interrupted 4. Check if there is TCM hardware circuit fault 5. Check if TCM is damaged and signal cannot be transmitted to ECM normally
U110017	CAN Module Input Power Voltage High	CAN communication voltage is higher than the threshold	1. CAN bus interface looseness or poor contact 2. Short circuit to power supply / ground or open circuit in CAN bus interface pin 3. Short circuit to power supply / ground, open circuit or internal circuit damage in CAN bus interface pin corresponding to ECM terminal	1. CAN bus interface looseness or poor contact 2. Short circuit to power supply / ground or open circuit in CAN bus interface pin 3. There is wire harness signal interference 4. Short circuit to power supply / ground, open circuit or internal circuit damage in CAN bus interface pin corresponding to ECM terminal
P141500	Response Reception Time Out Error of LIN Bus (Contact Between EMS and Intellectual Generator)	ECM receives LIN communication and sends fault information	1. Generator LIN bus interface looseness or poor contact 2. LIN wire interference 3. LIN line is broken or interrupted 4. Generator is damaged and cannot normally transmit signals to ECM	1. Generator LIN bus interface looseness or poor contact 2. There is wire harness signal interference 3. Generator LIN line is broken or interrupted 4. Generator is damaged and cannot normally transmit signals to ECM

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P141700	Checksum Error of LIN Bus (Contact Between EMS and Intellectual Generator)	ECM receives LIN communication and sends fault information	1. LIN communicatio-n version of intelligent generator is inconsistent with ECM	1. Whether the LIN communication version of intelligent generator is consistent with ECM
P051300 P063300 P161000 P161400 P161200 P161300 P161100	Immobilizer Malfunction	Anti-theft data authentication failed	1. ECM does not perform anti-theft matching or anti-theft status is wrong	1. Immobilizer connector looseness or disengagement 2. Immobilizer circuit fault 3. If ECM has been replaced, check if anti-theft authentication code is incorrect or not updated 4. Immobilizer fault 5. Immobilizer module circuit corresponding to ECM terminal is malfunctioning
P242200	Canister Vent Valve Stuck Normally Closed	Fuel tank pressure is below the threshold	1. Canister vent valve pin is low, which makes the canister vent valve close 2. Canister vent valve is stuck in the normally closed position and cannot be opened 3. Canister vent valve line is blocked 4. Canister valve stuck in normally open position 5. Fuel tank pressure sensor is damaged	1. Keep the sensor connector normal, use a multimeter to check whether the canister vent valve pin voltage is low and whether it is short to ground 2. Remove canister vent valve pipe and observe if it is blocked 3. Check if canister vent valve hardware is stuck at closed position 4. Check if canister valve is stuck at normally open position 5. Replace the fuel tank pressure sensor, start vehicle for 10 minutes, and check if the fault reappears
P045300	Fuel Tank Pressure Sensor Signal Short to Power Supply	Pressure sensor voltage signal is higher than 4.8 V	1. Fuel tank pressure sensor signal terminal is short to power supply 2. Short to power supply in fuel tank pressure sensor signal	1. Use a multimeter to measure if fuel tank pressure signal circuit voltage is close to or equal to 5 V 2. Measure whether the wire harness terminal voltage corresponding to fuel tank pressure signal is close to or equal to 5 V 3. Check

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			pin corresponding to ECM terminal	for short circuit to power supply or internal circuit damage in intake pressure sensor signal pin corresponding to ECM terminal.
P045200	Fuel Tank Pressure Sensor Signal Short to Ground	Boost sensor voltage signal is lower than 0.2 V	1. Fuel tank pressure sensor signal terminal is short to ground 2. Short to ground in fuel tank pressure sensor signal pin corresponding to ECM terminal	1. Use a multimeter to measure if fuel tank pressure signal circuit voltage is close to or equal to 0 V 2. Measure whether the wire harness terminal voltage corresponding to fuel tank pressure signal is close to or equal to 0 V 3. Check for short circuit to ground or internal circuit damage in intake pressure sensor signal pin corresponding to ECM terminal.
P128200	EVAP System Pressure Sensor/Switch Circuit Range Performance	Fuel tank pressure sensor pressure signal is continuously higher than the threshold	1. Canister vent valve closed 2. Line from fuel tank to canister is blocked 3. Fuel tank pressure sensor is damaged	1. Check if canister vent valve is closed 2. Check if pipe from fuel tank to canister is blocked 3. Replace fuel tank pressure sensor. Start vehicle for 10 minutes, and check whether the fault reappears
P128300	EVAP System Pressure Sensor/Switch Circuit Range Performance	Fuel tank pressure sensor pressure signal is continuously lower than the threshold	1. Canister vent valve closed 2. Line from fuel tank to canister is blocked 3. Fuel tank pressure sensor is damaged 4. Canister valve stuck in normally open position	1. Check if canister vent valve is closed 2. Check if pipe from fuel tank to canister is blocked 3. Replace fuel tank pressure sensor. Start vehicle and run it for 10 minutes to check if fault reappears 4. Check if canister valve is stuck at normally open position
P04512A	EVAP System Pressure Sensor&Switch Circuit Range Performance	Difference between maximum and minimum fuel tank pressure is below the threshold	1. Canister solenoid valve stuck in normally closed or normally open	1. Check if canister solenoid valve stuck in normally closed or normally open position 2. Check if the line from fuel tank to canister is blocked/disconnect 3.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			position 2. Line from fuel tank to canister is blocked or disconnected 3. Line from canister to canister valve is blocked or disconnected 4. Fuel tank pressure sensor is damaged	Check if the line from canister to canister valve is blocked/disconnected 4. Replace fuel tank pressure sensor. Start vehicle for 10 minutes, and check whether the fault reappears
P045125	EVAP System Pressure Sensor&Switch Circuit Range Performance	Fluctuating amount of fuel tank pressure continues to exceed the threshold	1. Fuel tank pressure sensor damaged 2. Canister valve is damaged	1. Replace fuel tank pressure sensor, start vehicle again, wait for 10 minutes to check if fault reappears 2. Replace ECM. Start vehicle again, wait for 10 minutes to check if fault reappears. 3. Check canister valve wire harness and replace canister valve, start vehicle again, wait for 10 minutes to check if fault reappears
P045128	EVAP System Pressure Sensor/Switch Circuit Range Performance	Difference between fuel tank pressure value and reference fuel tank pressure value during cold start exceeds the threshold	1. Fuel tank pressure sensor damaged 2. Line from fuel tank to canister is blocked	1. Replace fuel tank pressure sensor, check if fault reappears 2. Check if the line from fuel tank to canister is blocked 3. Replace ECM, check if fault reappears
P046300	Fuel Level Sensor "A" Circuit High	Self-diagnosis of fuel level signal circuit connectivity	1. Abnormal connection of fuel level sensor wire harness 2. Abnormal connection of fuel level sensor wire harness 3. ECM internal circuit abnormal	1. Using a multimeter, check if sensor pin voltage is normal 2. Check if CAN signal is normal 3. Check if wire harness is normal 4. Replace ECM, check if fault reappears
P046200	Fuel Level Sensor "A" Circuit Low	Self-diagnosis of fuel level signal circuit connectivity	1. Abnormal connection of oil level sensor	1. Using a multimeter, check if sensor pin

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			wire harness 2. Fuel level sensor is damaged 3. ECM internal circuit abnormal	voltage is normal 2. Check if CAN signal is normal 3. Check if wire harness is normal 4. Replace ECM, check if fault reappears
P25B000	Fuel Level Sensor "A" Stuck	Fuel level signal change does not exceed the threshold	1. ECM CAN signal is abnormal 2. Fuel level sensor is damaged 3. Fuel level float inside fuel tank is stuck	1. Replace fuel level sensor, check if fault reappears 2. Check if fuel level float in fuel tank is stuck 3. Replace ECM, check if fault reappears
P046129	Fuel Level Sensor Unreasonable	There is a big difference between liquid level change and the calculated fuel consumption	1. ECM CAN signal is abnormal 2. Fuel level sensor is damaged	1. Check if CAN signal is normal 2. Replace ECM, check if fault reappears 3. Replace fuel level sensor, check if fault reappears
P044200	EVAP System Leak Detected (Small Leak)	The vacuum attenuation gradient of evaporation system exceeds the threshold	1. Fuel tank cap is not tightened or there is a leak 2.Canister vent valve cannot be completely closed 3. There is leakage in fuel tank - line - canister valve - canister solenoid valve - canister vent valve 4. Canister solenoid valve cannot be completely closed	1. Check if fuel tank cap is tightened 2. Check for leakage/blockage in fuel tank - pipeline - canister valve - canister solenoid valve - canister ventilation valve, and if connector is installed correctly 3. Check if canister vent valve can be completely closed, which can be achieved by shorting to pin 4. Check if canister solenoid valve is completely closed with power ON
P045500	EVAP System Leak Detected (Large Leak)	The vacuum degree of evaporation system cannot reach the target vacuum degree during the vacuuming process	1. Fuel tank cap is not tightened or there is a leak 2.Canister vent valve cannot be completely	1. Check if fuel tank cap is tightened 2. Check for leakage/blockage in fuel tank - pipeline - canister valve - canister solenoid valve - canister ventilation valve, and if connector is installed correctly 3.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			closed 3. There is leakage in fuel tank - line - canister valve - canister solenoid valve - canister vent valve 4. Canister solenoid valve cannot be completely closed	Check if canister vent valve can be completely closed, which can be achieved by shorting to pin. 4. Check if canister solenoid valve is completely closed with power ON
P049700	EVAP System Low Purge Flow	The pressure fluctuation of low load desorption line does not reach the threshold	1. Low load desorption line, check valve and connection between canister valve and engine are blocked or disconnected 2. Canister valve stuck in normally closed or normally open position	1. Check whether the desorption line, check valve (if equipped) and connection between canister valve and engine are blocked or disconnected. 2. Replace the corresponding line 3. Check if canister valve hardware is stuck at normally closed/normally open position. 4. Replace canister valve.
P04F000	EVAP System High Pressure Purge	The pressure fluctuation of high load desorption line does not reach the threshold	1. High load desorption line, check valve, venturi tube and connection between canister valve and engine are blocked or disconnected 2. The check valve of low load line is damaged and cannot function correctly 3. Canister valve stuck in normally open or normally closed position	1. Check if desorption line, check valve 2 (if equipped), venturi tube (if equipped) and connection between canister valve and engine are blocked or disconnected. 3. Replace the corresponding line. 4. Check if low load pipeline check valve is damaged and cannot function properly 5. Check if canister valve hardware is stuck at normally closed/ normally open position. 6. Replace canister valve.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P046800	EVAP Purge Flow Sensor Circuit High	high load desorption line pressure sensor voltage signal is higher than 4.88 V	1. Pressure sensor signal terminal is short to power supply 2. Short to power supply in high load desorption line voltage sensor signal corresponding to the ECM terminal	1. Use a multimeter to measure if high load desorption line pressure sensor signal line voltage is close to or equal to 5 V 2. Measure if pressure sensor wire harness terminal voltage is close to or equal to 5 V 3. Check for short circuit to power supply or internal circuit damage in high load desorption line pressure sensor signal pin corresponding to ECM terminal.
P046700	EVAP Purge Flow Sensor Circuit Low	High load desorption line pressure sensor voltage signal is lower than 0.2 V	1. Pressure sensor signal terminal is short to ground 2. Short to ground in high load desorption line voltage sensor signal corresponding to the ECM terminal	1. Use a multimeter to measure if high load desorption line pressure sensor signal line voltage is close to or equal to 0 V 2. Measure if pressure sensor wire harness terminal voltage is close to or equal to 0 V 3. Check for short circuit to ground or internal circuit damage in high load desorption line voltage sensor signal pin corresponding to ECM terminal.
P128500	EVAP Purge Flow Sensor Circuit Range Performance	High load desorption line pressure sensor pressure signal exceeds the threshold	1. Pressure sensor signal terminal is short to power supply 2. Short to power supply in high load desorption line voltage sensor signal corresponding to the ECM terminal 3. High load desorption line pressure sensor is damaged 4. Check valve of low load	1. Use a multimeter to measure if high load desorption line pressure sensor signal line voltage is close to or equal to 5 V 2. Measure if pressure sensor wire harness terminal voltage is close to or equal to 5 V 3. Check for short circuit to power supply or internal circuit damage in high load desorption line pressure sensor signal pin corresponding to ECM terminal. 4. Replace high load desorption line pressure sensor, start vehicle and drive with a heavy load, check if fault reappears 5. Replace low

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			desorption line is damaged and cannot function correctly 5. Venturi tube is disconnected	load desorption line check valve, start vehicle and drive with a heavy load, check if fault reappears 6. Check if venturi tube is disconnected
P128600	EVAP Purge Flow Sensor Circuit Range Performance	High load desorption line pressure sensor pressure signal is lower than the threshold	1. Pressure sensor signal terminal is short to ground 2. Short to ground in high load desorption line voltage sensor signal corresponding to the ECM terminal 3. High load desorption line pressure sensor is damaged 4. Venturi tube or check valve of high load desorption line is blocked	1. Use a multimeter to measure if high load desorption line pressure sensor signal line voltage is close to or equal to 0 V 2. Measure if pressure sensor wire harness terminal voltage is close to or equal to 0 V 3. Check for short circuit to ground or internal circuit damage in high load desorption line voltage sensor signal pin corresponding to ECM terminal. 4. Replace high load desorption line pressure sensor, start and drive vehicle, check if fault reappears 5. Replace high load desorption line check valve or venturi tube, start and drive the vehicle, check if fault reappears
P019000	Fuel Rail Pressure Sensor Circuit Bank 1	Fuel rail pressure sensor circuit voltage is lower than 0.2 V or higher than 4.8 V	1. Fuel rail pressure sensor signal terminal is short to ground or power supply 2. Short to power or ground in fuel rail pressure sensor pin corresponding to ECM	1. Check if sensor signal terminal is short to power supply or ground 2. Check if sensor is damaged 3. Check for short circuit to power supply or ground, or internal circuit damage in fuel rail pressure sensor signal pin corresponding to ECM terminal
P209700	Post Catalyst Fuel Trim System Too Rich Bank 1	The offset value of upstream oxygen characteristic based on downstream oxygen exceeds the upper threshold	1. Upstream oxygen has a negative characteristic deviation (rich) 2. A certain degree of	1. Check intake system and exhaust system for air leakage 2. Replace upstream LSU oxygen sensor, return vehicle to the customer, and check whether fault reappears

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			aging occurs in downstream oxygen 3. Leakage in intake and exhaust system 4. Catalytic converter is seriously degraded	3. Replace the downstream oxygen sensor, and check whether fault reappears 4. Check if catalytic converter is deteriorated 5. Replace catalytic converter, and check whether fault reappears
P209600	Post Catalyst Fuel Trim System Too Lean Bank 1	The offset value of upstream oxygen characteristic based on downstream oxygen is lower than the lower threshold	1. Upstream oxygen has a positive characteristic deviation (-lean) 2. A certain degree of aging occurs in downstream oxygen 3. Leakage in intake and exhaust system 4. Catalytic converter is seriously degraded	1. Check intake system and exhaust system for air leakage 2. Replace upstream LSU oxygen sensor, return vehicle to the customer, and check whether fault reappears 3. Replace the downstream oxygen sensor, and check whether fault reappears 4. Check if catalytic converter is deteriorated 5. Replace catalytic converter, and check whether fault reappears
P223200	O2 Sensor Signal Circuit Shorted to Heater Circuit Bank 1 Sensor 2	Within a certain number of times that the downstream oxygen sensor is heated and turned off, the change in voltage of downstream oxygen sensor is higher than the threshold	1. Downstream oxygen sensor wire harness and connector are abnormal 2. Oxygen sensor terminal heater power supply ground is short to oxygen sensor signal line	1. Do not disconnect oxygen sensor connector and measure if heater power supply positive voltage of downstream oxygen sensor wire harness oxygen sensor terminal is 12 V. 2. Do not disconnect oxygen sensor connector and measure if heater power supply ground voltage of downstream oxygen sensor wire harness oxygen sensor terminal is 12 V. 3. Do not disconnect oxygen sensor connector and measure if voltage between downstream oxygen sensor wire harness ECM terminal oxygen sensor signal line and oxygen sensor signal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				ground is about 0.45 V. 4. Start and keep vehicle idling until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector and measure if voltage between oxygen sensor signal line and oxygen sensor signal ground of upstream oxygen sensor wire harness ECM terminal jumps between 0 V and 1 V. 5. Start and keep vehicle idling until coolant temperature reaches normal value. Disconnect downstream oxygen sensor connector and check for short circuit between oxygen sensor terminal heater power supply ground and oxygen sensor signal line. 6. 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.
P013A00	O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	The transition time from rich to lean of downstream oxygen sensor voltage signal exceeds the threshold	1. Downstream oxygen sensor is aging	1. Replace downstream oxygen sensor and connect wire harness properly. Start and keep vehicle idling until coolant temperature reaches normal value. Release accelerator pedal to coast after vehicle speed reaches about 70 many times, the fault reappears.
P064D00	LSU Integrated Ship Failure	Chip communication self-diagnostic	1. LSU oxygen sensor is damaged 2. ECM internal communicatio-n is abnormal	1. Replace oxygen sensor, and check if fault reappears 2. Replace ECM, and check if fault reappears
P064D13	Upstream Oxygen Sensor Sensing Element Failure			
P223700	O2 Sensor Positive	Chip fault memory diagnosis	1. Open circuit in LSU oxygen	1. Replace oxygen sensor, and check if fault

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Current Control Circuit Open Bank 1 Sensor 1 (Close to ECM)		sensor APE line, which is close to ECM terminal 2. ECM internal circuit is abnormal	reappears 2. Replace ECM, and check if fault reappears
P223713	O2 Sensor Positive Current Control Circuit Open Bank 1 Sensor 1	Before and after applying the pump current, the current difference between APE wire and IPE wire is lower than threshold, and current difference between RE wire and IPE wire is higher than threshold	1. LSU oxygen sensor APE wire is disconnected	1. Check if oxygen sensor wire harness and connector are disconnected or poorly connected. 2. Replace upstream oxygen sensor. Start and keep vehicle idling until coolant temperature reaches normal value. The fault reappears.
P053F21	Cold Start Fuel Pressure Performance	During the catalytic converter is heating, the deviation between target fuel rail pressure of high pressure fuel rail and the actual fuel rail pressure exceeds the threshold	1. Oil passage is leaked 2. Insufficient fuel 3. Low pressure oil pump is damaged 4. The working capacity of high pressure oil pump is reduced	1. Check if oil passage is leaked 2. Check if fuel is insufficient 3. Check if low pressure oil pump is damaged 4. Check if the working capacity of high pressure oil pump is reduced
P053F22	Cold Start Fuel Pressure Performance	During the catalytic converter is heating, the deviation between target fuel rail pressure of high pressure fuel rail and the actual fuel rail pressure is lower than the threshold	1. High pressure oil pump control failure 2. Pressure relief valve blocked	1. Check if high pressure oil pump control is normal 2. Check relief valve for blockage or abnormal operation
P00C600	Fuel Rail Pressure Too Low - Engine Cranking Bank 1	The fuel rail pressure is low when starting and the high pressure starting is unsuccessful	1. Oil passage is leaked 2. Insufficient fuel 3. Low pressure oil pump is damaged 4. The working capacity of high pressure oil pump is reduced 5. Injector is damaged 6. Replace the	1. Check for leakage in oil passage 2. Check if fuel is insufficient 3. Check if low pressure oil pump is damaged 4. Check if working capacity of high pressure oil pump is reduced 5. Check if injector is damaged 6. Check if new oil pipe has been replaced or new vehicle has just off the production line 7. Clear fault, drive vehicle for 10 minutes, allow oil

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			new fuel pipe or new vehicle has just off the production line, the oil passage pressure has not been established yet, and a malfunction may be reported	pressure to be established fully, turn off the engine and start it again, check if fault reappears
P02CD00	Cylinder 1 Fuel Injector Offset Learning At Max Limit	CVO self-learning value of cylinder 1 injector exceeds the upper threshold	1. Cylinder 1 injector is damaged	1. Check cylinder 1 injector for damage
P02D100	Cylinder 3 Fuel Injector Offset Learning At Max Limit	CVO self-learning value of cylinder 3 injector exceeds the upper threshold	1. Cylinder 3 injector is damaged	1. Check cylinder 3 injector for damage
P02D300	Cylinder 4 Fuel Injector Offset Learning At Max Limit	CVO self-learning value of cylinder 4 injector exceeds the upper threshold	1. Cylinder 4 injector is damaged	1. Check cylinder 4 injector for damage
P02CF00	Cylinder 2 Fuel Injector Offset Learning At Max Limit	CVO self-learning value of cylinder 2 injector exceeds the upper threshold	1. Cylinder 2 injector is damaged	1. Check cylinder 2 injector for damage
P02CC00	Cylinder 1 Fuel Injector Offset Learning At Min Limit	CVO self-learning value of cylinder 1 injector is lower than the lower threshold	1. Cylinder 1 injector is damaged	1. Check cylinder 1 injector for damage
P02D000	Cylinder 3 Fuel Injector Offset Learning At Min Limit	CVO self-learning value of cylinder 3 injector is lower than the lower threshold	1. Cylinder 3 injector is damaged	1. Check cylinder 3 injector for damage
P02D200	Cylinder 4 Fuel Injector Offset Learning At Min Limit	CVO self-learning value of cylinder 4 injector is lower than the lower threshold	1. Cylinder 4 injector is damaged	1. Check cylinder 4 injector for damage
P02CE00	Cylinder 2 Fuel Injector Offset Learning At Min Limit	CVO self-learning value of cylinder 2 injector is lower than the lower threshold	1. Cylinder 2 injector is damaged	1. Check cylinder 2 injector for damage
P02EE00	Cylinder 1 Fuel Injector Control Circuit Short	Drive channel self-diagnosis is malfunctioning	1. Injector high side control circuit is short	1. Check if corresponding fuel injector high-side control circuit is short to low-side control circuit

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P02EF00	Cylinder 2 Fuel Injector Control Circuit Short		to low side control circuit	
P02F000	Cylinder 3 Fuel Injector Control Circuit Short			
P02F100	Cylinder 4 Fuel Injector Control Circuit Short			
P062B9A P062B64 P062B96	Internal Control Module Fuel Injector Control Performance - Component Internal Failure	All cylinders have CVO self-learning values that exceed the threshold or have unreasonable circuit signals	1. Injector wires for all cylinders are abnormal 2. ECM internal circuit is abnormal	1. Check whether all cylinder injector wire harness connections are normal 2. Replace the injectors of all cylinders, start the vehicle, and check whether the fault reappears 3. After replacing ECM, start the vehicle, and check whether the fault reappears
P012200 P022200	Electronic Throttle 1st Path / 2nd Path Signal Voltage Minimum	The voltage value of a certain path of throttle signal is lower than a certain value and lasts for a period of time	1. The first/ second signal line of the electronic throttle is open 2.The first/ second signal wire of electronic throttle is short to GND 3. An open circuit of electronic throttle 5 V power supply line will cause two faults to be reported at the same time	1. Collect the both paths signal voltage values ThrVlv_uRawSens1B1, ThrVlv_uRawSens2B1 of electronic throttle valve and check whether it drops to near zero. 2. The actions such as unplugging and plugging connector, shaking wire harness, etc. will affect the occurrence frequency of faults 3. Verify if wire harness resistance is the cause by electronic throttle flying wire connection 4. Replace the throttle body to determine whether there is an internal problem of throttle. 5. Clear DTC, restart vehicle and check if DTC is cleared
P012300 P022300	Electronic Throttle 1st Path / 2nd Path Signal Voltage Maximum	The voltage value of a certain path of throttle signal is higher than a certain value and lasts for a period of time	1. The first/ second signal wire of the electronic throttle is short to 5 V 2. An open circuit of	1. Collect the both paths signal voltage values ThrVlv_uRawSens1B1, ThrVlv_uRawSens2B1 of electronic throttle valve and check whether it drops to near zero. 2. The

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			electronic throttle signal ground wire cause two faults to be reported at the same time	actions such as unplugging and plugging connector, shaking wire harness, etc. will affect the occurrence frequency of faults 3. Verify if wire harness resistance is the cause by electronic throttle flying wire connection 4. Replace the throttle body to determine whether there is an internal problem of throttle. 5. Clear DTC, restart vehicle and check if DTC is cleared
P012100 P022100	Electronic Throttle 1st Path / 2nd Path Signal Voltage Improper	Compare the first path signal of electronic throttle body with 5 V minus the second path signal. When the deviation exceeds threshold and after a period of time, compare the both paths signals with the signal after inflation pressure conversion, the signal that deviates from the main inflation pressure signal exceeds a certain value and is confirmed after a period of time reports a failure	1. The first path signal of electronic throttle is short to the second path signal 2. There is resistance on electronic throttle 5 V power supply wire or GND wire, causing the pedal voltage to drop by 5 V or the zero voltage to be raised	1. Collect and observe whether the voltage value of the two DVE signals ThrVlv_uRawSens1B1 and ThrVlv_ uRawSens2B1 deviate from 5 V in addition 2. The actions such as unplugging and plugging connector, shaking wire harness, etc. will affect the occurrence frequency of faults 3. Measure the voltage drop of each section on wire harness by AD-Scan. If the wire harness is normal, there is no voltage drop, and if there is a voltage drop, it means that there is resistance in wire harness or connector 4. Verify if wire harness is the cause by electronic throttle flying wire connection 5. Replace the throttle body to determine whether there is an internal problem of throttle 6. Clear DTC, restart vehicle and check if DTC is cleared
P155400 P155500 P156100	Max Error of DV-E Return Spring Check Failure	After ignition switch is turned to ON, the system will command DVE to open to a certain opening by ECM, and check if	1.The PIN of electronic throttle drive motor is open or short 2.	1. Check if the actual opening ThrVlv_ ratActIntB1 is consistent with the target opening ThrVlv_ratDesB1 2. The

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		DVE can be reached within the specified time, and then check if DVE can be returned within the specified time; if it cannot reach the specified position within the specified time, it is determined as P1555; if it cannot return to the specified range within the specified time after opening, it is determined as P1554. When ECM drives the throttle, the ECM will always compare the target opening with the actual throttle feedback. When the deviation between target and actual exceeds a certain value and after a certain period of time to confirmed, it will be judged as P1561	Electronic throttle body valve plate is dirty or there are foreign matters, which makes the valve plate stuck	actions such as unplugging and plugging connector, shaking wire harness, etc. will affect the occurrence frequency of faults 3. Verify if wire harness is the cause by electronic throttle flying wire connection 4. Replace the throttle body to determine whether there is an internal problem of throttle 6. Clear DTC, restart vehicle and check if DTC is cleared
P156000	Electronic Throttle PID Adjustment Malfunction	When the duty ratio that ECM output to the throttle valve continues to exceed 80% and maintains for 5 seconds, P1560 (DFC_ ThrVlvDycB1) is reported	1.The PIN of electronic throttle drive motor is open or short 2. Electronic throttle body valve plate is dirty or there are foreign matters, which makes the valve plate resistance large and sticky 3. Throttle drive chip in ECM is abnormal	1. It may be caused by foreign matter sticking on throttle valve plate (the possibility is greater); it may be caused by the failure of throttle drive motor pin; or it may be also caused the DVE drive module inside ECM may have a hardware failure (the possibility is less) 2. Replace throttle body to determine if there is an internal problem in throttle 3. Replace ECM to determine if there is a throttle drive module failure in ECM 4. Clear DTC, restart vehicle and check if DTC is cleared
P155000 P155100	Electronic Throttle Self-learning Unable to Complete / Throttle Initial Self-learning Unable to Complete	Throttle self-learning must meet 7 conditions at the same time: no DVE or monitoring failure; speed is 0; vehicle speed is 0; pedal is 0; battery voltage is higher than 10 V; engine coolant	1. The conditions of DVE self-learning are not met, please refer to the above 7 conditions 2.	1. Compare the above 7 conditions and find out whether there are any unsatisfied ones one by one 2. Clear DTC, restart vehicle and check if DTC is cleared

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		temperature is higher than 5℃; intake air temperature is higher than 5℃. When the above 7 conditions cannot be met at the same time, P155000 will be reported. ECM will report P1551 if the conditions are not met during the first self-learning	When the coolant temperature or intake air temperature sensor is faulty, the temperature condition will not be met because the correct temperature is not collected. 3. Some vehicle assembly factories do not turn on the heater in workshop in winter, and the fault may be caused when the temperature is too low	
P210000 P210300 P210600 P211800	Electronic Throttle Drive Level Malfunction	Monitor DVE power driver stage-SPI bus or signal failure	1. Throttle valve failure (-valve plate stuck or motor failure) 2. Throttle drive module failure in ECM	1. Replace throttle body to determine if there is an internal problem in throttle 2. Replace ECM to determine if there is a throttle drive module failure in ECM 3. Clear DTC, restart vehicle and check if DTC is cleared
P155800 P155900 P155A00 P155B00	Not Plausible Error of DV-E Limphome Learning Position	The NLP position learned by throttle is out of the reasonable range, and a fault is reported	1. Throttle valve or ECM is abnormal during throttle self-learning	In an environment with a temperature higher than 5℃, ignition ON again, use the diagnostic tester to trigger throttle self-learning once, and observe whether the throttle can successfully complete the self-learning 2. Clear DTC, restart vehicle and check if DTC is cleared
P155600 P155700	Electronic Throttle Lower Mechanic Stop Re-learning Error	When the bottom dead center position learned by throttle is out of the	1. Throttle valve or ECM is abnormal	1. In an environment with a temperature higher than 5℃, ignition ON again, use the diagnostic tester

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		reasonable range, and a fault is reported	during throttle self-learning	to trigger throttle self-learning once, and observe whether the throttle can successfully complete the self-learning 2. Clear DTC, restart vehicle and check if DTC is cleared
P15A000	CPU0: MPU Error (Memory, DSPR, PSPR)	ECM chip hardware premier error	ECM hardware fault	1. Replace ECM 2. Clear DTC, restart vehicle and check if DTC is cleared
P15A100	CPU0: DCACHE/ DSPR ECC Uncorrectable Error			
P15A200	CPU0: DCACHE/ DSPR Address Error			
P15A300	CPU0: DCACHE TAG SRAM ECC Uncorrectable Error			
P15A400	CPU0: DCACHE TAG SRAM Address Error			
P15A500	CPU0: PCACHE TAGRAM ECC Uncorrectable Error			
P15A600	CPU0: PCACHE TAGRAM Address Error			
P15A700	CPU0: PCACHE/ PSPR ECC Uncorrectable Error			
P15A800	CPU0: PCACHE/ PSPR Address Error			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P15A900	CPU1:Lockstep Comparator Error			
P15AA00	CPU1:MPU Error (Memory, DSPR, PSPR)			
P15AB00	CPU1: DCACHE/ DSPR ECC Uncorrectable Error			
P15AC00	CPU1: DCACHE/ DSPR Address Error			
P15AD00	CPU1: DCACHE TAGRAM ECC Uncorrectable Error			
P15AE00	CPU1: DCACHE TAGRAM Address Error			
P15AF00	CPU1: PCACHE TAGRAM ECC Uncorrectable Error			
P15B000	CPU1: PCACHE TAGRAM Address Error			
P15B100	CPU1: PCACHE TAGRAM Address Error			
P15B100	CPU1: PCACHE/ PSPR ECC Uncorrectable Error			
P15B200	CPU1: PCACHE/ PSPR Address Error			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P15B300	LMU:SRAM ECC Monitoring Error			
P15B400	LMU:SRAM ECC Uncorrectable Error			
P15B500	LMU:SRAM Address Error			
P15B600	SMU: Recover Timer 0 Timeout Error			
P15B700	SMU: Recover Timer 1 Timeout Error			
P15B800	PMU:PFLASH ECC Uncorrectable Multi-bit Error			
P15B900	PMU:PFLASH Address Error			
P15BA00	PMU: PFLASH ECC Monitoring Error (Cover All ECC Module)			
P15BB00	PMU: PFLASH EDC Comparator Error (Cover All PFLASH Instances)			
P15BC00	SCU/CGU: System PLL OSC_WDT: Input Clock Exceeds Limit Error			
P15BD00	SCU/CGU: System PLL VCO Clock Event Loss Error			
P15BE00	SCU/EVR: EVR 1.3V Digital Undervoltage Error			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P15BF00	SCU/EVR: EVR 3.3V Overvoltage Error			
P15C000	SCU/EVR: External Power Supply Overvoltage Error			
P15C100	SCU/WDTS: Safety Watchdog Timeout Error			
P15C200	SCU/ WDTCPU0: Watchdog CPU0 Timeout Error			
P15C300	SCU/ WDTCPU1: Watchdog CPU1 Timeout Error			
P15C400	SCU/CGU: PLL_ERAY VCO Clock Event Loss Error			
P15C500	SCU/ WDTCPU2: Watchdog CPU2 Timeout Error			
P15C600	SCU/DTS: Temperature Sensor Overflow Error			
P15C700	Registers: Register Monitor Detects Error			
P15C800	SCU/LSCU: SCU Configuration Error: Monitor Dual-track Properties (- Inverted Signal) Alarm from			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Lockstep Comparator (LSCU)			
P15C900	SCU/CGU: Clock Monitoring: STM Exceed Frequency Range Error			
P15CA00	SCU/CGU: Clock Monitoring: PLL_ERAY Exceed Frequency Range Error			
P15CB00	SCU/CGU: Clock Monitoring: PLL Exceed Frequency Range Error			
P15CC00	SCU/CGU: Clock Monitoring: SRI Exceed Frequency Range Error			
P15CD00	SCU/CGU: Clock Monitoring: SPB Exceed Frequency Range Error			
P15CE00	SCU/CGU: Clock Monitoring: GTM Exceed Frequency Range Error			
P15CF00	SCU/CGU: Clock Monitoring: ADC Exceed Frequency Range Error			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P15D000	GTM: SRAMs Uncorrectable Error			
P15D100	FLEXRAY: SRAM Address Error			
P15D200	Misc SRAMs: SRAM ECC Uncorrectable Error			
P15D300	Misc SRAMs: SRAM Address Error			
P15D400	GTM: SRAMs Address Error			
P15D500	CAN: SRAM Uncorrectable Error			
P15D600	CAN: SRAM Address Error			
P15D700	FLEXRAY: SRAM ECC Uncorrectable Error			
P15D800	CPU2:MPU Error (Memory, DSPR, PSPR)			
P15D900	CPU2: DCACHE/ DSPR ECC Uncorrectable Error			
P15DA00	CPU2: DCACHE/ DSPR Address Error			
P15DB00	CPU2: DCACHE TAG SRAM ECC Uncorrectable Error			
P15DC00	CPU2: DCACHE TAG SRAM Address Error			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P15DD00	CPU2:121 PCACHE TAGRAM ECC Uncorrectable Error			
P15DE00	CPU2: PCACHE TAGRAM Address Failure			
P15DF00	CPU2: PCACHE/ PSPR ECC Uncorrectable Error			
P15E000	CPU2: PCACHE/ PSPR Address Error			
P061A00	Safely Monitor Torque Exceeds Limit	In the 2nd layer monitoring, when the actual torque calculated by ECM exceeds the 2nd layer allowable torque and the duration exceeds 520 ms, a fault is reported	1. ECM data settings are wrong, usually because the EGAS safety monitoring function is not matched or preset 2. The external torque increase request was not considered during the data setting process	1. Communicate with EGAS security monitoring matching engineer to confirm if it is necessary to perform security monitoring presets or matching 2. Confirm if there is an external torque increase request with the customer (ESP torque increase request, TCU torque increase request, etc.) 3. Clear DTC, restart vehicle and check if DTC is cleared
P060D00	Accelerator Pedal 2nd Layer Monitoring Error	In the 2nd layer of monitoring, when the deviation of pedal two signals exceeds the limit, a fault will be reported	1. ECM data settings are wrong, usually because the EGAS safety monitoring function is not matched or preset 2. The application layer data of pedal module does not match the monitoring layer data during the data	1. Communicate with EGAS security monitoring matching engineer to confirm if it is necessary to perform security monitoring presets or matching 2. Confirm if pedal model has been changed with the customer 3. Clear DTC, restart vehicle and check if DTC is cleared

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			setting process	
P152000	Function Monitoring: Check of Predicted Air Mass Failed	In the 2nd layer of monitoring, when recognizing that there is a deviation between the calculation of load to fuel injection volume and calculation of monitoring layer in the calculation of ECM application layer, the fault is reported	1. ECM data settings are wrong, usually because the EGAS safety monitoring function is not matched or preset 2. The calculation of application layer from load to fuel injection volume is wrong	1. Communicate with EGAS security monitoring matching engineer to confirm if it is necessary to perform security monitoring presets or matching 2. Check if calculation process of load to fuel injection in the calculation of application layer is incorrect 3. Clear DTC, restart vehicle and check if DTC is cleared
P152100	Function Monitoring: Fault of ECU Check of Injection Cut-off			
P152200	Function Monitoring: Fault of ECU in Check of Cylinder Individual Fuel Corrections			
P153900	Synchronizatio-n process rationality check (based on speed and synchronization count)			
P153700	Function Monitoring: Fault of ECU or Sensor in rl-Comparison			
P153500	Function Monitoring: Fault of ECU or Sensor in Mixture Check			
P153600	Function Monitoring: Fault of ECU Comparison of Lambda and Operation Mode			
P153800	Electronic Throttle Safety Monitoring Function Error (Ignition Angle Signal, Wire	ECM Bottom Fault Response Measure Error	1. ECM Internal Malfunction	1. Replace ECM 2. Clear DTC, restart vehicle and check if DTC is cleared

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Harness or ECM Error)			
P152700	Function Monitoring: Monitoring of ICO From Level1	Monitoring layer recognizes an abnormal safety oil cut-off	1. ECM Internal Malfunction	1. Replace ECM 2. Clear DTC, restart vehicle and check if DTC is cleared
P152800	Function Monitoring: Monitoring of ICO From Level2			
P061C00	Safety Monitoring Function Error (2nd Layer Engine Speed Monitoring Error)	The monitoring layer speed signal is inconsistent with the application layer speed signal	1. ECM Internal Malfunction	1. Replace ECM 2. Clear DTC, restart vehicle and check if DTC is cleared
P152900	Function Monitoring: Fault of Starter Control	2nd layer of monitoring identified an abnormal start-stop function	1. ECM Internal Malfunction	1. Replace ECM 2. Clear DTC, restart vehicle and check if DTC is cleared
P153000	Function Monitoring: Fault of ECM ADC - Null Load Test Pulse	Hardware bottom data error	1. ECM Internal Malfunction	1. Replace ECM 2. Clear DTC, restart vehicle and check if DTC is cleared
P153100	Function Monitoring: Fault of ECM ADC - Test Voltage			
P157100	Closed Path Checking, Driver Level Check Error Or Communication Error			
P157200	Under Normal Voltage, ABE Activated			
P157300	Diagnostic Fault Check to Report "WDA active" Due to Errors in Query/ Response Communication			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P157400	Errorpin Activated and Monitoring Communication Normal			
P157500	Diagnostic Fault Check to Report "WDA active" Due to Overvoltage Detection			
P213800	Deviation Between Both Paths Signal of Accelerator Pedal Out of Limit	Both paths signal of accelerator pedal are compared. When the deviation exceeds the threshold and confirmed after a period of time, the fault will be reported.	1. There is a short circuit or resistance between first path and second path signal wires of accelerator pedal 2. There is resistance on first path/ second path 5 V power supply wire of accelerator pedal or GND wire, causing the pedal terminal voltage to drop by 5 V or the zero voltage to be raised	1. Collect two paths of accelerator pedal voltage values APP_uRaw1, APP_uRaw2, and observe if the relationship between them is twice at the moment the fault reappears 2. The actions such as unplugging and plugging connector, shaking wire harness, etc. will affect the occurrence frequency of faults 3. Measure the voltage drop of each section on wire harness by AD-Scan. If the wire harness is normal, there is no voltage drop, and if there is a voltage drop, it means that there is resistance in wire harness or connector 4. Verify if wire harness resistance is the cause by accelerator pedal flying wire connection 5. Replace pedal to determine if there is an internal problem in pedal 6. Clear DTC, restart vehicle and check if DTC is cleared
P212300	Accelerator Pedal 1st Path / 2nd Path Signal Voltage High	The voltage value of one path of pedal is higher than APP_ uRaw1SRCHigh_C / APP_uRaw2SRCHigh_C and continues for TUPWGO time	1. The first path /second path signal ground wire GND of accelerator pedal is open 2. First path /- second path	1. Collect two paths of accelerator pedal voltage values APP_uRaw1, APP_uRaw2, and observe if it is pulled near 5 V when fault reappears 2. The actions such as unplugging and plugging connector, shaking wire
P212800				

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			signal wire of accelerator pedal is short to 5 V	harness, etc. will affect the occurrence frequency of faults 3. Verify if wire harness is the cause by accelerator pedal flying wire connection 4. Replace pedal, check if it is caused by pedal 5. Clear DTC, restart vehicle and check if DTC is cleared
P212200 P212700	Accelerator Pedal 1st Path / 2nd Path Signal Voltage Low	The voltage value of one path of pedal is lower than APP_uRaw1SRCLow_C / APP_uRaw2SRCLow_C and continues for TUPWGU time	1. The 5 V power supply line of the first path /second path signal of accelerator pedal is open 2. The first path /second path signal wire of accelerator pedal is open 3. First path /-second path signal wire of accelerator pedal is short to GND	1. Collect two paths of accelerator pedal voltage values APP_uRaw1, APP_uRaw2, and observe if it drops near zero when fault reappears 2. The actions such as unplugging and plugging connector, shaking wire harness, etc. will affect the occurrence frequency of faults 3. Verify if wire harness is the cause by accelerator pedal flying wire connection 4. Replace pedal, check if it is caused by pedal 5. Clear DTC, restart vehicle and check if DTC is cleared
P049900	EVAP System Vent Control Circuit Short to Power Supply	Drive channel self-diagnosis is malfunctioning	1. Canister vent valve control circuit is short to power supply 2. Canister vent valve control circuit pin corresponding to ECM terminal is short to power supply	1. Canister vent valve control circuit is short to power supply 2. Canister vent valve control circuit pin corresponding to ECM terminal is short to power supply
P049800	EVAP System Vent Control Circuit Short to Ground	Drive channel self-diagnosis is malfunctioning	1. Canister vent valve control circuit is short to ground 2. Canister vent valve control	1. Canister vent valve control circuit is short to ground 2. Canister vent valve control circuit pin is short to ground

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			circuit pin is short to ground	
P044700	EVAP System Vent Control Circuit Short to Ground	Drive channel self-diagnosis is malfunctioning	1. Connector looseness or poor contact 2. Canister vent valve control circuit is open 3. Canister vent valve control circuit power supply terminal is open or shorted to ground 4. Canister vent valve control circuit fuse is blown or damaged 5. Open circuit or internal circuit damage in canister vent valve control circuit pin corresponding to ECM	1. Connector looseness or poor contact 2. Canister vent valve control circuit is open 3. Canister vent valve control circuit power supply terminal is open or shorted to ground 4. Canister vent valve control circuit fuse is blown or damaged 5. Open circuit or internal circuit damage in canister vent valve control circuit pin corresponding to ECM
P069100	Fan Control Circuit Low	Drive channel self-diagnosis is malfunctioning	1. Cooling fan relay control circuit is short to ground 2. Cooling fan relay control pin corresponding to ECM terminal is short to ground	1. Cooling fan relay control circuit is short to ground 2. Cooling fan relay control pin corresponding to ECM terminal is short to ground
P069200	Fan Control Circuit High	Drive channel self-diagnosis is malfunctioning	1. Cooling fan relay control circuit is short to power supply 2. Cooling fan relay control pin corresponding to ECM terminal is	1. Cooling fan relay control circuit is short to power supply 2. Cooling fan relay control pin corresponding to ECM terminal is short to power supply

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			short to power supply	
P048000	Cooling Fan Control Circuit Error	Drive channel self-diagnosis is malfunctioning	1. Cooling fan relay control circuit is open 2. Cooling fan relay control circuit pin corresponding to ECM terminal is open	1. Connector looseness or poor contact 2. Cooling fan relay circuit signal terminal is open 3. Cooling fan relay is malfunctioning (fuse is blown or damaged) 4. Open circuit or internal circuit damage in cooling fan relay pin corresponding to ECM terminal
P063400	Cooling Fan Drive Chip Overheating	Drive channel self-diagnosis is malfunctioning	1. Cooling fan relay control circuit is short to power supply 2. Cooling fan relay control pin corresponding to ECM terminal is short to power supply	1. Cooling fan relay control circuit is short to power supply 2. Whether there is a fault in internal chip of ECM
P214800	Cylinder 1 or Cylinder 4 Fuel Injector Control Circuit Short to Power Supply	Drive channel self-diagnosis is malfunctioning	1. Injector high side control circuit is short to power supply 2. Short to power supply in injector high side control pin corresponding to ECM	1. Check if corresponding fuel injector high side control circuit is short to power supply 2. Check if fuel injector high side control circuit pin corresponding to ECM is short to power supply
P215100	Cylinder 2 or Cylinder 3 Fuel Injector Control Circuit Short to Power Supply			
P070000	TCU Requests to Illuminate MIL Light	TCU Requests to Illuminate MIL Light	1. TCU fault	1. Check whether TCU fault memory is faulty
P145000	Brake Booster Pressure Sensor Circuit Range/ Performance (High)	The brake chamber pressure is higher than the possible limit	1. Brake vacuum sensor characteristics have deviation 2. Brake vacuum chamber leakage	1. Check whether there is contact resistance in brake vacuum sensor wire harness 2. Check if sensor is damaged 3. Check for leakage in brake vacuum chamber
P145100	Brake Booster Pressure Sensor Circuit	The brake chamber pressure is lower than the possible limit		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Range/ Performance (Low)			
P121200	Vehicle Speed Sensor Performance Failure (Vehicle Speed Exceed Maximum Range)	Vehicle speed signal exceeds maximum possible value	1. ESP sends wrong speed signal	1. Check whether the CAN signal sent by ESP is too high
P050184	Vehicle Speed Sensor Performance Failure (Vehicle Speed Exceed Minimum Range)	Vehicle speed signal exceeds minimum possible value	1. ESP sends wrong speed signal 2. Vehicle speed signal frame communicatio- n between ESP and ECM is lost	1. Check if communication between ESP and ECM is lost 2. Check if CAN signal sent by ESP is always 0
P050165	Vehicle speed sensor performance failure (vehicle speed is too low when oil cut-off during coasting)	Vehicle speed signal exceeds minimum possible value		
P050166	Vehicle Speed Sensor "A" Circuit Range/ Performance	Vehicle speed signal exceeds minimum possible value		
P050000	Vehicle Speed Sensor Input Signal Fault	CAN speed signal received by ECM is wrong		
P050B00	Cold Start Ignition Timing Performance	The ignition angle efficiency exceeds the setting threshold during heating of parking idle catalytic converter	1. There are other DTC such as throttle valve failure or misfire failure, resulting in a decrease in intake air flow and abnormal ignition angle efficiency 2. Electronic throttle is stuck in a position with a small opening 3 Check if intake	1. Using a diagnostic tester, check if there are other faults such as misfire faults and throttle faults 2. Electronic throttle is stuck in a position with a small opening 3. Check if intake manifold is air leaked, exhaust resistance is too large, and the oil supply pressure is too low 4. Whether ECM is malfunctioning

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			manifold is air leaked, exhaust resistance is too large, and the oil supply pressure is too low 4. ECM failure	
P050B20	Cold Start Ignition Timing Performance	The ignition angle efficiency exceeds the setting threshold during heating of running catalytic converter	1. There are other DTC such as throttle valve failure or misfire failure, resulting in a decrease in intake air flow and abnormal ignition angle efficiency 2. Electronic throttle is stuck in a position with a small opening 3 Electronic throttle is stuck in a position with a small opening 4. ECM failure	1. Using a diagnostic tester, check if there are other faults such as misfire faults and throttle faults 2. Electronic throttle is stuck in a position with a small opening 3. Check if intake manifold is air leaked, exhaust resistance is too large, oil supply pressure is too low, and whether the boost system has insufficient supercharging 4. Whether ECM is malfunctioning
P057100	Brake Pedal Signal Synchronizatio-n Malfunction	When the both paths of brake signal Brk_stMn and Brk_stRed are out of synchronization for more than 1 second, and the number of consecutive times exceeds Brk_ cntrSynErrThd_C, a fault will be reported	1. The brake switch or the brake light switch is open or short circuit 2. The switch in brake pedal has a mechanical failure	1. Collect brake switch main signal Brk_stMn and brake redundancy signal Brk_stRed, and check if they meet the requirements of UMC: Stroke of two asynchronous sections cannot be too long 2. Check if brake pedal wire harness is connected reliably and if mechanical structure of brake pedal is abnormal 3. Clear DTC, restart vehicle and check if DTC is cleared
P142000	CAN Hardware Memory Response Timeout	CAN module initialization failed	1. CAN module of MCU initialization failed	1. Power off the key until the ECM is completely powered off, then power on the key to check

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				whether the fault is eliminated
P142100	LIN Hardware Memory Response Timeout	LIN module initialization failed	1. LIN module of MCU initialization failed	1. Power off the key until the ECM is completely powered off, then power on the key to check whether the fault is eliminated
P064100	5 V Power Supply Module 1 Fail	5 V power supply module 1 has an overvoltage or undervoltage problem	1.5V power supply module 1 has an overvoltage or undervoltage problem	1. There is wire harness signal interference
P065100	5 V Power Supply Module 2 Fail	5 V power supply module 2 has an overvoltage or undervoltage problem	1.5V power supply module 2 has an overvoltage or undervoltage problem	1. There is wire harness signal interference
P069700	5 V Power Supply Module 3 Fail	5 V power supply module 3 has an overvoltage or undervoltage problem	1.5V power supply module 3 has an overvoltage or undervoltage problem	1. There is wire harness signal interference
P068500	Main Relay Open Circuit Error	When ECM is powered on, the main relay is open	1. Open circuit in main relay	1. There is wire harness interference 2. The transmission line between main relay and ECM is damaged or interrupted
P068700	Main Relay Short to Power Supply	When ECM is powered on, the main relay is short to power supply	1. Open circuit in main relay	1. There is wire harness interference 2. Transmission line between main relay and ECM is damaged, resulting in short to power supply
P068600	Main Relay Short to Ground	When ECM is powered on, the main relay is short to ground	1. Short to ground in main relay	1. There is wire harness interference 2. Transmission line between main relay and ECM is damaged, resulting in short to ground
P06869E	ECM/PCM Power Relay Control Circuit Low	When ECM is powered off, the UBR voltage is greater than the	1. When ECM is powered off, the UBR	1. Main relay is stuck 2. There is interference in BR wire harness, and it is short to UBD

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		reasonable range after main relay is disconnected	voltage is greater than the reasonable range after main relay is disconnected	
P261000	Unreasonable Shutdown Timing	When ECM is powered on, shutdown timing data is unreasonable	1. Shutdown timing data is unreasonable	1. Power off the key until the ECM is completely powered off, then power on the key to check whether the fault is eliminated
P06B842 P06B843	Error when Reading/ Writing Flash Block	When ECM is powered on, failure occurs when reading/writing Flash Block	1. Failure occurs when reading/writing Flash Block	1. Power off the key until the ECM is completely powered off, then power on the key to check whether the fault is eliminated
P126100	Cylinder 1 Injector Circuit Range/ Performance - Signal Plausibility Failure	The first five times the voltage signal value of cylinder 1 injector is lower than the lower threshold, or the last three times the voltage signal value exceeds the upper threshold	1. Injector wire harness for cylinder 1 is abnormal 2. ECM internal circuit is abnormal	1. Check whether cylinder 1 injector wire harness connection is normal 2. Replace the injector of cylinder 1, start the vehicle, and check whether the fault reappears 3. After replacing ECM, start the vehicle, and check whether the fault reappears
P126300	Cylinder 3 Injector Circuit Range/ Performance - Signal Plausibility Failure	The first five times the voltage signal value of cylinder 3 injector is lower than the lower threshold, or the last three times the voltage signal value exceeds the upper threshold	1. Injector wire harness of cylinder 3 is abnormal 2. ECM internal circuit is abnormal	1. Check whether cylinder 3 injector wire harness connection is normal 2. Replace the injector of cylinder 3, start the vehicle, and check whether the fault reappears 3. After replacing ECM, start the vehicle, and check whether the fault reappears
P126400	Cylinder 4 Injector Circuit Range/ Performance - Signal Plausibility Failure	The first five times the voltage signal value of cylinder 4 injector is lower than the lower threshold, or the last three times the voltage signal value exceeds the upper threshold	1. Injector wire harness of cylinder 4 is abnormal 2. ECM internal circuit is abnormal	1. Check whether cylinder 4 injector wire harness connection is normal 2. Replace the injector of cylinder 4, start the vehicle, and check whether the fault reappears 3. After replacing ECM, start the

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				vehicle, and check whether the fault reappears
P126200	Cylinder 2 Injector Circuit Range/ Performance - Signal Plausibility Failure	The first five times the voltage signal value of cylinder 2 injector is lower than the lower threshold, or the last three times the voltage signal value exceeds the upper threshold	1. Injector wire harness of cylinder 2 is abnormal 2. ECM internal circuit is abnormal	1. Check whether cylinder 2 injector wire harness connection is normal 2. Replace the injector of cylinder 2, start the vehicle, and check whether the fault reappears 3. After replacing ECM, start the vehicle, and check whether the fault reappears
P143000	Battery Has Been Changed and Long Time No Tester Confirmation	ECM receives LIN communication and sends fault information	1. The battery type has changed	1. Check whether the battery type has changed
P143100	EBS or Battery Error	ECM receives LIN communication and sends fault information	1. EBS circuit is open 2. EBS is damaged	1. Check if EBS circuit is open 2. EBS is damaged
P143200	EBS Temporary Error	ECM receives LIN communication and sends fault information	1. Wire harness interference in EBS LIN communicatio-n	1. Check whether there is wire harness interference in EBS LIN communication
P144200	Communication Fault of Generator	ECM receives LIN communication and sends fault information	1. Interference or damage in generator LIN wire harness	1. Check whether there is interference or damage in generator LIN communication module
P144100	Mechanical Fault of Generator	ECM receives LIN communication and sends fault information	1. The mechanical part of generator is stuck or damaged	1. Check whether the mechanical part of generator is stuck or damaged
P144000	Generator Circuit Error	ECM receives LIN communication and sends fault information	1. Electronic part of generator is damaged	1. Check whether the electronic part of generator is damaged
P001100	"A" Camshaft Position - Timing Over-Advanced or System	When the engine starts, the intake camshaft is not in the locked position and exceeds the calibrated threshold	1. Intake VVT phase regulator and oil control valve are failure	1. Check the operating status of intake VVT phase regulator and oil control valve (Blocked by dirt, stuck, oil pressure

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Performance Bank 1			not completely relieved, lock pin invalid, etc.)
P001400	"B" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	When the engine starts, the exhaust camshaft is not in the locked position and exceeds the calibrated threshold	1. Exhaust VVT phase regulator and oil control valve are failure	1. Check the operating status of intake VVT phase regulator and oil control valve (Blocked by dirt, stuck, oil pressure not completely relieved, lock pin invalid, etc.)
P062700	Fuel Pump “A” Control Circuit Open	Hardware circuit self-diagnostic	1. Open circuit in fuel pump relay control circuit 2. Open circuit in fuel pump relay control terminal corresponding to ECM	1. Check for open circuit in fuel pump relay control circuit 2. Check for open circuit in fuel pump relay control pin corresponding to ECM terminal
P062800	Fuel Pump “A” Control Circuit Low	Hardware circuit self-diagnostic	1. Fuel pump relay control circuit is short to ground 2. Fuel pump relay control terminal corresponding to ECM is short to ground	1. Check if fuel pump relay control circuit is short to ground 2. Check if fuel pump relay control pin corresponding to ECM terminal is short to ground
P062900	Fuel Pump “A” Control Circuit High	Hardware circuit self-diagnostic	1. Fuel pump relay control circuit is short to power supply 2. Fuel pump relay control terminal corresponding to ECM is short to power supply	1. Check if fuel pump relay control circuit is short to power supply 2. Check if fuel pump relay control pin corresponding to ECM terminal is short to power supply
P05BD00	Start and Stop Main Switch is Stuck Failure	The sticky time of start and stop main switch exceeds the threshold	1. The start and stop main switch is damaged 2. The corresponding pin of the start and stop main switch is short	1. Check whether the start and stop main switch is damaged, whether it cannot be reset for a long time after being pressed 2. Check whether the corresponding pin of the start and stop main switch is short to power supply

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			to power supply	
P26F100	Starter Relay R1 (Crank Relay) or Starter (Drive Chain) Relay R2 (Pt State Relay) Cannot Be Combined	There is a start request but no starter feedback signal	1. Start relay R1 is damaged 2. Starter (-drive chain) relay R2 is damaged	1. Check whether the start relay R1 is damaged 2. Check whether the starter (drive chain) relay R2 is damaged
P26F200	Starter (Drive Chain) Status Relay R2 (PT State Relay) Cannot Be Disconnected	The starter feedback signal can be detected by sending the start test pulse when the drive chain is locked	1. Starter (-drive chain) relay R2 switch adhesion damage	1. Check starter (drive chain) relay R2 switch for adhesion
P26F000	Starter Relay R1 (Crank relay) Cannot Be Disconnected	After the start, the starter feedback signal is detected when there is no start request	1. Starter relay R1 switch adhesion damage	1. Check starter relay R1 switch for adhesion
P14AD00	Engine Block or Starter is not Engaged	There is voltage drop and start feedback signal when starting, but the engine does not turn	1. Engine crankshaft or flywheel is stuck 2. The starter and the flywheel cannot be meshed	1. Check whether the engine crankshaft and flywheel are blocked by foreign matters 2. Turn the key to "start", and check whether the starter and flywheel can mesh normally
P14AF00	KL50r Wire Short Circuit to Ground	The engine can start normally, but there is no starter feedback voltage signal	1. Start feedback signal circuit is open 2. Start feedback signal circuit is short to ground	1. Check whether the starter feedback voltage signal circuit is short to ground or open
P14AE00	KL50r Wire Short Circuit to Battery	No start request, but the starter feedback voltage signal setting time exceeds the threshold	1. Start feedback signal circuit is short to power supply	1. Check whether the start switch feedback signal circuit is short to power supply
P14AC00	Starter Damaged or Wire Dropped	There is no voltage drop and start feedback signal when starting, and engine does not turn	1. The starter power supply circuit is disconnected or damaged and short to power supply 2. The starter	1. Check whether the starter power supply circuit is disconnected or damaged 2. Check whether the starter body is damaged or not working properly

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			body is damaged or cannot work normally	
P1388 24	Ambient Temperature Sensor Cold Start Test Positive Deviation Unreasonable	/	1. The initial value of ambient temperature is much higher than the basic calibration value (main water temperature, average intake air temperature) 2. The initial value of ambient temperature is much lower than the basic calibration value (main water temperature, average intake air temperature)	/
P1388 23	Ambient Temperature Sensor Cold Start Test Negative Deviation Unreasonable			
P0070	Ambient Air Temperature Sensor Circuit "A"	/	1. ECM failed to normally receive the ambient temperature status transmitted from CAN 2. The transmitter of ambient temperature fails to send the signal normally	1. Read ambient temperature value on CAN and check if it is reasonable 2. Read ambient temperature value on CAN and check if it is reasonable 3. Read ambient temperature status on CAN and check if it is reasonable
U0128	Lost Communication With EPB Module	ECM receiving EPB information timed out	1. EPB connector looseness or disengageme-nt 2. Transmission line between	1. EPB connector looseness or disengagement 2. There is wire harness signal interference 3. Transmission line between EPB and ECM

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			EPB and ECM damaged or interrupted 3. EPB is damaged and signal cannot be transmitted to ECM normally	damaged or interrupted 4. Check if there is CAN hardware circuit fault 5. EPB is damaged and signal cannot be transmitted to ECM normally
U0131	Lost Communication With EPS (HS CAN)	ECM receiving EPS information timed out	1. EPS connector looseness or disengageme-nt 2. Transmission line between EPS and ECM damaged or interrupted 3. EPS is damaged and signal cannot be transmitted to ECM normally	1. EPS connector looseness or disengagement 2. There is wire harness signal interference 3. Transmission line between EPS and ECM damaged or interrupted 4. Check if there is CAN hardware circuit fault 5. EPS is damaged and signal cannot be transmitted to ECM normally
U0151	Lost Communication With Airbag Module (SDM) (HS CAN)	ECM receiving SDM information timed out	1. SDM connector looseness or disengageme-nt 2. Transmission line between SDM and ECM damaged or interrupted 3. SDM is damaged and signal cannot be transmitted to ECM normally	1. SDM connector looseness or disengagement 2. There is wire harness signal interference 3. Transmission line between SDM and ECM damaged or interrupted 4. Check if there is CAN hardware circuit fault 5. SDM is damaged and signal cannot be transmitted to ECM normally
U0073	Control Module Communication Bus 1 Off (CAN1 Bus off)	CAN1 bus is off	1. CAN1 bus interface looseness or poor contact 2. Short circuit to power supply / ground or open circuit in CAN1 bus interface pin 3. Short circuit to	1. CAN1 bus interface looseness or poor contact 2. Short circuit to power supply / ground or open circuit in CAN1 bus interface pin 3. There is wire harness signal interference 4. Short circuit to power supply / ground, open circuit or internal circuit damage in

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			power supply / ground, open circuit or internal circuit damage in CAN1 bus interface pin corresponding to ECM terminal	CAN1 bus interface pin corresponding to ECM terminal
P150100	Airbag Communicate Message Unplausible	The signal sent by airbag controller to engine ECM has not passed the verification	1. There is wire harness interference or unreliable signal transmission 2. The signal sent by airbag controller to engine ECM has not passed the verification, check whether the signal is abnormal	1. There is wire harness interference or unreliable signal transmission 2. The signal sent by airbag controller to engine ECM has not passed the verification, check whether the signal is abnormal
P150000	EMS Received Crash Signal	CAN information is unreasonable	1. The vehicle crashes and airbag pops up 2. There is electromagnet-ic interference in the connection wire harness between airbag and ECM 3. There is electromagnet-ic interference in the connection wire harness between airbag and ECM	1. The vehicle crashes and airbag pops up 2. There is electromagnetic interference in the connection wire harness between airbag and ECM 3. The signal sent by airbag to ECM is error and unreasonable
P053300	A/C Refrigerant Pressure Sensor "A" Circuit High	Sensor voltage is higher than the threshold	1. Intake manifold pressure sensor signal terminal is	1. Connect diagnostic tester, turn ignition switch to “ON”. Do not start engine, use a multimeter to measure if voltage between intake manifold

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			short to power supply or open 2. Sensor reference ground terminal is open 3. Short circuit to power supply or open circuit in intake pressure sensor signal pin terminal corresponding to ECM terminal 4. Sensor is damaged	pressure sensor signal terminal and ground is close to or equal to 5 V 2. Turn ignition switch to “OFF”, check connector for looseness or poor contact 3. Check if intake manifold pressure sensor signal terminal is short to power supply or open 4. Check if sensor reference ground terminal is open 5. Check if sensor is damaged 6. Check for short circuit to power supply, open circuit or internal circuit damage in intake pressure sensor signal pin terminal corresponding to ECM terminal
P053200	A/C Refrigerant Pressure Sensor "A" Circuit Low	Sensor voltage is lower than the threshold	1. A/C pressure sensor signal terminal is short to ground 2. 5 V reference voltage of sensor is open 3. Short circuit to ground in A/C pressure sensor signal pin corresponding to ECM terminal	1. Connect diagnostic tester, turn ignition switch to “ON”. Do not start the engine, use a multimeter to measure if the voltage of air conditioning pressure sensor signal terminal is close to or equal to 0 V. 2. Turn ignition switch to “OFF”, check if pressure sensor signal terminal is short to ground 3. Check if sensor 5 V reference voltage terminal is open 4. Check if intake pressure sensor signal pin terminal corresponding to ECM terminal is short to ground
P050F00	Brake Assist Vacuum Too Low	When the vacuum pump is working, the differential pressure between front and rear of brake disc vacuum is lower than the setting threshold within a certain period of time (- such as 1 second)	1. There is a problem with the sealing characteristics of brake booster system 2. Vacuum pump is damaged	1. Check whether the sealing characteristics of brake booster system are abnormal 2. Check whether the vacuum pump is damaged

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P258A00	Vacuum Pump Control Circuit Open	Drive channel self-diagnosis is malfunctioning	1. Connector looseness or poor contact 2. Brake vacuum pump relay control circuit is open 3. Brake vacuum pump relay control circuit power supply terminal is open or shorted to ground 4. Brake vacuum pump relay fuse is blown or damaged 5. Open circuit or internal circuit damage in brake vacuum pump control pin corresponding to ECM	1. Connector looseness or poor contact 2. Brake vacuum pump relay control circuit is open 3. Brake vacuum pump relay control circuit power supply terminal is open or shorted to ground 4. Brake vacuum pump relay fuse is blown or damaged 5. Open circuit or internal circuit damage in brake vacuum pump control pin corresponding to ECM
P258C00	Vacuum Pump Control Circuit "A" Low	Drive channel self-diagnosis is malfunctioning	1. Brake vacuum pump relay control circuit is short to ground 2. Brake vacuum pump relay pin corresponding to ECM terminal is short to ground	1. Brake vacuum pump relay control circuit is short to ground 2. Brake vacuum pump relay pin corresponding to ECM terminal is short to ground
P258D00	Vacuum Pump Control Circuit "A" High	Drive channel self-diagnosis is malfunctioning	1. Brake vacuum pump relay circuit is short to power supply 2. Brake vacuum pump relay pin corresponding to ECM terminal is short to power supply	1. Brake vacuum pump relay circuit is short to power supply 2. Brake vacuum pump relay pin corresponding to ECM terminal is short to power supply
U015187	Lose Communication	ECM receiving ABM/EGS/ EPB/MFS/PEPS/SAM/	1. ABM/EGS/ EPB/MFS/	1. ABM/EGS/EPB/MFS/ PEPS/SAM/EBS/DECOS

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U010387 U012887 U118787 U024887 U021287 U01B000 U010987	With ABM/ EGS/EPB/MFS/ PEPS/SAM/ EBS/DECOS or Signal Abnormal	EBS/DECOS information timed out	PEPS/SAM/ EBS/DECOS connectors looseness or disengageme-nt 2. Transmission line between ABM/EGS/ EPB/MFS/ PEPS/SAM/ EBS/DECOS and ECM damaged or interrupted 3. ABM/EGS/ EPB/MFS/ PEPS/SAM/ EBS/DECOS are damaged and signal cannot be transmitted to ECM normally	connectors looseness or disengagement 2. There is wire harness signal interference 3. Transmission line between ABM/EGS/EPB/ MFS/PEPS/SAM/EBS/ DECOS and ECM damaged or interrupted 4. Check if there is CAN hardware circuit fault 5. ABM/EGS/EPB/MFS/ PEPS/SAM/EBS/DECOS are damaged and signal cannot be transmitted to ECM normally
U041681 U040281 U045281 U042281 U042481 U040481 U041781 U041081 U042381 U059B81 U042681 U042981	Data Received by ECM from ESP/TCM/ ABM/BCM/ CLM/EGS/EPB/ FPC/ICM/MFS/ PEPS/SAM Module not Reliable	Data from ESP/TCM/ ABM/BCM/CLM/EGS/ EPB/FPC/ICM/MFS/ PEPS/SAM module is invalid	1. The checksum value sent by ESP/TCM/ ABM/BCM/ CLM/EGS/ EPB/FPC/ICM/ MFS/PEPS/ SAM module is abnormal 2. The Alive counter value sent by ESP/ TCM/ABM/ BCM/CLM/ EGS/EPB/ FPC/ICM/ MFS/PEPS/ SAM module is abnormal 3. The value sent by ESP/TCM/ ABM/BCM/ CLM/EGS/ EPB/FPC/ICM/ MFS/PEPS/ SAM module contains an Invalid value	1.ESP/TCM/ABM/BCM/ CLM/EGS/EPB/FPC/ICM/ MFS/PEPS/SAM connectors looseness or disengagement 2. There is wire harness signal interference 3. Transmission line between ESP/TCM/ABM/ BCM/CLM/EGS/EPB/ FPC/ICM/MFS/PEPS/ SAM and ECM damaged or interrupted 4. Check if there is CAN hardware circuit fault 5. ESP/TCM/ ABM/BCM/CLM/EGS/ EPB/FPC/ICM/MFS/ PEPS/SAM are damaged and signal cannot be transmitted to ECM normally

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P059700	Thermostat Heater Control Circuit Open	Drive channel self-diagnosis is malfunctioning	1. Connector looseness or poor contact 2. Electronic thermostat drive circuit pin is open 3. Open circuit or internal circuit damage in electronic thermostat drive circuit pin corresponding to ECM terminal	1. Check connector for looseness or poor contact 2. Check if electronic thermostat drive circuit pin is open 3. Check for open circuit or internal circuit damage in electronic thermostat drive circuit pin corresponding to ECM terminal
P059800	Thermostat Heater Control Circuit Low	Drive channel self-diagnosis is malfunctioning	1. Electronic thermostat drive circuit short to ground 2. Short to ground in electronic thermostat drive circuit corresponding to ECM terminal	1. Check if electronic thermostat drive circuit is short to ground 2. Check for short circuit to ground in electronic thermostat drive circuit pin corresponding to ECM terminal
P059900	Thermostat Heater Control Circuit High	Drive channel self-diagnosis is malfunctioning	1. Electronic thermostat drive circuit short to power supply 2. Short to power supply in electronic thermostat drive circuit corresponding to ECM terminal	1. Check for short circuit to power supply in electronic thermostat drive circuit pin 2. Check for short circuit to power supply in electronic thermostat drive circuit corresponding to ECM terminal
U007388	CAN1 Bus OFF (- Communication Closed)	CAN1 bus is off	1. CAN1 bus interface looseness or poor contact 2. Short circuit to power supply / ground or open circuit in CAN1 bus interface pin 3. Short circuit to	1. CAN1 bus interface looseness or poor contact 2. Short circuit to power supply / ground or open circuit in CAN1 bus interface pin 3. There is wire harness signal interference 4. Short circuit to power supply / ground, open circuit or internal circuit damage in

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			power supply / ground, open circuit or internal circuit damage in CAN1 bus interface pin corresponding to ECM terminal	CAN1 bus interface pin corresponding to ECM terminal
P007200	Ambient Air Temperature Sensor Circuit "A" Low	Ambient temperature sensor circuit connectivity self-diagnosis	1. Wire harness of ambient temperature sensor is abnormally connected 2 Ambient temperature sensor is damaged	1. Using a multimeter, check if sensor pin voltage is normal 2. Check if CAN signal is normal 3. Check if wire harness is normal 4. Replace ECM, check if fault reappears
P007300	Ambient Air Temperature Sensor Circuit "A" High	Ambient temperature sensor signal circuit connectivity self-diagnosis	1. Wire harness of ambient temperature sensor is abnormally connected 2 Ambient temperature sensor is damaged	1. Using a multimeter, check if sensor pin voltage is normal 2. Check if CAN signal is normal 3. Check if wire harness is normal 4. Replace ECM, check if fault reappears
P254200	DECOS Oil Passage Pressure Sensor Circuit High Voltage	Fuel rail pressure sensor circuit voltage is higher than 4.8 V	1. Fuel rail pressure sensor circuit short to power supply 2. Fuel rail pressure sensor pin corresponding to ECM short to power supply	1. Check if sensor signal terminal is short to power supply or open 2. Check if sensor is damaged 3. Check for short circuit to power supply, open circuit or internal circuit damage in fuel rail pressure sensor signal pin corresponding to ECM terminal
P254100	DECOS Oil Passage Pressure Sensor Circuit Low Voltage	Fuel rail pressure sensor circuit voltage is lower than 0.2 V	1. Fuel rail pressure sensor circuit short to ground 2. Fuel rail pressure sensor pin corresponding	1. Check if sensor signal terminal is short to ground 2. Check if sensor is damaged 3. Check for short circuit to power supply, open circuit or internal circuit damage in fuel rail pressure sensor

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			to ECM short to ground	signal pin corresponding to ECM terminal
P254029	DECOS Oil Passage Pressure Sensor Circuit Bank 1-Positive Offset	The low pressure fuel rail pressure signal during the end of engine operation is higher than the upper threshold	1. Low pressure oil passage sensor internal circuit and wire harness are deteriorated	1. Check whether there is a large contact resistance at the connector of DECOS pressure sensor or in the wire harness. 2. Replace the DECOS pressure sensor, return the vehicle to customer, and check whether the fault will be reported again.
P254028	DECOS Oil Passage Pressure Sensor Circuit Bank 1-Negative Offset	The low pressure fuel rail pressure signal during the end of engine operation is lower than the threshold	1. Low pressure oil passage sensor internal circuit and wire harness are deteriorated	1. Check whether there is a large contact resistance at the connector of DECOS pressure sensor or in the wire harness. 2. Replace the DECOS pressure sensor, return the vehicle to customer, and check whether the fault will be reported again.
P137000	DECOS Oil Passage Pressure Sensor Relative Pressure Too Low	The relative pressure of pressure sensor is lower than the fault threshold	1. Oil passage leakage 2. Insufficient fuel 3. Check valve is damaged 4. Low pressure oil pump is damaged	1. Check if oil passage is leaked 2. Check if fuel is insufficient 3. Check if check valve is damaged 4. Check if low pressure oil pump is damaged
P137100	DECOS Oil Passage Pressure Sensor Relative Pressure Too High	The low pressure fuel rail pressure signal is higher than the upper threshold	1. Relief valve is blocked 2. Low pressure oil pump is damaged	1. Check if relief valve of low pressure oil circuit is blocked 2. Check if low pressure oil pump is damaged
P025D00	Fuel Pump Module "A" Control Circuit High	Hardware circuit self-diagnostic	1. Low pressure oil pump control circuit short to power supply 2. Short to power supply in low pressure oil pump pin corresponding to ECM	1. Check for short circuit to power supply in actuator terminal 2. Check for short circuit to power supply in actuator pin corresponding to ECM terminal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P025A00	Fuel Pump Module "A" Control Circuit Open	Hardware circuit self-diagnostic	1. Low pressure oil pump control circuit is open 2. Open circuit in low pressure oil pump pin corresponding to ECM	1. Check for open circuit in actuator terminal 2. Check for open circuit in actuator pin corresponding to ECM terminal
P008A00	DECOS Low Pressure Oil Passage Pressure Too Low	The low pressure fuel rail pressure is lower than the expected value	1. Oil passage leakage 2. Insufficient fuel 3. Check valve is damaged 4. Low pressure oil pump is damaged	1. Check if oil passage is leaked 2. Check if fuel is insufficient 3. Check if check valve is damaged 4. Check if low pressure oil pump is damaged
P008B00	Low Pressure Fuel System Pressure - Too High	The low pressure fuel rail pressure is higher than the expected value	1. Low pressure oil pump is damaged 2. Relief valve is blocked	1. Check if damage to low pressure oil pump is normal 2. Check relief valve for blockage or abnormal operation
P016F00	DECOS Low Pressure Oil Passage PWM Control Deviation Too Large	Control deviation exceeds the maximum	1. Relief valve is blocked 2. Low pressure oil pump is damaged	1. Check if relief valve of low pressure oil circuit is blocked 2. Check if low pressure oil pump is damaged
P062A00	Fuel Pump Module Control Circuit High	Drive channel self-diagnosis is malfunctioning	1. Fuel pump relay control circuit is short to power supply 2. Fuel pump relay control pin corresponding to ECM is short to power supply	1. Check if oil pump relay terminal is short to power supply 2. Whether there is a fault in internal chip of ECM
P013000	Upstream Oxygen Sensor Compensating Circuit Open	Under the condition of low exhaust temperature and oil cut-off, the oxygen sensor voltage signal is high for a long time	1. Upstream oxygen sensor compensation circuit is open	1. Check for poor contact in pin corresponding to green wire at oxygen sensor connector 2. Check for continuity of oxygen sensor wire harness to check if the line is open 3. Check for abnormal pin at connector between wire harness and ECM, which may

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				result in poor contact 4. Clear DTC, start and keep vehicle idling until coolant temperature reaches normal value. Check if malfunction is reported again. 5. Check for abnormality in LSU processing circuit in ECM
P223700	O2 Sensor Positive Current Control Circuit Open Bank 1 Sensor 1 (Close to ECM)	Chip fault memory diagnosis	1. Open circuit in LSU oxygen sensor APE line, which is close to ECM terminal 2. ECM internal circuit is abnormal	1. Replace oxygen sensor, and check if fault reappears 2. Replace ECM, and check if fault reappears
P208062	Particulate Filter Upstream Temperature Sensor Signal Measured Value Unreasonable	The measured value of upstream temperature sensor of particulate filter is too different from the model value	1. There is interference in upstream temperature sensor circuit of particulate filter 2. The particulate filter upstream temperature sensor characteristic is aging and deviation	1. Check the upstream temperature sensor circuit of particulate filter for interference 2. Check whether the upstream temperature sensor of particulate filter is aging and deviation
P20802A	Particulate Filter Upstream Temperature Sensor Signal Stuck	The signal of upstream temperature sensor of particulate filter is sticky	1. There is interference in upstream temperature sensor circuit of particulate filter 2. The particulate filter upstream temperature sensor characteristic is aging and deviation	1. Check the GPF temperature sensor circuit for interference 2. Check whether the GPF temperature sensor is aging and deviation
P054500	Particulate Filter Upstream Temperature Sensor Circuit Voltage Low	The voltage of upstream temperature sensor circuit of particulate filter is below the limit	1. The upstream temperature sensor signal terminal of particulate	1. Use a multimeter to measure if upstream temperature sensor signal terminal voltage of particulate filter is close to or equal to 0 V 2. Turn

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			filter is short to the ground	ignition switch “OFF”, and check if particulate filter upstream temperature sensor signal terminal is short to ground 3. Check if sensor is damaged 4. Particulate filter upstream temperature sensor signal pin terminal corresponding to the ECM terminal is short to ground
P054600	Particulate Filter Upstream Temperature Sensor Circuit Voltage High	The voltage of upstream temperature sensor circuit of particulate filter is higher than the limit	1. Particulate filter upstream temperature sensor signal terminal is short to power supply or open 2. Short circuit to power supply, open circuit or internal circuit damage in particulate filter upstream temperature sensor signal pin	1. Use a multimeter to measure if the voltage between particulate filter upstream temperature sensor signal terminal and ground is close to or equal to 5 V 2. Turn ignition switch to “OFF”, check connector for looseness or poor contact 3. Check if sensor signal terminal is short to power supply or open 4. Check if sensor reference ground is open 5. Check if sensor is damaged 6. Check for short circuit to power supply, open circuit or internal circuit damage in particulate filter upstream temperature sensor signal pin terminal corresponding to ECM terminal
P20E224	Particulate Filter Upstream Temperature Sensor Cold Start Correction Improper (-Positive Deviation)	The particulate filter upstream temperature sensor signal is too high for cold start calibration	1. There is interference in upstream temperature sensor circuit of particulate filter 2. The particulate filter upstream temperature sensor characteristic is aging and deviation	1. Check the upstream temperature sensor circuit of particulate filter for interference 2. Check whether the upstream temperature sensor of particulate filter is aging and deviation
P20E223	Particulate Filter Upstream Temperature Sensor Cold Start Correction Improper	The particulate filter upstream temperature sensor signal is too low for cold start calibration		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	(Negative Deviation)			
P218324	Engine Coolant Temperature Sensor 2 Circuit Range/ Performance	Deviation of coolant temperature sensor 2 cold start and the model value is too large	1. Internal resistance of coolant temperature sensor 2 is unreasonable	1. Check wire harness for contact resistance 2. Check if internal resistance value of sensor greatly deviates from the normal value
P218323	Engine Coolant Temperature Sensor 2 Circuit Range/ Performance			
P12A300	Particulate Filter Differential Pressure Sensor Line Connection Error	The measured value of particulate filter differential pressure sensor is unreasonable	1. The front/ rear differential pressure sensor line falls off or leaks 2. The front and rear differential pressure sensor lines are reversed	1. Check whether the front and rear differential pressure sensor lines fall off or leak 2. Check whether there is a reverse connection between the front and rear differential pressure sensor lines
U060100	Particulate Filter Differential Pressure Sensor Sent Communication Failure	Sent message indicates communication failure	1. Differential pressure sensor itself failure	1. Check whether the differential pressure sensor circuit harness is faulty 2. Check whether the sensor itself is faulty
U060141	Particulate Filter Differential Pressure Sensor Data Inspection Non-plausible	Sent information indicates that the data check is unreasonable		
P129300	Particulate Filter Differential Pressure Sensor Channel 1 Digital Signal Non-plausible (-SENT Signal High or Low)	Channel 1 digital signal is unreasonable		
P245500	Particulate Filter Differential	Particulate Filter Differential Pressure	1. The differential pressure	1. Check whether the wire harness of differential pressure sensor circuit is

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Pressure Sensor Circuit Voltage High	Sensor Circuit Voltage High	sensor circuit is short to power supply	short to power supply 2. Check whether the sensor itself is short
P245400	Particulate Filter Differential Pressure Sensor Circuit Voltage Low	Particulate Filter Differential Pressure Sensor Circuit Voltage Low	1. The differential pressure sensor circuit is short to ground	1. Check whether the wire harness of differential pressure sensor circuit is short to ground 2. Check whether the sensor itself is short
P129100	Dynamic Response Performance of Particulate Filter Differential Pressure Sensor Non-plausible	The measured value of particulate filter differential pressure does not match the flow model	1. Differential pressure sensor failure 2. Frozen in the sampling line	1. Check whether the differential pressure sensor line is frozen 2. Replace the sensor and check if the fault is repaired
P226D00	Particulate Filter Removed	The calculation amount of particulate filter differential pressure model is lower than the threshold	1. The particulate filter is removed 2. Particulate filter is burnt	1. Check whether the particulate filter has been removed 2. Check whether the particulate filter is burnt
P129000	Offset Check Value After Running Particulate Filter Differential Pressure Sensor Unreasonable	The running learning value of particulate filter differential pressure sensor exceeds the limit	1. The zero offset of differential pressure sensor is too large	1. Check whether there is contact resistance in differential pressure sensor circuit wire harness 2. Check whether the characteristic deviation of sensor itself is too large
P054A00	Exhaust VVT actual position deviation fault during catalytic converter heating	The actual position of exhaust VVT during the heating process of catalytic converter is too different from the target position	1. Insufficient OCV oil valve pressure 2. OCV oil valve is blocked or leaking	1. Check if operating condition of cam phase regulator is normal (dirt blockage, oil leakage, sticking) 2. Check if operating condition of OCV oil control valve is normal
P048371	Fan Rationality Check Error (-Type 1)	The fan feedback signal type is fault type 1	1. Fun blocking	1. Check if cooling fan is blocked
P048372	Fan Rationality Check Error (-Type 2)	The fan feedback signal type is fault type 2	1. Fan overload	1. Check whether the cooling fan load is too high

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P048373	Fan Rationality Check Error (- Type 3)	The fan feedback signal type is fault type 3	1. Fan power supply is too high or too low	1. Check if cooling fan power supply is too high or too low
P048374	Fan Rationality Check Error (- Type 4)	The fan feedback signal type is fault type 4	1. Fan control circuit over temperature	1. Check if cooling fan control circuit is short or overloaded
U010187	Lost Communication With TCM (- Transmission Controller)	ECM receiving TCM information timed out	1. TCM connector looseness or disengageme- nt 2. Transmission line between TCM and ECM damaged or interrupted 3. TCM is damaged and signal cannot be transmitted to ECM normally	1. TCM connector looseness or disengagement 2. There is wire harness signal interference 3. Transmission line between TCM and ECM damaged or interrupted 4. Check if there is CAN hardware circuit fault 5. TCM is damaged and signal cannot be transmitted to ECM normally
U012287	Lost Communication With ESP (- Electronic Stability Program)	ECM receiving ESP information timed out	1. ESP connector looseness or disengageme- nt 2. Transmission line between ESP and ECM damaged or interrupted 3. ESP is damaged and signal cannot be transmitted to ECM normally	1. ESP connector looseness or disengagement 2. There is wire harness signal interference 3. Transmission line between ESP and ECM damaged or interrupted 4. Check if there is CAN hardware circuit fault 5. ESP is damaged and signal cannot be transmitted to ECM normally
P218400	Engine Coolant Temperature Sensor 2 Circuit Low	Coolant temperature sensor 2 voltage is lower than 0.09 V	1. Coolant temperature sensor 2 signal terminal is short to ground 2. Short circuit to ground in coolant temperature sensor 2 signal pin corresponding to ECM	1.Use a multimeter to measure if coolant temperature sensor 2 signal terminal voltage is close to or equal to 0 V 2. Turn ignition switch to “OFF”, check if coolant temperature sensor 2 signal terminal is short to ground 3. Check if sensor is damaged 4. Check if coolant temperature sensor 2 signal pin

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			terminal 3. Sensor is damaged	terminal corresponding to ECM is short to ground
P218500	Engine Coolant Temperature Sensor 2 Circuit High	Coolant temperature sensor 2 voltage is higher than 4.9 V	1. connector looseness or poor contact 2. Coolant temperature sensor 2 signal terminal is short to power supply or open 3. Short circuit to power supply or open in coolant temperature sensor 2 signal pin corresponding to ECM terminal 4. Sensor is damaged	1. Use a multimeter to measure if voltage between coolant temperature sensor 2 signal terminal and ground is close to or equal to 5 V. 2. Turn ignition switch to “OFF”, check connector for looseness or poor contact 3. Check if sensor signal terminal is short to power supply or open 4. Check if sensor reference ground is open 5. Check if sensor is damaged 6. Check for short circuit to power supply, open circuit or internal circuit damage in coolant temperature sensor 2 signal pin terminal corresponding to ECM
U015587	Lost Communication With IP (-Instrument Cluster)	ECM receiving IP information timed out	1. IP connector looseness or disengageme-nt 2. Transmission line between IP and ECM damaged or interrupted 3. IP is damaged and signal cannot be transmitted to ECM normally	1. IP connector looseness or disengagement 2. There is wire harness signal interference 3. Transmission line between IP and ECM damaged or interrupted 4. Check if there is CAN hardware circuit fault 5. IP is damaged and signal cannot be transmitted to ECM normally
U016487	Communication between ECM and AC Control Module Failure	ECM receiving AC information timed out	1. AC connector looseness or disengageme-nt 2. Transmission line between AC and ECM damaged or interrupted 3. AC is	1. AC connector looseness or disengagement 2. There is wire harness signal interference 3. Transmission line between AC and ECM damaged or interrupted 4. Check if there is CAN hardware circuit fault 5. AC is damaged and

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			damaged and signal cannot be transmitted to ECM normally	signal cannot be transmitted to ECM normally
U014087	Lost Communication With BCM (-Body Control Module)	ECM receiving BCM information timed out	1. BCM connector looseness or disengageme-nt 2. Transmission line between BCM and ECM damaged or interrupted 3. BCM is damaged and signal cannot be transmitted to ECM normally	1. BCM connector looseness or disengagement 2. There is wire harness signal interference 3. Transmission line between BCM and ECM damaged or interrupted 4. Check if there is CAN hardware circuit fault 5. BCM is damaged and signal cannot be transmitted to ECM normally
P12E000	Offset Check Value After Running Particulate Filter Differential Pressure Sensor Unreasonable	The running learning value of particulate filter differential pressure sensor exceeds the limit	1. The zero offset of differential pressure sensor is too large	1. Check whether there is contact resistance in differential pressure sensor circuit wire harness 2. Check whether the characteristic deviation of sensor itself is too large
P12E100	Dynamic Response Performance of Particulate Filter Differential Pressure Sensor Non-plausible	The measured value of particulate filter differential pressure does not match the flow model	1. Differential pressure sensor failure 2. Frozen in the sampling line	1. Check whether the differential pressure sensor line is frozen 2. Replace the sensor and check if the fault is repaired
P12E300	Particulate Filter Differential Pressure Sensor Channel 1 Digital Signal Non-plausible (-SENT Signal High or Low)	Channel 1 digital signal is unreasonable	1. Differential pressure sensor itself failure	1. Check whether the differential pressure sensor circuit harness is faulty 2. Check whether the sensor itself is faulty
P12A200	Particulate Filter	The measured value of particulate filter differential	1. The front/ rear differential	1. Check whether the front and rear differential

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Differential Pressure Sensor Line Connection Error	pressure sensor is unreasonable	pressure sensor line falls off or leaks 2. The front and rear differential pressure sensor lines are reversed	pressure sensor lines fall off or leak 2. Check whether there is a reverse connection between the front and rear differential pressure sensor lines
P246100	Particulate Filter Differential Pressure Sensor Circuit Voltage High	Particulate Filter Differential Pressure Sensor Circuit Voltage High	1. The differential pressure sensor circuit is short to power supply	1. Check whether the wire harness of differential pressure sensor circuit is short to power supply 2. Check whether the sensor itself is short
P246000	Particulate Filter Differential Pressure Sensor Circuit Voltage Low	Particulate Filter Differential Pressure Sensor Circuit Voltage Low	1. The differential pressure sensor circuit is short to ground	1. Check whether the wire harness of differential pressure sensor circuit is short to ground 2. Check whether the sensor itself is short
U060200	Particulate Filter Differential Pressure Sensor Sent Communication Failure	Sent message indicates communication failure	1. Differential pressure sensor itself failure	1. Check whether the differential pressure sensor circuit harness is faulty 2. Check whether the sensor itself is faulty
U060241	Particulate Filter Differential Pressure Sensor Data Inspection Non-plausible	Sent information indicates that the data check is unreasonable	1. Differential pressure sensor itself failure	1. Check whether the differential pressure sensor circuit harness is faulty
P025C00	Fuel Pump Module "A" Control Circuit Low	Hardware circuit self-diagnostic	1. Low pressure oil pump control circuit short to ground 2. Short to ground in low pressure oil pump pin corresponding to ECM	1. Check for short circuit to ground in actuator terminal 2. Check for short circuit to ground in actuator pin corresponding to ECM terminal
P016E00	Closed Loop Fuel Pressure Control At Limit	Control deviation is below minimum	1. Low pressure oil pump is damaged 2.	1. Check if damage to low pressure oil pump is normal 2. Check relief

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	- Pressure Too High		Relief valve is blocked	valve for blockage or abnormal operation
P053A00	Crankcase Heating Line Circuit Open	Drive channel self-diagnosis is malfunctioning	1. Connector looseness or poor contact 2. Open circuit in crankcase line heater control circuit pin terminal 3. Crankcase line heater control circuit power supply terminal is not connected to main relay 4. Sensor is damaged 5. Open circuit or internal circuit damage in crankcase line heater pin circuit corresponding to ECM terminal	1. Check connector for looseness or poor contact 2. Open circuit in crankcase line heater control circuit pin terminal 3. Crankcase line heater control circuit power supply terminal is not connected to main relay 4. Sensor is damaged 5. Open circuit or internal circuit damage in crankcase line heater pin circuit corresponding to ECM terminal
P053C00	Crankcase Heating Line Circuit Voltage Too High	Drive channel self-diagnosis failure	1. Short to power supply in crankcase line heater control circuit pin terminal	1. Check for short circuit to power supply in crankcase line heater control circuit pin terminal 2. Check for short circuit to power supply in crankcase line heater pin corresponding to ECM terminal
P053B00	Crankcase Heating Line Circuit Voltage Too Low	Drive channel self-diagnosis is malfunctioning	1. Crankcase line heater control circuit pin terminal is short to ground 2. Crankcase line heater control circuit power supply terminal is grounded 3. Crankcase line heater pin corresponding to ECM	1. Check connector for looseness or poor contact 2. Open circuit in crankcase line heater control circuit pin terminal 3. Crankcase line heater control circuit power supply terminal is not connected to main relay

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			terminal is short to ground	
P121B00	Front Left Wheel Speed Sensor Signal NG	ABS-ECM sends the front left wheel speed sensor fault flag bit	1. The front left wheel speed sensor is faulty	1. Check if there is a fault in the ABS-ECM fault memory
P121C00	Front Right Wheel Speed Sensor Signal NG	ABS-ECM sends the front right wheel speed sensor fault flag bit	1. The front right wheel speed sensor is faulty	1. Check if there is a fault in the ABS-ECM fault memory
P121D00	Rear Left Wheel Speed Sensor Signal NG	ABS-ECM sends the rear left wheel speed sensor fault flag bit	1. The rear left wheel speed sensor is faulty	1. Check if there is a fault in the ABS-ECM fault memory
P121E00	Rear Right Wheel Speed Sensor Signal NG	ABS-ECM sends the rear right wheel speed sensor fault flag bit	1. The rear right wheel speed sensor is faulty	1. Check if there is a fault in the ABS-ECM fault memory
P063449	Brake Vacuum Pump Drive Chip Overheat	Drive channel self-diagnosis is malfunctioning	1. Short circuit to power supply in brake vacuum pump control circuit 2. Brake vacuum pump control pin corresponding to ECM terminal is short to power supply	1. Check for short circuit to power supply in brake vacuum pump control circuit 2. Check if there is a fault in the internal chip of ECM

DTC Diagnosis Procedure

Intake/Exhaust Phaser Operation (Slow, Stuck) Malfunctions

DTC	**P000A00**	**"A" Camshaft Position Slow Response Bank 1**
DTC	**P003C00**	**“A" Camshaft Profile Control Performance/Stuck Off Bank 1**
DTC	**P000B00**	**“B" Camshaft Position Slow Response Bank 1**
DTC	**P005A00**	**“B" Camshaft Profile Control Performance/Stuck Off Bank 1**
DTC	**P001100**	**"A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1**
DTC	**P001400**	**"B" Camshaft Position - Timing Over-Advanced or System Performance Bank 1**
DTC	**P054A00**	**Exhaust VVT actual position deviation fault during catalytic converter heating**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check phaser solenoid valve, valve body bolt components state**

(a) Disconnect the negative battery cable.
(b) Remove intake/exhaust phaser solenoid valve; Check for blockage or dirty.
(c) Remove intake/exhaust phaser valve body bolts; Check for blockage or dirt.

NG → **Clean or replace phaser solenoid valve and valve body bolts.**

OK

2	**Check engine maintenance condition**

(a) Check if engine oil level is normal, and check for oil leakage and oil seepage.
(b) Remove valve trim cover, and check engine lubrication and cleaning conditions, and check for wear or sludge dirty

NG → **Clean and maintain the engine, replace the damaged components.**

OK

3	**Check engine oil pressure**

(a) Remove oil pressure sensor; Connect oil pressure tester to test oil pressure.

Main oil passage pressure: Limit pressure range (0.9 - 10 bar)

NG → **Check or replace oil pump assembly.**

OK

4	Check intake/exhaust phaser assembly

(a) Check if operating condition of cam phase regulator is normal (dirt blocked, oil leaked, stuck, etc.).

NG → **Replace intake/exhaust phaser assembly.**

OK

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

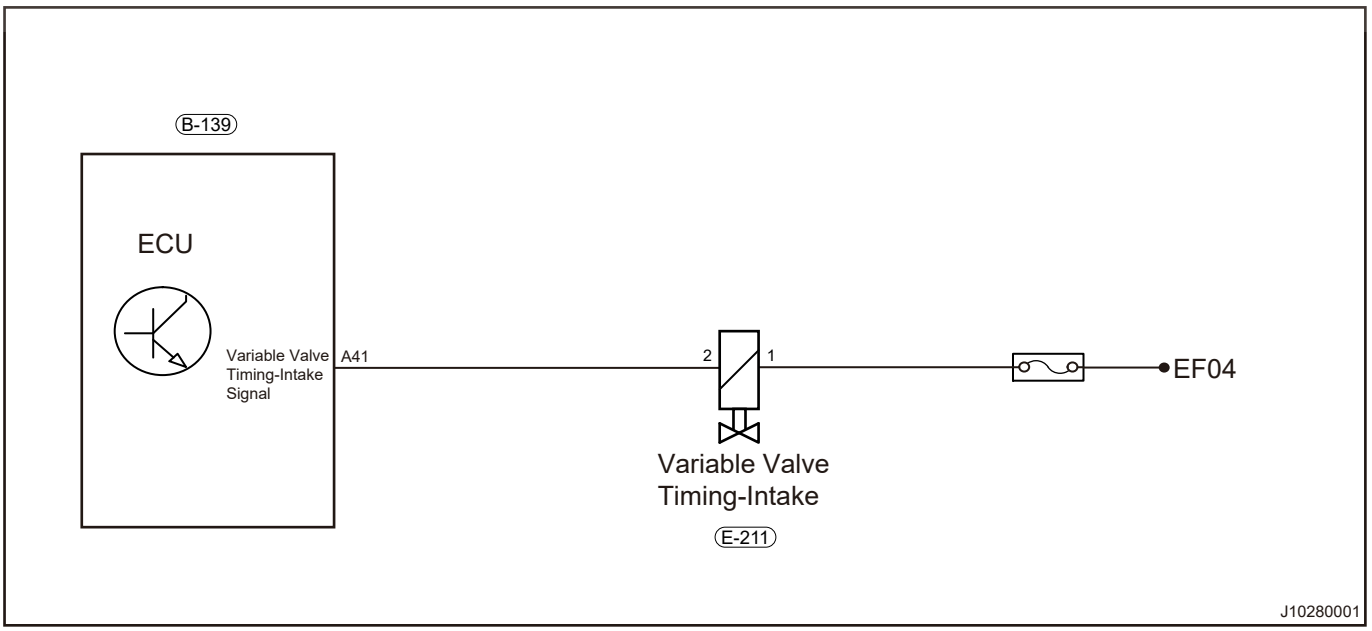
OK → **Conduct test and confirm malfunction has been repaired**

Intake Phaser Solenoid Valve Control Circuit Open

DTC	P001000	"A" Camshaft Position Actuator Control Circuit Open Bank 1

Description

Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check intake phaser solenoid valve connector**

(a) Disconnect the negative battery.
(b) Unplug intake phaser solenoid valve connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair connector or replace intake phaser solenoid valve.**

OK ↓

2	**Check intake phaser solenoid valve internal resistance**

(a) Using ohm band of multimeter, measure if internal resistances of intake phaser solenoid valve (1-2) are normal with red and black probes respectively.

Resistance at ambient temperature: 6 Ω

NG → **Replace intake phaser solenoid valve assembly.**

OK ↓

3	**Check intake phaser solenoid valve power supply fuse**

(a) Turn ENGINE START STOP switch to ON.
(b) Check fuse EF04 15A of engine compartment fuse and relay box with 21 W test light.

Test light should be bright

NG → **It indicates that there is short to ground in circuit.**

OK ↓

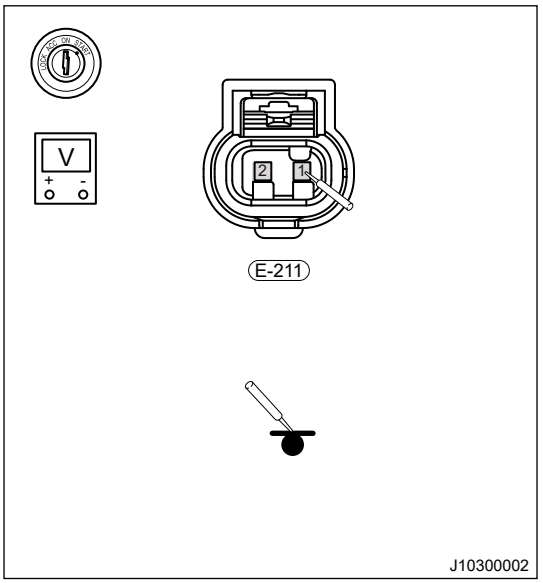
4	Check intake phaser solenoid valve power supply and control terminal

(a) Connect intake phaser solenoid valve connector.

(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of intake phaser solenoid valve E-211 (1, 2) with red probe.

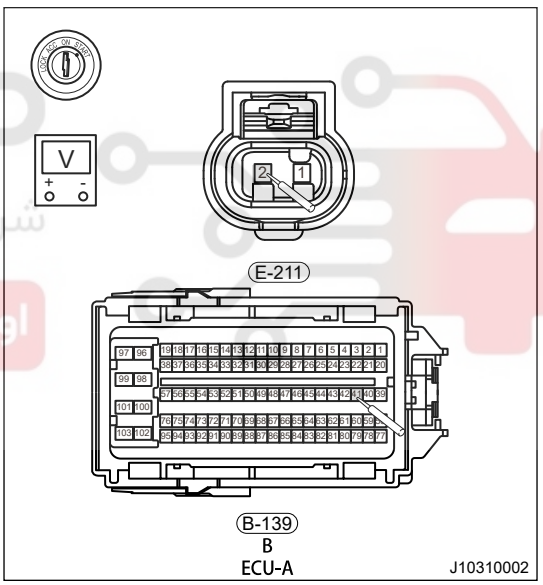
Test voltage is current battery voltage



(d) Start the engine.

(e) Using voltage band of multimeter (voltage drop method), connect black probe to ECM B-139 (41), measure voltages of intake phaser solenoid valve E-211 (2) with red probe

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair wire harness.**

OK →

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

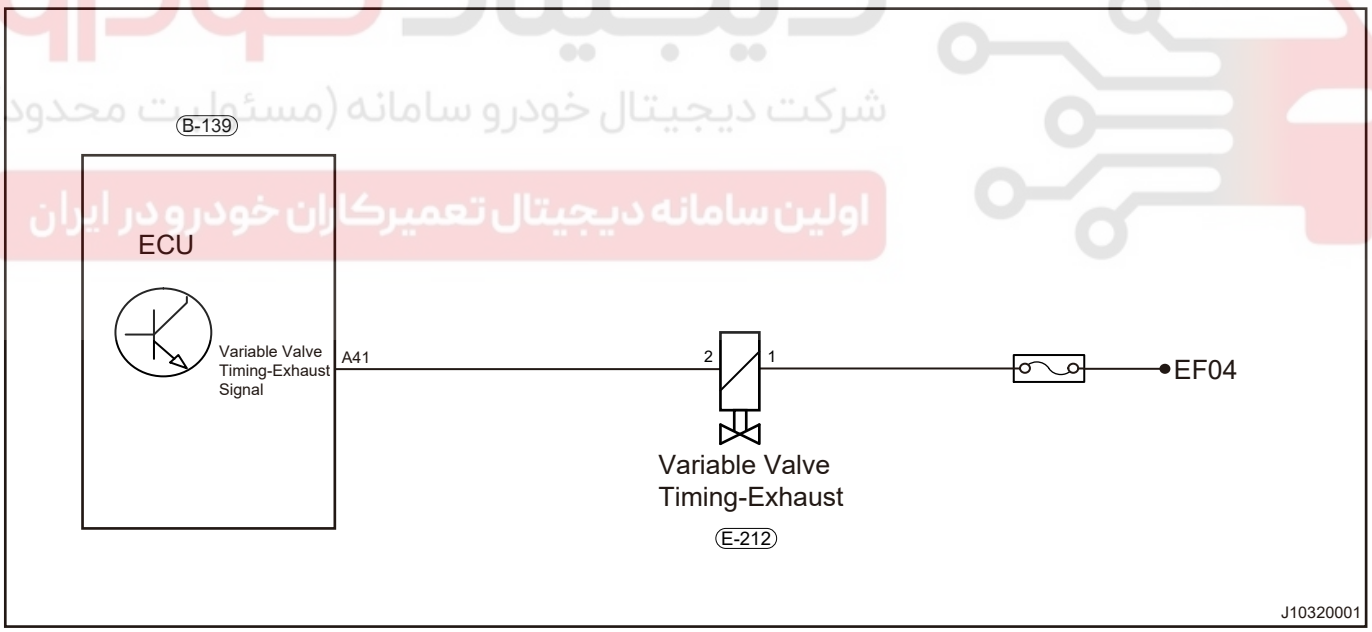
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Exhaust Phaser Solenoid Valve Control Circuit Open

DTC	P001300	"B" Camshaft Position Actuator Control Circuit Open Bank 1

Description
Control Schematic Diagram



DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	Check exhaust phaser solenoid valve connector

(a) Disconnect the negative battery.
(b) Unplug exhaust phaser solenoid valve connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair connector or replace exhaust phaser solenoid valve.**

OK

2	Check exhaust phaser solenoid valve internal resistance

(a) Using ohm band of multimeter, measure if internal resistances of exhaust phaser solenoid valve (1-2) are normal with red and black probes respectively.

NG → **Replace exhaust phaser solenoid valve assembly.**

OK

3	Check exhaust phaser solenoid valve power supply fuse

(a) Turn ENGINE START STOP switch to ON.
(b) Check fuse EF04 15A in engine compartment fuse and relay box with 21 W test light.

Test light should be bright

NG → **It indicates that there is short to ground in circuit.**

OK

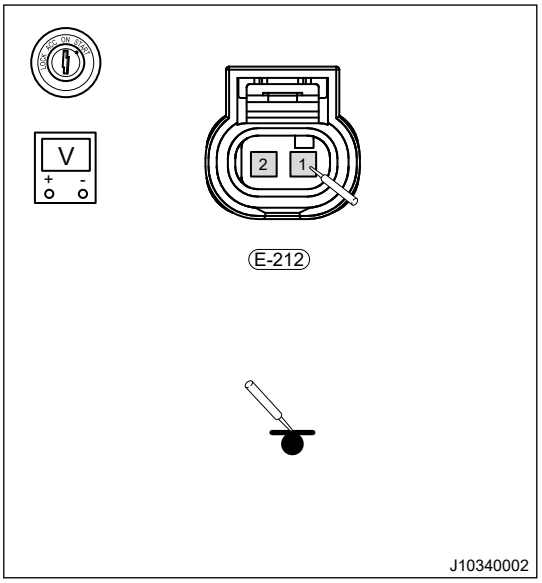
4	Check exhaust phaser solenoid valve power supply and control terminal

(a) Connect exhaust phaser solenoid valve connector.

(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of exhaust phaser solenoid valve E-212 (1, 2) with red probe.

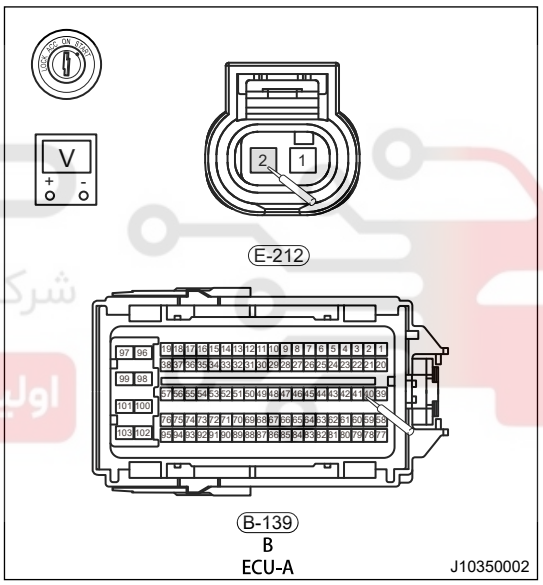
Test voltage is current battery voltage



(d) Start the engine.

(e) Using voltage band of multimeter (voltage drop method), connect black probe to ECM B-139 (40), measure voltage of exhaust phaser solenoid valve E-212 (2) with red probe.

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair wire harness.**

OK →

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Crankshaft - Intake/Exhaust Camshaft Installation Position Non-plausible/Deviation Excessive Malfunction

DTC	**P001676**	**Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A**
DTC	**P001678**	**Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A**
DTC	**P001776**	**Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B**
DTC	**P001778**	**Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check phaser solenoid valve, valve body bolt components state**

(a) Disconnect the negative battery cable.
(b) Remove intake/exhaust phaser solenoid valve; Check for blockage or dirty.
(c) Remove intake/exhaust phaser valve body bolts; Check for blockage or dirt.

NG → **Clean or replace phaser solenoid valve and valve body bolts.**

OK

2	Check engine maintenance condition

(a) Check if engine oil level is normal, and check for oil leakage and oil seepage.

(b) Remove valve trim cover, and check engine lubrication and cleaning conditions, and check for wear or sludge dirty

NG → **Clean and maintain the engine, replace the damaged components.**

OK ↓

3	Check engine oil pressure

(a) Remove oil pressure sensor; Connect oil pressure tester to test oil pressure.

Main oil passage pressure: Limit pressure range (0.9 - 10 bar)

NG → **Check or replace oil pump assembly.**

OK ↓

4	Check valve mechanism timing

(a) Check if valve mechanism timing is normal, and check timing chain for teeth skipping, misalignment, elongation, etc.

(b) Check camshaft signal plate for misalignment, looseness, etc.

NG → **Replace timing chain or camshaft assembly.**

OK ↓

5	Check intake/exhaust phaser assembly

(a) Check if operating condition of cam phase regulator is normal (dirt blocked, oil leaked, stuck, etc.).

NG → **Replace intake/exhaust phaser assembly.**

OK

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Downstream Oxygen Sensor Heater Control Circuit Open/Low/High/Faulty

DTC	**P003000**	**HO2S Heater Control Circuit Bank 1 Sensor 1**
DTC	**P003100**	**HO2S Heater Control Circuit Low Bank 1 Sensor 1**
DTC	**P003200**	**HO2S Heater Control Circuit High Bank 1 Sensor 1**
DTC	**P005300**	**HO2S Heater Resistance Bank 1 Sensor 1**
DTC	**P064D00**	**LSU Integrated Ship Failure**
DTC	**P064D13**	**Upstream Oxygen Sensor Sensing Element Failure**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check upstream oxygen sensor connector**

(a) Disconnect the negative battery.
(b) Unplug upstream oxygen sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace upstream oxygen sensor.**

OK

2	**Check upstream oxygen sensor heater internal resistance**

(a) Using ohm band of multimeter, measure if internal resistances of upstream oxygen sensor (3-4) are normal with red and black probes respectively.

NG → **Replace upstream oxygen sensor assembly.**

OK ↓

3	**Check upstream oxygen sensor heater power supply fuse**

(a) Turn ENGINE START STOP switch to ON.

(b) Check fuse EF02 10A of engine compartment fuse and relay box with 21 W test light.

Test light should be bright

NG → **It indicates that there is short to ground in circuit.**

OK ↓

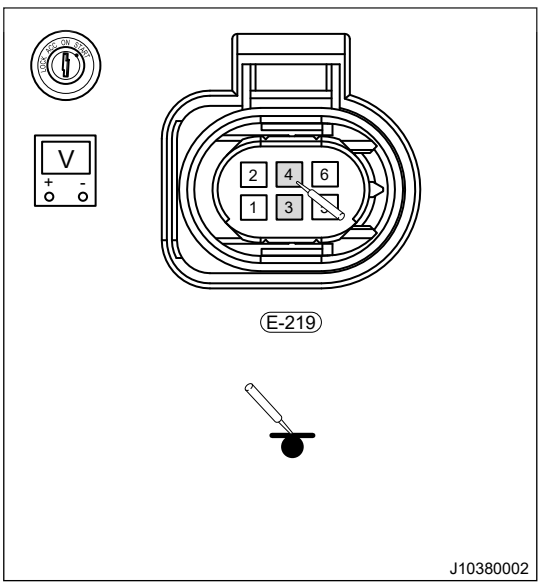
4	**Check upstream oxygen sensor heater power supply and heater control terminal**

(a) Install the upstream oxygen sensor connector.

(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of upstream oxygen sensor E-219 (3, 4) with red probe.

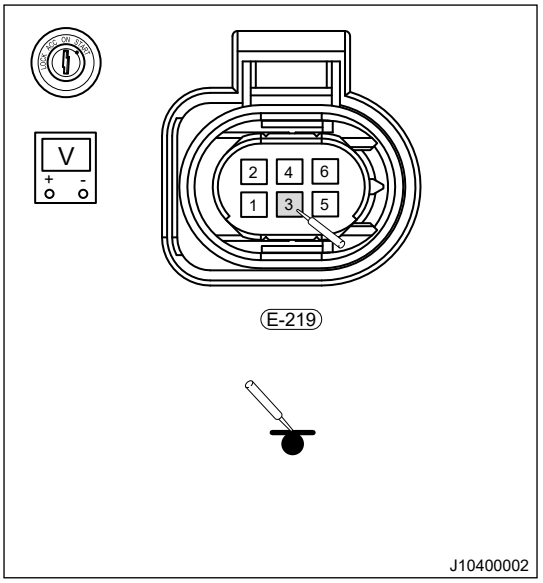
Test voltage is current battery voltage



(d) Start the engine.

(e) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of upstream oxygen sensor E-219 (3) with red probe.

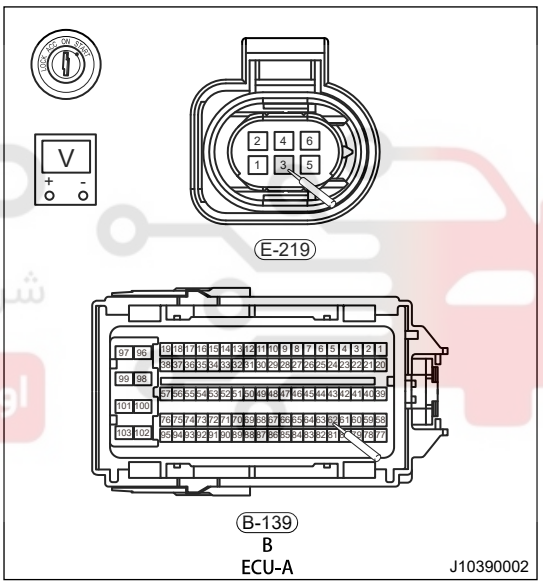
Control heating voltage should be within 0 V and current battery voltage



(f) Start the engine.

(g) Using voltage band of multimeter (voltage drop method), connect black probe to ECM B-139 (62), measure voltage of upstream oxygen sensor E-219 (3) with red probe

Test voltage drop value should be less than approximately 0.2 V



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

OK →

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Boost Discharge Control Valve Drive Circuit Short to Ground/Power Supply

DTC	**P003411**	**Boost Discharge Control Valve Drive Circuit Short to Ground**
DTC	**P003512**	**Boost Discharge Control Valve Drive Circuit Short to Power Supply**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check boost discharge control valve connector**

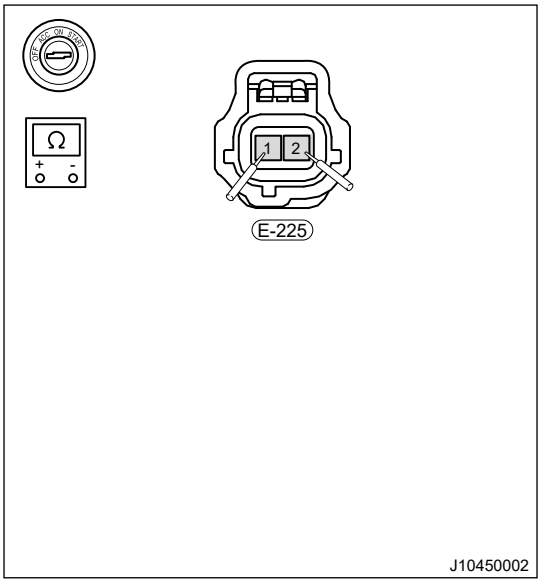
(a) Disconnect the negative battery.
(b) Unplug boost discharge valve connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace boost discharge valve connector.**

OK

2	**Check boost discharge valve internal resistance**

(a) Using ohm band of multimeter, measure if internal resistances of boost discharge valve E-225 (1-2) are normal with red and black probes respectively.



NG → **Replace boost discharge valve assembly.**

OK

3	**Check boost discharge valve power supply fuse**

(a) Turn ENGINE START STOP switch to ON.

(b) Check fuse EF04 15A in engine compartment fuse and relay box with 21 W test light.

Test light should be bright

NG → **It indicates that there is short to ground in circuit.**

OK

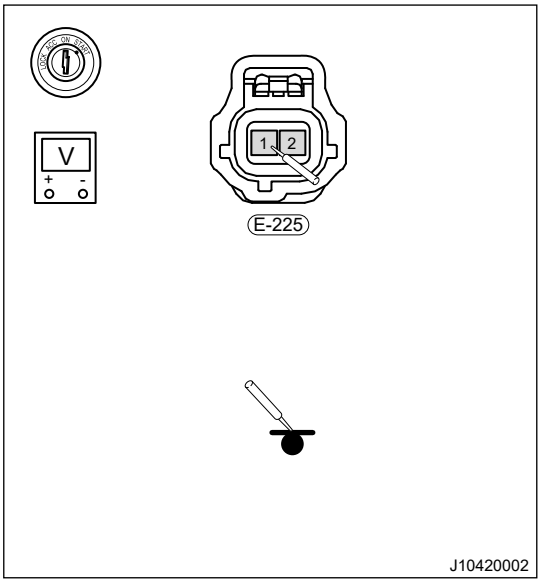
4	**Check boost discharge valve power supply and heater control terminal**

(a) Connect the boost discharge valve connector.

(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of boost discharge valve E-225 (1) with red probe.

Test voltage is current battery voltage

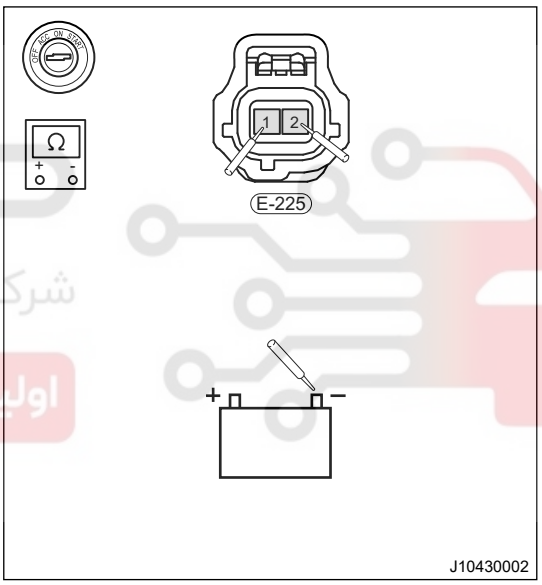


(d) Disconnect the boost discharge valve connector.

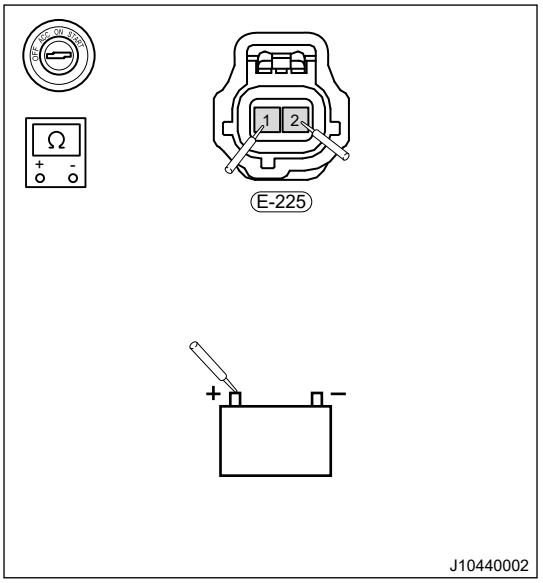
(e) Disconnect engine compartment fuse and relay box fuse EF21 15A.

(f) Disconnect the ECM connector (B-139).

(g) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of boost discharge valve E-225 (1, 2) with red probe respectively. Check if circuit is short to ground.



(h) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of boost discharge valve E-225 (1, 2) with red probe respectively. Check if circuit is short to power supply.



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

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

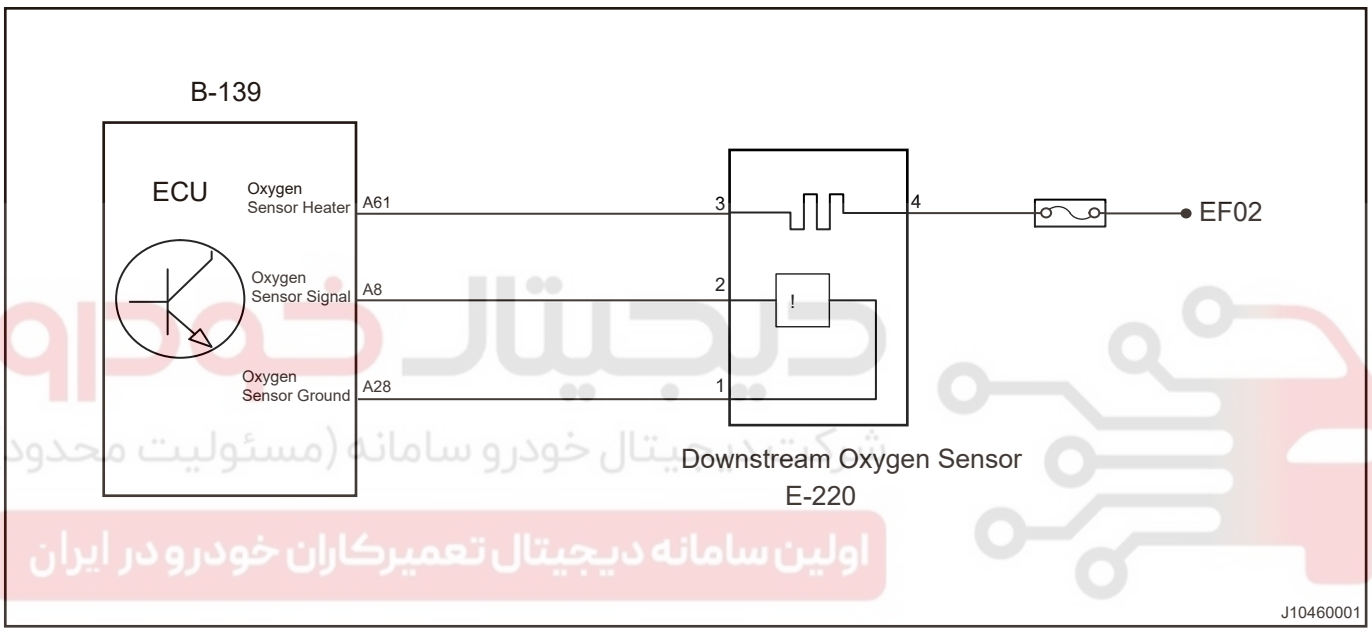
Downstream Oxygen Sensor Heater Control Circuit Open/Low/High/Heater Internal Resistance

Non-plausible

DTC	**P003600**	**HO2S Heater Control Circuit Bank 1 Sensor 2**
DTC	**P003700**	**HO2S Heater Control Circuit Low Bank 1 Sensor 2**
DTC	**P003800**	**HO2S Heater Control Circuit High Bank 1 Sensor 2**
DTC	**P005400**	**HO2S Heater Resistance Bank 1 Sensor 2**
DTC	**P223200**	**O2 Sensor Signal Circuit Shorted to Heater Circuit Bank 1 Sensor 2**

Description

Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check downstream oxygen sensor connector**

(a) Disconnect the negative battery.

(b) Unplug downstream oxygen sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace downstream oxygen sensor.**

OK

2	Check downstream oxygen sensor heater internal resistance

(a) Using ohm band of multimeter, measure if internal resistances of downstream oxygen sensor (3-4) are normal with red and black probes respectively.

NG → **Replace downstream oxygen sensor assembly.**

OK

3	Check downstream oxygen sensor heater power supply fuse

(a) Turn ENGINE START STOP switch to ON.

(b) Check fuse EF02 10A of engine compartment fuse and relay box with 21 W test light.

Test light should be bright

NG → **It indicates that there is short to ground in circuit.**

OK

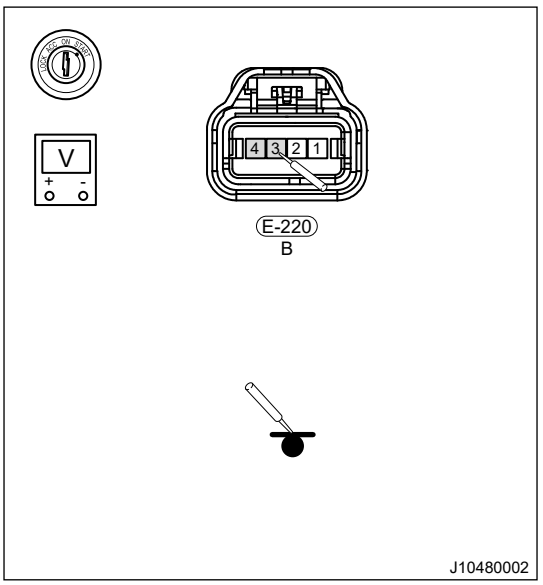
4	Check downstream oxygen sensor heater power supply and heater control terminal

(a) Install the upstream oxygen sensor connector.

(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of downstream oxygen sensor E-220 (4) with red probe.

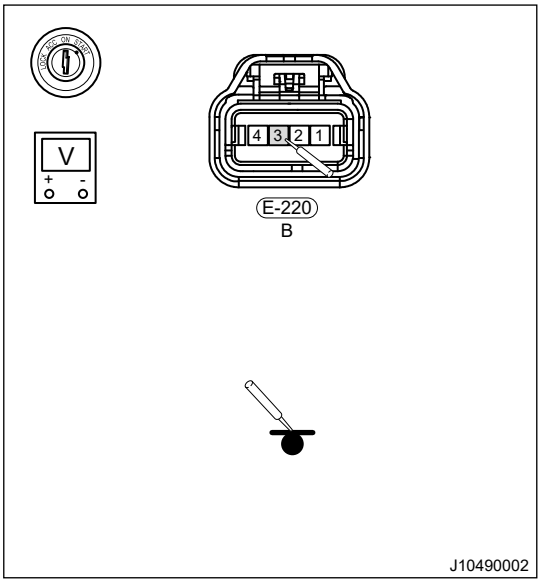
Test voltage is current battery voltage



(d) Start the engine.

(e) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of downstream oxygen sensor E-220 (3) with red probe.

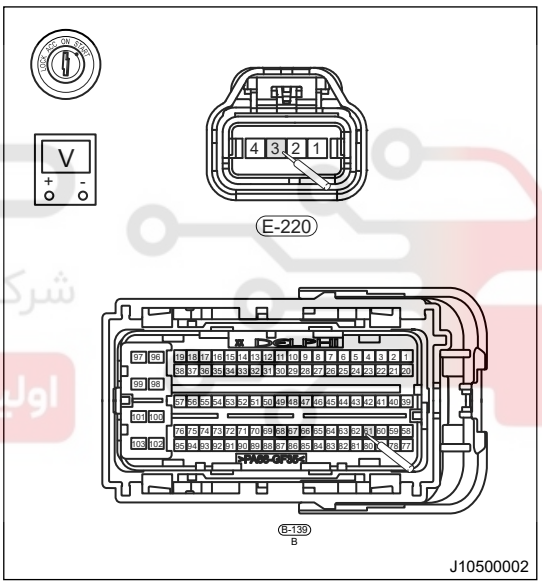
Control heating voltage should be within 0 V and current battery voltage



(f) Start the engine.

(g) Using voltage band of multimeter (voltage drop method), connect black probe to ECM B-139 (61), measure voltage of downstream oxygen sensor E-220 (3) with red probe.

Test voltage drop value should be less than approximately 0.2 V



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

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Turbocharger Electronic Waste Gate Self-learning/Duty Ratio Out of Limit

DTC	P003A22	Turbocharger/Supercharger Boost Control "A" Position Exceeded Learning Limit
DTC	P003A21	Turbocharger/Supercharger Boost Control "A" Position Exceeded Learning Limit
DTC	P003A72	Turbocharger/Supercharger Boost Control "A" Position Exceeded Learning Limit
DTC	P003A73	Turbocharger/Supercharger Boost Control "A" Position Exceeded Learning Limit
DTC	P024437	The duty ratio of turbocharger electronic waste gate control exceeds the limit

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	Check by-pass valve actuator conditions

(a) Check for foreign matter near turbocharger closed position.
(b) Check if electronic waste gate is stuck.
(c) Push the turbocharger to closed position manually, read position voltage to check if it is out of the range of SPEC.

NG → **Clean up foreign matter or replace turbocharger assembly.**

OK

2	Check by-pass valve actuator connector

(a) Check if connector and wire harness are deteriorated.

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

OK

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Turbocharger Electronic Waste Gate Position Sensor Voltage Low/High

DTC	P256400	Turbocharger Boost Control Position Sensor "A" Circuit Low
DTC	P256500	Turbocharger Boost Control Position Sensor "A" Circuit High

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	Check electronic waste gate connector

(a) Disconnect the negative battery.
(b) Unplug electronic waste gate connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	Check electronic waste gate position sensor power supply and ground

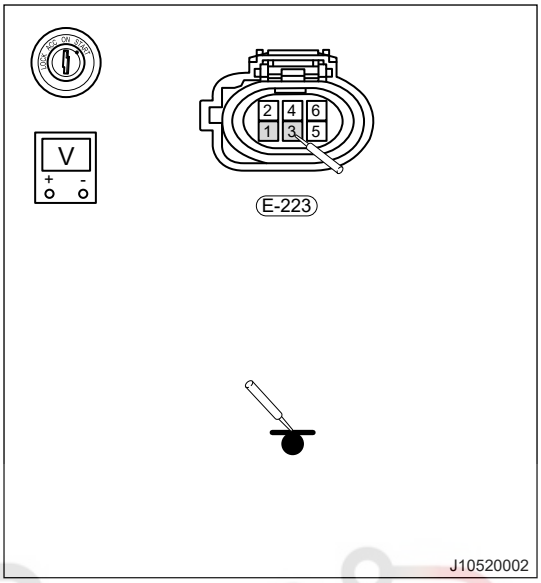
(a) Connect electronic waste gate connector.

(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of electronic waste gate position sensor E-223 (1, 3) with red probe.

Reference power supply: 5 V

Ground: 0 V



NG → **Repair wire harness or replace engine control unit.**

OK

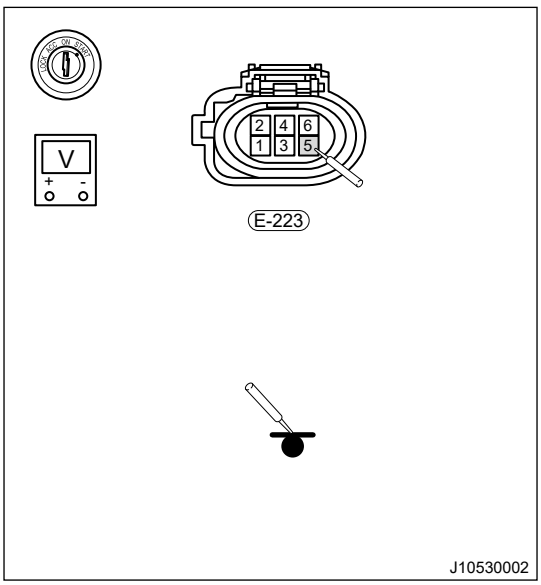
3	Check electronic waste gate position sensor signal terminal

(a) Connect the boost discharge valve connector.

(b) Start the engine.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure if voltage of electronic waste gate position sensor E-223 (5) varies according to opening angle with red probe.

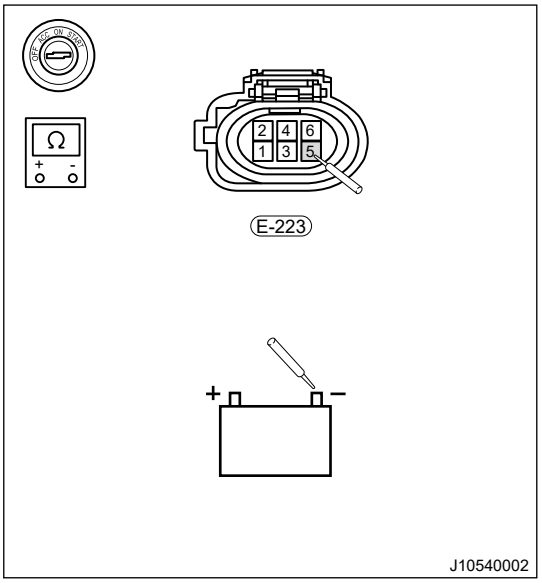
Test voltage is current battery voltage



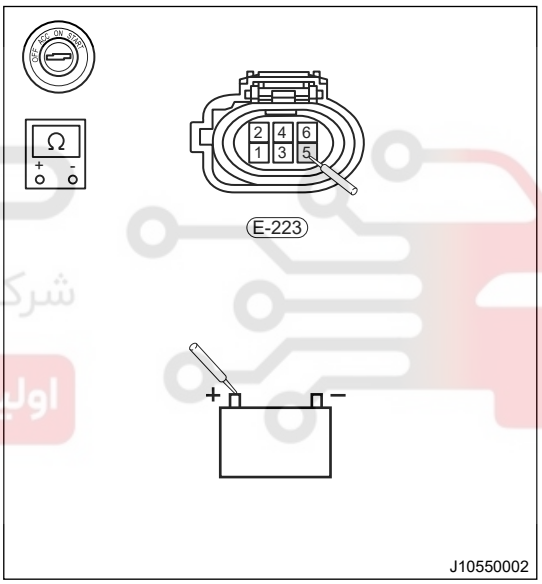
(d) Disconnect the electronic waste gate connector.

(e) Disconnect the ECM connector (E-204).

(f) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of electronic waste gate position sensor E-223 (5) with red probe respectively. Check if circuit is short to ground.



(g) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistance of electronic waste gate position sensor E-223 (5) with red probe respectively. Check if circuit is short to power supply.



NG → **Repair or replace wire harness or replace turbocharger assembly.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Communication Failure of Supercharger Wastegate Control Circuit

DTC	**P170300**	**Communication Failure of Supercharger Wastegate Control Circuit**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check electronic waste gate connector**

(a) Disconnect the negative battery.
(b) Unplug electronic waste gate connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check electronic waste gate internal resistance**

(a) Using ohm band of multimeter, measure if internal resistances of boost discharge valve (6-2) are normal with red and black probes respectively.

NG → **Replace turbocharger assembly.**

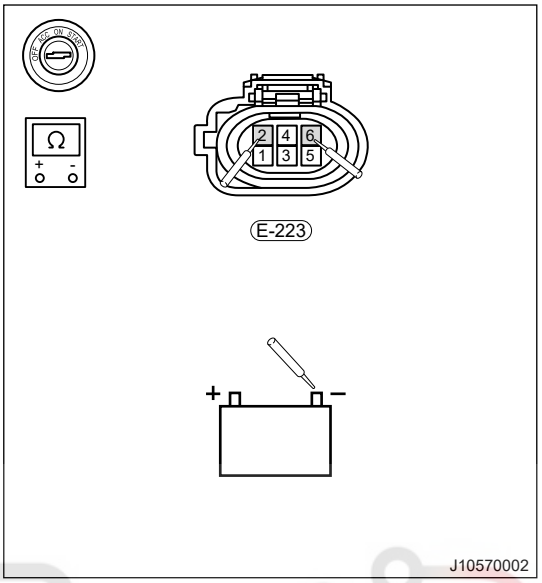
OK

3	Check for short circuit to ground / power supply in electric waste gate control circuit

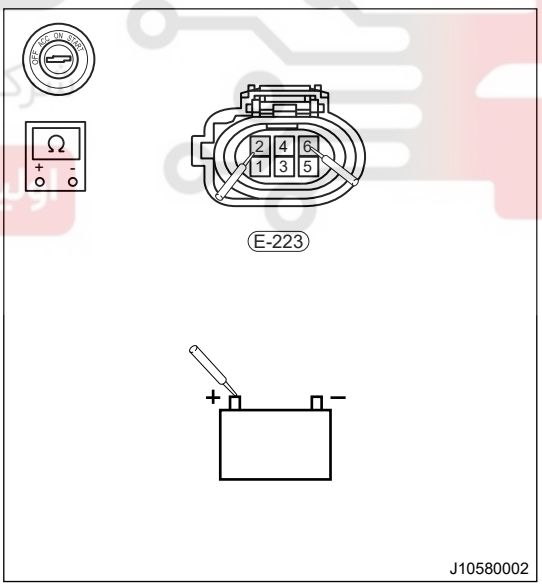
(a) Disconnect the electronic waste gate connector.

(b) Disconnect the ECM connector (E-204).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistances of waste gate E-223 (6, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistances of waste gate E-223 (6, 2) with red probe respectively. Check if circuit is short to power supply.



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

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Ambient pressure sensor malfunction

DTC	**P222900**	**Barometric Pressure Sensor "A" Circuit High**
DTC	**P222800**	**Barometric Pressure Sensor "A" Circuit Low Problem**
DTC	**P222722**	**Barometric Pressure Sensor "A" Circuit Range/Performance**
DTC	**P222721**	**Barometric Pressure Sensor "A" Circuit Range/Performance**
DTC	**P222785**	**Barometric Pressure Measurement System - Multiple Sensor Correlation Bank 1**
DTC	**P222784**	**Barometric Pressure Measurement System - Multiple Sensor Correlation Bank 1**
DTC	**P120200**	**Barometric Pressure Sensor "A" Circuit Range/Performance**
DTC	**P120300**	**Barometric Pressure Sensor "A" Circuit Range/Performance**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check Engine Control Module (ECM)**

(a) The built-in ambient pressure sensor in ECM is malfunctioning.
(b) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(c) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

2	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

High Pressure Fuel Supply Control Deviation Too High/Too Low/Fuel Rail Pressure Too Low/Too High

DTC	**P008985**	**Fuel Pressure Regulator 1 Performance-Pressure Too Low**
DTC	**P008984**	**Fuel Pressure Regulator 1 Performance-Pressure Too High**
DTC	**P008700**	**Fuel Rail/System Pressure - Too Low**
DTC	**P008800**	**Fuel Rail/System Pressure - Too High**
DTC	**P053F21**	**Cold Start Fuel Pressure Performance**
DTC	**P053F22**	**Cold Start Fuel Pressure Performance**
DTC	**P00C600**	**Fuel Rail Pressure Too Low - Engine Cranking Bank 1**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check if fuel is insufficient**

(a) Check that fuel in fuel tank is sufficient.

NG → **Add the fuel.**

OK

2	**Check fuel connecting line for leakage**

(a) Check low pressure/high pressure fuel connecting lines for squash, leakage.

NG → **Replace the corresponding line.**

OK

3	**Check low pressure fuel pressure**

(a) Connect fuel pressure gauge to test if low pressure fuel pressure is met the standard.

NG → **Replace fuel pump assembly.**

OK

4	**Check high pressure fuel pump**

(a) Remove the high pressure fuel pump;
(b) Check high pressure fuel pump for fuel leakage.
(c) Check relief valve for blockage or abnormal operation.

NG → **Replace high pressure fuel pump assembly.**

OK

5	**Reconfirm DTCs**

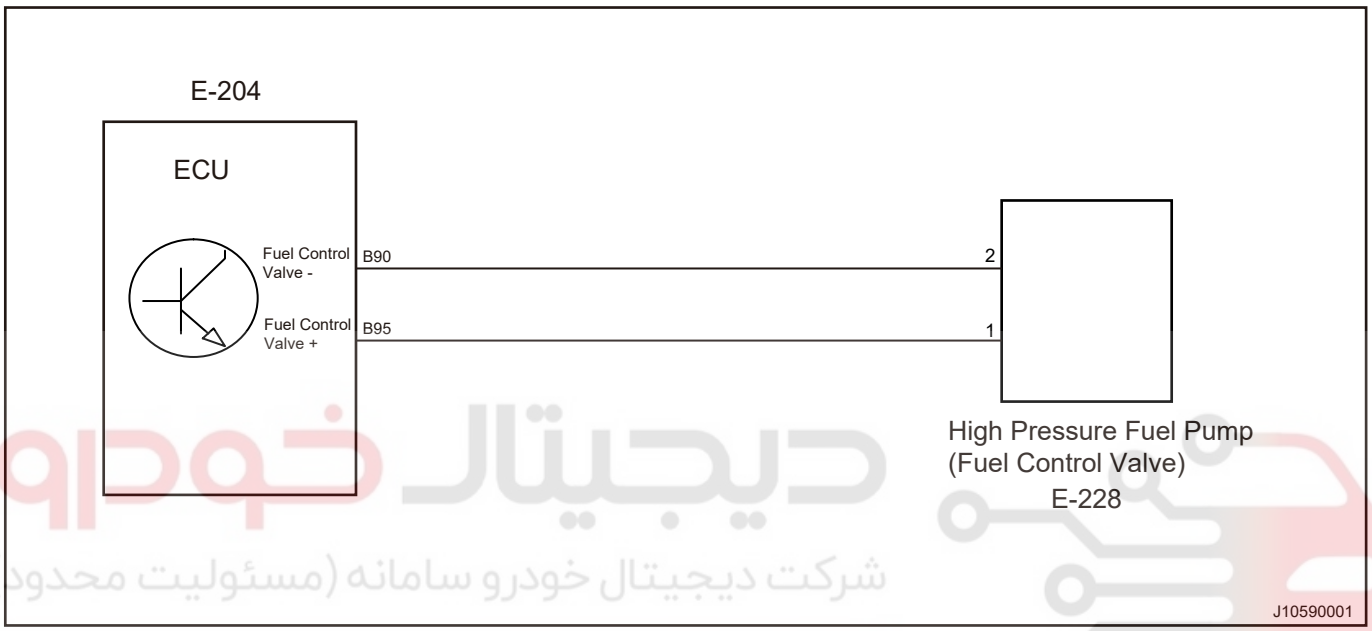
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	Conduct test and confirm malfunction has been repaired

Short Circuit in High Side and Low Side Control Circuit of Flow Control Valve

DTC	P009000	Short Circuit in High Side and Low Side Control Circuit of Flow Control Valve

Description
Control Schematic Diagram



DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	Check flow control valve connector

(a) Disconnect the negative battery.
(b) Unplug flow control valve connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG	Repair and adjust connector, or replace it.

OK

2	Check flow control valve internal resistance

(a) Using ohm band of multimeter, measure if internal resistances of flow control valve (1-2) are normal with red and black probes respectively.

NG → **Replace high pressure fuel pump assembly.**

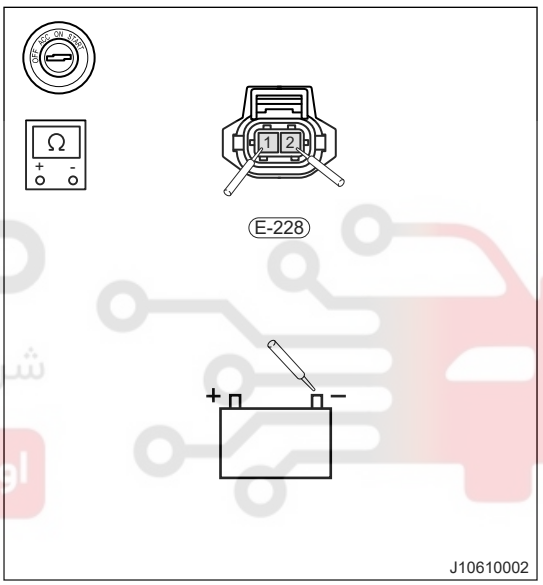
OK

3	Check for short circuit to ground / power supply in flow control valve control circuit

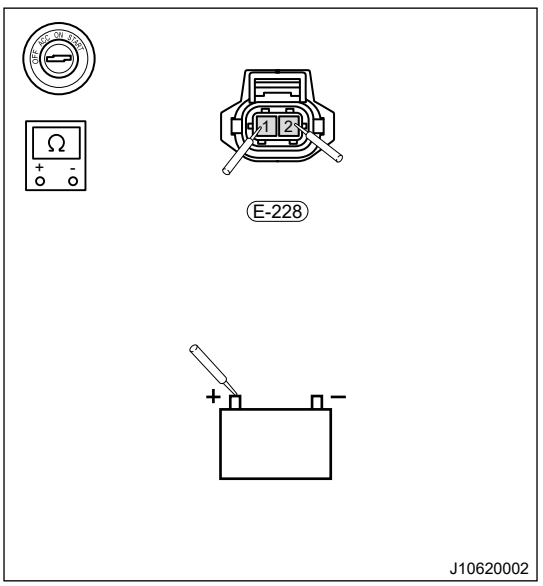
(a) Disconnect the high pressure fuel pump connector.

(b) Disconnect the ECM connector (E-204).

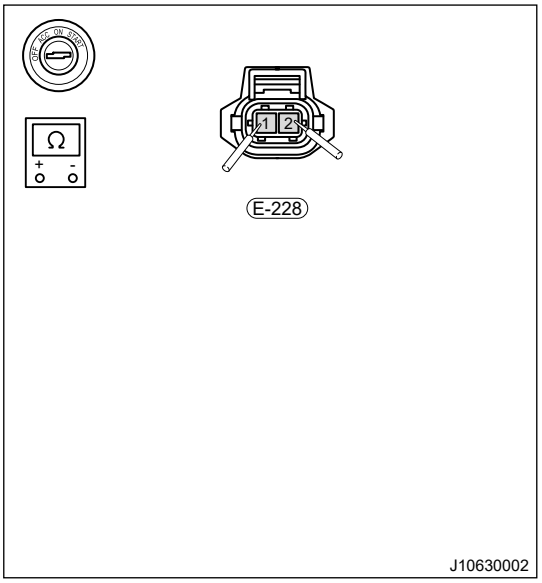
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of high pressure fuel pump E-228 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of high pressure fuel pump E-228 (1, 2) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of high pressure fuel pump E-228 (1, 2) with red and black probes respectively. Check if control circuits are shorted with each other.



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

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Intake Air Sensor 2 Voltage Too High/Too Low/Signal Non-plausible

DTC	**P009626**	**Intake Air Temp.Circ. Performance Non-plausible**
DTC	**P009800**	**Intake Air Temperature Sensor 2 Circuit High Bank 1**
DTC	**P009700**	**Intake Air Temperature Sensor 2 Circuit Low Bank 1**
DTC	**P009900**	**Intake Air Temperature Sensor 2 Circuit Intermittent Bank 1**

Description
Control Schematic Diagram

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check boost pressure/temperature sensor connector**

(a) Disconnect the negative battery.
(b) Unplug boost pressure/temperature sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace boost pressure/temperature sensor.**

OK

2	Check boost pressure/temperature sensor internal resistance

(a) Using ohm band of multimeter, measure if resistances of boost pressure/temperature sensor (1-2) are normal with red and black probes respectively. They should vary in accordance with intake temperature.

NG → **Replace boost pressure/temperature sensor assembly.**

OK

3	Check boost pressure/temperature sensor signal terminal and ground terminal

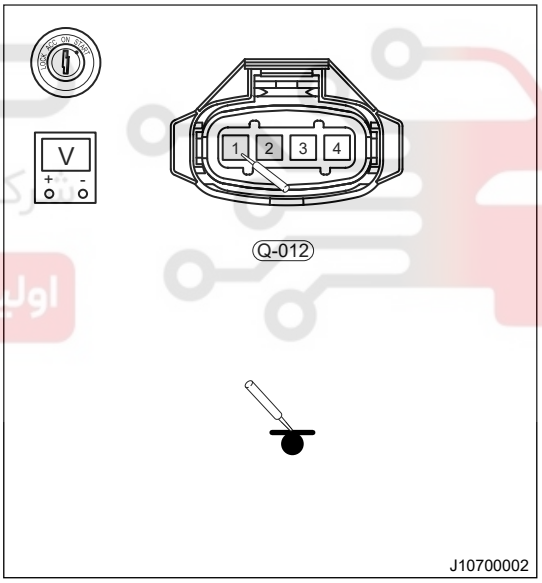
(a) Connect boost pressure/temperature sensor connector.

(b) Start the engine.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of boost pressure/temperature sensor Q-012 (1, 2) with red probe.

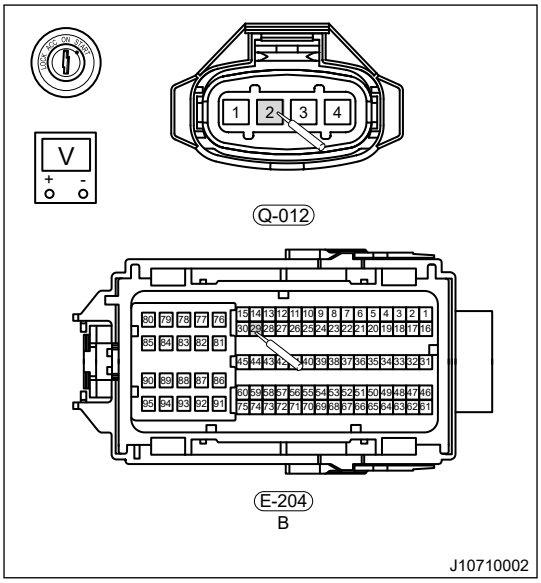
Signal terminal: Voltage signal should vary in accordance with intake temperature.

Ground terminal: Voltage < 0.2 V



(d) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-204 (29), measure voltages of boost pressure/temperature sensor Q-012 (2) with red probe.

Test voltage drop value should be less than approximately 0.2 V



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

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Intake Pressure/Temperature Sensor Malfunction

DTC	**P01062A**	**Manifold Absolute Pressure Sensor Circuit Range/Performance**
DTC	**P010622**	**Manifold Absolute Pressure Sensor Circuit Range/Performance**
DTC	**P010621**	**Manifold Absolute Pressure Sensor Circuit Range/Performance**
DTC	**P120000**	**Manifold Absolute Pressure Sensor Circuit Range/Performance**
DTC	**P120100**	**Manifold Absolute Pressure Sensor Circuit Range/Performance**
DTC	**P00C721**	**Intake Air Pressure Measurement System - Multiple Sensor Correlation Bank 1**
DTC	**P00C722**	**Intake Air Pressure Measurement System - Multiple Sensor Correlation Bank 1**
DTC	**P010700**	**Intake Manifold Pressure Sensor Circuit Voltage Too Low**
DTC	**P010800**	**Intake Manifold Pressure Sensor (Electric) Circuit Short to Battery**

Description

Control Schematic Diagram

DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check intake pressure/temperature sensor connector**

(a) Disconnect the negative battery.
(b) Unplug intake pressure sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace intake pressure sensor.**

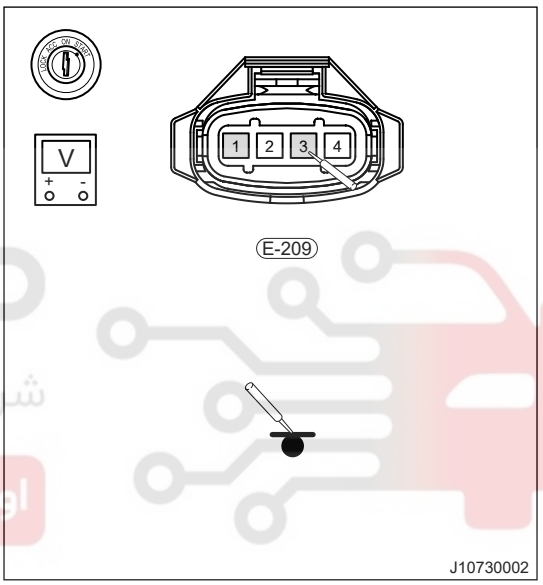
OK

2	**Check intake pressure/temperature sensor power supply and ground terminals**

(a) Connect boost pressure/temperature sensor connector.
(b) Start the engine.
(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of intake pressure/temperature sensor E-209 (1, 3) with red probe.

Power supply terminal: 5 V

Ground terminal: Voltage < 0.2 V



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

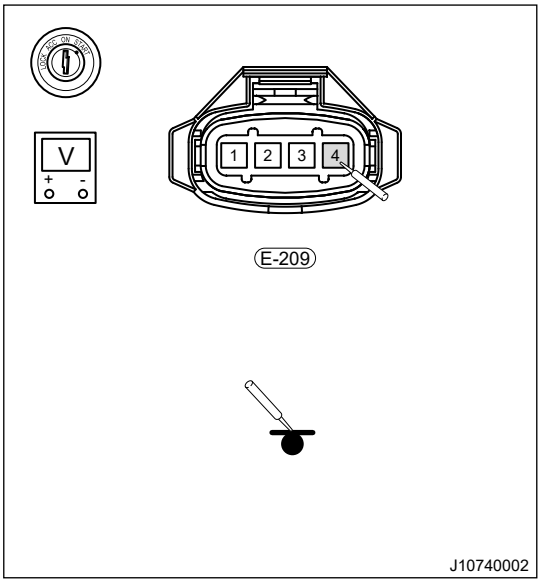
OK

3	**Check intake pressure/temperature sensor signal terminal**

(a) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of intake pressure/temperature sensor E-209 (4) with red probe.

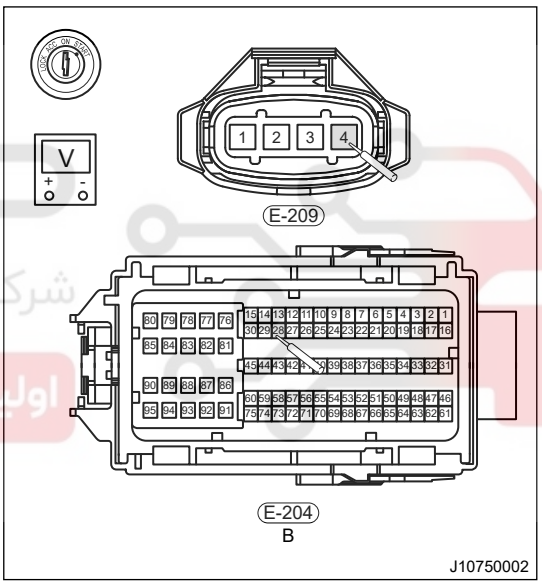
Under idling state: 1 V

When the vehicle accelerates rapidly, voltage can instantly reach 4 V, and then drop to 1.7 V



(b) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-204 (28), measure voltage of intake pressure/temperature sensor E-209 (4) with red probe.

Test voltage drop value should be less than approximately 0.2 V



NG

Repair and replace wire harness, or replace intake pressure/temperature sensor.

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Boost Pressure Out of Range High/Low/Non-plausible

DTC	P120400	Turbocharger/Supercharger Boost Sensor "A" Circuit Range/ Performance
DTC	P120500	Turbocharger/Supercharger Boost Sensor "A" Circuit Range/ Performance
DTC	P023622	Turbocharger/Supercharger Boost Sensor "A" Circuit Range/ Performance
DTC	P023621	Turbocharger/Supercharger Boost Sensor "A" Circuit Range/ Performance

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	Check intake line condition

(a) Check if intake line is detached or seriously air leaked.

NG → **Repair and adjust or replace related connecting lines.**

OK

2	Check boost pressure/temperature sensor

(a) Check boost pressure/temperature sensor connector for looseness or poor contact.
(b) Check if there is any freeze, oil stain, etc. on measurement terminal of boost pressure/temperature sensor, which will affect normal measurement.

NG → **Adjust connector, or replace boost pressure/temperature sensor.**

OK

3	**Reconfirm DTCs**

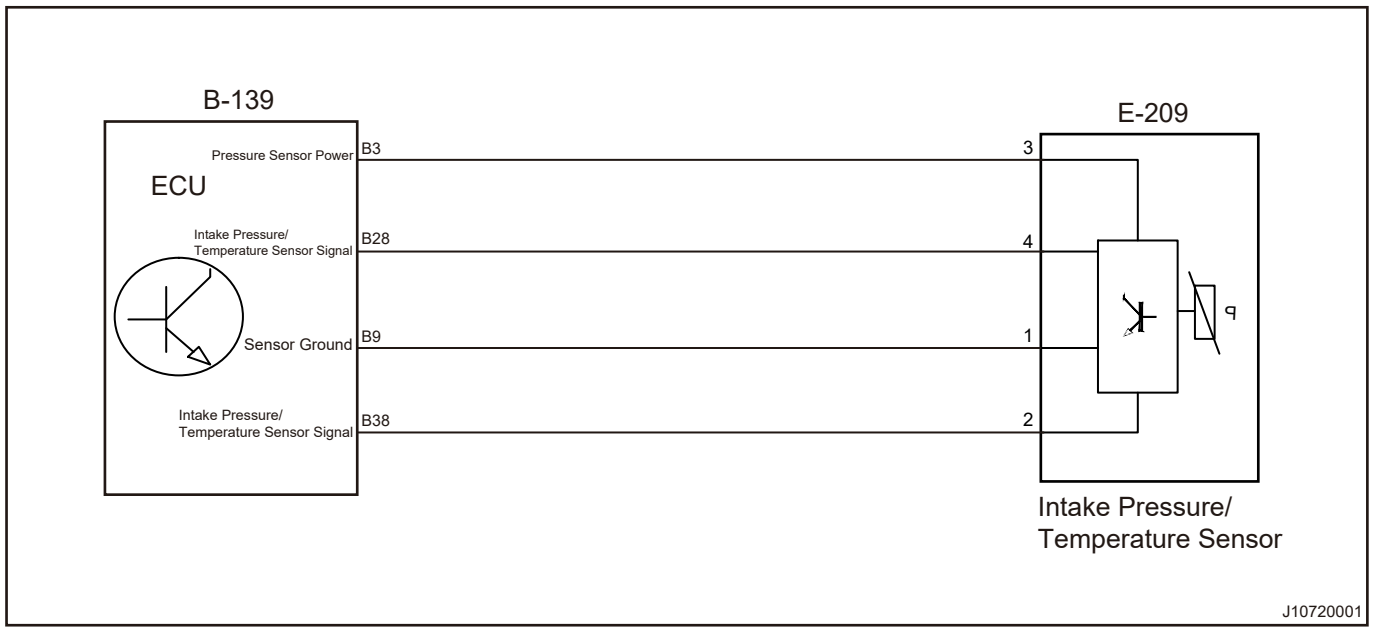
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Intake Pressure Sensor Malfunction

DTC	**P011126**	**Intake Air Temp.Circ. Performance Non-plausible**
DTC	**P011200**	**Intake Air Temp.Circ. Low Input**
DTC	**P011300**	**Intake Air Temp.Circ. High Input**
DTC	**P011400**	**Poor Contact in Intake Manifold Temperature Sensor Circuit**
DTC	**P00CE23**	**Intake Air Temperature Sensor 2 Multiple Check Bank1**
DTC	**P138024**	**Intake Air Temperature Sensor 2 Multiple Check Bank1**
DTC	**P138023**	**Intake Air Temperature Sensor 2 Multiple Check Bank1**

Description
Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check intake pressure/temperature sensor connector**

(a) Disconnect the negative battery.

(b) Unplug intake pressure/temperature sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace intake pressure/temperature sensor.**

OK

2	**Check intake pressure/temperature sensor resistance**

(a) Using ohm band of multimeter, measure if resistances of intake pressure/temperature sensor (1-2) are normal with red and black probes respectively.

Rated resistance at 20°C: 2.5 KΩ ± 5%

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

OK

3	**Check intake pressure/temperature sensor signal and ground terminals**

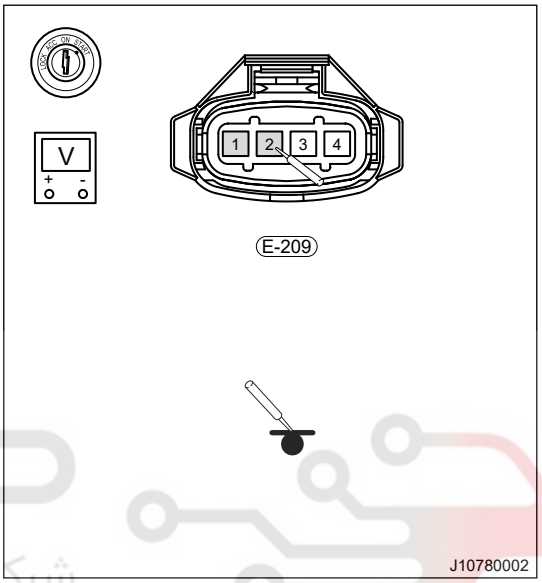
(a) Connect the intake pressure/temperature sensor connector.

(b) Start the engine.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of intake pressure/temperature sensor E-209 (1, 2) with red probe.

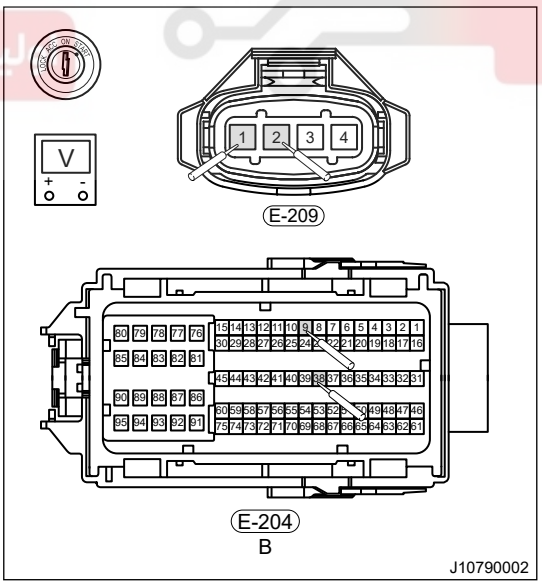
Signal terminal: Signal voltage should vary in accordance with temperature

Ground terminal: Voltage < 0.2 V



(d) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-204 (9, 38), measure voltages of intake pressure/temperature sensor E-209 (1, 2) with red probe

Test voltage drop value should be less than approximately 0.2 V



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

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

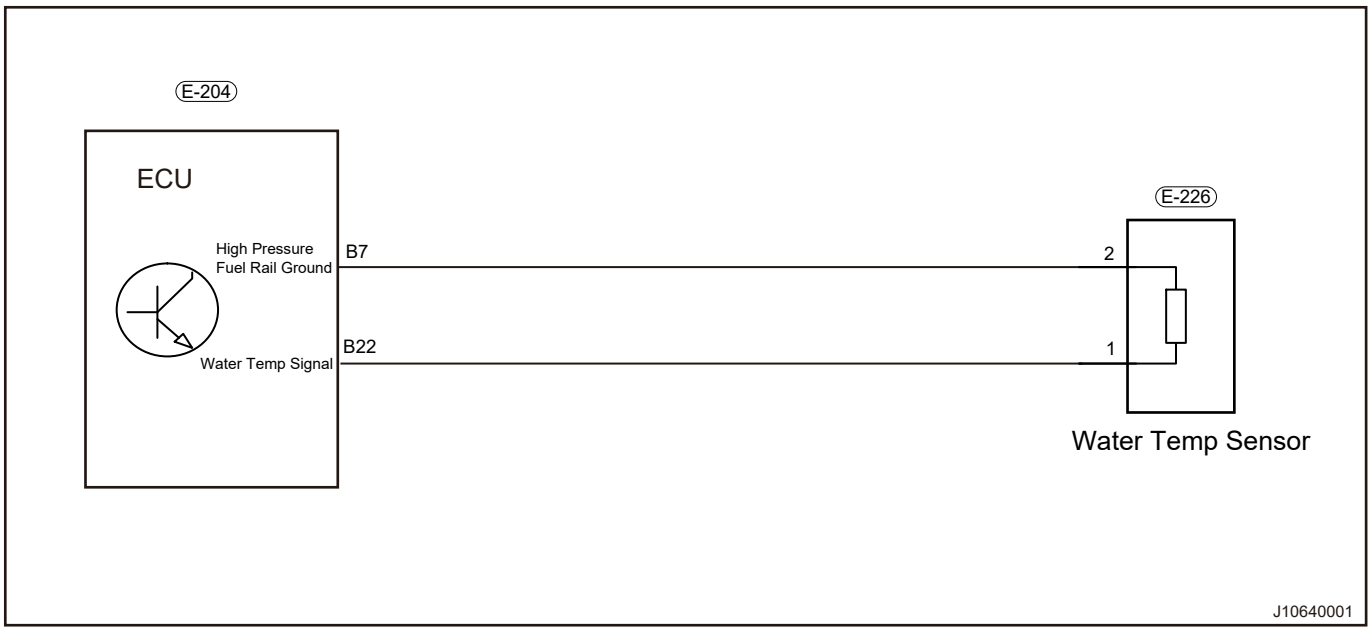
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Coolant Temperature Sensor 1 Malfunction

DTC	P011623	Coolant Temperature Sensor 1 Signal Not Plausible
DTC	P011626	Engine Coolant Temperature Sensor 1 Circuit Range/ Performance
DTC	P050C24	Cold Start Engine Coolant Temperature Performance
DTC	P050C23	Cold Start Engine Coolant Temperature Performance
DTC	P011700	Engine Coolant Temperature Sensor 1 Circuit Low
DTC	P011800	Engine Coolant Temperature Sensor 1 Circuit High
DTC	P011900	Engine Coolant Temperature Sensor 1 Circuit Intermittent

Description
Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check coolant temperature sensor 1 connector**

(a) Disconnect the negative battery.

(b) Unplug coolant temperature sensor 1 connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace coolant temperature sensor 1.**

OK

2	**Check coolant temperature sensor internal resistance**

(a) Using ohm band of multimeter, measure if internal resistances of coolant temperature sensor 1 (1-2) are normal with red and black probes respectively. They should vary in accordance with coolant temperature.

NG → **Replace coolant temperature sensor 1 assembly.**

OK

3	Check coolant temperature sensor 1 signal terminal and ground terminal

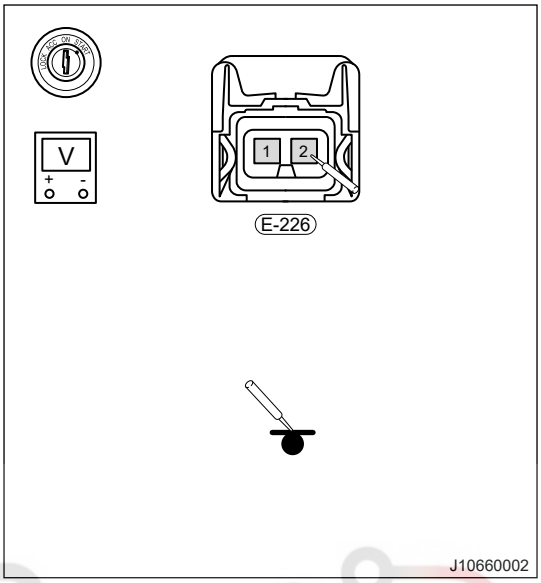
(a) Check coolant temperature sensor 1 connector.

(b) Start the engine.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of coolant temperature sensor 1 E-226 (1, 2) with red probe.

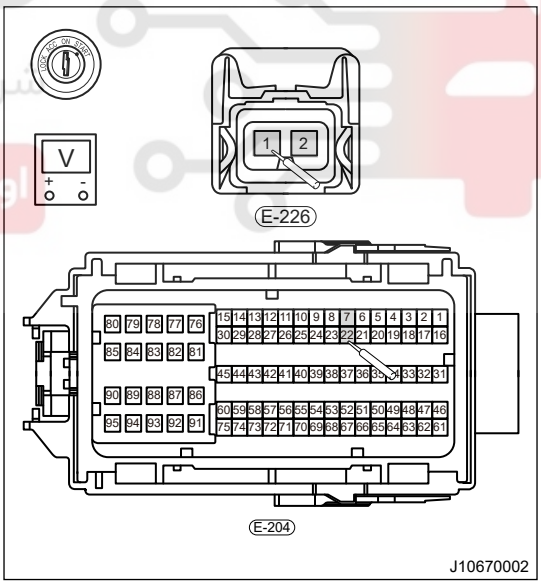
Signal terminal: Voltage signal should vary in accordance with temperature.

Ground terminal: Voltage < 0.2 V



(d) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-204 (7, 22), measure voltages of coolant temperature sensor E-226 (1, 2) with red probe

Test voltage drop value should be less than approximately 0.2 V



NG **Repair or replace wire harness.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Thermostat Performance Unreasonable

DTC	**P012800**	**Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check electronic thermostat**

(a) Check if electronic thermostat is normally open or damaged

NG → **Replace electronic thermostat assembly.**

OK

2	**Check coolant temperature sensor 1 resistance**

(a) Using ohm band of multimeter, measure if internal resistances of coolant temperature sensor 1 (1-2) are normal with red and black probes respectively. They should vary in accordance with coolant temperature.

Rated resistance at 20℃: 2.5 KΩ ± 10%

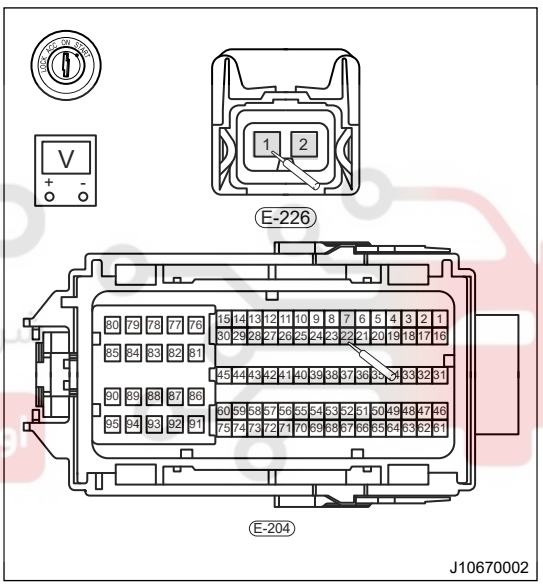
NG → **Replace coolant temperature sensor 1 assembly.**

OK

3	**Check coolant temperature sensor 1 connecting wire voltage drop value**

(a) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-204 (7, 22), measure voltages of coolant temperature sensor E-226 (1, 2) with red probe

Test voltage drop value should be less than approximately 0.2 V



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

OK

4	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Upstream Oxygen Sensor Signal Circuit Voltage Low/High (APE IPE RE Line Short to Ground/ Power Supply)

DTC	**P013100**	**O2 Sensor Circuit Low Voltage Bank 1 Sensor 1**
DTC	**P013200**	**O2 Sensor Circuit High Voltage Bank 1 Sensor 1**
DTC	**P223700**	**O2 Sensor Positive Current Control Circuit Open Bank 1 Sensor 1 (Close to ECM)**
DTC	**P223713**	**O2 Sensor Positive Current Control Circuit Open Bank 1 Sensor 1**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check upstream oxygen sensor connector**

(a) Disconnect the negative battery.
(b) Unplug upstream oxygen sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

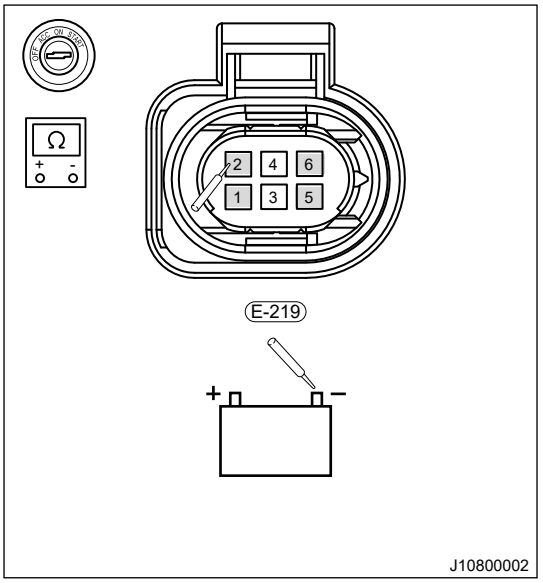
OK →

2	**Check for short circuit to ground / power supply in upstream oxygen sensor circuit**

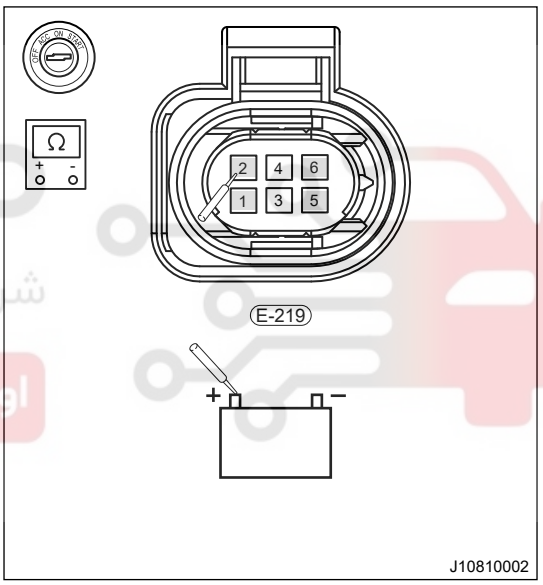
(a) Disconnect the upstream oxygen sensor connector.

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of upstream oxygen sensor E-219 (2, 6, 1, 5) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of upstream oxygen sensor E-219 (2, 6, 1, 5) with red probe respectively. Check if circuit is short to power supply.

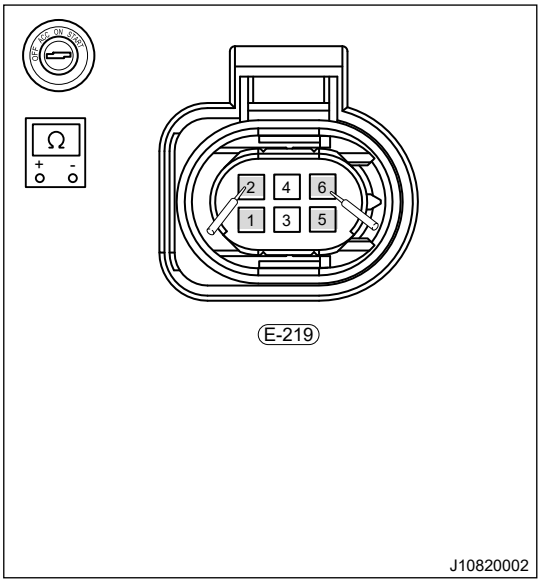


NG → **Repair or replace wire harness.**

OK →

3	**Check if circuits of upstream oxygen sensor themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of upstream oxygen sensor E-219 (2, 6, 1, 5) with red and black probes respectively. Check if internal circuits are shorted to each other.



NG → **Replace upstream oxygen sensor assembly.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

O2 Sensor Circuit Slow Response Bank 1 Sensor 1

DTC	P013300	O2 Sensor Circuit Slow Response Bank 1 Sensor 1

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	Check intake/exhaust air for leakage

(a) Check intake system for air leakage.
(b) Check exhaust system for air leakage.

NG → **Repair and handle parts related to air leakage.**

OK ↓

2	Check the upstream oxygen sensor.

(a) Check if upstream oxygen sensor is deteriorated; Check if response speed is slow.

NG → **Replace upstream oxygen sensor assembly.**

OK ↓

3	Reconfirm DTCs

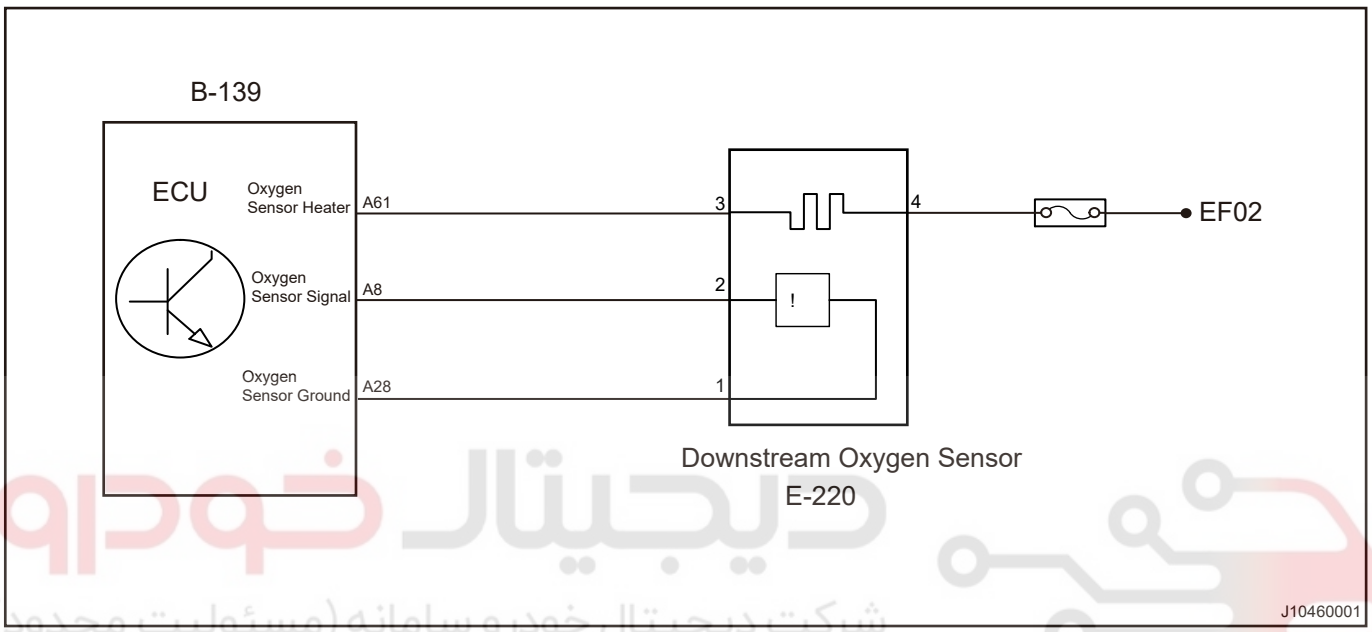
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Downstream Oxygen Sensor Signal Improper/Signal Wire Short to Ground/Power Supply

DTC	**P013600**	**O2 Sensor Circuit Bank 1 Sensor 2**
DTC	**P013700**	**O2 Sensor Circuit Low Voltage Bank 1 Sensor 2**
DTC	**P013800**	**O2 Sensor Circuit High Voltage Bank 1 Sensor 2**

Description
Control Schematic Diagram



DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check downstream oxygen sensor connector**

(a) Disconnect the negative battery.
(b) Unplug downstream oxygen sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

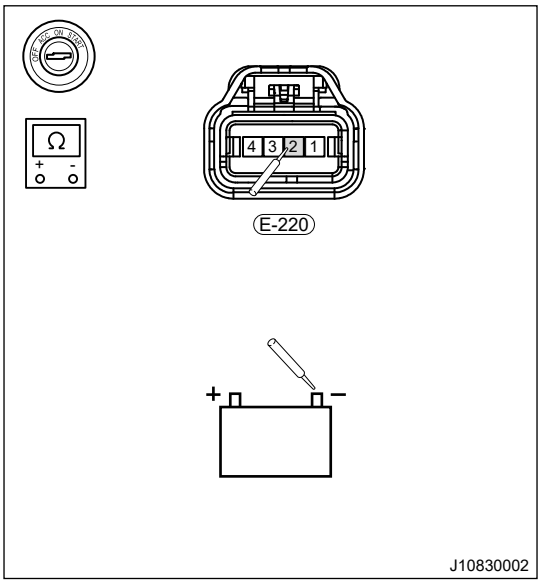
OK →

2	**Check for short circuit to ground / power supply in downstream oxygen sensor signal**

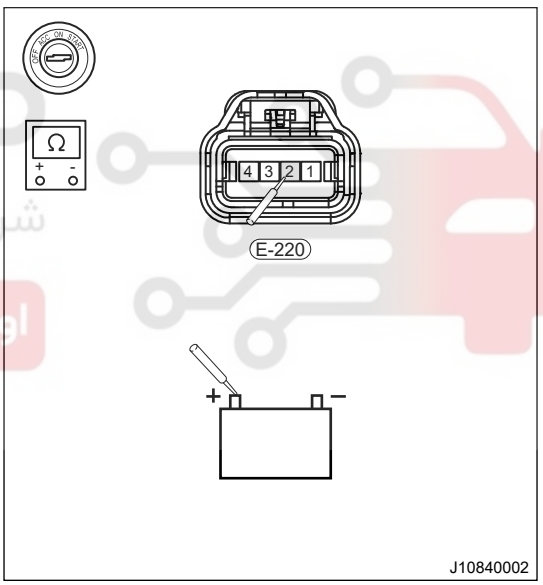
(a) Disconnect the downstream oxygen sensor connector.

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of downstream oxygen sensor E-220 (2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistance of downstream oxygen sensor E-220 (2) with red probe respectively. Check if circuit is short to power supply.

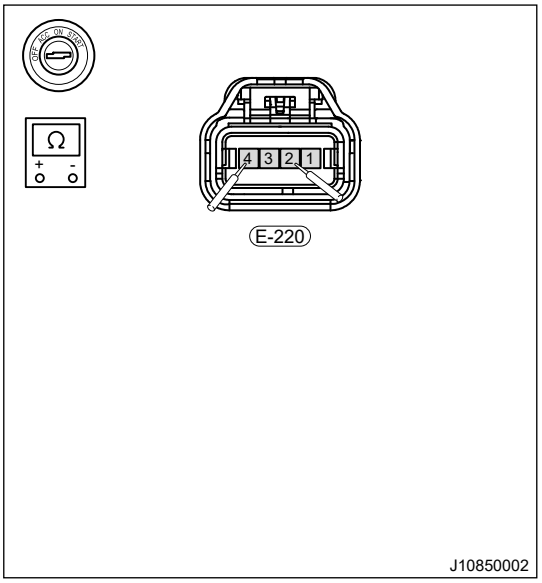


NG → **Repair or replace wire harness.**

OK →

3	**Check if downstream oxygen sensor themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of upstream oxygen sensor E-220 (1, 2, 3, 4) with red and black probes respectively. Check if internal circuits are shorted to each other.



NG → **Replace downstream oxygen sensor assembly.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

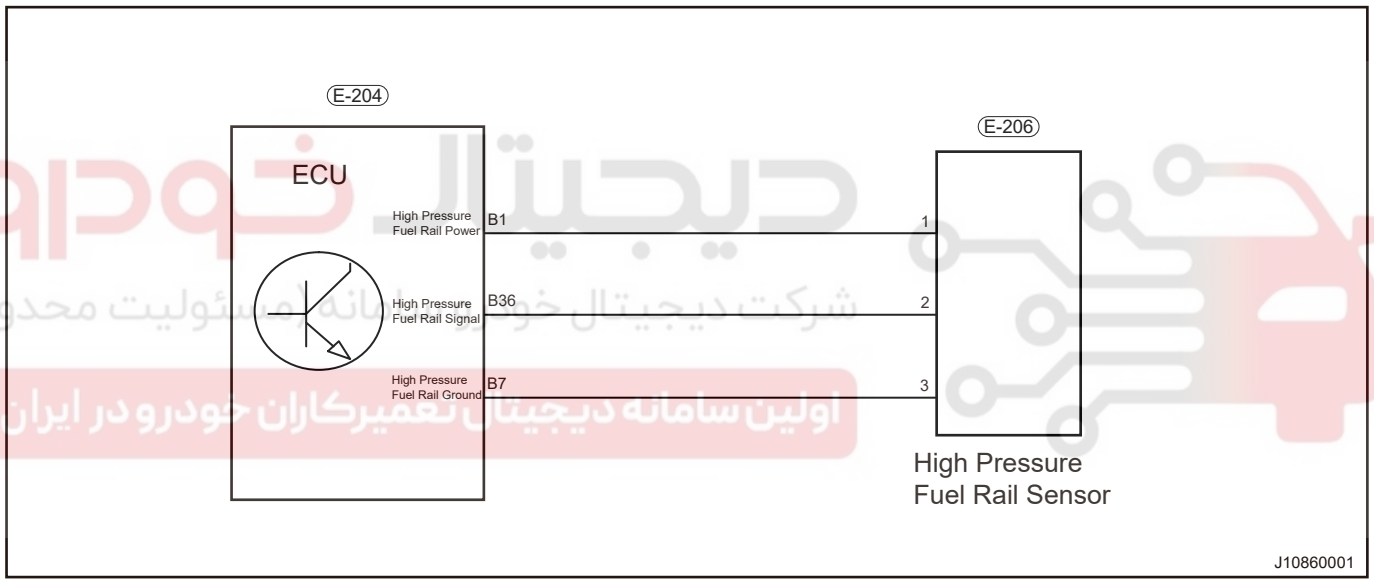
OK → **Conduct test and confirm malfunction has been repaired**

Fuel Rail Pressure Sensor Circuit Short to Ground/Power Supply/Signal Stuck/Signal Non-plausible

DTC	P019200	Fuel Rail Pressure Sensor Circuit Short to Ground
DTC	P019300	Fuel Rail Pressure Sensor Circuit Short to Power Supply
DTC	P019400	Fuel Rail Pressure Sensor Circuit Intermittent/Erratic Bank 1
DTC	P019128	Fuel Rail Pressure Sensor Circuit Bank 1-Negative Offset
DTC	P019129	Fuel Rail Pressure Sensor Circuit Bank 1-Positive Offset
DTC	P019000	Fuel Rail Pressure Sensor Circuit Bank 1
DTC	P254200	DECOS Oil Passage Pressure Sensor Circuit High Voltage
DTC	P254100	DECOS Oil Passage Pressure Sensor Circuit Low Voltage

Description

Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check fuel rail pressure sensor connector**

(a) Disconnect the negative battery.

(b) Unplug fuel rail pressure sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check fuel rail pressure sensor circuit**

(a) Connect the fuel rail pressure sensor connector.

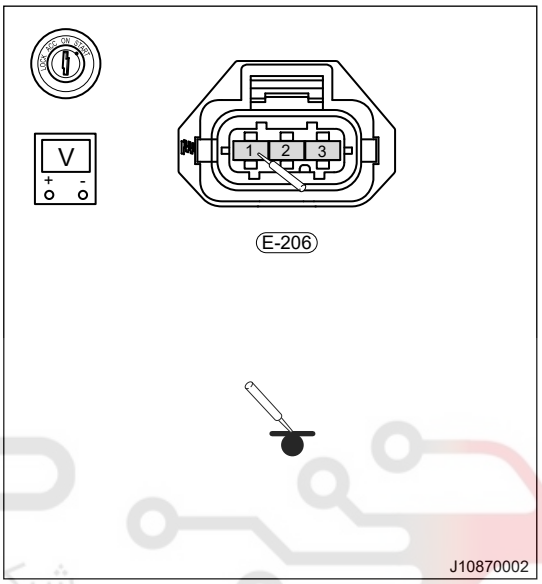
(b) Ignition switch ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of fuel rail pressure sensor E-206 (1, 2, 3) with red probe respectively.

Power supply: 5 V

Ground: < 0.2 V

Signal: Under atmospheric pressure (100 Kpa), signal output is 0.500 ± 0.048 V



NG → **Check and repair wire harness, or replace fuel rail pressure sensor.**

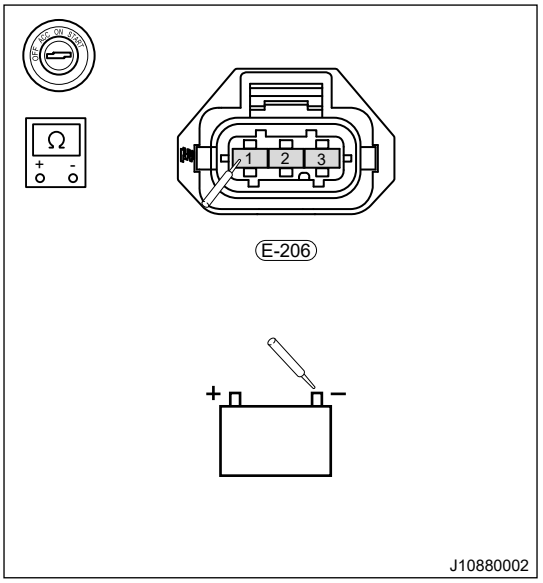
OK

3	**Check for short circuit to ground / power supply in fuel rail pressure sensor**

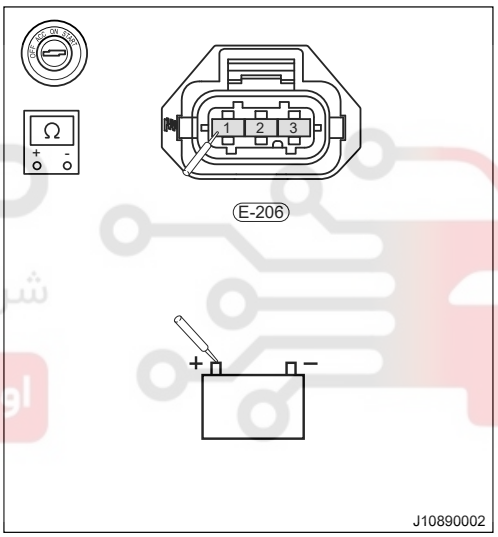
(a) Disconnect the fuel rail pressure sensor connector.

(b) Disconnect the ECM connector (E-204).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of fuel rail pressure sensor E-206 (1, 2, 3) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of fuel rail pressure sensor E-206 (1, 2, 3) with red probe respectively. Check if circuit is short to power supply.

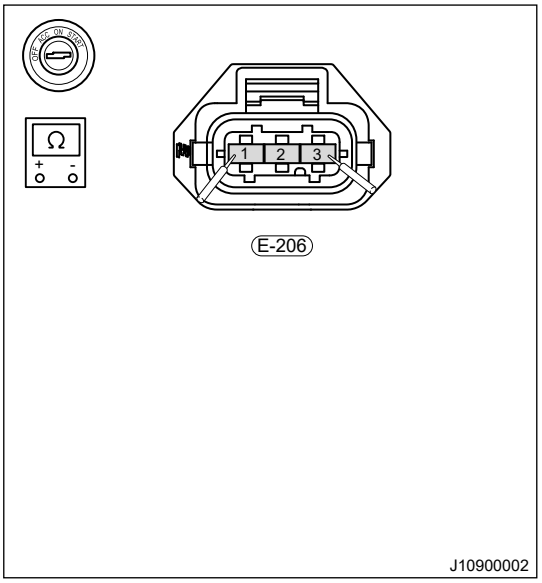


NG → **Check and repair wire harness.**

OK →

4	**Check if circuits of fuel rail pressure sensor themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of fuel rail pressure sensor E-206 (1, 2, 3) with red and black probes respectively. Check if internal circuits are shorted to each other.



NG → **Replace fuel rail pressure sensor assembly.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Fuel Injector Control Circuit Open

DTC	**P020113**	**Cylinder 1 Fuel Injector Control Circuit Open**
DTC	**P020213**	**Cylinder 2 Fuel Injector Control Circuit Open**
DTC	**P020313**	**Cylinder 3 Fuel Injector Control Circuit Open**
DTC	**P020413**	**Cylinder 4 Fuel Injector Control Circuit Open**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Take troubleshooting of cylinder 1 fuel injector as an example.

1	**Check injector connector**

(a) Disconnect the negative battery.
(b) Check if fuel injector connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check internal resistance of fuel injector**

(a) Disconnect the injector connector.
(b) Using ohm band of multimeter, measure resistances of fuel injector (1, 2) with red and black probes respectively.

NG → **Replace cylinder 1 fuel injector assembly.**

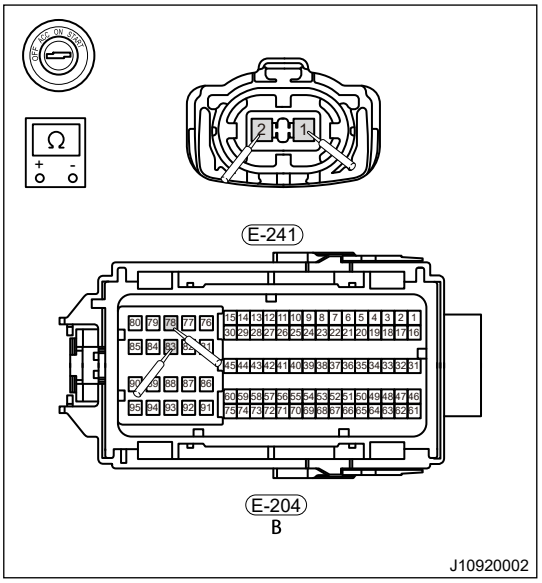
OK

3	**Check fuel injector control circuit**

(a) Disconnect the injector connector.

(b) Disconnect the ECM connector (E-204).

(c) Using ohm band of multimeter, connect black probe to ECM E-204 (83, 78), measure for continuity between fuel injector E-241 (1, 2) with red probe respectively.



NG → **Check and repair circuit.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Ignition Coil Control Circuit Voltage High/Low

DTC	P230112	Ignition Coil “A” Primary Control Circuit High
DTC	P230412	Ignition Coil “B” Primary Control Circuit High
DTC	P230712	Ignition Coil “C” Primary Control Circuit High
DTC	P231012	Ignition Coil “D” Primary Control Circuit High
DTC	P230011	Ignition Coil “A” Primary Control Circuit Low
DTC	P230311	Ignition Coil “B” Primary Control Circuit Low
DTC	P230611	Ignition Coil “C” Primary Control Circuit Low
DTC	P230911	Ignition Coil “D” Primary Control Circuit Low
DTC	P035113	Ignition Coil "A" Primary Control Circuit Failure
DTC	P035213	Ignition Coil "B" Primary Control Circuit Failure
DTC	P035313	Ignition Coil "C" Primary Control Circuit Failure
DTC	P035413	Ignition Coil "D" Primary Control Circuit Failure

DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

Take troubleshooting of cylinder 1 ignition coil as an example.

1	**Check ignition coil connector**

(a) Disconnect the negative battery.

(b) Unplug ignition coil connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check ignition coil power supply fuse**

(a) Check if fuse EF03 15A of engine compartment fuse and relay box is blown.

NG → **There is short circuit in circuit or ignition coil.**

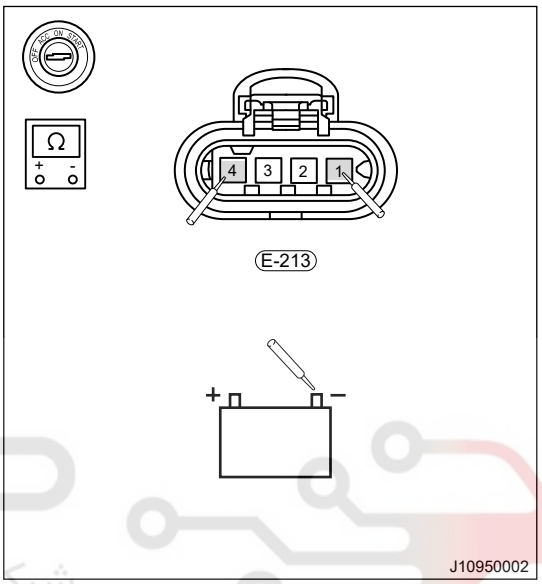
OK

3	**Check for short circuit to ground / power supply in ignition coil circuit**

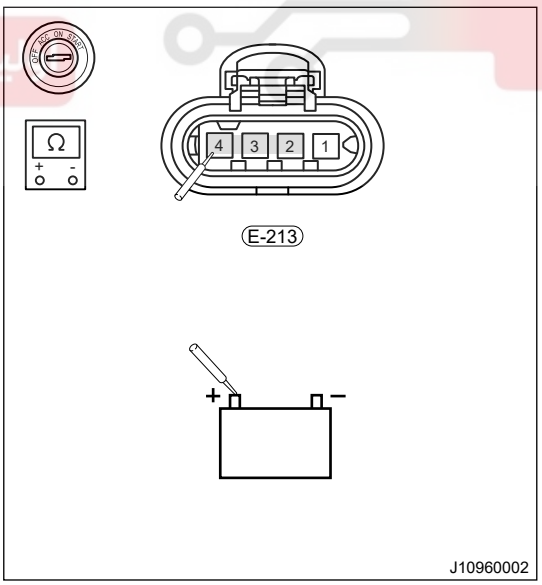
(a) Disconnect the ignition coil connector.

(b) Disconnect the ECM connector (E-204).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of ignition coil E-213 (1, 4) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of ignition coil E-213 (2, 3, 4) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair wire harness.**

OK

4	Check ignition coil control circuit

(a) Connect the ignition coil connector.

(b) Ignition switch ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of ignition coil E-213 (1, 2, 3) with red probe respectively.

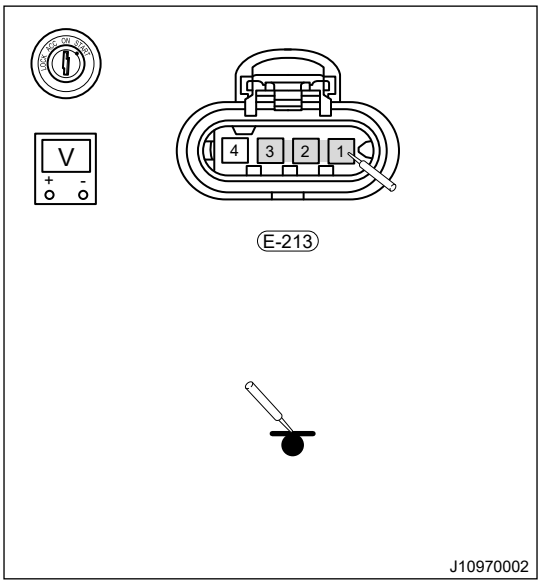
Power supply: 12V

Ground: < 0.2 V

(d) Start the engine.

(e) Using the LED test light, connect clip to battery negative terminal, measure ignition coil E-213 (4) with another end.

Under normal conditions, test light should flash.

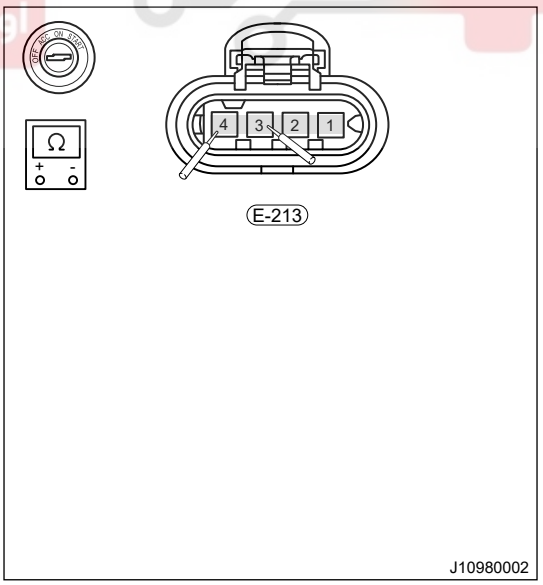


NG → **Check and repair wire harness**

OK

5	Check if circuits of ignition coil themselves are shorted to each other

(a) Using ohm band of multimeter, measure resistances of ignition coil E-213 (1, 2, 3, 4) with red and black probes respectively. Check if internal circuits are shorted to each other.



NG → **Replace ignition coil assembly.**

OK

6	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

7	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Fuel Injector Control Circuit Short to Power Supply

DTC	**P026200**	**Cylinder 1 Fuel Injector Control Circuit Short to Power Supply**
DTC	**P026800**	**Cylinder 3 Fuel Injector Control Circuit Short to Power Supply**
DTC	**P027100**	**Cylinder 4 Fuel Injector Control Circuit Short to Power Supply**
DTC	**P026500**	**Cylinder 2 Fuel Injector Control Circuit Short to Power Supply**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Take troubleshooting of cylinder 1 fuel injector as an example.

1	**Check injector connector**

(a) Disconnect the negative battery.
(b) Check if fuel injector connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

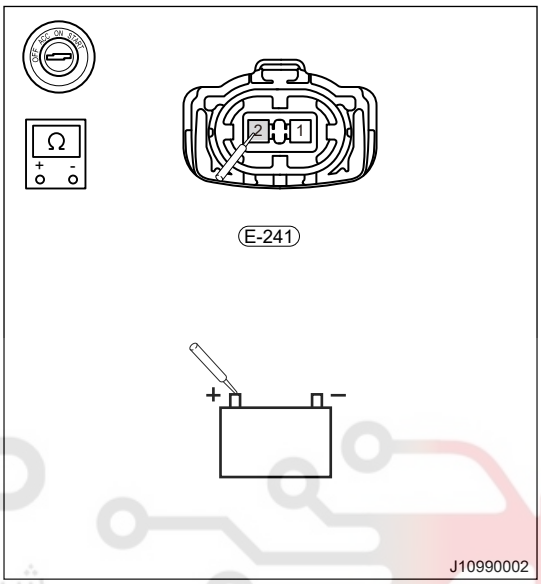
OK ↓

2	**Check if fuel injector control terminal is short to power supply**

(a) Disconnect the injector connector.

(b) Disconnect the ECM connector (E-204).

(c) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistance of fuel injector E-241 (2) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair circuit.**

OK ↓

3	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG ↓

4	**Reconfirm DTCs**

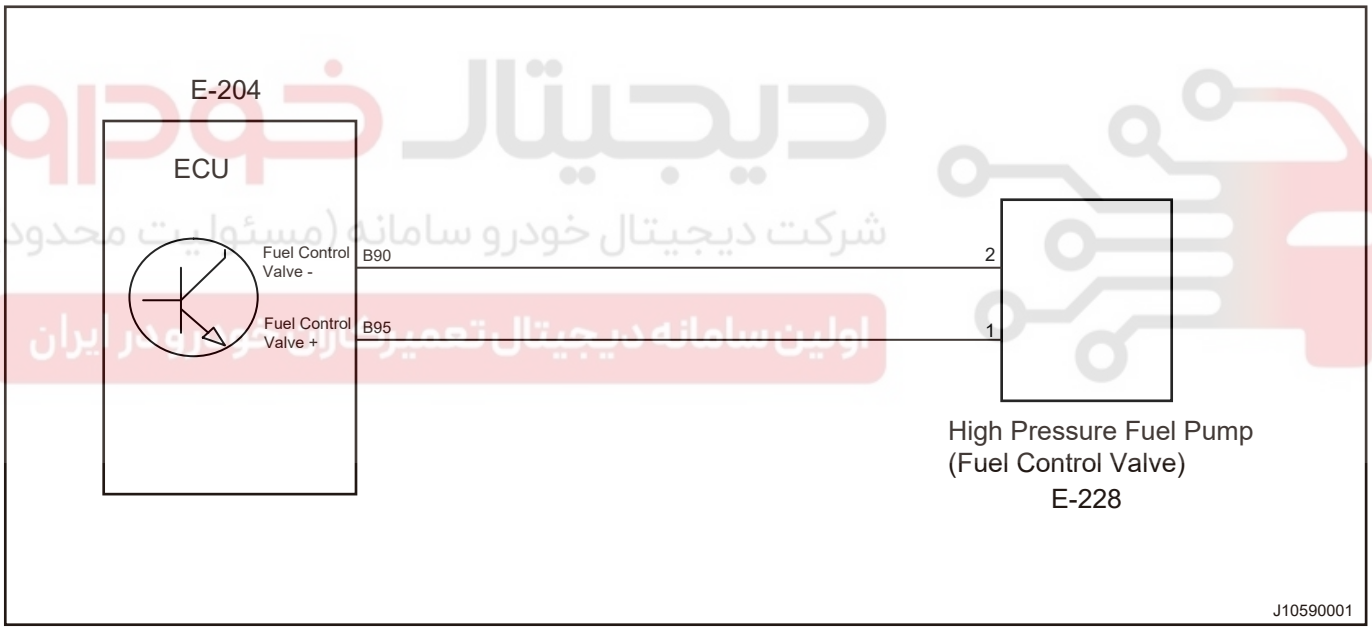
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	**Conduct test and confirm malfunction has been repaired**

Flow Control Valve Control Circuit Open/Too High/Too Low

DTC	**P025100**	**Flow Control Valve Positive or Negative Control Circuit Open**
DTC	**P025400**	**Flow Control Valve High Side Control Circuit Voltage Too High or Too Low**
DTC	**P025900**	**Injection Pump Fuel Metering Control “A” Low (Cam/Rotor/Injector)**

Description
Control Schematic Diagram



DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check high pressure fuel pump connector**

(a) Disconnect the negative battery.

(b) Unplug high pressure fuel pump connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

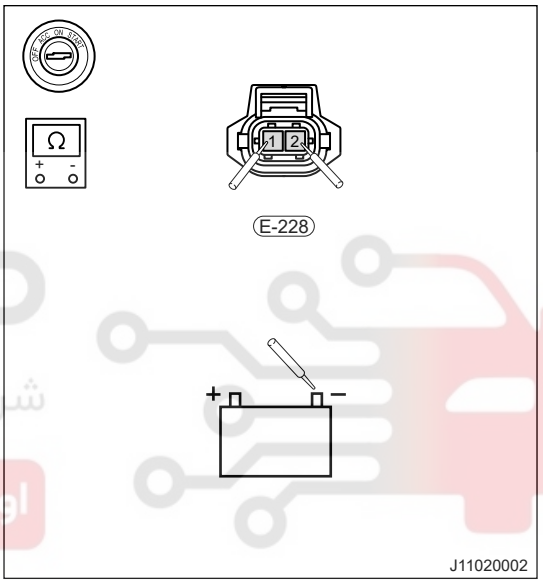
OK ↓

2	**Check for short circuit to ground / power supply in high pressure fuel pump circuit**

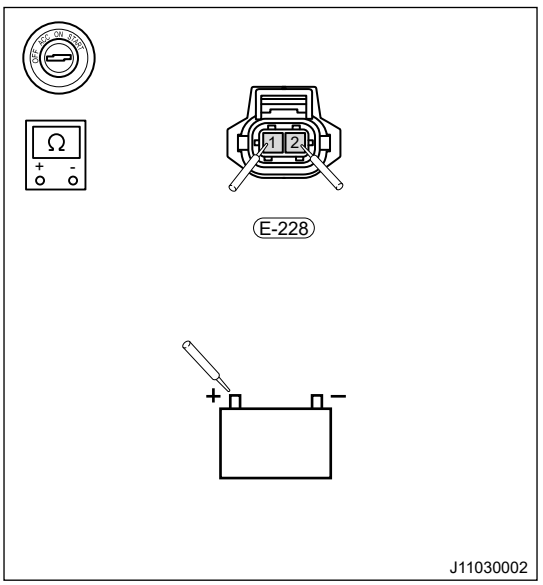
(a) Disconnect the high pressure fuel pump connector.

(b) Disconnect the ECM connector (E-204).

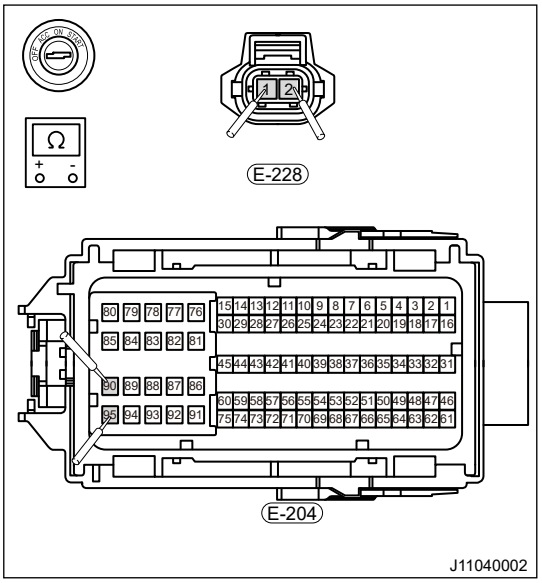
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of high pressure fuel pump E-228 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of high pressure fuel pump E-228 (1, 2) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, connect black probe to ECM E-204 (95, 90), measure for continuity between high pressure fuel pump E-228 (1, 2) with red probe respectively; Check for open circuit.



NG → **Check and repair wire harness.**

OK

3	**Check if circuits of flow control valve themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of high pressure fuel pump (1, 2) with red and black probes respectively. Check if internal circuits are shorted to each other.

NG → **Replace high pressure fuel pump assembly.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Multiple Cylinder Misfire Detected

DTC	P030000	Random/Multiple Cylinder Misfire Detected
DTC	P030100	Cylinder 1 Misfire Detected
DTC	P030200	Cylinder 2 Misfire Detected
DTC	P030300	Cylinder 3 Misfire Detected
DTC	P030400	Cylinder 4 Misfire Detected
DTC	P036300	Cylinder Selective Fuel Cutoff Active due to Catalyst Damaging Misfire

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check fuel injector, ignition coil connector**

(a) Disconnect the negative battery.
(b) Check if fuel injector, ignition coil connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check if ignition coil control circuit is abnormal**

(a) Check if ignition coil control circuit is abnormal.
(b) Under normal conditions of control circuit, replace ignition coil and perform test.

NG → **Check and repair circuit, or replace ignition coil assembly.**

OK →

3	**Check spark plug**

(a) Check spark plug insulating ceramic for cracks;
(b) Check spark plug head electrode for corrosion, damage;
(c) Check if clearance between spark plug head side electrode and center electrode is normal.

NG → **Replace spark plug assembly.**

OK →

4	**Check if fuel injector control circuit is abnormal**

(a) Check if fuel injector control circuit is abnormal.
(b) Under normal conditions of control circuit, replace fuel injector and perform test.

NG → **Check and repair circuit, or replace fuel injector assembly.**

OK →

5	**Check fuel quality**

(a) Check if fuel quality is abnormal.

NG → **Replace fuel.**

OK →

6	**Check engine system for serious carbon deposition**

(a) Check if fuel injector is dirty or blocked.
(b) Check if electronic throttle is dirty.
(c) Check intake valve for serious carbon deposition.

NG → **Clean engine system.**

OK

7	**Test engine cylinder pressure**

(a) Test if cylinder pressure of each cylinder is met standard with the cylinder pressure gauge.

NG → **Repair the engine.**

OK

8	**Reconfirm DTCs**

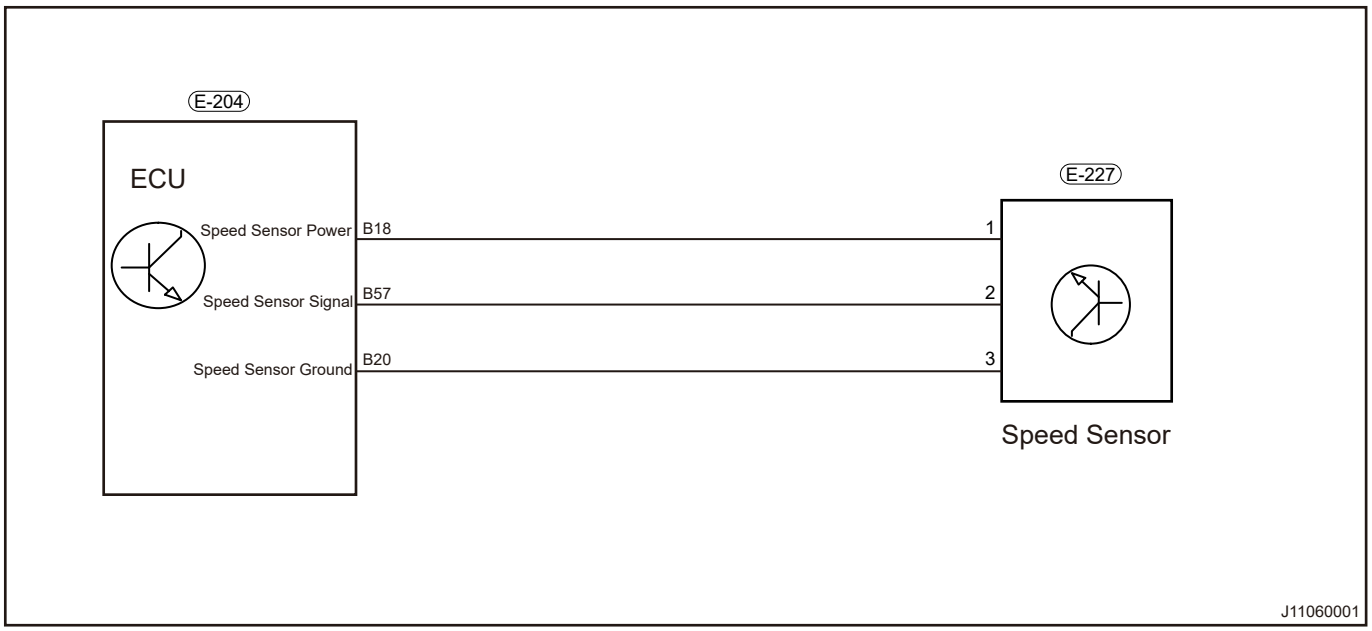
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Crankshaft Position Sensor Signal Improper/Missing

DTC	**P033900**	**Crankshaft Position Sensor "A" Circuit Intermittent**
DTC	**P261700**	**Crankshaft Position Signal Output Circuit Open**

Description
Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check speed sensor connector**

(a) Disconnect the negative battery.

(b) Check if speed sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check speed sensor and signal gear ring condition**

(a) Remove the speed sensor.

(b) Check head of speed sensor for a large amount of iron chips.

(c) Check signal gear ring for tooth missing, damage or iron chips adhesion.

NG → **Clean up iron chips or replace damaged flywheel.**

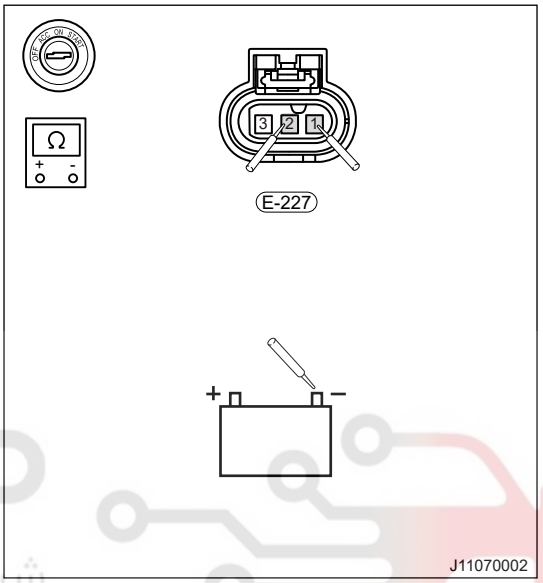
OK →

3	**Check for short circuit to ground / power supply in speed sensor circuit**

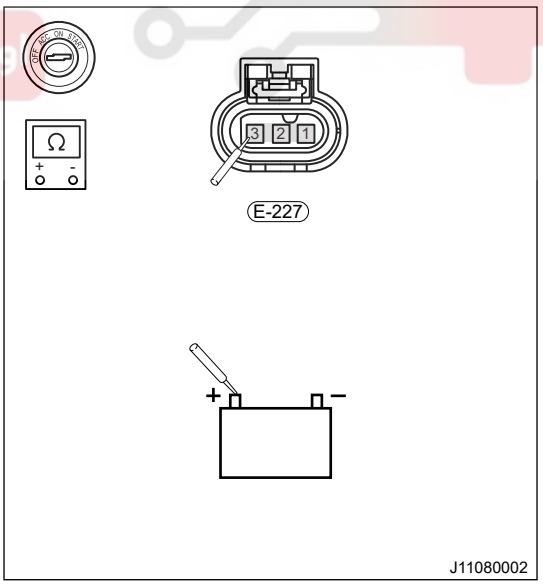
(a) Disconnect the speed sensor connector.

(b) Disconnect the ECM connector (E-204).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of speed sensor E-227 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of speed sensor E-227 (1, 2, 3) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair wire harness.**

OK →

4	Check speed sensor signal circuit

(a) Connect the speed sensor connector.

(b) Ignition switch ON.

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure voltage of speed sensor E-227 (1, 3) with red probe respectively.

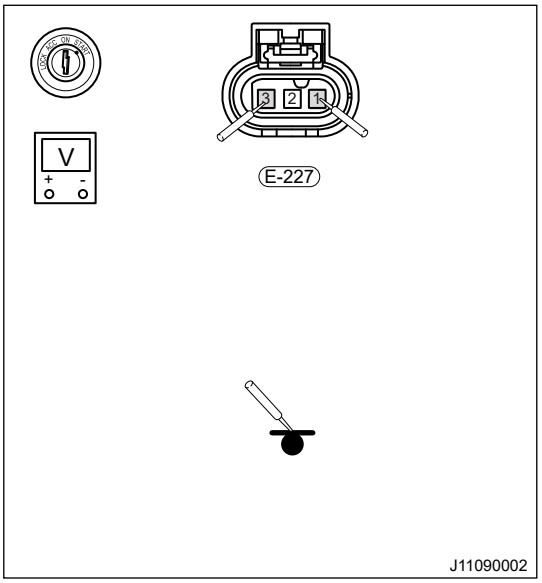
Power supply: 5 V

Ground: < 0.2 V

(d) Start the engine.

(e) Using the LED test light, connect clip to battery negative terminal, measure speed sensor E-227 (2) with another end.

Under normal conditions, test light should flash.

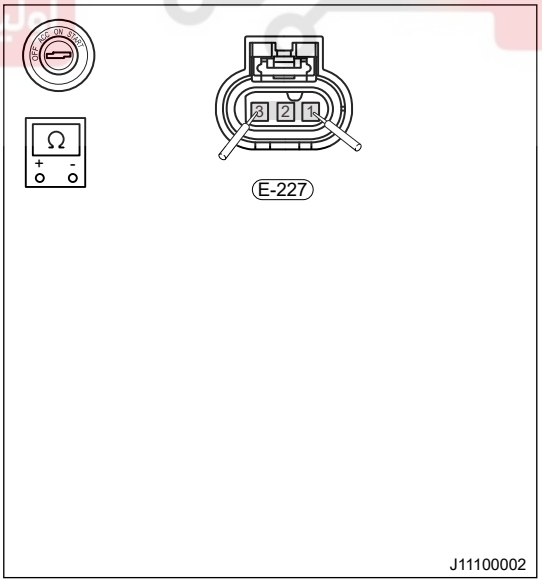


NG → **Check and repair wire harness**

OK

5	Check if circuits of speed sensor themselves are shorted to each other

(a) Using ohm band of multimeter, measure resistances of speed sensor E-227 (1, 2, 3) with red and black probes respectively. Check if internal circuits are shorted to each other.



NG → **Replace speed sensor assembly.**

OK

6	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

7	Reconfirm DTCs

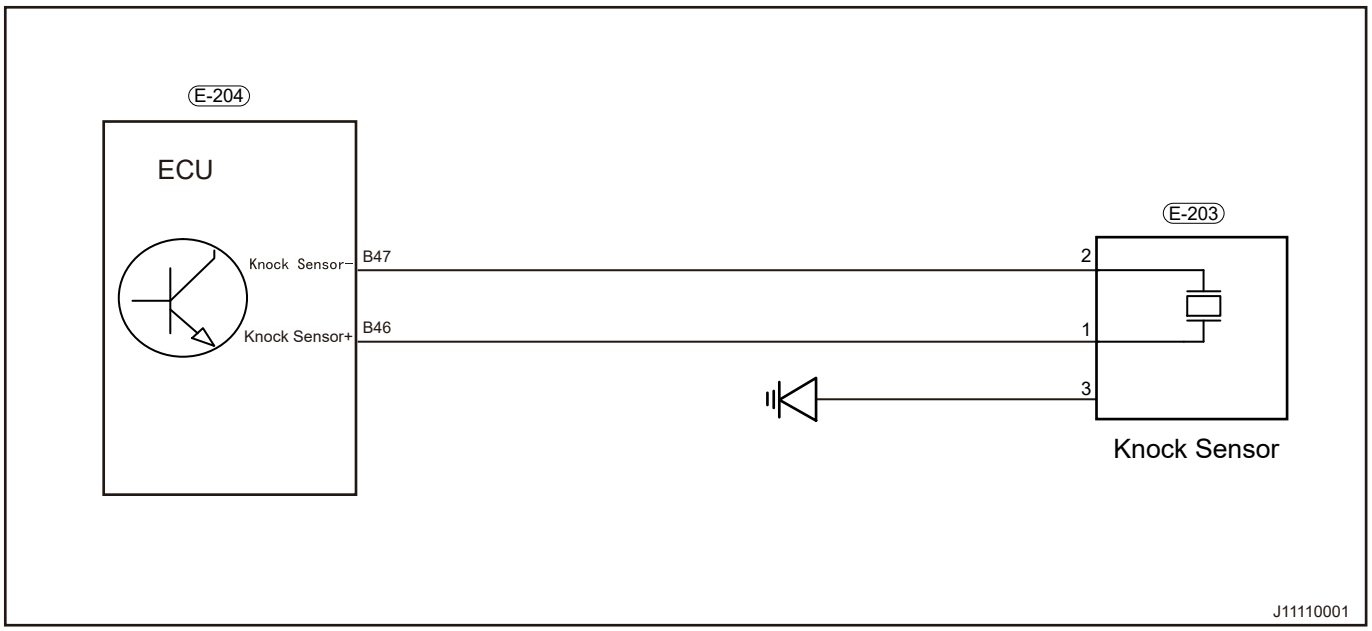
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Knock Sensor (Terminal A/B) Signal Short to Ground/Power Supply/Voltage Too High/Too Low

DTC	P032700	Knock Sensor Signal Short to Ground (A)
DTC	P032714	Knock Sensor Signal Short to Ground (B)
DTC	P032800	Knock Sensor Signal Short to Power Supply (A)
DTC	P032815	Knock Sensor Signal Short to Power Supply (B)
DTC	P032500	Knock Sensor Signal Circuit Voltage Too Low
DTC	P151000	Knock Control System Failure
DTC	P032600	Knock/Combustion Vibration Sensor 1 Circuit Bank 1 or Single Sensor

Description
Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check knock sensor connector**

(a) Disconnect the negative battery.

(b) Check if knock sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check knock sensor condition**

(a) Check if knock sensor is exposed to oil, coolant, water, etc. for a long time; Avoid corrosion to sensor.

(b) Check knock sensor fixing bolts for looseness.

Tightening torque: 20 ± 5 N·m

NG → **Clean and tighten fixing bolts to specified torque.**

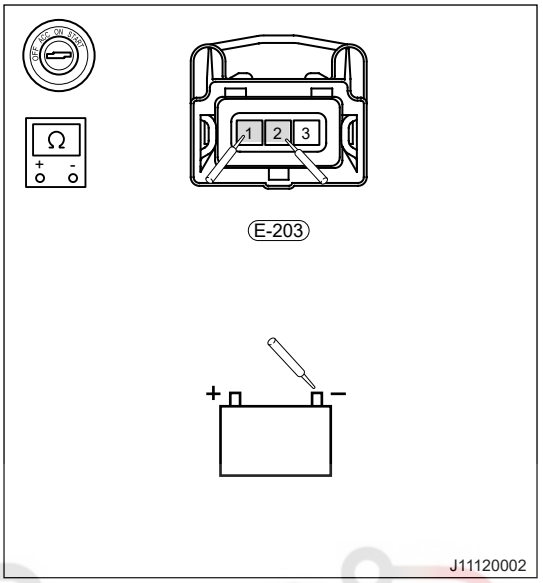
OK

3	Check for short circuit to ground / power supply in knock sensor circuit

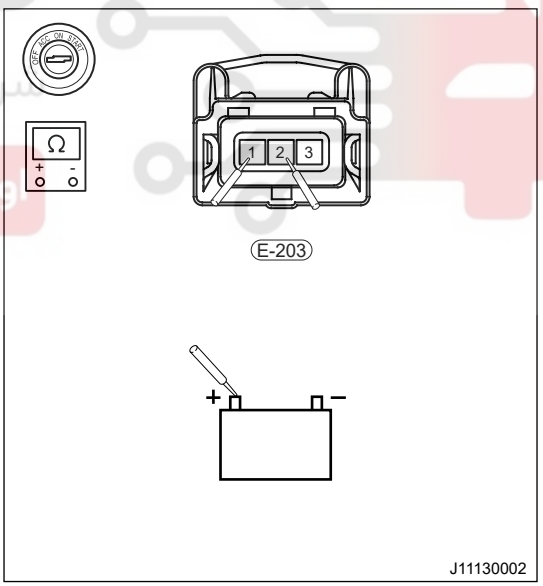
(a) Disconnect the knock sensor connector.

(b) Disconnect the ECM connector (E-204).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of knock sensor E-203 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of knock sensor E-203 (1, 2) with red probe respectively. Check if circuit is short to power supply.



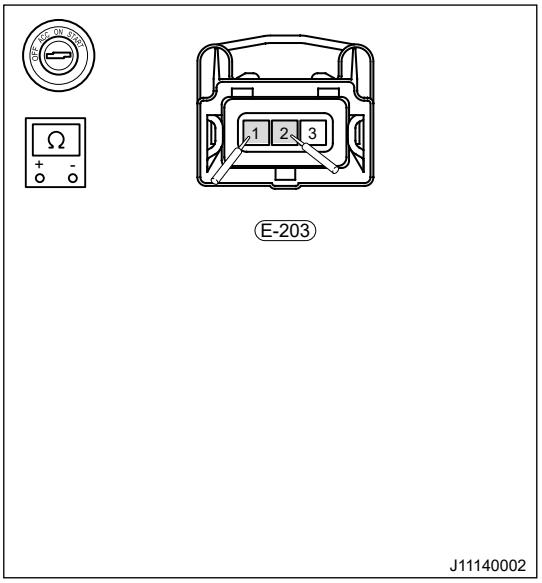
NG → **Check and repair wire harness.**

OK

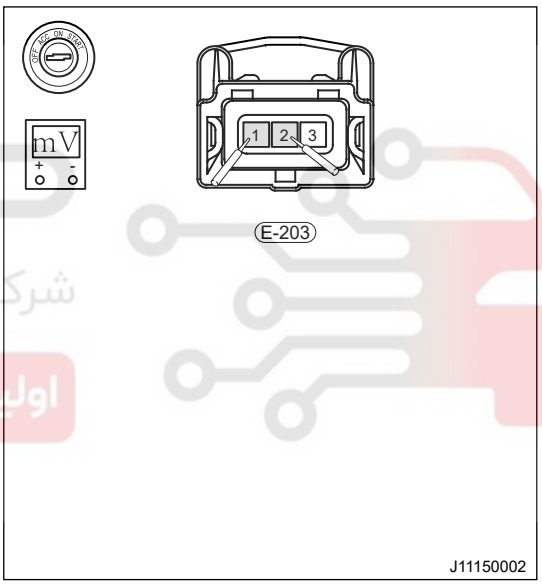
4	Check knock sensor itself

(a) Using ohm band of multimeter, measure resistances of knock sensor E-203 (1, 2) with red and black probes respectively.

Resistance at ambient temperature should be 4.9 MΩ ± 20%



(b) Using mV band of multimeter, measure voltages of knock sensor E-203 (1, 2) with red and black probes respectively. Using a small hammer to tap near knock sensor, there should be a voltage signal output at this time.



NG → **Replace knock sensor assembly.**

OK →

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Intake/Exhaust Camshaft Phaser Sensor Signal Improper

DTC	**P034100**	**Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor**
DTC	**P036600**	**Exhaust Camshaft Phaser Sensor Signal Improper**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check phaser solenoid valve, valve body bolt components state**

(a) Disconnect the negative battery cable.
(b) Remove intake/exhaust phaser solenoid valve; Check for blockage or dirty.
(c) Remove intake/exhaust phaser valve body bolts; Check for blockage or dirt.

NG → **Clean or replace phaser solenoid valve and valve body bolts.**

OK

2	**Check engine maintenance condition**

(a) Check if engine oil level is normal, and check for oil leakage and oil seepage.
(b) Remove valve trim cover, and check engine lubrication and cleaning conditions, and check for wear or sludge dirty

NG → **Clean and maintain the engine, replace the damaged components.**

OK ↓

3	**Check valve mechanism timing**

(a) Check if valve mechanism timing is normal, and check timing chain for teeth skipping, misalignment, elongation, etc.
(b) Check camshaft signal plate for misalignment, looseness, etc.

NG → **Replace timing chain or camshaft assembly.**

OK ↓

4	**Check intake/exhaust phaser assembly**

(a) Check if operating condition of cam phase regulator is normal (dirt blocked, oil leaked, stuck, etc.).

NG → **Replace intake/exhaust phaser assembly.**

OK ↓

5	**Reconfirm DTCs**

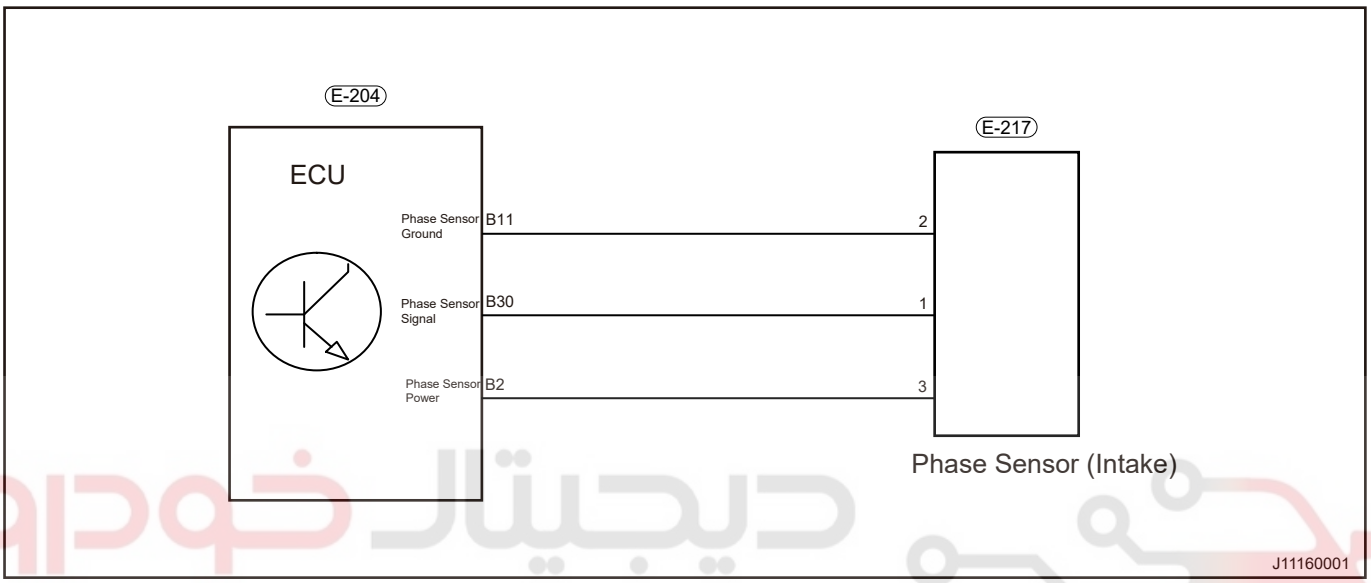
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Exhaust Camshaft Phase Signal Circuit Voltage Low/High

DTC	**P034200**	**Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor**
DTC	**P034300**	**Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor**

Description
Control Schematic Diagram



DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check intake camshaft phaser sensor connector**

(a) Disconnect the negative battery.
(b) Check if intake camshaft phaser sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

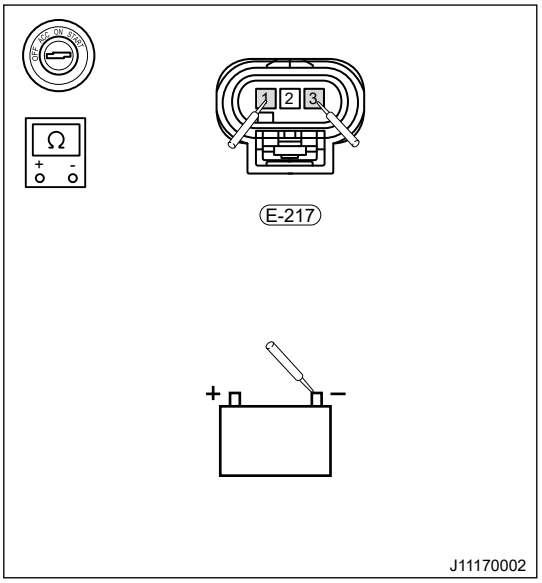
OK

2	**Check for short circuit to ground / power supply in intake camshaft phaser sensor circuit**

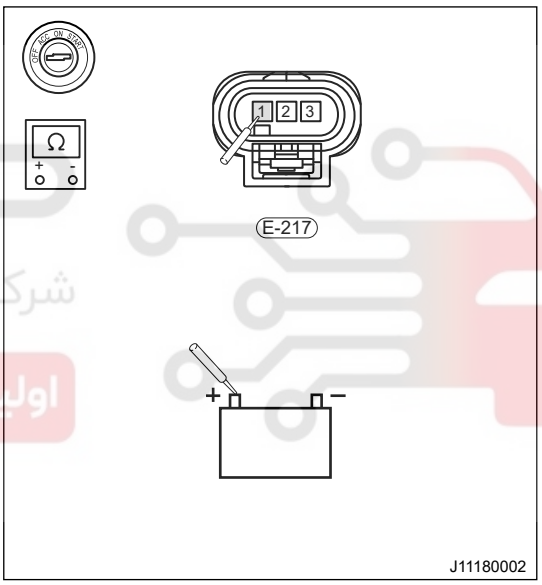
(a) Disconnect the intake camshaft phaser sensor connector.

(b) Disconnect the ECM connector (E-204).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of intake camshaft phaser sensor E-217 (1, 3) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure intake camshaft phaser sensor E-217 (1) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair wire harness.**

OK

3	**Check intake camshaft phaser sensor circuit**

(a) Connect the intake camshaft phaser sensor connector.

(b) Start the engine.

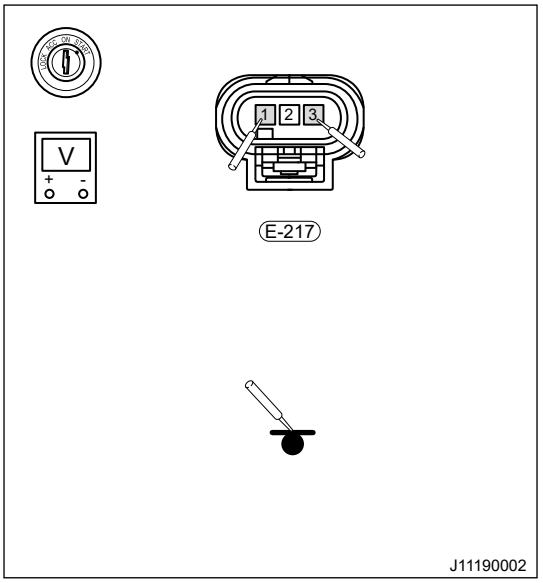
(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of intake camshaft phaser sensor E-217 (1, 3) with red probe respectively.

Power supply: 12V

Ground: < 0.2 V

(d) Using the LED test light, connect clip to battery negative terminal, measure intake camshaft phaser sensor E-217 (1) with another end.

Under normal conditions, test light should flash.



NG → **Check wire harness or replace intake camshaft phaser sensor assembly.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

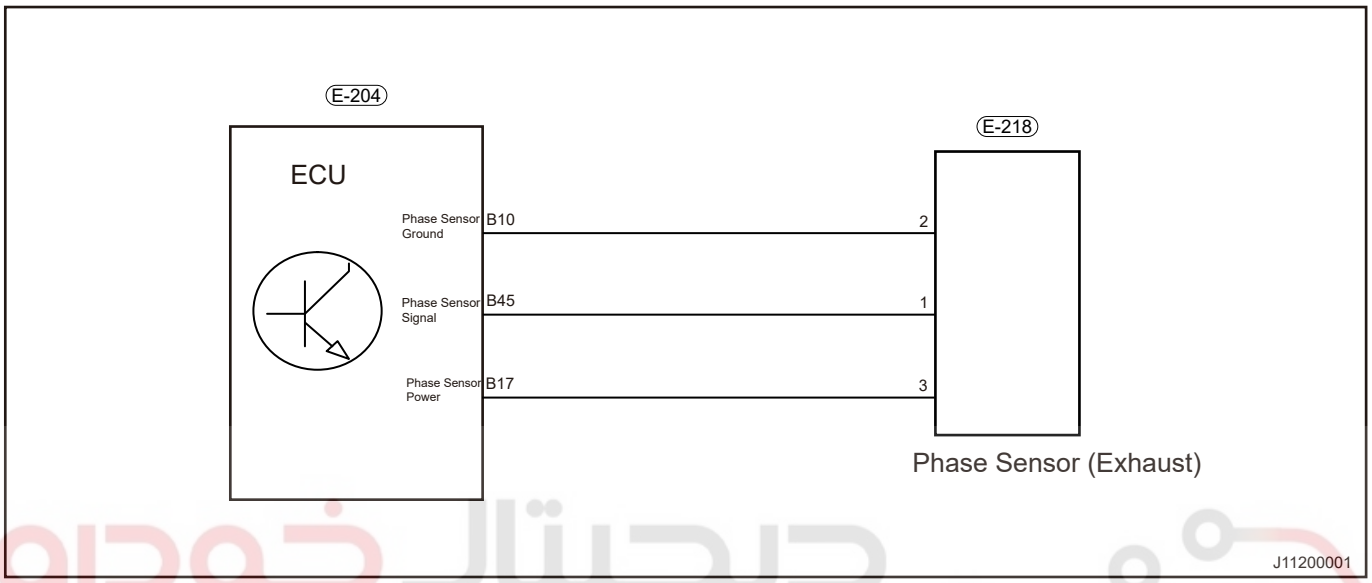
OK → **Conduct test and confirm malfunction has been repaired**

Exhaust Camshaft Phaser Signal Circuit Voltage Low/High

DTC	**P036700**	**Camshaft Position Sensor “B” Circuit Low (Bank1)**
DTC	**P036800**	**Camshaft Position Sensor "B" Circuit High (Bank1)**

Description

Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check exhaust camshaft phaser sensor connector**

(a) Disconnect the negative battery.

(b) Check if exhaust camshaft phaser sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

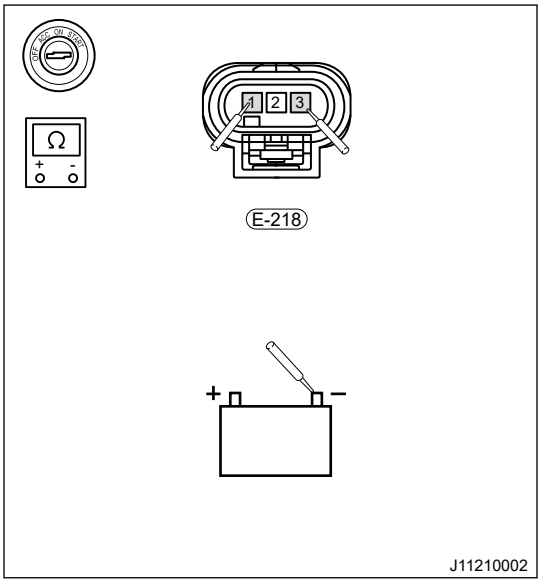
OK

2	**Check for short circuit to ground / power supply in exhaust camshaft phaser sensor circuit**

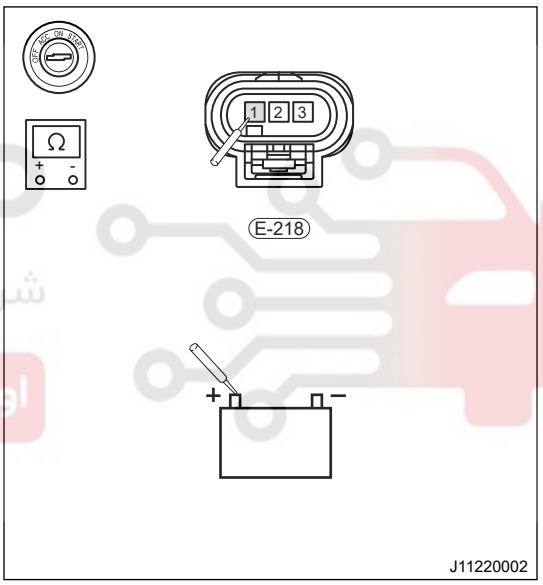
(a) Disconnect the exhaust camshaft phaser sensor connector.

(b) Disconnect the ECM connector (E-204).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of exhaust camshaft phaser sensor E-218 (1, 3) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure exhaust camshaft phaser sensor E-218 (1) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair wire harness circuit.**

OK

3	**Check exhaust camshaft phaser sensor circuit**

(a) Connect the exhaust camshaft phaser sensor connector.

(b) Start the engine.

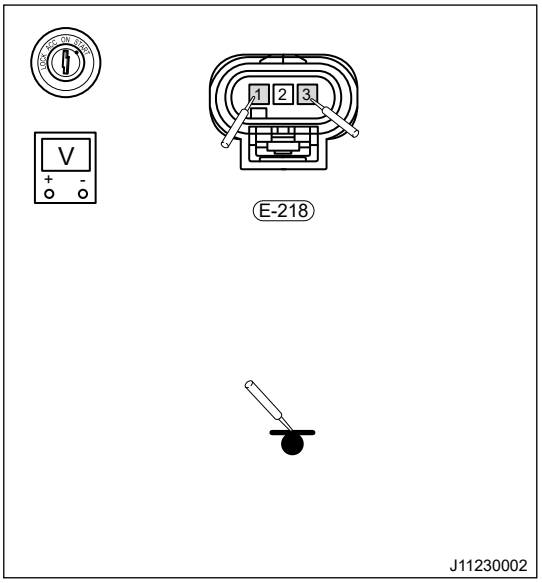
(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of exhaust camshaft phaser sensor E-218 (1, 3) with red probe respectively.

Power supply: 12V

Ground: < 0.2 V

(d) Using the LED test light, connect clip to battery negative terminal, measure exhaust camshaft phaser sensor E-218 (1) with another end.

Under normal conditions, test light should flash.



NG → **Check wire harness or replace exhaust camshaft phaser sensor assembly.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

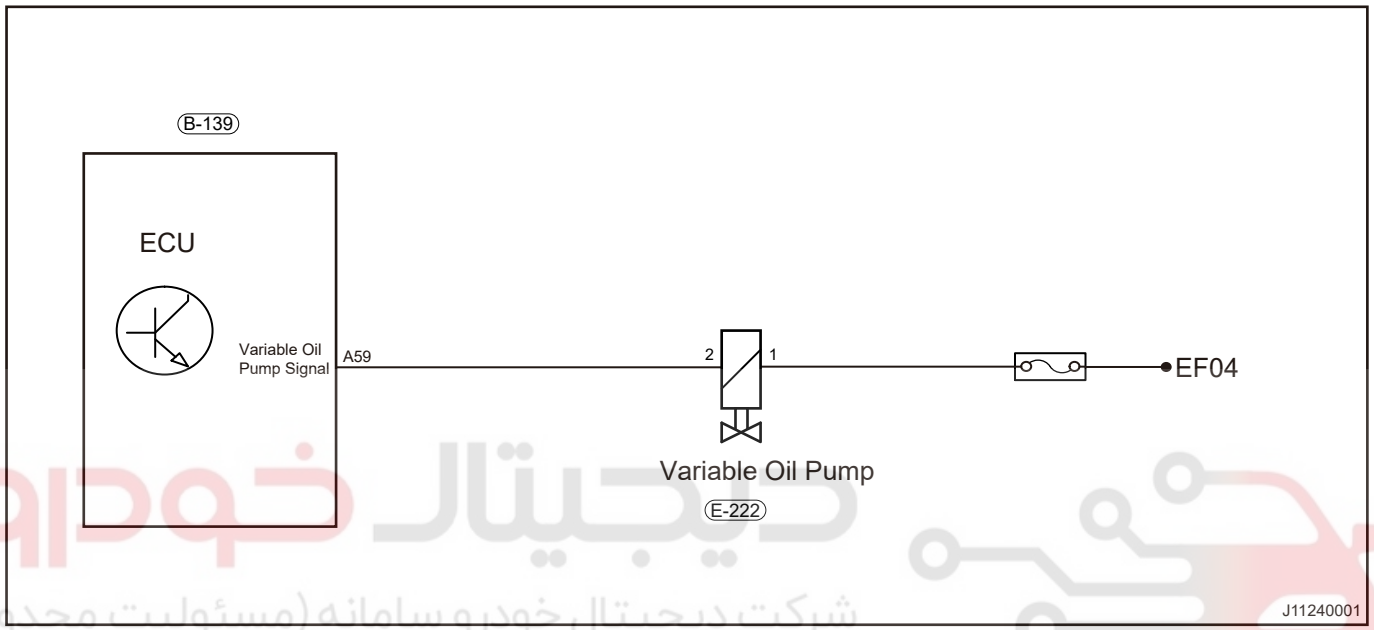
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Secondary Oil Pump Drive Circuit Open/Short to Ground/Power Supply

DTC	**P06DA13**	**Secondary Oil Pump Drive Circuit Open**
DTC	**P06DB11**	**Secondary Oil Pump Drive Circuit Short to Ground**
DTC	**P06DC12**	**Secondary Oil Pump Drive Circuit Short to Power Supply**

Description
Control Schematic Diagram



DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check variable oil pump connector**

(a) Disconnect the negative battery.
(b) Check if variable oil pump connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK →

2	**Check variable oil pump power supply fuse**

(a) Check if fuse EF04 (15A) of engine compartment fuse and relay box is damaged.

NG → **Check and repair short circuit malfunction of circuit.**

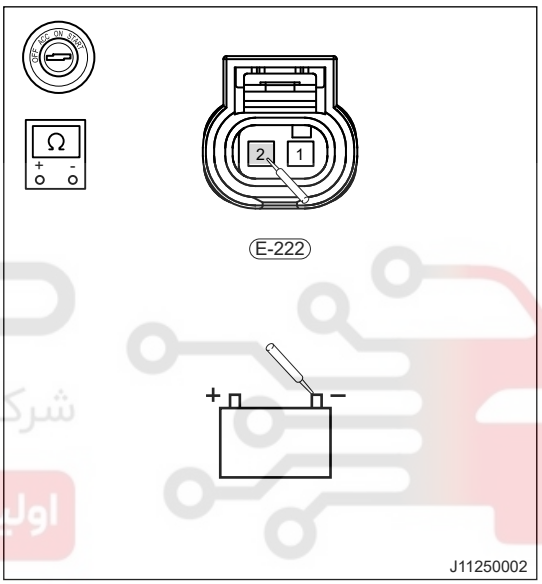
OK

3	**Check for short circuit to ground / power supply in variable oil pump circuit**

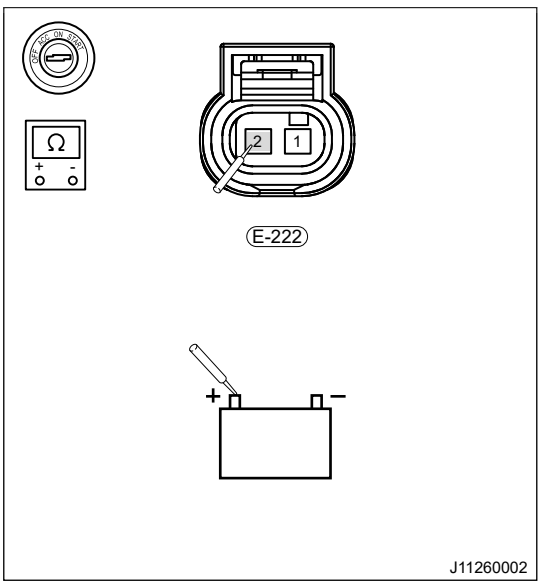
(a) Disconnect the variable oil pump connector.

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of variable oil pump E-222 (2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure variable oil pump E-222 (2) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair control circuit.**

OK

4	**Check if circuits of variable oil pump themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of variable oil pump (1, 2) with red and black probes respectively; Check if they are shorted to each other.

NG → **Replace variable oil pump assembly.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Catalyst System Efficiency Below Threshold Bank 1

DTC	**P042000**	**Catalyst System Efficiency Below Threshold Bank 1**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check pre-catalytic converter**

(a) Check pre-catalytic converter for mechanical damage.
(b) Check pre-catalytic converter for lead intoxication.

NG → **Replace pre-catalytic converter assembly.**

OK

2	**Reconfirm DTCs**

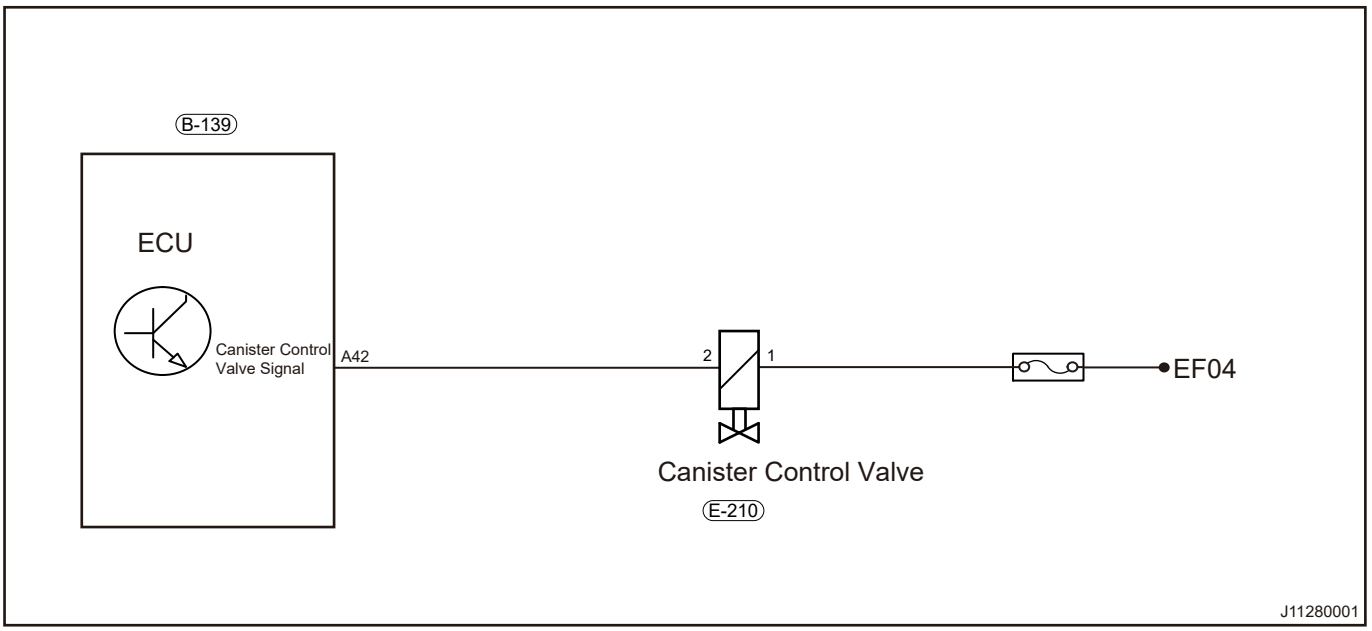
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Canister Control Valve Control Circuit Open/Low/High

DTC	**P044413**	**Evaporative Emission System Purge Control Valve Circuit Open**
DTC	**P045811**	**Evaporative Emission System Purge Control Valve Circuit Low**
DTC	**P045912**	**Evaporative Emission System Purge Control Valve Circuit High**

Description
Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check canister solenoid valve connector**

(a) Disconnect the negative battery.

(b) Check if canister solenoid valve connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check canister solenoid valve power supply fuse**

(a) Check if fuse EF04 (15A) of engine compartment fuse and relay box is damaged.

NG → **Check and repair short circuit malfunction of circuit.**

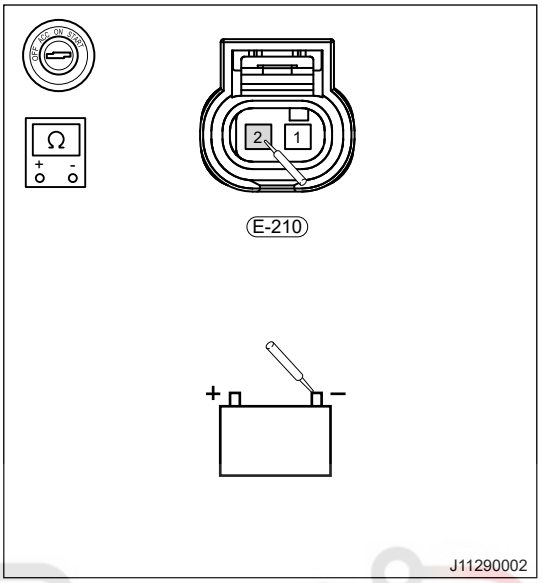
OK

3	Check for short circuit to ground / power supply in canister solenoid valve circuit

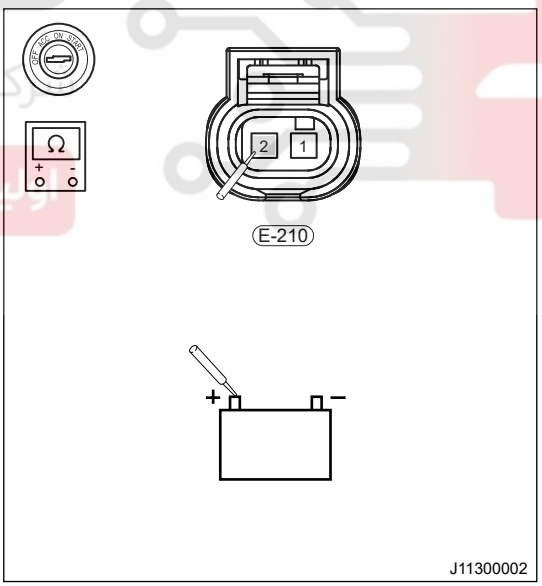
(a) Disconnect the variable oil pump connector.

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of canister solenoid valve E-210 (2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure canister solenoid valve E-210 (2) with red probe respectively. Check if circuit is short to power supply.

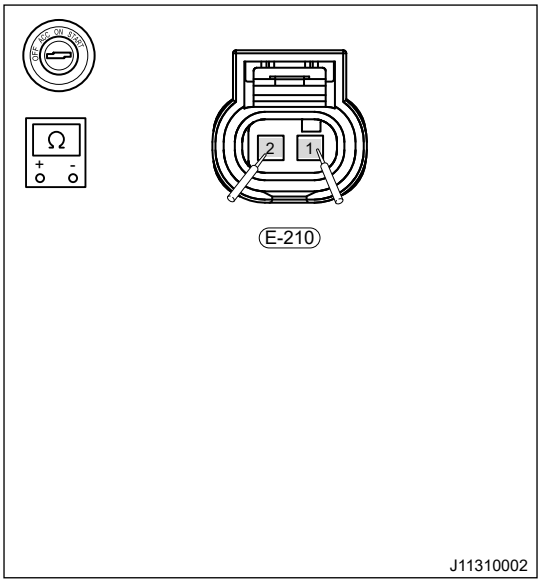


NG → **Check and repair control circuit.**

OK

4	Check if circuits of canister solenoid valve themselves are shorted to each other

(a) Using ohm band of multimeter, measure resistances of canister solenoid valve E-210 (1, 2) with red and black probes respectively; Check if they are shorted to each other.



NG → **Replace canister solenoid valve assembly.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Idling Too High/Too Low

DTC	**P050600**	**Idle Control System RPM Lower Than Expected**
DTC	**P050A21**	**Cold Start Idle Control System Performance**
DTC	**P050700**	**Idle Control System RPM Higher than Expected**
DTC	**P050500**	**Unreasonable Engine Idling-large Fluctuation**
DTC	**P050A22**	**Cold Start Idle Control System Performance**
DTC	**P050D00**	**Cold Start Rough Idle**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check electronic throttle connector**

(a) Disconnect the negative battery.
(b) Check if electronic throttle connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check electronic throttle condition**

(a) Check if electronic throttle is stuck.
(b) Check if electronic throttle is dirty.

NG → **Clean or replace electronic throttle.**

OK

3	**Check intake manifold for air leakage**

(a) Check intake manifold or connecting lines for air leakage.

NG → **Replace parts related to air leakage.**

OK

4	**Check if fuel pressure too low**

(a) Check if low/high pressure fuel pressure is too low.

NG → **Replace parts that cause low fuel pressure**

OK

5	**Check injector for blockage**

(a) Check fuel injector for blockage or leakage.

NG → **Clean or replace fuel injector assembly.**

OK

6	**Check if exhaust back pressure is too high**

(a) Check pre-catalytic converter for blockage.
(b) Check GPF converter for blockage.

NG → **Replace blocked parts or perform regeneration function.**

OK

7	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Battery Voltage Low Malfunction

DTC	P056200	System Voltage Low

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	Check battery voltage

(a) Check that battery voltage should not be lower than 12 V.

NG → **It is necessary to recharge or replace the battery assembly.**

OK ↓

2	Check generating capacity of generator

(a) Check if generating capacity of generator is normal.

Generator output voltage: 13.5 V - 15 V

NG → **Replace generator assembly.**

OK ↓

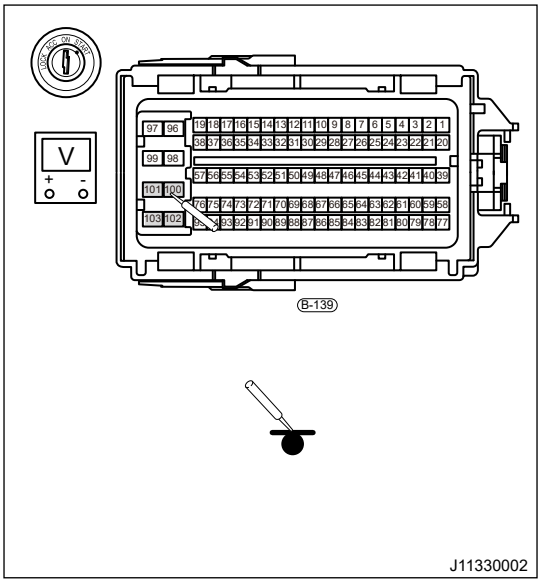
3	Check ECM power supply circuit

(a) Disconnect the ECM connector (B-139).

(b) Short the main relay switch side with wire harness.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of ECM B-139 (100, 101, 102, 103) with red probe respectively.

(d) Or use test light to measure ECM B-139 (100, 101, 102, 103); Test light should be bright.



(e) Connect the ECM connector (B-139).

(f) Using voltage band of multimeter, connect black probe to engine compartment fuse and relay box B-019 (1), measure ECM B-139 (100, 101, 102, 103) with red probe respectively. Check if circuit voltage drop value is too large.

NG → **Check and repair control circuit.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

System Battery Voltage High

DTC	P056300	System Battery Voltage High

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	Check generating capacity of generator

(a) Check if generating capacity of generator is normal.
Generator output voltage: 13.5 V - 15 V

NG → **Replace generator assembly.**

OK

2	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Starter Relay Control Terminal Circuit Low/High

DTC	**P061513**	**Starter Relay Control Circuit Error**
DTC	**P061611**	**Starter Relay "A" High Circuit Low**
DTC	**P061712**	**Starter Relay "A" Circuit High**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check starter relay coil terminal power supply fuse**

(a) Check if fuse EF21 of engine compartment fuse and relay box is blown.

NG → **Check and repair short circuit malfunction of circuit.**

OK

2	**Check starter relay**

(a) Replace starter relay.

NG → **Replace starter relay.**

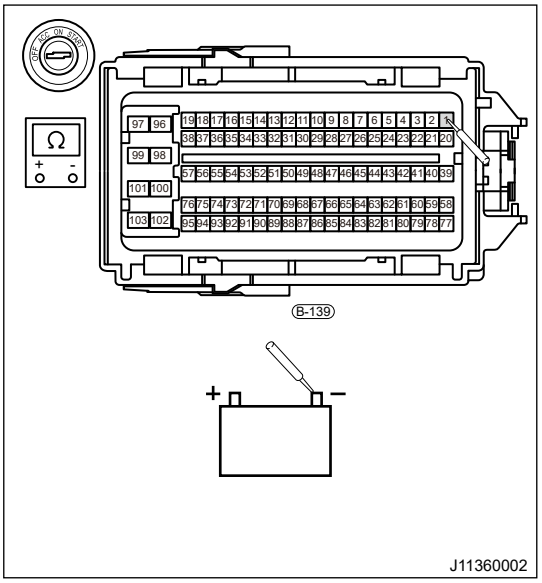
OK

3	**Check for short circuit to ground / power supply in ECM control circuit**

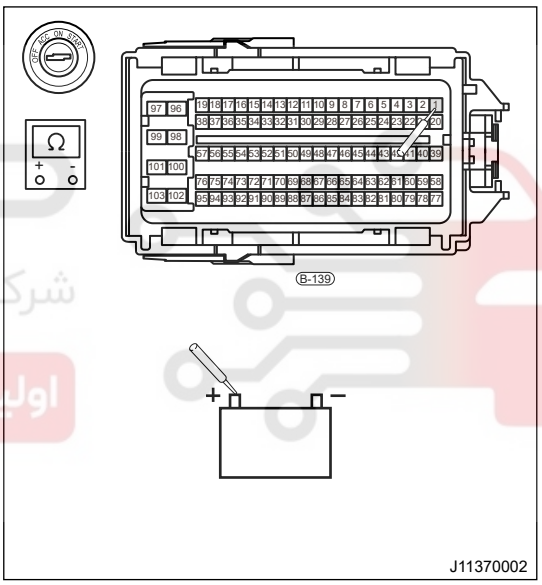
(a) Disconnect the engine compartment fuse and relay box connector (B-020).

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECU B-139 (1) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure ECM B-139 (1) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair control circuit.**

OK →

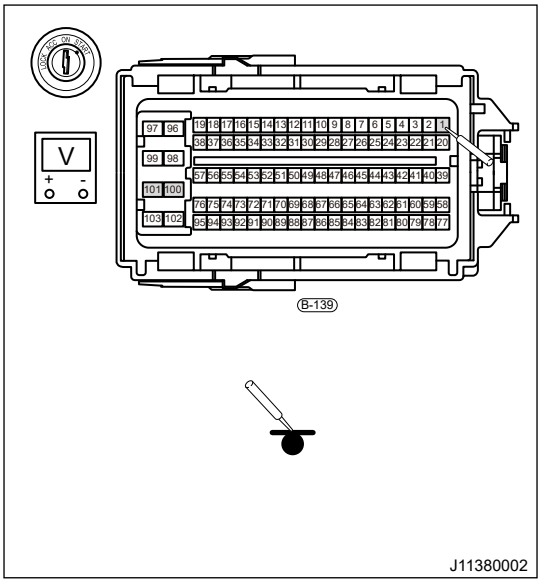
4	**Check ECM control circuit**

(a) Connect the engine compartment fuse and relay box connector (B-020).

(b) Short the main relay switch side with wire harness.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of ECM B-139 (1) with red probe respectively.

(d) Or use test light to measure ECM B-139 (1); Test light should be bright.



NG → **Check and repair control circuit.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Brake Chamber Vacuum Pressure Sensor Voltage High/Low

DTC	**P055800**	**Brake Booster Pressure Sensor Circuit High**
DTC	**P055700**	**Brake Booster Pressure Sensor Circuit Low**
DTC	**P145000**	**Brake Booster Pressure Sensor Circuit Range/Performance (High)**
DTC	**P145100**	**Brake Booster Pressure Sensor Circuit Range/Performance (Low)**

Description
Control Schematic Diagram

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check vacuum pressure sensor connector**

(a) Disconnect the negative battery.
(b) Check if vacuum pressure sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	Check brake vacuum booster system for damage or air leakage

(a) Check brake vacuum booster system each line for damage, or connecting pipe port for air leakage, vacuum pump for abnormal operation, etc.

NG → **Repair or replace the damaged parts related to brake booster system.**

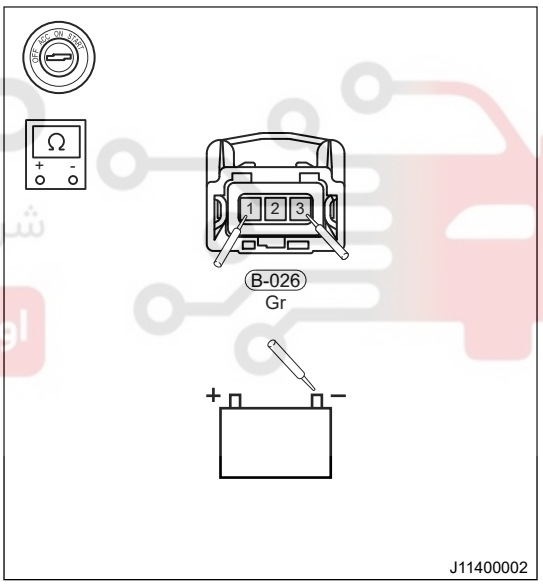
OK

3	Check for short circuit to ground / power supply in vacuum pressure sensor

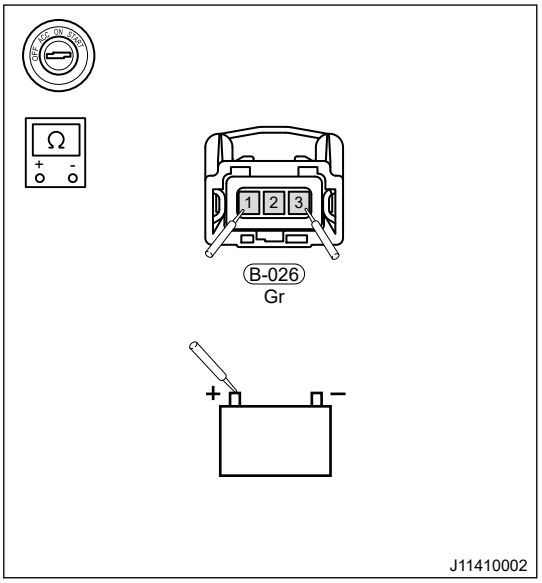
(a) Disconnect the vacuum pressure sensor connector.

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of vacuum pressure sensor B-030 (1, 2, 3) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of vacuum pressure sensor B-030 (1, 2, 3) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair wire harness.**

OK

4	**Check vacuum pressure sensor voltage signal**

(a) Connect vacuum pressure sensor and ECM connectors.

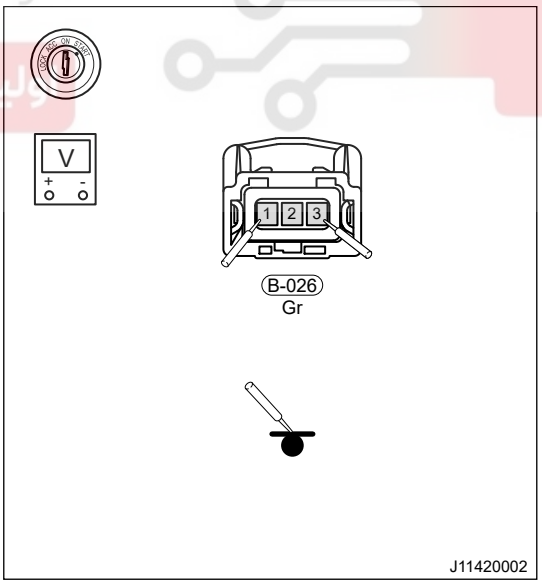
(b) Ignition switch ON.

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure voltage of vacuum pressure sensor B-030 (1, 2, 3) with red probe respectively.

Power supply: 5 V

Ground: < 0.2 V

Depress brake pedal consecutively; Signal voltage should vary in accordance with pressure.



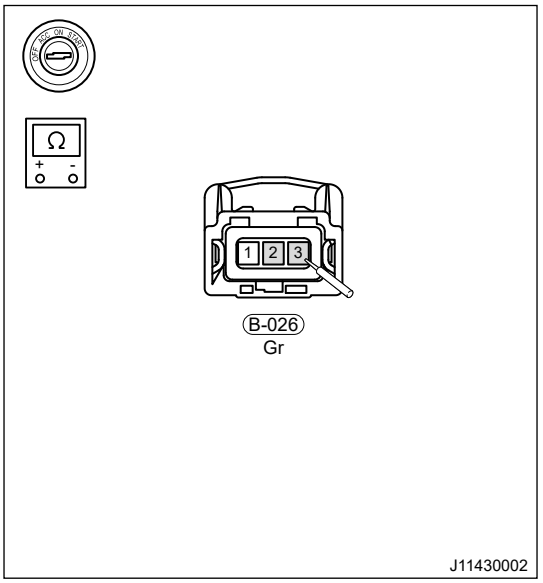
NG → **Check and repair wire harness, or replace vacuum pressure sensor.**

OK

5	Check vacuum pressure sensor itself

(a) Using ohm band of multimeter, measure resistance between vacuum pressure sensor B-030 (1, 3), and resistance between (1, 2) with red and black probes respectively. Check if internal circuits are shorted to each other.

Resistance at ambient temperature: 1 KΩ ~ 2 KΩ



NG → **Replace vacuum pressure sensor assembly.**

OK

6	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

7	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

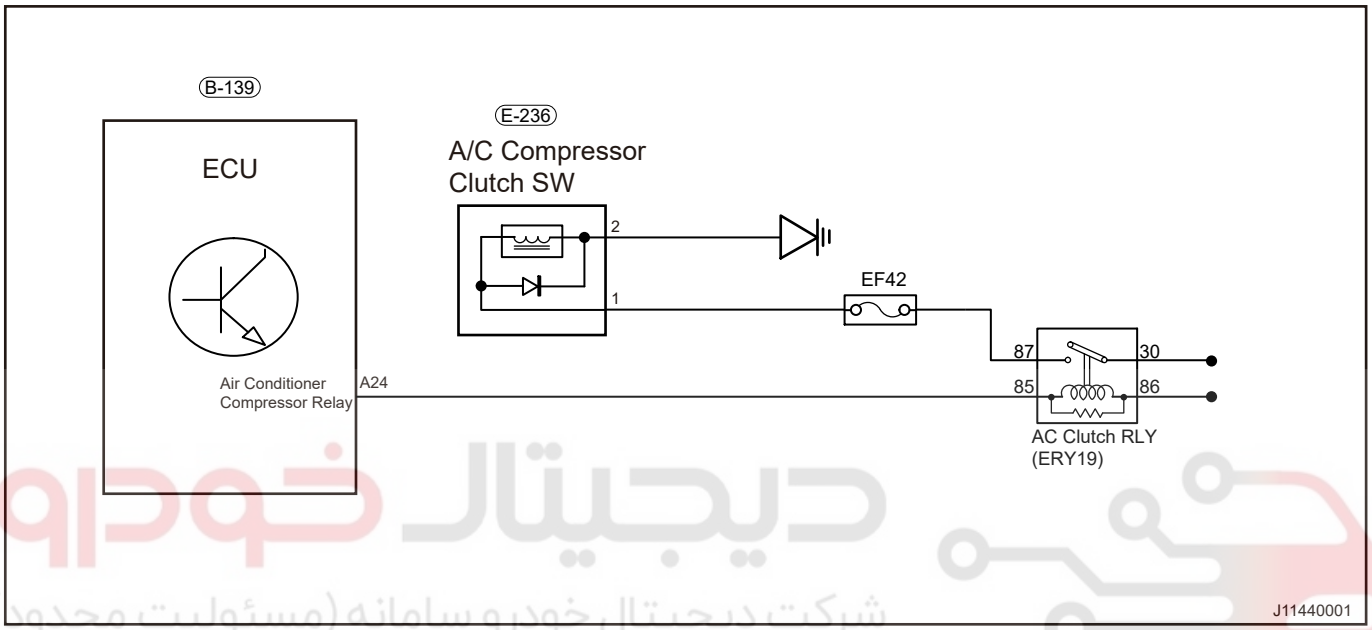
OK → **Conduct test and confirm malfunction has been repaired**

A/C Compressor Circuit Voltage Too Low/Too High

DTC	**P064513**	**A/C Clutch Relay Circuit Open**
DTC	**P064611**	**A/C Compressor Relay Circuit Low**
DTC	**P064712**	**A/C Compressor Relay Control Circuit High**

Description

Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check A/C compressor relay coil terminal power supply fuse**

(a) Check if fuse EF42 of engine compartment fuse and relay box is blown.

NG → **Check and repair short circuit malfunction of circuit.**

OK ↓

2	**Check A/C compressor relay**

(a) Replace A/C compressor relay.

NG → **Replace A/C compressor relay**

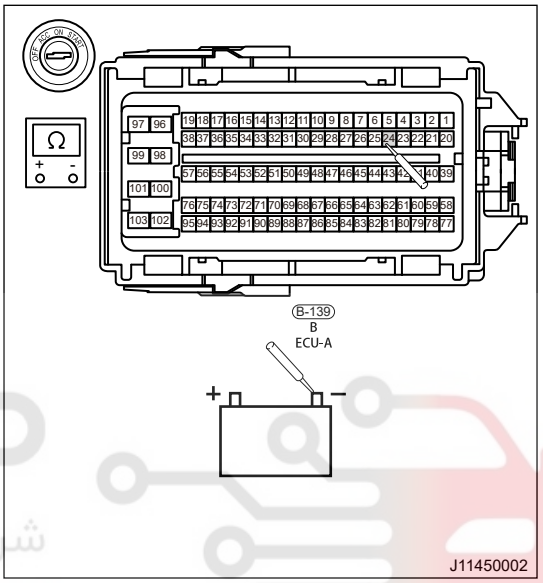
OK →

3	**Check for short circuit to ground / power supply in ECM control circuit**

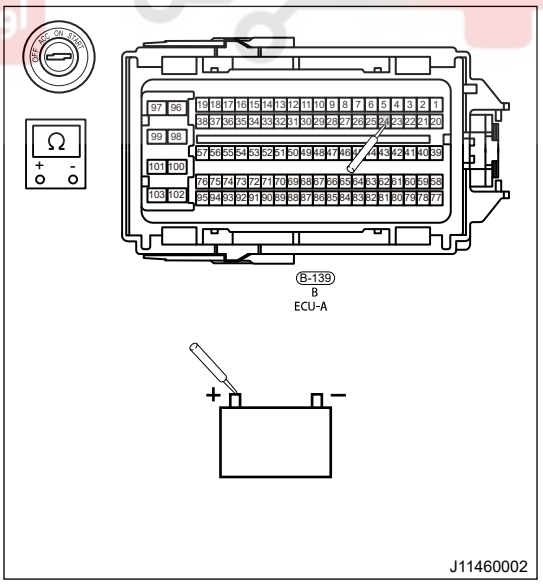
(a) Unplug the A/C compressor relay.

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECU B-139 (24) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure ECM B-139 (24) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair control circuit.**

OK →

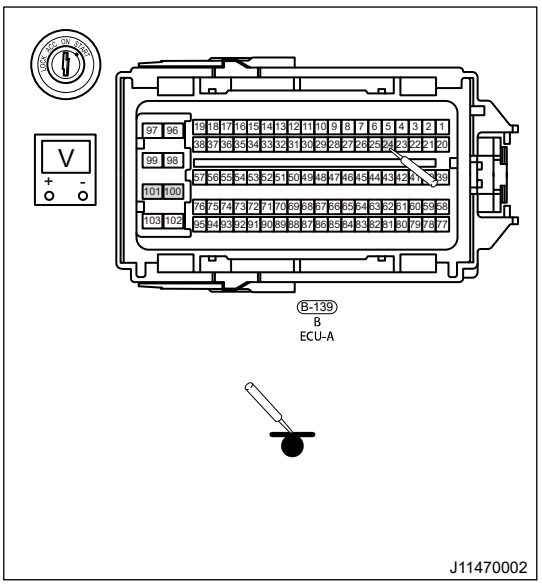
4	Check ECM control circuit

(a) Connect A/C compressor relay.

(b) Short the main relay switch side with wire harness.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of ECM B-139 (24) with red probe respectively.

(d) Or use test light to measure ECM B-139 (24); Test light should be bright.



NG → **Check and repair control circuit.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

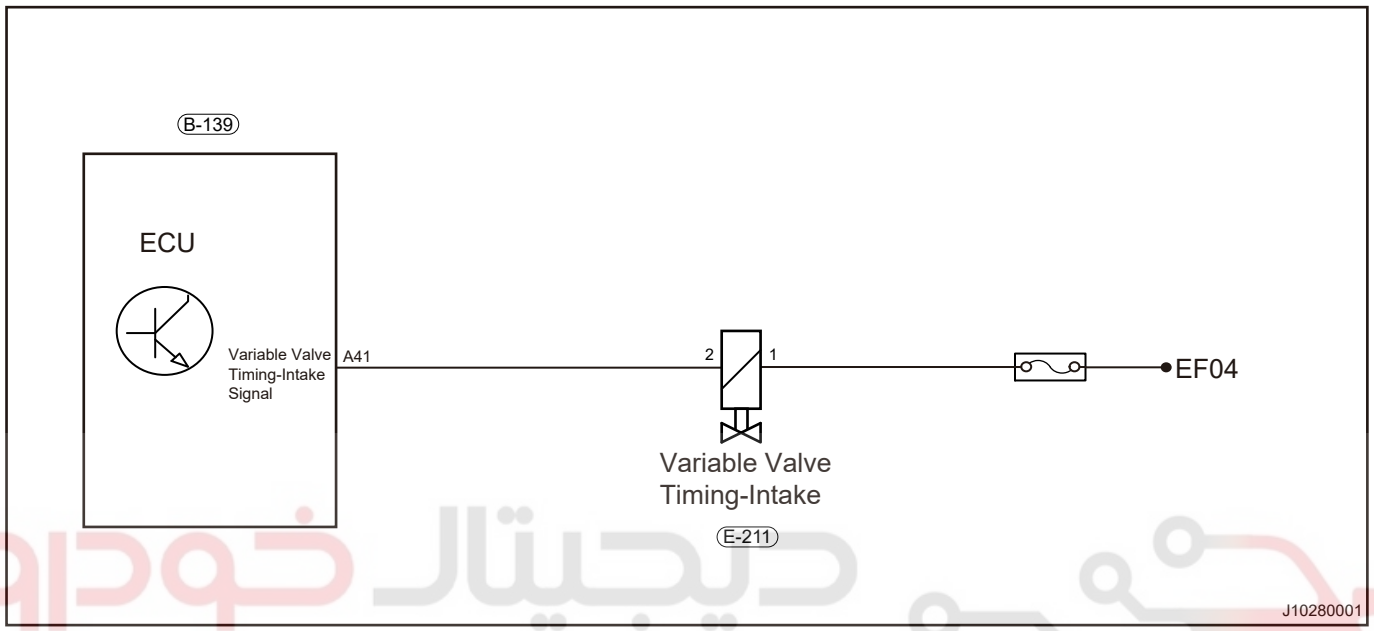
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Intake VVT Control Circuit Voltage Too Low/Too High

DTC	**P208800**	**“A" Camshaft Position Actuator Control Circuit Low Bank 1**
DTC	**P208900**	**“A" Camshaft Position Actuator Control Circuit High Bank 1**

Description
Control Schematic Diagram



DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check intake phaser solenoid valve connector**

(a) Disconnect the negative battery.
(b) Check if intake phaser solenoid valve connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check intake phaser solenoid valve power supply fuse**

(a) Check if fuse EF04 of engine compartment fuse and relay box is blown.

NG → **Check and repair short circuit malfunction of circuit.**

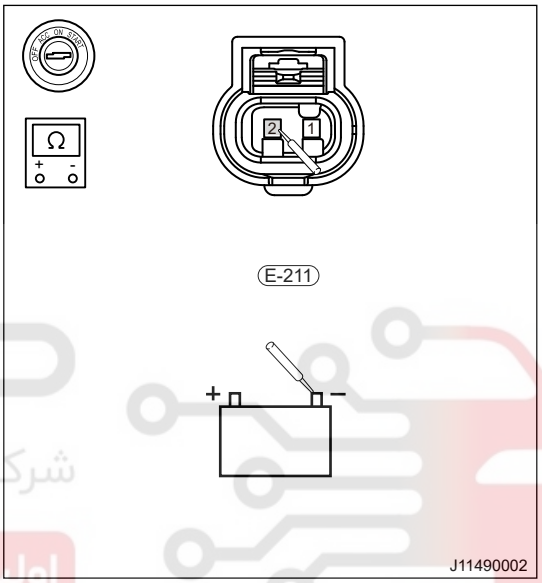
OK

3	**Check for short circuit to ground / power supply in intake phaser solenoid valve circuit**

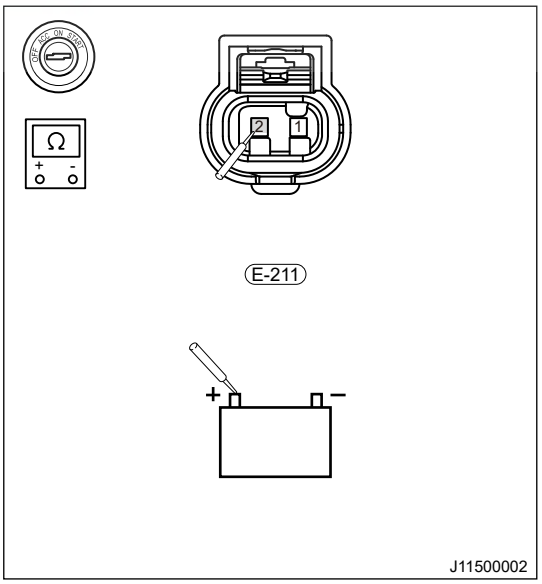
(a) Disconnect the intake phaser solenoid valve connector.

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of intake phaser solenoid valve E-211 (2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistance of intake phaser solenoid valve E-211 (2) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair control circuit.**

OK

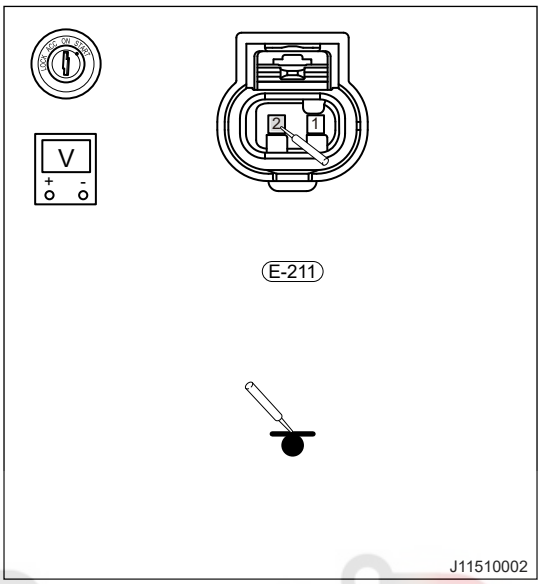
4	Check intake phaser solenoid valve control circuit

(a) Connect the intake phaser solenoid valve connector.

(b) Turn the ignition switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of intake phaser solenoid valve E-211 (2) with red probe.

(d) Or use test light to measure intake phaser solenoid valve E-211 (2); Test light should be bright.

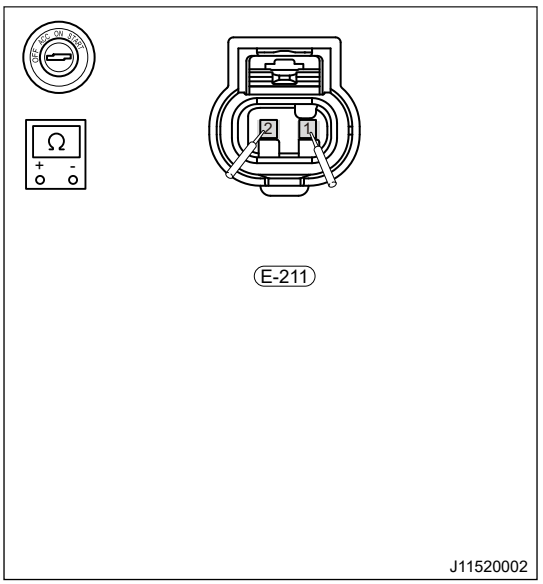


NG → **Check and repair control circuit.**

OK

5	Check if circuits of intake phaser solenoid valve themselves are shorted to each other

(a) Using ohm band of multimeter, measure resistances of intake phaser solenoid valve E-211 (1, 2) with red and black probes respectively; Check if they are shorted to each other.



NG → **Replace intake phaser solenoid valve assembly.**

OK

6	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

7	Reconfirm DTCs

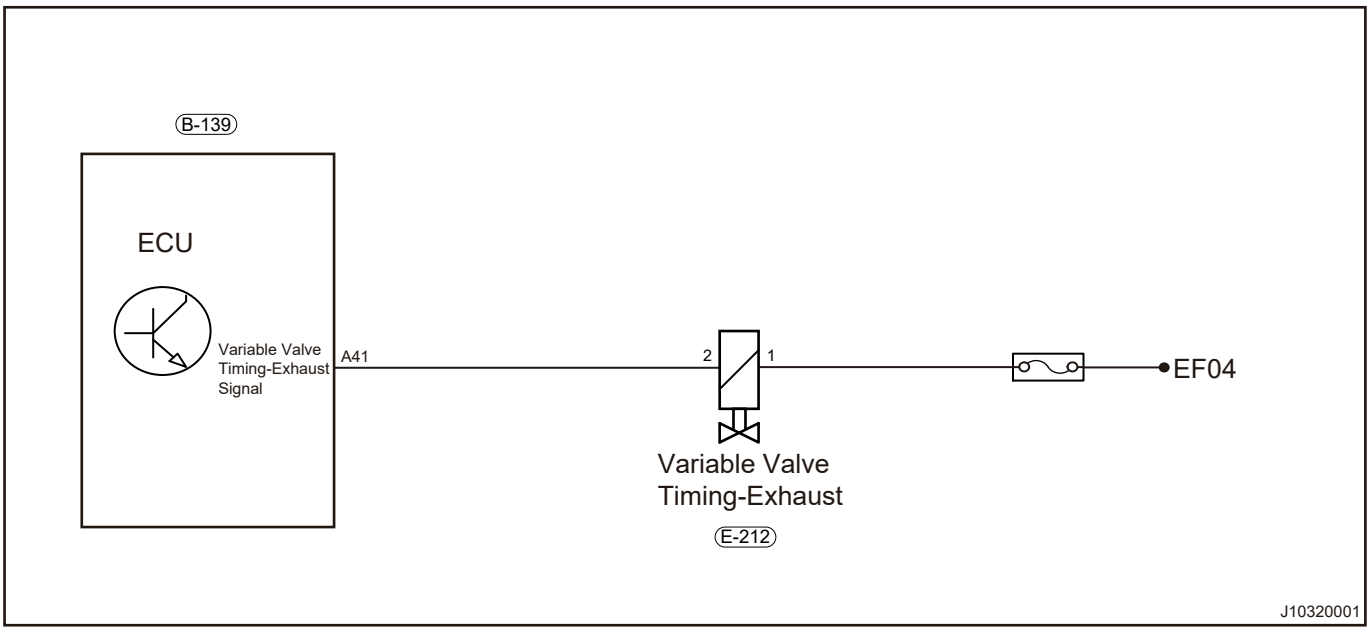
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Exhaust VVT Control Circuit Voltage Too Low/Too High

DTC	**P209000**	**“B" Camshaft Position Actuator Control Circuit Low Bank 1**
DTC	**P209100**	**“B" Camshaft Position Actuator Control Circuit High Bank 1**

Description
Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check exhaust phaser solenoid valve connector**

(a) Disconnect the negative battery.

(b) Check if exhaust phaser solenoid valve connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check exhaust phaser solenoid valve power supply fuse**

(a) Check if fuse EF04 15A of engine compartment fuse and relay box is blown.

NG → **Check and repair short circuit malfunction of circuit.**

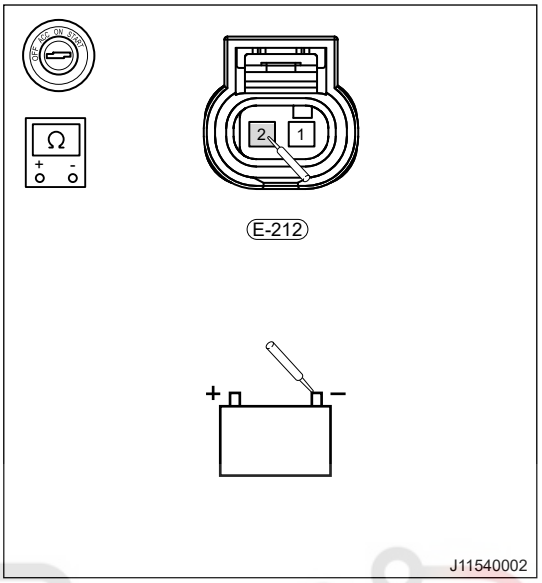
OK

3	Check for short circuit to ground / power supply in exhaust phaser solenoid valve circuit

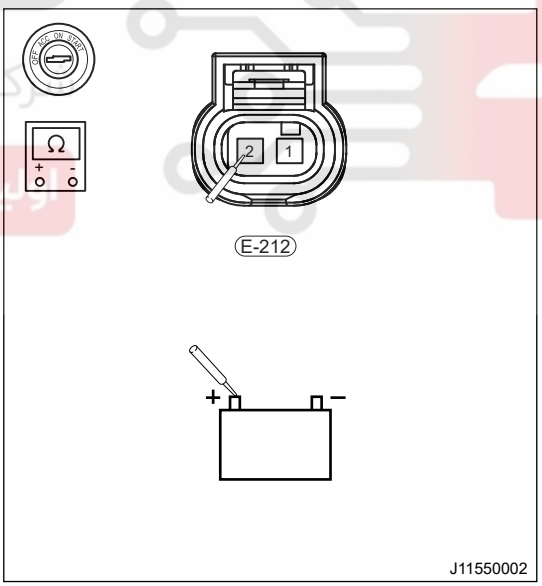
(a) Disconnect the exhaust phaser solenoid valve connector.

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of exhaust phaser solenoid valve E-212 (2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistance of exhaust phaser solenoid valve E-212 (2) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair control circuit.**

OK

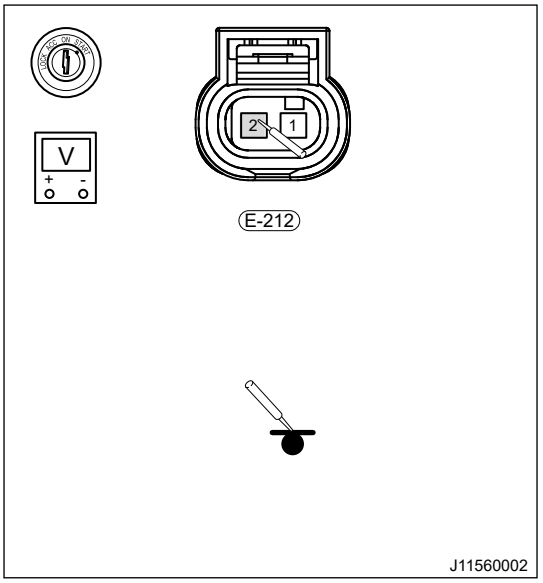
4	Check exhaust phaser solenoid valve control circuit

(a) Connect exhaust phaser solenoid valve connector.

(b) Turn the ignition switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of exhaust phaser solenoid valve E-212 (2) with red probe.

(d) Or use test light to measure exhaust phaser solenoid valve E-212 (2); Test light should be bright.



NG → **Check and repair control circuit.**

OK

5	**Check if circuits of exhaust phaser solenoid valve themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of exhaust phaser solenoid valve (1, 2) with red and black probes respectively; Check if they are shorted to each other.

NG → **Replace exhaust phaser solenoid valve assembly.**

OK

6	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

7	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	**Conduct test and confirm malfunction has been repaired**

Air-fuel Ratio Closed Loop Control Correction

DTC	**P217700**	**System Too Lean Off Idle Bank 1**
DTC	**P217800**	**System Too Rich Off Idle Bank 1**
DTC	**P218700**	**System Too Lean at Idle Bank 1**
DTC	**P218800**	**System Too Lean at Idle Bank 1**
DTC	**P219500**	**O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1**
DTC	**P219600**	**O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1**
DTC	**P241400**	**O2 Sensor Exhaust Sample Error Bank 1 Sensor 1**
DTC	**P209700**	**Post Catalyst Fuel Trim System Too Rich Bank 1**
DTC	**P209600**	**Post Catalyst Fuel Trim System Too Lean Bank 1**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check upstream oxygen sensor**

(a) Depress the accelerator pedal sharply under idling condition, oxygen pump control voltage of oxygen sensor should be lower than 2.5 V at this time.
(b) Oxygen pump control voltage of oxygen sensor should be higher than 2.5 V when releasing the accelerator pedal quickly.

NG	**Replace upstream oxygen sensor assembly.**

OK

2	Check intake pressure/temperature sensor

(a) Check intake pressure/temperature sensor (pressure signal).

Under idling state: Approximately 1 V

When the vehicle accelerates rapidly, voltage can instantly reach 4 V, and then drop to approximately 1.7 V

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

OK

3	Check fuel system

(a) Check if low/high pressure fuel pressure is within the proper range.
(b) Check if fuel injector is dirty.

NG → **Replace fuel system damaged parts or clean fuel injector.**

OK

4	Check intake system

(a) Check intake manifold, etc. to determine each line for air leakage.

NG → **Replace the leaked or damaged parts.**

OK

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Downstream Oxygen Sensor Deteriorated

DTC	**P227000**	**O2 Sensor Signal Biased&Stuck Lean Bank 1 Sensor 2**
DTC	**P227100**	**O2 Sensor Signal Biased&Stuck Rich Bank 1 Sensor 2**
DTC	**P013A00**	**O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check downstream oxygen sensor**

(a) Check if downstream oxygen sensor heating resistance is normal.

Resistance at ambient temperature: 7 ~ 11 Ω

(b) Check if downstream oxygen sensor signal voltage is normal.

It is normal when signal voltage fluctuates slightly from 0.55 to 0.65 V

NG → **Replace downstream oxygen sensor assembly.**

OK

2	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	**Conduct test and confirm malfunction has been repaired**

Turbocharger Boost Pressure Too High

DTC	**P023400**	**Turbocharger Boost Pressure Too High**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check turbocharger relief valve**

(a) Check turbocharger relief valve connector for looseness or poor contact.
(b) Check if turbocharger relief valve stuck.

NG	**Replace turbocharger relief valve assembly.**

OK

2	**Check exhaust gas by-pass valve**

(a) Pull exhaust gas by-pass valve pulling rod with hand to check that it can move smoothly and there is no stuck.

NG	**Replace turbocharger assembly.**

OK

3	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	**Conduct test and confirm malfunction has been repaired**

Turbocharger Pressure Sensor Short to Ground/Power Supply

DTC	**P023700**	**Turbocharger/Supercharger Boost Sensor "A" Circuit Low**
DTC	**P023800**	**Turbocharger/Supercharger Boost Sensor "A" Circuit High**

Description
Control Schematic Diagram

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check boost pressure/temperature sensor connector**

(a) Disconnect the negative battery.
(b) Check if boost pressure/temperature sensor connector is loose, and contact between male and female terminals is in good condition.

NG	**Repair and adjust connector, or replace it.**

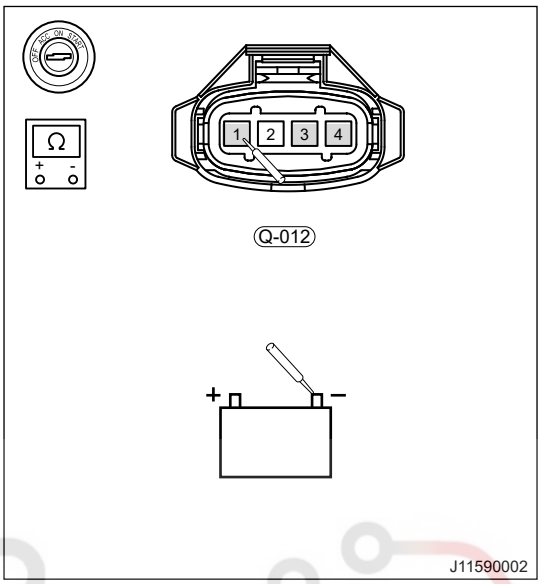
OK

2	**Check for short circuit to ground / power supply in boost pressure/temperature sensor circuit**

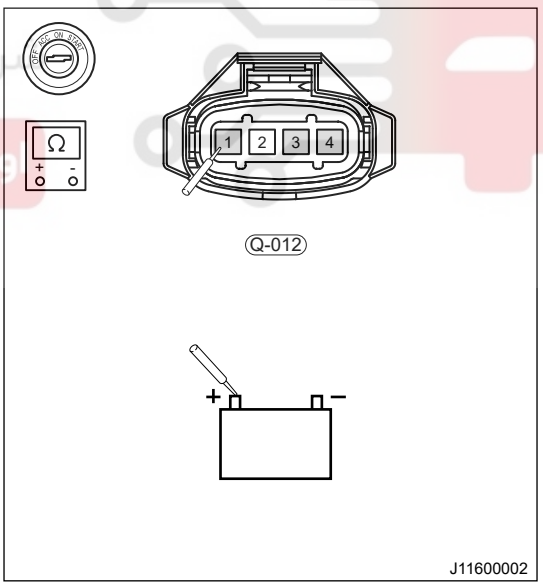
(a) Disconnect the boost pressure/temperature sensor connector.

(b) Disconnect the ECM connector (E-204).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of boost pressure/temperature sensor Q-012 (1, 3, 4) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of boost pressure/temperature sensor Q-012 (1, 3, 4) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair control circuit.**

OK

3	**Check boost pressure/temperature sensor control circuit**

(a) Connect boost pressure/temperature sensor connector.

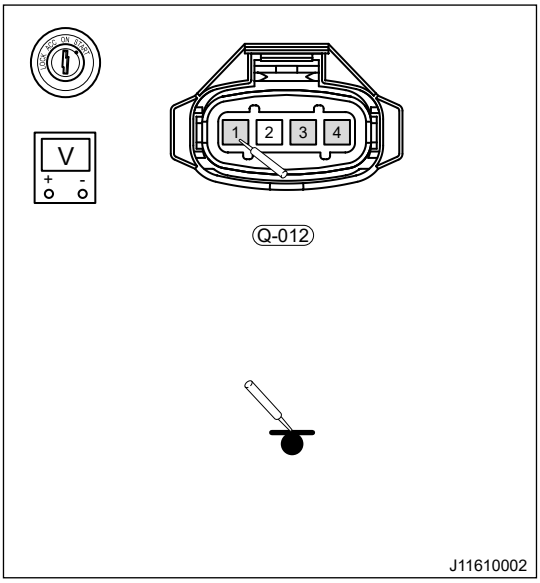
(b) Turn the ignition switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of boost pressure/temperature sensor Q-012 (1, 3, 4) with red probe respectively.

Power supply terminal: 5 V

Ground terminal: < 0.2 V

Signal voltage varies in accordance with turbocharger line pressure

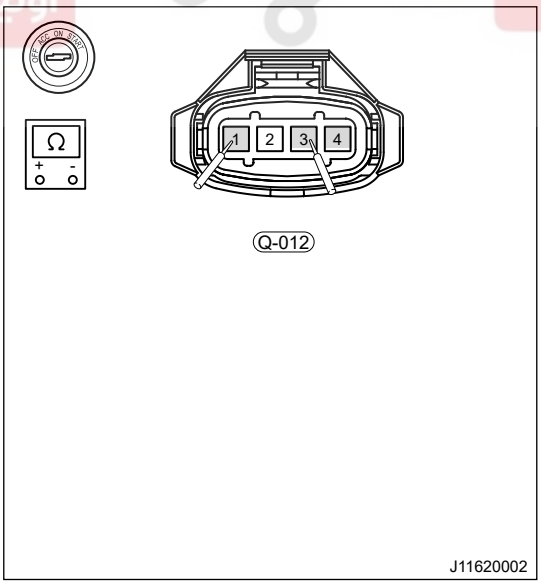


NG → **Check and repair control circuit, or replace boost pressure/temperature sensor.**

OK →

4	**Check if circuits of boost pressure/temperature sensor themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of boost pressure/temperature sensor Q-012 (1, 3, 4) with red and black probes respectively; Check if they are shorted to each other.



NG → **Replace boost pressure/temperature sensor assembly.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Booster Exhaust Gas Control Circuit Open, Voltage Too High or Too Low

DTC	**P024300**	**Booster Exhaust Gas Control Circuit Open**
DTC	**P024600**	**Booster Exhaust Gas Control Circuit Voltage Too High or Too Low**

DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check exhaust gas bypass actuator connector**

(a) Disconnect the negative battery.

(b) Check if exhaust gas bypass actuator connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

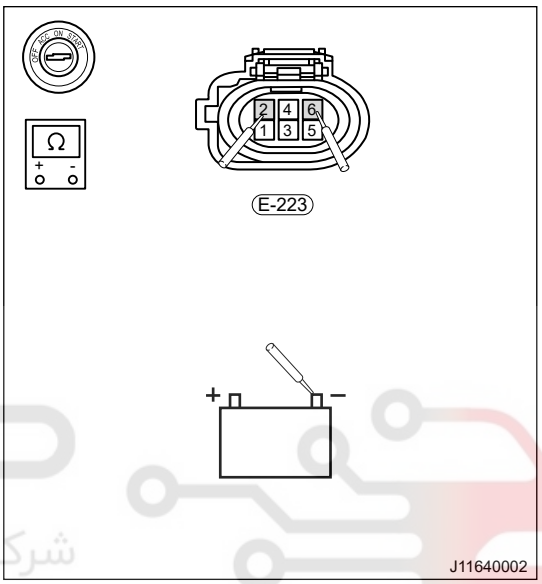
OK →

2	**Check whether the exhaust gas bypass actuator circuit is short to ground or power supply**

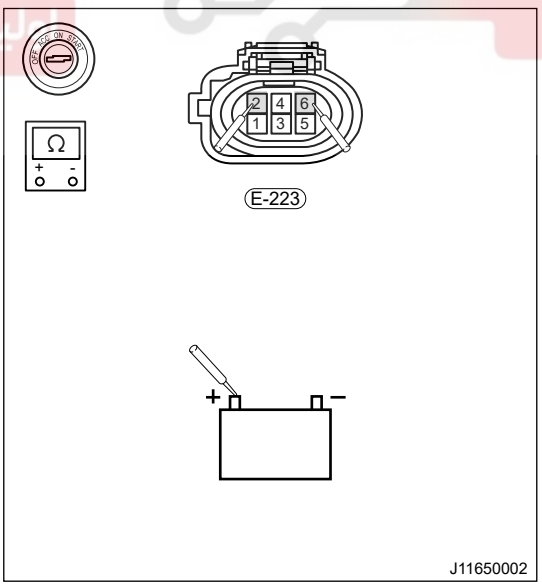
(a) Disconnect the exhaust gas bypass actuator connector.

(b) Disconnect the ECM connector (E-204).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of exhaust gas bypass actuator E-223 (2, 6) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of exhaust gas bypass actuator E-223 (2, 6) with red probe respectively. Check if circuit is short to power supply.

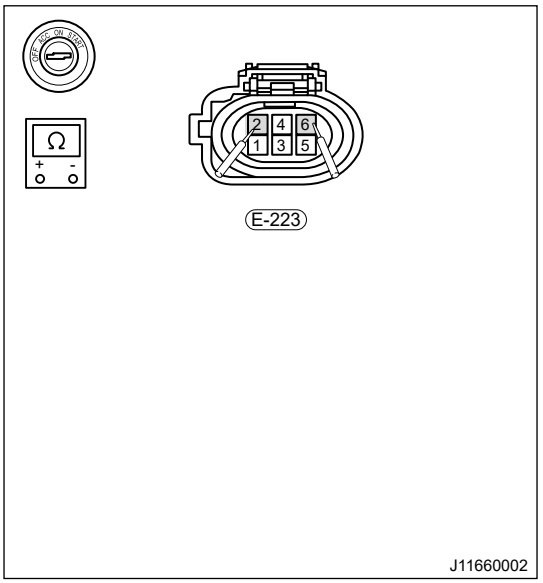


NG → **Check and repair control circuit.**

OK →

3	Check whether the exhaust gas bypass actuator is short to each other

(a) Using ohm band of multimeter, measure resistances of exhaust gas bypass actuator E-223 (2, 6) with red and black probes respectively; Check if they are shorted to each other.



NG → **Replace the exhaust gas bypass actuator assembly.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Turbocharger Boost Pressure Too Low

DTC	P029900	Turbocharger Boost Pressure Too Low

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	Check air filter

(a) Check if air filter is dirty, blocked, etc.

NG → **Replace the air filter assembly.**

OK ↓

2	Check each connecting line of turbocharger

(a) Check each connecting line of turbocharger for falling off, damage or air leakage, etc.

NG → **Replace the damaged line.**

OK ↓

3	Check exhaust gas by-pass valve

(a) Pull exhaust gas by-pass valve pulling rod with hand, there should be no stuck.

NG → **Replace turbocharger assembly.**

OK ↓

4	Check relief solenoid valve

(a) Check that relief solenoid valve connector is not loose or does not fall off.
(b) Check if relief solenoid valve is stuck at normally open position.

NG → **Replace relief solenoid valve assembly.**

OK

5	**Check turbocharger**

(a) Check operation parts such as turbine, impeller for damage or blade missing.

NG → **Replace turbocharger assembly.**

OK

6	**Check if exhaust back pressure is too high**

(a) Check pre-catalytic converter for blockage.
(b) Check GPF particulate filter for blockage.

NG → **Replace pre-catalytic converter assembly or perform GPF regeneration.**

OK

7	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Turbocharger/Supercharger Bypass Valve "A" - Mechanical

DTC	P226100	Turbocharger/Supercharger Bypass Valve "A" - Mechanical

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check relief solenoid valve**

(a) Check that relief solenoid valve connector is not loose or does not fall off.
(b) Check if relief solenoid valve is not stuck.

NG → **Replace relief solenoid valve assembly.**

OK

2	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Upstream Oxygen Sensor RE Line, IPE Line Open

DTC	**P224300**	**O2 Sensor Negative Current Control Circuit Open Bank 1 Sensor 1**
DTC	**P225100**	**O2 Sensor Negative Current Control Circuit Open Bank 1 Sensor 1**
DTC	**P013000**	**Upstream Oxygen Sensor Compensating Circuit Open**
DTC	**P223700**	**O2 Sensor Positive Current Control Circuit Open Bank 1 Sensor 1 (Close to ECM)**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check upstream oxygen sensor connector**

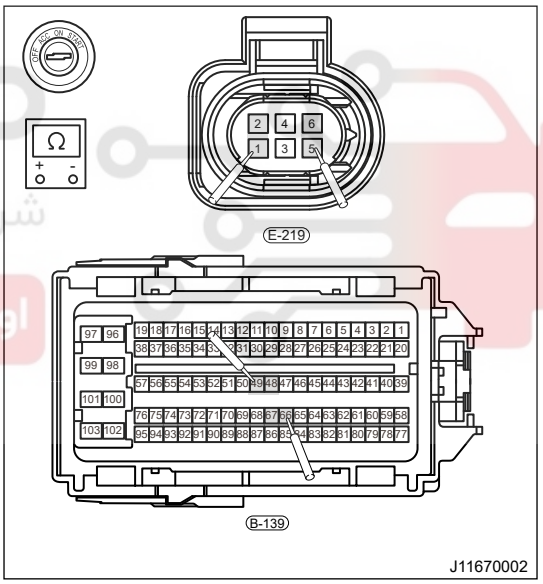
(a) Disconnect the negative battery.
(b) Check if upstream oxygen sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check upstream oxygen sensor circuit for open**

(a) Disconnect the upstream oxygen sensor connector.
(b) Disconnect the ECM connector (B-139).
(c) Using ohm band of multimeter, connect black probe to ECM B-139 (48, 49, 66, 67), measure resistances of upstream oxygen sensor E-219 (1, 2, 5, 6) with red probe respectively. Check the circuit for open.



NG → **Check and repair control circuit.**

OK

3	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

4	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Network Malfunction

DTC	U012287	Lost Communication With ESP (Electronic Stability Program)
DTC	U014687	Lost Communication With GW (Gateway)
DTC	U012687	Lost Communication With SAS (Steering Angle)
DTC	U010187	Lost Communication With TCM (Transmission Controller)
DTC	U110017	CAN Module Input Power Voltage High
DTC	P1388 24	Ambient Temperature Sensor Cold Start Test Positive Deviation Unreasonable
DTC	P1388 23	Ambient Temperature Sensor Cold Start Test Negative Deviation Unreasonable
DTC	P0070	Ambient Air Temperature Sensor Circuit "A"
DTC	U0128	Lost Communication With EPB Module
DTC	U0131	Lost Communication With EPS (HS CAN)
DTC	U0151	Lost Communication With Airbag Module (SDM) (HS CAN)
DTC	U0073	Control Module Communication Bus 1 Off (CAN1 Bus off)
DTC	P150100	Airbag Communicate Message Unplausible
DTC	P150000	EMS Received Crash Signal
DTC	U015187	Lose Communication With ABM/EGS/EPB/MFS/PEPS/SAM/ EBS/DECOS or Signal Abnormal
DTC	U010387	
DTC	U012887	
DTC	U118787	
DTC	U024887	
DTC	U021287	

DTC	U01B000	
DTC	U010987	
DTC	U041681	Data Received by ECM from ESP/TCM/ABM/BCM/CLM/EGS/ EPB/FPC/ICM/MFS/PEPS/SAM Module not Reliable
DTC	U040281	
DTC	U045281	
DTC	U042281	
DTC	U042481	
DTC	U040481	
DTC	U041781	
DTC	U041081	
DTC	U042381	
DTC	U059B81	
DTC	U042681	
DTC	U042981	
DTC	U007388	CAN1 Bus OFF (Communication Closed)
DTC	U010187	Lost Communication With TCM (Transmission Controller)
DTC	U012287	Lost Communication With ESP (Electronic Stability Program)
DTC	U015587	Lost Communication With IP (Instrument Cluster)
DTC	U016487	Communication between ECM and AC Control Module Failure
DTC	U014087	Lost Communication With BCM (Body Control Module)

DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Refer to diagnosis in CAN network section.

Response Reception Time Out/Error of LIN Bus (Contact Between EMS and Intellectual Generator)

DTC	P141500	Response Reception Time Out Error of LIN Bus (Contact Between EMS and Intellectual Generator)
DTC	P141700	Checksum Error of LIN Bus (Contact Between EMS and Intellectual Generator)
DTC	P144200	Communication Fault of Generator
DTC	P144100	Mechanical Fault of Generator
DTC	P144000	Generator Circuit Error

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check generator connector**

(a) Disconnect the negative battery.
(b) Check if generator connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check LIN line voltage**

(a) Disconnect the generator connector.
(b) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of generator LIN line with red probe respectively.

Equivalent voltage: Approximately 10 V

OK → **Replace generator.**

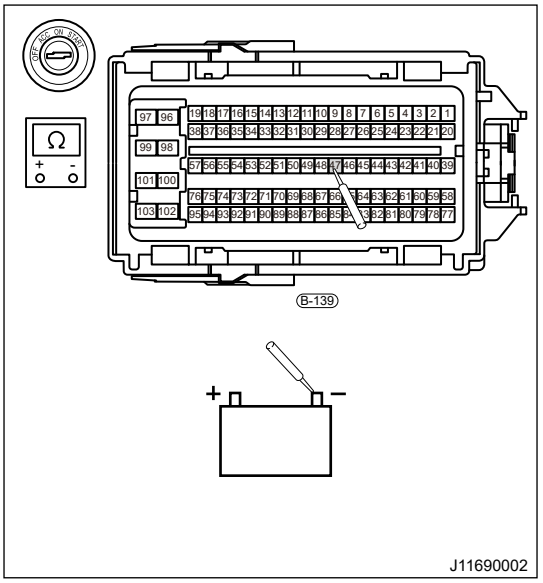
NG

3	**Check for short circuit to ground / power supply in LIN line**

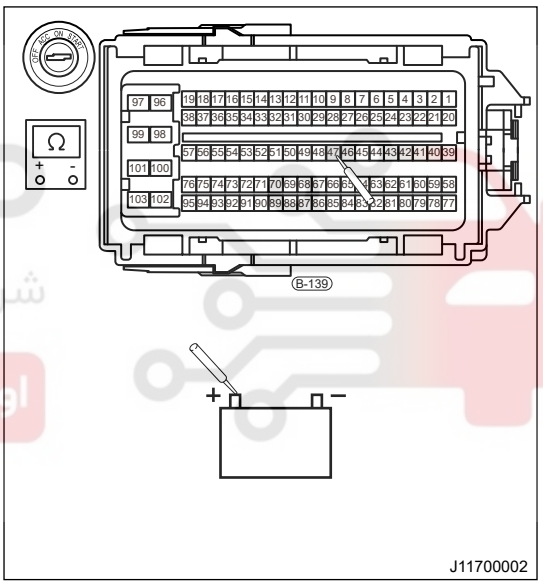
(a) Disconnect the generator connector.

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECU B-139 (47) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistance of ECM B-139 (47) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair control circuit.**

OK →

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Immobilizer Malfunction

DTC	**P051300**	**Immobilizer Malfunction**
DTC	**P063300**	
DTC	**P161000**	
DTC	**P161400**	
DTC	**P161200**	
DTC	**P161300**	
DTC	**P161100**	

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Refer to diagnosis in immobilizer system section.

Canister Vent Valve Stuck Normally Closed

DTC	**P242200**	**Canister Vent Valve Stuck Normally Closed**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	Check canister vent valve

(a) Check if line or charcoal canister filter at canister vent valve is blocked.
(b) Check if canister vent valve is stuck closed position.

NG → **Replace charcoal canister filter or canister vent valve.**

OK

2	Reconfirm DTCs

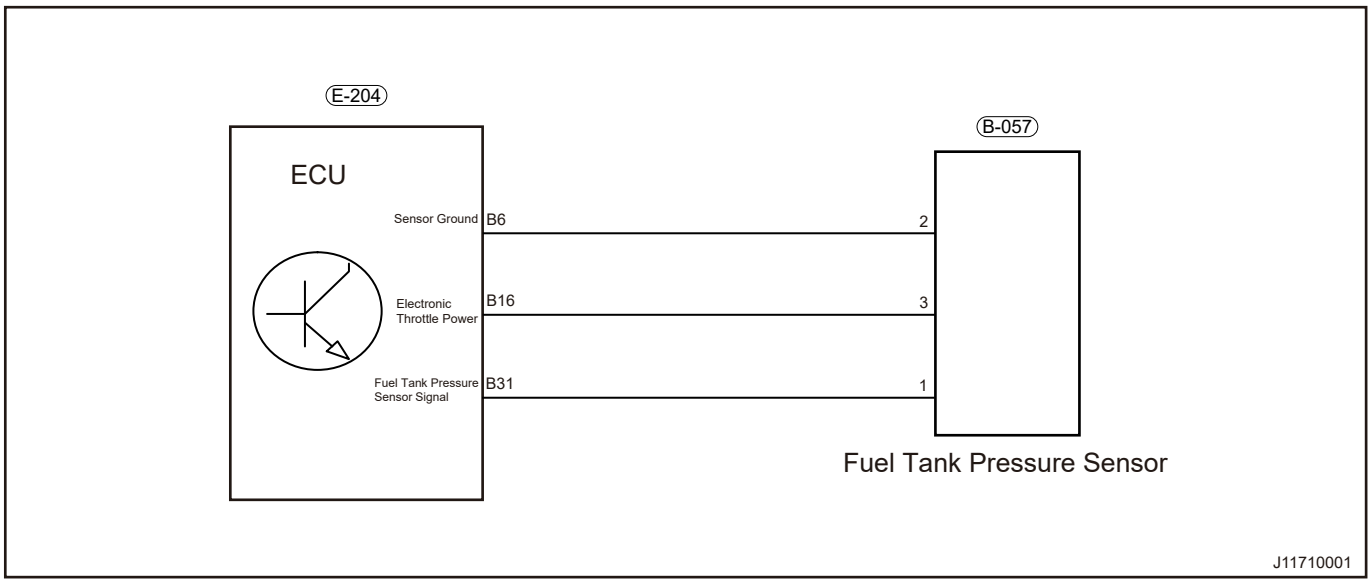
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Fuel Tank Pressure Sensor Malfunction

DTC	P045300	Fuel Tank Pressure Sensor Signal Short to Power Supply
DTC	P045200	Fuel Tank Pressure Sensor Signal Short to Ground
DTC	P128200	EVAP System Pressure Sensor/Switch Circuit Range Performance
DTC	P128300	EVAP System Pressure Sensor/Switch Circuit Range Performance
DTC	P04512A	EVAP System Pressure Sensor&Switch Circuit Range Performance
DTC	P045125	EVAP System Pressure Sensor&Switch Circuit Range Performance
DTC	P045128	EVAP System Pressure Sensor/Switch Circuit Range Performance

Description
Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check fuel tank pressure sensor connector**

(a) Disconnect the negative battery.

(b) Check if fuel tank pressure sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check canister vent valve**

(a) Check if line or charcoal canister filter at canister vent valve is blocked.

(b) Check if canister vent valve is stuck closed or normally open position.

NG → **Replace charcoal canister filter or canister vent valve.**

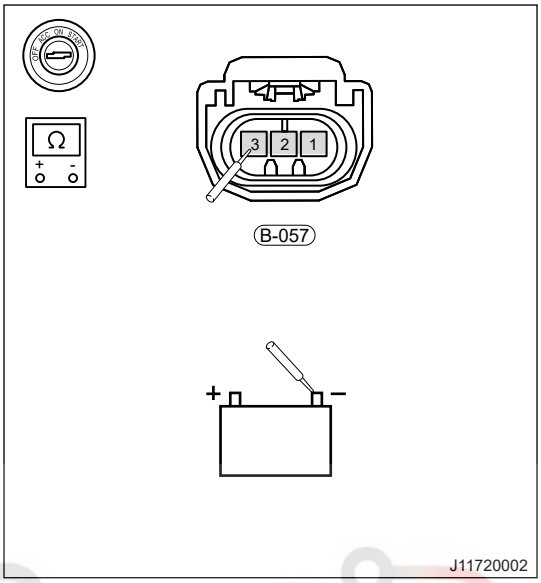
OK

3	Check for short circuit to ground / power supply in fuel tank pressure sensor circuit

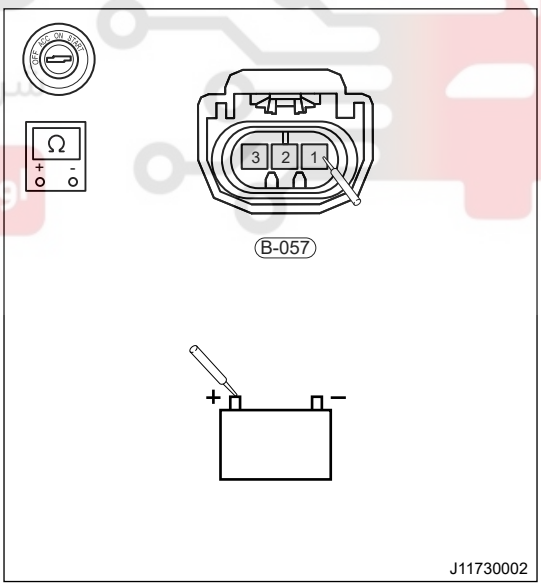
(a) Disconnect fuel tank pressure sensor connector.

(b) Disconnect the ECM connector (E-204).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of fuel tank pressure sensor B-092 (1, 2, 3) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of fuel tank pressure sensor B-092 (1, 2, 3) with red probe respectively. Check if circuit is short to power supply.

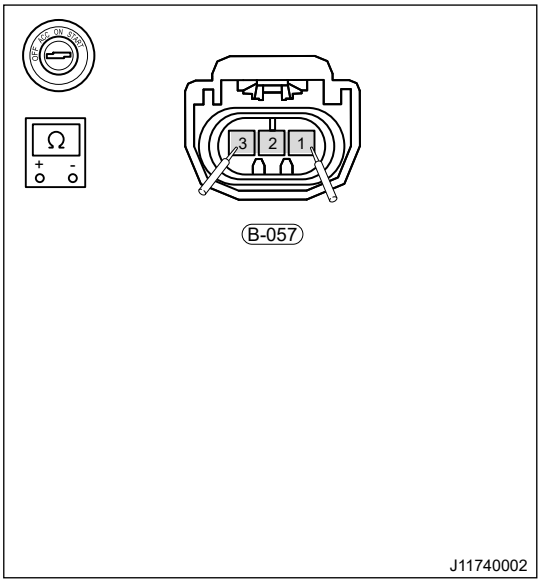


NG → **Check and repair control circuit.**

OK

4	Check if circuits of fuel tank pressure sensor themselves are shorted to each other

(a) Using ohm band of multimeter, measure resistances of fuel tank pressure sensor B-092 (1, 2, 3) with red and black probes respectively; Check if they are shorted to each other.



NG → **Replace fuel tank pressure sensor assembly.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Fuel Level Sensor Malfunction

DTC	**P046300**	**Fuel Level Sensor "A" Circuit High**
DTC	**P046200**	**Fuel Level Sensor "A" Circuit Low**
DTC	**P25B000**	**Fuel Level Sensor "A" Stuck**
DTC	**P046129**	**Fuel Level Sensor Unreasonable**

Description

Control Schematic Diagram

DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check fuel pump connector**

(a) Disconnect the negative battery.

(b) Check if fuel pump connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check for short circuit to ground / power supply in fuel level sensor circuit**

(a) Disconnect the fuel level sensor connector.

(b) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of fuel level sensor B-151 (1, 2) with red probe respectively. Check if circuit is short to ground.

(c) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of fuel level sensor B-151 (1, 2) with red probe respectively. Check if circuit is short to power supply.

NG → **Check and repair control circuit.**

OK ↓

3	**Check if circuits of fuel level sensor themselves are shorted to each other or opened**

(a) Using ohm band of multimeter, measure resistances of fuel level sensor B-151 (1, 2) with red and black probes respectively; Check if they are shorted to each other or opened.

NG → **Replace fuel level sensor assembly.**

OK ↓

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG ↓

5	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Evaporation System Leakage Malfunction

DTC	**P044200**	**EVAP System Leak Detected (Small Leak)**
DTC	**P045500**	**EVAP System Leak Detected (Large Leak)**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check fuel tank cap**

(a) Check if fuel tank cap is tightened, and check if internal seal ring is deformed.
(b) Check fuel tank cap for damage or leaked port.

NG → **Repair and adjust or replace fuel tank assembly.**

OK

2	**Check evaporation system connecting line**

(a) Check each line for damage or small hole, etc.
(b) Check each line joint is clamped into place and check if worm clamp is tightened.

NG → **Repair and adjust or replace the damaged parts.**

OK

3	Check charcoal canister

(a) Check charcoal canister for damage or small hole, etc.
(b) Check if connecting pipe joint is clamped into place.

NG → **Repair and adjust or replace charcoal canister assembly.**

OK

4	Check canister vent valve

(a) Check if canister vent valve is not closed tightly or stuck.

NG → **Replace canister vent valve assembly.**

OK

5	Check canister solenoid valve

(a) Check if canister solenoid valve is not closed tightly or stuck.

NG → **Replace canister solenoid valve assembly.**

OK

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

High/Low Load Desorption Line Malfunction - Canister Solenoid Valve

DTC	**P049700**	**EVAP System Low Purge Flow**
DTC	**P04F000**	**EVAP System High Pressure Purge**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check low/high load desorption line**

(a) Check each connecting line for breakage, damage or small hole, etc.
(b) Check if line check valve is damaged or inoperative.
(c) Check connection position between intake hose and desorption line for blockage.

NG → **Repair and adjust or replace the damaged parts.**

OK

2	**Check canister vent valve**

(a) Check if canister vent valve is stuck closed position.

NG → **Replace canister vent valve assembly.**

OK

3	**Check canister solenoid valve**

(a) Check if canister solenoid valve is stuck closed position.

NG → **Replace canister solenoid valve assembly.**

OK

4	**Reconfirm DTCs**

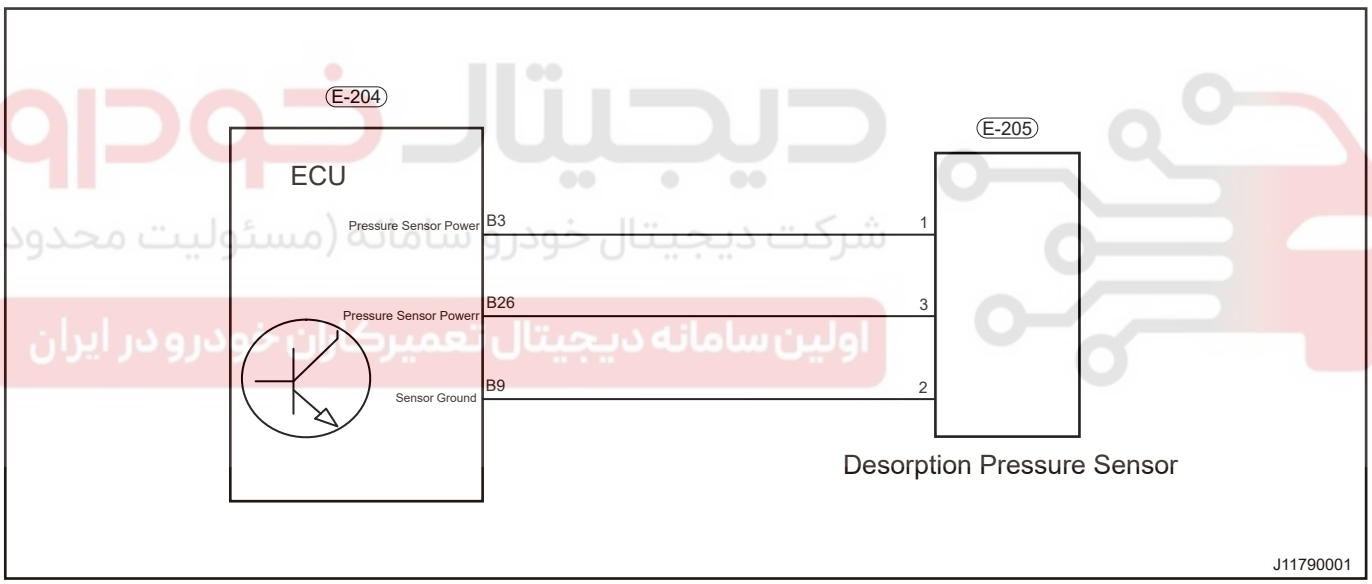
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Desorption pressure sensor malfunction

DTC	**P046800**	**EVAP Purge Flow Sensor Circuit High**
DTC	**P046700**	**EVAP Purge Flow Sensor Circuit Low**
DTC	**P128500**	**EVAP Purge Flow Sensor Circuit Range Performance**
DTC	**P128600**	**EVAP Purge Flow Sensor Circuit Range Performance**

Description
Control Schematic Diagram



DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check desorption pressure sensor connector**

(a) Disconnect the negative battery.
(b) Check if desorption pressure sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK ↓

2	**Check high load desorption line**

(a) Check each connecting line for breakage, damage or small hole, etc.
(b) Check if line check valve is damaged or inoperative.
(c) Check connection position between intake hose and desorption line for blockage.

NG → **Repair and adjust or replace the damaged parts.**

OK ↓

3	**Check for short circuit to ground / power supply in desorption pressure sensor circuit**

(a) Disconnect the desorption pressure sensor connector.
(b) Disconnect the ECM connector (E-204).
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of desorption pressure sensor E-205 (1, 2, 3) with red probe respectively. Check if circuit is short to ground.

(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of desorption pressure sensor E-205 (1, 2, 3) with red probe respectively. Check if circuit is short to power supply.

NG → **Check and repair control circuit.**

OK ↓

4	**Check if circuits of desorption pressure sensor themselves are shorted to each other or opened**

(a) Using ohm band of multimeter, measure resistances of desorption pressure sensor E-205 (1, 2, 3) with red and black probes respectively; Check if they are shorted to each other or opened.

NG → **Replace desorption pressure sensor assembly.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 CVO Self-learning Adjustment Reach Upper Limit/ Lower Limit Malfunction

DTC	**P02CD00**	**Cylinder 1 Fuel Injector Offset Learning At Max Limit**
DTC	**P02D100**	**Cylinder 3 Fuel Injector Offset Learning At Max Limit**
DTC	**P02D300**	**Cylinder 4 Fuel Injector Offset Learning At Max Limit**
DTC	**P02CF00**	**Cylinder 2 Fuel Injector Offset Learning At Max Limit**
DTC	**P02CC00**	**Cylinder 1 Fuel Injector Offset Learning At Min Limit**
DTC	**P02D000**	**Cylinder 3 Fuel Injector Offset Learning At Min Limit**
DTC	**P02D200**	**Cylinder 4 Fuel Injector Offset Learning At Min Limit**
DTC	**P02CE00**	**Cylinder 2 Fuel Injector Offset Learning At Min Limit**

DTC	P062B9A	Internal Control Module Fuel Injector Control Performance - Component Internal Failure
DTC	P062B64	
DTC	P062B96	
DTC	P126100	Cylinder 1 Injector Circuit Range/Performance - Signal Plausibility Failure
DTC	P126300	Cylinder 3 Injector Circuit Range/Performance - Signal Plausibility Failure
DTC	P126400	Cylinder 4 Injector Circuit Range/Performance - Signal Plausibility Failure
DTC	P126200	Cylinder 2 Injector Circuit Range/Performance - Signal Plausibility Failure

DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check injector connector**

(a) Disconnect the negative battery.
(b) Check fuel injector connector for looseness or poor contact, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check fuel injector**

(a) Remove the fuel injector assembly.
(b) Check fuel injector for blockage or leakage.

NG → **Clean or replace fuel injector assembly.**

OK

3	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Fuel Injector Control Circuit Short

DTC	**P02EE00**	**Cylinder 1 Fuel Injector Control Circuit Short**
DTC	**P02EF00**	**Cylinder 2 Fuel Injector Control Circuit Short**
DTC	**P02F000**	**Cylinder 3 Fuel Injector Control Circuit Short**
DTC	**P02F100**	**Cylinder 4 Fuel Injector Control Circuit Short**
DTC	**P214800**	**Cylinder 1 or Cylinder 4 Fuel Injector Control Circuit Short to Power Supply**
DTC	**P215100**	**Cylinder 2 or Cylinder 3 Fuel Injector Control Circuit Short to Power Supply**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Take troubleshooting of cylinder 1 fuel injector as an example.

1	**Check injector connector**

(a) Disconnect the negative battery.
(b) Check if fuel injector connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

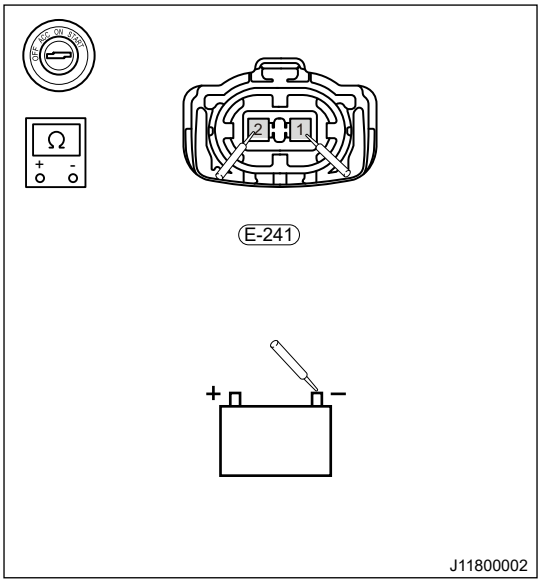
OK ↓

2	**Check if fuel injector control terminal is short to ground/power supply or short to each other**

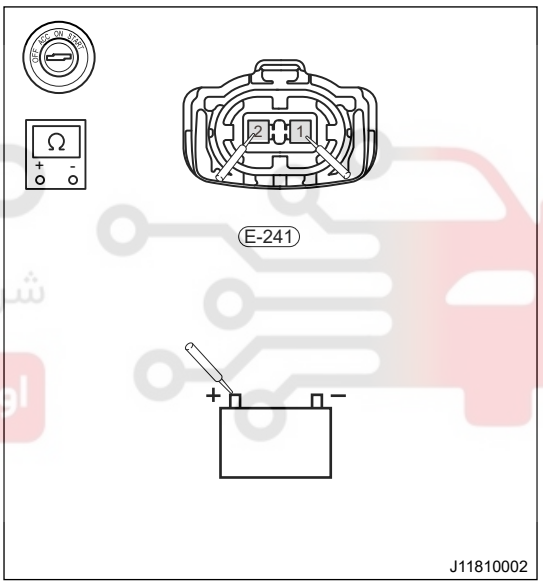
(a) Disconnect the injector connector.

(b) Disconnect the ECM connector (E-204).

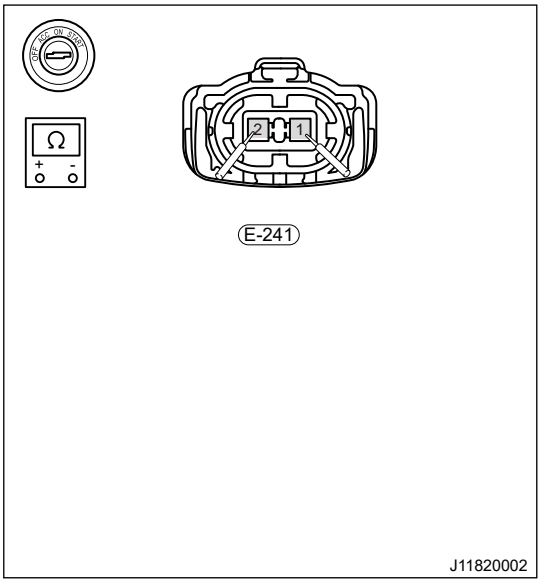
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of fuel injector E-241 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of fuel injector E-241 (1, 2) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of fuel injector E-241 (1, 2) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK

3	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

4	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

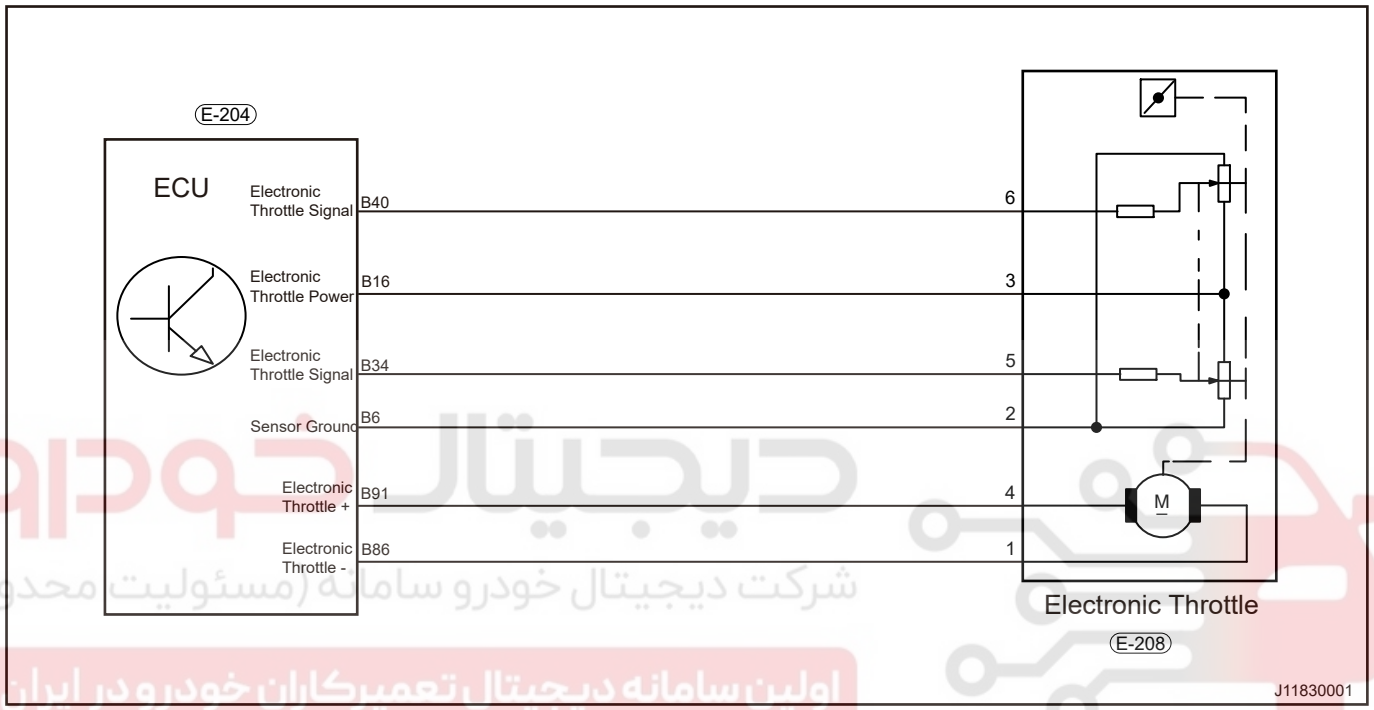
Electronic Throttle 1st Path / 2nd Path Signal Voltage Minimum / Maximum / Improper

DTC	**P012200**	**Electronic Throttle 1st Path / 2nd Path Signal Voltage Minimum**

DTC	**P022200**	
DTC	**P012300**	**Electronic Throttle 1st Path / 2nd Path Signal Voltage Maximum**
DTC	**P022300**	
DTC	**P012100**	**Electronic Throttle 1st Path / 2nd Path Signal Voltage Improper**
DTC	**P022100**	

Description

Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check electronic throttle connector**

(a) Disconnect the negative battery.

(b) Check if electronic throttle connector is loose, and contact between male and female terminals is in good condition.

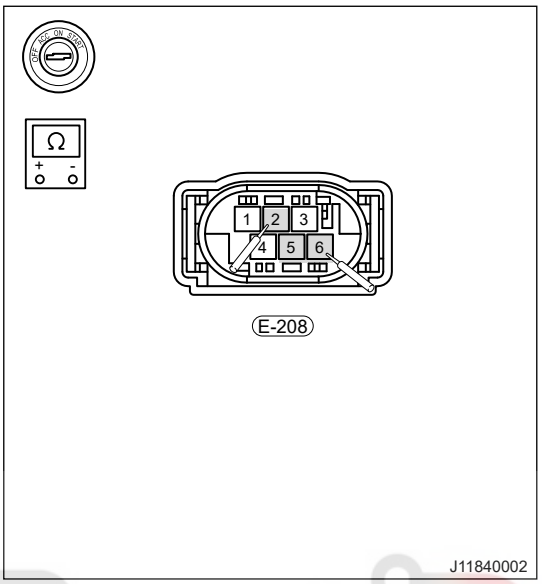
NG → **Repair and adjust connector, or replace it.**

OK

2	**Check electronic throttle internal resistance**

(a) Using ohm band of multimeter, measure if resistances of electronic throttle E-208 (2 - 6) and (2 - 5) are normal with red and black probes respectively.

Resistance values should change continuously when the valve plate is toggled by hand



NG → **Replace electronic throttle assembly.**

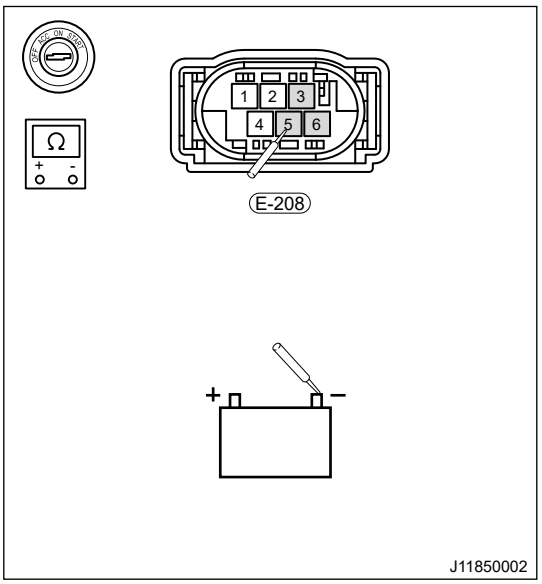
OK

3	**Check for short circuit to ground / power supply or short to each other in electronic throttle line**

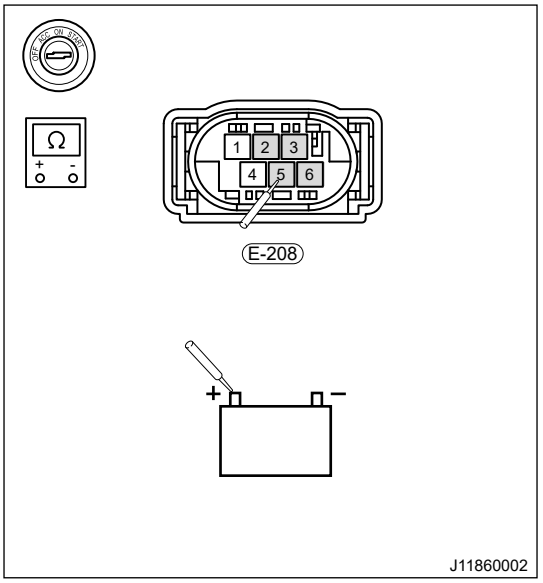
(a) Disconnect the electronic throttle connector.

(b) Disconnect the ECM connector (E-204).

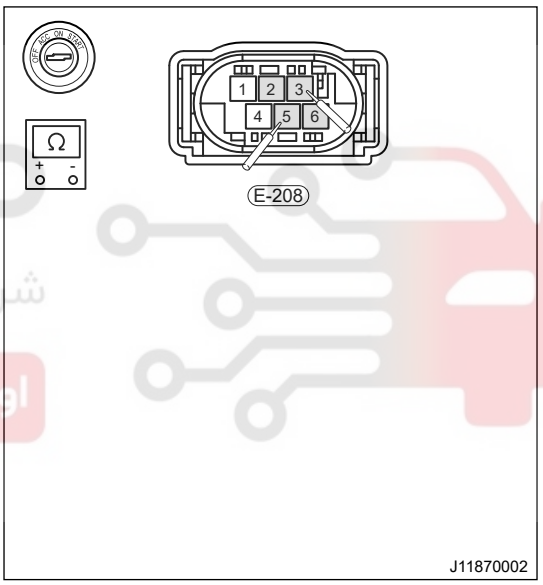
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistances of electronic throttle E-208 (3, 5, 6) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistances of electronic throttle E-208 (3, 5, 6) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of electronic throttle E-208 (2, 3, 5, 6) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK →

4	**Check electronic throttle position sensor power supply / ground / signal**

(a) Connect electronic throttle and ECM connector (E-204)

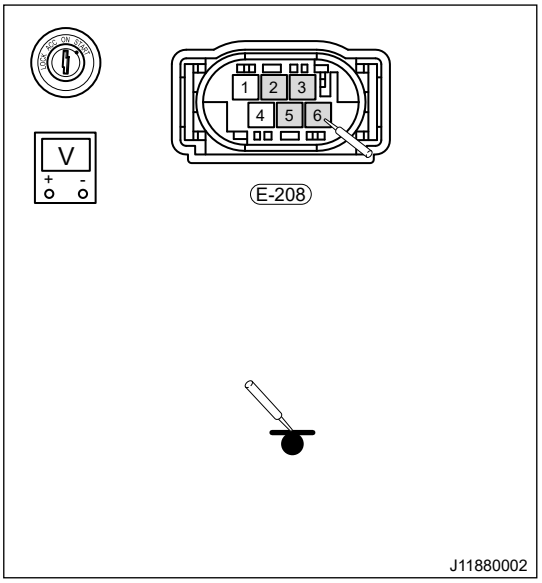
(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, and measure voltages of electronic throttle E-208 (2, 3, 5, 6) with red probe respectively.

Power supply terminal: 5 V

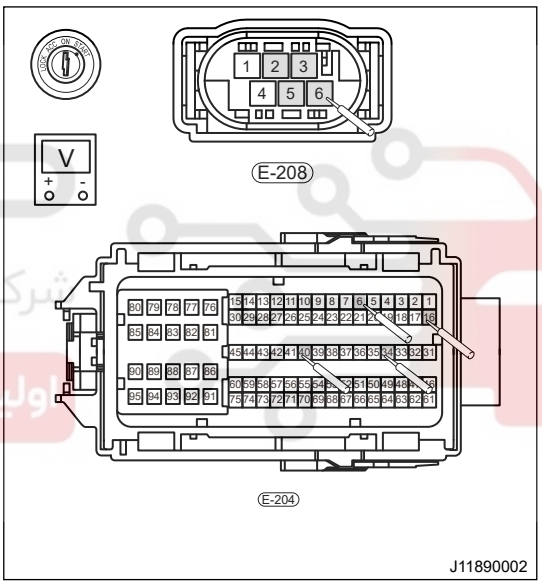
Ground terminal: < 0.2 V

The sum of signal 1 voltage and signal 2 voltage is approximately 5 V



(d) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-204 (40, 16, 34, 6), measure electronic throttle E-208 (2, 3, 5, 6) with red probe

Test voltage drop value should be less than approximately 0.2 V



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

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

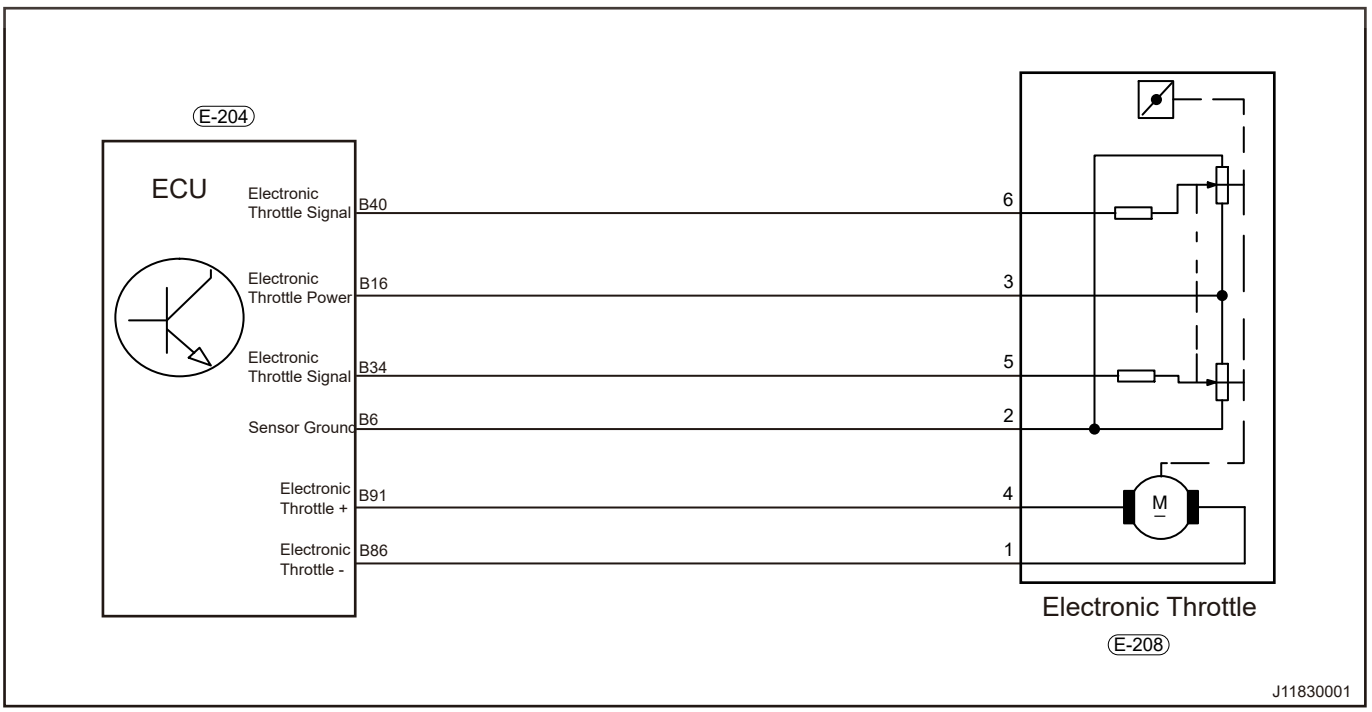
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Electronic Throttle Spring Inspection Malfunction Minimum, Maximum / Deviation Between Throttle Target Opening Angle and Actual Opening Angle / Adjustment / Drive Level Malfunction

DTC	P155400	Max Error of DV-E Return Spring Check Failure
DTC	P155500	
DTC	P156100	
DTC	P156000	Electronic Throttle PID Adjustment Malfunction
DTC	P210000	Electronic Throttle Drive Level Malfunction
DTC	P210300	
DTC	P210600	
DTC	P211800	

Description
Control Schematic Diagram



DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check electronic throttle connector**

(a) Disconnect the negative battery.
(b) Check if electronic throttle connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check electronic throttle condition**

(a) Electronic throttle body valve plate is dirty or there are foreign matters, so that the valve plate resistance is large or valve plate is stuck.

NG → **Clean or replace electronic throttle assembly.**

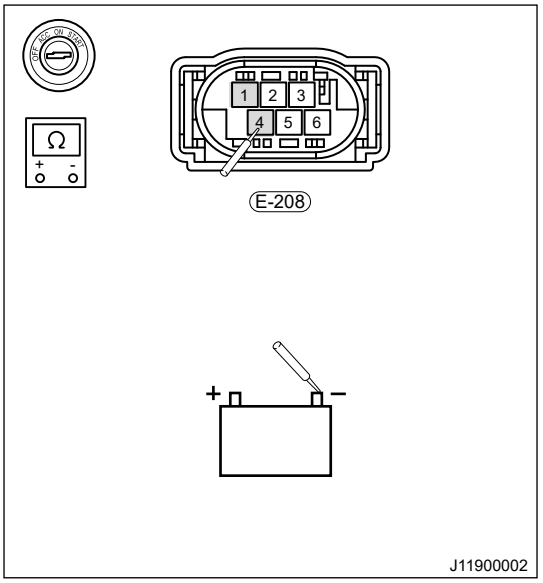
OK

3	**Check for short circuit to ground / power supply or short to each other in electronic throttle line**

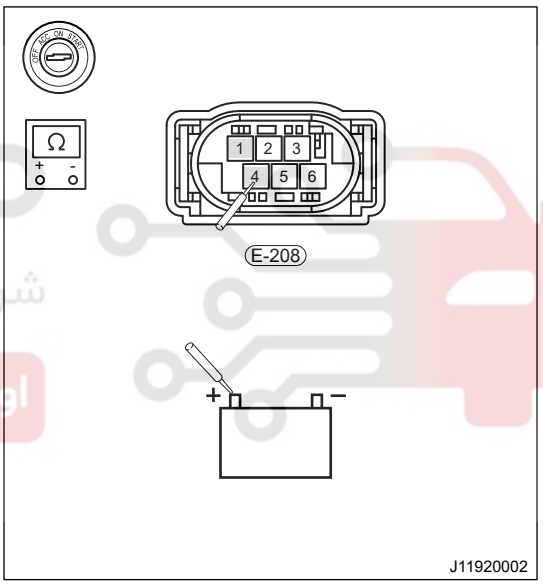
(a) Disconnect the electronic throttle connector.

(b) Disconnect the ECM connector (E-204).

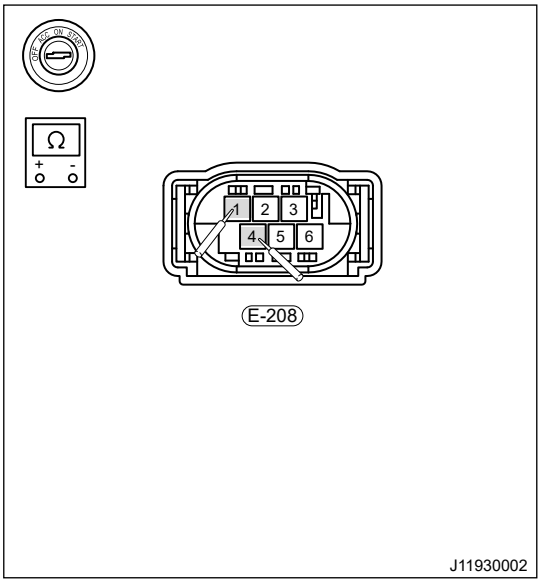
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistances of electronic throttle E-208 (4, 1) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistances of electronic throttle E-208 (4, 1) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of electronic throttle E-208 (4, 1) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Electronic Throttle Self-learning Unable to Complete / Throttle Initial Self-learning Unable to Complete

DTC	P155000	Electronic Throttle Self-learning Unable to Complete / Throttle Initial Self-learning Unable to Complete
DTC	P155100	
DTC	P155800	Not Plausible Error of DV-E Limphome Learning Position
DTC	P155900	
DTC	P155A00	
DTC	P155B00	
DTC	P155600	Electronic Throttle Lower Mechanic Stop Re-learning Error
DTC	P155700	

DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check if electronic throttle self-learning condition is met**

(a) No malfunctions related to DVE or monitoring;
(b) Rotation speed is 0;
(c) Vehicle speed is 0;
(d) Pedal opening angle is 0;
(e) Battery voltage is higher than 10 V;
(f) Engine coolant temperature is higher than 5°C;
(g) Intake temperature is higher than 5°C

NG → **Handle the malfunctions that do not meet the self-learning conditions.**

OK

2	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

3	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

ECM Internal Malfunction

DTC	P15A000	CPU0: MPU Error (Memory, DSPR, PSPR)
DTC	P15A100	CPU0: DCACHE/DSPR ECC Uncorrectable Error
DTC	P15A200	CPU0: DCACHE/DSPR Address Error
DTC	P15A300	CPU0:DCACHE TAG SRAM ECC Uncorrectable Error
DTC	P15A400	CPU0:DCACHE TAG SRAM Address Error
DTC	P15A500	CPU0:PCACHE TAGRAM ECC Uncorrectable Error
DTC	P15A600	CPU0:PCACHE TAGRAM Address Error
DTC	P15A700	CPU0: PCACHE/PSPR ECC Uncorrectable Error
DTC	P15A800	CPU0:PCACHE/PSPR Address Error
DTC	P15A900	CPU1:Lockstep Comparator Error
DTC	P15AA00	CPU1:MPU Error (Memory, DSPR, PSPR)
DTC	P15AB00	CPU1:DCACHE/DSPR ECC Uncorrectable Error
DTC	P15AC00	CPU1:DCACHE/DSPR Address Error
DTC	P15AD00	CPU1:DCACHE TAGRAM ECC Uncorrectable Error
DTC	P15AE00	CPU1:DCACHE TAGRAM Address Error
DTC	P15AF00	CPU1:PCACHE TAGRAM ECC Uncorrectable Error
DTC	P15B000	CPU1:PCACHE TAGRAM Address Error
DTC	P15B100	CPU1:PCACHE/PSPR ECC Uncorrectable Error
DTC	P15B200	CPU1:PCACHE/PSPR Address Error
DTC	P15B300	LMU:SRAM ECC Monitoring Error
DTC	P15B400	LMU:SRAM ECC Uncorrectable Error
DTC	P15B500	LMU:SRAM Address Error

DTC	P15B600	SMU: Recover Timer 0 Timeout Error
DTC	P15B700	SMU: Recover Timer 1 Timeout Error
DTC	P15B800	PMU:PFLASH ECC Uncorrectable Multi-bit Error
DTC	P15B900	PMU:PFLASH Address Error
DTC	P15BA00	PMU: PFLASH ECC Monitoring Error (Cover All ECC Module)
DTC	P15BB00	PMU: PFLASH EDC Comparator Error (Cover All PFLASH Instances)
DTC	P15BC00	SCU/CGU: System PLL OSC_WDT: Input Clock Exceeds Limit Error
DTC	P15BD00	SCU/CGU: System PLL VCO Clock Event Loss Error
DTC	P15BE00	SCU/EVR: EVR 1.3V Digital Undervoltage Error
DTC	P15BF00	SCU/EVR: EVR 3.3V Overvoltage Error
DTC	P15C000	SCU/EVR: External Power Supply Overvoltage Error
DTC	P15C100	SCU/WDTS: Safety Watchdog Timeout Error
DTC	P15C200	SCU/WDTCPU0: Watchdog CPU0 Timeout Error
DTC	P15C300	SCU/WDTCPU1: Watchdog CPU1 Timeout Error
DTC	P15C400	SCU/CGU: PLL_ERAY VCO Clock Event Loss Error
DTC	P15C500	SCU/WDTCPU2: Watchdog CPU2 Timeout Error
DTC	P15C600	SCU/DTS: Temperature Sensor Overflow Error
DTC	P15C700	Registers: Register Monitor Detects Error
DTC	P15C800	SCU/LSCU: SCU Configuration Error: Monitor Dual-track Properties (Inverted Signal) Alarm from Lockstep Comparator (LSCU)
DTC	P15C900	SCU/CGU: Clock Monitoring: STM Exceed Frequency Range Error
DTC	P15CA00	SCU/CGU: Clock Monitoring: PLL_ERAY Exceed Frequency Range Error
DTC	P15CB00	SCU/CGU: Clock Monitoring: PLL Exceed Frequency Range Error
DTC	P15CC00	SCU/CGU: Clock Monitoring: SRI Exceed Frequency Range Error
DTC	P15CD00	SCU/CGU: Clock Monitoring: SPB Exceed Frequency Range Error
DTC	P15CE00	SCU/CGU: Clock Monitoring: GTM Exceed Frequency Range Error
DTC	P15CF00	SCU/CGU: Clock Monitoring: ADC Exceed Frequency Range Error
DTC	P15D000	GTM: SRAMs Uncorrectable Error

DTC	P15D100	FLEXRAY:SRAM Address Error
DTC	P15D200	Misc SRAMs:SRAM ECC Uncorrectable Error
DTC	P15D300	Misc SRAMs:SRAM Address Error
DTC	P15D400	GTM: SRAMs Address Error
DTC	P15D500	CAN: SRAM Uncorrectable Error
DTC	P15D600	CAN: SRAM Address Error
DTC	P15D700	FLEXRAY:SRAM ECC Uncorrectable Error
DTC	P15D800	CPU2:MPU Error (Memory, DSPR, PSPR)
DTC	P15D900	CPU2: DCACHE/DSPR ECC Uncorrectable Error
DTC	P15DA00	CPU2: DCACHE/DSPR Address Error
DTC	P15DB00	CPU2: DCACHE TAG SRAM ECC Uncorrectable Error
DTC	P15DC00	CPU2:DCACHE TAG SRAM Address Error
DTC	P15DD00	CPU2:121 PCACHE TAGRAM ECC Uncorrectable Error
DTC	P15DE00	CPU2:PCACHE TAGRAM Address Failure
DTC	P15DF00	CPU2: PCACHE/PSPR ECC Uncorrectable Error
DTC	P15E000	CPU2: PCACHE/PSPR Address Error
DTC	P061A00	Safely Monitor Torque Exceeds Limit
DTC	P060D00	Accelerator Pedal 2nd Layer Monitoring Error
DTC	P152000	Function Monitoring: Check of Predicted Air Mass Failed
DTC	P152100	Function Monitoring: Fault of ECU Check of Injection Cut-off
DTC	P152200	Function Monitoring: Fault of ECU in Check of Cylinder Individual Fuel Corrections
DTC	P153900	Synchronization process rationality check (based on speed and synchronization count)
DTC	P153700	Function Monitoring: Fault of ECU or Sensor in rl-Comparison
DTC	P153500	Function Monitoring: Fault of ECU or Sensor in Mixture Check
DTC	P153600	Function Monitoring: Fault of ECU Comparison of Lambda and Operation Mode
DTC	P153800	Electronic Throttle Safety Monitoring Function Error (Ignition Angle Signal, Wire Harness or ECM Error)
DTC	P152700	Function Monitoring: Monitoring of ICO From Level1
DTC	P152800	Function Monitoring: Monitoring of ICO From Level2
DTC	P061C00	Safety Monitoring Function Error (2nd Layer Engine Speed Monitoring Error)
DTC	P152900	Function Monitoring: Fault of Starter Control
DTC	P153000	Function Monitoring: Fault of ECM ADC - Null Load Test Pulse

DTC	P153100	Function Monitoring: Fault of ECM ADC - Test Voltage
DTC	P157100	Closed Path Checking, Driver Level Check Error Or Communication Error
DTC	P157200	Under Normal Voltage, ABE Activated
DTC	P157300	Diagnostic Fault Check to Report "WDA active" Due to Errors in Query/Response Communication
DTC	P157400	Errorpin Activated and Monitoring Communication Normal
DTC	P157500	Diagnostic Fault Check to Report "WDA active" Due to Overvoltage Detection
DTC	P142000	CAN Hardware Memory Response Timeout
DTC	P142100	LIN Hardware Memory Response Timeout
DTC	P064100	5 V Power Supply Module 1 Fail
DTC	P065100	5 V Power Supply Module 2 Fail
DTC	P069700	5 V Power Supply Module 3 Fail
DTC	P261000	Unreasonable Shutdown Timing
DTC	P06B842	Error when Reading/Writing Flash Block
DTC	P06B843	

DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

2	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	**Conduct test and confirm malfunction has been repaired**

Deviation Between Both Paths Signal of Accelerator Pedal Out of Limit/Voltage Too High/Too Low

DTC	**P213800**	**Deviation Between Both Paths Signal of Accelerator Pedal Out of Limit**
DTC	**P212300**	**Accelerator Pedal 1st Path / 2nd Path Signal Voltage High**
DTC	**P212800**	
DTC	**P212200**	**Accelerator Pedal 1st Path / 2nd Path Signal Voltage Low**
DTC	**P212700**	

Description
Control Schematic Diagram

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check electronic accelerator pedal connector**

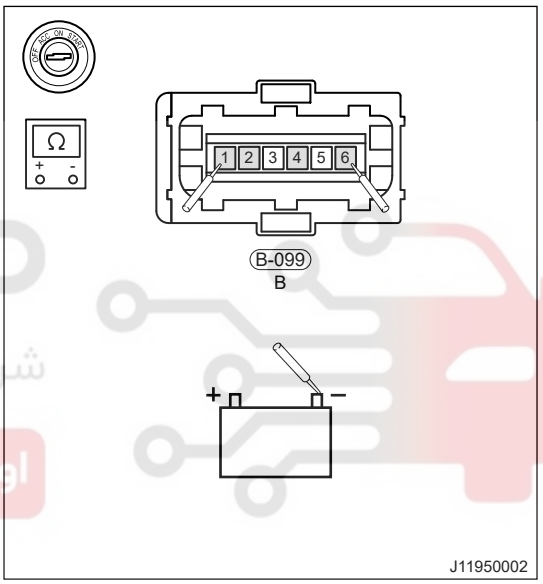
(a) Disconnect the negative battery.
(b) Check if electronic accelerator pedal connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

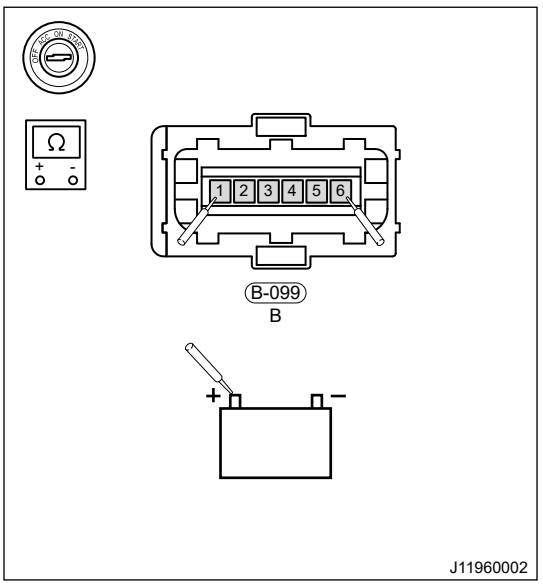
OK

2	**Check for short circuit to ground / power supply or short to each other in electronic accelerator pedal line**

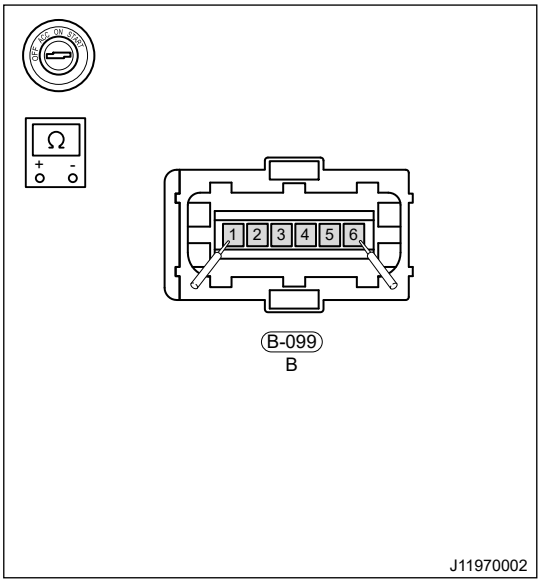
(a) Disconnect the electronic accelerator pedal connector.
(b) Disconnect the ECM connector (B-139).
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistances of electronic accelerator pedal B-099 (1, 2, 4, 6) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistances of electronic accelerator pedal B-099 (1, 2, 3, 4, 5, 6) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of electronic accelerator pedal B-099 (1, 2, 3, 4, 5, 6) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK

3	**Check electronic accelerator pedal position sensor power supply / ground / signal**

(a) Connect electronic accelerator pedal and ECM connector (B-139)

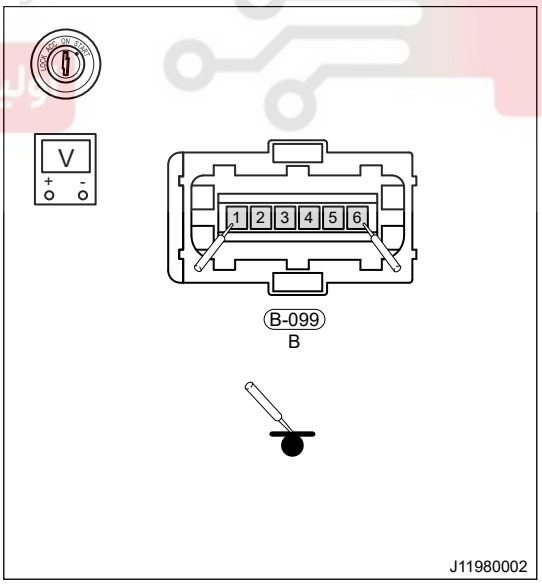
(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, and measure voltages of electronic accelerator pedal B-099 (1, 2, 3, 4, 5, 6) with red probe respectively.

Power supply terminal: 5 V

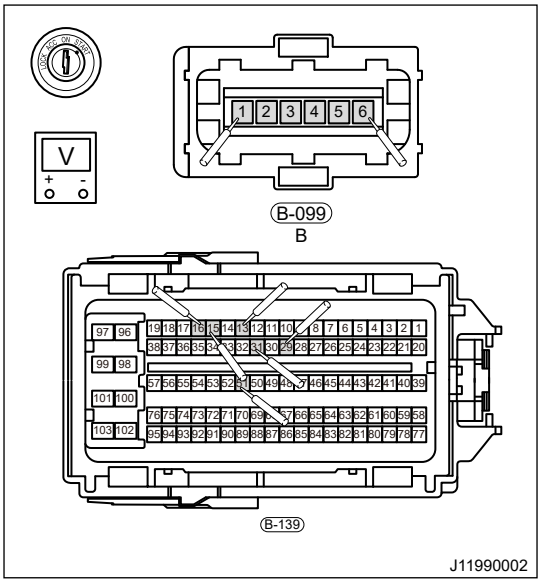
Ground terminal: < 0.2 V

Signal 1 voltage value and signal 2 voltage value maintain a voltage multiplying relationship



(d) Using voltage band of multimeter (voltage drop method), connect black probe to ECM B-139 (15, 31, 13, 16, 51, 29), measure electronic accelerator pedal B-099 (1, 2, 3, 4, 5, 6) with red probe

Test voltage drop value should be less than approximately 0.2 V



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

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

EVAP System Vent Control Circuit Short to Ground or Power Supply

DTC	**P049900**	**EVAP System Vent Control Circuit Short to Power Supply**
DTC	**P049800**	**EVAP System Vent Control Circuit Short to Ground**
DTC	**P044700**	**EVAP System Vent Control Circuit Short to Ground**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check canister vent valve connector**

(a) Disconnect the negative battery.
(b) Check if canister vent valve connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check canister vent valve power supply fuse**

(a) Check if fuse EF10 of engine compartment fuse and relay box is blown.

NG → **Check and repair short circuit malfunction and replace fuse.**

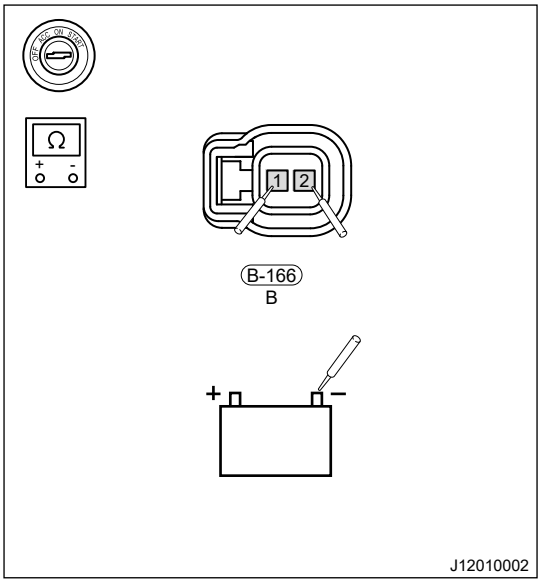
OK

3	**Check for short circuit to ground / power supply or short to each other in canister vent valve line**

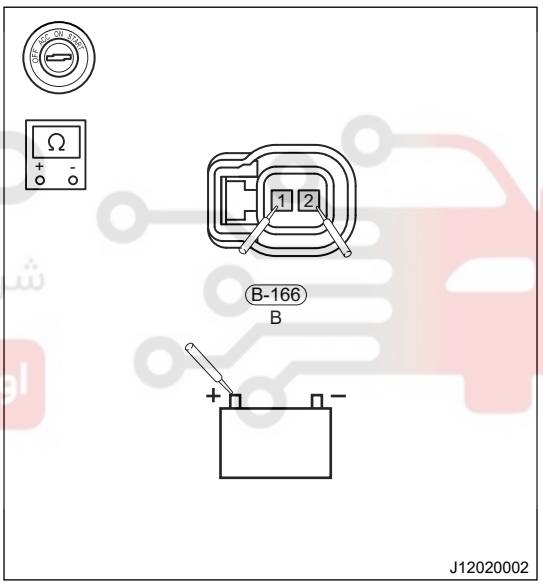
(a) Disconnect the canister vent valve connector.

(b) Disconnect the ECM connector (B-139).

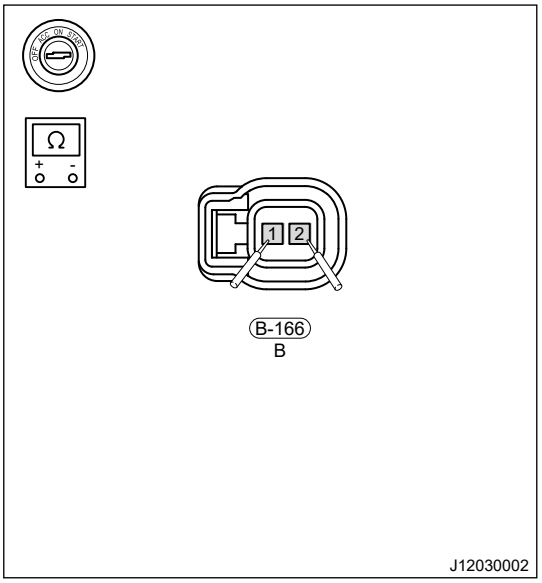
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of canister vent valve B-166 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of canister vent valve B-166 (1, 2) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of canister vent valve B-166 (1, 2) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Cooling Fan Control Circuit Voltage Too Low/Too High

DTC	P069100	Fan Control Circuit Low
DTC	P069200	Fan Control Circuit High
DTC	P048000	Cooling Fan Control Circuit Error
DTC	P063400	Cooling Fan Drive Chip Overheating
DTC	P048371	Fan Rationality Check Error (Type 1)
DTC	P048372	Fan Rationality Check Error (Type 2)
DTC	P048373	Fan Rationality Check Error (Type 3)
DTC	P048374	Fan Rationality Check Error (Type 4)

DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check cooling fan connector**

(a) Disconnect the negative battery.

(b) Check if cooling fan connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check cooling fan power supply fuse**

(a) Check if fuses EF06 and EF50 of engine compartment fuse and relay box are blown.

NG → **Check and repair short circuit malfunction of circuit.**

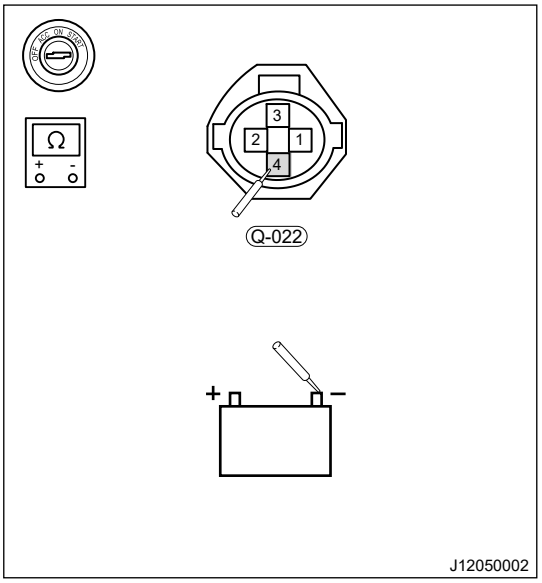
OK

3	**Check for short circuit to ground / power supply in cooling fan control circuit**

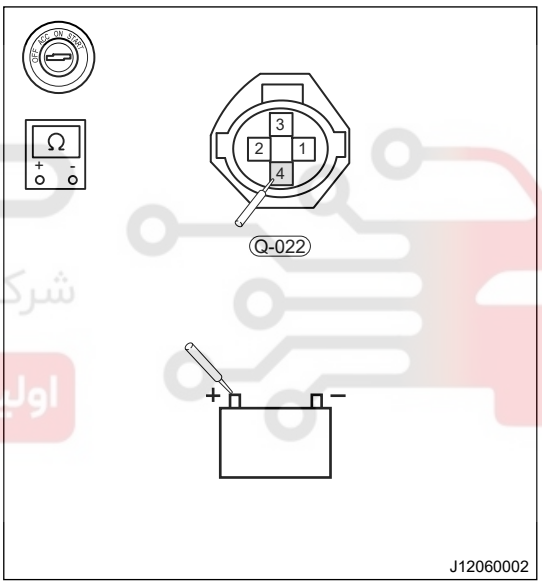
(a) Disconnect the cooling fan connector.

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of cooling fan Q-022 (4) with red probe. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistance of cooling fan Q-022 (4) with red probe. Check if circuit is short to power supply.



NG → **Check and repair circuit.**

OK

4	**Check cooling fan power supply / ground / control signal**

(a) Connect cooling fan and ECM connector (B-139)

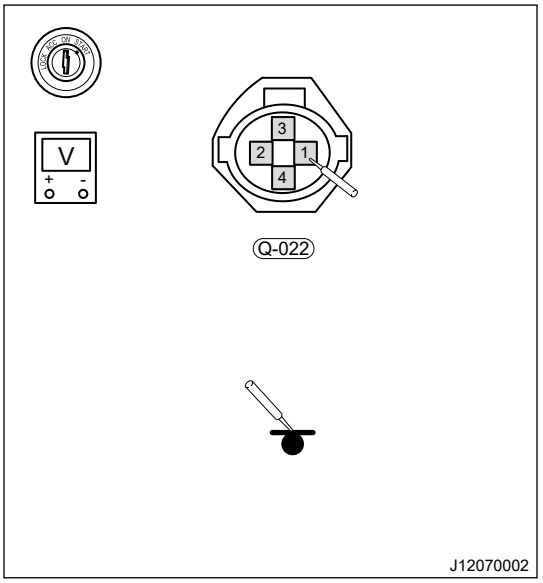
(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, and measure voltages of cooling fan Q-022 (1, 2, 3, 4) with red probe.

Power supply terminal: 12V

Ground terminal: < 0.2 V

The control signal adopts duty ratio control (high level is effective)



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

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

TCU Requests to Illuminate MIL Light

DTC	P070000	TCU Requests to Illuminate MIL Light

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Read transmission system DTCs and refer to transmission system diagnosis.

Vehicle Speed Sensor Performance / Improper / Input Signal Fault

DTC	**P121200**	**Vehicle Speed Sensor Performance Failure (Vehicle Speed Exceed Maximum Range)**
DTC	**P050184**	**Vehicle Speed Sensor Performance Failure (Vehicle Speed Exceed Minimum Range)**
DTC	**P050165**	**Vehicle speed sensor performance failure (vehicle speed is too low when oil cut-off during coasting)**
DTC	**P050166**	**Vehicle Speed Sensor "A" Circuit Range/Performance**
DTC	**P050000**	**Vehicle Speed Sensor Input Signal Fault**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Read brake control system DTCs and refer to brake control system diagnosis.

Ignition Angle Efficiency Monitoring During Catalytic Converter Heating

DTC	**P050B00**	**Cold Start Ignition Timing Performance**
DTC	**P050B20**	**Cold Start Ignition Timing Performance**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check electronic throttle condition**

(a) Check if electronic throttle is dirty or is stuck at position with a small opening angle.

NG → **Clean or replace electronic throttle assembly.**

OK

2	**Check ignition system**

(a) Check engine for DTCs related to ignition.
(b) Check ignition coil and spark plug for damage.

NG → **Replace the damaged parts.**

OK

3	**Check intake system**

(a) Check intake manifold or each connecting line for air leakage.

NG → **Replace the leaked or damaged parts.**

OK

4	**Check fuel system**

(a) Check if low/high pressure fuel pressure is too low.

NG → **Replace the damaged parts.**

OK

5	**Check if exhaust back pressure is too high**

(a) Check pre-catalytic converter for blockage.
(b) Check GPF particulate filter for blockage.

NG → **Replace pre-catalytic converter assembly or perform GPF regeneration.**

OK

6	**Check boost system**

(a) Check each connecting line of boost system for falling off.
(b) Check if turbocharger can boost normally and each actuator can operate normally.

NG → **Replace turbocharger assembly.**

OK

7	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

8	**Reconfirm DTCs**

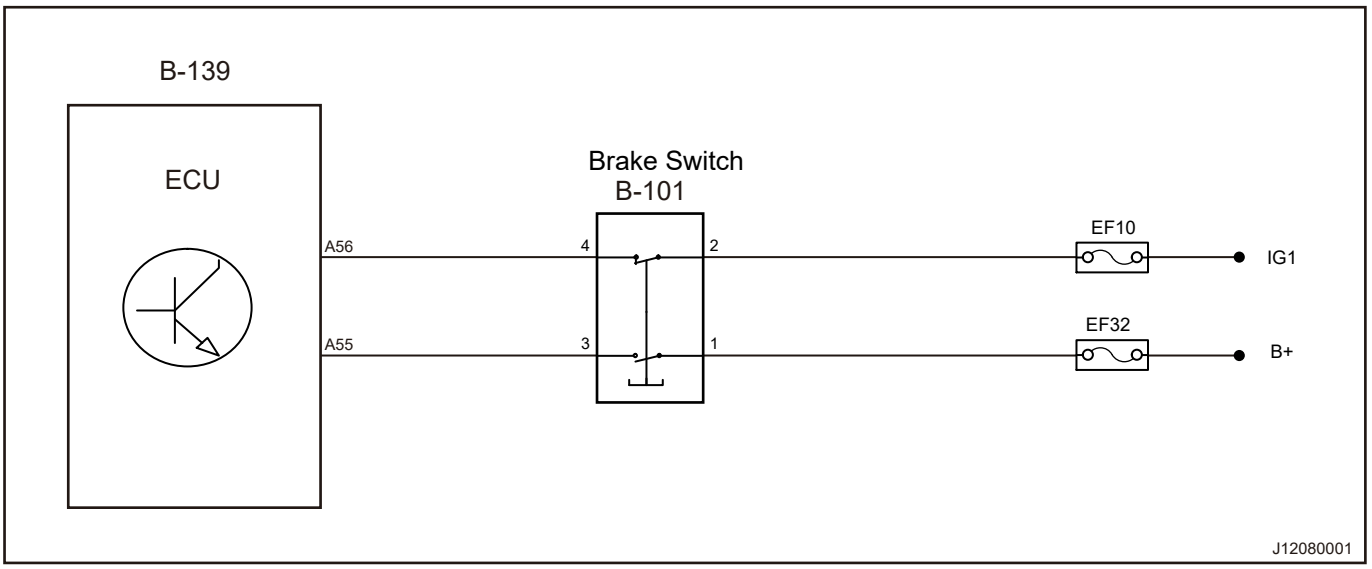
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Brake Pedal Signal Synchronization Malfunction

DTC	P012200	Brake Pedal Signal Synchronization Malfunction

Description
Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check brake switch connector**

(a) Disconnect the negative battery.

(b) Check if brake switch connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK ↓

2	**Check brake switch power supply fuse**

(a) Check if fuses EF32 and EF10 of instrument panel fuse box are blown.

NG → **Check and repair short circuit malfunction of circuit.**

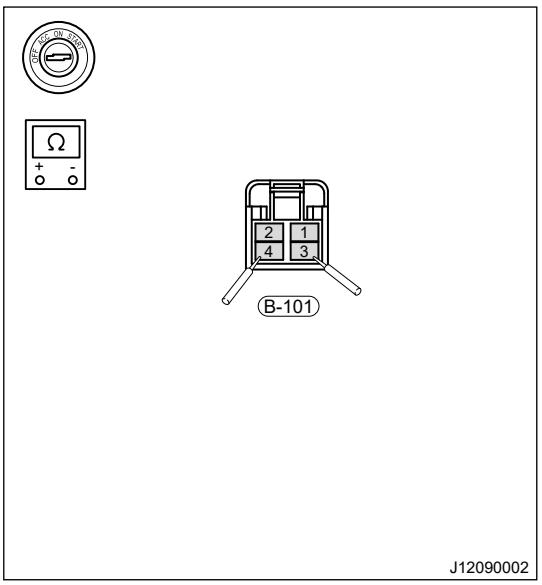
OK ↓

3	Check brake switch condition

(a) Unplug the brake switch connector.

(b) Using ohm band of multimeter, measure brake switch B-101 (1, 3) with red and black probes; There should be continuity without brake pedal depressed and no continuity with brake pedal depressed.

(c) Using ohm band of multimeter, measure brake switch B-101 (2, 4) with red and black probes; There should be no continuity without brake pedal depressed and there should be continuity with brake pedal depressed.



NG → **Replace brake switch assembly.**

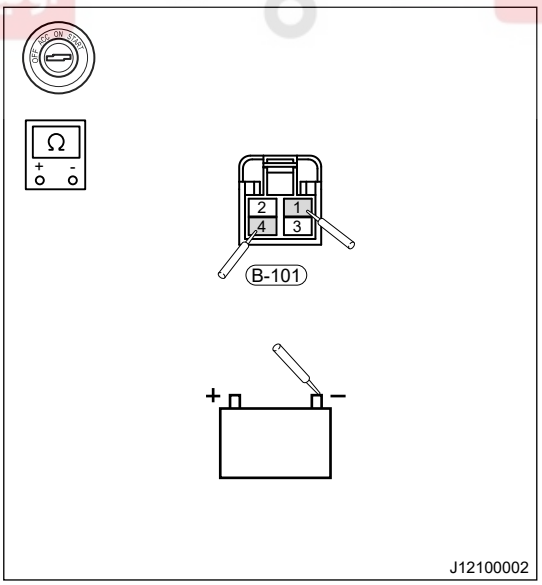
OK

4	Check for short circuit to ground / power supply or short to each other in brake switch line

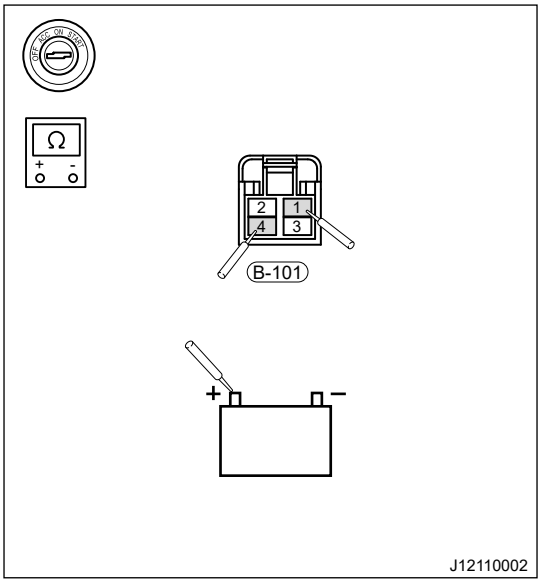
(a) Disconnect the brake switch connector.

(b) Disconnect the ECM connector (B-139).

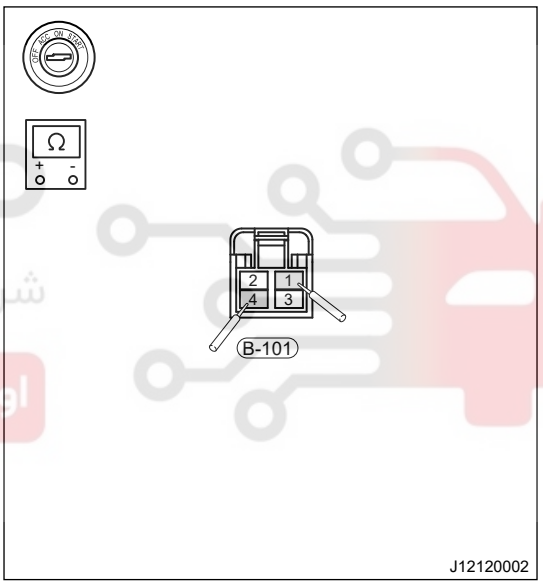
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistances of brake switch B-101 (1, 4) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistances of brake switch B-101 (1, 4) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of brake switch B-101 (1, 4) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Main Relay Open / Short to Ground / Power Supply

DTC	**P068500**	**Main Relay Open Circuit Error**
DTC	**P068700**	**Main Relay Short to Power Supply**
DTC	**P068600**	**Main Relay Short to Ground**
DTC	**P06869E**	**ECM/PCM Power Relay Control Circuit Low**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check main relay**

(a) Replace the main relay in engine compartment fuse and relay box.

NG → **Replace main relay**

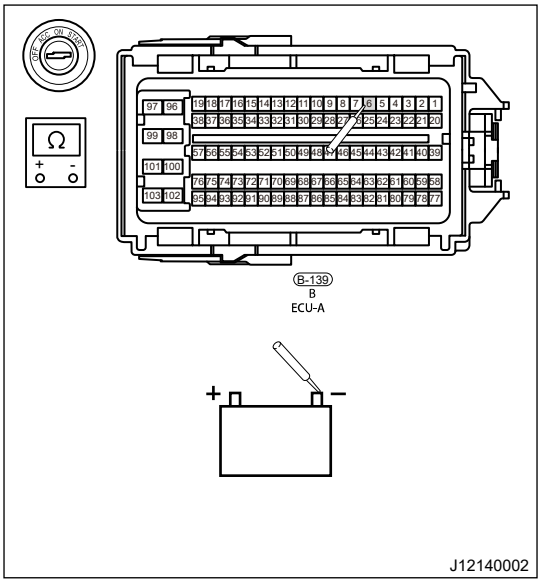
OK

2	**Check for short circuit to ground / power supply in main relay control circuit**

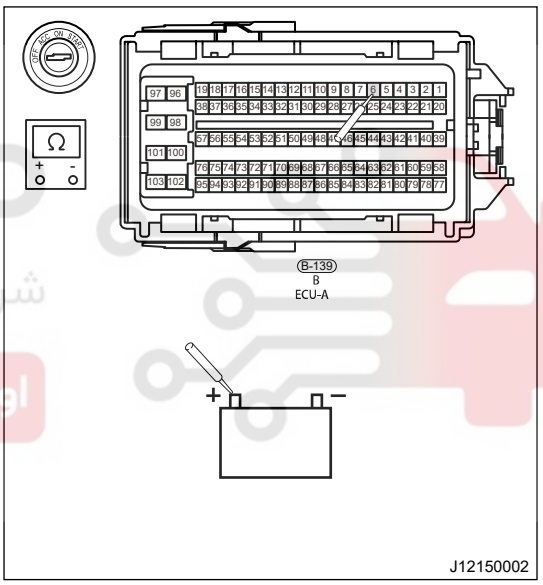
(a) Disconnect the engine compartment fuse and relay box connector (B-020).

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECU B-139 (6) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistance of ECM B-139 (6) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair circuit.**

OK

3	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Response Reception Time Out/Error of LIN Bus (Contact Between EMS and Intellectual Generator)

DTC	**P143000**	**Battery Has Been Changed and Long Time No Tester Confirmation**
DTC	**P143100**	**EBS or Battery Error**
DTC	**P143200**	**EBS Temporary Error**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	Check battery model

(a) Check if battery model is in agreement with genuine battery.

NG → **Use genuine battery to replace.**

OK

2	Check battery sensor connector

(a) Disconnect the negative battery.
(b) Check if battery sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

3	**Check LIN line voltage**

(a) Disconnect the battery sensor connector.
(b) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of battery sensor LIN line with red probe respectively.

Equivalent voltage: Approximately 10 V

NG → **Check and repair LIN line.**

OK

4	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Starter Relay / Drive Chain State Relay Fault

DTC	**P26F100**	**Starter Relay R1 (Crank Relay) or Starter (Drive Chain) Relay R2 (Pt State Relay) Cannot Be Combined**
DTC	**P26F200**	**Starter (Drive Chain) Status Relay R2 (PT State Relay) Cannot Be Disconnected**
DTC	**P26F000**	**Starter Relay R1 (Crank relay) Cannot Be Disconnected**
DTC	**P14AD00**	**Engine Block or Starter is not Engaged**
DTC	**P14AF00**	**KL50r Wire Short Circuit to Ground**
DTC	**P14AE00**	**KL50r Wire Short Circuit to Battery**
DTC	**P14AC00**	**Starter Damaged or Wire Dropped**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.

- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check drive chain state relay**

(a) Replace the drive chain state relay in engine compartment fuse and relay box.

NG → **Replace drive chain state relay.**

OK →

2	**Check drive chain state relay feedback terminal power supply fuse**

(a) Check if fuse EF21 10A of engine compartment fuse and relay box is blown.

NG → **Check and repair short circuit malfunction of circuit.**

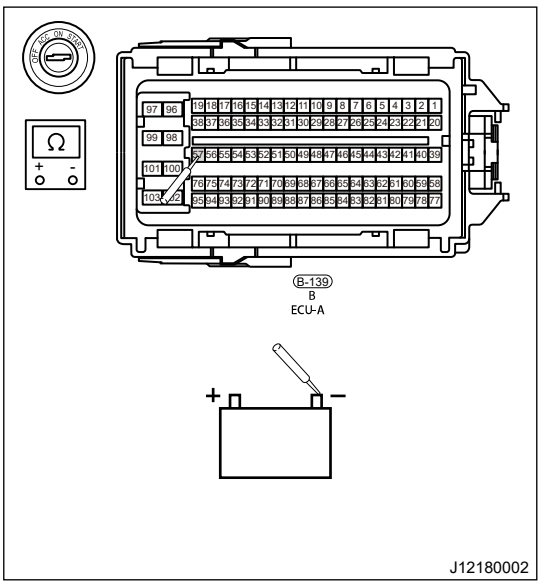
OK →

3	**Check for short circuit to ground / power supply in drive chain state relay feedback circuit**

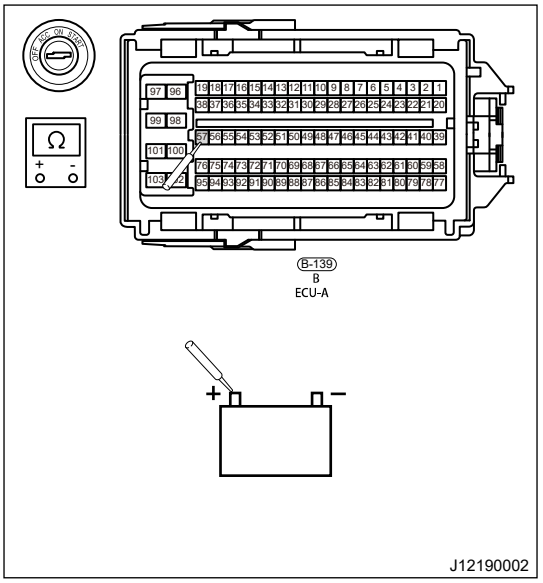
(a) Disconnect the engine compartment fuse and relay box connector (B-023).

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECU B-139 (57) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistance of ECM B-139 (57) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair circuit.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

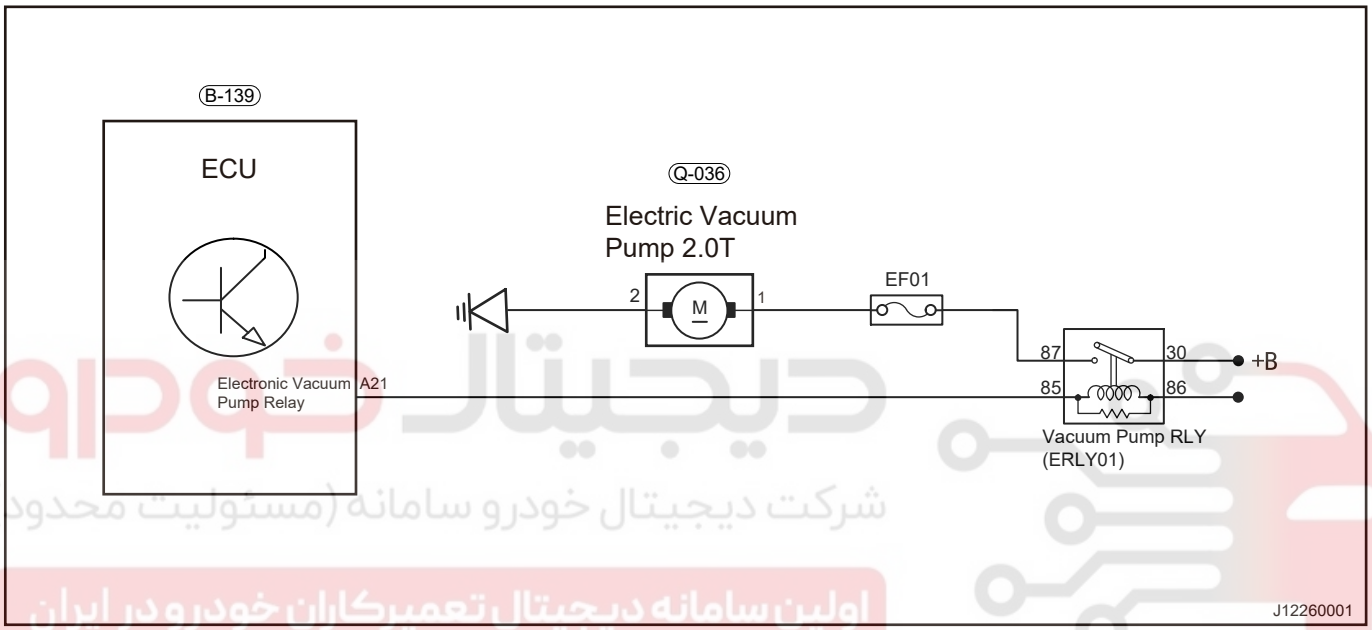
OK → **Conduct test and confirm malfunction has been repaired**

Brake Vacuum Pump Control Circuit Open / Voltage Too Low / Too High

DTC	**P050F00**	**Brake Assist Vacuum Too Low**
DTC	**P258A00**	**Vacuum Pump Control Circuit Open**
DTC	**P258C00**	**Vacuum Pump Control Circuit "A" Low**
DTC	**P258D00**	**Vacuum Pump Control Circuit "A" High**
DTC	**P063449**	**Brake Vacuum Pump Drive Chip Overheat**

Description

Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check electric vacuum pump connector**

(a) Disconnect the negative battery.

(b) Check if electric vacuum pump connector is loose, and contact between male and female terminals is in good condition.

NG	**Repair and adjust connector, or replace it.**

OK

2	**Check electric vacuum pump relay**

(a) Replace the electric vacuum pump relay in engine compartment fuse and relay box.

NG → **Replace electric vacuum pump relay.**

OK

3	**Check electric vacuum pump relay coil terminal power supply fuse**

(a) Check if fuse EF01 of engine compartment fuse and relay box is blown.

NG → **Check and repair short circuit malfunction of circuit.**

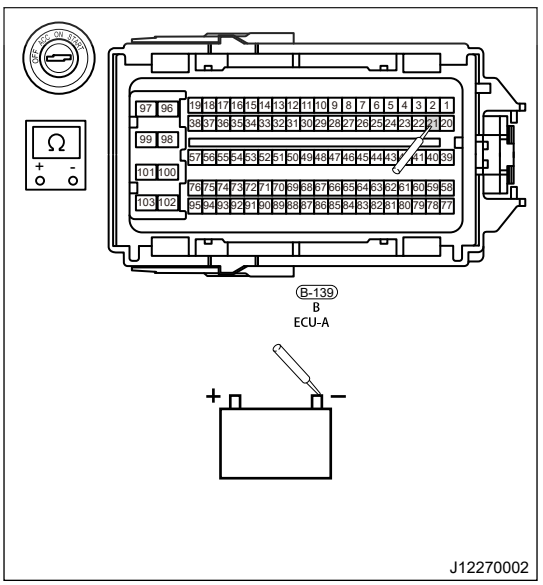
OK

4	**Check for short circuit to ground / power supply in electric vacuum pump relay control circuit**

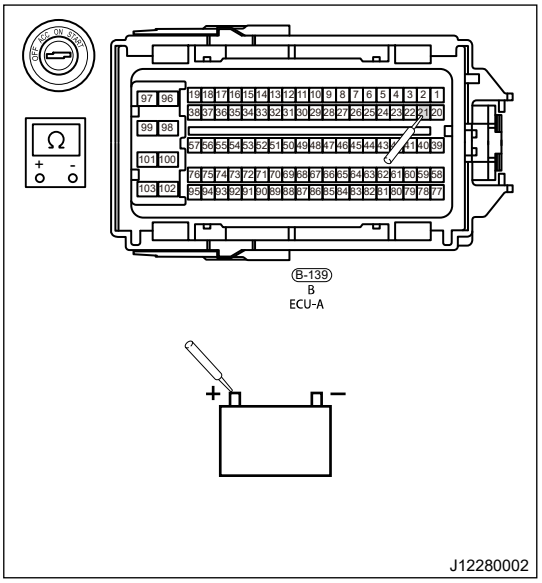
(a) Unplug the electric vacuum pump relay.

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECU B-139 (21) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistance of ECM B-139 (21) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair circuit.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

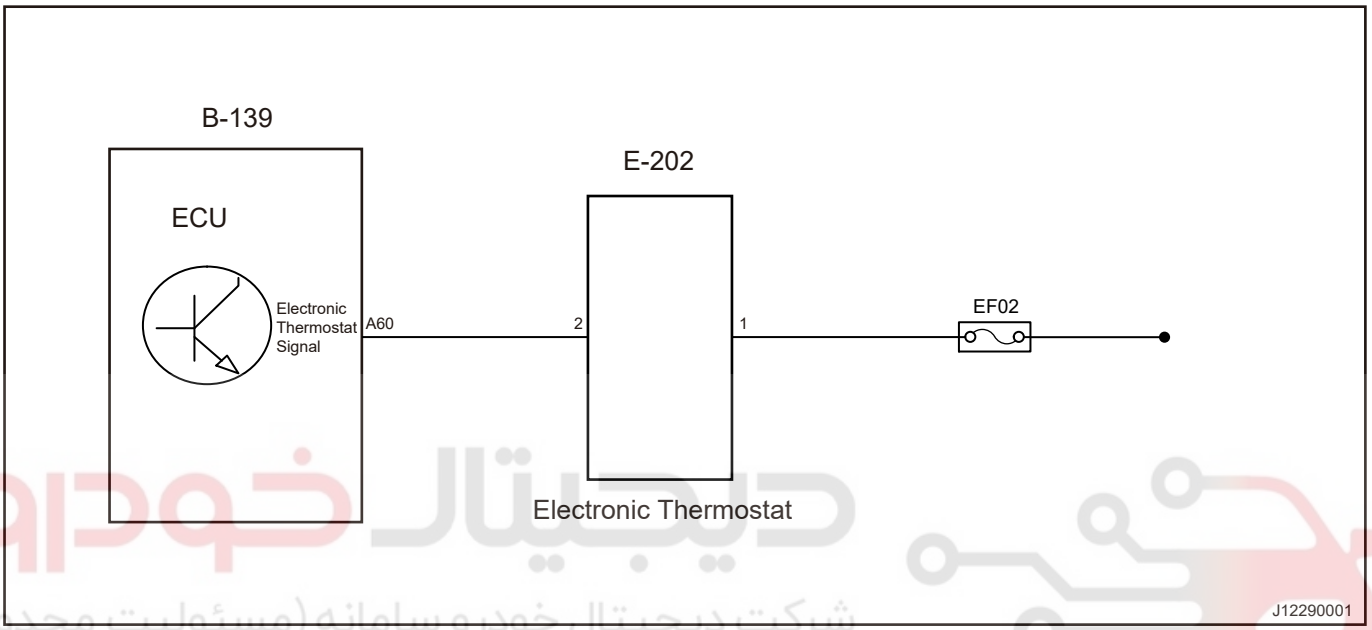
OK → **Conduct test and confirm malfunction has been repaired**

Electronic Thermostat Control Circuit Open / Voltage Too Low / Too High

DTC	**P059700**	**Thermostat Heater Control Circuit Open**
DTC	**P059800**	**Thermostat Heater Control Circuit Low**
DTC	**P059900**	**Thermostat Heater Control Circuit High**

Description

Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check electronic thermostat connector**

(a) Disconnect the negative battery.

(b) Check if electronic thermostat connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK →

2	**Check electronic thermostat power supply fuse**

(a) Check if fuse EF02 of engine compartment fuse and relay box is blown.

NG → **Check and repair short circuit malfunction of circuit.**

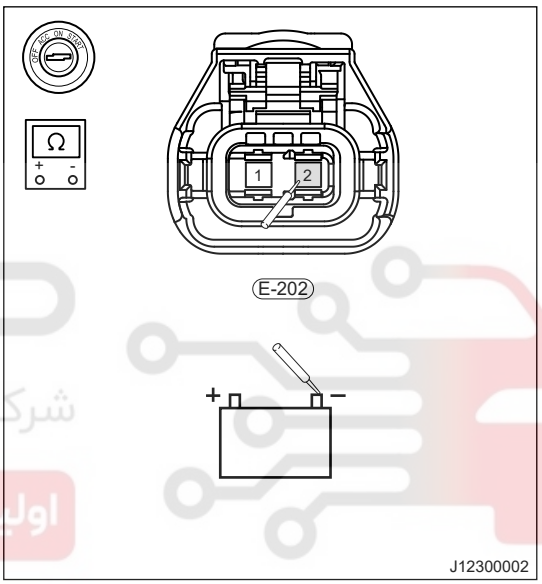
OK

3	**Check for short circuit to ground / power supply in electronic thermostat control circuit**

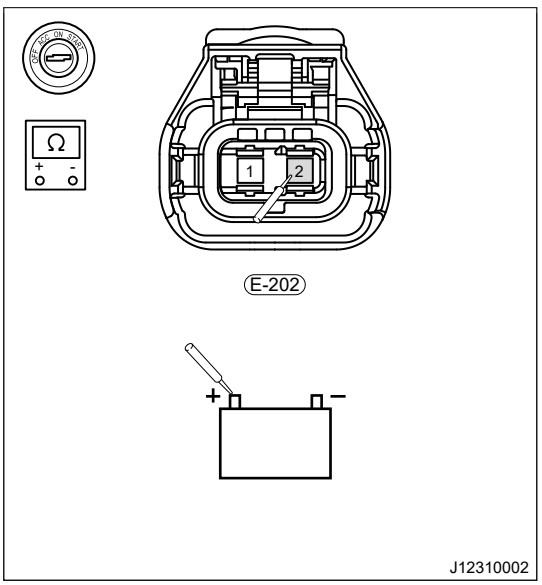
(a) Disconnect the electronic thermostat connector.

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of electronic thermostat E-202 (2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistance of electronic thermostat E-202 (2) with red probe respectively. Check if circuit is short to power supply.

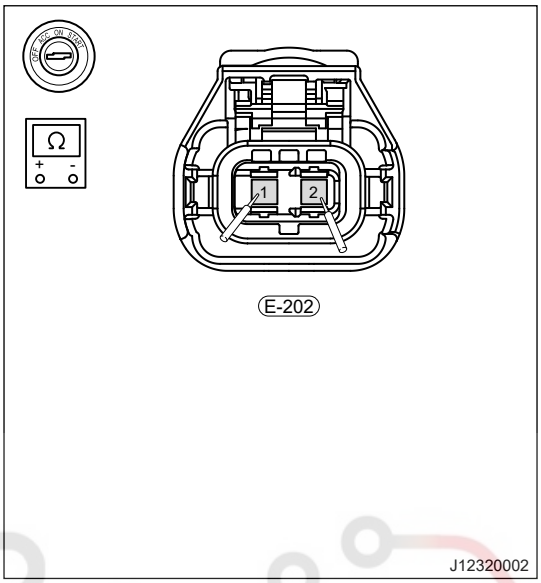


NG → **Check and repair circuit.**

OK

4	**Check if circuits of electronic thermostat themselves are shorted to each other or opened**

(a) Using ohm band of multimeter, measure resistances of electronic thermostat E-202 (1, 2) with red and black probes respectively; Check if they are shorted to each other or opened.



NG → **Replace electronic thermostat assembly.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Ambient Temperature Sensor Circuit Voltage Too Low / Too High

DTC	**P007200**	**Ambient Air Temperature Sensor Circuit "A" Low**
DTC	**P007300**	**Ambient Air Temperature Sensor Circuit "A" High**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

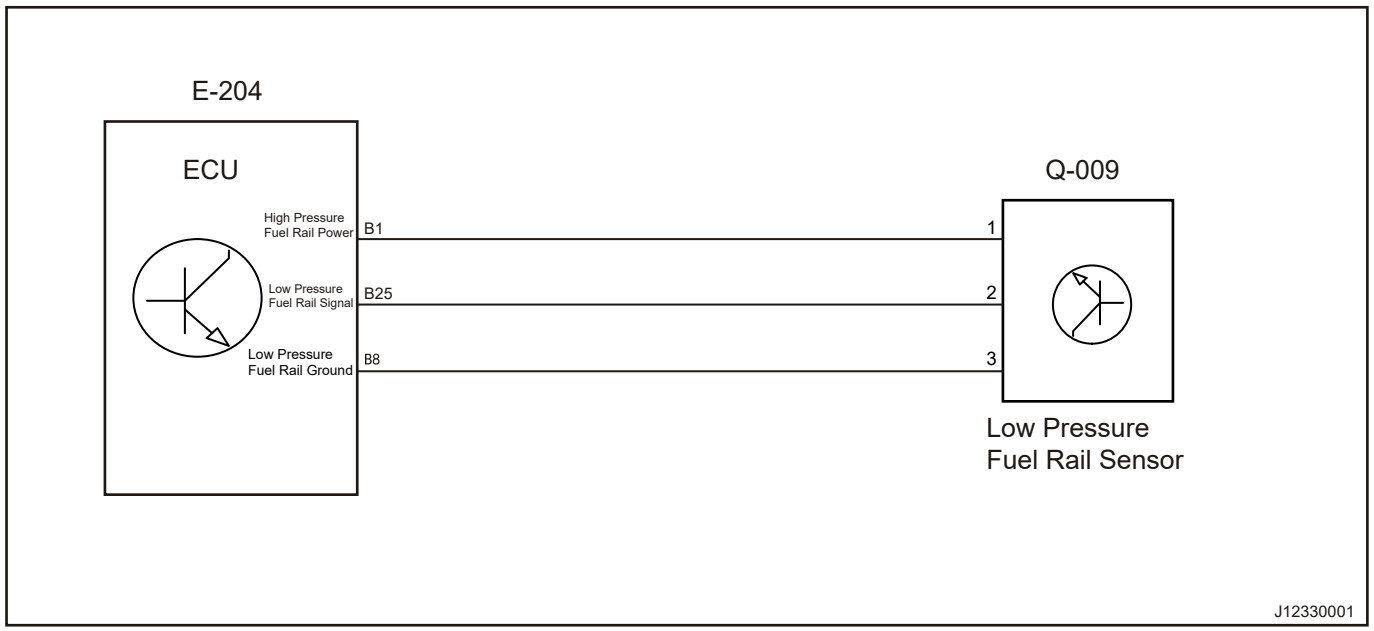
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Read A/C system DTCs and refer to A/C system diagnosis.

Low Pressure Fuel Pressure Sensor Malfunction

DTC	**P254029**	**DECOS Oil Passage Pressure Sensor Circuit Bank 1-Positive Offset**
DTC	**P254028**	**DECOS Oil Passage Pressure Sensor Circuit Bank 1-Negative Offset**
DTC	**P137000**	**DECOS Oil Passage Pressure Sensor Relative Pressure Too Low**
DTC	**P137100**	**DECOS Oil Passage Pressure Sensor Relative Pressure Too High**
DTC	**P008A00**	**DECOS Low Pressure Oil Passage Pressure Too Low**
DTC	**P008B00**	**Low Pressure Fuel System Pressure - Too High**
DTC	**P016F00**	**DECOS Low Pressure Oil Passage PWM Control Deviation Too Large**
DTC	**P016E00**	**Closed Loop Fuel Pressure Control At Limit - Pressure Too High**

Description
Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check low pressure fuel pressure sensor connector**

(a) Disconnect the negative battery.

(b) Check if low pressure fuel pressure sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check low pressure end fuel pressure**

(a) Using the fuel pressure gauge to test if low pressure end fuel pressure is met the standard.

NG → **Replace electric fuel pump assembly.**

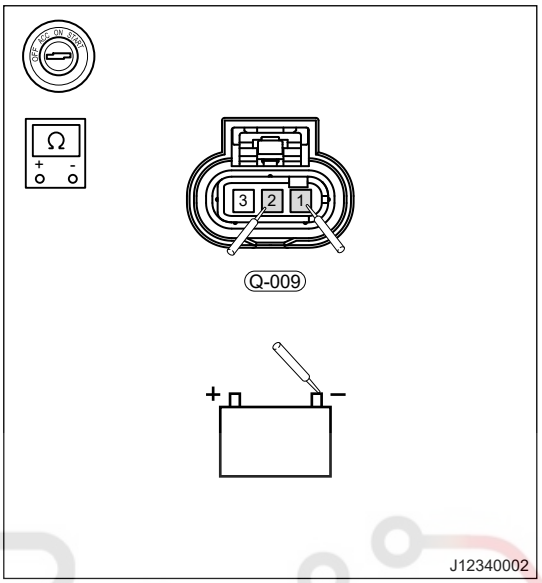
OK

3	**Check for short circuit to ground / power supply or short to each other in low pressure fuel pressure sensor**

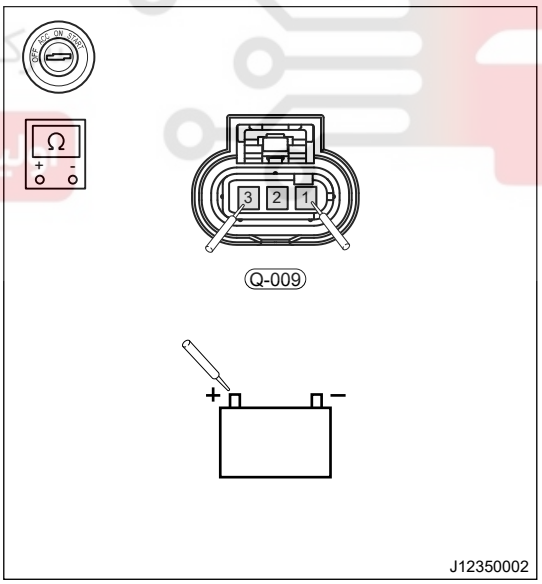
(a) Disconnect the low pressure fuel pressure sensor connector.

(b) Disconnect the ECM connector (E-204).

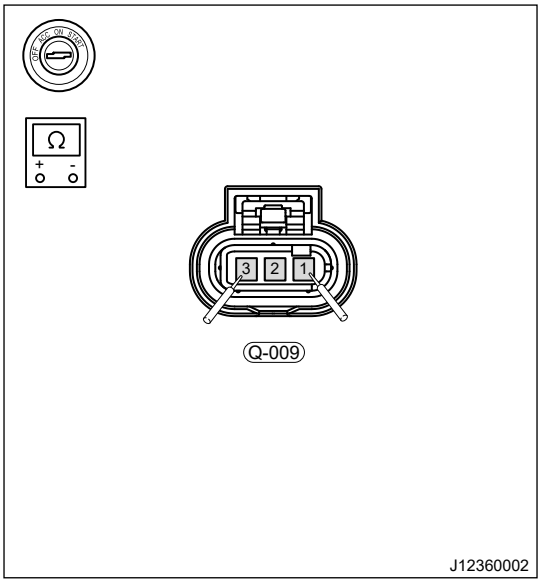
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of low pressure fuel pressure sensor Q-009 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of low pressure fuel pressure sensor Q-009 (1, 2, 3) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of low pressure fuel pressure sensor Q-009 (1, 2, 3) with red and black probes respectively. Check if circuits are shorted to each other.

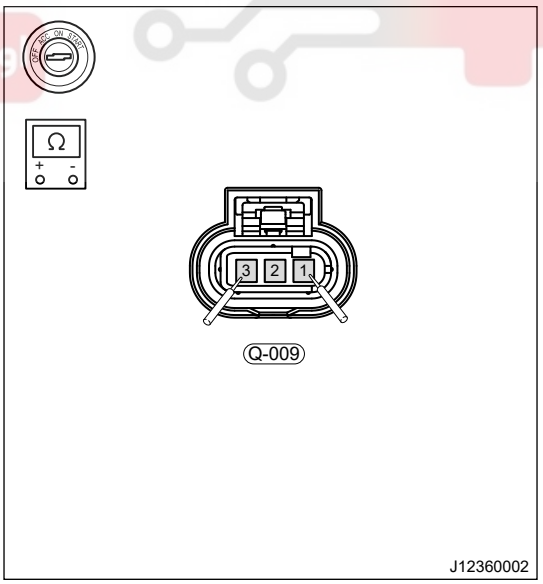


NG → **Check and repair circuit.**

OK

4	**Check if circuits of low pressure fuel pressure sensor themselves are shorted to each other or opened**

(a) Using ohm band of multimeter, measure resistances of low pressure fuel pressure sensor Q-009 (1, 2, 3) with red and black probes respectively; Check if they are shorted to each other or opened.



NG → **Replace low pressure fuel pressure sensor assembly.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

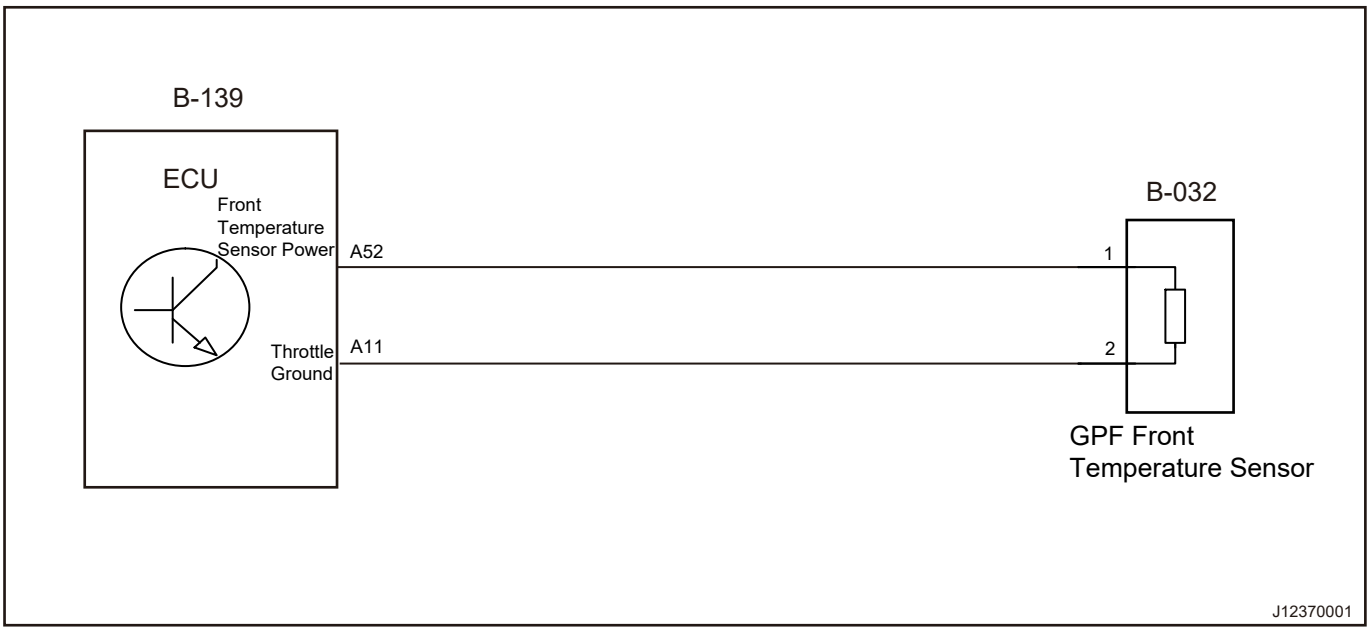
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Particulate Filter Upstream Temperature Sensor Error

DTC	P208062	Particulate Filter Upstream Temperature Sensor Signal Measured Value Unreasonable
DTC	P20802A	Particulate Filter Upstream Temperature Sensor Signal Stuck
DTC	P054500	Particulate Filter Upstream Temperature Sensor Circuit Voltage Low
DTC	P054600	Particulate Filter Upstream Temperature Sensor Circuit Voltage High
DTC	P20E224	Particulate Filter Upstream Temperature Sensor Cold Start Correction Improper (Positive Deviation)
DTC	P20E223	Particulate Filter Upstream Temperature Sensor Cold Start Correction Improper (Negative Deviation)

Description
Control Schematic Diagram



DTC Confirmation Procedure

Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

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

1	**Check GPF temperature sensor connector**

(a) Disconnect the negative battery.

(b) Check if GPF temperature sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

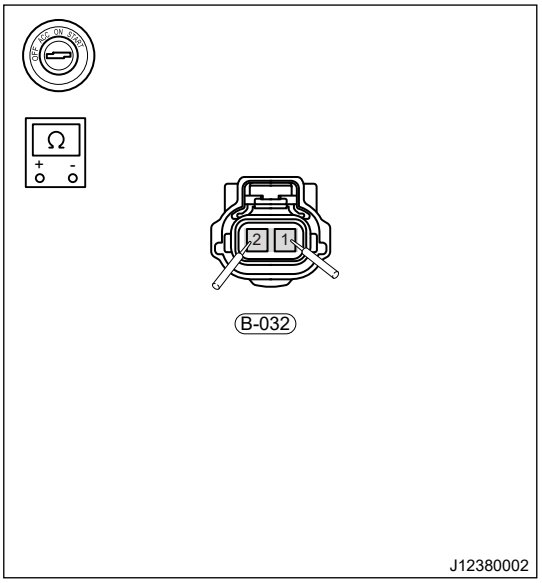
OK

2	**Check GPF temperature sensor internal resistance**

(a) Disconnect the GPF temperature sensor connector

(b) Using ohm band of multimeter, measure if resistances of GPF temperature sensor B-032 (1, 2) are normal with red and black probes respectively.

Normal resistance value at ambient temperature (10 ~ 30℃) should be: 200 ~ 230Ω.



NG → **Replace GPF temperature sensor assembly.**

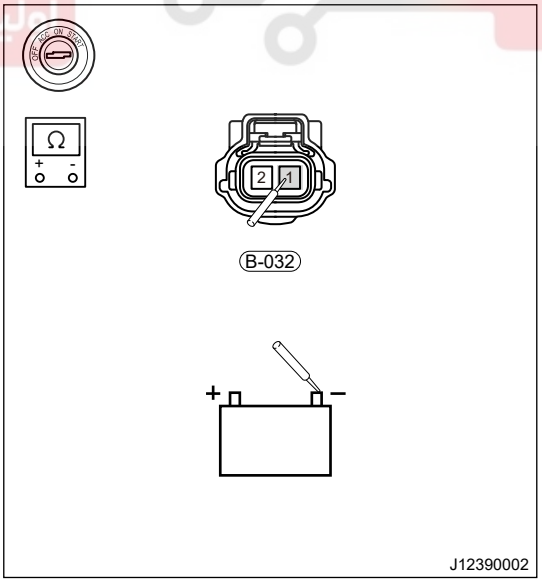
OK

3	**Check for short circuit to ground / power supply or short to each other in GPF temperature sensor circuit**

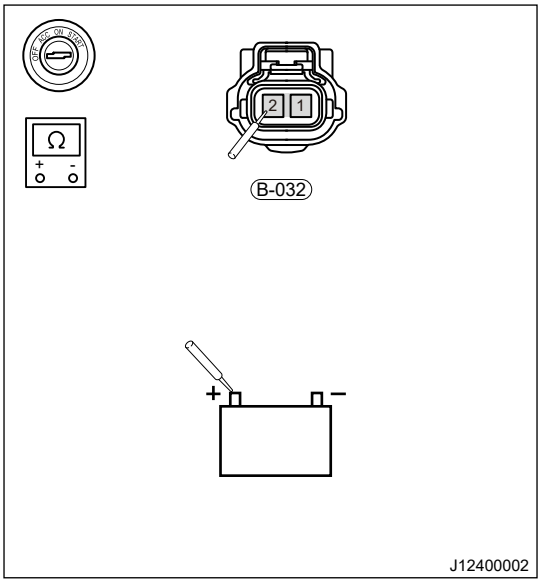
(a) Disconnect the GPF temperature sensor connector.

(b) Disconnect the ECM connector (B-139).

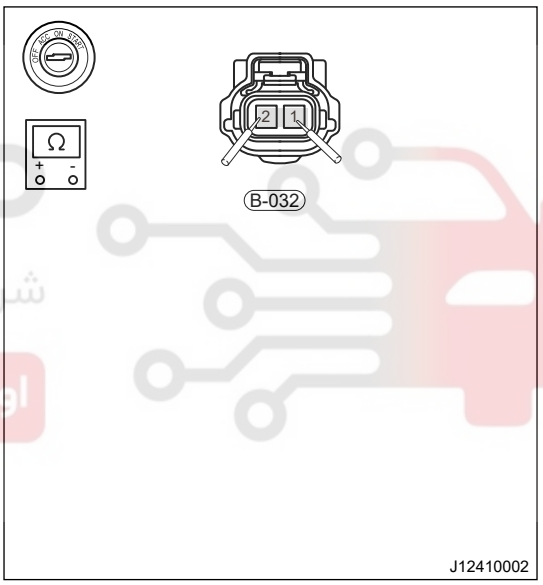
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of GPF temperature sensor B-032 (1) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of GPF temperature sensor B-032 (1, 2) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of GPF temperature sensor B-032 (1, 2) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK →

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Engine Coolant Temperature Sensor 2 Cold Start Calibration Unreasonable (Positive Deviation)/(-Negative Deviation)

DTC	**P218324**	**Engine Coolant Temperature Sensor 2 Circuit Range/ Performance**
DTC	**P218323**	**Engine Coolant Temperature Sensor 2 Circuit Range/ Performance**
DTC	**P218400**	**Engine Coolant Temperature Sensor 2 Circuit Low**
DTC	**P218500**	**Engine Coolant Temperature Sensor 2 Circuit High**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check coolant temperature sensor 2 connector**

(a) Disconnect the negative battery.
(b) Check if coolant temperature sensor 2 connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check coolant temperature sensor 2 internal resistance**

(a) Disconnect the coolant temperature sensor 2 connector

(b) Using ohm band of multimeter, measure if resistances of coolant temperature sensor 2 (1, 2) are normal with red and black probes respectively.

Rated resistance at 20°C: 2.5 KΩ ± 5%

NG → **Replace coolant temperature sensor 2 assembly.**

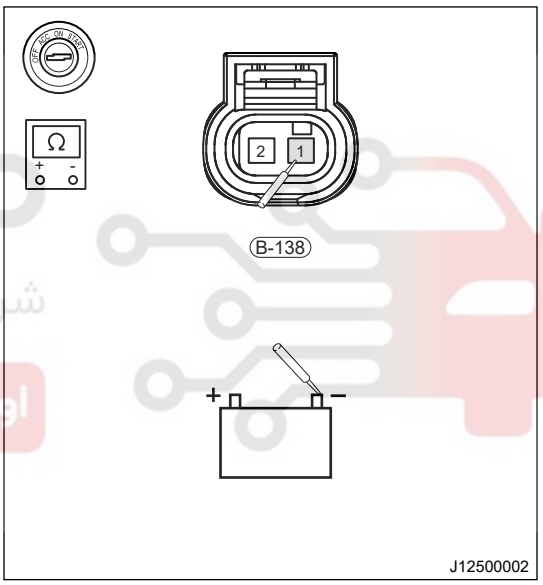
OK →

3	**Check for short circuit to ground / power supply or short to each other in coolant temperature sensor 2 circuit**

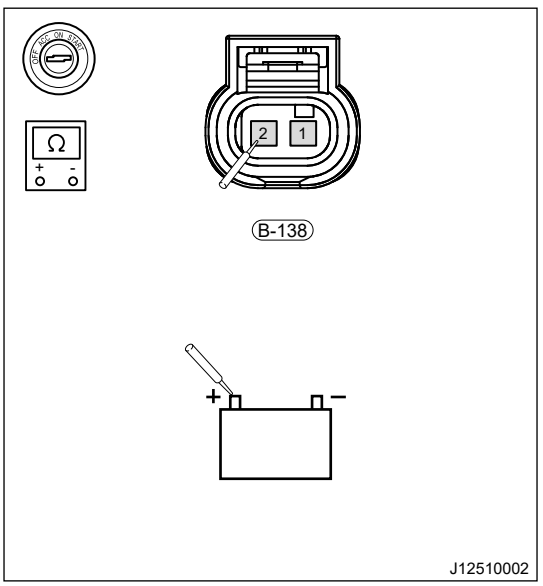
(a) Disconnect the coolant temperature sensor 2 connector.

(b) Disconnect the ECM connector (E-204).

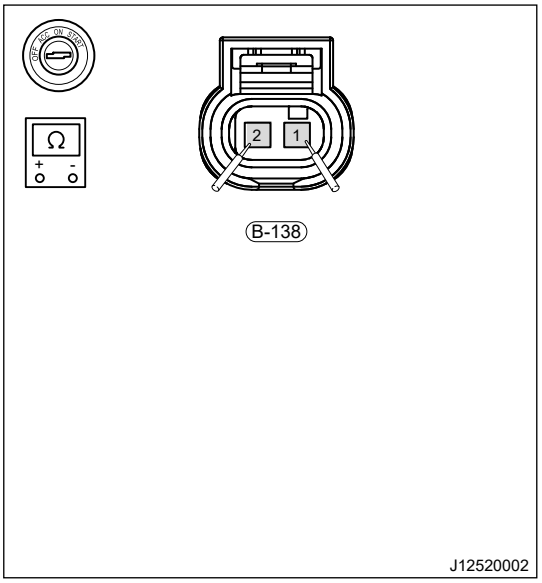
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of coolant temperature sensor 2 B-138 (1) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of coolant temperature sensor 2 B-138 (1, 2) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure the resistances of coolant temperature sensor 2 B-138 (1, 2) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

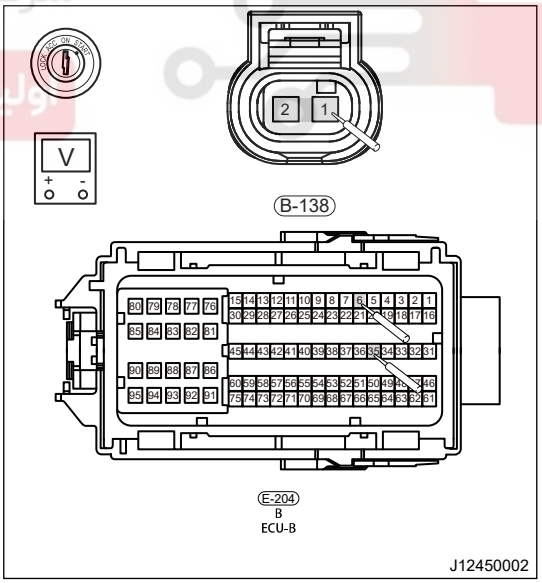
OK

4	**Check whether there is contact resistance in coolant sensor 2 circuit**

(a) Connect the coolant temperature sensor 2 and ECM connector (E-204).

(b) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-204 (6, 35), measure voltages of coolant temperature sensor 2 B-138 (1, 2) with red probe

Test voltage drop value should be less than approximately 0.2 V



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

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Particulate Filter Differential Pressure Sensor Malfunction

DTC	**P12A300**	**Particulate Filter Differential Pressure Sensor Line Connection Error**
DTC	**U060100**	**Particulate Filter Differential Pressure Sensor Sent Communication Failure**
DTC	**U060141**	**Particulate Filter Differential Pressure Sensor Data Inspection Non-plausible**
DTC	**P129300**	**Particulate Filter Differential Pressure Sensor Channel 1 Digital Signal Non-plausible (SENT Signal High or Low)**
DTC	**P245500**	**Particulate Filter Differential Pressure Sensor Circuit Voltage High**
DTC	**P245400**	**Particulate Filter Differential Pressure Sensor Circuit Voltage Low**
DTC	**P129100**	**Dynamic Response Performance of Particulate Filter Differential Pressure Sensor Non-plausible**
DTC	**P129000**	**Offset Check Value After Running Particulate Filter Differential Pressure Sensor Unreasonable**
DTC	**P12E000**	**Offset Check Value After Running Particulate Filter Differential Pressure Sensor Unreasonable**
DTC	**P12E100**	**Dynamic Response Performance of Particulate Filter Differential Pressure Sensor Non-plausible**
DTC	**P12E300**	**Particulate Filter Differential Pressure Sensor Channel 1 Digital Signal Non-plausible (SENT Signal High or Low)**

DTC	**P12A200**	**Particulate Filter Differential Pressure Sensor Line Connection Error**
DTC	**P246100**	**Particulate Filter Differential Pressure Sensor Circuit Voltage High**
DTC	**P246000**	**Particulate Filter Differential Pressure Sensor Circuit Voltage Low**
DTC	**U060200**	**Particulate Filter Differential Pressure Sensor Sent Communication Failure**
DTC	**U060241**	**Particulate Filter Differential Pressure Sensor Data Inspection Non-plausible**

Description
Control Schematic Diagram

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check GPF pressure sensor connector**

(a) Disconnect the negative battery.
(b) Check if GPF pressure sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check GPF pressure sensor connecting line**

(a) Check if GPF pressure sensor connecting line falls off or is connected incorrectly.

NG → **Adjust the connecting line.**

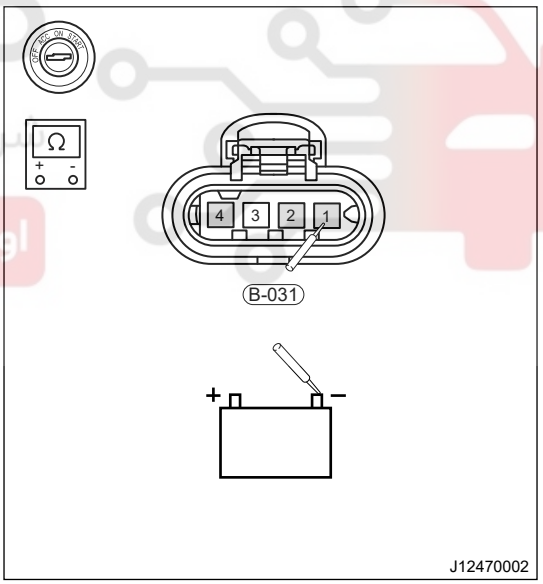
OK

3	**Check for short circuit to ground / power supply or short to each other in GPF pressure sensor circuit**

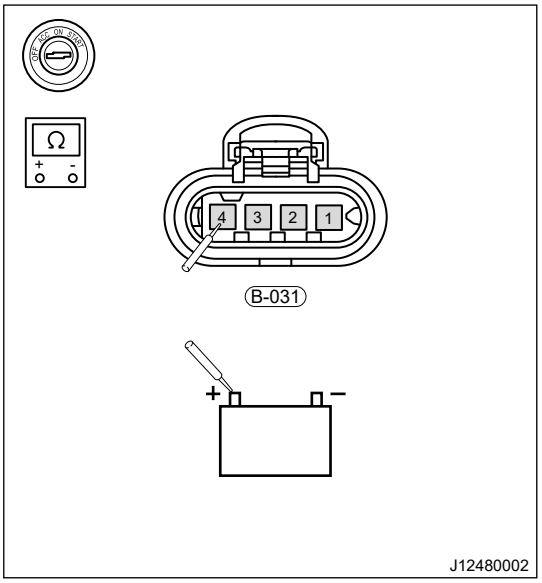
(a) Disconnect the GPF pressure sensor connector.

(b) Disconnect the ECM connector (E-204).

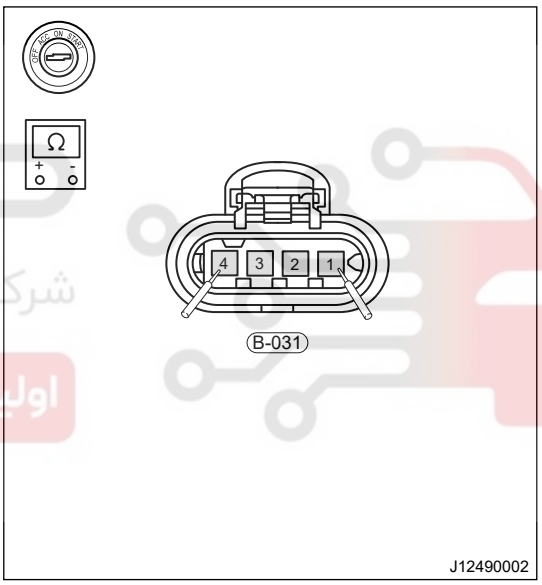
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of GPF pressure sensor B-031 (1, 2, 4) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of GPF pressure sensor B-031 (1, 2, 3, 4) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of GPF pressure sensor B-031 (1, 2, 3, 4) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK →

4	**Check if circuits of GPF pressure sensor themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of GPF pressure sensor (1, 2, 3, 4) with red and black probes respectively; Check if they are shorted to each other.

NG → **Replace GPF pressure sensor assembly.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Particulate Filter is Removed

DTC	P226D00	Particulate Filter Removed

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	Check GPF particulate filter

(a) Check if GPF particulate filter is removed.
(b) Check if GPF particulate filter is melted.

NG → **Replace GPF particulate filter.**

OK

2	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Fuel Pump Enable Control Circuit is Open/Voltage Too High/Too Low

DTC	**P025D00**	**Fuel Pump Module "A" Control Circuit High**
DTC	**P025A00**	**Fuel Pump Module "A" Control Circuit Open**
DTC	**P025C00**	**Fuel Pump Module "A" Control Circuit Low**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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

1	**Check fuel pump controller connector**

(a) Disconnect the negative battery.
(b) Check if fuel pump controller connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

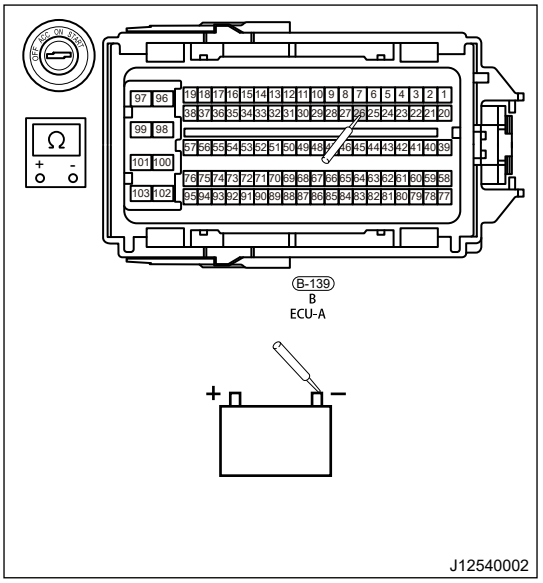
OK

2	**Check whether the fuel pump enable signal circuit is short to ground/power supply**

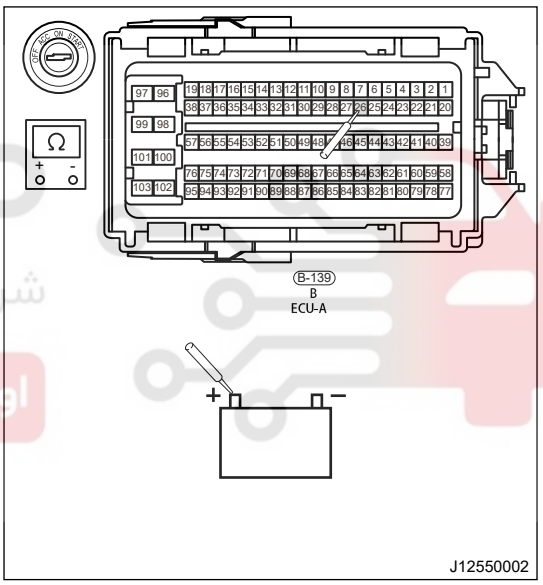
(a) Disconnect the fuel pump controller connector.

(b) Disconnect the ECM connector (B-139).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECU B-139 (26) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistance of ECM B-139 (26) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair circuit.**

OK →

3	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

4	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired**

Ambient Temperature Sensor Circuit Voltage Too Low / Too High

DTC	**P121B00**	**Front Left Wheel Speed Sensor Signal NG**
DTC	**P121C00**	**Front Right Wheel Speed Sensor Signal NG**
DTC	**P121D00**	**Rear Left Wheel Speed Sensor Signal NG**
DTC	**P121E00**	**Rear Right Wheel Speed Sensor Signal NG**

DTC Confirmation Procedure
Confirm that battery voltage is not less than 12V before performing following procedures.

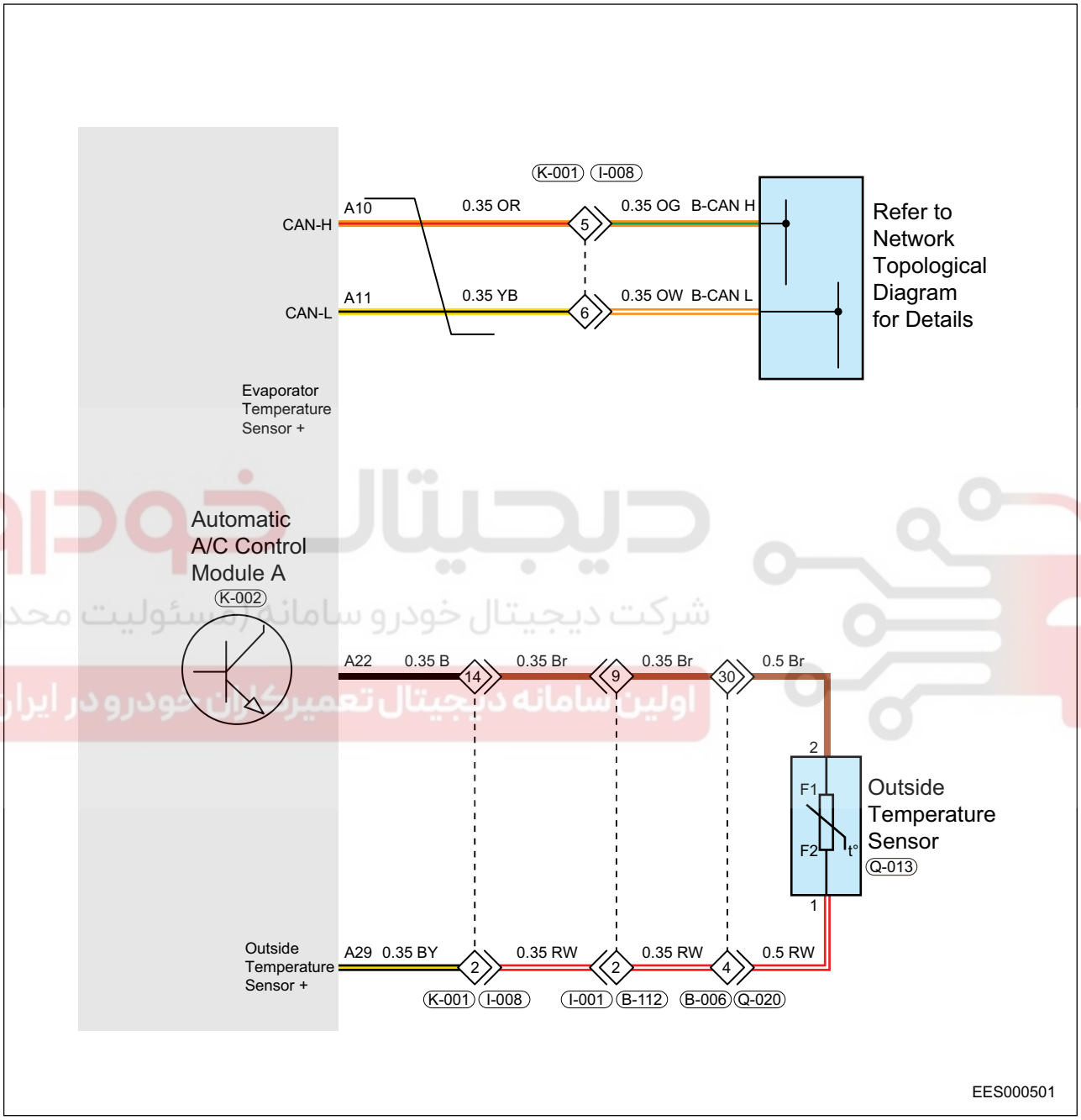
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Read brake control system DTCs and refer to brake control system diagnosis.

Diagnostic Information and Steps

DTC	P0070 00	Ambient Air Temperature Sensor Circuit "A"

Circuit Diagram



Description

DTC	DTC Definition	Possible Cause
P0070 00	Ambient Air Temperature Sensor Circuit "A"	• Ambient temperature sensor • CAN line • Automatic A/C control module

Confirmation Procedure
Confirm that battery voltage is over 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect diagnostic tester (the latest software) to diagnostic interface.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

1	**Check automatic A/C control module**

(a) Connect the diagnostic tester and enter the automatic A/C diagnostic procedure to check whether the ambient temperature sensor signal is normal. If the instrument cluster can display the outside temperature, check whether the outside temperature is normal.

NG → **Check and replace the ambient temperature sensor, automatic A/C module and related wiring harness, and check whether the software configuration code of automatic A/C module is correct**

OK

2	**Check the network communication between ECM and the automatic A/C module**

(b) Check whether ECM software configuration code is correct.

NG → **Write the correct ECM software configuration code**

OK

3	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

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

OK → **Conduct test and confirm malfunction has been repaired**

DTC	**P0483 72**	**Fan Rationality Check Error (Type 2)**

Description

DTC	DTC Definition	Possible Cause
P0483 72	Fan Rationality Check Error (type 2)	• Cooling fan power supply • Cooling fan ground • Cooling fan and related wire harnes connector

Confirmation Procedure

Confirm that battery voltage is over 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect diagnostic tester (the latest software) to diagnostic interface.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

1	**Check battery power supply voltage**

(a) Start the vehicle and use a multimeter to measure if battery power supply voltage is normal.

NG → **Check generate system**

OK ↓

2	**Check cooling fan circuit**

(b) Turn ENGINE START STOP switch to OFF.

(c) Disconnect the negative battery cable.

(d) Check that the cooling fan power supply fuse EF50 60A is installed properly and there is no poor contact.

(e) Check that the cooling fan connector is securely connected and the terminals are free of disengagement and rust.

(f) Check that the cooling fan grounding point is secure and free of rust.

NG → **Replace or repair related components**

OK ↓

3	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new cooling fan to check if fault reoccurs.**

OK	**Conduct test and confirm malfunction has been repaired**

DTC	U0164 87	Lost Communication With CLM

Description

DTC	DTC Definition	Possible Cause
U0164 87	Lost Communication With CLM	• Signal interference of additional on-board electrical equipment • ECM, ECM software configuration code • CLM, CLM software configuration code • Central network module

Confirmation Procedure

Confirm that battery voltage is over 12V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect diagnostic tester (the latest software) to diagnostic interface.
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

1	**Check CLM**

(a) Check the vehicle for additional on-board electrical appliances, and disconnect the power to the additional electrical equipment if necessary.

(b) Check CLM connector for looseness.

(c) Turn ENGINE START STOP switch to ON and connect diagnostic tester.

(d) Check whether the diagnostic tester can access the CLM diagnostic system.

NG	**Check CLM CAN network system**

OK

2	**Check CLM and ECM software configuration code**

(e) Contact Chery after-sale department to coordinate the vehicle configuration code or CLM and ECM configuration code of this vehicle.

(f) Turn ENGINE START STOP switch to ON and connect diagnostic tester.

(g) Connect the diagnostic tester to read whether the ECM and CLM configuration codes are correct.

NG	**Write the correct software configuration code**

OK

3	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

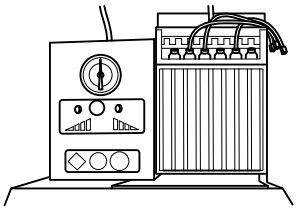
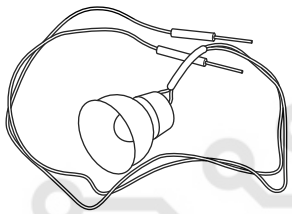
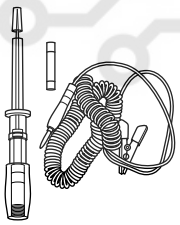
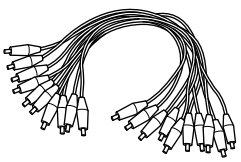
NG → **Replace with a new ECM to check if fault reoccurs**

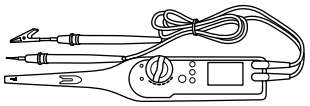
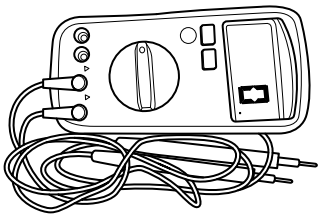
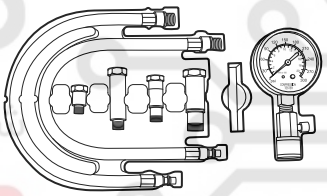
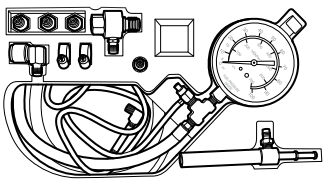
OK → **Conduct test and confirm malfunction has been repaired**

On-vehicle Service

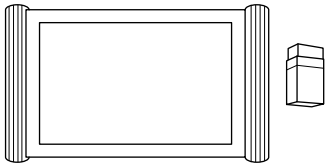
Tools

General Tools

Tool Name	Tool Drawing
Fuel Injector Cleaning Analyzer	 S00043
21 W Test Light	 S00061
LED Test Light	 S00077
Jumper Wire	 S00062

Tool Name	Tool Drawing
Diode Test Light	 S00078
Digital Multimeter	 S00002
Cylinder Pressure Gauge	 S00033
Fuel Pressure Gauge	 S00035

Special Tool

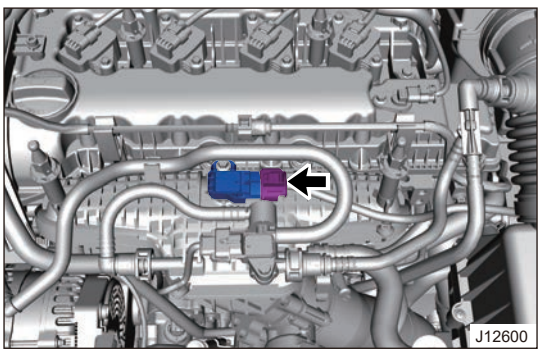
Tool Name	Tool Drawing
Diagnostic Tester	 S00001

Intake Pressure/Temperature Sensor

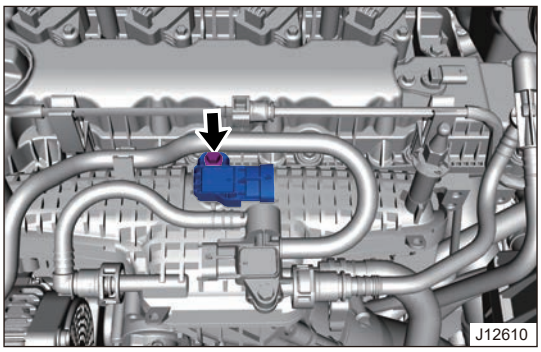
Removal

Warning
• Be sure to wear necessary safety equipment to prevent accidents, when removing intake pressure/temperature sensor. • Appropriate force should be applied when removing intake pressure/temperature sensor. Be careful not to operate roughly.

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Remove the engine compartment trim cover assembly.
3. Disconnect the negative battery cable.
4. Disconnect the intake pressure/temperature sensor connector (arrow).


J12600

5. Remove the intake pressure/temperature sensor fixing bolt (arrow) and take it out carefully.


J12610

Inspection

1. Temperature sensor part: (Remove the connector) Turn digital multimeter to ohm band, connect two probes to sensor pins 1# and 2# respectively, the rated resistance is 2.5 kΩ ± 5% at 20℃. 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.
2. Pressure sensor part: (Connect the connector) Turn digital multimeter to DC voltage band, ground the black probe, connect red probe to pins 3# and 4# respectively. Under idling status, there should be 5 V of reference voltage at pin 3#, and about 1 V of voltage at pin 4#; Under unloaded status, slowly open the throttle, the voltage of pin 4# has not changed too much; Quickly open the throttle, the voltage of pin 4# can reach about 4 V instantaneously (value changes with model), and then drops to about 1.7 V (value changes with model).

Installation

1. Install the intake pressure/temperature sensor fixing bolt.

   Torque: 6 ± 1 N·m

2. connector and intake pressure/temperature sensor connector.

Electronic Throttle

Removal

1. For details about removal methods, refer to the removal steps of electronic throttle assembly in intake system.

Inspection

1. Judgment methods for specific mechanical damage: Valve plate should be in NLP position with power off and can rotate smoothly when flipping it by hand. If stuck occurs, it indicates that internal components may be damaged.
2. Simple measurement of internal sensors: (remove the connector) Turn digital multimeter to ohm band.
   a. Connect two probes to pin IP1S and pin IPM respectively, flip valve plate by hand, and resistance should change continuously.
   b. Connect two probes to pin IP2S and pin IPM respectively, flip valve plate by hand, and resistance should change continuously.
   c. If there are conditions, you can fully close or fully open throttle body with constant current source [- fully close throttle body with 3A current (UMA), fully open throttle body with 2A current (OMA)], connect 5 V constant voltage source to pins UIP and IPM simultaneously, measure the output voltage values of IP1S and IP2S at fully close and fully open positions.

Installation

1. For details about installation methods, refer to the installation steps of electronic throttle assembly in intake system.

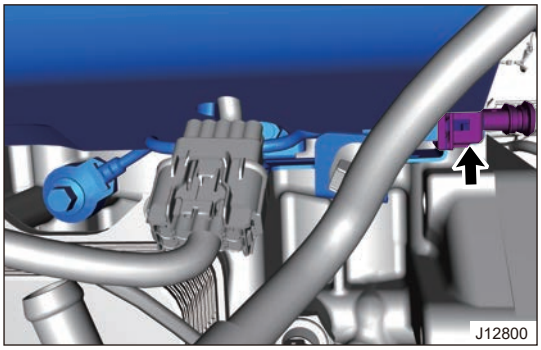
Knock Sensor

Removal

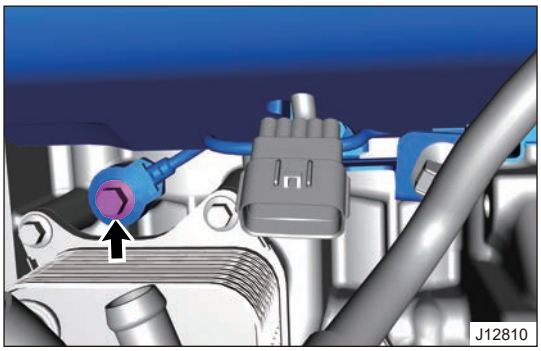
Warning
• Be sure to wear necessary safety equipment to prevent accidents, when removing knock sensor. • Appropriate force should be applied when removing knock sensor. Be careful not to operate roughly.

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Remove the engine compartment trim cover assembly.
3. Disconnect the negative battery cable.
4. Remove the intake hose assembly.

5. Disconnect the knock sensor connector (arrow).



6. Remove the knock sensor fixing bolt (arrow) and take it out carefully.



Inspection

1. Simple measurement method:(Remove the connector) Turn digital multimeter to ohm band, connect two probes to the pins of sensor type knock sensor 1#, 2# or cable type knock sensor 1#, 2#, and their resistance value at normal temperature should be (4.9±20%) MW. Turn digital multimeter to mV band, use a small hammer to tap near knock sensor, there should be output a voltage signal.

Installation

Caution
• 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. • When wiring the sensor signal cable, you should pay attention not to make the signal cable resonate, so as not to break.

1. Install the knock sensor fixing bolt.

   Torque: 20 ± 5 N·m

2. Connect the knock sensor connector.

Coolant Temperature Sensor

Removal

1. For details about removal methods, refer to removal steps of coolant temperature sensor assembly in cooling system.

Inspection

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.	Rated resistance is 2.5 kΩ ± 10% at 20℃. Measurement can also be performed by simulating. Specifically, the working area of sensor is placed in 100℃ of boiled water (note that the soaking time must be sufficient), and observe the changes of sensor resistance. At this time, the resistance should drop to 170 Ω~200Ω.	Yes	Next
			No	Replace coolant temperature sensor
2	Connect coolant temperature sensor wire harness connector, turn ignition switch to ON, measure the voltage between two pins of coolant temperature sensor wire harness.	5 ± 0.5 V	Yes	Diagnostic help
			/	Check for continuity and ground of wire harness

Installation

1. For details about installation methods, refer to installation steps of coolant temperature sensor assembly in cooling system.

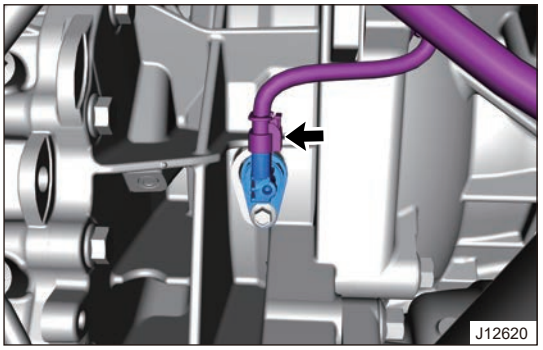
Speed Sensor

Removal

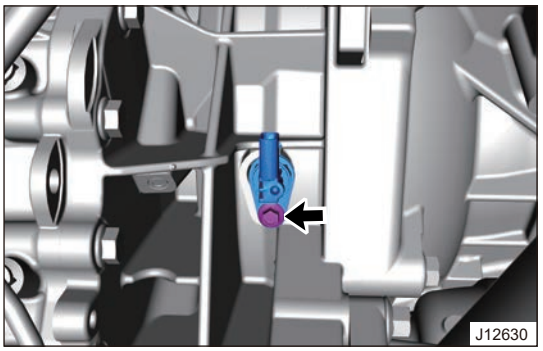
Warning
• Be sure to wear necessary safety equipment to prevent accidents, when removing speed sensor. • Appropriate force should be applied when removing speed sensor. Be careful not to operate roughly.

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Remove the engine compartment trim cover assembly.
3. Disconnect the negative battery cable.

4. Disconnect the speed sensor connector (arrow).



5. Remove the speed sensor fixing bolt (arrow) and take it out carefully.



Inspection

1. Simple measurement method: (Remove the connector) Turn LCR meter to ohm band (in-line mode, test frequency is 10 kHz), connect two probes to sensor connector terminals 1 and 3, rated resistance is 33 Ω ± 20%; Turn LCR meter to capacitance band (in-parallel mode, est frequency is 1 kHz), connect two probes to sensor connector terminals 1 and 3, rated capacitance is 100 nF ± 20%;Turn LCR meter to capacitance band (in-parallel mode, est frequency is 1 kHz), connect two probes to sensor connector terminals 2 and 3, rated capacitance is 4.7 nF ± 20%.

Installation

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).

1. Install the speed sensor fixing bolt.

   Torque: 7 ± 1 N·m

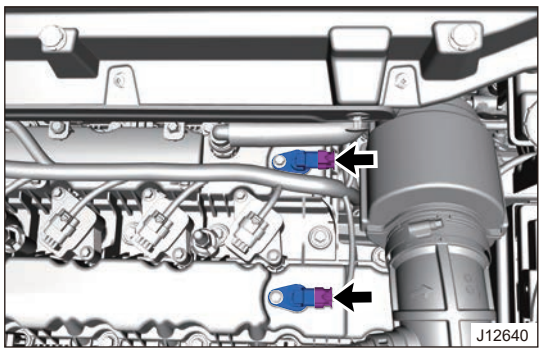
2. Connect the speed sensor connector.

Camshaft Position Sensor

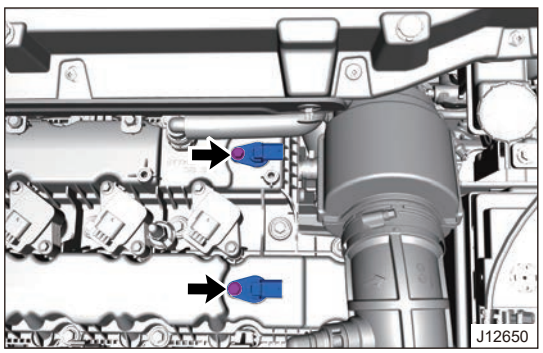
Removal

Warning
• Be sure to wear necessary safety equipment to prevent accidents, when removing camshaft position sensor. • Appropriate force should be applied when removing camshaft position sensor. Be careful not to operate roughly.

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Remove the engine compartment trim cover assembly.
3. Disconnect the negative battery cable.
4. Disconnect the intake/exhaust phaser sensor connectors (arrow).



5. Remove the intake/exhaust phaser sensor fixing bolts (-arrow) and take them out carefully.



Installation

Caution
• 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).

1. Install the intake/exhaust phaser sensor fixing bolts.

   Torque: 8 ± 3 N·m

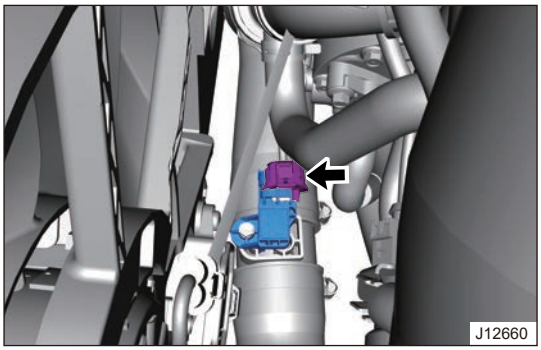
2. Connect the phaser sensor connector.

Boost pressure/temperature sensor

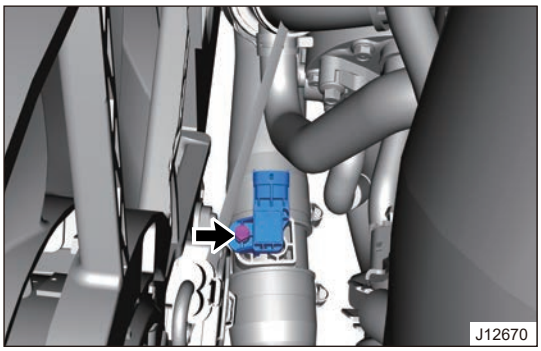
Removal

Warning
• Be sure to wear necessary safety equipment to prevent accidents, when removing boost pressure/temperature sensor. • Appropriate force should be applied when removing boost pressure/temperature sensor. Be careful not to operate roughly.

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Remove the engine compartment trim cover assembly.
3. Disconnect the negative battery cable.
4. Disconnect the boost pressure/temperature sensor connector (arrow).



5. Remove the boost pressure/temperature sensor fixing bolt (arrow) and take it out carefully.



Installation

1. Install the boost pressure/temperature sensor fixing bolt.

   Torque: 9 ± 1.5 N·m

2. Connect the boost pressure/temperature sensor connector.

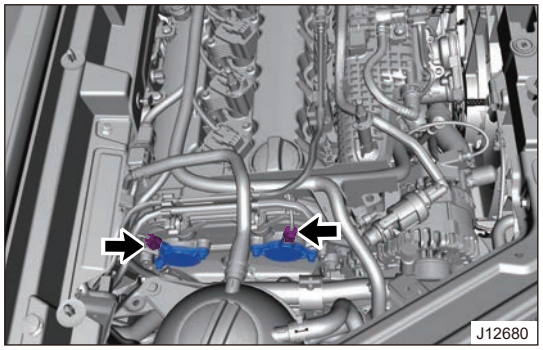
VVT Control Valve

Removal

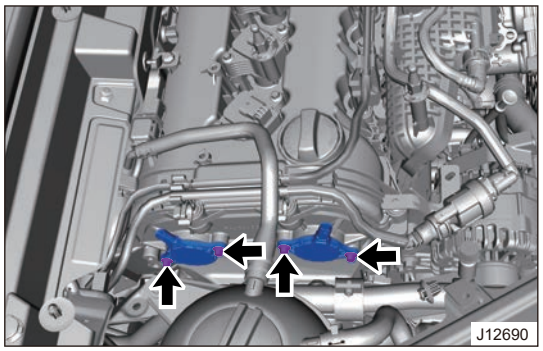
Warning
• Be sure to wear safety equipment to prevent accidents, when removing VVT control valve. • Appropriate force should be applied, when removing VVT control valve. Be careful not to operate roughly.

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Remove the engine compartment trim cover assembly.
3. Disconnect the negative battery cable.

4. Disconnect the intake/exhaust VVT control valve connectors (arrow).



5. Remove the intake/exhaust VVT control valve fixing bolts (arrow) respectively and take them out carefully.



Inspection

Step	Operation	Test Value	Test Result	Subsequent Step
1	Remove VVT control valve wire harness connector, use a multimeter to measure if resistance between two terminals of sensor is normal.	Resistance at ambient temperature: 6 Ω	Yes	Next
			No	Replace VVT control valve
2	Remove VVT control valve, and check for foreign matter stuck or internal leakage.	/	Yes	Replace VVT control valve
			No	Diagnostic help

Installation

Caution
• Control valve 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).

1. Install the intake/exhaust VVT control valve fixing bolt.
2. Connect the intake/exhaust VVT control valve connector.

Fuel Rail Injector

Removal

1. For details about removal methods, refer to removal steps of fuel rail injector assembly in fuel system.

Inspection

1. Simple measurement method: (Remove the connector) Turn digital multimeter to ohm band, connect two probes to two terminals of fuel injector respectively, the rated resistance is 1.83 Ω at 20℃.

Installation

1. For details about installation methods, refer to installation steps of fuel rail injector assembly in fuel system.

High Pressure Fuel Rail Pressure Sensor

Removal

1. For details about removal methods, refer to removal steps of high pressure fuel rail pressure sensor assembly in fuel system.

Inspection

1. Simple measurement method: Remove the sensor, connect 5 V power supply at normal temperature and atmospheric pressure, pressure signal output is 0.500 ± 0.048 V at this time.

Installation

1. For details about installation methods, refer to installation steps of high pressure fuel rail pressure sensor in fuel system.

Canister control valve

Removal

1. For details about removal methods, refer to removal steps of canister control valve assembly in fuel system.

Inspection

1. Simple measurement method: (Remove the connector) Turn digital multimeter to ohm band, connect two probes to two terminals of canister control valve respectively, resistance is 14~ 18 Ω at 20℃. Replace it if the resistance does not meet the specification.

Installation

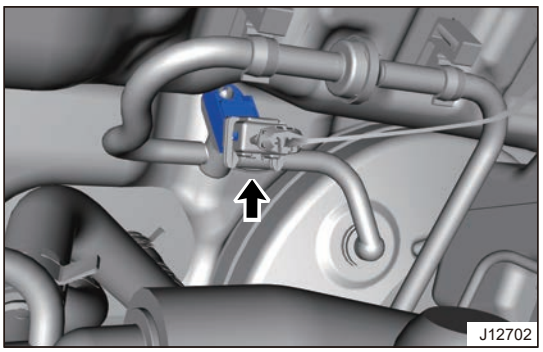
1. For details about installation methods, refer to installation steps of canister control valve assembly in fuel system.

Brake Vacuum Pressure Sensor

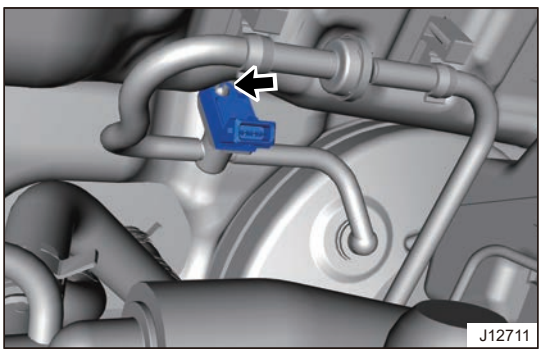
Removal

Warning
• Be sure to wear necessary safety equipment to prevent accidents, when removing brake vacuum pressure sensor. • Appropriate force should be applied when removing brake vacuum pressure sensor. Be careful not to operate roughly.

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Remove the engine compartment trim cover assembly.
3. Disconnect the negative battery cable.
4. Disconnect the brake vacuum pressure sensor connector (arrow).



5. Press brake vacuum pressure sensor fixed clamping area and take out sensor (arrow) carefully.



Inspection

1. Simple measurement method: (Remove the connector) Turn digital multimeter to ohm band, you can perform the following simple measurements respectively:
   a. Connect two probes to sensor pins 1# and 2# respectively, the resistance is 1 kΩ ~ 2 kΩ at normal temperature. There may be short or open circuit in power supply circuit if the resistance is abnormal;
   b. Connect two probes to sensor pins 1# and 3# respectively, the resistance is 1 kΩ ~ 2 kΩ at normal temperature. There may be short or open circuit in output circuit if the resistance is abnormal.

Installation

Caution
• 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. • Press sensor detecting sleeve into installation hole manually during installation, and do not install sensor with striking tool.

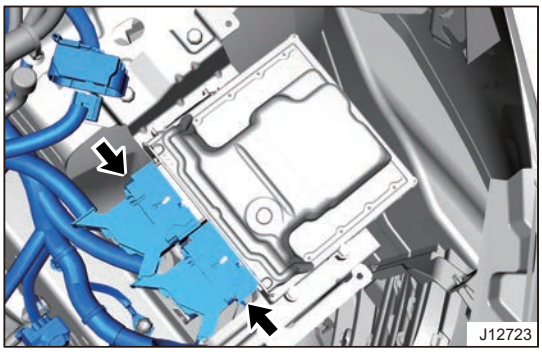
1. Insert the brake vacuum pressure sensor into installation hole carefully, and make sure that fixing clip has been fully clamped.
2. Connect the brake vacuum pressure sensor connector.

Engine Control Unit (ECU)

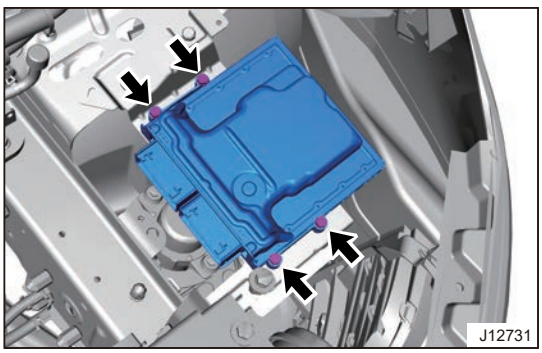
Removal

Warning
• Be sure to wear safety equipment to prevent accidents, when removing engine control unit. • Appropriate force should be applied, when removing engine control unit. Be careful not to operate roughly.

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Remove the engine compartment trim cover assembly.
3. Disconnect the negative battery cable.
4. Remove the air filter assembly.
5. Disconnect the engine control module connectors (arrow).



6. Removal 4 fixing bolts (arrow) from engine control module, and take out engine control module assembly carefully.



Inspection

1. Simple measurement method: 1. (Connect the connector) Use engine data CAN line to read engine trouble records; 2. (Remove the connector) Check if ECM connecting wire is in good condition,

focusing on if ECM power supply and ground line are normal; 3. Check if the external sensor is operating properly, output signal is reliable and its circuit is in good condition; 4. Check if the actuator is operating properly and its circuit is in good condition; 5. Finally replace ECM and perform test.

Installation

Caution
• Pay attention to static electricity protection during installation; Pay attention to the protection of the connector pin.

1. Install 4 fixing bolts to engine control unit mounting bracket.

   Torque: 8 ± 2 N·m

2. Install 4 fixing bolts to engine control unit.

   Torque: 8 ± 2 N·m

3. Connect the engine control unit connector.

Matching Learning

Self-diagnostic

1. Mainly include: read DTC, clear DTC; freeze frame, DTC extended information, DTC failure type (DTC low byte).

System Parameter Display - Data Flow Collection Based On CAN UDS Protocol

1. Mainly include: Coolant temperature, intake temperature, intake pressure, boost, 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.

System Condition

1. 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.

Actuator Test

1. Mainly include: Canister control valve control, fuel pump relay control, cooling fan control, electronic throttle control, PWM fan control, DVE self-learning, DVE first self-learning, conventional idle control, high speed idle control, CVO self-learning test.

System Initialization Reset (Adaptive Reset)

1. After the engine stalling, initialization command is sent and system resets the previous self-adaption. The functions involved are: VVT learning, anti-theft learning after-sales, EBS battery data reading and writing, and command to replace GPF.

Odometer

1. Mainly include: Display of vehicle driving distance and driving time.

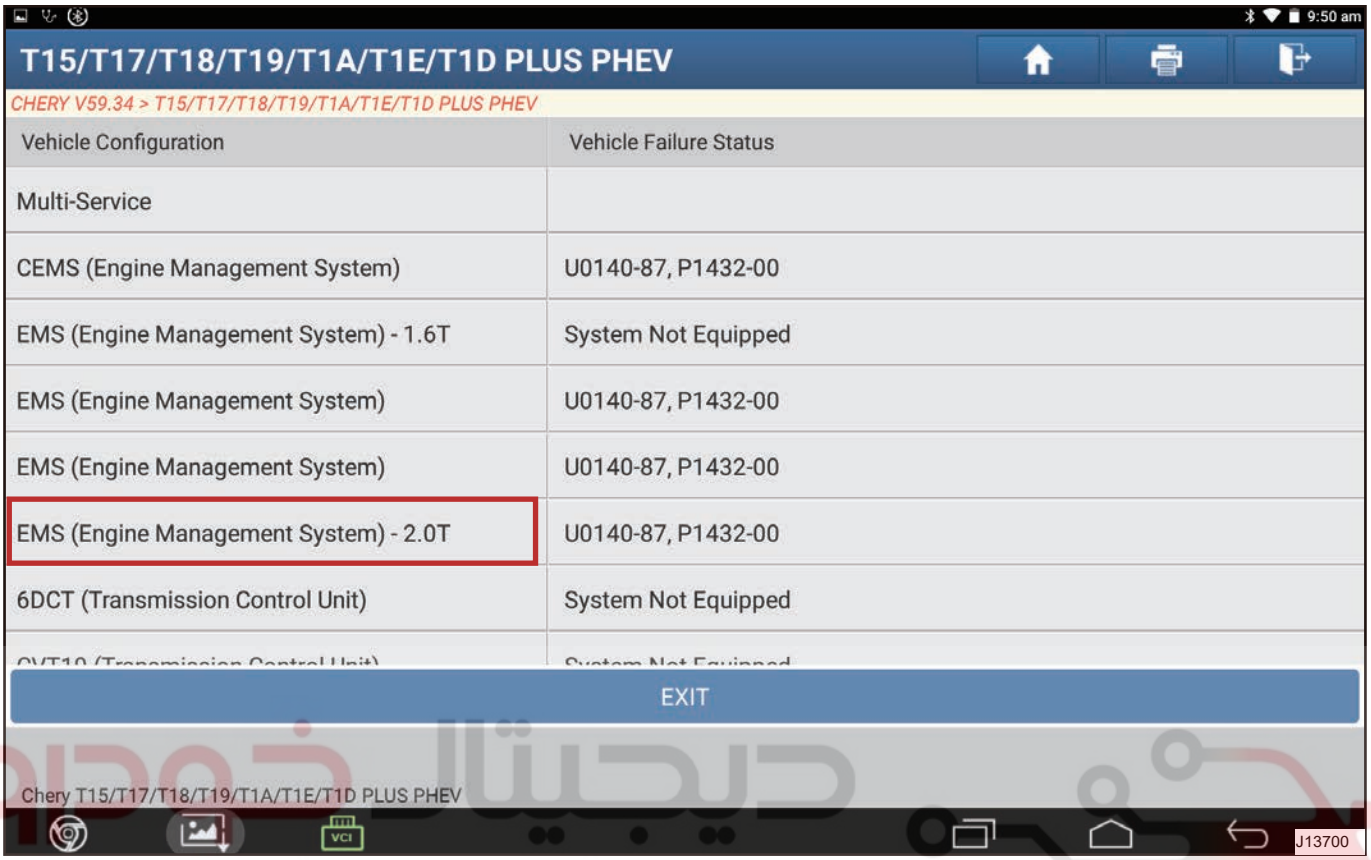
Version Information

1. Mainly include: Display of vehicle identification number (VIN), ECM hardware number, ECM software number.

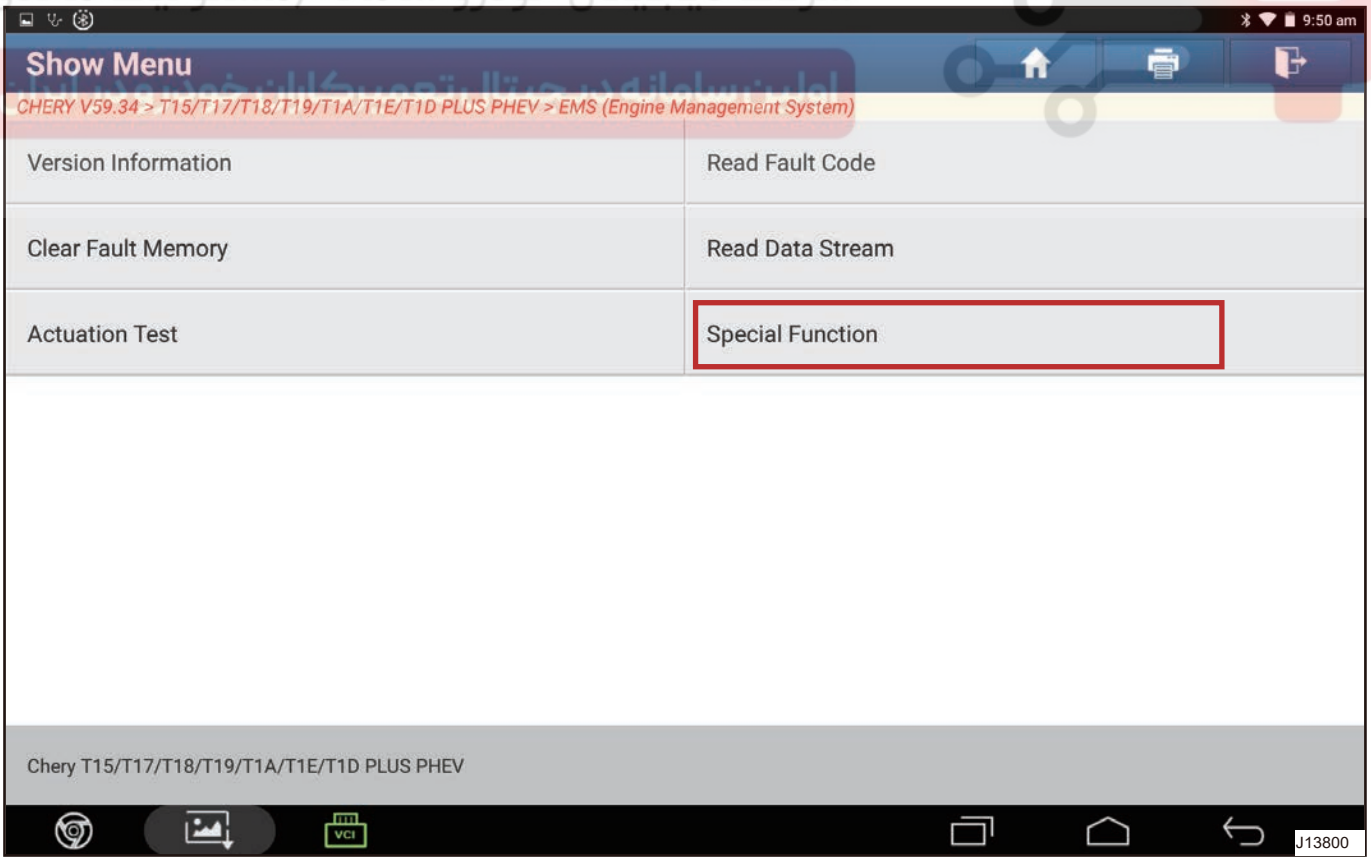
Writing VIN Code Manually

1. Connect diagnostic tester, and select Tiggo8 pro model

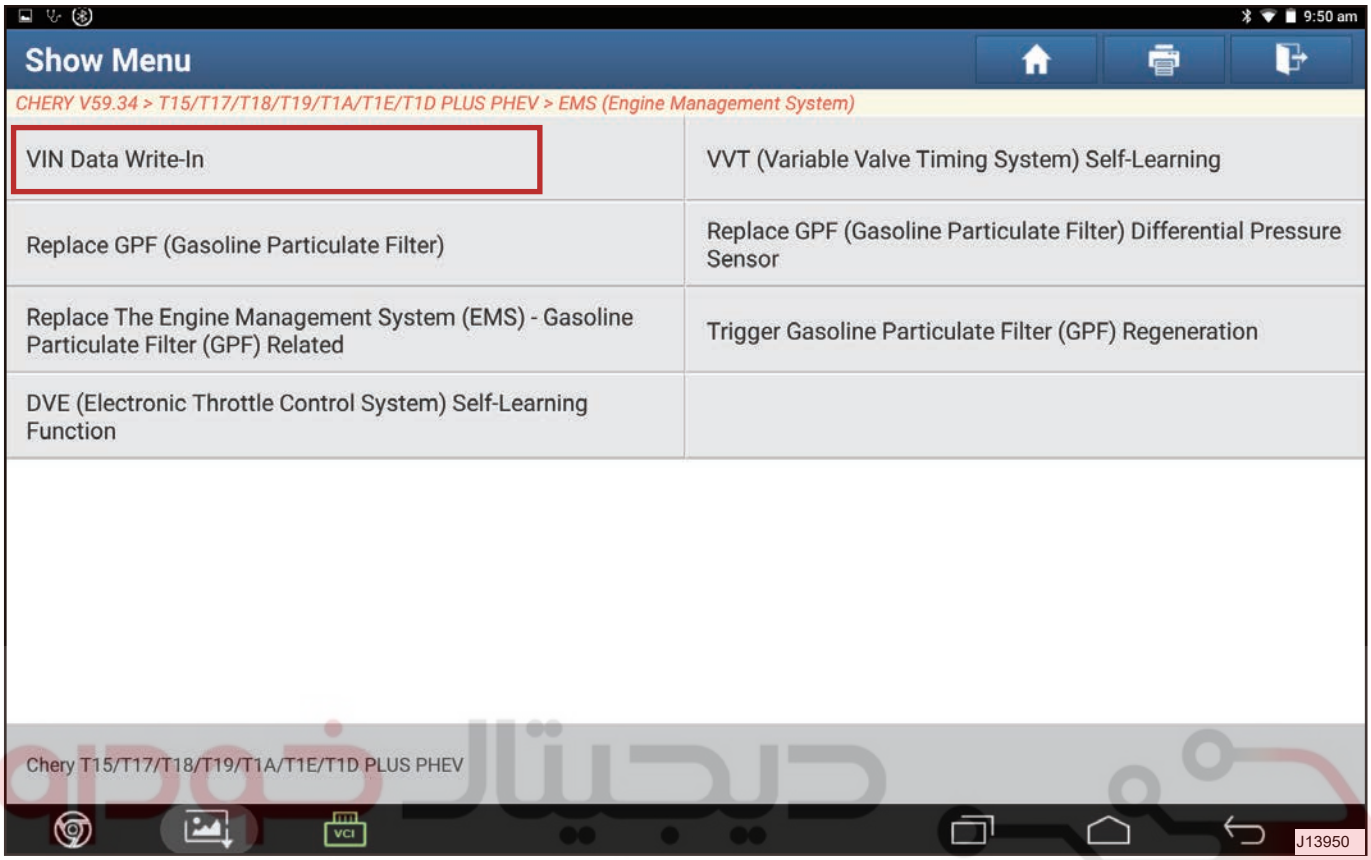
2. Click “EMS (Engine Control System)”



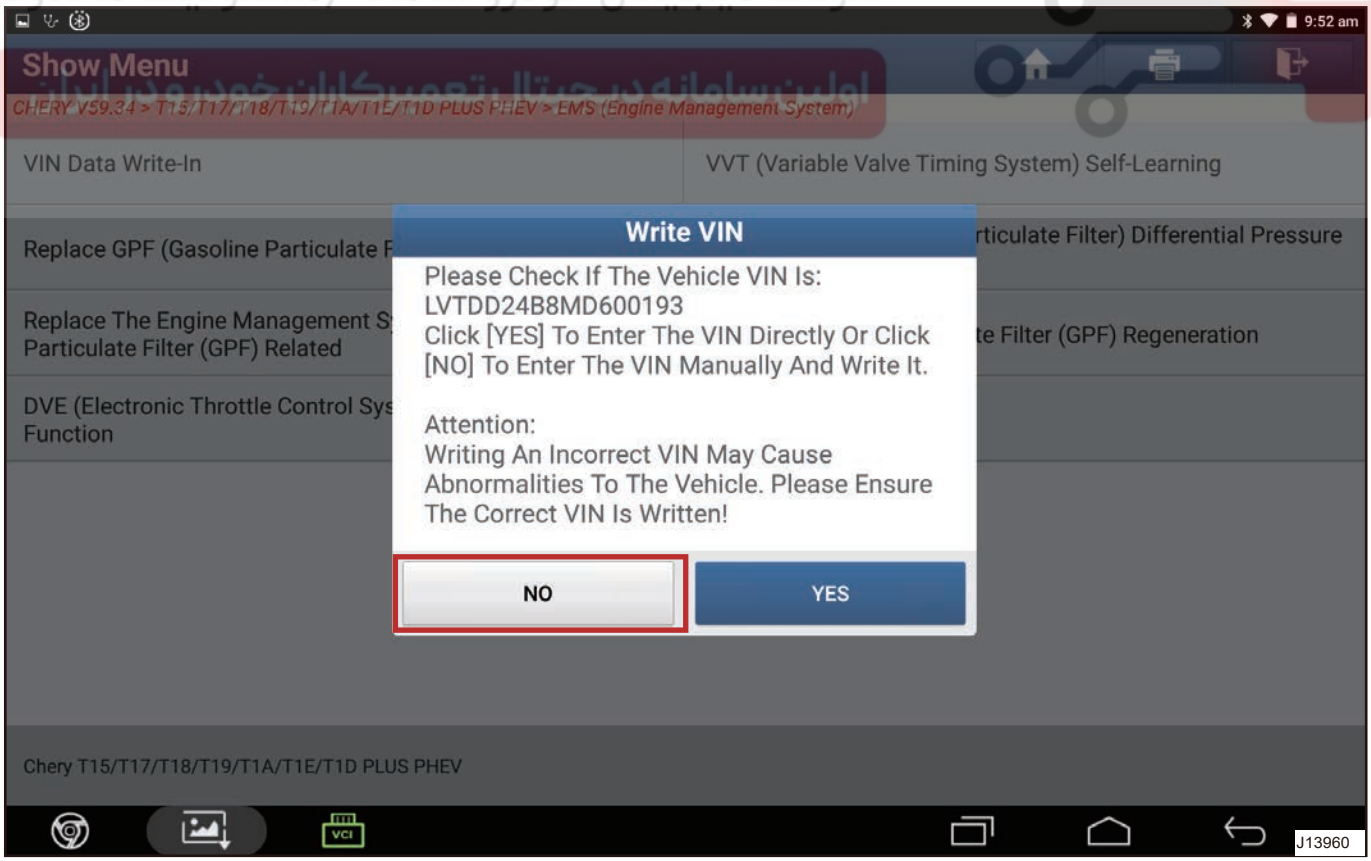
3. Click and select “Special Function”.



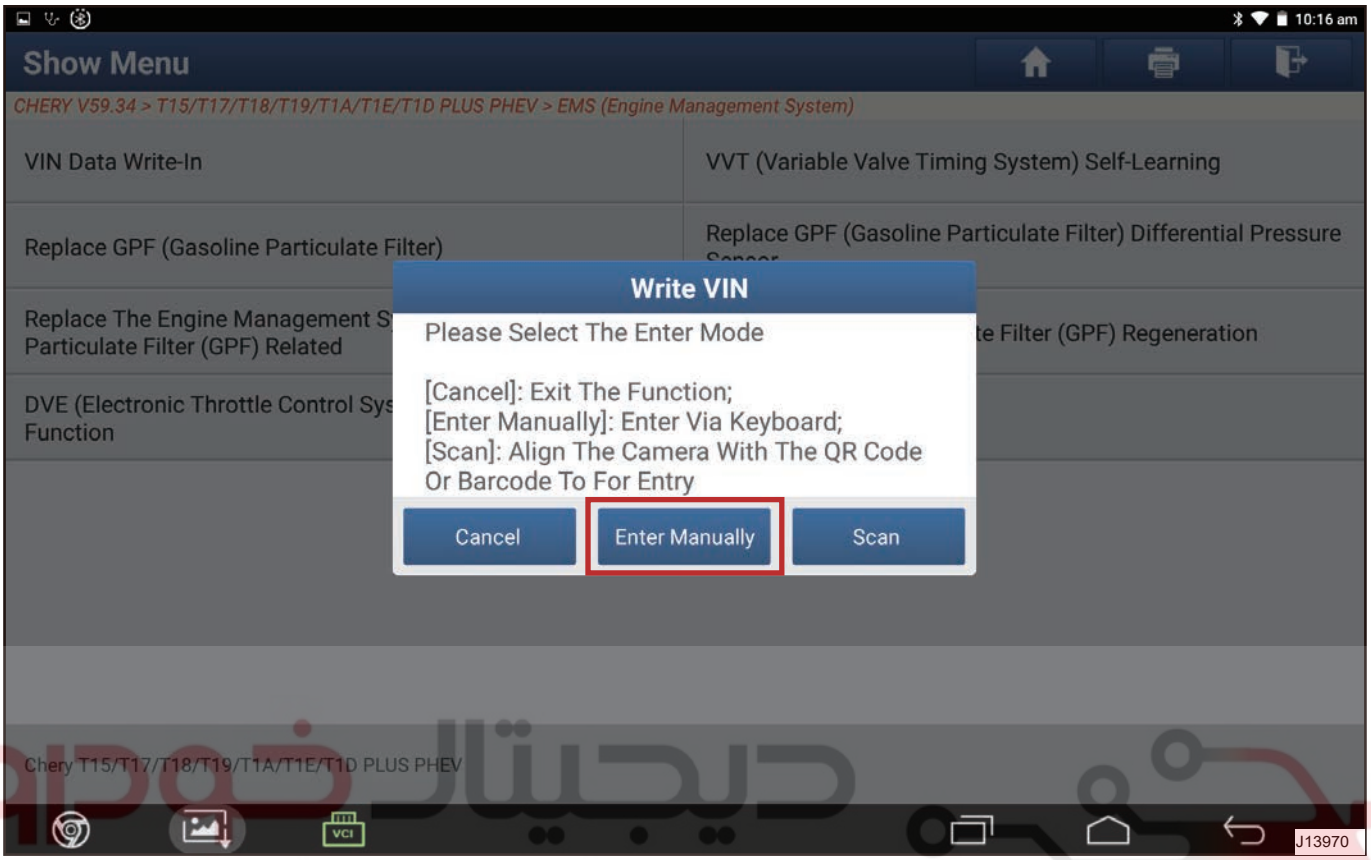
4. Click and select “Writing VIN Code”.



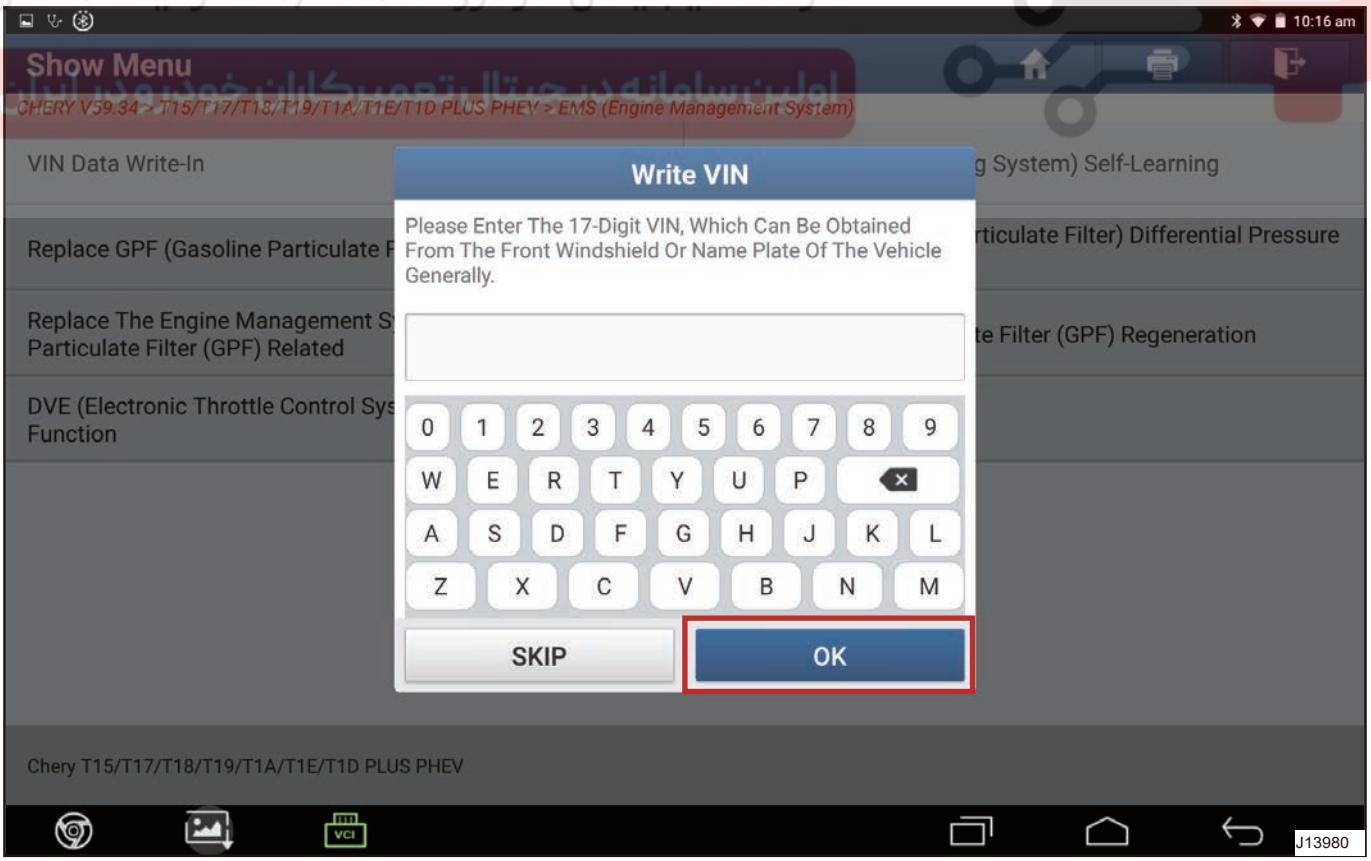
5. Click and select “Whether to enter manually” and select “No”.



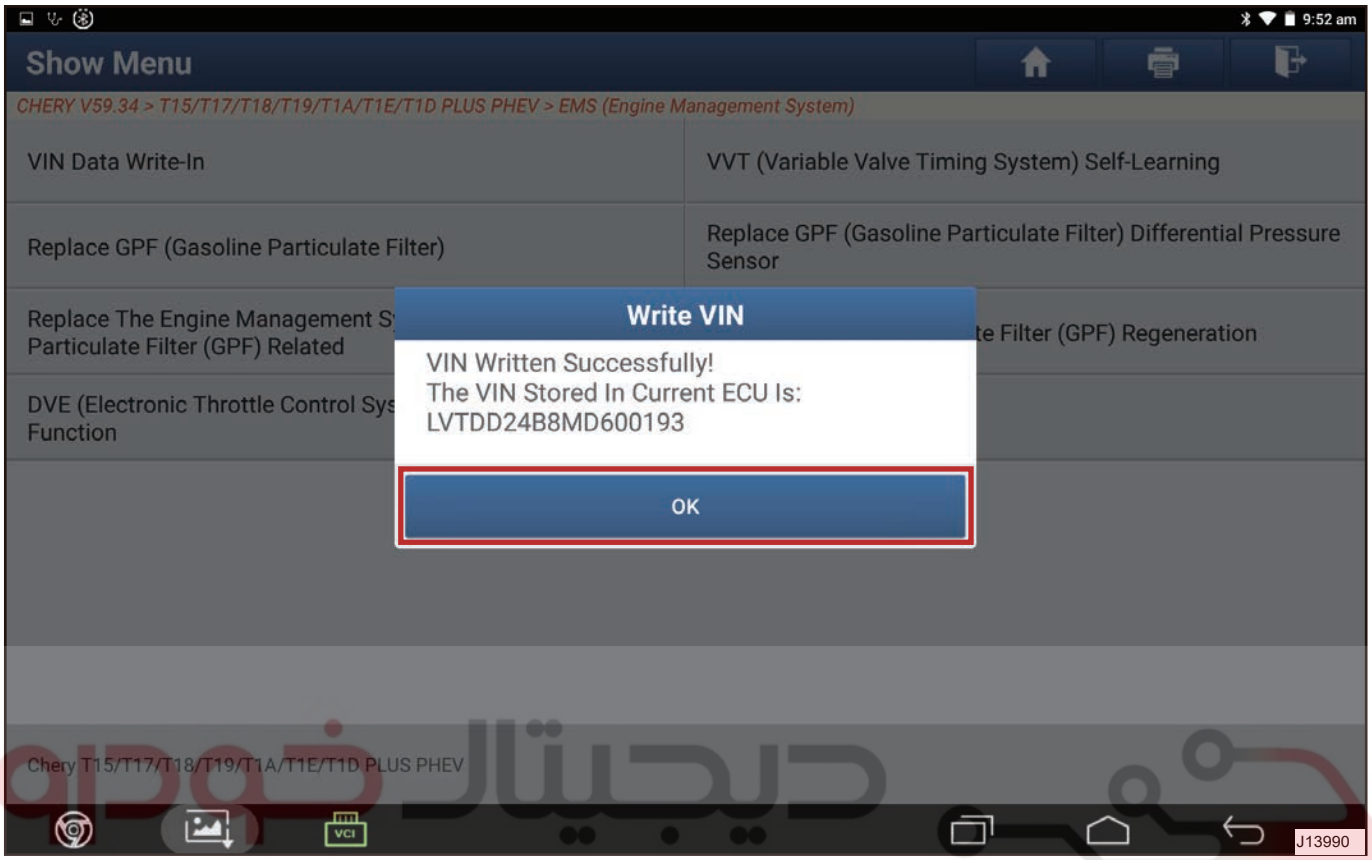
6. Click and select “Enter Manually”.



7. Input 17-digit VIN code, and click “OK”.



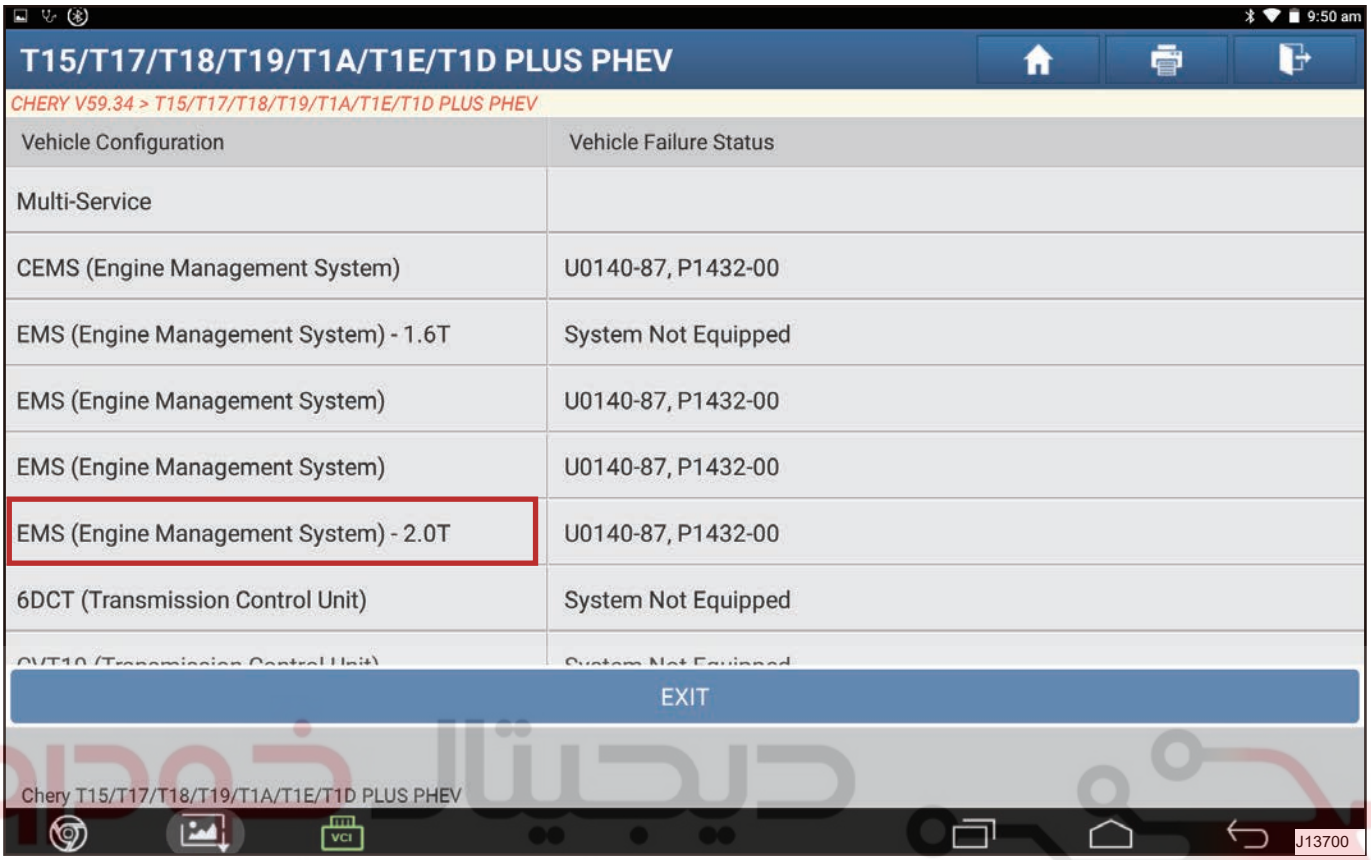
8. Display shows that VIN has been written, click "OK".



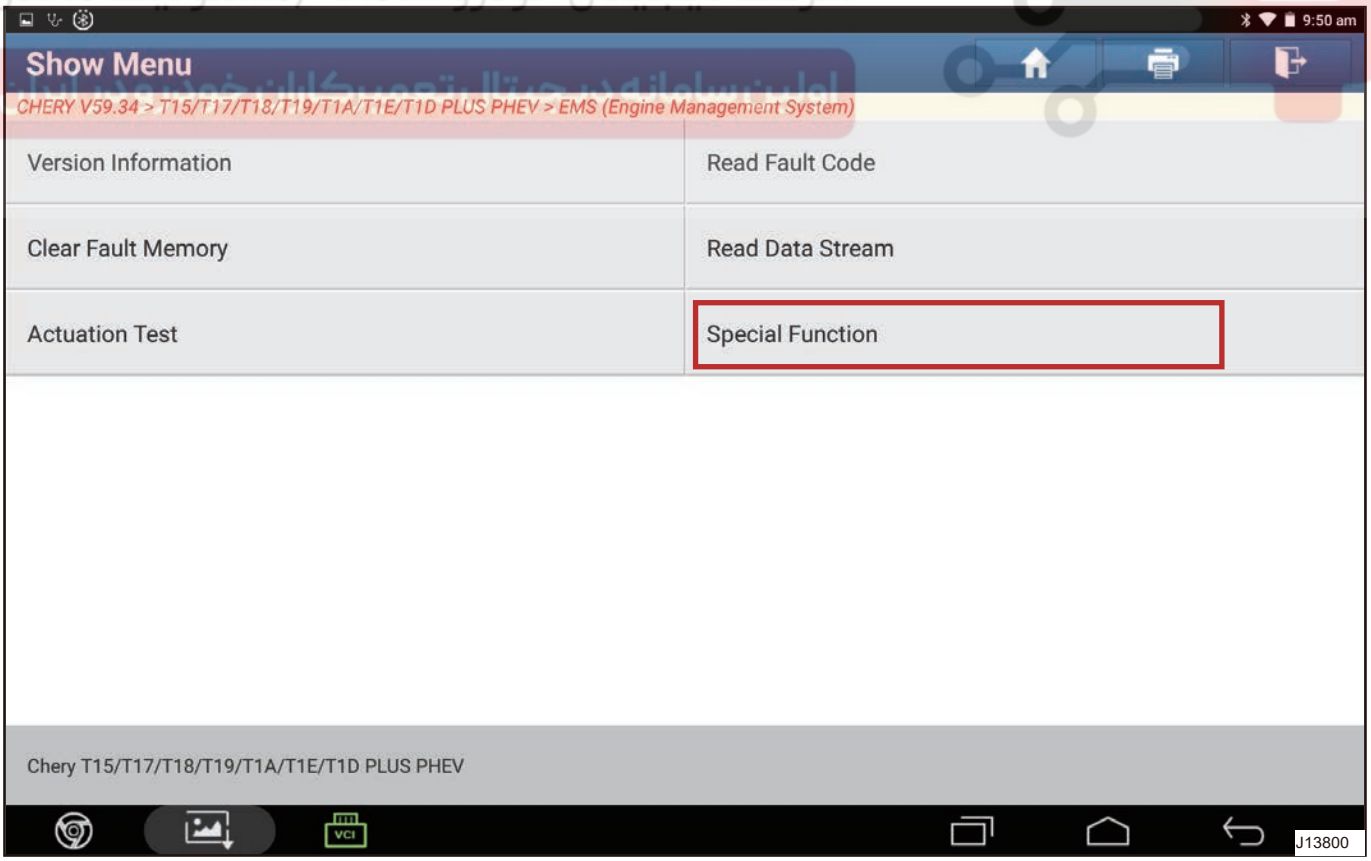
VVT (Variable Valve Timing System) Position Learning

1. Connect diagnostic tester, and select Tiggo8 pro model

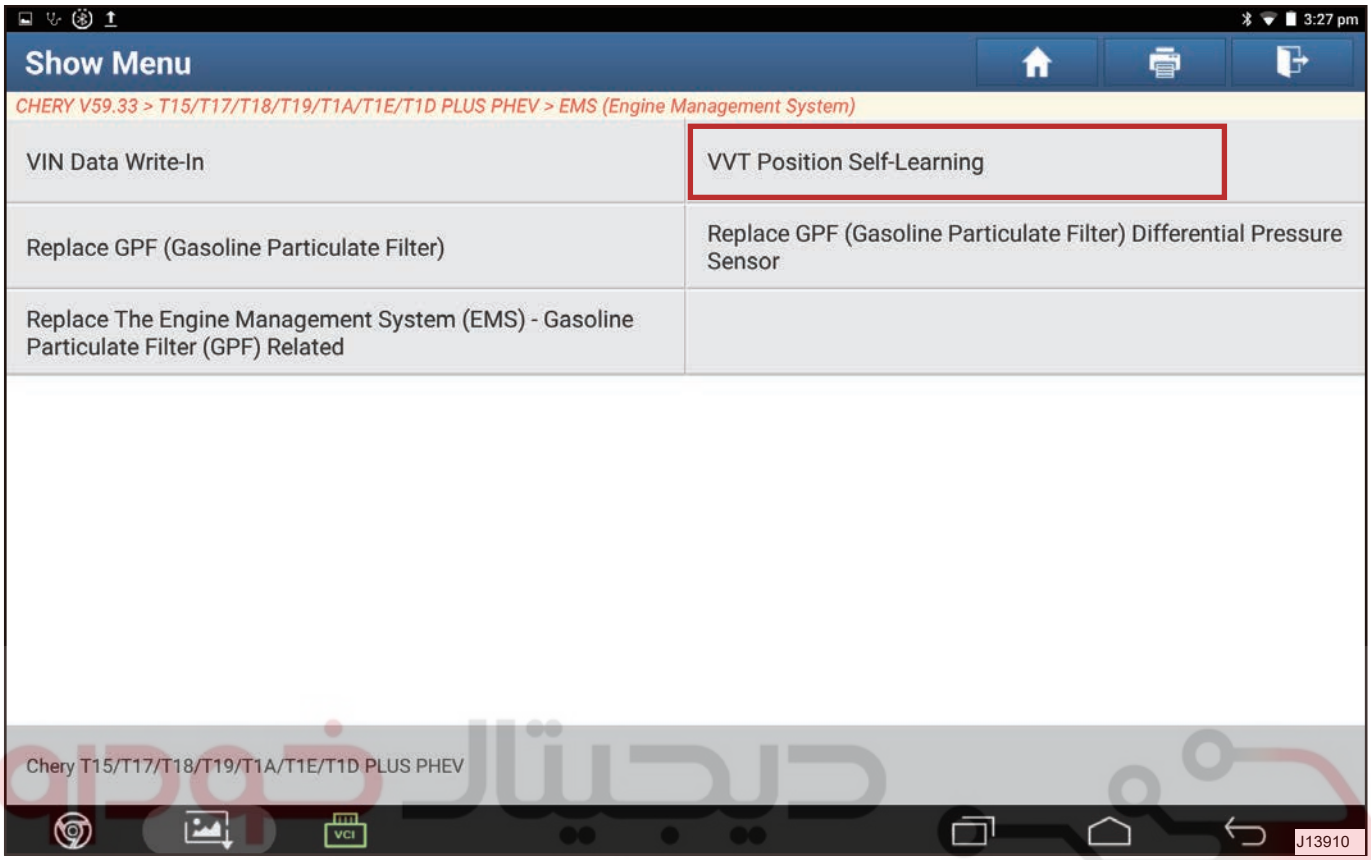
2. Click “EMS (Engine Control System)”



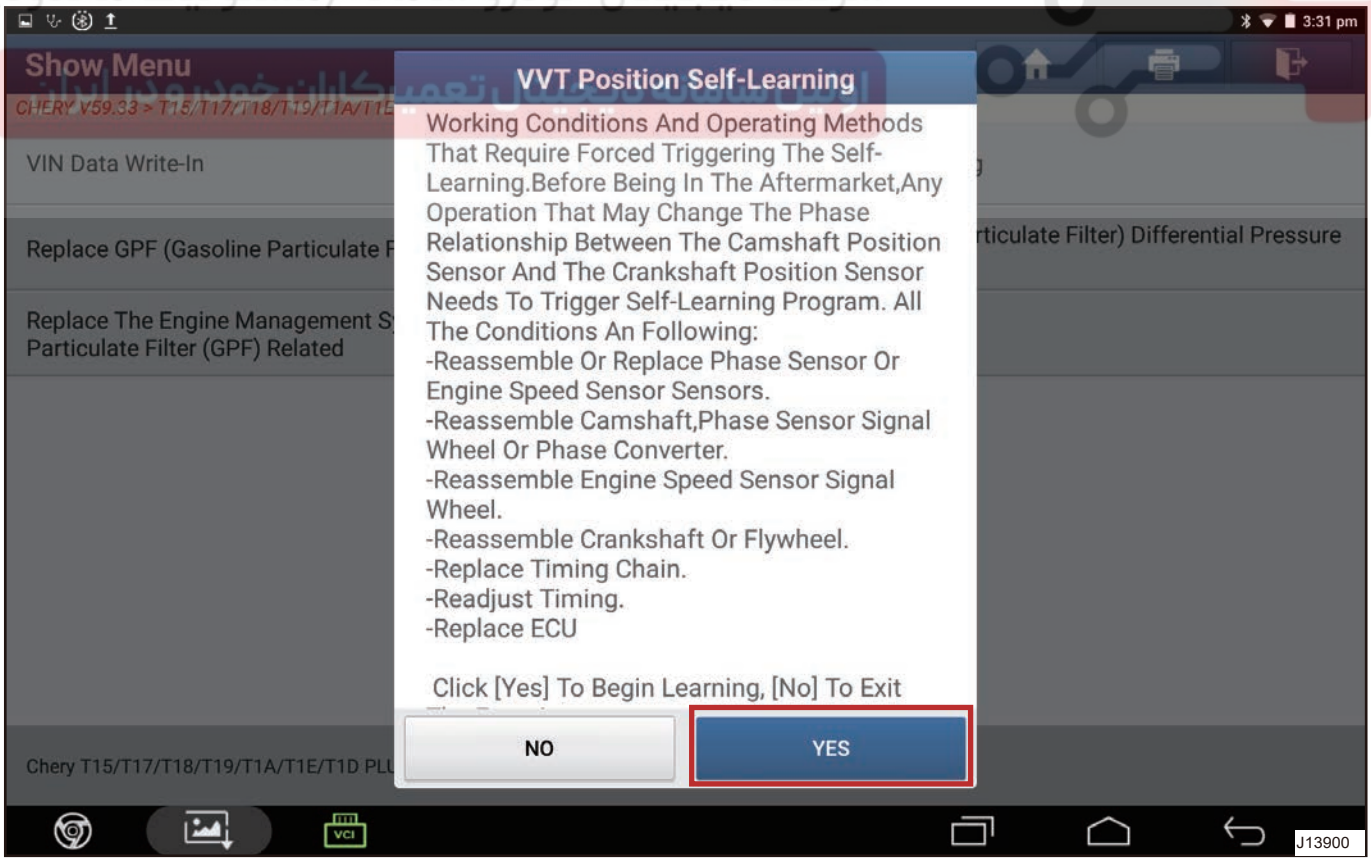
3. Click “Special Function”.



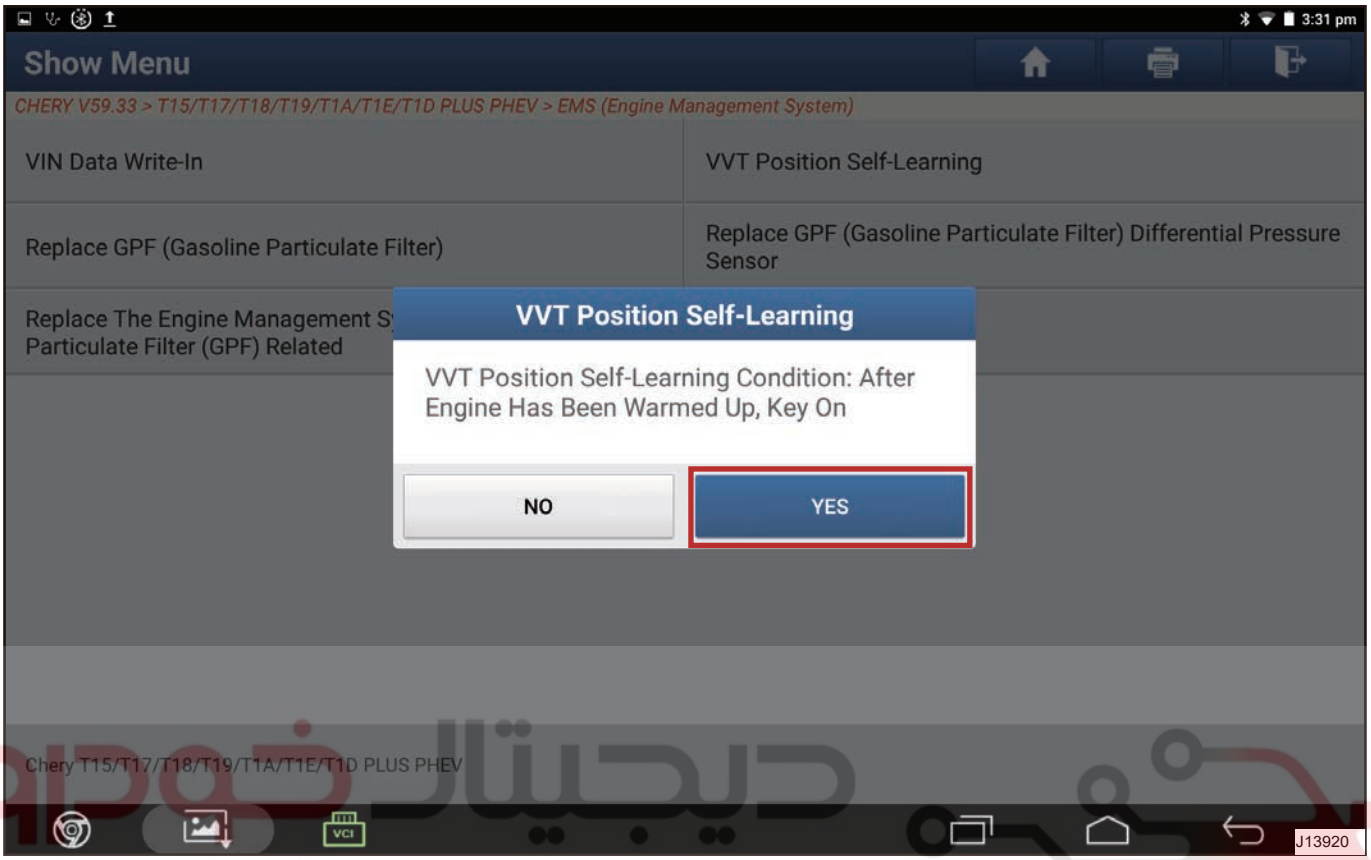
4. Click and select “VVT (Variable Valve Timing) Position Self-learning”.



5. After system prompts are confirmed, click “Yes”.

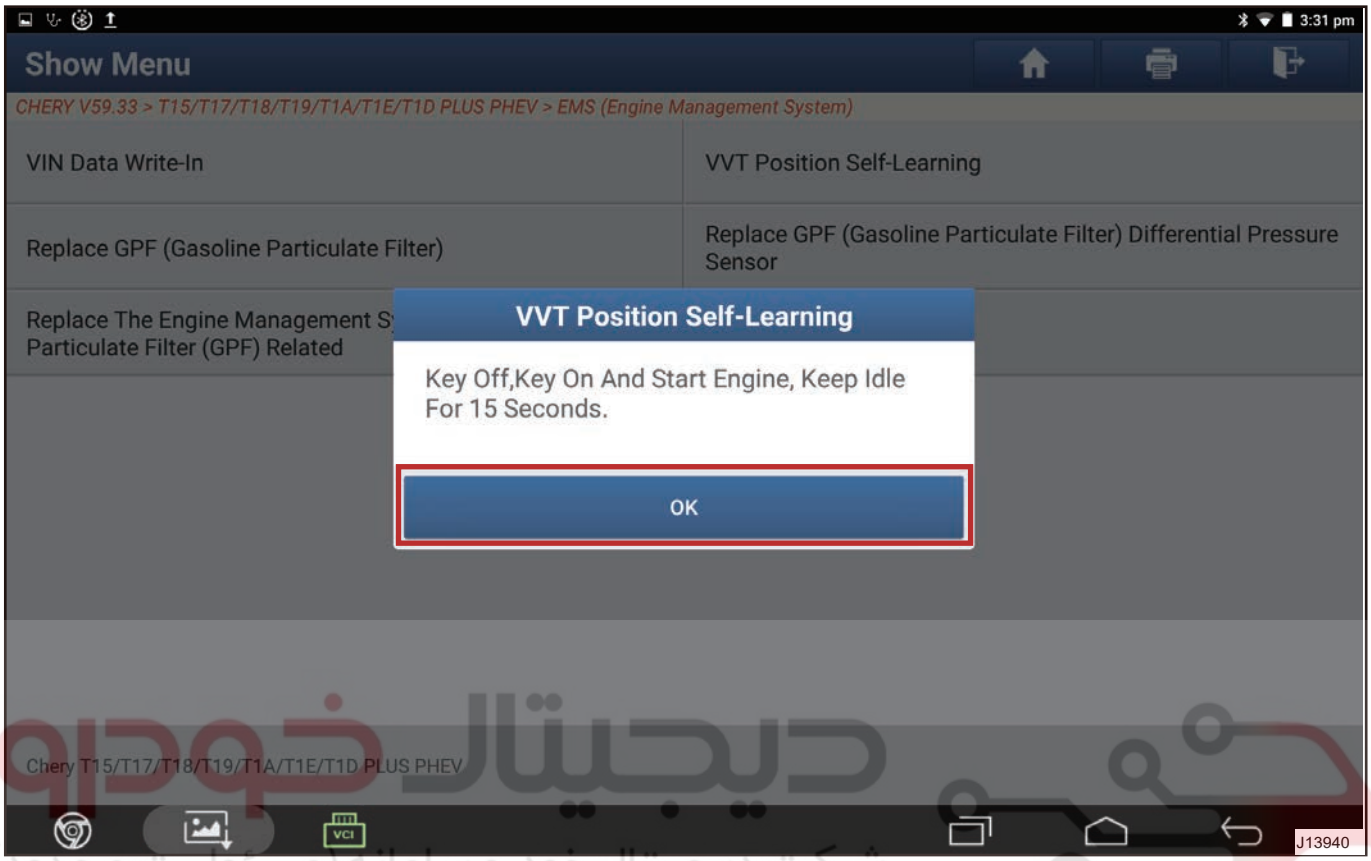


6. After system prompts are confirmed, click “Yes”.



7. System prompts that “VVT (Variable Valve Timing System) position learning is successfully completed”, then click "OK".

8. System prompts that the key is turned to off, restart after key is turned to on, and idle it for 15 seconds, then click "OK".

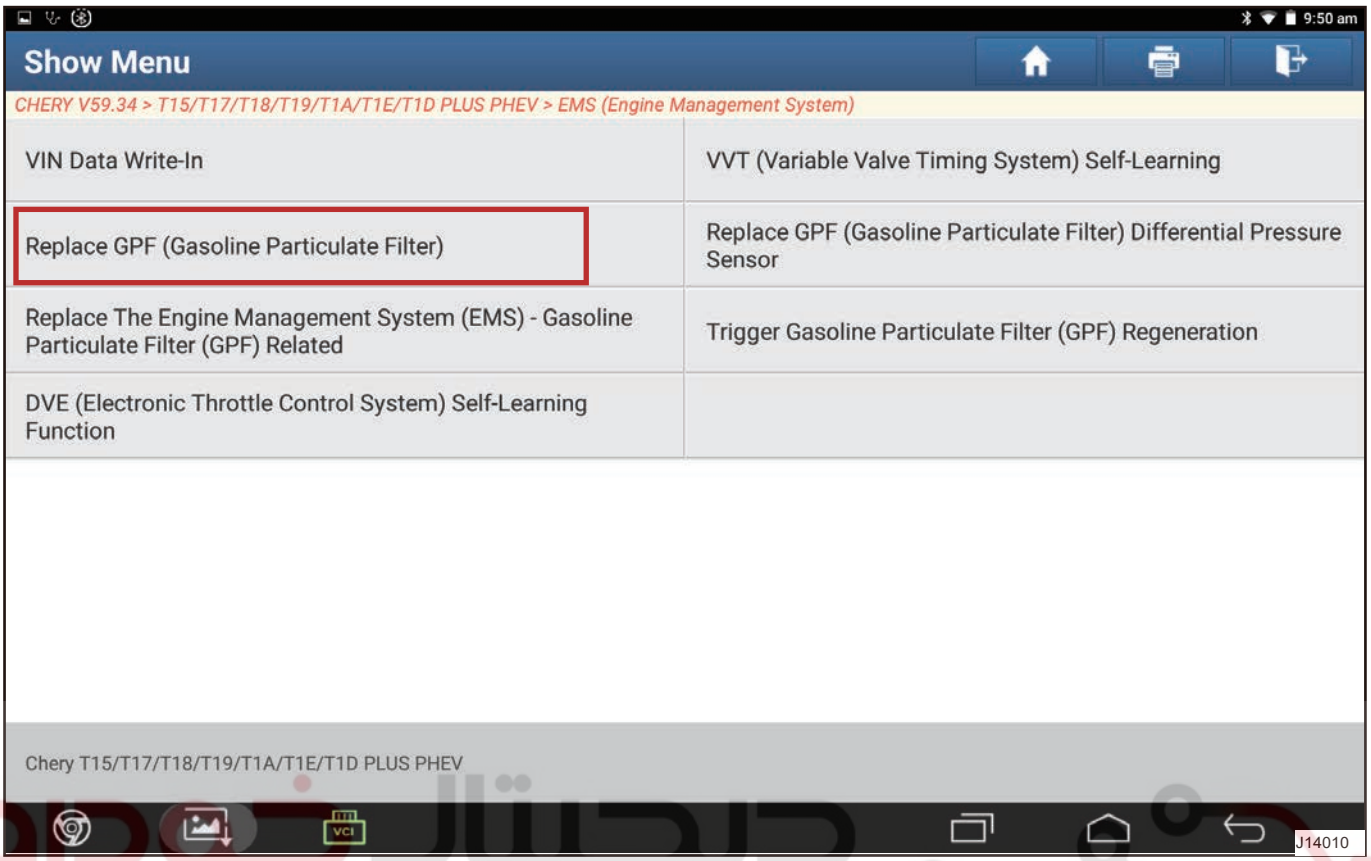


Write GPF Information

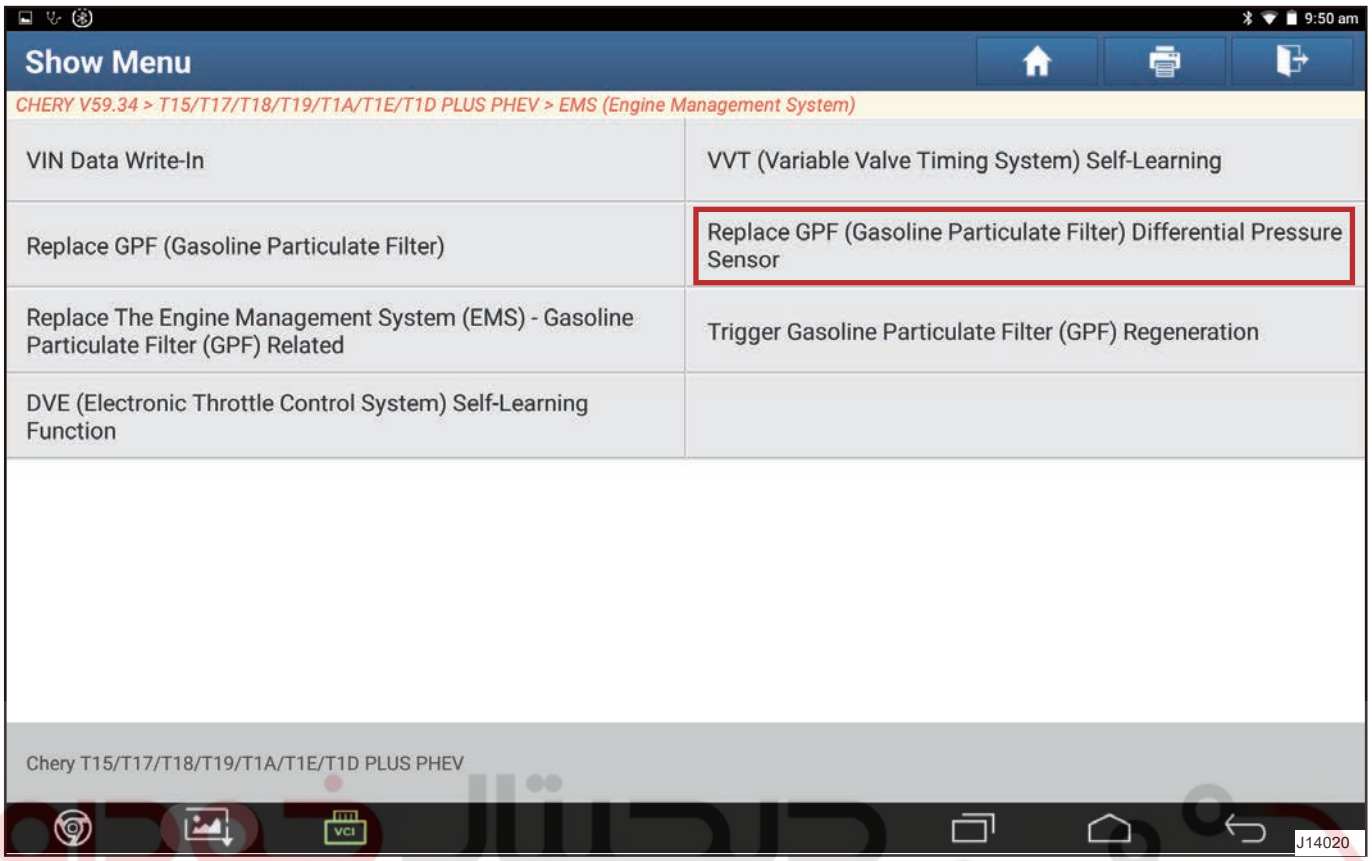
Write GPF Information

In the following cases, GPF information needs to be written

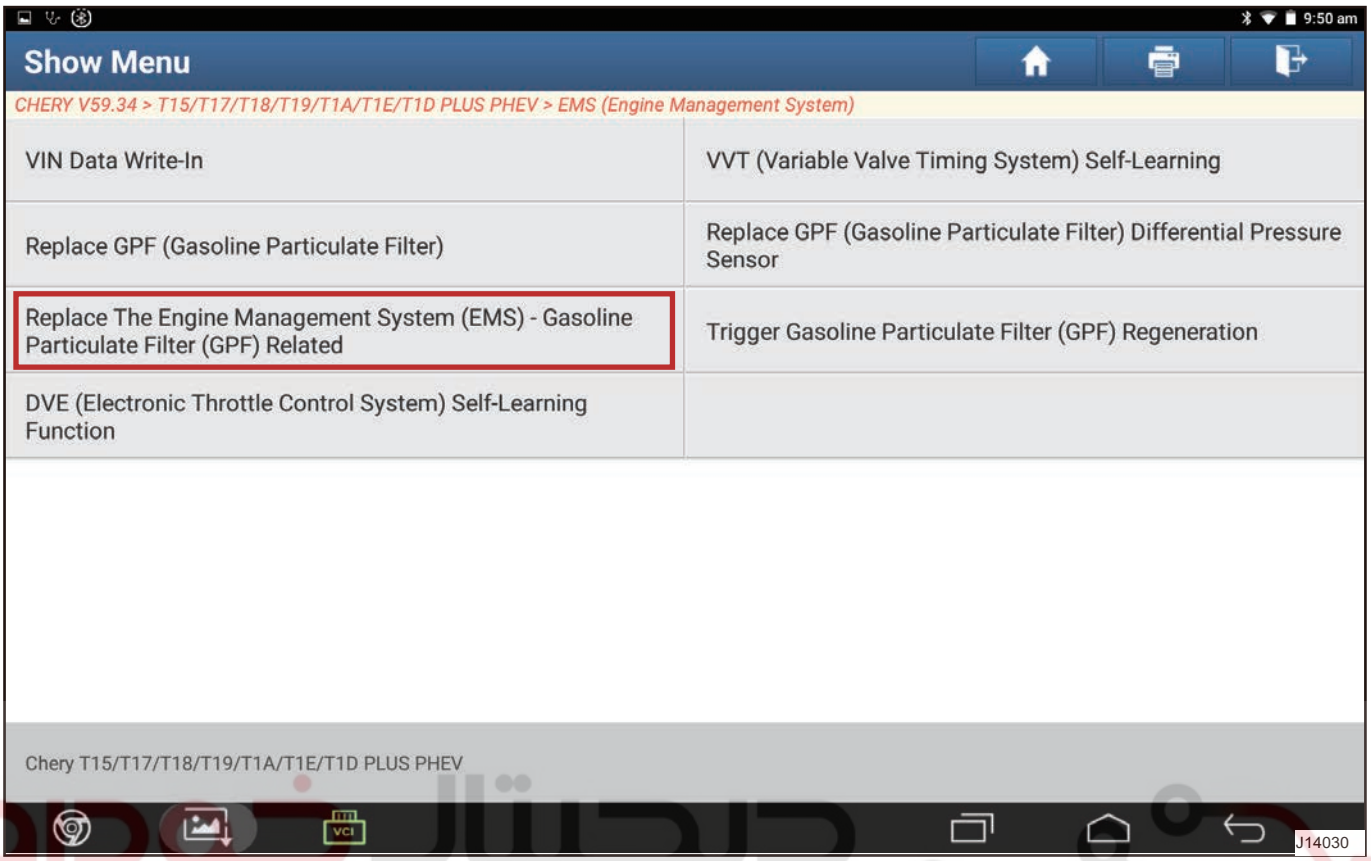
1. Replace GPF
   a. Stop the vehicle in a safe place;
   b. The engine stops, after the GPF temperature has cooled to room temperature, replace GPF with a new one;
   c. When the engine is powered on and not started, the command will be sent by UDS service of diagnostic tester;
   d. Power off, wait for 720s, power on again to read the current model carbon value $\leqslant$ 0.6, the corresponding fuel cumulative value is 0, that is, write to EEPROM is successful;
   e. Replacement of GPF is complete.



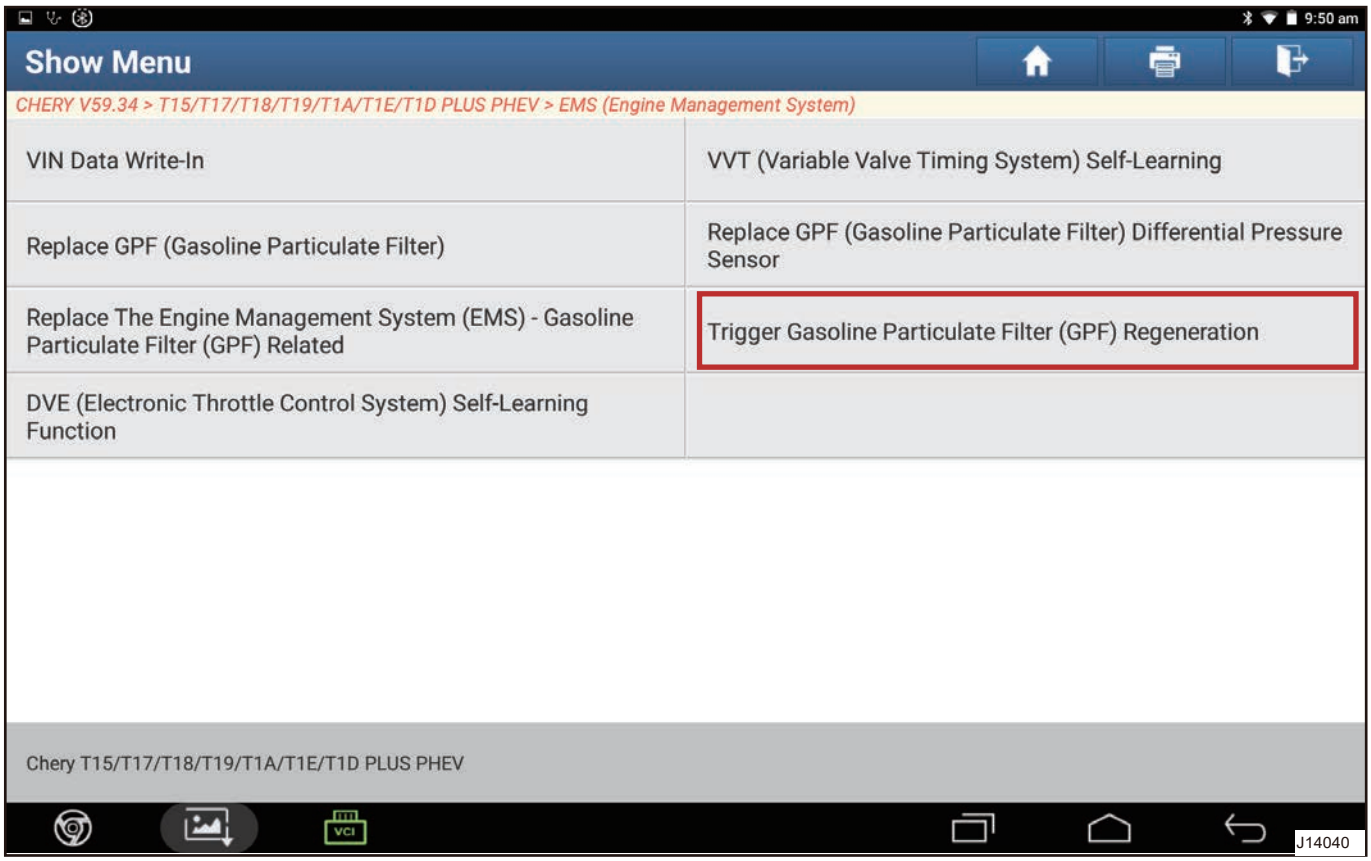
2. Replace differential pressure sensor
   a. Stop the vehicle in a safe place;
   b. The engine stops, after the GPF temperature has cooled to room temperature, replace differential pressure sensor with a new one and ensure that the upstream and downstream lines are installed correctly;
   c. When the engine is powered on and not started, the command will be sent by UDS service of diagnostic tester;
   d. Power off, wait for 720s, power on again to read the learning value of differential pressure sensor as 0, that is, write to EEPROM successfully;
   e. Replacement of differential pressure sensor is complete.



3. Replace ECM.
   a. Stop the vehicle in a safe place;
   b. When the engine is stopped, power on and use the UDS service of diagnostic tester to read out the expected rewritten amount (if the diagnostic tester has a storage function, store it in the diagnostic tester; if not, you need to manually record each EEP value);
   c. Power off the engine, after the ECM is cooled to room temperature, replace it with a new one;
   d. When the engine is powered on and not started, send commands by UDS service, and send (flag bit + value) fields to new ECM one by one;
   e. Power off, wait for 720s, power on again to read the current model carbon value $\geqslant$ 0.6, the corresponding fuel cumulative value is not 0, that is, write to EEPROM is successful;
   f. Replacement of ECM complete.



4. Parking service regeneration
   a. Stop the vehicle in a safe place, avoid exposure to the sun and around inflammables, do not open the hood, if there is a blower, it can be placed in front of the intake grille to blow;
   b. Power on and shift to P, start the engine, idle until the coolant temperature exceeds 60℃, turn off the air conditioning, turn on the vehicle heater, turn the target temperature to maximum, and make the wind speed to maximum;
   c. Send the command by the UDS service of diagnostic tester, and the engine speed reaches 3900 rpm, then the parking regeneration is triggered successfully;
   d. Within 1 hour after triggering regeneration, the engine returns to normal idle speed;
   e. Use the diagnostic tester to read the current model carbon value ⩽ 1.5g, and the mileage value since the last fully successful regeneration is 0, the regeneration is successful, if not, turn the engine OFF and power off. Restart the engine and trigger the parking regeneration again according to the above steps.
   f. Service regeneration is complete.



Caution

- Before performing parking regeneration, all DTC of vehicle engine should be repaired according to the regulations.
- Non-related personnel should not approach the regenerative vehicle.
- During the regeneration process, there are the following possibilities to interrupt the process:
  1. GPF temperature is too high.
  2. Regeneration time is too long.
  3. The remaining gasoline is too low.
  4. Vehicle is moving.
  5. Engine knocking.
  6. Enriched with air-fuel ratio.
  7. Shifting.
  8. Accelerator pedal depressed.
  9. Brake pedal depressed.
  10. Coolant temperature is too high or too low.
  11. Misoperation of diagnostic tester.