EADO Workshop Manual

Electronic control system

EADORM2H/1/1

3.1.13 Electronic control system - MT22.1

3.1.14 Electronic Control System (Low-Carbon)

Specifications

Torque Specifications

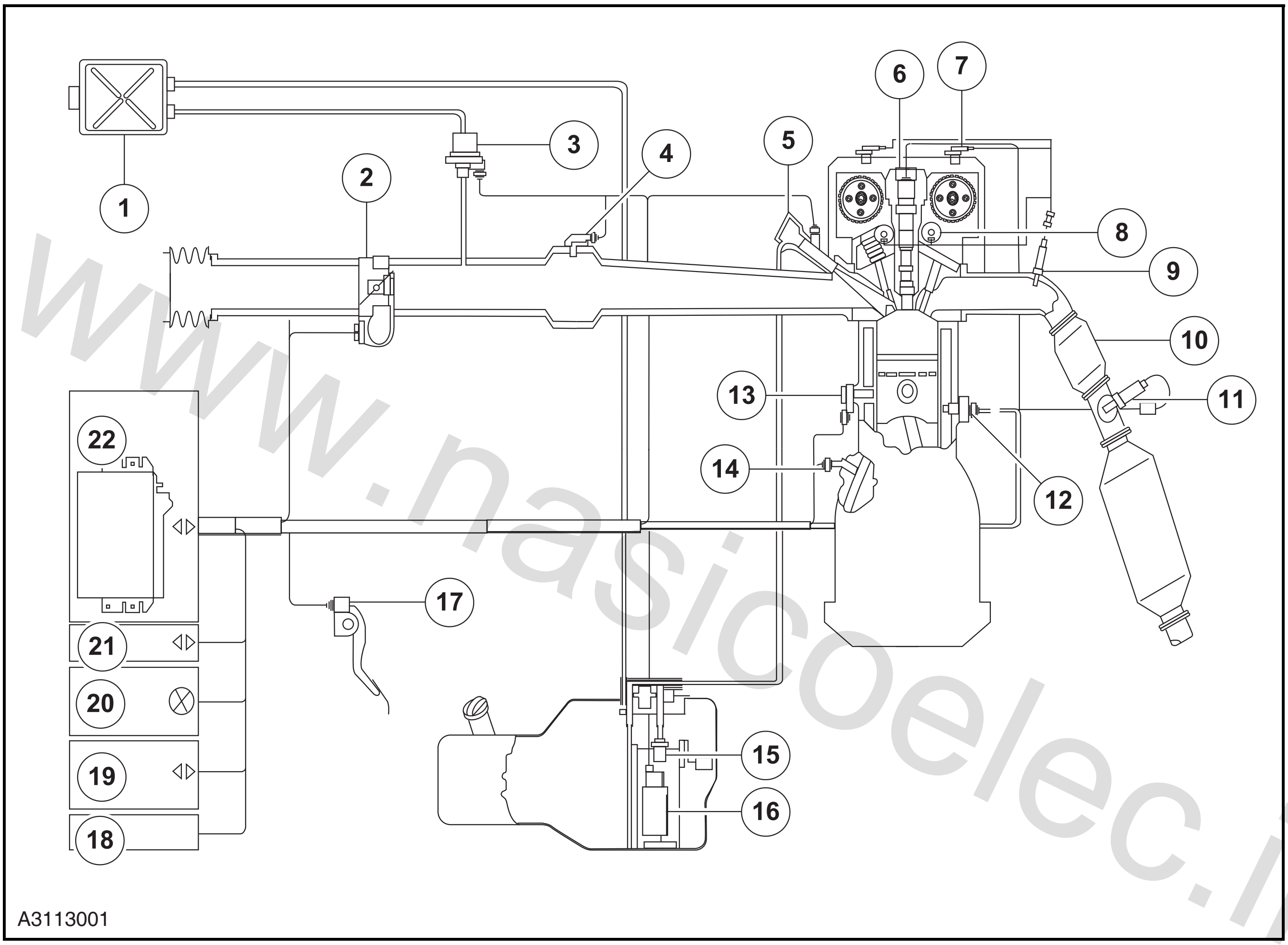
Name	Nm	lb-ft	lb-in
Intake pressure temperature sensor retaining bolt	23	17	-
Spark plug	23	17	-
Throttle body retaining bolt	13	10	-
Engine control module retaining bolt	10	-	89
Crankshaft position sensor retaining bolt	10	-	89
Camshaft position sensor retaining bolt	10	-	89
Engine coolant temperature sensor bolt	20	15	-
Intake pressure temperature sensor retaining bolt	10	-	89
Fuel distribution pipe assembly retaining bolt	23	17	-
Upstream oxygen sensor	50	37	-
Downstream oxygen sensor	50	37	-
Knock sensor retaining bolt	23	17	-
Accelerator pedal position sensor retaining bolt	32	24	-

Description and Operation

System Overview

Electronic control system is consist of the following components:

1. Various sensors that judge the engine status and operation conditions.
2. Engine control module that controls each actuator of EFI system based on the signal of each sensor.
3. Various electronic control actuators.



Item	Description	Item	Description
1	Carbon canister	12	Water temperature sensor
2	Carbon canister control valve	13	Knock sensor
3	Electronic throttle body	14	Crankshaft position sensor
4	Air intake pressure temperature sensor	15	Fuel pressure regulator
5	Fuel distribution pipe	16	Electronic fuel pump
6	Ignition coil and spark plug	17	Accelerator pedal
7	Camshaft Position Sensor	18	Anti-burglary
8	Oil Control Valve	19	Diagnostic Interface

Item	Description	Item	Description
9	Pre-catalytic oxygen sensor	20	Fault indicator
10	Three-way catalytic converter	21	CAN
11	Post-catalytic oxygen sensor	22	Electronic control unit (ECU)

According to the performance, the electrical control system can be divided into the following subsystems:

- Fuel injection control system
- Idle speed control system
- Fuel pump control system
- Ignition timing control system
- Radiator-fan control system
- Fuel vapor emission control system
- Climate control system
- DVVT control system

MT22.1 system input / output signal

The main sensor input signals of ECM in MT22.1 system include:

- EFP signal
- Airflow signal
- Throttle rotor angle signal
- Coolant temperature signal
- Engine speed signal
- Phase signal
- Knock sensor signal
- Oxygen sensor signal
- Vehicle speed signal
- Air-conditioning pressure signal

After the above information goes into ECM, they are been processed then the required actuator control signals are generated, these signals are amplified in the output driver circuit, and are transmitted to each corresponding actuator, these control signals include:

- Electronic throttle motor
- Injection timing and injection duration
- Fuel pump relay
- Carbon canister control valve opening
- Ignition coil dwell angle and spark advance angle
- A/C compressor relay
- Cooling fan relay
- Oil Control Valve

Fuel injection control

ECM controls the injection time and the injection timing from injector to the cylinder head intake port based on various sensors signals, to ensure the appropriate mixed gas is provided in different driving conditions. There are two forms of injection timing, one is synchronous injection, which always inject at the same crankshaft angle, the other is non-synchronous injection, which is controlled based on inlet pressure temperature sensors and other sensor signals.

1. Synchronous injection

When the engine starts, the air in the intake manifold is still, the internal pressure of the intake manifold shows as the surrounding atmospheric pressure. Electrical throttle opens to a certain angle based on a fixed parameter that determined by the starting temperature. 4 injectors will inject synchronously in each cycle. Fuel injection amount varies according to the engine temperature. Before the engine reaches a certain speed, the mixture need to be enriched. Once the engine is running, the system immediately begins to reduce the cranking enrichment, until the end of starting (600 ~ 700 rpm), start enriching is completely canceled.

When a cylinder is in exhaust stroke after the engine starts, the fuel injection only occurs in the cylinder's injector. ECM tests No. 1 cylinder compression stroke by camshaft position sensor, also with this as the basis, follow the order of 1st, 3rd, 4th, 2nd cylinder to control the injection order of the injector. When the camshaft position sensor fails, the engine automatically goes into the synchronous state to maintain the engine running.

2. Non-synchronous injection

After engine starts and the following conditions are met, all fuel injectors will not be controlled by the pressure / temperature sensor.

- Fuel injection system starts to inject when fuel is disconnected.
- When the throttle opening rate is higher than the specified value (throttle opens too fast).

Non-synchronous injection system is generated quickly under above two situations.

3. Injection time

The main elements of identifying the fuel injection time is based on the basic injection time value that calculated according to the engine speed, the intake manifold pressure temperature (air intake flow rate), and a variety of the compensation value that is determined by the sensor signals which is used for testing the engine and the operating conditions.

4. Fuel cut-off

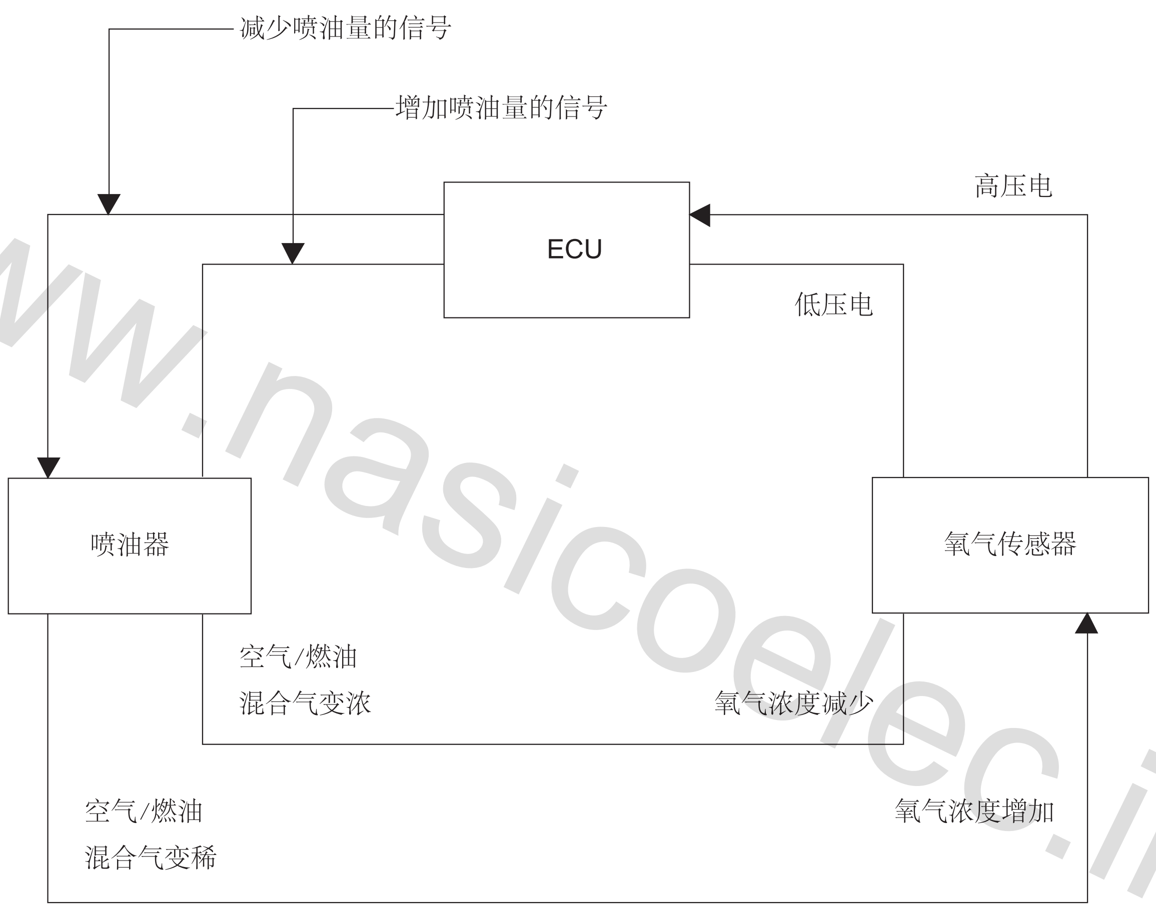
The injection stops (by stopping injector) while slowing down (for example, when throttle is placed on idling position and engine is running with high speed). It ensures that unburned gas will not be discharged and be started again in above different conditions.

Air-fuel ratio feedback compensation (Closed-loop system)

The air-fuel mixture must be close to stoichiometric air-fuel ratio (14.7) to ensure that the three way catalyst conversion process is fully carried out and reach high purification rate of CO, HC and NOx in exhausting.

λ closed loop control system can work only with oxygen sensor equipped. Oxygen sensor monitors the oxygen content in the exhausting in the side location of three way catalytic converter, lean mixture (λ> 1) generate about 100mV sensor voltage, rich mixture (λ < 1) produces about 800mV sensor voltage. When λ = 1, the sensor voltage has a jump. λ closed-loop control responds to the input signal (λ is greater than or equal to 1 lean mixture, λ is less than or equal to 1 rich mixture) modify the control variables, resulting in correction factor as a multiplier to correct the fuel injection duration. When any one of the following conditions is met, ECM exits the closed-loop control.

- When the engine starts to operate and the injection quantity is increased after the engine starts.
- When the engine coolant temperature is too low.
- When the load is high and fuel injection capacity is increasing.
- When the fuel is cut off.
- When the oxygen sensor is cooled.



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Idle control

The control system can use ECM controlled electronic throttle to keep the stability of the engine basic idle speed , but the engine idle speed will change for the following reasons.

- Add load to the engine (for example, open A/C switch when adding electric load).
- Engine itself changes over time.
- Improve the starting performance of the engine.
- Adjust the air-fuel ratio during deceleration (reduction buffer function).
- When engine warm-up, improve its performance.

Operation:

Idle speed control is based on ECM effective output information, ECM inspects the engine operating status through the signals of various sensors and switches and controls the air flow by controlling the throttle opening through electronic throttle.

When the vehicle is stopped, the throttle is at idle position and the engine is at running state, at this time the engine speed is kept at specified idle speed.

Engine Idle speed (r/min)	**A/C OFF**		**A/C ON**	
	Electric load is off	Electric load is on	Electric load is off	Electric load is on
	700	750	800	850

Fuel Pump Control

ECM controls the on and off actions of the fuel pump, in either of the following cases, it connects to the fuel pump through the fuel pump relay.

- 1.5 seconds after the ignition switch is turned off
- When the engine is started (engine start signal output to ECM)
- When camshaft position sensor signal is input in ECM

Ignition timing control

The system adopts distributor-less, double-cylinder direct ignition, through the on and off of internal high power transistor (Darlington) to control the on-and-off of the ignition coil primary winding circuit, enable the ignition coil produce high voltage (the ignitor internal structure varies with different engine types. Some engines are not equipped with ignitors, and high-power triode transistor is directly equipped in the internal of electrical controller ECM. Some ignitors only hava a Darlington transistor as a switch, and other electrical control components and electrical controls works as a whole. In addition, some ignitors have switch function, as well as the function of constant current control, closed angle control, cylinder identification and ignition monitoring)

The control unit includes the following three different forms:

- Ignition time when the engine start (initial ignition time)
- Engine after-start control
- Charge current time control

1. Ignition control after engine start

If the ignition time of the engine after starting can be confirmed as follows, then the ignition can occur in the most appropriate moment under different conditions of the engine.

Ignition time	=	Initial ignition time	+	Ignition time	+	Basic ignition advance angle	+	Various compensation angles

When the throttle is at idle speed position, ignition time is reached based on the initial ignition timing, plus the the basic ignition advance angle that is determined by engine speed, engine cooling compensation and the relative idle stability advance compensation angle.

When the throttle opening is larger than idle speed position, it is also reached based on the initial ignition timing, plus the the basic ignition advance angle that is determined by engine speed, engine cooling compensation and the relative idle stability advance compensation angle.

Radiator Fan Control

The system controls the operation of radiator fan motor (on and off), radiator fan realizes the on-off control motor through the relay that controlled by ECM.

Radiator fan motor	Engine cooling temperature
OFF → ON (low speed)	97 ℃
ON → OFF (low speed)	94 ℃
OFF → ON (high speed)	102 ℃
ON → OFF (high speed)	99 ℃

When air conditioning is operated or stopped, the radiator fan motor should be turned on or off accordingly.

CAUTION: With A/C ON, the fan starts rotating and will run at high speed when high pressure of refrigerant exceeds 15.2 bar.

A/C compressor control

A/C request signal is sent to ECM which controls A/C relay to pick up and at the same time sends the speed increase signal to electronic throttle and switches on the electronic fan.

To ensure power output and protect the engine, the system may discontinue A/C operation under certain working conditions.

A/C working conditions:

- A/C stops working at temperature 108 ℃
- A/C resumes working at temperature 105 ℃

After startup of A/C and evaporator, the target idle speed of engine raises by 150rpm.

DVVT Control

The engine variable valve timing (VVT) means that the variation of overlap of timing and opening of intake and exhaust valves is hydraulically VVT controlled to enable the camshaft to rotates at certain angles (rightwards, leftwards) and further advance or delay the time to drive the valve to open or close. The engine with VVT can increase intake charge and volumetric efficiency, the torque and power of engine can also be further improved.

DVVT is also called dual VVT, that is both intake camshaft and exhaust camshafts are VVT controlled. It can improve engine's power performance and economic results and also reduce engine's emission.

1. Dual VVT Components:

- Intake and exhaust camshafts with inserted helical tooth push rod unit.
- Both intake and exhaust valves each has a VVT.
- Two 3-way solenoid change-over valves.
- 2 Hall camshaft position sensors

2. DVVT Advantages:

- Engine torque increase at 1,500-2,000 RPM.
- Smaller overlap angle of camshaft at idle, improving idle behavior and allowing for more complete combustion.
- Exhaust camshaft adjustment for reduced NOX emissions and exhaust gas circulation.
- Reduction in fuel consumption.

3. DVVT Operation:

- DVVT unit is used to change the intake and exhaust timing.
- EMS computer monitors intake and exhaust camshaft position through dual camshaft position sensors.
- EMS computer changes VVT control timing according to engine speed, coolant temperature and throttle position.

⚠ **CAUTION: Single VVT is used on JL478QEB engine and the VVT control is only available on the intake camshaft.**

Fuel vapor emission control

Fuel evaporative emission control system is used to prevent fuel vapor from evaporation. This vapor is generated from the fuel during running or engine stopped, it goes into the gasoline carbon canister through the tank pressure control valve, and absorbed or stored by the carbon canister. This vapor is generated from the fuel during the running or engine stop, it goes into the carbon canister through the tank pressure control valve, and absorbed or stored in the carbon canister.

Carbon canister sewage valve is controlled by ECM based on various sensors signals.

Only when the following conditions are met, ECM will open the vacuum channel of carbon canister sewage valve.

- When the engine is at normal working temperature.
- When the engine speed is higher than the specified value.
- When the opening of the throttle is greater than the idle speed position (the close position of the throttle).
- When the engine is running within the required load.

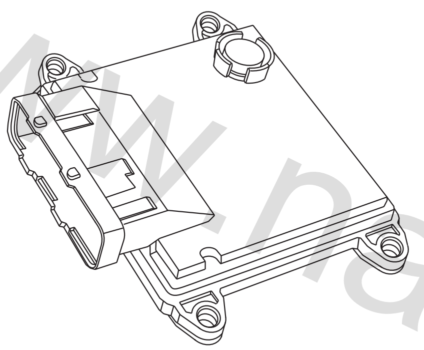
The result is the carbon canister is purified due to the air flow goes through the carbon filter located at the bottom of the canister.

Fuel tank pressure control valve is used to maintain constant tank pressure. When the fuel tank pressure is E and reaches specified value, this valve opens to make the vapor flow into the carbon canister. On the contrary, when the tank pressure is negative and reaches its specified value, open the valve so that air could go into the tank.

Component Description

Engine control module (ECM)

Engine control module ECM is installed in the air cleaner side, to receive the input signals, output the control signal and inspect the system state, record the DTC when there is and turn on the malfunction lights.



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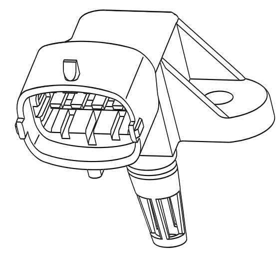
Air intake pressure temperature sensor MAP, IAT

Air intake temperature and pressure sensors are installed on the intake manifold integrated with air intake pressure and temperature sensors. Two sensor's signals are taken as the signal for air measurement. The measurement of intake pressure sensing device changes as the intake manifold pressure changed that caused by the change of engine load and speed. It transforms the changes into output voltage. Intake air temperature sensor is a negative temperature coefficient resister.



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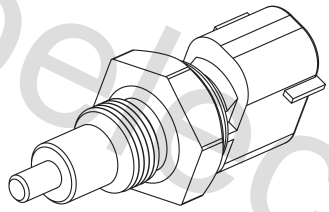
Water temperature sensor ECT

The water temperature sensor is directly mounted near the coolant output plug in the cylinder head. Water temperature sensor is a negative temperature coefficient (NTC) resistor. ECM calculates coolant temperature by voltage drop of water temperature sensor. The signal of water temperature sensor is supplied to ECM to control cooling fan motor and to judge fuel and ignition according to engine status. Water temperature sensor output also offers input signal to instrument panel thermometer.



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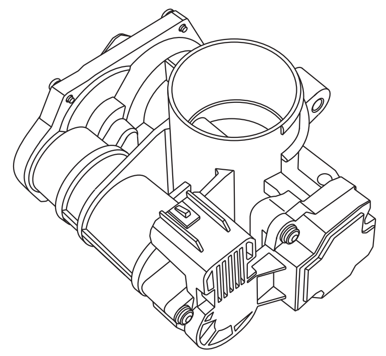
Electronic throttle assembly

The electronic throttle assembly integrates the actuating motor and the throttle position sensor. The electronic throttle valve casing is driven by the drive motor through a set of reducing mechanism and meanwhile the throttle position sensor can real-time monitor the motor position. The electronic throttle can adjust the engine load through electronic pedal signal, which can control the throttle opening through a DC motor to make the engine from the idle position to full load.



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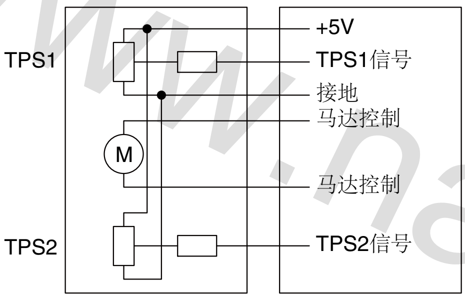
Throttle opening feedback signal is provided by two potentiometers that integrated in the throttle body . Their power supply and ground are common, provided by the engine module.



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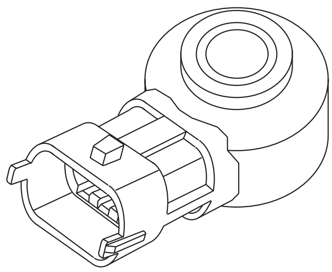
Throttle position sensor is consisted of carbon composition resistor and sliding pointer. It is a linear output angle sensor, which is composed of two arc-shaped sliding contact resistors and two sliding contact arms. The revolving shaft of the sliding contact arm connected to the same shaft with the throttle shaft. Sliding contact resistor is with 5V power supply voltage at both ends .

When the throttle rotates, the sliding contact arm rotates also, at the same time move along the sliding contact resistor, and will lead out the electrical potential of the contact point as output voltage. So it is actually proportional a voltage signal that of corner potentiometer, potentiometer output and throttle position.

Throttle drive motor is a mini motor. The motor drives a particular gear sector and a two-way spring, when the system is in power off state, the opening of throttle is guaranteed by this section to maintain at the position that greater than idle speed position, which however can not place at a too high security position , to guarantee that the vehicles have the ability to continue the driving, if the engine control system steps into the failure mode, step on the accelerator pedal, the electronic throttle body of the valve plate will not move.

Knock sensor KS

The knock sensor is directly installed on the engine body and is located under the air intake manifold. Knock sensor will record the increased vibration when the engine body increases the combustion noise. ECM using the knock sensor signal to avoid fuel pre-ignition through adjusting the ignition and fuel supply characteristics.



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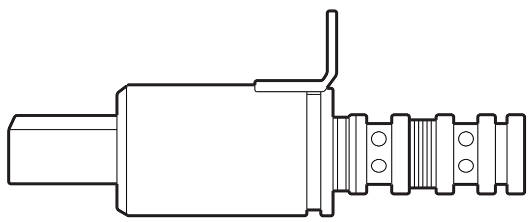
Oil Control Valve OCV

The oil control valve is controlled by the duty cycle signal of EMS to change the direction of oil circuit of VVT unit, thus changing the phase of VVT unit's camshaft and changing the valve timing.



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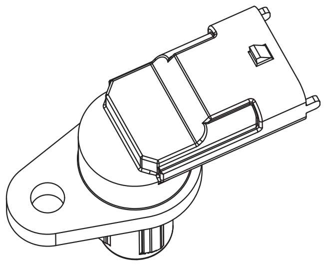
Camshaft position sensor CMP

Camshaft position sensor is a kind of Hall-effect sensor that located at the outside cover of camshaft, is used to capture the raised signal of 1st cylinder intake camshaft. Camshaft position sensor can not be adjusted, and does not require set-up process during installation.



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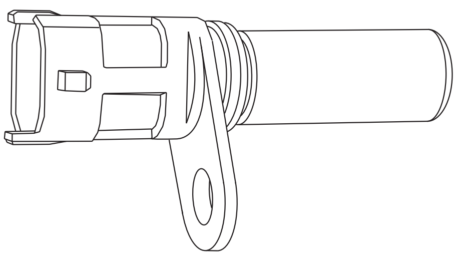
Crankshaft position sensor CKP

Crankshaft position sensor is a electromagnetic induction sensor on the clutch body and captures flywheel signal ring. Signal ring has 58 teeth and ECM judges top dead center position from signal of missing teeth. Camshaft position sensor can not be adjusted, and it is not required to set up process during installation.



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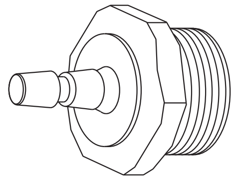
Power steering fuel pressure switch

Power steering fuel pressure switch is installed on the power steering pump body. When turning the steering wheel at the engine idle speed, the signal from power steering fuel pressure switch can be used to control the engine idle speed.



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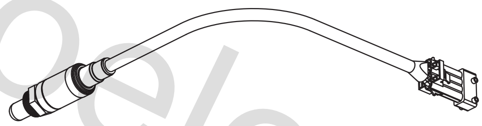
Pre-catalytic oxygen sensor

Pre-catalytic oxygen sensor is on the exhaust manifold, before the three-way catalytic device, it is a zirconia oxygen sensor. Pre-catalytic oxygen sensor is used to monitor the oxygen content of the gases that generated from the burning of air-fuel mixture in the combustion chamber. The signal from the Pre-catalytic oxygen sensor is received by the ECM and is used to adjust the injector pulse width.



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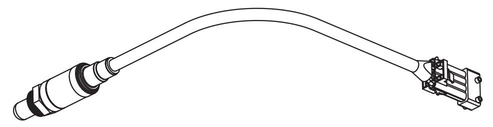
Post-catalytic oxygen sensor

Post-catalytic oxygen sensor located behind the three-way catalytic converters, used to detect the catalytic conversion capacity and oxygen storage capacity of the catalytic converters. The post-catalytic oxygen sensor is a zirconia oxygen sensor, and ECM receives the signals of Post-catalytic oxygen sensor and compare it with the signal that from the Pre-catalytic oxygen sensor. If the three-way catalytic converter is working normally, also the fuel the engine electrical control system is in closed loop control, the sensor voltage output with stable 0.45 V voltage.



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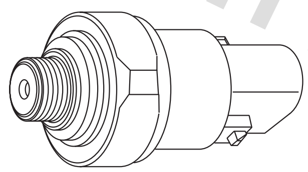
Refrigerant pressure switch

Refrigerant pressure switch is located on the high pressure side of the refrigeration system, it provides cooling pipe status signals to ECM, ECM uses this information for to control of air-conditioning solenoid clutch, air-conditioning fan and idle speed.



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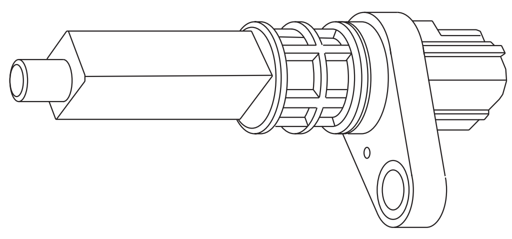
Vehicle speed sensor

Speed sensor is installed on the transmission, the speed sensor is Hall-style, the working power is applied by the ECM controlled main relay, when the vehicle is driving, the sensor outputs rectangular pulse signal.



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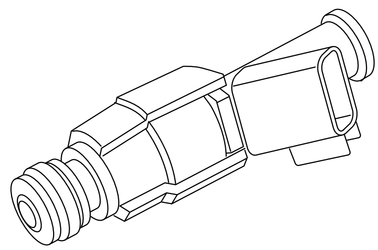
Fuel injector

Fuel injector is installed on the cylinder head, it follows the ECM instruction to inject fuel within the stipulated time, ECM controls the injector ground signal. The injector is solenoid-controlled, the fuel injection quantity depends on the needle valve opening time which is the pulse width of the turning on electricity.



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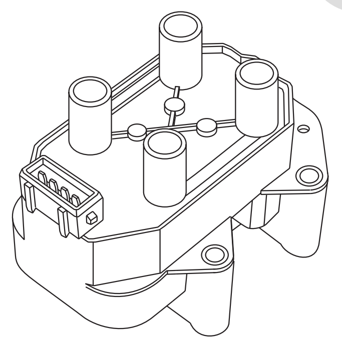
Ignition coil

The ignition coil of 1st cylinder and 4th cylinder is located on the upper part of the 4th cylinder spark hole, the ignition coil of 2nd cylinder and 3rd cylinder is at the top of 2nd cylinder spark plug hole. Ignition coil transforms the low voltage of primary winding into secondary winding high voltage, spark discharge through the spark plug, igniting the mixture of air and fuel within the cylinder. ECM controls the ignition coil primary coil to ground.



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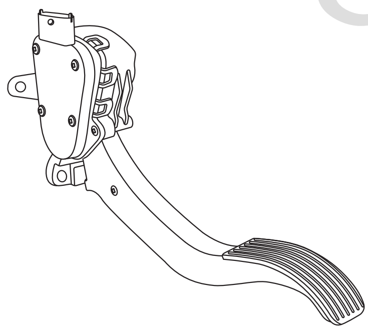
Accelerator Pedal Position Sensor APP

The accelerator pedal position sensor has an internal damping design and contains two identical potentiometric sensors. The signal pointer of the sensor shares the same axle with the pedal. When the pedal is depressed, the potentiometer pointer rotates with the pedal coaxially and with the sliding of the pointer, the signal terminal outputs different voltage signals. To prevent signal distortion due to engine voltage fluctuations, a comparison circuit is used in the ECM, which compares signal voltage output by the sensor with reference voltage, and ECM uses percentage to determine the pedal amplitude. ECM compares signals input by Sensor 1 and Sensor 2, and judges together with engine speed, load and other sensors the true or false condition of the output signal. If signals from either of two sensors are determined as distortion, ECU will control the engine to enter into the fault mode, take restricted driving measures and maintain certain opening of the throttle.



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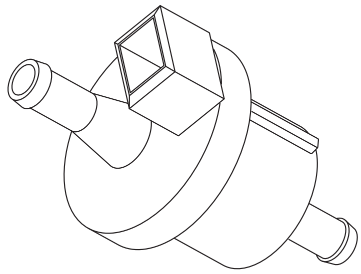
Carbon canister sewage solenoid

Carbon canister sewage solenoid is located at the side of cylinder head, to control the sewage air flow of carbon canister, carbon canister sewage solenoid cleaning flow is controlled by the duty cycle signal from the ECM, in the following condition, carbon canister will not conduct the discharge work:

- A certain time after engine cold start.
- Low engine coolant temperature.
- Engine idle speed operation period.
- High engine load period.
- The important sensor of the system fails.



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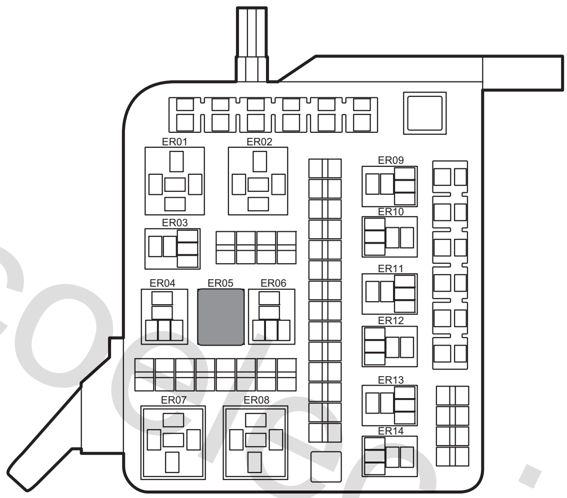
Main relay

Main relay is located in the engine compartment electric center, ECM controls the main relays to realize the control of fuel pump, fuel injector, carbon canister sewage solenoid power supply.



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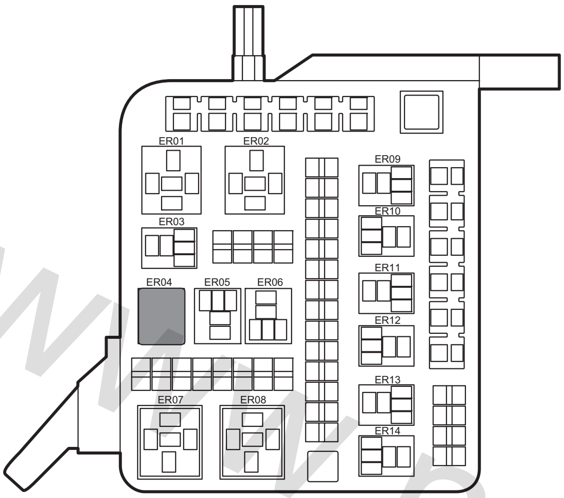
Fuel pump relay and fuel pump

Fuel pump relay is located in the indoor electric center, fuel pump is installed in the fuel tank. ECM controls the pump relay closed, then the fuel pump starts working, the system uses no oil return fuel supply system, fuel pressure regulator is on the fuel pump assembly.



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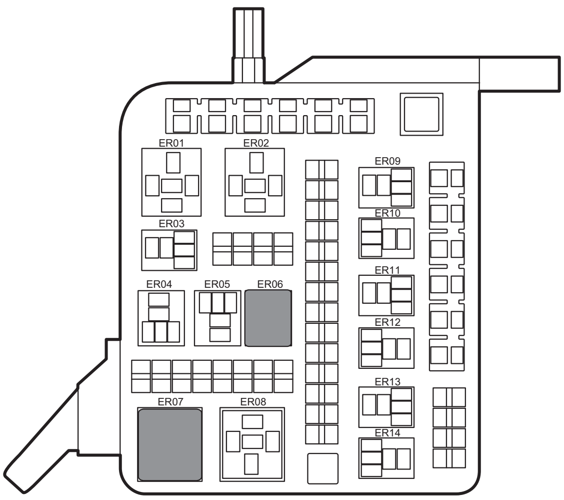
Electronic fan high speed relay, electronic fan low speed relay

Electronic fan high speed, low speed operation are controlled by the two relays ER06 and ER07, ECM controls the work of the two relays to achieve the high speed, and low speed operation.



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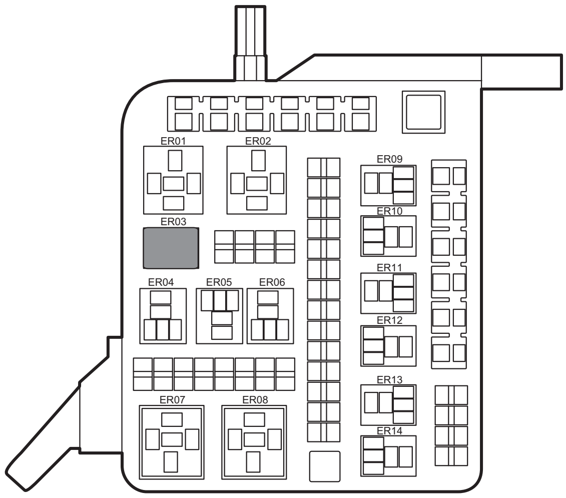
A/C compressor relay

A/C compressor relay is located in the engine compartment electric center. ECM controls the relay operation and realizes A/C compressor operation control according to A/C opening signal, refrigerant pressure switch and engine condition.



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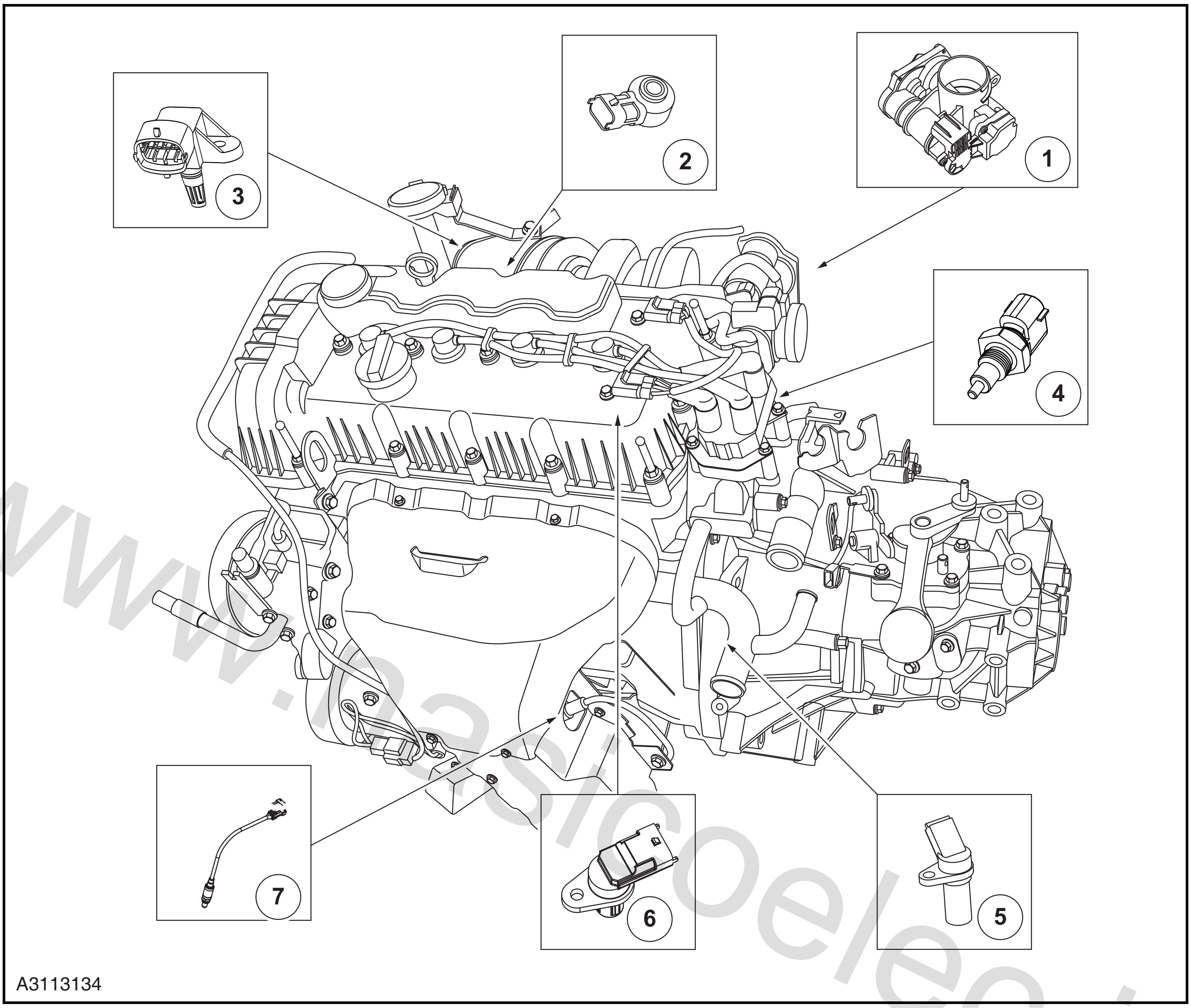
Component position



Item	Description	Item	Description
1	Electronic throttle body	5	Crankshaft position sensor
2	Knock sensor	6	Camshaft Position Sensor
3	Intake temperature pressure sensor	7	Oxygen sensor
4	Coolant temperature sensor		

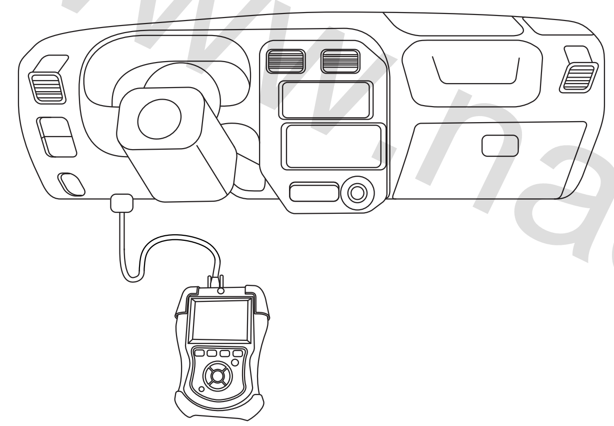
General Inspection

General Tool

Diagnostic Tool
Multimeter

DTC reading procedure

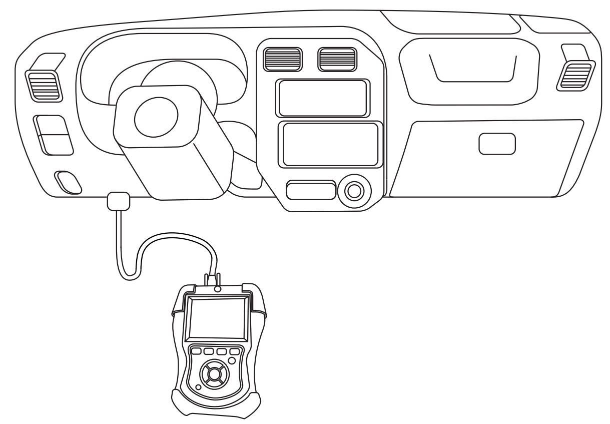
1. Carry out necessary vehicle preparation and appearance inspection.
2. Connect the diagnostic tool to the diagnosis interface in the cab.
3. Use the diagnostic tool to diagnosis the trouble codes DTC.



A3113026

Data stream reading procedure

1. Carry out necessary vehicle preparation and appearance inspection.
2. Connect the diagnosis tool to the diagnosis interface in the cab.
3. Use diagnosis tool to access to the engine system to read the data stream.



A3113026

Implement the components test procedure

1. Carry out necessary vehicle preparation and appearance inspection.
2. Connect the diagnosis tool to the diagnosis interface in the cab.
3. Use the diagnosis tool to access to the active test menu, carry out the components test that is needed.

Symptom Diagnosis and Test

General Equipments

Multimeter
Diagnostic Tool
Exhaust backpressure gauge
Cylinder pressure gauge
Fuel pressure gauge

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.
3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible), before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and confirm the symptom with Diagnosis tool.

Visual Inspection Chart

Electrical
•Fuse •Wiring harness •Wiring harness connector •Relay •Sensor •Switch •Engine control module (ECM)

Intermittent Malfunction Diagnosis Procedure

CAUTION: Eliminate DTC.

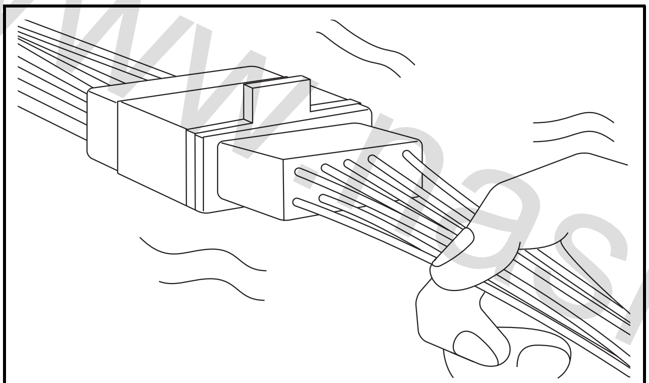
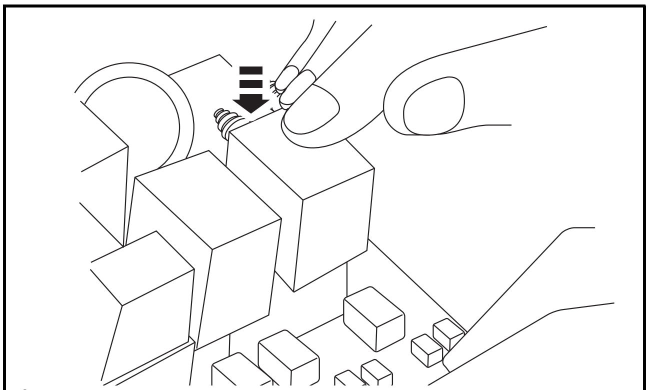
CAUTION: Carry out simulation test.

CAUTION: Inspect and shake harness, plugs and terminals.

Malfunction can not be inspected by DTC and occurs occasionally while using. Confirm the circuit and components that may lead to malfunction. Carry out the basic inspections as shown in the flow chart to find out trouble location effectively in many cases. Particularly the malfunctions such as bad contact of wiring harness connector.

Malfunction definition: This malfunction currently does not appear, but the historical malfunction diagnosis code record indicates that the malfunction occurred before. Or customer reports the malfunction, but as the malfunction is not related to the malfunction diagnosis code, and currently the malfunction symptoms can not show again.

Test Conditions	Details/Results/Actions
1.Vibration method	
	A.If driving on a tough roads, the malfunction occurs or becomes more serious, or the engine start vibration, perform the following steps. B.There are several reasons that will cause electrical faults due to the vehicle or engine vibration. Inspect the following items: • Connector is not fully in position • Wiring harness does not have enough clearance • Wiring harness layout across the support or moving components • Wiring harness lays too close to the high temperature components C.Incorrect wiring, tight or loose wiring harness will lead the connecting cable to be squeezed between the components. D.Connector joint, vibration location, the location of wiring harness crossed, are all required for focus inspection, such as: wiring harness crosses the firewall and the body panels.
2. Inspection method of switch connector or wiring harness	

Test Conditions	Details/Results/Actions
 A3113027	A.Connect the diagnosis tool to diagnosis interface DLC. B.Turn the ignition switch to position "ON" (stop the engine). ⚠ **CAUTION: If the engine is started, running, carry out the following procedures during its idle speed operation.** C.Access to the switch data stream that your are inspecting. D.Turn on the switch manually. E.When monitor the data stream, vertically, horizontally gently shake each connector or wiring harness. If the data stream value is unstable, please inspect if there is a bad connection.
3. Inspection method of sensor connector or wiring harness	
 A3113028	A.Connect the diagnosis tool to diagnosis interface DLC. B.Turn the ignition switch to position "ON" (stop the engine). ⚠ **CAUTION: If the engine is started, running, carry out the following procedures during its idle speed operation.** C.Access to the switch data stream that your are inspecting. D.When monitor the data stream, vertically, horizontally gently shake each connector or wiring harness. If the data stream value is unstable, please inspect if there is a bad connection.
4. Inspection method of actuator or relay	
 A3113029	A.Connect the diagnosis tool to diagnosis interface DLC. B.Turn the ignition switch to position "ON" (stop the engine). ⚠ **CAUTION: If the engine is started, running, carry out the following procedures during its idle speed operation.** C.Get the output state control function ready for the actuator or relay that you are inspecting. D.When the output state control function is activated, vibrate actuator or relay with fingers for 3 seconds. If you can hear unstable "clicking" sound, inspect to see whether there are bad connections or the actuator or the relay is improperly installed. ⚠ **CAUTION: Strong vibration of the relay may cause the relay disconnection.**

Test Conditions	Details/Results/Actions
5. Water sprinkling method	
 A3113030	If the malfunction only occurs in the high humidity, or snow / rain weather, the following steps should be performed: Through spraying water on the face of the radiator to indirectly change the temperature and the humidity. If a vehicle is easily leaking, it may damage the control module. Special protective measures must be taken while inspecting whether the vehicle leaks. A.If you want to inspect the sensor or switch, connect the diagnosis tool to diagnosis interface DLC. B.Turn the ignition switch to position "ON" (stop the engine). **CAUTION: If the engine is started and running, carry out the following procedures during its idle speed process.** C.If you want to inspect the sensor or switch, access to the data stream of the sensor or switch. D.If you want to inspect the switch, manually connect it. E.Spray water on the vehicle, or drive the vehicle pass the vehicle washing bay. If the data stream value is unstable or fails, please repair or replace the components when necessary.

Symptom Chart

If the fault occurs, but there is no DTC stored in the ECM for this fault, and can not confirm the cause, then follow the procedure to diagnose the fault and fix it.

Symptom	Possible Sources	Action
Engine can not start at normal start speed	•Crankshaft position sensor •Fuel pump •Ignition coil •ECM •Engine Mechanical •Anti-theft system	Refer to: Diagnosis procedures for engine can not start in normal start speed (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).
Cold start problems	•Water temperature sensor •Spark plug •Fuel pump •Fuel injector •Throttle body •Engine Mechanical •Engine control module circuit	Refer to: Diagnostic procedures for cold start problems (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).
Warm start problem	•Water temperature sensor •Ignition coil •Fuel pump •Engine control module circuit	Refer to: Diagnostic procedures for warm start problems (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).
Normal start but unstable idle speed at any time	•Air Intake system •Spark plug •Throttle body •Ignition timing •Engine Mechanical •Engine control module circuit	Refer to: Diagnostic procedures for normal start but unstable idle speed at any time (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).
Normal start, unstable idle speed or stall with partial load	•AC system •Throttle body •Fuel injector	Refer to: Diagnosis procedures for normal start, unstable idling or stall with partial load (3.1.13 Electronic Control System - MT22.1, Diagnosis and Test).
Normal start, idle too high	•Water temperature sensor •Throttle body •Vacuum tube •Ignition timing •Control module circuit	Refer to: Diagnostic procedures for normal start, idle too high (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).

Symptom	Possible Sources	Action
Speed does not increase or stall at acceleration Acceleration problem Acceleration slow reaction Acceleration weak, poor performance	•Air Intake system •Inlet air pressure sensor •Throttle body •Fuel injector •Spark plug •Ignition timing •Fuel •Exhaust block •Control module circuit	Refer to: Diagnosis procedures for acceleration fault (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).
A/C control not accurate	• A/C switch •Refrigerant pressure switch •A/C relay •Solenoid clutch • ECM	Refer to: Insufficient Cooling Diagnosis (4.1.1 Manual Climate Control System, Symptom Diagnosis and Testing).
Unstable engine operation	•Oxygen sensor •Fuel injector •Spark plug •Ignition timing •Fuel pressure •Retaining bolts loose or engine mounting components damage •Control module circuit	Refer to: Diagnostic procedures for unstable engine operation (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).
Easy stall at start	•Crankshaft position sensor •Fuel injector •Spark plug •Ignition timing •Fuel pressure •AC compressor •Control module circuit	Refer to: Diagnosis procedures for easy stall at start (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).

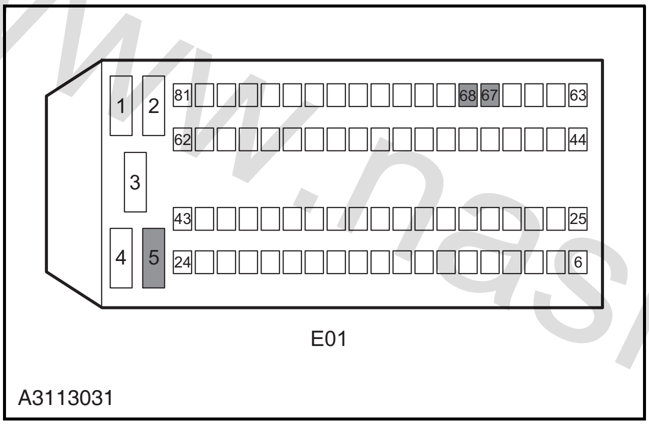
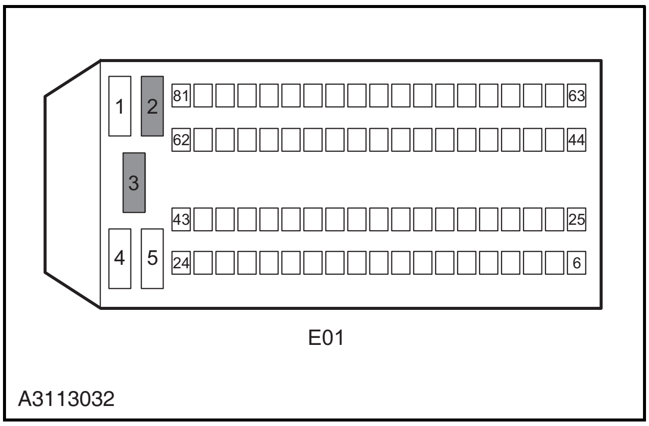
Symptom	Possible Sources	Action
Emergency during vehicle driving	• MAP sensor, APP sensor •Incorrect A/C system operation •No signal from CMP sensor or the signal is unstable •Air-intake system components leak •Sewage solenoid fault •Unstable signal from CKP sensor •Vacuum leakage •Poor fuel quality •Intermittent fault of the main relay and the fuel pump relay •Throttle body fault •Engine overheat •Spark plug fault •Ignition timing •Exhaust system restrictions •Fuel pressure inadequate •Fuel pump mechanical fault •Fuel injector • Unstable signal of APP sensor	Refer to: Diagnosis procedures for emergency in driving (3.1.13 Electronic Control System - MT22.1, Symptom Diagnose and Test).

Symptom	Possible Sources	Action
Stall during coasting	•Vacuum leakage •Air intake system leakage •Air / fuel mixing ratio improper control •Engine electronic control of fuel evaporative emissions system fault • APP sensor or related circuit fault • MAP sensor or related circuit fault • Incorrect operation of A/C solenoid clutch •Fuel injector •Spark plug •Ignition timing •Fuel •Exhaust block	Refer to: Diagnosis procedures for stall during coasting (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).
MIL indicator is always on	•Instrument circuit •Instrument • ECM • ECM circuit • CAN network	Refer to: MIL indicator fault Diagnosis Procedures (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).
MIL indicator is not on	• MIL indicator bulb •Instrument circuit •Instrument • ECM • ECM circuit • CAN network	Replace instrument. Refer to: Instrument Cluster Assembly (4.3.2 Instrument Cluster, Removal and Installation). Refer to: MIL indicator fault Diagnosis Procedures (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).

Diagnosis procedures for the engine can not start at normal start speed

Test Conditions	Details/Results/Actions
1. Inspect DTC	
	A.Connect the diagnosis tool. B.Turn the ignition switch to position "ON", diagnose the engine system. Are there any DTC? **Y** Go to DTC diagnosis procedure， **Refer to: DTC Diagnosis Procedures Index (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).** **N** Go to step 2.
2. Inspect the ignition system	
	A.Turn the ignition switch to "LOCK" position. B.Carry out the spark plug test. **Refer to: Ignition Spark Test (3.1.8 Ignition System, General Procedures).** Is the spark plug ignition spark test normal？ **Y** Go to step 3. **N** Inspect the ignition system. **Refer to: Spark Plug Misfire Diagnosis Procedures (3.1.8 Ignition System, Symptom Diagnosis and Testing).**

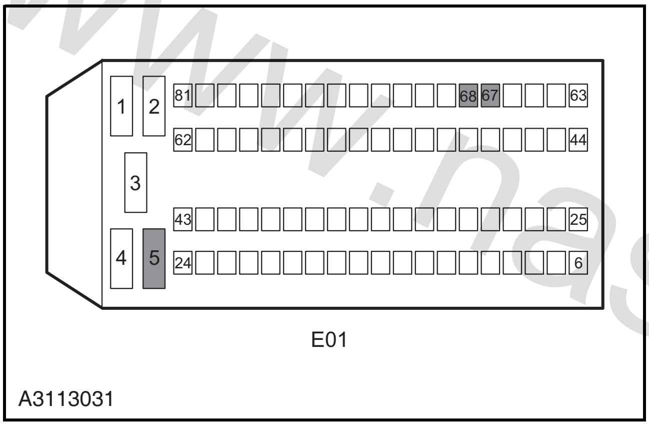
Test Conditions	Details/Results/Actions
3. Inspect the fuel pressure	
	A.Turn the ignition switch to "LOCK" position. B.Measure the fuel pressure. **Refer to: Fuel System Pressure Test (3.1.7 Fuel System， General Procedures).** Is the fuel pressure normal? **Y** Go to step 4. **N** Inspect the fuel system. **Refer to: Diagnosis procedures for fuel pump not working (3.1.7 Fuel System, Symptom Diagnosis and Testing).**
4. Inspect engine compression pressure	
	A.Inspect engine compression pressure **Refer to: Cylinder compression Pressure Inspection (3.1.2 Mechanical System, General Procedures).** Is the cylinder compression pressure normal？ **Y** Go to step 5. **N** Inspect the engine mechanical system.
5. Inspect anti-theft system	
	A.Inspect anti-theft system. Is the anti-theft system activated? **Y** Repair the anti-theft system, remove the anti-theft activation. **Refer to: ECM always Detects that the Vehicle Anti-theft Unreleased Fault Diagnosis Procedures (3.1.12 Anti-theft System, Symptom Diagnosis and Testing).** **N** Go to step 6.

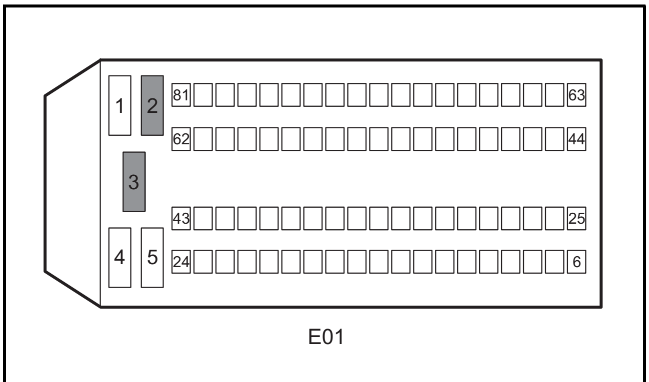
Test Conditions	Details/Results/Actions
6. Inspect the water in the fuel	
	A.Remove the fuel filter joint. **Refer to: Replace Fuel Filter (3.1.7 Fuel System, Removal and Installation).** B.Drain the fuel in the fuel filter and inspect the water in the fuel. Is there any water in fuel tank? **Y** Remove the water mixed in the fuel, add high standard pure fuel. **N** Go to step 7.
7. Inspect ECM power supply circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 8. **N** Repair and inspect the ECM power supply circuit.
8. Inspect ECM ground circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

Diagnosis procedures for cold start problems

Test Conditions	Details/Results/Actions
1. Inspect DTC	
	A.Connect the diagnosis tool. B.Turn the ignition switch to position "ON", diagnose the engine system. Are there any DTC? **Y** Go to DTC diagnosis procedures. **Refer to: DTC Diagnostic Procedures Index (3.1.13 Electronic Control System -MT22.1， DTC Diagnosis and Testing).** **N** Go to step 2.
2. Inspect throttle	
	A.Start the engine by depressing the accelerator panel slightly. Can the engine be started easily? **Y** Clean the throttle. **N** Go to step 3.
3. Inspect the ignition system	
	A.Turn the ignition switch to "LOCK" position. B.Carry out the ignition spark test. **Refer to: Ignition Spark Test (3.1.8 Ignition System, General Procedures).** Is the spark plug ignition spark test normal? **Y** Go to step 4. **N** Inspect the ignition system. **Refer to: Spark Plug Misfire Diagnosis Procedures (3.1.8 Ignition System, Symptom Diagnosis and Testing).**

Test Conditions	Details/Results/Actions
4. Inspect the fuel pressure	
	A.Turn the ignition switch to "LOCK" position. B.Measure the fuel pressure. **Refer to: Fuel System Pressure Test (3.1.7 Fuel System, General Procedures).** Is the fuel pressure normal? **Y** Go to step 5. **N** Inspect the fuel system. **Refer to: Diagnosis procedures for fuel pump not working (3.1.7 Fuel System, Symptom Diagnosis and Testing).**
5. Inspect the water temperature sensor	
	A.Disconnect the plug E22 of the water temperature sensor. B.Install in series of a 2500 Ω resistor at the temperature sensor joints to replace the water temperature sensor. C.Engine cold start. Whether the engine starts smoothly? **Y** Replace the water temperature sensor. **N** Go to step 6.
6. Inspect the compression pressure	
	A.Inspect the engine compression pressure. **Refer to: Cylinder Compression Pressure Inspection (3.1.2 Mechanical System, General Procedures).** Is the pressure insufficient in any cylinder? **Y** Go to step 7. **N** Inspect the engine mechanical system.

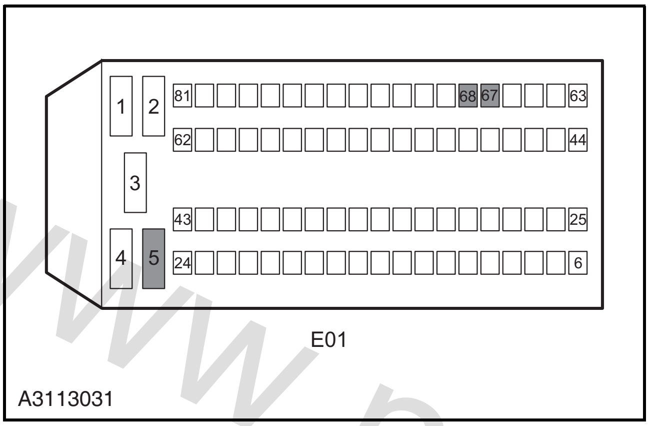
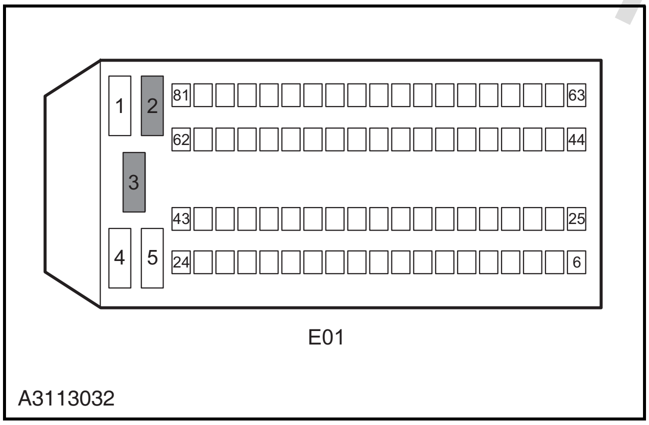
Test Conditions	Details/Results/Actions
7. Inspect the fuel injector	
	A. Remove the fuel injector. B. Use fuel Injector dedicated cleaning analyzer inspects the fuel injector for leakage or blockage. Is the fuel injector normal? **Y** Go to step 8. **N** Replace the fuel injector. **Refer to: Fuel Injector (3.1.13 Electronic Control System - MT22.1, Removal and Installation).**
8. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 9. **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
9. Inspect ECM ground circuit	
 A3113032	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

Diagnosis procedures of difficult warm start

Test Conditions	Details/Results/Actions
1. Inspect DTC	
	A.Connect the diagnosis tool. B.Turn the ignition switch to position "ON", diagnose the engine system. Are there any DTC? **Y** Go to DTC diagnosis procedures. **Refer to: DTC Diagnosis Procedures Index (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).** **N** Go to step 2.

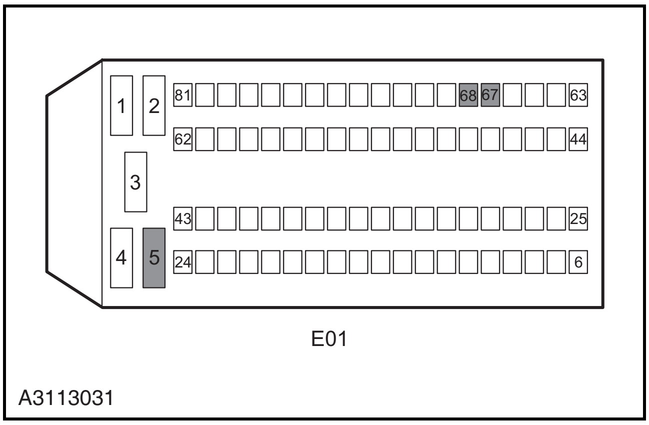
<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">2. Inspect the ignition system</td></tr>
<tr><td></td><td>A.Turn the ignition switch to "LOCK" position.
B.Carry out the ignition spark test.
Refer to: Ignition Spark Test (3.1.8 Ignition System, General Procedures).
Is the spark plug ignition spark test normal?
Y
Go to step 3.
N
Inspect the ignition system.
Refer to: Spark Plug Misfire Diagnosis Procedures (3.1.8 Ignition System, Symptom Diagnosis and Testing).</td></tr>
<tr><td colspan="2">3. Inspect the fuel pressure</td></tr>
<tr><td></td><td>A.Turn the ignition switch to "LOCK" position.
B.Measure the fuel pressure.
Refer to: Fuel System Pressure Test (3.1.7 Fuel System, General Procedures).
Is the fuel pressure normal?
Y
Go to step 4.
N
Inspect the fuel system.
Refer to: Diagnosis procedures for fuel pump does not working (3.1.7 Fuel System, Symptom Diagnosis and Testing).</td></tr>
<tr><td colspan="2">4. Inspect the water temperature sensor</td></tr>
<tr><td></td><td>A.Disconnect the connector E22 of the water temperature sensor.
B.Install in series of a 300 Ω resistor at the temperature sensor joints to replace the water temperature sensor.
C.Start the engine.
Whether the engine starts smoothly?
Y
Replace the water temperature sensor.
N
Go to step 5.</td></tr>
</table>

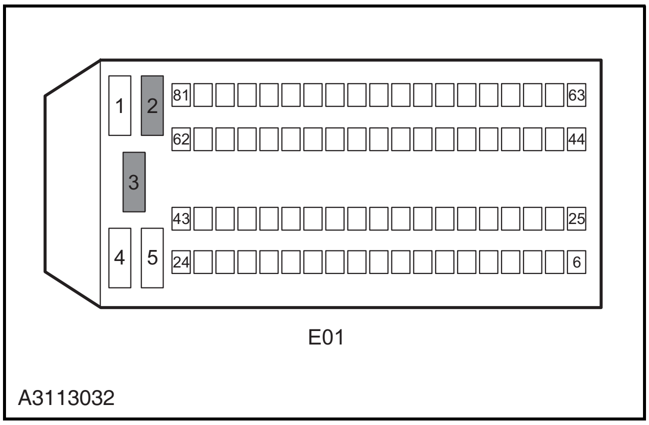
Test Conditions	Details/Results/Actions
5. Inspect fuel	
	Is the fault caused by just refueling? **Y** Replace fuel. **N** Go to step 6.
6. Inspect the ECM power supply circuit	
 A3113031	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 7. **N** Repair and inspect the ECM power supply circuit.
7. Inspect ECM ground circuit	
 A3113032	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

Diagnosis procedures for normal start, but unstable idling at all time

Test Conditions	Details/Results/Actions
1. Inspect DTC	
	A.Connect the diagnosis tool. B.Turn the ignition switch to position "ON", diagnose the engine system. Are there any DTC? **Y** Go to DTC diagnosis procedures. **Refer to: DTC Diagnosis Procedures Index (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).** **N** Go to step 2.
2.Inspect air intake system	
	A.Turn the ignition switch to "LOCK" position. B.Inspect the air intake system for block. C.Inspect air intake system for leakage. **Refer to: Intake Air Leakage Diagnosis Procedures (3.1.5 Intake System, Symptom Diagnosis and Testing).** Is the air intake system normal？ **Y** Go to step 3. **N** Repair the air intake system.
3. Inspect the throttle	
	A.Turn the ignition switch to "LOCK" position. B.Inspect throttle for stuck. C.Inspect throttle for carbon deposition. Is the throttle normal？ **Y** Go to step 4. **N** Clean or replace the throttle.

Test Conditions	Details/Results/Actions
4. Inspect the spark plug	
	A.Remove the spark plug. B. Inspect spark plug in each cylinder, observe whether the model and clearance meet the standard. **Refer to: Spark Plug Test (3.1.8 Ignition System, General Procedures).** Is the spark plug in each cylinder normal？ **Y** Go to step 5. **N** Replace the spark plug.
5. Inspect the fuel injector	
	A.Remove the fuel injector. B.Use fuel Injector dedicated cleaning analyzer inspects the fuel injector for leakage, blockages or the phenomenon of flow out of tolerance. Is the fuel injector normal？ **Y** Go to step 6. **N** Replace the fuel injector. **Refer to: Fuel Injector (3.1.13 Electronic Control System - MT22.1, Removal and Installation).**
6. Inspect fuel	
	A.Remove the fuel filter joint. **Refer to: Fuel Filter (3.1.7 Fuel System, Removal and Installation).** B.Drain the fuel in the fuel filter and inspect the water in the fuel. Is there any water in fuel tank? Y Remove the water mixed in the fuel, add high standard pure fuel. N Go to step 7.

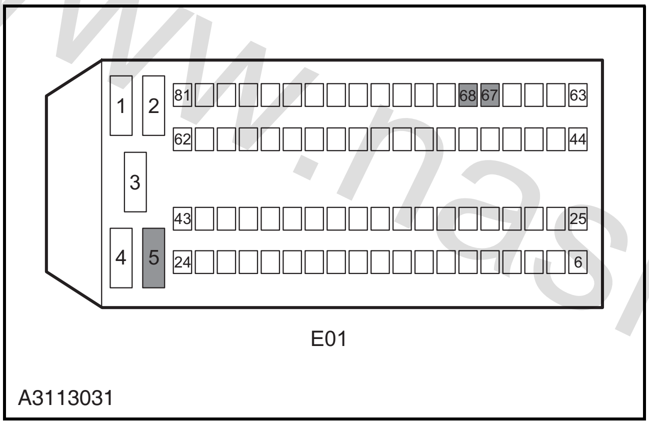
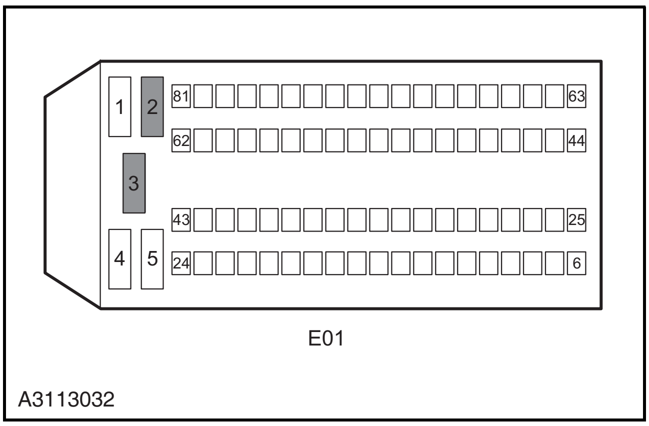
Test Conditions	Details/Results/Actions
7. Inspect compression pressure	
	A.Inspect engine compression pressure. **Refer to: Cylinder compression pressure inspection (3.1.2 Mechanical System, General Procedures).** Is there insufficient pressure or big differences in any cylinder? **Y** Go to step 8. **N** Inspect the engine mechanical system.
8. Inspect the ignition timing	
	A.Inspect the ignition sequence. B.Inspect the ignition timing. **Refer to: Timing Inspection (3.1.2 Mechanical System, General Procedures).** Are the ignition sequence and igition timing normal? **Y** Go to step 9. **N** Adjust the ignition timing.
9. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 10. **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
10. Inspect ECM ground circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

Diagnosis procedures for normal start when partial load (e.g. A/C is on), unstable idling or vehicle stall

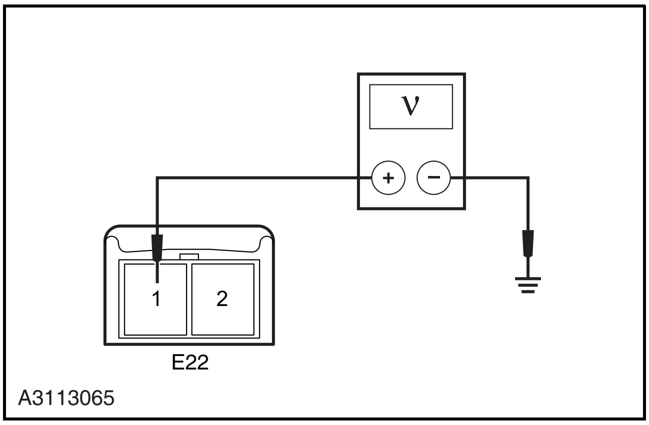
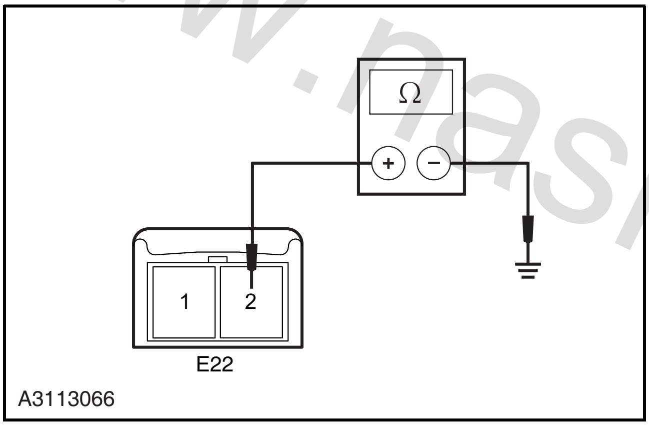
Test Conditions	Details/Results/Actions
1. Inspect DTC	
	A.Connect the diagnosis tool. B.Turn the ignition switch to position "ON", diagnose the engine system. Are there any DTC? **Y** Go to DTC diagnosis procedures. **Refer to: DTC Diagnosis Procedures Index (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).** **N** Go to step 2.

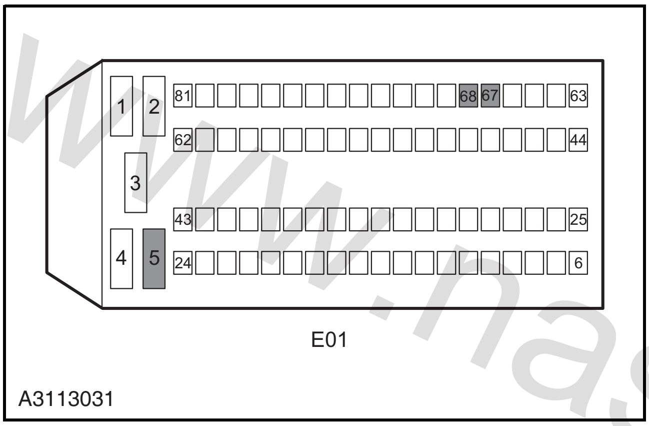
Test Conditions	Details/Results/Actions
2. Inspect the throttle	
	A.Turn the ignition switch to "LOCK" position. B.Inspect throttle for stuck. C.Inspect throttle for carbon deposition. Is the throttle normal？ **Y** Go to step 3. **N** Clean or replace the throttle.
3. Inspect if the engine output power increased when A/C on	
	A.Turn the ignition switch to "LOCK" position. B.Connect the diagnosis tool. C.Start the engine, access to the engine data stream menu, select the spark advance angle, fuel injection pulse width and the intake pressure sensor parameters. D.Turn on the air-conditioning, observe the change of data stream parameters. Does the data stream change? **Y** Go to step 4. **N** Inspect the A/C system. **Refer to: Diagnosis procedures for insufficient AC refrigeration (4.1.1 Climate Control System, Symptom Diagnosis and Testing).**
4. Inspect engine module A/C on signal	
	A.Turn the ignition switch to "ON" position. B. Measure the level signal of connecting wire of terminal 34 of engine control module wiring harness connector E01 with a multimeter, while A/C is on. When A/C is turned on, whether the voltage of terminal 34 of E01 is 0 V ? **Y** Go to step 5. **N** Repair the circuit.

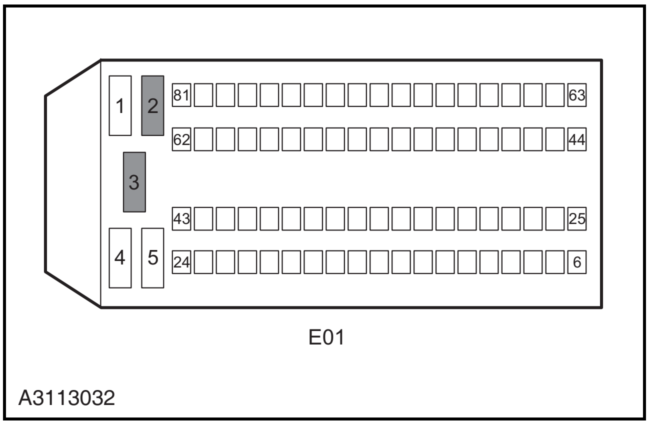
Test Conditions	Details/Results/Actions
5. Inspect the fuel injector	
	A.Remove the fuel injector. B.Use fuel Injector dedicated cleaning analyzer inspects the fuel injector for leakage, blockages or the phenomenon of flow out of tolerance. Is the fuel injector normal? **Y** Go to step 6. **N** Replace the fuel injector. **Refer to: Fuel Injector (3.1.13 Electronic Control System - MT22.1, Removal and Installation).**
6. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 7. **N** Repair and inspect the ECM power supply circuit.
7. Inspect ECM ground circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

Diagnosis procedures for normal start, idling is too high

Test Conditions	Details/Results/Actions
1. Inspect DTC	
	A.Connect the diagnosis tool. B.Turn the ignition switch to position "ON", diagnose the engine system. Are there any DTC? **Y** Go to DTC diagnosis procedures. **Refer to: DTC Diagnosis Procedures Index (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).** **N** Go to step 2.
2. Inspect if the accelerator pedal is stuck or too tight.	
	A.Turn the ignition switch to position “OFF”. B.Inspect if the accelerator pedal is stuck or too tight. Is the accelerator pedal stuck or too tight? **Y** Repair or replace the accelerator pedal. **N** Go to step 3.
3. Inspect the vacuum pipeline	
	A.Inspect air intake system for leakage. **Refer to: Diagnostic procedures for air intake system for leakage (3.1.5 Air intake system, General Procedures).** Does the air intake system leak? **Y** Repair the air intake system. **N** Go to step 4.
4. Inspect the water temperature sensor	
	A.Replace the water temperature sensor with a new one. B.Start engine, observe the engine. Is the engine idle speed too high? **Y** Go to step 7. **N** Go to step 5

Test Conditions	Details/Results/Actions
5. Inspect water temperature sensor signal circuit	
	A.Turn the ignition switch to "LOCK" position. B.Disconnect the water temperature sensor wiring harness connector E22. Turn the ignition switch to position "ON". C.Measure the voltage between terminal 1 of water temperature sensor wiring connector E22 and the reliable ground. **Standard Voltage Value: 4.7~5.5 V** Is the voltage normal？ **Y** Go to step 6. **N** Repair the fault circuit between terminal 1 of water temperature sensor joint E22 and terminal 49 of ECM wiring harness connector E01.
6. Inspect water temperature sensor ground circuit	
	A.Turn the ignition switch to "LOCK" position. B.Disconnect the water temperature sensor wiring harness connector E22 and measure the resistance value between terminal 2 of the connector E22 and reliable ground. **Standard Resistance Value: 10 MΩ or higher** C.Turn the ignition switch to position "ON". D. Measure the resistance value between terminal 2 of the water temperature sensor connector E22 and the reliable ground. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the water temperature sensor. **N** Repair the fault circuit between terminal 2 of water temperature sensor connector E22 and terminal 74 of ECM wiring harness connector E01.

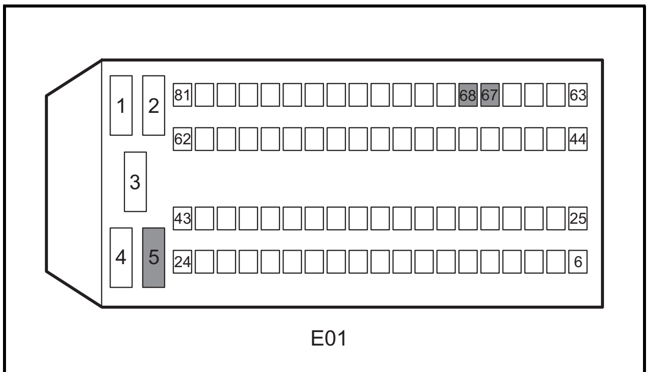
Test Conditions	Details/Results/Actions
7. Inspect the ignition timing	
	A.Inspect the ignition timing. Refer to: Ignition Timing Inspection (3.1.2 Mechanical System, General Procedures). Is the ignition timing normal? **Y** Go to step 8. **N** Adjust the ignition timing.
8. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 9. **N** Repair and inspect the ECM power supply circuit.

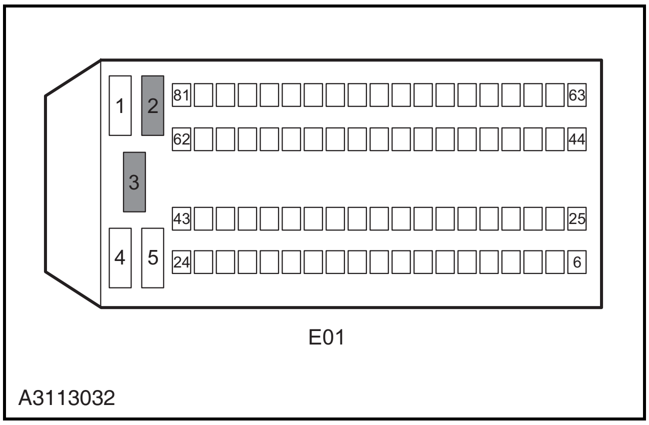
9. Inspect ECM ground circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation). **N** Inspect and repair the ECM ground circuit.

Acceleration fault diagnosis procedures

Test Conditions	Details/Results/Actions
1. Inspect DTC	
	A.Connect the diagnosis tool. B.Turn the ignition switch to position "ON", diagnose the engine system. Are there any DTC? **Y** Go to DTC diagnosis procedures. **Refer to: DTC Diagnosis Procedures Index (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).** **N** Go to step 2.
2. Inspect the air intake system	
	A.Turn the ignition switch to "LOCK" position. B.Inspect the air intake system for block. **Refer to: Symptom Chart (3.1.5 Air Intake System, Symptom Diagnosis and Testing).** C.Inspect the air intake system for leakage. **Refer to: Air Intake Leakage Inspection (3.1.5 Air Intake System, General Procedures).** Is the air intake system normal？ **Y** Go to step 3. **N** Repair the air intake system.
3. Inspect the throttle	
	A.Turn the ignition switch to "LOCK" position. B.Inspect throttle for stuck. C.Inspect throttle for carbon deposition. Is the throttle normal？ **Y** Go to step 4. **N** Clean or replace the throttle.

Test Conditions	Details/Results/Actions
4. Inspect the spark plug	
	A.Remove the spark plug. B. Inspect spark plug in each cylinder, observe whether the model and clearance meet the standard. **Refer to: Spark Plug Test (3.1.8 Ignition System, General Procedures).** Is the spark plug in each cylinder normal? **Y** Go to step 5. **N** Replace the spark plug.
5. Inspect the fuel injector	
	A.Remove the fuel injector. B.Use fuel Injector dedicated cleaning analyzer inspects the fuel injector for leakage, blockages or the phenomenon of flow out of tolerance. Is the fuel injector normal? **Y** Go to step 6. **N** Replace the fuel injector.
6. Inspect the fuel	
	Is the fault caused by just refueling? **Y** Replace fuel. **N** Go to step 7.
7. Inspect the air intake pressure sensor, throttle sensor.	
	A.Turn the ignition switch to "LOCK" position. B.Connect the diagnosis tool. C.Start engine, inspect the data stream of the air intake pressure sensor and throttle sensor. Is the data stream of the air intake pressure sensor and throttle sensor normal? **Y** Go to step 8. **N** Replace air intake pressure sensor and throttle sensor or repair sensor circuit.

Test Conditions	Details/Results/Actions
8. Inspect the ignition timing	
	A.Inspect the ignition sequence. B.Inspect the ignition timing. **Refer to: Timing Inspection (3.1.2 Mechanical System, General Procedures).** Are the ignition sequence and ignition timing normal？ **Y** Go to step 9. **N** Adjust the ignition timing.
9. Inspect the exhaust backpressure	
	A.Inspect exhaust back pressure. **Refer to: Exhaust Backpressure Test (3.1.6 Exhaust System, General Procedures).** Is the exhaust backpressure normal？ **Y** Go to step 10. **N** Repair the exhausts system.
10. Inspect the ECM power supply circuit	
 A3113031	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 11. **N** Repair and inspect the ECM power supply circuit.

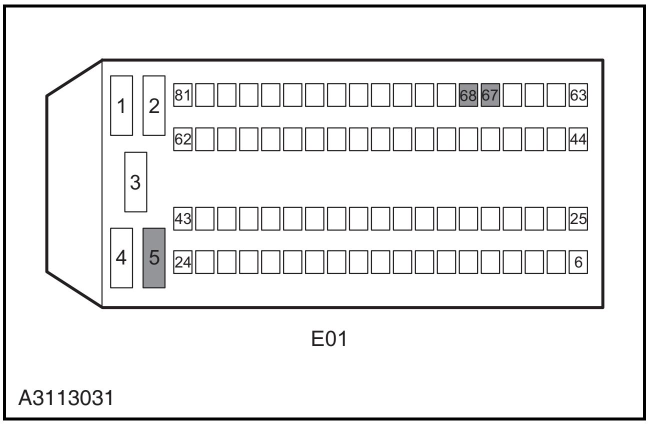
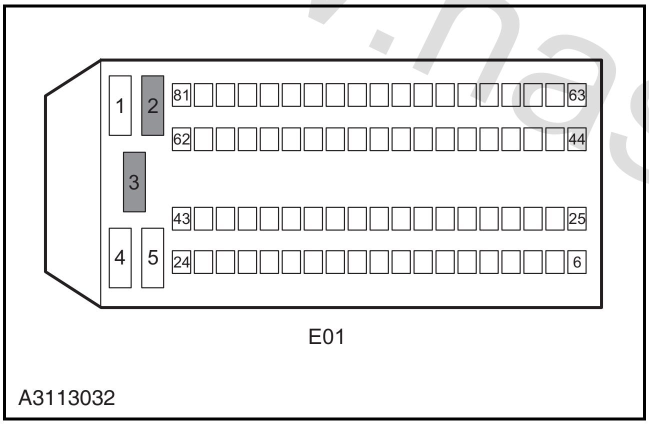
Test Conditions	Details/Results/Actions
11. Inspect ECM ground circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

Engine unstable running diagnosis procedures

Test Conditions	Details/Results/Actions
1. Inspect DTC	
	A.Connect the diagnosis tool. B.Turn the ignition switch to position "ON", diagnose the engine system. Are there any DTC? **Y** Go to DTC diagnosis procedures. **Refer to: DTC Diagnosis Procedures Index (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).** **N** Go to step 2.
2. Inspect the air intake system	
	A.Turn the ignition switch to "LOCK" position. B.Inspect the air intake system for block. **Refer to: Symptom Chart (3.1.5 Air Intake System, Symptom Diagnosis and Testing).** C.Inspect the air intake system for leakage. **Refer to: Air Intake System Leakage Diagnosis Procedures (3.1.5 Air Intake System, Symptom Diagnosis and Testing).** Is the air intake system normal? **Y** Go to step 3. **N** Repair the air intake system.
3. Inspect oxygen sensor	
	A.Connect the diagnosis tool. B.Turn the ignition switch to position "ON"，operate diagnosis tool to access to the engine data stream and read "pre-catalytic oxygen sensor pressure and post-catalytic oxygen sensor voltage". Is the data stream normal？ **Y** Go to step 4. **N** Repair or replace pre-catalytic oxygen sensor and the circuit.

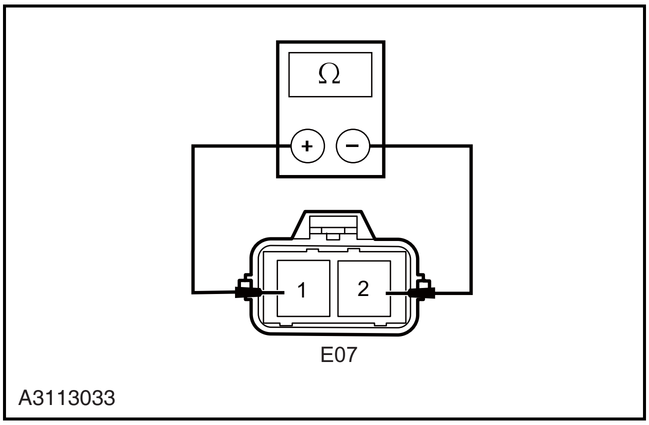
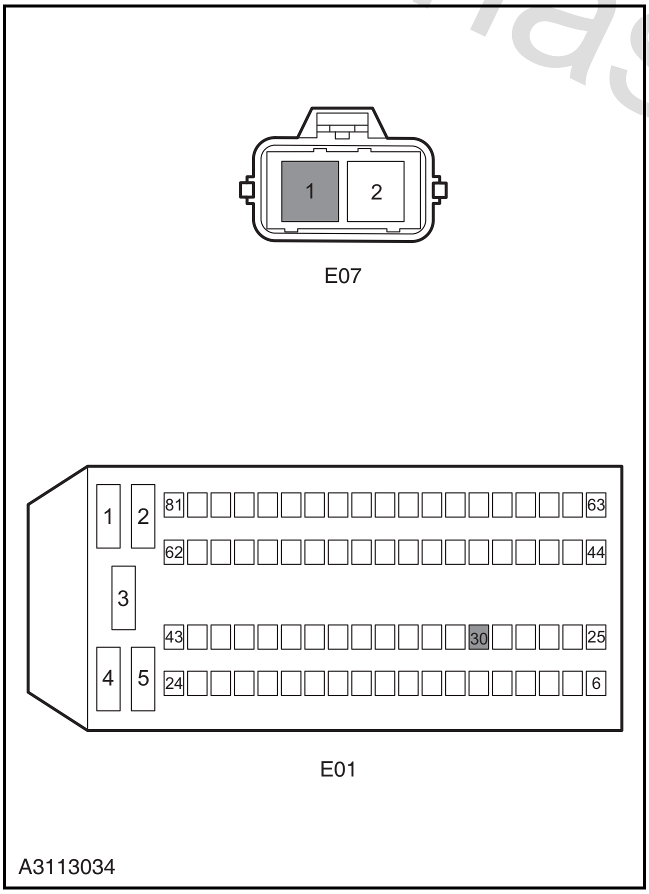
Test Conditions	Details/Results/Actions
4. Inspect the spark plug	
	A.Remove the spark plug. B. Inspect spark plug in each cylinder, observe whether the model and clearance meet the standard. **Refer to: Spark Plug Test (3.1.8 Ignition System, General Procedures).** Is the spark plug in each cylinder normal? **Y** Go to step 5. **N** Replace the spark plug.
5. Inspect the fuel injector	
	A.Remove the fuel injector. B.Inspect the fuel injector for leakage, blockages or the phenomenon of flow out of tolerance. Is the fuel injector normal? **Y** Go to step 6. **N** Replace the fuel injector.
6. Inspect the fuel pressure	
	A.Turn the ignition switch to "LOCK" position. B.Measure the fuel pressure. **Refer to: Fuel System Pressure Test (3.1.7 Fuel System， General Procedures).** Is the fuel pressure normal? **Y** Go to step 7. **N** Inspect the fuel system. **Refer to: Diagnosis procedures for fuel pump does not working (3.1.7 Fuel System, Symptom Diagnosis and Testing).**

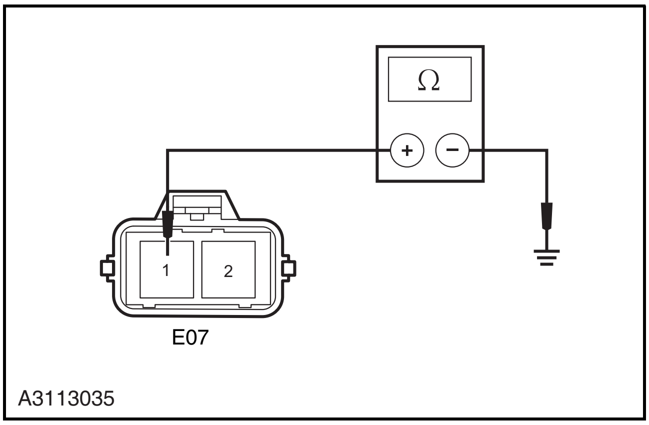
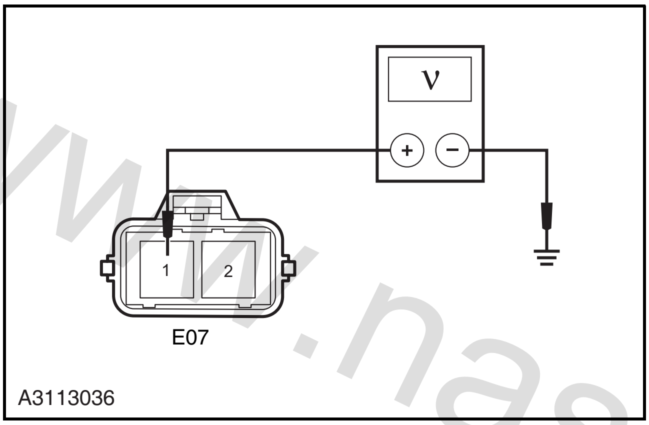
Test Conditions	Details/Results/Actions
7. Inspect the air intake pressure sensor, throttle position sensor	
	A.Turn the ignition switch to "LOCK" position. B.Connect the diagnosis tool. C.Start engine, inspect the data stream of the air intake pressure sensor and throttle sensor. Is the data stream of the air intake pressure sensor and throttle sensor normal? **Y** Go to step 8. **N** Replace air intake pressure sensor and throttle sensor or repair sensor circuit.
8. Inspect the ignition timing	
	A.Inspect the ignition sequence. B.Inspect the ignition timing. **Refer to: Timing Inspection (3.1.2 Mechanical System, General Procedures).** Are the ignition sequence and ignition timing normal? **Y** Go to step 9. **N** Adjust the ignition timing.
9. Inspect the engine support component	
	A.Inspect the engine support component. Are the engine suspension component cracked, damaged, bolts loose or lost? **Y** Repair the fault part. **N** Go to step 10.

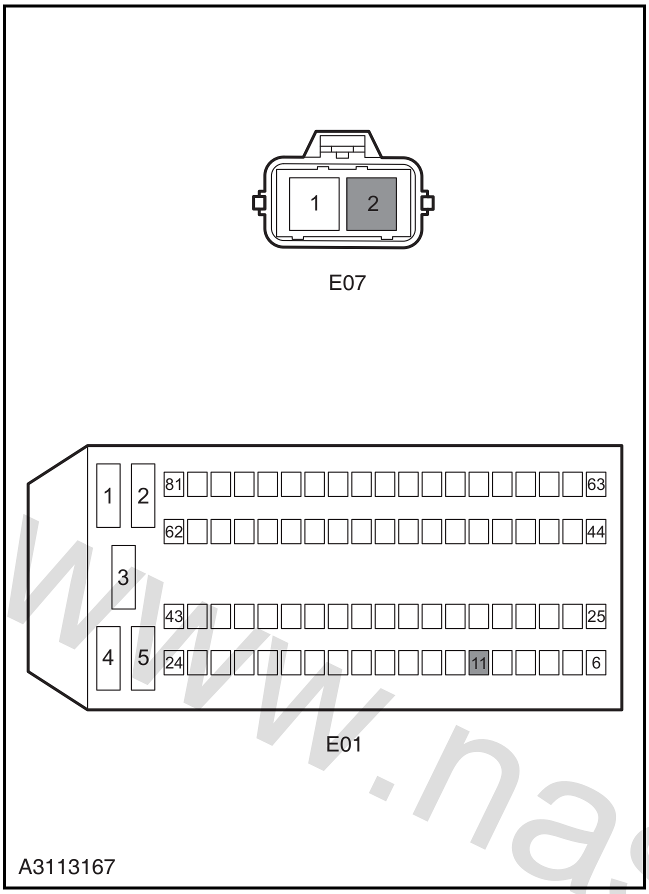
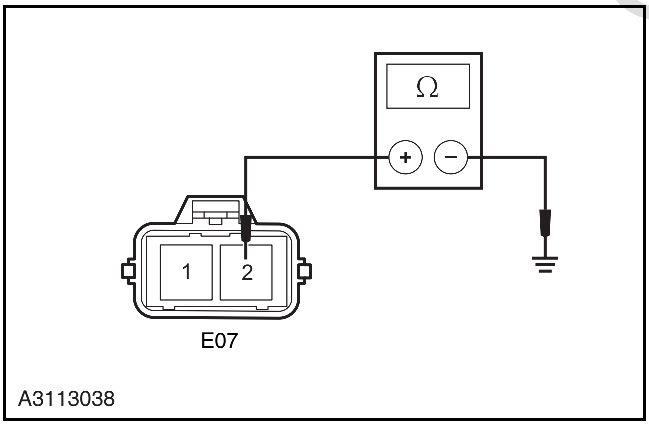
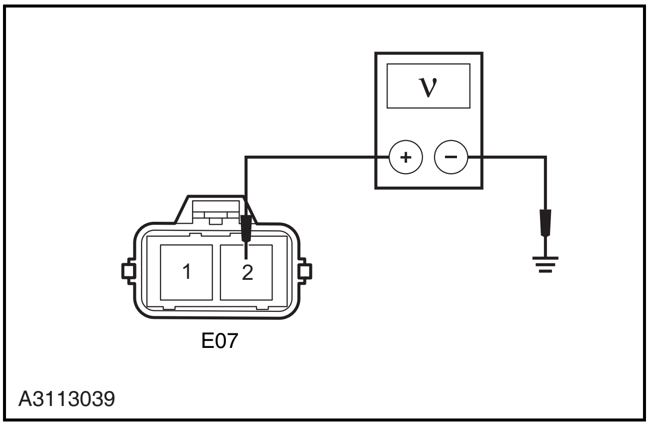
Test Conditions	Details/Results/Actions
10. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 11. **N** Repair and inspect the ECM power supply circuit.
11. Inspect ECM ground circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

Diagnosis procedures for easy stall at start

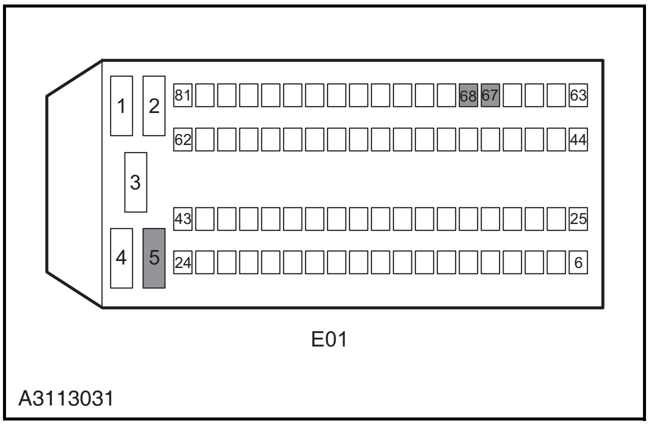
Test Conditions	Details/Results/Actions
1. Inspect DTC	
	A.Connect the diagnosis tool. B.Turn the ignition switch to position "ON", diagnose the engine system. Are there any DTC? **Y** Go to DTC diagnosis procedures. **Refer to: DTC Diagnosis Procedures Index (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).** **N** Go to step 2.
2. Air Intake System	
	A.Turn the ignition switch to "LOCK" position. B.Inspect the air intake system for block. **Refer to: Symptom Chart (3.1.5 Air Intake System, Symptom Diagnosis and Testing).** C.Inspect the air intake system for leakage. **Refer to: Air Intake System Leakage Diagnosis Procedures (3.1.5 Air Intake System, Symptom Diagnosis and Testing).** Is the air intake system normal? **Y** Go to step 3. **N** Repair the air intake system.

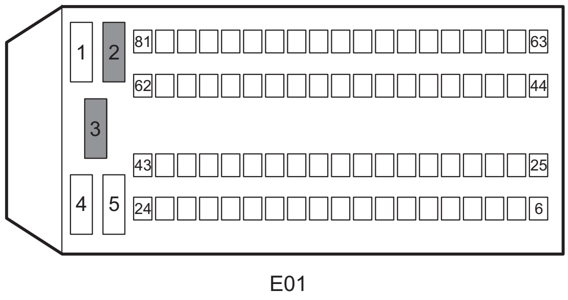
Test Conditions	Details/Results/Actions
3. Crankshaft position sensor	
	A.Turn the ignition switch to position “OFF”. B.Disconnect the crankshaft position sensor wiring harness connector E07. C.Measure the resistance value of crankshaft position sensor. **Standard Resistance Value: 20 ℃ (68 ºF) 900 ~ 1100 Ω** D.Connect crankshaft position sensor wiring harness connector E07. Is the resistance value normal? **Y** Go to step 4. **N** Replace the crankshaft position sensor. **Refer to: Crankshaft Position Sensor (3.1.13 Electronic Control System - MT22.1, Removal and Installation).**
4. Inspect crankshaft position sensor terminal 1 circuit	
	A.Turn the ignition switch to "LOCK" position. B.Disconnect the crankshaft position sensor wiring harness connector E07. C.Disconnect ECM wiring harness connector E01. D.Measure the resistance value between the terminal 1 of crankshaft position sensor wiring harness connector E07 and the terminal 30 of ECM wiring harness connector E01. Inspect for open circuit. **Standard Resistance Value: less than 5Ω** E.Measure the resistance value between the terminal 1 of crankshaft position sensor wiring harness connector E07 and the reliable ground. Inspect for short circuit to ground. **Standard Resistance Value: 10 MΩ or more** F.Measure the voltage between the terminal 1 of crankshaft position sensor wiring harness connector E07 and the reliable ground. Inspect for short circuit to power supply. **Standard voltage: 0 V** Is the circuit normal? **Y** Go to step 5. **N** Repair the circuit between the terminal 1 of crankshaft position sensor E07 and the terminal 30 of engine control module E01.

Test Conditions	Details/Results/Actions
	
	
5. Inspect crankshaft position sensor terminal 2 circuit	

Test Conditions	Details/Results/Actions
  	A.Turn the ignition switch to position “OFF”. B.Disconnect the knock sensor wiring harness connector E07. C.Disconnect ECM wiring harness connector E01. D.Measure the resistance value between the terminal 2 of crankshaft position sensor wiring harness connector E07 and the terminal 11 of ECM wiring harness connector E01. Inspect for open circuit. **Standard Resistance Value: less than 5Ω** E.Measure the resistance value between the terminal 2 of crankshaft position sensor wiring harness connector E07 and the reliable ground. Inspect for short circuit to ground. **Standard Resistance Value: 10 MΩ or higher** F.Measure the voltage between the terminal 2 of crankshaft position sensor wiring harness connector E07 and the reliable ground. Inspect for short circuit to power supply. **Standard voltage: 0 V** Is the circuit normal？ **Y** Go to step 6. **N** Repair the circuit between the terminal 2 of crank-shaft position sensor E07 and the terminal 11 of engine control module E01.

Test Conditions	Details/Results/Actions
6. Inspect the spark plug	
	A.Remove the spark plug. B. Inspect the spark plug in each cylinder, observe whether the model and clearance meet the standard. **Refer to: Spark Plug Test (3.1.8 Ignition System, General Procedures).** Is the spark plug in each cylinder normal? **Y** Go to step 7. **N** Replace the spark plug.
7. Inspect the fuel injector	
	A.Remove the fuel injector. B.Inspect the fuel injector for leakage, blockages or the phenomenon of flow out of tolerance. Is the fuel injector normal? **Y** Go to step 8. **N** Replace the fuel injector.
8. Inspect the fuel pressure	
	A.Turn the ignition switch to "LOCK" position. B.Measure the fuel pressure. **Refer to: Fuel System Pressure Test (3.1.7 Fuel System，General Procedures).** Is the fuel pressure normal? **Y** Go to step 9. **N** Inspect the fuel system. **Refer to: Diagnosis procedures for fuel pump does not working (3.1.7 Fuel System, Symptom Diagnosis and Testing).**

Test Conditions	Details/Results/Actions
9. Inspect the air intake pressure sensor, throttle position sensor	
	A.Turn the ignition switch to "LOCK" position. B.Connect the diagnosis tool. C.Start engine, inspect the data stream of the air intake pressure sensor and throttle sensor. Is the data stream of the air intake pressure sensor and throttle sensor normal? **Y** Go to step 10. **N** Replace air intake pressure sensor and throttle sensor or repair sensor circuit.
10. Inspect the ignition timing	
	A.Inspect the ignition sequence. B.Inspect the ignition timing. **Refer to: Timing Inspection (3.1.2 Mechanical System, General Procedures).** Are the ignition sequence and ignition timing normal? **Y** Go to step 11. **N** Adjust the ignition timing.
11. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 12. **N** Repair and inspect the ECM power supply circuit.

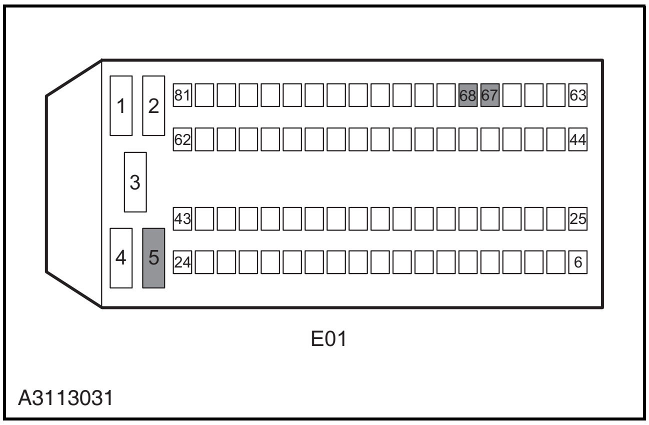
Test Conditions	Details/Results/Actions
12. Inspect ECM ground circuit	
 A3113032	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

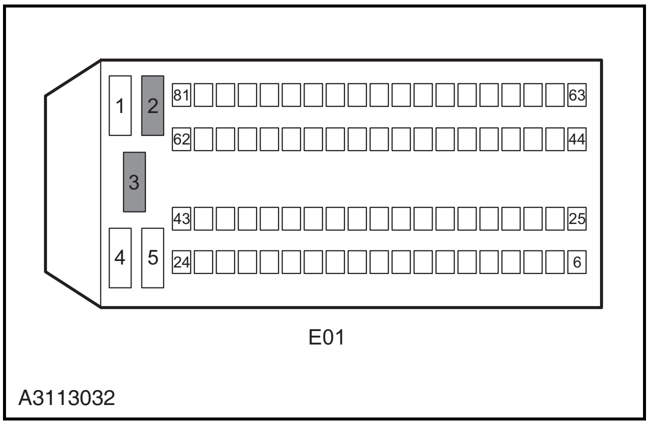
Emergency occurs during vehicle driving diagnosis procedures

Test Conditions	Details/Results/Actions
1. General inspection	
	A.Inspect the following items. • Vacuum pipeline connection • Air cleaner element • Air intake system no leakage • Air intake system no limitation • Intake manifold and the components installed on the intake manifold are correctly sealed • Ignition circuit • Proper quality of fuel (Such as proper octane value, impurity, winter/summer mixture) • Electrical connection • Stable operation of throttle Is the switch normal? **Y** Go to step 2. **N** Repair the fault part.
2. Inspect DTC	
	A.Connect the diagnosis tool. B.Turn the ignition switch to position "ON", diagnose the engine system. Are there any DTC? **Y** Repair and inspect DTC malfunction. **Refer to: DTC Diagnosis Procedures Index (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).** **N** Go to step 3.

Test Conditions	Details/Results/Actions
3. Inspect data stream	
	A.Connect the diagnosis tool. B.Use diagnostic tool to inspect the following data stream of the engine: • Engine speed • Actual air intake manifold pressure • Throttle potentiometer 1 voltage • Throttle potentiometer 2 voltage • Knock sensor signal 1 • Knock sensor signal 2 Is the data stream changes normally in the required range？ **Y** Go to step 4. **N** Repair the corresponding data stream fault.
4. Inspect the crankshaft position sensor and camshaft position sensor signals wheel	
	A.Turn the ignition switch to "LOCK" position. B.Visually inspect the crankshaft position sensor and camshaft position sensor signals wheel. Is the signal wheel normal？ **Y** Go to step 5. **N** Replace the signal wheel.
5. Inspect the spark plug	
	A.Remove the spark plug. B. Inspect the spark plug in each cylinder, observe whether the model and clearance meet the standard. **Refer to: Spark Plug Test (3.1.8 Ignition System, General Procedures).** Is the spark plug in each cylinder normal？ **Y** Go to step 6. **N** Replace the spark plug.

Test Conditions	Details/Results/Actions
6. Inspect the fuel injector	
	A.Remove the fuel injector. B.Inspect the fuel injector for leakage, blockages or the phenomenon of flow out of tolerance. Is the fuel injector normal? **Y** Go to step 7. **N** Replace the fuel injector. **Refer to: Fuel Injector (3.1.13 Electronic Control System - MT22.1, Removal and Installation).**
7. Inspect the fuel pressure	
	A.Turn the ignition switch to "LOCK" position. B.Measure the fuel pressure. **Refer to: Fuel System Pressure Test (3.1.7 Fuel System， General Procedures).** Is the fuel pressure normal? **Y** Go to step 8. **N** Inspect the fuel system. **Refer to: Diagnosis procedures for fuel pump does not working (3.1.7 Fuel System, Symptom Diagnosis and Testing).**
8. Inspect the ignition timing	
	A.Inspect the ignition sequence. B.Inspect the ignition timing. **Refer to: Timing Inspection (3.1.2 Mechanical System, General Procedures).** Are the ignition sequence and ignition timing normal? **Y** Go to step 9. **N** Adjust the ignition timing.

Test Conditions	Details/Results/Actions
9. Inspect the carbon canister system	
	A.Inspect the Carbon canister system. Refer to: Carbon canister Inspection (3.1.11 Exhaust Control System, General Procedures). Is the carbon canister system normal? **Y** Go to step 10. **N** Repair the carbon canister system.
10. Inspect exhaust backpressure	
	A.Inspect exhaust back pressure. Refer to: Exhaust Backpressure Test (3.1.6 Exhaust System, General Procedures). Is the exhaust backpressure normal? **Y** Go to step 11. **N** Repair the exhausts system.
11. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 12. **N** Repair and inspect the ECM power supply circuit.

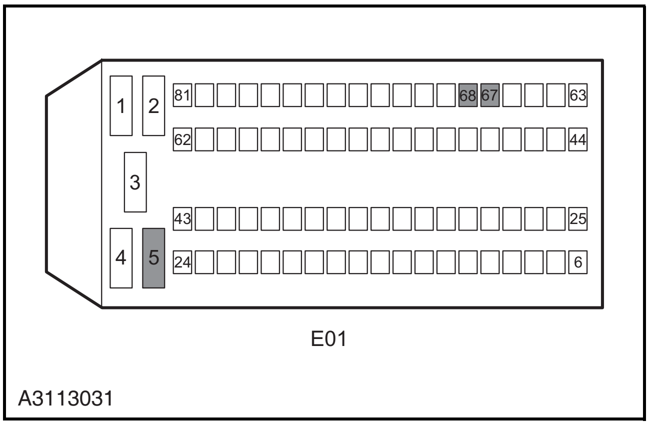
Test Conditions	Details/Results/Actions
12. Inspect ECM ground circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

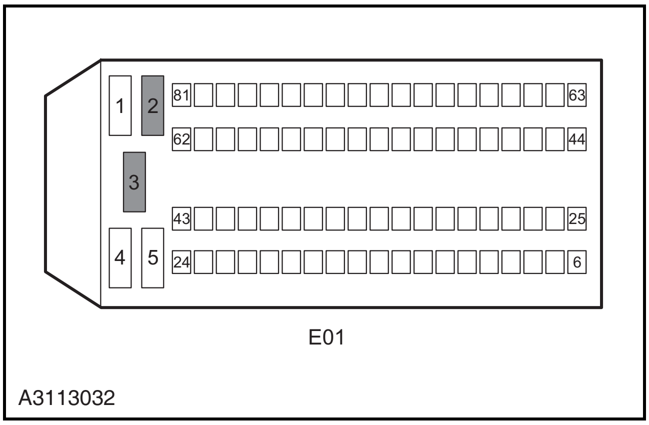
Stall during coasting diagnosis procedures

Test Conditions	Details/Results/Actions
1. General inspection	
	A.Inspect vacuum pipeline correctly positioned and with no damage B.Inspect the intake system for no leakage. Is the inspect normal? **Y** Go to step 2. **N** Repair the fault part.
2. Engine idle speed	
	A.Inspect the engine idle speed Is the engine idle stable? **Y** **Refer to: Diagnosis procedures for normal start, unstable idling or stall with partial load (3.1.13 Electronic Control System - MT22.1, Diagnosis and Test).** **N** Go to step 3.

Test Conditions	Details/Results/Actions
3. Inspect A/C compressors and electronic fans close	
	A.Turn the ignition switch to "LOCK" position. B.Disconnect the A/C compressor solenoid clutch. C.Is the A/C system inspecting is normal. D.Restore the solenoid clutch connector. Is the system normal after disconnecting the solenoid clutch and fan wiring harness connector? **Y** Repair the fault of solenoid clutch doesn't switch off. **N** Go to step 4.
4. Inspect DTC	
	A.Connect the diagnosis tool. B.Turn the ignition switch to position "ON", diagnose the engine system. Are there any DTC? **Y** Go to DTC diagnosis procedure. **Refer to: DTC Diagnosis Procedures Index (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).** **N** Go to step 5.
5. Inspect the spark plug	
	A.Remove the spark plug. B. Inspect the spark plug in each cylinder, observe whether the model and clearance meet the standard. **Refer to: Spark Plug Test (3.1.8 Ignition System, General Procedures).** Is the spark plug in each cylinder normal? **Y** Go to step 6. **N** Replace the spark plug.

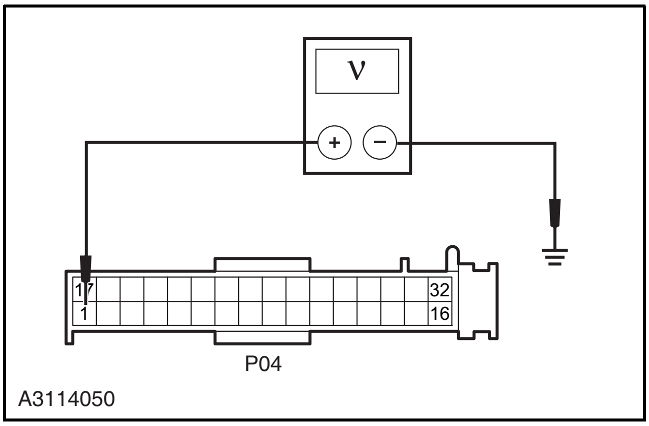
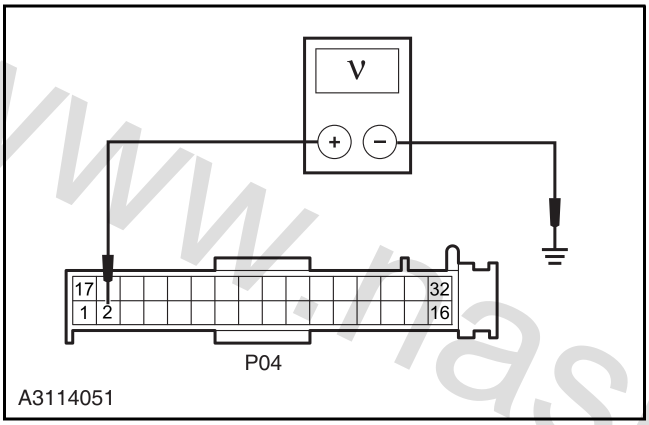
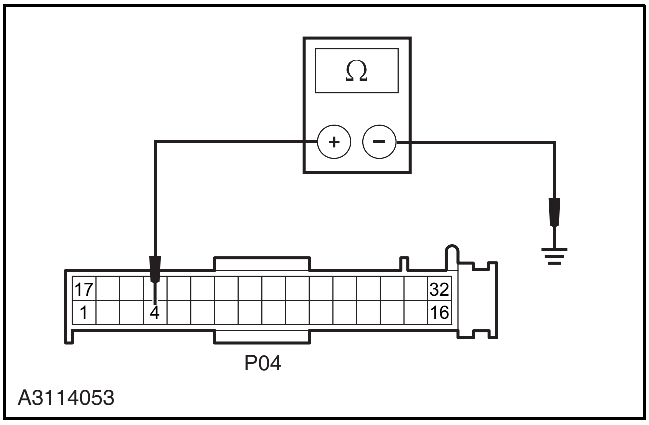
Test Conditions	Details/Results/Actions
6. Inspect the fuel injector	
	A.Remove the fuel injector. B.Inspect the fuel injector for leakage, blockages or the phenomenon of flow out of tolerance. Is the fuel injector normal? **Y** Go to step 7. **N** Replace or clean the fuel injector. **Refer to: Fuel Injector (3.1.13 Electronic Control System - MT22.1, Removal and Installation).**
7. Inspect fuel	
	Is the fault caused by just refueling? **Y** Replace fuel. **N** Go to step 8.
8. Inspect the air intake pressure sensor, throttle position sensor.	
	A.Turn the ignition switch to "LOCK" position. B.Connect the diagnosis tool. C.Start engine, inspect the data stream of the air intake pressure sensor and throttle sensor. Is the data stream of the air intake pressure sensor and throttle sensor normal? **Y** Go to step 9. **N** Replace air intake pressure sensor and throttle sensor or repair sensor circuit.

Test Conditions	Details/Results/Actions
9. Inspect the ignition timing	
	A.Inspect the ignition sequence. B.Inspect the ignition timing. **Refer to: Timing Inspection (3.1.2 Mechanical System, General Procedures).** Are the ignition sequence and ignition timing normal？ **Y** Go to step 10. **N** Adjust the ignition timing.
10. Inspect exhaust backpressure	
	A.Inspect exhaust backpressure. **Refer to: Exhaust backpressure Inspection (3.1.6 Exhaust System, General Procedures).** Is the exhaust backpressure normal？ **Y** Go to step 11. **N** Repair the exhausts system.
11. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 12. **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
12. Inspect ECM ground circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

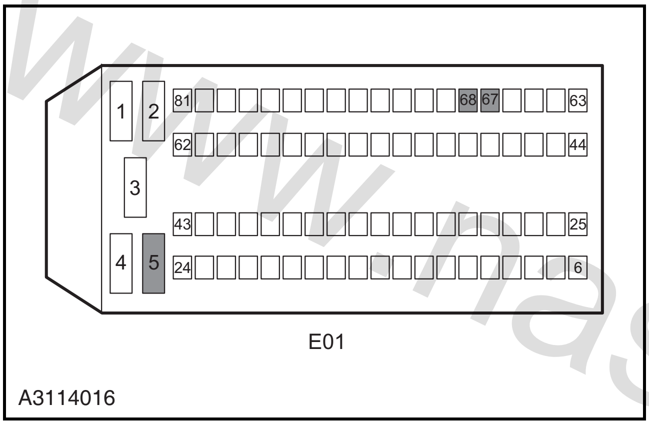
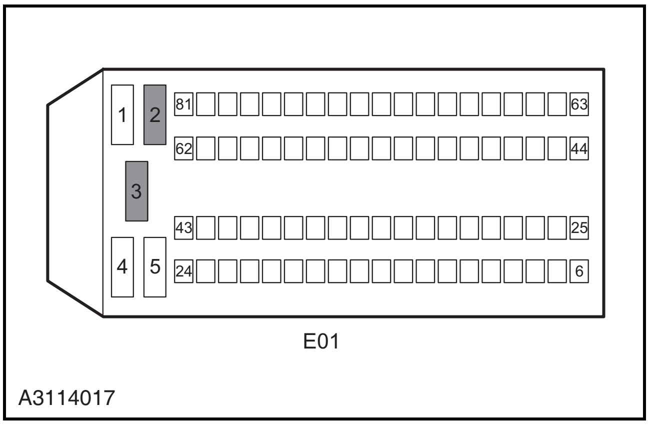
MIL indicator fault diagnosis procedures

Test Conditions	Details/Results/Actions
1. Inspect instrument other warning indicator status	
	A.Turn the ignition switch to position "ON". B.Inspect the status of all warning indicators. Is there any other warning indicator is abnormal on besides MIL indicator? **Y** Go to step 2. **N** Go to step 4.

Test Conditions	Details/Results/Actions
2. Inspect instrument power supply circuit	
 	A.Turn ignition switch to position "LOCK" and measure the voltage between instrument cluster wiring harness connector P04 terminal 1 and reliable ground. **Standard Voltage Value: 11~14 V** B.Turn ignition switch to position "ON" and measure the voltage between cluster instrument wiring harness connector P04 terminal 2 and reliable ground. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 3. **N** Repair the instrument cluster power supply circuit.
3. Inspect the ground circuit of the instruments	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the instrument cluster wiring harness connector P04. C.Turn the ignition switch to position "LOCK" and measure the wiring harness resistance between the terminal 4 of the instrument cluster wiring harness connector P04 and the GND point. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Go to step 4. **N** Repair the instrument cluster ground circuit.

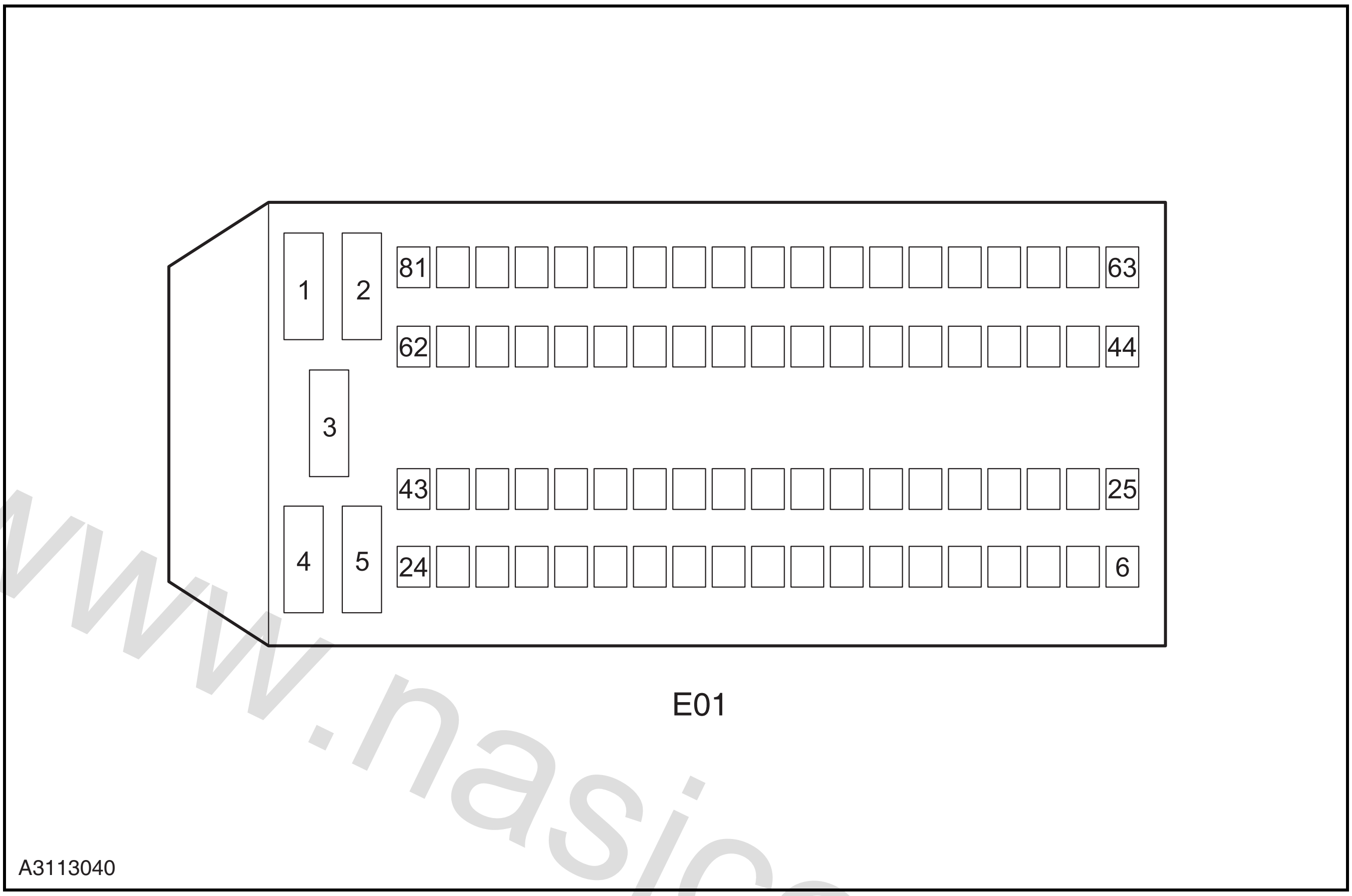
<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">4. Replace the instrument cluster</td></tr>
<tr><td></td><td>A.Replace instrument.

Refer to: Instrument Cluster Assembly (4.3.2 Instrument Cluster, Removal and Installation).

Does the system become normal?
Y
The diagnosis is completed.
N
Go to step 5.</td></tr>
<tr><td colspan="2">5. Inspect the ECM power supply circuit</td></tr>
<tr><td>
</td><td>A.Turn the ignition switch to "LOCK" position.
B.Measure from the back of ECM wiring harness connector E01.
C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply.
Standard Voltage Value: 11~14 V
Is the voltage normal?
Y
Go to step 6.
N
Repair and inspect the ECM power supply circuit.</td></tr>
<tr><td colspan="2">6. Inspect ECM ground circuit</td></tr>
<tr><td>
</td><td>A.Turn the ignition switch to "LOCK" position.
B.Measure from the back of ECM wiring harness connector E01.
C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal.
Standard Resistance Value: less than 5Ω
Is the resistance value normal?
Y
Replace the engine control module.
Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).
N
Inspect and repair the ECM ground circuit.</td></tr>
</table>

DTC Diagnosis and Test

Control module terminal list



Terminal No.	Connection	Terminal definition	Detailed description of terminal
1	1D01	0.85 LG/WH	Ignition coil (2, 3) signal output
2	1D02	1.25 BK	GND
3	1D03	1.25 BK	GND
4	1D04	0.85 PK/BU	Ignition coil (1, 4) signal output
5	1D05	0.85 BK/BU	ECM power (main relay control)
6	1D06	0.75 BU/RD	Fuel injector 1 signal output
7	1D07	0.85 BK/GN	Fuel injector 3 signal output
8	1D08	0.75 OG/VT	Fuel injector 2 signal output
9	1D09	0.5 BN/RD	Compressor relay signal output
10	1D10	0.5 OG/BN	Fuel pump relay signal output
11	1D11	0.5 GY	Crankshaft position sensor signal (LO)
12	-	-	-
13	-	-	-

Terminal No.	Connection	Terminal definition	Detailed description of terminal
14	-	-	-
15	-	-	-
16	-	-	-
17	1D17	0.5 GN/BK	Cooling fan relay (high speed) signal output
18	-	-	-
19	-	-	-
20	1D20	0.5 GN	Electronic throttle body actuator motor signal (L0)
21	1D21	0.5 YD	Electronic throttle body actuator motor signal (HI)
22	1D22	0.5 VT/BU	OCV exhaust valve signal output
23	1D23	0.85 BK/GY	Post-catalytic oxygen sensor heating wire signal output
24	1D24	0.85 RD/BK	Pre-catalytic oxygen sensor heating wire signal output
25	1D25	0.85 RD/OG	Fuel injector 4 signal output
26	-	-	-
27	1D27	0.5 YE/WH	Electronic throttle position sensor signal 2
28	-	-	-
29	-	-	-
30	1D30	0.5 BU	Crankshaft position sensor signal (HI)
31	-	-	-
32	-	-	-
33	1D33	0.5 WH	Brake lamp signal
34	1D34	0.5 OG/BK	Blower open signal
35	1D35	0.85 OG/WH	Compressor signal
36	1D36	0.5 GY/RD	Knock sensor signal (HI)
37	1D37	0.5 GY/GN	Knock sensor signal (LO)
38	1D38	0.3 LG/BK	CAN-L
39	1D39	0.3 LG	CAN-H
40	1D40	0.5 WH/PK	Refrigerant pressure switch signal
41	1D41	0.5 YE/OG	Electronic accelerator pedal sensor signal 1

Terminal No.	Connection	Terminal definition	Detailed description of terminal
42	1D42	0.5 BN/WH	Electronic accelerator pedal sensor signal 2
43	1D43	0.5 BU/YE	OCV intake valve signal output
44	1D44	0.5 RD/OG	Main relay signal output
45	-	-	-
46	-	-	-
47	1D47	0.5 RD/WH	Pre-catalytic oxygen sensor signal
48	1D48	0.5 BU/GN	Post-catalytic oxygen sensor signal
49	1D49	0.5 YE/BN	Water temperature sensor signal
50	-	-	-
51	-	-	-
52	1D52	0.5 BN/YE	Electronic throttle position sensor signal 1
53	-	-	-
54	1D54	0.5 GY/VT	Inlet air pressure sensor signal
55	-	-	-
56	-	-	-
57	-	-	-
58	1D58	0.5 WH/YE	Exhaust camshaft position sensor signal
59	-	-	-
60	1D60	0.5 RD/GN	Power steering switch signal
61	-	-	-
62	-	-	-
63	-	-	-
64	1D64	0.75 BK/GN	Carbon canister solenoid signal output
65	1D65	0.5 GY/YE	Water tank fan relay (low speed) signal output
66	1D66	0.5 YE/BK	5V power output
67	1D67	0.5 PK/YE	ECM power (+B)
68	1D68	0.5 WH/RD	ECM power (IG1)
69	1D69	0.5 BN/BU	Brake switch signal
70	1D70	0.5 VT/YE	5V power output
71	1D71	0.5 BU/BN	Air intake temperature sensor signal

Terminal No.	Connection	Terminal definition	Detailed description of terminal
72	-	-	-
73	1D73	0.5 OG	Sensor internal ground
74	1D74	0.5 PK/WH	Sensor internal ground
75	1D75	0.5 YE/GN	K-LINE
76	1D76	0.5 GN/WH	Sensor internal ground
77	1D77	0.5 PK/BK	Intake camshaft position sensor signal
78	-	-	-
79	1D79	0.5 PK/BN	Clutch switch signal
80	-	-	-
81	-	-	-

Diagnostic Trouble Code (DTC) Type

Fault type	Definition
Type A	For the first "Fail", MIL indicator will be illuminated and DTC recorded. If a fault disappears automatically and the "Passed Key Cycle" self-diagnosis is passed in 3 consecutive strokes, the indicator will turn off automatically and the fault will be deleted after consecutive 40 warm-up cycles without malfunction. The misfire fault leading to catalyst damage is defined as Type A.
Type B	Only when one "Fail Key Cycle" occurs during each of two consecutive strokes could make MIL indicator be illuminated and DTC recorded. If a fault disappears automatically and the "Passed Key Cycle" self-diagnosis is passed in 3 consecutive strokes, the indicator will turn off automatically and the fault will be deleted after 40 consecutive warm-up cycles without malfunction. The misfire fault leading to emission damage is defined as Type B.
Type C	The MIL indicator will be illuminated immediately after the diagnostic result "Fail" comes out and will turn off after the diagnostic result "Pass" comes out. Or, the indicator turns on for 1s upon start of new "Key Cycle", the system automatically considers the diagnosis as "Pass" and turn off the indicator.
Type E	Only when one "Fail Key Cycle" occurs during each of three consecutive strokes could make MIL indicator be illuminated and DTC recorded. If a fault disappears automatically and the "Passed Key Cycle" self-diagnosis is passed in 3 consecutive strokes, the indicator will turn off automatically and the fault will be deleted after 40 consecutive warm-up cycles without malfunction.
Type Z	The fault diagnosis system will make no diagnosis of Type Z faults.

DTC code list

Fault code	Description	Fault type	Is the MIL indicator on	Is the SVS indicator on
P0011	Intake VCP phase response lagging	A	√	-
P0012	Intake VCP camshaft phase error big	A	√	-
P0014	Exhaust VCP phase response lagging	A	√	-
P0015	Exhaust VCP camshaft phase error big	A	√	-
P0016	Intake VCP cam tooth learning deviation out of range	A	√	-
P0017	Exhaust VCP cam tooth learning deviation out of range	A	√	-
P0026	Intake VCP hydraulic control valve clamped	A	√	-
P0027	Exhaust VCP hydraulic control valve clamped	A	√	-
P0031	Pre-catalytic oxygen sensor heater short circuit to low voltage	A	√	-
P0032	Pre-catalytic oxygen sensor heater short circuit to high voltage	A	√	-
P0037	Post-catalytic oxygen sensor heater short circuit to low voltage	A	√	-
P0038	Post-catalytic oxygen sensor heater short circuit to high voltage	A	√	-
P0068	Electronic throttle air flow error	A	√	-
P0076	Intake VCP hydraulic control valve coil low voltage or open circuit	A	√	-
P0077	Intake VCP hydraulic control valve coil high voltage	A	√	-
P0079	Exhaust VCP hydraulic control valve coil low voltage or open circuit	A	√	-
P0080	Exhaust VCP hydraulic control valve coil high voltage	A	√	-
P0105	Intake pressure sensor signal clamped	E	√	-
P0106	Intake pressure/throttle position rationality fault	E	√	-
P0107	Intake pressure sensor circuit low voltage or open circuit	A	√	-
P0108	Intake pressure sensor circuit high voltage	A	√	-
P0112	Intake temperature sensor circuit low voltage	E	√	-

Fault code	Description	Fault type	Is the MIL indicator on	Is the SVS indicator on
P0113	Intake temperature sensor circuit high voltage or open circuit	E	√	-
P0117	Coolant temperature sensor circuit low voltage	A	√	-
P0118	Coolant temperature sensor circuit high voltage or open circuit	A	√	-
P0122	Electronic throttle position sensor 1# circuit low voltage	A	√	-
P0123	Electronic throttle position sensor 1# circuit high voltage	A	√	-
P0131	Pre-catalytic oxygen sensor short circuit to low voltage	E	√	-
P0132	Pre-catalytic oxygen sensor short circuit to high voltage	E	√	-
P0133	Pre-catalytic oxygen sensor response too slow	E	√	-
P0134	Pre-catalytic oxygen sensor open circuit	A	√	-
P0137	Post-catalytic oxygen sensor short circuit to low voltage	E	√	-
P0138	Post-catalytic oxygen sensor short circuit to high voltage	E	√	-
P0140	Post-catalytic oxygen sensor open circuit	E	√	-
P0171	Fuel system too lean in non-idle condition	E	√	-
P0172	Fuel system too rich in non-idle condition	E	√	-
P0222	Electronic throttle position sensor 2# circuit low voltage	A	√	-
P0223	Electronic throttle position sensor 2# circuit high voltage	A	√	-
P0230	Fuel pump relay fault	A	√	-
P0261	Cylinder 1 injector circuit low voltage fault	A	√	-
P0262	Cylinder 1 injector circuit high voltage fault	A	√	-
P0264	Cylinder 2 injector circuit low voltage fault	A	√	-
P0265	Cylinder 2 injector circuit high voltage fault	A	√	-
P0267	Cylinder 3 injector circuit low voltage fault	A	√	-

Fault code	Description	Fault type	Is the MIL indicator on	Is the SVS indicator on
P0268	Cylinder 3 injector circuit high voltage fault	A	√	-
P0270	Cylinder 4 injector circuit low voltage fault	A	√	-
P0271	Cylinder 4 injector circuit high voltage fault	A	√	-
P0300	Single/multiple cylinder misfire	A/B	√	-
P0324	Knock control system fault	C	-	√
P0325	Knock sensor fault	C	-	√
P0335	Crankshaft position sensor circuit no signal	A	√	-
P0336	Crankshaft position sensor circuit signal interference	E	√	-
P0340	Intake/exhaust VCP camshaft position sensor status diagnosis	A	√	-
P0341	Intake VCP target wheel diagnosis fault	A	√	-
P0351	Cylinder 1 & 4 ignition coil fault	A	√	-
P0352	Cylinder 2 & 3 ignition coil fault	A	√	-
P0366	Exhaust VCP target wheel - CAM sensor fault	A	√	-
P0420	Catalytic converter efficiency low	A	√	-
P0458	Carbon canister solenoid circuit short to low voltage or open circuit	E	√	-
P0459	Carbon canister solenoid circuit short to high voltage	E	√	-
P0480	Low speed fan fault	C	-	√
P0481	High speed fan fault	C	-	√
P0502	No vehicle speed sensor signal (speed from CAN communication)	E	√	-
P0504	Brake switch correlation fault	C	-	√
P0506	Idle speed too low	E	√	-
P0507	Idle speed too high	E	√	-
P0551	Power steering switch circuit voltage range/performance fault	C	-	√
P0562	The system voltage is too low	C	-	√
P0563	The system voltage is too high	C	-	√
P0571	Braking light switch status does not change during braking application	E	√	-
P0602	ECM programming error (software version unmatched)	A	√	-

Fault code	Description	Fault type	Is the MIL indicator on	Is the SVS indicator on
P0604	RAM error	A	√	-
P0606	ECM processor fault	A	√	-
P060A	ECM processor fault	A	√	-
P0641	ETC reference voltage A# amplitude fault	A	√	-
P0646	A/C clutch relay circuit short to low voltage or open circuit	C	-	√
P0647	A/C clutch relay circuit short to high voltage	C	-	√
P0651	ETC reference voltage B# amplitude fault	A	√	-
P0685	Main relay fault	A	√	-
P0831	Clutch switch circuit signal low (short to power supply or open circuit)	C	-	√
P0832	Clutch switch circuit signal high (short to ground)	C	-	√
P1167	Front oxygen rich in deceleration fuel cutoff	E	√	-
P1171	Front oxygen lean in acceleration fuel richening	E	√	-
P1337	58-tooth gear error not learned	A	√	-
P1516	ETC drive stable state diagnosis error	A	√	-
P2101	ETC drive step 2 diagnosis error	A	√	-
P2104	Engine forced idle	A	√	-
P2105	Engine forced shutdown	A	√	-
P2106	Engine performance restriction	A	√	-
P2110	Engine power management	A	√	-
P2119	Electronic throttle returning fault	C		√
P2122	Electronic accelerator pedal position sensor 1# circuit low voltage	A	√	-
P2123	Electronic accelerator pedal position sensor 1# circuit high voltage	A	√	-
P2127	Electronic accelerator pedal position sensor 2# circuit low voltage	A	√	-
P2128	Electronic accelerator pedal position sensor 2# circuit high voltage	A	√	-
P2135	Electronic throttle position sensor 1# & 2# circuits correlation fault	E	√	-
P2138	Electronic accelerator pedal position sensor 1# & 2# circuits correlation fault	A	√	-

Fault code	Description	Fault type	Is the MIL indicator on	Is the SVS indicator on
P2187	Fuel system too lean in idle condition	E	√	-
P2188	Fuel system too rich in idle condition	E	√	-
U0001	CAN communication fault (C001)	A	√	-
U0073	CAN bus off (C073)	A	√	-
U0121	Loss of communication between ECM and ESP or ABS control module (C121)	C	-	√
U0140	Loss of communication between ECM and vehicle body control module (C140)	C	-	√
U0155	Loss of communication between ECM and instrument panel cluster control module (C155)	C	-	√

Failure protection list

DTC code	Part	Failure protection operation	Prerequisite of releasing failure protection
P0011, P0012, P0016, P0341	Intake VCP fault		Repair fault
P0026, P0076, P0077	Intake VCP hydraulic control valve signal	Disable variable intake control	Remove circuit faults between intake oil control valve and ECM, or replace the intake oil control valve
P0014, P0015, P0017, P0336	Exhaust VCP fault		Repair fault
P0027, P0079, P0080	Exhaust VCP hydraulic control valve signal	Disable variable exhaust control	Remove circuit faults between exhaust oil control valve and ECM, or replace the exhaust oil control valve
P0340	Intake/exhaust VCP camshaft position sensor fault		Repair fault or replace the phase sensor

DTC code	Part	Failure protection operation	Prerequisite of releasing failure protection
P0105, P0106, P0107, P0108	Intake pressure sensor signal	1. Disable fuel correction pulse width 2. Update no sub-learning value anymore 3. Prohibit adjusting target idle speed 4. Update no atmospheric pressure anymore 5. Take MAP value as the default	Remove circuit faults between MAP sensor and ECM, or replace the intake pressure & temperature sensor
P0112, P0113	Intake temperature sensor signal	Use the default intake temperature	Remove circuit faults between IAT sensor and ECM, or replace the intake pressure & temperature sensor
P0117, P0118	Coolant temperature sensor signal	1. Control system estimates the maximum temperature at CTS not exceed 90.75 ℃ as per the default formula on the basis of the engine running time and intake temperature. 2. When DTC sets, high-speed fan starts working after 0.5s delay.	Remove circuit faults between CTS sensor and ECM, or replace the coolant temperature sensor
P0122, P0123, P0222, P0223, P2135	Throttle position sensor signal fault	1. Estimate the throttle opening according to engine RPM. 2. Disable the flooding feature.	Remove circuit faults between TPS sensor and ECM, or replace TPS sensor
P0068, P0641, P0651, P1516, P2101, P2119	Throttle drive motor fault		Remove circuit faults between ETC and ECM, or replace electronic throttle
P0131, P0132, P0134	Pre-catalytic oxygen sensor signal	Stop closed loop fuel control	Remove injector choking, fuel pressure regulator damage, intake vacuum leakage, exhaust pipe leakage, fuel contamination or circuit faults between Pre-catalytic oxygen sensor and ECM

DTC code	Part	Failure protection operation	Prerequisite of releasing failure protection
P0133	Pre-catalytic oxygen sensor response too slow	Stop closed loop fuel control	Remove oxygen sensor poisoning fault due to fuel contamination or excessive oil consumption, replace the oxygen sensor
P0031, P0032	Pre-catalytic oxygen sensor heater circuit does not work	Stop closed loop fuel control	Remove circuit faults between the heater and ECM, or replace Pre-catalytic oxygen sensor
P1167	Front oxygen rich in deceleration and fuel cutoff	Stop closed loop fuel control	Remove excessive fuel pressure, fuel injector leakage, fuel pressure regulator damage or circuit faults between oxygen sensor and ECM
P1171	Front oxygen lean in acceleration and fuel richening	Stop closed loop fuel control	Remove fuel pressure regulator damage, intake vacuum leakage, exhaust system pipe leakage, fuel contamination or circuit faults between Pre-catalytic oxygen sensor and ECM
P0037, P0038	Post-catalytic oxygen sensor heater circuit fault	Disable Post-catalytic oxygen sensor	Remove circuit faults between Post-catalytic oxygen sensor and ECM, or replace the Post-catalytic oxygen sensor
P0137, P0138, P0140	Post-catalytic oxygen sensor signal	Disable Post-catalytic oxygen sensor	Remove circuit faults between Post-catalytic oxygen sensor and ECM, or replace the Post-catalytic oxygen sensor
P0171	Fuel system too lean in non-idle condition		Remove intake air leakage, inadequate fuel pressure, fuel injector choking or crankcase forced ventilation jamming fault

DTC code	Part	Failure protection operation	Prerequisite of releasing failure protection
P0172	Fuel system too rich in non-idle condition		Remove intake air system choking, high fuel pressure or fuel injector leakage fault
P0230	Fuel pump relay fault		Remove circuit faults between fuel pump relay and ECM, or replace the fuel pump relay
P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271	Fuel injector circuit fault	Fuel control enters into open-loop control	Remove circuit faults between fuel injector and ECM, or replace the injector
P0300	Single/multiple cylinder misfire	1. In case of lower misfire degree just affecting exhaust gas emission: there is no emergency control plan, just record DTC, freeze data flow and turn on MIL indicator. 2. In case of higher misfire degree which could overheat the catalyst: force into fuel open-loop control condition and disable rear oxygen correction learning, when engine speed exceeds 2000RPM or MAP exceeds 50KPA, MIL indicator will flash at 1Hz, informing driver to reduce engine speed and load immediately and head for a repair shop for service.	Remove ignition system fault, air leakage, incorrect crankshaft position sensor clearance, incorrect ignition timing, fuel injector fault, incorrect fuel pressure, incorrect engine compression ratio, or replace ECM
P0324, P0325	Knock sensor system fault	Take the system default value as the ignition advance angle	Remove circuit faults between knock sensor and ECM, or replace the knock sensor
P0335, P0336	Crankshaft position sensor circuit performance problem		Remove poor electrical connection, interference noise, target related fault, circuit faults between crankshaft position sensor and ECM, or replace ECM

DTC code	Part	Failure protection operation	Prerequisite of releasing failure protection
P1336	Crankshaft position tooth information is not learned		Perform the vehicle tooth information learning procedure
P0351	Cylinder 1 & 4 ignition coil fault	1. Stop fuel injection of Cylinders 1 & 4 2. Disable closed loop fuel control	Remove circuit faults between ignition coil and ECM, or replace the ignition coil
P0352	Cylinder 2 & 3 ignition coil fault	1. Stop fuel injection of Cylinders 2 & 3 2. Disable closed loop fuel control	Remove circuit faults between ignition coil and ECM, or replace the ignition coil
P0420	Catalytic converter efficiency low		Replace the catalytic converter
P0458, P0459	Carbon canister solenoid circuit fault	Disable the canister purge feature	Remove circuit faults between carbon canister solenoid and ECM, or replace the solenoid
P0480, P0481	Low-speed fan and high-speed fan faults		Remove circuit faults between fan and ECM
P0502	No vehicle speed sensor signal	Disable idle closed-loop control	Remove circuit faults between vehicle speed sensor and TCM, or replace the vehicle speed sensor.
P0504, P0571	Brake switch circuit fault		Remove circuit faults between brake switch and ECM, or replace the brake switch
P0506	Idle speed too low	Disable idle speed regulation	Remove idle control circuit, ETC or ignition system faults
P0507	RPM too high at idle	Disable idle speed regulation	Remove ignition system fault, vacuum leakage, circuit faults between ETC and TCM, or ETC fault
P0551	Power steering switch circuit fault	Disable power steering system	Remove circuit faults between power steering switch and ECM, or replace the power steering switch

DTC code	Part	Failure protection operation	Prerequisite of releasing failure protection
P0557, P0558	Brake vacuum sensor circuit fault	Idle start/stop control off	Remove circuit faults between brake vacuum sensor and ECM, or replace the brake vacuum sensor
P0562, P0563	System voltage too low or too high		Remove the charging system faults or replace ECM
P0602, P0604, P0606, P060A, P2104, P2105, P2106, P2110	ECM fault		Repair faults or replace ECM
P0616, P0617, P1616	Starter relay circuit fault		Repair faults or replace starter relay
P0646, P0647	A/C clutch relay circuit fault		Remove circuit faults between A/C clutch relay and ECM, or replace the A/C clutch relay
P0685	Main relay fault		Repair fault
P0831, P0832	Clutch switch circuit fault	Idle start/stop control off	Repair faults or replace clutch switch
P1515	Starter status feedback signal circuit fault	Idle start/stop control off	Repair fault
P1560	Battery sensor signal	Idle start/stop control off	Remove circuit faults between battery sensor and ECM, or replace the battery sensor
P1561, P1562, P1563, P1564, P1614, P1615	Drive chain signal fault	Idle start/stop control off	Remove circuit faults between drive chain relay and ECM, or replace the drive chain relay
P1565, P1566	Start/stop main switch signal fault	Idle start/stop control off	Remove circuit faults between idle start/stop switch and ECM, or replace the idle start/stop switch
P1661, P1662, P1663, P1664	Start/stop status indicator fault		Repair faults or replace instrument cluster

DTC code	Part	Failure protection operation	Prerequisite of releasing failure protection
P2122, P2123, P2127, P2128, P2138	Electronic accelerator pedal position sensor circuit fault		Remove circuit faults between electronic accelerator pedal position sensor and ECM, or replace the electronic accelerator pedal position sensor
P2187	Fuel system too lean in idle condition		Remove intake air leakage, inadequate fuel pressure, fuel injector choking or crankcase forced ventilation jamming fault
P2188	Fuel system too rich in idle condition		Remove intake air system choking, high fuel pressure or fuel injector leakage fault
U0001, U0073, U0121, U0140, U0155	CAN communication fault		Repair faults or replace wiring harness

Data stream list

By reading the "Data Stream List" on the diagnosis tool, do not remove any component, and inspect the working state of switches, sensors and actuators. Before diagnosis the fault of the engine electronic control system, the observation and analysis of data is the first step in troubleshooting, this can reduce the troubleshooting time.

CAUTION: The following table lists the data under normal conditions, only for reference. Do not determine the failure based on these standard values. Generally, use a normal vehicle to compare a vehicle in diagnosis under the same state to determine the data of the diagnosis vehicle under the current state normal or not.

1. Let the engine reach normal operating temperature.
2. Turn the ignition switch to position "OFF".
3. Connect fault diagnostic tool.
4. Turn the ignition switch to position "ON".
5. Select "Changan Auto"/"C201"/"DELPHI MT22.1_V2.2(CAN)"/"Read Data Stream"/"Diagnostic Data".
6. Refer to the chart below to inspect all data.

Data Stream Item	Ignition switch "ON"	Idle running	Engine rotate speed 2500rpm
Current calculated load value	0.0%	21.96%	19.22%
Current non-default coolant temperature	82 ℃	79 ℃	90 ℃
Current short-term fuel correction (Bank 1)	%	-1.56%	-3.91%
Current long-term fuel correction (Bank 1)	1.56%	2.34%	0.0%
Current non-default absolute boost pressure	98 kPa	42 kPa	33 kPa
Current non-default engine speed	0.0 RPM	740 RPM	2500 RPM
Current non-default vehicle speed	0 KPH	0 KPH	0 KPH
Current instructed Cylinder 1 ignition advance angle	0°	3°	13°
Current non-default intake temperature	31 ℃	26 ℃	33 ℃
Current non-default absolute throttle position A	17.25%	14.12%	18.04%
Non-default Pre-catalytic oxygen sensor voltage	0.81 V	0.75 V	0.71 V
Pre-catalytic oxygen sensor short-term fuel correction	0.0%	-1.56%	-3.12%
Non-default Post-catalytic oxygen sensor voltage	0.68 V	0.68 V	1.12 V
Post-catalytic oxygen sensor short-term fuel correction	99.22%	99.22%	99.22%
Vehicle travel distance when MIL ON	0 Km	0 Km	0 Km
Evaporator purge rate	0.0%	0.0%	5.10%
Fuel level input	90.59%	90.59%	90.59%
OBD warm-ups after DTC clearance	0 Cycles	0 Cycles	0 Cycles
Vehicle travel distance after DTC clearance	0 km	0 km	0 km
Atmospheric pressure	98 kPa	98 kPa	98 kPa
Pre-catalytic oxygen sensor catalyst temperature	190 ℃	361 ℃	210 ℃
Control module voltage	12.349 V	13.949 V	14.124 V
Absolute load value	0.0%	23.53%	19.61%
Control equivalent ratio	0.787 Ratio	0.999 Ratio	Ratio
Relative throttle position	7.45%	3.92%	8.24%
Absolute throttle position B	18.43%	14.90%	18.82%

Data Stream Item	Ignition switch "ON"	Idle running	Engine rotate speed 2500rpm
Acceleration pedal position D	14.51%	14.51%	17.65%
Acceleration pedal position E	7.06%	7.06%	8.63%
Commanded throttle excitation control	9.41%	5.49%	11.37%
Vehicle working time when MIL ON	0 Minutes	0 Minutes	0 Minutes
Ignition voltage	12.3 V	13.8 V	14.0 V
A/C pressure analog-digital conversion	0.0 V	0.0 V	0.0 V
Pre-catalytic oxygen sensor	803 mV	122 mV	512 mV
Post-catalytic oxygen sensor heating	681 mV	582 mV	699 mV
Linear EGR feedback A/D conversion	0.0 V	0.0 V	0.0 V
Fuel tank vacuum pressure A/D conversion	0.0 V	0.0 V	0.0 V
Linear specified EGR	0.0%	0.0%	0.0%
Fuel level sensor A/D conversion	0.0 V	0.0 V	0.0 V
Engine cam activity	0 Counts	0 Counts	0 Counts
Rotating speed or vehicle speed input	0 KPH	0 KPH	0 KPH
Coolant temperature (start)	℃	31 ℃	75 ℃
EEVAP valve duty cycle	0.0%	0.0%	0.0%
EGR duty cycle	0.0%	0.0%	0.0%
Fuel correction unit	19 Cell#	18 Cell#	2 Cell#
Ideal idle speed	1161.5 RPM	712.5 RPM	762.5 RPM
Carried BPW	3.68 MS	2.94 S	2.33 MS
Ideal linear EGR position	0.0%	0.0%	0.0%
Atmospheric pressure	98.52 KPA	98.52 KPA	98.52 KPA
Air/fuel ratio	Ratio	14.5 Ratio	14.5 Ratio
Knock counter	0 Counts	0 Counts	0 Counts
Engine running time	0 Seconds	612 Seconds	442 Seconds
Calculated catalyst temperature	600 ℃	360 ℃	618 ℃
Knock delay	0°	0°	0°
Calculated air flow	0.0 GPS	2.53 GPS	7.45 GPS
EGR shut-off valve position	0.0%	0.0%	0.0%
EGR test sample count	0 Test	0 Test	0 Test
EGR EWMA limit	32768 Counts	32768 Counts	32768 Counts
EGR EWMA result (service)	32768 Counts	32768 Counts	32768 Counts

Data Stream Item	Ignition switch "ON"	Idle running	Engine rotate speed 2500rpm
EGR valve position error	200.00 Counts	200.00 Counts	200.00 Counts
Pre-catalytic oxygen sensor response to lean-rich conversion	0 Counts	0 Counts	0 Counts
Cylinder mode misfire	65535 Counts	0 Counts	0 Counts
Conversion mode misfire	65535 Counts	0 Counts	0 Counts
Misfire period delay counter	0 Counts	1 Counts	47 Counts
Total misfires	0 Counts	0 Counts	0 Counts
Cylinder 1 historical misfire	0 Counts	0 Counts	0 Counts
Cylinder 2 historical misfire	0 Counts	0 Counts	0 Counts
Cylinder 3 historical misfire	0 Counts	0 Counts	0 Counts
Cylinder 4 historical misfire	0 Counts	0 Counts	0 Counts
Cylinder 2 current misfire	0 Counts	0 Counts	0 Counts
Cylinder 1 current misfire	0 Counts	0 Counts	0 Counts
Cylinder 3 current misfire	0 Counts	0 Counts	0 Counts
Cylinder 4 current misfire	0 Counts	0 Counts	0 Counts
Pre-catalytic oxygen sensor rich/lean to lean/rich response ratio	0.0 Ratio	0.0 Ratio	0.0 Ratio
Pre-catalytic oxygen sensor response to rich-lean conversion	0 Counts	0 Counts	0 Counts
Engine odometer	0 KM	0 KM	0 KM
Misfire fault after first failure	0 Counts	0 Counts	0 Counts
Misfire pass after first failure	1 Counts	1 Counts	1 Counts
Pre-catalytic oxygen sensor response - total lean-to-rich time	0.0 ms	0.0 ms	0.0 ms
Pre-catalytic oxygen sensor response - total rich-to-lean time	0.0 ms	0.0 ms	0.0 ms
Pre-catalytic oxygen sensor response - average lean-to-rich time	0.0 ms	0.0 ms	0.0 ms
Idle error	-1168.88 rpm	-11.88 rpm	1746.38 rpm
ETC accelerator pedal position	0.0%	0.0%	3.61%
ETC throttle indication position	10.63%	5.55%	%
ETC pedal position sensor 1	0.0%	0.0%	3.51%
ETC pedal position sensor 2	0.0%	0.0%	3.32%
ETC throttle position sensor 1	7.60%	4.08%	8.18%
ETC throttle position sensor 2	7.61%	3.86%	8.58%

Data Stream Item	Ignition switch "ON"	Idle running	Engine rotate speed 2500rpm
Fuel level output	90.98%	90.98%	90.98%
Pre-catalytic oxygen sensor - average rich-to-lean time	0.0 ms	0.0 ms	0.0 ms
Start intake temperature sensor	33 ℃	22 ℃	35 ℃
Intake pressure difference	KPA	0.0 KPA	0.0 KPA
G sensor	0.0 V	0.0 V	0.0 V
TEC rich-to-lean attempt	Counts	Counts	Counts
ETC ideal throttle position	9.62%	5.62%	12.12%
Cylinder 1 TEC learned value	32751 Counts	32751 Counts	32751 Counts
Cylinder 2 TEC learned value	32784 Counts	32784 Counts	32784 Counts
Cylinder 3 TEC learned value	32751 Counts	32751 Counts	32751 Counts
Cylinder 4 TEC learned value	32784 Counts	32784 Counts	32784 Counts
EGR EWMA result	32768 Counts	32768 Counts	32768 Counts
EGR deceleration test pass counter	0 Counts	0 Counts	0 Counts
EGR deceleration test fail counter	0 Counts	0 Counts	0 Counts
Knock sensor fail counter	0 Counts	0 Counts	0 Counts
Knock sensor sampling counter	0 Counts	0 Counts	0 Counts
Knock system fault high counter	0 Counts	0 Counts	0 Counts
Knock system fault low counter	0 Counts	0 Counts	0 Counts
Knock system sampling counter	0 Counts	0 Counts	0 Counts
Idle catalyst monitoring oxygen storage EWMA value	0.0 Seconds	0.0 Seconds	0.0 Seconds
Idle catalyst oxygen storage fail limit	0.0 Seconds	0.0 Seconds	0.0 Seconds
A/C pressure	0 KPA	0 KPA	0 KPA
Ideal intake cam phase position	0°	0°	0°
Ideal exhaust cam phase position	0°	0°	-25°
Actual intake cam phase position	0°	0°	0°
Actual exhaust cam phase position	0°	0°	-25°
Duty ratio of intake cam phase	0.0E%	0.0E%	0.0E%
Duty ratio of exhaust cam phase	0.0E%	0.0E%	0.49E%
Current Pre-catalytic oxygen sensor heating	0.50 E	0.50 E	0.50 E
Current Post-catalytic oxygen sensor heating	0.50 E	0.50 E	0.50 E

Data Stream Item	Ignition switch "ON"	Idle running	Engine rotate speed 2500rpm
ICMD enabled min. catalyst temperature	500 ℃	500 ℃	500 ℃
ICMD enabled max. catalyst temperature	900 ℃	900 ℃	℃
Idle catalyst monitoring time - final test results	Seconds	0.0 Seconds	0.0 Seconds
Idle catalyst monitoring status timer	0.0 Seconds	0.0 Seconds	0.0 Seconds
ETC powerless throttle position	10.51%	10.51%	10.51%
Cruise speed error	0 Kph	0 Kph	0 Kph
Target cruise speed	0 Kph	0 Kph	0 Kph
Target engine torque during cruise	-200 Nm	-200 Nm	-200 Nm
Decisive VCPC enabled oil temperature	77 ℃	84 ℃	93 ℃
Current Pre-catalytic oxygen sensor heating	0.50 Amps	0.50 Amps	0.50 Amps
Current Post-catalytic oxygen sensor heating	0.50 Amps	0.50 Amps	0.50 Amps

Active test list

By reading the "Active Test List" on the diagnosis tool, do not remove any components, inspect the work state of relay and actuator that controlled by ECM. Before the fault diagnosis of the engine electronic control system. The implementation of active test is the precondition in troubleshooting, this can reduce the troubleshooting time.

CAUTION: The following table lists the data under normal conditions, only for reference. Do not determine the failure based on these standard values. Generally, use a normal vehicle to compare a vehicle in diagnosis under the same state to determine the data of the diagnosis vehicle under the current state normal or not.

1. Let the engine reach normal operating temperature.
2. Turn the ignition switch to position "OFF".
3. Connect fault diagnostic tool.
4. Turn the ignition switch to position "ON".
5. Select "Changan Auto"/"C201"/"DELPHI MT22.1_V2.2(CAN)"/"Active Test".
6. Refer to the chart below, carry out active test.

Diagnostic tool item	Part	Control range	Diagnostic description
Fault indicator	Enable the engine malfunction indicator (MIL)	On/Off	When engine is running or ignition switch is on, engine control module will send requirement to the instrument to turn on the start malfunction indicator lamp after receiving command, and the instrument will turn on/off the malfunction indicator light within 3 ~ 5s.
Fuel pump	Enable the fuel pump relay	On/Off	**CAUTION: This test can only be carried out when vehicle speed is 0 and speed sensor is with no fault.** This function could control fuel pump relay. When the command is "ON", the fuel pump relay will be energized/de-energized within 3~5s.
Low speed fan	Enable low speed electronic fan relay	On/Off	**CAUTION: Carry out the test only when engine coolant temperature is lower than 100 ℃ (212ºF) with A/C switch off.** This function could control low speed electronic fan relay. When the command is "ON", the electronic fan will be started at low speed for 5s.
High speed fan	Enable high speed electronic fan relay	On/Off	**CAUTION: Carry out the test only when engine coolant temperature is lower than 100 ℃ (212ºF) with A/C switch off.** This function could control high speed electronic fan relay. When the command is "ON", the electronic fan will be started at high speed for 5s.
A/C compressor	Enable A/C compressor clutch relay	On/Off	**CAUTION: Carry out the test only when ignition switch is at “ON” position, and engine is not running.** This function could control A/C compressor relay. When the command is "ON", the A/C compressor will be ON/OFF within 3-5s.

Diagnostic tool item	Part	Control range	Diagnostic description
Carbon canister ventilation	Enable active carbon canister ventilation valve	On/Off	This function could control ventilation valve of active carbon canister. When the command is "ON", the ventilation valve of active carbon canister will be opened/closed within 3~5s.
Shut off injection nozzle	Do not use fuel injection to prevent the work of injector	Shut off Cylinder 1/ Shut off Cylinder 2/ Shut off Cylinder 3/ Shut off Cylinder 4	**CAUTION: This function can not turn off two fuel injectors at the same time, carry out the test only when the engine is running, vehicle speed is 0, and vehicle speed sensor is with no fault, and oxygen sensor signal display is thin.** This function could forbid fuel injector action, detect fuel injector sealing state.
Variable air intake valve	Enable variable air intake valve	On/Off	This function could control variable air intake valve. When the command is "ON", the variable air intake valve will be opened/closed within 3~5s.
Carbon canister purge valve	Enable carbon canister purge valve	0 ~ 24	**CAUTION: This function could be tested only when the fuel tank pressure is maintained within the protective limit, the engine is running and the vehicle speed is zero.** Control the carbon canister control command, which is between 0~24, realizing control over cleaning flow of carbon canister.
EGR (Exhaust gas recirculation)	Enable exhaust gas recirculation	0 ~ 24	**CAUTION: This function could be carried out only when the engine is running and the vehicle speed is zero.** Control the EGR control command, which is between 0~24, realizing control over EGR flow.

Diagnostic tool item	Part	Control range	Diagnostic description
Ignition advance angle	Test the ignition advance angle	Enter/Cancel	**CAUTION: This function could be carried out only when the engine is running and the vehicle speed is zero.** This function can detect the ignition advance angle of engine.
Fuel volume	It tests the fuel volume in the fuel tank.	0 ~ 24	**CAUTION: This function could be carried out only when the engine is running and the vehicle speed is zero.** Control the fuel level sensor control command, which is between 0~24, realizing control of fuel level sensor.
Tachometer	Control engine speed to set speed	0 ~ 24	**CAUTION: This function could be carried out only when the engine is running and the vehicle speed is zero.** Control the ECM control command, which is between 0~24, realizing control of engine speed.
ETC motor	Enable the electronic throttle actuator motor	0 ~ 24	**CAUTION: Carry out the test only when ignition switch is at "ON" position, and engine is not running.** Control the throttle actuator motor control command, which is between 0~24, realizing control of throttle opening.
Intake camshaft phaser	Test intake camshaft phaser	0 ~ 24	**CAUTION: This function could be carried out only when the engine is running and the vehicle speed is zero.** Control the intake oil control valve command, which is between 0~24, realizing control of intake camshaft phase.

Diagnostic tool item	Part	Control range	Diagnostic description
Intake camshaft phaser oil control valve	Enable intake camshaft phaser oil control valve	0 ~ 24	**CAUTION: Carry out the test only when ignition switch is at "ON" position, and engine is not running.** Control the intake camshaft phaser oil control valve command from 0 to 24 for the ON control of intake camshaft phaser oil control valve.
Exhaust camshaft phaser	Test exhaust camshaft phaser	0 ~ 24	**CAUTION: This function could be carried out only when the engine is running and the vehicle speed is zero.** Control the exhaust oil control valve command from 0 to 24 for the control of exhaust camshaft phase.
Exhaust camshaft phaser oil control valve	Enable exhaust camshaft phaser oil control valve	0 ~ 24	**CAUTION: Carry out the test only when ignition switch is at "ON" position, and engine is not running.** Control the exhaust camshaft phaser oil control valve command, which is between 0~24, realizing the ON control of exhaust camshaft phaser oil control valve.
Tooth information learning	Enter into tooth information learning	Start/Stop	**CAUTION: This function could be carried out only when the engine is running and the vehicle speed is zero.** Vehicles with new ECM shall go through the tooth information learning.
BLM learning	Enter into BLM learning	Start/Stop	**CAUTION: This function could be carried out only when the engine is running and the vehicle speed is zero.** Vehicles with new brake light switch shall go through the BLM learning.

Diagnostic tool item	Part	Control range	Diagnostic description
Fuel open-loop control	Enable fuel open-loop control	Open/Exit	**CAUTION: This function could be carried out only when the engine is running and the vehicle speed is zero.** Conduct open-loop control of the engine.
Idle catalyst monitoring	Enable idle catalyst monitoring	Open/Exit	**CAUTION: This function could be carried out only when the engine is running and the vehicle speed is zero.** Test catalytic results of three-way catalyst.
Oxygen sensor response	Test oxygen sensor	Open/Exit	**CAUTION: This function could be carried out only when the engine is running and the vehicle speed is zero.** Test working condition of oxygen sensor
Target idle speed	Control engine speed to set speed	0 ~ 24	**CAUTION: This function could be carried out only when the engine is running and the vehicle speed is zero.** Control the carbon canister control command, which is between 0~24, realizing control over cleaning flow of carbon canister.
BLM reset	Clear the brake light switch self-learning value	Reset	**CAUTION: Carry out the test only when ignition switch is at “ON” position, and engine is not running.** Know about the brake light switch self-learning value stored by the engine.

Diagnostic tool item	Part	Control range	Diagnostic description
Reset TPS learning value	Clear the electronic throttle position sensor self-learning value	Reset	**CAUTION: Carry out the test only when ignition switch is at "ON" position, and engine is not running.** Know about the electronic throttle position self-learning value stored by the engine.

DTC diagnosis flow index

Fault code	Description	Diagnosis Procedures
P0011	Intake VCP phase response lagging	**Refer to: DTC P0011, P0012, P0016, P0340, P0341**
P0012	Intake VCP camshaft phase error big	
P0016	Intake VCP cam tooth learning deviation out of range	
P0340	Intake/exhaust VCP camshaft position sensor status diagnosis	
P0341	Intake VCP target wheel diagnosis fault	
P0026	Intake VCP hydraulic control valve clamped	**Refer to: DTC P0026, P0076, P0077**
P0076	Intake VCP hydraulic control valve coil low voltage or open circuit	
P0077	Intake VCP hydraulic control valve coil high voltage	
P0014	Exhaust VCP phase response lagging	**Refer to: DTC P0011, P0012, P0016, P0340, P0341**
P0015	Exhaust VCP camshaft phase error big	
P0017	Exhaust VCP cam tooth learning deviation out of range	
P0366	Exhaust VCP target wheel - CAM sensor fault	
P0027	Exhaust VCP hydraulic control valve clamped	**Refer to: DTC P0026, P0076, P0077**
P0079	Exhaust VCP hydraulic control valve coil low voltage or open circuit	
P0080	Exhaust VCP hydraulic control valve coil high voltage	
P0031	Pre-catalytic oxygen sensor heater short circuit to low voltage	**Refer to: DTC P0031, P0032**
P0032	Pre-catalytic oxygen sensor heater short circuit to high voltage	

Fault code	Description	Diagnosis Procedures
P0037	Post-catalytic oxygen sensor heater short circuit to low voltage	**Refer to: DTC P0037, P0038**
P0038	Post-catalytic oxygen sensor heater short circuit to high voltage	
P0068	Electronic throttle air flow error	**Refer to: DTC P0641, P0651**
P2119	Electronic throttle returning fault	
P0105	Intake pressure sensor signal clamped	**Refer to: DTC P0105, P0106, P0107, P0108**
P0106	Intake pressure/throttle position rationality fault	
P0107	Intake pressure sensor circuit low voltage or open circuit	
P0108	Intake pressure sensor circuit high voltage	
P0112	Intake temperature sensor circuit low voltage	**Refer to: DTC P0112, P0113**
P0113	Intake temperature sensor circuit high voltage or open circuit	
P0117	Coolant temperature sensor circuit low voltage	**Refer to: DTC P0117, P0118**
P0118	Coolant temperature sensor circuit high voltage or open circuit	
P0122	Electronic throttle position sensor 1# circuit low voltage	**Refer to: DTC P0122, P0123, P2135**
P0123	Electronic throttle position sensor 1# circuit high voltage	
P2135	Electronic throttle position sensor 1# & 2# circuits correlation fault	
P0131	Pre-catalytic oxygen sensor short circuit to low voltage	**Refer to: DTC P0131, P0132, P0133, P0134**
P0132	Pre-catalytic oxygen sensor short circuit to high voltage	
P0133	Pre-catalytic oxygen sensor response too slow	
P0134	Pre-catalytic oxygen sensor open circuit	
P0137	Post-catalytic oxygen sensor short circuit to low voltage	**Refer to: DTC P0137, P0138, P0140**
P0138	Post-catalytic oxygen sensor short circuit to high voltage	
P0140	Post-catalytic oxygen sensor open circuit	

Fault code	Description	Diagnosis Procedures
P0171	Fuel system too lean in non-idle condition	Refer to: DTC P0171, P0172, P2187, P2188
P0172	Fuel system too rich in non-idle condition	
P2187	Fuel system too lean in idle condition	
P2188	Fuel system too rich in idle condition	
P0222	Electronic throttle position sensor 2# circuit low voltage	Refer to: DTC P0222, P0223, P2135
P0223	Electronic throttle position sensor 2# circuit high voltage	
P2135	Electronic throttle position sensor 1# & 2# circuits correlation fault	
P0230	Fuel pump relay fault	Refer to: DTC P0230
P0261	Cylinder 1 injector circuit low voltage fault	Refer to: DTC P0261, P0262
P0262	Cylinder 1 injector circuit high voltage fault	
P0264	Cylinder 2 injector circuit low voltage fault	Refer to: DTC P0261, P0262
P0265	Cylinder 2 injector circuit high voltage fault	
P0267	Cylinder 3 injector circuit low voltage fault	Refer to: DTC P0261, P0262
P0268	Cylinder 3 injector circuit high voltage fault	
P0270	Cylinder 4 injector circuit low voltage fault	Refer to: DTC P0261, P0262
P0271	Cylinder 4 injector circuit high voltage fault	
P0300	Single/multiple cylinder misfire	Refer to: DTC P0300
P0324	Knock control system fault	Refer to: DTC P0324, P0325
P0325	Knock sensor fault	
P0335	Crankshaft position sensor circuit no signal	Refer to: DTC P0335, P0336
P0336	Crankshaft position sensor circuit signal interference	
P0351	Cylinder 1 & 4 ignition coil fault	Refer to: DTC P0351
P0352	Cylinder 2 & 3 ignition coil fault	Refer to: DTC P0351
P0420	Catalytic converter efficiency low	Refer to: DTC P0420
P0458	Carbon canister solenoid circuit short to low voltage or open circuit	Refer to: DTC P0458, P0459
P0459	Carbon canister solenoid circuit short to high voltage	
P0480	Low speed fan fault	Refer to: DTC P0480
P0481	High speed fan fault	Refer to: DTC P0481

Fault code	Description	Diagnosis Procedures
P0504	Brake switch correlation fault	Refer to: DTC P0504, P0571
P0571	Braking light switch status not changed during braking application	
P0506	Idle speed too low	Refer to: DTC P0506, P0507
P0507	Idle speed too high	
P0551	Power steering switch circuit voltage range/ performance fault	Refer to: DTC P0551
P0562	The system voltage is too low	Refer to: DTC P0562, P0563
P0563	The system voltage is too high	
P0602	ECM programming error (software version unmatched)	Refer to: DTC P0602, P0604, P0606, P060A
P0604	RAM error	
P0606	ECM processor fault	
P060A	ECM processor fault	
P0641	ETC reference voltage A# amplitude fault	Refer to: DTC P0641, P0651
P0651	ETC reference voltage B# amplitude fault	
P0646	A/C clutch relay circuit short to low voltage or open circuit	Refer to: DTC P0646, P0647
P0647	A/C clutch relay circuit short to high voltage	
P0685	Main relay fault	Refer to: DTC P0685
P0831	Clutch switch circuit signal low (short to power supply or open circuit)	Refer to: DTC P0831, P0832
P0832	Clutch switch circuit signal high (short to ground)	
P1167	Front oxygen rich in deceleration and fuel cut-off	Refer to: DTC P0131, P0132, P0133, P0134
P1171	Front oxygen lean in acceleration and fuel richening	
P1336	58-tooth gear error not learned	Refer to: DTC P1336
P1516	ETC drive stable state diagnosis error	Refer to: DTC P0641, P0651
P2101	ETC drive step 2 diagnosis error	
P2104	Engine forced idle	Refer to: DTC P2104, P2105, P2106, P2110
P2105	Engine forced shutdown	
P2106	Engine performance restriction	
P2110	Engine power management	

Fault code	Description	Diagnosis Procedures
P2122	Electronic accelerator pedal position sensor 1# circuit low voltage	Refer to: DTC P2122, P2123, P2138
P2123	Electronic accelerator pedal position sensor 1# circuit high voltage	
P2138	Electronic accelerator pedal position sensor 1# & 2# circuits correlation fault	
P2127	Electronic accelerator pedal position sensor 2# circuit low voltage	Refer to: DTC P2127, P2128, P2138
P2128	Electronic accelerator pedal position sensor 2# circuit high voltage	
P2138	Electronic accelerator pedal position sensor 1# & 2# circuits correlation fault	
U0001	CAN communication fault (C001)	Refer to: DTC U0001, U0073, U0121, U0140, U0155
U0073	CAN bus off (C073)	
U0121	Loss of communication between ECM and ESP or ABS control module (C121)	
U0140	Loss of communication between ECM and vehicle body control module (C140)	
U0155	Loss of communication between ECM and instrument panel cluster control module (C155)	

DTC P0011, P0012, P0016, P0340, P0341

1. Fault code description

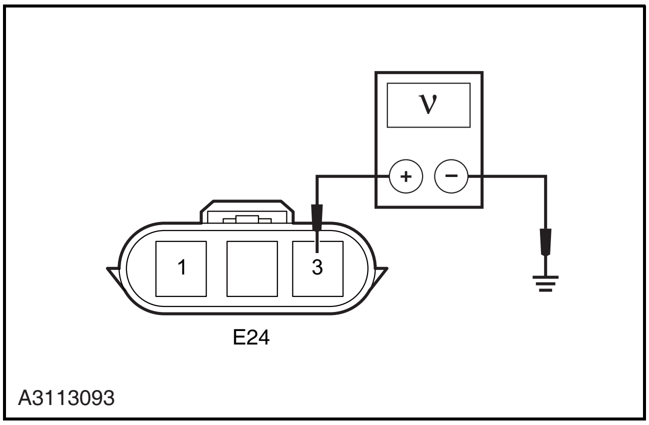
<table>
<tr><th>Fault code</th><th>Description</th><th>Definition</th></tr>
<tr><td>P0011</td><td>Intake VCP phase response lagging</td><td rowspan="5">•Engine control module ECM uses the crankshaft position sensor CKP and camshaft position sensor CMP pulse signal to monitor the correlation between CKP and the camshaft position. Crankshaft variable reluctance rotor has 60 teeth; and two teeth are missing and used as a reference clearance. Uniform spacing between each tooth is 6°, only the reference clearance is exception and it is 12°. Camshaft signal plate has four teeth, two are narrow, and the other two are wide. The distance between every four posterior teeth is 90°.
•Camshaft position sensor circuit includes the following circuits:
•Reference voltage: ECM provides reference voltage for terminal 3 on CMP sensor wiring harness connector E24 through terminal 70 on ECM wiring harness E01.
•Signal circuit: ECM receives signal voltage of terminal 1 on CMP sensor wiring harness connector E24 through terminal 58 on ECM wiring harness E01.
• ECM low voltage circuit: ECM positions the terminal 2 on CMP sensor wiring harness connector E24 to low electric potential through terminal 74 of ECM wiring harness connector E01.</td></tr>
<tr><td>P0012</td><td>Intake VCP camshaft phase error big</td></tr>
<tr><td>P0016</td><td>Intake VCP cam tooth learning deviation out of range</td></tr>
<tr><td>P0340</td><td>Intake/exhaust VCP camshaft position sensor status diagnosis</td></tr>
<tr><td>P0341</td><td>Intake VCP target wheel diagnosis fault</td></tr>
</table>

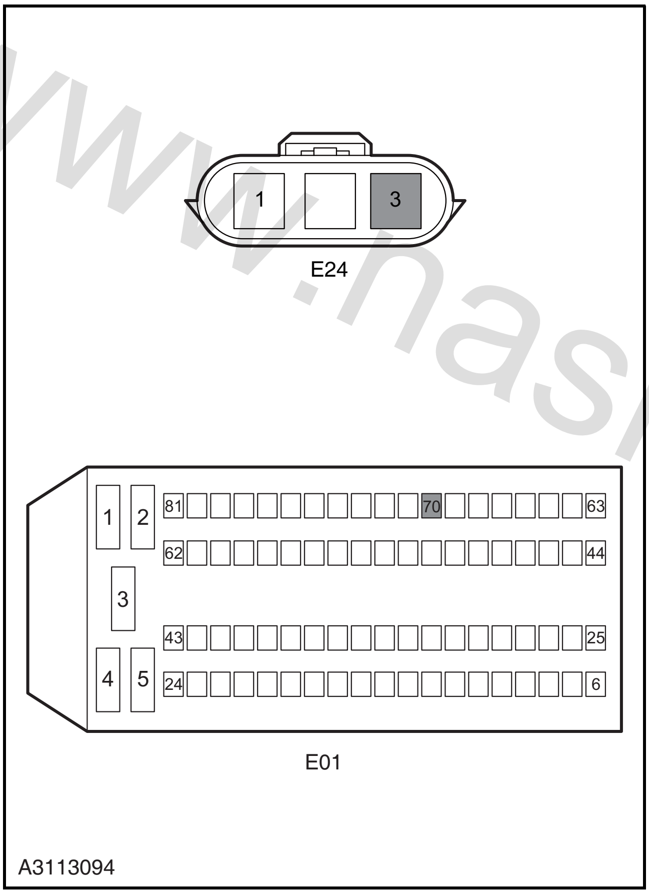
2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0011 P0012 P0016 P0340 P0341	Relative installation position of camshaft and crankshaft unreasonable	-	•Camshaft position sensor circuit fault •Camshaft position sensor fault •Phase signal wheel damaged • VCP phaser damaged • ECM

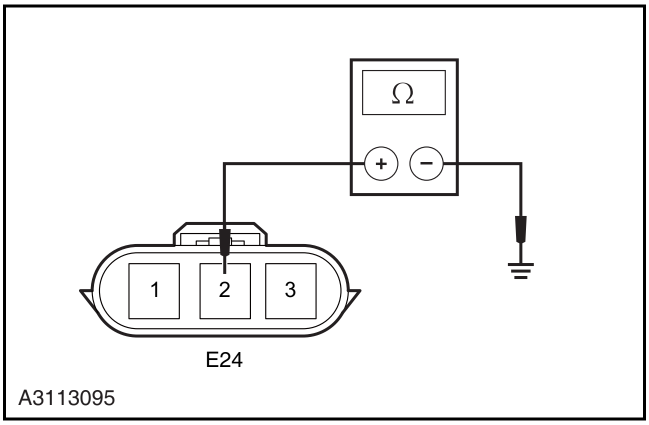
3. Diagnosis procedure

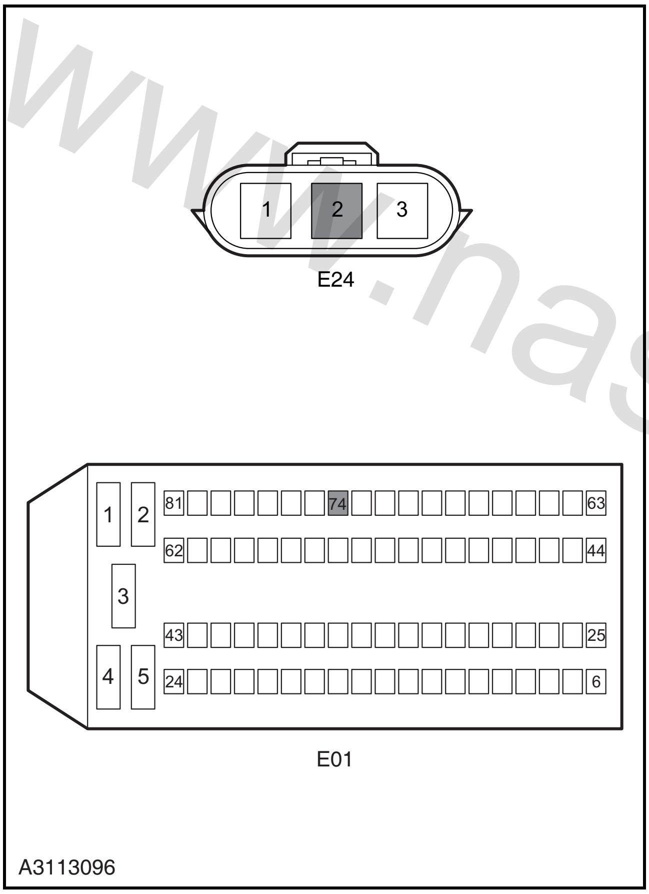
Test Conditions	Details/Results/Actions
1. General inspection	
	A. Inspect the wiring harness connector E24 of intake camshaft position sensor for loose or poor contact. B. Inspect intake camshaft position sensor for proper installation. C. Inspect intake camshaft position sensor for normal clearance. Is it normal? **Y** Go to step 2. **N** Repair the fault point.

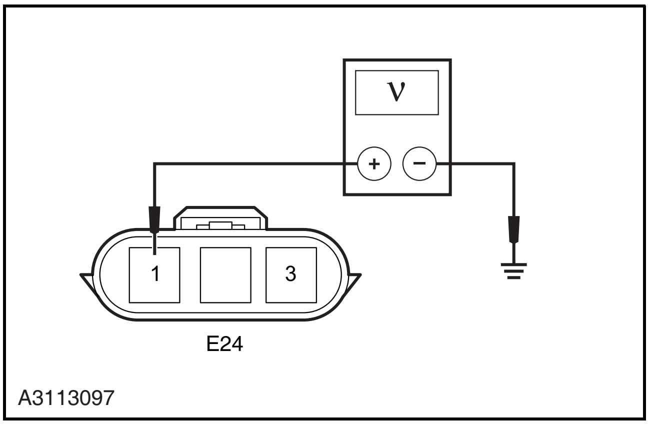
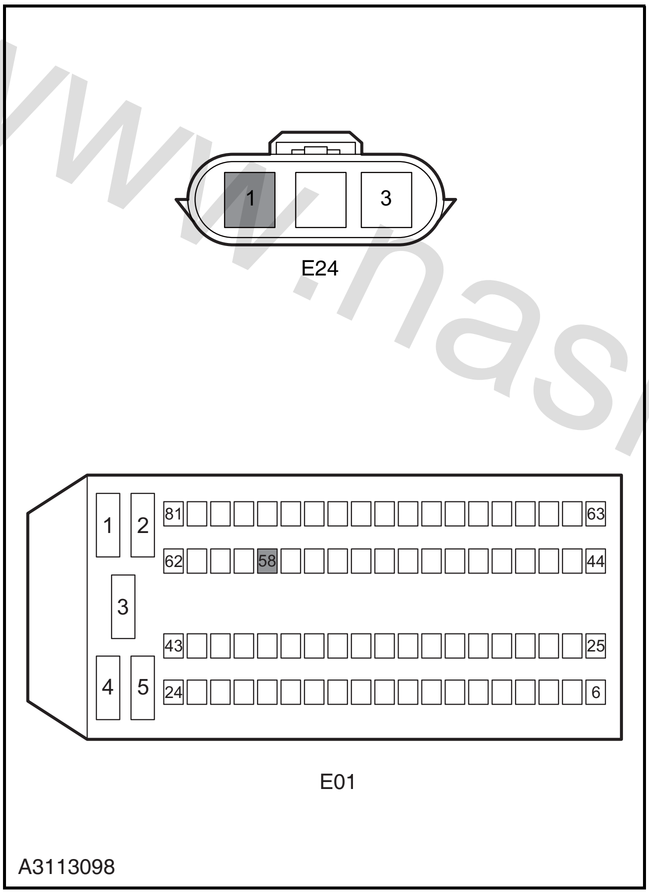
<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">2. Inspect the intake camshaft position sensor power supply circuit</td></tr>
<tr><td>




</td><td>
A. Turn the ignition switch to "LOCK" position.
B.Disconnect the battery cathode cable.
C. Disconnect the wiring harness connector E24 of intake camshaft position sensor.
D. Turn the ignition switch to position "ON".
E. Measure the voltage between terminal 3 of intake camshaft position sensor wiring harness connector E24 and reliable ground.
Standard Voltage Value: 4.5~5.5 V
Is the voltage normal?
Y
Go to step 4.
N
Repair the circuit faults between the terminal 3 of intake camshaft position sensor wiring harness connector E24 and the terminal 70 of ECM wiring harness connector E01.
</td></tr>
</table>

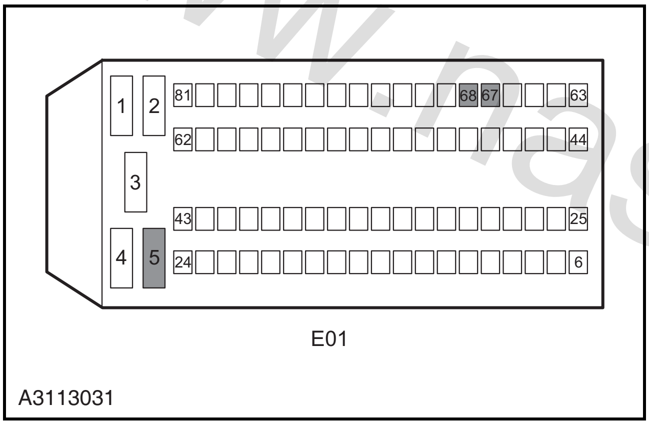
<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">3. Inspect the intake camshaft position sensor ground circuit</td></tr>
<tr><td>

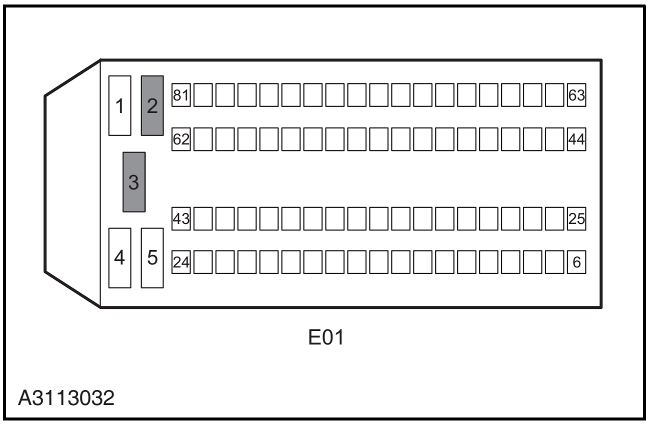

</td><td>A. Turn the ignition switch to "LOCK" position.
B.Disconnect the wiring harness connector E24 of intake camshaft position sensor.
C.Turn the ignition switch to position "ON".
D.Measure the resistance between terminal 2 of intake camshaft position sensor wiring harness connector E24 and reliable ground.
Standard Resistance Value: less than 5Ω
Is the resistance normal?
Y
Go to step 4.
N
Repair the circuit between the terminal 2 of intake camshaft position sensor wiring harness connector E24 and the terminal 74 of ECM wiring harness connector E01.</td></tr>
</table>

Test Conditions	Details/Results/Actions
4. Inspect intake camshaft position sensor signal circuit	
 	A. Turn the ignition switch to "LOCK" position. B.Disconnect camshaft phase sensor wiring harness connector E24. C.Turn the ignition switch to position "ON". D.Measure the voltage between terminal 1 of intake camshaft position sensor wiring harness connector E24 and reliable ground. **Standard Voltage Value: 4.5~5.5 V** Is the voltage normal? **Y** Go to step 5. **N** Repair the circuit between the terminal 1 of intake camshaft position sensor wiring harness connector E24 and the terminal 58 of ECM wiring harness connector E01.
5. Inspect the ignition timing	
	A. Inspect the ignition timing. **Refer to: Timing Inspection (3.1.2 Mechanical System, General Procedures).** Is the ignition timing normal? **Y** Go to step 6. **N** Adjust ignition timing.

Test Conditions	Details/Results/Actions
6. Inspect the camshaft position sensor	
	A.Use a diagnosis tool to clear the DTC. B.Replace a intake camshaft position sensor that in good condition, and fasten it with the standard torque. C. Start the engine and run it to the normal operating temperature, then read DTC with diagnostic tool. Does fault code still exist? **Y** Go to step 7. **N** Replace the camshaft position sensor. **Refer to: Camshaft Position Sensor (3.1.13 Electronic Control System ME-7, Removal and Installation).**
7. Inspect camshaft position sensor signal wheel	
	A. Inspect camshaft position sensor signal wheel installation location and tooth form. Is the camshaft position sensor signal wheel normal? **Y** Go to step 8. **N** Replace or repair the camshaft position sensor signal wheel. **Refer to: Camshaft Hydraulic Rocker Component (3.1.2 Mechanical System, Disassembly and Assembly).**

Test Conditions	Details/Results/Actions
8. Crankshaft position sensor	
	A.Turn the ignition switch to position "ON"， engine doesn’t run. B.Clear the DTC with diagnosis tool. C. Start the engine. D.Gently tap and swing crankshaft position sensor. E. Turn the ignition switch to position "ON"， engine doesn’t run. F. Inspect sensor wiring harness connector, and inspect the ECM wiring harness connector for damaged, bent, corrosion or pulled pins/terminals. G.Inspect crankshaft position sensor circuit relative connector. Is the DTC still there? **Y** Go to step 9. **N** Repair the fault circuit based on the inspection, replace as necessary.
9. Inspect the crankshaft position sensor signal wheel	
	A.Turn the ignition switch to position "LOCK". B.Rotate the flywheel, inspect the crankshaft position sensor signal wheel for worn and dirty attachments. **Y** Go to step 9. **N** Replace crankshaft position sensor signals wheel. **Refer to: Main Bearing, Crankshaft and Cylinder Body (3.1.2 Mechanical System, Disassembly and Assembly).**

Test Conditions	Details/Results/Actions
9. Use the diagnosis tool to carry out intake VCP phaser active test	
	A.Connect the diagnosis tool to "fault diagnosis interface". B.Start the engine, open the diagnosis tool. C.Enter the menu: "Changan Auto"/"C201"/"DELPHI MT22.1_V2.2(CAN) "/"Active Test"/"Intake VCP Phaser", carry out active test for the intake VCP phaser. Check if the intake VCP phaser works properly. **Y** Go to step 10. **N** Replace the intake VCP phaser. **Refer to: Timing Gear (3.1.2 Mechanical System, Removal and Installation).**
10. Inspect ECM power supply circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 11. **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
11. Inspect ECM ground circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0026, P0076, P0077

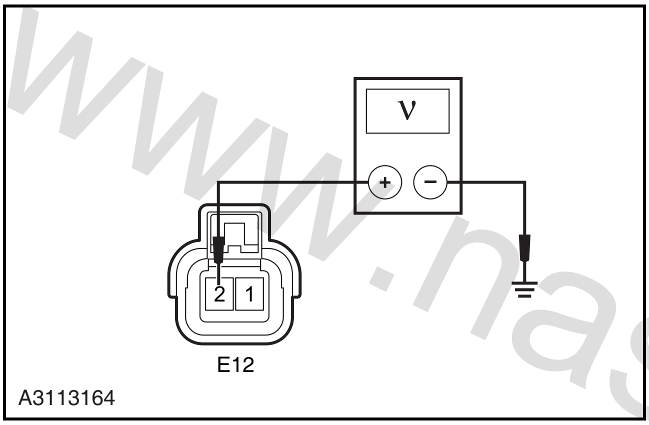
1. Fault code description

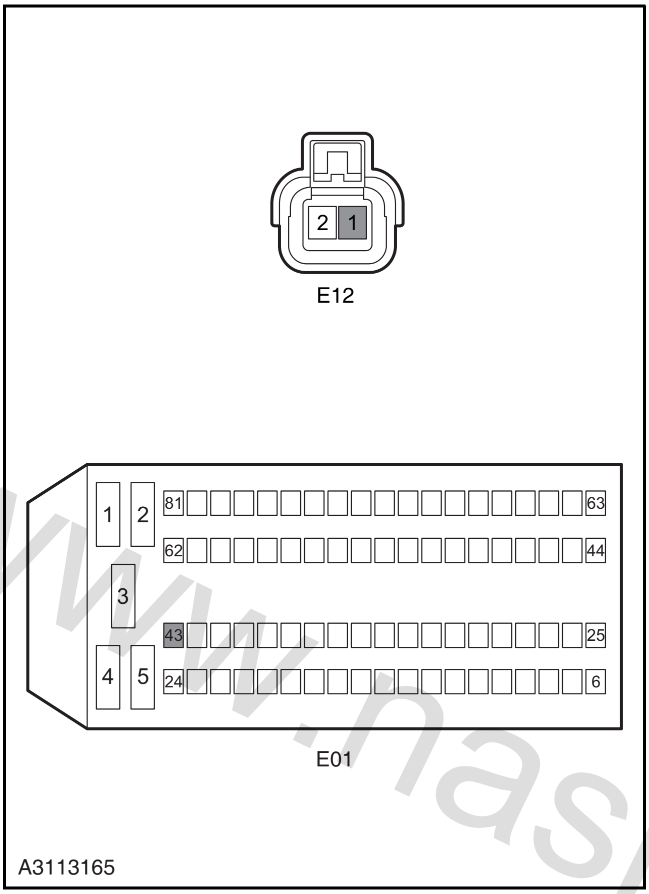
Fault code	Description	Definition
P0026	Intake VCP hydraulic control valve clamped	•Intake VCP hydraulic control valve circuits consist of the following: •Supply voltage: main relay provides reference voltage to terminal 2 of OCV control valve wiring harness connector E12 through terminal 31 of wiring harness connector C01. • ECM control ground circuit: ECM positions the terminal 1 on OCV control valve wiring harness connector E12 to low electric potential through terminal 43 of ECM wiring harness connector E01.
P0076	Intake VCP hydraulic control valve coil low voltage or open circuit	
P0077	Intake VCP hydraulic control valve coil high voltage	

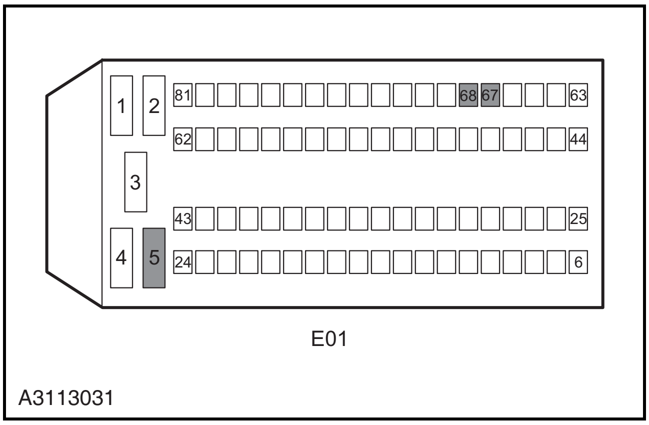
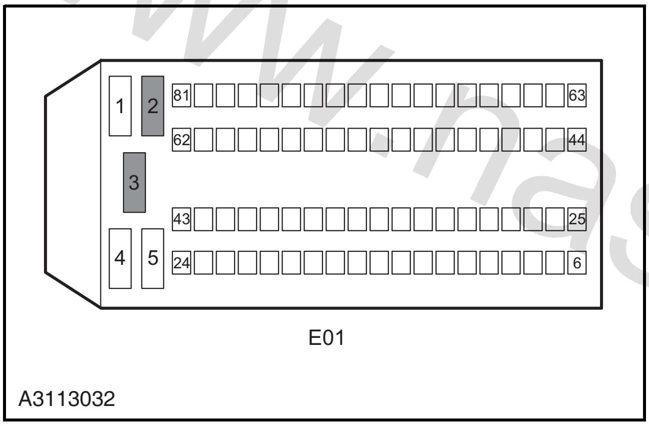
2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0026	Hardware Circuit Inspection	•Short to ground or open circuit •Short circuit to power supply	• OCV control valve circuit fault • OCV control valve fault • ECM
P0076			
P0077			

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A. Inspect the OCV control valve wiring harness connector E12 for loose or poor contact. B. Check if OCV control valve is properly installed. Is it normal? **Y** Go to step 2. **N** Repair the fault point.
2. Inspect the power supply line of OCV control valve	
	A. Turn the ignition switch to "LOCK" position. B. Disconnect camshaft phase sensor wiring harness connector E12. C. Turn the ignition switch to position "ON". D. Measure the voltage value between terminal 2 of OCV control valve wiring harness connector E12 and reliable ground. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 4. **N** Repair the circuit faults from terminal 2 of camshaft position sensor wiring harness connector E12 to terminal 31 of the engine compartment electric center C01.

Test Conditions	Details/Results/Actions
3. Inspect the ground circuit of OCV control valve	
	A. Turn the ignition switch to "LOCK" position. B.Disconnect the battery cathode cable. C.Disconnect OCV control valve wiring harness connector E12. D.Disconnect ECM wiring harness connector E01. E.Measure the resistance value between terminal 1 of OCV control valve wiring harness connector E12 and terminal 43 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** Is the resistance normal? **Y** Go to step 4. **N** Repair the circuit between the terminal 1 of cam-shaft position sensor wiring harness connector E12 and the terminal 43 of ECM wiring harness connector E01.
4. Inspect the OCV control valve	
	A. Turn the ignition switch to "LOCK" position. B.Replace OCV control valve of failed vehicle. C.Turn the ignition to the "ON" position and test with diagnostic tool if DTC is cleared. Is it normal? **Y** Replace with a new OCV control valve **N** Go to step 5.

Test Conditions	Details/Results/Actions
5. Inspect ECM power supply circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 6. **N** Repair and inspect the ECM power supply circuit.
6. Inspect ECM ground circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0031, P0032

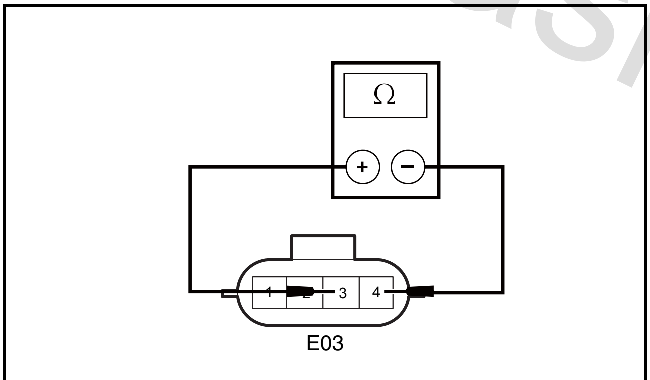
1. Fault code description

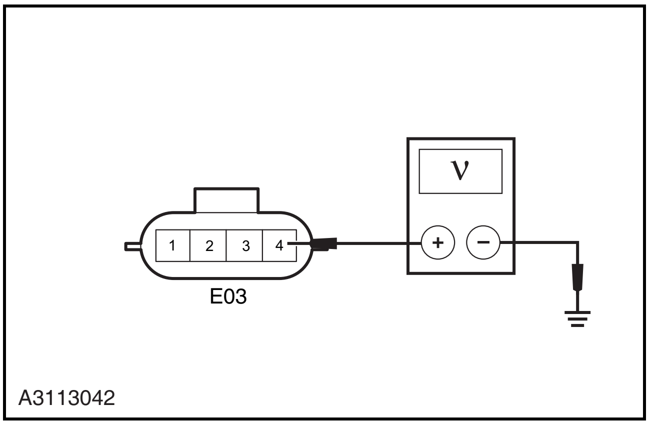
Fault code	Description	Definition
P0031	Pre-catalytic oxygen sensor heater short circuit to low voltage	The working voltage of Pre-catalytic oxygen sensor heating coil is provided by the main relay that controlled by ECM , when the ignition switch is turned to "ON" state, the terminal 4 of oxygen sensor plug E03 is with battery voltage. ECM controls the working time of the heater by the terminal 24 of ECM wiring harness connector E01.
P0032	Pre-catalytic oxygen sensor heater short circuit to high voltage	

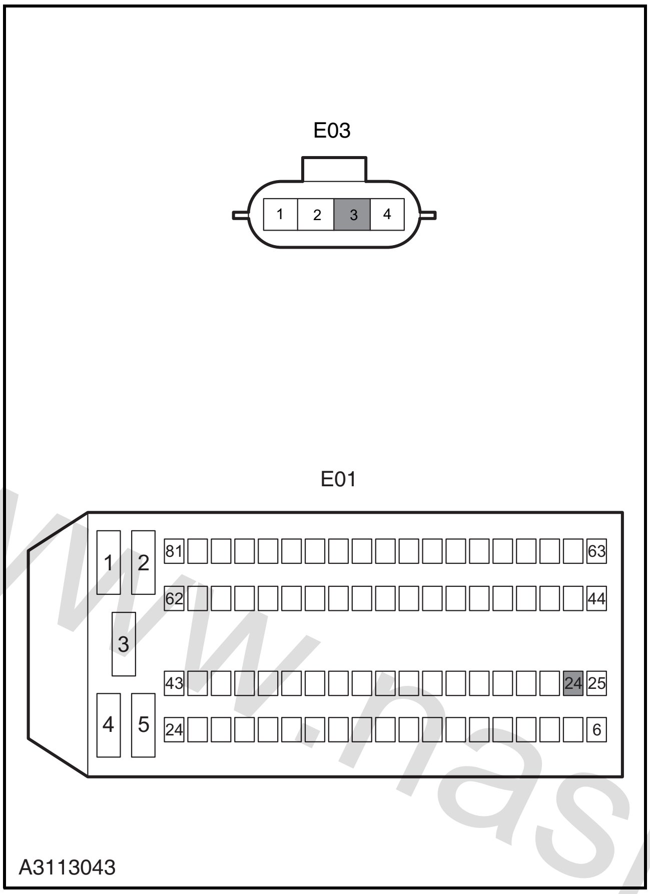
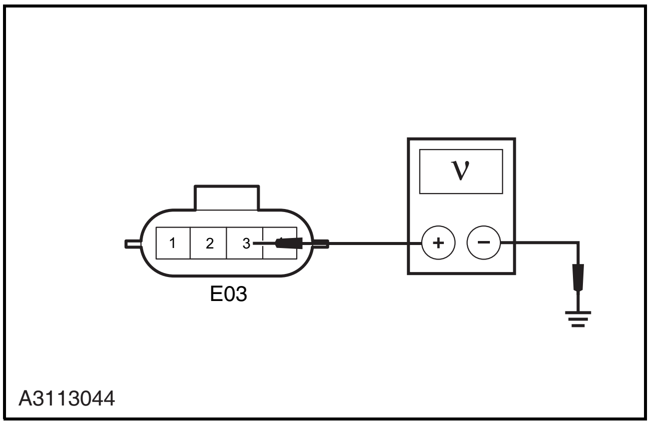
2. Possible Sources

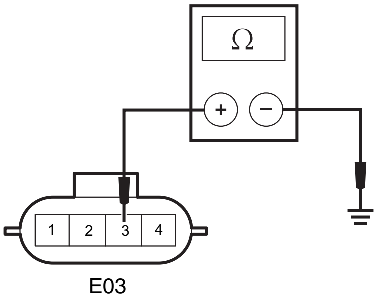
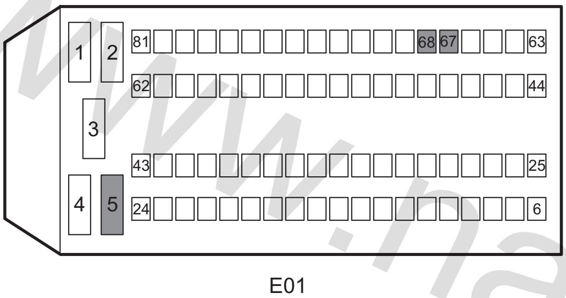
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0031	•Hardware Circuit Inspection	• Short circuit to ground • Short circuit to power	•Sensor circuit fault •Sensor fault • ECM fault
P0032			

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A.Inspect the Pre-catalytic oxygen sensor wiring harness connector for damage, poor contact, aging and loose. Is it normal? **Y** Go to step 2. **N** Repair the fault point.
2. Inspect the pre-catalytic oxygen sensor heater resistance value	
A3113041	A.Turn the ignition switch to "LOCK" position. B.Disconnect the pre-catalytic oxygen sensor wiring harness connector E03. C.Measure the resistance value of the heater that between terminal 3 and terminal 4 of pre-catalytic oxygen sensor wiring harness connector E03. **Standard Resistance Value: 20 ℃ (68ºF) 9 Ω** Is the resistance value normal? **Y** Go to step 3. **N** Replace the pre-catalytic oxygen sensor. **Refer to: Pre-catalytic oxygen sensor (3.1.13 Electronic Control System - MT22.1, Removal and Installation).**

Test Conditions	Details/Results/Actions
3. Inspect heater working voltage	
	A.Turn the ignition switch to "LOCK" position. B.Disconnect the Pre-catalytic oxygen sensor wiring harness connector E03. C.Turn the ignition switch to position "ON". D.Measure the voltage between the terminal 4 of Pre-catalytic oxygen sensor wiring harness connector E03 and the reliable ground. **Standard Voltage Value: 11~14 V** Is voltage normal? **Y** Go to step 5. **N** Go to step 4.
4. Inspect heater power supply circuit	
	A.Remove the fuse EF03 from engine compartment electric center. B.Inspect the fuse. Is the fuse normal? **Y** Repair the circuit from terminal 4 of Pre-catalytic oxygen sensor wiring harness connector E03 to terminal 31 of the engine compartment electric center C01. **N** Replace the fuse.

Test Conditions	Details/Results/Actions
5. Inspect heater control signal circuit	
 	A.Turn the ignition switch to position "LOCK". B.Disconnect ECM wiring harness connector E01. C.Disconnect the Pre-catalytic oxygen sensor wiring harness connector E03. D.Measure the resistance between the terminal 3 of Pre-catalytic oxygen sensor wiring harness connector E03 and the terminal 24 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** E.Measure the voltage between the terminal 3 of Pre-catalytic oxygen sensor wiring harness connector E03 and the reliable ground. **Standard Voltage Value: 0 V** F.Measure the resistance between the terminal 3 of Pre-catalytic oxygen sensor wiring harness connector E03 and the reliable ground. **Standard Resistance Value: 10 MΩ or more** Is it normal? **Y** Go to step 6. **N** Repair the circuit faults between the terminal 3 of Pre-catalytic oxygen sensor wiring harness connector E03 and the terminal 24 of ECM wiring harness connector E01.

Test Conditions	Details/Results/Actions
 A3113045	
6. Inspect the ECM power supply circuit	
 A3113031	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 7. **N** Repair and inspect the ECM power supply circuit.
7. Inspect ECM ground circuit	
 A3113032	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0037, P0038

1. Fault code description

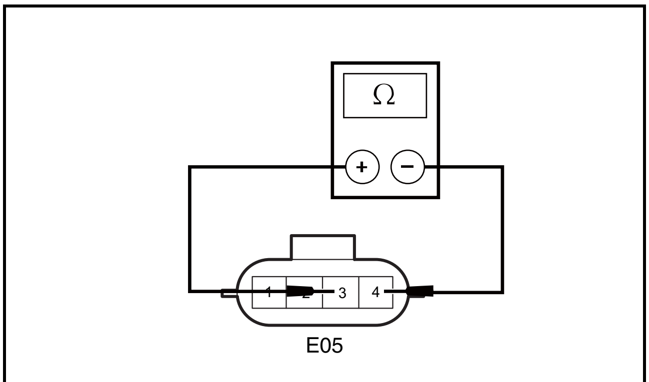
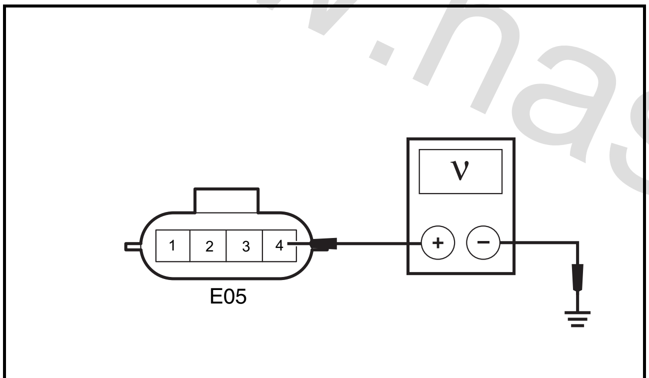
Fault code	Description	Definition
P0037	Post-catalytic oxygen sensor heater short circuit to low voltage	The working voltage of Post-catalytic oxygen sensor heating coil is provided by the main relay that controlled by ECM, when the ignition switch is turned to "ON" state, the terminal 4 of oxygen sensor plug E05 is with battery voltage. ECM controls the working time of the heater by the terminal 23 of ECM wiring harness connector E01.
P0038	Post-catalytic oxygen sensor heater short circuit to high voltage	

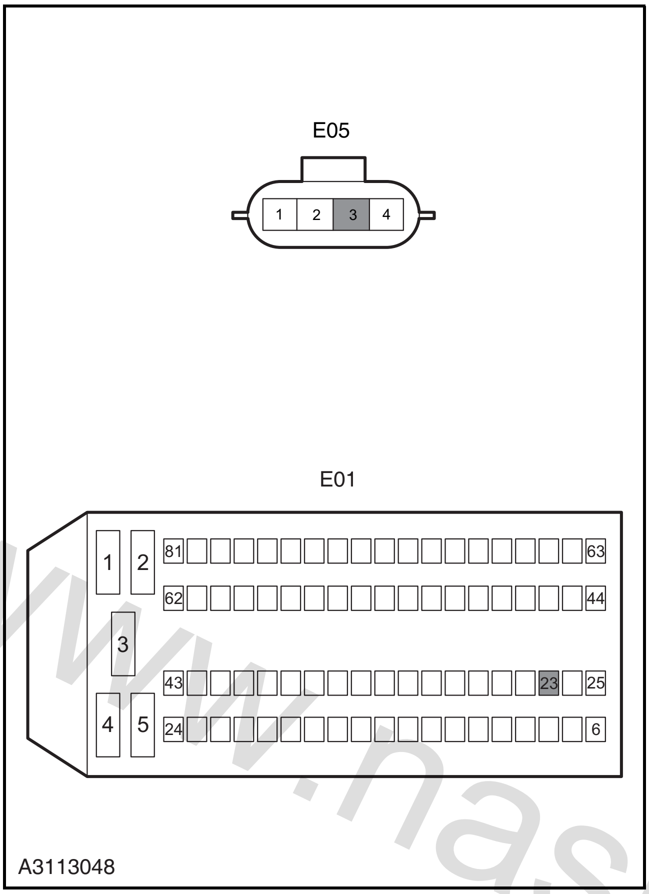
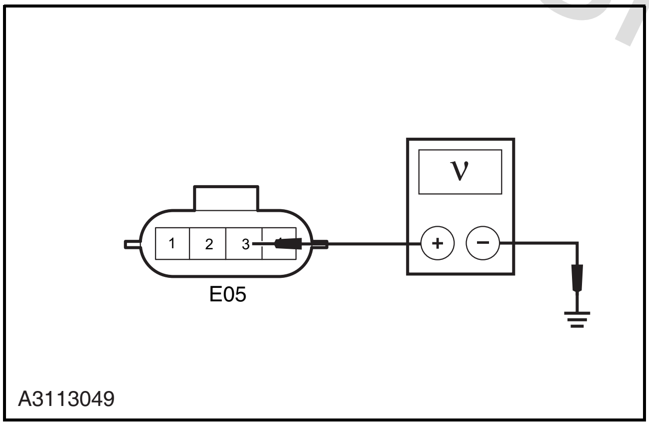
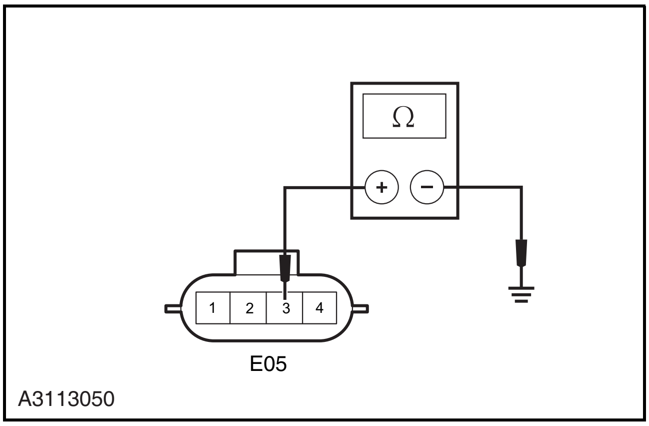
2. Possible Sources

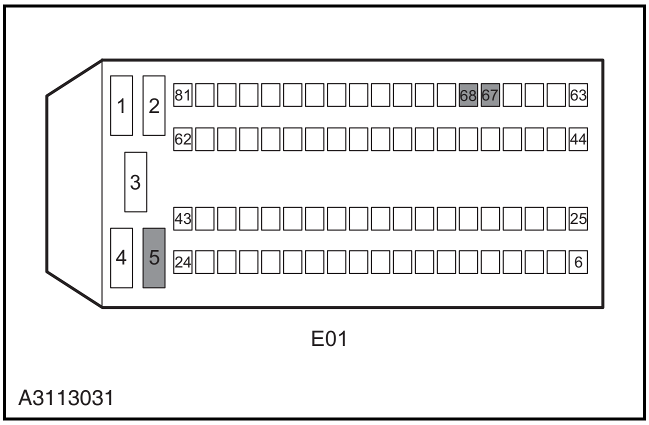
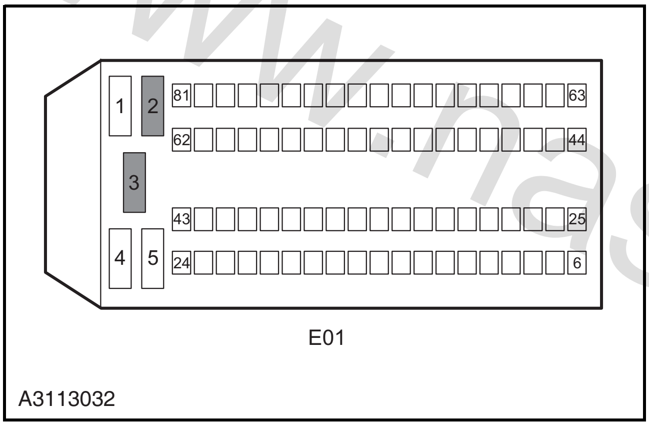
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0037	Hardware Circuit Inspection	•Short circuit to ground •Short circuit to power	• Sensor circuit fault •Sensor fault • ECM
P0038			

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A.Inspect Post-catalytic oxygen sensor wiring harness connector for damage, poor contact, aging and loose. Is it normal? **Y** Go to step 2. **N** Repair the fault point.

Test Conditions	Details/Results/Actions
2. Inspect Post-catalytic oxygen sensor heater resistance value	
 A3113046	A.Turn the ignition switch to "LOCK" position. B.Disconnect the Post-catalytic oxygen sensor wiring harness connector E05. C.Measure the resistance value of the heater that between terminal 3 and terminal 4 of Post-catalytic oxygen sensor connector E05. **Standard Resistance Value: 20 ℃ (68°F) 9 Ω** Is the resistance value normal? **Y** Go to step 3. **N** Replace Post-catalytic oxygen sensor. **Refer to: Post-catalytic oxygen sensor (3.1.13 Electronic Control System - MT22.1, Removal and Installation).**
3. Inspect heater working voltage	
 A3113047	A.Turn the ignition switch to "LOCK" position. B.Disconnect the Post-catalytic oxygen sensor wiring harness connector E05. C.Turn the ignition switch to position "ON". D.Measure the voltage between the terminal 4 of Post-catalytic oxygen sensor wiring harness connector E05 and the reliable ground. **Standard Voltage Value: 11~14 V** Is voltage normal? **Y** Go to step 5. **N** Go to step 4.
4. Inspect heater power supply circuit	
	A.Remove the fuse EF03 from engine compartment electric center. B.Inspect the fuse. Is the fuse normal? **Y** Repair the circuit from terminal 4 of Post-catalytic oxygen sensor wiring harness connector E05 to terminal 31 of the engine compartment electric center C01. **N** Replace the fuse.
5. Inspect heater control signal circuit	

Test Conditions	Details/Results/Actions
  	A.Turn the ignition switch to position "LOCK". B.Disconnect ECM wiring harness connector E01. C.Disconnect the Post-catalytic oxygen sensor wiring harness connector E05. D.Measure the resistance between the terminal 3 of Post-catalytic oxygen sensor wiring harness connector E05 and the terminal 23 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** E.Measure the voltage between the terminal 3 of Post-catalytic oxygen sensor wiring harness connector E05 and the reliable power supply. **Standard Voltage Value: 0 V** F.Measure the resistance between the terminal 3 of Post-catalytic oxygen sensor wiring harness connector E05 and the reliable ground. **Standard Resistance Value: 10 MΩ or more** Is it normal? **Y** Go to step 6. **N** Repair the circuit faults between the terminal 3 of Post-catalytic oxygen sensor wiring harness connector E05 and the terminal 23 of ECM wiring harness connector E01.

Test Conditions	Details/Results/Actions
6. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 7. **N** Repair and inspect the ECM power supply circuit.
7. Inspect ECM ground circuit	
	A.Turn the ignition switch to "LOCK" position. B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0105, P0106, P0107, P0108

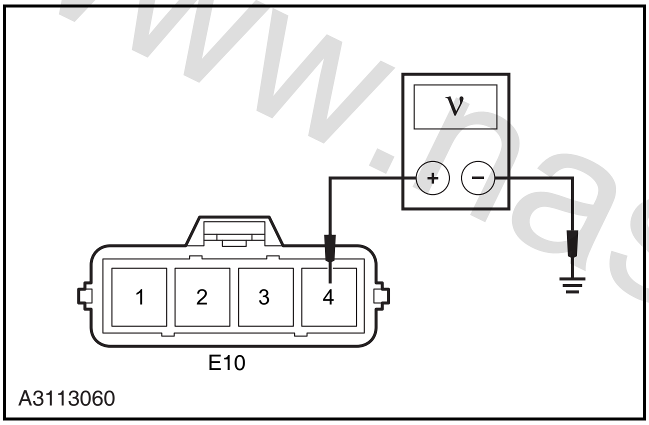
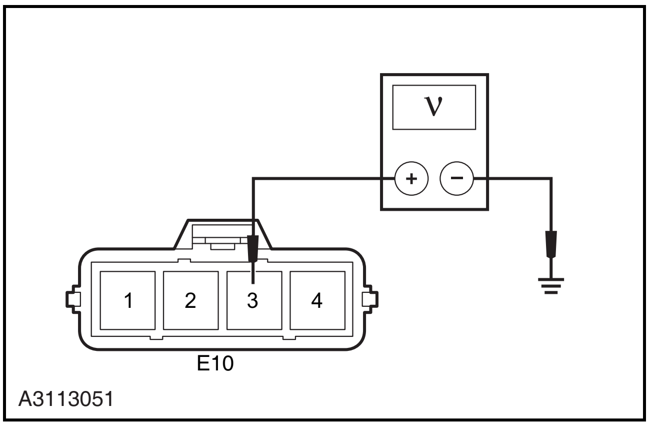
1. Fault code description

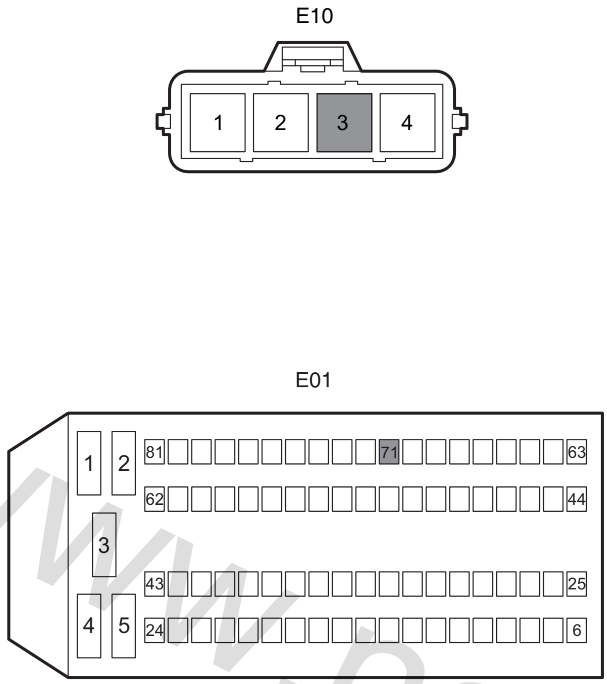
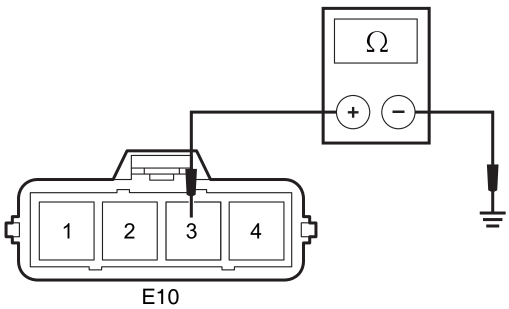
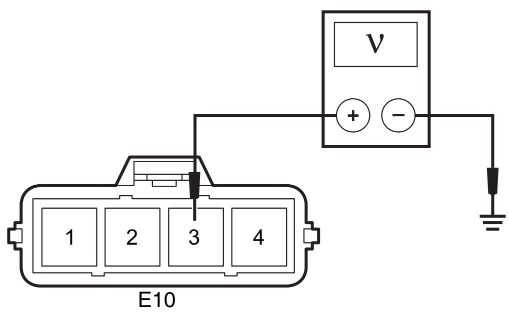
Fault code	Description	Definition
P0105	Intake pressure sensor signal clamped	The intake pressure temperature sensor has four terminals, when the ignition switch is turned to "ON" position, the engine control module through terminal 66 on connector E01 to provide 5 V voltage for the sensor terminal 3, the terminal 76 of E01 enable the sensor terminal 1 ground, the sensor terminal 1 provides an signal that follow the changes of intake pressure to terminal 54 of the ECM connector E01.
P0106	Intake pressure/throttle position rationality fault	
P0107	Intake pressure sensor circuit low voltage or open circuit	
P0108	Intake pressure sensor circuit high voltage	

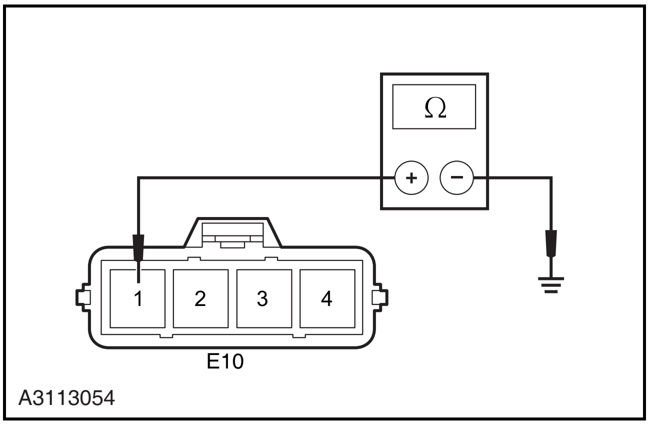
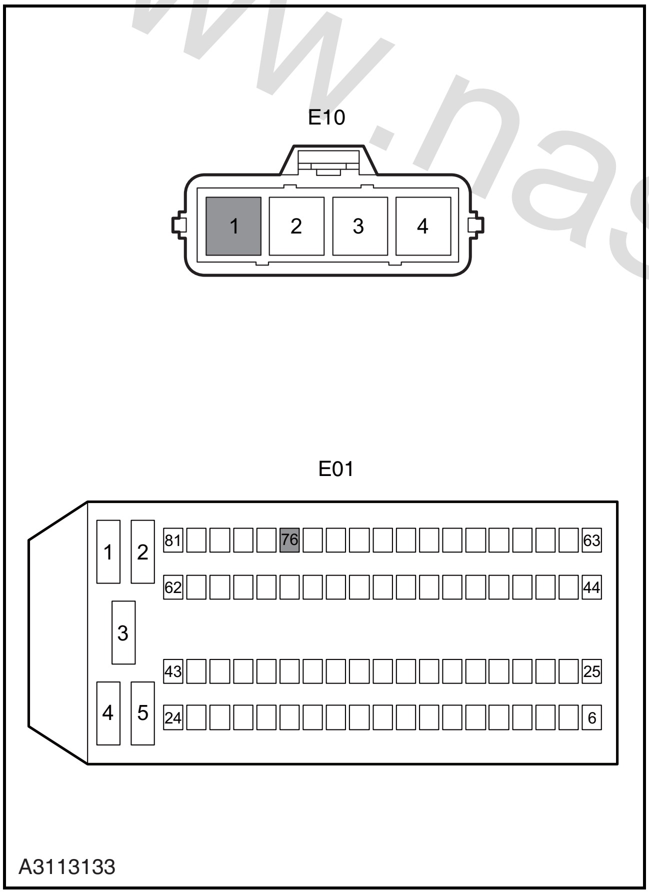
2. Possible Sources

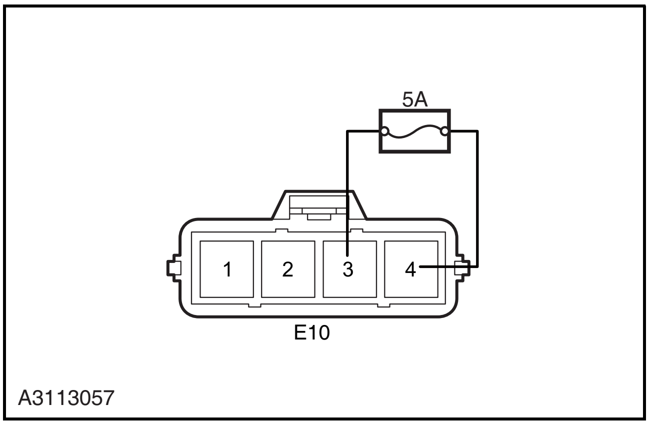
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0105	Hardware or circuit inspection	•Engine speed greater than 800RPM •After start, pressure drop less than 1 kPa •Last for more than 1s	•Sensor circuit fault •Sensor fault • ECM fault
P0106		•Engine speed greater than 800RPM •After start, pressure drop less than 1 kPa •Last for more than 1s	
P0107		Pressure sensor voltage is less than 0.195V last for more than 1s	
P0108		After it is started, intake pressure sensor voltage is greater than 4.95V for over 1s.	

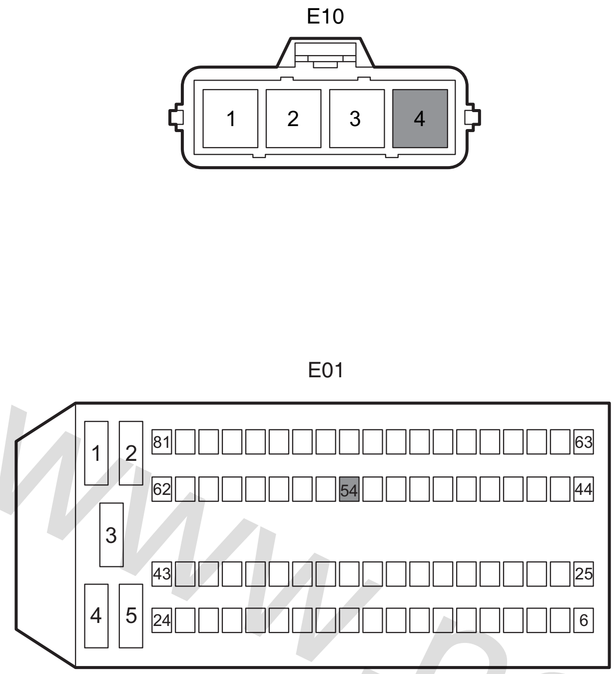
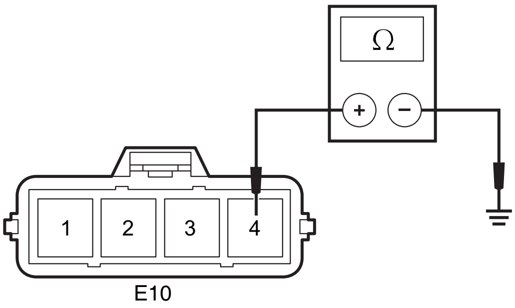
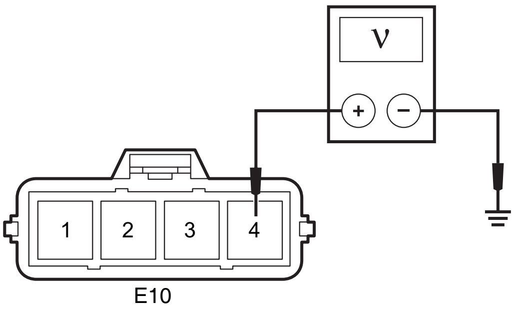
3. Diagnosis procedure

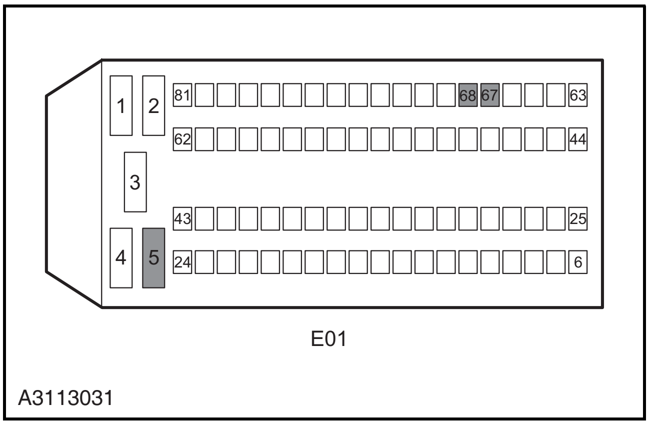
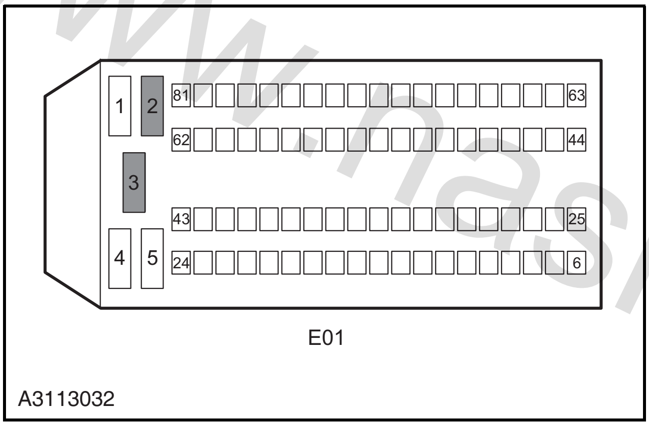
Test Conditions	Details/Results/Actions
1. General inspection	
	A.Inspect for the following items: •Sensor housing is damaged, vacuum pipe cracks. •Sensor sealing is damaged. •Sensor loose or improper installation. •Sensor vacuum pipe is blocked. Is it normal? **Y** Go to step 2. **N** Repair the fault point.
2. Inspect intake pressure sensor signal voltage	
	A. Start the engine. B. Measure the voltage at terminal 4 of intake pressure temperature sensor wiring harness connector E10 from the side using a multimeter, the voltage of signal pin at idle speed is about 1.3V, when the throttle is opened slowly without load, the voltage changes a little, if the throttle is opened quickly, the voltage can reach about 4V instantly and then drop to about 1.5V. Is the voltage normal？ **Y** Go to step 8. **N** Go to step 3.
3. Inspect intake pressure sensor power supply voltage	
	A. Turn the ignition switch to position "LOCK". B.Disconnect the intake pressure temperature sensor wiring harness connector E10. C.Turn the ignition switch to position "ON". D. Measure the voltage between the terminal 3 of intake pressure temperature sensor wiring harness connector E10 and the reliable ground. **Standard Voltage Value: 4.5~5.5 V** Is the voltage normal？ **Y** Go to step 5. **N** Go to step 4.
4. Inspect intake pressure sensor power supply circuit	

Test Conditions	Details/Results/Actions
 A3113052  A3113053  A3113051	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery negative cable. C.Disconnect the intake pressure temperature sensor wiring harness connector E10. D.Disconnect ECM wiring harness connector E01. E.Measure the resistance between terminal 3 of intake pressure temperature sensor connector E10 and terminal 71 of ECM wring harness connector E01. **Standard Resistance Value: less than 5Ω** F.Measure the resistance value between the terminal 3 of intake pressure temperature sensor wiring harness connector E10 and reliable ground. **Standard Resistance Value: 10 MΩ or higher** G.Measure the voltage between the terminal 3 of intake pressure temperature sensor wiring harness connector E10 and the reliable ground. **Standard Voltage Value: 0 V** Are the resistance and voltage above normal? **Y** Go to step 6. **N** Repair the fault circuit, inspect the system for normal working.

Test Conditions	Details/Results/Actions
5. Inspect intake pressure sensor ground	
 A3113054	A.Turn the ignition switch to position "LOCK". B.Disconnect the intake pressure temperature sensor wiring harness connector E10. C.Turn the ignition switch to position "ON". D.Measure the resistance value between the terminal 1 of intake pressure temperature sensor wiring harness connector E10 and reliable ground. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Go to step 7. **N** Go to step 6.
6. Inspect intake pressure sensor ground circuit	
 A3113133	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery negative cable. C.Disconnect the intake pressure temperature sensor wiring harness connector E10. D.Disconnect ECM wiring harness connector E01. E.Measure the resistance between terminal 1 of intake pressure temperature sensor wiring harness connector E10 and terminal 76 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** F.Measure the voltage between the terminal 1 of intake pressure temperature sensor wiring harness connector E10 and the reliable ground. **Standard Voltage Value: 0 V** G.Measure the resistance value between the terminal 1 of intake pressure temperature sensor wiring harness connector E10 and reliable ground. **Standard Resistance Value: less than 5Ω** Are the resistance and voltage normal? **Y** Go to step 7. **N** Repair the fault circuit

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">7. Inspect intake pressure sensor</td></tr>
<tr><td></td><td>A.Turn the ignition switch to position "LOCK".
B.Disconnect the intake pressure temperature sensor wiring harness connector E10.
C.Connect a jumper with 5 A fuse between the terminals 3 and 4 of E10.
D.Turn the ignition switch to position "ON".
E.Connect the diagnosis tool，access to engine data stream, read the "actual manifold absolute pressure" parameter.
Standard parameter: 1,050 kPa
Is the data normal？
Y
Replace the intake pressure sensor.
Refer to: Intake pressure Sensor (3.1.13 Electronic Control System - MT22.1, Removal and Installation).
N
Go to step 8.</td></tr>
<tr><td colspan="2">8. Inspect intake pressure sensor signal circuit</td></tr>
</table>

Test Conditions	Details/Results/Actions
 A3113058  A3113059  A3113060	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery negative cable. C.Disconnect the intake pressure temperature sensor wiring harness connector E10. D.Disconnect ECM wiring harness connector E01. E.Measure the resistance between terminal 4 of intake pressure temperature sensor wiring harness connector E10 and terminal 54 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** F.Measure the resistance value between the terminal 4 of intake pressure temperature sensor wiring harness connector E10 and reliable ground. **Standard Resistance Value: 10 MΩ or higher** G.Measure the voltage between the terminal 4 of intake pressure temperature sensor wiring harness connector E10 and the reliable ground. **Standard Voltage Value: 0 V** Are the voltage and resistance normal? **Y** Go to step 9. **N** Repair the circuit.

Test Conditions	Details/Results/Actions
9. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 10. **N** Repair and inspect the ECM power supply circuit.
10. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0112, P0113

1. Fault code description

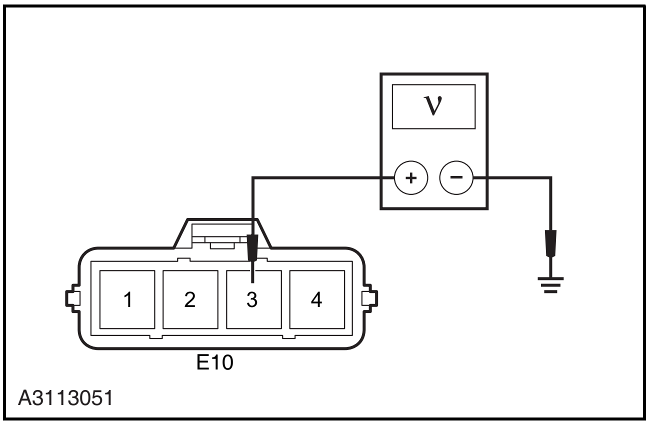
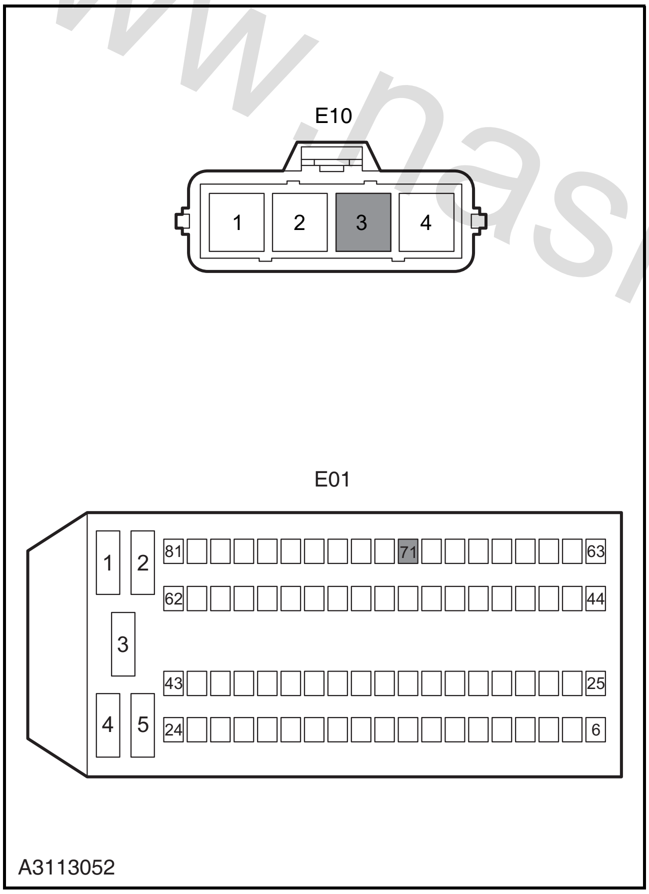
Fault code	Description	Definition
P0112	Air intake temperature sensor signal circuit voltage too low	Air intake temperature sensor is integrated in the engine intake pressure and temperature sensors to measure the temperature of the air that goes into the engine. ECM internal pressure regulator circuit provides 5V reference voltage to terminal 3 of intake pressure and temperature sensor wiring harness connector E10 through terminal 66 of ECM wiring harness connector E01. The air intake temperature voltage-drop signal can be obtained in this circuit. Place terminal 2 of intake pressure temperature sensor E10 on low potential by terminal 71 of E01.
P0113	Air intake temperature sensor signal circuit voltage too high	

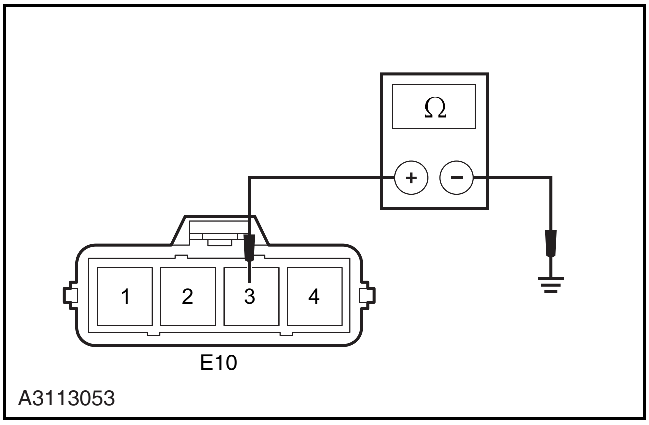
2. Possible Sources

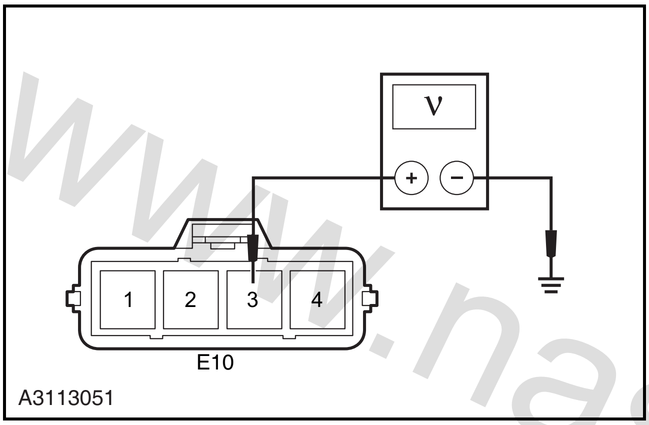
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0112	Hardware or circuit inspection	Air intake temperature is higher than 128.25 ℃	•Sensor circuit fault • Sensor fault • ECM fault
P0113		Air intake temperature less than -38.25 ℃	

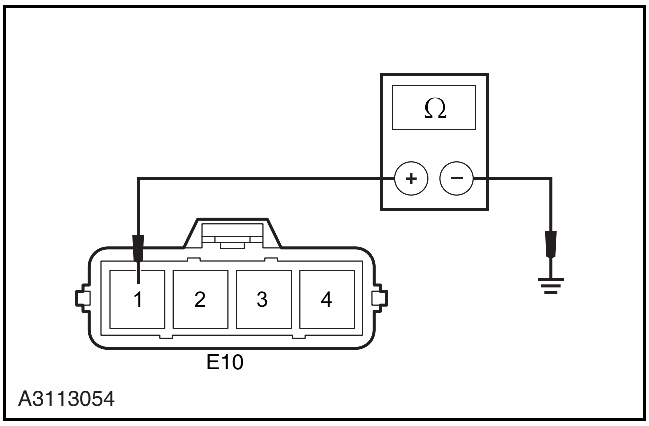
3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A.Inspect for the following items: •Sensor housing is damaged, vacuum pipe cracks. •Sensor sealing is damaged. •Sensor loose or improper installation. •Sensor vacuum pipe is blocked. Is it normal? **Y** Go to step 2. **N** Repair the fault point.

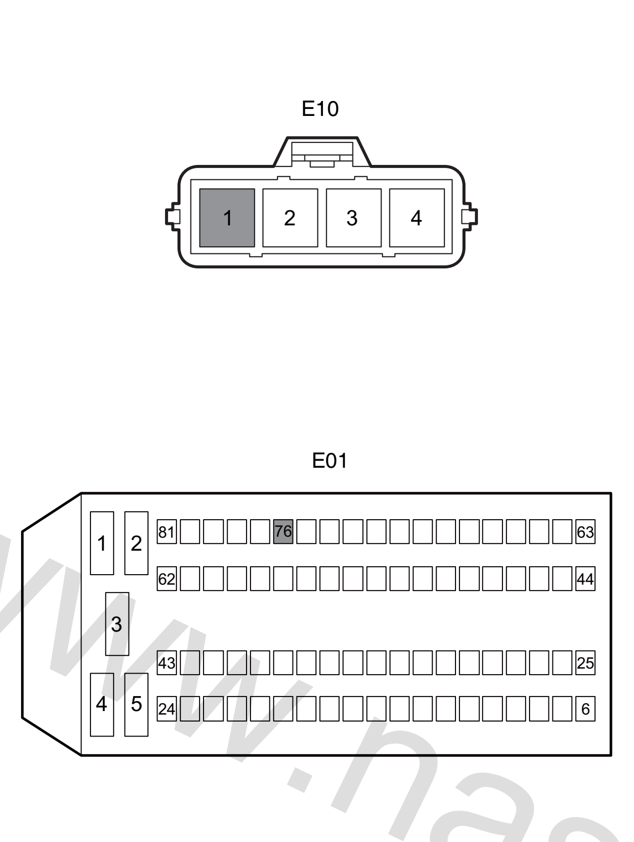
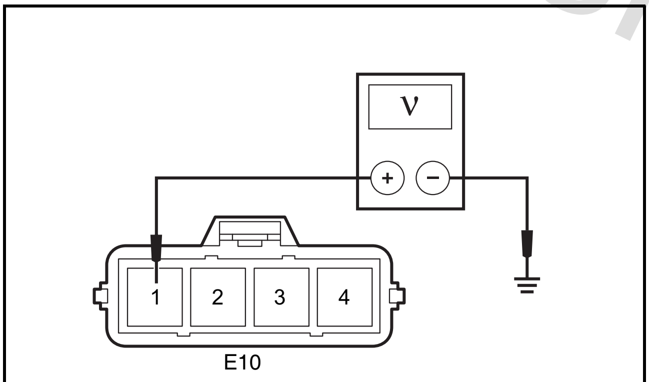
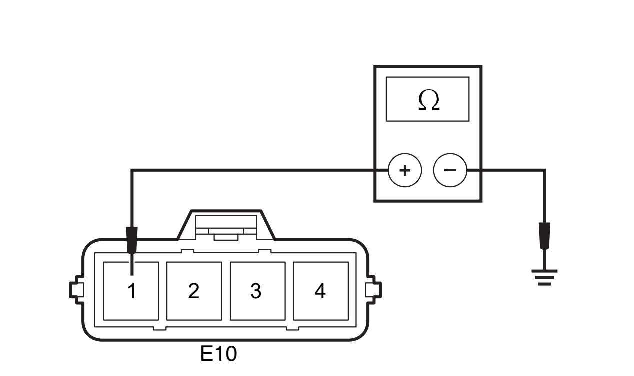
Test Conditions	Details/Results/Actions
2. Inspect intake temperature sensor power supply voltage	
	A. Turn the ignition switch to position "LOCK". B.Disconnect the intake temperature sensor wiring harness connector E10. C.Turn the ignition switch to position "ON". D. Measure the voltage between the terminal 3 of intake pressure temperature sensor wiring harness connector E10 and the reliable ground. **Standard Voltage Value: 4.5~5.5 V** Is the voltage normal？ **Y** Go to step 4. **N** Go to step 3.
3. Inspect intake temperature sensor power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery cathode cable. C.Disconnect the intake pressure temperature sensor wiring harness connector E10. D.Disconnect ECM wiring harness connector E01. E.Measure the resistance between terminal 3 of intake pressure temperature sensor plug E10 and terminal 71 of ECM wring harness connector E01. **Standard Resistance Value: less than 5Ω** F.Measure the resistance value between the terminal 3 of intake pressure temperature sensor wiring harness connector E10 and reliable ground. **Standard Resistance Value: 10 MΩ or higher** G.Measure the voltage between the terminal 3 of intake pressure temperature sensor wiring harness connector E10 and the reliable ground. **Standard Voltage Value: 0 V** Are the resistance and voltage above normal? **Y** Go to step 5. **N** Repair the fault circuit, inspect the system for normal working.

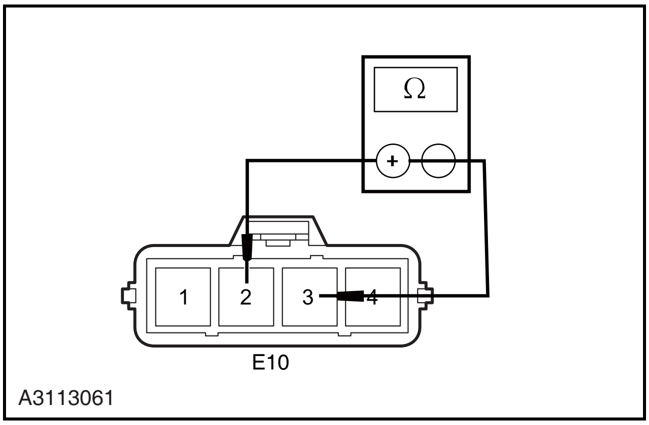
<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td>


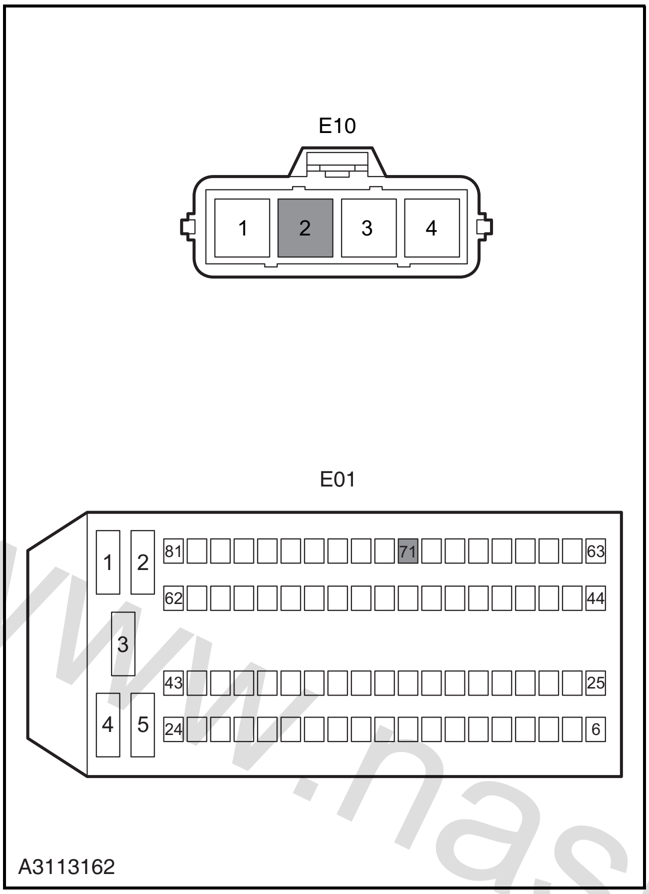
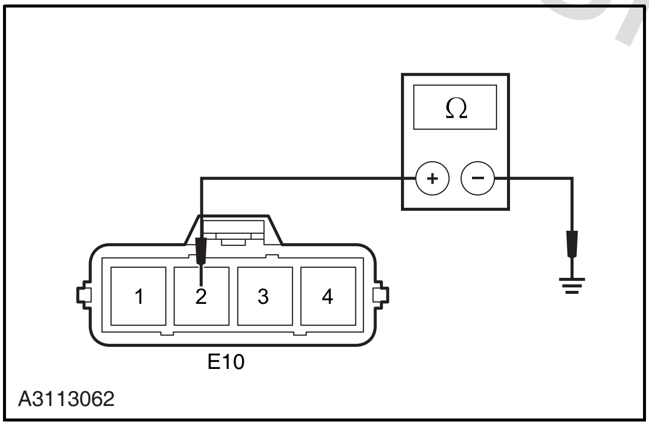
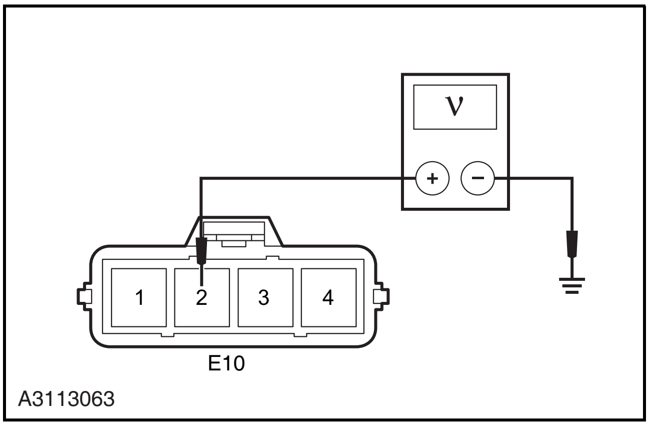


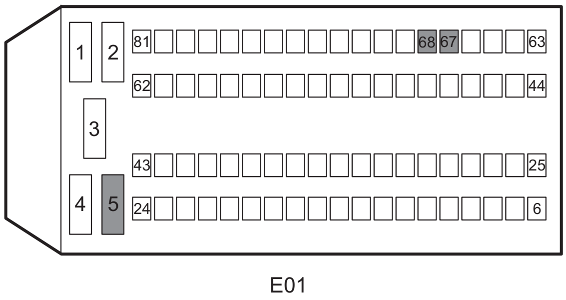
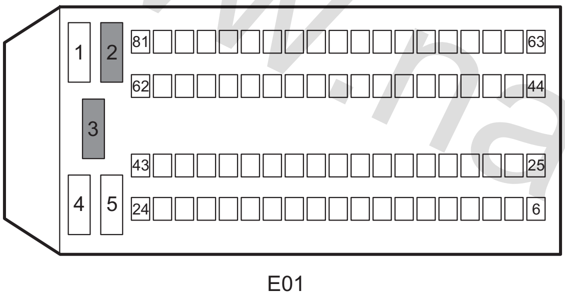
</td><td></td></tr>
<tr><td colspan="2">4. Inspect intake temperature sensor ground</td></tr>
<tr><td>


</td><td>
A.Turn the ignition switch to position "LOCK".
B.Disconnect the intake pressure temperature sensor wiring harness connector E10.
C.Turn the ignition switch to position "ON".
D.Measure the resistance value between the terminal 1 of intake pressure temperature sensor wiring harness connector E10 and reliable ground.
Standard Resistance Value: less than 5Ω
Is the resistance value normal?
Y
Go to step 6.
N
Go to step 5.
</td></tr>
<tr><td colspan="2">5. Inspect intake temperature sensor ground circuit</td></tr>
</table>

Test Conditions	Details/Results/Actions
A3113133 A3113056 A3113054	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery cathode cable. C.Disconnect the intake pressure temperature sensor wiring harness connector E10. D.Disconnect ECM wiring harness connector E01. E.Measure the resistance between terminal 1 of intake pressure temperature sensor wiring harness connector E10 and terminal 76 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** F.Measure the voltage between the terminal 1 of intake pressure temperature sensor wiring harness connector E10 and the reliable ground. **Standard Voltage Value: 0 V** G.Measure the resistance value between the terminal 1 of intake pressure temperature sensor wiring harness connector E10 and reliable ground. **Standard Resistance Value: less than 5Ω** Are the resistance and voltage normal? **Y** Go to step 6. **N** Repair the fault circuit.

Test Conditions	Details/Results/Actions
6. Inspect the intake temperature sensor resistance	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the intake pressure temperature sensor wiring harness connector E10. C.Measure the resistance between terminal 2 and terminal 3 of intake temperature sensor wiring harness connector E10. **Standard Resistance Value: 20 ℃ (68ºF) Rated resistance 3.325~3.675 kΩ** Is it normal? **Y** Go to step 7. **N** Replace intake pressure temperature sensor.
7. Inspect intake temperature sensor signal circuit	

Test Conditions	Details/Results/Actions
 	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery negative cable. C.Disconnect the intake pressure temperature sensor wiring harness connector E10. D.Disconnect ECM wiring harness connector E01. E.Measure the resistance between terminal 2 of intake pressure temperature sensor wiring harness connector E10 and terminal 71 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** F.Measure the resistance value between the terminal 2 of intake pressure temperature sensor wiring harness connector E10 and reliable ground. **Standard Resistance Value: 10 MΩ or higher** G.Measure the voltage between the terminal 2 of intake pressure temperature sensor wiring harness connector E10 and the reliable ground. **Standard Voltage Value: 0 V** Are the voltage and resistance normal? **Y** Go to step 8. **N** Repair the circuit.
	

Test Conditions	Details/Results/Actions
8. Inspect the ECM power supply circuit	
A3113031	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 9. **N** Repair and inspect the ECM power supply circuit.
9. Inspect ECM ground circuit	
A3113032	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0117, P0118

1. Fault code description

Fault code	Description	Definition
P0117	Coolant temperature sensor circuit low voltage	ECT sensor is a variable resistor of negative temperature coefficient, used for measuring engine coolant temperature. ECM provides 5 V voltage to the terminal 2 of the ECT sensor harness connector E22 through terminal 74 of ECM wiring harness connector E01, and get ECT signals from terminal 49 of E01. ECT sensor is ground via vehicle body.
P0118	Coolant temperature sensor circuit high voltage or open circuit	

2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0117	Exceeding upper limit, short circuit to ground	Coolant temperature measured value is higher than 138 ℃	•Sensor circuit fault •Sensor fault • ECM fault
P0118	Exceeding lower limit, short circuit to power supply or open circuit	Coolant temperature measured value is less than -38.25 ℃	

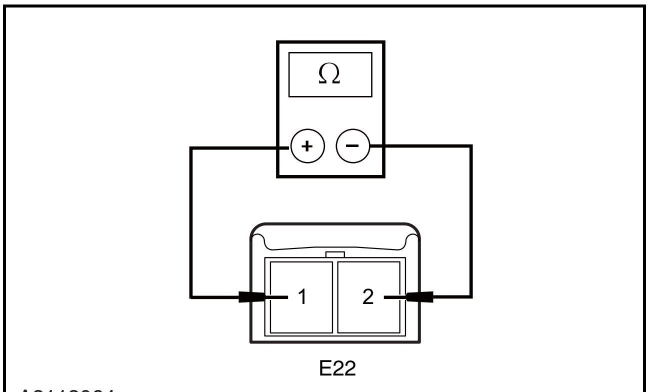
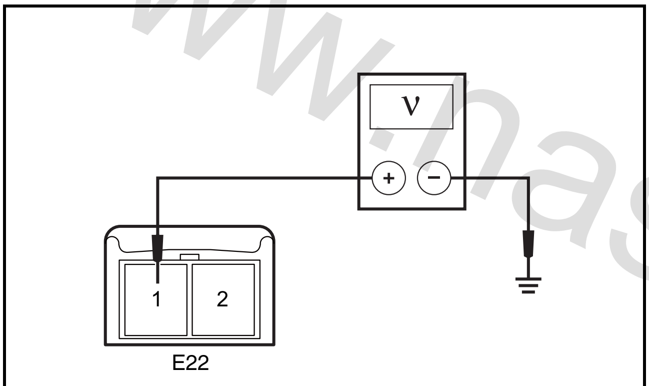
3. Diagnosis procedure

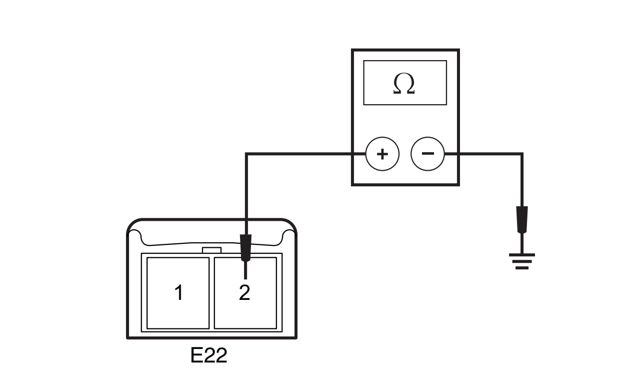
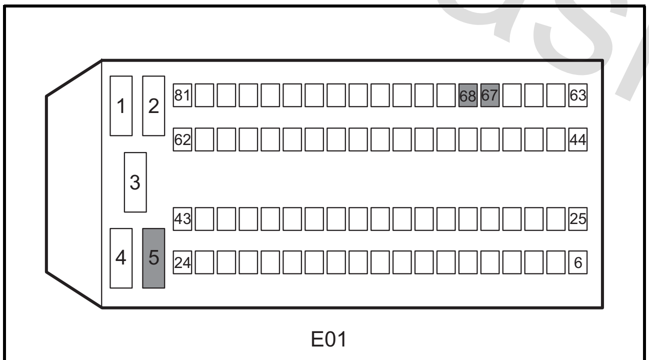
WARNING: Refer to Warning and Notice (3.1.4 Cooling System， General Procedures).

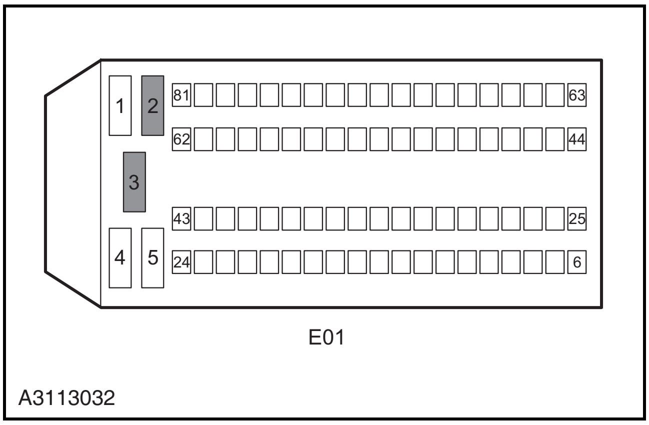
CAUTION: Before the diagnostic procedure, observe the list of diagnostic data, analysis the accuracy of the data for quick troubleshooting.

CAUTION: It is not recommended at any time of flammable coolant, such as alcohol. Flammable coolant can cause serious fire.

Test Conditions	Details/Results/Actions
1. General inspection	
	A.Inspect whether the engine water temperature sensor is with the signs of corrosion, and whether the coolant is leaking through the engine sensor. B.Inspect if the level of the engine coolant in engine cooling system stock tank is correct. C.Inspect the sensor for loose or improper installation. Is it normal? **Y** Go to step 2. **N** Repair the fault point.

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">2. Inspect water temperature sensor resistance</td></tr>
<tr><td>
A3113064</td><td>A.Turn the ignition switch to position "LOCK".
B. Disconnect the water temperature sensor wiring harness connector E22.
C. Measure the resistance between terminal 1 and terminal 2 of water temperature sensor wiring harness connector E22.
Standard Resistance Value: 20 ℃ (68ºF) Rated resistance 2.375~2.625 kΩ
Is it normal？
Y
Go to step 3.
N
Replace the water temperature sensor.</td></tr>
<tr><td colspan="2">3. Inspect water temperature sensor signal circuit</td></tr>
<tr><td>
A3113065</td><td>A.Turn the ignition switch to position "LOCK".
B.Disconnect the water temperature sensor wiring harness connector E22. Turn the ignition switch to position "ON".
C.Measure the voltage between terminal 1 of water temperature sensor wiring connector E22 and the reliable ground.
Standard Voltage Value: 4.7~5.5 V
Is the voltage normal？
Y
Go to step 4.
N
Repair the circuit faults between terminal 1 of water temperature sensor wiring harness connector E22 and terminal 49 of ECM wiring harness connector E01.</td></tr>
</table>

Test Conditions	Details/Results/Actions
4. Inspect water temperature sensor ground	
A3113066	A.Turn the ignition switch to position "LOCK". B.Disconnect the water temperature sensor wiring harness connector E22 and measure the resistance value between terminal 2 of the water temperature sensor wiring harness connector E22 and reliable ground. **Standard Resistance Value: 10 MΩ or higher** C.Turn the ignition switch to position "ON". D. Measure the resistance value between terminal 2 of water temperature sensor plug E22 and the reliable ground. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Go to step 5. **N** Repair the fault circuit between terminal 2 of water temperature sensor plug E22 and terminal 74 of ECM wiring harness connector E01.
5. Inspect ECM power supply circuit	
A3113031	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 6. **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
6. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0122, P0123, P2135

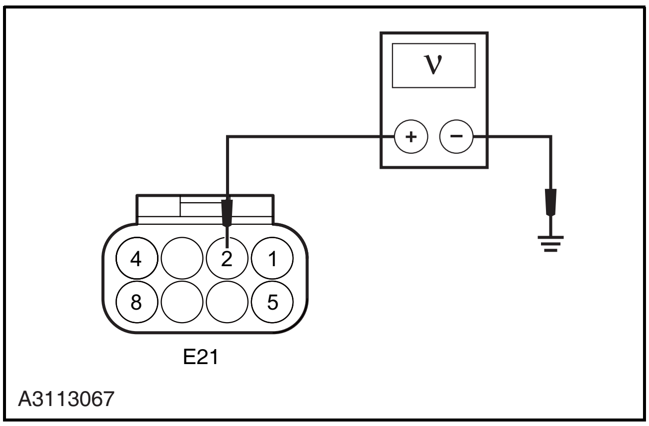
1. Fault code description

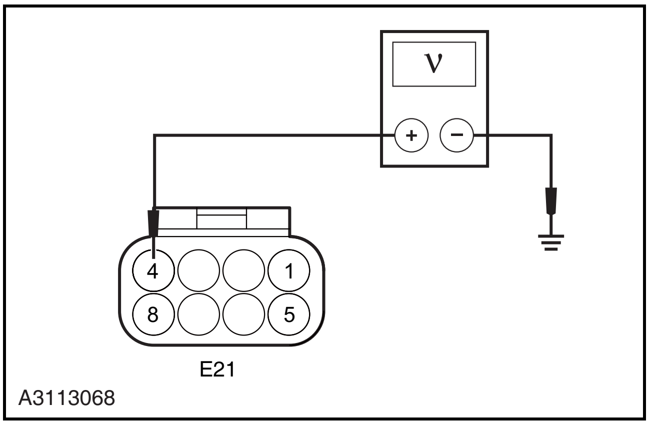
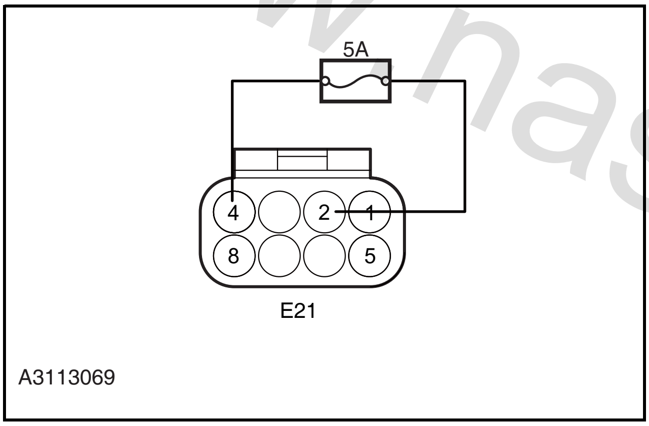
Fault code	Description	Definition
P0122	Electronic throttle position sensor 1# circuit low voltage	•ECM provides 5V reference voltage to terminal 4 of TPS sensor wiring harness connector E21 through terminal 70 of wiring harness connector E01. •TPS provides sensor signal voltage to terminal 52 of ECM wiring harness connector E01 through terminal 2 of wiring harness connector E21. ECM positions terminal 1 of TPS sensor wiring harness connector E21 at low electrical potential through terminal 74 of wiring harness connector E01.
P0123	Electronic throttle position sensor 1# circuit high voltage	
P2135	Electronic throttle position sensor 1 & 2 circuits correlation fault	

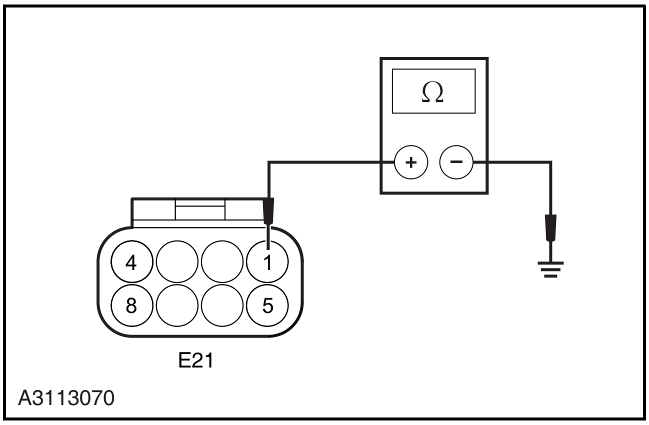
2. Possible Sources

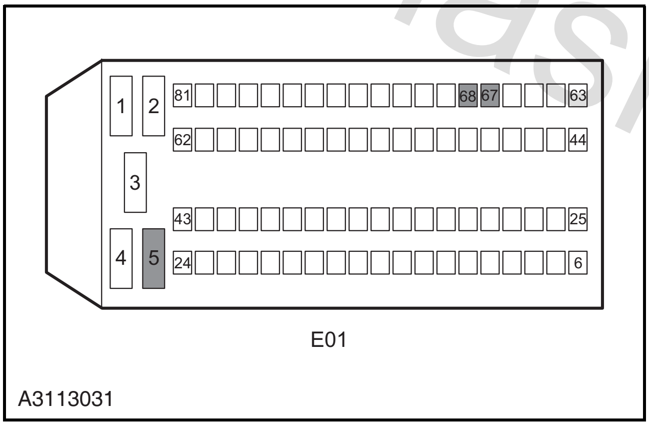
<table>
<tr><th>Fault code</th><th>Test Tactics</th><th>Setting conditions (control strategy)</th><th>Fault location</th></tr>
<tr><td>P0122</td><td>Signal circuit voltage too low, short circuit to ground</td><td rowspan="3">Turn ignition switch to position "ON", and engine is off or is running.</td><td rowspan="3">•Sensor circuit fault
•Sensor fault
• ECM fault</td></tr>
<tr><td>P0123</td><td>Signal circuit voltage too high, short circuit to power supply</td></tr>
<tr><td>P2135</td><td>Throttle position sensor 1 and throttle position sensor 2 signals different, greater than the specified.</td></tr>
</table>

3. Diagnosis procedure

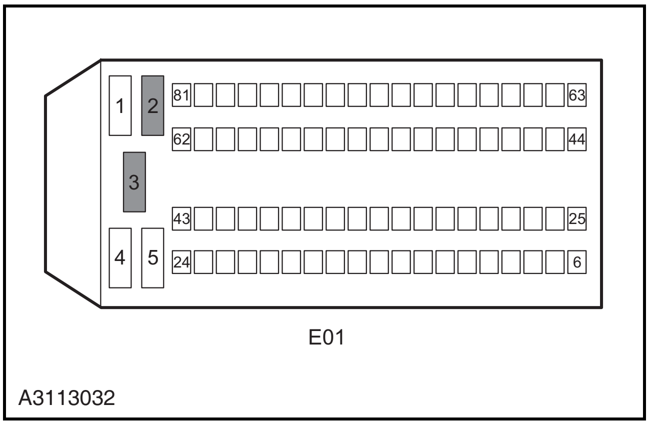
<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">1. General inspection</td></tr>
<tr><td></td><td>A. Inspect sensor wiring harness connector for loose signs.
B.Inspect sensor appearance for damage.
Is it normal?
Y
Go to step 2.
N
Repair the fault point.</td></tr>
<tr><td colspan="2">2. Inspect throttle position sensor voltage</td></tr>
<tr><td></td><td>A. Turn the ignition switch to position "ON".
B. Measure the voltage value at terminal 2 of throttle position sensor wiring harness connector E21 from the back, it should be a continuously changing analog signal.
Standard Voltage:
Do not depress the accelerator pedal 0.74 V
Step on the accelerator pedal in the end 4.62 V
Is the voltage value normal?
Y
Go to step 3.
N
Replace the throttle position sensor.</td></tr>
</table>

Test Conditions	Details/Results/Actions
3. Inspect throttle position sensor power supply circuit	
A3113068	A.Turn the ignition switch to position "LOCK". B.Disconnect the throttle position sensor wiring harness connector E21. C.The ignition switch is set to position "ON". D.Measure the voltage value between the terminal 4 of throttle position sensor wiring harness connector E21 and reliable ground. **Standard Voltage Value: 4.5~5.5 V** Is the voltage value normal？ **Y** Go to step 4. **N** Repair the fault circuit between terminal 3 of throttle position sensor wiring harness connector E24 and terminal 108 of ECM wiring harness connector E01.
4. Inspect throttle position sensor signal circuit	
A3113069	A.Turn the ignition switch to position "LOCK". B.Disconnect the throttle position sensor wiring harness connector E21. C. Turn the ignition switch to position "ON". D. Connect a jumper wire with a 5A fuse between terminals 2 and 4 of E21, use diagnosis tool to observe the "actual throttle position sensor voltage" parameter. **Standard Voltage Value: 4.5~5.5 V** Is the voltage normal？ **Y** Go to step 5. **N** Repair the fault circuit between terminal 6 of throttle position sensor wiring harness connector E24 and terminal 54 of ECM wiring harness connector E01.

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">5. Inspect throttle position sensor ground</td></tr>
<tr><td>


</td><td>
A.Turn the ignition switch to position "LOCK".
B.Disconnect the throttle position sensor wiring harness connector E21 and measure the resistance between terminal 1 of the throttle position sensor wiring harness connector E21 and reliable ground.
Standard Resistance Value: 10 MΩ or higher
C.The ignition switch is set to position "ON".
D. Measure the resistance between the terminal 1 of throttle position sensor wiring harness connector E21 and the reliable ground.
Standard Resistance Value: less than 5Ω
Is the resistance value normal?
Y
Go to step 6.
N
Repair the fault circuit between terminal 2 of throttle position sensor wiring harness connector E24 and terminal 78 of ECM wiring harness connector E01.
</td></tr>
<tr><td colspan="2">6. Inspect ECM power supply circuit</td></tr>
<tr><td>


</td><td>
A.Turn the ignition switch to position "LOCK".
B.Measure from the back of ECM wiring harness connector E01.
C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply.
Standard Voltage Value: 11~14 V
Is the voltage normal?
Y
Go to step 7.
N
Repair and inspect the ECM power supply circuit.
</td></tr>
</table>

Test Conditions	Details/Results/Actions
7. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0222, P0223, P2135

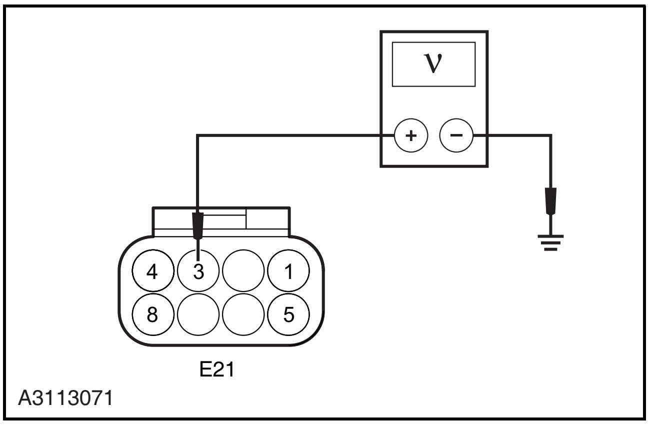
1. Fault code description

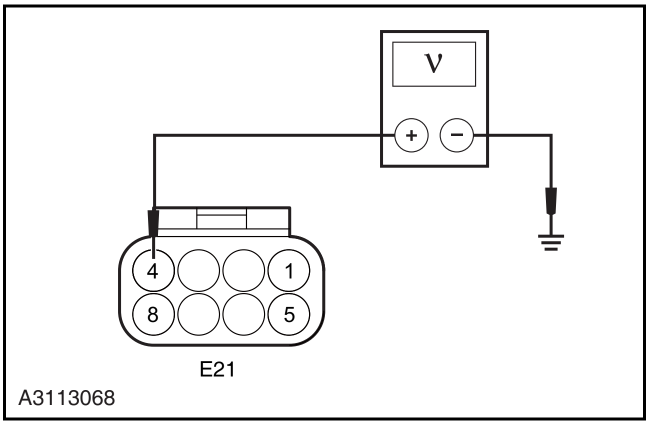
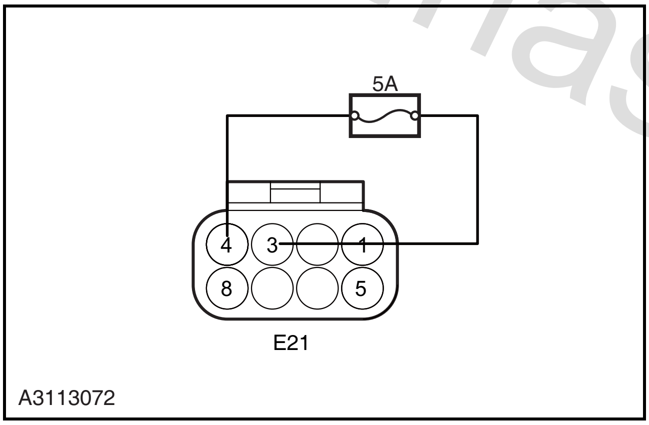
Fault code	Description	Definition
P0222	Electronic throttle position sensor 2 circuit low voltage	• ECM provides 5V reference voltage to terminal 4 of TPS sensor wiring harness connector E21 through terminal 70 of wiring harness connector E01. •TPS provides sensor signal voltage to terminal 27 of ECM wiring harness connector E01 through terminal 3 of E21. ECM positions terminal 1 of TPS sensor wiring harness connector E24 at low electrical potential through terminal 74 of wiring harness connector E01.
P0223	Electronic throttle position sensor 2 circuit high voltage	
P2135	Electronic throttle position sensor 1 & 2 circuits correlation fault	

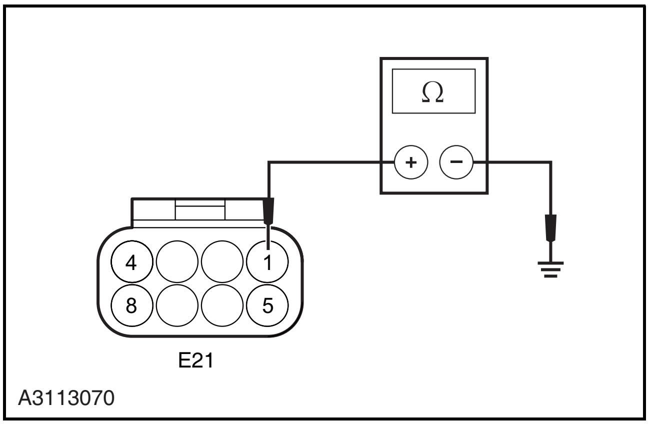
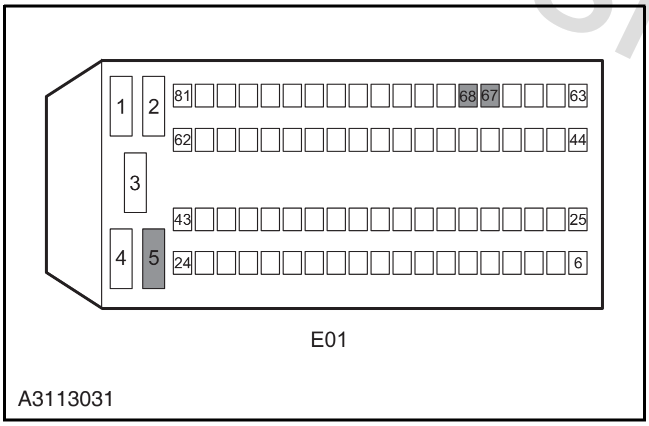
2. Possible Sources

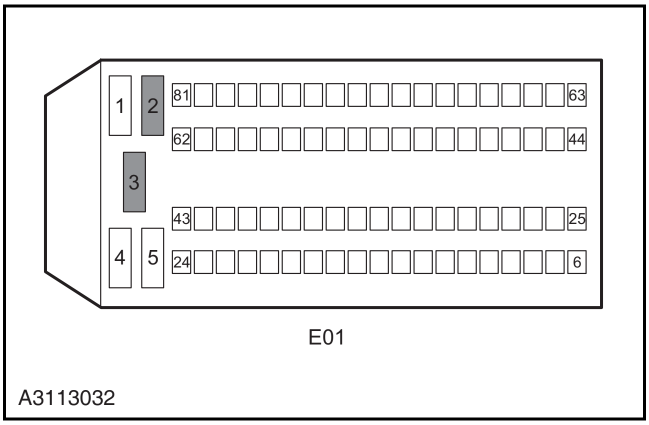
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0222	Signal circuit voltage too low, short circuit to ground	Turn ignition switch to position "ON", and engine is off or is running.	•Sensor circuit fault •Sensor fault • ECM fault
P0223	Signal circuit voltage too high, short circuit to power supply		
P2135	Throttle position sensor 2 and throttle position sensor 1 signals different, greater than the specified value		

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A. Inspect sensor wiring harness connector for loose signs. B.Inspect sensor appearance for damage. Is it normal? **Y** Go to step 2. **N** Repair the fault point.
2. Inspect throttle position sensor voltage	
	A. Turn the ignition switch to position "ON". B. Measure the voltage value at terminal 3 of throttle position sensor wiring harness connector E21 from the back, it should be a continuously changing analog signal. **Standard Voltage:** **Do not depress the accelerator pedal 4.24 V** **Step on the accelerator pedal in the end 0.72 V** Is the voltage value normal? **Y** Go to step 3. **N** Replace the throttle position sensor.

Test Conditions	Details/Results/Actions
3. Inspect throttle position sensor power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the throttle position sensor wiring harness connector E21. C.The ignition switch is set to position "ON". D.Measure the voltage between the terminal 4 of throttle position sensor wiring harness connector E21 and reliable ground. **Standard Voltage Value: 4.5~5.5 V** E. Connect throttle position sensor wiring harness connector E21. Is the voltage value normal? **Y** Go to step 4. **N** Repair the fault circuit between terminal 4 of throttle position sensor wiring harness connector E21 and terminal 70 of ECM wiring harness E01.
4. Inspect throttle position sensor signal circuit	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the throttle position sensor wiring harness connector E21. C. Turn the ignition switch to position "ON". D. Connect a jumper wire with a 5A fuse between terminals 3 and 4 of E21, use a diagnosis tool to observe the "actual throttle position sensor voltage" parameter. **Standard Voltage Value: 4.5~5.5 V** E. Connect throttle position sensor wiring harness connector E21. Is the voltage normal? **Y** Go to step 5. **N** Repair the fault circuit between terminal 3 of throttle position sensor wiring harness connector E21 and terminal 27 of ECM wiring harness connector E01.

Test Conditions	Details/Results/Actions
5. Inspect throttle position sensor ground	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the throttle position sensor wiring harness connector E21 and measure the resistance between terminal 1 of the throttle position sensor wiring harness connector E21 and reliable ground. **Standard Resistance Value: 10 MΩ or higher** C.The ignition switch is set to position "ON". D. Measure the resistance between the terminal 1 of throttle position sensor wiring harness connector E21 and the reliable ground. **Standard Resistance Value: less than 5Ω** E. Connect throttle position sensor wiring harness connector E21. Is the resistance value normal? **Y** Go to step 6. **N** Repair the fault circuit between terminal 1 of throttle position sensor wiring harness connector E21 and terminal 74 of ECM wiring harness connector E01.
6. Inspect ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 7. **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
7. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0131, P0132, P0133, P0134, P1167, P1171

1. Fault code description

Fault code	Description	Definition
P0131	Pre-catalytic oxygen sensor short circuit to low voltage	After vehicle starts, the electronic control module work under open loop mode, which is to ignore the Pre-catalytic oxygen sensor signal voltage in the calculation of air-fuel ratio. ECM provides approximately 450 mV reference voltage for Pre-catalytic oxygen sensor. When the engine is running, the Pre-catalytic oxygen sensor start heating and start generating 0.1 ~ 0.9 V voltage. The voltage goes along the reference voltage fluctuations. Once the control module finds the Pre-catalytic oxygen sensor voltage exceeding the set threshold, then it will immediately goes into closed loop mode. ECM determines the air-fuel ratio based on the Pre-catalytic oxygen sensor voltage. If the Pre-catalytic oxygen sensor voltage is greater than 0.45 V, indicating that the mixture is too thick. If the Pre-catalytic oxygen sensor voltage is below 0.45 V, it means the mixture is too thin. ECM make the terminal 3 of the Pre-catalytic oxygen sensor plug E03 at low-potential through terminal 24 of wiring harness connector E01, when oxygen sensor get to normal operating temperature, it transmit oxygen sensor signal to the ECM through terminal 2 of plug E03 that connects to terminal 47 of plug E01 on the ECM.
P0132	Pre-catalytic oxygen sensor short circuit to high voltage	
P0133	Pre-catalytic oxygen sensor response too slow	
P0134	Pre-catalytic oxygen sensor open circuit	
P1167	Front oxygen rich in deceleration and fuel cutoff	
P1171	Front oxygen lean in acceleration and fuel richening	

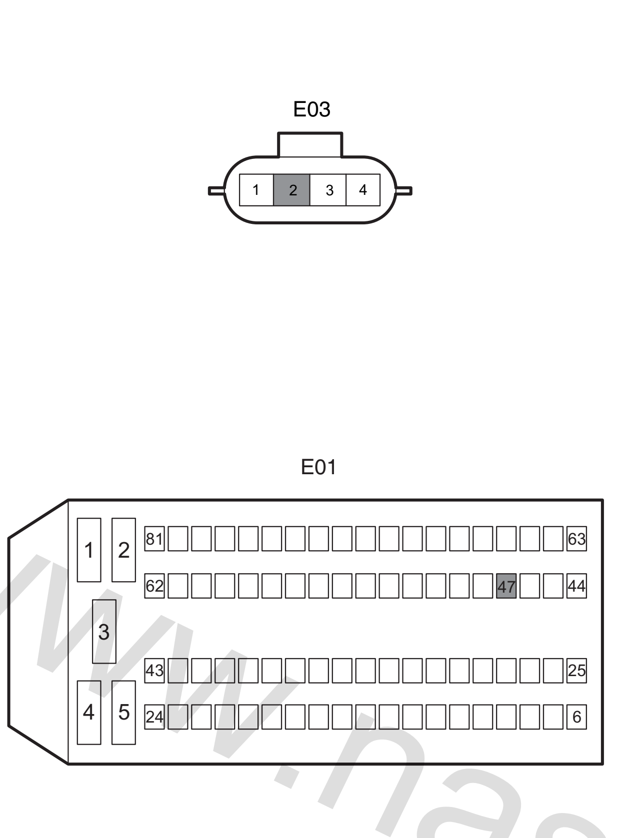
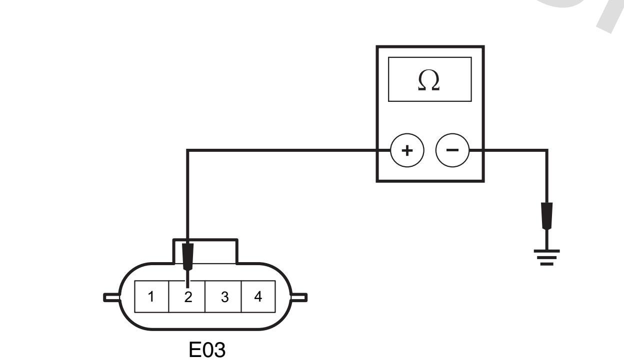
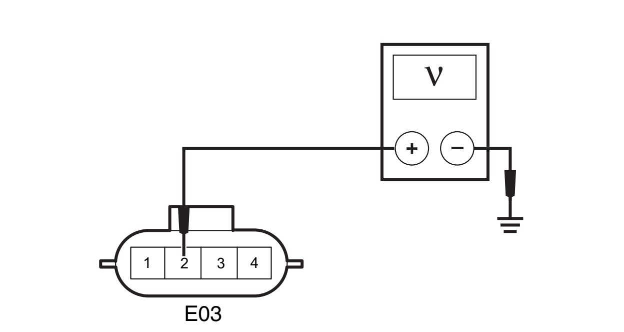
2. Possible Sources

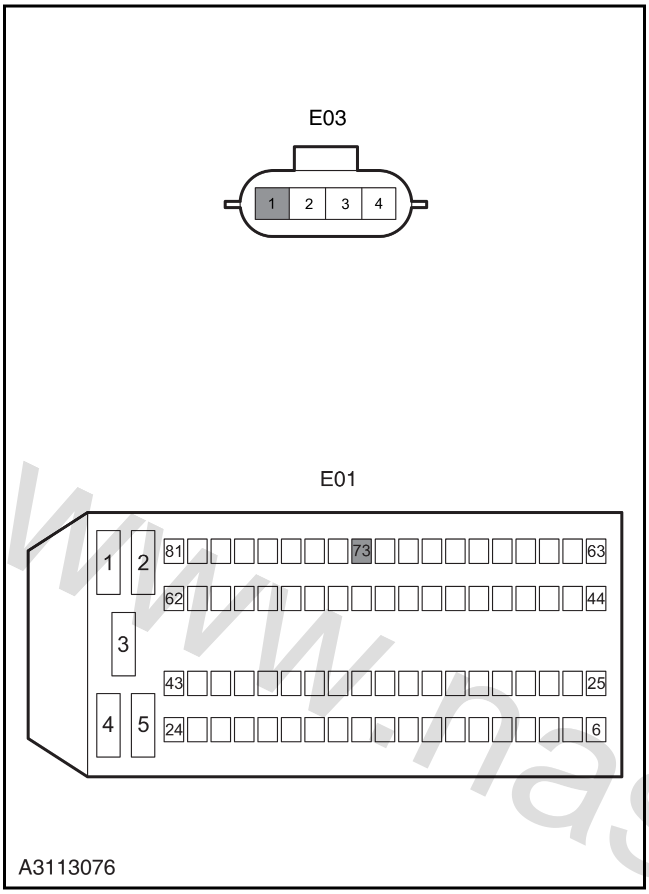
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0131	Signal short circuit to ground	•Pre-catalytic oxygen sensor output voltage is less than 0.06 V	•Sensor circuit fault •Sensor fault • ECM fault •Fuel pressure regulator •Fuel injector
P0132	Signal short circuit to power line	•Pre-catalytic oxygen sensor voltage is higher than 1.5V •Engine speed greater than 25RPM •Targetλ ＝ 1 •Exhaust temperature is lower than 850 ℃ •Oxygen sensor voltage reaches working temperature for 150s	
P0133	Front oxygen integral value exceeds the upper limit	• Pre-catalytic oxygen sensor is activated •Front oxygen integral value is higher than 1.0s	
	Front oxygen integral value exceeds the lower limit	•Rear oxygen control integral value is less than 1.0s • Catalyst converter is normal • No diagnosis stop condition •Diagnosis time 30s	
P0134	Signal open circuit	•Pre-catalytic oxygen sensor voltage range 0.40 ～ 0.60 V •Pre-catalytic oxygen sensor is always hot	
P1167	Front oxygen integral value exceeds the upper limit	• Pre-catalytic oxygen sensor is activated •Front oxygen integral value is higher than 1.0s	
	Front oxygen integral value exceeds the lower limit	•Rear oxygen control integral value is less than 1.0s • Catalyst converter is normal • No diagnosis stop condition •Diagnosis time 30s	
P1171	Front oxygen integral value exceeds the upper limit	• Pre-catalytic oxygen sensor is activated •Front oxygen integral value is higher than 1.0s	
	Front oxygen integral value exceeds the lower limit	•Rear oxygen control integral value is less than 1.0s • Catalyst converter is normal • No diagnosis stop condition •Diagnosis time 30s	

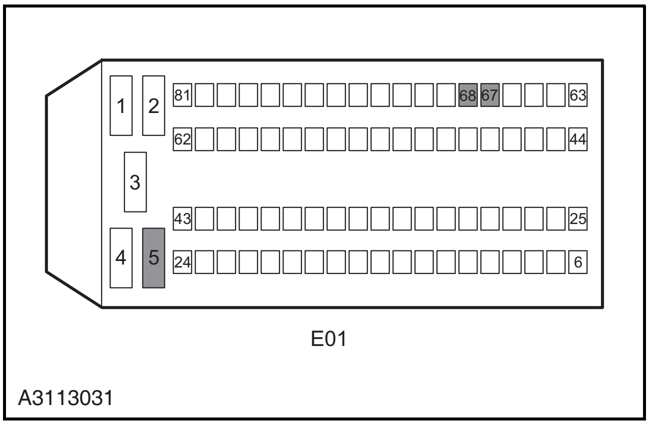
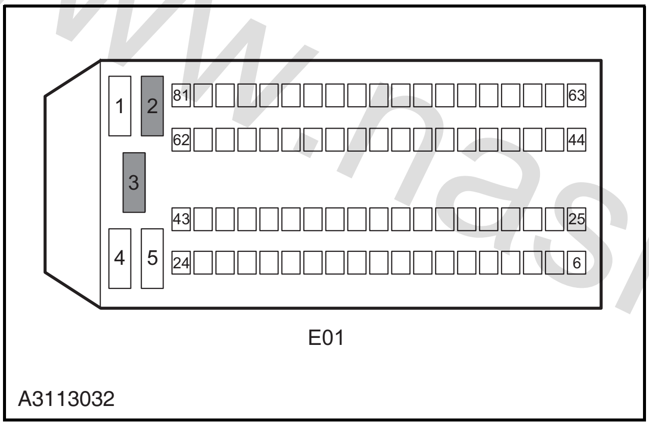
3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A. Turn the ignition switch to position "LOCK", connect the diagnosis tool. B. Start the engine, use diagnosis tool to inspect engine system. Is there any DTC besides P0131, P0132, P0133, P0134, P1167, P1171? **Y** **Refer to: DTC Diagnostic Procedure Index (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).** **N** Go to step 2.
2. Inspect the Pre-catalytic oxygen sensor data stream	
	A. Start the engine, keep the engine running till the engine water temperature is higher than 80 ℃ . B. Use diagnosis tool access to engine data stream, observe the "Pre-catalytic oxygen sensor voltage" parameter. **Standard Voltage Value: 0.1~0.9 V** Is it within the standard values? **Y** Intermittent fault. **Refer to: Intermittent Fault Inspection (3.1.13 Electronic Control System - MT22.1, Diagnosis and Test).** **N** Go to step 3.

Test Conditions	Details/Results/Actions
3. Inspect the Pre-catalytic oxygen sensor condition (carry out oxygen sensor signal test)	
	A. If the data stream shows voltage is consistently below 0.45 V (mixture too lean), inspect the following steps: •Jet proper amount of propane into the inlet port. •Observe if the Pre-catalytic oxygen sensor data stream voltage changes obviously, the signal voltage will rise quickly. B.If the data stream shows voltage is consistently above 0.45 V (mixture too dense), inspect the following steps: •Position the transmission at neutral gear. •Pull the hand brake. •Press the accelerator pedal until the engine speed suddenly increased to 4,000 rpm and then quickly release the accelerator pedal. •Repeat the previous step more than 3 times. •Observe if the Pre-catalytic oxygen sensor data stream voltage changes obviously, the signal voltage will drop quickly. •In the implementation of the above test, the oxygen sensor signal voltage should change significantly as the test continues. Whether the oxygen sensor signal voltage changes significantly? **Y** Inspect the reason that caused the engine air-fuel ratio is too thin / too dense. **N** Go to step 4.
4. Inspect the Pre-catalytic oxygen sensor signal circuit	

Test Conditions	Details/Results/Actions
 A3113073  A3113074  A3113075	A.Turn the ignition switch to position "LOCK". B.Disconnect the Pre-catalytic oxygen sensor wiring harness connector E03. C. Disconnect ECM wiring harness connector E01. D. Measure the resistance between the terminal 2 of Pre-catalytic oxygen sensor wiring harness connector E03 and the terminal 47 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** E. Measure the resistance between the terminal 2 of Pre-catalytic oxygen sensor wiring harness connector E03 and the reliable ground. **Standard Resistance Value: less than 5Ω** F. Measure the voltage between the terminal 2 of Pre-catalytic oxygen sensor wiring harness connector E03 and the reliable ground. **Standard Voltage Value: 0 V** Is it normal? **Y** Go to step 5. **N** Repair the circuit faults between the terminal 2 of Pre-catalytic oxygen sensor wiring harness connector E03 and the terminal 47 of ECM wiring harness connector E01.

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">5. Inspect the Pre-catalytic oxygen sensor ground circuit</td></tr>
<tr><td>
</td><td>A.Turn the ignition switch to position "LOCK".
B.Disconnect the Pre-catalytic oxygen sensor wiring harness connector E03.
C.Disconnect the engine control module wiring harness connector E01.
D. Measure the resistance between terminal 1 of Pre-catalytic oxygen sensor E03 and terminal 73 of engine control module wiring harness connector E01.
Standard Resistance Value: less than 5Ω
Is the resistance value normal?
Y
Go to step 6.
N
Repair the circuit between the terminal 1 of Pre-catalytic oxygen sensor wiring harness connector E03 and the terminal 73 of ECM wiring harness connector E01.</td></tr>
<tr><td colspan="2">6. Inspect the Pre-catalytic oxygen sensor</td></tr>
<tr><td></td><td>A. Exchange the Pre-catalytic oxygen sensor with the normal vehicle of the same model.
B. Use diagnosis tool access to engine data stream, observe the "Pre-catalytic oxygen sensor voltage" parameter.
Standard Voltage Value: 0.1~0.9 V
Is the fault eliminated？
Y
Replace the failed Pre-catalytic oxygen sensor.
N
Go to step 7.</td></tr>
</table>

Test Conditions	Details/Results/Actions
7. Inspect ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 8. **N** Repair and inspect the ECM power supply circuit.
8. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0137, P0138, P0140

1. Fault code description

<table>
<tr><th>Fault code</th><th>Description</th><th>Definition</th></tr>
<tr><td>P0137</td><td>Post-catalytic oxygen sensor short circuit to low voltage</td><td rowspan="3">After vehicle starts, the electronic control module works under open loop mode, which is to ignore the Post-catalytic oxygen sensor signal voltage in the calculation of air-fuel ratio. ECM provides approximately 450 mV reference voltage for Post-catalytic oxygen sensor. When the engine is running, the Post-catalytic oxygen sensor start heating and start generating 0.1 ~ 0.9 V voltage. The voltage goes along the reference voltage fluctuations. Once the control module finds the Post-catalytic oxygen sensor voltage exceeds the set threshold, then it will immediately goes into closed loop mode. ECM determines the air-fuel ratio based on the Post-catalytic oxygen sensor voltage. If the Post-catalytic oxygen sensor voltage is greater than 0.45 V, indicating that the mixture is too thick. If the Post-catalytic oxygen sensor voltage is below 0.45 V, it means the mixture is too thin.

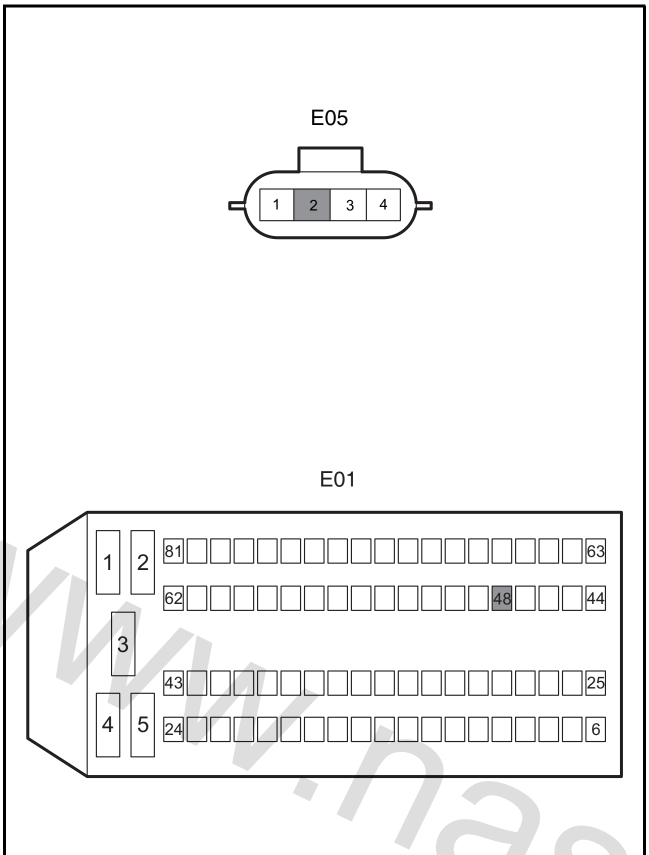
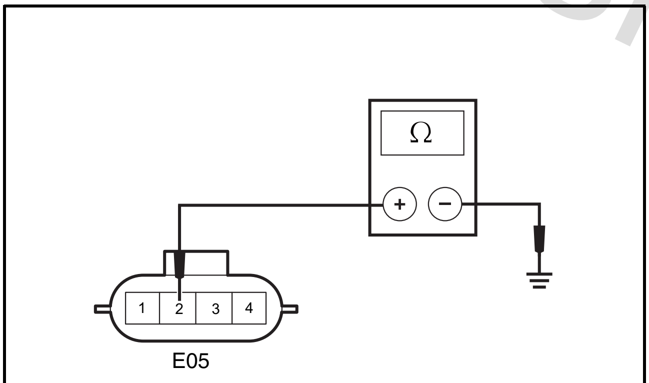
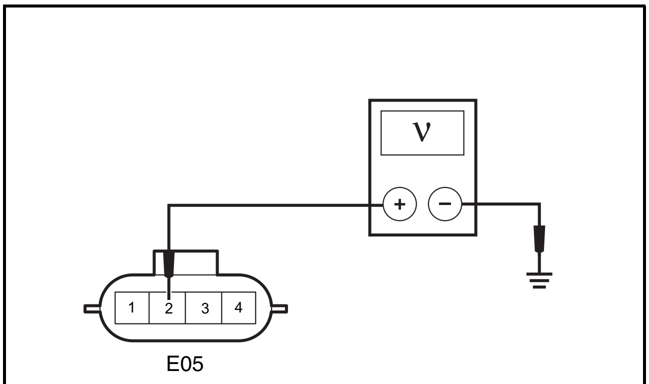
ECM make the terminal 3 of the Post-catalytic oxygen sensor wiring harness connector E05 at low-potential through terminal 23 of connector E01 , when Post-catalytic oxygen sensor get to normal operating temperature, it transmit oxygen sensor signal to the ECM through terminal 2 of connector E05 that connects to terminal 48 of connector E01 on the ECM.</td></tr>
<tr><td>P0138</td><td>Post-catalytic oxygen sensor short circuit to high voltage</td></tr>
<tr><td>P0140</td><td>Post-catalytic oxygen sensor open circuit</td></tr>
</table>

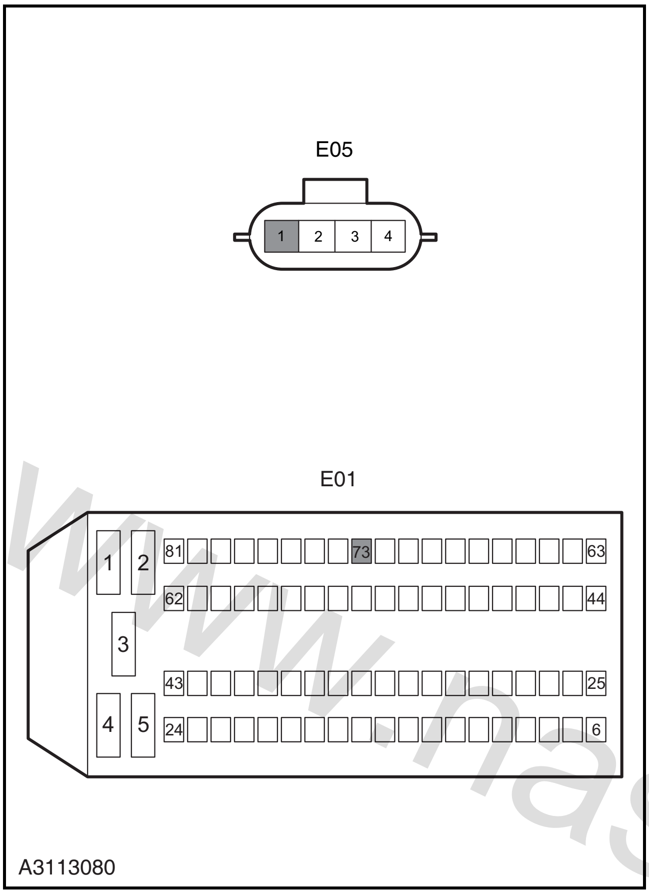
2. Possible Sources

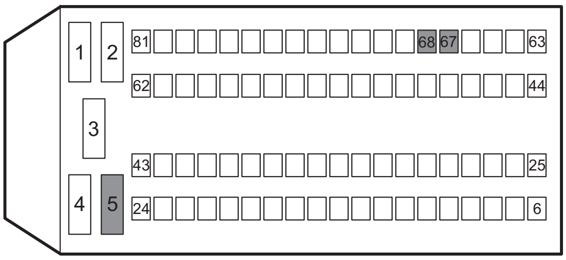
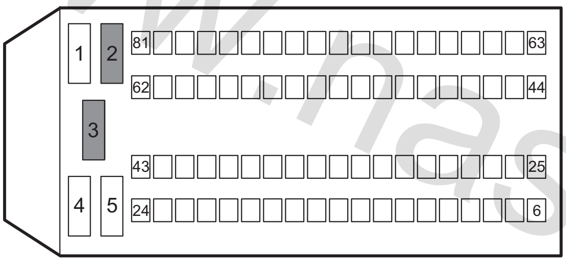
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0137	Post-catalytic oxygen sensor signal short circuit to ground	•Post-catalytic oxygen sensor output voltage is less than 0.06 V •Post-catalytic oxygen sensor voltage reaches working temperature	•Sensor circuit fault •Sensor fault • ECM fault
P0138	Post-catalytic oxygen sensor signal short circuit to high voltage	•Post-catalytic oxygen sensor voltage higher than 1.5 V •Engine speed greater than 25RPM •Target$\lambda = 1$ •Catalyst temperature is higher than 250 ℃ •Oxygen sensor voltage reaches working temperature •Battery voltage higher than 10.68 V	
P0140	Post-catalytic oxygen sensor signal open circuit	•Post-catalytic oxygen sensor voltage reaches working temperature •Post-catalytic oxygen sensor voltage range 0.4~0.5 V	

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A. Turn the ignition switch to position "LOCK", connect the diagnosis tool. B. Start the engine, use diagnosis tool to inspect engine system. Is there any DTC besides P0137, P0138 and P0140？ **Y** **Refer to: DTC Diagnostic Procedure Index (3.1.13 Electronic Control System -MT22.1, DTC Diagnosis and Testing).** **N** Go to step 2.
2. Inspect Post-catalytic oxygen sensor data stream	
	A. Start the engine, keep the engine running till the engine water temperature is higher than 80 ℃ . B. Use diagnosis tool access to engine data stream, observe the "Post-catalytic oxygen sensor voltage" parameter. **Standard Voltage Value: 0.1~0.9 V** Is it within the standard values? **Y** Intermittent fault. **Refer to: Intermittent Fault Inspection (3.1.13 Electronic Control System -MT22.1, Diagnosis and Test).** **N** Go to step 3.
3. Inspect Post-catalytic oxygen sensor signal circuit	

Test Conditions	Details/Results/Actions
 A3113037  A3113078  A3113079	A.Turn the ignition switch to position "LOCK". B.Disconnect the Post-catalytic oxygen sensor wiring harness connector E05. C. Disconnect ECM wiring harness connector E01. D. Measure the resistance between the terminal 2 of Post-catalytic oxygen sensor wiring harness connector E05 and the terminal 48 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** E. Measure the resistance between the terminal 2 of Post-catalytic oxygen sensor wiring harness connector E05 and the reliable ground. **Standard Resistance Value: 10 MΩ or higher** F. Measure the voltage between the terminal 2 of Post-catalytic oxygen sensor wiring harness connector E05 and the reliable ground. **Standard Voltage Value: 0 V** Is it normal？ **Y** Go to step 5. **N** Repair the circuit faults between the terminal 2 of Post-catalytic oxygen sensor wiring harness connector E05 and the terminal 48 of ECM wiring harness connector E01.

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">4. Inspect Post-catalytic oxygen sensor ground circuit</td></tr>
<tr><td></td><td>A.Turn the ignition switch to position "LOCK".
B.Disconnect the Post-catalytic oxygen sensor wiring harness connector E05.
C.Disconnect the engine control module wiring harness connector E01.
D. Measure the resistance between the terminal 1 of Post-catalytic oxygen sensor wiring harness connector E05 and the terminal 73 of ECM wiring harness connector E01.
Standard Resistance Value: less than 5Ω
Is the resistance value normal?
Y
Go to step 5.
N
Repair the circuit between the terminal 1 of Post-catalytic oxygen sensor wiring harness connector E05 and the terminal 73 terminal of ECM wiring harness connector E01.</td></tr>
<tr><td colspan="2">5. Inspect oxygen sensor</td></tr>
<tr><td></td><td>A. Exchange the oxygen sensor with the normal vehicle of the same model.
Is the fault eliminated？
Y
Replace the oxygen sensor on the failed vehicle.
N
Go to step 6.</td></tr>
</table>

Test Conditions	Details/Results/Actions
6. Inspect ECM power supply circuit	
 E01 A3113031	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 7. **N** Repair and inspect the ECM power supply circuit.
7. Inspect ECM ground circuit	
 E01 A3113032	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0171, P0172, P2187, P2188

1. Fault code description

<table>
<tr><th>Fault code</th><th>Description</th><th>Definition</th></tr>
<tr><td>P0171</td><td>Fuel system too lean in non-idle condition</td><td rowspan="4">Engine control module (ECM) controls closed loop air-fuel ratio measuring system, it controls the performance, fuel economy and emissions control to achieve the best cooperation. In closed loop mode, ECM monitors the voltage of the heating oxygen sensor (HO_2S) signal and regulate the fuel supply according to the signal voltage.

Changes in fuel supply will change the fuel adjustment value of long-term and short-term. The fuel short-term adjust value will respond to the change of heating oxygen sensor signal voltage and it will change rapidly. These changes will be fine-tuning the engine fuel supply. Long-term fuel regulating value is in response to the short-term trends change. Long-term fuel supply adjusts roughly, in order to back to the center fuel value of short-term, to recover the control to short-term adjust of the fuel regulator.

Ideal value of the fuel adjustment is about 0%. If the fuel adjustment value is positive, it says the engine control module is increasing fuel to compensate the condition of fuel mixture is too lean. Negative value of the fuel adjustment shows the engine control module is reducing the fuel to compensate the thick mixture.</td></tr>
<tr><td>P0172</td><td>Fuel system too rich in non-idle condition</td></tr>
<tr><td>P2187</td><td>Fuel system too lean in idle condition</td></tr>
<tr><td>P2188</td><td>Fuel system too rich in idle condition</td></tr>
</table>

2. Possible Sources

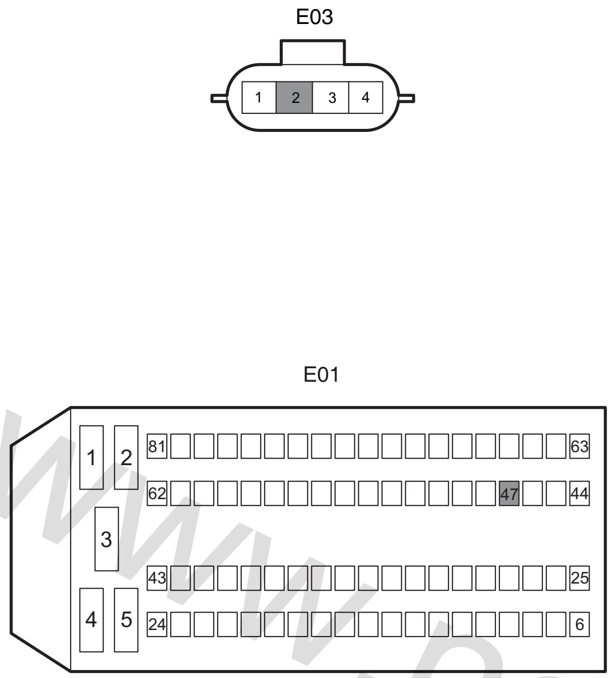
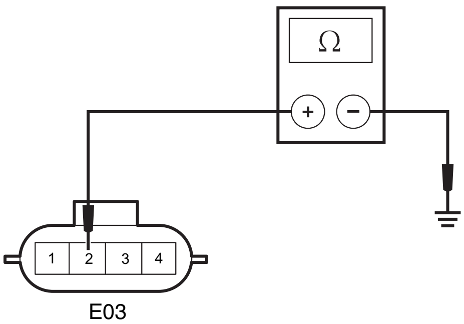
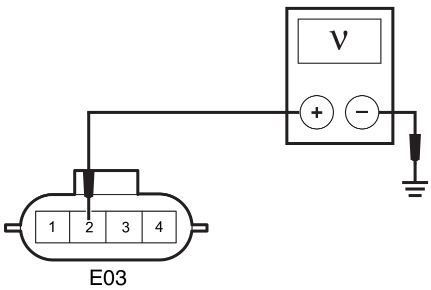
<table>
<tr><th>Fault code</th><th>Test Tactics</th><th>Setting conditions (control strategy)</th><th>Fault location</th></tr>
<tr><td>P0171</td><td rowspan="4">-</td><td rowspan="4">-</td><td rowspan="4">• MAP sensor work fault
•Oxygen sensor fault
• Oxygen sensor circuit fault
•Oxygen sensor heater work fault
• ECT sensor work fault
•Fuel system fault
•Ignition system performance fault
•Engine mechanical problems
•Engine control accessory fault
• ECM fault</td></tr>
<tr><td>P0172</td></tr>
<tr><td>P2187</td></tr>
<tr><td>P2188</td></tr>
</table>

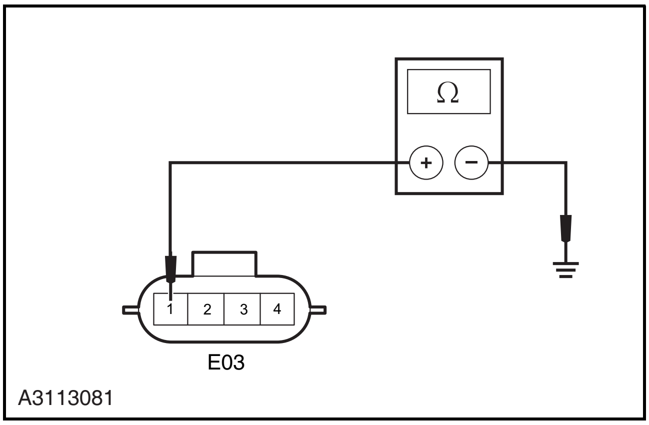
3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A. Inspect the oxygen sensor, intake pressure and temperature sensors, engine coolant temperature sensor wiring harness connector for damage, poor contact, aging, loosening or other signs. B.Inspect the vacuum tubes for the phenomena of damage, loose, or leakage. C.Inspect air intake system for leakage. D.Inspect for pollutants that may damage the oxygen sensor: polluting fuels, unqualified silicone, oil and coolant. E. Inspect engine PCV (crankcase forced ventilation) system for clogged. F.Inspect engine exhaust system for reduce expenditure or leakage. Is it normal? **Y** Go to step 2. **N** Repair the fault part.
2. Inspect DTC	
	A. Connect the Diagnosis tool B. Start the engine, inspect engine system. C. Inspect DTC. Is there any DTC other than DTC P0171, P0172, P2187 and P2188? **Y** Go to DTC diagnosis procedures. **Refer to: DTC Diagnostic Procedure Index (3.1.13 Electronic Control System -MT22.1， DTC Diagnosis and Testing).** **N** Go to step 3.

Test Conditions	Details/Results/Actions
3. Inspect data stream	
	A. Connect the diagnosis tool. B. Start engine, access to diagnosis tool engine system data stream. C. Inspect the fuel long-term, short-term modified value, long-term correction factor, additional correction factor data stream. Whether the fuel long-term, short-term modified value is in the normal range? **Y** Go to step 4. **N** **Refer to: Intermittent Fault Inspection (3.1.13 Electronic Control System - MT22.1, Diagnosis and Test).**
4. Inspect the Pre-catalytic oxygen sensor data stream	
	A. Start the engine, keep the engine running till the engine water temperature is higher than 80 ℃ . B. Use diagnosis tool access to engine data stream, observe the "Pre-catalytic oxygen sensor voltage" data stream. **Standard Voltage Value: oxygen sensor signal 0.1 ~ 0.9 V** C.Test complete, turn the ignition switch to position "LOCK". Is the oxygen sensor fluctuating between 0.1 ~ 0.9 V? **Y** Go to step 6. **N** Go to step 5.

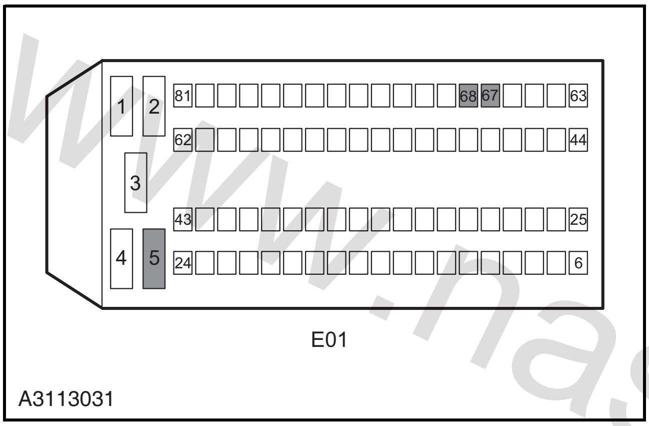
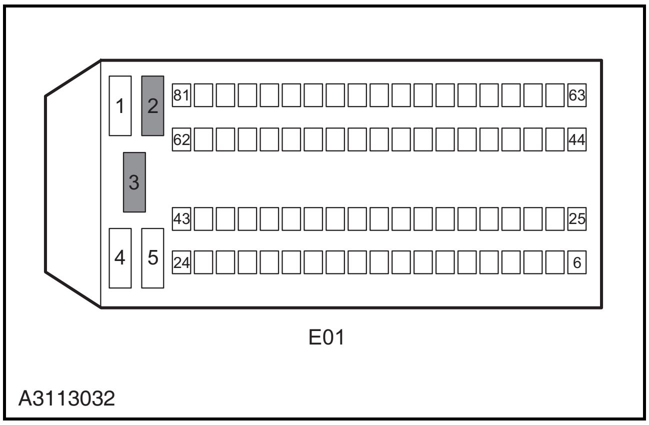
Test Conditions	Details/Results/Actions
5. Inspect the Pre-catalytic oxygen sensor condition (carry out oxygen sensor signal test)	
	A. If the data stream shows voltage is consistently below 0.45 V (mixture too lean), inspect the following steps: •Jet proper amount of propane into the inlet port. •Observe if the Pre-catalytic oxygen sensor data stream voltage changes obviously, the signal voltage will rise quickly. B. If the data stream shows voltage is consistently above 0.45 V (mixture too dense), inspect the following steps: •Position the transmission at neutral gear. •Pull the hand brake. •Press the accelerator pedal until the engine speed suddenly increased to 4,000 rpm and then quickly release the accelerator pedal. •Repeat the previous step more than 3 times. •Observe if the Pre-catalytic oxygen sensor data stream voltage changes obviously, the signal voltage will drop quickly. •In the implementation of the above test, the oxygen sensor signal voltage should change significantly as the test continues. Whether the oxygen sensor signal voltage change significantly? **Y** Go to step 6. **N** Replace the Pre-catalytic oxygen sensor.
6. Inspect the Pre-catalytic oxygen sensor signal circuit	

Test Conditions	Details/Results/Actions
 A3113073  A3113074  A3113075	A. Turn the ignition switch to position "LOCK". B.Disconnect the Pre-catalytic oxygen sensor wiring harness connector E03. C.Disconnect ECM wiring harness connector E01. D.Measure the resistance value between the terminal 2 of Pre-catalytic oxygen sensor wiring harness connector E03 and the terminal 47 of ECM wiring harness connector E01. Inspect for open circuit. **Standard Resistance Value: less than 5Ω** E.Measure the resistance value between the terminal 2 of Pre-catalytic oxygen sensor wiring harness connector E03 and reliable ground. Inspect for short circuit to ground. **Standard Resistance Value: 10 MΩ or higher** F. Measure the voltage value between the terminal 2 of Pre-catalytic oxygen sensor wiring harness connector E03 and reliable ground. Inspect for short circuit to power supply. **Standard Voltage Value: 0 V** Is it normal？ **Y** Go to step 7. **N** Repair the circuit faults between the terminal 2 of Pre-catalytic oxygen sensor wiring harness connector E03 and the terminal 47 of ECM wiring harness connector E01.

Test Conditions	Details/Results/Actions
7. Inspect the Pre-catalytic oxygen sensor ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the Pre-catalytic oxygen sensor wiring harness connector E03. C.The ignition switch is set to position "ON". D. Measure the resistance value between the terminal 1 of Pre-catalytic oxygen sensor wiring harness connector E03 and the reliable ground. **Standard Resistance Value: less than 5Ω** E. Connect Pre-catalytic oxygen sensor wiring harness connector E03. Is the resistance value normal? **Y** Go to step 8. **N** Repair the circuit between the terminal 1 of Pre-catalytic oxygen sensor wiring harness connector E03 and the terminal 73 of ECM wiring harness connector E01.
8. Inspect air intake pressure sensor MAP	
	A.Turn the ignition switch to position "LOCK". B. Connect a vacuum meter to the air intake manifold vacuum source. C. Turn the ignition switch to position "ON". D. Use diagnosis tool to read the "actual intake manifold pressure" data stream. Is the indication on the diagnosis tool of the vacuum meter in the 1 in (25 mm) range? **Y** Go to step 9. **N** Replace the air air intake pressure and temperature sensor, clean the throttle and the air intake manifold.

Test Conditions	Details/Results/Actions
9. Inspect engine water temperature sensor	
	CAUTION: To make the test valid, the thermostat should work normally. **CAUTION: It is preferred to carry out this test, when the engine under cold state (completely cold) .** A.Turn the ignition switch to position "ON". B.Use diagnosis tool to read the engine temperature (ECT) sensor. If the engine is allowed to be set all night (completely cold), the temperature should close to the ambient temperature. C. Start the engine. During the engine is warm-up, monitor the ECT sensor value. Changes in temperature should be a smooth transition from start to normal operating temperature 82°C(180°F), this value should at lest reaches 82°C(180°F). Is the water temperature sensor temperature inspect normal? **Y** Go to step 10. **N** Inspect cooling system or replace water temperature sensor.
10. Inspect the fuel pressure	
	A.Turn the ignition switch to position "LOCK". B. Connect the fuel pressure tester. **Refer to: Fuel System Pressure Test (3.1.7 Fuel System，General Procedures).** C. Turn the ignition switch to position "ON". D. Measure the fuel pressure. Is the fuel pressure normal? **Y** Go to step 11. **N** Inspect the fuel system. **Refer to: Diagnosis procedures for fuel pump not work (3.1.7 Fuel System, Symptom Diagnosis and Test)**

Test Conditions	Details/Results/Actions
11. Inspect fuel injector control circuit	
	A. Disconnect fuel injector wiring harness connector. B. Connect the test electrography with LED to the injector connector control terminal. C. Does LED flash at certain frequency? **Y** Go to step 12. **N** Inspect fuel injector wiring harness. Repair or replace if necessary.
12. Inspect the fuel injector	
	A.Remove the injector. B. Replace fuel injector in good condition. C. Remove DTC. D. Start engine, carry out road test when necessary. E. Diagnose the engine system. Any DTC P0171, P0172, P2187 and P2188 fault code? **Y** Go to step 13. **N** Replace the fuel injector.
13. Inspect the compressing pressure in the cylinder	
	A.Inspect engine compression pressure **Refer to: Cylinder compression Pressure Inspection (3.1.2 Mechanical System, General Procedures).** Is the compression pressure normal? **Y** Go to step 14. **N** Eliminate the low compression pressure fault.

Test Conditions	Details/Results/Actions
14. Inspect the ignition timing	
	A.Inspect the ignition timing. **Refer to: Timing Inspection (3.1.2 Mechanical System, General Procedures).** Is the ignition timing normal? **Y** Go to step 15. **N** Repair the ignition timing fault.
15. Inspect ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 16. **N** Repair and inspect the ECM power supply circuit.
16. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0261, P0262

1. Fault code description

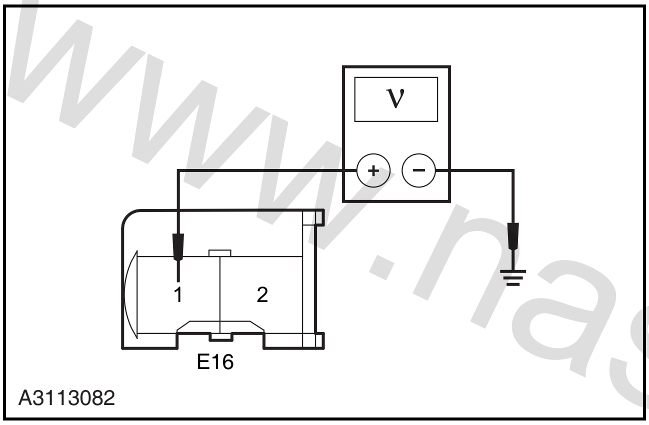
Fault code	Description	Definition
P0261	Cylinder 1 injector circuit low voltage fault	Injector operating voltage is controlled by the main relay that controlled by the ECM, battery voltage through terminal 29 of the engine compartment electric center C01 is transported to terminal 1 of all injector wiring harness connector. ECM controls the internal ground of injector 1 through terminal 6 on wiring harness connector E01. ECM monitors the working state of all the injectors driver circuit. If the ECM detects driving voltage not corresponding to the correct voltage, it will set up a fuel injector control circuit fault diagnosis DTC.
P0262	Cylinder 1 injector circuit high voltage fault	

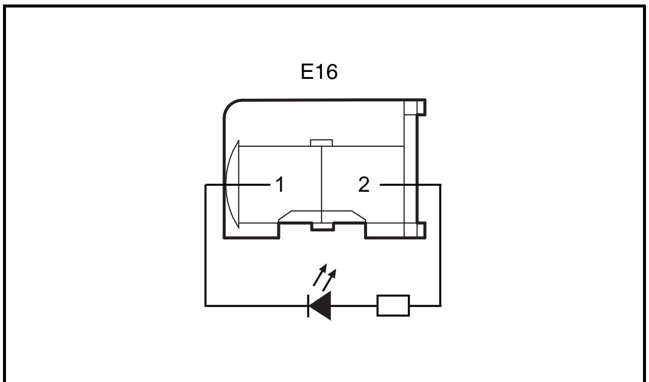
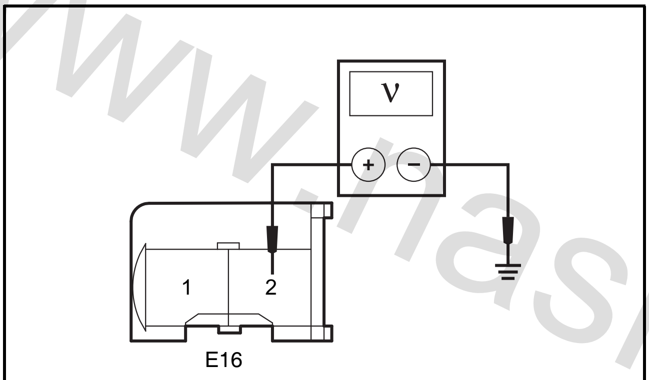
2. Possible Sources

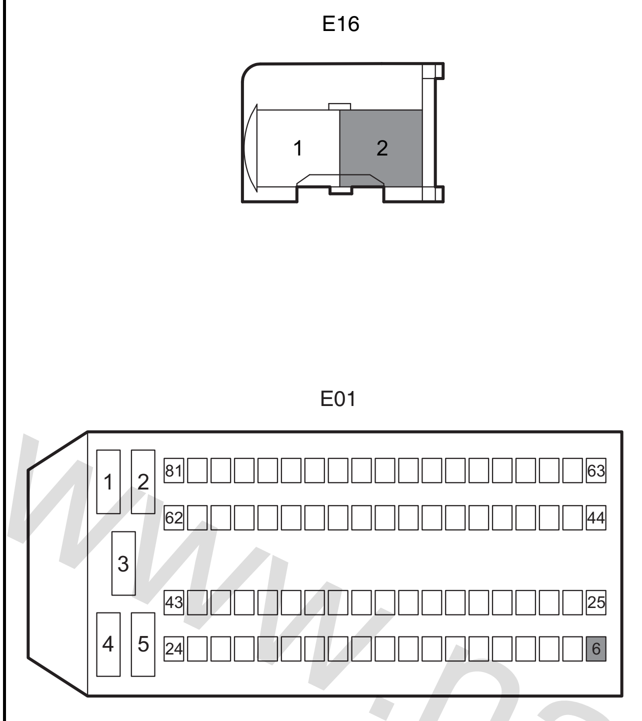
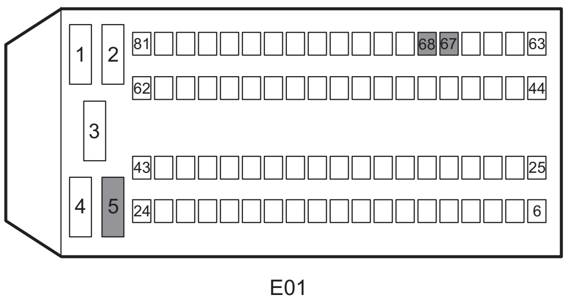
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0261	Hardware or circuit inspection	•Short circuit to ground •Short circuit to power	•Injector circuit fault •Fuel injector fault • ECM fault
P0262			

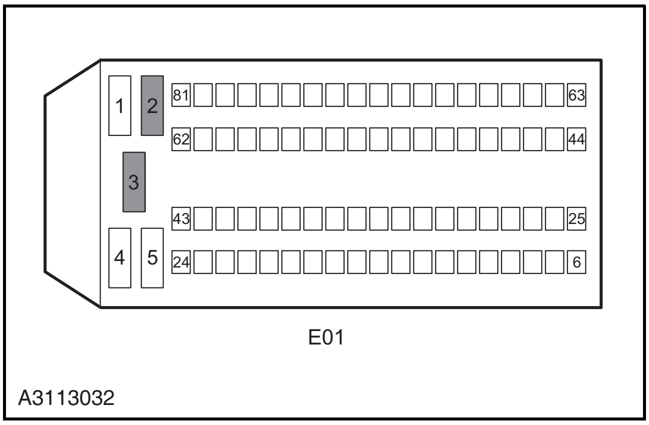
3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A. Inspect fuel injector wiring harness connector for damage, poor contact, aging and loose. Is it normal? **Y** Go to step 2. **N** Repair the fault point.
2. Inspect fuel injector nozzle	

Test Conditions	Details/Results/Actions
	A. Disconnect the fuel injector wiring harness connector E16. B. Measure the resistance value between the two terminals of the fuel injector. **Standard Resistance Value: 20 ℃ (68ºF) 11 ~ 16 Ω** Is the resistance value normal? **Y** Go to step 3. **N** Replace the fuel injector.
3. Inspect fuel injector working voltage	
	A.Turn the ignition switch to position "LOCK". B. Disconnect cylinder 1 injector wiring harness connector E16. C.The ignition switch is set to position "ON". D.Measure the voltage between terminal 1 of the cylinder 1 injector wiring harness connector E16 and the reliable ground. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 5. **N** Go to step 4.
4. Inspect fuel injector power supply circuit	
	A.Remove the fuse EF02 from engine compartment electric center. B.Inspect the fuse. Is the fuse normal? **Y** Repair the circuit continuity faults between terminal 1 on fuel injector wiring harness connector E16 and EF02 on engine compartment electric center C01. **N** Replace the fuse.

Test Conditions	Details/Results/Actions
5. Inspect fuel injector control signal	
 A3113083	A. Turn the ignition switch to position "LOCK". B.Disconnect cylinder 1 injector connector E16. C.Connect the test electrography with LED to the terminals 1 and 2 of E16 according to specification. D. Start the engine. E. Observe if the test lamp is normally flashing? Is the test lamp is flash normally？ **Y** Go to step 7. **N** Go to step 6.
6. Inspect fuel injector control signal circuit	
 A3113084	A. Turn the ignition switch to position "LOCK". B.Disconnect cylinder 1 injector wiring harness connector E16. C.Measure the voltage between terminal 2 of E16 and the reliable ground. **Standard Voltage Value: 0 V** D. Disconnect ECM wiring harness connector E01. E. Measure the resistance between terminal 2 of cylinder 1 fuel injector wiring harness connector E16 and terminal 6 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** Is it normal? **Y** Go to step 7. **N** Repair the circuit faults between the terminal 2 of E16 and the terminal 6 of ECM wiring harness connector E01.

Test Conditions	Details/Results/Actions
 A3113085	
7. Inspect ECM power supply circuit	
 A3113031	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 8. **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
8. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0300

1. Fault code description

Fault code	Description	Definition
P0300	Single/multiple cylinder misfire	ECM monitors the interval of CKP sensor input signal. ECM calculates the interval change for each cylinder. If the interval change exceeds the pre-programmed standard, then the ECM will detect the corresponding bad ignition cylinder. When the engine is running, ECM counts the ignition misfire frequency when the revolutions of the crankshaft is 200 rpm and 1,000 rpm, and calculates the misfire rate for crankshaft rotates one circle. If the misfire rate exceeds the pre-programmed standard, then the ECM will determine the occurrence of bad ignition that a catalytic converter can be damaged or can adversely affect emission performance.

2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0300	The misfire ratio that damages the catalyst	The misfire ratio that damage the catalyst is higher than 6%-23%. •Bad circuit test •Fuel cut-off •Torque interfere	•Connector connection loose, poor contact •Vacuum hose is broken, loose •Ignition system fault •Fuel system fault •Intake air pressure sensor fault •Engine water temperature sensor fault •Cylinder compression pressure fault •Valve clearance and timing fault •Evaporative emission control system •Crankshaft forced ventilation system •Air Intake system •Exhaust system air vent clog • ECM control wiring harness fault • ECM fault
	The misfire ratio that get the emission worse	•The misfire ratio that get the emission worse is bigger than 3.0 % •Engine speed is higher than 600rpm，less than 5800rpm • Engine load	
	Untrusted error	•The misfire ratio that get the emission worse is bigger than 3.0%. •Air intake temperature is higher than -25 ℃	

3. Diagnosis procedure

CAUTION: If the control system stores other DTC rather than misfiring DTC, first carry out troubleshooting for these DTC.

CAUTION: If misfire does not occur when sending to the service, carry out road test again to make the misfiring failure reappear. And use the diagnosis tool to record the ECM data when the misfiring occurs to analyze cause of the malfunction.

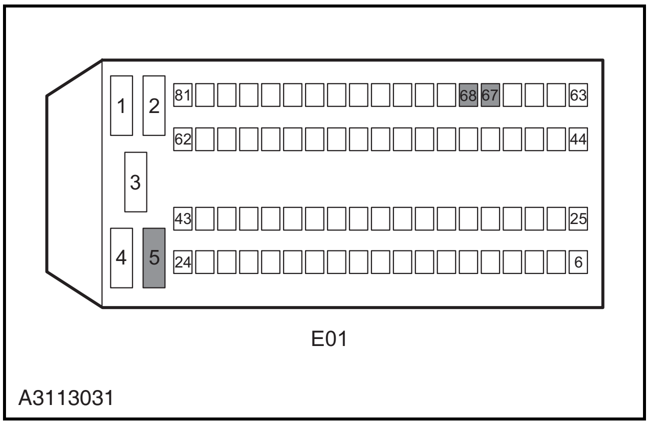
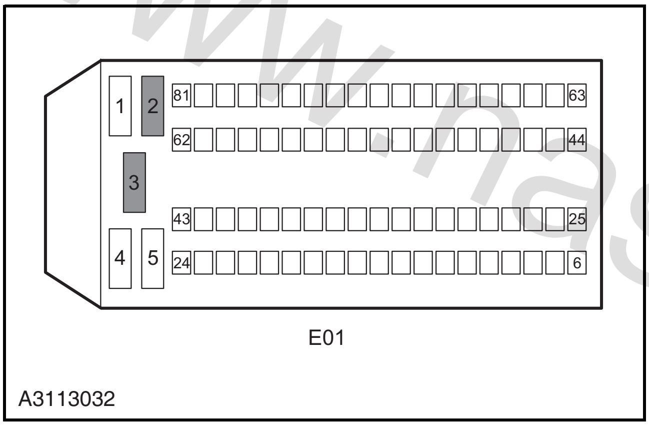
CAUTION: If the vehicle still stores no DTC that related to misfiring after long road test, then the failure may be caused by the following:

- Fuel tank is overfull, the fuel goes into the engine evaporative emissions electrical control system, causing the mixture too thick and misfire.
- Misfire caused by bad combustion of improper fuel.
- Misfire caused by ignition failure that resulted in by spark plug fouling.
- Carry out basic inspection to the system according to the DTC.
- After completion of the repairs, road test the vehicle to confirm that DTC is not stored.

Test Conditions	Details/Results/Actions
1. General inspection	
	A. Inspect the wiring harness connector for damage, poor contact, aging, loosening or other signs. B.Inspect the vacuum tubes for the phenomena of damage, loose, or leakage. C.Inspect air intake system for leakage. Is it normal? **Y** Go to step 2. **N** Repair the fault part.
2. Inspect DTC	
	A. Connect the diagnosis tool. B. Start the engine, inspect engine system. C.Inspect DTC Is there any other fault code except for P0300? **Y** Go to DTC diagnosis procedures. **Refer to: DTC Diagnostic Procedure Index (3.1.13 Electronic Control System -MT22.1， DTC Diagnosis and Testing).** **N** Go to step 3.

Test Conditions	Details/Results/Actions
3. Inspect data stream	
	A.Connect the diagnosis tool. B.Start engine, access to diagnosis tool engine system data stream. C.Inspect water temperature sensor ECT, air intake pressure sensor MAP, engine rotate speed, throttle position TPS data stream. Is the data stream normal? **Y** Repair the abnormal data stream. **N** Go to step 4.
4. Inspect the spark plug	
	A.Remove the spark plug on the misfire cylinder. B.Inspect the spark plug clearance to see it is too large or too small. **Standard clearance: 0.7 ~ 0.8mm (0.028 ~ 0.032 in)** C. Inspect spark plug electrode for erosion and damage. D. Inspect spark plug and the electrode skirt part for wet, and the existence of a serious gasoline smell. Is the spark plug normal? **Y** Go to step 5. **N** Replace or repair the spark plug.
5. Inspect the ignition coil	
	A.Remove the ignition coil. B.Inspect the ignition coil . **Refer to: Ignition Coil Inspection (3.1.8 Ignition System, General Procedures).** C. Install ignition coil. Is the ignition coil normal? **Y** Go to step 6. **N** Replace the ignition coil. **Refer to: Ignition Coil (3.1.8 Ignition System, Removal and Installation).**

Test Conditions	Details/Results/Actions
6. Inspect the ignition system	
	A.Turn the ignition switch to position "LOCK". B.Carry out the ignition spark test. **Refer to: Ignition Spark Test (3.1.8 Ignition System, General Procedures).** Is the spark plug ignition spark test normal? **Y** Go to step 7. **N** Inspect the ignition system. **Refer to: Diagnosis procedures for spark plugs does not flash over (3.1.8 Ignition System, Symptom Diagnosis and Testing).**
7. Inspect the fuel pressure	
	A. Turn the ignition switch to position "LOCK". B.Measure the fuel pressure. **Refer to: Fuel System Pressure Test (3.1.7 Fuel System, General Procedures).** Is the fuel pressure normal? **Y** Go to step 8. **N** Inspect the fuel system. **Refer to: Fuel Pump Malfunction Diagnosis Procedures (3.1.7 Fuel System, Symptom Diagnosis and Testing).**
8. Inspect the compression pressure	
	A.Inspect the engine compression pressure. **Refer to: Cylinder Compression Pressure Inspection (3.1.2 Mechanical System, General Procedures).** Is the compression pressure normal? **Y** Go to step 9. **N** Eliminate the low compression pressure fault.

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">9. Inspect the ECM power supply circuit</td></tr>
<tr><td></td><td>A.Turn the ignition switch to position "LOCK".
B.Measure from the back of ECM wiring harness connector E01.
C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply.
Standard Voltage Value: 11~14 V
Is the voltage normal？
Y
Go to step 10.
N
Repair and inspect the ECM power supply circuit.</td></tr>
<tr><td colspan="2">10. Inspect the ECM ground circuit</td></tr>
<tr><td></td><td>A.Turn the ignition switch to position "LOCK".
B.Measure from the back of ECM wiring harness connector E01.
C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter.
Standard Resistance Value: less than 5Ω
Is the resistance value normal?
Y
Replace the engine control module.
Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).
N
Inspect and repair the ECM ground circuit.</td></tr>
</table>

DTC P0335, P0336

1. Fault code description

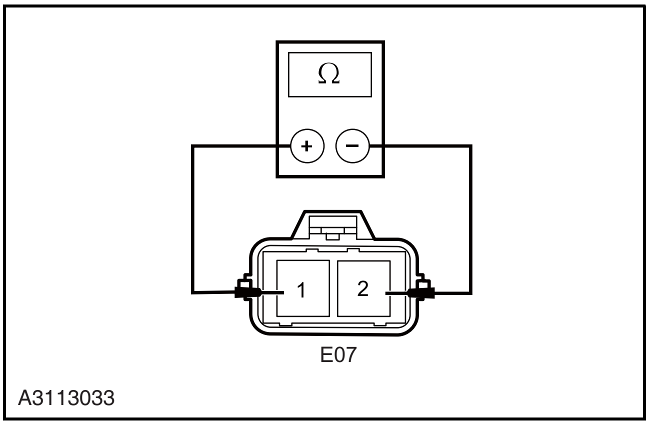
Fault code	Description	Definition
P0335	Crankshaft position sensor circuit no signal	Crankshaft upper dead center signal fault. CKP sensor signal tells ECM the speed and position of current crankshaft CKP sensor produces an alternating voltage with different amplitude and frequency. Frequency is decided by crankshaft speed and output alternating voltage is decided by CKP. CKP sensor cooperates with crankshaft's last retaining 58X variable reluctance rotor. ECM can calculate ignition timing, injection timing and knock ignition control according to input signal of CKP sensor and camshaft position sensor. CKP sensor is used for inspection of misfire and tachometer display. ECM transmits engine speed signal to instrument via CAN network. CKP sensor signal is connected to terminals 30, 11 of ECM wiring harness connector E01 respectively via terminals 1, 2 of CKP sensor wiring harness connector E07.
P0336	Crankshaft position sensor circuit signal interference	

2. Possible Sources

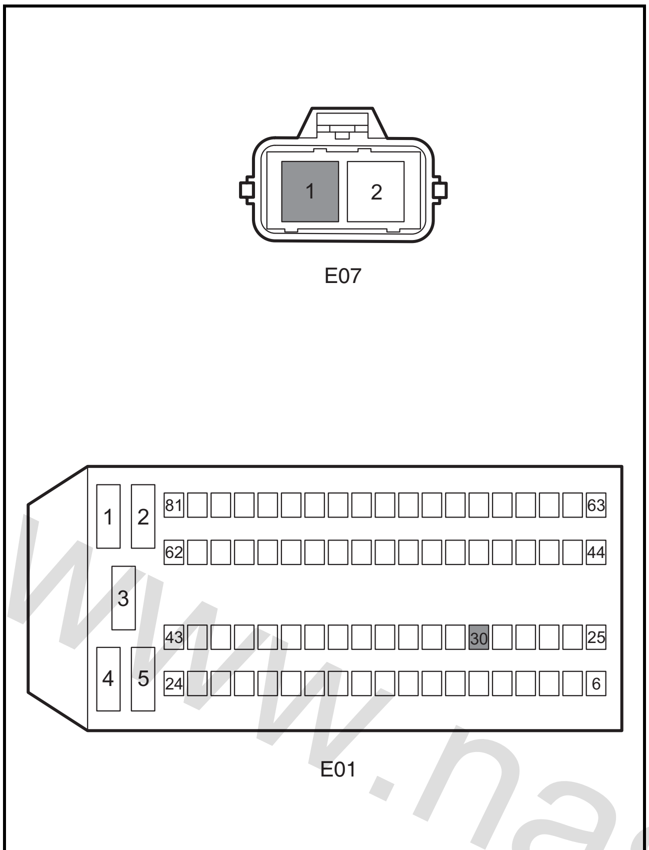
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0335	No crankshaft position signal is monitored after certain amount of camshaft position sensor signal	•Phase signal register value is higher than 18 •Relative low speed engine group speed	• Crankshaft position sensor fault •Crankshaft position sensor circuit fault • ECM fault
P0336	• Frequent correction to increase tooth •Frequent correction to decrease tooth •Speed sensor signal exist but the reference mark can not be found •Frequently lost reference mark	•Increase one tooth correction numeration time is bigger than 250 • Decrease one tooth correction numeration time is bigger than 250 •Unmonitored reference mis-tooth numeration time 4, more than 6 times. • The correction numeration time of the lost reference mis-tooth is more than 2000	

3. Diagnosis procedure

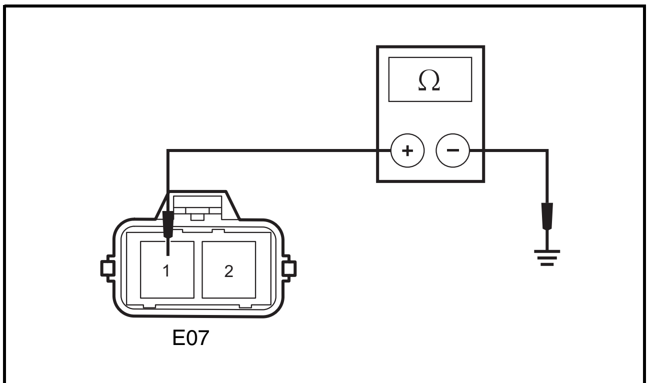
Test Conditions	Details/Results/Actions
1. General inspection	
	A. Inspect sensor wiring harness connector E07 for loose or poor contact. B.Inspect the sensor for proper installation. C. Inspect the sensor for normal clearance. Is it normal? **Y** Go to step 2. **N** Repair the fault point.
2. Read the engine data on the diagnosis tool (engine speed)	
	A. Connect the diagnosis tool. B. Turn the ignition switch to position "ON". C.Select "Changan Auto"/"C201"/"DELPHI MT22.1_V2.2(CAN)"/"Read Data Stream"/ "Diagnosis Data"/"Engine RPM". D. Start the engine. E. When the engine is running, read the engine speed data on the diagnosis tool. **Standard value: normal data. Refer to data stream list.** F. If the engine cannot start, inspect the data when the engine operates. G. If the engine speed on the diagnosis tool is "0", it means the wiring harness between crankshaft position sensor and ECM has open circuit or short circuit. Is the data stream normal? **Y** Intermittent fault. **Refer to: Intermittent Fault Inspection (3.1.13 Electronic Control System - MT22.1, Diagnosis and Test).** **N** Go to step 3.

Test Conditions	Details/Results/Actions
3. Inspect the crankshaft position sensor	
	A.Turn the ignition switch to position "LOCK". B. Disconnect the crankshaft position sensor wiring harness connector E07. C.Measure the resistance value of crankshaft position sensor. **Standard Resistance Value: 20 ℃ (68ºF), 900~1100 Ω** Is the resistance value normal? **Y** Go to step 4. **N** Replace the crankshaft position sensor. **Refer to: Crankshaft Position Sensor (3.1.13 Electronic Control System - MT22.1, Removal and Installation).**
4. Inspect crankshaft position sensor terminal 1 circuit	

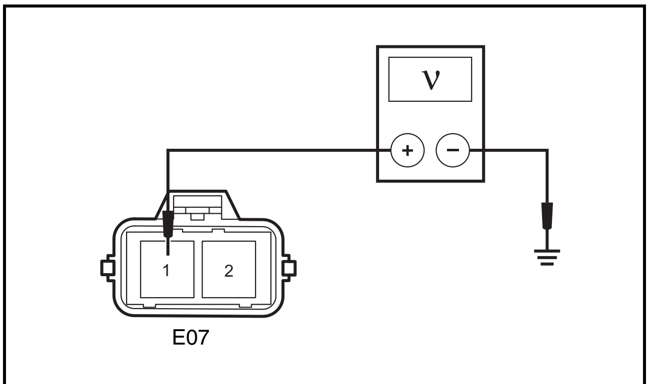
Test Conditions	Details/Results/Actions



A3113034



A3113035



A3113036

A.Turn the ignition switch to position "LOCK".

B.Disconnect the crankshaft position sensor wiring harness connector E07.

C. Disconnect ECM wiring harness connector E01.

D. Measure the resistance value between terminal 1 of crankshaft position sensor wiring harness connector E07 and terminal 30 of ECM wiring harness connector E01.

Standard Resistance Value: less than 5Ω

E.Measure the resistance between terminal 1 of crankshaft position sensor wiring harness connector E07 and reliable ground.

Standard Resistance Value: 10 MΩ or higher

F. Measure the voltage between terminal 1 of crankshaft position sensor wiring harness connector E07 and reliable ground.

Standard Voltage Value: 0 V

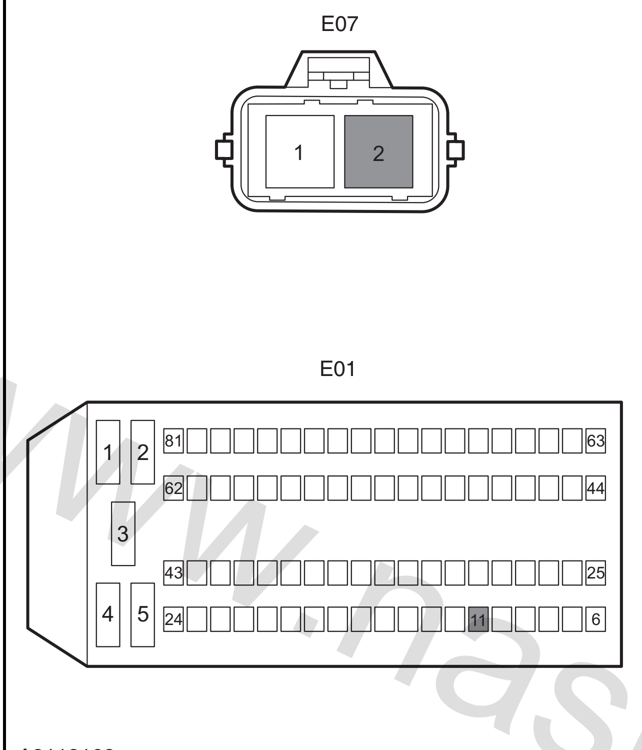
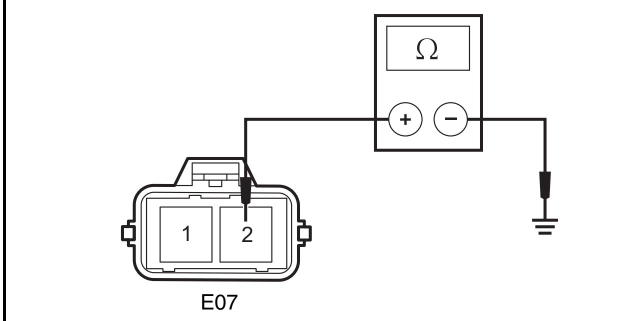
Is the circuit normal?

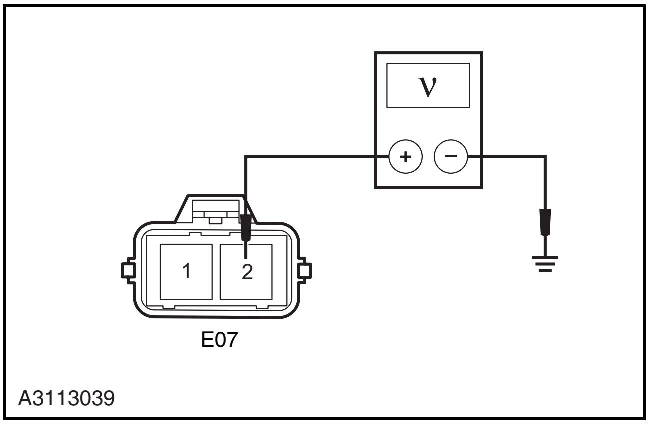
Y

Go to step 5.

N

Repair the fault circuit between the terminal 1 of crankshaft position sensor E07 and the terminal 30 of ECM wiring harness connector E01.

Test Conditions	Details/Results/Actions
5. Inspect crankshaft position sensor terminal 2 circuit	
 A3113163  A3113038	A.Turn the ignition switch to position "LOCK". B.Disconnect the crankshaft position sensor wiring harness connector E07. C. Disconnect ECM wiring harness connector E01. D. Measure the resistance value between terminal 2 of crankshaft position sensor wiring harness connector E07 and terminal 11 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** E. Measure the resistance between terminal 2 of crankshaft position sensor wiring harness connector E07 and reliable ground. **Standard Resistance Value: 10 MΩ or higher** F.Measure the voltage between terminal 2 of crankshaft position sensor wiring harness connector E07 and reliable ground. **Standard Voltage Value: 0 V** Is the circuit normal? **Y** Go to step 6. **N** Repair the fault circuit between the terminal 2 of crankshaft position sensor E07 and the terminal 11 of ECM wiring harness connector E01.

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td>
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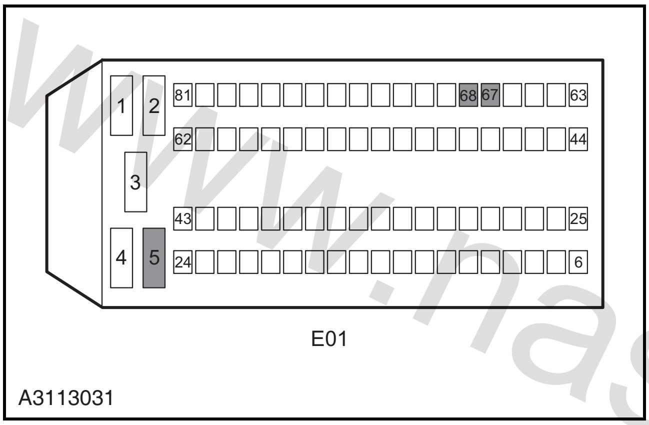
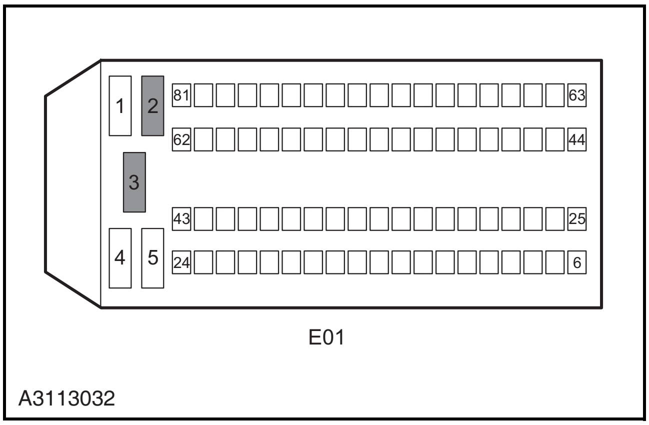
<tr><td colspan="2">6. Inspect ECM power supply circuit</td></tr>
<tr><td>
</td><td>A.Turn the ignition switch to position "LOCK".
B.Measure from the back of ECM wiring harness connector E01.
C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply.
Standard Voltage Value: 11~14 V
Is the voltage normal?
Y
Go to step 7.
N
Repair and inspect the ECM power supply circuit.</td></tr>
<tr><td colspan="2">7. Inspect ECM ground circuit</td></tr>
<tr><td>
</td><td>A.Turn the ignition switch to position "LOCK".
B.Measure from the back of ECM wiring harness connector E01.
C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter.
Standard Resistance Value: less than 5Ω
Is the resistance value normal?
Y
Replace the engine control module.
Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).
N
Inspect and repair the ECM ground circuit.</td></tr>
</table>

DTC P0324, P0325

1. Fault code description

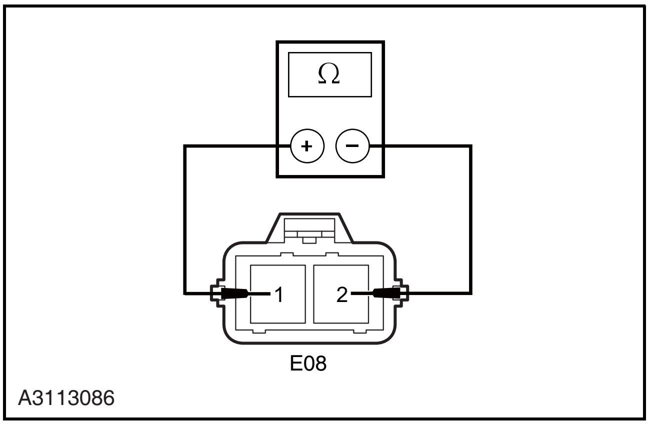
Fault code	Description	Definition
P0324	Knock control system fault	Knock sensor is located on the cylinder body that below the intake manifold. The AC signal voltage generated by the knock sensor changes as the vibration degree that occurred during the engine running. Engine control module adjusts the ignition timing based on the amplitude and frequency of the knock sensor signal. ECM receives the signal of terminals 1, 2 on knock sensor wiring harness connector E06 through terminals 19, 20 on wiring harness connector E01.
P0325	Knock sensor fault	

2. Possible Sources

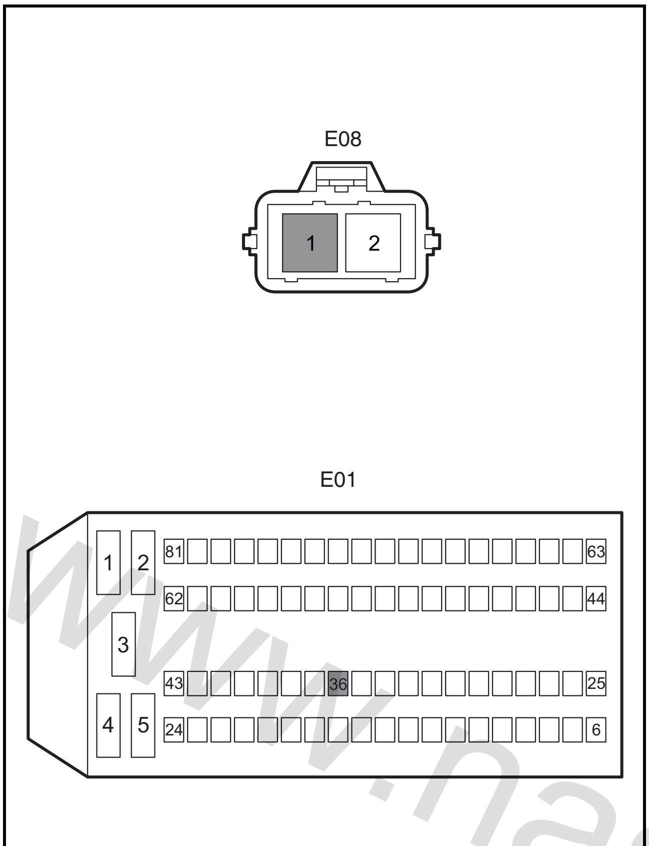
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0324	Zero test II	• Zero test integral slope is greater than 40-60mv/ms • 4 times in succession •Water temperature is higher than 40 ℃ •Engine speed is higher than 2500rpm，less than 5200rpm •Knock control is activated	•Knock sensor open circuit fault •Knock sensor fault •ECM fault
	Zero test I	•Knock control integral circuit integration value is higher than 0.234 V • 4 times in succession •Water temperature is higher than 40 ℃ •Knock control is activated	
	Test pulse	• When pulse test occurs, the control circuit integration value is less than 3.71V • 4 times in succession •Water temperature is higher than 40 ℃	
P0325	Signal range inspection	• Knock identification reference low voltage 0.097 V~2.05 V •Knock identification reference high voltage 9V~12V •25 times in succession	

3. Diagnosis procedure

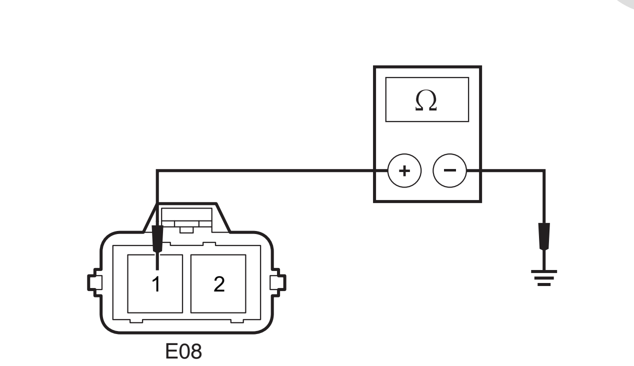
Test Conditions	Details/Results/Actions
1. General inspection	
	A. Inspect knock sensor for physical damage. B. Inspect knock sensor to see if the installation is proper, the torque is too tight or too loose will all lead to the set of fault diagnosis code. C. Inspect the installation surface of knock sensor for burr, overlab or foreign body. D. Knock sensor must be far away from hose, bracket and engine circuit. Is it normal? **Y** Go to step 2. **N** Repair the fault point.
2. Inspect data stream	
	A.Connect the diagnosis tool. B. Turn the ignition switch to position "ON". C. Start the engine, let the engine running to the normal working temperature. D. Select "engine"/"read data stream"/"knock sensor signal 1, knock sensor signal 2, ignition advance angle, engine speed". E. Road test to read the data stream that display on the diagnosis apparatus. Is the data stream normal? **Y** **Refer to: Intermittent Fault Diagnosis procedure (3.1.13 Electronic Control System -MT22.1, Symptom Diagnosis and Testing).** **N** Go to step 3.

Test Conditions	Details/Results/Actions
3. Inspect knock sensor	
	A.Turn the ignition switch to position "LOCK". B. Disconnect the knock sensor wiring harness connector E08. C. Measure resistance value of knock sensor. **Standard Voltage Value: 25 ℃ (77ºF) higher than 1MΩ** D. Connect knock sensor wiring harness connector E08. Is the resistance value normal? **Y** Go to step 4. **N** Replace the knock sensor. **Refer to: Knock Sensor (3.1.13 Electronic Control System - MT22.1, Removal and Installation).**
4. Inspect knock sensor terminal 1 circuit	

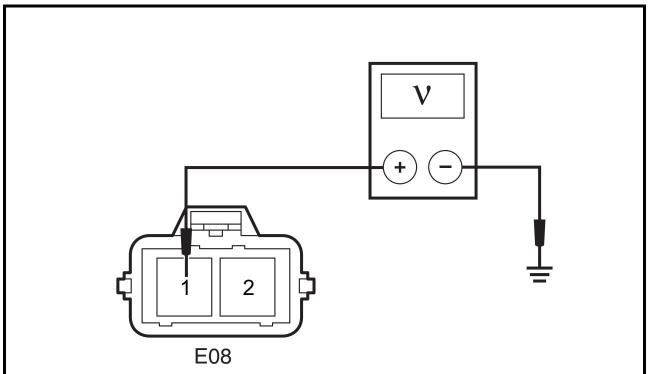
<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td>



A3113087



A3113088



A3113089

</td><td>

A. Turn the ignition switch to position "LOCK".

B. Disconnect the knock sensor wiring harness connector E08.

C. Disconnect ECM wiring harness connector E01.

D. Measure the resistance between the terminal 1 of knock sensor wiring harness connector E08 and the terminal 36 of ECM wiring harness connector E01.

Standard Resistance Value: less than 5Ω

E.Measure the resistance between terminal 1 of knock sensor wiring harness connector E08 and the reliable ground.

Standard Resistance Value: 10 MΩ or higher

F.Measure the voltage between the terminal 1 of knock sensor wiring harness connector E08 and the reliable ground.

Standard Voltage Value: 0 V

Is the circuit normal?

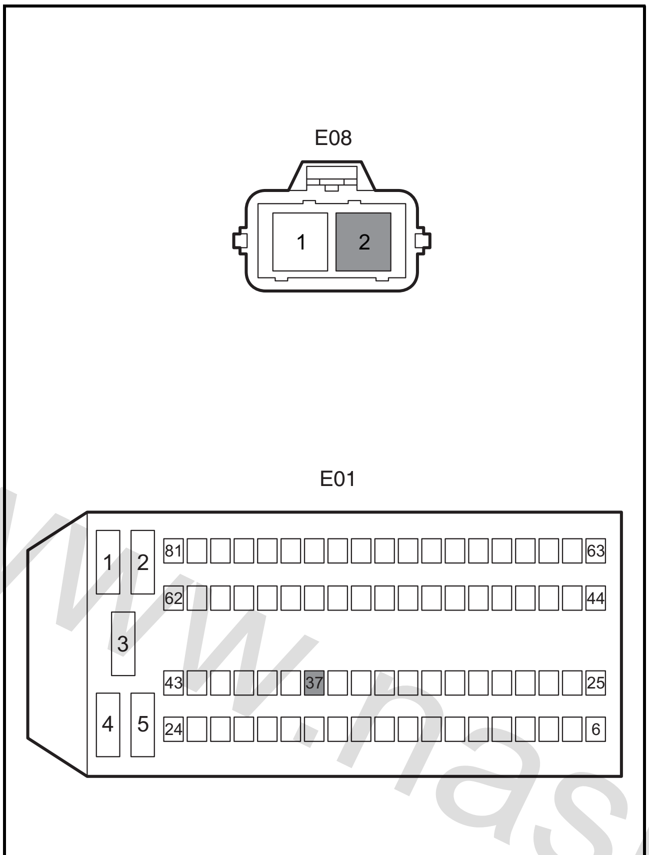
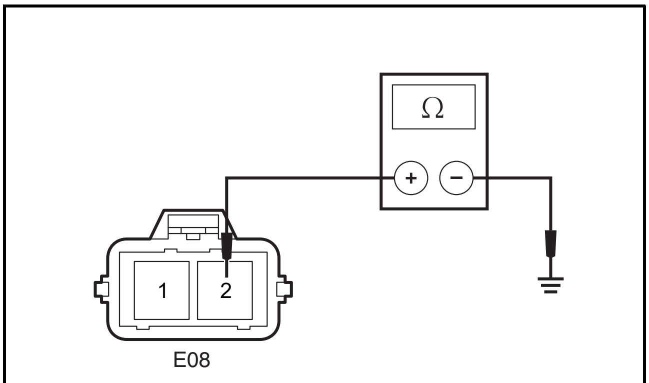
Y

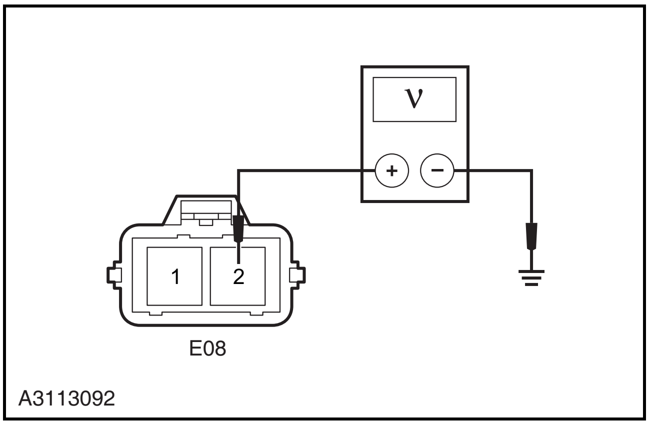
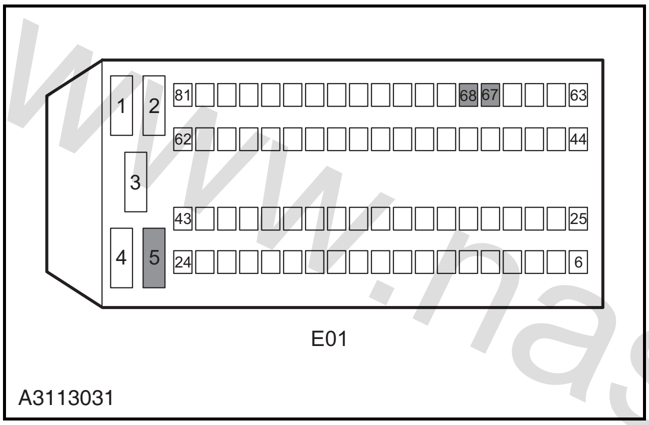
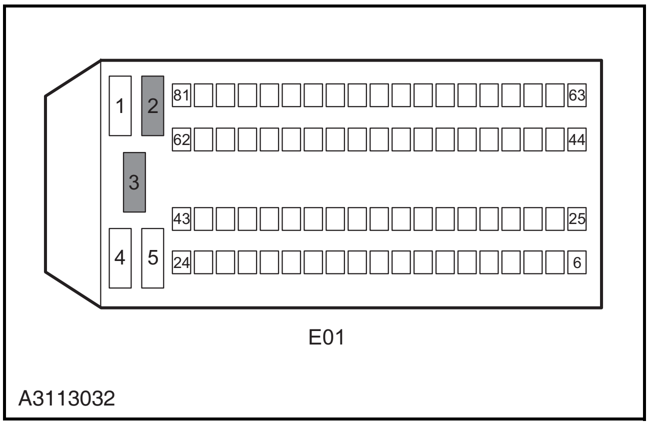
Go to step 5.

N

Repair the fault circuit between the terminal 1 of knock sensor wiring harness connector E08 and the terminal 36 of ECM wiring harness connector E01.

</td></tr>
</table>

Test Conditions	Details/Results/Actions
5. Inspect knock sensor terminal 2 circuit	
 A3113090  A3113091	A.Turn the ignition switch to position "LOCK". B. Disconnect the knock sensor wiring harness connector E08. C. Disconnect ECM wiring harness connector E01. D. Measure the resistance between the terminal 2 of knock sensor wiring harness connector E08 and the terminal 37 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** E.Measure the resistance between terminal 2 of knock sensor wiring harness connector E08 and the reliable ground. **Standard Resistance Value: 10 MΩ or higher** F.Measure the voltage between terminal 2 of knock sensor wiring harness connector E08 and the reliable ground. **Standard Voltage Value: 0 V** Is the circuit normal? **Y** Go to step 6. **N** Repair the fault circuit between the terminal 2 of wiring harness connector E08 and the terminal 37 of ECM wiring harness connector E01.

Test Conditions	Details/Results/Actions
	
6. Inspect ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 7. **N** Repair and inspect the ECM power supply circuit.
7. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0420

1. Fault code description

Fault code	Description	Definition
P0420	Catalytic converter efficiency low	

2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0420	Hardware and circuit inspection		•Oxygen sensor fault •Catalytic converter • ECM fault

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A.Inspect catalytic converter for following damage. •There is damage, dent or hole in catalytic converter. •As catalytic converter is too hot lead to serious discoloration. •There is fracture inside the catalytic converter. Catalytic converter is leaking. Is it normal? **Y** Go to step 2. **N** Replace catalytic converter.
2. Inspect the exhaust gas leakage.	
	A.Start the engine. B.Inspect if there is exhaust leakage between engine and Pre-catalytic oxygen sensor. C.Inspect if there is exhaust leakage between engine and Post-catalytic oxygen sensor. Is there any exhaust leakage? **Y** Repair the leakage fault. **N** Go to step 3.

Test Conditions	Details/Results/Actions
3. Inspect engine mechanical problem	
	A. Inspect if exhaust is with black smoke and too much blue smoke as the internal problems of the engine. Does the exhaust gas emit with too much black smoke and blue smoke？ **Y** Repair engine mechanical. **N** Go to step 4.
4. Inspect oxygen sensor aging (a new Post-catalytic oxygen sensor and a aged Pre-catalytic oxygen sensor work together may lead to the set of symptom code)	
	A. Inspect repair record to see if the oxygen sensor has been replaced. If the Post-catalytic oxygen sensor has been replaced while the Pre-catalytic oxygen sensor has not been replaced？ **Y** Replace Pre-catalytic oxygen sensor as needed. **N** Replace catalytic converter.

DTCP0458, P0459

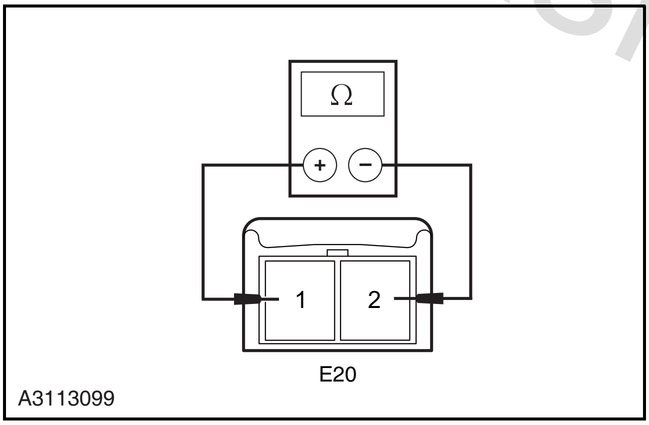
1. Fault code description

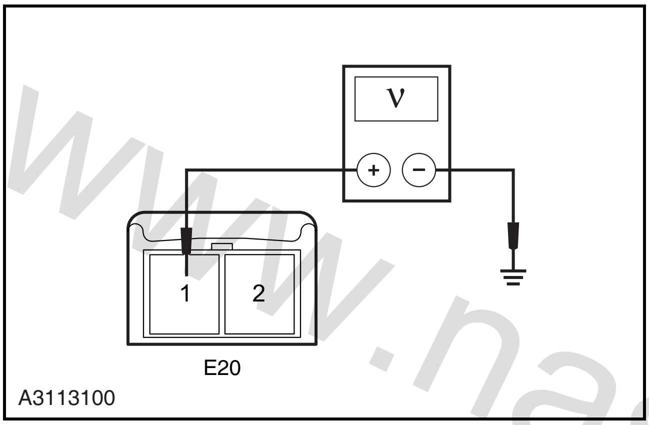
Fault code	Description	Definition
P0458	Carbon canister solenoid circuit short to low voltage or open circuit	Operating voltage of carbon canister control valve is controlled by the main relay controlled by the ECM, and battery voltage is transmitted to terminal 1 of carbon canister control valve wiring harness connector E20 through terminal 31 of engine compartment electric center wiring harness connector C01.
P0459	Carbon canister solenoid circuit short to high voltage	Control circuit: ECM controls the ground of terminal 2 of E20 through terminal 64 of ECM wiring harness connector E01.

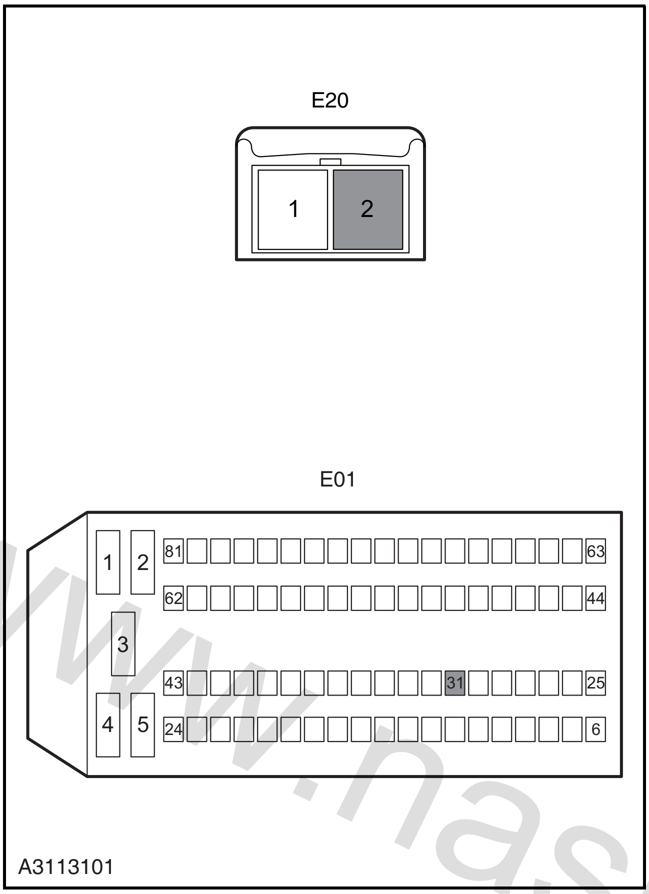
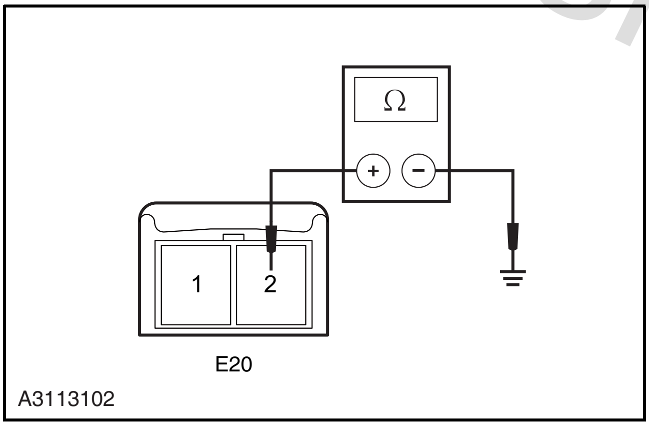
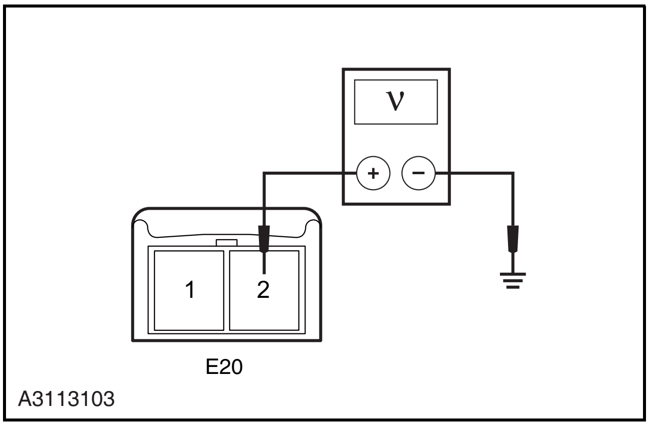
2. Possible Sources

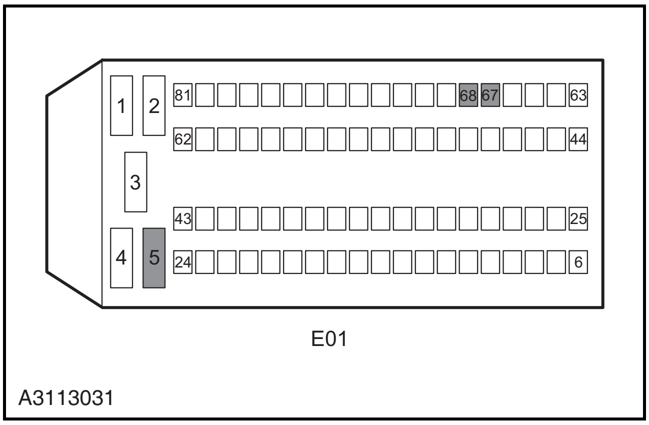
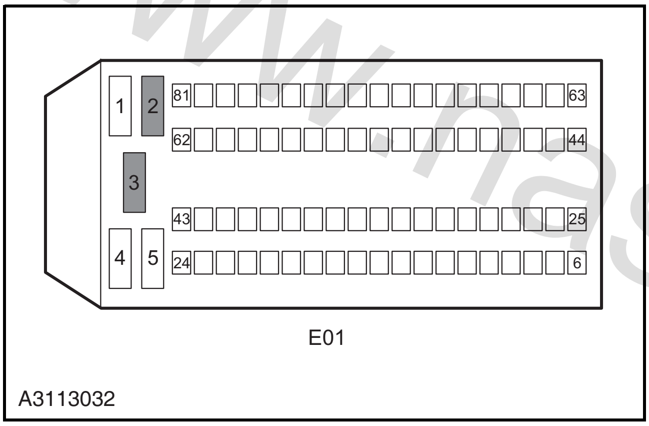
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0458		Open circuit Short circuit to ground Short circuit to power	•Solenoid valve •Solenoid valve circuit •ECM
P0459			

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. Use the diagnosis tool to carry out carbon canister solenoid valve active test	
	A.Connect the diagnosis tool to "fault diagnosis interface". B.Disconnect the vacuum pipe from carbon canister solenoid valve to active carbon canister. C.Start the engine, open the diagnosis tool. D.Enter the menu: "Changan Auto"/"C201"/"DELPHI MT22.1_V2.2(CAN)"/"Motion Test"/"Canister Control Valve". E.Use the the diagnosis tool to open "carbon canister control valve", cover the solenoid vacuum interface with your fingers. Is there vacuum suction？ **Y** **Refer to: Intermittent Fault Diagnosis procedure (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).** **N** Go to step 2.
2. Inspect carbon canister solenoid resistance value	
	A. Turn the ignition switch to position "LOCK". B. Disconnect the active carbon canister solenoid wiring harness connector E20. C. Measure the resistance between the two terminals of the active carbon canister solenoid. **Standard Resistance Value: 20 ℃ (68°F) 22 ~ 30 Ω** D. Connect the active carbon canister solenoid wiring harness connector E20. Is the resistance value normal? **Y** Go to step 3. **N** Replace the carbon canister solenoid.

Test Conditions	Details/Results/Actions
3. Inspect carbon canister solenoid power supply circuit	
	A.Turn the ignition switch to position "LOCK". B. Disconnect carbon canister solenoid wiring harness connector E20. C. Turn the ignition switch to position "ON". D. Measure the voltage between terminal 1 of active carbon canister solenoid wiring harness connector E20 and reliable ground. **Standard Voltage Value: 11~14 V** E. Connect carbon canister solenoid wiring harness connector E20. Is the voltage normal? **Y** Go to step 4. **N** Repair the circuit fault (include fuse EF03) between the terminal 1 of E20 and the terminal 31 of engine compartment wiring harness connector C01.
4.Inspect carbon canister solenoid control circuit	

Test Conditions	Details/Results/Actions
	A. Turn the ignition switch to position "LOCK". B. Disconnect the carbon canister solenoid wiring harness connector E20. C. Disconnect the engine control module wiring harness connector E01. D. Measure the resistance between terminal 2 of active carbon canister solenoid valve wiring harness connector E20 and terminal 31 of ECM wiring harness connector E01. Inspect for open circuit. **Standard Resistance Value: less than 5Ω** E. Measure the resistance between terminal 2 of carbon canister solenoid valve wiring harness connector E02 and reliable ground. Inspect for short circuit to ground. **Standard Resistance Value: 10 MΩ or more** F.Measure the voltage between terminal 2 of carbon canister solenoid valve wiring harness connector E20 and reliable ground. Inspect for short circuit to power supply. **Standard Voltage Value: 0 V** Is the circuit normal? **Y** Go to step 4. **N** Repair the fault circuit between the terminal 2 of carbon canister solenoid valve wiring harness connector E20 and the terminal 31 of ECM wiring harness connector E01.

Test Conditions	Details/Results/Actions
5. Inspect ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 6. **N** Repair and inspect the ECM power supply circuit.
6. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0480

1. Fault code description

Fault code	Description	Definition
P0480	Low speed fan fault	Cooling fan high and low-speed relay coil operating power is supplied by the main relay that controlled by ECM, ECM controls the work of relay through terminal 65 of ECM harness connector E01. There is a drive circuit control relay coil equipped within the ECM for ground. Drive circuit equips a feedback circuit for ECM, ECM determine the control circuit's open, ground short circuit or voltage short circuit through monitoring the feedback voltage.

2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0480	Hardware Circuit Inspection	Open circuit	•Circuit •Relay and fuse •Fan motor
		Short circuit to ground	
		Short circuit to power supply	

3. Diagnosis procedure

Refer to: Diagnosis procedures for electronic fan low speed does not run (3.1.4 Cooling System, Symptom Diagnosis and Testing).

DTC P0481

1. Fault code description

Fault code	Description	Definition
P0481	High speed fan fault	Cooling fan high and low-speed relay coil operating power is supplied by the main relay that controlled by ECM, ECM control the work of relay through terminal 17 of ECM harness connector E01. There is a drive circuit control relay coil equipped within the ECM for ground. Drive circuit equips a feedback circuit for ECM, ECM determine the control circuit's open, ground short circuit or voltage short circuit through monitoring the feedback voltage.

2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0481	Hardware Circuit Inspection	Open circuit	•Circuit
		Short circuit to ground	•Relay and fuse
		Short circuit to power supply	•Fan motor

3. Diagnosis procedure

Refer to: Diagnosis procedures for electronic fan high speed does not run (3.1.4 Cooling System, Symptom Diagnosis and Testing).

DTC P0506, P0507

1. Fault code description

Fault code	Description	Definition
P0506	Idle speed too low	Throttle actuator control motor is controlled by engine control module (ECM). DC motor in the throttle body drives the throttle. In order to reduce the idle speed and change the spark and fuel supply, engine control module instruct the throttle to close, thereby reducing the air flow that will access to the engine, so the idle is reduced. In order to increase idle speed, the engine control module to instruct the throttle to open, so that more air could go through the throttle. Engine control module (ECM) conduct the calculation and control to engine target idling based on coolant temperature, speed compensation, slow adjustment, AC compensation, voltage compensation. Terminal 20 of ECM wiring harness connector E01 connects to terminal 8 of throttle actuator control motor wiring harness connector E21. Terminal 21 of ECM wiring harness connector E01 connects to terminal 5 of throttle actuator control motor wiring harness connector E21.
P0507	Idle speed too high	

2. Possible Sources

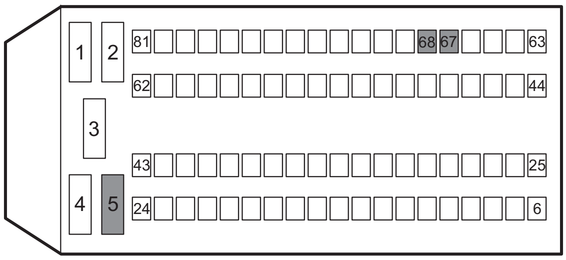
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0506	Throttle valve block at the small opening position	•Control integration reaches the minimum value •The difference between static state and actual speed is smaller than 100 rpm •Idle state •Engine coolant temperature is higher than 80.3°C • Air intake temperature is higher than 20.3°C	•Air Intake system •Exhaust system •Throttle body • ECM
P0507	Throttle valve block at the big opening position	•Idle integration reaches the minimum value •The difference between static state and actual speed is smaller than 200 rpm •Idle state	

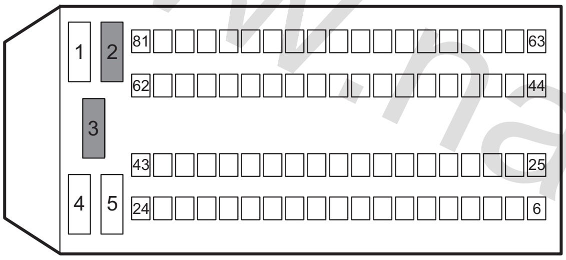
3. Diagnosis procedure

CAUTION: Before the diagnostic procedure, observe the list of diagnostic data, analysis the accuracy of the data for quick troubleshooting.

Test Conditions	Details/Results/Actions
1. Inspect DTC	
	A.Connect the diagnosis tool to fault diagnosis interface. B.Turn the ignition switch to position "ON". C.Select the menu: "Changan Auto"/"C201"/"DELPHI MT22.1_V2.2(CAN)"/"Read DTC", and read DTC. Is there any DTC besides DTC P0506 and P0507 ? **Y** **Refer to: DTC Diagnostic Procedure Index (3.1.13 Electronic Control System - MT22.1， DTC Diagnosis and Testing).** **N** Go to step 2.
2. Inspect generator	
	A.Use diagnosis tool, observe if the system voltage parameter is normal. Is the generator normal? **Y** Go to step 3. **N** Inspect generator fault.
3. Inspect air intake pressure sensor parameter	
	A.Use diagnosis tool, observe if the air intake pressure sensor parameter is normal. **Refer to: Data Stream Chart (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).** Is the air intake pressure sensor parameter normal? **Y** Go to step 4. **N** Go to step 5.

Test Conditions	Details/Results/Actions
4. Inspect A/C working state	
	A.Use diagnosis tool, observe the working state of A/C is in same as its actual operation state. **Refer to: Data Stream Chart (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).** Compressor pull in, does the engine increase the speed? **Y** Go to step 7. **N** Go to step 5.
5. Inspect air intake system, exhaust system	
	A.Inspect air intake system, exhaust system for clog and leakage. B.If there is too much carbon deposition at throttle. Does the above issues exist? **Y** Repair fault part. **N** Go to step 6.
6. Inspect engine accessories transmission	
	A. Inspect engine accessories belt. **Refer to: Accessory Drive Belt Inspection (3.1.2 Mechanical System, General Procedures).** Is there any noise with the transmission belt? **Y** **Refer to: Engine Transmission Belt Noise Diagnosis (3.1.2 Mechanical System，Symptom Diagnosis and Testing).** **N** Go to step 7.

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">7. Inspect ECM power supply circuit</td></tr>
<tr><td>

A3113031</td><td>A.Turn the ignition switch to position "LOCK".
B.Measure from the back of ECM wiring harness connector E01.
C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply.
Standard Voltage Value: 11~14 V
Is the voltage normal？
Y
Go to step 8.
N
Repair and inspect the ECM power supply circuit.</td></tr>
<tr><td colspan="2">8. Inspect ECM ground circuit</td></tr>
<tr><td>

A3113032</td><td>A.Turn the ignition switch to position "LOCK".
B.Measure from the back of ECM wiring harness connector E01.
C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter.
Standard Resistance Value: less than 5Ω
Is the resistance value normal?
Y
Replace the engine control module.
Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).
N
Inspect and repair the ECM ground circuit.</td></tr>
</table>

DTC P0562, P0563

1. Fault code description

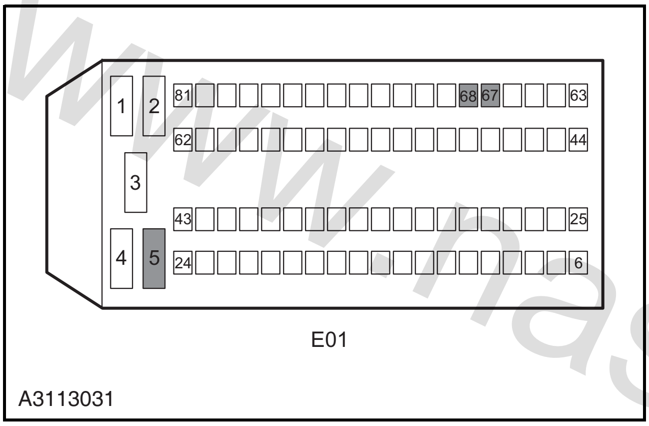
Fault code	Description	Definition
P0562	The system voltage is too low	ECM power supply is consist of the following circuits: Battery power supply provides ECM with power through EF14 fuse and terminal 67 of ECM connector E01. When the ignition switch turns to position "ON", the power supply of the ignition that turns to position "ON" provides ECM with power through fuse IF17 and terminal 68 of engine control module connector E01. When ECM detects there is battery voltage at terminal 68 of ECM wiring harness connector E01, ECM controls terminal 44 of E01 to connect to ground, controls the main relay to pull in. After the main relay pulls in, battery power supply provides ECM with power through EF03 fuse and main relay and the terminal 5 of E01.
P0563	The system voltage is too high	

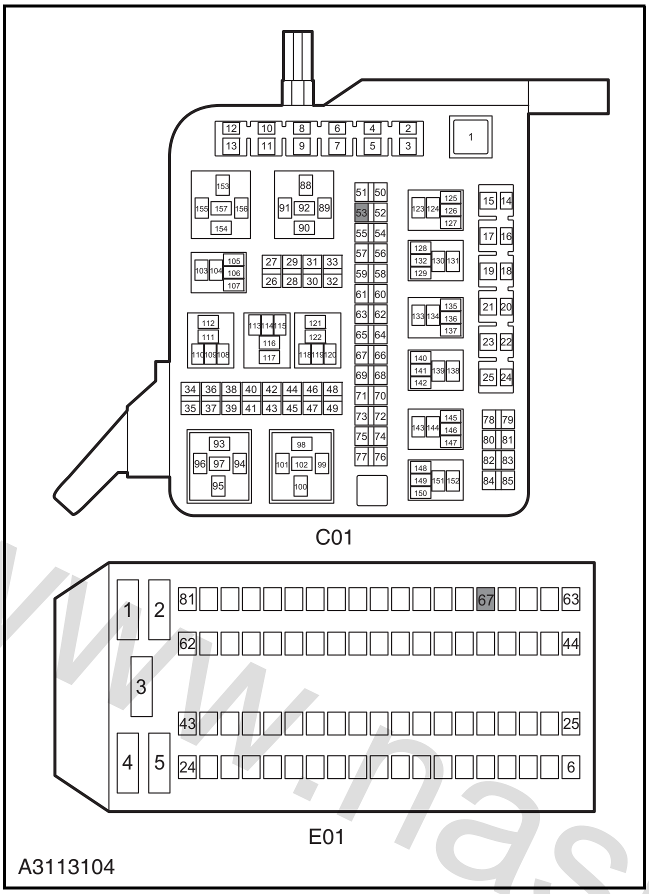
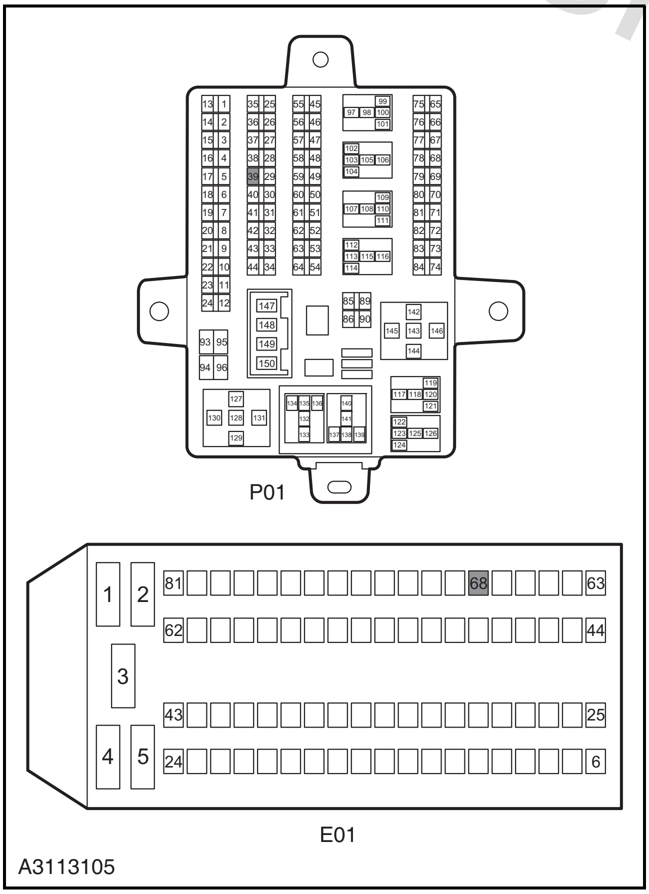
2. Possible Sources

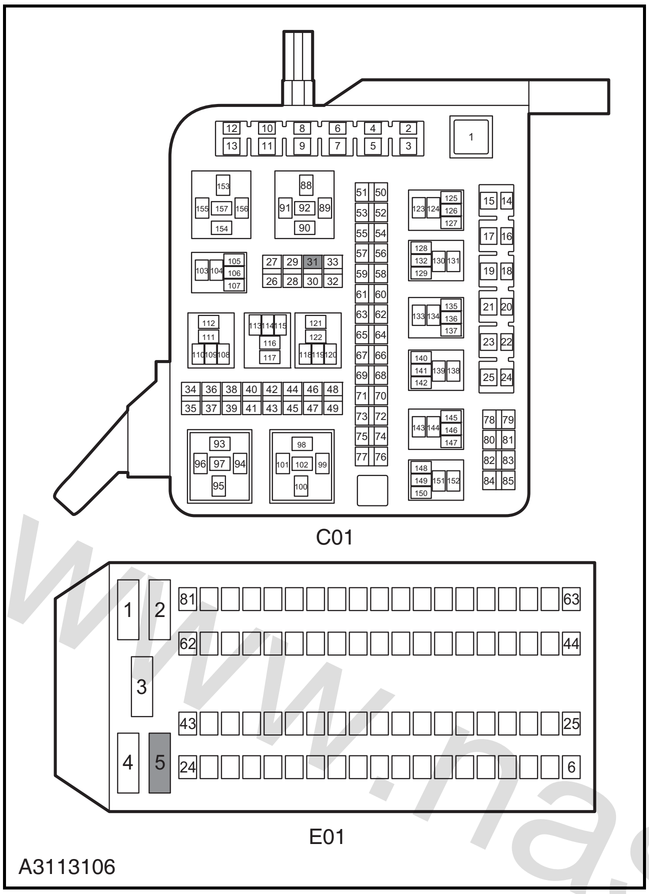
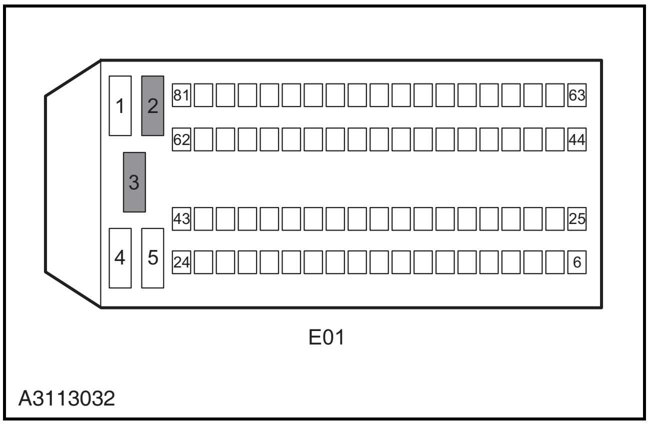
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0562	Lower limit value exceeding	•The starting time is greater than 180s •Battery voltage value is higher than 2.5 V, lower than 10.5 V	•Generator •ECM power supply circuit •ECM
P0563	Upper limit value exceeding	•Battery voltage value more than 17.02 V •Vehicle speed greater than 25 km/h	

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. Inspect EF03, EF14, EF22 (low carbon), SB12 and IF17 fuses	

Test Conditions	Details/Results/Actions
	A.Turn the ignition switch to position "LOCK". B.Remove fuses EF03, EF14, EF22 (low carbon) and SB12 from engine compartment electric center. C. Remove fuse IF17 from interior electric center. D. Use multimeter to measure the conductivity between the two terminals of the fuse. Is the fuse normal？ **Y** Go to step 2. **N** Replace the fuse.
2. Inspect ECM power supply voltage	
	A.Turn the ignition switch to position "LOCK". B. Measure from the back of ECM wiring harness connector E01. C. Turn the ignition switch to position "ON". D. Make sure the main relay is working normally, otherwise replace it. E. Measure the voltage between terminals 5, 67 and 68 of ECM wiring harness connector E01 and reliable ground. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 4. **N** Go to step 3.
3. Inspect ECM power supply circuit	

Test Conditions	Details/Results/Actions
	A. Turn the ignition switch to position "LOCK". B.Remove the fuse EF14. C.Measure the resistance value between terminal 53 of engine compartment electric center C01 and terminal 67 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** D.Remove the fuse IF17. E. Measure the resistance value between terminal 39 of interior electric center P01 and terminal 68 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** F.Remove the fuse EF03. G.Measure the resistance value between terminal 31 of the engine compartment electric center C01 and terminal 5 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5Ω** Is the circuit normal? **Y** Go to step 4. **N** Repair fault circuit and replace the engine compartment electric center if necessary.
	

Test Conditions	Details/Results/Actions
	
4. Inspect ECM ground circuit	
	A. Turn the ignition switch to position "LOCK". B. Measure from the back of ECM wiring harness connector E01. C.Measure the resistance value between terminals 2, 3 of ECM wiring harness connector E01 and reliable ground. **Standard Resistance Value: less than 5Ω** Is the resistance normal? **Y** Go to step 5. **N** Repair the fault circuit.

Test Conditions	Details/Results/Actions
5. Inspect charging system	
	A. Turn the ignition switch to position "LOCK". B. Inspect the battery voltage. **Standard Voltage Value: 11~14 V** C.Start the engine to normal temperature, shut down all the equipments, change the engine speed from idle speed to 4000 rpm. D. Inspect engine charging voltage. **Standard Voltage Value: 11~16 V** Is the voltage normal? **Y** **Refer to: Intermittent Fault Diagnosis procedure (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).** **N** Repair battery or charging system fault.

DTC P0504, P0571

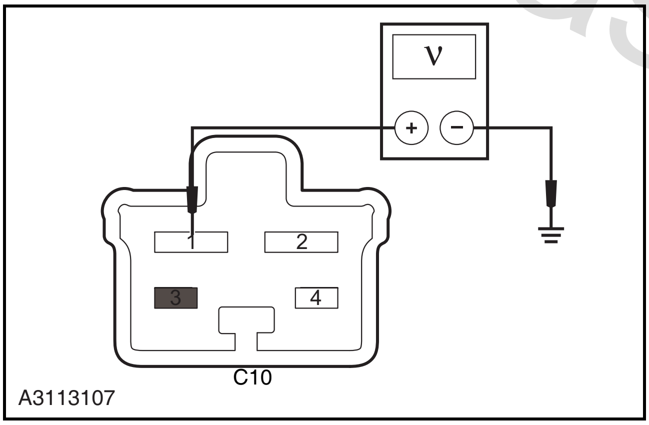
1. Fault code description

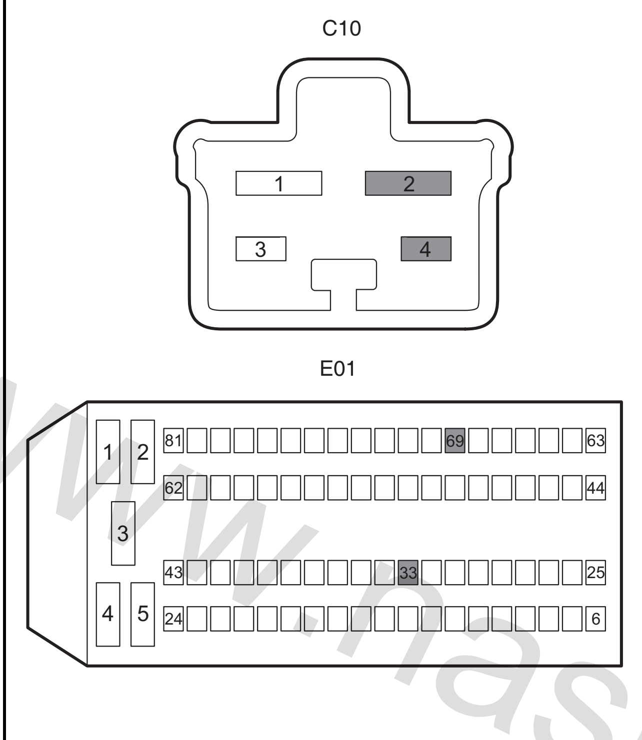
Fault code	Description	Definition
P0504	Brake switch correlation fault	ECM determines whether the vehicle is being braked by monitoring the voltage at terminals 33 and 69 of ECM wiring harness connector E01 so that ECM regulates the output power.
P0571	Braking light switch status not changed during braking application	

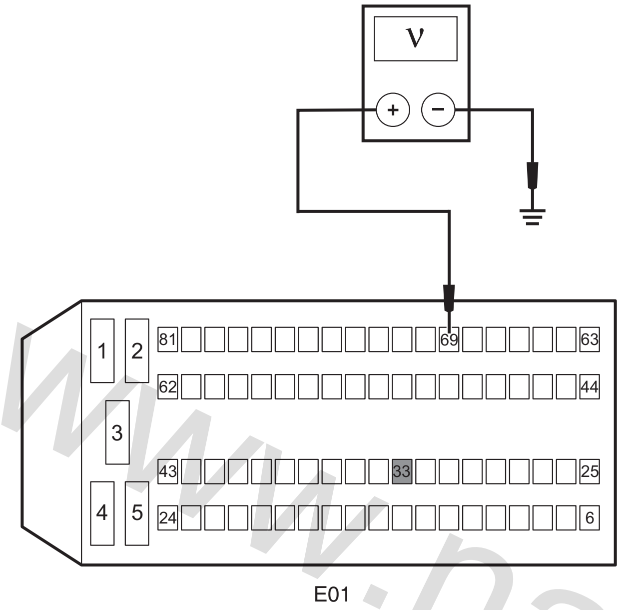
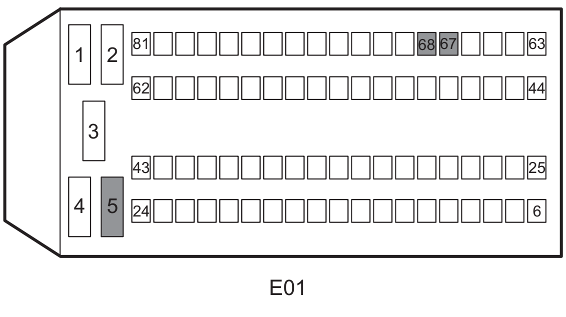
2. Possible Sources

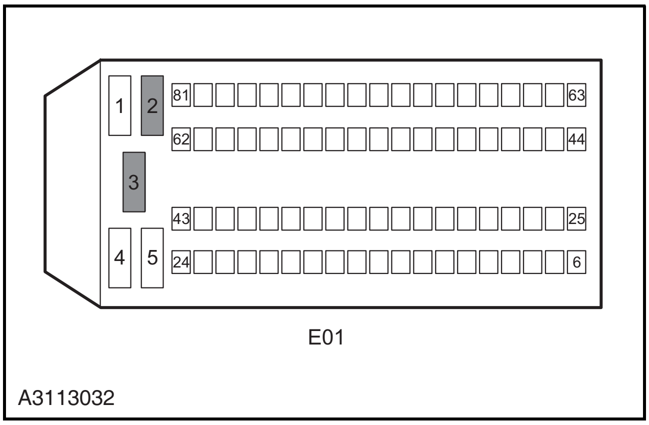
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0504		Open circuit Short circuit to ground Short circuit to power supply	•Circuit •Stop lamp switch •ECM
P0571			

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A.Inspect the related wiring harness connector for signs of damage, poor contact, aging or loose. Is it normal? **Y** Go to step 2. **N** Repair the fault point.
2. Inspect the fuse	
	A.Inspect the interior electric center fuse IF20 and engine compartment electric center fuse EF19. Is it normal? **Y** Go to step 3. **N** Repair the fuse circuit, replace the fuse in rated capacity.
3. Inspect the brake lamp switch power supply voltage	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the brake lamp switch wiring harness connector C10. C.Turn the ignition switch to “ON“. D.Measure the voltage between terminals 1 & 3 of wiring harness connector C10 with reliable ground. **Standard Voltage Value: 11~14 V** E.Disconnect the brake lamp switch wiring harness connector C10. Is the voltage normal? **Y** Go to step 4. **N** Repair the fault circuit.

Test Conditions	Details/Results/Actions
4. Inspect the brake lamp switch signal circuit	
 A3113108	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery cathode cable. C.Disconnect the brake lamp switch wiring harness connector C10. D.Disconnect the engine control module wiring harness connector E01. E.Measure the circuit between terminal 2 of C10 and terminal 33 of E01 for open circuit, short to ground or short to power supply. F.Measure the circuit between terminal 4 of C10 and terminal 69 of E01 for open circuit, short to ground or short to power supply. Is the circuit normal? **Y** Go to step 5. **N** Repair the fault circuit.

Test Conditions	Details/Results/Actions
5. Inspect the brake lamp switch	
 A3113109	A.Turn the ignition switch to position "LOCK". B.Disconnect the engine control module wiring harness connector E01. C.Turn the ignition switch to "ON". D.Meanwhile measure the voltage between terminals 33 and 69 of engine control module wiring harness connector E01 and reliable ground with a multimeter. **Standard Voltage:** **With brake not applied, voltage at terminal 69: 11~14V** **voltage at terminal 33: 0 V** **With brake applied, voltage at terminal 33: 11~14V** **voltage at terminal 69: 0 V** And the voltage to ground of both terminals are converted at the same time. Are both circuit voltage and its conversion normal? **Y** Go to step 6. **N** Replace the brake lamp switch.
6. Inspect ECM power supply circuit	
 A3113031	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 7. **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
7. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0551

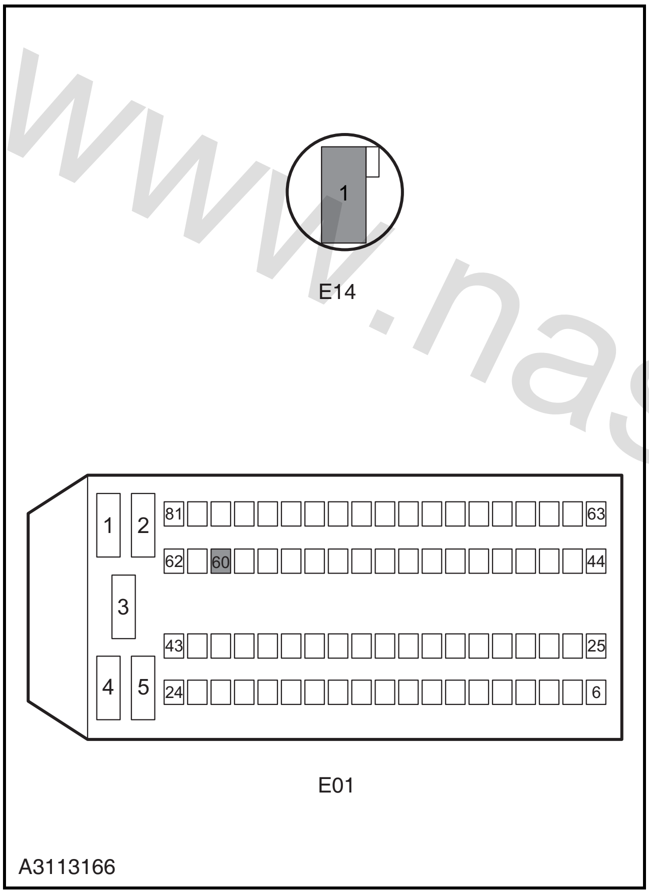
1. Fault code description

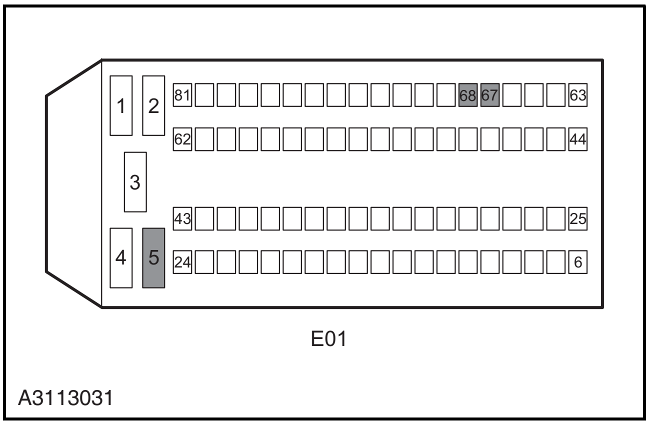
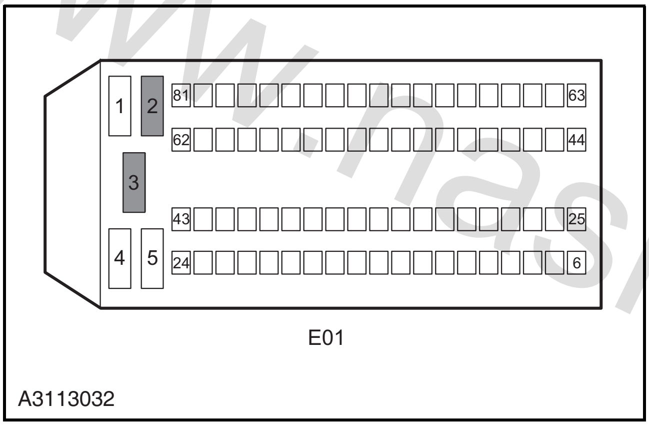
Fault code	Description	Definition
P0551	Power steering switch circuit voltage range/performance fault	The working power of power steering switch is supplied by ECM. ECM controls the internal ground of power steering switch through terminal 60 on ECM wiring harness connector E01.

2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0551		Open circuit Short circuit to ground Short circuit to power supply	•Circuit •Power steering switch •ECM

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A.Inspect the related wiring harness connector for signs of damage, poor contact, aging or loose. Is it normal? **Y** Go to step 2. **N** Repair the fault point.
2. Inspect the signal circuit of power steering switch	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery cathode cable. C.Disconnect the power steering switch wiring harness connector E14. D.Disconnect the engine control module wiring harness connector E01. E.Measure the circuit between terminal 1 of E14 and terminal 60 of E01 for open circuit, short to ground or short to power supply. **Y** Go to step 3. **N** Repair the fault circuit.
3. Inspect the power steering switch	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the power steering switch wiring harness connector E14. C.Replace the power steering switch of failed vehicle. Is the fault eliminated? **Y** Replace the power steering switch. **N** Go to step 4.

Test Conditions	Details/Results/Actions
4. Inspect ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 5. **N** Repair and inspect the ECM power supply circuit.
5. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0602, P0604, P0606, P060A

1. Fault code description

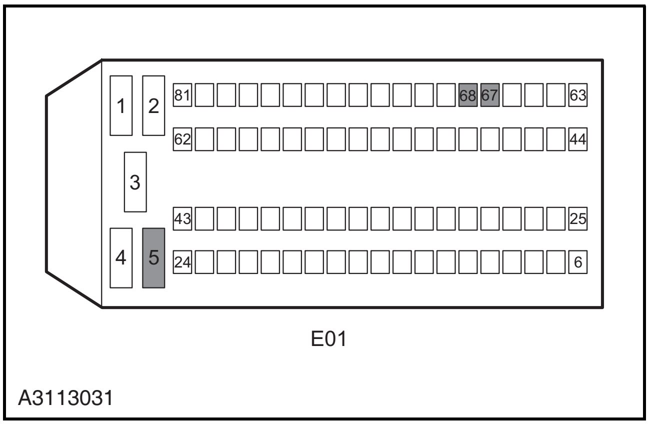
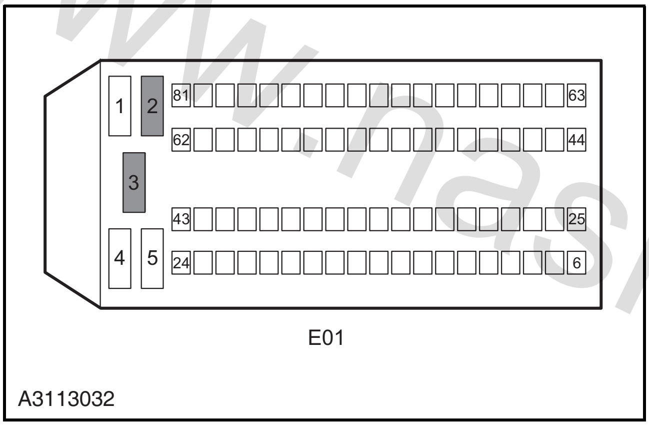
Fault code	Description	Definition
P0602	ECM programming error (software version unmatched)	ECM internal program processing fault, ECM power supply and ground abnormal.
P0604	RAM error	
P0606	ECM processor fault	
P060A	ECM processor fault	

2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0602	•Control unit EEPROM fault. •Diagnose the diagnosis data identification programming (DDI).		•ECM •Circuit
P0604			
P0606			
P060A			

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. Inspect DTC	
	A.Connect the diagnosis tool to fault diagnosis interface. B. Turn the ignition switch to position "ON". C. Diagnose the engine system. Is there any DTC besides P0602, P0604, P0606 and P060A? **Y** Repair the DTC besides P0602, P0604, P0606 and P060A. **Refer to: DTC Diagnostic Procedure Index (3.1.13 Electronic Control System - MT22.1， DTC Diagnosis and Testing).** **N** Go to step 2.

Test Conditions	Details/Results/Actions
2. Inspect ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 3. **N** Repair and inspect the ECM power supply circuit.
3. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0230

1. Fault code description

Fault code	Description	Definition
P0230	Fuel pump relay fault	Working power of oil pump relay coil is supplied by main relay controlled by ECM. ECM controls terminal 110 of fuel pump relay wiring harness connector C01 for ground through terminal 10 of ECM wiring harness connector E01, and the fuel pump relay engages. There is a drive circuit control relay coil equipped within the ECM for ground. Drive circuit provides a feedback circuit to ECM, ECM determines the control circuit open, short circuit to ground or to voltage through monitoring the feedback voltage.

2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0230	Hardware Circuit Inspection	Open circuit	•Relay •Relay circuit •ECM
		Short circuit to ground	
		Short circuit to power supply	

3. Diagnosis procedure

Refer to: Diagnosis procedures for fuel pump does not working (3.1.7 Fuel System, Symptom Diagnosis and Testing).

DTC P0646, P0647

1. Fault code description

<table>
<tr><th>Fault code</th><th>Description</th><th>Definition</th></tr>
<tr><td>P0646</td><td>A/C clutch relay circuit short to low voltage or open circuit</td><td rowspan="2">A/C compressor relay operating power is supplied by the main relay that under the control of ECM. ECM controls the internal ground of A/C compressor relay through terminal 9 of ECM harness connector E01, and the relay pickup.
There is a drive circuit control relay coil equipped within the ECM for ground. Drive circuit provides a feedback circuit to ECM, ECM determines the control circuit open, short circuit to ground or power through monitoring the feedback voltage.</td></tr>
<tr><td>P0647</td><td>A/C clutch relay circuit short to high voltage</td></tr>
</table>

2. Possible Sources

<table>
<tr><th>Fault code</th><th>Test Tactics</th><th>Setting conditions (control strategy)</th><th>Fault location</th></tr>
<tr><td rowspan="2">P0646</td><td rowspan="3">Hardware Circuit Inspection</td><td>Open circuit</td><td rowspan="3">•A/C relay
•Circuit
•ECM</td></tr>
<tr><td>Short circuit to ground</td></tr>
<tr><td>P0647</td><td>Short circuit to power supply</td></tr>
</table>

3. Diagnosis procedure

Refer to: Diagnosis procedures for A/C compressor does not working (4.1.1 Climate Control System, Symptom Diagnosis and Testing).

DTC P0351

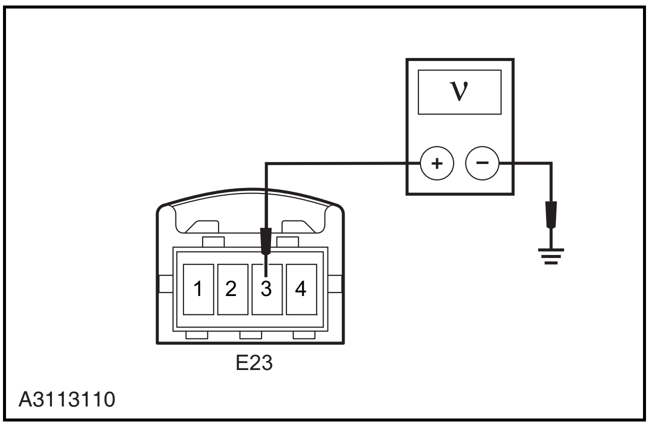
1. Fault code description

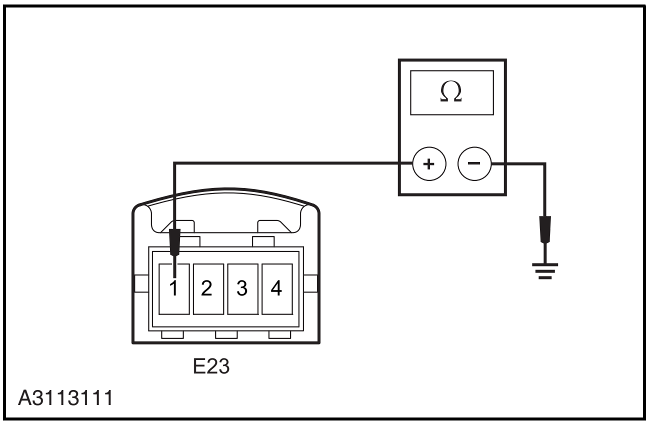
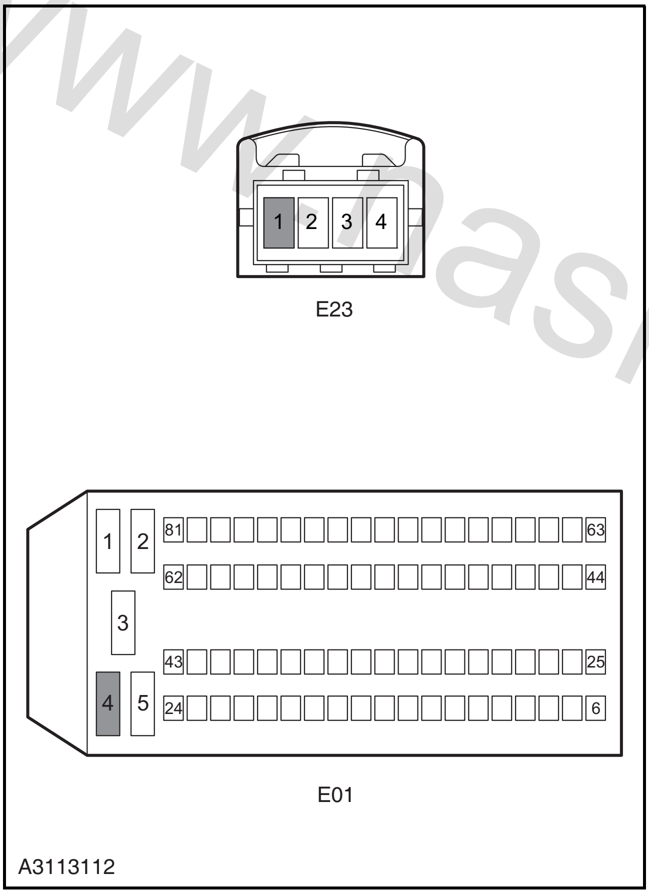
Fault code	Description	Definition
P0351	Cylinder 1 & 4 ignition coil fault	Ignition coil operating voltage is controlled by the main relay that controlled by the ECM, battery voltage through terminal 27 of the engine compartment electric center C01 is transported to terminals 3 and 4 of ignition coil E23 wiring harness connector. ECM controls internal ground of cylinder 1 & 4 ignition coils through terminal 4 of wiring harness connector E01. ECM monitors the working state of cylinder 4 driver circuit. If the ECM detects driving voltage not corresponding to the correct voltage, it will set up a fuel injector control circuit fault diagnosis DTC.

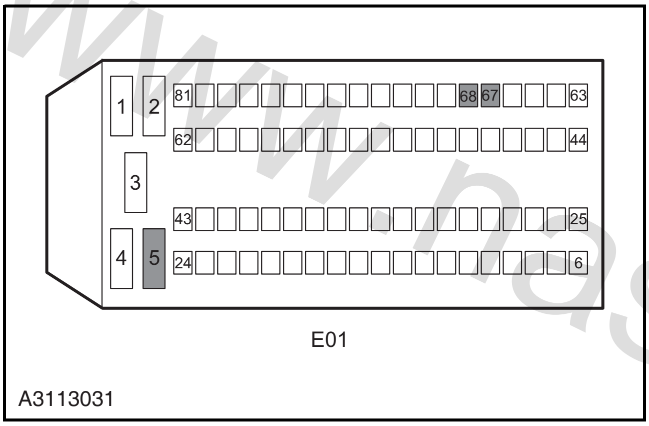
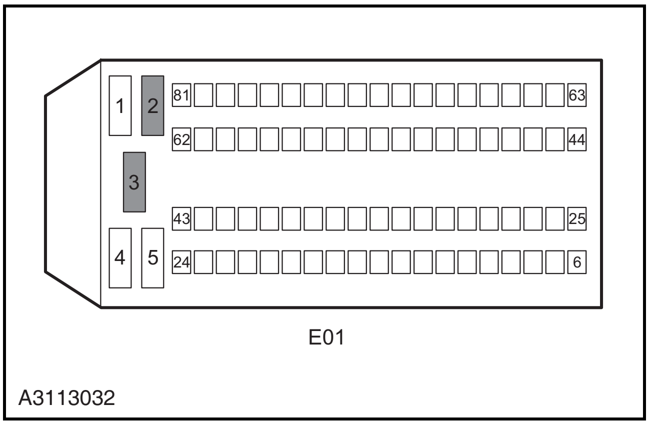
2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0351	Hardware Circuit Inspection	Open circuit Short circuit to ground Short circuit to power supply	•Circuit •Ignition coil • ECM

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A.Inspect the wiring harness connector of ignition coil for damage, poor contact, aging, or loose. Is it normal? Y Go to step 2. N Repair the fault point.
2. Inspect the power supply circuit of ignition coil	
	A.Turn the ignition switch to position "ON". B.Measure the voltage between the terminal 3 of ignition coil wiring harness connector E23 and reliable ground. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 3. **N** Repair the ignition coil power circuit.

Test Conditions	Details/Results/Actions
3. Inspect the ground circuit of the instruments	
	A.Turn the ignition switch to position "LOCK". B.Measure the resistance between the terminal 1 of ignition coil wiring harness connector E23 and the ground point wiring harness. **Standard Resistance Value: 10 MΩ or higher** Is the resistance value normal? **Y** Go to step 4. **N** Repair the ignition coil ground circuit.
4. Inspect driving circuit	
	A.Turn the ignition switch to position "LOCK" and disconnect the battery negative cable. B.Disconnect the connector E23 of the ignition coil. C.Disconnect the engine control module wiring harness connector E01. D.Inspect whether there is open circuit, short circuit to ground or short circuit to power supply between terminal 1 of ignition coil wiring harness connector E23 and terminal 4 of engine control module wiring harness connector E01. Is the circuit normal? **Y** Go to step 5. **N** Repair the fault circuit between the terminal 1 of ignition coil wiring harness connector E23 and the terminal 4 of engine control module wiring harness connector E01.

Test Conditions	Details/Results/Actions
5. Inspect the ignition coil	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the connector E23 of the ignition coil. C.Test the ignition coil. **Refer to: Ignition Coil Test (3.1.8 Ignition System, General Procedures).** Is the ignition coil working properly? **Y** Go to step 6. **N** Replace the ignition coil.
6. Inspect ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 7. **N** Repair and inspect the ECM power supply circuit.
7. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0685

1. Fault code description

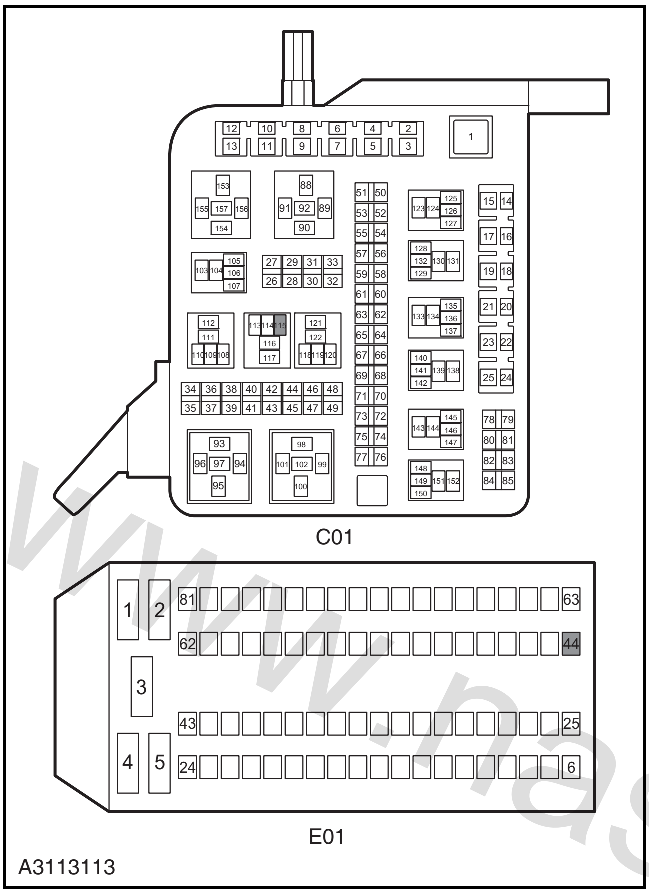
Fault code	Description	Definition
P0685	Main relay fault	ECM power supply is consist of the following circuits: Battery power supply provides ECM with power through EF14 fuse and terminal 67 of ECM connector E01. When the ignition switch turns to position "ON", the power supply of the ignition that turns to position "ON" provides ECM with power through fuse IF17 and terminal 68 of engine control module connector E01. When ECM detects there is battery voltage at terminal 68 of ECM wiring harness connector E01, ECM controls terminal 44 of E01 to connect to ground, controls the main relay to pull in. After the main relay pulls in, battery power supply provides ECM with power through EF03 fuse and main relay and the terminal 5 of E01.

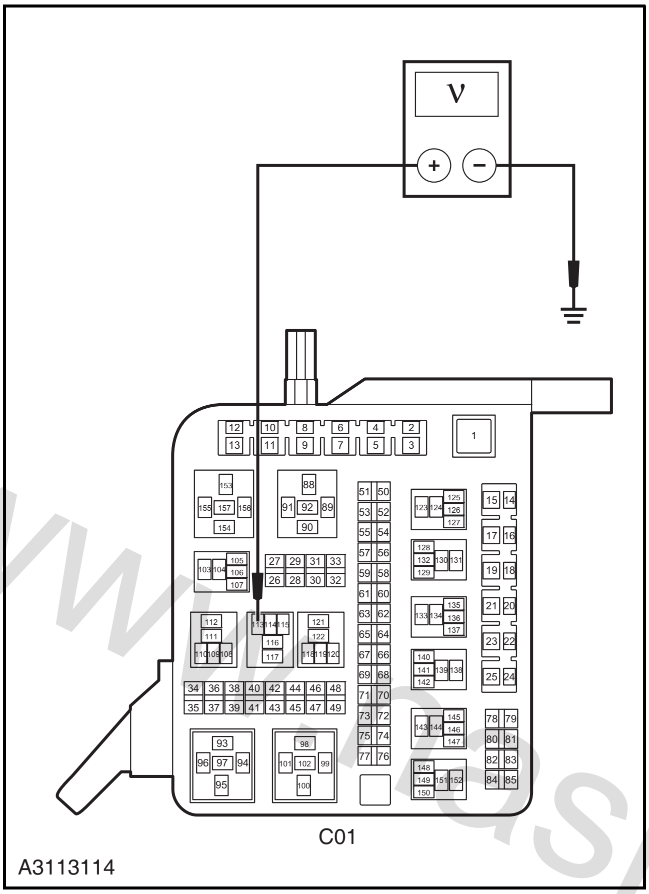
2. Possible Sources

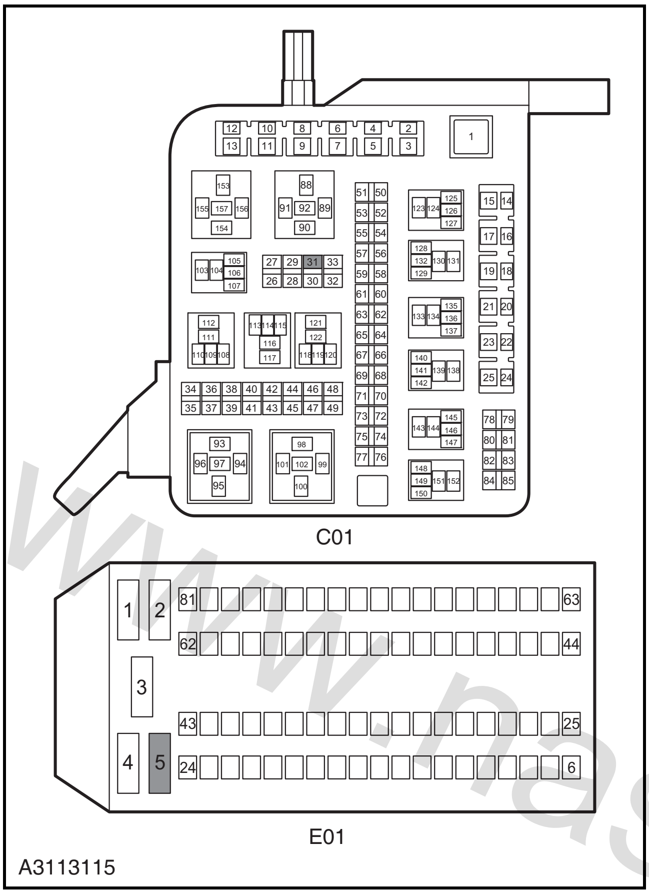
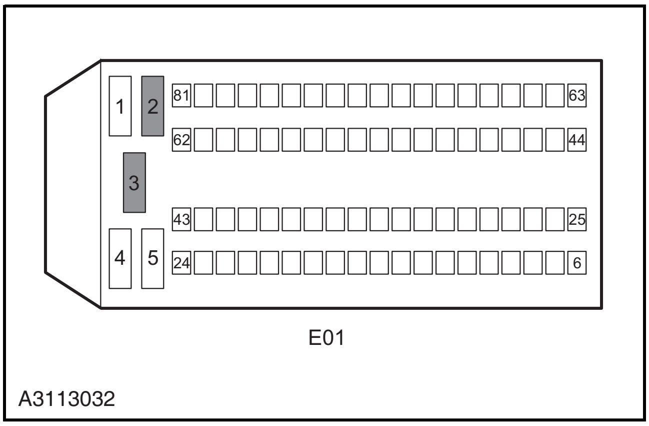
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0685	Hardware Circuit Inspection	Open circuit Short circuit to ground Short circuit to power supply	•Relay •Circuit •ECM

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. Inspect main relay ER05 and fuses SB12 and EF22 (low carbon)	
	A.Inspect main relay ER05 and fuses EF05 and EF22 (low carbon). Is it normal? **Y** Go to step 2. **N** Replace with relay and fuses of the same model.

Test Conditions	Details/Results/Actions
2. Inspect the relay coil circuit	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery cathode cable. C.Disconnect the engine control module wiring harness connector E01. D.Disconnect the wiring harness connector C01 of the engine compartment electrical center. E.Check the circuit between terminal 44 of wiring harness connector E01 and terminal 115 of wiring harness connector C01 for short circuit, short to ground or short to power supply. Is the circuit normal? **Y** Go to step 3. **N** Inspect the circuit faults between the terminal 44 of the wiring harness connector E01 and the terminal 115 of the wiring harness connector C01.

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">3. Inspect output voltage of main relay</td></tr>
<tr><td>
</td><td>A.Turn the ignition switch to position "ON".
B.Remove main relay ER05
C.Measure the voltage value between the terminal 113 of the engine compartment electric center C01 and the reliable ground.
Standard Voltage Value: 11~14 V
Is the voltage normal？
Y
Go to step 4.
N
Replace the engine compartment electrical center C01.</td></tr>
</table>

Test Conditions	Details/Results/Actions
4. Inspect output voltage circuit of main relay	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery cathode cable. C.Disconnect the engine compartment wiring harness C01 and ECM wiring harness E01. D.Inspect whether there is open circuit, short circuit to ground or short circuit to power supply between terminal 31 of engine compartment wiring harness connector C01 and terminal 5 of engine control module wiring harness connector E01. Is the circuit normal? **Y** Go to step 4. **N** Repair or replace the fault circuit.
5. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance value between terminals 2, 3 of ECM wiring harness connector E01 and reliable ground. **Standard Resistance Value: less than 5Ω** Is the resistance normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System-MT22.1, Removal and Installation).** **N** Repair the fault circuit.

DTC P0831, P0832

1. Fault code description

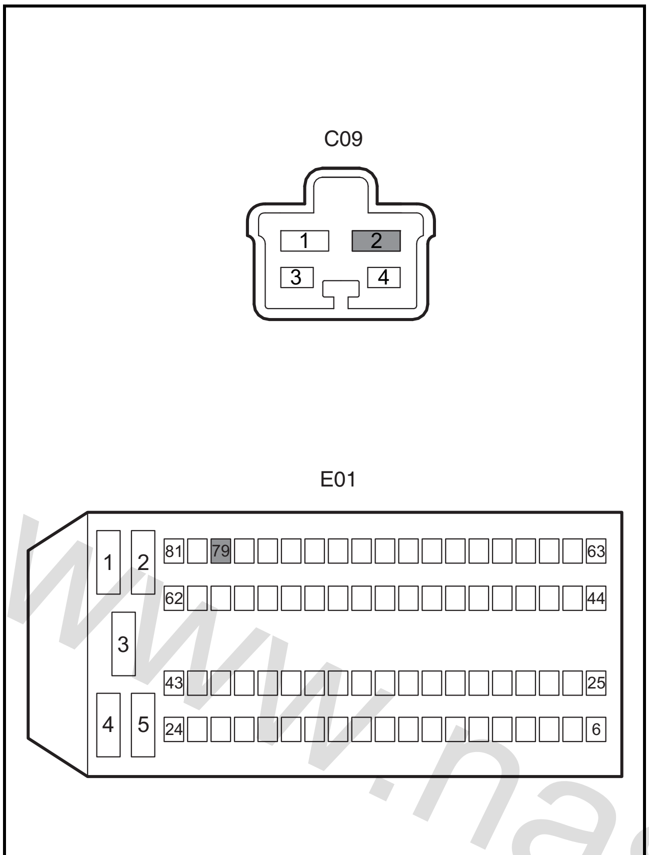
<table>
<tr><th>Fault code</th><th>Description</th><th>Definition</th></tr>
<tr><td>P0831</td><td>Clutch switch circuit signal low (short to power supply or open circuit)</td><td rowspan="2">ECM monitors current status of clutch through terminal 74 of E01, with the clutch switch being normally on. With the ignition in the "ON" position, if ECM monitors the ground signal of terminal 74 of E01, it determines that the driver has applied the clutch pedal.</td></tr>
<tr><td>P0832</td><td>Clutch switch circuit signal high (short to ground)</td></tr>
</table>

2. Possible Sources

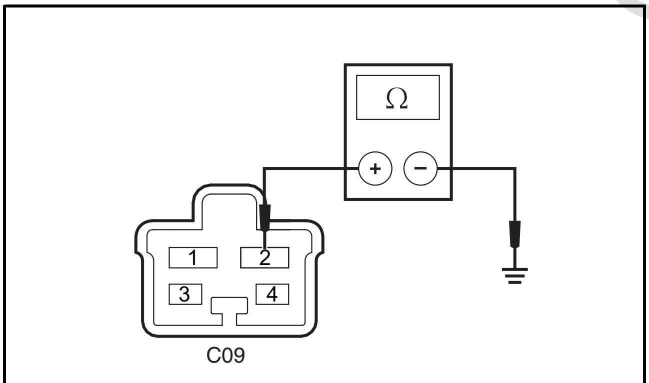
<table>
<tr><th>Fault code</th><th>Test Tactics</th><th>Setting conditions (control strategy)</th><th>Fault location</th></tr>
<tr><td>P0831</td><td rowspan="2">Hardware Circuit Inspection</td><td rowspan="2">Open circuit
Short circuit to ground
Short circuit to power supply
Clutch pedal switch damaged</td><td rowspan="2">•Circuit
•Clutch switch</td></tr>
<tr><td>P0832</td></tr>
</table>

3. Diagnosis procedure

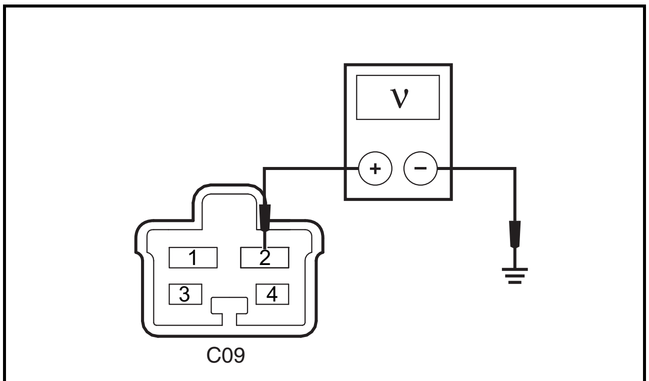
<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">1. General inspection</td></tr>
<tr><td></td><td>A.Inspect the related wiring harness connector for signs of damage, poor contact, aging or loose.
Is it normal?
Y
Go to step 2.
N
Repair the fault point.</td></tr>
<tr><td colspan="2">2. Eliminate Fault code</td></tr>
<tr><td></td><td>A.Connect fault diagnostic tool.
B.Enter into ECM.
C.Select "Eliminate Fault code" function.
D.Operate the clutch pedal switch.
E.Reread fault code.
Does fault code still exist?
Y
Go to step 3.
N
Refer to: Intermittent Fault Diagnosis procedure (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).</td></tr>
<tr><td colspan="2">3. Inspect the signal circuit of clutch pedal switch</td></tr>
</table>

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td>


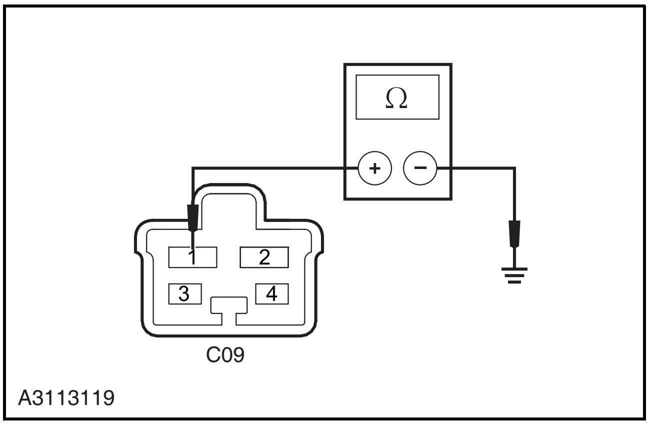
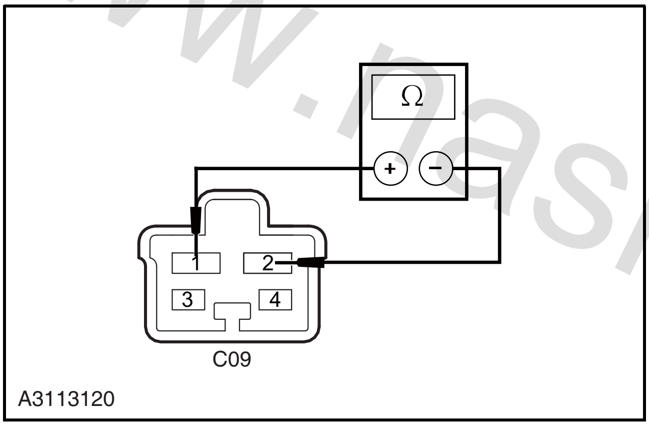
A3113116

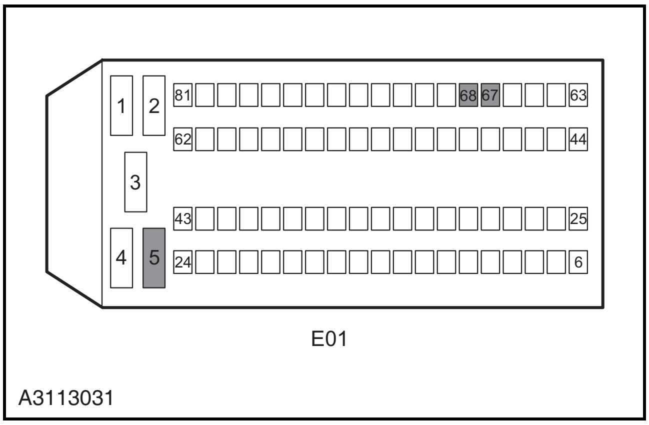
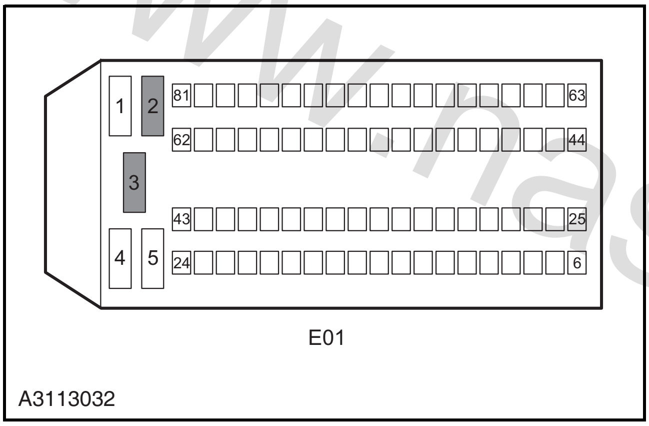


A3113117



A3113118
</td><td>
A. Turn the ignition switch to position "LOCK".
B. Disconnect the battery cathode cable.
C. Disconnect the clutch switch wiring harness connector C09 and ECM wiring harness connector E01.
D. Measure the resistance between terminal 2 of clutch switch wiring harness connector C09 and terminal 79 of ECM wiring harness connector E01.
Standard Resistance Value: less than 5Ω
E. Measure the resistance between the terminal 2 of clutch switch wiring harness connector C09 and the reliable ground. Inspect for short circuit to ground.
Standard Resistance Value: 10 MΩ or higher
F. Measure the voltage value between the terminal 2 of clutch switch wiring harness connector C09 and the reliable ground. Inspect for short circuit to power supply.
Standard Voltage Value: 0 V
G. Connect the clutch switch wiring harness connector C09 and ECM wiring harness connector E01.
Is the circuit normal?
Y
Go to step 4.
N
Repair or replace the fault circuit.
</td></tr>
</table>

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">4. Inspect the clutch switch ground circuit</td></tr>
<tr><td>
</td><td>A.Turn the ignition switch to position "LOCK".
B.Disconnect the clutch switch wiring harness connector C09.
C.Measure the resistance between the terminal 1 of the clutch switch wiring harness connector C09 and the reliable ground.
Standard Resistance Value: less than 5Ω
D.Connect the clutch switch wiring harness connector C09.
Is the resistance normal?
Y
Go to step 5.
N
Repair the fault circuit.</td></tr>
<tr><td colspan="2">5. Inspect the clutch switch</td></tr>
<tr><td>
</td><td>A.Turn the ignition switch to position "LOCK".
B.Disconnect the clutch switch wiring harness connector C09.
C.Measure the resistance between two terminals of the clutch switch wiring harness connector C09.
Standard Resistance Value: 10 MΩ or higher
D.Step down the clutch.
E.Measure the resistance between two terminals of the clutch switch wiring harness connector C09.
Standard Resistance Value: less than 1 Ω
Is the resistance value normal?
Y
Go to step 6.
N
Replace the clutch switch.</td></tr>
</table>

Test Conditions	Details/Results/Actions
6. Inspect ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 7. **N** Repair and inspect the ECM power supply circuit.
7. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0641, P0651

1. Fault code description

Fault code	Description	Definition
P0641	ETC reference voltage A# amplitude fault	Electronic throttle opening is directly controlled by ECM and the motor drives the opening of valve plate through torque increase by reduction gear, ECM controls terminal 8 of actuator motor connector E21 through terminal 20 of wiring harness connector E01 and controls terminal 5 of actuator motor connector E21 through terminal 21 of wiring harness connector E01.
P0651	ETC reference voltage B# amplitude fault	

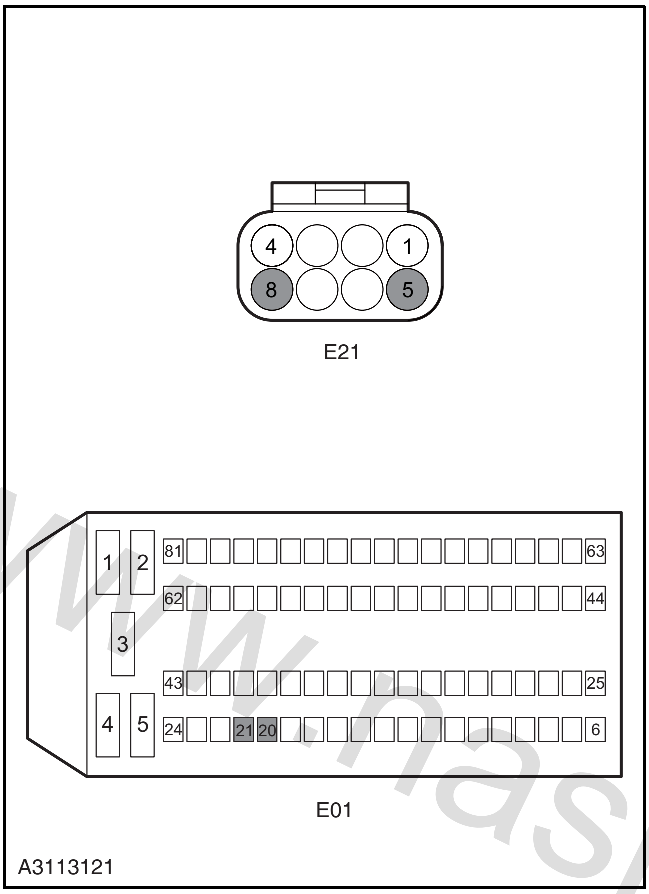
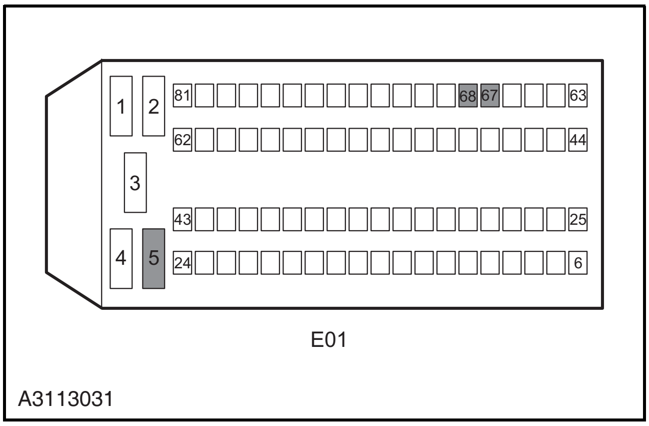
2. Possible Sources

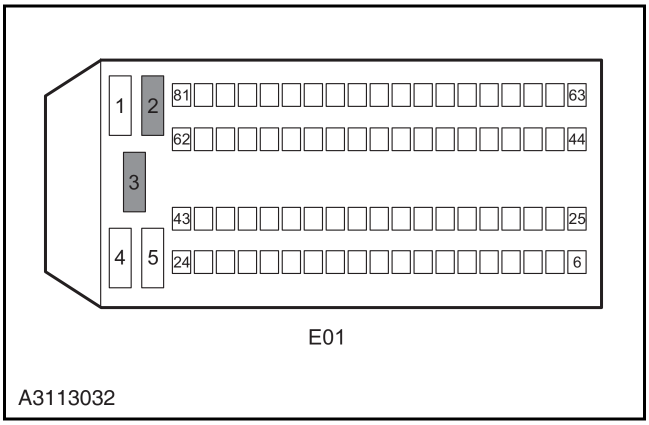
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P0641	Hardware.circuit inspect		•Circuit •Throttle •ECM
P0651	Hardware.circuit inspect		

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A. Inspect actuator wiring harness connector for loose signs. B. Inspect actuator appearance for damage. Is it normal? **Y** Go to step 2. **N** Repair the fault point.

Test Conditions	Details/Results/Actions
2. Inspect DTC	
	A. Connect the diagnosis tool to fault diagnosis interface. B. Turn the ignition switch to position "ON". C. Press the power button of the diagnosis tool. D. Select "DELPHI MT22.1"/"Read DTC". E. Read fault diagnosis code. Is there any DTC other than DTC P0641 and P0651? **Y** **Refer to: DTC Diagnostic Procedure Index (3.1.13 Electronic Control System - MT22.1，DTC Diagnosis and Testing).** **N** Go to step 3.
3.Inspect electronic throttle	
	A. Inspect electronic throttle for carbon deposition or clamping stagnation？ B.Remove the connector between the electronic throttle and air intake pipe. C. Turn the ignition switch to position "ON". D.One person step down the accelerator pedal, another person observe if the opening of electronic throttle changes with the change of accelerator pedal opening. Is the electronic throttle normal? **Y** Go to step 4. **N** Repair it or install a new one.

Test Conditions	Details/Results/Actions
4. Inspect electronic throttle control circuit	
	A. Turn the ignition switch to position "LOCK". B.Disconnect electronic throttle wiring harness connector E21 and engine ECM wiring harness connector E01. C.Inspect the circuit between terminal 8 of electronic throttle wiring harness connector E21 and terminal 20 of ECM wiring harness connector E01 for short or open circuit. D.Inspect the circuit between terminal 5 electronic throttle wiring harness connector E21 and terminal 21 of ECM wiring harness connector E01 for short or open circuit. Is the circuit normal? **Y** Go to step 5. **N** Repair or replace the fault circuit.
5. Inspect ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 6. **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
6. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P1336

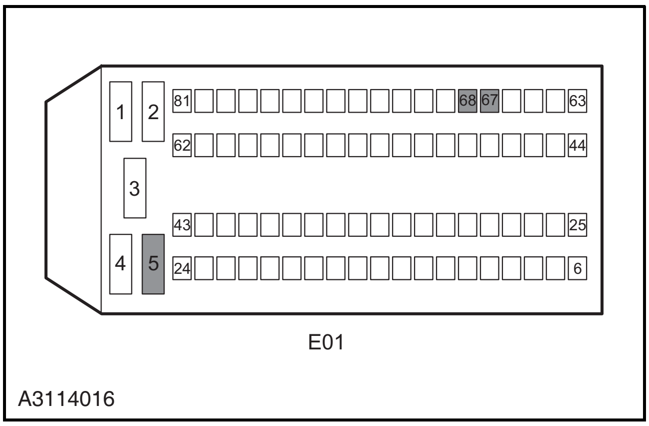
1. Fault code description

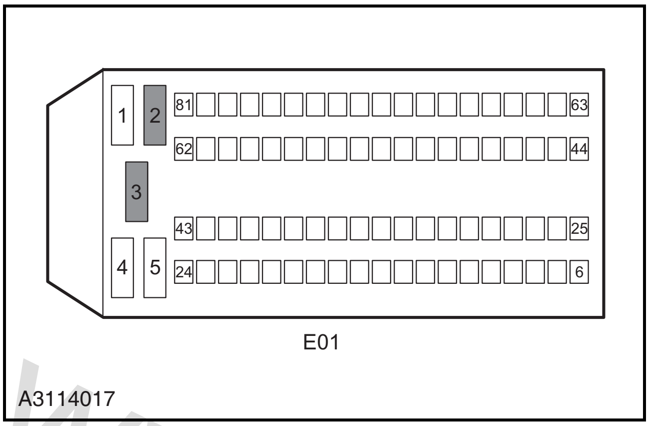
Fault code	Description	Definition
P1336	58-tooth gear error not learned	MIL will be illuminated upon start of the vehicle that is installed with a new computer and has not learned the tooth information

2.Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P1336	Tooth information non learned		ECM

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. Tooth information learning	
	A.Start the engine and wait until the water temperature reaches 60 ℃ , other onboard loads should be turned off when the vehicle operating time exceeds 10s. B."Tooth Information Learning" command ("30 2c 07 ff") is sent by the diagnostic tool. C.Press the accelerator pedal to the bottom and hold it, at this time ECM should carry out the tooth information learning and the engine speed of RPM 1300~4500 will be repeated in 2~5 cycles and stay around 4500RPM in the end to finish the learning, if the speed exceeds 5000RPM, then release the pedal, inspect the vehicle and identify problems. (the above is typical features of engine speed during the tooth information learning, by which the learning could be determined whether in progress or finished). D."Stop Tooth Information Learning" command ("30 2C 00") is sent by the diagnostic tool. E.The engine shuts down, Key-on after 15s and Key-off after DTC clearance. F.Start the engine 15s later and check if P1336 is passed using the diagnostic tool. Is the DTC P1336 still there? **Y** Go to step 2. **N** Go to diagnosis of default code.
2. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 3. **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
3. Inspect the ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P2104, P2105, P2106, P2110

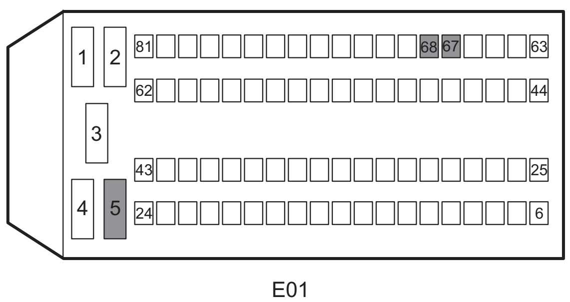
1. Fault code description

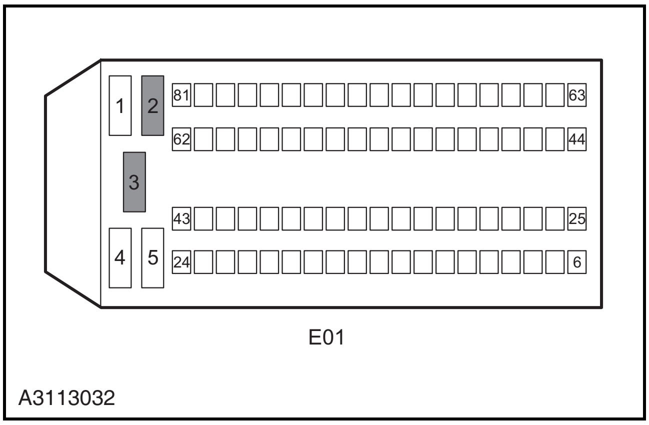
Fault code	Description	Definition
P2104	Engine forced idle	Electronic throttle opening is directly controlled by ECM and the motor drives the opening of valve plate through torque increase by reduction gear, ECM controls terminal 8 of actuator motor connector E21 through terminal 20 of wiring harness connector E01 and controls terminal 5 of actuator motor connector E21 through terminal 21 of wiring harness connector E01.
P2105	Engine forced shutdown	
P2106	Engine performance restriction	
P2110	Engine power management	

2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P2104	Reasonableness inspect		•Circuit •Throttle •ECM
P2105	Reasonableness inspect		
P2106	Reasonableness inspect		
P2110	Reasonableness inspect		

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. Inspect if there is DTC other than DTC P2104, P2105, P2106 and P2110 in control system.	
	A.Connect the diagnosis tool to fault diagnosis interface. B. Turn the ignition switch to position "ON". C. Press the power button of the diagnosis tool. D. Select "DELPHI MT22.1"/"Read DTC". E.Read DTC and check if there is any TDC other than DTC P2104, P2105, P2106 and P2110. **Y** **Refer to: DTC Diagnostic Procedure Index (3.1.13 Electronic Control System - MT22.1，DTC Diagnosis and Testing).** **N** Go to step 2.
2. Inspect electronic throttle	
	A.Inspect electronic throttle for carbon depositon or clamping stagnation? **Y** Clean it. **N** Go to step 3.
3. Inspect ECM power supply circuit	
 A3113031	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 4. **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
4. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P1515, P2101

1. Fault code description

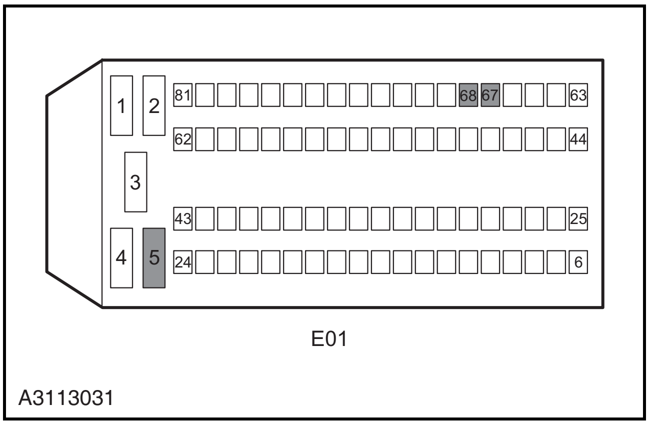
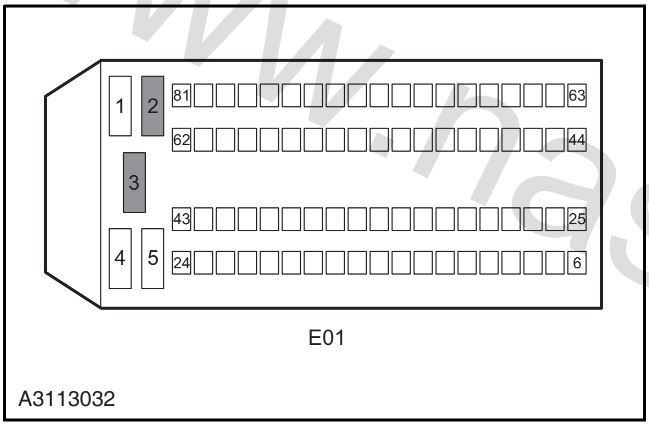
Fault code	Description	Definition
P1515	ETC drive stable state diagnosis error	
P2101	ETC drive step 2 diagnosis error	

2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P1515	Rationality inspection	-	•Solenoid •Solenoid circuit •ECM
P2101	Rationality inspection		

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. Inspect if there is DTC other than DTC P1515 and P2101 in control system.	
	A. Connect the diagnosis tool to fault diagnosis interface. B. Turn the ignition switch to position "ON". C. Press the power button of the diagnosis tool. D. Select "DELPHI MT22.1"/"Read DTC". E. Read fault diagnosis code. Is there any DTC other than DTC P1515 and P2101? **Y** **Refer to: DTC Diagnostic Procedure Index (3.1.13 Electronic Control System - MT22.1，DTC Diagnosis and Testing).** **N** Go to step 2.
2. Use diagnosis tool to confirm is DTC is stored again	
	A.Connect the diagnosis tool to diagnosis test interface. B.Turn the ignition switch to position "ON". C.Clear fault diagnosis code. D.Start engine and idle heating running at least 5 min. E.Read the control system DTC again,ensure if there is any DTC in system? **Y** Go to step 3. **N** **Refer to: Intermittent Fault Diagnosis procedure (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).**

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">3. Inspect ECM power supply circuit</td></tr>
<tr><td></td><td>A.Turn the ignition switch to position "LOCK".
B.Measure from the back of ECM wiring harness connector E01.
C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply.
Standard Voltage Value: 11~14 V
Is the voltage normal？
Y
Go to step 4.
N
Repair and inspect the ECM power supply circuit.</td></tr>
<tr><td colspan="2">4. Inspect the ECM ground circuit</td></tr>
<tr><td></td><td>A.Turn the ignition switch to position "LOCK".
B.Measure from the back of ECM wiring harness connector E01.
C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter.
Standard Resistance Value: less than 5Ω
Is the resistance value normal?
Y
Replace the engine control module.
Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).
N
Inspect and repair the ECM ground circuit.</td></tr>
</table>

DTC P2122, P2123, P2138

1. Fault code description

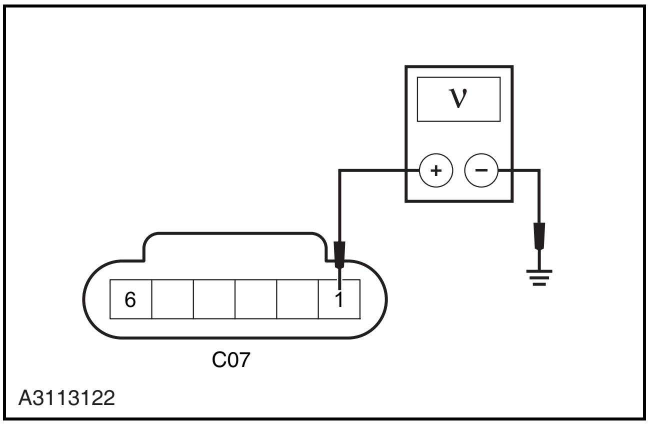
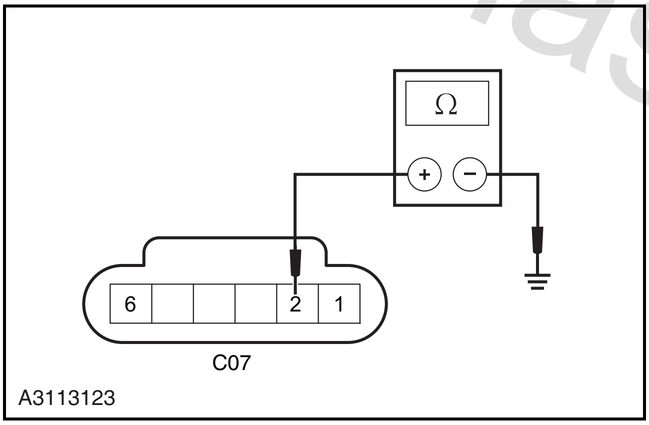
Fault code	Description	Definition
P2122	Electronic accelerator pedal position sensor 1# circuit low voltage	• ECM provides 5 V reference voltage to terminal 1 of electronic accelerator pedal position sensor wiring harness connector C07 through terminal 70 of ECM wiring harness connector E01. •Electronic accelerator pedal position sensor 1 provides signal voltage to terminal 41 of ECM wiring harness connector E01 through terminal 3 of connector C07. • ECM positions terminal 2 of electronic accelerator pedal position sensor 1 wiring harness connector C07 at low electrical potential through terminal 74 of ECM wiring harness connector E01.
P2123	Electronic accelerator pedal position sensor 1# circuit high voltage	
P2138	Electronic accelerator pedal position sensor 1# & 2# circuits correlation fault	

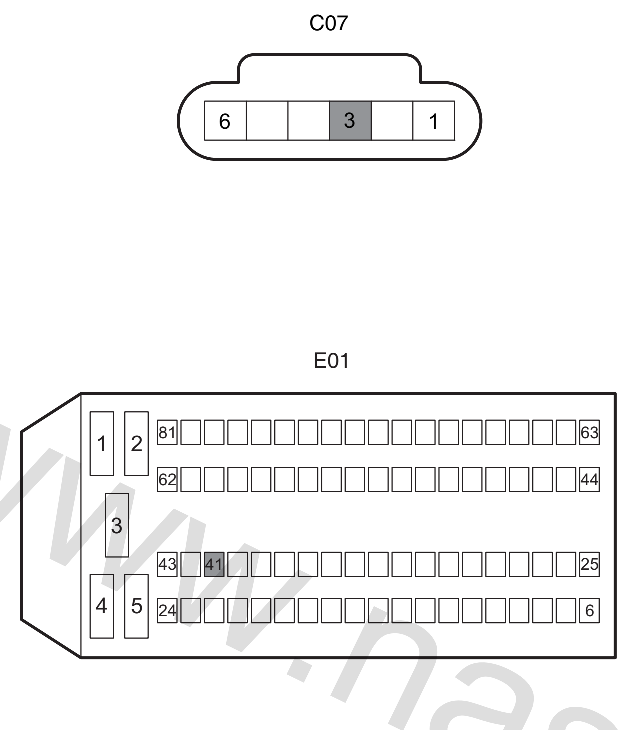
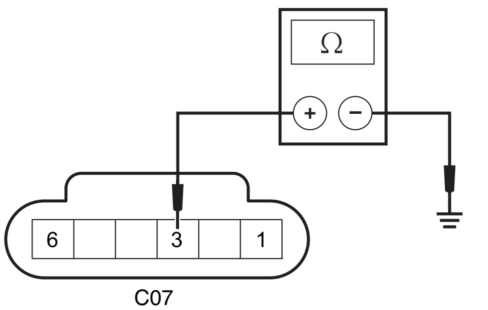
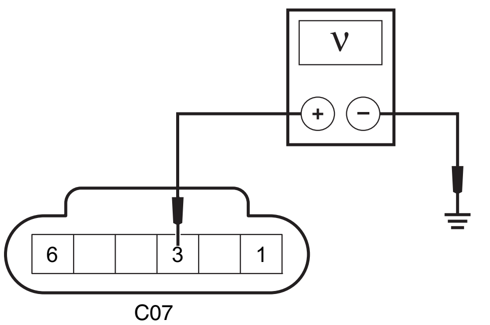
2. Possible Sources

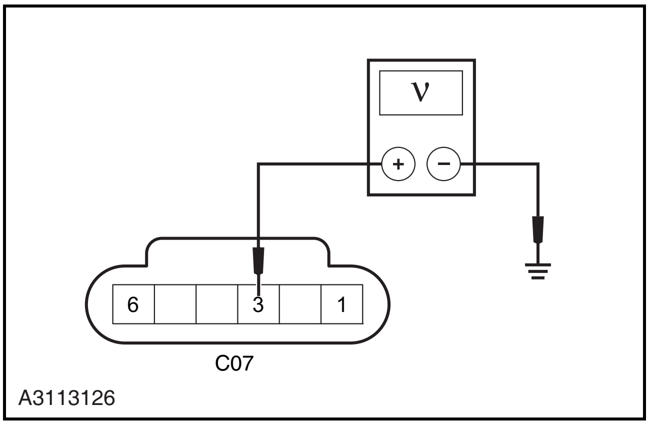
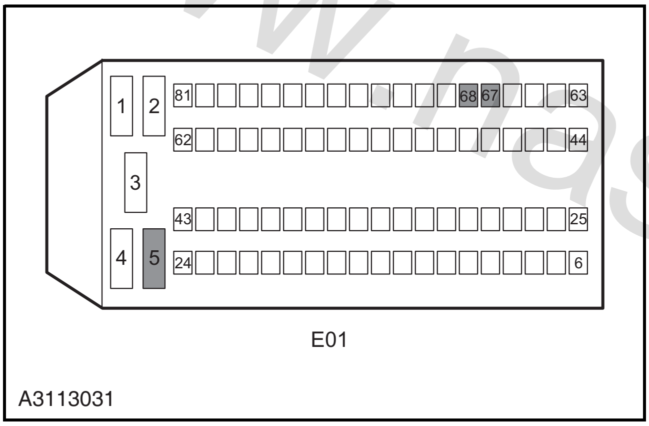
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P2122	Hardware, circuit fault	Signal circuit voltage too low, short circuit to ground	•Sensor circuit •Sensor •ECM
P2123		Signal circuit voltage too high, short circuit to power supply	
P2138		ECM compares the APP1 and APP2 input signal, APP1 input signal at all times is two times of APP2, if ECM monitor the APP1 and APP2 input signal can not satisfy this rule, it will report this DTC.	

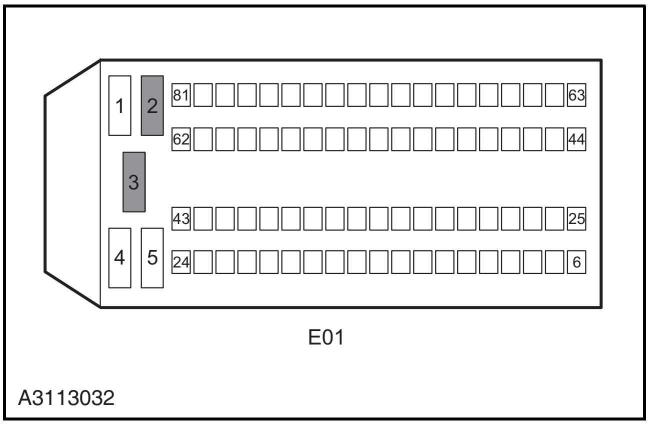
3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A. Inspect sensor wiring harness connector for loose signs. B. Inspect sensor appearance for damage. Is it normal? **Y** Go to step 2. **N** Repair the fault point.

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">2. Inspect electronic accelerator pedal position sensor 1 power supply circuit</td></tr>
<tr><td>
</td><td>A.Turn the ignition switch to position "LOCK".
B. Disconnect electronic accelerator pedal position sensor wiring harness connector C07.
C. Turn the ignition switch to position "ON".
D.Measure the voltage between the terminal 1 of electronic accelerator pedal position sensor wiring harness connector C07 and reliable ground.
Standard Voltage Value: 4.5~5.5 V
E. Connect electronic accelerator pedal position sensor wiring harness connector C07.
Is the voltage normal？
Y
Go to step 3.
N
Repair the fault circuit between terminal 1 of electronic accelerator pedal position sensor wiring harness connector C07 and terminal 70 of ECM E01.</td></tr>
<tr><td colspan="2">3. Inspect electronic accelerator pedal position sensor 1 ground circuit</td></tr>
<tr><td>
</td><td>A. Turn the ignition switch to position "LOCK".
B.Disconnect electronic accelerator pedal position sensor wiring harness connector C07.
C.Turn the ignition switch to position "ON".
D. Measure the resistance between the terminal 2 of electronic accelerator pedal position sensor wiring harness connector C07 and reliable ground.
Standard Resistance Value: less than 5Ω
E. Connect electronic accelerator pedal position sensor wiring harness connector C07.
Is the resistance value normal?
Y
Go to step 4.
N
Repair the fault circuit between terminal 2 of electronic accelerator pedal position sensor wiring harness connector C07 and terminal 74 of ECM wiring harness connector E01.</td></tr>
<tr><td colspan="2">4. Inspect electronic accelerator pedal position sensor 1 signal circuit</td></tr>
</table>

Test Conditions	Details/Results/Actions
 A3113124  A3113125  A3113126	A. Turn the ignition switch to position "LOCK". B. Disconnect the battery cathode cable. C.Disconnect electronic accelerator pedal position sensor wiring harness connector C07. D. Disconnect the engine control module wiring harness connector E01. E. Measure the resistance value between terminal 3 of electronic accelerator pedal position sensor wiring harness connector C07 and terminal 41 of ECM wiring harness connector E01, and check for open circuit. **Standard Resistance Value: less than 5Ω** F. Measure the resistance value between the terminal 3 of electronic accelerator pedal position sensor wiring harness connector C07 and the reliable ground. Inspect for short circuit to ground. **Standard Resistance Value: 10 MΩ or higher** G. Measure the voltage between the terminal 3 of electronic accelerator pedal position sensor wiring harness connector C07 and the reliable ground. Inspect for short circuit to power supply. **Standard Voltage Value: 0 V** H. Connect the wiring harness connectors C07 and E01. Is the circuit normal? **Y** Go to step 5. **N** Repair the fault circuit between terminal 3 of electronic accelerator pedal position sensor wiring harness connector C07 and terminal 41 of ECM wiring harness connector E01.

Test Conditions	Details/Results/Actions
5. Inspect electronic accelerator pedal position sensor 1 signal voltage	
	A.Turn the ignition switch to position "ON". B. Measure the voltage (continuously changing analog voltage) at terminal 3 of wiring harness connector C07 of electronic accelerator pedal position sensor 1 from the back, or observe the data stream. **Standard Voltage:** **Do not depress the accelerator pedal 0.84 V** **Step on the accelerator pedal in the end 4.71 V** Is the voltage normal？ **Y** Go to step 6. **N** Replace the electronic accelerator pedal position sensor.
6. Inspect ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 7. **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
7. Inspect ECM ground circuit	
 	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P2127, P2128, P2138

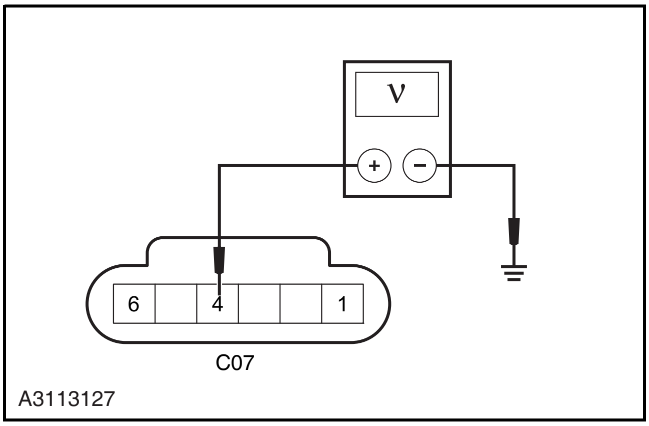
1. Fault code description

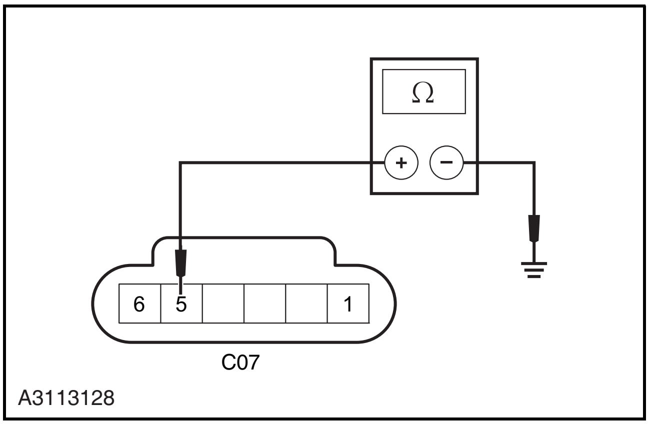
Fault code	Description	Definition
P2127	Electronic accelerator pedal position sensor 2# circuit low voltage	•ECM provides 5 V reference voltage to terminal 4 of electronic accelerator pedal position sensor wiring harness connector C07 through terminal 66 of ECM wiring harness connector E01. •Electronic accelerator pedal position sensor 2 provides signal voltage to terminal 42 of ECM wiring harness connector E01 through terminal 6 of connector C07. •ECM positions terminal 5 of electronic accelerator pedal position sensor 2 wiring harness connector C07 at low electrical potential through terminal 76 of ECM wiring harness connector E01.
P2128	Electronic accelerator pedal position sensor 2# circuit high voltage	
P2138	Electronic accelerator pedal position sensor 1# & 2# circuits correlation fault	

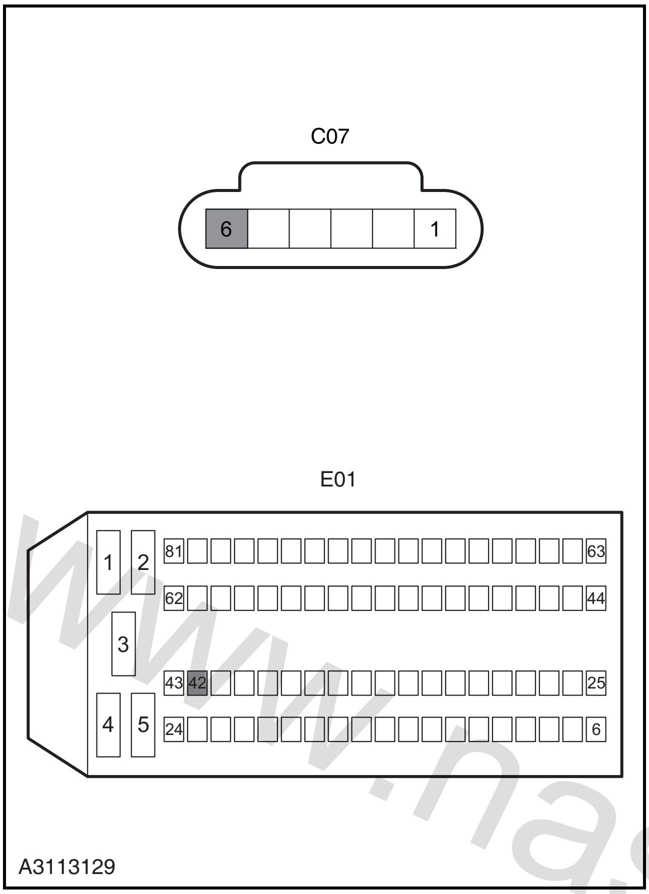
2. Possible Sources

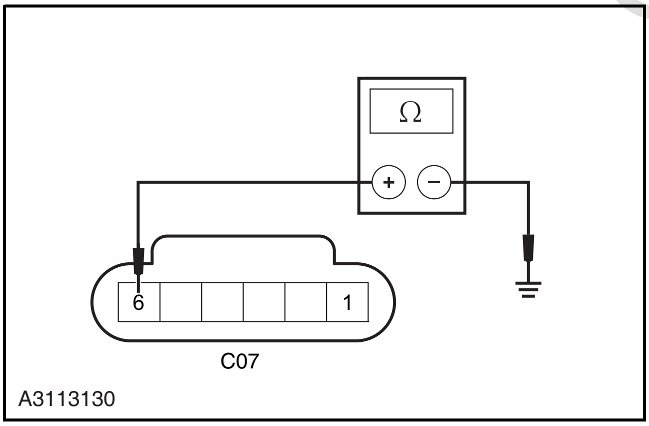
Fault code	Test Tactics	Setting conditions (control strategy)	Fault location
P2127	Hardware, circuit fault	Signal circuit voltage too low, short circuit to ground	•Sensor circuit •Sensor •ECM
P2128		Signal circuit voltage too high, short circuit to power supply	
P2138		ECM compares the APP1 and APP2 input signal, APP1 input signal at all times is two times of APP2, if ECM monitor the APP1 and APP2 input signal can not satisfy this rule, it will report this DTC.	

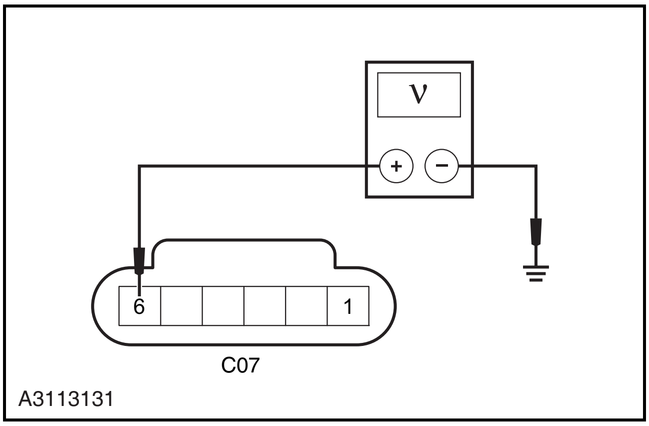
3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A.Inspect sensor wiring harness connector for loose signs. B.Inspect sensor appearance for damage. Is it normal? **Y** Go to step 2. **N** Repair the fault point.
2. Inspect electronic accelerator pedal position sensor 2 power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Disconnect electronic accelerator pedal position sensor wiring harness connector C07. C. Turn the ignition switch to position "ON". D.Measure the voltage between the terminal 4 of electronic accelerator pedal position sensor wiring harness connector C07 and reliable ground. **Standard Voltage Value: 4.5~5.5 V** E. Connect electronic accelerator pedal position sensor wiring harness connector C07. Is the voltage normal？ **Y** Go to step 3. **N** Repair the fault circuit between terminal 4 of electronic accelerator pedal position sensor wiring harness connector C07 and terminal 66 of ECM E01.

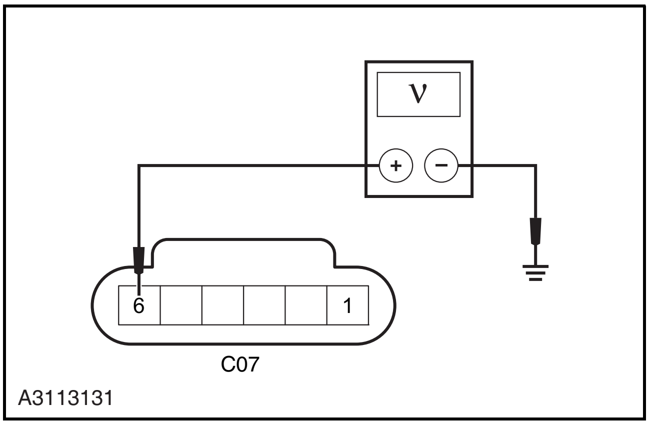
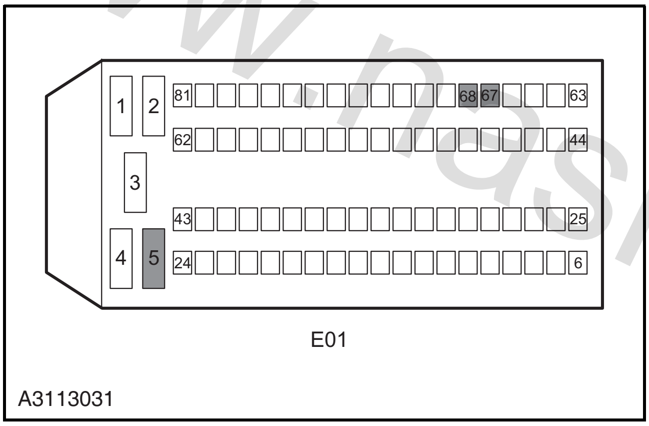
<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">3. Inspect electronic accelerator pedal position sensor 2 ground circuit</td></tr>
<tr><td>
</td><td>A. Turn the ignition switch to position "LOCK".
B. Disconnect electronic accelerator pedal position sensor wiring harness connector C07.
C. Turn the ignition switch to position "ON".
D. Measure the resistance between the terminal 5 of electronic accelerator pedal position sensor wiring harness connector C07 and reliable ground.
Standard Resistance Value: less than 5Ω
E. Connect electronic accelerator pedal position sensor wiring harness connector C07.
Is the resistance value normal?
Y
Go to step 4.
N
Repair the fault circuit between terminal 5 of electronic accelerator pedal position sensor wiring harness connector C07 and terminal 76 of ECM E01.</td></tr>
<tr><td colspan="2">4. Inspect electronic accelerator pedal position sensor 2 signal circuit</td></tr>
</table>

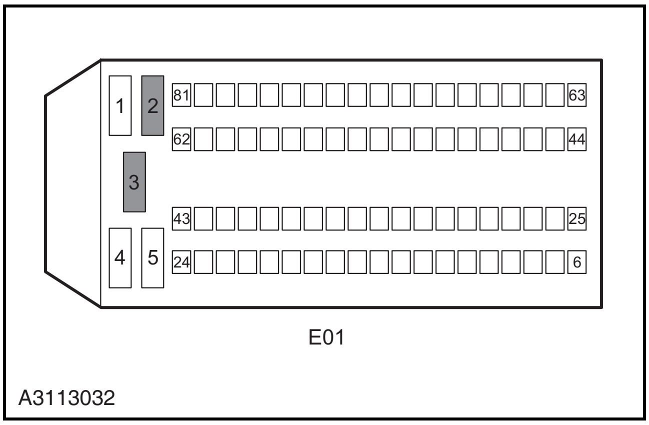
<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td>






</td><td>
A.Turn the ignition switch to position "LOCK".
B.Disconnect the battery cathode cable.
C.Disconnect electronic accelerator pedal position sensor wiring harness connector C07.
D.Disconnect the engine control module wiring harness connector E01.
E.Measure the resistance value between terminal 6 of electronic accelerator pedal position sensor wiring harness connector C07 and terminal 42 of ECM wiring harness connector E01, and check for open circuit.
Standard Resistance Value: less than 5Ω
F.Measure the resistance value between the terminal 6 of electronic accelerator pedal position sensor wiring harness connector C07 and the reliable ground. Inspect for short circuit to ground.
Standard Resistance Value: 10 MΩ or higher
G.Measure the voltage between the terminal 6 of electronic accelerator pedal position sensor wiring harness connector C07 and the reliable ground. Inspect for short circuit to power supply.
Standard Voltage Value: 0 V
H.Connect the wiring harness connectors C07 and E01.
Is the circuit normal?
Y
Go to step 5.
N
Repair the fault circuit between terminal 6 of electronic accelerator pedal position sensor wiring harness connector C07 and terminal 42 of ECM wiring harness connector E01.
</td></tr>
</table>

Test Conditions	Details/Results/Actions
5. Inspect electronic accelerator pedal position sensor 2 signal voltage	
	A. Turn the ignition switch to position "ON". B. Measure the voltage (continuously changing analog voltage) at terminal 6 of wiring harness connector C07 of electronic accelerator pedal position sensor 2 from the back, or observe the data stream. **Standard Voltage:** **Do not depress the accelerator pedal 0.21 V** **Step on the accelerator pedal in the end 2.18 V** Is the voltage normal? **Y** Go to step 6. **N** Replace the electronic accelerator pedal position sensor.
6. Inspect ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 7. **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
7. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC U0001, U0073, U0121, U0140, U0155

1. Fault code description

Fault code	Description	Definition
U0001	CAN communication fault (C001)	ECM communicates with ABS and BCM via CAN network and the diagnostic tool may be used to access ABS, ECM and BCM through diagnostic interface DLC.
U0073	CAN bus off (C073)	
U0121	Loss of communication between ECM and ESP or ABS control module (C121)	
U0140	Loss of communication between ECM and vehicle body control module (C140)	
U0155	Loss of communication between ECM and instrument panel cluster control module (C155)	

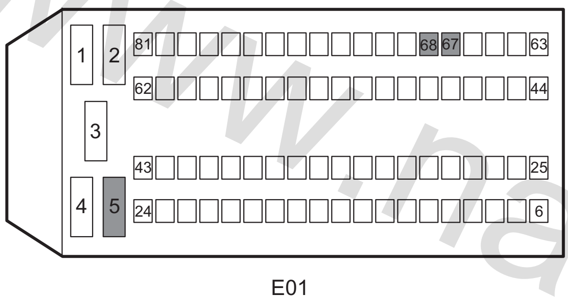
2. Possible Sources

Fault code	Test Tactics	Setting conditions (control strategy)	Fault location

U0001	Hardware Circuit Inspection	Communication signal lost, signal logic error.	CAN bus fault ABS fault ECM fault DLC fault
U0073			
U0121			
U0140			
U0155			

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General inspection	
	A.Inspect the related wiring harness connector for signs of damage, poor contact, aging or loose. Is it normal? **Y** Go to step 2. **N** Repair the fault point.
2. Eliminate Fault code	
	A. Connect the diagnosis tool. B. Use diagnosis tool to delete DTC. C. Swing, pull and press the diagnosis plug DLC, engine control module ECM and vehicle body control module BCM wiring harness connector. D. Use diagnosis tool to redo the diagnosis for DTC. Are there any DTC U0001, U0073, U0121, U0140 or U0155 ? **Y** Go to step 3. **N** **Refer to: Intermittent Fault Diagnosis procedure (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing).**

Test Conditions	Details/Results/Actions
3. Inspect and repair the CAN bus circuit	
	A.Inspect and repair the CAN bus circuit. **Refer to: CAN Bus Integrity Inspection (4.3.16 Onboard Network System, Description and Operation).** Is the network normal? **Y** Go to step 4. **N** Inspect and repair CAN network circuit of each control module, and replace the failed modules.
4. Inspect the ECM power supply circuit	
 A3113031	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminals 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 5. **N** Repair and inspect the ECM power supply circuit.
5. Inspect the ECM ground circuit	
 A3113032	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminals 2 and 3 of the ECM wiring harness connector E01 and the reliable ground with a multimeter. **Standard Resistance Value: less than 5Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System - MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

Removal and Installation

Engine Control Module (ECM)

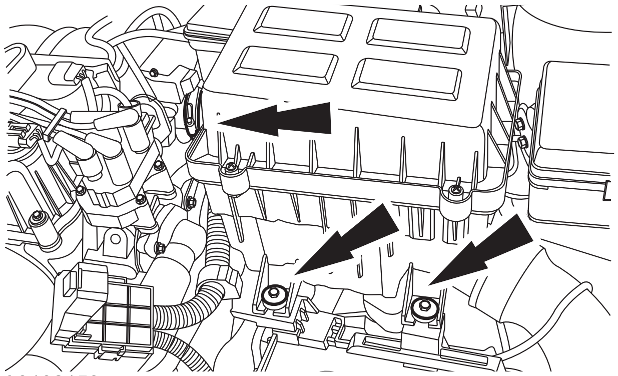
Removal

1. Remove the battery.

   Refer to: Battery (3.1.10 Charging System, Removal and Installation).

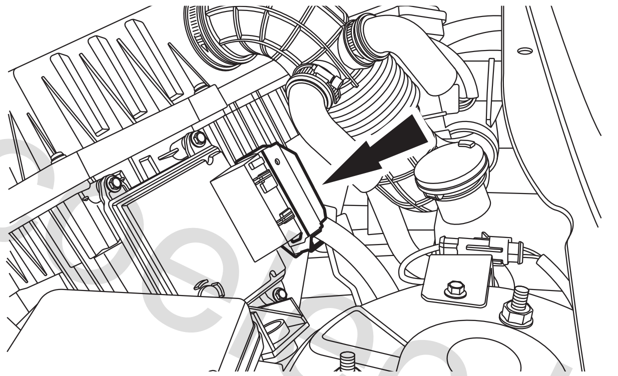
2. Remove the air filter assembly.

   Torque:10 Nm



A3102153

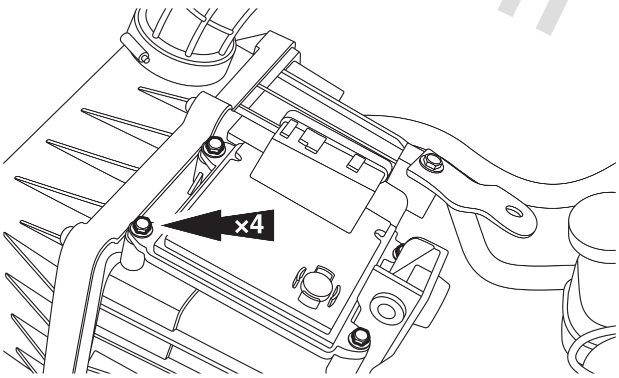
3. Disconnect the engine control module wiring harness connector.



A3102154

4. Remove 4 engine control module retaining bolts and take out the engine control module.

   Torque: 10 Nm



A3113135

Installation

1. To install, reverse the removal procedure.

Crankshaft Position Sensor

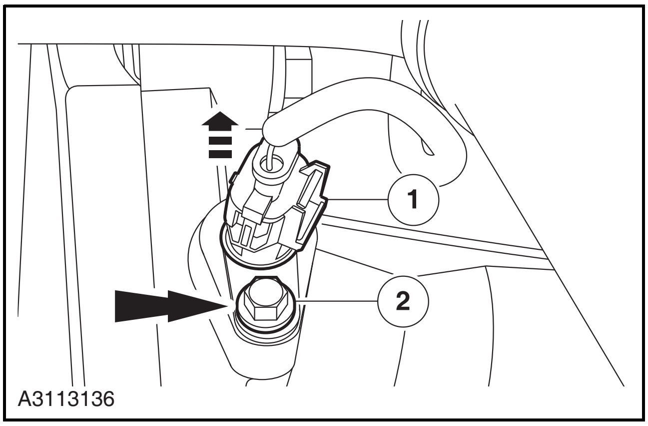
Removal

1. Disconnect the battery negative cable.

   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Disconnect the crankshaft position sensor wiring harness connector.
3. Remove the crankshaft position sensor retaining bolt.

   Torque: 10 Nm



Installation

1. To install, reverse the removal procedure.

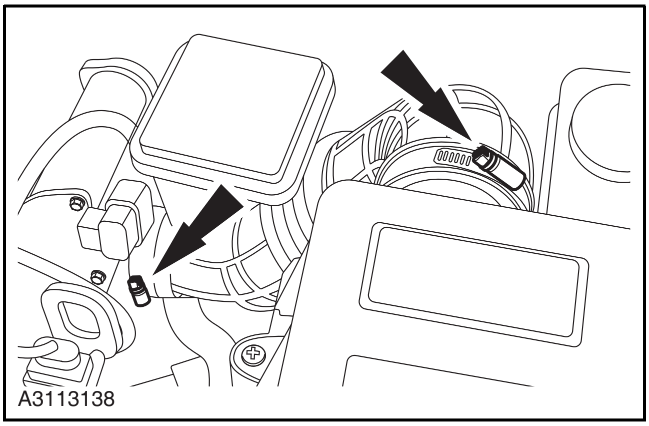
Electrical Throttle Body

Removal

1. Disconnect the battery negative cable.

   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Remove the intake main pipe.

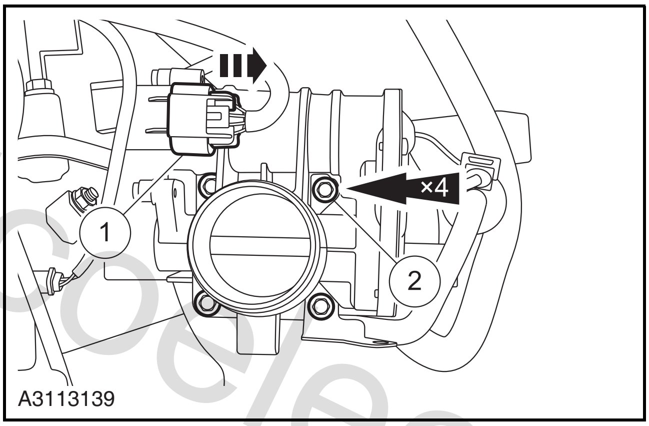


3. Remove the electrical throttle body.

   1. Disconnect the electric throttle body wiring harness connector.

   2. Remove the electric throttle body retaining bolt.

   Torque: 23 Nm



Installation

1. To install, reverse the removal procedure.

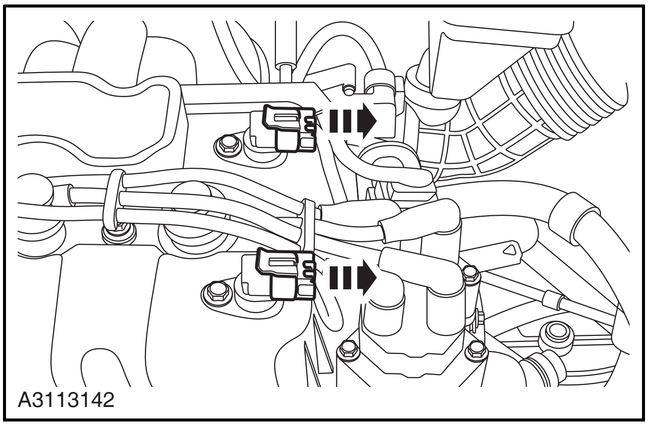
Camshaft Position Sensor

Removal

1. Disconnect the battery negative cable.

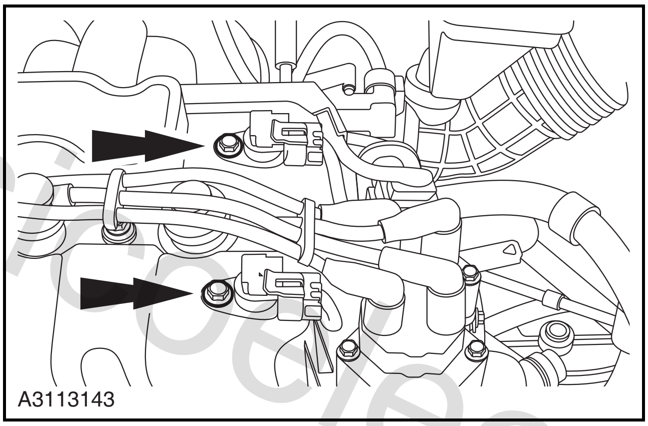
   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Disconnect the camshaft position sensor wiring harness connector.



3. Remove the camshaft position sensor retaining bolt.

   Torque: 10 Nm



Installation

1. To install, reverse the removal procedure.

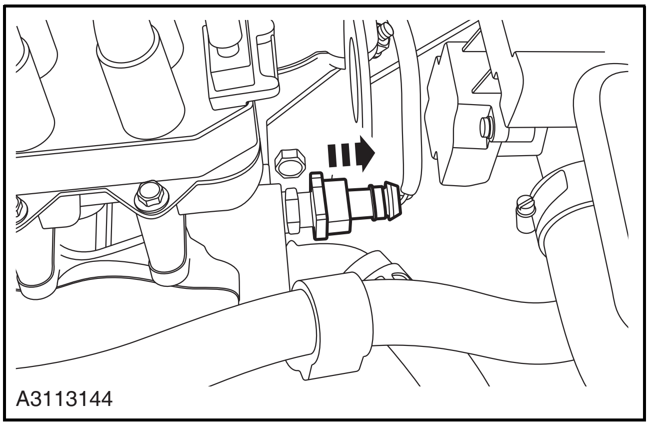
Engine Coolant Temperature Sensor

Removal

1. Disconnect the battery negative cable.

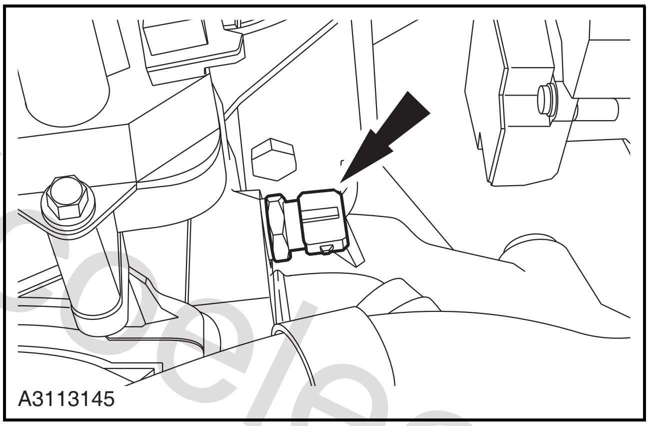
   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Disconnect the engine coolant temperature sensor wiring harness connector.



3. Remove the engine coolant temperature sensor.

   Torque: 20 Nm



Installation

1. To install, reverse the removal procedure.

Air Intake Pressure/ Temperature Sensor

Removal

1. Disconnect the battery negative cable.

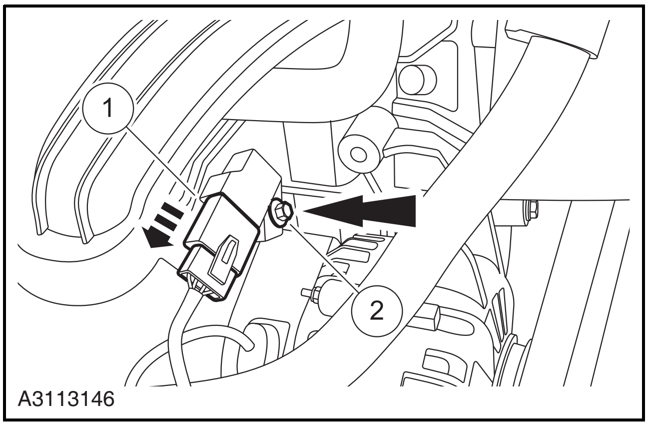
   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Remove the the intake air pressure temperature sensor.

   1. Disconnect the air intake pressure temperature sensor wiring harness connector.

   2. Remove the retaining bolt on the air intake pressure temperature sensor.

   Torque: 10 Nm



Installation

1. To install, reverse the removal procedure.

Fuel Injector

Removal

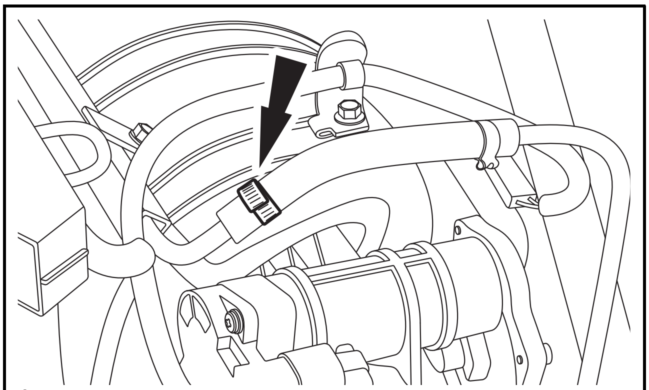
1. Release the fuel pressure.

   Refer to: Fuel System Pressure Test (3.1.7 Fuel System， General Procedures).

2. Disconnect the battery negative cable.

   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

3. Disconnect the fuel inlet pipe.



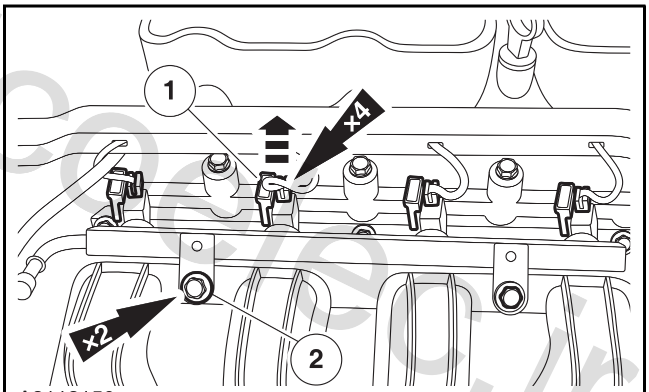
A3113148

4. Remove the fuel distribution pipe.

   1. Disconnect the injector wiring harness connectors in sequence.

   2. Remove the fuel distribution pipe assembly retaining bolt.

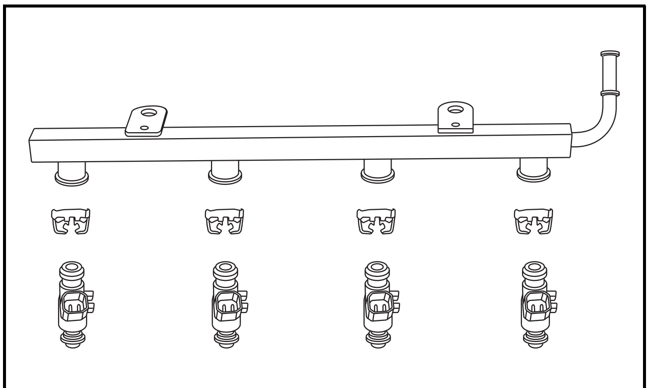
   Torque: 23 Nm



A3113150

5. Remove the injector from the fuel pipe.

   1. Remove the injector retaining clip.
   2. Pull out the injector.



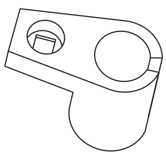
A3113152

Installation

1. To install, reverse the removal procedure.

Pre-Catalytic Oxygen Sensor

Special Tool

 CA301-022	Oxygen Sensor Sleeve CA301-022

Removal

1. Disconnect the battery negative cable.

   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

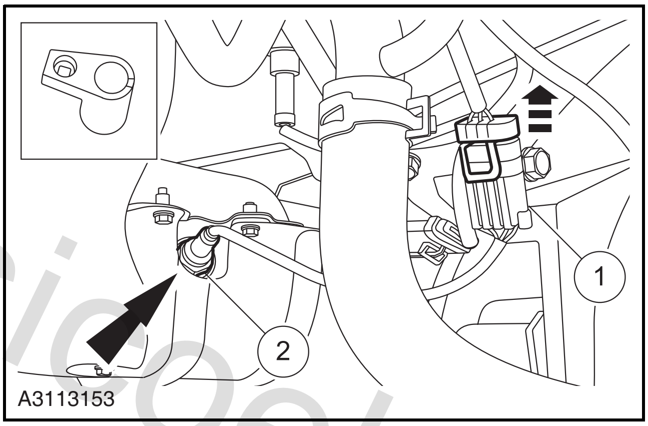
2. Remove the pre-catalytic oxygen sensor.

   1. Disconnect the pre-catalytic oxygen sensor wiring harness connector.

   2. Remove the pre-catalytic oxygen sensor with the oxygen sensor sleeve.

   Torque: 50 Nm

   Special tool: CA301-022

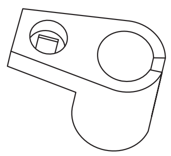


Installation

1. To install, reverse the removal procedure.

Post-Catalytic Oxygen Sensor

Special Tool

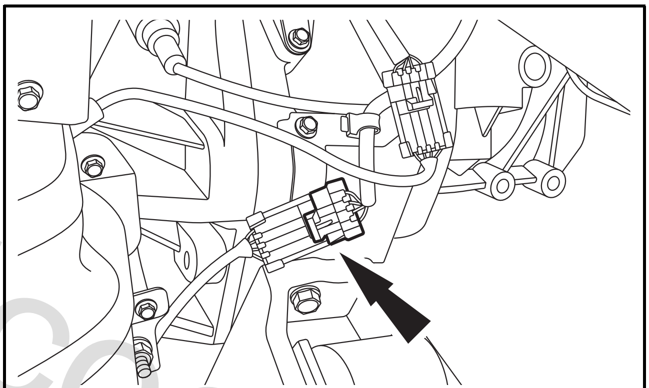
 CA301-022	Oxygen Sensor Sleeve CA301-022

Removal

1. Disconnect the battery negative cable.

   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Disconnect the post-catalytic oxygen sensor wiring harness connector.

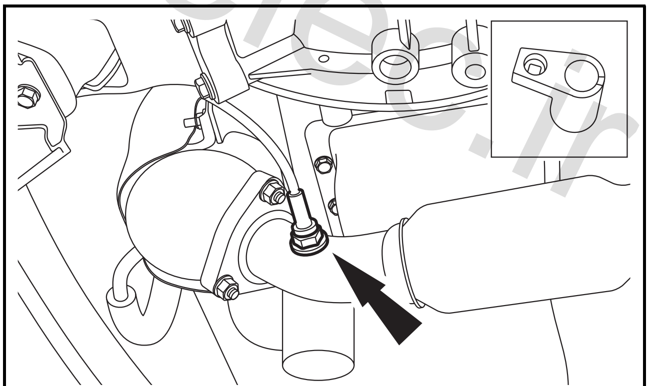


A3113154

3. Remove the post-catalytic oxygen sensor with the oxygen sensor sleeve.

   Torque: 50 Nm

   Special tool: CA301-022



A3113155

Installation

1. To install, reverse the removal procedure.

Knock Sensor

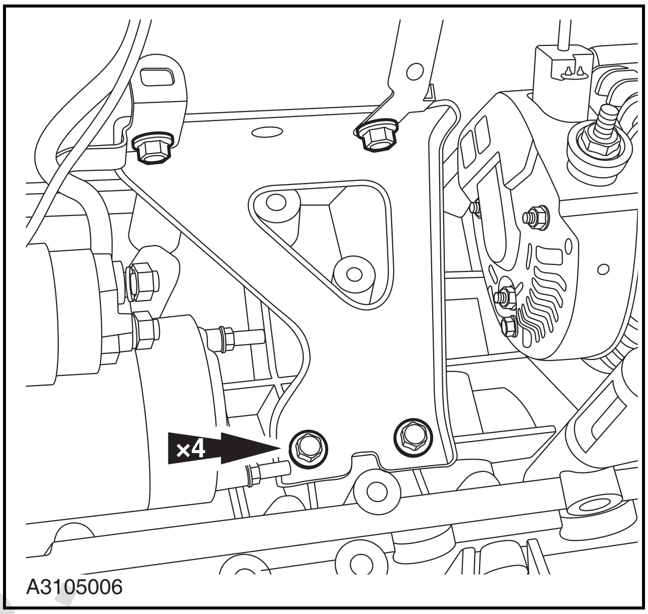
Removal

1. Disconnect the battery negative cable.

   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Remove the intake manifold reinforcement plate retaining bolt.

   Torque: 23 Nm

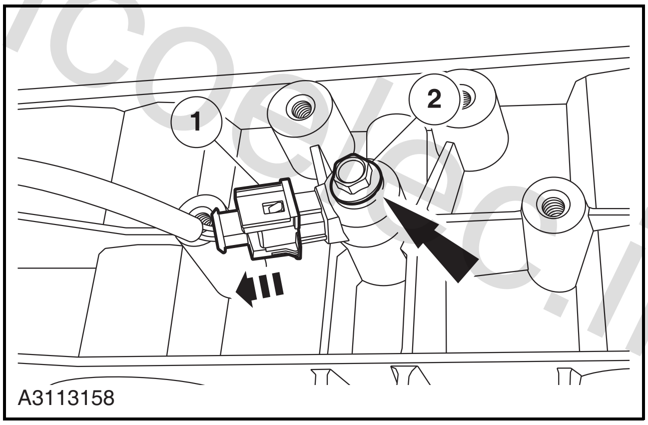


3. Replace the knock sensor.

   1. Disconnect the knock sensor wiring harness connector.

   2. Remove the knock sensor retaining bolt.

   Torque: 23Nm



Installation

1. To install, reverse the removal procedure.

Accelerator Pedal Position Sensor

Removal

1. Disconnect the battery negative cable.

Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

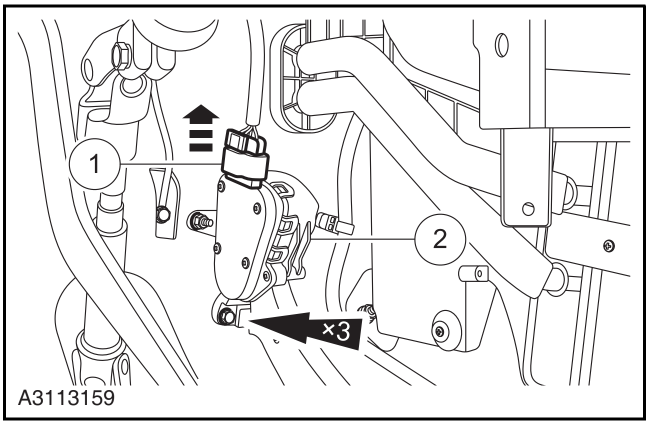
2. Remove the accelerator pedal position sensor.

1. Disconnect the accelerator pedal position sensor wiring harness connector.

2. Remove the accelerator pedal position sensor retaining bolt and nut.

Torque: 32 Nm

3. Remove the accelerator pedal position sensor assembly.



Installation

1. To install, reverse the removal procedure.

Oil Control Valve

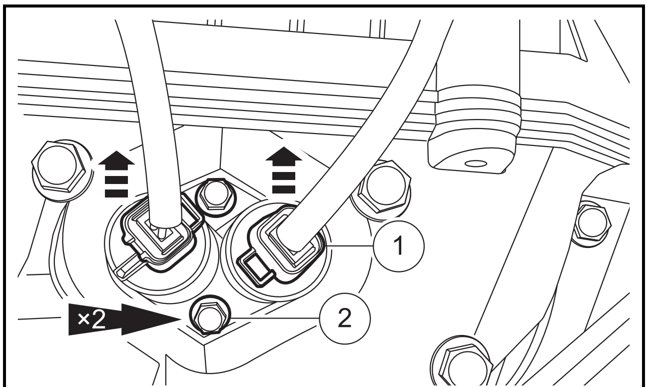
Removal

1. Disconnect the battery negative cable.

   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Disconnect oil control valve wiring harness connector.
3. Remove the oil control valve retaining screw.

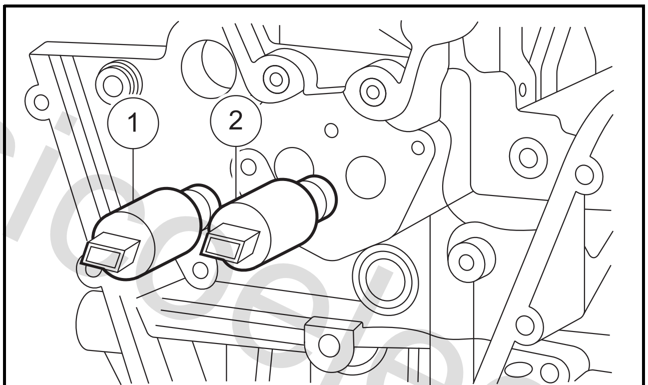
   Torque: 10 Nm



A3113160

4. Take out the oil control valve assembly.

CAUTION: Push the control valve into the cylinder cover installing hole until the control valve installing boss touches the cylinder cover when installing the oil control valve. Do not push the control valve into the holes forcibly by installing bolt. Make sure the clip of the control valve harness wiring connector faces the middle position.



A3102067

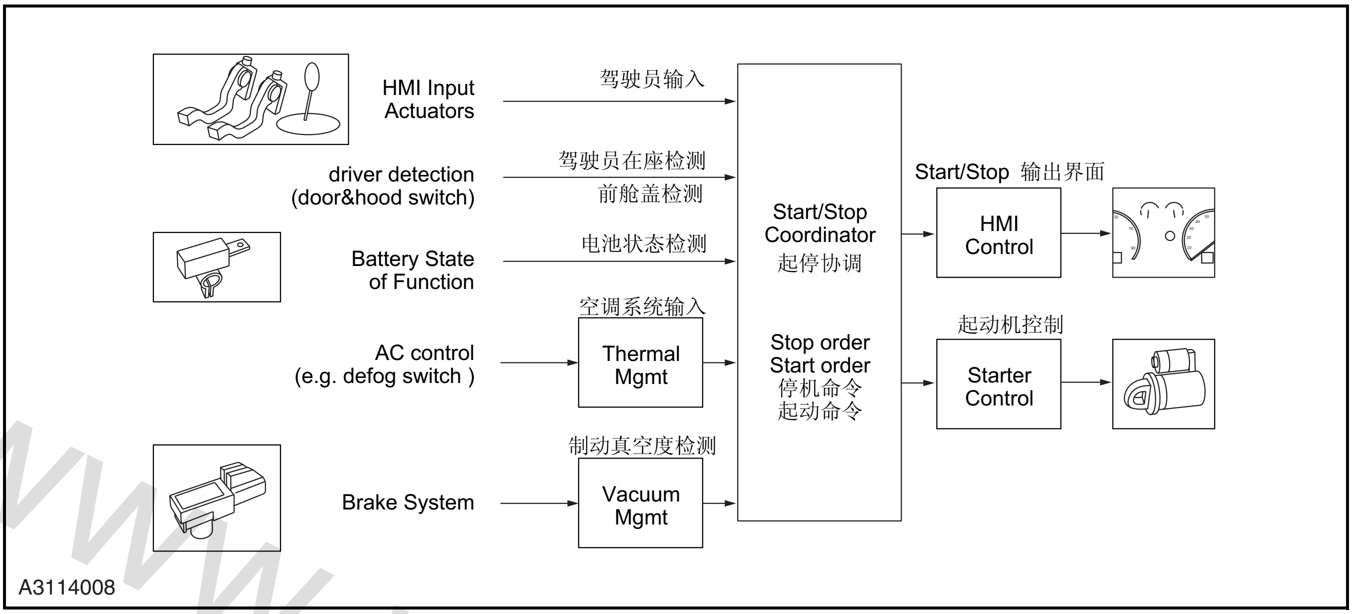
Installation

1. To install, reverse the removal procedure.

Description and Operation

System Overview

Coordinated Start / Stop Control Logic

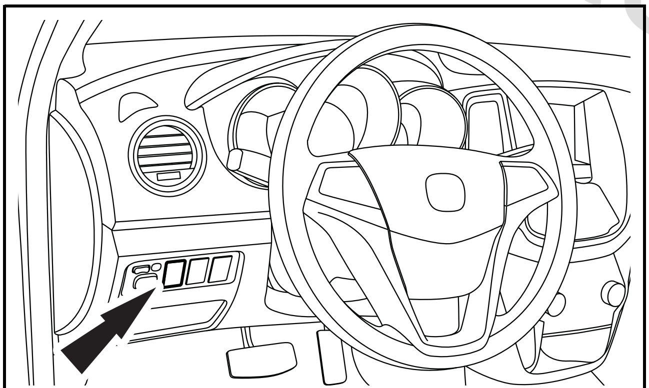


Idle start/stop switch

This system has the auto stop/start feature. When the vehicle is in the working condition (such as stop at red traffic light, short-time stop and etc.) at engine idle speed, the stop/start system will automatically shut down the engine if certain conditions are met. Upon restart, the starter will start working automatically and drive the engine to start quickly. The whole process is intended not to change normal driving habits of the driver and the auto stop/start feature may also be disabled automatically by control of stop/start system's main switch.

1. Main stop/start switch

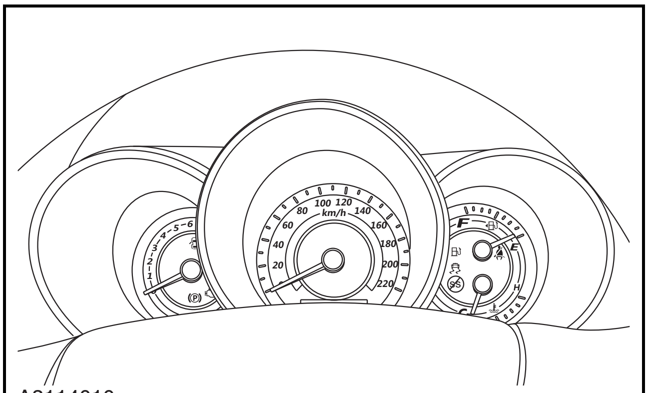
A main stop/start switch is arranged on the switch control box in the driving cab. It is also called as the idle start/stop switch With the key energized, press the button, the green light turns on and the idle stop/start feature is enabled, pressing the button again will turn off the green light and shut down the idle stop/start feature. At any time, the driver can select whether or not restore the vehicle to normal mode by controlling the idle stop/start switch based on actual needs.



A3114009

2. Stop/Start System Status/Malfunction Indicator Lamp(MIL)

A yellow LED indicator is provided on the instrument cluster.



A3114010

The indicator can indicate three stop/start conditions for the driver:

- Yellow LED Off: the stop/start feature is disabled or the idle stop/start is allowed in current condition.
- Yellow LED On: the stop/start feature is enabled and the idle stop/start is not allowed in current condition.
- Yellow remains On after flashing for some time (about 20s): there is a stop/start related fault and the idle stop/start is not allowed.

3. Conditions for Stop/Start service

The stop/start system may enable the engine shutdown according to actual working condition of the vehicle when automatic idle stop/start conditions permit. For driving safety and engine protection, only all of the following conditions are met could the stop/start feature be enabled:

- Driver seated (door closed and pedal operated).
- Engine coolant temperature above certain value (about 60°C).
- Vehicle speed after start exceeds certain value (about 10km/h).
- No stop/start system related component malfunction (e.g. sensor, relay) and pre-inspection of critical signals has been completed already (e.g. signal that the clutch pedal was applied has been acquired).
- Adequate battery capacity.
- Adequate brake boost effort.

4. Auto Idle Stop

Only when the stop/start working indicator turns green could the engine execute the automatic shutdown command.

Stop triggered by driver's operation

The auto stop/start system is to allow the driver's operation of gear shift and clutch pedal to identify driver's stop intent. The command of idle stop may be sent to the engine through the actions below:

1. When current vehicle speed is below 3km/h already.

2. With the vehicle being in a gear, when the driver applies the clutch and sets the gear lever into the neutral, or with the gear lever being in the neutral already, when the driver releases the clutch pedal.

Either of driver's operations above could trigger the stop command and the stop/start system will cause the engine to stop running automatically after recognizing that command.

Stop triggered due to no operation

After the vehicle is triggered to start automatically by the stop/start system, if there is no driver's pedal or gear change operation within certain time limit (about 15s), the system could consider the driver has no starting and driving intent, hence the system will enable engine shutdown to save unnecessary fuel consumption.

If current automatic stop is not the driver's desire, the driver can press the main stop/start switch to disable stop/start feature.

5. Auto Idle Start

Only when the stop/start working indicator turns green could the engine execute the automatic start command.

Start triggered by driver's operation

It is through driver's operation of gear shift, clutch pedal and accelerator pedal that the auto stop/start system identifies driver's start intent. The command of auto start may be sent to the engine through the actions below.

Trigger Mode 1

1. If the gear lever is in the neutral position.

2. The start command is sent when the driver presses the clutch pedal.

Trigger Mode 2

1. If the clutch pedal is pressed to the bottom and the gear lever is the neutral position.

2. The start command is sent when the driver changes into the reversing gear.

Trigger Mode 3

1. When the gear lever is in the neutral position of the clutch pedal has been pressed to the bottom already.

2. The start command is sent when the driver presses the main stop/start switch to disable the stop/start feature.

Trigger Mode 4

1. When the gear lever is in the neutral position of the clutch pedal has been pressed to the bottom already.

2. The start command is sent when the driver presses the accelerator pedal.

Auto Start Triggered by Other Conditions

When the engine enters the auto stop condition, the auto stop/start system will trigger the engine auto start if any of the following conditions occurs.

1. After stop, the vehicle coasts at a speed greater than certain value (about 5km/h).

2. The battery sensor detects a low battery level.

3. The brake vacuum is inadequate when the driver presses the brake pedal several times.

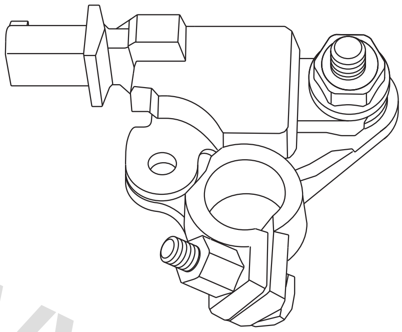
4. The driver turns on A/C or defogger switch, the engine will start automatically since the compressor operation needs to be driven by the engine.

Component Description

The 1.6L low-carbon version control system has additional sensor components and control circuits on the basis of 1.6L normal version.

Electronic Battery Sensor (EBS)

An electronic battery sensor (EBS) is mounted at the battery negative end. Through EBS, the EMS can detect the battery status (voltage, current and energy level) and with the battery related parameters from the sensor, it can determine whether current vehicle meets the stop conditions.



A3114011

Only when the EMS receives the signal allowing stop/stop from the EBS could it execute the auto stop/start command.

Conditions for normal operation of EBS:

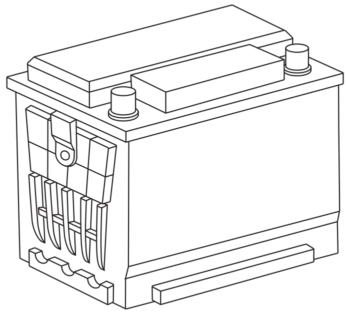
- EBS must properly match with the battery.
- Battery ID shall correspond to the data in EBS.

Enhanced Battery

To meet the needs of stop/start system's frequent stop/start cycles and frequent battery charging/ discharging cycles, the stop/start system uses the enhanced lead-acid battery. For battery replacement, visit the designated professional service shop:

Case 1: The user may select to replace original battery with the battery of the same type.

Case 2: The user may select to replace original battery with the battery type designated by the manufacturer and also needs to update software or data of battery sensor.

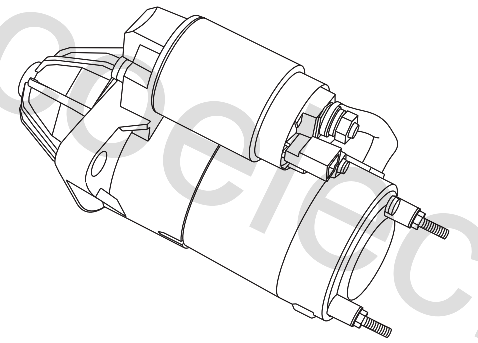


A3114012

Enhanced Starter

To meet requirements of frequent stop/start, the system uses the special enhanced starter having a longer service life. The original starter has significantly increased the use life and start cycles, hence there is no need to worry about starter damage due to frequent stop/stop.

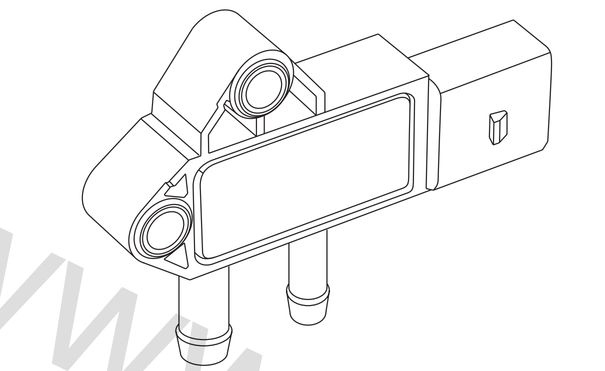
If the starter is damaged, it should be replaced with the starter of same type and the use of a normal starter could impair the start performance and service life.



A3114013

Vacuum Pressure Sensor

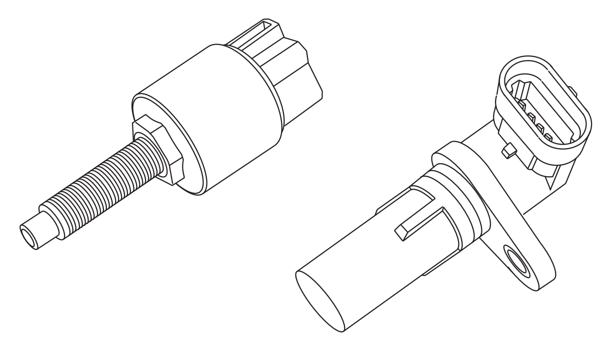
The vacuum pressure sensor is mounted over the brake booster. If the vehicle has no adequate brake boost effort, the idle stop/start system will be in restricted service. The system can monitor the brake pressure with vacuum pressure sensor. If ECM detects that the vacuum pressure signal is irrational, the auto stop/start system will be inoperative.



A3114014

Clutch Low Switch, Neutral Sensor

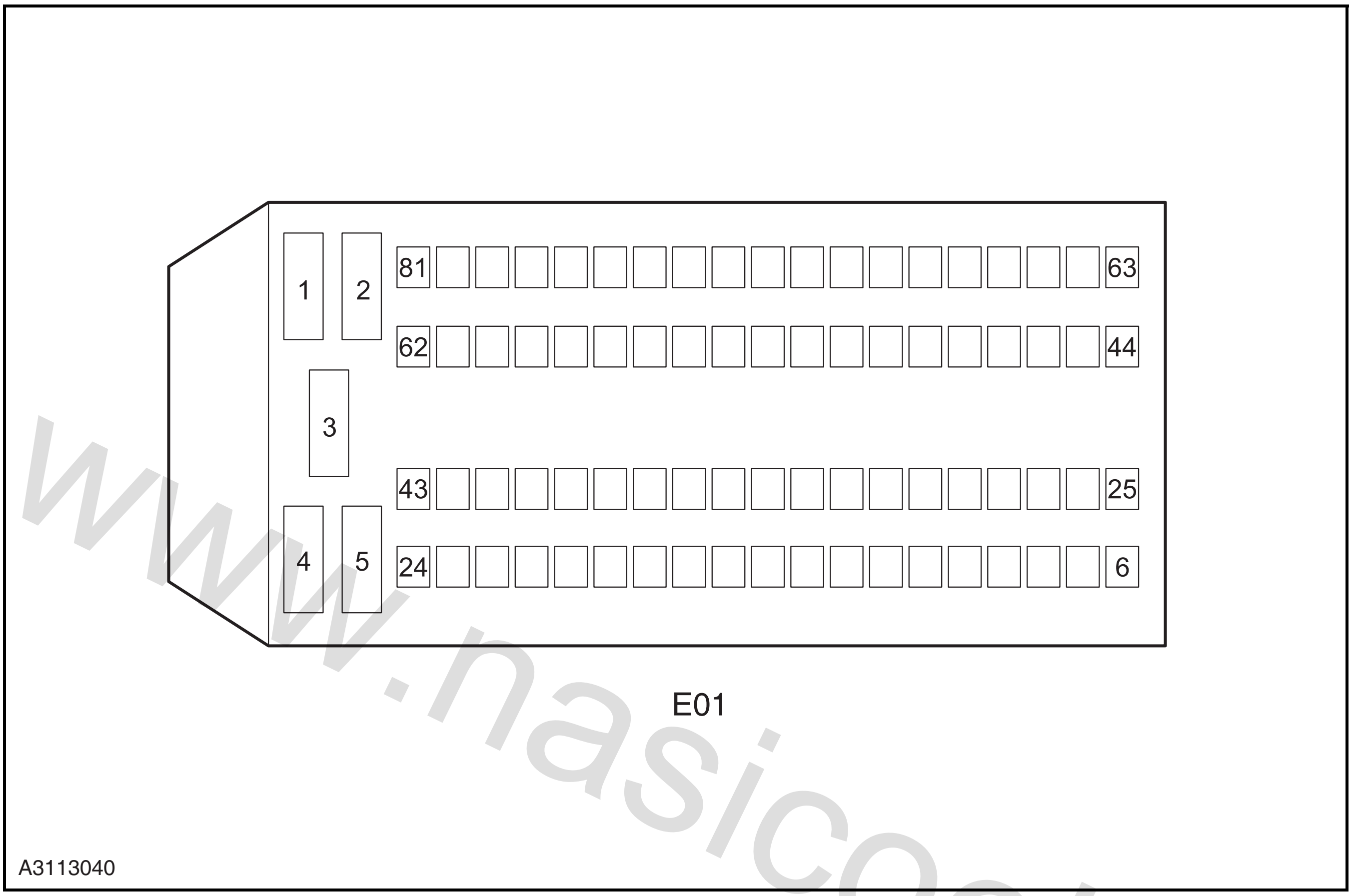
The clutch low switch ① mounted at the low position of clutch pedal and the neutral sensor ② mounted on the transmission work together in the idle stop/start system, and ECM controls auto stop/start action by monitoring their signals.



A3114062

DTC Diagnosis and Test

Control module terminal list



Terminal No.	Connection	Terminal definition	Detailed description of terminal
1	1D01	0.85 LG/WH	Ignition coil (2, 3)signal output
2	1D02	1.25 BK	GND
3	1D03	1.25 BK	GND
4	1D04	0.85 PK/BU	Ignition coil (1, 4) signal output
5	1D05	0.85 BK/BU	ECM power (main relay control)
6	1D06	0.75 BU/RD	Fuel injector 1 signal output
7	1D07	0.85 BK/GN	Fuel injector 3 signal output
8	1D08	0.75 OG/VT	Fuel injector 2 signal output
9	1D09	0.5 BN/RD	Compressor relay signal output
10	1D10	0.5 OG/BN	Fuel pump relay signal output
11	1D11	0.5 GY	Crankshaft position sensor signal (LO)
12	-	-	-

Terminal No.	Connection	Terminal definition	Detailed description of terminal
13	-	-	-
14	-	-	-
15	1D15	0.5 YE/RD	Starter relay signal output
16	1D16	0.5RD/WH	Battery sensor signal
17	1D17	0.5 GN/BK	Cooling fan relay (high speed) signal output
18	-	-	-
19	-	-	-
20	1D20	0.5 GN	Electronic throttle body actuator motor signal (L0)
21	1D21	0.5 YD	Electronic throttle body actuator motor signal (HI)
22	1D22	0.5 VT/BU	OCV exhaust valve signal output
23	1D23	0.85 BK/GY	Post-catalytic oxygen sensor heating wire signal output
24	1D24	0.85 RD/BK	Pre-catalytic oxygen sensor heating wire signal output
25	1D25	0.85 RD/OG	Fuel injector 4 signal output
26	-	-	-
27	1D27	0.5 YE/WH	Electronic throttle position sensor signal 2
28	-	-	-
29	-	-	-
30	1D30	0.5 BU	Crankshaft position sensor signal (HI)
31	-	-	-
32	1D32	0.5 BK/BU	vacuum level sensor signal
33	1D33	0.5 WH	Brake light signal
34	1D34	0.5 OG/BK	Blower ON signal
35	1D35	0.85 OG/WH	Compressor signal.
36	1D36	0.5 GY/RD	Knock sensor signal (HI)
37	1D37	0.5 GY/GN	Knock sensor signal (LO)
38	1D38	0.3 LG/BK	CAN-L
39	1D39	0.3 LG	CAN-H
40	1D40	0.5 WH/PK	Signal of the refrigerant pressure switch

Terminal No.	Connection	Terminal definition	Detailed description of terminal
41	1D41	0.5 YE/OG	Electronic accelerator pedal sensor signal 1
42	1D42	0.5 BN/WH	Electronic accelerator pedal sensor signal 2
43	1D43	0.5 BU/YE	OCV intake valve signal output
44	1D44	0.5 RD/OG	Main relay signal output
45	1D45	0.5 BN/BK	Drive chain relay output
46	-	-	-
47	1D47	0.5 RD/WH	Pre-catalytic oxygen sensor signal
48	1D48	0.5 BU/GN	Post-catalytic oxygen sensor signal
49	1D49	0.5 YE/BN	Water temperature sensor signal
50	-	-	-
51	-	-	-
52	1D52	0.5 BN/YE	Electronic throttle position sensor signal 1
53	1D53	0.5 GY/BU	Idle start/stop switch
54	1D54	0.5 GY/VT	Inlet air pressure sensor signal
55	-	-	-
56	1D56	0.5 BN/BU	Neutral gear sensor signal input
57	1D57	0.5 BN	Clutch bottom switch signal
58	1D58	0.5 WH/YE	Exhaust camshaft position sensor signal
59	-	-	-
60	1D60	0.5 RD/GN	Power steering switch signal
61	-	-	-
62	-	-	-
63	-	-	-
64	1D64	0.75 BK/GN	Canister solenoid signal output
65	1D65	0.5 GY/YE	Radiator fan relay (low speed) signal output
66	1D66	0.5 YE/BK	5V power output
67	1D67	0.5 PK/YE	ECM power (+B)
68	1D68	0.5 WH/RD	ECM power (IG1)
69	1D69	0.5 BN/BU	Brake switch signal
70	1D70	0.5 VT/YE	5V power output

Terminal No.	Connection	Terminal definition	Detailed description of terminal
71	1D71	0.5 BU/BN	Air intake temperature sensor signal
72	1D72	0.5 VT	Starter power signal
73	1D73	0.5 OG	Sensor internal grounding
74	1D74	0.5 PK/WH	Sensor internal grounding
75	1D75	0.5 YE/GN	K-LINE
76	1D76	0.5 GN/WH	Sensor internal grounding
77	1D77	0.5 PK/BK	Intake camshaft position sensor signal
78	-	-	-
79	1D79	0.5 PK/BN	Clutch switch signal
80	-	-	-
81	-	-	-

Diagnostic Trouble Code (DTC) Type

Fault type	Definition
Type A	For the first "Fail", MIL will be illuminated and DTC recorded. If a fault disappears automatically and the "Passed Key Cycle" self-diagnosis is passed in 3 consecutive strokes, the indicator will turn off automatically and the fault will be deleted after consecutive 40 warm-up cycles without malfunction. The misfire fault leading to catalyst damage is defined as Type A.
Type B	Only when one "Fail Key Cycle" occurs during each of two consecutive strokes could MIL be illuminated and DTC recorded. If a fault disappears automatically and the "Passed Key Cycle" self-diagnosis is passed in 3 consecutive strokes, the indicator will turn off automatically and the fault will be deleted after 40 consecutive warm-up cycles without malfunction. The misfire fault leading to emission damage is defined as Type B.
Type C	The MIL will be illuminated immediately after the diagnostic result "Fail" comes out and will turn off after the diagnostic result "Pass" comes out. Or, the indicator turns on for 1s upon start of new "Key Cycle", the system automatically considers the diagnosis as "Pass" and turn off the indicator.
Type E	Only when one "Fail Key Cycle" occurs during each of three consecutive strokes could MIL be illuminated and DTC recorded. If a fault disappears automatically and the "Passed Key Cycle" self-diagnosis is passed in 3 consecutive strokes, the indicator will turn off automatically and the fault will be deleted after 40 consecutive warm-up cycles without malfunction.
Type Z	The fault diagnosis system will make no diagnosis of Type Z faults.

DTC code list

Fault code	Description	Fault	Is the MIL on ?	Is the SVS lamp on ?
P0011	Intake VCP phase response lagging	A	√	-
P0012	Intake VCP camshaft phase error big	A	√	-
P0014	Exhaust VCP phase response lagging	A	√	-
P0015	Exhaust VCP camshaft phase error big	A	√	-
P0016	Intake VCP cam tooth learning deviation out of range	A	√	-
P0017	Exhaust VCP cam tooth learning deviation out of range	A	√	-
P0026	Intake VCP hydraulic control valve clamped	A	√	-
P0027	Exhaust VCP hydraulic control valve clamped	A	√	-
P0031	Pre-catalytic oxygen sensor heater circuit short to low voltage	A	√	-
P0032	Pre-catalytic oxygen sensor heater circuit short to high voltage	A	√	-
P0037	Post-catalytic oxygen sensor heater circuit short to low voltage	A	√	-
P0038	Post-catalytic oxygen sensor heater circuit short to high voltage	A	√	-
P0068	Electronic throttle air flow error	A	√	-
P0076	Intake VCP hydraulic control valve coil low voltage or open circuit	A	√	-
P0077	Intake VCP hydraulic control valve coil high voltage	A	√	-
P0079	Exhaust VCP hydraulic control valve coil low voltage or open circuit	A	√	-
P0080	Exhaust VCP hydraulic control valve coil high voltage	A	√	-
P0105	Inlet air pressure sensor signal clamp	E	√	-
P0106	Intake air pressure/throttle position rationale fault	E	√	-
P0107	Intake air pressure sensor circuit low voltage or open	A	√	-
P0108	Intake air pressure sensor circuit high voltage	A	√	-
P0112	Air intake temperature sensor circuit low voltage	E	√	-
P0113	Intake air temperature sensor circuit high voltage or open	E	√	-

Fault code	Description	Fault	Is the MIL on ?	Is the SVS lamp on ?
P0117	Coolant temperature sensor circuit low voltage	A	√	-
P0118	Coolant temperature sensor circuit high voltage or open	A	√	-
P0122	Electronic throttle position sensor 1# circuit low voltage	A	√	-
P0123	Electronic throttle position sensor 1# circuit high voltage	A	√	-
P0131	Pre-catalytic oxygen sensor circuit short to low voltage	E	√	-
P0132	Pre-catalytic oxygen sensor circuit short to high voltage	E	√	
P0133	Pre-catalytic oxygen sensor response too slow	E	√	-
P0134	Pre-catalytic oxygen sensor open circuit	A	√	-
P0137	Post-catalytic oxygen sensor short circuit to low voltage	E	√	-
P0138	Post-catalytic oxygen sensor short circuit to high voltage	E	√	-
P0140	Post-catalytic oxygen sensor open circuit	E	√	-
P0171	Fuel system too lean in non-idle condition	E	√	-
P0172	Fuel system too dense in non-idle condition	E	√	-
P0222	Electronic throttle position sensor 2# circuit low voltage	A	√	-
P0223	Electronic throttle position sensor 2# circuit high voltage	A	√	-
P0230	Fuel pump relay fault	A	√	-
P0261	Cylinder 1 injector circuit low voltage	A	√	-
P0262	Cylinder 1 injector circuit high voltage	A	√	-
P0264	Cylinder 2 injector circuit low voltage	A	√	-
P0265	Cylinder 2 injector circuit high voltage	A	√	-
P0267	Cylinder 3 injector circuit low voltage	A	√	-
P0268	Cylinder 3 injector circuit high voltage	A	√	-
P0270	Cylinder 4 injector circuit low voltage	A	√	-
P0271	Cylinder 4 injector circuit high voltage	A	√	-
P0300	Single/multiple cylinder misfire	A/B	√	-
P0324	Knock control system malfunction	C	-	√
P0325	Knock sensor fault	C	-	√

Fault code	Description	Fault	Is the MIL on ?	Is the SVS lamp on ?
P0335	Crankshaft position sensor circuit no signal	A	√	-
P0336	Crankshaft position sensor circuit signal interference	E	√	-
P0340	Intake/exhaust VCP camshaft position sensor status diagnosis	A	√	-
P0341	Intake VCP target wheel diagnosis fault	A	√	
P0351	Cylinder 1 & 4 ignition coil fault	A	√	-
P0352	Cylinder 2 & 3 ignition coil fault	A	√	-
P0366	Exhaust VCP target wheel - CAM sensor fault	A	√	-
P0420	Catalytic converter efficiency low	A	√	-
P0458	Canister solenoid circuit short to low voltage or open	E	√	-
P0459	Canister solenoid circuit short to high voltage	E	√	-
P0480	Low speed fan fault	C	-	√
P0481	High speed fan fault	C	-	√
P0502	No vehicle speed sensor signal (speed from CAN communication)	E	√	-
P0504	Brake switch correlation fault	C		√
P0506	Low idle speed	E	√	-
P0507	High idle speed	E	√	-
P0551	Power steering switch circuit voltage range/performance	C	-	√
P0562	Low system voltage	C	-	√
P0563	High system voltage	C	-	√
P0571	Braking light switch status not change during application	E	√	-
P0602	ECM programming error (software version un-match)	A	√	-
P0604	RAM error	A	√	-
P0606	ECM processor fault	A	√	-
P060A	ECM processor fault	A	√	
P0641	ETC reference voltage A# amplitude	A	√	-
P0646	A/C clutch relay circuit short to low voltage or open	C	-	√
P0647	A/C clutch relay circuit short to high voltage	C	-	√
P0651	ETC reference voltage B# amplitude	A	√	-

Fault code	Description	Fault	Is the MIL on ?	Is the SVS lamp on ?
P0685	Main relay fault	A	√	-
P0831	Clutch switch circuit signal low (short to supply or open circuit)	C	-	√
P0832	Clutch switch circuit signal low (short to ground)	C	-	√
P1167	Pre-catalytic oxygen sensor - Rich in deceleration and fuel cutoff	E	√	-
P1171	Pre-catalytic oxygen sensor - Lean in acceleration and fuel richening	E	√	-
P1337	58-tooth gear error not learned	A	√	-
P1516	ETC drive stable state diagnosis error	A	√	-
P2101	ETC drive step 2 diagnosis error	A	√	-
P2104	Engine forced idle	A	√	-
P2105	Engine forced shutdown	A	√	-
P2106	Engine performance limit	A	√	-
P2110	Engine power management	A	√	-
P2119	Electronic throttle returning fault	C	-	√
P2122	Electronic accelerator pedal position sensor 1# circuit voltage is low	A	√	-
P2123	Electronic accelerator pedal position sensor 1# circuit voltage is high	A	√	-
P2127	Electronic accelerator pedal position sensor 2# circuit voltage is low	A	√	-
P2128	Electronic accelerator pedal position sensor 2# circuit voltage is high	A	√	-
P2135	Electronic throttle position sensor circuits 1 & 2 correlation	E	√	-
P2138	Electronic accelerator position sensor circuits 1 & 2 correlation	A	√	-
P2187	Fuel system too lean at idle	E	√	-
P2188	Fuel system too rich at idle	E	√	-
U0001	CAN communication malfunction(C001)	A	√	-
U0073	CAN bus off (C073)	A	√	-
U0121	Loss of communication between ECM and ESP or ABS control module (C121)	C	-	√
U0140	Lost ECM communication with body control module (C140)	C	-	√

Fault code	Description	Fault	Is the MIL on ?	Is the SVS lamp on ?
U0155	Lost ECM communication with instrument panel cluster control module (C155)	C	-	√
P0557	Brake boost chamber pressure sensor short to low voltage	C	-	√
P0558	Brake boost chamber pressure sensor short circuit to high voltage	C	-	√
P0616	Starter relay circuit short circuit to high voltage	A	√	-
P0617	Starter relay circuit short circuit to low voltage or open circuit	A	√	-
P0831	Clutch switch circuit signal always low (short circuit to ground)	C	-	√
P0832	Clutch switch circuit signal always high (short circuit to power supply or open circuit)	C	-	√
P1515	Starter status feedback signal off or short circuit to high voltage	C	-	√
P1560	Lost ECM communication with EBS	C	-	√
P1561	Drive chain signal short to low voltage(drain chain, neutral position, clutch low switch correlation fault)	C	-	√
P1562	Drive chain signal short to low voltage (drain chain, neutral position, clutch low switch correlation fault)	C	-	√
P1563	Drive chain signal short to low voltage (drain chain, neutral position, clutch low switch correlation fault)	C	-	√
P1564	Drive chain signal short to low voltage (drain chain, neutral position, clutch low switch correlation fault)	C	-	√
P1614	Drive chain relay sticking	C	-	√
P1615	Starter relay or drive chain relay not pick up	C	-	√
P1616	Starter relay sticking	C	-	√
P1565	Main stop/start switch signal noise fault	C	-	√
P1566	Main stop/start switch signal sticking fault	C	-	√
P1661	Stop/start warning lamp output circuit short circuit to low voltage or open circuit	C	-	√
P1662	Stop/start warning lamp output circuit short circuit to high voltage	C	-	√

Fault code	Description	Fault	Is the MIL on ?	Is the SVS lamp on ?
P1663	Stop/start status indicator lamp output circuit short circuit to low voltage or open circuit	C	-	√
P1664	Stop/start status indicator lamp output circuit short circuit to high voltage	C	-	√

Data stream list

By reading the "Data Stream List" on the diagnosis tool, do not remove any component, and inspect the working state of switches, sensors, and actuators. Before diagnosis the fault of the engine Electronic control system the observation and analysis of data is the first step in troubleshooting, this can reduce the troubleshooting time.

CAUTION: The following table lists the data under normal conditions, only for reference. Do not determine the failure based on these standard values. Generally, use a normal vehicle to compare a vehicle in diagnosis under the same state to determine the data of the diagnosis vehicle under the current state normal or not.

1. Let the engine reach normal operating temperature.
2. Turn the ignition switch to position "LOCK".
3. Connect the Diagnosis tool.
4. Turn the ignition switch to ON position.
5. Select "Changan Auto"/"C201"/"DELPHI MT22.1_V2.2(CAN)"/"Read Data Stream"/"Diagnostic Data".
6. Refer to the chart below to inspect all the data.

Data Stream Item	Ignition switch ON	Idle running	Engine rotate speed 2,500 rpm
Current calculated load value	0.0%	21.96%	19.22%
Current non-default coolant temperature	82 ℃	79 ℃	90 ℃
Current short-term fuel correction (Bank 1)	%	-1.56%	-3.91%
Current long-term fuel correction (Bank 1)	1.56%	2.34%	0.0%
Current non-default absolute boost pressure	98 kPa	42 kPa	33 kPa
Current non-default engine speed	0.0 RPM	740 rpm	2500 rpm
Current non-default vehicle speed	0 KPH	0 KPH	0 KPH
Current commanded Cylinder 1 spark advance angle	0°	3°	13°
Current non-default intake air temperature	31 ℃	26 ℃	33 ℃

Data Stream Item	Ignition switch ON	Idle running	Engine rotate speed 2,500 rpm
Current non-default absolute throttle position A	17.25%	14.12%	18.04%
Non-default pre-catalytic oxygen sensor voltage	0.81 V	0.75 V	0.71 V
Pre-catalytic sensor short-term fuel correction	0.0%	-1.56%	-3.12%
Non-default post-catalytic oxygen sensor voltage	0.68 V	0.68 V	1.12 V
Post-catalytic oxygen sensor short-term fuel correction	99.22%	99.22%	99.22%
Vehicle travel distance until MIL ON	0 Km	0 Km	0 Km
Evaporator purge rate	0.0%	0.0%	5.10%
Fuel level input	90.59%	90.59%	90.59%
OBD warm-ups after DTC clearance	0 Cycles	0 Cycles	0 Cycles
Vehicle travel distance after DTC clearance	0 km	0 km	0 km
Barometric pressure	98 kPa	98 kPa	98 kPa
Pre-catalytic oxygen sensor catalyst temperature	190 ℃	361 ℃	210 ℃
Control module voltage	12.349 V	13.949 V	14.124 V
Absolute load value	0.0%	23.53%	19.61%
Control equivalent ratio	0.787 Ratio	0.999 Ratio	Ratio
Relative throttle position	7.45%	3.92%	8.24%
Absolute throttle position B	18.43%	14.90%	18.82%
Acceleration pedal position D	14.51%	14.51%	17.65%
Acceleration pedal position E	7.06%	7.06%	8.63%
Commanded throttle excitation control	9.41%	5.49%	11.37%
Vehicle working time until MIL ON	0 Minutes	0 Minutes	0 Minutes
Ignition voltage	12.3 V	13.8 V	14.0 V
A/C pressure A/D conversion	0.0 V	0.0 V	0.0 V
Pre-catalytic oxygen sensor	803 mV	122 mV	512 mV
Post-catalytic oxygen sensor heater	681 mV	582 mV	699 mV
Linear EGR feedback A/D conversion	0.0 V	0.0 V	0.0 V
Fuel tank vacuum pressure A/D conversion	0.0 V	0.0 V	0.0 V
Linear specified EGR	0.0%	0.0%	0.0%

Data Stream Item	Ignition switch ON	Idle running	Engine rotate speed 2,500 rpm
Fuel level sensor A/D conversion	0.0 V	0.0 V	0.0 V
Engine cam activity	0 Counts	0 Counts	0 Counts
Rotating speed or vehicle speed input	0 KPH	0 KPH	0 KPH
Coolant temperature signal (start)	℃	31 ℃	75 ℃
EEVAP valve duty cycle	0.0%	0.0%	0.0%
EGR duty cycle	0.0%	0.0%	0.0%
Fuel correction unit	19 Cell#	18 Cell#	2 Cell#
Ideal idle speed	1161.5 RPM	712.5 RPM	762.5 RPM
Carried BPW	3.68 MS	2.94 MS	2.3 3MS
Ideal linear EGR position	0.0%	0.0%	0.0%
Barometric pressure	98.52 KPA	98.52 KPA	98.5 KPA
Air/fuel ratio	Ratio	14.5 Ratio	14.5 Ratio
Knock counter	0 Counts	0 Counts	0 Counts
Engine running time.	0 Seconds	612 Seconds	442 Seconds
Calculated catalyst temperature	600 ℃	360 ℃	618 ℃
Knock retard	0°	0°	0°
Calculated air flow	0.0 GPS	2.53 GPS	7.45 GPS
EGR shutoff valve position	0.0%	0.0%	0.0%
EGR test sample count	0 Test	0 Test	0 Test
EGR EWMA limits	32768 Counts	32768 Counts	32768 Counts
EGR EWMA result (service)	32768 Counts	32768 Counts	32768 Counts
EGR valve position error	200.00 Counts	200.00 Counts	200.00 Counts
Pre-catalytic oxygen sensor response to lean-rich conversion	0 Counts	0 Counts	0 Counts
Cylinder mode misfire	65535 Counts	0 Counts	0 Counts
Conversion mode misfire	65535 Counts	0 Counts	0 Counts
Misfire period retard counter	0 Counts	1 Counts	47 Counts
Total misfires	0 Counts	0 Counts	0 Counts
Cylinder 1 historical misfire	0 Counts	0 Counts	0 Counts
Cylinder 2 historical misfire	0 Counts	0 Counts	0 Counts
Cylinder 3 historical misfire	0 Counts	0 Counts	0 Counts
Cylinder 4 historical misfire	0 Counts	0 Counts	0 Counts
Cylinder 2 current misfire	0 Counts	0 Counts	0 Counts

Data Stream Item	Ignition switch ON	Idle running	Engine rotate speed 2,500 rpm
Cylinder 1 current misfire	0 Counts	0 Counts	0 Counts
Cylinder 3 current misfire	0 Counts	0 Counts	0 Counts
Cylinder 4 current misfire	0 Counts	0 Counts	0 Counts
Pre-catalytic oxygen sensor rich-to-lean and lean-to-rich response ratio	0.0 Ratio	0.0 Ratio	0.0 Ratio
Pre-catalytic oxygen sensor response to rich-lean conversion	0 Counts	0 Counts	0 Counts
Engine odometer	0 KM	0 KM	0 KM
Misfire fault after first failure	0 Counts	0 Counts	0 Counts
Misfire pass after first failure	1 Counts	1 Counts	1 Counts
Pre-catalytic oxygen sensor response - total lean-to-rich time	0.0 ms	0.0 ms	0.0 ms
Pre-catalytic oxygen sensor response - total rich-to-lean time	0.0 ms	0.0 ms	0.0 ms
Pre-catalytic oxygen sensor response - average lean-to-rich time	0.0 ms	0.0 ms	0.0 ms
Idle error	-1168.88 rpm	-11.88 rpm	1746.38 rpm
ETC accelerator pedal position	0.0%	0.0%	3.61%
ETC throttle indicator position	10.63%	5.55%	%
ETC pedal position sensor #1	0.0%	0.0%	3.51%
ETC pedal position sensor #2	0.0%	0.0%	3.32%
ETC throttle position sensor #1	7.60%	4.08%	8.18%
ETC throttle position sensor #2	7.61%	3.86%	8.58%
Fuel level output	90.98%	90.98%	90.98%
Pre-catalytic oxygen sensor - average rich-to-lean time	0.0 ms	0.0 ms	0.0 ms
Air intake temperature sensor	33 ℃	22 ℃	35 ℃
Intake air pressure difference	kpa	0.0 KPA	0.0 KPA
G sensor	0.0 V	0.0 V	0.0 V
TEC rich-to-lean attempt	Counts	Counts	Counts
ETC ideal throttle position	9.62%	562	12.12%
Cylinder 1 TEC learning value	32751 Counts	32751 Counts	32751 Counts
Cylinder 2 TEC learning value	32784 Counts	32784 Counts	32784 Counts
Cylinder 3 TEC learning value	32751 Counts	32751 Counts	32751 Counts
Cylinder 4 TEC learning value	32784 Counts	32784 Counts	32784 Counts

Data Stream Item	Ignition switch ON	Idle running	Engine rotate speed 2,500 rpm
EGR EWMA result	32768 Counts	32768 Counts	32768 Counts
EGR deceleration test pass counter	0 Counts	0 Counts	0 Counts
EGR deceleration test fail counter	0 Counts	0 Counts	0 Counts
Knock sensor fail counter	0 Counts	0 Counts	0 Counts
Knock sensor sampling counter	0 Counts	0 Counts	0 Counts
Knock system fault high counter	0 Counts	0 Counts	0 Counts
Knock system fault low counter	0 Counts	0 Counts	0 Counts
Knock system sampling counter	0 Counts	0 Counts	0 Counts
Idle catalyst monitoring oxygen storage EWMA value	0.0 Seconds	0.0 Seconds	0.0 Seconds
Idle catalyst oxygen storage fail limits	0.0 Seconds	0.0 Seconds	0.0 Seconds
A/C pressure	0 KPA	0 KPA	0 KPA
Ideal intake cam phase position	0°	0°	0°
Ideal exhaust cam phase position	0°	0°	-25°
Actual intake cam phase position	0°	0°	0°
Actual exhaust cam phase position	0°	0°	-25°
Duty ratio of intake cam phase	0.0E%	0.0E%	0.0E%
Duty ratio of exhaust cam phase	0.0E%	0.0E%	0.49 E
Current pre-catalytic oxygen sensor heating	0.50 E	0.50 E	0.50 E
Front and post-catalytic oxygen sensor heater	0.50 E	0.50 E	0.50 E
ICMD enabled min. catalyst temperature	500 ℃	500 ℃	500 ℃
ICMD enabled max. catalyst temperature	900 ℃	900 ℃	℃
Idle catalyst monitoring time - final test results	Seconds	0.0 Seconds	0.0 Seconds
Idle catalyst monitoring status timer	0.0 Seconds	0.0 Seconds	0.0 Seconds
ETC powerless throttle position	10.51%	10.51%	10.51%
Cruise speed error	0 Kph	0 Kph	0 Kph
Target cruise speed	0 Kph	0 Kph	0 Kph
Target engine torque during cruise	-200 Nm	-200 Nm	-200 Nm
Decisive VCPC enabled oil temperature	77 ℃	84 ℃	93 ℃
Current pre-catalytic oxygen sensor heating	0.50 Amps	0.50 Amps	0.50 Amps

Data Stream Item	Ignition switch ON	Idle running	Engine rotate speed 2,500 rpm
Current post-catalytic oxygen sensor heating	0.50 Amps	0.50 Amps	0.50 Amps

System Status List

By reading the "Data Stream List" on the diagnosis tool, do not remove any component, and inspect the working state of switches, sensors, and actuators. Before diagnosis the fault of the engine Electronic control system the observation and analysis of data is the first step in troubleshooting, this can reduce the troubleshooting time.

CAUTION: The following table lists the data under normal conditions, only for reference. Do not determine the failure based on these standard values. Generally, use a normal vehicle to compare a vehicle in diagnosis under the same state to determine the data of the diagnosis vehicle uner the current state normal or not.

1. Let the engine reach normal operating temperature.
2. Turn the ignition switch to position "LOCK".
3. Connect the Diagnosis tool.
4. Turn the ignition switch to "ON" position.
5. Select "Changan Auto"/"C201"/"DELPHI MT22.1_V2.2(CAN)"/"Read Data Flow"/"System Status".
6. Refer to the chart below to inspect all the data.

System Name	Ignition switch "ON"	Idle running	Engine rotate speed 2500 rpm
MIL Condition	Off	Off	Off
Misfire monitoring	Supported	Supported	Supported
Fuel system monitoring	Supported	Supported	Supported
Comprehensive component monitoring	Supported	Supported	Supported
Misfire monitoring Test finished	Completed	Completed	Completed
Fuel system monitoring Test finished	Completed	Completed	Completed
Comprehensive component monitoring Test finished	Completed	Completed	Completed
Catalyst test	Supported	Supported	Supported
Catalyst heating test	Unsupported	Unsupported	Unsupported
Enhanced evaporator purge system test	Unsupported	Unsupported	Unsupported
Secondary air injection test	Unsupported	Unsupported	Unsupported
A/C system refrigerant test	Unsupported	Unsupported	Unsupported

System Name	Ignition switch "ON"	Idle running	Engine rotate speed 2500 rpm
Oxygen sensor test	Supported	Supported	Supported
Oxygen sensor heating test	Supported	Supported	Supported
Exhaust gas recirculation system test	Supported	Supported	Supported
Catalyst test finished	Completed	Completed	Completed
Catalyst heating test finished	Uncompleted	Uncompleted	Uncompleted
Enhanced evaporator purge system test finished	Uncompleted	Uncompleted	Uncompleted
Secondary air injection test finished	Uncompleted	Uncompleted	Uncompleted
A/C system refrigerant test finished	Uncompleted	Uncompleted	Uncompleted
Oxygen sensor test finished	Completed	Completed	Completed
Oxygen sensor heating test finished	Uncompleted	Uncompleted	Uncompleted
Exhaust recirculation system test finished	Completed	Completed	Completed
Current first fuel system condition	Closed-loop conditions not met	Closed loop	Closed loop
Current second fuel system condition	Closed loop, but only one used	Closed loop, but only one used	Closed loop, but only one used
B1-S1	Online	Online	Online
B1-S2	Online	Online	Online
B1-S3	Offline	Offline	Offline
B1-S4	Offline	Offline	Offline
B2-S1	Offline	Offline	Offline
B2-S2	Offline	Offline	Offline
B2-S3	Offline	Offline	Offline
B2-S4	Offline	Offline	Offline
Type of OBD system	EOBD	EOBD	EOBD
Throttle idle	Yes	Yes	No
Power steering	No	No	No
AC request	No	No	No
A/C clutch	No	No	No
Catalyst protection mode	No	No	No
Fuel pump commanded ON	No	Yes	Yes
MIL lamp	On	Off	Off
SVS light	Off	Off	Off
Low fuel level light	Off	Off	Off

System Name	Ignition switch "ON"	Idle running	Engine rotate speed 2500 rpm
VIM valve	Off	Off	Off
Oil shutoff active	No	No	No
Closed loop	No	Yes	Yes
Pre-catalytic oxygen sensor ready	Yes	Yes	Yes
Vehicle throttle stop	Inactivated	Inactivated	Inactivated
Fuel correction learning	No	Yes	Yes
Power strong	No	No	No
Knock exist	No	No	No
Rich/lean, pre-catalytic oxygen sensor	Rich	Lean	Lean
Low-speed fan	Off	Off	Off
High-speed fan	Off	Off	Off
P/N position	P / N	P / N	P / N
ETC mode	Normal	Normal	Normal
Poor road shielding misfire data	No	No	No
Camshaft pulse error in current key cycle	Error	Error	Error
EVAP outlet valve	No	No	No
EGR valve OFF position error	Error	Error	Error
Idle enable test	Error	Error	Error
EGR flow valve test allowance	Error	Error	Error
Main condition of pre-catalytic oxygen sensor	Data acquisition	Data acquisition	Data acquisition
Poor cylinder	Misfire undetected	Misfire undetected	Misfire undetected
Cam phase main enable package mark	No	Yes	Yes
Cam phase indicates all diagnosis unrelated enable conditions	No	Yes	Yes
Idle catalyst monitoring test condition	Test inactive	Test inactive	Test inactive
Cruise activation light	Off	Off	Off
Cruise enable light	Off	Off	Off

Active test list

By reading the "Active Test List" on the diagnosis tool, do not remove any components, inspect the work state of relay and actuator that controlled by ECM. Before the fault diagnosis of the engine Electronic control system the observation and analysis of active test is the precondition in troubleshooting, this can reduce the troubleshooting time.

CAUTION: The following table lists the data under normal conditions, only for reference. Do not determine the failure based on these standard values. Generally, use a normal vehicle to compare a vehicle in diagnosis under the same state to determine the data of the diagnosis vehicle uner the current state normal or not.

1. Let the engine reach normal operating temperature.
2. Turn the ignition switch to position "LOCK".
3. Connect the Diagnosis tool.
4. Turn the ignition switch to "ON" position.
5. Select "Changan Auto"/"C201"/"DELPHI MT22.1_V2.2(CAN)"/"Motion Test".
6. Refer to the chart below, carry out active test.

Diagnostic tool item	Part	Control range	Diagnostic description
Malfunction Indicator Lamp	Enable the engine malfunction indicator (MIL)	On/Off	When engine is running or ignition switch is on, engine control module will send requirement to the instrument to turn on the start malfunction indicator lamp after receiving command, and the instrument will turn on /off the fault indicator light with 3 ~ 5s.
Fuel pump	Enable the fuel pump relay	On/Off	**CAUTION: This test can only be carried out only when vehicle speed is 0 and speed sensor is with no fault.** This function could control fuel pump relay. When the command is "ON", the fuel pump relay will be energized/de-energized within 3~5s.
Low-speed fan	Enable low speed EDF relay	On/Off	**CAUTION: Carry out the test only when engine coolant temperature is lower than 100 ℃ (212 ºF) with A/C switch off.** This function could control low speed EDF relay. When the command is "ON", the electronic fan will be started at low speed for 5s.

Diagnostic tool item	Part	Control range	Diagnostic description
High-speed fan	Enable high speed EDF relay	On/Off	**CAUTION: Carry out the test only when engine coolant temperature is lower than 100 ℃ (212 ºF) with A/C switch off.** This function could control high speed EDF relay. When the command is "ON", the electronic fan will be started at high speed for 5s.
AC compressor	Enable A/C compressor clutch relay	On/Off	**CAUTION: Carry out the test only when ignition switch is at "ON" position, engine is not running.** The function controls A/C compressor relay. When the instruction is "ON",the A/C compressor relay will be ON/OFF within 3-5s.
Canister ventilation	Enable the active carbon canister ventilation valve	On/Off	This feature can control vent valve of activated carbon canister. When the command is "ON", the vent valve will be opened/closed within 3~5s.
Close injection nozzle	Do not use fuel injection to prevent the work of injector	Shut off Cylinder 1/ Shut off Cylinder 2/ Shut off Cylinder 3/ Shut off Cylinder 4/	**CAUTION: This function can not turn off two fuel injectors at the same time, carry out the test only when vehicle speed is 0, and speed sensor is with no fault, oxygen sensor signal display is thin.** This function can forbid fuel injector movement, detect fuel injector sealing state.
Variable air intake valve	Enable the variable air valve	On/Off	This feature can control variable air intake valve. When the command is "ON", the variable air intake valve will be opened/closed within 3~5s.
Canister purge valve	Enable the canister purge valve	0 ~ 24	**CAUTION: This feature could be tested only when the fuel tank pressure is maintained within the protective limits, the engine is running and the vehicle speed is zero.** Control the carbon canister control command, which is between 0 ~ 24, realizing control over purge flow

Diagnostic tool item	Part	Control range	Diagnostic description
EGR (Exhaust gas recirculation)	Enable the exhaust gas recirculation valve	0 ~ 24	**CAUTION: This feature could be tested only when the engine is running and the vehicle speed is zero.** Control EGR control command, which is between 0 ~ 24, realizing control over EGR flow
Ignition advance angle	Test ignition advance angle	Confirmation/ Cancel	**CAUTION: This feature could be tested only when the engine is running and the vehicle speed is zero.** This feature can detect the spark advance angle of engine.
Fuel level	Test the fuel quantity in the fuel tank	0 ~ 24	**CAUTION: This feature could be tested only when the engine is running and the vehicle speed is zero.** Control the fuel level sensor control command from 0 ~ 24 for the control of fuel level sensor.
Tachometer	Control engine speed to set speed	0 ~ 24	**CAUTION: This feature could be tested only when the engine is running and the vehicle speed is zero.** Control the ECM control command from 0 to 24 for the control of engine speed.
ETC motor	Enable the electronic throttle actuator motor	0 ~ 24	**CAUTION: Carry out the test only when ignition switch is at "ON" position, engine is not running.** Control the throttle actuator motor control command from 0 to 24 for the control of throttle opening.
Intake camshaft phaser	Test intake camshaft phaser	0 ~ 24	**CAUTION: This feature could be tested only when the engine is running and the vehicle speed is zero.** Control the intake oil control valve command from 0 to 24 for the control of intake camshaft phase.

Diagnostic tool item	Part	Control range	Diagnostic description
Intake camshaft phaser oil control valve	Enable the intake camshaft phaser oil control valve	0 ~ 24	**CAUTION: Carry out the test only when ignition switch is at "ON" position, engine is not running.** Control the intake camshaft phaser oil control valve command from 0 to 24 for the OPEN control of intake camshaft phaser oil control valve.
Exhaust camshaft phaser	Test exhaust camshaft phaser	0 ~ 24	**CAUTION: This feature could be tested only when the engine is running and the vehicle speed is zero.** Control the exhaust oil control valve command from 0 to 24 for the control of exhaust camshaft phase.
Exhaust camshaft phaser oil control valve	Enable exhaust camshaft phaser oil control valve	0 ~ 24	**CAUTION: Carry out the test only when ignition switch is at "ON" position, engine is not running.** Control the exhaust camshaft phaser oil control valve command from 0 to 24 for the OPEN control of exhaust camshaft phaser oil control valve.
Tooth information learning	Enter into tooth information learning	Start/Stop	**CAUTION: This feature could be tested only when the engine is running and the vehicle speed is zero.** Vehicles with new ECM shall go through the tooth information learning.
BLM learning	Enter into BLM learning	Start/Stop	**CAUTION: This feature could be tested only when the engine is running and the vehicle speed is zero.** Vehicles with new brake light switch shall go through the BLM learning.
Fuel open-loop control	Enable fuel open-loop control	Open/Exit	**CAUTION: This feature could be tested only when the engine is running and the vehicle speed is zero.** Conduct open-loop control of the engine.

Diagnostic tool item	Part	Control range	Diagnostic description
Idle catalyst monitoring	Enable idle catalyst monitoring	Open/Exit	**CAUTION: This feature could be tested only when the engine is running and the vehicle speed is zero.** Test catalytic results of three-way catalyst.
Oxygen sensor response	Test oxygen sensor	Open/Exit	**CAUTION: This feature could be tested only when the engine is running and the vehicle speed is zero.** Test working condition of oxygen sensor
Target idle speed	Control engine speed to set speed	0 ~ 24	**CAUTION: This feature could be tested only when the engine is running and the vehicle speed is zero.** Control the carbon canister control command, which is between 0 ~ 24, realizing control over cleaning flow.
BLM reset	Clear the brake light switch self-learning value	Reset	**CAUTION: Carry out the test only when ignition switch is at "ON" position, engine is not running.** Know about the brake light switch self-learning value stored by the engine.
Reset TPS learning value	Clear the electronic throttle position sensor self-learning value	Reset	**CAUTION: Carry out the test only when ignition switch is at "ON" position, engine is not running.** Clear self-learning value that been stored by engine.

DTC diagnosis flow index

Fault code	Description	Diagnosis Procedures
P0011	Intake VCP phase response lagging	Refer to: DTC P0011, P0012, P0016, P0340, P0341
P0012	Intake VCP camshaft phase error big	
P0016	Intake VCP cam tooth learning deviation out of range	
P0340	Intake/exhaust VCP camshaft position sensor status diagnosis	
P0341	Intake VCP target wheel diagnosis fault	
P0026	Intake VCP hydraulic control valve clamped	Refer to: DTC P0026, P0076, P0077
P0076	Intake VCP hydraulic control valve coil low voltage or open circuit	
P0077	Intake VCP hydraulic control valve coil high voltage	
P0014	Exhaust VCP phase response lagging	Refer to: DTC P0011, P0012, P0016, P0340, P0341
P0015	Exhaust VCP camshaft phase error big	
P0017	Exhaust VCP cam tooth learning deviation out of range	
P0366	Exhaust VCP target wheel - CAM sensor fault	
P0027	Exhaust VCP hydraulic control valve clamped	Refer to: DTC P0026, P0076, P0077
P0079	Exhaust VCP hydraulic control valve coil low voltage or open circuit	
P0080	Exhaust VCP hydraulic control valve coil high voltage	
P0031	Pre-catalytic oxygen sensor heater circuit short to low voltage	Refer to: DTC P0031, P0032
P0032	Pre-catalytic oxygen sensor heater circuit short to high voltage	
P0037	Post-catalytic oxygen sensor heater circuit short to low voltage	Refer to: DTC P0037, P0038
P0038	Post-catalyticr oxygen sensor heater circuit short to high voltage	
P0068	Electronic throttle air flow error	Refer to: DTC P0641, P0651
P2119	Electronic throttle returning fault	

Fault code	Description	Diagnosis Procedures
P0105	Inlet air pressure sensor signal clamp	Refer to: DTC P0105, P0106, P0107, P0108
P0106	Intake air pressure/throttle position rationale fault	
P0107	Intake air pressure sensor circuit low voltage or open	
P0108	Intake air pressure sensor circuit high voltage	
P0112	Air intake temperature sensor circuit low voltage	Refer to: DTC P0112, P0113
P0113	Intake air temperature sensor circuit high voltage or open	
P0117	Coolant temperature sensor circuit low voltage	Refer to: DTC P0117, P0118
P0118	Coolant temperature sensor circuit high voltage or open	
P0122	Electronic throttle position sensor 1# circuit low voltage	Refer to: DTC P0122, P0123, P2135
P0123	Electronic throttle position sensor 1# circuit high voltage	
P2135	Electronic throttle position sensor circuits 1 & 2 correlation fault	
P0131	Pre-catalytic oxygen sensor circuit short to low voltage	Refer to: DTC P0131, P0132, P0133, P0134
P0132	Pre-catalytic oxygen sensor circuit short to high voltage	
P0133	Pre-catalytic oxygen sensor response too slow	
P0134	Pre-catalytic oxygen sensor open circuit	
P0137	Post-catalytic oxygen sensor short circuit to low voltage	Refer to: DTC P0137, P0138, P0140
P0138	Post-catalytic oxygen sensor short circuit to high voltage	
P0140	Post-catalytic oxygen sensor open circuit	
P0171	Fuel system too lean in non-idle condition	Refer to: DTC P0171, P0172, P2187, P2188
P0172	Fuel system too dense in non-idle condition	
P2187	Fuel system too lean at idle	
P2188	Fuel system too rich at idle	

Fault code	Description	Diagnosis Procedures
P0222	Electronic throttle position sensor 2# circuit low voltage	Refer to: DTC P0222, P0223, P2135
P0223	Electronic throttle position sensor 2# circuit high voltage	
P2135	Electronic throttle position sensor circuits 1 & 2 correlation fault	
P0230	Fuel pump relay fault	Refer to: DTC P0230
P0261	Cylinder 1 injector circuit low voltage	Refer to: DTC P0261, P0262
P0262	Cylinder 1 injector circuit high voltage	
P0264	Cylinder 2 injector circuit low voltage	Refer to: DTC P0261, P0262
P0265	Cylinder 2 injector circuit high voltage	
P0267	Cylinder 3 injector circuit low voltage	Refer to: DTC P0261, P0262
P0268	Cylinder 3 injector circuit high voltage	
P0270	Cylinder 4 injector circuit low voltage	Refer to: DTC P0261, P0262
P0271	Cylinder 4 injector circuit high voltage	
P0300	Single/multiple cylinder misfire	Refer to: DTC P0300
P0324	Knock control system malfunction	Refer to: DTC P0324, P0325
P0325	Knock sensor fault	
P0335	Crankshaft position sensor circuit no signal	Refer to: DTC P0335, P0336
P0336	Crankshaft position sensor circuit signal interference	
P0351	Cylinder 1 & 4 ignition coil fault	Refer to: DTC P0351
P0352	Cylinder 2 & 3 ignition coil fault	Refer to: DTC P0351
P0420	Catalytic converter efficiency low	Refer to: DTC P0420
P0458	Canister solenoid circuit short to low voltage or open	Refer to: DTC P0458, P0459
P0459	Canister solenoid circuit short to high voltage	
P0480	Low speed fan fault	Refer to: DTC P0480
P0481	High speed fan fault	Refer to: DTC P0481
P0504	Brake switch correlation fault	Refer to: DTC P0504, P0571
P0571	Braking light switch status not change during application	
P0506	Low idle speed	Refer to: DTC P0506, P0507
P0507	High idle speed	
P0551	Power steering switch circuit voltage range/ performance	Refer to: DTC P0551

Fault code	Description	Diagnosis Procedures
P0562	The system voltage is low	Refer to: DTC P0562, P0563
P0563	High system voltage	
P0602	ECM programming error (software version un-match)	Refer to: DTC P0602, P0604, P0606, P060A
P0604	RAM error	
P0606	ECM processor fault	
P060A	ECM processor fault	
P0641	ETC reference voltage A# amplitude	Refer to: DTC P0641, P0651
P0651	ETC reference voltage B# amplitude	
P0646	A/C clutch relay circuit short to low voltage or open	Refer to: DTC P0646, P0647
P0647	A/C clutch relay circuit short to high voltage	
P0685	Main relay fault	Refer to: DTC P0685
P0831	Clutch switch circuit signal low (short to supply or open circuit)	Refer to: DTC P0831, P0832
P0832	Clutch switch circuit signal low (short to ground)	
P1167	Pre-catalytic oxygen sensor - Rich in deceler-ation and fuel cutoff	Refer to: DTC P0131, P0132, P0133, P0134
P1171	Pre-catalytic oxygen sensor - Lean in acceler-ation and fuel richening	
P1336	58-tooth gear error not learned	Refer to: DTC P1336
P1516	ETC drive stable state diagnosis error	Refer to: DTC P0641, P0651
P2101	ETC drive step 2 diagnosis error	
P2104	Engine forced idle	Refer to: DTC P2104, P2105, P2106, P2110
P2105	Engine forced shutdown	
P2106	Engine performance limit	
P2110	Engine power management	
P2122	Electronic accelerator pedal position sensor 1# circuit voltage is low	Refer to: DTC P2122, P2123, P2138
P2123	Electronic accelerator pedal position sensor 1# circuit voltage is high	
P2138	Electronic accelerator position sensor circuits 1 & 2 correlation fault	

Fault code	Description	Diagnosis Procedures
P2127	Electronic accelerator pedal position sensor 2# circuit voltage is low	Refer to: DTC P2127, P2128, P2138
P2128	Electronic accelerator pedal position sensor 2# circuit voltage is high	
P2138	Electronic accelerator position sensor circuits 1 & 2 correlation fault	
U0001	CAN communication malfunction (C001)	Refer to: DTC U0001, U0073, U0121, U0140, U0155
U0073	CAN bus off (C073)	
U0121	Loss of communication between ECM and ESP or ABS control module (C121)	
U0140	Lost ECM communication with body control module (C140)	
U0155	Lost ECM communication with instrument panel cluster control module (C155)	
P0557	Brake boost chamber pressure sensor short to low voltage	Refer to: DTC P0557, P0558
P0558	Brake boost chamber pressure sensor short circuit to high voltage	
P0616	Starter relay circuit short circuit to high voltage	Refer to: DTC P0616, P0617, P1614, P1615, P1616
P0617	Starter relay circuit short circuit to low voltage or open circuit	
P1614	Drive chain relay sticking	
P1615	Starter relay or drive chain relay not pick up	
P1616	Starter relay sticking	
P1561	Drive chain signal short to low voltage (drain chain, neutral position, clutch low switch correlation fault)	Refer to: DTC P1561, P1562, P1563, P1564
P1562	Drive chain signal short to high voltage (drain chain, neutral position, clutch low switch correlation fault)	
P1563	Drive chain signal short to high voltage (drain chain, neutral position, clutch low switch correlation fault)	
P1564	Drive chain signal short to high voltage (drain chain, neutral position, clutch low switch correlation fault)	
P1515	Starter status feedback signal off or short circuit to high voltage	Refer to: DTC P1515
P1560	Lost ECM communication with EBS	Refer to: DTC P1560

Fault code	Description	Diagnosis Procedures
P1565	Main stop/start switch signal noise fault	Refer to: DTC P1565, P1566
P1566	Main stop/start switch signal sticking fault	
P1661	Stop/start warning lamp output circuit short circuit to low voltage or open circuit	Refer to: DTC P1661, P1662, P1663, P1664
P1662	Stop/start warning lamp output circuit short circuit to high voltage	
P1663	Stop/start status indicator lamp output circuit short circuit to low voltage or open circuit	
P1664	Stop/start status indicator lamp output circuit short circuit to high voltage	

DTC P0557, P0558

1. Fault code description

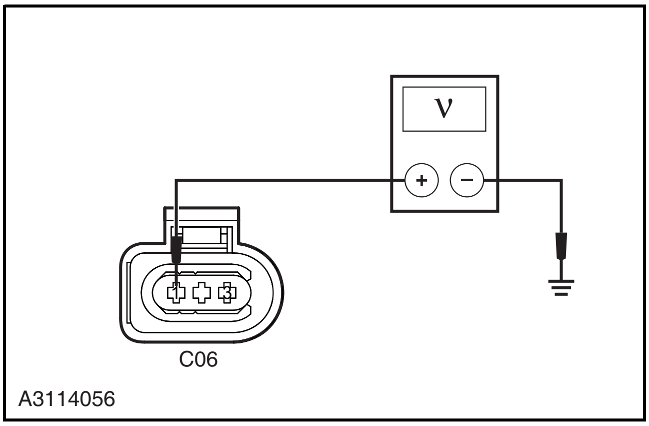
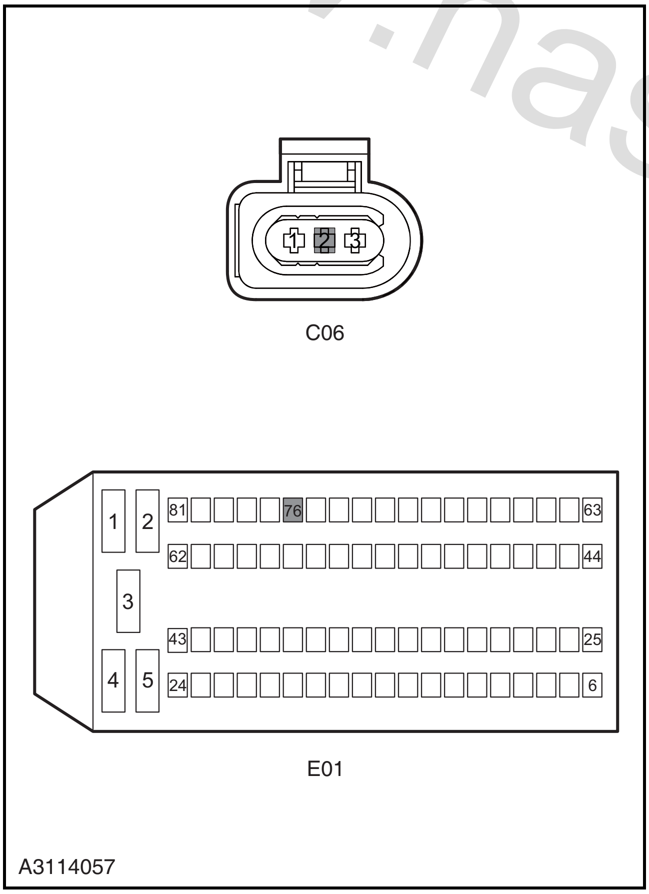
Fault code	Description	Definition
P0557	Brake boost chamber pressure sensor short to low voltage	Brake vacuum level sensor has 3 terminals, when the ignition switch is turned to "ON" position, the engine control module through terminal 33 of connector E01 to provide 5 V voltage for the sensor terminal 1, the terminal 17 of E01 enable the sensor 2 terminal ground, the sensor terminal 3 provide an signal that follow the changes of air intake pressure to terminal 43 of the ECM connector E01.
P0558	Brake boost chamber pressure sensor short circuit to high voltage	

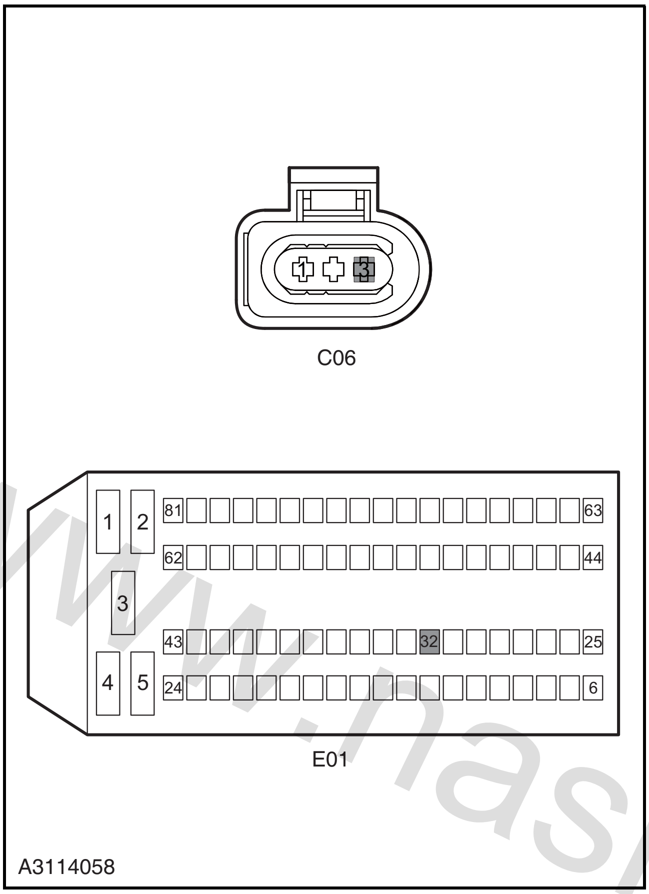
2.Possible Sources

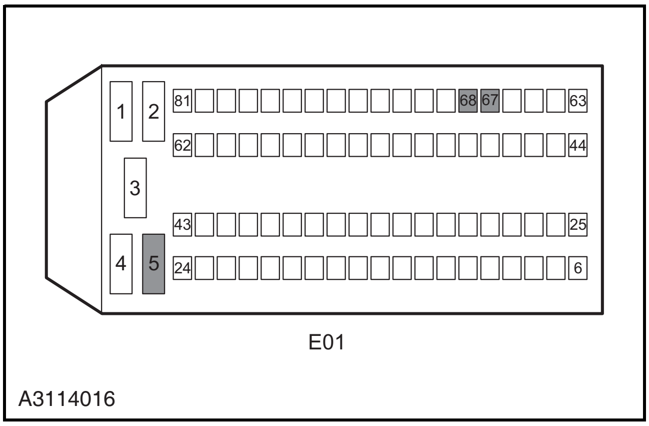
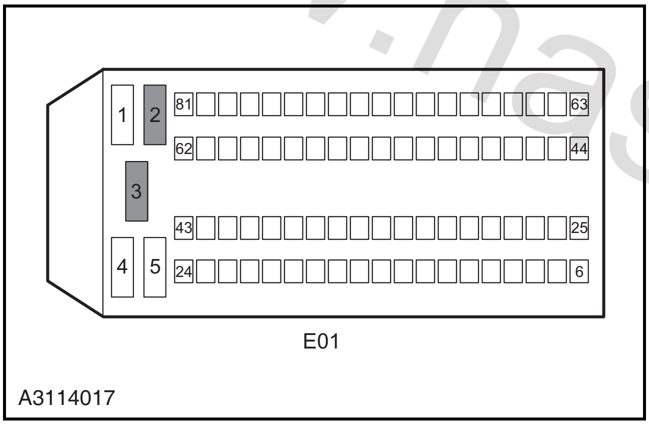
Fault code	Test Tactics	Setting conditions(control strategy)	Fault
P0557	Hardware Circuit Inspection	Short circuit to ground Short circuit to power Brake vacuum chamber damage	•Brake vacuum level sensor •Sensor circuit •Brake vacuum chamber
P0558			

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General Procedures	
	A.Check if the sensor is apparently damaged and its installation position is proper. Is it normal? **Y** Go to step 2 **N** Repair the fault.

Test Conditions	Details/Results/Actions
2. Inspect the brake vacuum level sensor power circuit	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the brake vacuum level sensor wiring harness connector C06. C.Turn the ignition switch to position "ON". D.Measure the voltage between the 1 terminal of air intake pressure temperature sensor wiring harness connector C06 and the reliable ground. **Standard Voltage Value: 4.5~5.5V** Is voltage normal? **Y** Go to step 3 **N** Repair the open circuit fault from Terminal 1 of brake vacuum level sensor wiring harness connector C06 to Terminal 66 of ECM wiring harness connector E01.
3. Inspect the grounding circuit of the brake vacuum level sensor.	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the brake vacuum level sensor wiring harness connector C06. C.Disconnect the engine control module wiring harness connector E01. D.Turn the ignition switch to position "ON". E.Measure the circuit resistance from Terminal 2 of brake vacuum level sensor wiring harness connector C06 to Terminal 76 of ECM wiring harness connector E01. **Standard Resistance Value: less than 5 Ω** Is the resistance normal? **Y** Go to step 4 **N** Repair the circuit.

Test Conditions	Details/Results/Actions
4. Inspect brake vacuum level sensor signal circuit	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the brake vacuum level sensor wiring harness connector C06. C.Disconnect the engine control module wiring harness connector E01. D.Turn the ignition switch to position "ON". E.Inspect whether there is open circuit, short circuit to ground or power between brake vacuum level sensor wiring harness connector C06 terminal 3 and engine control module wiring harness connector E01 terminal 32. Is the circuit normal? **Y** Go to step 5 **N** Repair the circuit.
5. Inspect the vacuum level sensor	
	A.Turn the ignition switch to LOCK position. B.Install a proper vacuum level sensor. C.Start the engine for road test. Does the system become normal? **Y** Replace the brake vacuum level sensor. **Refer to: Vacuum Pressure Sensor (3.1.14 Electronic Control System (Low-Carbon) , Vacuum Pressure Sensor).** Verify the system is normal. **N** Go to step 6

Test Conditions	Details/Results/Actions
6. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to ON position and use a multimeter to measure the voltage between the terminal 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 7 **N** Repair and inspect the ECM power supply circuit.
7. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminal 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5 Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System-MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P0616, P0617, P1614, P1615, P1616

1. Fault code description

Fault code	Description	Definition
P0616	Starter relay circuit short circuit to high voltage	Engine control module (ECM) conducts self-test, detects condition of corresponding terminals at this time, compare them with normal data stored by ECM and calculate to determine if the system is proper. If the terminal condition is detected as abnormal at this time, corresponding DTC will set.
P0617	Starter relay circuit short circuit to low voltage or open circuit	
P1614	Drive chain relay sticking	
P1615	Starter relay or drive chain relay not pick up	
P1616	Starter relay sticking	

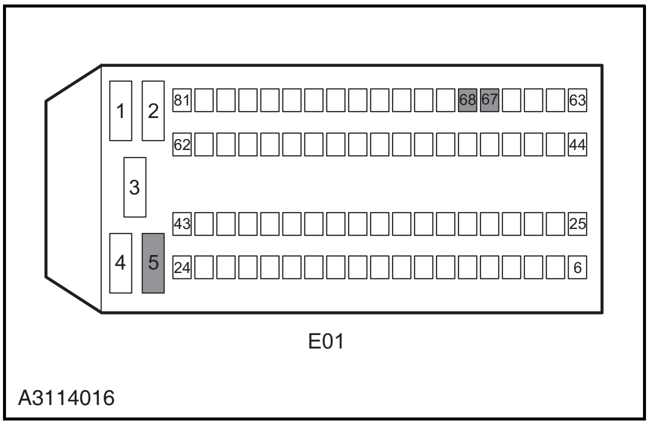
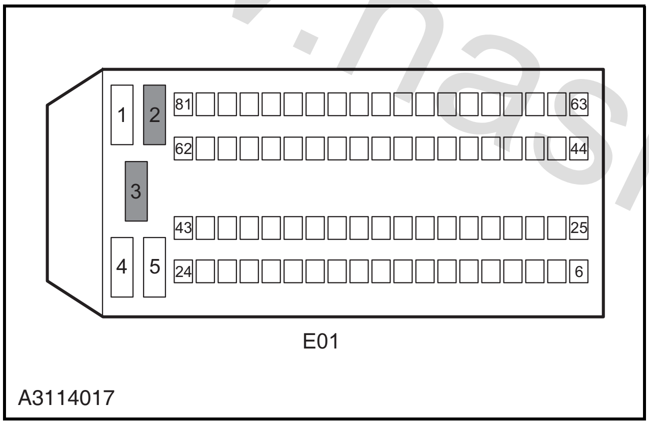
2.Possible Sources

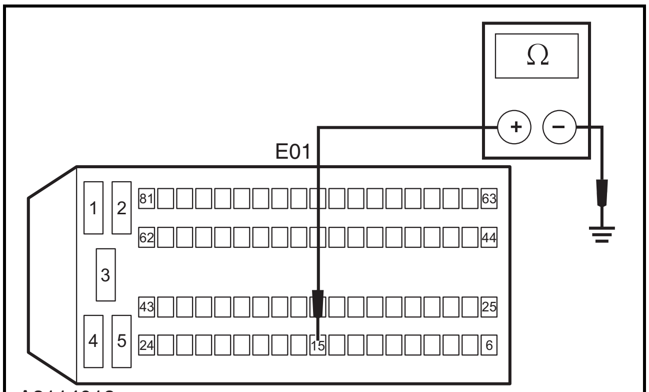
Fault code	Test Tactics	Setting conditions(control strategy)	Fault
P0616	Hardware or Circuit Inspection	-	•Corresponding circuit fault •Corresponding circuit wiring harness connector fault • ECM fault •Corresponding relay fault
P0617			
P1614			
P1615			
P1616			

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General Procedures	
	A.Inspect relevant wiring harness connectors from starter relay and drive chain relay to ECM for damage, poor contact, aging or looseness. Is it normal? **Y** Go to step 2 **N** Repair the fault.

Test Conditions	Details/Results/Actions
2. Read the engine fault code	
	A.Turn the ignition switch to position "LOCK"，Connect the diagnosis tool. B.Start the engine, use diagnosis tool to inspect engine system. Is there any DTC other than P0616, P0617, P1614, P1615 and P1616? **Y** **Refer to: DTC Diagnostic Procedure Index (3.1.14 Electronic Control System (Low-Carbon), DTC Diagnosis and Testing).** **N** Go to step 3
3. Inspect the working condition of drive chain relay ER01	
	A.Turn the ignition switch to the "ON" position and disable off "Idle Stop/Start" feature. B.Engage the gear lever into the "Neutral" or press the clutch pedal, turn the ignition switch to "ST" position to start the engine. Is the starter running？ **Y** Go to step 4 **N** Go to step 10.
4.Inspect the starter relay operation state	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery cathode cable. C.Disconnect the terminal 15 of ECM wiring harness connector E01 with the special tool. D.Turn the ignition switch to position "ON". E.Make the terminal 15 of the ECM wiring harness connector E01 ground reliably. Does the starter operate at this time? **Y** Go to step 5 **N** Go to step 7

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">5. Inspect the ECM power supply circuit</td></tr>
<tr><td>
</td><td>A.Turn the ignition switch to position "LOCK".
B.Measure from the back of ECM wiring harness connector E01.
C.Turn the ignition switch to ON position and use a multimeter to measure the voltage between the terminal 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply.
Standard Voltage Value: 11~14 V
Is the voltage normal?
Y
Go to step 6
N
Repair and inspect the ECM power supply circuit.</td></tr>
<tr><td colspan="2">6. Inspect ECM ground circuit</td></tr>
<tr><td>
</td><td>A.Turn the ignition switch to position "LOCK".
B.Measure from the back of ECM wiring harness connector E01.
C.Measure the resistance between terminal 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal.
Standard Resistance Value: less than 5 Ω
Is the resistance value normal?
Y
Replace the engine control module.
Refer to: Engine Control Module (3.1.13 Electronic Control System-MT22.1, Removal and Installation).
N
Inspect and repair the ECM ground circuit.</td></tr>
<tr><td colspan="2">7.Inspect the starter relay ER02</td></tr>
<tr><td></td><td>A.Turn the ignition switch to position "LOCK".
B.Replace it with a starter relay ER02 of the same type from a normally functioning vehicle.
C.Turn the ignition switch to position "ST".
Is the starter running?
Y
Replace the starter relay ER02 of the fault vehicle.
Verify the system is normal.
N
Go to step 8</td></tr>
<tr><td colspan="2">8.Inspect the control circuit of starter relay ER02</td></tr>
</table>

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td>


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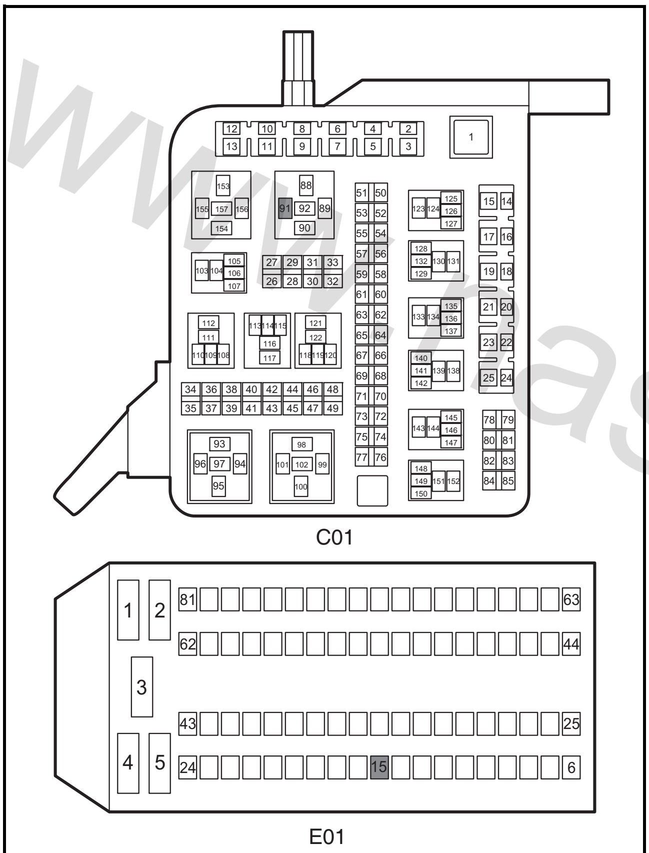
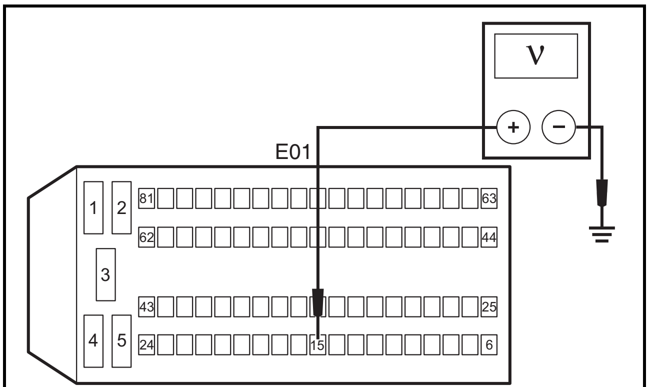
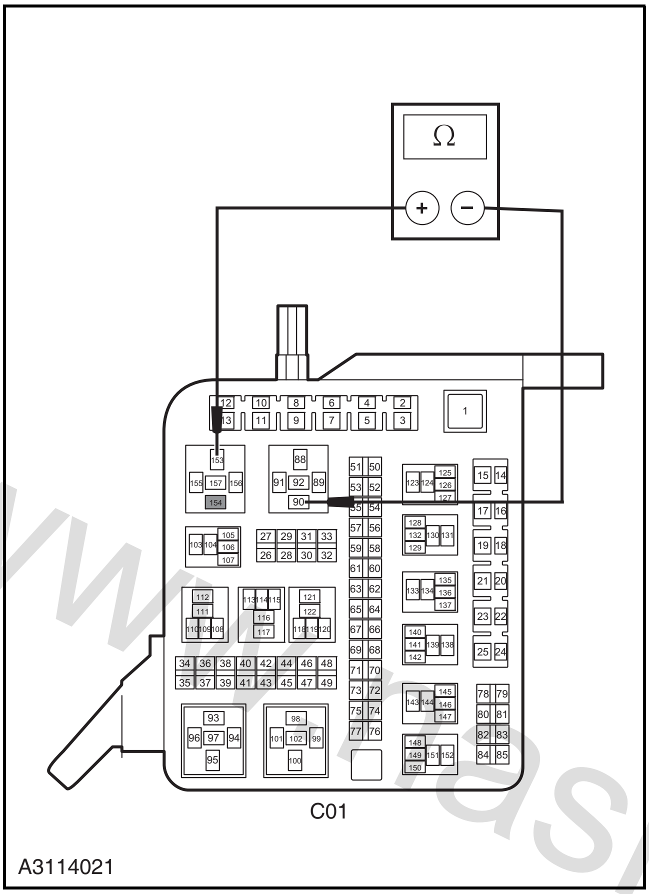
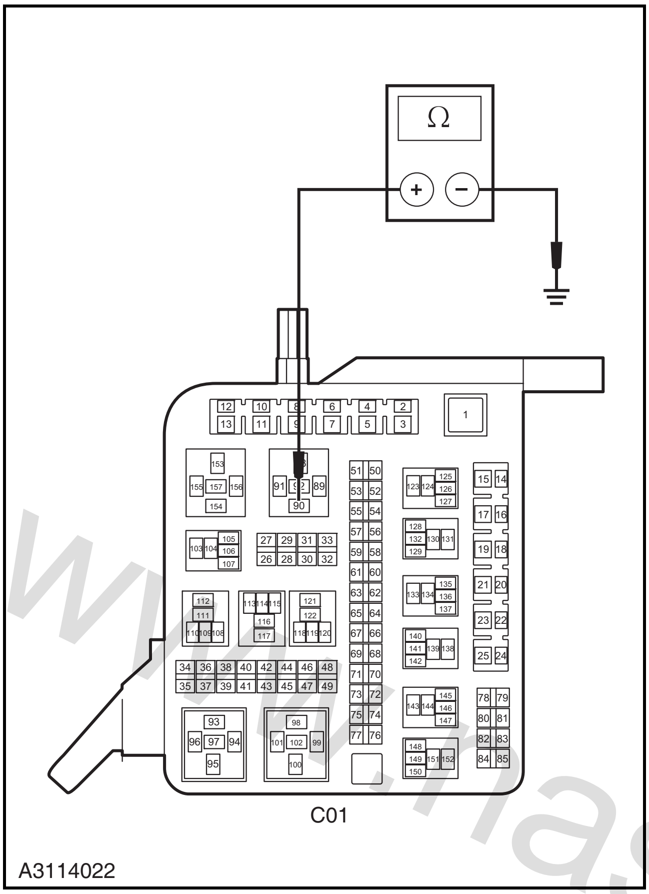
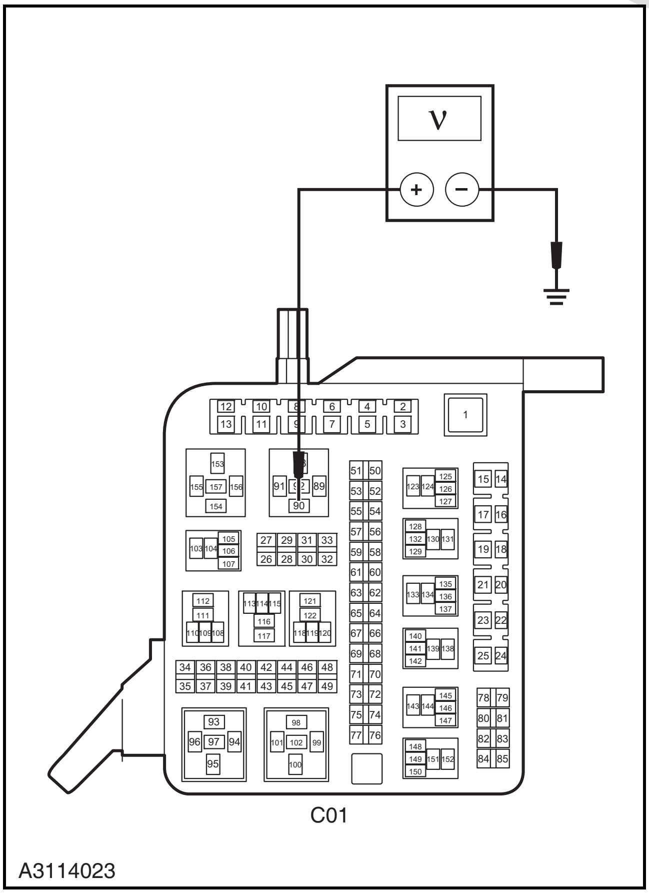
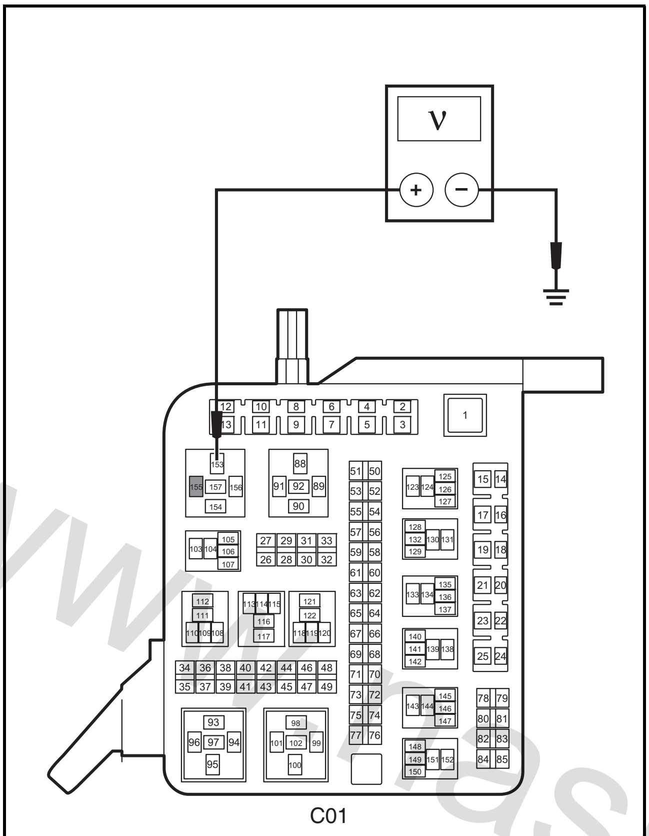


A3114019


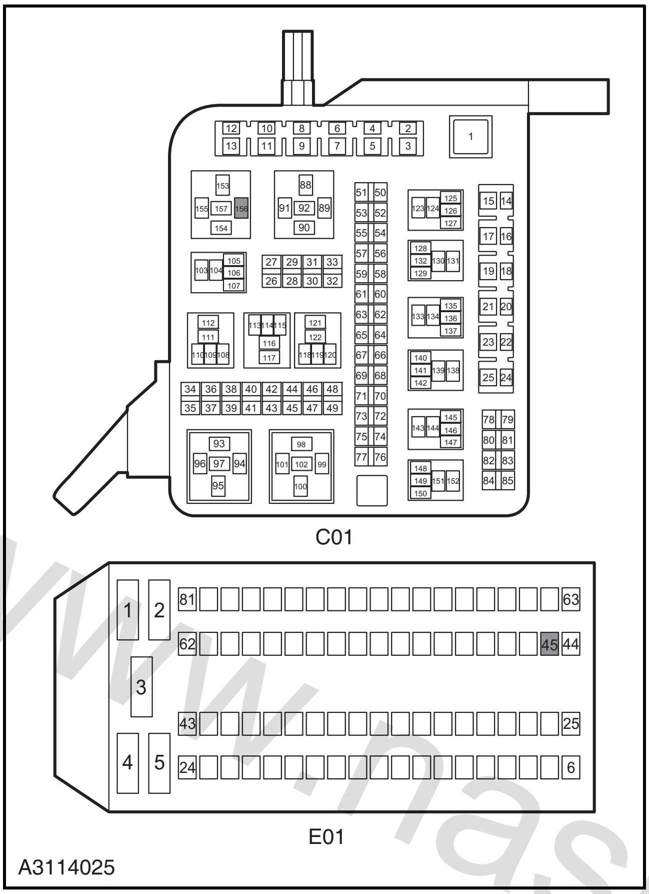
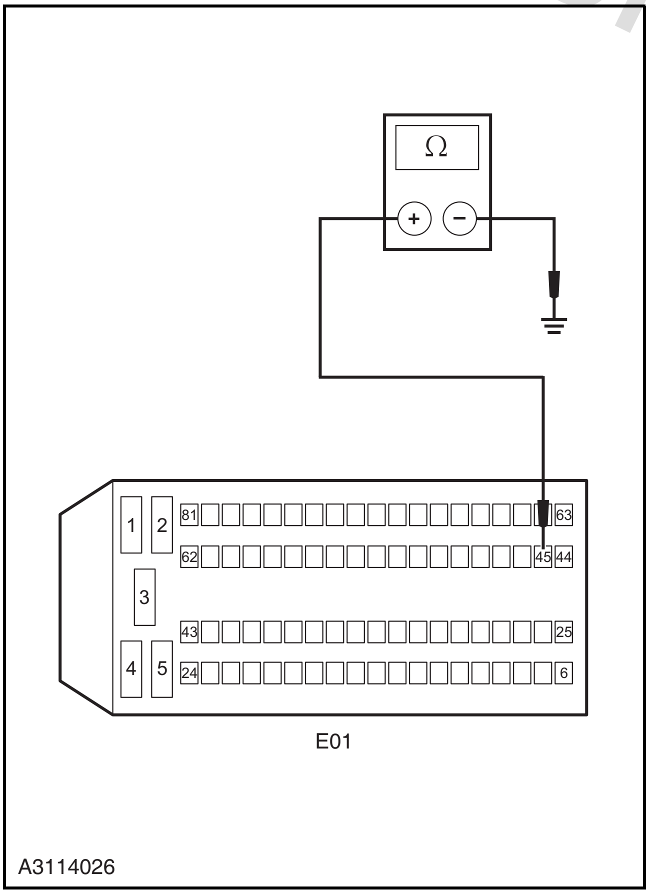
A3114020
</td><td>
A.Turn the ignition switch to position "LOCK".
B.Disconnect the battery cathode cable.
C.Disconnect the relay ER02 of the engine compartment Electronic center C01.
D.Disconnect ECM wiring harness connector E01.
E.Measure the resistance between terminal 15 of ECM wiring harness connector E01 and reliable ground.
Standard Resistance Value: 10 MΩ or more
F.Measure the resistance value between terminal 91 of the engine compartment Electronic center C01 and terminal 15 of ECM engine wiring harness connector E01.
Standard Resistance Value: less than 5 Ω
G.Measure the voltage between terminal 15 of ECM wiring harness connector E01 and the reliable ground terminal.
Standard voltage: 0 V
Is it normal?
Y
Go to step 9
N
Inspect and repair fault circuit from the terminal 91 of the engine compartment Electronic center C01 to the terminal 15 of the ECM wiring harness connector E01.
</td></tr>
</table>

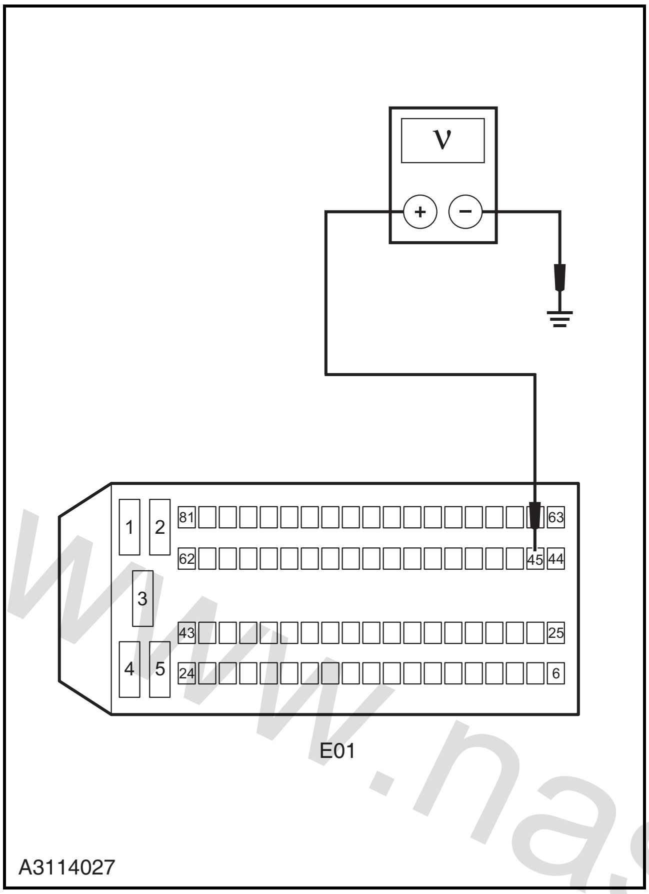
Test Conditions	Details/Results/Actions
9.Inspect the control circuit of starter relay ER02	
 	A.Turn the ignition switch to position "LOCK". B.Remove the relay ER02 of engine compartment Electronic center C01 and the drive chain relay ER01. C.Measure the resistance value between the terminal 90 of the engine compartment Electronic equipment center C01 and terminal 153 and 154. **Standard Resistance Value: less than 5 Ω**

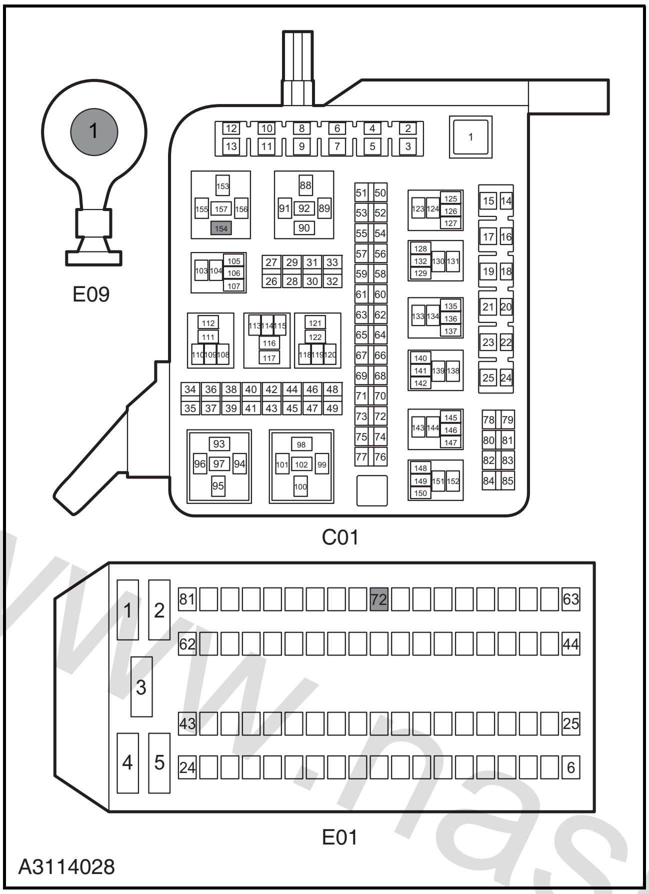
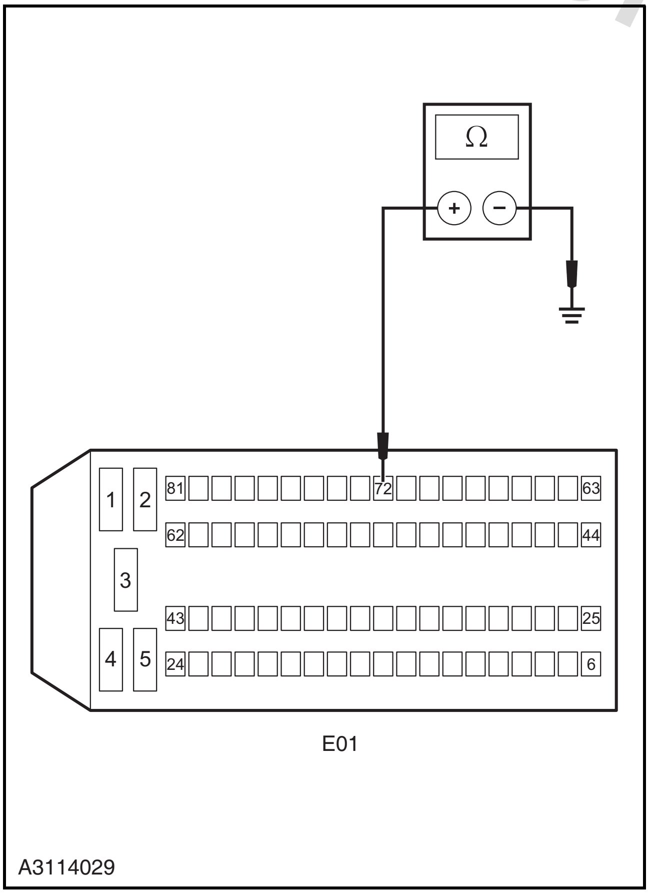
Test Conditions	Details/Results/Actions
	D.Measure the resistant value between the terminal 90 of the engine compartment Electronic center C01 and the reliable ground. **Standard Resistance Value: 10 MΩ or more**
	E.Measure the resistant value between the terminal 90 of the engine compartment Electronic center C01 and the reliable ground. **Standard voltage: 0 V** Is it normal? **Y** Inspect and repair the engine compartment Electronic center C01 and replace it if necessary. **N** Inspect the circuit fault from Terminal 90 of engine compartment Electronic center C01 to Terminals 153 and 154.

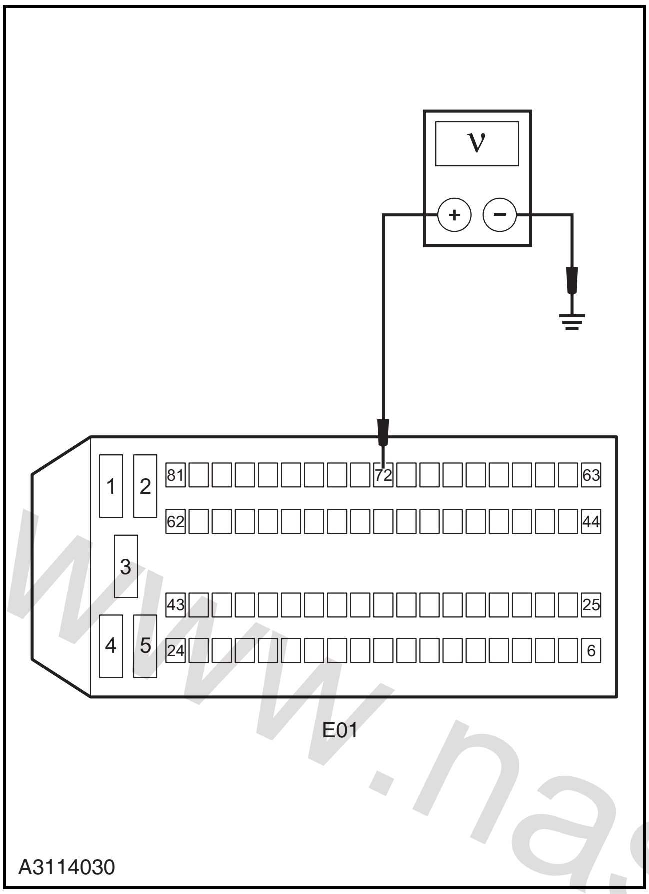
<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">10. Inspect the circuit from the ignition switch to the drive chain relay</td></tr>
<tr><td>
A3114024</td><td>A.Turn the ignition switch to position "ST".
B.Disconnect the drive chain relay ER01 of the engine compartment Electronic center C01.
C.Measure the resistant value between the terminal 153 and 155 of the engine compartment Electronic center C01 and the reliable ground.
Standard Voltage Value: 11~14V
Is the voltage normal？
Y
Go to step 11
N
Inspect and repair open circuit between the terminal 4 of the ignition switch wiring harness connector P05 and the terminal 153 and 155 of the engine compartment Electronic center C01.</td></tr>
<tr><td colspan="2">11. Inspect the drive chain relay ER01</td></tr>
<tr><td></td><td>A.Turn the ignition switch to position "LOCK".
B.Replace it with a drive chain relay ER01 of same type from a normally functioning vehicle.
C.Turn the ignition switch to position "ST".
Is the starter running？
Y
Replace the drive chain relay ER01 of the fault vehicle.
Verify the system is normal.
N
Go to step 12.</td></tr>
</table>

Test Conditions	Details/Results/Actions
12. Inspect the ground circuit of drive chain relay ER01 coil	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the terminal 45 of ECM wiring harness connector E01 with the special tool. C.Turn the ignition switch to position "ST". D.Make the terminal 45 of the ECM wiring harness connector E01 ground reliably. Does the starter operate at this time? **Y** Go to step 5. **N** Go to step 13.
13. Inspect the control circuit of drive chain relay ER01	

Test Conditions	Details/Results/Actions
 	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery cathode cable. C.Disconnect the drive chain relay ER01 of engine compartment Electronic center C01 and ECM wiring harness connector E01. D.Measure the resistance value between terminal 156 of the engine compartment Electronic center C01 and terminal 45 of ECM engine wiring harness connector E01. **Standard Resistance Value: less than 5 Ω** E.Measure the resistance between terminal 45 of ECM wiring harness connector E01 and reliable ground. **Standard Resistance Value: 10 MΩ or more**

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td>
</td><td>F.Measure the voltage between terminal 45 of ECM wiring harness connector E01 and the reliable ground terminal.
Standard voltage: 0 V
Is it normal?
Y
Go to step 14.
N
Inspect and repair fault circuit from the terminal 156 of the engine compartment Electronic center C01 to the terminal 45 of the ECM wiring harness connector E01.</td></tr>
<tr><td colspan="2">14. Inspect the output circuit of drive chain relay ER01</td></tr>
</table>

Test Conditions	Details/Results/Actions
 	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery cathode cable. C.Disconnect the drive chain relay ER01 of engine compartment Electronic center C01 and starter wiring harness connector E09, disconnect ECM wiring harness connector E01. D.Measure the resistance value from Terminal 154 of engine compartment Electronic center C01 to Terminal 1 of starter wiring harness connector E09 and Terminal 72 of ECM wiring harness connector E01 respectively. **Standard Resistance Value: less than 5 Ω** E.Measure the resistance between terminal 72 of ECM wiring harness connector E01 and reliable ground. **Standard Resistance Value: 10 MΩ or more**

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td></td><td>F.Measure the voltage between terminal 72 of ECM wiring harness connector E01 and the reliable ground terminal.
Standard voltage: 0 V
Is it normal?
Y
Inspect and repair the engine compartment Electronic center C01 and replace it if necessary.
N
Check for circuit fault from Terminal 154 of engine compartment Electronic center C01 to Terminal 1 of starter wiring harness connector E09, and circuit fault from Terminal of starter wiring harness connector E09 to Terminal 72 of ECM wiring harness connector E01.</td></tr>
</table>

DTC P1561, P1562, P1563, P1564

1. Fault code description

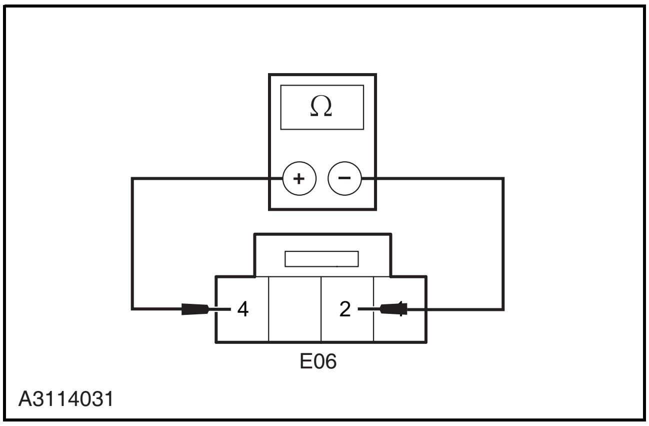
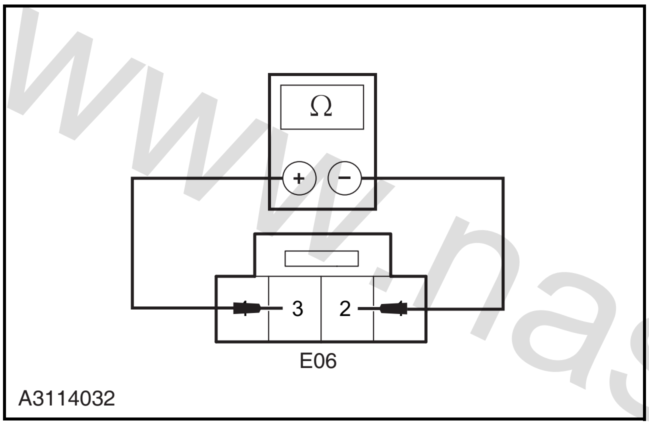
<table>
<tr><th>Fault code</th><th>Description</th><th>Definition</th></tr>
<tr><td>P1561</td><td>Drive chain signal short to low voltage (drain chain, neutral position, clutch low switch correlation fault)</td><td rowspan="4">Engine control module (ECM) detects neutral sensor and clutch low switch through electric level of the circuit to ECM to determine if the neutral sensor, clutch switch and circuit are in good order.</td></tr>
<tr><td>P1562</td><td>Drive chain signal short to low voltage (drain chain, neutral position, clutch low switch correlation fault)</td></tr>
<tr><td>P1563</td><td>Drive chain signal short to low voltage (drain chain, neutral position, clutch low switch correlation fault)</td></tr>
<tr><td>P1564</td><td>Drive chain signal short to low voltage (drain chain, neutral position, clutch low switch correlation fault)</td></tr>
</table>

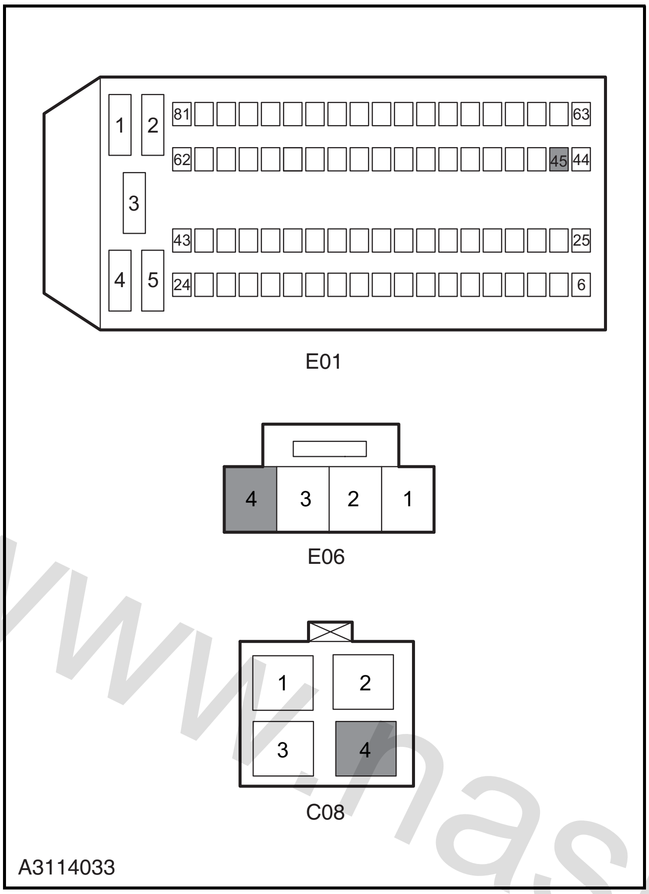
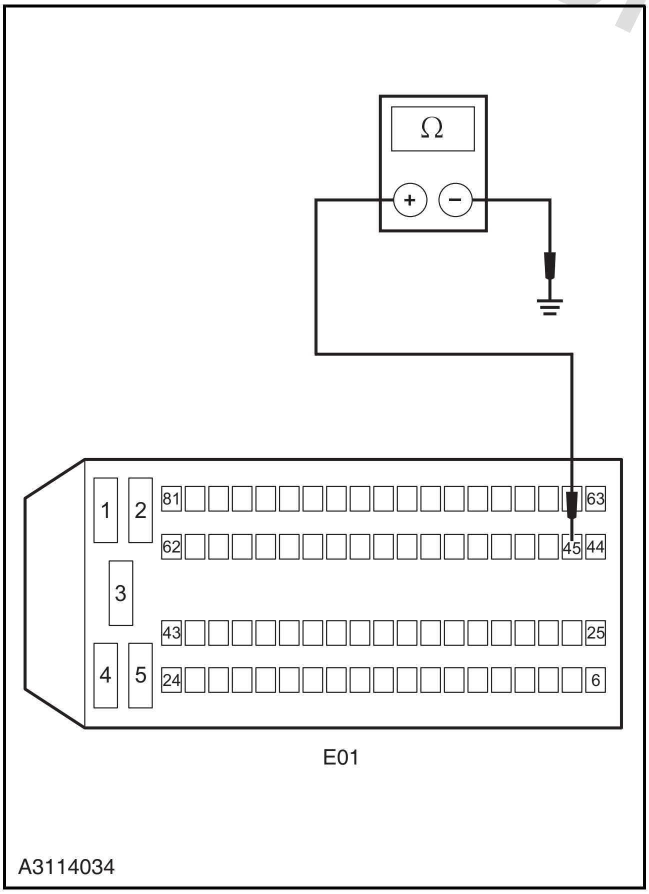
2.Possible Sources

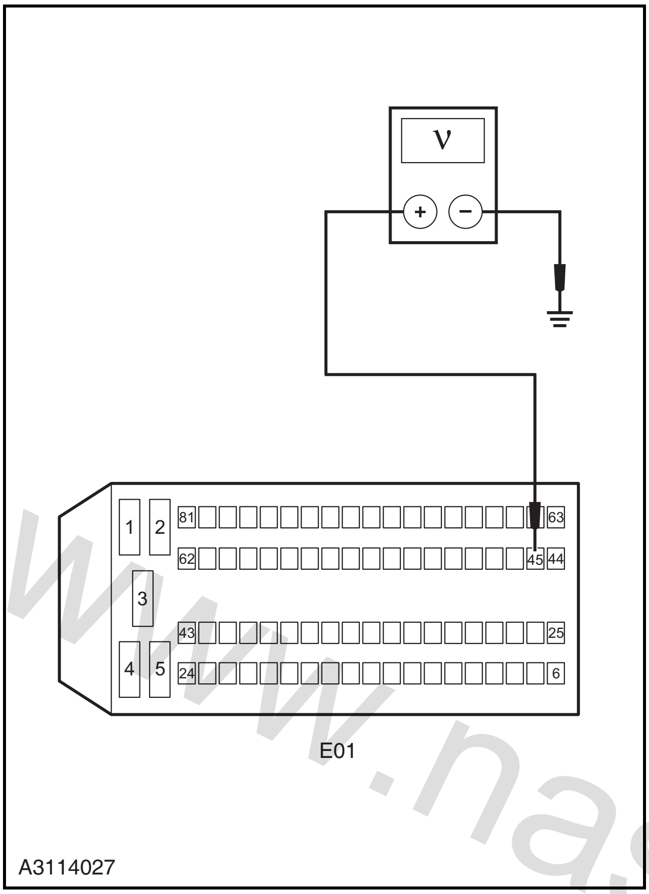
Fault code	Test Tactics	Setting conditions(control strategy)	Fault
P1561	Hardware or Circuit Inspection		•Empty gear sensor fault •Clutch low level switch fault •Corresponding circuit fault • ECM fault
P1562			
P1563			
P1564			

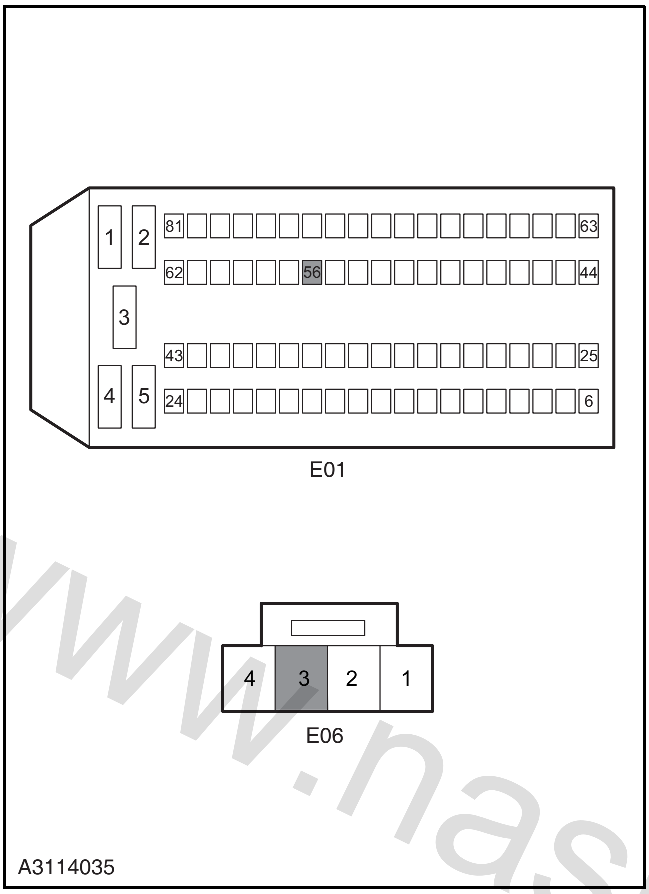
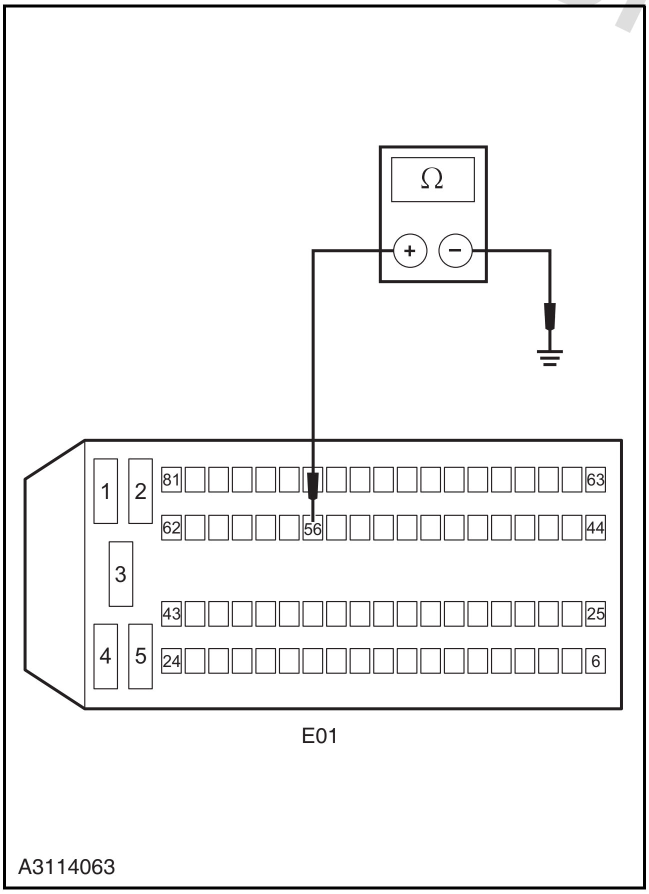
3. Diagnosis procedure

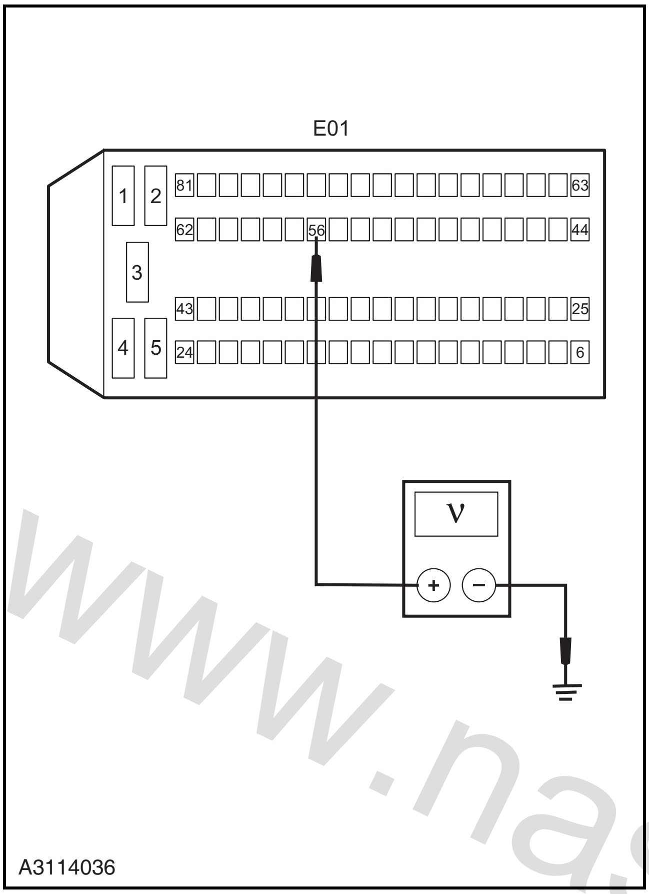
Test Conditions	Details/Results/Actions
1. General Procedures	
	A.Inspect the related wiring harness connectors for signs of damage, poor contact, aging or loose. Is it normal? **Y** Go to step 2 **N** Repair the fault.
2. Read the engine fault code	
	A.Turn the ignition switch to position "LOCK", Connect the diagnosis tool. B.Start the engine, use diagnosis tool to inspect engine system. Is there any DTC other than P1561, P1562, P1563 and P1564 ? **Y** **Refer to: DTC Diagnostic Procedure Index (3.1.14 Electronic Control System (Low-Carbon), DTC Diagnosis and Testing).** **N** Go to step 3.

Test Conditions	Details/Results/Actions
3. Inspect the neutral sensor	
 	A.Turn the ignition switch to position "LOCK". B.Disconnect the neutral sensor wiring harness connector E06. C.Set the gear lever in the neutral position and measure the resistance values of Pin 2 & 4 of neutral sensor. **Standard Resistance Value: less than 5 Ω** D.Set the gear lever in the forward or reverse gear and measure the resistance values of Pin 2 & 4 of neutral sensor. **Standard Resistance Value: 10 MΩ or more** E.Set the gear lever in the neutral position and measure the resistance values of Pin 2 & 3 of neutral sensor. **Standard Resistance Value: 10 MΩ or more** F.Set the gear lever in the forward or reverse gear and measure the resistance values of Pin 2 & 3 of neutral sensor. **Standard Resistance Value: less than 5 Ω** Is the resistance value normal? **Y** Go to step 4 **N** Replace the neutral sensor Verify the system is normal.
4. Inspect the circuit from ECM to the neutral sensor and clutch low switch	

Test Conditions	Details/Results/Actions
	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery cathode cable. C.Disconnect the neutral sensor wiring harness connector E06. D.Disconnect ECM wiring harness connector E01. E.Disconnect the clutch low level switch harness connector C08. F.Remove the relay ER01 of the engine compartment Electronic center C01. G.Measure the resistance value from Terminal 45 of ECM wiring harness connector E01 to Terminal 4 of neutral sensor wiring harness connector E06 and Terminal 4 of clutch low switch wiring harness connector C08 respectively. **Standard Resistance Value: less than 5 Ω** H.Measure the resistance between terminal 45 of ECM wiring harness connector E01 and reliable ground. **Standard Resistance Value: 10 MΩ or more**
	

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td></td><td>I.Measure the voltage between terminal 45 of ECM wiring harness connector E01 and the reliable ground terminal.
Standard voltage: 0 V
Is it normal?
Y
Go to step 5.
N
Inspect and repair relevant circuit fault.</td></tr>
<tr><td colspan="2">5. Inspect the circuit from neutral sensor to ECM</td></tr>
</table>

Test Conditions	Details/Results/Actions
 	A.Turn the ignition switch to position "LOCK". B.Disconnect the neutral sensor wiring harness connector E06. C.Disconnect ECM wiring harness connector E01. D.Measure the resistance value from Terminal 56 of ECM wiring harness connector E01 to Terminal 3 of neutral sensor wiring harness connector E06. **Standard Resistance Value: less than 5 Ω** E.Measure the resistance between terminal 56 of ECM wiring harness connector E01 and reliable ground. **Standard Resistance Value: 10 MΩ or higher**

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td>
</td><td>F.Measure the voltage between terminal 56 of ECM wiring harness connector E01 and the reliable ground terminal.

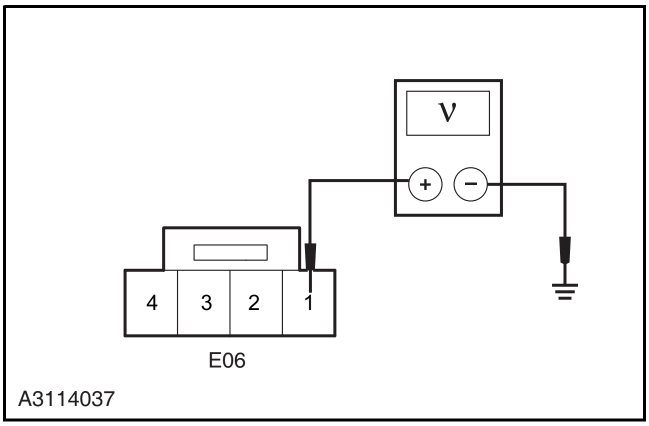
Standard voltage: 0 V

Is the Inspect Normal?

Y

Go to step 6.

N

Inspect and repair relevant circuit fault.</td></tr>
<tr><td colspan="2">6.Inspect neutral gear sensor power supply circuit</td></tr>
<tr><td>
</td><td>A.Turn the ignition switch to position "LOCK".

B.Disconnect the neutral sensor wiring harness connector E06.

C.Measure the voltage between the 1 terminal of neutral gear sensor wiring harness connector E06 and the reliable ground.

Standard Voltage Value: 4.5~5.5 V

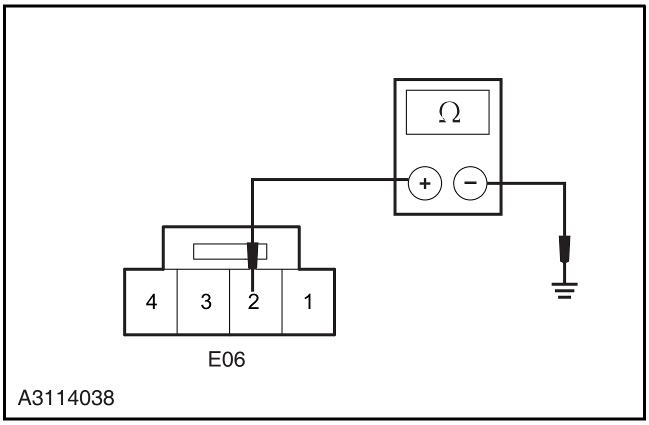
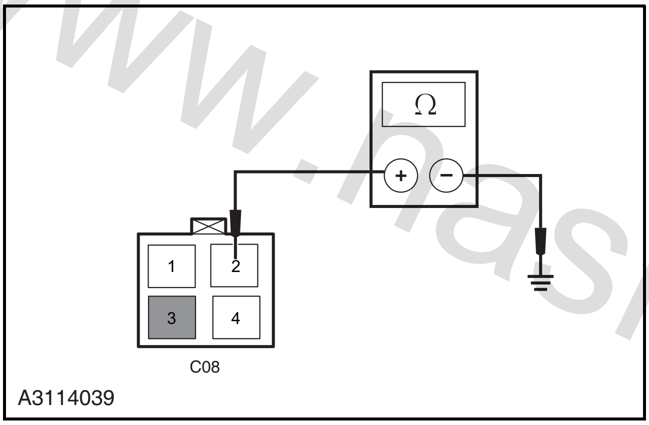
Is it normal?

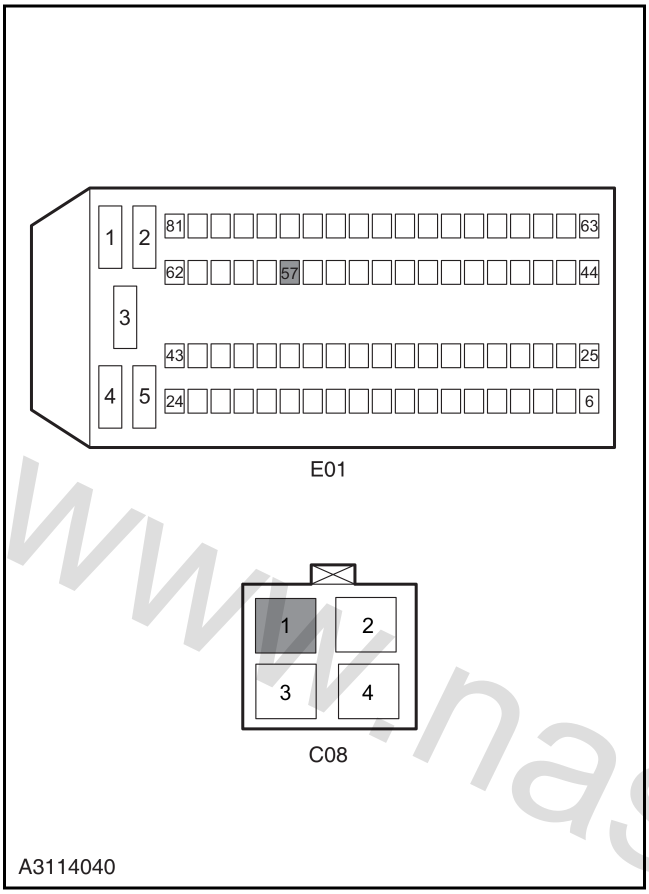
Y

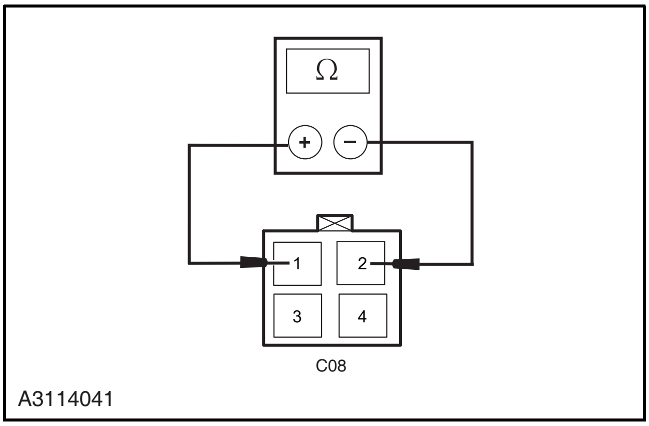
Go to step 7

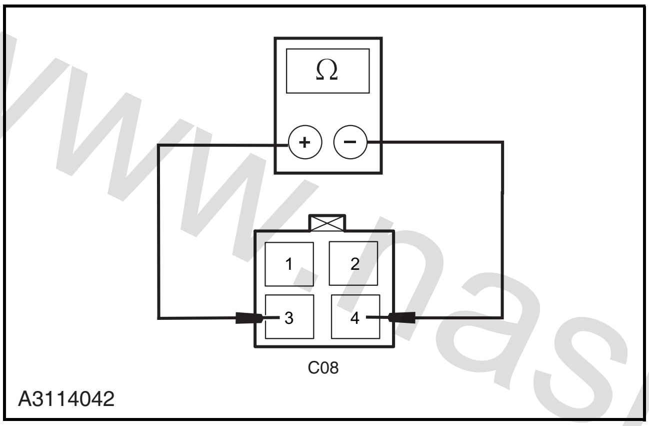
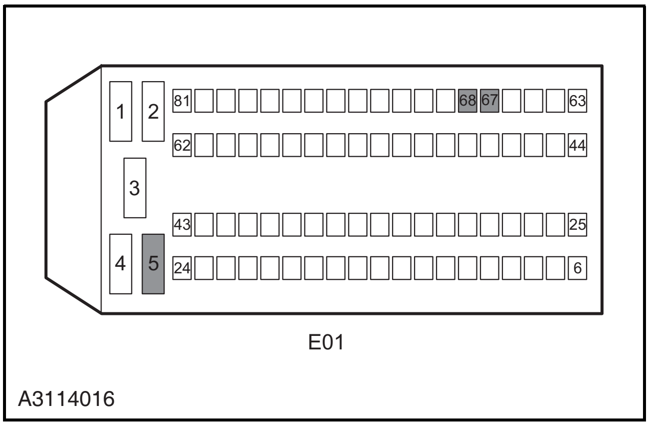
N

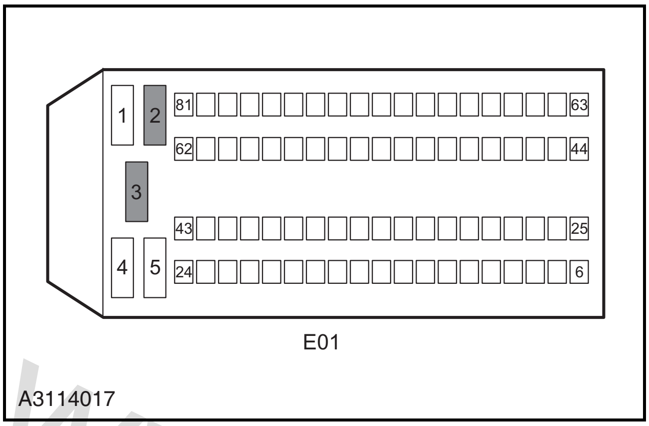
Inspect and repair the circuit fault between the neutral gear sensor wiring harness connector E06 terminal 1 and the engine compartment electric center C01 terminal 39.</td></tr>
</table>

Test Conditions	Details/Results/Actions
7.Inspect neutral gear sensor ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the neutral sensor wiring harness connector E06. C.Measure the resistance between the neutral gear sensor wiring harness connector E06 terminal 2 and the reliable ground. **Standard Resistance Value: less than 5 Ω** Is it normal? **Y** Go to step 8. **N** Inspect and repair relevant circuit fault.
8. Inspect the ground circuit of clutch low level switch	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the clutch low level switch harness connector C08. C.Measure the resistance between terminal 2 and 3 of clutch low level switch wiring harness connector C08 and the reliable ground. **Standard Resistance Value: less than 5 Ω** Is it normal? **Y** Go to step 9. **N** Inspect and repair relevant circuit fault.

Test Conditions	Details/Results/Actions
9. Inspect the circuit from clutch low switch to ECM	
	A.Turn the ignition switch to position "LOCK". B.Disconnect ECM wiring harness connector E01. C.Disconnect the clutch low level switch harness connector C08. D.Measure the resistance value from Terminal 57 of ECM wiring harness connector E01 to Terminal 1 of clutch low switch wiring harness connector C08. **Standard Resistance Value: less than 5 Ω** E.Measure the resistance between terminal 57 of ECM wiring harness connector E01 and reliable ground. **Standard Resistance Value: 10 MΩ or more** F.Measure the voltage between terminal 57 of ECM wiring harness connector E01 and the reliable ground terminal. **Standard voltage: 0 V** Is it normal? **Y** Go to step 10. **N** Inspect and repair relevant circuit fault.

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">10. Inspect the clutch low level switch</td></tr>
<tr><td>


</td><td>A.Turn the ignition switch to position "LOCK".
B.Disconnect the clutch low level switch harness connector C08.
C.When the clutch is not pressed.
• Measure the resistance value of Pin 1 & 2 of clutch low switch.
Standard Resistance Value: less than 5 Ω
• Measure the resistance value of Pin 3 & 4 of clutch low switch.
Standard Resistance Value: 10 MΩ or more
D.When the clutch is pressed.
• Measure the resistance value of Pin 1 & 2 of clutch low switch.
Standard Resistance Value: 10 MΩ or more
• Measure the resistance value of Pin 3 & 4 of clutch low switch.
Standard Resistance Value: less than 5 Ω
Is the resistance value normal?
Y
Go to step 11.
N
Replace the clutch low level switch.
Verify the system is normal.</td></tr>
<tr><td colspan="2">11. Inspect the ECM power supply circuit</td></tr>
<tr><td>
</td><td>A.Turn the ignition switch to position "LOCK".
B.Measure from the back of ECM wiring harness connector E01.
C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminal 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply.
Standard Voltage Value: 11~14 V
Is the voltage normal？
Y
Go to step 12.
N
Repair and inspect the ECM power supply circuit.</td></tr>
</table>

Test Conditions	Details/Results/Actions
12. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminal 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5 Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System-MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P1515

1. Fault code description

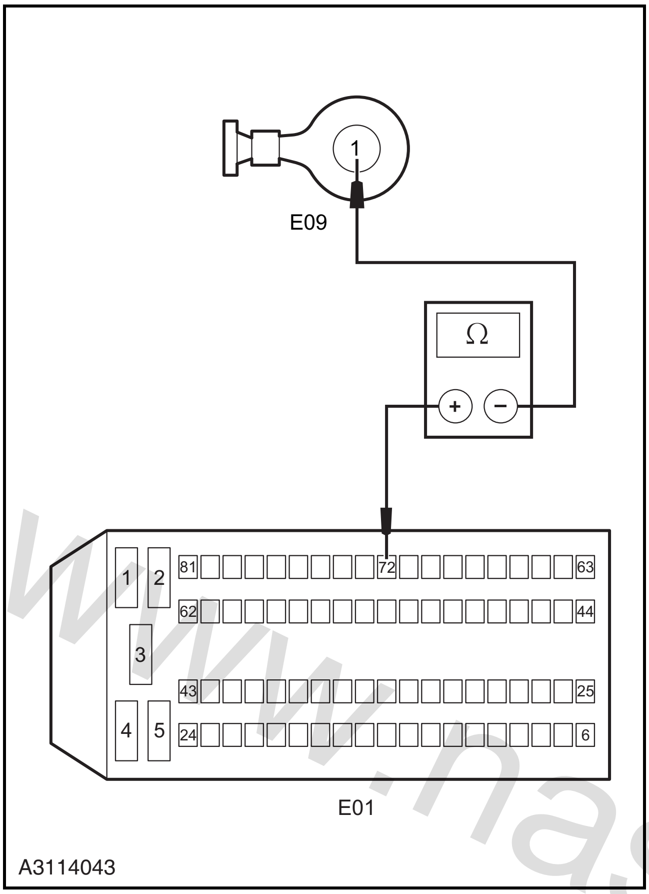
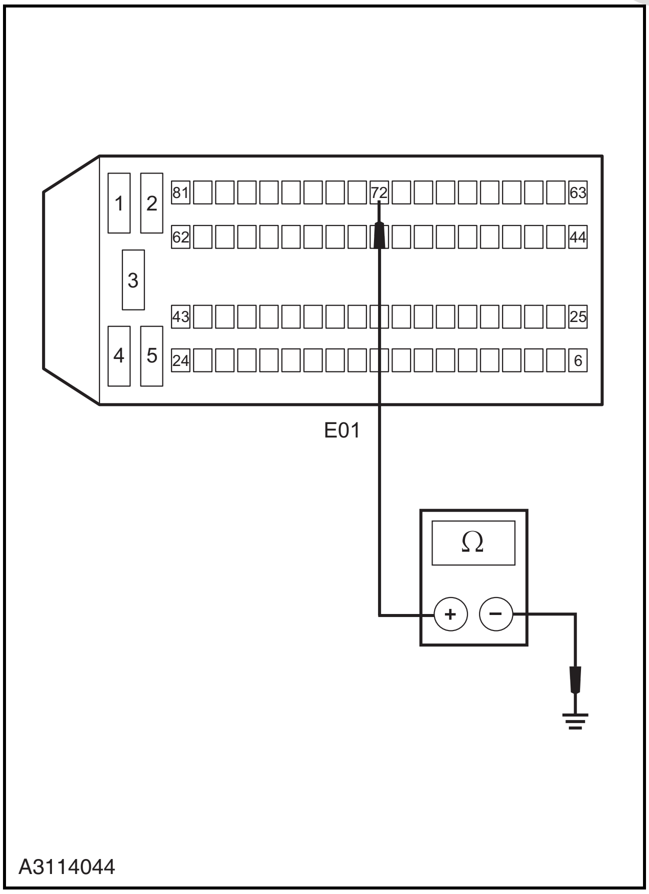
Fault code	Description	Definition
P1515	Starter status feedback signal off or short circuit to high voltage	Upon start, the ECM detects the engine speed signal, but Terminal 72 of ECM receives no starter feedback signal.

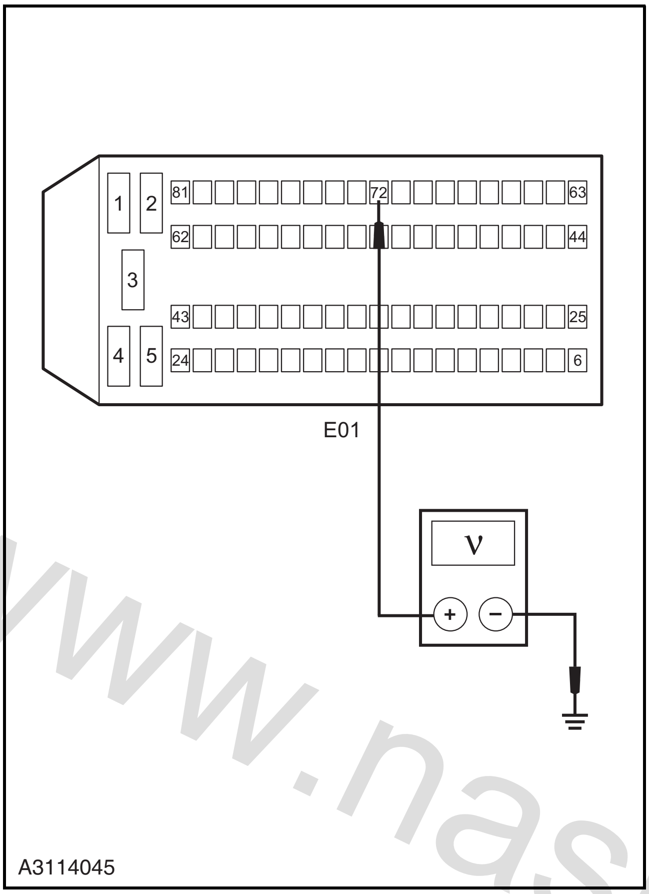
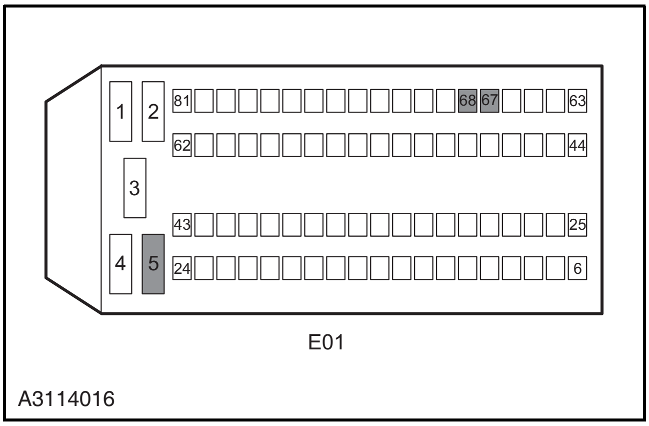
2.Possible Sources

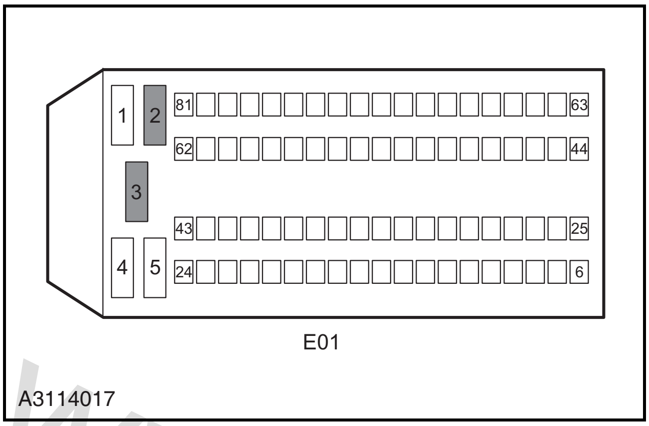
Fault code	Test Tactics	Setting conditions(control strategy)	Fault
P1515	Hardware or Circuit Inspection		•Corresponding circuit fault • ECM fault

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General Procedures	
	A.Inspect the related wiring harness connectors for signs of damage, poor contact, aging or loose. Is it normal? **Y** Go to step 2 **N** Repair the fault.
2. Inspect the circuit from ECM to the starter	

Test Conditions	Details/Results/Actions
 	A.Turn the ignition switch to position "LOCK". B.Disconnect ECM wiring harness connector E01. C.Disconnect the starter wiring harness connector E09. D.Disconnect the relay ER01 of the engine compartment Electronic center C01. E.Measure the resistance value from Terminal 72 of ECM wiring harness connector E01 to Terminal 1 of starter wiring harness connector E09. **Standard Resistance Value: less than 5 Ω** F.Measure the resistance between terminal 72 of ECM wiring harness connector E01 and reliable ground. **Standard Resistance Value: 10 MΩ or more**

Test Conditions	Details/Results/Actions
	G.Measure the voltage between terminal 72 of ECM wiring harness connector E01 and the reliable ground terminal. **Standard voltage: 0 V** Is it normal? **Y** Go to step 3 **N** Inspect and repair relevant circuit fault.
3. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminal 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 4 **N** Repair and inspect the ECM power supply circuit.

Test Conditions	Details/Results/Actions
4. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminal 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5 Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System-MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P1560

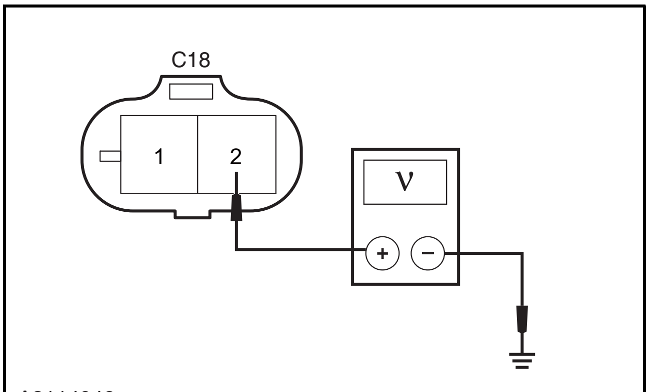
1. Fault code description

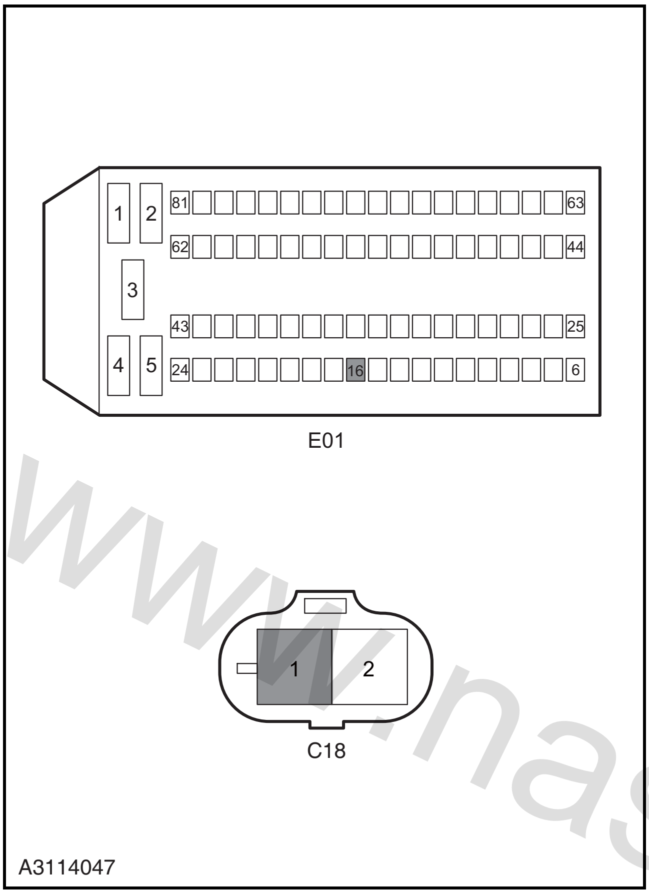
Fault code	Description	Definition
P1560	Lost ECM communication with EBS	Through LIN bus, EBS can provide ECM with information about battery condition (voltage, current and energy level) and with battery related parameters from the sensor, ECM can determine whether current vehicle meets the stop conditions.

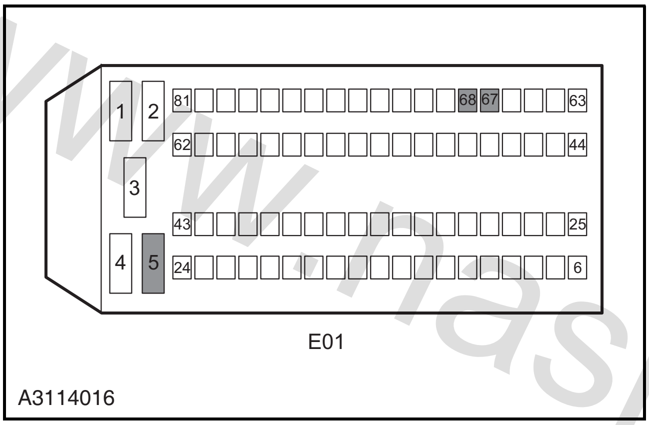
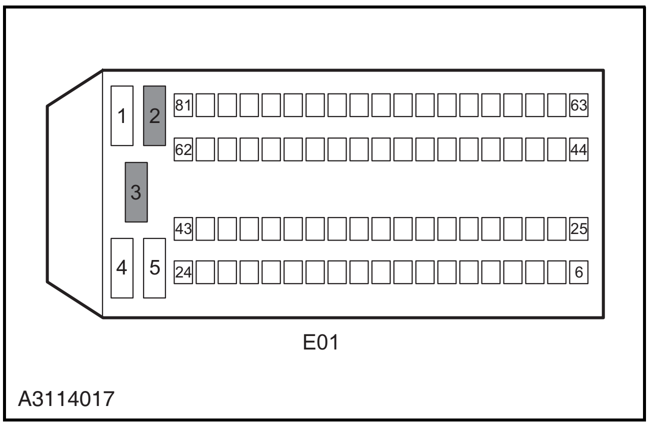
2.Possible Sources

Fault code	Test Tactics	Setting conditions(control strategy)	Fault
P1560	Hardware Circuit Inspection	Open circuit Short circuit to ground Short circuit to power EBS and battery mismatch	•Circuit •Battery sensor • ECM •Battery

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. General Procedures	
	A.Inspect the related wiring harness connectors for signs of damage, poor contact, aging or loose. Is it normal? **Y** Go to step 2 **N** Repair the fault.
2. Eliminate Fault code	
	A.Connect fault diagnostic tool. B.Turn the ignition switch to position "ON". C.Clear fault code D.Operate the vehicle. E.Reread fault code. Does fault code still exist? **Y** Go to step 3. **N** **Refer to: Intermittent Fault Diagnosis procedure (3.1.13 Electronic Control System - MT22.1, Symptom Diagnosis and Testing**
3. Match EBS with battery	
	A.Match EBS and battery using the diagnostic tool. Is the system normal? **Y** The diagnosis is completed. **N** Go to step 4.
4.Inspect battery sensor power supply circuit	
 A3114046	A.Turn the ignition switch to “ON“. B.Measure the voltage between terminal 2 of battery sensor wiring connector C18 and the reliable ground. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 5. **N** Repair EBS power circuit (including fuse EF11).

Test Conditions	Details/Results/Actions
5. Inspect LIN bus	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the sensor wiring harness connector C18. C.Disconnect the engine control module wiring harness E01. D.Measure the resistance value between Terminal 1 of C18 and Terminal 16 of E01, and check LIN bus for open circuit. **Standard Resistance Value: less than 5 Ω** E.Measure the resistance value between the terminal 1 of battery sensor wiring harness connector C18 and the reliable ground. Inspect for short circuit to ground of LIN bus. **Standard Resistance Value: 10 MΩ or higher** F.Measure the voltage value between the terminal 1 of battery sensor wiring harness connector C18 and the reliable ground. Inspect for short circuit to power supply of LIN bus. **Standard voltage: 0 V** Is the circuit normal? **Y** Go to step 6. **N** Repair or replace LIN bus.
6. Replace EBS	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery cathode cable. C.Replace battery sensor. D.Match battery sensor using the diagnostic tool. Is the system normal? **Y** The diagnosis is completed. **N** Go to step 7.

Test Conditions	Details/Results/Actions
7.Inspect CAN network circuit	
	A.Inspect CAN bus. **Refer to: CAN integrity inspection (4.3.16 Onboard Network System, Description and Operation)** Is the network normal? **Y** Go to step 8 **N** Repair the network circuit.
8. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminal 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 9. **N** Repair and inspect the ECM power supply circuit.
9. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminal 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5 Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System-MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P1565, P1566

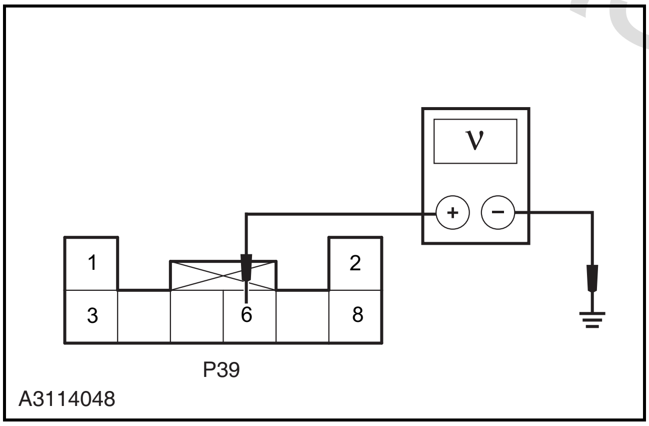
1. Fault code description

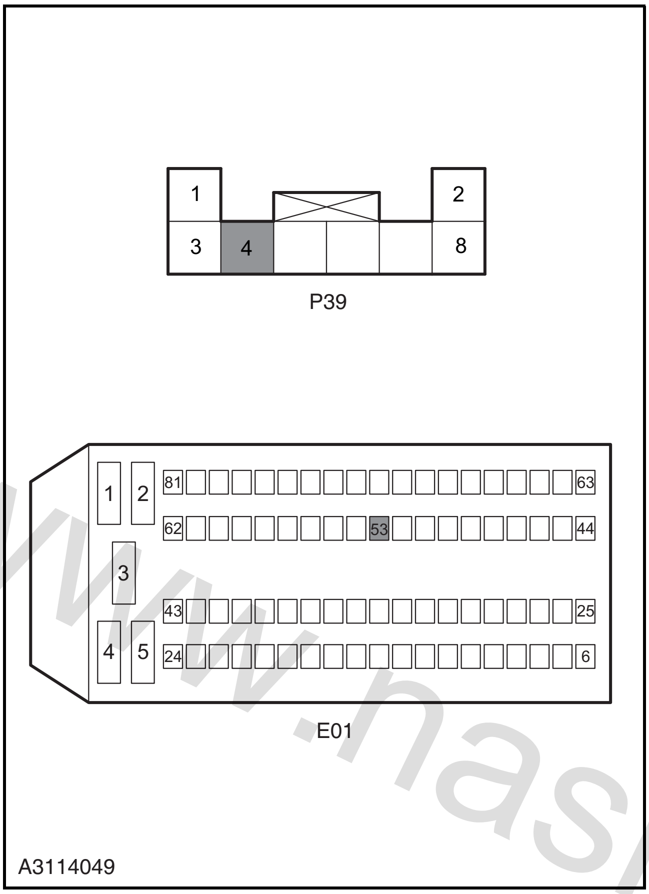
Fault code	Description	Definition
P1565	Stop/start switch signal noise fault	A main stop/start switch is arranged on the operator panel in the driving cab. With the key energized, pressing the switch once will trigger one changeover of stop/start mode.
P1566	Main stop/start switch signal sticking fault	

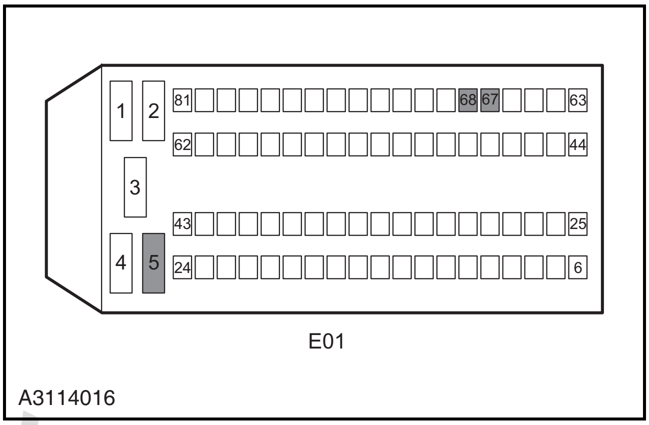
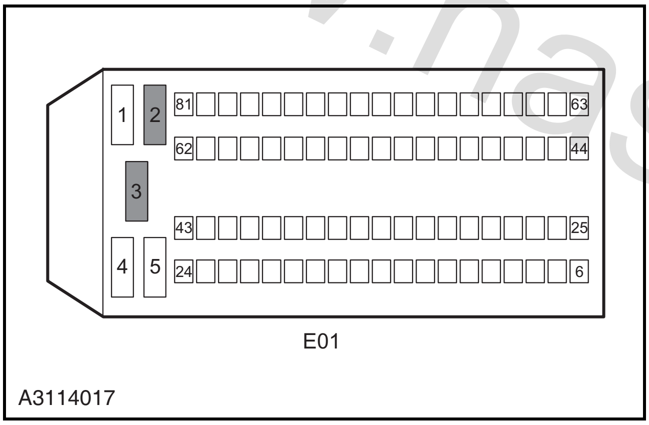
2.Possible Sources

Fault code	Test Tactics	Setting conditions(control strategy)	Fault
P1565	Hardware Circuit Inspection	Short circuit to power Stop/start switch malfunction	•Related circuit •Main stop/start switch • ECM
P1566			

3. Diagnosis procedure

Test Conditions	Details/Results/Actions
1. Inspect the power circuit if main idle stop/start switch	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the stop/start switch wiring harness connector P39. C.Turn the ignition switch to “ON“. D.Measure the resistance between the terminal 6 of the start/stop switch wiring harness connector P39 and the reliable ground. **Standard Voltage Value: 11~14 V** Is voltage normal? **Y** Go to step 2 **N** Repair the open circuit fault from Terminal 6 of wiring harness connector P39 to Terminal 39 of interior Electronic center P01 (including fuse IF17） .

Test Conditions	Details/Results/Actions
2. Inspect the idle stop/start signal circuit	
	A.Turn the ignition switch to position "LOCK". B.Disconnect the battery cathode cable. C.Disconnect the stop/start switch wiring harness P39. D.Disconnect the engine control module wiring harness E01. E.Measure the resistance value from Terminal 4 of P39 to Terminal 53 of E01 with a multimeter, and check the circuit if it is open. **Standard Resistance Value: less than 5 Ω** F.Measure the resistance between the 4 terminal of main idle start/stop switch wiring harness connector P39 and the reliable ground. Inspect for short circuit to ground. **Standard Resistance Value: 10 MΩ or higher** G.Measure the voltage between terminal 4 of main idle start/stop switch wiring harness connector P39 and the reliable ground. Inspect for short circuit to power. **Standard voltage:0 V** Is the circuit normal? **Y** Go to step 3. **N** Repair the circuit.
3. Replace main stop/start switch	
	A.Replace main stop/start switch. **Refer to: Idle Stop/Start Switch (3.1.14 Electronic Control System (Low-Carbon), Removal and Installation).** Is the system normal? **Y** The diagnosis is completed. **N** Go to step 4.

Test Conditions	Details/Results/Actions
4. Inspect the ECM power supply circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminal 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal？ **Y** Go to step 5. **N** Repair and inspect the ECM power supply circuit.
5. Inspect ECM ground circuit	
	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminal 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5 Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System-MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

DTC P1661, P1662, P1663, P1664

1. Fault code description

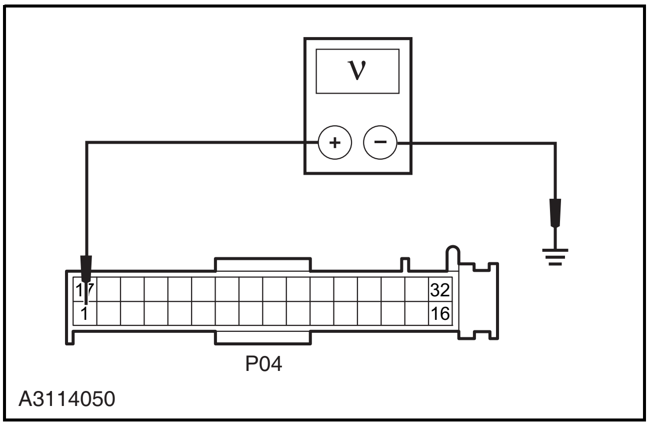
Fault code	Description	Definition
P1661	Stop/start warning lamp output circuit short circuit to low voltage or open circuit	A yellow LED indicator is provided on the instrument cluster to inform the driver of current condition of stop/start feature. If LED is off, it indicates the stop/start is disabled or the idle stop/start is allowed in current condition, if LED is on, it indicates the stop/start feature is enabled and the idle stop/start is not allowed in current condition, if the yellow LED remains on after flashing for some time, it indicates there is a stop/start related fault and the idle stop/start is not allowed. The on/off of stop/start status indicator is controlled by ECM through indicator drive-level circuit.
P1662	Stop/start warning lamp output circuit short circuit to high voltage	
P1663	Stop/start status indicator lamp output circuit short circuit to low voltage or open circuit	
P1664	Stop/start status indicator lamp output circuit short circuit to high voltage	

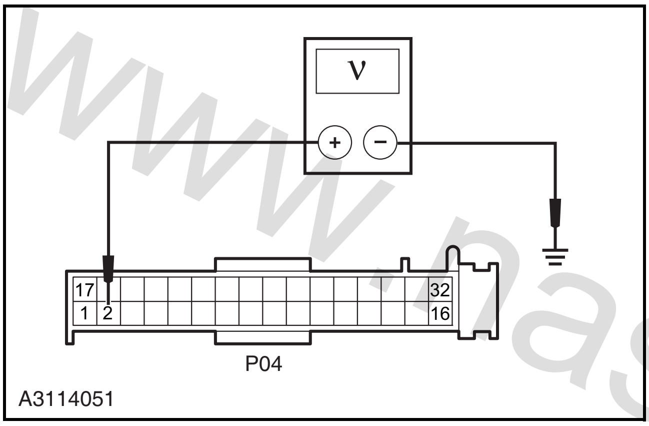
2.Possible Sources

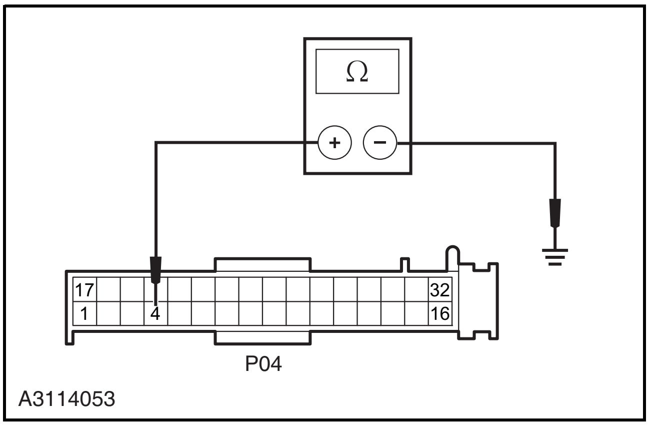
Fault code	Test Tactics	Setting conditions(control strategy)	Fault
P1661	Hardware Circuit Inspection	Open circuit Short circuit to ground Short circuit to power	•Circuit •Instrument cluster • ECM •Main idle stop/start switch
P1662			
P1663			
P1664			

3. Diagnosis procedure

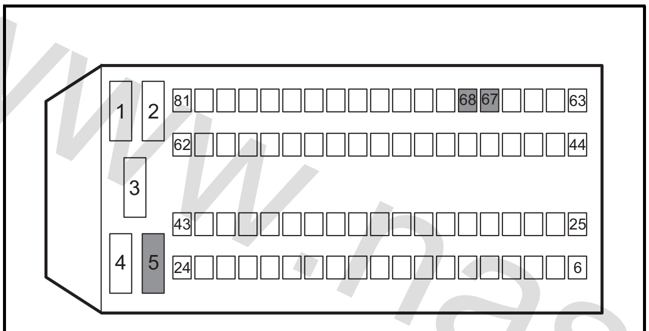
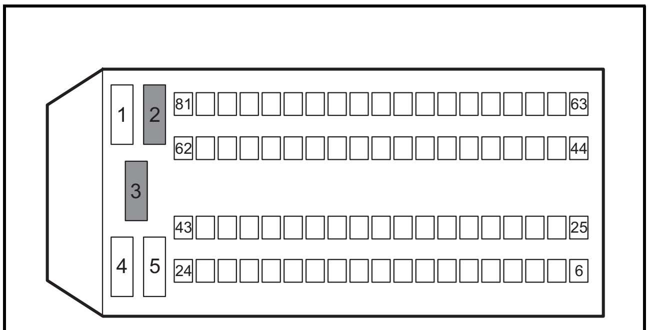
Test Conditions	Details/Results/Actions
1. Inspect instrument for other indicator state	
	A.Turn the ignition switch to position"ON". B.Inspect the status of all the indicators Is there any warning indicator lamp other than idle stop/start status indicator lamp illuminated abnormally ? **Y** Go to step 2. **N** Go to step 4.

<table>
<tr><th>Test Conditions</th><th>Details/Results/Actions</th></tr>
<tr><td colspan="2">2.Inspect instrument power supply circuit</td></tr>
<tr><td>




</td><td>
A.Turn ignition switch to "LOCK" and measure the voltage between instrument cluster wiring harness connector P04 terminal 1 and reliable ground.
Standard Voltage Value: 11~14 V
B.Turn ignition switch to "ON" and measure the voltage between the instrument cluster wiring harness connector P04 terminal 2 and reliable ground.
Standard Voltage Value: 11~14 V
Is the voltage normal?
Y
Go to step 3.
N
Repair the instrument cluster power supply circuit.
</td></tr>
<tr><td colspan="2">3. Inspect the ground circuit of the instruments</td></tr>
<tr><td>


</td><td>
A.Turn the ignition switch to position "LOCK".
B.Disconnect the instrument cluster wiring harness connector P04.
C.Turn the ignition switch to “LOCK” and measure the resistance between the instrument cluster wiring harness connector P04 terminal 4 and the GND point.
Standard Resistance Value: less than 5 Ω
Is the resistance value normal?
Y
Go to step 4.
N
Repair the circuit from the instrument cluster to ground.
</td></tr>
</table>

Test Conditions	Details/Results/Actions
4. Replace the instrument cluster	
	A.Replace instrument. **Refer to: Instrument Cluster Assembly (4.3.2 Instrument, Removal and Installation).** Does the system become normal? **Y** The diagnosis is completed. **N** Go to step 5.
5. Inspect the ECM power supply circuit	
 A3114016	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminal 5, 67 and 68 of the ECM wiring harness connector E01 and the power supply. **Standard Voltage Value: 11~14 V** Is the voltage normal? **Y** Go to step 6 **N** Repair and inspect the ECM power supply circuit.
6. Inspect ECM grounding circuit	
 A3114017	A.Turn the ignition switch to position "LOCK". B.Measure from the back of ECM wiring harness connector E01. C.Measure the resistance between terminal 2 and 3 of the ECM wiring harness connector E01 and the reliable ground terminal. **Standard Resistance Value: less than 5 Ω** Is the resistance value normal? **Y** Replace the engine control module. **Refer to: Engine Control Module (3.1.13 Electronic Control System-MT22.1, Removal and Installation).** **N** Inspect and repair the ECM ground circuit.

Removal and Installation

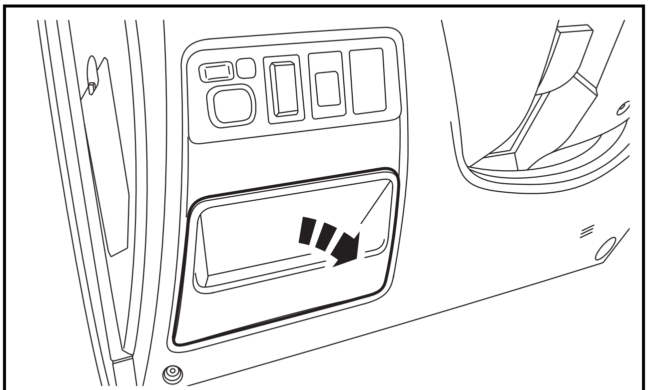
Idle Control Switch

Removal

1. Disconnect the battery negative cable.

   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

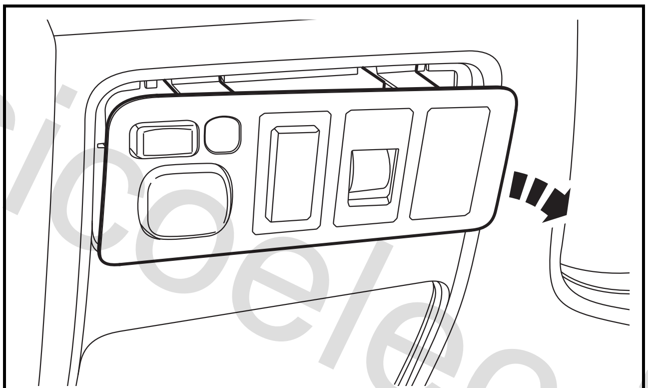
2. Remove the box at the driver side.


A3114061

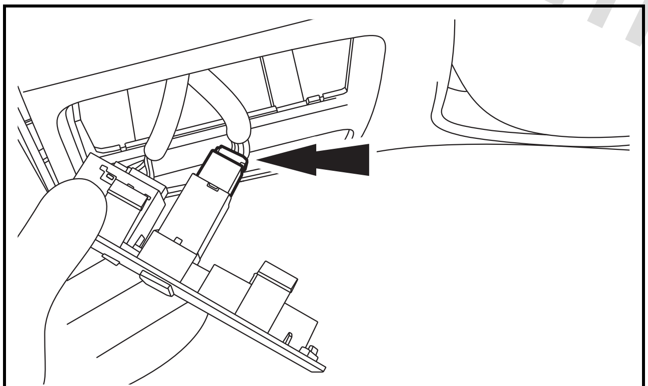
3. Remove the combination switch.

   1. Hand into the dashboard and press the combination switch clip.

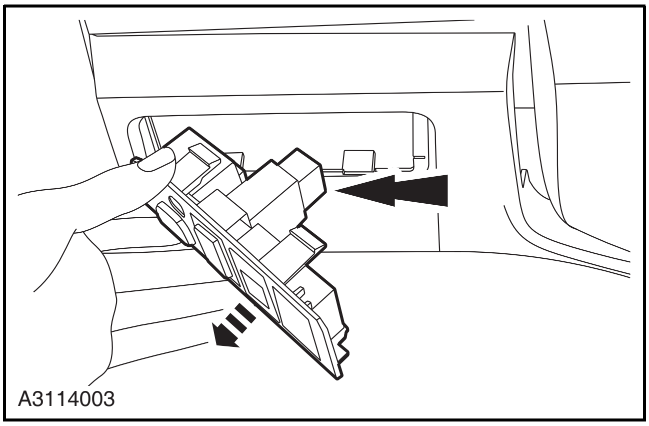
   2. Push the combination switch outwards.


A3114001

4. Disconnect the idle control switch harness wiring connector.


A3114002

5. Press the clip and take out the idle switch.



Installation

1. To install, reverse the removal procedure.

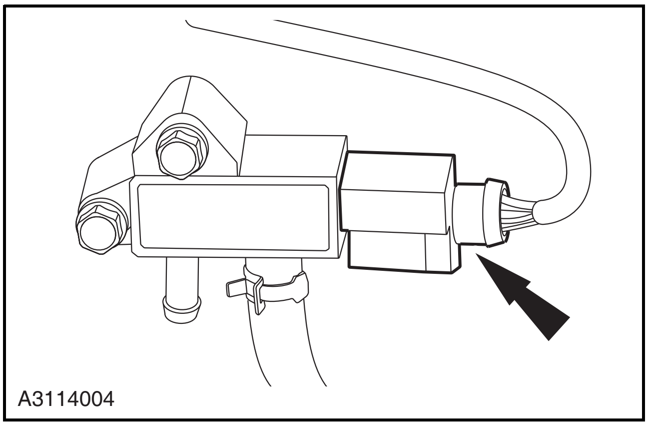
Vacuum Pressure Sensor

Removal

1. Disconnect the battery negative cable.

   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Disconnect the vacuum pressure sensor wiring harness connector.

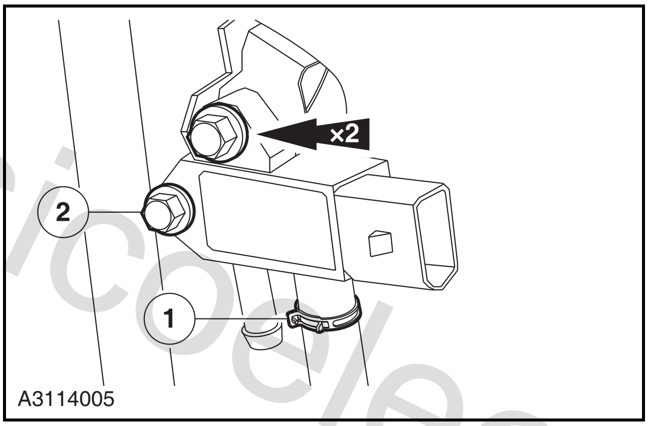


3. Remove the vacuum pressure sensor.

   1. Disconnect the connection of vacuum pressure sensor and the hose.

   2. Remove the vacuum pressure sensor retaining nut.

   Torque: 10 Nm



Installation

1. To install, reverse the removal procedure.

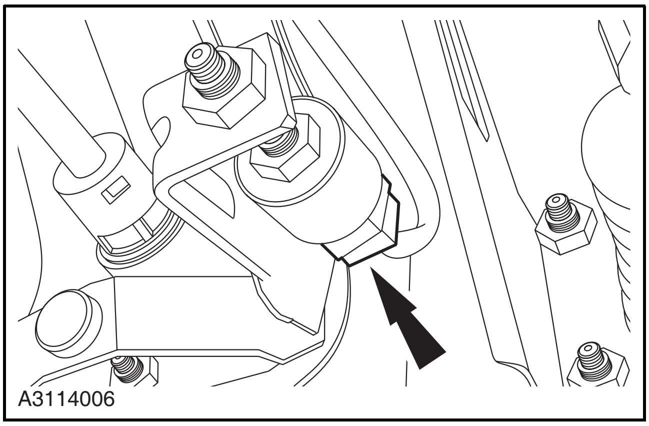
Clutch Low Level Switch

Removal

1. Disconnect the battery negative cable.

   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

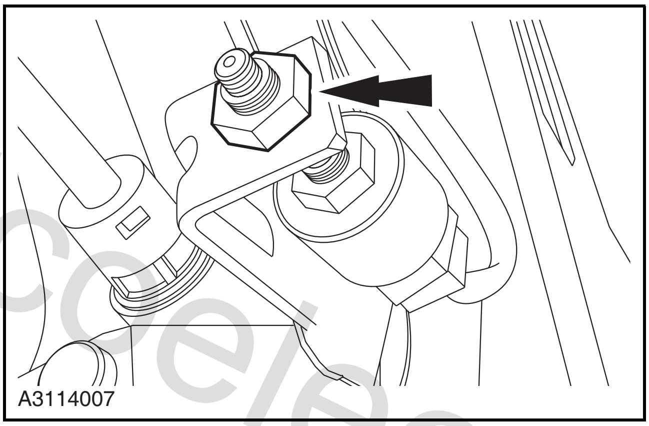
2. Disconnect the clutch low level switch harness connector.



3. Remove the clutch low level switch locking nut.

   Torque: 23 Nm

4. Remove the clutch low level switch.



Installation

1. To install, reverse the removal procedure.

3.1.11 Emission Control System

Description and Operation

System Overview

Positive Crankcase Ventilation System

At the end of the engine power combustion process, some unburned mixture leaks from the piston rings into the crank box with high pressure, this leakage is called "blow-by gas". The blow-by gas contains nitrogen oxides, carbon monoxide and hydrocarbons. If the mixed gas is not eliminate, the oil in the crankcase will be diluted, so that the engine oil will begin deterioration to cause the premature wear to engine. This blow-by gas will escape into the atmosphere from the crankcase which will cause pollution. In order to prevent blow-by gas emission into the atmosphere, at the same time prevent the oil from deterioration, use the positve crankcase ventilation system to conduct the gas in the crankcase back into the air intake system, so that the blow-by gas go through the PRV from the intake manifold into the combustion chamber to be burn.

Crankcase ventilation system consists of the following components:

- Positive crankshaft ventilation valve
- Crankcase ventilation tube
- Crankcase exhaust hose

The main control unit of the engine crankcase blow-by gas is the positve crankcase ventilation (PRV) valve. PRV measures the blow-by gas flow rate based on the manifold vacuum signal. PRV allows some of the vacuum pressure to go through the valve internal orifice and form low pressure in the crankcase. The blow-by gas in the crankcase then is absorbed into the intake system and then be burn out during the normal combustion. The blow-by gas that goes into the intake manifold is precisely controlled to maintain the idle speed quality. Use the correct and the proper the crankcase calibration that been gauged PRV. The relationship between the flow rate of the blow-by gas flow and the vacuum rate of the engine manifold is showed in the following table:

Manifold Vacuum	PRV	Blow-by Gas Flow Rate
Low	Large	Much
High	Small	Little

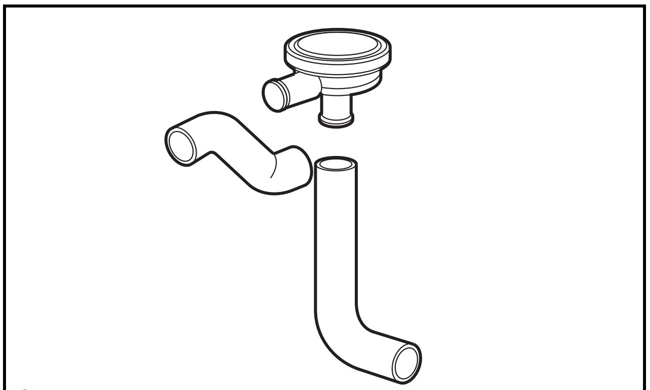
Evaporative Emission (EVAP) Control System

Fuel stored in fuel tank will generate the fuel vapor due to temperature, shaking and other factors. The fuel vapor will escape from the fuel tank into the atmosphere to cause pollution. In order to avoid this situation, fuel evaporative emission (EVAP) control system is adopted to control emissions of fuel vapor. It is activated carbon filter tank storage method. This method transfers fuel vapor from fuel tank to evaporative emission canister, or fuel vapor from the fuel tank into the fuel vapor recovery pipeline, the carbon can absorb and save the steam when the vehicle is not running. When the engine is running for a required time period, engine control module provides a ground circuit to meet the requirements of the clean working conditions, so that evaporative emission canister purge valve is switched on. Air is inhaled evaporative emission canister and mixed with steam. Then the mixture of fuel vapor is sucked out from the carbon then goes into the intake manifold to enter the cylinder to be consumed in the normal combustion process. The evaporative emission canister purge valve is controlled by the pulse width modulation (PWM) signal. The operating conditions determined by the air flow, fuel regulator and the intake air temperature control the PWM signal duty changes of evaporative emission canister purge valve.

Component Description

Positive Crankcase Ventilation Valve

Postive crankcase ventilation valve includes body, valves, cover and spring. The lower side of positive crankcase ventilation valve is connecting with the intake manifold by intake hose. The upper side is connecting with the vale chamber cap by the crankcase exhaust hose. The leakage beyond the system capacity (severe wear from the engine, continuous overload, etc.) enters into the air intake pipe, and be brought into the engine due to the systems. The positive crankcase ventilation system correct operation depends on engine seals. If the observed oil oxidation or dilution and crankcase ventilation system is normal, inspect the engine to determine the possible causes and fix them.

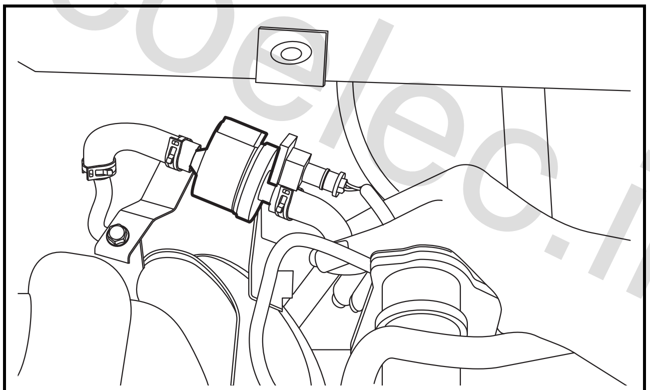


A3111001

Evaporative Emission Canister Purge Volve

Evaporative emission canister purge valve is a normally closed valve to control the evaporative emissions steam flowing from the system into the intake manifold. The valve is controlled by the engine control module through pulse width modulation (PWM) signal for precise control of fuel vapor flow into the engine.

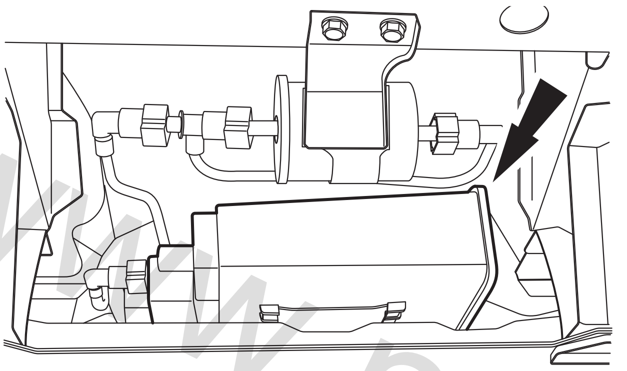
In the evaporative emissions system testing process, this valve will open to make the engine vacuum enter the evaporative emissions system.



A3111002

Evaporative Emission Canister

Evaporative emission canister is an emission control device with activated carbon particles in it. Evaporative emission canister is used to absorb and store the fuel vapor. Fuel vapor is always been stored in the evaporative emission canister; when meeting certain conditions, the engine control module will control the evaporative emission canister purge valve so that the fuel vapor is drawn off the engine cylinder and combusted.

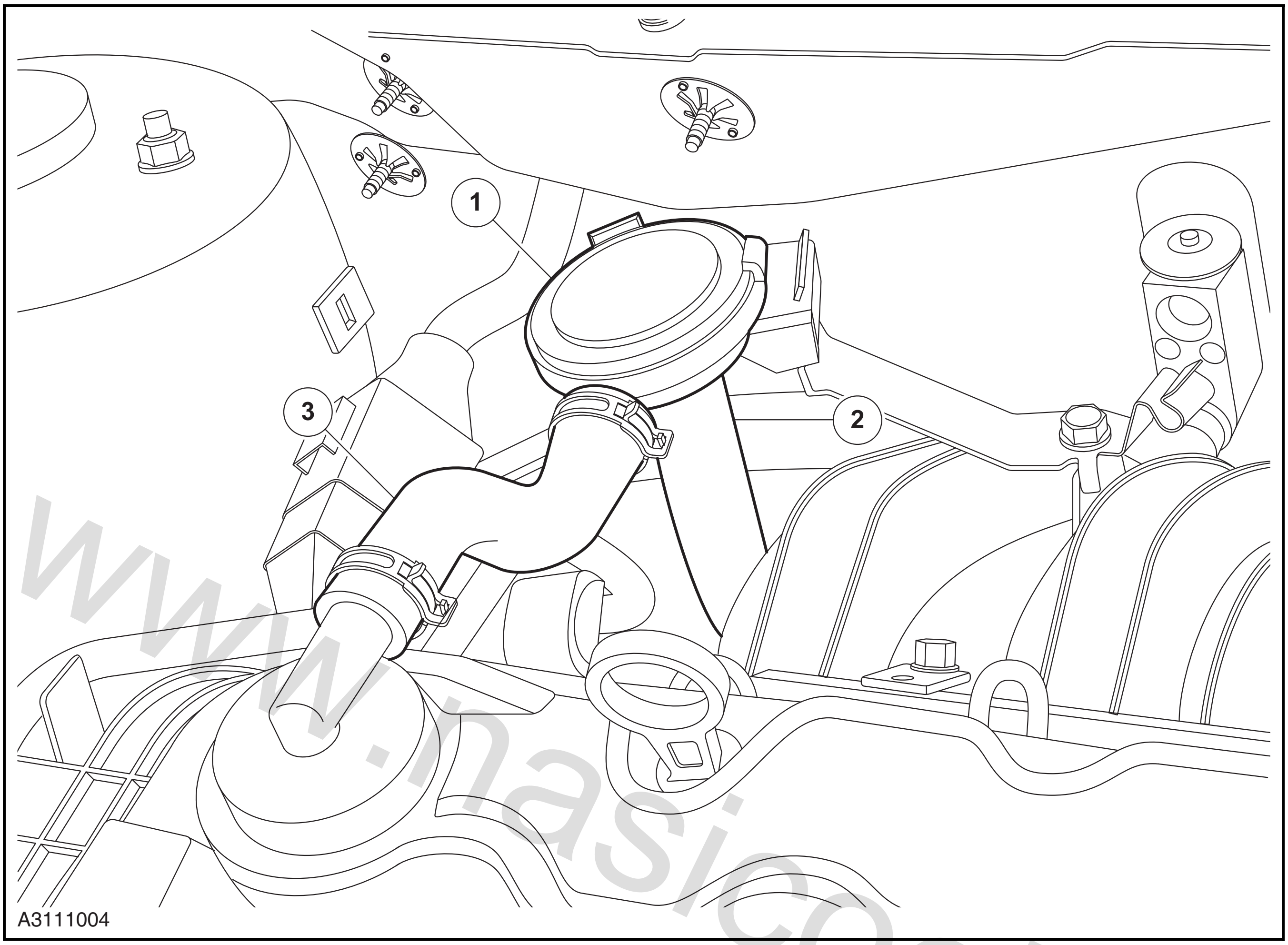


A3111003

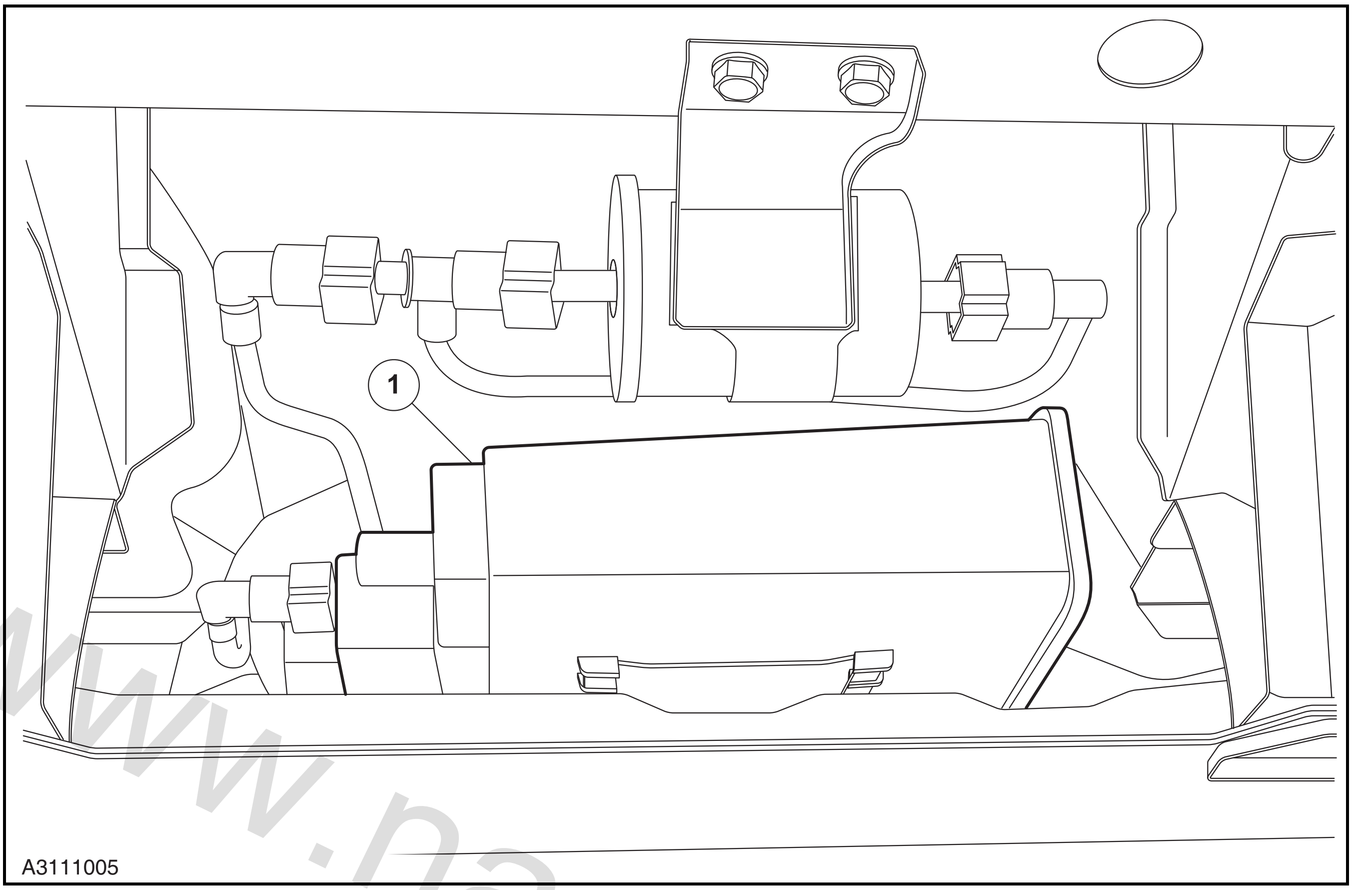
The following conditions can lead to poor engine idle speed, stalling and poor maneuverability:

- Evaporative emission canister purge valve does not work.
- Evaporative emission canister is damaged.
- Hose is broken, crack, or not properly connected to the pipeline.

Location View



Item	Description	Item	Description
1	Positive crankshaft ventilation valve	3	Crankcase exhaust hose
2	Crankcase ventilation tube		



Item	Description
1	Canister

General Procedures

General Equipment

Digital Multimeter

PRV Inspection

If the engine idle speed is unstable, inspect the PRV to see if it is blocked, if the vent filter, air filter is too dirty or the filter or hose is blocked. Perform the following procedures:

1. Remove the PRV from the valve chamber cover.
2. Run the engine at idle speed.
3. Put finger at the valve side to inspect for vacuum. If there is no vacuum, inspect for the following conditions:
   - The hose is blocked.
   - Manifold port is blocked.
   - PRV is blocked.

Blocked PRV or hose may cause the following malfunction.

- Engine idle speed is unstable
- Engine stall or idle speed is too low
- Engine oil leakage
- Oil enter the air filter
- Oil dirt in engine
- Engine crankcase pressure is too high

PRV or hose leaks can lead to the following conditions:

- Engine idle is unstable
- Engine stall
- Engine idle speed is too high
- Engine oil leakage

Evaporative Emission Canister Purge Valve Inspection

Perform the following procedures:

1. Remove the vacuum hose from the purge valve.
2. Run the engine at idle speed.
3. Put finger at the remote end of vacuum hose, inspect whether the tube is vacuum. If no vacuum, inspect for the following conditions:
   - Vacuum hose is blocked
   - Vacuum hose crack
4. Blow a appropriate air flow into the valve entry, the valve channel should be blocked, if there is leakage, replace the valve.
5. Use diagnostic tool to drive the valve, blow a appropriate air flow into the valve entry, the valve channel should be connected, if the channel is blocked, inspect and repair the valve.

Evaporative Emission Canister Inspection

1. Inspect the evaporative emission canister ventilation pipe on the filter, if there is any blockage, crack or deformation, replace the filter.
2. Evaporative emission canister visual inspection: if there is any crack or deformation, replace it if necessary.
3. Remove and shake the evaporative emission canister, if there is abnormal noise, replace it.
4. Inspect the evaporative emission canister hose, if blocked or damaged, replace it.
5. Blow a appropriate air flow into one of the pipe of evaporative emission canister, the air flow should flow out from the other two pipes. If not, replace the evaporative emission canister.

Symptom Diagnosis and Testing

General Equipment

Digital mulimeter

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect the obvious mechanical and electric damage.
3. If an obvious cause for an observed or reported concern is found, correct the cause before proceeding to the next step.
4. If the cause is not evident, verify the symptom and refer to the Symptom Chart.

Visual Inspection Chart

Mechanical	Electrical
• Hose/hose joint • Gasket • PRV • PRV separator • Vacuum tube • Evaporative emission canister • Evaporative emission system pipeline	• Eletronic connector • Wiring harness • Fuse • Relay • Evaporative emission canister purge valve • Engine control module (ECM)

Symptom Chart

If there is symptom but no diagnosis trouble code (DTC) is stored in control module and can not confirm symptom reasons in basic inspect, it is necessary to diagnosis and eliminate the symptoms in the following chart.

Symptom	Possible Sources	Action
Crankcase pressure is too high	• PRV or hose is blocked or damaged • Crankcase ventilation oil separator is blocked	• Inspect PRV system for components block, clean or install new components if necessary.
	• Engine component wear or damage	**Refer to: Engine Mechanical (3.1.2 Mechanical System, Disassembly and Assembly).**
Evaporative emission system leak	• Pipe crack • Evaporative emission canister is broken	• Replace the pipe. • Replace the evaporative emission canister.
Evaporative emission system block	• Ventilation pipe is blocked	• Clean the ventilation pipe. • Replace the ventilation pipe. • Replace the ventilation pipe filter.
	• Pipe is blocked	• Clean the pipe draining port. • Replace the pipe.
	• Valve pipe is blocked	• Clean the valve pipe block. • Replace the valve.
Evaporative emission purge valve does not work	• Circuit fault • Purge valve fault • ECM fault	• DTC diagnosis •Inspect and repair the circuit • Replace the purge valve • Replace ECM

Evaporative Emission Canister Purge Valve Not Work Diagnosis

Refer to: DTC P0458、 P0459 (3.1.13 Electronic Control System - MT22.1, DTC Diagnosis and Testing).

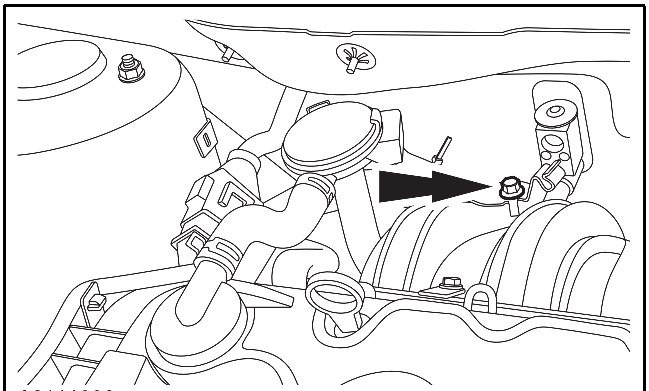
Removal and Installation

PRV Valve

Removal

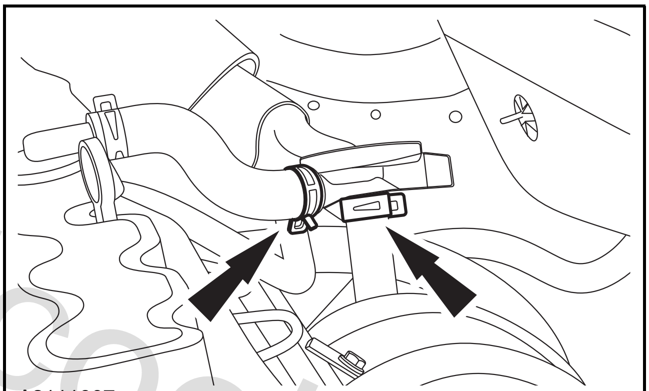
1. Remove the PRV valve fixed support bolt and take out the fixed support.

   Torque: 10 Nm



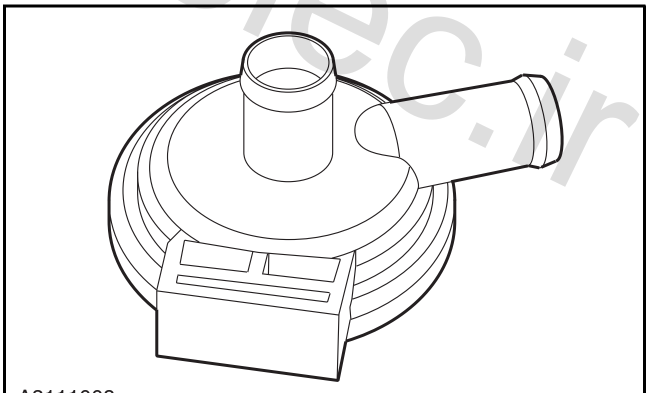
A3111006

2. Release the PCV vacuum tube clamp holder and detach the PCV vacuum tube.



A3111007

3. Check the PRV valve and replace it if necessary.



A3111008

Installation

1. To install, reverse the removal procedure.

CAUTION: After installation, inspect whether the intake manifold leaks.

Refer to: Diagnostic Procedures for Intake Air Leak (3.1.5 Intake Air System, Fault Symptom Diagnosis and Testing).

EVAP Solenoid Valve

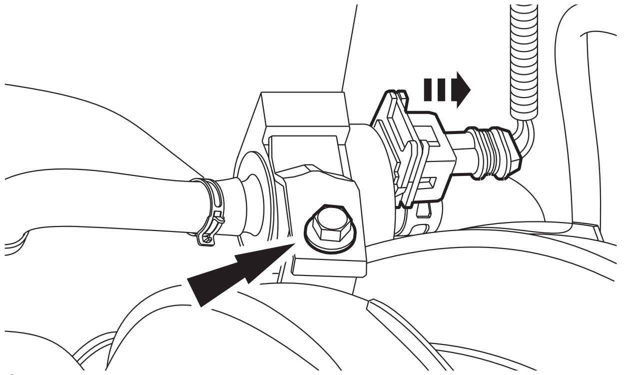
Removal

1. Disconnect the battery negative cable.

   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

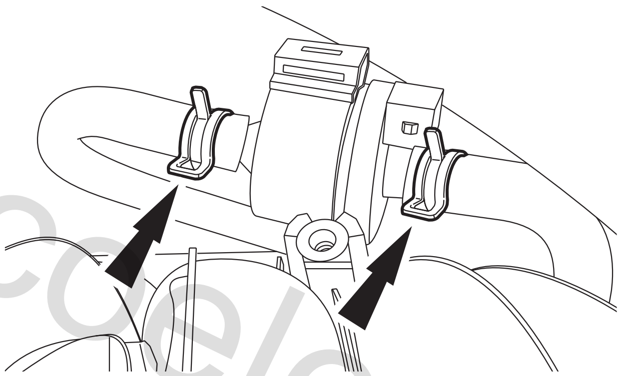
2. Remove the EVAP solenoid valve support bolt and take out the EVAP solenoid valve support.

   Torque: 10 Nm


A3111009

3. Disconnect the EVAP solenoid valve wiring harness connector.

4. Release the EVAP solenoid valve hose clamp holder and disengaged the EVAP hose valve.


A3111010

Installation

1. To install, reverse the removal procedure.

CAUTION: After installation, inspect whether the intake manifold leaks.

Refer to: Diagnostic Procedures for Intake Air Leak (3.1.5 Intake Air System, Fault Symptom Diagnosis and Testing).

Active Carbon Canister

Removal

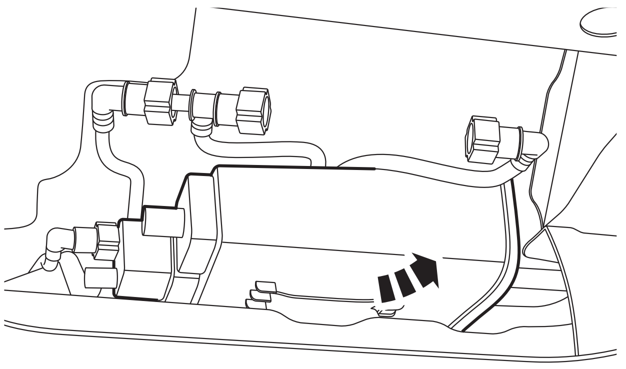
1. Disconnect the battery negative cable.

   Refer to: Battery Inspection (3.1.10 Charging System, General Procedures).

2. Remove the fuel filter.

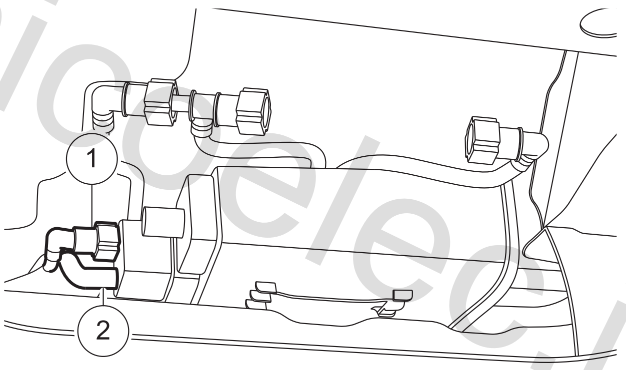
   Refer to: Fuel Filter (3.1.7 Fuel System, Removal and Installation).

3. Remove the active carbon canister.



A3111013

4. Disengage the hose 1 that from the active carbon canister to the fuel tank.
5. Disengage the hose 2 that from the active carbon canister to the solenoid valve.
6. Take out the active carbon canister.



A3111014

Installation

1. To install, reverse the removal procedure.