



Workshop Manual

Mulsanne 2012 ▶

Generic Scan Tool							
Engine ID	CKB A	CKB B	CZM A	CZM B			

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Edition 10.2019

List of Workshop Manual Repair Groups

Repair Group

ST - Generic Scan Tool



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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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ST – Generic Scan Tool

1 General Information

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Included in the contents of this Generic Scan Tool (GST) manual is a summary table of the vehicle specific OBD II Emission Related DTCs. The DTC table contains DTC Malfunction Criteria, Threshold Values, Secondary Parameters, Enabling Conditions, Monitoring Time Length, Frequency of Checks, and MIL Illumination information which can be used to accurately monitor and diagnose emissions related faults and perform functions required to run Modes 01 through 0A (if applicable) with a hand held scan tool.

This manual also contains the step by step procedures to accurately diagnose and repair a component or system once a DTC has been set. References to repair procedures and wiring diagrams can be found within the diagnostic test procedures.

- ◆ ⇒ [“1.1 Safety Precautions”, page 2](#)
- ◆ ⇒ [“1.2 Clean Working Conditions”, page 3](#)

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1.1 Safety Precautions

Check for Technical Bulletins that may supersede any information included in this manual.



WARNING

Failure to follow these instructions may result in personal injury or possible death.

Check the Technical Bulletins for information, cautions and warnings that may supersede or supplement any information included in this manual.

When performing the drive cycle operation, pay strict attention to driving conditions and observe and obey all posted speed limits.

Test equipment must always be secured to the rear seat and operated by a second person. If test and measuring equipment is operated from the passenger seat, the person seated could be injured in the event of an accident involving deployment of the passenger-side airbag.

The fuel system is under pressure! Before opening the fuel system, place rags around the connection area. Then release pressure by carefully loosening the connection.

The engine section of the fuel system, after the high pressure pump, is under extremely high pressure! When working on engine or fuel injection system, fuel pressure must be relieved to residual pressure before opening high pressure components. Refer to the Service Manual for the proper procedure.

If the battery has not been disconnected, the fuel pump fuse must be removed before opening the fuel supply system as the fuel pump may be activated by the driver's door contact switch.

Testing of the EVAP and ORVR systems can result in the escape of explosive fuel vapor. Do not smoke while testing the EVAP system, and make sure the area you are working in is well ventilated.

Observe the following for all procedures, especially in the engine compartment due to lack of room:

- ◆ *Route lines of all types (e.g. for fuel, hydraulic, EVAP canister system, coolant and refrigerant, brake fluid, vacuum) and electrical wiring so that the original path is followed.*
- ◆ *Watch for sufficient clearance to all moving or hot components.*
- ◆ *Do not touch or disconnect the Ignition Coils, ignition wires, connecting parts or adapter cables when the ignition is on or the engine is running or turning at starting RPM.*
- ◆ *Only disconnect and reconnect wires for injection and ignition system, including test leads, when the ignition is turned off.*

When removing and installing components from full or partially full fuel tanks, observe the following:

- ◆ *The fuel tank must only be partially full. How much fuel can remain in the fuel tank may be read in the respective work description. Empty the fuel tank if necessary.*



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◆ *Before starting work, switch on the exhaust extraction system and place an extraction hose close to the installation opening of the fuel tank to extract escaping fuel fumes. If no exhaust extraction system is available, a radial fan (as long as motor is not in air flow) with a displacement greater than 15 m³/h can be used.*

◆ *Prevent fuel from contacting the skin! Wear fuel-resistant gloves!*

When servicing the engine control module (ECM), it may be necessary to use a heat gun. The heat gun, shear bolts, and parts of the protective housing will become extremely hot. Use extreme caution when working with or handling these parts to avoid personal injury.

Observe operating instructions when working with a heat gun. To prevent damage (burning) to the wiring and harness connections, insulation and the electronic components, perform outlined work steps exactly!

The cooling system is under pressure. To avoid scalding, use caution when opening the cooling system and servicing cooling system components!



Caution

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The battery must only be disconnected and connected with the ignition switched off. Otherwise, the engine control module (ECM) can be damaged.

The use of nails, paper clips, or another unauthorized materials to back-probe harness connectors is strictly prohibited and may cause damage to the harness connectors, terminal ends or to a component. Use only the manufacturers test lead kit or an equivalent aftermarket test lead kit for back-probing all harness connectors.

Do not use sealants containing silicone. Particles of silicone drawn into the engine, will not be burned in the engine and will damage the oxygen sensors.

Secure all hose connections with the correct hose clips (the same as original equipment).

If engine is to be cranked without starting (for example; as part of a compression test), remove the fuses for the voltage supply of ignition coils and the fuel injectors.

An electrostatic charge can lead to functional problems of electrical components of the engine, transmission and selector lever mechanism. Touch a grounded object, e.g. a water pipe or a hoist, before working on electrical components.

Do not make direct contact with harness connector terminals.

Use only gold-plated terminals when servicing any component with gold-plated harness connector terminals.

1.2 Clean Working Conditions

Even minor contaminations can lead to malfunctions in the fuel injection system. When working on the fuel supply/injection system, pay careful attention to the following rules of cleanliness:

◆ Thoroughly clean all connections and the surrounding area before disconnecting.

- ◆ Place removed parts on a clean surface and cover. Use lint-free cloths.
- ◆ Carefully cover opened components or seal, if repairs are not performed immediately.
- ◆ When the system is open, do not work with compressed air. Do not move vehicle unless absolutely necessary.
- ◆ Install clean components: Remove the parts being replaced immediately prior to installation of the new parts. Do not use parts that have been stored unpacked (e.g. in tool boxes etc.).
- ◆ Electrical connectors that have been disconnected: Protect from dirt and moisture. Make sure connections are clean and dry when reconnecting.



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2 Description and Operation

- ◆ ⇒ [“2.1 On Board Diagnostic Systems”, page 5](#)
- ◆ ⇒ [“2.2 Evaporative Emission System”, page 5](#)
- ◆ ⇒ [“2.3 Electronic Throttle Control \(ETC\) System”, page 7](#)
- ◆ ⇒ [“2.4 Electronic Power Control \(EPC\) Warning Lamp”, page 7](#)
- ◆ ⇒ [“2.5 Engine Control Module \(ECM\)”, page 8](#)
- ◆ ⇒ [“2.6 Malfunction Indicator Lamp \(MIL\)”, page 8](#)
- ◆ ⇒ [“2.7 Controller Area Network \(CAN\)”, page 8](#)
- ◆ ⇒ [“2.8 Fuel Supply”, page 9](#)
- ◆ ⇒ [“2.9 Ignition and Timing”, page 10](#)
- ◆ ⇒ [“2.10 Variable Valve Timing”, page 11](#)
- ◆ ⇒ [“2.11 Exhaust-Gas Recirculation \(EGR\) System”, page 11](#)
- ◆ ⇒ [“2.12 Secondary Air Injection”, page 11](#)
- ◆ ⇒ [“2.13 Exhaust Systems”, page 11](#)

2.1 On Board Diagnostic Systems

On Board Diagnostics, or OBD, is an automotive term referring to a vehicle's self-diagnostic and reporting capability. OBD systems give the vehicle owner or repair technician access to the status of the various vehicle sub-systems. Modern OBD implementations use a standardized digital communications port to provide real-time data in addition to a standardized series of Diagnostic Trouble Codes (DTCs) which allow one to rapidly identify and remedy malfunctions within the vehicle. Legislation mandates a vehicle equipped with OBD-II to light up the fault indicator lamp if its emissions exceed the prevailing limit due to system malfunction.

All cars built since January 1st, 1996 (MY 1996) are equipped with OBD-II systems. Manufacturers started incorporating OBD-II in various models as early as 1994; however, some early OBD-II cars (MY 1994 and MY 1995) were not 100% compliant.

2.2 Evaporative Emission System

The evaporative emission system has been designed to minimize the release of hydrocarbons from the fuel system into the atmosphere. The evaporative emission system components all work together with the ECM to prevent fuel vapor from escaping and route it to the intake manifold to be burned during normal combustion.

The leak detection system checks the integrity of the evaporative emission system by pressurizing the system.

- ◆ There are 3 different types of evaporative emission systems used. These systems are explained below.
- ◆ ⇒ [“2.2.1 Leak Detection Pump \(LDP\) EVAP System”, page 6](#)
- ◆ ⇒ [“2.2.2 Tank Leak Diagnostic Module \(DM - TL\) EVAP System”, page 6](#)
- ◆ ⇒ [“2.2.3 Natural Vacuum Leak Detection \(NVLD\) EVAP System”, page 6](#)
- ◆ ⇒ [“2.2.4 EVAP System, Checking for Leaks”, page 6](#)

2.2.1 Leak Detection Pump (LDP) EVAP System

The leak detection pump (LDP) is integrated into the EVAP system and can have two functions. The LDP can:

- ◆ Pressurize the EVAP system and detect a drop in pressure that would indicate a leak.
- ◆ Function as the EVAP Canister Vent on vehicles that do not have a separate EVAP Canister Vent.

The LDP is a vacuum-driven, ECM controlled, diaphragm pump. In order to operate, the engine must be running and vacuum applied to the Vacuum Switch.

2.2.2 Tank Leak Diagnostic Module (DM - TL) EVAP System

The canister purge valve can be actively checked using the Tank Leak Diagnostic Module (DM - TL). For this purpose the electric pump is shortly activated while the combustion engine is running, to build up a minor pressure in the fuel tank and monitor the pressure decay after opening the canister purge valve. Optionally as a quick pass method, the monitoring can be carried out by passively monitoring the fuel mixture deviation when the canister purge valve is opened. If a significant fuel mixture deviation is detected, the purge valve monitor passes. The Tank Leak Diagnostic Module (DM - TL) consists of an electrically operated air pump, an orifice with a defined diameter serving as a reference leak, and a change-over valve switching the air flow between the reference leak and the tank. If neither the pump nor the change-over valve is activated, the tank is ventilated through a bypass in the module.

2.2.3 Natural Vacuum Leak Detection (NVLD) EVAP System

The system utilizes an engine-off natural vacuum evaporative system integrity check that tests for leaks with a diameter of 0.020 inch while the engine is off and the ignition is off. The natural vacuum leak detection (NVLD) evaporative system integrity check uses a pressure switch to detect evaporative system leaks. The correlation between the pressure and the temperature in a sealed system is used to generate a vacuum in the tank when the temperature drops. If a sufficient temperature drop is detected for a minimum time period, the vacuum level in a sealed system will exceed the threshold to close the NVLD pressure switch. Therefore, if the switch does not close under these conditions, a leak is detected. If the switch closes, the system is considered to be leak-free.

2.2.4 EVAP System, Checking for Leaks

The following procedure is used to diagnose EVAP System leaks.

Special tools and workshop equipment required

- ◆ Smoke tester.
- ◆ EVAP and Fuel Supply System Vacuum hose and line routing diagram.

Leak checking

- Using a Smoke tester, check the Evaporative Emission (EVAP) canister system for leaks.
- Always follow the manufacturers directions for the proper installation and operation of the smoke tester being used.

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If a leak is detected:

- Check the fuel filler cap seal for damage and for proper installation. Replace if necessary.
- Check all hose connections of the fuel supply system and replace or repair any leaking lines.
- Check all hose connections of the EVAP system and replace or repair any leaking lines.
- Check that the seal under the locking flange is properly tightened on the fuel tank.
- Secure all hose connections using appropriate fittings for the model type.
- Replace seals and gaskets when performing repair work.
- Repair or replace any damaged component.

If no leaks are found in the EVAP system:

- Erase the DTC memory if a DTC was set. Refer to [⇒ “3.3.4 Diagnostic Mode 04 – Erase DTC Memory”, page 22](#).
- Perform a road test to verify repair.

If a DTC was set and does not return:

Diagnosis complete. Generate readiness code. Refer to [⇒ “3.2 Readiness Code”, page 14](#).

If the same DTC does return and no leaks are found in the EVAP system:

- Check for any related TSB's.
- Perform the diagnostic test procedure for the suspected component.

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2.3 Electronic Throttle Control (ETC) System

The electronic throttle control (ETC) system consists of the accelerator-pedal module, the engine control module (ECM), and the electronic throttle body. The electronic throttle body mainly consists of the throttle valve, the electric throttle-valve drive element, and the throttle-valve position sensor (TPS). The drive element is a DC servomotor, which acts on the throttle-valve shaft via a gear unit. The throttle-valve position sensor is a redundant sensor system that detects the position of the throttle valve. The sensors have opposite resistance curves so that the ECM can always cross check the signals to ensure the correct position of the throttle valve is always known.

The driver command is detected by a redundant sensor system in the accelerator-pedal module, and the signal is sent to the engine control module. The engine control module then determines the required throttle-valve position by performing calculations from data measured by sensors such as accelerator pedal position sensor, engine speed sensor and vehicle speed sensor. The actual throttle opening can be more or less in proportion to accelerator pedal position given different engine operating points.

2.4 Electronic Power Control (EPC) Warning Lamp

When the ignition is switched on, the engine control module (ECM) checks the electronic throttle control system for static system integrity (e.g. circuit integrity, communications, etc); the electronic power control (EPC) warning light is turned on via the Instrument Cluster during this process. Shortly after engine start,

the EPC warning light is turned off if no malfunction in the electronic throttle control system is detected. In the event of a malfunction while the engine is running, the ECM will activate the EPC warning light via the Instrument Cluster and at the same time, a Diagnostic Trouble Code (DTC) is stored in the ECM memory.

2.5 Engine Control Module (ECM)

The Engine Control Module (ECM) is a generic term for any embedded system that controls one or more of the electrical systems or subsystems in a vehicle. It controls a series of actuators on an internal combustion engine to ensure that driver commands (e.g. to accelerate) are translated into appropriate engine performance. It reads values from a multitude of sensors, interprets the data, and adjusts the engine actuators accordingly. The ECM also interacts with the transmission control module (TCM), ABS/traction/stability control module and other vehicle function related control systems.

ECM controlled systems and functions (performance and emission related) will be introduced in the following chapters. These include the OBD system, controller area network (CAN), throttle control module, fuel supply, ignition, variable valve timing, exhaust-gas recirculation, secondary air injection, exhaust system, and EVAP system.

2.6 Malfunction Indicator Lamp (MIL)

When the ignition is switched on, the Engine Control Module (ECM) performs checks on static system integrity (e.g. circuit integrity, communications, etc). The Malfunction Indicator Lamp (MIL) is switched on during this process via the Instrument Cluster. After engine starts, the ECM examines engine operation for potential malfunction(s) or failure(s) that can lead to increased emission values. If no malfunction is detected, the ECM switches off the MIL via the Instrument Cluster.

In the event of a malfunction during the operation of the engine, the ECM will activate the MIL via the instrument cluster and at the same time, a Diagnostic Trouble Code (DTC) is stored in the ECM memory. In OBD systems, the MIL can have up to three stages: steady, flashing and Stop Vehicle. A steady MIL indicates a minor fault (e.g. a failing oxygen sensor) whereas a flashing MIL indicates a more severe malfunction that could result in damage of engine or exhaust system components (e.g. the catalytic converter) if left uncorrected for an extended period. This would also indicate a severe fault. The three stages are 1. ON, then OFF; 2. ON steady; 3. flashing constantly. The 3rd stage indicates damage may occur and driver must stop.

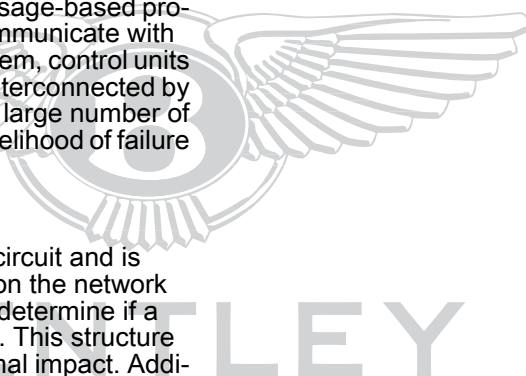
2.7 Controller Area Network (CAN)

Overview

The Controller Area Network (CAN) bus is a message-based protocol that allows control units and devices to communicate with each other using a shared network. With this system, control units of the various electronic systems are no longer interconnected by multiple separate cables. This does away with a large number of electrical connections and results in a reduced likelihood of failure of the device network.

Broadcast Communication

Each of the devices on the network has a CAN circuit and is therefore is considered "intelligent". All devices on the network see all transmitted messages. Each device can determine if a message is relevant or if it should be filtered out. This structure allows modifications to CAN networks with minimal impact. Addi-



tional non-transmitting nodes can be added without modification to the network.

Priority

Every message has an assigned priority. If two nodes try to send messages simultaneously, the one with the higher priority gets transmitted and the one with the lower priority gets postponed. This arbitration does not affect other messages and results in non-interrupted transmission of the highest priority message

2.8 Fuel Supply

Overview

The fuel supply system delivers fuel to an internal combustion engine. With carburetors being replaced by fuel injections systems in the late 1980s and 1990s, the most common types of fuel supply system currently in use are throttle body injection (single-point injection), multiport injection (MPI) and direct injection (DI).

Fuel injectors atomize fuel because high pressure is forcing the fuel through a small nozzle in the injector into the intake air stream or the combustion chamber. This process is often controlled by the ECM and is dependent on data received from other sources (e.g. mass air flow sensor, throttle position sensor, etc.) to determine the precise amount of fuel needed for any given operating condition. The primary advantages of fuel injection over carburetor are improved fuel economy, increased power output and reduced emissions. The following sections will discuss each fuel injection concept in detail.

Throttle Body Injection

Throttle body injection uses a single electrically controlled injector at the throttle body. The fuel is drawn by an electric fuel pump out of the fuel tank and flows through a paper filter into the fuel injector. Since injection happens at the same location as the carburetor, very little engine redesign (intake manifold, fuel line routing, etc.) is necessary. The cost saving of throttle body injection compared to other fuel injection methods encouraged vast adoption in the late 1980s and early 1990s.

Throttle body injection system also inherits many disadvantages of the carburetor. One of them being the inability to precisely control the amount of fuel supplied into each cylinder, and is unable to precisely control combustion and emissions. It also restricts the design of intake manifold as any sharp bends in the intake path will cause atomized fuel to accumulate on the outer wall of the intake path. Supplying moderate engine heat to the intake manifold is also necessary to ensure that the fuel stay vaporized. This results in a relatively high intake air temperature and compromises performance.

Multiport Injection (MPI)

Multiport injection (MPI) consists of an injector for each cylinder just upstream of the intake valve. The fuel pump delivers the fuel into a high-pressure line where it flows to the fuel rail and injectors. When activated by the ECM, each injector sprays fuel at the intake port of its corresponding cylinder – this allows individual cylinders to receive the right amount of fuel in a more precisely timed manner. Sequential fuel injection mode can be applied to activate each injector individually to improve engine response. Lowered fuel consumption and emissions are also achieved.

Sequential multiport injection is still the most common fuel injection system found on most economy cars thanks to its high efficiency, control simplicity and low manufacturing cost (compared to direct injection). However, to further improve drivability (performance) while reducing emissions and fuel consumption, direct injection becomes a superior alternative.

Direct Injection

Injectors in directly injected (DI) engines are mounted on the cylinder head and fuel is injected directly into the engine's combustion chamber. In order to overcome the pressure in the combustion chamber during compression and power stroke, injectors often operate at a primary pressure as high as 3,000 psi. At such extreme pressure level, no single fuel pump can supply the required pressure directly from the fuel tank to the injectors. Instead, a low-pressure and a high-pressure system are employed. The low-pressure system principally utilizes the same fuel systems and components for multiport injected engines. The high-pressure system consists of a high-pressure fuel pump driven directly by the camshaft, a fuel rail (high-pressure accumulator), a high-pressure sensor and, depending on the system, a pressure-control valve or a pressure limiter. The injectors are operated by the ECM to send a precise amount of fuel from the high-pressure rail directly into the combustion chamber.

The distinctive difference between direct injection and other injection methods is that direct injection offers the flexibility regarding when in the combustion cycle the fuel is added and how. MPI systems can only add fuel during induction; A DI system can add fuel whenever it needs to. For example, fuel can be added during induction to create a homogeneous charge then added again after ignition to enhance power delivery under full load conditions.

VW/Audi Fuel Stratified Injection (FSI)

The goal of a stratified-charge operation is to form an ignitable mixture near the spark plug at the instant of ignition. This means that, instead of supplying the corresponding stoichiometric fuel quantity to the amount of air in the combustion chamber, the fuel interacts only with a portion of the air before it is conveyed to the spark plug. The rest of the fresh air surrounds the stratified charge allowing an ultra-lean condition with air-fuel ratio exceeding 50:1 in some instances. As less fuel is used to "burn" more air, stratified injection helps to further reduce fuel consumption when the engine is operating in low-load conditions (e.g. highway cruising). This is created by designing the combustion chamber so that a "swirling" effect of the air-fuel charge is caused.

2.9 Ignition and Timing

Ignition

A spark ignition (SI) engine requires a spark to initiate combustion in the combustion chamber. Voltage is supplied to the spark plug where the electricity will arc across a gap at a voltage as high as 100 kilovolts. The ECM determines the precise moment to fire each spark plug using ignition logic which is pre-programmed into the ECM as a function of engine speed and load. An optimally calibrated ignition system ensures consistent and reliable ignition under all conditions. Knock or misfire as a result of incorrect ignition can lead to destruction of engine components or damage of the catalytic converter.

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Timing

Shifts in the moment of ignition (ignition timing) can result in increased emissions, decreased performance and fuel economy. Whereas more spark advance improves power and fuel economy, it also raises HC and NOx emissions. Excessive spark advance can cause engine knock which is potentially destructive to engines. If the ECM detects knock from a signal sent by a knock sensor, it will delay (retard) the timing of the spark. Excessive spark retard lowers power output and produces high exhaust temperatures, which can also harm the engine. Carefully designed ignition logic provides optimum timing that best balances performance, fuel economy and emissions.

2.10 Variable Valve Timing

Engines equipped with variable valve timing provide the option of adjusting the phase of the camshaft with respect to the crankshaft. This allows the ECM to control the time at which the valves open or close, and therefore better assists engine “breathing” at various engine speeds. When engine speed increases, the duration of intake and exhaust stroke shortens so that less fresh air can be drawn into the combustion chamber and less exhaust gas can escape. In such a scenario, the ECM opens the intake valve before the exhaust gas has completely left the combustion chamber, and their considerable velocity assists in drawing in the fresh charge – this is referred to as “valve overlap”.

In addition to valve timing, some engines also employ variable valve lift that switches to a more aggressive camshaft-lobe profile as engine speed increases. A more aggressive camshaft-lobe profile actuates valves more rapidly and lifts valves to a greater magnitude in comparison to a normal camshaft-lobe profile. This improves intake and exhaust flow rate, allowing engines to raise maximum operating speed and power output.

2.11 Exhaust-Gas Recirculation (EGR) System

Exhaust-Gas Recirculation (EGR) can be utilized to control the cylinder charge and therefore the combustion process. The exhaust gas that is recirculated to the intake manifold increases the proportion of inert gas in the fresh gas filling; this results in a reduction in the peak combustion temperature and, in turn, a drop in temperature-dependent NO_x emission.

Exhaust-gas recirculation is made possible by a connection between the exhaust pipe and the intake manifold. Due to the pressure differential, the intake manifold can draw in exhaust gas via this connection. Together with the exhaust-gas recirculation valve, the ECM adjusts the opening cross-section and therefore controls the partial flow tapped from the main exhaust flow. A malfunction in exhaust-gas recirculation system can result in performance loss and increased emissions. In such a scenario, the Malfunction Indicator Lamp (MIL) lights up and a Diagnostic Trouble Code (DTC) is stored in the ECM memory.

2.12 Secondary Air Injection

Additionally injecting air into the exhaust pipe triggers an exothermic (release of heat) reaction. This leads to the combustion of HC and CO components that prevail mainly during the warm up phase. This oxidation process releases additional heat. Consequently, the exhaust gas becomes hotter, causing the catalytic converter to heat up at a faster rate. For spark-ignition engines, secondary-air injection is an effective means of reducing HC and CO emissions after starting the engine and to rapidly heat up the catalytic converter. This ensures that the conversion of NO_x emissions commences earlier.

An electronically controlled valve operates the secondary-air valve (a one-way check valve). The ECM actuates the pump and the control valve, ensuring that secondary air can be injected at a defined point in time. The secondary air must also be injected as close to the outlet valve as possible in order to exploit the high temperatures to utilize the exothermic (release of heat) reaction effectively.

2.13 Exhaust Systems

Overview

There are three important functions of the exhaust system: to reduce the pollutants in exhaust gas, muffle engine combustion noise and to discharge exhaust gas at a convenient location on

the vehicle (often underneath the rear bumper). A passenger-car exhaust system consists of the following; exhaust manifold, exhaust treatment components, sound absorption components and the system of pipes connecting these components.

Exhaust Manifold

The manifold is an important component in the exhaust system. It routes the exhaust gas out of the cylinder outlet ports into the subsequent exhaust system. The geometry of the manifold (i.e. length and cross-section of the individual pipes) has an impact on the performance characteristics, the acoustic behavior of the exhaust system, and the exhaust temperature. In some cases, the manifold is insulated with an air gap to quickly reach high exhaust temperature and to shorten the time taken by the catalytic converter to reach its operating temperature.

Emission Control

The primary emission control component is the catalytic converter, which breaks down the gaseous pollutants in the exhaust gas (CO, HC and NOx). Catalytic converters are installed as close as possible to the engine so that they can quickly reach their operating temperature and therefore be effective in urban driving. It also bears a sound-absorbing function, especially to the higher frequency portion of the engine combustion noise.

Sound Absorption

Mufflers dampen or absorb the noise produced by engine combustion. In principle, they can be installed at any position in the exhaust system. However, they are mostly located in the middle and rear sections of the exhaust system. Depending on the number of cylinders and engine output, generally 1 to 3 mufflers are used in an exhaust system. In V-engines, the left and right cylinder banks are often run separately, each being fitted with its own catalytic converters and mufflers. Although the aim of mufflers is to reduce noise in compliance with legislations, they can also help to create the sound specific to the type of vehicle.



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3 Diagnosis and Testing

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- ◆ ⇒ [“3.6 Diagnostic Procedures”, page 1591](#)

3.1 Preliminary Check



Note

- ◆ *Before performing any pin point test or component diagnosis, a Preliminary Check must be performed.*
- ◆ *Check for Technical Bulletins that may supersede any information included in the repair manual or GST Manual.*
- ◆ For Electrical Testing: Refer to ⇒ [page 13](#) .
- ◆ For Fuel System Mechanical Testing: Refer to ⇒ [page 14](#) .
- ◆ For Oxygen Sensor Preliminary Tests: Refer to ⇒ [page 14](#) .

Electrical Testing

Step	Procedure	Result / Action to Take
1	• CONNECT: Scan Tool. • IGNITION: ON. • CHECK: For stored or related DTCs. – Were any other DTCs stored?	– YES: ◆ GO TO: Step 2 ⇒ page 13 . – NO: ◆ GO TO: Step 3 ⇒ page 13 .
2	• Repair these DTCs first before performing any of the following steps.	◆ GO TO: Proper Diagnostic procedure per the stored DTC. Refer to ⇒ “3.4 Engine DTC Tables”, page 122 .
3	• Using the Scan Tool, erase the DTC memory. Refer to ⇒ “3.3.4 Diagnostic Mode 04 – Erase DTC Memory”, page 22 . • Perform a road test to attempt to duplicate the customers complaint. – Does DTC return?	– YES: ◆ GO TO: Step 4 ⇒ page 13 . – NO: ◆ GO TO: Step 5 ⇒ page 13 .
4	• Perform the diagnostic procedure for that DTC.	◆ GO TO: Proper Diagnostic procedure per the stored DTC. Refer to ⇒ “3.4 Engine DTC Tables”, page 122 .
5	• FAULT: Intermittent or a sporadic condition. • CHECK: Suspected components. • PERFORM: Visual Inspection of wiring and components. • CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. • REPAIR: Faulty wiring or connector.	◆ Perform a road test to verify the repair. ◆ Generate readiness code. Refer to ⇒ “3.2 Readiness Code”, page 14 .

Fuel System Mechanical Testing

Check the following items for possible mechanical delivery deficiency:

- Fuel level in tank is too low.
- Fuel lines pinched.
- Fuel filter plugged.
- Fuel pump delivery unit internal leak.
- Clogged injectors.
- Poor fuel quantity delivery. Refer to appropriate repair manual.

Oxygen Sensor Preliminary Tests

Check for the following conditions which can cause Oxygen Sensor Faults to set without requiring Oxygen Sensor replacement:

Common issues for lean faults:

- ◆ Vacuum leaks - check for failed or loose vacuum lines, leaking intake gaskets, or any other source of un-metered air leaks (leaks after the Mass Air Flow Sensor).
- ◆ Restricted fuel filter or bent/pinched fuel system lines.
- ◆ Incorrect input from other sensors, such as the Mass Air Flow Sensor, which may not always set a fault.
- ◆ Engine misfire.
- ◆ Exhaust leaks.
- ◆ Camshaft timing.

Common issues for rich faults:

- ◆ Leaking or faulty fuel injector.
- ◆ Fuel injector driver shorted in ECM, or wiring short for injectors (short to ground).
- ◆ Leaking or faulty fuel pressure regulator or restricted return line.
- ◆ Faulty fuel pump or fuel pump driver module.
- ◆ Incorrect input from other sensors, such as the Mass Air Flow Sensor, which may not always set a fault.
- ◆ Aftermarket components or performance chips.
- ◆ Camshaft timing.

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3.2 Readiness Code



Caution

When performing the Readiness drive cycle operation, pay strict attention to driving conditions and observe and obey all posted speed limits.

Readiness code description

Diagnostics are performed at regular intervals during normal vehicle operation. After repairing an emissions related system, a readiness code is generated by road testing the vehicle.

If a malfunction is recognized during the drive cycle, it will be stored in the DTC memory.

The OBD drive cycle operation will be monitored with a hand held diagnostic tool. Consult the manufacturer's instruction manual for correct tool operation.

The readiness code is erased every time the DTC memory is erased or any time the battery is disconnected. If the DTC memory has been erased or the battery is disconnected, a new readiness code must be generated.

Only erase the DTC memory if a DTC has been stored.

General recommendations

Most monitors will complete easier and quicker using a "steady-foot" and "smooth" acceleration during the drive cycle operation.

Operating conditions

For the EVAP monitor test, the coolant temperature and the ambient air temperature must be between 10° C and 35° C with a difference between them no greater than 4° C. The ambient air temperature must not change more than 4° C during the drive cycle procedure (e.g. when driving out of a heated workshop in the winter).



Note

Do not assume that the scan tool ID and engine code are correct if the scan tool communicates. The scan tool does not use the ID to establish communication – the units are automatically identified.

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Test requirements

- NO DTC in memory.
- Switch OFF all electrical and electronic accessories.
- Necessary driving speed: 50 – 70 mph.
- Drive profile takes approximately 60 – 90 min.

Readiness Drive Cycle Procedure

– CONNECT: Scan Tool.

Step	Procedure	Result / Action to Take
1	Activate Monitors: • START: Engine and idle for 2 – 3 min.	◆ Monitoring Active. ◆ Executes Misfire Monitoring.
2	O2 Sensor Monitoring: • DRIVE: Vehicle at 45 – 55 mph for a continuous 7 minute period. Avoid stopping.	◆ Executes O2 Sensor Monitoring. ◆ Executes Fuel Trim Monitoring. ◆ Executes EVAP Monitoring.
3	Fuel Cut-Off Monitoring: • ACCELERATE: Vehicle to an engine speed of 5,000 RPM; lift off the throttle until the engine speed is around 1,200 RPM.	◆ Fuel Cut-Off Monitoring Ready.

Step	Procedure	Result / Action to Take
4	Catalyst Monitoring: • ACCELERATE: Vehicle smoothly to 60 – 65 mph, cruise at a constant speed for 5 min.	◆ Executes Catalyst Monitoring. ◆ Executes O2 Sensor Monitoring. ◆ Executes Fuel Trim Monitoring. ◆ Executes Misfire Monitoring. ◆ Executes EVAP Monitoring.
5	Secondary Air Injection, EVAP Monitoring: • DRIVE: Vehicle for 30 – 40 min. at a constant speed of 50 – 70 mph in high gear for 2 min with no coasting.	◆ Executes Secondary Air Injection Monitoring. ◆ Executes EVAP Monitoring. • Check the status of the readiness code.

- If any engine monitor fails the drive cycle test. Repeat the drive cycle test until all engine monitors have successfully run through and passed.



Note

- ◆ *When repeating the drive cycle operation for a failed evaporative or thermostat monitor, allow the engine to cool until the coolant temperature and the ambient air temperature are between 10° C and 35° C with a difference between them no greater than 4° C and then repeat the drive cycle operation.*
- ◆ *Depending on the scan tool used, the readiness code status may be displayed as complete, passed or OK. At an ambient air temperature < 7° C, the setting of the readiness for the NOx catalytic converter test is delayed. Here the vehicle must be driven considerably longer.*

Readiness Codes and Monitoring Completed

- 1 - If any engine monitor fails the drive cycle test, repeat the drive cycle test until all engine monitors have successfully run through and passed.
- 2 - If the drive cycle operation fails again:
- 3 - Check the DTC memory for stored DTCs.
- 4 - Repair the vehicle if necessary.
- 5 - Repeat the drive cycle operation until all engine monitors have successfully run through and passed.
- 6 - Remove the scan tool and switch the ignition off.

3.3 Diagnostic Modes 01 – 0A

- ◆ ⇒ [“3.3.1 Diagnostic Mode 01 – Read Current System Data”, page 17](#)
- ◆ ⇒ [“3.3.2 Diagnostic Mode 02 – Read Operating Conditions”, page 19](#)
- ◆ ⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#)
- ◆ ⇒ [“3.3.4 Diagnostic Mode 04 – Erase DTC Memory”, page 22](#)
- ◆ ⇒ [“3.3.5 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, \(2011 – 2014 MY\)”, page 23](#)

- ◆ ⇒ [“3.3.6 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2015 MY”, page 37](#)
- ◆ ⇒ [“3.3.7 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2016 MY”, page 51](#)
- ◆ ⇒ [“3.3.8 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2017 MY”, page 64](#)
- ◆ ⇒ [“3.3.9 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2018 MY”, page 78](#)
- ◆ ⇒ [“3.3.10 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2019 MY”, page 91](#)
- ◆ ⇒ [“3.3.11 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2020 MY”, page 105](#)
- ◆ ⇒ [“3.3.12 Diagnostic Mode 07 – Read Faults Detected During the Current or Last Driving Cycle”, page 118](#)
- ◆ ⇒ [“3.3.13 Diagnostic Mode 08 – Request Control of On-Board System, Test or Component”, page 119](#)
- ◆ ⇒ [“3.3.14 Diagnostic Mode 09 – Read Vehicle Information”, page 120](#)
- ◆ ⇒ [“3.3.15 Diagnostic Mode 0A – Request Emission-Related Diagnostic Trouble Codes with Permanent Status”, page 121](#)

The information provided in Modes 01 through 09 displays the various levels of emission related data that may be monitored, as well as the ability to retrieve and read stored DTC trouble codes, erase stored DTC trouble codes, generate readiness codes, and select the various PID's and Test-ID's used within the modes to monitor the engine, and emission related component parameters.

The following table provides a link to all diagnostic modes that monitor all components and systems which influence the emission quality.



Note

Depending on scan tool and protocol used, the information in diagnostic mode 01 may be referred to by different names such as Test-ID (TID), Hex-ID, or On-Board Diagnostic Monitor Identifier (OBDMID).

3.3.1 Diagnostic Mode 01 – Read Current System Data

Diagnostic Mode 01 makes it possible to access current emissions-related measured values and diagnostic data. The original measured values (no replacement values), input and output data and system status information are displayed using Diagnostic Mode 1.

Test requirement

- Coolant temperature at least 80° C.

Procedure

- Connect the scan tool.
- Start the engine and run at idle.
- Select “Diagnostic Mode 1: Obtain data”.
- From the following table, select the desired “PID” that is to be monitored, e.g. “PID 05, Coolant temperature”.



Note

More than one "PID" may be selected and monitored.

The current values of the component or system that is being monitored will be displayed on the scan tool screen.

PID	Component or System
\$01:	Monitor Status Since DTC's Cleared
\$03:	Fuel System 1, 2 Status
\$04:	Calculated Load Value
\$05:	Engine Coolant Temperature
\$06:	Short Term Fuel Trim Bank 1
\$07:	Long Term Fuel Trim Bank 1
\$08:	Short Term Fuel Trim Bank 2
\$09:	Long Term Fuel Trim Bank 2
\$0A:	Fuel Rail Pressure
\$0B:	Manifold Absolute Pressure
\$0C:	Engine Speed
\$0D:	Vehicle Speed
\$0E:	Ignition Timing Advance Cylinder 1
\$0F:	Intake Air Temperature
\$10:	Air Flow Rate From Mass Airflow Sensor
\$11:	Throttle Valve Position 1 Absolute
\$12:	Secondary Air Injection Status
\$13:	Location Of Oxygen Sensors
\$15:	Oxygen Sensor Voltage Bank 1 Sensor 2
\$19:	Oxygen Sensor Voltage Bank 2 Sensor 2
\$1C:	OBD Requirements
\$1F:	Time After Engine Start
\$21:	Distance Traveled With MIL On
\$2E:	Commanded Evap Purge
\$2F:	Fuel Level
\$30:	Number Of Warm Ups Since DTC Cleared
\$31:	Distance Driven Since DTC Cleared
\$33:	Barometric Pressure
\$34:	Oxygen Sensor Actual Value Bank 1 – Sensor 1, Oxygen Sensor Monitoring Pump Current Bank 1 – Sensor 1
\$38:	Oxygen Sensor Actual Value Bank 2 – Sensor 1, Oxygen Sensor Monitoring Pump Current Bank 2 – Sensor 1
\$3C:	Catalytic Converter Temperature Bank 1 – Sensor 1
\$3D:	Catalytic Converter Temperature Bank 2 – Sensor 1
\$41:	Monitor Status In This Driving Cycle
\$42:	Control Module Voltage
\$43:	Absolute Load Value
\$44:	Fuel/Air Commanded Equivalence Ratio
\$45:	Relative Throttle Valve Position
\$46:	Ambient Air Temperature
\$47:	Absolute Throttle Position B

PID	Component or System
\$48:	Absolute Throttle Position C
\$49:	Accelerator Pedal Position D
\$4A:	Accelerator Pedal Position E
\$4C:	Commanded Throttle Actuator Control
\$4F:	Maximum Value For Air Flow Rate From Mass Air Flow Sensor
\$50:	Maximum Value For Oxygen Sensor Voltage
\$51:	Type Of Fuel Currently Being Utilized By The Vehicle
\$52:	Alcohol In Fuel Percentage
\$56:	Long Term Secondary O2 Sensor Fuel Trim Bank 1
\$58:	Long Term Secondary O2 Sensor Fuel Trim Bank 2
\$70:	Boost Pressure Control
\$75:	Turbocharger A Temperature
\$76:	Turbocharger B Temperature
\$8D:	Absolute Throttle Position G

- Switch the ignition off.

3.3.2 Diagnostic Mode 02 – Read Operating Conditions

When an emissions-related fault (pending DTC, visible in mode 07) is first detected, operating conditions are stored. Mode 02 makes it possible to access this freeze frame data as soon as this fault is shown in mode 03. Each control module only shows freeze frame data for one fault via mode 02. Therefore, there are two priority levels. If there is a malfunction with higher priority, the freeze frame data is overwritten.

- Fault with higher priority: Misfire malfunction or fuel trim malfunction.
- Fault with normal priority: All other emissions-related faults.



Note

Depending on scan tool and protocol used, the information in diagnostic mode 02 may be referred to by different names such as Test-ID (TID), Hex-ID, or On-Board Diagnostic Monitor Identifier (OBDMID).

Procedure

- Connect the scan tool.
- Start the engine and run at idle.



Note

If the engine does not start, crank the engine using starter for at least 5 seconds, do not switch the ignition off afterward under any circumstances.

- Select “Diagnostic Mode 2: Obtain operating conditions”.
- From the following table, select the desired “PID”, e.g. “PID 05, Coolant temperature” that is to be monitored.



Note

More than one "PID" may be selected and monitored.

The current values of the component or system that is being monitored will be displayed on the scan tool screen.

PID	Component or System
\$02:	Fault Code That Activated The Freeze Frame Save
\$03:	Fuel System Status
\$04:	Calculated Load Value
\$05:	Engine Coolant Temperature
\$06:	Short Term Fuel Trim Bank 1
\$07:	Long Term Fuel Trim Bank 1
\$08:	Short Term Fuel Trim Bank 2
\$09:	Long Term Fuel Trim Bank 2
\$0A:	Fuel Rail Pressure
\$0B:	Manifold Absolute Pressure
\$0C:	Engine Speed
\$0D:	Vehicle Speed
\$0E:	Ignition Timing Advance Cylinder 1
\$0F:	Intake Air Temperature
\$10:	Air Flow Rate From Mass Airflow Sensor
\$11:	Absolute Throttle Position
\$12:	Commanded Secondary Air Injection Status
\$1F:	Time Since Engine Start
\$2E:	Commanded Evap Purge
\$2F:	Fuel Level
\$33:	Barometric Pressure
\$42:	Control Module Voltage
\$43:	Absolute Load Value
\$44:	Fuel/Air Commanded Equivalence Ratio
\$45:	Relative Throttle Valve Position
\$46:	Ambient Air Temperature
\$47:	Absolute Throttle Position B
\$49:	Accelerator Pedal Position D
\$4A:	Accelerator Pedal Position E
\$4C:	Commanded Throttle Actuator Control
\$51:	Type Of Fuel Currently Being Used By The Vehicle
\$52:	Alcohol Fuel Percentage
\$56:	Long Term Secondary O2 Sensor Fuel Trim Bank 1
\$58:	Long Term Secondary O2 Sensor Fuel Trim Bank 2
\$70:	Boost Pressure Control
\$75:	Turbocharger A Temperature
\$76:	Turbocharger B Temperature

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- Switch the ignition off.

3.3.3 Diagnostic Mode 03 – Read DTC Memory

Diagnostic Mode 03 makes it possible to read emissions-related faults (confirmed DTC's: faults which have activated the MIL) in the ECM.

When the Engine Control Module (ECM) recognizes an emission related fault it turns on the Malfunction Indicator Lamp (MIL) or if a Electronic Throttle Malfunction is recognized, the Engine Control Module (ECM) turns on the Electronic Power Control (EPC) Warning Lamp which are both located in the instrument cluster.

The DTC's are sorted by SAE code with the DTC tables consisting of a 5 digit alpha numeric value.



Note

Depending on scan tool and protocol used, diagnostic mode 03 and the information provided may be referred to by a different name.

The following tables provide a breakdown and explanation of the DTC code.

P-Codes

Component group					
P	x	x	x	x	DTC for the drivetrain
Norm-Code					
P	0	x	x	x	Trouble codes defined by SAE with specified malfunction texts
P	1	x	x	x	Additional emission relevant DTC's provided by the manufacturer
P	2	x	x	x	DTC's defined by SAE with specified texts, from MY 2000
P	3	x	x	x	Additional emission relevant DTC's provided by the manufacturer from MY 2000

Component group					
Repair group					
P	x	0	x	x	Fuel and air mixture and additional emission regulations
P	x	1	x	x	Fuel and air ratios
P	x	2	x	x	Fuel and air ratios
P	x	3	x	x	Ignition system
P	x	4	x	x	Additional exhaust system
P	x	5	x	x	Speed and idle control
P	x	6	x	x	Control module and output signals
P	x	7	x	x	Transmission
P	x	8	x	x	Transmission
P	x	9	x	x	Control modules, input and output signals

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U-Codes

Component group					
U	x	x	x	x	DTC for network (CAN bus)
Norm-Code					

U	0	x	x	x	Trouble codes defined by SAE with specified malfunction texts

- Refer to the DTC tables below for the diagnostic repair procedures:

- ◆ ⇒ [“3.4.1 Engine Control Module , \(2011 – 2014 MY\)”](#), [page 122](#)
- ◆ ⇒ [“3.4.2 Engine Control Module , 2015 MY”](#), [page 209](#)
- ◆ ⇒ [“3.4.3 Engine Control Module , 2016 MY”](#), [page 379](#)
- ◆ ⇒ [“3.4.4 Engine Control Module , 2017 MY”](#), [page 571](#)
- ◆ ⇒ [“3.4.5 Engine Control Module , 2018 MY”](#), [page 772](#)
- ◆ ⇒ [“3.4.6 Engine Control Module , 2019 MY”](#), [page 975](#)
- ◆ ⇒ [“3.4.7 Engine Control Module , 2020 MY”](#), [page 1178](#)

- Switch the ignition off.

3.3.4 Diagnostic Mode 04 – Erase DTC Memory

Diagnostic Mode 04 makes it possible to erase the DTC memory and to reset all emissions-related diagnostic data. In that way, all faults in the DTC memory in the ECM are erased. The adaptation values may also be reset.

Emissions-related diagnostic data includes (as applicable):

- ◆ - MIL Status
- ◆ - Number of DTC's
- ◆ - Readiness Bits
- ◆ - Confirmed DTC's
- ◆ - Pending DTC's
- ◆ - DTC that belongs to freeze frame
- ◆ - Freeze frame data
- ◆ - Test results of specific diagnostic functions
- ◆ - Distance driven with “MIL ON”
- ◆ - Number of Warm-Up Cycles after erasing the DTC memory
- ◆ - Distance driven after erasing the DTC memory
- ◆ - Misfire counter



Note

Depending on scan tool and protocol used, diagnostic mode 04 and the information provided may be referred to by a different name.

Procedure

- Connect the scan tool.
- Switch the ignition to the “ON” position.
- Select “Diagnostic Mode 03: Interrogating fault memory”.
- Then select “Mode 4: Reset/delete diagnostic data”.

The scan tool will display: "Diagnostic data are being erased".

- Switch the ignition off.

3.3.5 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, (2011 – 2014 MY)

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The values of the individual test results must reach the specified value or must be within the min. and max. limits.



Note

Depending on the scan tool and protocol used, the information displayed in diagnostic mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, or On-Board Diagnostic Monitor Identifier (OBDMID).

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Test requirements

- Exhaust system must be properly sealed between catalytic converter and cylinder head.
- No DTC's in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select the desired "Test-ID".

The current minimum and maximum values will be displayed on the scan tool screen.

ECM Monitors

Monitor ID	Component or System
\$01: ⇒ page 24	Oxygen sensor Bank 1 sensor 1
\$02: ⇒ page 24	Oxygen sensor Bank 1 sensor 2
\$05: ⇒ page 25	Oxygen Sensor Monitor Bank 2 Sensor 1
\$06: ⇒ page 26	Oxygen Sensor Monitor Bank 2 Sensor 2
\$21: ⇒ page 27	Catalyst Monitor Bank 1
\$22: ⇒ page 27	Catalyst Monitor Bank 2
\$35: ⇒ page 28	Variable Valve Timing Monitor
\$3A: ⇒ page 28	EVAP monitor (0.090)
\$3B: ⇒ page 29	EVAP monitor (0.040)
\$3C: ⇒ page 29	EVAP monitor (0.020)
\$3D: ⇒ page 29	Purge flow monitor air flow at idle
\$41: ⇒ page 30	O2 sensor heater monitor Bank 1 Sensor 1 ceramic temperature

Monitor ID	Component or System
\$42: ⇒ page 30	O2 sensor heater monitor Bank 1 Sensor 2 ceramic temperature
\$45: ⇒ page 31	Oxygen Sensor Heater Monitor Bank 2 - Sensor 1
\$46: ⇒ page 31	Oxygen Sensor Heater Monitor Bank 2 - Sensor 2
\$71: ⇒ page 32	Secondary Air Injection (AIR) System Bank 1
\$72: ⇒ page 32	Secondary Air Injection (AIR) System Bank 2
\$A2: ⇒ page 33	Mis-Fire Cylinder 1 Data
\$A3: ⇒ page 33	Mis-Fire Cylinder 2 Data
\$A4: ⇒ page 34	Mis-Fire Cylinder 3 Data
\$A5: ⇒ page 34	Mis-Fire Cylinder 4 Data
\$A6: ⇒ page 35	Mis-Fire Cylinder 5 Data
\$A7: ⇒ page 35	Mis-Fire Cylinder 6 Data
\$A8: ⇒ page 36	Mis-Fire Cylinder 7 Data
\$A9: ⇒ page 36	Mis-Fire Cylinder 8 Data

Monitor \$01: Oxygen Sensor Monitor Bank 1 - Sensor 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$01”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0133	Response Check.	0.45	1.999	Refer to DTC P0133 in the DTC table. ⇒ page 136
\$84	P2096	Rationality Check.	-1	1	Refer to DTC P2096 in the DTC table. ⇒ page 177
\$84	P2097	Rationality Check.	1	-1	Refer to DTC P2097 in the DTC table. ⇒ page 178
\$84	P2195/ P2196	Rationality Check.	-0.0600 0	0.06000	Refer to DTC P2195 in the DTC table ⇒ page 187 . or Refer to DTC P2196 in the DTC table ⇒ page 187 .

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$02: Oxygen Sensor Monitor Bank 1- Sensor 2

- Connect the scan tool .

- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$02”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P013A	Rich to Lean transient time	0 Sec	0.6 Sec	Refer to DTC P013A in the DTC table. ⇒ page 138
\$05	P0139	Rich to Lean transient time	0.0000 Sec.	0.5000 Sec.	Refer to DTC P0139 in the DTC table. ⇒ page 138
\$06	P013B	Lean to Rich transient time	0 Sec	1 Sec	Refer to DTC P013B in the DTC table. ⇒ page 138
\$81	P2271	Minimum sensor voltage of oscillation	0.00000 V	0.65000 V	Refer to DTC P2271 in the DTC table. ⇒ page 192
\$82	P2270	Maximum sensor voltage of oscillation	0.65000 V	1.08000 V	Refer to DTC P2270 in the DTC table. ⇒ page 192
\$86	P2271	Oxygen sensor response time	0 Sec.	2.0 to 8.0 Sec.	Refer to DTC P2271 in the DTC table. ⇒ page 192
\$8C	P013F	Exhaust gas sensor monitor Bank 1 Sensor 2	0 Sec	1.2 Sec	Refer to DTC P013F in the DTC table. ⇒ page 139
\$8D	P013E	Exhaust gas sensor monitor Bank 1 Sensor 2	0 Sec	0.6 Sec	Refer to DTC P013E in the DTC table. ⇒ page 139

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$05: Oxygen Sensor Monitor Bank 2 - Sensor 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$05”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0153	Response Check.	0.32	1.999	Refer to DTC P0153 in the DTC table. ⇒ page 142



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Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P2096	Rationality Check.	-1	1	Refer to DTC P2096 in the DTC table. ⇒ page 177
\$84	P2097	Rationality Check.	1	-1	Refer to DTC P2097 in the DTC table. ⇒ page 178
\$84	P2197/ P2198	Rationality Check.	-0.0599 9	-0.05999	Refer to DTC P2197 in the DTC table ⇒ page 187 . or Refer to DTC P2198 in the DTC table ⇒ page 188 .

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$06: Oxygen Sensor Monitor Bank 2 - Sensor 2

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$06”.

- Select the desired “Test-ID”.
- Check specified values at idle.



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Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P0159	Rich to Lean transient time	0.0000 Sec.	0.5000 Sec.	Refer to DTC P0159 in the DTC table. ⇒ page 143
\$05	P013C	Rich to Lean transient time	0 Sec	0.6 Sec	Refer to DTC P013C in the DTC table. ⇒ page 139
\$06	P013D	Lean to Rich transient time	0 Sec	1 Sec	Refer to DTC P013D in the DTC table. ⇒ page 139
\$81	P2273	Minimum sensor voltage of oscillation	0.00000 V	0.65000 V	Refer to DTC P2273 in the DTC table. ⇒ page 193
\$82	P2272	Maximum sensor voltage of oscillation	0.65000 V	1.08000 V	Refer to DTC P2272 in the DTC table. ⇒ page 193
\$86	P2273	Oxygen sensor response time	0 Sec.	2.0 to 8.0 Sec.	Refer to DTC P2273 in the DTC table. ⇒ page 193
\$8C	P014B	Exhaust gas sensor monitor Bank 1 Sensor 2	0 Sec	1.2 Sec	Refer to DTC P014B in the DTC table. ⇒ page 140
\$8D	P014A	Exhaust gas sensor monitor Bank 1 Sensor 2	0 Sec	0.6 Sec	Refer to DTC P014A in the DTC table. ⇒ page 141

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$21: Catalyst Monitor Bank 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$21”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0420	Conversion Capability (storage) Check.	4096	65535	Refer to DTC P0420 in the DTC table. ⇒ page 163

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$22: Catalyst Monitor Bank 2

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$22”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0430	Conversion Capability (storage) Check.	4096	65535	Refer to DTC P0430 in the DTC table. ⇒ page 164

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- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$35: Variable Valve Timing

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$35”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0011	Intake Camshaft Position Timing - Over-Advanced (Bank 1)	-27.00 to 22.00	-9.00 to 25.00	Refer to DTC P0011 in the DTC table. ⇒ page 123
\$81	P000A	Engine Position System Performance - Bank 1	-27.00 to 22.00	-9.00 to 25.00	Refer to DTC P000A in the DTC table. ⇒ page 122
\$82	P0014	Exhaust Camshaft Position Timing - Over-Advanced (Bank 1)	-20.00 to -1.00	-17.00 to 2.00	Refer to DTC P0014 in the DTC table. ⇒ page 124
\$83	P000B	Engine Position System Performance - Bank 2	-20.00 to -1.00	-17.00 to 2.00	Refer to DTC P000B in the DTC table. ⇒ page 123

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$3A: Fuel Tank EVAP System Leak Test Large Leak

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$3A”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0455	Fuel Tank Leak Test - Large leak.	1.000 to 1.350 Sec	65535	Refer to DTC P0455 in the DTC table ⇒ page 166 .

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$3B: EVAP Monitor Small Leak

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$3B”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0442	Fuel Tank Leak Test - Small Leak.	2.100 - 2.800 Sec.	65535	Refer to DTC P0442 in the DTC table. ⇒ page 165

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$3C: EVAP Monitor Very Small Leak

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$3C”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0456	Fuel Tank Leak Test - Very Small Leak.	2.400 to 6.000 Sec	65535	Refer to DTC P0456 in the DTC table. ⇒ page 167
\$82	Only Pass	EVAP Monitor system- OK by initial purge check.	39.8 g	6553.5 g	---

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.
- End of diagnosis.

Monitor \$3D: Tank Vent Valve function check

- Connect the scan tool
- Start the engine and let run at idle speed.

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- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$3D”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80:	Only Pass	EVAP purge valve air flow at idle	---	---	---
\$84	Only Pass	EVAP purge valve OK by initial purge	56	65535	---
\$85	Only Pass	EVAP purge valve OK by leak check	0.000 Sec.	1.300 Sec.	---
\$88	P0441	Purge flow monitor by lambda deviation	2	65535	Refer to DTC P0441 in the DTC table. ⇒ page 165

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$41: Oxygen Sensor Heater Monitor Bank 1 - Sensor 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$41”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0135	Oxygen sensor ceramic temperature.	720.0 °C	1262.8 °C	Refer to DTC P0135 in the DTC table. ⇒ page 137
\$85	P0606	ECM / PCM Processor Failure		2560 Ohms	Refer to DTC P0606 in the DTC table. ⇒ page 174

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$42: Oxygen Sensor Heater Monitor Bank 1 - Sensor 2

- Connect the scan tool .
- Start the engine and let run at idle speed.

- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$42”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0141	Oxygen sensor internal resistance check	0 kOhm	0.648 to 10.560 kOhm	Refer to DTC P0141 in the DTC table. ⇒ page 140

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#).

Switch the ignition off.
Monitor \$45: Oxygen Sensor Heater Monitor Bank 2- Sensor 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$45”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0155	Oxygen sensor ceramic temperature.	720.0 °C	1262.8 °C	Refer to DTC P0155 in the DTC table. ⇒ page 142

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#).

- Switch the ignition off.

Monitor \$46: Oxygen Sensor Heater Monitor Bank 2 - Sensor 2

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$46”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0161	Oxygen sensor internal resistance check	0 kOhm	0.648 to 10.560 kOhm	Refer to DTC P0161 in the DTC table. ⇒ page 144

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$71 : Secondary Air Injection Bank 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$71”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0491	Secondary air monitor Bank 1 low flow	0.70300 to 0.75800	1.99999	Refer to DTC P0491 in the DTC table. ⇒ page 168
\$81	P2440	Secondary air monitor valve check Bank 1	0.000 kPa	0.281 to 0.758 hPa	Refer to DTC P2440 in the DTC table. ⇒ page 201

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- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$72: Secondary Air Injection Bank 2

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$72”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0491	Secondary air monitor Bank 1 low flow	0.70300 to 0.75800	1.99999	Refer to DTC P0492 in the DTC table. ⇒ page 168

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P2440	Secondary air monitor valve check Bank 1	0.000 kPa	0.281 to 0.758 hPa	Refer to DTC P2442 in the DTC table. ⇒ page 201

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#),
[page 21](#) .

- Switch the ignition off.

Monitor \$A2: Mis-Fire Cylinder 1 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A2”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
\$0B	P0301	Cylinder data averaged during last 10 drive cycles	0 - 65535 (counts)	Refer to DTC P0301 in the DTC table ⇒ page 154 .
\$0C	P0301	Cylinder data during current drive cycle	0 - 65535 (counts)	Refer to DTC P0301 in the DTC table ⇒ page 154 .

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#),
[page 21](#) .

- Switch the ignition off.

Monitor \$A3: Mis-Fire Cylinder 2 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A3”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
\$0B	P0302	Cylinder data averaged during last 10 drive cycles	0 - 65535 (counts)	Refer to DTC P0302 in the DTC table ⇒ page 154 .
\$0C	P0302	Cylinder data during current drive cycle	0 - 65535 (counts)	Refer to DTC P0302 in the DTC table ⇒ page 154 .

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$A4: Mis-Fire Cylinder 3 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A4”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
\$0B	P0303	Cylinder data averaged during last 10 drive cycles	0 - 65535 (counts)	Refer to DTC P0303 in the DTC table ⇒ page 155 .
\$0C	P0303	Cylinder data during current drive cycle	0 - 65535 (counts)	Refer to DTC P0303 in the DTC table ⇒ page 155 .

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$A5: Mis-Fire Cylinder 4 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A5”.

- Select the desired “Test-ID”.

- Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
\$0B	P0304	Cylinder data averaged during last 10 drive cycles	0 - 65535 (counts)	Refer to DTC P0304 in the DTC table ⇒ page 155 .
\$0C	P0304	Cylinder data during current drive cycle	0 - 65535 (counts)	Refer to DTC P0304 in the DTC table ⇒ page 155 .

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#).

- Switch the ignition off.

Monitor \$A6: Mis-Fire Cylinder 5 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A6”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
\$0B	P0305	Cylinder data averaged during last 10 drive cycles	0 - 65535 (counts)	Refer to DTC P0305 in the DTC table ⇒ page 156 .
\$0C	P0305	Cylinder data during current drive cycle	0 - 65535 (counts)	Refer to DTC P0305 in the DTC table ⇒ page 156 .

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#).

- Switch the ignition off.

Monitor \$A7: Mis-Fire Cylinder 6 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A7”

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
\$0B	P0306	Cylinder data averaged during last 10 drive cycles	0 - 65535 (counts)	Refer to DTC P0306 in the DTC table ⇒ page 156 .
\$0C	P0306	Cylinder data during current drive cycle	0 - 65535 (counts)	Refer to DTC P0306 in the DTC table ⇒ page 156 .

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$A8: Mis-Fire Cylinder 7 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A8”

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
\$0B	P0307	Cylinder data averaged during last 10 drive cycles	0 - 65535 (counts)	Refer to DTC P0307 in the DTC table ⇒ page 157 .
\$0C	P0307	Cylinder data during current drive cycle	0 - 65535 (counts)	Refer to DTC P0307 in the DTC table ⇒ page 157 .

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$A9: Mis-Fire Cylinder 8 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select "Monitor \$A9"

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
\$0B	P0308	Cylinder data averaged during last 10 drive cycles	0 - 65535 (counts)	Refer to DTC P0308 in the DTC table ⇒ page 157 .
\$0C	P0308	Cylinder data during current drive cycle	0 - 65535 (counts)	Refer to DTC P0308 in the DTC table ⇒ page 157 .

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).
- Switch the ignition off.
- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).
- Switch the ignition off.

3.3.6 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2015 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The values of the individual test results must reach the specified value or must be within the min. and max. limits.



Note

Depending on the scan tool and protocol used, the information displayed in diagnostic mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, or On-Board Diagnostic Monitor Identifier (OBDMID).

Test requirements

- Exhaust system must be properly sealed between catalytic converter and cylinder head.
- No DTC's in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select the desired “Test-ID”.

The current minimum and maximum values will be displayed on the scan tool screen.

ECM Monitors

Monitor ID	Component or System
\$01: ⇒ page 38	Oxygen sensor Bank 1 sensor 1
\$02: ⇒ page 39	Oxygen sensor Bank 1 sensor 2
\$05: ⇒ page 40	Oxygen Sensor Monitor Bank 2 Sensor 1
\$06: ⇒ page 40	Oxygen Sensor Monitor Bank 2 Sensor 2
\$21: ⇒ page 41	Catalyst Monitor Bank 1
\$22: ⇒ page 41	Catalyst Monitor Bank 2
\$35: ⇒ page 42	Variable Valve Timing Monitor
\$3A: ⇒ page 42	EVAP monitor (0.090)
\$3B: ⇒ page 42	EVAP monitor (0.040)
\$3C: ⇒ page 43	EVAP monitor (0.020)
\$3D: ⇒ page 43	Purge flow monitor air flow at idle
\$41: ⇒ page 44	O2 sensor heater monitor Bank 1 Sensor 1 ceramic temperature
\$42: ⇒ page 44	O2 sensor heater monitor Bank 1 Sensor 2 ceramic temperature
\$45: ⇒ page 45	Oxygen Sensor Heater Monitor Bank 2 - Sensor 1
\$46: ⇒ page 45	Oxygen Sensor Heater Monitor Bank 2 - Sensor 2
\$71: ⇒ page 46	Secondary Air Injection (AIR) System Bank 1
\$72: ⇒ page 46	Secondary Air Injection (AIR) System Bank 2
\$A2: ⇒ page 47	Mis-Fire Cylinder 1 Data
\$A3: ⇒ page 47	Mis-Fire Cylinder 2 Data
\$A4: ⇒ page 48	Mis-Fire Cylinder 3 Data
\$A5: ⇒ page 48	Mis-Fire Cylinder 4 Data
\$A6: ⇒ page 48	Mis-Fire Cylinder 5 Data
\$A7: ⇒ page 49	Mis-Fire Cylinder 6 Data
\$A8: ⇒ page 49	Mis-Fire Cylinder 7 Data
\$A9: ⇒ page 50	Mis-Fire Cylinder 8 Data

Monitor \$01: Oxygen Sensor Monitor Bank 1 - Sensor 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$01”.

- Select the desired “Test-ID”.
- Check specified values at idle.

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Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0133	Response Check.	0.220	1.999	Refer to DTC P0133 in the DTC table. ⇒ page 230
\$84	P2096	Rationality Check.	-0.070	0.070	Refer to DTC P2195 in the DTC table ⇒ page 328 . or Refer to DTC P2196 in the DTC table ⇒ page 330 .

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#) .

- Switch the ignition off.

Monitor \$02: Oxygen Sensor Monitor Bank 1- Sensor 2

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$02”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P013A	Rich to Lean transient time	0 Sec	0.6 Sec	Refer to DTC P013A in the DTC table. ⇒ page 234
\$06	P013B	Lean to Rich transient time	0 Sec	1 Sec	Refer to DTC P013B in the DTC table. ⇒ page 234
\$8A	P2271	Minimum sensor voltage of oscillation	0.00000 V	0.200 V	Refer to DTC P2271 in the DTC table. ⇒ page 344
\$8B	P2270	Maximum sensor voltage of oscillation	0.71777 V	7.99985 V	Refer to DTC P2270 in the DTC table. ⇒ page 343
\$8C	P013F	Exhaust gas sensor monitor Bank 1 Sensor 2	0 Sec	1.2 Sec	Refer to DTC P013F in the DTC table. ⇒ page 236
\$8D	P013E	Exhaust gas sensor monitor Bank 1 Sensor 2	0 Sec	0.6 Sec	Refer to DTC P013E in the DTC table. ⇒ page 236

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#) .

- Switch the ignition off.

Monitor \$05: Oxygen Sensor Monitor Bank 2 - Sensor 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$05”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0153	Response Check.	0.22008	1.99993	Refer to DTC P0153 in the DTC table. ⇒ page 245
\$84	P2197 / P2198	Rationality Check.	-0.0700 0	0.07000	Refer to DTC P2197 in the DTC table ⇒ page 332 . or Refer to DTC P2198 in the DTC table ⇒ page 334 .

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$06: Oxygen Sensor Monitor Bank 2 - Sensor 2

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$06”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P013C	Rich to Lean transient time	0 Sec	0.6 Sec	Refer to DTC P013C in the DTC table. ⇒ page 235
\$06	P013D	Lean to Rich transient time	0 Sec	1 Sec	Refer to DTC P013D in the DTC table. ⇒ page 235
\$8A	P2273	Minimum sensor voltage of oscillation	0.00000 V	0.20019 V	Refer to DTC P2273 in the DTC table. ⇒ page 345
\$8B	P2272	Maximum sensor voltage of oscillation	0.71777 V	7.99985 V	Refer to DTC P2272 in the DTC table. ⇒ page 344
\$8C	P014B	Exhaust gas sensor monitor Bank 1 Sensor 2	0 Sec	1.0 Sec	Refer to DTC P014B in the DTC table. ⇒ page 241

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$8D	P014A	Exhaust gas sensor monitor Bank 1 Sensor 2	0 Sec	0.6 Sec	Refer to DTC P014A in the DTC table. ⇒ page 241

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#),
[page 21](#) .

- Switch the ignition off.

Monitor \$21: Catalyst Monitor Bank 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$21”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0420	Conversion Capability (storage) Check.	0.99737	19.9993 16	Refer to DTC P0420 in the DTC table. ⇒ page 273

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure .

- Switch the ignition off.

Monitor \$22: Catalyst Monitor Bank 2

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$22”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0430	Conversion Capability (storage) Check.	0.79985 1	19.9993 16	Refer to DTC P0430 in the DTC table. ⇒ page 275

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$35: Variable Valve Timing

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$35”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0011	Intake Camshaft Position Timing - Over-Advanced (Bank 1)	5.5°	19.5°	Refer to DTC P0011 in the DTC table. ⇒ page 210
\$81	P000A	Engine Position System Performance - Bank 1	5.5°	19.5°	Refer to DTC P000A in the DTC table. ⇒ page 209

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- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$3A: Fuel Tank EVAP System Leak Test Large Leak

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$3A”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0455	Fuel Tank Leak Test - Large leak.	0.95 Sec	65.535 Sec	Refer to DTC P0455 in the DTC table. ⇒ page 279

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$3B: EVAP Monitor Small Leak

- Connect the scan tool.

- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$3B”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0442	Fuel Tank Leak Test - Small Leak.	1.75 Sec.	65.535 Sec	Refer to DTC P0442 in the DTC table. ⇒ page 278

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$3C: EVAP Monitor Very Small Leak

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$3C”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0456	Fuel Tank Leak Test - Very Small Leak.	4.75 Sec	65,535 Sec	Refer to DTC P0456 in the DTC table. ⇒ page 280
\$82	Only Pass	EVAP Monitor system- OK by initial purge check.	39.8 g	6553.5 g	---

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.
- End of diagnosis.

Monitor \$3D: Tank Vent Valve function check

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$3D”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80:	P0441	EVAP purge valve air flow at idle			Refer to DTC P0441 in the DTC table. ⇒ page 277
\$84	P0441	EVAP purge valve OK by initial purge	0.00 Sec	10 Sec	Refer to DTC P0441 in the DTC table. ⇒ page 277
\$85	P0441	EVAP purge valve OK by leak check			Refer to DTC P0441 in the DTC table. ⇒ page 277
\$88	P0441	Purge flow monitor by lambda deviation			Refer to DTC P0441 in the DTC table. ⇒ page 277

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$41: Oxygen Sensor Heater Monitor Bank 1 - Sensor 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$41”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0135	Oxygen sensor ceramic temperature.	725.0° C	1262.8° C	Refer to DTC P0135 in the DTC table. ⇒ page 231

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$42: Oxygen Sensor Heater Monitor Bank 1 - Sensor 2

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$42”.

- Select the desired “Test-ID”.

- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0141	Oxygen sensor internal resistance check	0 kOhm	1.874 kOhm	Refer to DTC P0141 in the DTC table. ⇒ page 240

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#).

- Switch the ignition off.

Monitor \$45: Oxygen Sensor Heater Monitor Bank 2- Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$45”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0155	Oxygen sensor ceramic temperature.	725.0° C	1262.8° C	Refer to DTC P0155 in the DTC table. ⇒ page 246

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#).

- Switch the ignition off.

Monitor \$46: Oxygen Sensor Heater Monitor Bank 2 - Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$46”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0161	Oxygen sensor internal resistance check	0 kOhm	1.596 kOhm	Refer to DTC P0161 in the DTC table. ⇒ page 250

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic

repair procedure

⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor \$71 : Secondary Air Injection Bank 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select "Monitor \$71".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0491	Secondary air monitor Bank 1 low flow	0.38280 52	1.99993 16	Refer to DTC P0491 in the DTC table. ⇒ page 281
\$81	P2440	Secondary air monitor valve check Bank 1	0.0	1.20310 22	Refer to DTC P2440 in the DTC table. ⇒ page 357

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor \$72: Secondary Air Injection Bank 2

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select "Monitor \$72".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0492	Secondary air monitor Bank 1 low flow	0.38280 52	1.99993 16	Refer to DTC P0492 in the DTC table. ⇒ page 282
\$81	P2442	Secondary air monitor valve check Bank 1	0.0 kPa	1.20310 22	Refer to DTC P2442 in the DTC table. ⇒ page 357

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.



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Monitor \$A2: Mis-Fire Cylinder 1 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A2”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max .	Additional Information
\$0B	P0301	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0301 in the DTC table . ⇒ page 262
\$0C	P0301	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0301 in the DTC table . ⇒ page 262

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$A3: Mis-Fire Cylinder 2 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A3”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0302	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0302 in the DTC table . ⇒ page 262
\$0C	P0302	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0302 in the DTC table . ⇒ page 262

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$A4: Mis-Fire Cylinder 3 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A4”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0303	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0303 in the DTC table . ⇒ page 263
\$0C	P0303	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0303 in the DTC table . ⇒ page 263

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$A5: Mis-Fire Cylinder 4 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A5”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0304	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0304 in the DTC table . ⇒ page 264
\$0C	P0304	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0304 in the DTC table . ⇒ page 264

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$A6: Mis-Fire Cylinder 5 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.

- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A6”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0305	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0305 in the DTC table . ⇒ page 264
\$0C	P0305	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0305 in the DTC table . ⇒ page 264

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$A7: Mis-Fire Cylinder 6 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A7”

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0306	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0306 in the DTC table . ⇒ page 265
\$0C	P0306	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0306 in the DTC table . ⇒ page 265

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$A8: Mis-Fire Cylinder 7 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A8”

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0307	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0307 in the DTC table . ⇒ page 266
\$0C	P0307	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0307 in the DTC table . ⇒ page 266

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$A9: Mis-Fire Cylinder 8 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A9”

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0308	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0308 in the DTC table . ⇒ page 266
\$0C	P0308	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0308 in the DTC table . ⇒ page 266

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

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3.3.7 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2016 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The values of the individual test results must reach the specified value or must be within the min. and max. limits.



Note

Depending on the scan tool and protocol used, the information displayed in diagnostic mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, or On-Board Diagnostic Monitor Identifier (OBDMID).

Test requirements

- Exhaust system must be properly sealed between catalytic converter and cylinder head.
- No DTC's in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select the desired “Test-ID”.

The current minimum and maximum values will be displayed on the scan tool screen.

ECM Monitors

Monitor ID	Component or System
\$01: ⇒ page 52	Oxygen sensor Bank 1 sensor 1
\$02: ⇒ page 52	Oxygen sensor Bank 1 sensor 2
\$05: ⇒ page 53	Oxygen Sensor Monitor Bank 2 Sensor 1
\$06: ⇒ page 53	Oxygen Sensor Monitor Bank 2 Sensor 2
\$21: ⇒ page 54	Catalyst Monitor Bank 1
\$22: ⇒ page 54	Catalyst Monitor Bank 2
\$35: ⇒ page 55	Variable Valve Timing Monitor
\$3A: ⇒ page 55	EVAP monitor (0.090)
\$3B: ⇒ page 56	EVAP monitor (0.040)
\$3C: ⇒ page 56	EVAP monitor (0.020)
\$3D: ⇒ page 57	Purge flow monitor air flow at idle
\$41: ⇒ page 57	O2 sensor heater monitor Bank 1 Sensor 1 ceramic temperature
\$42: ⇒ page 58	O2 sensor heater monitor Bank 1 Sensor 2 ceramic temperature

Monitor ID	Component or System
\$45: ⇒ page 58	Oxygen Sensor Heater Monitor Bank 2 - Sensor 1
\$46: ⇒ page 59	Oxygen Sensor Heater Monitor Bank 2 - Sensor 2
\$71: ⇒ page 59	Secondary Air Injection (AIR) System Bank 1
\$72: ⇒ page 60	Secondary Air Injection (AIR) System Bank 2
\$A2: ⇒ page 60	Mis-Fire Cylinder 1 Data
\$A3: ⇒ page 61	Mis-Fire Cylinder 2 Data
\$A4: ⇒ page 61	Mis-Fire Cylinder 3 Data
\$A5: ⇒ page 62	Mis-Fire Cylinder 4 Data
\$A6: ⇒ page 62	Mis-Fire Cylinder 5 Data
\$A7: ⇒ page 63	Mis-Fire Cylinder 6 Data
\$A8: ⇒ page 63	Mis-Fire Cylinder 7 Data
\$A9: ⇒ page 64	Mis-Fire Cylinder 8 Data

Monitor \$01: Oxygen Sensor Monitor Bank 1 - Sensor 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$01”.

- Select the desired “Test-ID”.
- Check specified values at idle.

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Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0133	Response Check.	0.275	1.999	Refer to DTC P0133 in the DTC table ⇒ page 398 .

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#),
[page 21](#) .
- Switch the ignition off.

Monitor \$02: Oxygen Sensor Monitor Bank 1- Sensor 2

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$02”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P013A	Rich to Lean transient time	0 Sec	0.6 Sec	Refer to DTC P013A in the DTC table. ⇒ page 403

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$06	P013B	Lean to Rich transient time	0 Sec	1 Sec	Refer to DTC P013B in the DTC table. ⇒ page 405
\$93	P013F	Exhaust gas sensor monitor Bank 1 Sensor 2	0 Sec	1.2 Sec	Refer to DTC P013F in the DTC table. ⇒ page 413
\$94	P013E	Exhaust gas sensor monitor Bank 1 Sensor 2	0 Sec	0.6 Sec	Refer to DTC P013E in the DTC table. ⇒ page 411
\$95	P2270	Maximum sensor voltage of oscillation	0.7177 V	7.9998 V	Refer to DTC P2270 in the DTC table. ⇒ page 524
\$96	P2271	Minimum sensor voltage of oscillation	0.0000 V	0.2001 V	Refer to DTC P2271 in the DTC table. ⇒ page 526

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$05: Oxygen Sensor Monitor Bank 2 - Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$05”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0153	Response Check.	0.2750	1.99993	Refer to DTC P0153 in the DTC table. ⇒ page 422

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$06: Oxygen Sensor Monitor Bank 2 - Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$06”.

- Select the desired “Test-ID”.

- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P013C	Rich to Lean transient time	0 Sec	0.6 Sec	Refer to DTC P013C in the DTC table. ⇒ page 407
\$06	P013D	Lean to Rich transient time	0 Sec	1 Sec	Refer to DTC P013D in the DTC table. ⇒ page 409
\$93	P014B	Exhaust gas sensor monitor Bank 1 Sensor 2	0 Sec	1.2 Sec	Refer to DTC P014B in the DTC table. ⇒ page 419
\$94	P014A	Exhaust gas sensor monitor Bank 1 Sensor 2	0 Sec	0.6 Sec	Refer to DTC P014A in the DTC table. ⇒ page 417
\$95	P2272	Maximum sensor voltage of oscillation	0.71777 V	7.99985 V	Refer to DTC P2272 in the DTC table. ⇒ page 528
\$96	P2273	Minimum sensor voltage of oscillation	0.00000 V	0.20019 V	Refer to DTC P2273 in the DTC table. ⇒ page 530

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$21: Catalyst Monitor Bank 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$21”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0420	Conversion Capability (storage) Check.	[80.00 – 100.00] %	655.35 %	Refer to DTC P0420 in the DTC table. ⇒ page 449

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$22: Catalyst Monitor Bank 2

- Connect the scan tool.
- Start the engine and let run at idle speed.



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- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$22”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0430	Conversion Capability (storage) Check.	[80.00 – 100.00] %	655.35 %	Refer to DTC P0430 in the DTC table. ⇒ page 451

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#).

- Switch the ignition off.

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Monitor \$35: Variable Valve Timing

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$35”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0011	Intake Camshaft Position Timing - Over-Advanced (Bank 1)	[2.00 - 37.00]°	[7.00 - 44.00]°	Refer to DTC P0011 in the DTC table. ⇒ page 380
\$81	P000A	Engine Position System Performance - Bank 1	[2.00 - 37.00]°	[7.00 - 44.00]°	Refer to DTC P000A in the DTC table. ⇒ page 379
\$84	P0012	Locked Start Position Intake	-8.00°	12.00°	Refer to DTC P0012 in the DTC table. ⇒ page 380

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#).

- Switch the ignition off.

Monitor \$3A: Fuel Tank EVAP System Leak Test Large Leak

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$3A”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0455	Fuel Tank Leak Test - Large leak.	[0.950 – 1.000] Sec	65.535 Sec	Refer to DTC P0455 in the DTC table . ⇒ page 455

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .
- Switch the ignition off.

Monitor \$3B: EVAP Monitor Small Leak

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$3B”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0442	Fuel Tank Leak Test - Small Leak.	[1.600 – 2.600] Sec.	65.535 Sec	Refer to DTC P0442 in the DTC table. ⇒ page 453

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .
- Switch the ignition off.

Monitor \$3C: EVAP Monitor Very Small Leak

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$3C”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0456	Fuel Tank Leak Test - Very Small Leak.	[3.000 – 5.800] Sec	65.535 Sec	Refer to DTC P0456 in the DTC table. ⇒ page 456

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$82	Only Pass	EVAP Monitor system- OK by initial purge check.	39.80 g	6553.50 g	---

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.
- End of diagnosis.

Monitor \$3D: Tank Vent Valve function check

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$3D”.

- Select the desired “Test-ID”.
- Check specified values at idle.

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Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80:	P0441	EVAP purge flow monitor	0.3099	1.999	Refer to DTC P0441 in the DTC table. ⇒ page 452
\$84	P0441	EVAP active purge check	0.00 Sec	10 Sec	Refer to DTC P0441 in the DTC table. ⇒ page 452
\$85	Only Pass	EVAP Monitor system- OK by initial purge check	39	65535	
\$88	P0441	Purge flow check	1	65535	Refer to DTC P0441 in the DTC table. ⇒ page 452

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor \$41: Oxygen Sensor Heater Monitor Bank 1 - Sensor 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$41”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0135	Oxygen sensor ceramic temperature.	725.0° C	6513.5° C	Refer to DTC P0135 in the DTC table. ⇒ page 400

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#).

- Switch the ignition off.

Monitor \$42: Oxygen Sensor Heater Monitor Bank 1 - Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$42”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0141	Oxygen sensor internal resistance check	0 kOhm	[1.260 - 20.400] kOhm	Refer to DTC P0141 in the DTC table. ⇒ page 416

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#).

- Switch the ignition off.

Monitor \$45: Oxygen Sensor Heater Monitor Bank 2- Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$45”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0155	Oxygen sensor ceramic temperature.	725.0° C	6513.5° C	Refer to DTC P0155 in the DTC table. ⇒ page 424

- If any component or system fails to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ "3.3.3 Diagnostic Mode 03 – Read DTC Memory",
page 21 .

- Switch the ignition off.

Monitor \$46: Oxygen Sensor Heater Monitor Bank 2 - Sensor 2

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select "Monitor \$46".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0161	Oxygen sensor internal resistance check	0 kOhm	[1.260 – 20.40 0] kOhm	Refer to DTC P0161 in the DTC table. ⇒ page 428

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ "3.3.3 Diagnostic Mode 03 – Read DTC Memory",
page 21 .

- Switch the ignition off.

Monitor \$71 : Secondary Air Injection Bank 1

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select "Monitor \$71".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$82	P0491	Secondary air monitor Bank 1 low flow	0.250	1.99993 16	Refer to DTC P0491 in the DTC table. ⇒ page 458
\$84	P0491	Pressure oscillation check bank 1	[0.351 - 1.000] kPa	32.767 kPa	Refer to DTC P0491 in the DTC table. ⇒ page 458
\$85	P0410	Delta pressure pre to past active air bank 1	0.0 kPa	2.000 kPa	Refer to DTC P0410 in the DTC table. ⇒ page 448
\$8B	P2440	Secondary air monitor valve check Bank 1	-32.768 kPa	0.227 kPa	Refer to DTC P2440 in the DTC table. ⇒ page 547

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic

repair procedure

⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor \$72: Secondary Air Injection Bank 2

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select "Monitor \$72".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$82	P0491	Secondary air monitor Bank 2 low flow	0.250	1.99993 16	Refer to DTC P0491 in the DTC table. ⇒ page 458
\$84	P0492	Pressure oscillation check bank 2	[0.351 - 1.000] kPa	32.767 kPa	Refer to DTC P0492 in the DTC table. ⇒ page 459
\$85	P25F6	Delta pressure pre to past active air bank 2	0.0 kPa	2.000 kPa	Refer to DTC P25F6 in the DTC table. ⇒ page 548
\$8B	P2442	Secondary air monitor valve check Bank 2	-32.768 kPa	0.227 kPa	Refer to DTC P2442 in the DTC table. ⇒ page 548

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor \$A2: Mis-Fire Cylinder 1 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select "Monitor \$A2".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0301	Cylinder data averaged during last 10 drive cycles	0.0	65,5 35 counts	Refer to DTC P0301 in the DTC table . ⇒ page 439

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0C	P0301	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0301 in the DTC table . ⇒ page 439

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#) .
- Switch the ignition off.

Monitor \$A3: Mis-Fire Cylinder 2 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A3”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0302	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0302 in the DTC table . ⇒ page 440
\$0C	P0302	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0302 in the DTC table . ⇒ page 440

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- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#) .
- Switch the ignition off.

Monitor \$A4: Mis-Fire Cylinder 3 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A4”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0303	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0303 in the DTC table . ⇒ page 440

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0C	P0303	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0303 in the DTC table . ⇒ page 440

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#) .

- Switch the ignition off.

Monitor \$A5: Mis-Fire Cylinder 4 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A5” .

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- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0304	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0304 in the DTC table . ⇒ page 441
\$0C	P0304	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0304 in the DTC table . ⇒ page 441

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#) .

- Switch the ignition off.

Monitor \$A6: Mis-Fire Cylinder 5 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A6” .

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0305	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0305 in the DTC table . ⇒ page 441

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0C	P0305	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0305 in the DTC table . ⇒ page 441

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#) .

- Switch the ignition off.

Monitor \$A7: Mis-Fire Cylinder 6 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A7”

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0306	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0306 in the DTC table . ⇒ page 442
\$0C	P0306	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0306 in the DTC table . ⇒ page 442

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- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”](#), [page 21](#) .

- Switch the ignition off.

Monitor \$A8: Mis-Fire Cylinder 7 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A8”

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0307	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0307 in the DTC table . ⇒ page 442

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0C	P0307	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0307 in the DTC table . ⇒ page 442

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

Monitor \$A9: Mis-Fire Cylinder 8 Data

- Connect the scan tool .
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor \$A9”

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0308	Cylinder data averaged during last 10 drive cycles	0.0	65,535 counts	Refer to DTC P0308 in the DTC table . ⇒ page 443
\$0C	P0308	Cylinder data during current drive cycle	0.0	65,535 counts	Refer to DTC P0308 in the DTC table . ⇒ page 443

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#) .

- Switch the ignition off.

3.3.8 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2017 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

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The values of the individual test results must reach the specified value or must be within the min. and max. limits.

Note

Depending on the scan tool and protocol used, the information displayed in diagnostic mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, or On-Board Diagnostic Monitor Identifier (OBDMID).

Test requirements

- Exhaust system must be properly sealed between catalytic converter and cylinder head.
- No DTC's in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select the desired "Test-ID".

The current minimum and maximum values will be displayed on the scan tool screen.

ECM Monitors

Monitor ID	Component or System
\$01: ⇒ page 66	Oxygen Sensor Monitor Bank 1 – Sensor 1
\$02: ⇒ page 66	Oxygen Sensor Monitor Bank 1 – Sensor 2
\$05: ⇒ page 67	Oxygen Sensor Monitor Bank 2 – Sensor 1
\$06: ⇒ page 67	Oxygen Sensor Monitor Bank 2 – Sensor 2
\$21: ⇒ page 68	Catalyst Monitor Bank 1
\$22: ⇒ page 68	Catalyst Monitor Bank 2
\$35: ⇒ page 68	Variable Valve Timing Monitor
\$3A: ⇒ page 69	EVAP Monitor (0.090")
\$3B: ⇒ page 69	EVAP Monitor (0.040" / 1.0 mm)
\$3C: ⇒ page 70	EVAP Monitor (0.020" / 0.5 mm)
\$3D: ⇒ page 70	EVAP Valve Function Check
\$41: ⇒ page 71	Oxygen Sensor Heater Monitor Bank 1 – Sensor 1
\$42: ⇒ page 71	Oxygen Sensor Heater Monitor Bank 1 – Sensor 2
\$45: ⇒ page 72	Oxygen Sensor Heater Monitor Bank 2 – Sensor 1
\$46: ⇒ page 72	Oxygen Sensor Heater Monitor Bank 2 – Sensor 2
\$71: ⇒ page 73	Secondary Air Injection (AIR) System Bank 1
\$72: ⇒ page 73	Secondary Air Injection (AIR) System Bank 2
\$A2: ⇒ page 74	Mis-Fire Monitor Cylinder 1 Data
\$A3: ⇒ page 74	Mis-Fire Monitor Cylinder 2 Data
\$A4: ⇒ page 75	Mis-Fire Monitor Cylinder 3 Data
\$A5: ⇒ page 75	Mis-Fire Monitor Cylinder 4 Data
\$A6: ⇒ page 76	Mis-Fire Monitor Cylinder 5 Data
\$A7: ⇒ page 76	Mis-Fire Monitor Cylinder 6 Data
\$A8: ⇒ page 77	Mis-Fire Monitor Cylinder 7 Data

Monitor ID	Component or System
\$A9: ⇒ page 77	Mis-Fire Monitor Cylinder 8 Data

Monitor-ID \$01: Oxygen Sensor Monitor Bank 1 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$01”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0133	Oxygen Sensor Signal Dynamic (Bank 1, Sensor 1).	0.275	1.999	Refer to DTC P0133 in the DTC summary table. ⇒ page 590

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$02: Oxygen Sensor Monitor Bank 1 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$02”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P013A	Oxygen Sensor Transient Time Rich-Lean (Bank 1, Sensor 2).	0.0 s	0.6 s	Refer to DTC P013A in the DTC summary table. ⇒ page 596
\$06	P013B	Oxygen Sensor Transient Time Lean-Rich (Bank 1, Sensor 2).	0.0 s	1.0 s	Refer to DTC P013B in the DTC summary table. ⇒ page 598
\$93	P013F	Oxygen Sensor Delay Time Lean-Rich (Bank 1, Sensor 2).	0.0 s	1.2 s	Refer to DTC P013F in the DTC summary table. ⇒ page 606
\$94	P013E	Oxygen Sensor Delay Time Rich-Lean (Bank 1, Sensor 2).	0.0 s	0.6 s	Refer to DTC P013E in the DTC summary table. ⇒ page 604
\$95	P2270	Oxygen Sensor Maximum Oscillation Voltage (Bank 1, Sensor 2).	0.717 V	7.999 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 722
\$96	P2271	Oxygen Sensor Minimum Oscillation Voltage (Bank 1, Sensor 2).	0.0 V	0.200 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 724

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Mem-

ory" to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$05: Oxygen Sensor Monitor Bank 2 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$05".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0153	Oxygen Sensor Signal Dynamic (Bank 2, Sensor 1).	0.275	1.999	Refer to DTC P0153 in the DTC summary table. ⇒ page 617

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$06: Oxygen Sensor Monitor Bank 2 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$06".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P013C	Oxygen Sensor Transient Time Rich-Lean (Bank 2, Sensor 2).	0.0 s	0.6 s	Refer to DTC P013C in the DTC summary table. ⇒ page 600
\$06	P013D	Oxygen Sensor Transient Time Lean-Rich (Bank 2, Sensor 2).	0.0 s	1.0 s	Refer to DTC P013D in the DTC summary table. ⇒ page 602
\$93	P014B	Oxygen Sensor Delay Time Lean-Rich (Bank 2, Sensor 2).	0.0 s	1.2 s	Refer to DTC P014B in the DTC summary table. ⇒ page 613
\$94	P014A	Oxygen Sensor Delay Time Rich-Lean (Bank 2, Sensor 2).	0.0 s	0.6 s	Refer to DTC P014A in the DTC summary table. ⇒ page 611
\$95	P2272	Oxygen Sensor Maximum Oscillation Voltage (Bank 2, Sensor 2).	0.717 V	7.999 V	Refer to DTC P2272 in the DTC summary table. ⇒ page 726
\$96	P2273	Oxygen Sensor Minimum Oscillation Voltage (Bank 2, Sensor 2).	0.0 V	0.200 V	Refer to DTC P2273 in the DTC summary table. ⇒ page 728

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- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$21: Catalyst Monitor Bank 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$21”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0420	Catalyst Quality Compared To Borderline Catalyst Bank 1.	80.0 – 100.0%	655.35%	Refer to DTC P0420 in the DTC summary table. ⇒ page 650

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$22: Catalyst Monitor Bank 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$22”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0430	Catalyst Quality Compared To Borderline Catalyst Bank 2.	80.0 – 100.0%	655.35%	Refer to DTC P0430 in the DTC summary table. ⇒ page 652

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#)

- Switch the ignition off.

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Monitor-ID \$35: Variable Valve Timing Monitor

- Connect the scan tool.

- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$35”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0011	Target Error Intake.	2.0 – 37.0°	7.0 – 44.0°	Refer to DTC P0011 in the DTC summary table. ⇒ page 572
\$81	P000A	Slow Response Intake.	2.0 – 37.0°	7.0 – 44.0°	Refer to DTC P000A in the DTC summary table. ⇒ page 571
\$84	P0012	Locked Start Position Intake.	-8.0°	12.0°	Refer to DTC P0012 in the DTC summary table. ⇒ page 573

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$3A: EVAP Monitor (0.090")

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$3A”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0455	Large Leak.	0.950 – 1.0 s	65.535 s	Refer to DTC P0455 in the DTC summary table. ⇒ page 657

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$3B: EVAP Monitor (0.040" / 1.0 mm)

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$3B”.

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- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0442	Small Leak.	1.6 – 2.6 s	65.535 s	Refer to DTC P0442 in the DTC summary table. ⇒ page 655

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”,
[page 21](#).

- Switch the ignition off.

Monitor-ID \$3C: EVAP Monitor (0.020" / 0.5 mm)

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$3C”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0456	Very Small Leak.	3.0 – 5.8 s	65.535 s	Refer to DTC P0456 in the DTC summary table. ⇒ page 659
\$82	Only Pass	EVAP Monitor System Okay By Initial Purge Check.	39.80 g	6,553.50 g	–

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”,
[page 21](#).

- Switch the ignition off.

Monitor-ID \$3D: EVAP Valve Function Check

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$3D”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0441	Purge Flow Monitor.	0.309	1.999	Refer to DTC P0441 in the DTC summary table. ⇒ page 654

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0441	Active Purge Check.	0.0 s	10.0 s	Refer to DTC P0441 in the DTC summary table. ⇒ page 654
\$85	Only Pass	Purge Valve Okay During Initial Purge Check.	39	65,535	–
\$88	P0441	Purge Flow Check.	1	65,535	Refer to DTC P0441 in the DTC summary table. ⇒ page 654

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$41: Oxygen Sensor Heater Monitor Bank 1 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$41”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0135	Oxygen Sensor Ceramic Temperature (Bank 1, Sensor 1).	725.0° C	6,513.5° C	Refer to DTC P0135 in the DTC summary table. ⇒ page 593

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$42: Oxygen Sensor Heater Monitor Bank 1 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$42”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0141	Oxygen Sensor Internal Resistance (Bank 1, Sensor 2).	0.0 kΩ	1.260 – 20.40 kΩ	Refer to DTC P0141 in the DTC summary table. ⇒ page 610

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$45: Oxygen Sensor Heater Monitor Bank 2 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$45”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0155	Oxygen Sensor Ceramic Temperature (Bank 2, Sensor 1).	725.0° C	6,513.5° C	Refer to DTC P0155 in the DTC summary table. ⇒ page 620

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$46: Oxygen Sensor Heater Monitor Bank 2 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$46”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0161	Oxygen Sensor Internal Resistance (Bank 2, Sensor 2).	0.0 kΩ	1.260 – 20.40 kΩ	Refer to DTC P0161 in the DTC summary table. ⇒ page 624

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Mem-

ory" to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$71: Secondary Air Injection (AIR) System Bank 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$71".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$82	P0491	Functional Check Leakage Bank 1.	0.250	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 661
\$82	P0491	Functional Check Blockage Bank 1.	0.508	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 661
\$82	P0491	Flow Check Leakage Bank 1.	0.594	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 661
\$82	P0491	Flow Check Blockage Bank 1.	0.703	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 661
\$84	P0491	Pressure Oscillation Check Bank 1.	0.351 – 1.0 kPa	32.767 kPa	Refer to DTC P0491 in the DTC summary table. ⇒ page 661
\$85	P0410	Delta Pressure Pre To Past Active Air Bank 1.	0.0 kPa	2.0 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 648
\$8B	P2440	Tightness Check Bank 1.	32.768 kPa	0.227 kPa	Refer to DTC P2440 in the DTC summary table. ⇒ page 748

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$72: Secondary Air Injection (AIR) System Bank 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$72".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$82	P0491	Functional Check Leakage Bank 2.	0.250	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 661

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$82	P0491	Functional Check Blockage Bank 2.	0.508	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 661
\$82	P0491	Flow Check Leakage Bank 2.	0.594	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 661
\$82	P0491	Flow Check Blockage Bank 2.	0.703	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 661
\$84	P0492	Pressure Oscillation Check Bank 2.	0.351 – 1.0 kPa	32.767 kPa	Refer to DTC P0492 in the DTC summary table. ⇒ page 662
\$85	P25F6	Delta Pressure Pre To Past Active Air Bank 2.	0.0 kPa	2.0 kPa	Refer to DTC P25F6 in the DTC summary table. ⇒ page 749
\$8B	P2442	Tightness Check Bank 2.	-32.768 kPa	0.227 kPa	Refer to DTC P2442 in the DTC summary table. ⇒ page 749

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A2: Mis-Fire Monitor Cylinder 1 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A2”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0301	Cylinder 1 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 638
\$0C	P0301	Cylinder 1 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 638

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A3: Mis-Fire Monitor Cylinder 2 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.

- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A3”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0302	Cylinder 2 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 638
\$0C	P0302	Cylinder 2 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 638

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A4: Mis-Fire Monitor Cylinder 3 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A4”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0303	Cylinder 3 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 639
\$0C	P0303	Cylinder 3 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 639

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- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A5: Mis-Fire Monitor Cylinder 4 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A5”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0304	Cylinder 4 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 640
\$0C	P0304	Cylinder 4 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 640

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A6: Mis-Fire Monitor Cylinder 5 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A6”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0305	Cylinder 5 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 640
\$0C	P0305	Cylinder 5 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 640

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A7: Mis-Fire Monitor Cylinder 6 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A7”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0306	Cylinder 6 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0306 in the DTC summary table. ⇒ page 641
\$0C	P0306	Cylinder 6 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0306 in the DTC summary table. ⇒ page 641

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$A8: Mis-Fire Monitor Cylinder 7 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A8”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0307	Cylinder 7 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0307 in the DTC summary table. ⇒ page 642
\$0C	P0307	Cylinder 7 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0307 in the DTC summary table. ⇒ page 642

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$A9: Mis-Fire Monitor Cylinder 8 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A9”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0308	Cylinder 8 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0308 in the DTC summary table. → page 642
\$0C	P0308	Cylinder 8 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535 counts	Refer to DTC P0308 in the DTC summary table. → page 642

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
→ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

3.3.9 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2018 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The values of the individual test results must reach the specified value or must be within the min. and max. limits.



Note

Depending on the scan tool and protocol used, the information displayed in diagnostic mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, or On-Board Diagnostic Monitor Identifier (OBDMID).

Test requirements

- Exhaust system must be properly sealed between catalytic converter and cylinder head.
- No DTC's in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select the desired Test-ID

The current minimum and maximum values will be displayed on the scan tool screen.

ECM Monitors

Monitor ID	Component or System
\$01: → page 79	Oxygen Sensor Monitor Bank 1 – Sensor 1

Monitor ID	Component or System
\$02: ⇒ page 80	Oxygen Sensor Monitor Bank 1 – Sensor 2
\$05: ⇒ page 80	Oxygen Sensor Monitor Bank 2 – Sensor 1
\$06: ⇒ page 81	Oxygen Sensor Monitor Bank 2 – Sensor 2
\$21: ⇒ page 81	Catalyst Monitor Bank 1
\$22: ⇒ page 82	Catalyst Monitor Bank 2
\$35: ⇒ page 82	Variable Valve Timing Monitor
\$3A: ⇒ page 83	EVAP Monitor (0.090")
\$3B: ⇒ page 83	EVAP Monitor (0.040" / 1.0 mm)
\$3C: ⇒ page 83	EVAP Monitor (0.020" / 0.5 mm)
\$3D: ⇒ page 84	EVAP Valve Function Check
\$41: ⇒ page 84	Oxygen Sensor Heater Monitor Bank 1 – Sensor 1
\$42: ⇒ page 85	Oxygen Sensor Heater Monitor Bank 1 – Sensor 2
\$45: ⇒ page 85	Oxygen Sensor Heater Monitor Bank 2 – Sensor 1
\$46: ⇒ page 86	Oxygen Sensor Heater Monitor Bank 2 – Sensor 2
\$71: ⇒ page 86	Secondary Air Injection (AIR) System Bank 1
\$72: ⇒ page 87	Secondary Air Injection (AIR) System Bank 2
\$A2: ⇒ page 87	Mis-Fire Monitor Cylinder 1 Data
\$A3: ⇒ page 88	Mis-Fire Monitor Cylinder 2 Data
\$A4: ⇒ page 88	Mis-Fire Monitor Cylinder 3 Data
\$A5: ⇒ page 89	Mis-Fire Monitor Cylinder 4 Data
\$A6: ⇒ page 89	Mis-Fire Monitor Cylinder 5 Data
\$A7: ⇒ page 90	Mis-Fire Monitor Cylinder 6 Data
\$A8: ⇒ page 90	Mis-Fire Monitor Cylinder 7 Data
\$A9: ⇒ page 91	Mis-Fire Monitor Cylinder 8 Data

Monitor-ID \$01: Oxygen Sensor Monitor Bank 1 – Sensor 1

- Connect the scan tool.
 - Start the engine and let run at idle speed.
 - Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".
- Select "Monitor-ID \$01".
- Select the desired "Test-ID".
 - Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0133	Oxygen Sensor Signal Dynamic (Bank 1, Sensor 1).	0.275	1.999	Refer to DTC P0133 in the DTC summary table. ⇒ page 791

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).
- Switch the ignition off.

Monitor-ID \$02: Oxygen Sensor Monitor Bank 1 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$02”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P013A	Oxygen Sensor Transient Time Rich-Lean (Bank 1, Sensor 2).	0.0 s	0.6 s	Refer to DTC P013A in the DTC summary table. ⇒ page 797
\$06	P013B	Oxygen Sensor Transient Time Lean-Rich (Bank 1, Sensor 2).	0.0 s	1.0 s	Refer to DTC P013B in the DTC summary table. ⇒ page 799
\$93	P013F	Oxygen Sensor Delay Time Lean-Rich (Bank 1, Sensor 2).	0.0 s	1.2 s	Refer to DTC P013F in the DTC summary table. ⇒ page 807
\$94	P013E	Oxygen Sensor Delay Time Rich-Lean (Bank 1, Sensor 2).	0.0 s	0.6 s	Refer to DTC P013E in the DTC summary table. ⇒ page 805
\$95	P2270	Oxygen Sensor Maximum Oscillation Voltage (Bank 1, Sensor 2).	0.717 V	7.999 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 925
\$96	P2271	Oxygen Sensor Minimum Oscillation Voltage (Bank 1, Sensor 2).	0.0 V	0.200 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 927

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$05: Oxygen Sensor Monitor Bank 2 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$05”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0153	Oxygen Sensor Signal Dynamic (Bank 2, Sensor 1).	0.275	1.999	Refer to DTC P0153 in the DTC summary table. ⇒ page 818

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$06: Oxygen Sensor Monitor Bank 2 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$06”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P013C	Oxygen Sensor Transient Time Rich-Lean (Bank 2, Sensor 2).	0.0 s	0.6 s	Refer to DTC P013C in the DTC summary table. ⇒ page 801
\$06	P013D	Oxygen Sensor Transient Time Lean-Rich (Bank 2, Sensor 2).	0.0 s	1.0 s	Refer to DTC P013D in the DTC summary table. ⇒ page 803
\$93	P014B	Oxygen Sensor Delay Time Lean-Rich (Bank 2, Sensor 2).	0.0 s	1.2 s	Refer to DTC P014B in the DTC summary table. ⇒ page 814
\$94	P014A	Oxygen Sensor Delay Time Rich-Lean (Bank 2, Sensor 2).	0.0 s	0.6 s	Refer to DTC P014A in the DTC summary table. ⇒ page 812
\$95	P2272	Oxygen Sensor Maximum Oscillation Voltage (Bank 2, Sensor 2).	0.717 V	7.999 V	Refer to DTC P2272 in the DTC summary table. ⇒ page 929
\$96	P2273	Oxygen Sensor Minimum Oscillation Voltage (Bank 2, Sensor 2).	0.0 V	0.200 V	Refer to DTC P2273 in the DTC summary table. ⇒ page 931

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$21: Catalyst Monitor Bank 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$21”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0420	Catalyst Quality Compared To Borderline Catalyst Bank 1.	80.0 – 100.0%	655.35%	Refer to DTC P0420 in the DTC summary table. ⇒ page 853

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$22: Catalyst Monitor Bank 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$22".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0430	Catalyst Quality Compared To Borderline Catalyst Bank 2.	80.0 – 100.0%	655.35%	Refer to DTC P0430 in the DTC summary table. ⇒ page 855

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$35: Variable Valve Timing Monitor

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$35".

- Select the desired "Test-ID".
- Check specified values at idle.

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Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0011	Target Error Intake.	2.0 – 37.0°	7.0 – 44.0°	Refer to DTC P0011 in the DTC summary table. ⇒ page 773
\$81	P000A	Slow Response Intake.	2.0 – 37.0°	7.0 – 44.0°	Refer to DTC P000A in the DTC summary table. ⇒ page 772
\$84	P0012	Locked Start Position Intake.	-8.0°	12.0°	Refer to DTC P0012 in the DTC summary table. ⇒ page 774

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$3A: EVAP Monitor (0.090")

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$3A".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0455	Large Leak.	0.950 – 1.0 s	65.535 s	Refer to DTC P0455 in the DTC summary table. ⇒ page 860

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$3B: EVAP Monitor (0.040" / 1.0 mm)

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$3B".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0442	Small Leak.	1.6 – 2.6 s	65.535 s	Refer to DTC P0442 in the DTC summary table. ⇒ page 858

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$3C: EVAP Monitor (0.020" / 0.5 mm)

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$3C".

- Select the desired "Test-ID".

- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0456	Very Small Leak.	3.0 – 5.8 s	65.535 s	Refer to DTC P0456 in the DTC summary table. ⇒ page 862
\$82	Only Pass	EVAP Monitor System Okay By Initial Purge Check.	39.80 g	6,553.50 g	–

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$3D: EVAP Valve Function Check

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$3D”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0441	Purge Flow Monitor.	0.309	1.999	Refer to DTC P0441 in the DTC summary table. ⇒ page 857
\$84	P0441	Active Purge Check.	0.0 s	10.0 s	Refer to DTC P0441 in the DTC summary table. ⇒ page 857
\$85	Only Pass	Purge Valve Okay During Initial Purge Check.	39	65,535	–
\$88	P0441	Purge Flow Check.	1	65,535	Refer to DTC P0441 in the DTC summary table. ⇒ page 857

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$41: Oxygen Sensor Heater Monitor Bank 1 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$41”

- Select the desired “Test-ID”

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- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0135	Oxygen Sensor Ceramic Temperature (Bank 1, Sensor 1).	725.0° C	6,513.5° C	Refer to DTC P0135 in the DTC summary table. ⇒ page 794

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$42: Oxygen Sensor Heater Monitor Bank 1 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$42”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0141	Oxygen Sensor Internal Resistance (Bank 1, Sensor 2).	0.0 kΩ	1.260 – 20.40 kΩ	Refer to DTC P0141 in the DTC summary table. ⇒ page 811

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$45: Oxygen Sensor Heater Monitor Bank 2 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$45”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0155	Oxygen Sensor Ceramic Temperature (Bank 2, Sensor 1).	725.0° C	6,513.5° C	Refer to DTC P0155 in the DTC summary table. ⇒ page 821

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$46: Oxygen Sensor Heater Monitor Bank 2 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$46”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0161	Oxygen Sensor Internal Resistance (Bank 2, Sensor 2).	0.0 kΩ	1.260 – 20.40 kΩ	Refer to DTC P0161 in the DTC summary table. ⇒ page 825

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$71: Secondary Air Injection (AIR) System Bank 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$71”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$82	P0491	Functional Check Leakage Bank 1.	0.250	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 864
\$82	P0491	Functional Check Blockage Bank 1.	0.508	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 864
\$82	P0491	Flow Check Leakage Bank 1.	0.594	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 864
\$82	P0491	Flow Check Blockage Bank 1.	0.703	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 864
\$84	P0491	Pressure Oscillation Check Bank 1.	0.351 – 1.0 kPa	32.767 kPa	Refer to DTC P0491 in the DTC summary table. ⇒ page 864
\$85	P0410	Delta Pressure Pre To Past Active Air Bank 1.	0.0 kPa	2.0 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 851

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$8B	P2440	Tightness Check Bank 1.	-32.768 kPa	0.227 kPa	Refer to DTC P2440 in the DTC summary table. ⇒ page 951

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$72: Secondary Air Injection (AIR) System Bank 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$72”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$82	P0491	Functional Check Leakage Bank 2.	0.250	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 864
\$82	P0491	Functional Check Blockage Bank 2.	0.508	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 864
\$82	P0491	Flow Check Leakage Bank 2.	0.594	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 864
\$82	P0491	Flow Check Blockage Bank 2.	0.703	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 864
\$84	P0492	Pressure Oscillation Check Bank 2.	0.351 – 1.0 kPa	32.767 kPa	Refer to DTC P0492 in the DTC summary table. ⇒ page 865
\$85	P25F6	Delta Pressure Pre To Past Active Air Bank 2.	0.0 kPa	2.0 kPa	Refer to DTC P25F6 in the DTC summary table. ⇒ page 952
\$8B	P2442	Tightness Check Bank 2.	-32.768 kPa	0.227 kPa	Refer to DTC P2442 in the DTC summary table. ⇒ page 952

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A2: Mis-Fire Monitor Cylinder 1 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A2”.

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- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0301	Cylinder 1 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 839
\$0C	P0301	Cylinder 1 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 839

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$A3: Mis-Fire Monitor Cylinder 2 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A3”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0302	Cylinder 2 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 839
\$0C	P0302	Cylinder 2 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 839

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A4: Mis-Fire Monitor Cylinder 3 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A4”.

- Select the desired “Test-ID”.

- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0303	Cylinder 3 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 840
\$0C	P0303	Cylinder 3 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 840

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A5: Mis-Fire Monitor Cylinder 4 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A5”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0304	Cylinder 4 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 841
\$0C	P0304	Cylinder 4 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 841

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A6: Mis-Fire Monitor Cylinder 5 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A6”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0305	Cylinder 5 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 842
\$0C	P0305	Cylinder 5 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 842

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$A7: Mis-Fire Monitor Cylinder 6 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A7”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0306	Cylinder 6 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0306 in the DTC summary table. ⇒ page 843
\$0C	P0306	Cylinder 6 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0306 in the DTC summary table. ⇒ page 843

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- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$A8: Mis-Fire Monitor Cylinder 7 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A8”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0307	Cylinder 7 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0307 in the DTC summary table. ⇒ page 844
\$0C	P0307	Cylinder 7 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0307 in the DTC summary table. ⇒ page 844

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$A9: Mis-Fire Monitor Cylinder 8 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A9”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0308	Cylinder 8 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0308 in the DTC summary table. ⇒ page 845
\$0C	P0308	Cylinder 8 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0308 in the DTC summary table. ⇒ page 845

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

3.3.10 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2019 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The values of the individual test results must reach the specified value or must be within the min. and max. limits.



Note

Depending on the scan tool and protocol used, the information displayed in diagnostic mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, or On-Board Diagnostic Monitor Identifier (OBDMID).

Test requirements

- Exhaust system must be properly sealed between catalytic converter and cylinder head.
- No DTC's in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Mode 6: Check test the results of components that are not continuously monitored".

Select the desired "Test-ID".

The current minimum and maximum values will be displayed on the scan tool screen.

ECM Monitors

Monitor ID	Component or System
\$01: ⇒ page 93	Oxygen Sensor Monitor Bank 1 – Sensor 1
\$02: ⇒ page 93	Oxygen Sensor Monitor Bank 1 – Sensor 2
\$05: ⇒ page 94	Oxygen Sensor Monitor Bank 2 – Sensor 1
\$06: ⇒ page 94	Oxygen Sensor Monitor Bank 2 – Sensor 2
\$21: ⇒ page 95	Catalyst Monitor Bank 1
\$22: ⇒ page 95	Catalyst Monitor Bank 2
\$35: ⇒ page 95	Variable Valve Timing Monitor
\$3A: ⇒ page 96	EVAP Monitor (0.090")
\$3B: ⇒ page 96	EVAP Monitor (0.040" / 1.0 mm)
\$3C: ⇒ page 97	EVAP Monitor (0.020" / 0.5 mm)
\$3D: ⇒ page 97	EVAP Valve Function Check
\$41: ⇒ page 98	Oxygen Sensor Heater Monitor Bank 1 – Sensor 1
\$42: ⇒ page 98	Oxygen Sensor Heater Monitor Bank 1 – Sensor 2
\$45: ⇒ page 99	Oxygen Sensor Heater Monitor Bank 2 – Sensor 1
\$46: ⇒ page 99	Oxygen Sensor Heater Monitor Bank 2 – Sensor 2
\$71: ⇒ page 100	Secondary Air Injection (AIR) System Bank 1
\$72: ⇒ page 100	Secondary Air Injection (AIR) System Bank 2
\$A2: ⇒ page 101	Mis-Fire Monitor Cylinder 1 Data
\$A3: ⇒ page 101	Mis-Fire Monitor Cylinder 2 Data
\$A4: ⇒ page 102	Mis-Fire Monitor Cylinder 3 Data
\$A5: ⇒ page 102	Mis-Fire Monitor Cylinder 4 Data
\$A6: ⇒ page 103	Mis-Fire Monitor Cylinder 5 Data
\$A7: ⇒ page 103	Mis-Fire Monitor Cylinder 6 Data
\$A8: ⇒ page 104	Mis-Fire Monitor Cylinder 7 Data
\$A9: ⇒ page 104	Mis-Fire Monitor Cylinder 8 Data

Monitor-ID \$01: Oxygen Sensor Monitor Bank 1 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$01”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0133	Oxygen Sensor Signal Dynamic (Bank 1, Sensor 1).	0.275	1.999	Refer to DTC P0133 in the DTC summary table. → page 994

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
→ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$02: Oxygen Sensor Monitor Bank 1 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$02”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P013A	Oxygen Sensor Transient Time Rich-Lean (Bank 1, Sensor 2).	0.0 s	0.6 s	Refer to DTC P013A in the DTC summary table. → page 1000
\$06	P013B	Oxygen Sensor Transient Time Lean-Rich (Bank 1, Sensor 2).	0.0 s	1.0 s	Refer to DTC P013B in the DTC summary table. → page 1002
\$93	P013F	Oxygen Sensor Delay Time Lean-Rich (Bank 1, Sensor 2).	0.0 s	1.2 s	Refer to DTC P013F in the DTC summary table. → page 1010
\$94	P013E	Oxygen Sensor Delay Time Rich-Lean (Bank 1, Sensor 2).	0.0 s	0.6 s	Refer to DTC P013E in the DTC summary table. → page 1008
\$95	P2270	Oxygen Sensor Maximum Oscillation Voltage (Bank 1, Sensor 2).	0.717 V	7.999 V	Refer to DTC P2270 in the DTC summary table. → page 1128
\$96	P2271	Oxygen Sensor Minimum Oscillation Voltage (Bank 1, Sensor 2).	0.0 V	0.200 V	Refer to DTC P2271 in the DTC summary table. → page 1130

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure

⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$05: Oxygen Sensor Monitor Bank 2 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$05".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0153	Oxygen Sensor Signal Dynamic (Bank 2, Sensor 1).	0.275	1.999	Refer to DTC P0153 in the DTC summary table. ⇒ page 1021

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$06: Oxygen Sensor Monitor Bank 2 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$06".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P013C	Oxygen Sensor Transient Time Rich-Lean (Bank 2, Sensor 2).	0.0 s	0.6 s	Refer to DTC P013C in the DTC summary table. ⇒ page 1004
\$06	P013D	Oxygen Sensor Transient Time Lean-Rich (Bank 2, Sensor 2).	0.0 s	1.0 s	Refer to DTC P013D in the DTC summary table. ⇒ page 1006
\$93	P014B	Oxygen Sensor Delay Time Lean-Rich (Bank 2, Sensor 2).	0.0 s	1.2 s	Refer to DTC P014B in the DTC summary table. ⇒ page 1017
\$94	P014A	Oxygen Sensor Delay Time Rich-Lean (Bank 2, Sensor 2).	0.0 s	0.6 s	Refer to DTC P014A in the DTC summary table. ⇒ page 1015
\$95	P2272	Oxygen Sensor Maximum Oscillation Voltage (Bank 2, Sensor 2).	0.717 V	7.999 V	Refer to DTC P2272 in the DTC summary table. ⇒ page 1132
\$96	P2273	Oxygen Sensor Minimum Oscillation Voltage (Bank 2, Sensor 2).	0.0 V	0.200 V	Refer to DTC P2273 in the DTC summary table. ⇒ page 1134

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Mem-

ory" to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$21: Catalyst Monitor Bank 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$21".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0420	Catalyst Quality Compared To Borderline Catalyst Bank 1.	80.0 – 100.0%	655.35%	Refer to DTC P0420 in the DTC summary table. ⇒ page 1056

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- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$22: Catalyst Monitor Bank 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$22".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0430	Catalyst Quality Compared To Borderline Catalyst Bank 2.	80.0 – 100.0%	655.35%	Refer to DTC P0430 in the DTC summary table. ⇒ page 1058

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$35: Variable Valve Timing Monitor

- Connect the scan tool.
- Start the engine and let run at idle speed.

- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$35”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0011	Target Error Intake.	2.0 – 37.0°	7.0 – 44.0°	Refer to DTC P0011 in the DTC summary table. ⇒ page 976
\$81	P000A	Slow Response Intake.	2.0 – 37.0°	7.0 – 44.0°	Refer to DTC P000A in the DTC summary table. ⇒ page 975
\$84	P0012	Locked Start Position Intake.	-8.0°	12.0°	Refer to DTC P0012 in the DTC summary table. ⇒ page 977

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$3A: EVAP Monitor (0.090")

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$3A”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0455	Large Leak.	0.950 – 1.0 s	65.535 s	Refer to DTC P0455 in the DTC summary table. ⇒ page 1063

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$3B: EVAP Monitor (0.040" / 1.0 mm)

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$3B”.

- Select the desired “Test-ID”.

- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0442	Small Leak.	1.6 – 2.6 s	65.535 s	Refer to DTC P0442 in the DTC summary table. ⇒ page 1061

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$3C: EVAP Monitor (0.020" / 0.5 mm)

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$3C”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0456	Very Small Leak.	3.0 – 5.8 s	65.535 s	Refer to DTC P0456 in the DTC summary table. ⇒ page 1065
\$82	Only Pass	EVAP Monitor System Okay By Initial Purge Check.	39.80 g	6,553.50 g	–

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$3D: EVAP Valve Function Check

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$3D”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0441	Purge Flow Monitor.	0.309	1.999	Refer to DTC P0441 in the DTC summary table. ⇒ page 1060
\$84	P0441	Active Purge Check.	0.0 s	10.0 s	Refer to DTC P0441 in the DTC summary table. ⇒ page 1060

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	Only Pass	Purge Valve Okay During Initial Purge Check.	39	65,535	–
\$88	P0441	Purge Flow Check.	1	65,535	Refer to DTC P0441 in the DTC summary table. ⇒ page 1060

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”,
[page 21](#).

- Switch the ignition off.

Monitor-ID \$41: Oxygen Sensor Heater Monitor Bank 1 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$41”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0135	Oxygen Sensor Ceramic Temperature (Bank 1, Sensor 1).	725.0° C	6,513.5° C	Refer to DTC P0135 in the DTC summary table. ⇒ page 997

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”,
[page 21](#).

- Switch the ignition off.

Monitor-ID \$42: Oxygen Sensor Heater Monitor Bank 1 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$42”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0141	Oxygen Sensor Internal Resistance (Bank 1, Sensor 2).	0.0 kΩ	1.260 – 20.40 kΩ	Refer to DTC P0141 in the DTC summary table. ⇒ page 1014

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$45: Oxygen Sensor Heater Monitor Bank 2 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$45”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0155	Oxygen Sensor Ceramic Temperature (Bank 2, Sensor 1).	725.0° C	6,513.5° C	Refer to DTC P0155 in the DTC summary table. ⇒ page 1024

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$46: Oxygen Sensor Heater Monitor Bank 2 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$46”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0161	Oxygen Sensor Internal Resistance (Bank 2, Sensor 2).	0.0 kΩ	1.260 – 20.40 kΩ	Refer to DTC P0161 in the DTC summary table. ⇒ page 1028

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$71: Secondary Air Injection (AIR) System Bank 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$71”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$82	P0491	Functional Check Leakage Bank 1.	0.250	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1067
\$82	P0491	Functional Check Blockage Bank 1.	0.508	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1067
\$82	P0491	Flow Check Leakage Bank 1.	0.594	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1067
\$82	P0491	Flow Check Blockage Bank 1.	0.703	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1067
\$84	P0491	Pressure Oscillation Check Bank 1.	0.351 – 1.0 kPa	32.767 kPa	Refer to DTC P0491 in the DTC summary table. ⇒ page 1067
\$85	P0410	Delta Pressure Pre To Past Active Air Bank 1.	0.0 kPa	2.0 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 1054
\$8B	P2440	Tightness Check Bank 1.	-32.768 kPa	0.227 kPa	Refer to DTC P2440 in the DTC summary table. ⇒ page 1154

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$72: Secondary Air Injection (AIR) System Bank 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$72”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$82	P0491	Functional Check Leakage Bank 2.	0.250	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1067
\$82	P0491	Functional Check Blockage Bank 2.	0.508	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1067
\$82	P0491	Flow Check Leakage Bank 2.	0.594	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 864
\$82	P0491	Flow Check Blockage Bank 2.	0.703	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1067

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0492	Pressure Oscillation Check Bank 2.	0.351 – 1.0 kPa	32.767 kPa	Refer to DTC P0492 in the DTC summary table. ⇒ page 1068
\$85	P25F6	Delta Pressure Pre To Past Active Air Bank 2.	0.0 kPa	2.0 kPa	Refer to DTC P25F6 in the DTC summary table. ⇒ page 1155
\$8B	P2442	Tightness Check Bank 2.	-32.768 kPa	0.227 kPa	Refer to DTC P2442 in the DTC summary table. ⇒ page 1155

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A2: Mis-Fire Monitor Cylinder 1 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A2”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0301	Cylinder 1 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 1042
\$0C	P0301	Cylinder 1 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 1042

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A3: Mis-Fire Monitor Cylinder 2 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A3”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0302	Cylinder 2 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 1042
\$0C	P0302	Cylinder 2 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 1042

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$A4: Mis-Fire Monitor Cylinder 3 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A4”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0303	Cylinder 3 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 1043
\$0C	P0303	Cylinder 3 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 1043

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$A5: Mis-Fire Monitor Cylinder 4 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A5”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0304	Cylinder 4 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 1044
\$0C	P0304	Cylinder 4 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 1044

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A6: Mis-Fire Monitor Cylinder 5 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A6”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0305	Cylinder 5 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 1045
\$0C	P0305	Cylinder 5 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 1045

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A7: Mis-Fire Monitor Cylinder 6 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A7”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0306	Cylinder 6 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0306 in the DTC summary table. ⇒ page 1046
\$0C	P0306	Cylinder 6 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0306 in the DTC summary table. ⇒ page 1046

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$A8: Mis-Fire Monitor Cylinder 7 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A8”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0307	Cylinder 7 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0307 in the DTC summary table. ⇒ page 1047
\$0C	P0307	Cylinder 7 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0307 in the DTC summary table. ⇒ page 1047

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$A9: Mis-Fire Monitor Cylinder 8 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A9”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0308	Cylinder 8 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0308 in the DTC summary table. ⇒ page 1048
\$0C	P0308	Cylinder 8 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0308 in the DTC summary table. ⇒ page 1048

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

3.3.11 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2020 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The values of the individual test results must reach the specified value or must be within the min. and max. limits.



Note

Depending on the scan tool and protocol used, the information displayed in diagnostic mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, or On-Board Diagnostic Monitor Identifier (OBDMID).

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Test requirements

- Exhaust system must be properly sealed between catalytic converter and cylinder head.
- No DTC’s in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select the desired “Test-ID”.

The current minimum and maximum values will be displayed on the scan tool screen.

ECM Monitors

Monitor ID	Component or System
\$01: ⇒ page 106	Oxygen Sensor Monitor Bank 1 – Sensor 1

Monitor ID	Component or System
\$02: ⇒ page 107	Oxygen Sensor Monitor Bank 1 – Sensor 2
\$05: ⇒ page 107	Oxygen Sensor Monitor Bank 2 – Sensor 1
\$06: ⇒ page 108	Oxygen Sensor Monitor Bank 2 – Sensor 2
\$21: ⇒ page 108	Catalyst Monitor Bank 1
\$22: ⇒ page 109	Catalyst Monitor Bank 2
\$35: ⇒ page 109	Variable Valve Timing Monitor
\$3A: ⇒ page 110	EVAP Monitor (0.090")
\$3B: ⇒ page 110	EVAP Monitor (0.040" / 1.0 mm)
\$3C: ⇒ page 110	EVAP Monitor (0.020" / 0.5 mm)
\$3D: ⇒ page 111	EVAP Valve Function Check
\$41: ⇒ page 111	Oxygen Sensor Heater Monitor Bank 1 – Sensor 1
\$42: ⇒ page 112	Oxygen Sensor Heater Monitor Bank 1 – Sensor 2
\$45: ⇒ page 112	Oxygen Sensor Heater Monitor Bank 2 – Sensor 1
\$46: ⇒ page 113	Oxygen Sensor Heater Monitor Bank 2 – Sensor 2
\$71: ⇒ page 113	Secondary Air Injection (AIR) System Bank 1
\$72: ⇒ page 114	Secondary Air Injection (AIR) System Bank 2
\$A2: ⇒ page 114	Mis-Fire Monitor Cylinder 1 Data
\$A3: ⇒ page 115	Mis-Fire Monitor Cylinder 2 Data
\$A4: ⇒ page 115	Mis-Fire Monitor Cylinder 3 Data
\$A5: ⇒ page 116	Mis-Fire Monitor Cylinder 4 Data
\$A6: ⇒ page 116	Mis-Fire Monitor Cylinder 5 Data
\$A7: ⇒ page 117	Mis-Fire Monitor Cylinder 6 Data
\$A8: ⇒ page 117	Mis-Fire Monitor Cylinder 7 Data
\$A9: ⇒ page 118	Mis-Fire Monitor Cylinder 8 Data

Monitor-ID \$01: Oxygen Sensor Monitor Bank 1 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$01”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0133	Oxygen Sensor Signal Dynamic (Bank 1, Sensor 1).	0.275	1.999	Refer to DTC P0133 in the DTC summary table. ⇒ page 1197

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$02: Oxygen Sensor Monitor Bank 1 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$02”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P013A	Oxygen Sensor Transient Time Rich-Lean (Bank 1, Sensor 2).	0.0 s	0.6 s	Refer to DTC P013A in the DTC summary table. ⇒ page 1203
\$06	P013B	Oxygen Sensor Transient Time Lean-Rich (Bank 1, Sensor 2).	0.0 s	1.0 s	Refer to DTC P013B in the DTC summary table. ⇒ page 1205
\$93	P013F	Oxygen Sensor Delay Time Lean-Rich (Bank 1, Sensor 2).	0.0 s	1.2 s	Refer to DTC P013F in the DTC summary table. ⇒ page 1213
\$94	P013E	Oxygen Sensor Delay Time Rich-Lean (Bank 1, Sensor 2).	0.0 s	0.6 s	Refer to DTC P013E in the DTC summary table. ⇒ page 1211
\$95	P2271	Oxygen Sensor Maximum Oscillation Voltage (Bank 1, Sensor 2).	0.0 V	0.200 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 1333
\$96	P2270	Oxygen Sensor Minimum Oscillation Voltage (Bank 1, Sensor 2).	0.717 V	7.999 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 1331

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure [⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
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- Switch the ignition off.

Monitor-ID \$05: Oxygen Sensor Monitor Bank 2 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$05”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$83	P0153	Oxygen Sensor Signal Dynamic (Bank 2, Sensor 1).	0.275	1.999	Refer to DTC P0153 in the DTC summary table. ⇒ page 1224

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure [⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$06: Oxygen Sensor Monitor Bank 2 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$06”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$05	P013C	Oxygen Sensor Transient Time Rich-Lean (Bank 2, Sensor 2).	0.0 s	0.6 s	Refer to DTC P013C in the DTC summary table. ⇒ page 1207
\$06	P013D	Oxygen Sensor Transient Time Lean-Rich (Bank 2, Sensor 2).	0.0 s	1.0 s	Refer to DTC P013D in the DTC summary table. ⇒ page 1209
\$93	P014B	Oxygen Sensor Delay Time Lean-Rich (Bank 2, Sensor 2).	0.0 s	1.2 s	Refer to DTC P014B in the DTC summary table. ⇒ page 1220
\$94	P014A	Oxygen Sensor Delay Time Rich-Lean (Bank 2, Sensor 2).	0.0 s	0.6 s	Refer to DTC P014A in the DTC summary table. ⇒ page 1218
\$95	P2273	Oxygen Sensor Maximum Oscillation Voltage (Bank 2, Sensor 2).	0.0 V	0.200 V	Refer to DTC P2273 in the DTC summary table. ⇒ page 1337
\$96	P2272	Oxygen Sensor Minimum Oscillation Voltage (Bank 2, Sensor 2).	0.717 V	7.999 V	Refer to DTC P2272 in the DTC summary table. ⇒ page 1335

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$21: Catalyst Monitor Bank 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$21”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0420	Catalyst Quality Compared To Borderline Catalyst Bank 1.	80.0 – 100.0%	655.35%	Refer to DTC P0420 in the DTC summary table. ⇒ page 1259

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$22: Catalyst Monitor Bank 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$22".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$84	P0430	Catalyst Quality Compared To Borderline Catalyst Bank 2.	80.0 – 100.0%	655.35%	Refer to DTC P0430 in the DTC summary table. ⇒ page 1261

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$35: Variable Valve Timing Monitor

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select "Diagnostic Mode 6: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID \$35".

- Select the desired "Test-ID".
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0011	Target Error Intake.	2.0 – 37.0°	7.0 – 44.0°	Refer to DTC P0011 in the DTC summary table. ⇒ page 1179
\$81	P000A	Slow Response Intake.	2.0 – 37.0°	7.0 – 44.0°	Refer to DTC P000A in the DTC summary table. ⇒ page 1178
\$84	P0012	Locked Start Position Intake.	-8.0°	12.0°	Refer to DTC P0012 in the DTC summary table. ⇒ page 1180

- If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ ["3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21](#).

- Switch the ignition off.

Monitor-ID \$3A: EVAP Monitor (0.090")

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$3A”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0455	Large Leak.	0.950 – 1.0 s	65.535 s	Refer to DTC P0455 in the DTC summary table. ⇒ page 1266

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$3B: EVAP Monitor (0.040" / 1.0 mm)

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$3B”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0442	Small Leak.	1.6 – 2.6 s	65.535 s	Refer to DTC P0442 in the DTC summary table. ⇒ page 1264

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$3C: EVAP Monitor (0.020" / 0.5 mm)

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$3C”.

- Select the desired “Test-ID”.

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- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0456	Very Small Leak.	3.0 – 5.8 s	65.535 s	Refer to DTC P0456 in the DTC summary table. ⇒ page 1268
\$82	Only Pass	EVAP Monitor System Okay By Initial Purge Check.	39.80 g	6,553.50 g	–

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$3D: EVAP Valve Function Check

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$3D”.

- Select the desired “Test-ID”.

- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$80	P0441	Purge Flow Monitor.	0.309	1.999	Refer to DTC P0441 in the DTC summary table. ⇒ page 1263
\$84	P0441	Active Purge Check.	0.0 s	10.0 s	Refer to DTC P0441 in the DTC summary table. ⇒ page 1263
\$85	Only Pass	Purge Valve Okay During Initial Purge Check.	39	65,535	–
\$88	P0441	Purge Flow Check.	1	65,535	Refer to DTC P0441 in the DTC summary table. ⇒ page 1263

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure

⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$41: Oxygen Sensor Heater Monitor Bank 1 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$41”.

- Select the desired “Test-ID”.

- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0135	Oxygen Sensor Ceramic Temperature (Bank 1, Sensor 1).	725.0° C	6,513.5° C	Refer to DTC P0135 in the DTC summary table. ⇒ page 1200

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$42: Oxygen Sensor Heater Monitor Bank 1 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$42”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0141	Oxygen Sensor Internal Resistance (Bank 1, Sensor 2).	0.0 kΩ	1.260 – 20.40 kΩ	Refer to DTC P0141 in the DTC summary table. ⇒ page 1217

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- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$45: Oxygen Sensor Heater Monitor Bank 2 – Sensor 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$45”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$85	P0155	Oxygen Sensor Ceramic Temperature (Bank 2, Sensor 1).	725.0° C	6,513.5° C	Refer to DTC P0155 in the DTC summary table. ⇒ page 1227

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure

⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”,
page 21 .

- Switch the ignition off.

Monitor-ID \$46: Oxygen Sensor Heater Monitor Bank 2 – Sensor 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$46”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$81	P0161	Oxygen Sensor Internal Resistance (Bank 2, Sensor 2).	0.0 kΩ	1.260 – 20.40 kΩ	Refer to DTC P0161 in the DTC summary table. ⇒ page 1231

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure

⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”,
page 21 .

- Switch the ignition off.

Monitor-ID \$71: Secondary Air Injection (AIR) System Bank 1

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$71”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$82	P0491	Functional Check Leakage Bank 1.	0.250	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1270
\$82	P0491	Functional Check Blockage Bank 1.	0.508	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1270
\$82	P0491	Flow Check Leakage Bank 1.	0.594	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1270
\$82	P0491	Flow Check Blockage Bank 1.	0.703	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1270
\$84	P0491	Pressure Oscillation Check Bank 1.	0.351 – 1.0 kPa	32.767 kPa	Refer to DTC P0491 in the DTC summary table. ⇒ page 1270
\$85	P0410	Delta Pressure Pre To Past Active Air Bank 1.	0.0 kPa	2.0 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 1270

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$8B	P2440	Tightness Check Bank 1.	-32.768 kPa	0.227 kPa	Refer to DTC P2440 in the DTC summary table. ⇒ page 1357

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$72: Secondary Air Injection (AIR) System Bank 2

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$72”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$82	P0491	Functional Check Leakage Bank 2.	0.250	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1270
\$82	P0491	Functional Check Blockage Bank 2.	0.508	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1270
\$82	P0491	Flow Check Leakage Bank 2.	0.594	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1270
\$82	P0491	Flow Check Blockage Bank 2.	0.703	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 1270
\$84	P0492	Pressure Oscillation Check Bank 2.	0.351 – 1.0 kPa	32.767 kPa	Refer to DTC P0492 in the DTC summary table. ⇒ page 1271
\$85	P25F6	Delta Pressure Pre To Past Active Air Bank 2.	0.0 kPa	2.0 kPa	Refer to DTC P25F6 in the DTC summary table. ⇒ page 1358
\$8B	P2442	Tightness Check Bank 2.	-32.768 kPa	0.227 kPa	Refer to DTC P2442 in the DTC summary table. ⇒ page 1358

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A2: Mis-Fire Monitor Cylinder 1 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A2”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0301	Cylinder 1 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 1245
\$0C	P0301	Cylinder 1 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 1245

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A3: Mis-Fire Monitor Cylinder 2 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A3”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0302	Cylinder 2 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 1245
\$0C	P0302	Cylinder 2 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 1245

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A4: Mis-Fire Monitor Cylinder 3 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A4”.

- Select the desired “Test-ID”.

- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0303	Cylinder 3 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. → page 1246
\$0C	P0303	Cylinder 3 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. → page 1246

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
→ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A5: Mis-Fire Monitor Cylinder 4 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A5”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0304	Cylinder 4 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. → page 1247
\$0C	P0304	Cylinder 4 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. → page 1247

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
→ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

Monitor-ID \$A6: Mis-Fire Monitor Cylinder 5 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A6”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0305	Cylinder 5 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 1248
\$0C	P0305	Cylinder 5 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 1248

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$A7: Mis-Fire Monitor Cylinder 6 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A7”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0306	Cylinder 6 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0306 in the DTC summary table. ⇒ page 1249
\$0C	P0306	Cylinder 6 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0306 in the DTC summary table. ⇒ page 1249

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC’s or the corresponding diagnostic repair procedure
[⇒ “3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$A8: Mis-Fire Monitor Cylinder 7 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A8”.

- Select the desired “Test-ID”.
- Check specified values at idle.

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Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0307	Cylinder 7 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0307 in the DTC summary table. ⇒ page 1250
\$0C	P0307	Cylinder 7 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0307 in the DTC summary table. ⇒ page 1250

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).
- Switch the ignition off.

Monitor-ID \$A9: Mis-Fire Monitor Cylinder 8 Data

- Connect the scan tool.
- Start the engine and let run at idle speed.
- Select “Diagnostic Mode 6: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID \$A9”.

- Select the desired “Test-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
\$0B	P0308	Cylinder 8 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0308 in the DTC summary table. ⇒ page 1251
\$0C	P0308	Cylinder 8 Data Current Driving Cycle, Only Indication (Pass).	0.0 counts	65,535.0 counts	Refer to DTC P0308 in the DTC summary table. ⇒ page 1251

- If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ [“3.3.3 Diagnostic Mode 03 – Read DTC Memory”, page 21](#).

- Switch the ignition off.

3.3.12 Diagnostic Mode 07 – Read Faults Detected During the Current or Last Driving Cycle

Mode 07 makes it possible to check emissions-related faults which appeared during the current or last driving cycle (pending DTC's).

A pending DTC is saved the first time a fault is detected (output via Mode 07).

- If the fault is detected again by the end of the following driving cycle, a confirmed DTC is entered (output via Mode 03) and the MIL is activated.

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- If this malfunction is not detected again by the end of the following driving cycle, the corresponding pending code will be deleted at the end of the driving cycle.

 Note

Depending on scan tool and protocol used, some of the information provided may be referred to by a different name.

Procedure

- Connect the scan tool.
- Start the engine and run at idle.

 Note

If the engine does not start, crank the engine using starter for at least 5 seconds. Do not switch the ignition off afterward.

- Select “Mode 7: Check test results of components that are continuously monitored”.

The number of pending DTC's or “0 malfunctions detected” will be displayed on the scan tool screen.

- Refer to the DTC tables below for the diagnostic repair procedures:

- ◆ ⇒ [“3.4.1 Engine Control Module , \(2011 – 2014 MY\)”](#), [page 122](#)
- ◆ ⇒ [“3.4.2 Engine Control Module , 2015 MY”](#), [page 209](#)
- ◆ ⇒ [“3.4.3 Engine Control Module , 2016 MY”](#), [page 379](#)
- ◆ ⇒ [“3.4.4 Engine Control Module , 2017 MY”](#), [page 571](#)
- ◆ ⇒ [“3.4.5 Engine Control Module , 2018 MY”](#), [page 772](#)

- Switch the ignition off.

3.3.13 Diagnostic Mode 08 – Request Control of On-Board System, Test or Component

Diagnostic Mode 08 is used to control the operation of an on-board system, test or component. A Mode 8 service can be used to turn on-board system ON or OFF, or to cycle an on-board system, test or component ON or OFF for a specific period of time. The service can also be used to request system status or to report test results.

Diagnostic Mode 08, Test ID \$01

Diagnostic Mode 08, Test ID \$01 is used to determine if the evaporative system may be leaking.

 Note

Depending on scan tool and protocol used, diagnostic mode 08 and the information provided may be referred to by a different name.

**Note**

If the accelerator pedal is depressed during the test, the test will be aborted.

Test requirements

- No DTC's stored in the DTC memory.
- Intake Air Temperature (IAT) maximum 60° C.
- Coolant temperature 80 – 110° C.
- Throttle valve angle 12.0 – 16.0%.

Procedure

- Connect the scan tool.
- Start the engine and run at idle for at least 15 minutes.
- Select “Mode 8: Tank Leak Test”.
- Select “Test-ID 01: Tank Leak Test”.
- Check the specified value of the tank leak test at idle.
- The following will be displayed on the scan tool screen:

Tank leak test	Specified value
◆ Test function active ◆ Test function is being initiated, please wait ◆ Test off ◆ Test aborted	Test OK

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- Switch the ignition Off.

If the specified value is obtained:

- Refer to “Diagnostic mode 03: Interrogating fault memory ” to check for any DTC's that may be stored.
- To repeat the tank test, switch the ignition off and start the engine again and let run for 15 minutes at idle.
- Switch the ignition off.

3.3.14 Diagnostic Mode 09 – Read Vehicle Information

Diagnostic Mode 09 makes it possible to access vehicle-specific information from the ECM and the TCM (where applicable).

**Note**

Depending on scan tool and protocol used, Diagnostic Mode 09 and the information provided may be referred to by a different name.

Test requirement

- No DTC's stored in the DTC memory.

Procedure

- Connect the scan tool.
- Switch the ignition on.
- Select “Mode 09: Vehicle information”.
- Select the desired “Test-ID”.
- The information requested will be displayed on the scan tool screen.

The following table is a numerical list of all “Test-ID’s” that may be selected.

Test-ID	Diagnostic text
\$02:	Vehicle identification number (VIN) e.g.
	◆ A different 17 digit number will be displayed for each vehicle
\$04:	Calibration identification (Cal ID) e.g.
	◆ Engine Control Module
	◆ Transmission Control Module
\$06:	Calibration Verification Number (CVN) (check sum) e.g.
	◆ EC5AE460 the check sum is different for every control module version
	◆ 000D105
\$08:	In Use Performance Tracking
\$0A:	ECU's / module's acronym and text name

- Switch the ignition off.

3.3.15 Diagnostic Mode 0A – Request Emission-Related Diagnostic Trouble Codes with Permanent Status

Mode 0A - Check Permanent DTC Memory (Request emissions-related diagnostic trouble codes with permanent status after code clear)

Permanent Fault Codes From MY 2010 with Phase-In conforming to CCR 1968.2 (d)(2.2.5): 50% from MY 2010 / 75% from MY 2011 / 100% from MY 2012 The vehicle only participates in Phase-In if all of the OBD-relevant control modules in the vehicle meet these requirements.

Mode 0A may only be supported exclusively by OBD control modules in US vehicles. Mode 0A may not be supported in EOBD vehicles, meaning the control module may not send a response here.

Mode 0A enables the request of all OBD-relevant faults with the status “Permanent Fault Code”: - Permanent Fault Codes are Confirmed Fault Codes that are currently activating the MIL. That means faults that are still displayed in Mode 03 but no longer activate the MIL (History Fault Codes) are not Permanent Fault Codes. - Permanent Fault Codes are updated in Mode 0A at the same time as NVRAM storage immediately after switching the ignition off. A newly detected Permanent Fault Code is only visible after switching the ignition off/on in Mode 0A. - Permanent Fault Codes may only be erased in the control module after they are corrected as long as the last diagnostic result was a PASS and the MIL is no longer activated by this fault. The Permanent Fault Codes should be erased from Mode 0A at the same time the MIL

switches off when the ignition is switched off/on. - Permanent Fault Codes may not be erased by clearing the DTC memory or disconnecting the power supply. Storage in NVRAM is required. - Permanent Fault Codes may only be erased after clearing the DTC memory under the following conditions: - As long as no FAIL diagnostic result was detected for a Permanent Fault Code - and at least one PASS diagnostic result was detected - and the Minimum Trip Conditions for a General Denominator (without considering high/ambient temperature) were met in this phase in any DCY after erasing the DTC memory. - The engine control module relays the message "Minimum Trip conditions met" to all other OBD control modules via CAN: CAN message OBD 01, Byte 8, Bit 4: OBD_Minimum_Trip - Permanent Fault Codes may NOT be erased if the diagnostic result is FAIL after clearing the DTC memory. A Pending Fault Code should be stored and the DTC memory line should be overwritten with new Freeze Frame data. (Exception: If the Pending Fault Code is corrected without a Confirmed Fault Code being detected, the Permanent Fault Code may also be erased under the conditions described below.) - Permanent Fault Codes should be erased in engine control modules after Update Programming. At this time, all readiness bits (Mode 01 PID \$01) must be reset to "not complete". Permanent Fault Codes should not be erased in OBD control modules with Comprehensive Components (CCM) as a single readiness bit if the identical program/data status is being programmed. If a different program/data status is being programmed, Permanent Fault Codes should be erased after Update Programming. The procedure in Mode 01 through Mode 09 and In Use Performance Tracking is NOT affected by implementation of the Permanent Fault Codes.

3.4 Engine DTC Tables

- ◆ ⇒ ["3.4.1 Engine Control Module , \(2011 – 2014 MY\)", page 122](#)
- ◆ ⇒ ["3.4.2 Engine Control Module , 2015 MY", page 209](#)
- ◆ ⇒ ["3.4.3 Engine Control Module , 2016 MY", page 379](#)
- ◆ ⇒ ["3.4.4 Engine Control Module , 2017 MY", page 571](#)
- ◆ ⇒ ["3.4.5 Engine Control Module , 2018 MY", page 772](#)
- ◆ ⇒ ["3.4.7 Engine Control Module , 2020 MY", page 1178](#)

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3.4.1 Engine Control Module , (2011 – 2014 MY)

DTC/Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P000A "A" Camshaft Position Slow Response Bank 1	Camshaft Position Slow Response	- Difference between target and actual position > 0.0194 rev. - For time of < 2 Sec. - Adjustment angle difference > 0.1111 rev. within 1.9 Sec.	- Camshaft to crankshaft adaptation completed - Time after engine start, > 3 to 10 Sec. - Engine speed 480 to 600 RPM - Modeled oil temperature -50 and < 179.9 °C - V V T power stage diagnosis finished	3.5 Sec.	- Continuous 2 DCY	Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205 Checking", page 1597.

P000 B "B" Camshaft Position Slow Response Bank 1	Camshaft Position Slow Response	• Difference between target and actual position > 0.0194 rev. • For time of < 2 Sec. • Adjustment angle difference > 0.1111 rev. within 1.9 Sec.	• Camshaft to crankshaft adaptation completed • Time after engine start, > 3 to 10 Sec. • Engine speed 480 to 600 RPM • Modeled oil temperature -50 and < 179.9 °C • V V T power stage diagnosis finished	3.5 Sec.	• Continuous • 2 DCY	– Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597.
P0010 "A" Camshaft Position Actuator Control Circuit/Open Bank 1	Camshaft Position Actuator Circuit Open	Signal voltage 4.4 to 5.6 V	• Battery voltage > 9 V • Engine speed > 80 RPM	Immediate	• Continuous • 2 DCY	– Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597.
P0011 "A" Camshaft Position Timing Over-Advanced or System Performance Bank 1	Camshaft Position Timing Over-Advanced	• Difference between target and actual position > 6 to 20 °CRK • For time of > 1.25 to 5 Sec. • Adjustment angle difference > 3 °CRK	• Camshaft to crankshaft adaptation completed • Time after engine start, > 3 to 10 Sec. • Engine speed 480 to 600 RPM • Modeled oil temperature -50 and < 179.9 °C • V V T power stage diagnosis finished	3.5 Sec.	• Continuous • 2 DCY	– Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597. – Check Intake Camshaft Position Sensor 1 - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40, Checking", page 1599.

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P0012 "A" Camshaft Position Timing Over-Retarded Bank 1	Camshaft Position Timing Over-Retarded	Variance > 5 degrees between locked camshaft position readings	- Camshaft to crankshaft adaptation completed - Time since engine start < 1 Sec. - Setpoint V V T is in locking position - V V T power stage diagnosis finished	Immediate	- Each DCY 2 DCY	- Check Intake Camshaft Position Sensor 1 - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40, Checking", page 1599 . - Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597 .
P0014 "B" Camshaft Position Timing Over-Advanced or System Performance Bank 1	Camshaft Position Timing Over-Advanced	- Difference between target and actual position > 6 to 20 °CRK - For time of > 1.25 to 5 Sec. - Adjustment angle difference > 3 °CRK	- Camshaft to crankshaft adaptation completed - Time after engine start, > 3 to 10 Sec. - Engine speed 480 to 600 RPM - Modeled oil temperature -50 and < 179.9 °C - V V T power stage diagnosis finished	3.5 Sec.	- Continuous 2 DCY	- Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597 . - Check Intake Camshaft Position Sensor 1 - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40, Checking", page 1599 .
P0016 Crankshaft Position vs. Intake Camshaft Position Correlation Bank 1 Sensor A	Crankshaft Position vs. Intake Camshaft Position Correlation	Average value of camshaft offset > 0.0306 or < -0.0306 rev.	- Engine reverse running not detected - Synchronization between cam and crank = finished	Immediate	- Multiple 2 DCY	Check Intake Camshaft Position Sensor 1 - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40, Checking", page 1599 .

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P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	HO2S Heater Control Circuit Bank 1 Sensor 1	Heater voltage 2.34 to 3.59 V	- Time after engine start > 5 Sec. - Heater, Commanded off	5 Sec.	- Continuous 2 DCY	Check Bank 1 Heated Oxygen Sensor - G39/GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	HO2S Heater Control Circuit Low Bank 1 Sensor 1	Heater voltage < 2.34 V	- Time after engine start > 5 Sec. - Heater, Commanded off	5 Sec.	- Continuous 2 DCY	Check Bank 1 Heated Oxygen Sensor - G39/GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	HO2S Heater Control Circuit High Bank 1 Sensor 1	Heater voltage > 3.59 V	- Time after engine start > 5 Sec. - Heater, Commanded off	5 Sec.	- Continuous 2 DCY	Check Bank 1 Sensor 1 Heated Oxygen Sensor - G39/GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	HO2S Heater Control Circuit Bank 1 Sensor 2	Heater voltage 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	0.5 Sec.	- Immediate 2 DCY	Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	HO2S Heater Control Circuit Low Bank 1 Sensor 2	Heater voltage < 3.00 V	- Battery voltage > 9 V - Engine speed > 80 RPM	0.5 Sec.	- Immediate 2 DCY	Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650

P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	HO2S Heater Control Circuit High Bank 1 Sensor 2	Heater current 2.70 to 5.50 A	- Battery voltage > 9 V - Engine speed > 80 RPM	0.5 Sec.	- Immediate 2 DCY	Bank 1 Sensor 2 Heated Oxygen Sensor - GX130- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .
P0040 O2 Sensor Signals Swapped Bank 1 Sensor 1/ Bank 2 Sensor 1	O2 Sensor Signals Swapped Bank 1 Sensor 1/ Bank 2 Sensor 1	- A/F ratio correction factor Bank 1 > 1.2 - A/F ratio correction factor Bank 1 < 0.8	Fuel system status closed loop	5 Sec.	- Continuous 2 DCY	Using a scan tool with the engine running, check the Bank 1 and Bank 2 Long Term fuel trim - if one is above 10 negative and the other above 10 positive, swap the front HO2s sensor connectors and look for the long term values to move close to a zero or low single digit reading.
P0050 HO2S Heater Control Circuit Bank 2 Sensor 1	HO2S Heater Control Circuit Bank 2 Sensor 1	Heater voltage 2.34 to 3.59 V	- Time after engine start > 5 Sec. - Heater, Commanded off	5 Sec.	- Continuous 2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659
P0051 HO2S Heater Control Circuit Low Bank 2 Sensor 1	HO2S Heater Control Circuit Low Bank 2 Sensor 1	Heater voltage < 2.34 V	- Time after engine start > 5 Sec. - Heater, Commanded off	5 Sec.	- Continuous 2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659

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P0052 HO2S Heater Control Circuit High Bank 2 Sensor 1	HO2S Heater Control Circuit High Bank 2 Sensor 1	Heater voltage > 3.59 V	- Time after engine start > 5 Sec. - Heater, Commanded off	5 Sec.	- Continuous 2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659
P0056 HO2S Heater Control Circuit Bank 2 Sensor 2	HO2S Heater Control Circuit Bank 2 Sensor 2	Heater voltage 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	0.5 Sec.	- Immediate 2 DCY	Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656
P0057 HO2S Heater Control Circuit Low Bank 2 Sensor 2	HO2S Heater Control Circuit Low Bank 2 Sensor 2	Heater voltage < 3.00 V	- Battery voltage > 9 V - Engine speed > 80 RPM	0.5 Sec.	- Immediate 2 DCY	Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656
P0058 HO2S Heater Control Circuit High Bank 2 Sensor 2	HO2S Heater Control Circuit High Bank 2 Sensor 2	Heater current 2.70 to 5.50 A	- Battery voltage > 9 V - Engine speed > 80 RPM	0.5 Sec.	- Immediate 2 DCY	Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656

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P0087 Fuel Rail/ Sys- tem Pres- sure - Too Low Bank 1	Fuel Rail Pressure Too Low	Difference be- tween fuel pres- sure and MAP < 250 kPa	• Engine speed > 20 RPM • Time after engine start > 2 Sec.	5 Sec.	• Contin- uous • 2 DCY	– Perform a fuel pressure test. Refer to the Repair Manual for procedure and specification. If the fuel pressure is in range: – Check the Fuel Pres- sure Sensor - G247- . Re- fer to ⇒ “3.6.18 Fuel Pres- sure Sensor G247 . Checking”, page 1626 .
P0088 Fuel Rail/ Sys- tem Pres- sure - Too High Bank 1	Fuel Rail Pressure Too High	Difference be- tween fuel pres- sure and MAP > 550 kPa	• Engine speed > 20 RPM • Time after engine start > 2 Sec.	5 Sec.	• Contin- uous • 2 DCY	– Perform a fuel pressure test. Refer to the Repair Manual for procedure and specification. If the fuel pressure is in range: – Check the Fuel Pres- sure Sensor - G247- . Re- fer to ⇒ “3.6.18 Fuel Pres- sure Sensor G247 . Checking”, page 1626 .
P00A6 Intake Air Tempera- ture Sen- sor 2 Circuit Rang e/Per- formanc e Bank 2	Intake Air Tempera- ture Sen- sor 2 Cir- cuit Bank 2 Range/ Perform- ance	IAT 2 vs. ECT at start > 20.3 or < -45 °C	• ECT at last engine stop > 80.3 °C • Difference of ECT at last engine stop and at recent start > 39.8 °C • ECT at start < 40.5 and > -35.3 °C • Block heater not de- tected	5 Sec.	• Once • 2 DCY	– Check the Mass Airflow Sensor 2 - G246- . Re- fer to ⇒ “3.6.28 Mass Airflow Sensor 2 G246 . Checking”, page 1646

P00A 7 Intake Air Tem- pera- ture Sen- sor 2 Circuit Low Bank 2	Intake Air Tempera- ture Sen- sor 2 Cir- cuit Low Bank 2	Signal from IAT sensor 2 < 0.107 V	- ECT > -48 °C - MAF < 283.33 g/Sec. - Vehicle speed < 198.1 mph	1 Sec.	- Contin- uous 2 DCY	– Check the Mass Airflow Sensor 2 - G246- . Re- fer to ⇒ “3.6.28 Mass Airflow Sensor 2 G246 . Checking” , page 1646
P00A 8 Intake Air Tem- pera- ture Sen- sor 2 Circuit High Bank 2	Intake Air Tempera- ture Sen- sor 2 Cir- cuit High Bank 2	Signal from IAT sensor 2 > 2.959 V	- ECT > -48 °C - MAF < 283.33 g/Sec. - Vehicle speed < 198.1 mph	1 Sec.	- Contin- uous 2 DCY	– Check the Mass Airflow Sensor 2 - G246- . Re- fer to ⇒ “3.6.28 Mass Airflow Sensor 2 G246 . Checking” , page 1646
P00B 2 Radi- ator Cool- ant Tem- pera- ture Sen- sor Circuit Rang e/Per- form- anc e	Radiator Coolant Tempera- ture Sen- sor Circuit Perform- ance	Difference of cool- ant temp at radi- ator inlet vs. ECT > 20 °C Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by Bentley Motors. Bentley Motors does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by Bentley Motors.	ECT > -39 and < 138 °C	2 Sec.	- Contin- uous 2 DCY	– Check En- gine Coolant Temperature Sensor 2 - G83- . Refer to ⇒ “3.6.12 Engine Cool- ant Temper- ature Sensor On Radiator Outlet G83 . Checking” , page 1615
P00B 3 Radi- ator Cool- ant Tem- pera- ture Sen- sor Circuit Low	Radiator Coolant Tempera- ture Sen- sor Circuit Low	Raw voltage of ra- diator inlet temper- ature sensor < 0.227 V	---	2 Sec.	- Contin- uous 2 DCY	– Check En- gine Coolant Temperature Sensor 2 - G83- . Refer to ⇒ “3.6.12 Engine Cool- ant Temper- ature Sensor On Radiator Outlet G83 . Checking” , page 1615

P00B 4 Radiator Coolant Temperature Sensor Circuit High	Radiator Coolant Temperature Sensor Circuit High	Raw voltage of radiator inlet temperature sensor > 3.213 V	---	2 Sec.	- Continuous 2 DCY	Check Engine Coolant Temperature Sensor 2 - G83- . Refer to ⇒ "3.6.12 Engine Coolant Temperature Sensor On Radiator Outlet G83- Checking", page 1615
P00B 6 Radiator Coolant Temperature/ Engine Coolant Temperature Correlation	Radiator Coolant Temperature/ Engine Coolant Temperature Correlation	Difference between ECT and Radiator Inlet Temperature > 20 °C	---	5 Sec	- Continuous 2 DCY	Check Engine Coolant Temperature Sensor 2 - G83- . Refer to ⇒ "3.6.12 Engine Coolant Temperature Sensor On Radiator Outlet G83- Checking", page 1615
P00B C Mass or Volume Air Flow "A" Circuit Range/ Performance - Air Flow Too Low	Mass Air Flow Sensor 1 Air Flow Too Low	Measured MAF < -19.4 g/Sec.	Number of crankshaft revolutions > 150 RPM	3.5 Sec.	- Continuous 2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70- Checking", page 1644
P00B D Mass or Volume Air Flow "A" Circuit Range/ Performance - Air Flow Too High	Mass Air Flow Sensor 1 Air Flow Too High	Measured MAF > 694.4 g/Sec.	Number of crankshaft revolutions > 150 RPM	3.5 Sec.	- Continuous 2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70- Checking", page 1644

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P0100 Mass or Volume Air Flow Sensor "A" Circuit	Mass Air Flow Sensor 1 Circuit	MAF signal frequency period duration from MAF sensor = 0 Sec.	Engine speed > 20 RPM	0.2 Sec.	- Multiple 2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
P0101 Mass or Volume Air Flow Sensor "A" Circuit Range/Performance	Mass Air-flow Sensor 1 Performance	- Mass air flow vs. lower threshold model < -5 to 1200 kg/h - Mass air flow vs. upper threshold model > -5 to 1200 kg/h	- Time after engine start > 150 camshaft revs. - Engine speed 920 to 4000 RPM - Throttle position 0 to 100%	3.5 Sec.	- Continuous 2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
P0102 Mass or Volume Air Flow Sensor "A" Circuit Low	Mass Air-flow Sensor 1 Low Input	MAF sensor signal < 0.2 V	Engine speed > 20 RPM	0.2 Sec.	- Multiple 2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
P0103 Mass or Volume Air Flow Sensor "A" Circuit High	Mass Air-flow Sensor 1 High Input	MAF sensor signal > 4.80 V	Engine speed > 20 RPM	0.2 Sec.	- Multiple 2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
P0106 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/Performance	Baro Pressure Sensor Performance	- Difference between altitude sensor vs. boost pressure sensor before engine start < 15 kPa - Time since engine start < 25 Sec. - Difference between altitude sensor vs. last drive cycle > 100 hPa	- Time after engine start < 25 Sec. - Engine speed > 300 RPM - Throttle position < 5%	2.5 Sec.	- once / DCY 2 DCY	The Baro sensor is located within the ECM and will require replacement of the ECM if the scan tool reading is off by more than 10% of actual Barometric pressure. Refer to the Repair Manual for ECM replacement.

P0107 Manifold Absolute Pressure 1 Low Input	Manifold Absolute Pressure 1 Low Input	MAP reading < 10 kPa or MAP sensor voltage < 0.20 V	Engine speed > 80 RPM	1 to 2 Sec.	- Continuous 2 DCY	Check Intake Manifold Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640
P0108 Manifold Absolute Pressure 1 High Input	Manifold Absolute Pressure 1 High Input	MAP > 280 kPa or MAP voltage > 4.88V	Engine speed > 80 RPM	1 Sec.	- Continuous 2 DCY	Check Intake Manifold Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640
P010 A Mass or Volume Air Flow Sensor "B" Circuit	Mass Air-flow Sensor 2 Circuit	MAF signal frequency period duration from MAF sensor = 0 Sec.	Engine speed > 20 RPM	0.2 Sec.	- Multiple 2 DCY	Check Mass Air Flow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 , Checking", page 1646
P010 B Mass or Volume Air Flow Sensor "B" Circuit Range/Performance	Mass Air-flow Sensor 2 Circuit Performance	- Mass air flow vs. lower threshold model < -5 to 1200 kg/h - Mass air flow vs. upper threshold model > -5 to 1200 kg/h	- Time after engine start > 150 camshaft revs. - Engine speed 920 to 4000 RPM - Throttle position 0 to 100%	0.2 Sec.	- Multiple 2 DCY	Check Mass Air Flow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 , Checking", page 1646

P010C Mass or Volume Air Flow Sensor "B" Circuit Low	Mass Air-flow Sensor 2 Circuit Low Input	MAF sensor signal < 0.2 V	Engine speed > 20 RPM	0.2 Sec.	• Multiple • 2 DCY	– Check Mass Air Flow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246- . Checking", page 1646
P010D Mass or Volume Air Flow Sensor "B" Circuit High	Mass Air-flow Sensor 2 Circuit High Input	MAF sensor signal > 4.80 V	Engine speed > 20 RPM	0.2 Sec.	• Multiple • 2 DCY	– Check Mass Air Flow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246- . Checking", page 1646
P010F Mass or Volume Air Flow Sensor A/B Correlation	Mass Air Flow Sensor 1 to 2 Correlation	Difference between MAF 1 and MAF 2 signal > 19.4 g/Sec.	• Engine speed < 2500 RPM • Desired MAF > 38.9 and < 83.3 g/Sec. • Not in fuel cutoff • MAF 1, 2 > 27.78 g/Sec.	2.5 Sec.	• Continuous • 2 DCY	– Check Mass Air Flow Sensor 1 or 2 - G70 or G246- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70- . Checking", page 1644 - Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246- . Checking", page 1646
P0111 Intake Air Temperature Sensor 1 Bank 1 Circuit Range/Performance	Intake Air Temperature Sensor 1 Bank 1 Circuit Range/Performance	IAT sensor > 60 to 100 °C or IAT vs. ECT at start > 20.3 °C	• MAF > 42.22 and < 166.67 g/Sec. • ECT at start < 13.8 °C • ECT > 80.3 °C	10 Sec.	• Continuous • 2 DCY	– Check Mass Air Flow Sensor 1 - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70- . Checking", page 1644

P0112 Intake Air Temperature Sensor 1 Circuit Low Bank 1	Intake Air Temperature Sensor 1 Circuit Low	IAT > 130 °C	- Time after engine start > 5 Sec. - Engine speed idle to 6000 RPM - Fuel cutoff not active	5 Sec.	- Continuous 2 DCY	Check Mass Air Flow Sensor 1 - G70- Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
P0113 Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake Air Temperature Sensor 1 Circuit High	IAT < -46 °C	- Time after engine start > 240 Sec. - Engine speed idle to 6000 RPM - Fuel cutoff not active	5 Sec.	- Continuous 2 DCY	Check Mass Air Flow Sensor 1 - G70- Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
P0116 Engine Coolant Temperature Sensor 1 Circuit Range/Performance	Engine Coolant Temperature Sensor 1 Circuit Performance	- No change on signal 0 to 1.5 Kelvin - Signal in range 80 to 105 °C	- ECT at start -46 to 141 °C - ECT 105 to 141 °C - Driving condition one time > 600 Sec. - Vehicle speed 0 to 25 km/h - Mass air flow 4 to 1000 kg/h - Time required > 20 Sec. - Frequency > 3 times	120 Sec.	- once / DCY 2 DCY	Check Engine Coolant Temperature Sensor 1 - G62- Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613 .
P0117 Engine Coolant Temperature Sensor 1 Circuit Low	Engine Coolant Temperature Sensor 1 Circuit Low	Short to ground - ECT > 141° C	---	2 Sec.	- Continuous 2 DCY	Check Engine Coolant Temperature Sensor 1 - G62- Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613 .
P0118 Engine Coolant Temperature Sensor 1 Circuit High	Engine Coolant Temperature Sensor 1 Circuit High	Short to battery positive or open circuit - ECT < - 46 °C	---	2 Sec.	- Continuous 2 DCY	Check Engine Coolant Temperature Sensor 1 - G62- Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613 .

P0121 Throttle/ Pedal Position Sensor A Circuit Range/Performance	Throttle/ Pedal Position Sensor A Circuit Range/Performance	- TPS 1 vs. TPS 2 > 6.3% > TPS 1 calc. value > actual TPS 2 value - OR TPS 1 calc. value > 9%	Engine speed > 480 RPM	0.3 Sec.	- Multiple 2 DCY	Check the EPC Throttle Drive - G186- . Refer to "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0122 Throttle/ Pedal Position Sensor A Circuit Low	Throttle/ Pedal Position Sensor A Circuit Low Input	Signal voltage < 0.18 V	---	0.1 Sec.	- Continuous 2 DCY	Check the EPC Throttle Drive - G186- . Refer to "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0123 Throttle/ Pedal Position Sensor A Circuit High	Throttle/ Pedal Position Sensor A Circuit High Input	Signal voltage > 4.63 V	---	0.1 Sec.	- Multiple 2 DCY	Check the EPC Throttle Drive - G186- . Refer to "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0130 O2 Sensor Circuit Bank 1 Sensor 1 Malfunction	O2 Sensor Circuit Bank 1 Sensor 1 Malfunction	- O2 sensor ceramic temperature < 690° C - Internal resistance of primary O2S > or = 950 ohms	- Modeled EGT near primary O2S > 350 °C - Battery voltage > or = 10.7 and < 16 V - Heater control of primary O2S active - No fuel cutoff for 20 Sec. - Electrical adjustment of primary O2S not active	20 Sec.	- Multiple 2 DCY	Check the Bank 1 Sensor 1 Heated Oxygen Sensor - G39/ GX10- Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .

P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	O2 Sensor Circuit Bank 1 Sensor 1 Low Voltage	- Virtual mass (VM) < 1.75 V - Nernst voltage (UN) < 1.50 V - Adjustment voltage (IA) < 0.3 V - Adjustment voltage (IP) < 0.3 V	---	5 Sec.	- Multiple 2 DCY	Check the Bank 1 Sensor 1 Heated Oxygen Sensor - G39/ GX10- Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653.
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	O2 Sensor Circuit Bank 1 Sensor 1 High Voltage	- Virtual mass (VM) > 3.25 V - Nernst voltage (UN) > 4.40 V - Adjustment voltage (IA) > 7.00 V - Adjustment voltage (IP) > 7.00 V	- Battery voltage > 10.7 and < 16.1 V - Engine speed 480 to 600 RPM	5 Sec.	- Multiple 2 DCY	Check the Bank 1 Sensor 1 Heated Oxygen Sensor - G39/ GX10- Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653.
P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	O2 Sensor Circuit Bank 1 Sensor 1 Slow Response	- Number of primary O2S dynamic measurements > or = 6 - Dynamic value of primary O2S < 0.22	- Primary O2S ready - Engine speed 1160 to 2520 RPM - Engine load 27 to 80% - Delta engine load < 1.5% - Actual lambda value 0.92 to 1.08 - ECT > 60 °C - Ceramic temperature of primary O2S > 720 °C - Slope ratio > 0.01 and < 0,04 and < 1.50 - Forced lambda oscillation active - Catalyst temperature >=400° C - Lambda control closed loop - lambda control 2. control loop deactivated	Immediate	- Once per DCY 2 DCY	Check the Bank 1 Sensor 1 Heated Oxygen Sensor - G39/ GX10- Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653.

P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1 Malfunction	- O2S ceramic temperature < 725 °C - Heater duty cycle > 95% - Time after O2S heater on 30 Sec.	- Modeled exhaust gas temperature > 350 °C - Heater control active - ECT at start > -10 °C - Engine shut off time > 300 Sec. - During ECM keep alive time after ignition off < 800 Sec.	3 to 60 Sec.	- Multiple 2 DCY	Check the Bank 1 Sensor 1 Heated Oxygen Sensor - G39/GX10- Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653.
P0136 O2 Sensor Circuit Bank 1 Sensor 2 Performance	- Counter of detected heater coupling events at secondary O2S > or = 4 - Change of sensor voltage signal between 2 samples > or = 2 V - During a number of heater power signal switches > or = 6	- Integrated heat quantity dependant on MAF through exhaust system > 0 to 493.3 kJ - Diagnosis of the power stage of the secondary O2S heater switched on/off	10 Sec.	- Continuous 1 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.
P0137 O2 Sensor Circuit Bank 1 Sensor 2 Low Voltage	- Secondary O2S voltage < 0.060 V - Result of the load pulse check < 0.015 V	- Fuel system status (deceleration) = no fuel cutoff - Catalyst status = no active enrichment for clear out after a fuel cutoff event	3 Sec.	- Continuous 2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.
P0138 O2 Sensor Circuit Bank 1 Sensor 2 High Voltage	- Target lambda secondary O2S > .995 V - Output voltage O2S > 1.080 V	- Battery voltage > 10.7 V - Modeled exhaust gas temp. < 700 °C - For a calibrated period of time 10 Sec.	3 Sec.	- Continuous 2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.

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P0139 O2 Sensor Circuit Slow Response Bank 1 Sensor 2	O2 Circuit Bank 1 Sensor 2 Slow Response	- EWMA filtered maximum differential transition time at fuel cutoff > 0.6 Sec. - Number of checks >= 3	- Rich voltage enable >= 602 mV - Lean voltage < -150 mV - O2S rear ready - Rear O2S signal oscillating monitoring ready - EVAP purge valve diagnosis ready - O2S front ready - Fuel cutoff active - Front O2 lambda signal > 2.00 - Modeled exhaust gas temp. > 500 °C - Slope of exhaust mass < 60 kg/h	3 Sec	- Continuous 1 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .
P013A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	- EWMA filtered transient time at fuel cutoff > 0.5 Sec. - In voltage range of 201 to 450 mV - Number of checks >= 1	- Fuel cutoff active < 2.5 Sec. during fuel cutoff - Secondary O2S signal before FCO > 0.55 V	10 Sec	- Continuous 1 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .
P013B O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 2	O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 2	- EWMA filtered transient time at fuel restart after fuel cut off > 1 Sec. - Number of checks >= 3	- Restart after FCO - Secondary O2S signal < 0.15 V	10 Sec	- Continuous 1 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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P013 C O2 Sensor Slow Response - Rich to Lean Bank 2 Sensor 2	- EWMA filtered transient time at fuel cutoff > 0.5 Sec. - In voltage range of 201 to 450 mV - Number of checks >= 1	- Fuel cutoff active < 2.5 Sec. during fuel cutoff - Secondary O2S signal before FCO > 0.55 V	10 Sec	- Continuous 1 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.
P013 D O2 Sensor Slow Response - Lean to Rich Bank 2 Sensor 2	- EWMA filtered transient time at fuel restart after fuel cut off > 1 Sec. - Number of checks >= 3	- Restart after FCO - Secondary O2S signal < 0.15 V	10 Sec	- Continuous 1 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.
P013 E O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 2	- EWMA filtered transient time at Rich to Lean transition > 0.60 Sec. - Number of checks >= 3	- Measured lambda < 0.97 V - Secondary O2S voltage > 0.75 V - Secondary O2S Voltage gradient > -0.01 V/Sec - Secondary O2S Voltage gradient < 0.1 V/Sec - Integrated negative O2 mass flow > 0.05 - Secondary O2S voltage > 0.83 V	10 Sec	- Continuous 1 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.
P013 F O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 2	- EWMA filtered transient time at Lean to Rich transition > 1.20 Sec. - Number of checks >= 3	- Measured lambda > 1.03 V - Secondary O2S voltage < 0.16V - Secondary O2S Voltage gradient > -0.15 V/Sec - Secondary O2S Voltage gradient < 0.2 V/Sec - Integrated negative O2 mass flow > 0.05 - Secondary O2S voltage < 0.05 V	10 Sec	- Continuous 1 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.

P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	O2 Circuit No Activity Detected Bank 1, Sensor 2	- Output voltage O2S > or = 0.401 or < or = to 0.602 V - EGT of downstream catalyst > 600 °C - Internal resistance of lambda sensor downstream > 40000 ohms	- Power stage diagnosis of the secondary O2S heater finished - Modeled exhaust gas temp. < 700 °C - Secondary O2S heater power > or = 0.5	3 Sec.	- Continuous 2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .
P0141 O2 Sensor Heater Control Circuit Malfunction Bank 1 Sensor 2	O2 Sensor Heater Control Circuit Malfunction Bank 1 Sensor 2	Heater resistance 1000 to 10000 Ω	- Modeled exhaust gas temp. 300 to 670 °C - Engine shut off time > 5000 Sec. - During ECM keep alive time after ignition off < 800 Sec. - Number of checks 10 - Fuel cutoff not active - Heater commanded on	20 Sec.	- Continuous 2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .
P014A O2 Sensor Delayed Response - Rich to Lean Bank 2 Sensor 2	O2 Sensor Delayed Response - Rich to Lean Bank 2 Sensor 2	- EWMA filtered transient time at Rich to Lean transition > 0.60 Sec. - Number of checks >= 3	- Measured lambda < 0.97 V - Secondary O2S voltage > 0.75 V - Secondary O2S Voltage gradient > -0.01 V/Sec - Secondary O2S Voltage gradient < 0.1 V/Sec - Integrated negative O2 mass flow > 0.05 - Secondary O2S voltage > 0.83 V	10 Sec	- Continuous 1 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

P014 B O2 Sensor Delayed Response - Lean to Rich Bank 2 Sensor 2	O2 Sensor Delayed Response - Lean to Rich Bank 2 Sensor 2	- EWMA filtered transient time at Lean to Rich transition > 1.20 Sec. - Number of checks >= 3	- Measured lambda > 1.03 V - Secondary O2S voltage < 0.16V - Secondary O2S Voltage gradient > -0.15 V/Sec - Secondary O2S Voltage gradient < 0.2 V/Sec - Integrated negative O2 mass flow > 0.05 - Secondary O2S voltage < 0.05 V	10 Sec	- Continuous 1 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .
P0150 O2 Sensor Circuit Bank 2 Sensor 1	O2 Sensor Circuit Bank 2 Sensor 1 Malfunction	- O2 sensor ceramic temperature < 690° C - Internal resistance of primary O2S > or = 950 ohms	- Modeled EGT near primary O2S > 350 °C - Battery voltage > or = 10.7 and < 16 V - Heater control of primary O2S active - No fuel cutoff for 20 Sec. - Electrical adjustment of primary O2S not active	20 Sec.	- Multiple 2 DCY	Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P0151 O2 Sensor Circuit Low Voltage Bank 2 Sensor 1	O2 Sensor Circuit Bank 2 Sensor 1 Low Voltage	- Virtual mass (VM) < 1.75 V - Nernst voltage (UN) < 1.50 V - Adjustment voltage (IA) < 0.3 V - Adjustment voltage (IP) < 0.3 V	- Battery voltage > 10.7 and < 16.1 V - Engine speed 480 to 600 RPM	5 Sec.	- Multiple 2 DCY	Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P0152 O2 Sensor Circuit High Voltage Bank 2 Sensor 1	O2 Sensor Circuit Bank 2 Sensor 1 High Voltage	- Virtual mass (VM) > 3.25 V - Nernst voltage (UN) > 4.40 V - Adjustment voltage (IA) > 7.00 V - Adjustment voltage (IP) > 7.00 V	- Battery voltage > 10.7 and < 16.1 V - Engine speed 480 to 600 RPM	5 Sec.	- Multiple 2 DCY	Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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P0153 O2 Sensor Circuit Slow Response Bank 2 Sensor 1	O2 Sensor Circuit Bank 2 Sensor 1 Slow Response	- Number of primary O2S dynamic measurements > or = 6 - Dynamic value of primary O2S < 0.22	- Primary O2S ready - Engine speed 1160 to 2520 RPM - Engine load 27 to 80% - Delta engine load < 1.5% - Actual lambda value 0.92 to 1.08 - ECT > 60 °C - Ceramic temperature of primary O2S > 720 °C - Slope ratio > 0.01 and < 0.04 and < 1.50 - Forced lambda oscillation active - Catalyst temperature >=400° C - Lambda control closed loop - lambda control 2. control loop deactivated	Immediate	- Once per DCY 2 DCY	Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P0155 O2 Sensor Heater Circuit Bank 2 Sensor 1	O2 Sensor Circuit Bank 2 Sensor 1 Heater Circuit	- O2S ceramic temperature < 725 °C - Heater duty cycle > 95% - Time after O2S heater on 30 Sec.	- Modeled exhaust gas temperature > 350 °C - Heater control active - ECT at start > -10 ° C - Engine shut off time > 300 Sec. - During ECM keep alive time after ignition off < 800 Sec.	3 to 60 Sec.	- Multiple 2 DCY	Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P0156 O2 Sensor Circuit Bank 2 Sensor 2 Malfunction	O2 Sensor Circuit Bank 2 Sensor 2 Malfunction	- Counter of detected heater coupling events at secondary O2S > or = 4 - Change of sensor voltage signal between 2 samples > or = 2 V - During a number of heater power signal switches > or = 6	- Integrated heat quantity dependant on MAF through exhaust system > 0 to 493.3 kJ - Diagnosis of the power stage of the secondary O2S heater switched on/off	10 Sec.	- Continuous 1 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

P0157 O2 Sensor Circuit Low Voltage Bank 2 Sensor 2	O2 Sensor Circuit Bank 2 Sensor 2 Low Voltage	- Secondary O2S voltage < 0.060 V - Result of the load pulse check < 0.015 V	- Fuel system status (deceleration) = no fuel cutoff - Catalyst status = no active enrichment for clear out after a fuel cutoff event	3 Sec.	- Continuous 2 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.
P0158 O2 Sensor Circuit High Voltage Bank 2 Sensor 2	O2 Sensor Circuit Bank 2 Sensor 2 High Voltage	- Target lambda secondary O2S > .995 V - Output voltage O2S > 1.080 V	- Battery voltage > 10.7 V - Modeled exhaust gas temp. < 700 °C - For a calibrated period of time 10 Sec.	3 Sec.	- Continuous 2 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.
P0159 O2 Sensor Circuit Slow Response Bank 2 Sensor 2	O2 Sensor Circuit Bank 2 Sensor 2 Slow Response	- EWMA filtered transient time at fuel cutoff > 0.5 Sec. - In voltage range of 201 to 450 mV - Number of checks >= 1	- Rich voltage enable >= 602 mV - Lean voltage < -150 mV - O2S rear ready - Rear O2S signal oscillating monitoring ready - EVAP purge valve diagnosis ready - O2S front ready - Fuel cutoff active - Front O2 lambda signal > 2.00 - Modeled exhaust gas temp. > 500 °C - Slope of exhaust mass < 60 kg/h	< 5 Sec. during fuel cutoff	- Continuous 1 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.
P0160 O2 Sensor Circuit No Activity Detected Bank 2 Sensor 2	O2 Sensor Circuit Bank 2 Sensor 2 No Activity Detected	- Output voltage O2S > or = 0.401 or < or = to 0.602 V - EGT of downstream catalyst > 600 °C - Internal resistance of lambda sensor downstream > 40000 ohms	- Power stage diagnosis of the secondary O2S heater finished - Modeled exhaust gas temp. < 700 °C - Secondary O2S heater power > or = 0.5	3 Sec.	- Continuous 2 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.

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P0161 O2 Sensor Heater Circuit Bank 2 Sensor 2	O2 Sensor Heater Control Circuit High Bank 2 Sensor 2	Heater resistance 1000 to 10000 Ω	- Modeled exhaust gas temp. 300 to 670 °C - Engine shut off time > 5000 Sec. - During ECM keep alive time after ignition off < 800 Sec. - Number of checks 10 - Fuel cutoff not active - Heater commanded on	20 Sec.	- Continuous 2 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.
P0191 Fuel Rail Pressure Sensor Circuit Range/Performance Bank 1	Fuel Rail Pressure Sensor Circuit Performance	Actual value fuel pressure > or = to 700 kPa or < or = to 250 kPa	- RPM > 1200 - All injection valves active = true	1.5 Sec.	- Continuous 2 DCY	- Check the fuel pressure. Refer to the repair manual for test procedure. - Check the Fuel Pressure Sensor - G247- . Refer to ⇒ "3.6.18 Fuel Pressure Sensor G247, Checking", page 1626.
P0192 Fuel Rail Pressure Sensor Circuit Low Bank 1	Fuel Rail Pressure Sensor Circuit Low Input	Mean voltage FRP sensor > 4.70 V	RPM > 480 to 600 revolutions	0.5 Sec.	- Continuous 2 DCY	Check the Fuel Pressure Sensor - G247- . Refer to ⇒ "3.6.18 Fuel Pressure Sensor G247, Checking", page 1626.
P0193 Fuel Rail Pressure Sensor Circuit High Bank 1	Fuel Rail Pressure Sensor Circuit High Input	Mean voltage FRP sensor < 0.30 V	RPM > 480 to 600 revolutions	0.5 Sec.	- Continuous 2 DCY	Check the Fuel Pressure Sensor - G247- . Refer to ⇒ "3.6.18 Fuel Pressure Sensor G247, Checking", page 1626.

P0201 Cylinder 1 Injector "A" Circuit	Injector Circuit Open Cylinder 1	Signal voltage 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel Injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0202 Cylinder 2 Injector "A" Circuit	Injector Circuit Open Cylinder 2	Signal voltage 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0203 Cylinder 3 Injector "A" Circuit	Injector Circuit Open Cylinder 3	Signal voltage 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0204 Cylinder 4 Injector "A" Circuit	Injector Circuit Open Cylinder 4	Signal voltage 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0205 Cylinder 5 Injector "A" Circuit	Injector Circuit Open Cylinder 5	Signal voltage 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

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P0206 Cylinder 6 Injector "A" Circuit	Injector Circuit Open Cylinder 6	Signal voltage 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624 .
P0207 Cylinder 7 Injector "A" Circuit	Injector Circuit Open Cylinder 7	Signal voltage 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624 .
P0208 Cylinder 8 Injector "A" Circuit	Injector Circuit Open Cylinder 8	Signal voltage 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624 .
P0221 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Range/ Performance	Accelerator Pedal Position Sensor 2 Circuit Performance	- TPS - TPS 2 > 6.3% - Actual TPS 2 - calc. value > actual TPS 1 - calc. value OR - Actual TPS 2 - calc. value > 9%	Engine speed > 480	0.3 Sec.	- Multiple 2 DCY	Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0222 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Low	Accelerator Pedal Position Sensor 2 Circuit Low	Signal voltage < 0.16 V	---	0.1 Sec.	- Multiple 2 DCY	Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .

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P0223 Throttle/ Pedal Position Sensor/ Switch "B" Circuit High	Accelerator Pedal Position Sensor 2 Circuit High	Signal voltage > 4.88 V	---	0.1 Sec.	• Multiple • 2 DCY	– Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P0234 Turbocharger/ Supercharger "A" Overboost Condition	Turbocharger Overboost Condition	Difference between set point and current boost pressure > 27 to 112.5 kPa	Engine speed > 300 RPM	2 Sec.	• Continuous • 2 DCY	– Check the Charge Pressure Control Solenoid 1 - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 . – Check the Combustion Air Valve - N44- . Refer to ⇒ "3.6.7 Combustion Air Valve N44 , Checking", page 1605
P0236 Turbocharger/ Supercharger Boost Sensor "A" Circuit Range/ Performance	Charge Air Pressure Sensor 1 Circuit Performance	• Measured value from boost pressure sensor + 2 kPa < BARO -10 kPa • Measured value from boost pressure sensor -2 kPa > BARO -20 kPa	• Engine speed > 80 and < 1000 RPM • Throttle angle < 5% • For > 3 Sec.	2 Sec.	• Continuous • 2 DCY	– Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640

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P0237 Turbo-charger/Super-charger Boost Sensor "A" Circuit Low	Charge Air Pressure Sensor 1 Circuit Low Input	Measured value from pressure sensor < 37 kPa or Signal voltage < 0.20 V	Signal voltage of pressure sensor > 0.20 and < 4.88 V	2 Sec.	- once / DCY 2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640
P0238 Turbo-charger/Super-charger Boost Sensor "A" Circuit High	Charge Air Pressure Sensor 1 Circuit High Input	Measured value from pressure sensor > 300 kPa or Signal voltage > 4.879 V	Signal voltage of pressure sensor > 0.20 and < 4.88 V	2 Sec.	- once / DCY 2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640
P0243 Turbo-charger/Super-charger Waste gate Actuator "A"	Turbo-charger Wastegate Solenoid	Signal voltage 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Charge Pressure Control Solenoid 1 - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .
P0245 Turbo-charger/Super-charger Waste gate Actuator "A" Low	Turbo-charger Wastegate Solenoid Low	Signal voltage 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Charge Pressure Control Solenoid 1 - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .

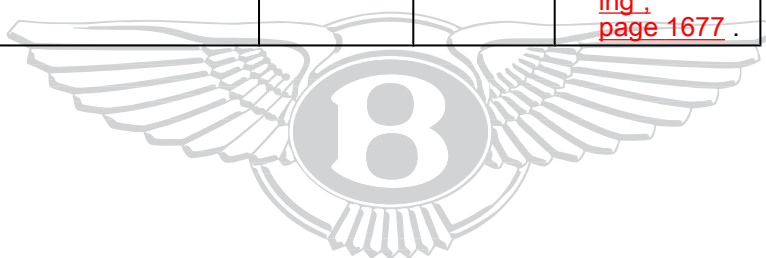
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P0246 Turbo-charger/Super-charger Waste gate Actuator "A" High	Turbo-charger Wastegate Solenoid High	Signal voltage 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Charge Pressure Control Solenoid 1 - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .
P0261 Cylinder 1 Injector Circuit Low	Cylinder 1 Injector Circuit Low	Signal voltage < 3.0 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0262 Cylinder 1 Injector Circuit High	Cylinder 1 Injector Circuit High	Signal current 2.2 to 4.0 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0264 Cylinder 2 Injector Circuit Low	Cylinder 2 Injector Circuit Low	Signal voltage < 3.0 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0265 Cylinder 2 Injector Circuit High	Cylinder 2 Injector Circuit High	Signal current 2.2 to 4.0 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

P0267 Cylinder 3 Injector Circuit Low	Cylinder 3 Injector Circuit Low	Signal voltage < 3.0 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0268 Cylinder 3 Injector Circuit High	Cylinder 3 Injector Circuit High	Signal current 2.2 to 4.0 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0270 Cylinder 4 Injector Circuit Low	Cylinder 4 Injector Circuit Low	Signal voltage < 3.0 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0271 Cylinder 4 Injector Circuit High	Cylinder 4 Injector Circuit High	Signal current 2.2 to 4.0 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0273 Cylinder 5 Injector Circuit Low	Cylinder 5 Injector Circuit Low	Signal voltage < 3.0 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

P0274 Cylinder 5 Injector Circuit High	Cylinder 5 Injector Circuit High	Signal current 2.2 to 4.0 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 .
P0276 Cylinder 6 Injector Circuit Low	Cylinder 6 Injector Circuit Low	Signal voltage < 3.0 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 .
P0277 Cylinder 6 Injector Circuit High	Cylinder 6 Injector Circuit High	Signal current 2.2 to 4.0 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 .
P0279 Cylinder 7 Injector Circuit Low	Cylinder 7 Injector Circuit Low	Signal voltage < 3.0 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 .
P0280 Cylinder 7 Injector Circuit High	Cylinder 7 Injector Circuit High	Signal current 2.2 to 4.0 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 .

P0282 Cylinder 8 Injector Circuit Low	Cylinder 8 Injector Circuit Low	Signal voltage < 3.0 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624 .
P0283 Cylinder 8 Injector Circuit High	Cylinder 8 Injector Circuit High	Signal current 2.2 to 4.0 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel injectors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624 .
P0299 Turbo- charger/ Super- charger "A" Under- boost Condition	Turbo Charger Under- boost	Difference be- tween set point and current boost pressure > 20 kPa	- Engine speed > 300 RPM - Set point exceeds current boost pressure >4.8 kPa	2 Sec.	- Continuous 2 DCY	Check the Charge Pressure Control Solenoid 1 - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75, Checking", page 1677 .



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P0300 Random/ Multiple Cylinder Misfire De- tected	Random Misfire De- tected	- Emission threshold 1st interval % (MR), > 1.2% - Catalyst damage misfire rate (MR), > 2.4 to 38%	- Time after engine start, idle + 1 camshaft revolution - Engine speed range, 400-4200 RPM - Engine torque, > 0 (Nm) - Fuel cut off, Not active - ECT at start > -30 °C - IAT > -48 °C - Not in fuel cutoff, rough road not detected	1000 Rev. 200 Rev.	- Continuous 2 DCY - Immed.	- If a Fuel system rich or lean fault exists, perform the diagnostic for those codes first. Use a scan tool and note whether the miss is specific to a few cylinders or is random. If random, check for contamination in the fuel by drawing a fuel sample. - Check spark plugs for signs of fouling. - Check Fuel Pressure. Refer to the Repair Manual for procedure. - Check Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 . - Check Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .

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P0301 Cylinder 1 Misfire De- tected	Cylinder 1 Misfire De- tected	- Emission threshold 1st interval % (MR), > 1.2% - Catalyst damage misfire rate (MR), > 14 to 47%	- Time after engine start, idle + 1 camshaft revolution - Engine speed range, 400-4200 RPM - Engine torque, > 0 (Nm) - Fuel cut off, Not active - ECT at start > -30 °C - IAT > -48 °C - Not in fuel cutoff, rough road not detected	1000 Rev. 200 Rev.	- Continuous 2 DCY - Immed.	- Check fuel injector . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.
P0302 Cylinder 2 Misfire De- tected	Cylinder 2 Misfire De- tected	- Emission threshold 1st interval % (MR), > 1.2% - Catalyst damage misfire rate (MR), > 14 to 47%	- Time after engine start, idle + 1 camshaft revolution - Engine speed range, 400-4200 RPM - Engine torque, > 0 (Nm) - Fuel cut off, Not active - ECT at start > -30 °C - IAT > -48 °C - Not in fuel cutoff, rough road not detected	1000 Rev. 200 Rev.	- Continuous 2 DCY - Immed.	- Check fuel injector . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.

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P0303 Cylinder 3 Misfire Detected	Cylinder 3 Misfire De- tected	- Emission threshold 1st interval % (MR), > 1.2% - Catalyst damage misfire rate (MR), > 14 to 47%	- Time after engine start, idle + 1 camshaft revolution - Engine speed range, 400-4200 RPM - Engine torque, > 0 (Nm) - Fuel cut off, Not active - ECT at start > -30 °C - IAT > -48 °C - Not in fuel cutoff, rough road not detected	1000 Rev. 200 Rev.	- Continuous 2 DCY - Immed.	- Check fuel injector . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.
P0304 Cylinder 4 Misfire Detected	Cylinder 4 Misfire De- tected	- Emission threshold 1st interval % (MR), > 1.2% - Catalyst damage misfire rate (MR), > 14 to 47%	- Time after engine start, idle + 1 camshaft revolution - Engine speed range, 400-4200 RPM - Engine torque, > 0 (Nm) - Fuel cut off, Not active - ECT at start > -30 °C - IAT > -48 °C - Not in fuel cutoff, rough road not detected	1000 Rev. 200 Rev.	- Continuous 2 DCY - Immed.	- Check fuel injector . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.

P0305 Cylinder 5 Misfire Detected	Cylinder 5 Misfire De- tected	- Emission threshold 1st interval % (MR), > 1.2% - Catalyst damage misfire rate (MR), > 14 to 47%	- Time after engine start, idle + 1 cam-shaft revolution - Engine speed range, 400-4200 RPM - Engine torque, > 0 (Nm) - Fuel cut off, Not active - ECT at start > -30 °C - IAT > -48 °C - Not in fuel cutoff, rough road not detected	1000 Rev. 200 Rev.	- Continuous 2 DCY - Immed.	- Check fuel injector . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.
P0306 Cylinder 6 Misfire Detected	Cylinder 6 Misfire De- tected	- Emission threshold 1st interval % (MR), > 1.2% - Catalyst damage misfire rate (MR), > 14 to 47%	- Time after engine start, idle + 1 cam-shaft revolution - Engine speed range, 400-4200 RPM - Engine torque, > 0 (Nm) - Fuel cut off, Not active - ECT at start > -30 °C - IAT > -48 °C - Not in fuel cutoff, rough road not detected	1000 Rev. 200 Rev.	- Continuous 2 DCY - Immed.	- Check fuel injector . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.

P0307 Cylinder 7 Misfire De- tected	Cylinder 7 Misfire De- tected	- Emission threshold 1st interval % (MR), > 1.2% - Catalyst damage misfire rate (MR), > 14 to 47%	- Time after engine start, idle + 1 camshaft revolution - Engine speed range, 400-4200 RPM - Engine torque, > 0 (Nm) - Fuel cut off, Not active - ECT at start > -30 °C - IAT > -48 °C - Not in fuel cutoff, rough road not detected	1000 Rev. 200 Rev.	- Continuous 2 DCY - Immed.	- Check fuel injector . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.
P0308 Cylinder 8 Misfire De- tected	Cylinder 8 Misfire De- tected	- Emission threshold 1st interval % (MR), > 1.2% - Catalyst damage misfire rate (MR), > 14 to 47%	- Time after engine start, idle + 1 camshaft revolution - Engine speed range, 400-4200 RPM - Engine torque, > 0 (Nm) - Fuel cut off, Not active - ECT at start > -30 °C - IAT > -48 °C - Not in fuel cutoff, rough road not detected	1000 Rev. 200 Rev.	- Continuous 2 DCY - Immed.	- Check fuel injector . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.

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P0321 Ignition/ Distribu- tor En- gine Speed Input Circuit Rang e/Per- form- anc e	Engine Speed In- put Circuit Perform- ance	Debounce counter wrong crankshaft signal > 80 revs.	- Engine speed > 520 RPM - Engine reverse run- ning not detected - Vehicle speed < 0.8 or > 19.2 mph - Sync between cam and crank finished	Immediate	- Contin- uous 2 DCY	Check En- gine Speed Sensor - G28- . Refer to ⇒ "3.6.13 Engine Speed Sen- sor G28, Checking", page 1616 .
P0322 Ignition/ Distribu- tor En- gine Speed Input Circuit No Signal	Engine Speed Sensor Circuit No Signal	- Crank gap found = not ac- tive - Waiting for crank gap = not active - Disable new synchroniza- tion = not active - Camshaft rev > 1	- Engine speed > 520 RPM - Engine reverse run- ning not detected - Vehicle speed < 0.8 or > 19.2 mph - Sync between cam and crank finished	Immediate	- Contin- uous 2 DCY	Check En- gine Speed Sensor - G28- . Refer to ⇒ "3.6.13 Engine Speed Sen- sor G28, Checking", page 1616 .
P0324 Knock Control Sys- tem Error	Knock Control System Error	- Counter of knock control signal evalua- tion errors per combustion > 48 counts - Measurement window angle < 0.40 rev.	- Number of ignitions = 600 - Engine speed > 2500 RPM - Engine load > 30% - Knock control ac- tive	3 Sec.	- Contin- uous 2 DCY	- Check Knock Sensor 1 - G61- . Refer to ⇒ "3.6.22 Knock Sen- sor 1 G61, Checking", page 1634 . - Check Knock Sensor 2 - G66- . Refer to ⇒ "3.6.23 Knock Sen- sor 2 G66, Checking", page 1636 .
P0327 Knock Sensor 1 Circuit Low Input	Knock Sensor 1 Circuit Low Input	Reference signal < -0.7 V	- Engine speed > 1000 RPM - ECT > 40 °C - Engine load > 30%	250 working cycles	- Contin- uous 2 DCY	Check Knock Sensor 1 - G61- . Refer to ⇒ "3.6.22 Knock Sen- sor 1 G61, Checking", page 1634 .

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P0328 Knock Sensor 1 /Com- bus- tion Vibra- tion Sen- sor 1 Circuit High Bank 1 or Single Sen- sor	Knock Sensor 1 Circuit High Input	Reference signal > 1.0 V	• Engine speed > 1600 RPM • ECT > 40 °C • Engine load > 30%	250 working cycles	• Contin- uous • 2 DCY	– Check Knock Sensor 1 - G61- . Refer to ⇒ “3.6.22 Knock Sen- sor 1 G61, Checking”, page 1634 .
P0332 Knock Sensor 2 /Com- bus- tion Vibra- tion Sen- sor 2 Circuit Low Bank 2	Knock Sensor 2 Circuit Low Input	Reference signal < -0.7 V	• Engine speed > 1000 RPM • ECT > 40 °C • Engine load > 30%	250 working cycles	• Contin- uous • 2 DCY	– Check Knock Sensor 2 - G66- . Refer to ⇒ “3.6.23 Knock Sen- sor 2 G66, Checking”, page 1636 .
P0333 Knock Sensor 2 /Com- bus- tion Vibra- tion Sen- sor 2 Circuit High Bank 2	Knock Sensor 2 Circuit High Input	Reference signal > 1.0 V	• Engine speed > 1600 RPM • ECT > 40 °C • Engine load > 30%	250 working cycles	• Contin- uous • 2 DCY	– Check Knock Sensor 2 - G66- . Refer to ⇒ “3.6.23 Knock Sen- sor 2 G66, Checking”, page 1636 .
P0341 Camshaft Position Sensor Circuit Perform- ance Sensor "A" Circuit Rang e/Per- formanc e Bank 1 or Single Sen- sor	Camshaft Position Sensor Circuit Perform- ance	Signal voltage not alternating	Crankshaft gap found	Immediate	• Contin- uous • 2 DCY	– Check Intake Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40, Checking”, page 1599 .

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P0342 Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	Camshaft Position Sensor Circuit Low Input	Signal voltage low > 8 revs.	Crankshaft gap found	Immediate	- Continuous 2 DCY	Check Intake Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40, Checking", page 1599 .
P0343 Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	Camshaft Position Sensor Circuit High Input	Signal voltage high > 8 revs.	Crankshaft gap found	Immediate	- Continuous 2 DCY	Check Intake Camshaft Position Sensor 1 - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40, Checking", page 1599 .
P0351 Ignition Coil A Primary Circuit	Ignition Coil A Primary Circuit	Signal voltage 5.20 to 6.00 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0352 Ignition Coil B Primary Circuit	Ignition Coil B Primary Circuit	Signal voltage 5.20 to 6.00 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N127- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

P0353 Ignition Coil "C" Primary Control Circuit/ Open	Ignition Coil C Primary Circuit	Signal voltage 5.20 to 6.00 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N291-. Refer to "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P0354 Ignition Coil "D" Primary Control Circuit/ Open	Ignition Coil D Primary Circuit	Signal voltage 5.20 to 6.00 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N292-. Refer to "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P0355 Ignition Coil "E" Primary Control Circuit/ Open	Ignition Coil E Primary Circuit	Signal voltage 5.20 to 6.00 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N323-. Refer to "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P0356 Ignition Coil "F" Primary Control Circuit/ Open	Ignition Coil F Primary Circuit	Signal voltage 5.20 to 6.00 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N324-. Refer to "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P0357 Ignition Coil "G" Primary Control Circuit/ Open	Ignition Coil G Primary Circuit	Signal voltage 5.20 to 6.00 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N325-. Refer to "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.

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P0358 Ignition Coil H Pri- mary Cir- cuit Primary Control Circuit/ Open	Ignition Coil H Pri- mary Cir- cuit	Signal voltage 5.20 to 6.00 V	Engine speed > 680 RPM	< 2 Sec.	- Contin- uous 2 DCY	Check Igni- tion Coil with Power Out- put Stage - N326-. Refer to ⇒ "3.6.21 Ig- nition Coils With Power Output Stage , Checking", page 1633 .
P0418 AIR Sys- tem Con- trol "A" Circuit	Secondary Air Injec- tion Sys- tem Relay Control Circuit Bank 1	Signal voltage > 4.5 to 5.5 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Contin- uous 2 DCY	Check Sec- ondary Air In- jection Pump Relay 1 - - J299-- . Re- fer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Sec- ondary Air In- jection Pump Motor V101 , Checking", page 1661 .
P0419 AIR Sys- tem Con- trol "B" Circuit	Secondary Air Injec- tion Sys- tem Relay Control Circuit Bank 2	Signal voltage > 4.5 to 5.5 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Contin- uous 2 DCY	Check Sec- ondary Air In- jection Pump Relay 2 - - J545-- . Re- fer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Sec- ondary Air In- jection Pump Motor 2 V189 , Checking", page 1664 .

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P0420 Catalyst System Efficiency Below Threshold Bank 1	Catalyst System Efficiency Below Threshold Bank 1	Measured Oxygen Storage Content compared to OSC of borderline catalyst <1.0 -	- Time after dew point > 50 to 400 Sec. - Delta exhaust mass flow < 25 kg/h - Exhaust gas mass flow 45 to 100 kg/h - Modeled exhaust gas temp in catalyst 540 to 675 °C - Engine speed, 1400-2120 RPM - Number of checks = 4 - O2 front and rear ready	9 Sec.	- once / DCY 2 DCY	- Check the exhaust system for leaks and correct any defects found. If any misfire or fuel trim codes are also set, correct those codes first. - Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 . - Check Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 . - Check Three Way Catalytic Converter (TWC). Refer to "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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P0430 Catalyst System Efficiency Below Threshold Bank 2	Warm Up Catalyst Efficiency Below Threshold Bank 2	Measured Oxygen Storage Content compared to OSC of borderline catalyst <1.0 -	• Time after dew point > 50 to 400 Sec. • Delta exhaust mass flow < 25 kg/h • Exhaust gas mass flow 45 to 100 kg/h • Modeled exhaust gas temp in catalyst 540 to 675 °C • Engine speed, 1400-2120 RPM • Number of checks = 4 • O2 front and rear ready	9 Sec.	• once / DCY • 2 DCY	– Check the exhaust system for leaks and correct any defects found. – Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . – Check Oxygen Sensor 2 After Catalytic Converter - G131- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 . – Check Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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P0441 EVAP System Incorrect Purge Flow	Evapora- tive Emission Sys- tem Incor- rect Purge Flow	• Deviation lambda control < 0.035 to 0.060 • Range lambda control < 0.050 to 0.075	• Integrated air mass 3 to 9 kg • Engine speed range < = 600 RPM • Battery voltage > 11 and < 16 V • Engine load range < 34.99% • ECT > 60 °C or modeled ECT > 60 °C • AAT > 3.8 °C • Altitude < 2800m	< 60 Sec.	• once / DCY • 2 DCY	– Check for restrictions or kinks in the EVAP pipes, including charcoal intrusion into the pipes. If pipes are free from obstruction: Check Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .
P0442 EVAP System Leak Detected (small leak)	Evapora- tive Emission Sys- tem Leak Detected Small Leak	Time for pressure drop > 1.6 to 2.6 Sec.	• Time after engine start > 5 Sec. • ECT > 3.8 and < 110.3 °C • IAT > 3 and < 90 °C • IAT drop after engine start < 8.25 °C • intake manifold vacuum > 80 hPa • Altitude, <2700 m • EVAP purge valve, Closed • LDP, Activated • delta ambient pressure, <.25 kPa • ECT at start, 4-35° C • Vehicle speed ones > 30 km/h • Selected gear, Any drive	81 Sec.	• once / DCY • 2 DCY	– Check Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .

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P0444 EVAP Sys- tem Purge Con- trol Valve "A" Circuit Open	Evapora- tive Emis- sion Sys- tem Purge Control Valve Cir- cuit Open	Signal voltage > 4.5- 5.5 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Contin- uous 2 DCY	Check Evap- orative Emis- sion (EVAP) Canister Purge Regu- lator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canis- ter Purge Regulator Valve 1 N80, Checking", page 1619 .
P0455 EVAP Sys- tem Leak De- tected (large leak)	Evapora- tive Emis- sion Sys- tem Leak Detected Gross Leak De- tected	Time for pressure drop < 0.95 -1.0 Sec.	- Time after engine start > 5 and < 1200 Sec. - ECT > 3.8 and < 110.3 °C - IAT > 3 and < 90 °C - IAT drop after en- gine start < 8.25 °C - Altitude, < 2700 m - Vehicle speed > 5.47 mph at least once - EVAP purge valve, Closed - LDP, Activated - delta ambient pres- sure, < 2.5 kPa - ECT at start, 4-35° C - Number of diagnos- tic attempts, 5 - Selected gear, Any drive	78 Sec.	- once / DCY 2 DCY	- Check the EVAP Sys- tem for Leaks. Refer to ⇒ "2.2.4 EVAP System, Checking for Leaks", page 6 . - Check Evap- orative Emis- sion (EVAP) Canister Purge Regu- lator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canis- ter Purge Regulator Valve 1 N80, Checking", page 1619 . - Check Leak Detection Pump (LDP) - V144- . Re- fer to ⇒ "3.6.24 Leak Detec- tion Pump V144, Checking", page 1638 .

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P0456 EVAP System Leak Detected (very small leak)	Evaporative Emission System Leak Detected Very Small Leak	Time for pressure drop < 2.4 - 6.0 Sec.	- Time after engine start > 5 and < 800 Sec. - ECT > 3.8 and < 110.3 °C - IAT > 3 and < 69.8 °C - IAT drop after engine start < 6.75 °C - Altitude, < 2700 m - Vehicle speed > 5.47 mph at least once - EVAP purge valve, Closed - LDP, Activated - delta ambient pressure, < 2.5 kPa - ECT at start, 4-35° C - Number of diagnostic attempts, 5 - Selected gear, Any drive	100 Sec.	- once / DCY 2 DCY	- Check Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 . - Check Leak Detection Pump (LDP) - V144- . Refer to ⇒ "3.6.24 Leak Detection Pump V144, Checking", page 1638 .
P0458 EVAP System Purge Control Valve "A" Circuit Low	Evaporative Emission System Purge Control Valve Circuit Low	Signal voltage < 3.0 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .
P0459 EVAP System Purge Control Valve "A" Circuit High	Evaporative Emission System Purge Control Valve Circuit High	Signal current 2.2 to 4.0 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .

P0491 AIR Sys- tem Insuf- ficient Flow Bank 1	Secondary Air Injec- tion Sys- tem Insuf- ficient Flow Bank 1	- SAI pressure measured with SAI pressure sensor vs. modeled < 70 - 75.8% - Absolute deviation of raw pressure signal from filtered signal - mean value < 1.1 hPa	- Mass air flow, 180...7.0 kg/h - Delta engine load -10 to 10% - ECT 4.5 to 114.8 °C - IAT 4.5 to 100 °C - Altitude < 2700 m - SAI pressure sensor ready	Immediate	- once / DCY 2 DCY	- Check SAI attaching hoses to the exhaust for kinks damage or obstructions. - Check Secondary Air Injection (AIR) Pump Motor - V101-- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 . - Check Combination valve for Secondary Air Injection (SAI). Refer to Repair Manual.
P0492 AIR Sys- tem Insuf- ficient Flow Bank 2	Secondary Air Injec- tion Sys- tem Insuf- ficient Flow Bank 2	- SAI pressure measured with SAI pressure sensor vs. modeled < 70 - 75.8% - Absolute deviation of raw pressure signal from filtered signal - mean value < 1.1 hPa	- Mass air flow, 180...7.0 kg/h - Delta engine load -10 to 10% - ECT 4.5 to 114.8 °C - IAT 4.5 to 100 °C - Altitude < 2700 m - SAI pressure sensor ready	Immediate	- once / DCY 2 DCY	- Check SAI attaching hoses to the exhaust for kinks damage or obstructions. - Check Secondary Air Injection Pump Motor 2 - V189-- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 . - Check Combination valve for Secondary Air Injection (SAI). Refer to Repair Manual.

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P0504 Brake Switch A / B Correlation	Brake Switch A / B Correlation	- Electrical connection of Brake Switch and redundant Brake Switch do not correlate - Brake Switch Signal and redundant Brake Switch Signal do not correlate	---	Immediate	- Continuous 2 DCY	– Check the brake switch. Refer to appropriate repair manual.
P0506 Idle Air Control System RPM Lower Than Expected	Idle Air Control System RPM Lower Than Expected	- Engine speed deviation between desired and actual > 100 RPM - Speed governor torque > = -80 Nm	- Engine speed > 20 RPM - Vehicle speed 0 MPH - Altitude < 2700 m - Engine load < 36% - ECT > 59.3 °C - IAT > 0 °C - Catalyst heating not active - External torque demand not active	5 Sec.	- Multiple 2 DCY	– Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P0507 Idle Air Control System RPM Higher Than Expected	Idle Air Control System RPM Higher Than Expected	- Engine speed deviation < -100 RPM - Speed governor torque > = -80 Nm	- Engine speed > 20 RPM - Vehicle speed 0 MPH - Altitude < 2700 m - Engine load < 36% - ECT > 59.3 °C - IAT > 0 °C - Catalyst heating not active - External torque demand not active	5 Sec.	- Multiple 2 DCY	– Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P050A Cold Start Idle Control System Performance	Idle Air Control System RPM Lower Or Higher Than Expected	- Engine speed deviation > 100 RPM - AND - Speed governor torque > = -80 Nm OR - Engine speed deviation < -200 RPM - AND - Speed governor torque > = 80 Nm	- Engine speed > 20 RPM - Vehicle speed 0 MPH - Altitude < 2700 m - Engine temp at start < 69.8 °C - Catalyst heating active - External torque demand not active - Not in fuel cutoff	4 Sec.	- Multiple 2 DCY	– Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .

P050 B Cold Start Ignition Timing Per- form- anc e	Cold Start Ignition Timing Perform- ance	Delta command to actual ignition re- tard > 85%	- Time during cata- lyst heating >= 4 Sec. - Fuel system status = no fuel cutoff - Altitude < 2909 m - Desired ignition re- tard during catalyst heating < 97% - Delta engine load within 5 sec. < 100% - Delta engine speed within 5 sec. < 2000 RPM	0.1 Sec.	- once / DCY 2 DCY	- Inspect the air cleaner element and the air intake system for leaks. - Inspect the PCV system for leaks. - Check En- gine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Cool- ant Temper- ature Sensor G62 , Check- ing", page 1613 . - Check the EPC Throttle Drive - G186- . Re- fer to ⇒ "3.6.39 Throttle Valve Con- trol Module GX3 , Check- ing", page 1671 . - Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205 , Checking", page 1597 . - Verify the lat- est Engine Control Mod- ule - J623- software is being used.

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P0544 Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 1	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 1	Magnitude of PWM period time error > 0.03 Sec.	Modeled EGT pre catalyst > 600 °C	60 Sec.	- Continuous 2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
P0545 Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 1	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 1 Low	EGT reading from sensor < -37 °C	Battery voltage > 9.9 V for > 1 Sec.	60 Sec.	- Continuous 2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
P0546 Exhaust Gas Temperature Sensor Circuit High Bank 1 Sensor 1	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 1 High	EGT reading from sensor > 1107 °C	Battery voltage > 9.9 V for > 1 Sec.	3 Sec.	- Continuous 2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
P0547 Exhaust Gas Temperature Sensor Circuit Bank 2 Sensor 1	Exhaust Gas Temperature Sensor Circuit Bank 2 Sensor 1	Magnitude of PWM period time error > 0.03 Sec.	Modeled EGT pre catalyst > 600 °C	60 Sec.	- Continuous 2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to "3.6.16 Exhaust Gas Temperature Sensor 2 G448- Checking", page 1622 .
P0548 Exhaust Gas Temperature Sensor Circuit Low Bank 2 Sensor 1	Exhaust Gas Temperature Sensor Circuit Bank 2 Sensor 1 Low	EGT reading from sensor < -37 °C	Battery voltage > 9.9 V for > 1 Sec.	60 Sec.	- Continuous 2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to "3.6.16 Exhaust Gas Temperature Sensor 2 G448- Checking", page 1622 .

P0549 Exhaust Gas Temperature Sensor Circuit High Bank 2 Sensor 1	Exhaust Gas Temperature Sensor Circuit Bank 2 Sensor 1 High	EGT reading from sensor > 1107 °C	Battery voltage > 9.9 V for > 1 Sec.	3 Sec.	- Continuous 2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448, Checking", page 1622 .
P0556 Brake Booster Pressure Sensor Circuit Range/Performance	Brake Booster Pressure Sensor Circuit Range/Performance	- Max pressure in brake booster pressure sensor > 119 kPa - Minimal pressure in brake pressure sensor < 10 kPa - Brake booster pressure minus ambient air temperature > 255 kPa	---	0.4 Sec	- Continuous 2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201, Checking", page 1595
P0557 Brake Booster Pressure Sensor Circuit Low	Brake Booster Pressure Sensor Circuit Low Input	Voltage from brake booster pressure sensor < 0.1 V	---	0.4 Sec	- Continuous 2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201, Checking", page 1595
P0558 Brake Booster Pressure Sensor Circuit High Input	Brake Booster Pressure Sensor Circuit High Input	Voltage from brake booster pressure sensor > 4.9 V	---	0.4 Sec	- Continuous 2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201, Checking", page 1595

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P0560 System Voltage Malfunction	System voltage < 2.54 V	- Engine speed > 480 to 600 RPM - For 180 Sec. - System voltage > 2.54 V - Main relay switched on	2 Sec.	- Continuous 2 DCY	Perform a charging system check and battery test to determine if the battery or charging system need to be serviced. Refer to the Repair Manual for battery/charging system diagnosis.
P0562 System Voltage Low	System voltage < 9.99 V	Main relay = switched on	2 Sec.	- Continuous 2 DCY	Perform a charging system check and battery test to determine if the battery or charging system need to be serviced. Refer to the Repair Manual for battery/charging system diagnosis.
P0563 System Voltage High	System voltage > 15.92V	- Engine speed > 480 to 600 RPM - For 180 Sec. - Vehicle speed > 15.5 mph - Main relay switched on	2 Sec.	- Continuous 2 DCY	Perform a charging system check and battery test to determine if the battery or charging system need to be serviced. Refer to the Repair Manual for battery/charging system diagnosis.

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P0606 Control Module Proces- sor	ECM Pro- cessor In- ternal Fault	- Signal voltage < 0.20 V - Signal voltage > 4.80 V - Drive by wire module check failed - EEPROM check failed - Engine torque out of range - Engine operation condition out of range	---	2 Sec.	- Continuous 2 DCY	Check for any component or circuit fault codes and diagnose them first. If no faults are found during diagnosis, and the ECM has lost a driver output, replace the Engine Control Module. Refer to Repair Manual.
P0627 Fuel Pump "A" Control Circuit/ Open	Fuel Pump 1 Control Circuit Open	Signal voltage < 3 V or 4.50 to 5.50 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel Pump Control Module. Refer to ⇒ "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276, Checking", page 1628
P0629 Fuel Pump "A" Control Circuit High	Fuel Pump 1 Control Circuit High	Signal current 0.60 to 1.20 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check the Fuel Pump Control Module. Refer to ⇒ "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276, Checking", page 1628
P0638 Throt- tle Ac- tuator Control Rang e/Per- formanc e Bank 1	Throttle Actuator Control Perform- ance	- Time to open over reference point > 0.10 Sec. and reference point 12% - Time to open under reference point > 0.6 Sec. - TPS 1 signal voltage NOT 0.21 to 0.87 V - TPS 2 signal voltage NOT 4.41 to 4.84 V	- Ignition on - Engine speed 0 RPM - Vehicle speed, <= 0 MPH - ECT > 5 °C - IAT > 5 °C	0.3 Sec.	- Multiple 2 DCY	Check EPC Throttle Drive - G186-. Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671

P0641 Sensor Reference Voltage "A" Circuit/ Open	Sensor Reference Voltage A Circuit Open	Sensor supply under voltage < 0.96 V or supply over voltage > 1.04 V	---	Immediate	- Continuous 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module (ECM) - J623- . Refer to the Repair Manual.
P0651 Sensor Reference Voltage "B" Circuit/ Open	Sensor Reference Voltage B Circuit Open	Sensor supply under voltage < 0.96 V or supply over voltage > 1.04 V	---	Immediate	- Continuous 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module (ECM) - J623- . Refer to the Repair Manual.
P0657 Actuator Supply Voltage Circuit / Open	Actuator Supply Voltage Circuit / Open	Internal fault	---	0.3 Sec	- Continuous 1DCY	– Check ECM Power Supply Relay . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757 . Checking", page 1611 .
P0658 Actuator Supply Voltage Circuit Low	Actuator Supply Voltage Circuit Low	Internal fault	---	Immediate	- Continuous 1DCY	– Check ECM Power Supply Relay . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757 . Checking", page 1611 .
P0659 Actuator Supply Voltage Circuit High	Actuator Supply Voltage Circuit High	Internal fault	---	Immediate	- Continuous 1DCY	– Check ECM Power Supply Relay . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757 . Checking", page 1611 .

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P0688 ECM/ PCM Power Relay Sense Circuit/ Open	ECM Power Relay Sense Circuit Open	System voltage after main relay > 15.92 V	• Engine speed > 480 to 600 RPM • For 120 Sec. • Vehicle speed > 15.5 mph	2 Sec.	• Continuous • 2 DCY	– Check ECM Power Supply Relay . Refer to ⇒ “3.6.10 Engine Compartment Power Supply Relay J757 . Checking”, page 1611 .
P0691 Fan 1 Control Circuit Low	Cooling Fan 1 Control Circuit Low	Signal voltage < 3.0 V	---	0.5 Sec.	• Continuous • 2 DCY	– Check Engine Cooling Fan 1 - V116- . Refer to ⇒ “3.6.9 Engine Compartment Fan V116 . Checking”, page 1609 .
P0692 Fan 1 Control Circuit High	Cooling Fan 1 Control Circuit High	Signal current 0.60 to 1.20 A	---	0.5 Sec.	• Continuous • 2 DCY	– Check Engine Cooling Fan 1 - V116- . Refer to ⇒ “3.6.9 Engine Compartment Fan V116 . Checking”, page 1609 .
P0697 Sensor Reference Voltage "C" Circuit/ Open	Sensor Reference Voltage C Circuit Open	Sensor supply under voltage < 0.96 V or supply over voltage > 1.04 V	---	Immediate	• Continuous • 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to the Repair Manual.
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	Camshaft Position Actuator Control Circuit Low	Signal voltage < 2.15 to 3.25 V	• Battery voltage > 9 V • Engine speed > 80 RPM	Immediate	• Continuous • 2 DCY	– Check Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 . Checking”, page 1597 .

P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	Camshaft Position Actuator Control Circuit High	Signal current > 2.2 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check Camshaft Adjustment Valve 1 - N205- . Refer to "3.6.3 Camshaft Adjustment Valve 1 N205- . Checking", page 1597 .
P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Post Catalyst Fuel Trim System Too Lean Bank 1	Portion of 2nd lambda control loop < -0.030	- Modeled exhaust gas temperature 480 to 800 °C - Exhaust gas mass flow 24...180 kg/h - Lambda control, Closed loop - Lambda control not at Min. or Max. 2nd Lambda control closed loop - O2S and heater front, Ready - O2S and heater rear, Ready - Fuel cutoff not active - Catalyst heating not active - SAI not active	< 80 Sec.	- Continuous 2 DCY	- Check the Bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. - Check Bank 1 Sensor 1, Oxygen Sensor . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10 . Checking", page 1653 . - Check Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7 . Checking", page 1650 .



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P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Portion of 2nd lambda control loop > 0.030	- Modeled exhaust gas temperature 480 to 800 °C - Exhaust gas mass flow 24...180 kg/h - Lambda control, Closed loop - Lambda control not at Min. or Max. 2nd Lambda control closed loop - O2S and heater front, Ready - O2S and heater rear, Ready - Fuel cutoff not active - Catalyst heating not active - SAI not active	< 80 Sec.	- Continuous 2 DCY	- If a misfire code or injector fault is set, diagnose those codes first. - Check Heated Oxygen Sensor (HO2S) . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 . - Check Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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P2098 Post Catalyst Fuel Trim System Too Lean Bank 2	Post Catalyst Fuel Trim System Too Lean Bank 2	1 portion of 2nd lambda control loop < -0.030	- Modeled exhaust gas temperature 480 to 800 °C - Exhaust gas mass flow 24...180 kg/h - Lambda control, Closed loop - Lambda control not at Min. or Max. 2nd Lambda control closed loop - O2S and heater front, Ready - O2S and heater rear, Ready - Fuel cutoff not active - Catalyst heating not active - SAI not active	< 80 Sec.	- Continuous 2 DCY	- Check the Bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. - Check Heated Oxygen Sensor (HO2S) . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 . - Check Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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P2099 Post Catalyst Fuel Trim System Too Rich Bank 2	Post Catalyst Fuel Trim System Too Rich Bank 2	1 portion of 2nd lambda control loop > 0.030	- Modeled exhaust gas temperature 480 to 800 °C - Exhaust gas mass flow 24...180 kg/h - Lambda control, Closed loop - Lambda control not at Min. or Max. 2nd Lambda control closed loop - O2S and heater front, Ready - O2S and heater rear, Ready - Fuel cutoff not active - Catalyst heating not active - SAI not active	< 80 Sec.	- Continuous 2 DCY	- If a misfire code or injector fault is set, diagnose those codes first. - Check Heated Oxygen Sensor (HO2S) . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 . - Check Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .
P2101 Throttle Actuator Control "A" Control Motor Circuit Range/Performance	Throttle Actuator Control Motor Circuit Performance	- Duty cycle > 80% - AND ECM power stage No Failure - Deviation throttle valve angles vs. calculated values > 4 to 50%	---	0.5 to 5 Sec.	- Continuous 2 DCY	Check the Throttle Valve Control Module . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .

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P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Control System Forced Limited Power	ECM power stage Failure	---	2 Sec.	- Multiple 2 DCY	Check the Throttle Valve Control Module . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking" , page 1671 .
P2122 Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	Throttle/ Pedal Position Switch D Circuit Low Input	Signal voltage < 0.59 V	---	0.5 Sec.	- Continuous 2 DCY	Check Accelerator Pedal Position Sensor 1 - G79- / Accelerator Pedal Position Sensor 2 - G185- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2 , Checking" , page 1593 .
P2123 Throttle/ Pedal Position Sensor/ Switch "D" Circuit High	Throttle/ Pedal Position Switch D Circuit High Input	Signal voltage > 4.82 V	---	0.5 Sec.	- Continuous 2 DCY	Check Accelerator Pedal Position Sensor 1 - G79- / Accelerator Pedal Position Sensor 2 - G185- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2 , Checking" , page 1593 .
P2127 Throttle/ Pedal Position Sensor/ Switch "E" Circuit Low	Throttle/ Pedal Position Switch E Circuit Low Input	Signal voltage < 0.35 V	---	0.5 Sec.	- Continuous 2 DCY	Check Accelerator Pedal Position Sensor 1 - G79- / Accelerator Pedal Position Sensor 2 - G185- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2 , Checking" , page 1593 .

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P2128 Throttle/ Pedal Po- sition Sensor/ Switch "E" Circuit High	Throttle/ Pedal Po- sition Switch E Circuit High Input	Signal voltage > 4.92 V	---	0.5 Sec.	• Contin- uous • 2 DCY	– Check Accel- erator Pedal Position Sensor 1 - G79- / Accel- erator Pedal Position Sensor 2 - G185- . Re- fer to ⇒ "3.6.1 Ac- celerator Pedal Mod- ule GX2 . Checking", page 1593 .
P2138 Throt- tle/ Pedal Po- sition Sen- sor/ Switc h "D"/"E" " Volt- age Corre- lation	Throttle/ Pedal Po- sition Switch D / E Voltage Correla- tion	Signal voltage sensor 1 vs. sen- sor 2 > 0.31 to 1.23 V	Signal voltage • Sensor 1 > 0.86 V • sensor 2 > 0.86 V	0.50 Sec.	• Contin- uous • 2 DCY	– Check Accel- erator Pedal Position Sensor 1 - G79- / Accel- erator Pedal Position Sensor 2 - G185- . Re- fer to ⇒ "3.6.1 Ac- celerator Pedal Mod- ule GX2 . Checking", page 1593 .
P2177 Sys- tem Too Lean Off Idle Bank 1	System Too Lean Off Idle, Bank 1	Adaptive value > 18.00%	• Long term fuel trim completed = not de- tected • Time since long term fuel trim com- pleted > 1040 Sec. • EVAP canister load factor > 37 and < -6 • ECT > 54.75 °C • Injection counter > 1000 • Lambda control closed loop	80 Sec.	• Contin- uous • 2 DCY	– If any fault codes are set for MAF, in- jector, igni- tion coil or fuel pressure perform those diag- nostics first. Check for leaks in the exhaust sys- tem before the upstream O2 sensor. – Check Bank 1 Heated Oxygen Sen- sor - G39/ GX10- . Re- fer to ⇒ "3.6.31 Oxygen Sen- sor 1 Before Catalytic Converter GX10 . Checking", page 1653 .

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P2178 System Too Rich Off Idle Bank 1	System Too Rich Off Idle, Bank 1	Adaptive value < -18.00%	- Long term fuel trim completed = not detected - Time since long term fuel trim completed > 1040 Sec. - EVAP canister load factor > 37 and < -6 - ECT > 54.75 °C - Injection counter > 1000 - Lambda control closed loop	80 Sec.	- Continuous 2 DCY	- Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. - Check Bank 1 Heated Oxygen Sensor - G39/ GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .
P2179 System too lean off idle, Bank 2	System Too Lean Off Idle, Bank 2	Adaptive value > 18.00%	- Long term fuel trim completed = not detected - Time since long term fuel trim completed > 1040 Sec. - EVAP canister load factor > 37 and < -6 - ECT > 54.75 °C - Injection counter > 1000 - Lambda control closed loop	80 Sec.	- Continuous 2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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P2180 System Too Rich Off Idle Bank 2	System Too Rich Off Idle, Bank 2	Adaptive value < -18.00%	- Long term fuel trim completed = not detected - Time since long term fuel trim completed > 1040 Sec. - EVAP canister load factor > 37 and < -6 - ECT > 54.75 °C - Injection counter > 1000 - Lambda control closed loop	80 Sec.	- Continuous 2 DCY	- Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. - Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P2181 Cooling System Performance	Cooling System Performance	Coolant system temperature too low after a sufficient air mass flow integral 84 °C	- ECT at start -11 to 60 °C - IAT -11 to 60 °C - Fuel cutoff not active - Engine load 17.30 to 159.80%	2 Sec.	- once / DCY 2 DCY	- Check Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613 . - Check Coolant Thermostat. Refer to Repair Manual.

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P2187 System Too Lean at Idle Bank 1	System Too Lean At Idle Bank 1	Adaptive value > 5.5%	• Engine speed < 920 RPM • Engine load < 30% • ECT > 61 °C • IAT < 86 °C • Delta part load adaptation ready • Lambda control closed • EVAP purge valve closed • High PCV purge load due to oil dilution • If low fuel signal then wait until fuel consumption	80 Sec.	• Continuous • 2 DCY	– Check for air leaks behind the Bank 1 MAF including intake manifold. Check the Bank 1 exhaust system for leaks before the upstream O2S. Check the accuracy of the MAF. Refer to "3.6.27 Mass Airflow Sensor G70, Checking", page 1644. – Check Bank 1 Heated Oxygen Sensor - G39/ GX10-. Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653.
P2188 System Too Rich at Idle Bank 1	System Too Rich At Idle, Bank 1	Adaptive value < -5.5%	• Engine speed < 920 RPM • Engine load < 30% • ECT > 61 °C • IAT < 86 °C • Delta part load adaptation ready • Lambda control closed • EVAP purge valve closed • High PCV purge load due to oil dilution	80 Sec.	• Continuous • 2 DCY	– Check for correct fuel pressure. Refer to the Repair Manual for the procedure. Check the accuracy of the MAF. Refer to "3.6.27 Mass Airflow Sensor G70, Checking", page 1644. – Check Bank 1 Heated Oxygen Sensor - G39/ GX10-. Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653.

P2189 System Too Lean At Idle Bank 2	System Too Lean At Idle Bank 2	Adaptive value > 5.5%	• Engine speed < 920 RPM • Engine load < 30% • ECT > 61 °C • IAT < 86 °C • Delta part load adaptation ready • Lambda control closed • EVAP purge valve closed • High PCV purge load due to oil dilution • If low fuel signal then wait until fuel consumption	80 Sec.	• Continuous • 2 DCY	– Check for air leaks behind the Bank 1 MAF including intake manifold. Check the Bank 2 exhaust system for leaks before the upstream O2S. Check the accuracy of the MAF. Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644. – Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11-. Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659.
P2190 System Too Rich At Idle Bank 2	System Too Rich At Idle, Bank 2	Adaptive value < -5.5%	• Engine speed < 920 RPM • Engine load < 30% • ECT > 61 °C • IAT < 86 °C • Delta part load adaptation ready • Lambda control closed • EVAP purge valve closed • High PCV purge load due to oil dilution	80 Sec.	• Continuous • 2 DCY	– Check for correct fuel pressure. Refer to the Repair Manual for the procedure. Check the accuracy of the MAF. Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644. – Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11-. Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659.

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P2195 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 1	Delta lambda of 2nd lambda control loop > 0.70	- Electrical diagnosis of secondary O2S finished - Aging diagnosis of secondary O2S finished - Diagnosis of the secondary O2S heater power stage finished - Integrated exhaust gas mass flow > or = 100 g for calibrated amount of times > 15 - Catalyst heating not active - ECT > 50.3 °C	< 80 Sec.	- Continuous 2 DCY	Check Heated Oxygen Sensor (HO2S) - G39- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .
P2196 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 1	Delta lambda of 2nd lambda control loop < -0.70	- Electrical diagnosis of secondary O2S finished - Aging diagnosis of secondary O2S finished - Diagnosis of the secondary O2S heater power stage finished - Integrated exhaust gas mass flow > or = 100 g for calibrated amount of times > 15 - Catalyst heating not active - ECT > 50.3 °C	< 80 Sec.	- Continuous 2 DCY	Check Heated Oxygen Sensor (HO2S) - G39- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .
P2197 O2 Sensor Signal Biased/ Stuck Lean Bank 2 Sensor 1	Delta lambda of 2nd lambda control loop > -0.70	- Electrical diagnosis of secondary O2S finished - Aging diagnosis of secondary O2S finished - Diagnosis of the secondary O2S heater power stage finished - Integrated exhaust gas mass flow > or = 100 g for calibrated amount of times > 15 - Catalyst heating not active - ECT > 50.3 °C	< 80 Sec.	- Continuous 2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

P2198 O2 Sensor Signal Biased/ Stuck Rich Bank 2 Sensor 1	O2 Sensor Signal Biased/ Stuck Rich Bank 2 Sensor 1	Delta lambda of 2nd lambda control loop < -0.70	- Electrical diagnosis of secondary O2S finished - Aging diagnosis of secondary O2S finished - Diagnosis of the secondary O2S heater power stage finished - Integrated exhaust gas mass flow > or = 100 g for calibrated amount of times > 15 - Catalyst heating not active - ECT > 50.3 °C	< 80 Sec.	- Continuous 2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P2199 Intake Air Temperature Sensor 1 vs. Intake Air Temperature Sensor 2 Correlation	Intake Air Temperature Sensor 1 vs. Intake Air Temperature Sensor 2 Correlation	Difference of IAT sensor 1 and 2 > 39.8 and < -50.3 °C	- MAF > 22.22 and < 166.67 g/Sec. - Vehicle speed > 28 mph - Ratio of boost pressure and BARO < 1.10 g/Sec.	5 Sec.	- once / DCY 2 DCY	Check both of the IAT's (in MAF 1 and 2) for accuracy. Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644 , Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246, Checking", page 1646
P2226 Barometric Pressure Sensor Circuit Fault	Barometric Pressure Sensor Circuit Fault	BARO < 50 or > 115 kPa	---	2 Sec.	- Continuous 2 DCY	The Baro sensor is located within the ECM and will require replacement of the ECM if the scan tool reading is off by more than 10% of actual Barometric pressure. Refer to the Repair Manual for ECM replacement.

P2227 Barometric Pressure Sensor "A" Circuit Range/Performance	Barometric Pressure Circuit Performance	- Change in BARO > 5 kPa within 20 Sec. - Difference between measured BARO and stored BARO of previous drive cycle > 10 kPa	- Engine speed < 1000 RPM - Throttle angle < 5% - For a calibrated period of time > 3 Sec.	20 Sec.	- Continuous 2 DCY	The Baro sensor is located within the ECM and will require replacement of the ECM if the scan tool reading is off by more than 10% of actual Barometric pressure. Refer to the Repair Manual for ECM replacement.
P2228 Barometric Pressure Sensor "A" Circuit Low	Barometric Pressure Circuit Low	BARO sensor voltage < 0.20 V	---	1 Sec.	- Continuous 2 DCY	The Baro sensor is located within the ECM and will require replacement of the ECM if the scan tool reading is off by more than 10% of actual Barometric pressure. Refer to the Repair Manual for ECM replacement.
P2229 Barometric Pressure Sensor "A" Circuit High	Barometric Pressure Circuit High	BARO sensor voltage > 4.80 V	---	1 Sec.	- Continuous 2 DCY	The Baro sensor is located within the ECM and will require replacement of the ECM if the scan tool reading is off by more than 10% of actual Barometric pressure. Refer to the Repair Manual for ECM replacement.

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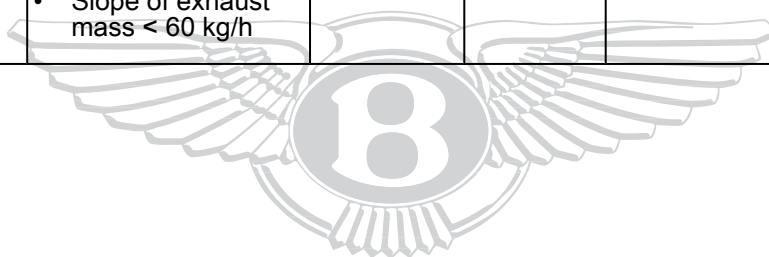
P2237 O2 Sensor Positive Current Control Circuit Open Bank 1 Sensor 1	- Primary O2S voltage > 1.464 and < 1.536 V - For time > 10 Sec. - Integrated MAF > 200 g OR - Delta lambda controller > 0.01 - For time > 1.5 Sec.	- Battery voltage > 10.7 and < 16.1 V - O2S ceramic temperature > 720 °C - Electrical adjustment, Not active - Lambda control, Closed loop - Heater control closed loop - Lambda modulation > 0.020.97 or > 1.03	5 to 10 Sec.	- Multiple 2 DCY	Check Heated Oxygen Sensor (HO2S) - G39- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .
P2240 O2 Sensor Positive Current Control Circuit Open Bank 2 Sensor 1	- Primary O2S voltage > 1.464 and < 1.536 V - For time > 10 Sec. - Integrated MAF > 200 g OR - Delta lambda controller > 0.01 - For time > 1.5 Sec.	- Battery voltage > 10.7 and < 16.1 V - O2S ceramic temperature > 720 °C - Electrical adjustment, Not active - Lambda control, Closed loop - Heater control closed loop - Lambda modulation > 0.020.97 or > 1.03	5 to 10 Sec.	- Multiple 2 DCY	Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P2243 O2 Sensor Reference Voltage Circuit Open Bank 1 Sensor 1	- O2S signal front > 4.70 V - OR O2S signal front < 0.20 V - Internal resistance > 950 Ω	- Battery voltage > 10.7 and < 16.1 V - Engine speed > 480 to 600 RPM - Ceramic temperature of primary O2S > 775 °C	5 Sec.	- Multiple 2 DCY	Check Heated Oxygen Sensor (HO2S) - G39- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .
P2247 O2 Sensor Reference Voltage Circuit Open Bank 2 Sensor 1	- O2S signal front > 4.70 V - OR O2S signal front < 0.20 V - Internal resistance > 950 Ω	- Battery voltage > 10.7 and < 16.1 V - Engine speed > 480 to 600 RPM - Ceramic temperature of primary O2S > 775 °C	5 Sec.	- Multiple 2 DCY	Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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P2257 AIR System Control "A" Circuit Low	Secondary Air Injection System Control Bank 1 Circuit Low	Signal voltage < 3.00 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check Secondary Air Injection (AIR) Pump Relay - J299- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 .
P2258 AIR System Control "A" Circuit High	Secondary Air Injection System Control Bank 1 Circuit High	Signal current 0.60 to 1.20 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check Secondary Air Injection (AIR) Pump Relay - J299- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 .
P2259 AIR System Control "B" Circuit Low	Secondary Air Injection System Control Bank 2 Circuit Low	Signal voltage < 3.00 V	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check Secondary Air Injection Pump Relay 2 - J545- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .
P2260 AIR System Control "B" Circuit High	Secondary Air Injection System Control Bank 2 Circuit High	Signal current 0.60 to 1.20 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check Secondary Air Injection Pump Relay 2 - J545- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .

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P2270 O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 2	O2 Sensor Signal Stuck Lean Bank 1 Sensor 2	O2S signal rear < 0.620 V	- Battery voltage > 10.9 V - RPM > 20 - Mass air flow 24 to 120 kg/h - Modeled exhaust gas temperature > 420 °C - O2S rear readiness > 10 Sec. 2nd lambda control closed loop	100 Sec.	- Continuous 2 DCY	Check Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .
P2271 O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 2	O2 Sensor Signal Stuck Rich Bank 1 Sensor 2	- Response time at fuel cutoff > 2.5 Sec. - Measurement range from fuel cutoff to voltage threshold <= 152 mV - Number of checks >= 1	- Mass air flow 24 to 120 kg/h - Modeled exhaust gas temperature > 350 °C - O2S rear readiness > 10 Sec. - Fuel cutoff > 5 Sec. 2nd lambda control closed loop OR - Rich voltage enable >= 602 mV - Lean voltage <= 150 mV - O2S rear ready - Rear O2S signal oscillating monitoring ready - EVAP purge valve diagnosis ready - Fuel cutoff active - Front O2 lambda signal > 2.0 - Modeled exhaust gas temperature > 500 °C - Slope of exhaust mass < 60 kg/h	< 5 Sec. during fuel cutoff	- Continuous 2 DCY	Check Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .



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P2272 O2 Sensor Signal Biased/ Stuck Lean Bank 2 Sensor 2	O2S signal rear < 0.620 V	- Battery voltage > 10.9 V - RPM > 20 - Mass air flow 24 to 120 kg/h - Modeled exhaust gas temperature > 420 °C - O2S rear readiness > 10 Sec. 2nd lambda control closed loop	100 Sec.	- Continuous 2 DCY	Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656
P2273 O2 Sensor Signal Biased/ Stuck Rich Bank 2 Sensor 2	- Response time at fuel cutoff > 2.5 Sec. - Measurement range from fuel cutoff to voltage threshold <= 152 mV - Number of checks >= 1	- Mass air flow 24 to 120 kg/h - Modeled exhaust gas temperature > 420 °C - O2S rear readiness > 10 Sec. - Fuel cutoff > 5 Sec. 2nd lambda control closed loop OR - Rich voltage enable >= 602 mV - Lean voltage <= 150 mV - O2S rear ready - Rear O2S signal oscillating monitoring ready - EVAP purge valve diagnosis ready - Fuel cutoff active - Front O2 lambda signal > 2.0 - Modeled exhaust gas temperature > 500 °C - Slope of exhaust mass < 60 kg/h	< 5 Sec. during fuel cutoff	- Continuous 2 DCY	Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656

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P2279 Intake Air System Leak	Intake Air System Leak	Threshold to detect a defective system 1.65 AND ratio of the tie System Defective during the measurement window to the whole duration of the measurement window 0.80	- Time after engine start > 0 Sec. - Engine load < 100.01% - Mass air flow < 25 kg/h - ECT > -30 °C - IAT < 120 °C - Lambda control value > -25% - Vehicle speed < 1 km/h - Duration of measurement > 4 Sec. - Number of checks 1 - Lambda control active	0.8 to 4 Sec.	- Continuous 2 DCY	This code will set if the calculated air intake is more than the MAF actual value. Check for air leaks after the MAF sensor. Check the MAF. Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644.
P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition Coil A Primary Control Circuit Low	Signal voltage < 0.5...1.0 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N70-. Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2301 Ignition Coil "A" Primary Control Circuit High	Ignition Coil A Primary Control Circuit High	Signal current < 5.0 to 8.8 mA	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N70-. Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition Coil B Primary Control Circuit Low	Signal voltage < 0.5...1.0 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N127-. Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.

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P2304	Ignition Coil B Primary Control Circuit High	Signal current < 5.0 to 8.8 mA	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N127-. Refer to "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2306	Ignition Coil C Primary Control Circuit Low	Signal voltage < 0.5...1.0 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N291-. Refer to "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2307	Ignition Coil C Primary Control Circuit High	Signal current < 5.0 to 8.8 mA	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N291-. Refer to "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2309	Ignition Coil D Primary Control Circuit Low	Signal voltage < 0.5...1.0 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N292-. Refer to "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2310	Ignition Coil D Primary Control Circuit High	Signal current < 5.0 to 8.8 mA	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N292-. Refer to "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.

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P2312 Ignition Coil "E" Primary Control Circuit Low	Ignition Coil "E" Primary Control Circuit Low	Signal voltage < 0.5...1.0 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N323-. Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2313 Ignition Coil "E" Primary Control Circuit High	Ignition Coil "E" Primary Control Circuit High	Signal current < 5.0 to 8.8 mA	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N323-. Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2315 Ignition Coil "F" Primary Control Circuit Low	Ignition Coil "F" Primary Control Circuit Low	Signal voltage < 0.5...1.0 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N324-. Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2316 Ignition Coil "F" Primary Control Circuit High	Ignition Coil "F" Primary Control Circuit High	Signal current < 5.0 to 8.8 mA	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N324-. Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2318 Ignition Coil "G" Primary Control Circuit Low	Ignition Coil "G" Primary Control Circuit Low	Signal voltage < 0.5...1.0 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N325-. Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.

P2319	Ignition Coil "G" Primary Control Circuit High	Signal current < 5.0 to 8.8 mA	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N325- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2321	Ignition Coil "H" Primary Control Circuit Low	Signal voltage < 0.5...1.0 V	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N326- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2322	Ignition Coil "H" Primary Control Circuit High	Signal current < 5.0 to 8.8 mA	Engine speed > 680 RPM	< 2 Sec.	- Continuous 2 DCY	Check Ignition Coil with Power Output Stage - N326- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2400	Evaporative Emission System Leak Detection Pump Control Circuit Open	Signal voltage > 4.5 - 5.5 V	- Battery voltage > 9 V - Engine speed > 80 RPM - For a period of > 10 Sec.	Immediate	- Continuous 2 DCY	Check Leak Detection Pump (LDP) - V144- . Refer to ⇒ "3.6.24 Leak Detection Pump V144, Checking", page 1638 .
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage < 3.5 V	- Battery voltage > 9 V - Engine speed > 80 RPM - For a period of > 10 Sec.	Immediate	- Continuous 2 DCY	Check Leak Detection Pump (LDP) - V144- . Refer to ⇒ "3.6.24 Leak Detection Pump V144, Checking", page 1638 .

P2402 EVAP System Leak De- tec- tion Pump Con- trol Circuit High	Evapora- tive Emis- sion Sys- tem Leak Detection Pump Control Circuit High	Signal current > 2.7 - 5.0 A	- Battery voltage > 9 V - Engine speed > 80 RPM - For a period of > 10 Sec.	Immediate	- Contin- uous 2 DCY	Check Leak Detection Pump (LDP) - V144- . Re-fer to ⇒ "3.6.24 Leak Detec-tion Pump V144 . Checking", page 1638 .
P2403 EVAP System Leak De- tec- tion Pump Sense Cir- cuit/ Open	Evapora- tive Emis- sion Sys- tem Leak Detection Pump Sense Cir- cuit Open	Low signal voltage > 0.5 Seconds	- Time after engine start, 5 – 1200 Sec. - Preceding engine shut off time > 900 Sec. - ECT 3.8 – 110.3 °C - IAT > 3 and < 90 °C - Integrated purge flow > 39.8 g - Restart tempera- ture difference > 45 °C - Altitude < 2700 m - Selected gear, Any drive - EVAP purge valve, rear - LDP Commanded off	Immediate	- once / DCY 2 DCY	Check Leak Detection Pump (LDP) - V144- . Re-fer to ⇒ "3.6.24 Leak Detec-tion Pump V144 . Checking", page 1638 .
P2404 EVAP System Leak De- tec- tion Pump Sense Circuit Rang e/Per- formanc e	Evapora- tive Emis- sion Sys- tem Leak Detection Pump Sense Cir- cuit Per- formance	High signal volt- age > 12 Sec.	- Time after engine start, 5 – 1200 Sec. - Preceding engine shut off time > 900 Sec. - ECT 3.8 – 110.3 °C - IAT > 3 and < 90 °C - Integrated purge flow > 39.8 g - Restart tempera- ture difference > 45 °C - Altitude < 2700 m - Selected gear, Any drive - EVAP purge valve, rear - LDP Commanded off	Immediate	- once / DCY 2 DCY	Check Leak Detection Pump (LDP) - V144- . Re-fer to ⇒ "3.6.24 Leak Detec-tion Pump V144 . Checking", page 1638 .

P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Signal voltage from primary O2S > 2.71 V or required lambda from primary fuel control system < 0.950 V	• Lambda voltage < 4.81 V • O2S ceramic temperature > 665 °C • Fuel cut off, Not active • Engine speed 480 to 600 RPM	10 Sec.	• Multiple • 2 DCY	– Check Heated Oxygen Sensor (HO2S) - G39- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10 Checking", page 1653 .
P2415 O2 Sensor Exhaust Sample Error Bank 2 Sensor 1	O2 Sensor Exhaust Sample Error Bank 2 Sensor 1	Signal voltage from primary O2S > 2.71 V or required lambda from primary fuel control system < 0.950 V	• Lambda voltage < 4.81 V • O2S ceramic temperature > 665 °C • Fuel cut off, Not active • Engine speed 480 to 600 RPM	10 Sec.	• Multiple • 2 DCY	– Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11 Checking", page 1659 .
P2431 AIR System Air Flow/Pressure Sensor Circuit Range/Performance Bank 1	Secondary Air System Pressure Sensor Performance Bank 1	Difference between SAI pressure and ambient pressure -6.0 to 6.0 hPa	• Engine off time > 5 Sec. • BARO sensor voltage > 0.2 and < 4.8 V • Air injection finished	Immediate	• Continuous • 2 DCY	– Check Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609 Checking", page 1666 .
P2432 AIR System Air Flow/Pressure Sensor Circuit Low Bank 1	Secondary Air System Pressure Sensor Low Bank 1	Signal voltage < 0.40 V	---	0.5 Sec.	• Continuous • 2 DCY	– Check Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609 Checking", page 1666 .

P2433 AIR System Air Flow/ Pressure Sensor Circuit High Bank 1	Secondary Air System Pressure Sensor High Bank 1	Signal voltage > 4.605 V	---	0.5 Sec.	- Continuous 2 DCY	Check Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609- Checking", page 1666 .
P2436 AIR System Air Flow/ Pressure Sensor Circuit Range/ Performance Bank 2	Secondary Air System pressure Sensor Performance Bank 2	Difference between SAI pressure and ambient pressure -6.0 to 6.0 hPa	- Engine off time > 5 Sec. - BARO sensor voltage > 0.2 and < 4.8 V - Air injection finished	Immediate	- Continuous 2 DCY	Check Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .
P2437 AIR System Air Flow/ Pressure Sensor Circuit Low Bank 2	Secondary Air System Pressure Sensor Low Bank 2	Signal voltage < 0.40 V	---	0.5 Sec.	- Continuous 2 DCY	Check Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .
P2438 AIR System Air Flow/ Pressure Sensor Circuit High Bank 2	Secondary Air System Pressure Sensor High Bank 2	Signal voltage > 4.605 V	---	0.5 Sec.	- Continuous 2 DCY	Check Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .

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P2440 AIR System Switching Valve Stuck Open Bank 1	Secondary Air Injection System Switching Valve Stuck Open Bank 1	Deviation of raw pressure signal from filtered signal: • Maximum value > 0.5 kPa • Minimum value < -0.7 kPa • Mean value > 0.23 kPa	• Mass air flow > 1.94 and < 59.7 g/Sec. • Delta engine load -5 to 5% • ECT 4.5 to 114.8 °C • Engine speed > 480 to 600 RPM • Altitude < 2700 m • Air pressure sensor ready	Immediate	• once / DCY • 2 DCY	– Check Combination valve for secondary air injection (AIR). Refer to Repair Manual. – Check Secondary Air Injection (AIR) Pump Relay - J299-. Refer to "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661.
P2442 AIR System Switching Valve Stuck Open Bank 2	Secondary Air Injection System Switching Valve Stuck Open Bank 2	Deviation of raw pressure signal from filtered signal: • Maximum value > 0.5 kPa • Minimum value < -0.7 kPa • Mean value > 0.23 kPa	• Mass air flow > 1.94 and < 59.7 g/Sec. • Delta engine load -5 to 5% • ECT 4.5 to 114.8 °C • Engine speed > 480 to 600 RPM • Altitude < 2700 m • Air pressure sensor ready	Immediate	• once / DCY • 2 DCY	– Check Combination valve for secondary air injection (AIR). Refer to Repair Manual. – Check Secondary Air Injection (AIR) Pump Motor. Refer to "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664.
P2632 Fuel Pump "B" Control Circuit / Open	Fuel Pump 2 Control Circuit Open	Signal voltage < 3 V or 4.50 to 5.50 V	• Battery voltage > 9 V • Engine speed > 80 RPM	Immediate	• Continuous • 2 DCY	– Check Fuel Pump 2 - V277-. Refer to "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277, Checking", page 1630.

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P2634 Fuel Pump "B" Control Circuit High	Fuel Pump 2 Control Circuit High	Signal current 0.60 to 1.20 A	- Battery voltage > 9 V - Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277- Checking", page 1630
P30A 3 Cylinder Deactivation Valve 1 Stuck Open	Cylinder Deactivation Valve 1 Stuck Open	Minimum air charge factor from non CD cylinders vs. CD cylinder < 0.150	Engine speed > 500 and < 2850 RPM	0.5 Sec.	- Continuous 2 DCY	Check Inlet Deactivation Valve - N518- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607
P30A 4 Cylinder Deactivation Valve 1 Stuck Closed	Cylinder Deactivation Valve 1 Stuck Closed	Air charge factor in this cylinder > 0.15 and < 0.50	- Engine speed > 500 and < 2850 RPM - MAF 1,2 > -27.78 g/Sec. - Battery voltage > 11 V	0.5 Sec.	- Continuous 2 DCY	Check Inlet Deactivation Valve - N518- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607
P30A 5 Cylinder Deactivation Valve 2 Stuck Open	Cylinder Deactivation Valve 2 Stuck Open	Minimum air charge factor from non CD cylinders vs. CD cylinder < 0.150	Engine speed > 500 and < 2850 RPM	0.5 Sec.	- Continuous 2 DCY	Check Inlet Deactivation Valve - N519- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607
P30A 6 Cylinder Deactivation Valve 2 Stuck Closed	Cylinder Deactivation Valve 2 Stuck Closed	Air charge factor in this cylinder > 0.15 and < 0.50	- Engine speed > 500 and < 2850 RPM - MAF 1,2 > -27.78 g/Sec. - Battery voltage > 11 V	0.5 Sec.	- Continuous 2 DCY	Check Inlet Deactivation Valve - N519- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607

P30A 7 Cylinder Deactivation Valve 3 Stuck Open	Cylinder Deactivation Valve 3 Stuck Open	Minimum air charge factor from non CD cylinders vs. CD cylinder < 0.150	Engine speed > 500 and < 2850 RPM	0.5 Sec.	• Continuous • 2 DCY	– Check Inlet Deactivation Valve - N520-. Refer to ⇒ “3.6.8 Dis- placement On Demand Rotary Sole- noid NX8, Checking”, page 1607.
P30A 8 Cylinder Deactivation Valve 3 Stuck Closed	Cylinder Deactivation Valve 3 Stuck Closed	Air charge factor in this cylinder > 0.15 and < 0.50	• Engine speed > 500 and < 2850 RPM • MAF 1,2 > -27.78 g/ Sec. • Battery voltage > 11 V	0.5 Sec.	• Continuous • 2 DCY	– Check Inlet Deactivation Valve - N520-. Refer to ⇒ “3.6.8 Dis- placement On Demand Rotary Sole- noid NX8, Checking”, page 1607.
P30A 9 Cylinder Deactivation Valve 4 Stuck Open	Cylinder Deactivation Valve 4 Stuck Open	Minimum air charge factor from non CD cylinders vs. CD cylinder < 0.150	Engine speed > 500 and < 2850 RPM	0.5 Sec.	• Continuous • 2 DCY	– Check Inlet Deactivation Valve - N521-. Refer to ⇒ “3.6.8 Dis- placement On Demand Rotary Sole- noid NX8, Checking”, page 1607.
P30A A Cylinder Deactivation Valve 4 Stuck Closed	Cylinder Deactivation Valve 4 Stuck Closed	Air charge factor in this cylinder > 0.15 and < 0.50	• Engine speed > 500 and < 2850 RPM • MAF 1,2 > -27.78 g/ Sec. • Battery voltage > 11 V	0.5 Sec.	• Continuous • 2 DCY	– Check Inlet Deactivation Valve - N521-. Refer to ⇒ “3.6.8 Dis- placement On Demand Rotary Sole- noid NX8, Checking”, page 1607.
P3376 Intake Air Temperature Sensor 2 Signal Too Low	Intake Air Temperature Sensor 2 Signal Too Low	IAT > 141 °C	• Time after engine start > 5 Sec. • Engine speed idle to 6000 RPM • Fuel cutoff not ac- tive	5 Sec.	• Continuous • 2 DCY	– Check Mass Airflow Sen- sor 2 - G246-. Re- fer to ⇒ “3.6.28 Mass Airflow Sensor 2 G246, Checking”, page 1646.

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P3377 Intake Air Temperature Sensor 2 Signal Too High	Intake Air Temperature Sensor 2 Signal Too High	IAT < -46 °C	- Time after engine start > 5 Sec. - Engine speed idle to 6000 RPM - Fuel cutoff not active	5 Sec.	- Continuous 2 DCY	Check Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246- Checking", page 1646 .
P3409 Cylinder 2 Deactivation Valve Control Circuit Open	Cylinder 2 Deactivation Valve Control Circuit Open	IC internal driver voltage fault	Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check Inlet Deactivation Valve - N518- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .
P3411 Cylinder 2 Deactivation Valve Control Circuit Low	Cylinder 2 Deactivation Valve Control Circuit Low	IC internal driver voltage fault	Battery voltage > 10 V	Immediate	- Continuous 2 DCY	Check Inlet Deactivation Valve - N518- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .
P3412 Cylinder 2 Deactivation Valve Control Circuit High	Cylinder 2 Deactivation Valve Control Circuit High	IC internal driver voltage fault	Battery voltage > 10 V	Immediate	- Continuous 2 DCY	Check Inlet Deactivation Valve - N518- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .
P3417 Cylinder 3 Deactivation Valve Control Circuit Open	Cylinder 3 Deactivation Valve Control Circuit Open	IC internal driver voltage fault	Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check Inlet Deactivation Valve - N519- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .

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P3419 Cylinder 3 Deactivation Valve Control Circuit Low	Cylinder 3 Deactivation Valve Control Circuit Low	IC internal driver voltage fault	Battery voltage > 10 V	Immediate	- Continuous 2 DCY	Check Inlet Deactivation Valve - N519- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .
P3420 Cylinder 3 Deactivation Valve Control Circuit High	Cylinder 3 Deactivation Valve Control Circuit High	IC internal driver voltage fault	Battery voltage > 10 V	Immediate	- Continuous 2 DCY	Check Inlet Deactivation Valve - N519- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .
P3433 Cylinder 5 Deactivation Valve Control Circuit Open	Cylinder 5 Deactivation Valve Control Circuit Open	IC internal driver voltage fault	Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check Inlet Deactivation Valve - N520- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .
P3435 Cylinder 5 Deactivation Valve Control Circuit Low	Cylinder 5 Deactivation Valve Control Circuit Low	IC internal driver voltage fault	Battery voltage > 10 V	Immediate	- Continuous 2 DCY	Check Inlet Deactivation Valve - N520- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .
P3436 Cylinder 5 Deactivation Valve Control Circuit High	Cylinder 5 Deactivation Valve Control Circuit High	IC internal driver voltage fault	Battery voltage > 10 V	Immediate	- Continuous 2 DCY	Check Inlet Deactivation Valve - N520- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .

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P3457 Cylinder 8 Deactivation Valve Control Circuit Open	Cylinder 8 Deactivation Valve Control Circuit Open	IC internal driver voltage fault	Engine speed > 80 RPM	Immediate	- Continuous 2 DCY	Check Inlet Deactivation Valve - N521- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .
P3459 Cylinder 8 Deactivation Valve Control Circuit Low	Cylinder 8 Deactivation Valve Control Circuit Low	IC internal driver voltage fault	Battery voltage > 10 V	Immediate	- Continuous 2 DCY	Check Inlet Deactivation Valve - N521- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .
P3460 Cylinder 8 Deactivation Valve Control Circuit High	Cylinder 8 Deactivation Valve Control Circuit High	IC internal driver voltage fault	Battery voltage > 10 V	Immediate	- Continuous 2 DCY	Check Inlet Deactivation Valve - N521- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .
U0001 High Speed CAN Communication Bus	High Speed CAN Communication Bus	CAN message, No feedback	---	0.5 Sec.	- Continuous 2 DCY	Check terminal resistance of CAN-Bus ⇒ “3.6.5 CAN-Bus Terminal Resistance . Checking”, page 1601 .
U0002 High Speed CAN Communication Bus Performance	High Speed CAN Communication Bus Performance	Global time-out, receiving no messages.	---	0.5 Sec.	- Continuous 2 DCY	Check terminal resistance of CAN-Bus ⇒ “3.6.5 CAN-Bus Terminal Resistance . Checking”, page 1601 .

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U010 1 Lost Communication with TCM	Lost Communication with TCM	No CAN messages received from TCM	Not active for > 5 Sec.	2 Sec.	- Continuous 2 DCY	Check terminal resistance of CAN-Bus between Engine Control Module (ECM) - J623- and Transmission Control Module (TCM) - J217- . Refer to "3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 1603 .
U012 1 Lost Communication With Anti-Lock Brake System (ABS) Control Module	Lost Communication From Anti Lock Brake Control Module	Message time out	---	Immediate	- Continuous 2 DCY	Check ABS CAN-Bus operation. Refer to appropriate repair manual.
U014 6 Lost Communication With Gateway Control Module	Lost Communication With Gateway Control Module	Message time out	---	Immediate	- Continuous 2 DCY	Check terminal resistance of CAN-Bus "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601 .
U015 5 Lost Communication With Instrument Panel Cluster (IPC) Control Module	Lost Communication With Instrument Cluster Control Module	Message time out	---	Immediate	- Continuous 2 DCY	Check the Instrument Cluster CAN-Bus. Refer to appropriate repair manual.

U040 2 Invalid Data Received From TCM	Invalid Data Received From Transmission Control Module	Invalid data received from TCM.	---	0.5 Sec.	• Continuous • 2 DCY	– Check for correct VIN and software ID stored in TCM. If the software ID or VIN is incorrect, a re-flash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to ⇒ “3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking”, page 1603.
U041 5 Invalid Data Received From Anti-Lock Brake System (ABS) Control Module	Invalid Data Received From Anti-Lock Brake Control Module	CAN message time out or checksum fault	---	Immediate	• Continuous • 2 DCY	– Check for correct VIN and software ID stored in ABS. If the software ID or VIN is incorrect, a re-flash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to appropriate repair manual.
U042 3 Invalid Data Received From Instrument Cluster Control Module	Invalid Data Sent From Instrument Cluster Control Module	CAN message length or time out error	---	Immediate	• Continuous • 2 DCY	– Check the Instrument Cluster CAN-Bus Refer to appropriate repair manual.

U044 7 Invalid Data Data Re- ceived From Gate- way "A"	Invalid Data From Gateway Control Module	Message length < 8	---	Immediate	- Continuous 2 DCY	Check terminal resistance of CAN-Bus ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.

3.4.2 Engine Control Module , 2015 MY

DTC/ Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P000A "A" Camshaft Position Slow Response Bank 1	VVT Commanded valve timing check - slow response error	Start monitoring if: - Difference between target and actual position > 7° CRK - Monitoring of actual value: - Stored set-point CMP not reached within < 2 Sec - Measured change of CMP ≥ 40° CRK - Within > 1.9 Sec. - For counts (the trigger deviation between current and setpoint cam position must be reached) > 7 counts	- Camshaft to crankshaft adaptation completed - Frequency < 3 times - Engine speed 480 - 600 RPM - Time since engine start > 3 – 10 Sec. - V V T power stage diagnosis finished	3.5 s - Continuous	2 DCY	Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597.
P0010 "A" Camshaft Position Actuator Control Circuit/ Open Bank 1	VVT Intake Powerstage Circuit Continuity - Open Circuit	Voltage IC Internal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Immediate - Continuous	2 DCY	Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597.

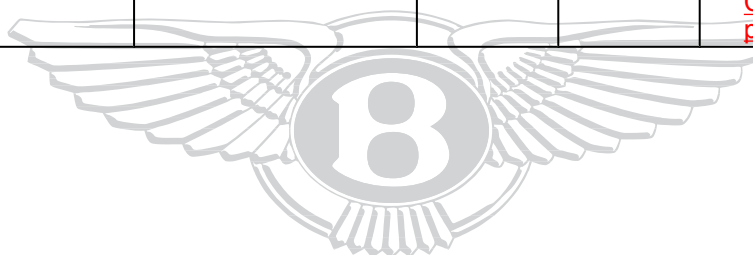
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P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	VVT Com-manded valve timing check - target error	Start monitoring if: • Difference between target and actual position > 7° CRK • Monitoring of actual valve behavior: • Stored set-point CMP not reached within < 2 Sec • Measured change of CMP < 0° CRK • Within > 1.9 Sec. • For counts (the trigger deviation between current and setpoint cam position must be reached) > 7 counts	• Camshaft to crankshaft adaptation completed • Frequency < 3 times • Engine speed 480 - 600 RPM • Time since engine start > 3 – 10 Sec. • V V T power stage diagnosis finished	• 3.5 s • Continuous	• 2 DCY	– Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205 . Checking", page 1597 . – Check Intake Camshaft Position (CMP) Sensor 1 - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40 . Checking", page 1599 .
P0012 "A" Camshaft Position - Timing Over-Retarded Bank 1	VVT Camshaft Locking Pin position check	• No. of registered angles for averaging of angle camshaft = 5 • Difference between measured CMPs (average) and camshaft locked position ≥ 10° CRK	• Camshaft to crankshaft adaptation completed • Frequency (normal operation) < 3 times • Time since engine start < 1 Sec. • Setpoint V V T is in locking position; true • diagnosis of V V T intake powerstage finished	Once/DCY	• 2 DCY	– Check Intake Camshaft Position (CMP) Sensor 1 - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40 . Checking", page 1599 . – Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205 . Checking", page 1597 .

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P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	CMP Sensor Offset check	Average value of camshaft offset > 0.0306 or < -0.0306 rev.	- Engine reverse running not detected - Synchronization between cam and crank finished = true	- Immediate - Continuous	2 DCY	Check Intake Camshaft Position (CMP) Sensor 1 - G40- . Refer to "3.6.4 Camshaft Position Sensor G40- , Checking", page 1599 .
P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Primary O2S heater control power-stage Bank 1 Open circuit	Voltage IC Internal	- RPM > 80 rpm - Battery voltage > 9 V	- Immediate - Continuous	2 DCY	Check Bank 1 Heated Oxygen Sensor - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- , Checking", page 1653
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Primary O2S heater control power-stage Bank 1 short to GND	Voltage IC Internal	- RPM > 80 rpm - Battery voltage > 9 V	- Immediate - Continuous	2 DCY	Check Bank 1 Heated Oxygen Sensor - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- , Checking", page 1653
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Primary O2S heater control power-stage Bank 1 short to battery voltage	Voltage IC Internal	- RPM > 80 rpm - Battery voltage > 9 V	- Immediate - Continuous	2 DCY	Check Bank 1 Heated Oxygen Sensor - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- , Checking", page 1653

P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Sec- ondary O2S heater power stage Bank 1 Open cir- cuit	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Bank 1 Sen- sor 2 Heat- ed Oxygen Sensor - G130- . Re- fer to ⇒ "3.6.30 Oxygen Sensor 1 After Cata- lytic Con- verter GX7 . Checking". page 1650 .
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Sec- ondary O2S heater power stage Bank 1 short to GND	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Bank 1 Sen- sor 2 Heat- ed Oxygen Sensor - G130- . Re- fer to ⇒ "3.6.30 Oxygen Sensor 1 After Cata- lytic Con- verter GX7 . Checking". page 1650 .
P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	Sec- ondary O2S heater power stage Bank 1 short to battery voltage	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Bank 1 Sen- sor 2 Heat- ed Oxygen Sensor - G130- . Re- fer to ⇒ "3.6.30 Oxygen Sensor 1 After Cata- lytic Con- verter GX7 . Checking". page 1650 .



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P0040 O2 Sensor Signals Swapped Bank 1 Sensor 1/ Bank 2 Sensor 1	Primary O2S exchange Comparison of A/F ratio correction factors in both banks (primary O2S exchange detection)	- A/F ratio correction factor Bank 1 > 1.2 - A/F ratio corr. factor bank 2 < 0.8 OR - A/F ratio correction factor Bank 1 < 0.8 - A/F ratio corr. factor bank 2 > 1.2	Fuel system status closed loop	5 s - Continuous	2 DCY	- Using a scan tool with the engine running, check the Bank 1 and Bank 2 Long Term fuel trim - if one is above 10 negative and the other above 10 positive, swap the front HO2s sensor connectors and look for the long term values to move close to a zero or low single digit reading. - Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10 Checking", page 1653 - Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11 Checking", page 1659

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P0050 HO2S Heater Control Circuit Bank 2 Sensor 1	primary O2S heater control power- stage Bank 2 Open cir- cuit	Voltage IC In- ternal	- RPM > 80 rpm - Battery voltage > 9 V	- Imme- diate - Contin- uous	2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Re- fer to ⇒ "3.6.33 Oxygen Sensor 2 Before Cat- alytic Con- verter GX11, Checking", page 1659
P0051 HO2S Heater Control Circuit Low Bank 2 Sensor 1	Primary O2S heater control power- stage Bank 2 short to GND	Voltage IC In- ternal	- RPM > 80 rpm - Battery voltage > 9 V	- Imme- diate - Contin- uous	2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Re- fer to ⇒ "3.6.33 Oxygen Sensor 2 Before Cat- alytic Con- verter GX11, Checking", page 1659
P0052 HO2S Heater Control Circuit High Bank 2 Sensor 1	Primary O2S heater control power- stage Bank 2 short to battery voltage	Voltage IC In- ternal	- RPM > 80 rpm - Battery voltage > 9 V	- Imme- diate - Contin- uous	2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Re- fer to ⇒ "3.6.33 Oxygen Sensor 2 Before Cat- alytic Con- verter GX11, Checking", page 1659
P0056 HO2S Heater Control Circuit Bank 2 Sensor 2	Secon- dary O2S heater power stage Bank 2 Open cir- cuit	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Re- fer to ⇒ "3.6.32 Oxygen Sensor 2 After Cata- lytic Con- verter GX8, Checking", page 1656

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P0057 HO2S Heater Control Circuit Low Bank 2 Sensor 2	Sec- ondary O2S heater power stage Bank 2 short to GND	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Re- fer to ⇒ "3.6.32 Oxygen Sensor 2 After Cata- lytic Con- verter GX8, Checking", page 1656
P0058 HO2S Heater Control Circuit High Bank 2 Sensor 2	Sec- ondary O2S heater power stage Bank 2 short to battery voltage	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Re- fer to ⇒ "3.6.32 Oxygen Sensor 2 After Cata- lytic Con- verter GX8, Checking", page 1656
P0087 Fuel Rail/ System Pressure - Too Low Bank 1	Fuel rail pressure Sensor Signal check	Difference be- tween fuel pressure and MAP < 250 kPa	- Engine speed > 20 RPM - Time after engine start > 2 Sec. - Diagnosis of FRP sensor = finished	5 s - Contin- uous	2 DCY	- Perform a fuel pres- sure test. Refer to the Repair Manual for procedure and specifi- cation. If the fuel pres- sure is in range: - Check the Fuel Pres- sure Sensor - G247- . Refer to ⇒ "3.6.18 Fuel Pres- sure Sensor G247, Checking", page 1626

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P0088 Fuel Rail/ System Pressure - Too High Bank 1	Fuel rail pressure Sensor Signal check	Difference between fuel pressure and MAP > 550 kPa	- Engine speed > 20 RPM - Time after engine start > 2 Sec. - Diagnosis of FRP sensor = finished	5 s - Continuous	2 DCY	- Perform a fuel pressure test. Refer to the Repair Manual for procedure and specification. If the fuel pressure is in range: - Check the Fuel Pressure Sensor - G247- . Refer to ⇒ "3.6.18 Fuel Pressure Sensor G247, Checking", page 1626 .
P00A6 Intake Air Temperature Sensor 2 Circuit Range/ Performance Bank 2	IAT Sensor 2 Low side check	IAT 2 vs. ECT at start > 20.3 or < -45° C	- ECT at last engine stop > 80.3° C - Difference of ECT at last engine stop and at recent start > 39.8° C - ECT at start < 40.5 and > -35.3° C - Block heater not detected - Conditions for block heater detection: - ECT < 50.3° C (ECT at start) - ECT > 3° C - Time after engine start < 200 Sec	5 s - Once/DCY	2 DCY	Check the Mass Air-flow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Air-flow Sensor 2 G246, Checking", page 1646 .
P00A7 Intake Air Temperature Sensor 2 Circuit Low Bank 2	IAT Sensor 2 circuit continuity short to GND	Signal from IAT sensor 2 < 0.107 V	- ECT > -48° C - MAF < 283.33 g/Sec. - Vehicle speed < 198.1 mph	1 s - Continuous	2 DCY	Check the Mass Air-flow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Air-flow Sensor 2 G246, Checking", page 1646 .
P00A8 Intake Air Temperature Sensor 2 Circuit High Bank 2	IAT Sensor 2 circuit continuity short to battery	Signal from IAT sensor 2 > 2.959 V	- ECT > -48° C - MAF < 283.33 g/Sec. - Vehicle speed < 198.1 mph	1 s - Continuous	2 DCY	Check the Mass Air-flow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Air-flow Sensor 2 G246, Checking", page 1646 .

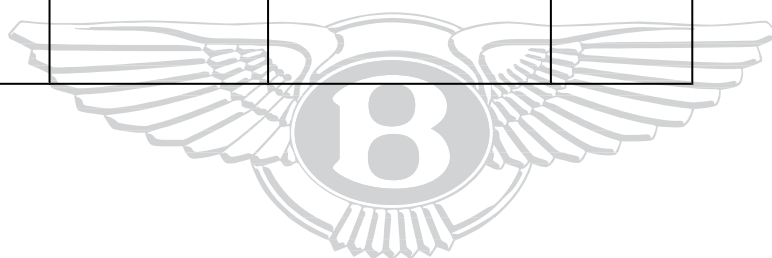
P00B2 Radiator Coolant Tempera- ture Sen- sor Cir- cuit Per- formance	Radiator Inlet Tempera- ture Sen- sor Stuck Check	• difference of the maximum and minimum of radiator inlet temperature < 5.0° C	• Fuel system status = no fuel cut-off • Vehicle speed > 18.6 mph • Vehicle speed < 74.6 – 93.2 mph • RPM > 800 rpm • All of above for a cumulative time > 400 s • ECT > 81.1° C • AAT > -9.7° C • ECT at start < 60.0° C • Difference of coolant temperature between engine start and last engine shut off > 10.0 – 60.0° C	• 2 s • Contin- uous	• 2 DCY	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ "3.6.12 Engine Coolant Temperature Sensor On Radiator Outlet G83- Checking", page 1615 .
	Radiator Inlet Temperature Sensor high side check	• Radiator inlet temperature inus ECT > 20.0° C		• 3 s • Contin- uous	• 2 DCY	
	Radiator Inlet Temperature Sensor low side check	• Difference between IAT and Radiator Inlet Temperature > 20.0° C	• Cold start detected: Difference between IAT and IAT at start < 2.3° C • ECT at last shut-off > 81° C • Vehicle speed > 18.6 mph • For time 15 Sec. • Integrated MAF since engine start > 1200g	• Imme- diately • Once per warm-up cycle	• 2 DCY	
P00B3 Radiator Coolant Tempera- ture Sen- sor Cir- cuit Low	Radiator Inlet Temperature Sensor Circuit continuity - short to GND	• Raw voltage of radiator inlet temperature < 0.227 V	---	• 2 s • Contin- uous	• 2 DCY	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ "3.6.12 Engine Coolant Temperature Sensor On Radiator Outlet G83- Checking", page 1615 .

P00B4 Radiator Coolant Temperature Sensor Circuit High	Radiator Inlet Temperature Sensor Circuit continuity - short to battery	Raw voltage of radiator inlet temperature sensor > 3.213 V	---	2 s - Continuous	2 DCY	Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83-. Refer to ⇒ "3.6.12 Engine Coolant Temperature Sensor On Radiator Outlet G83-. Checking", page 1615.
P00B6 Radiator Coolant Temperature/ Engine Coolant Temperature Correlation	Radiator inlet Temperature and ECT Correlation	Difference between ECT and Radiator Inlet Temperature > 20° C	- Modeled ECT > 85° C - Modeled ECT < 87° C - Engine run time > 125 s	5 s - Continuous	2 DCY	- Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83-. Refer to ⇒ "3.6.12 Engine Coolant Temperature Sensor On Radiator Outlet G83-. Checking", page 1615. - Check Engine Coolant Temperature Sensor - G62-. Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62-. Checking", page 1613.
P00BC Mass or Volume Air Flow "A" Circuit Range/ Performance - Air Flow Too Low	MAF Sensor Bank 1 / Bank 2 Range Check	Measured MAF < -12.5 g/sec	Number of crankshaft revolutions > 150	3.5 s - Continuous	2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Air-flow Sensor G70-. Checking", page 1644.

P00BD Mass or Volume Air Flow "A" Circuit Range/Performance - Air Flow Too High	MAF Sensor Bank 1 Range Check	Measured MAF > 305.5 g/sec	Number of crankshaft revolutions > 150	3.5 s - Continuous	2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Air-flow Sensor G70, Checking", page 1644
P00BE Mass or Volume Air Flow "B" Circuit Range/Performance - Air Flow Too Low	MAF Sensor Bank 2 Range Check	Measured MAF < -12.5 g/sec	Number of crankshaft revolutions > 150	3.5 s - Continuous	2 DCY	Check Mass Air-flow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Air-flow Sensor 2 G246, Checking", page 1646
P00BF Mass or Volume Air Flow "B" Circuit Range/Performance - Air Flow Too High	MAF Sensor Bank 2 Range Check	Measured MAF > 305.5 g/sec	Number of crankshaft revolutions > 150	3.5 s - Continuous	2 DCY	Check Mass Air-flow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Air-flow Sensor 2 G246, Checking", page 1646
P0100 Mass or Volume Air Flow Sensor "A" Circuit	MAF Sensor Bank 1 Loose connection	MAF signal frequency period duration from MAF sensor = 0 s	Engine speed > 20 RPM	0.2 s - Continuous	2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Air-flow Sensor G70, Checking", page 1644
P0101 Mass or Volume Air Flow Sensor "A" Circuit Range/Performance	MAF Sensor Bank 1 Rationality Check	- Measured MAF < maximum modeled MAF g/sec. - Measured MAF > minimum modeled MAF g/sec.	- RPM > 1,000 rpm; < 4,000 rpm - ECT > 40; < 120° C - BARO > 68 kPa - IAT < -30; > 100° C - Change in cam timing < 3° CRK - For time 50 Sec. - Throttle position > 8; < 15% - Vehicle speed < 124 mph	2.0 s - Continuous	2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Air-flow Sensor G70, Checking", page 1644

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P0102 Mass or Volume Air Flow Sensor "A" Circuit Low	MAF Sensor Bank 1 Loose connection with low frequency	MAF signal frequency period duration from MAF sensor < 0.0001; ≠ 0 s	Engine speed > 20 RPM	0.2 s - Continuous	2 DCY	– Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Air-flow Sensor G70, Checking", page 1644
	MAF Sensor Bank 1 Range Check	Period for factor correction from airflow meter < 0.044 s		1.0 s - Continuous		
P0103 Mass or Volume Air Flow Sensor "A" Circuit High	MAF Sensor Bank 1 Loose connection with high frequency	MAF signal frequency period duration from MAF sensor > 0.0009 s	Engine speed > 20 RPM	0.2 s - Continuous	2 DCY	– Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Air-flow Sensor G70, Checking", page 1644
	MAF Sensor Bank 1 Range Check	Period for factor correction from airflow meter > 0.060 s		1.0 s - Continuous		
P0106 Manifold Absolute Pressure/Barometric Pressure Sensor Circuit Range/Performance	MAP sensor Dynamic check	- Amplitude of MAP sensor < 0.3 – 4.4 kPa - For counts > 30 - Number of synchro events > 50	- RPM > 1200; < 3520 rpm - Quotient of MAP and TCB pressure > 0.20; < 0.90	1.0 s - Continuous	2 DCY	– Check Intake Manifold Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71, Checking", page 1640



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	MAP sensor Rationality check	• Difference of intake MAP and maximum modeled intake MAP > 2 kPa • The difference of minimum Modeled intake MAP and intake MAP > 2 kPa OR • Intake MAP before engine start < 50 kPa • Time since engine start < 25 s OR • Difference of BARO and intake MAP before engine start < 15 kPa • Time since engine start < 25 s	• BARO is valid, i.e. • Condition TCB pressure valid i.e. RPM > 300 rpm • Fuel system status (deceleration) = no fuel cut-off • MAF calculation is valid, i.e. Condition fresh air temperature in combustion chamber is valid, i.e. • Condition IAT is valid • Condition ECT is valid • Condition MAF through throttle blade is valid, i.e. • Condition modeled MAP over throttle blade = valid • Condition intake manifold temperature = valid • Condition ratio check of maximum and minimum pressure sensor value < 1	• 2.5 s • Continuous		
P0107 Manifold Absolute Pressure/Barometric Pressure Sensor Circuit Low	MAP sensor Range check	• Intake MAP < 10 kPa		• 2.0 s • Continuous	• 2 DCY	– Check Intake Manifold Pressure Sensor - G71- . Refer to "3.6.25 Manifold Absolute Pressure Sensor G71, Checking", page 1640
	MAP sensor Circuit continuity - short to GND	• Voltage MAP sensor < 0.20 V	• Engine speed > 80 RPM	• 1.0 s • Continuous		
P0108 Manifold Absolute Pressure/Barometric Pressure Sensor Circuit High	MAP sensor Range check	• Intake MAP > 280 kPa		• 2.0 s • Continuous	• 2 DCY	– Check Intake Manifold Pressure Sensor - G71- . Refer to "3.6.25 Manifold Absolute Pressure Sensor G71, Checking", page 1640
	MAP sensor Circuit continuity - short to battery	• Voltage MAP > 4.88 V	• Engine speed > 80 RPM	• 1.0 s • Continuous		

P010A Mass or Volume Air Flow Sensor "B" Circuit	MAF Sensor Bank 2 Loose connection	MAF signal frequency period duration from MAF sensor = 0 s	Engine speed > 20 RPM	0.2 s - Continuous	2 DCY	Check Mass Air Flow Sensor 2 - G246- . Refer to "3.6.28 Mass Air-flow Sensor 2 G246, Checking", page 1646
P010B Mass or Volume Air Flow Sensor "B" Circuit Range/Performance	MAF Sensor Bank 2 Rationality Check	- Measured MAF < maximum modeled MAF g/sec. - Measured MAF > minimum modeled MAF g/sec.	- RPM > 1,000 rpm; < 4,000 rpm - ECT > 40; < 120° C - BARO > 68 kPa - IAT < -30; > 100° C - Change in cam timing < 3° CRK - For time 50 Sec. - Throttle position > 8; < 15% - Vehicle speed < 124 mph	2.0 s - Continuous	2 DCY	Check Mass Air Flow Sensor 2 - G246- . Refer to "3.6.28 Mass Air-flow Sensor 2 G246, Checking", page 1646
P010C Mass or Volume Air Flow Sensor "B" Circuit Low	MAF Sensor Bank 2 Loose connection with low frequency	MAF signal frequency period duration from MAF sensor < 0.0001; ≠ 0 s	Engine speed > 20 RPM	0.2 s - Continuous	2 DCY	Check Mass Air Flow Sensor 2 - G246- . Refer to "3.6.28 Mass Air-flow Sensor 2 G246, Checking", page 1646
	MAF Sensor Bank 2 Range Check	Period for factor correction from airflow meter < 0.044 s		1.0 s - Continuous		
P010D Mass or Volume Air Flow Sensor "B" Circuit High	MAF Sensor Bank 2 Loose connection with high frequency	MAF signal frequency period duration from MAF sensor > 0.0009 s	Engine speed > 20 RPM	0.2 s - Continuous	2 DCY	Check Mass Air Flow Sensor 2 - G246- . Refer to "3.6.28 Mass Air-flow Sensor 2 G246, Checking", page 1646
	MAF Sensor Bank 2 Range Check	Period for factor correction from airflow meter > 0.060 s		1.0 s - Continuous		

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P0111 Intake Air Temperature Sensor 1 Circuit Range/Performance Bank 1	IAT Sensor 1 high side check	IAT Sensor 1 > 60 – 100° C	- MAF > 42.22 and < 166.67 g/sec - For a calibrated period of time > 15 s - Vehicle speed > 28 mph - AND - RPM > 20 rpm - For a calibrated period of time > 15 s	10 s - Continuous	2 DCY	– Check Mass Air Flow Sensor 1 - G70- . Refer to ⇒ "3.6.27 Mass Air-flow Sensor G70, Checking", page 1644
	IAT Sensor 1 stuck check	Difference of IAT minimum and maximum value < 5.3° C	- ECT at start < 138° C - Number of condition: high IAT > 2 - MAF < 14.44 g/sec - Vehicle speed < 6.2 mph - ECT > 80.3° C - Integrated MAF > 1,000 – 4,000 g - For a calibrated period of time > 15 s	10 s - Continuous		
	IAT Sensor 1 Low side check	- IAT 1 ECT at start > 20.3° C - IAT 1 ECT at start < -45.0° C	- ECT at last engine stop > 80.3° C - Difference of ECT at last engine stop and at recent start > 39.8° C - ECT at start < 40.5° C - ECT at start > -35.3° C - Condition powerfail since last dcyl not active - Block heater not detected - Conditions for block heater detection: - ECT < 50.3° C (ECT at start) - ECT > 3° C - Time after engine start < 200 s	10 s - Once/DCY	2 DCY	

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P0112 Intake Air Temperature Sensor 1 Circuit Low Bank 1	IAT Sensor 1 circuit continuity short to GND	Signal from IAT sensor 1 < 0.107 V	- ECT > -48° C - MAF < 283.33g/sec - Vehicle speed < 198.1 mph	1 s - Continuous	2 DCY	Check Mass Air Flow Sensor 1 - G70- . Refer to ⇒ "3.6.27 Mass Air-flow Sensor G70- . Checking", page 1644
P0113 Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake Air Temperature Sensor 1 Circuit High	Signal from IAT sensor 1 > 4.502 V	- Time after engine start > 240 s - Engine speed idle to 6,000 RPM - Fuel cutoff not active	1 s - Continuous	2 DCY	Check Mass Air Flow Sensor 1 - G70- . Refer to ⇒ "3.6.27 Mass Air-flow Sensor G70- . Checking", page 1644



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P0116 Engine Coolant Temperature Sensor 1 Circuit Range/Performance	ECT Sensor rationality - stuck check	• difference between maximum and minimum value of ECT < 2.3° C • No change on signal 0 to 1.5 Kelvin • Signal in range 80 to 105 °C	• RPM > 480 – 600 rpm • For a calibrated period of time > 6 s • ECT < 81.8° C • ECT > 93° C AND • Number of times all dropping ECT > 1 • Vehicle speed > 28 mph • Vehicle speed < 93.2 mph • MAF > 2.2 g/sec • MAF < 42.2 – 97.8 g/sec • Modeled ECT > -45° C • Fuel system status = no fuel cut-off • For a calibrated period of time > 10 s AND • Number of times all rising ECT > 3 • Vehicle speed > 0 mph • Vehicle speed < 12.4 mph • MAF > 2.22 g/sec • MAF < 14.4 – 23.3 g/sec • Substitute temperature model > -45° C • For a calibrated period of time > 10 s	• 2 s • Continuous	• 2 DCY	– Check Engine Coolant Temperature (ECT) Sensor 1 - G62- Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613.

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	ECT Sensor rationality - high side check	ECT at engine start > 20.3 – 75.0° C	- Cold start detected = active - IAT at engine start < 2.3° C - Battery voltage > 7 V - Battery voltage < 16 V - Integrated MAF since engine start > 1200g - vehicle speed < 30 mph - for a calibrated period of time > 15 s - ECT at engine shut-off > 81° C - condition engine start = active - RPM > 20 rpm			
	ECT Sensor rationality - low side check	Modeled ECT minus ECT > 15.0° C	- Time since engine start > 60 s - IAT < 75° C - Modeled ECT < 75° C - difference between IAT and IAT at last engine shut off < 0 – 70.5° C - Block heater = not detected Conditions for block heater detection: - ECT < 50.3° C - ECT at start > 3° C - Time after engine start < 200 s			
P0117 Engine Coolant Temperature Sensor 1 Circuit Low	ECT Sensor short to GND	ECT > 138° C	- RPM > 480 - 600 rpm - Calibrated amount of time > 60 s - IAT < 75° C - Difference between IAT and IAT at last engine shut off < 0 – 70.5° C	2 s - Continuous	2 DCY	Check Engine Coolant Temperature (ECT) Sensor 1 - G62- Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613.

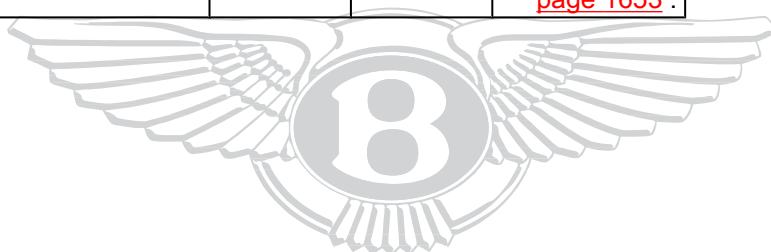
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P0118 Engine Coolant Temperature Sensor 1 Circuit High	ECT Sensor short to Battery	ECT < - 39.0° C	---	2 s - Continuous	2 DCY	Check Engine Coolant Temperature (ECT) Sensor 1 - G62- Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613.
P0121 Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance	TP sensor 1 / 2 Rationality Check	- difference between TP sensor 1 and sensor 2 > 6.3% - deviation of sensor 1 / 2 to the reference TP angle > 9.0% - active fault of MAF sensor = True - deviation of TP sensor 1 / 2 from reference angle is greater than deviation of sensor 2 / 1 from reference angle = true - difference between TP sensor 1 and sensor 2 > 6.3%	- Engine speed > 480 RPM - Battery voltage > 6.5 V - Fuel system status = no safety fuel cut-off	0.3 s - Continuous	2 DCY	Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671.
P0122 Throttle/Pedal Position Sensor/Switch "A" Circuit Low	TP sensor 1 / 2 range check low	voltage TP sensor 1 / 2 < 0.176 / 0.156 V	- Battery voltage > 6.5 V - Fuel system status = no safety fuel cut-off - RPM > 0 RPM	0.2 s - Continuous	2 DCY	Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671.
P0123 Throttle/Pedal Position Sensor/Switch "A" Circuit High	TP sensor 1 / 2 range check high	voltage TP sensor 1 / 2 > 4.629 / 4.883 V	- Battery voltage > 6.5 V - Fuel system status = no safety fuel cut-off	0.2 s - Continuous	2 DCY	Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671.

P0130 O2 Sensor Circuit Bank 1 Sensor 1	Primary O2S electrical fault Bank 1 / Ceramic temperature and internal resistance of primary O2S	• Ceramic temperature of primary O2S < 690° C • Internal resistance of primary O2S ≥ 950 Ω	• Modeled EGT near primary O2S > 350° C • Battery voltage ≥ 10.7; ≤ 16 V • Heater control of primary O2S active • Primary O2S is ready for operation. That means: • Ceramic temperature of primary O2S > 665° C • RPM > 480 – 600 rpm • Fuel system status, No fuel cutoff • For a calibrated period of time 20 Sec. • Validity flag for calculation of inner resistor. That means: • Reference pump current of primary O2S < 5 • Absolute value of correction for internal resistance of Nerst cell of primary O2S < 2560 Ω • Absolute value of change in the voltage signal proportional to internal resistor of Nerst cell < 0.15 V • Trimming of internal resistor of nerst cell of primary O2S not active. That means: • Inner resistor measurement pulse is switched off • Electrical adjustment of primary O2S not active • Ceramic temperature of primary O2S > 775° C • Relative heater output of primary O2S heater = 100% • For a calibrated period of time > 0.1 s	• 20 s • Continuous	• 2 DCY	– Check the Bank 1 Sensor 1 Heated Oxygen Sensor - GX10- Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653.

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			For a calibrated number of counts > 20			
P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Evaluation IC primary O2S Bank 1 Signal range check	- Short to GND Is detected respectively for the single line (VM, UN) when: - Virtual mass (VM) < 1.75 V - Nernst voltage (UN) < 1.50 V	- Battery voltage > 10.7 and < 16.1 V - Engine speed 480 – 600 RPM	5.0 s - Continuous	2 DCY	Check the Bank 1 Sensor 1 Heated Oxygen Sensor - GX10- Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653.
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Evaluation IC primary O2S Bank 1 Signal range check	- Short to battery Is detected respectively for the single line (VM, UN) when: - Virtual mass (VM) > 3.25 V - Nernst voltage (UN) > 4.40 V	- Battery voltage > 10.7 and < 16.1 V - Engine speed 480 – 600 RPM	5.0 s - Continuous	2 DCY	Check the Bank 1 Sensor 1 Heated Oxygen Sensor - GX10- Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653.



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P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	Dynamic check Primary O2S Signal Bank 1 Signal Dynamic Check	- Number of primary O2S dynamic measurements ≥ 6 - Dynamic value of primary O2S < 0.22	- Primary O2S ready - Ceramic temperature of Primary O2S $> 665^{\circ}\text{C}$ - Engine speed 480 – 600 RPM - Diagnosis primary O2S pump current line, electrical check = finished - Ceramic temperature of primary O2S $> 720^{\circ}\text{C}$ - ECT $\geq 60^{\circ}\text{C}$ - Time since last dynamic measurement $\geq 2\text{ s}$ - RPM $\leq 2,520$; $\geq 1,160\text{ rpm}$ - Engine load ≤ 80; $\geq 27\%$ - Fuel system status (deceleration) = no fuel cut-off - Time constant of lambda control ≤ 0.28; $\geq 0.12\text{ s}$ - Modeled EGT near secondary O2S $\geq 500^{\circ}\text{C}$ - Desired lambda setpoint = 1 - Relative load change for release of dynamic measurement $\leq 3\%/0.5\text{ s}$ - Condition gear-shift in process = not active	- Immediate - Once per DCY	2 DCY	Check the Bank 1 Sensor 1 Heated Oxygen Sensor - GX10- Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653.

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P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Diagnosis of primary O2S heater Bank 1 Sensor element temperature and heater power are different from set value	• Ceramic temperature of primary O2S < 725° C • Relative Heater output > 95%	• RPM > 20 rpm • Integrated heat quantity dependant on MAF through echaust system ≥ 0 – 550 kJ • Battery voltage ≥ 10.7; ≤ 16 V • EGT upstream catalyst > 350° C • Fuel system status (deceleration) no fuel cut-off • Absolute value of correction for internal resistor of Nernst cell of LSU < 2560Ω • Trimming of internal resistance of nernst cell of primary O2S not active. That means: Internal resistance measurement pulse is switched off • Electrical adjustment of primary O2S = not active • Either Ceramic temperature of primary O2S > 775° C • OR • Relative heater output of primary O2S heater = 100% • For a calibrated period of time > 0.1 s • For a calibrated number of counts > 20	• 60 s • Continuous	• 2 DCY	– Check the Bank 1 Sensor 1 Heated Oxygen Sensor - GX10- Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653.

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	Heating process after start	Ceramic temperature of primary O2S < 725° C	- RPM > 20 rpm - Integrated heat quantity dependant on MAF through echaust system ≥ 0 – 550 kJ - Battery voltage ≥ 10.7; ≤ 16 V - EGT upstream catalyst > 350° C - Absolute value of change in the voltage signal proportional to internal resistance of Nernst cell < 0.151 V	3.0 s - Once/ DCY	2 DCY	

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P0136 O2 Sensor Circuit Bank 1 Sensor 2	Secondary O2S readiness Bank 1 Heater coupling	- Number of detected secondary O2S heater coupling events ≥ 4 - A heater coupling event at the secondary O2S is detected when: - During heater switch off for the secondary O2S, the change of the sensor voltage signal in between two samples ≥ 2.0 V - During a number of heater power signal switches ≥ 6	- Condition temp. Downstream cat exceeds dew point. That means: - Integrated heat quantity dependant on MAF through exhaust system > 0 to 493.3 kJ - Diagnosis of the power stage of the secondary O2S heater switched on/off	10 s - Continuous	2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7 Checking", page 1650.
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Secondary O2S readiness Bank 1 Range check	- Secondary O2S voltage < 0.060 V - Modeled and measured internal resistance, secondary sensor / result of the load pulse check < 0.015 V	- Fuel system status (deceleration) = no fuel cutoff - Catalyst status = no active enrichment for clear out after a fuel cutoff event	3 s - Continuous	2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7 Checking", page 1650.
P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2	Secondary O2S readiness Bank 1 Range check	- Target lambda secondary O2S $> .995$ V - Output voltage O2S > 1.080 V	Battery voltage > 10.7 V	0.1 s - Continuous	2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7 Checking", page 1650.

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P013A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	Rich to Lean Bank 1 Check of differential transition time at fuel cut off (FCO)	- EWMA filtered maximum differential transition time at fuel cutoff ≥ 0.60 s - Number of checks ≥ 3 (initialization and step change only)	- Fuel system status = fuel cut-off - For time > 2.5 s - Secondary O2S signal before FCO > 0.55 V IF - Fuel cut off time > 20 s THEN - Minimum time to next fuel cut-off 60 s - Downstream O2 signal at end of measurement ≤ 0.15 V - Integrated O2 mass flow during FCO $> 1.8 - 3.0$ g - Time after integrated O2 threshold reached > 0.5 s	10 s - Once/DCY	1 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.
P013B O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 2	Lean to Rich Bank 1 Check of differential transition time at fuel restart after fuel cut off	- EWMA filtered maximum differential transition time at fuel restart after fuel cut off ≥ 1 s - Number of checks ≥ 3	- Fuel system status = Restart after FCO - Downstream O2S signal < 0.15 V IF - Fuel cut off time > 20 s THEN - Minimum time to next fuel cut-off 60 s - Downstream O2 signal at end of measurement ≥ 0.65 V - Integrated O2 mass flow during FCO $> 1.8 - 3.0$ g - Time after integrated O2 threshold reached > 0.5 s	10 s - Once/DCY	1 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.

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P013C O2 Sensor Slow Response - Rich to Lean Bank 2 Sensor 2	Rich to Lean Bank 2 Check of differential transition time at fuel cut off (FCO)	- EWMA filtered maximum differential transition time at fuel cutoff ≥ 0.60 s - Number of checks ≥ 3 (initialization and step change only)	- Fuel system status = fuel cut-off - For time > 2.5 s - Secondary O2S signal before FCO > 0.55 V IF - Fuel cut off time > 20 s THEN - Minimum time to next fuel cut-off 60 Sec. - Downstream O2 signal at end of measurement ≤ 0.15 V - Integrated O2 mass flow during FCO $> 1.8 - 3.0$ g - Time after integrated O2 threshold reached > 0.5 s	10 s - Once/DCY	1 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.
P013D O2 Sensor Slow Response - Lean to Rich Bank 2 Sensor 2	Lean to Rich Bank 2 Check of differential transition time at fuel restart after fuel cut off	- EWMA filtered maximum differential transition time at fuel restart after fuel cut off ≥ 1 s - Number of checks ≥ 3	- Fuel system status = Restart after FCO - Downstream O2S signal < 0.15 V IF - Fuel cut off time > 20 s THEN - Minimum time to next fuel cut-off 60 s - Downstream O2 signal at end of measurement ≥ 0.65 V - Integrated O2 mass flow during FCO $> 1.8 - 3.0$ g - Time after integrated O2 threshold reached > 0.5 s	10 s - Once/DCY	1 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.

P013E O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 2	Rich to Lean Bank 1 Check of differential delay time at Rich to Lean transition	- EWMA filtered maximum differential delay time at Rich to Lean transition > 0.60 s - Number of checks ≥ 3	- Measured lambda < 0.97 V - Secondary O2S voltage ≥ 0.75 V - Secondary O2S Voltage gradient > -0.01 V/Sec - Secondary O2S Voltage gradient < 0.1 V/Sec - Integrated negative O2 mass flow ≥ 0.12 g - Secondary O2S voltage ≥ 0.83 V	25 s - Once/DCY	1 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.
P013F O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 2	Lean to Rich Bank 1 Check of differential delay time at Lean to Rich transition	- EWMA filtered maximum differential delay time at Lean to Rich transition > 1.20 s - Number of checks ≥ 3	- Measured lambda > 1.03 V - Secondary O2S voltage < 0.16V - Secondary O2S Voltage gradient > -0.15 V/Sec - Secondary O2S Voltage gradient < 0.2 V/Sec - Integrated negative O2 mass flow ≥ 0.05 - Secondary O2S voltage < 0.05 V	25 s - Once/DCY	1 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.

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	Secondary O2S slow transition		- Primary O2S is ready for operation: - Ceramic temperature of primary O2S > 665° C - RPM > 480 – 600 rpm - Secondary O2S is ready for operation: - Either: Modeled EGT near secondary O2S ≥ 700° C - Or: secondary O2S heater power ≥ 0.5 - For a calibrated period of time > 10 Sec. - RPM > 520; < 3,000 rpm - Integrated air mass since engine start > 1,000 g - Exhaust mass flow > 3.3 g/sec - Battery voltage > 10.7 V - Modeled EGT at downstream O2S > 500° C - Change of exhaust mass flow > -22.2; < 22.2 g/sec	10 s - Once/DCY	1 DCY	

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P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Secondary O2S readiness Bank 1 No activity of the secondary O2S signal detected	- Output voltage O2S ≥ 0.401 or ≤ 0.602 V - Modeled and measured internal resistance, secondary sensor / result of the load pulse check ≥ 2.798 V - High internal resistance due to wire interruption, that means: True - EGT of downstream catalyst $> 600^\circ\text{C}$ - Internal resistance of lambda sensor downstream $> 40,000 \Omega$	- Secondary O2S is ready for operation: - Modeled EGT near secondary O2S $\geq 700^\circ\text{C}$ - OR - Secondary O2S heater power ≥ 0.5 - For a calibrated period of time > 10 Sec. - Power stage diagnosis of the secondary O2S heater finished - Condition temperature downstream cat exceeds dew point, that means: True - Integrated heat quantity dependant on MAF through exhaust system $\geq 0 - 493.3$ kJ - Condition for lambda sensor heater ready for operation, that means: True - Engine temperature $> -9.8^\circ\text{C}$ - Battery voltage < 16.5 V - For a calibrated period of time > 0.2 Sec. - Condition end of start, that means: RPM $> 480 - 600$ rpm - For a calibrated period of time > 40 s	3 s - Continuous	2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7 Checking", page 1650.

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	Secondary O2S delayed response		• Primary O2S is ready for operation: • Ceramic temperature of primary O2S > 665° C • RPM > 480 – 600 rpm • Secondary O2S is ready for operation: • Either: Modeled EGT near secondary O2S $\geq 700^{\circ}$ C • Or: secondary O2S heater power ≥ 0.5 • For a calibrated period of time > 10 s • Integrated exhaust mass since: • Secondary O2S ready > 1,000 g • Integrated air mass since engine start > 2,000 g • Fuel system status = closed loop • RPM > 1120; < 3,000 rpm • Modeled catalyst temperature > 400; < 800° C • Exhaust mass flow > 11.1; < 33.3 g/sec • Change of exhaust mass flow > -2.8; < 2.8 g/sec	• 25 s • Once/DCY	• 1 DCY	



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P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Secondary O2S heater monitoring Bank 1 Range check	The measured resistance of the secondary O2S's Nernst cell is compared with the calculated temperature dependent reference level 1,000 to 10,000 Ω	- Engine shut off time > 5,000 Sec. - IAT > -6.8° C - RPM > 480-600rpm - Battery voltage ≥ 10.7 V - Battery voltage ≤ 16.1 V - Filtered EGT ≥ 350° C - Filtered EGT ≤ 650° C - Internal resistance of the secondary O2S is calculated and valid. That means: = True - Either: Modeled exhaust temperature near secondary O2S ≥ 700° C - Or: Secondary O2S heater power ≥ 0.5 - Diagnosis of the power stage of the secondary O2S heater = finished - Integrated heat quantity dependant on MAF through exhaust system > 0 – 493.3 kJ - All these conditions of for a calibrated period of time > 10 Sec. - The difference between Modeled and measured internal resistance, secondary sensor with and without test load ≥ 0 - number of measurements to determine the internal resistance of the Nernst cell > 10 - Restart count after elapsed time > 8 Sec. The following conditions may not be detected: - Modeled exhaust temperature near secondary O2S > 600° C	20 s - Continuous	2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7. Checking", page 1650.

			- Measured resistance of the secondary O2S > 40,000Ω - If both conditions are fulfilled the monitor is inhibited until - Measured resistance of the secondary O2S < 1,000Ω - Fuel system status (deceleration) = no fuel cut-off			
P014A O2 Sensor Delayed Response - Rich to Lean Bank 2 Sensor 2	Rich to Lean Bank 2 Check of differential delay time at Rich to Lean transition	- EWMA filtered maximum differential delay time at Rich to Lean transition > 0.60 Sec. - Number of checks ≥ 3	- Measured lambda < 0.97 V - Secondary O2S voltage ≥ 0.75 V - Secondary O2S Voltage gradient > -0.01 V/Sec - Secondary O2S Voltage gradient < 0.1 V/Sec - Integrated negative O2 mass flow ≥ 0.12 g - Secondary O2S voltage ≥ 0.83 V	25 s - Once/DCY	1 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.
P014B O2 Sensor Delayed Response - Lean to Rich Bank 2 Sensor 2	Lean to Rich Bank 2 Check of differential delay time at Lean to Rich transition	- EWMA filtered maximum differential delay time at Lean to Rich transition > 1.20 s - Number of checks ≥ 3	- Measured lambda > 1.03 V - Secondary O2S voltage < 0.16V - Secondary O2S Voltage gradient > -0.15 V/Sec - Secondary O2S Voltage gradient < 0.2 V/Sec - Integrated negative O2 mass flow ≥ 0.05 - Secondary O2S voltage < 0.05 V	25 s - Once/DCY	1 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.

	Secondary O2S slow transition		• Primary O2S is ready for operation: • Ceramic temperature of primary O2S > 665° C • RPM > 480 – 600 rpm • Secondary O2S is ready for operation: • Either: Modeled EGT near secondary O2S ≥ 700° C • Or: secondary O2S heater power ≥ 0.5 • For a calibrated period of time > 10 s • RPM > 520; < 3,000 rpm • Integrated air mass since engine start > 1,000 g • Exhaust mass flow > 3.3 g/sec • Battery voltage > 10.7 V • Modeled EGT at downstream O2S > 500° C • Change of exhaust mass flow > -22.2; < 22.2 g/sec	• 10 s • Once/DCY	• 1 DCY	

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P0150 O2 Sensor Circuit Bank 2 Sensor 1	Primary O2S electrical fault Bank 2 Ceramic temperature and internal resistance of primary O2S	• Ceramic temperature of primary O2S < 690° C • Internal resistance of primary O2S ≥ 950 Ω	• Modeled EGT near primary O2S > 350° C • Battery voltage ≥ 10.7; ≤ 16 V • Heater control of primary O2S active • Primary O2S is ready for operation. That means: • Ceramic temperature of primary O2S > 665° C • RPM > 480 – 600 rpm • Fuel system status, No fuel cutoff • For a calibrated period of time 20 s • Validity flag for calculation of inner resistor. That means: • Reference pump current of primary O2S < 5 • Absolute value of correction for internal resistance of Nerst cell of primary O2S < 2560 Ω • Absolute value of change in the voltage signal proportional to internal resistor of Nerst cell < 0.15 V • Trimming of internal resistor of nernst cell of primary O2S not active. That means: • Inner resistor measurement pulse is switched off • Electrical adjustment of primary O2S not active • Ceramic temperature of primary O2S > 775° C • Relative heater output of primary O2S heater = 100% • For a calibrated period of time > 0.1 s	• 20 s • Continuous	• 2 DCY	– Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659.

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			For a calibrated number of counts > 20			
P0151 O2 Sensor Circuit Low Voltage Bank 2 Sensor 1	Evaluation IC primary O2S Bank 2 Signal range check	- Short to GND Is detected respectively for the single line (VM, UN) when: - Virtual mass (VM) < 1.75 V - Nernst voltage (UN) < 1.50 V	- Battery voltage > 10.7 and < 16.1 V - Engine speed 480 – 600 RPM	5 s - Continuous	2 DCY	Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659.
P0152 O2 Sensor Circuit High Voltage Bank 2 Sensor 1	Evaluation IC primary O2S Bank 2 Signal range check	- Short to battery Is detected respectively for the single line (VM, UN) when: - Virtual mass (VM) > 3.25 V - Nernst voltage (UN) > 4.40 V	- Battery voltage > 10.7 and < 16.1 V - Engine speed 480 – 600 RPM	5 s - Continuous	2 DCY	Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659.

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P0153 O2 Sensor Circuit Slow Response Bank 2 Sensor 1	Dynamic check Primary O2S Signal 2 Signal Dynamic Check	- Number of primary O2S dynamic measurements ≥ 6 - Dynamic value of primary O2S < 0.22	- Primary O2S ready - Ceramic temperature of Primary O2S $> 665^{\circ}\text{C}$ - Engine speed 480 – 600 RPM - Diagnosis primary O2S pump current line, electrical check = finished - Ceramic temperature of primary O2S $> 720^{\circ}\text{C}$ - ECT $\geq 60^{\circ}\text{C}$ - Time since last dynamic measurement $\geq 2\text{ Sec.}$ - RPM $\leq 2,520$; $\geq 1,160\text{ rpm}$ - Engine load ≤ 80; $\geq 27\%$ - Fuel system status (deceleration) = no fuel cut-off - Time constant of lambda control ≤ 0.28; $\geq 0.12\text{ Sec}$ - Modeled EGT near secondary O2S $\geq 500^{\circ}\text{C}$ - Desired lambda setpoint = 1 - Relative load change for release of dynamic measurement $\leq 3\%/ 0.5\text{ Sec.}$ - Condition gear-shift in process = not active	- Immediate - Once per DCY	2 DCY	Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659.

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P0155 O2 Sensor Heater Circuit Bank 2 Sensor 1	Diagnosis of primary O2S heater Bank 2 Sensor element temperature and heater power are different from set value	• Ceramic temperature of primary O2S < 725° C • Relative Heater output > 95%	• RPM > 20 rpm • Integrated heat quantity dependant on MAF through exhaust system ≥ 0 – 550 kJ • Battery voltage ≥ 10.7; ≤ 16 V • EGT upstream catalyst > 350° C • Fuel system status (deceleration) no fuel cut-off • Absolute value of correction for internal resistor of Nernst cell of LSU < 2560Ω • Trimming of internal resistance of nernst cell of primary O2S not active. That means: Internal resistance measurement pulse is switched off • Electrical adjustment of primary O2S = not active • Either Ceramic temperature of primary O2S > 775° C • OR • Relative heater output of primary O2S heater = 100% • For a calibrated period of time > 0.1 s • For a calibrated number of counts > 20	• 60 s • Continuous	• 2 DCY	– Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11 Checking", page 1659 .

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	Heating process after start	• Ceramic temperature of primary O2S < 725° C	• RPM > 20 rpm • Integrated heat quantity dependant on MAF through echaust system $\geq 0 - 550$ kJ • Battery voltage ≥ 10.7; ≤ 16 V • EGT upstream catalyst > 350° C • Absolute value of change in the voltage signal proportional to internal resistance of Nernst cell < 0.151 V	• 3 s • Once/DCY	• 2 DCY	

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P0156 O2 Sensor Circuit Bank 2 Sensor 2	Secondary O2S readiness 2 Heater coupling	- Number of detected secondary O2S heater coupling events ≥ 4 - A heater coupling event at the secondary O2S is detected when: - During heater switch off for the secondary O2S, the change of the sensor voltage signal in between two samples ≥ 2.0 V - During a number of heater power signal switches ≥ 6	- Condition temp. Downstream cat exceeds dew point. That means: - Integrated heat quantity dependant on MAF through exhaust system > 0 to 493.3 kJ - Diagnosis of the power stage of the secondary O2S heater switched on/off	10 s - Continuous	2 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.
P0157 O2 Sensor Circuit Low Voltage Bank 2 Sensor 2	Secondary O2S readiness 2 Range check	- Secondary O2S voltage < 0.060 V - Modeled and measured internal resistance, secondary sensor / result of the load pulse check < 0.015 V	- Fuel system status (deceleration) = no fuel cutoff - Catalyst status = no active enrichment for clear out after a fuel cutoff event	3 s - Continuous	2 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.
P0158 O2 Sensor Circuit High Voltage Bank 2 Sensor 2	Secondary O2S readiness 2 Range check	- Target lambda secondary O2S $> .995$ V - Output voltage O2S > 1.080 V	- Battery voltage > 10.7 V - Secondary O2S is ready for operation: - Modeled EGT near secondary O2S $\geq 700^{\circ}$ C - OR - Secondary O2S heater power ≥ 0.5 - For a calibrated period of time > 10 s	3 s - Continuous	2 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.

P0160 O2 Sensor Circuit No Activity Detected Bank 2 Sensor 2	Secondary O2S readiness 2 No activity of the secondary O2S signal detected	• Output voltage O2S ≥ 0.401 or ≤ 0.602 V • Modeled and measured internal resistance, secondary sensor / result of the load pulse check ≥ 2.798 V • High internal resistance due to wire interruption, that means: True • EGT of downstream catalyst $> 600^{\circ}\text{C}$ • Internal resistance of lambda sensor downstream $> 40,000\ \Omega$	• Secondary O2S is ready for operation: • Modeled EGT near secondary O2S $\geq 700^{\circ}\text{C}$ • OR • Secondary O2S heater power ≥ 0.5 • For a calibrated period of time > 10 s • Power stage diagnosis of the secondary O2S heater finished • Condition temperature downstream cat exceeds dew point, that means: True • Integrated heat quantity dependant on MAF through exhaust system $\geq 0 - 493.3$ kJ • Condition for lambda sensor heater ready for operation, that means: True • Engine temperature $> -9.8^{\circ}\text{C}$ • Battery voltage < 16.5 V • For a calibrated period of time > 0.2 s • Condition end of start, that means: RPM $> 480 - 600$ rpm • For a calibrated period of time > 40 s	• 3 s • Continuous	• 2 DCY	– Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8. Checking", page 1656.

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P0161 O2 Sensor Heater Circuit Bank 2 Sensor 2	Secondary O2S heater monitoring 2 Range check	The measured resistance of the secondary O2S's Nernst cell is compared with the calculated temperature dependent reference level 1,000 to 10,000 Ω	- Engine shut off time > 5,000 Sec. - IAT > -6.8° C - RPM > 480-600rpm - Battery voltage ≥ 10.7 V - Battery voltage ≤ 16.1 V - Filtered EGT ≥ 350° C - Filtered EGT ≤ 650° C - Internal resistance of the secondary O2S is calculated and valid. That means: = True - Either: Modeled exhaust temperature near secondary O2S ≥ 700° C - Or: Secondary O2S heater power ≥ 0.5 - Diagnosis of the power stage of the secondary O2S heater = finished - Integrated heat quantity dependant on MAF through exhaust system > 0 – 493.3 kJ - All these conditions of for a calibrated period of time > 10 Sec. - The difference between Modeled and measured internal resistance, secondary sensor with and without test load ≥ 0 - number of measurements to determine the internal resistance of the Nernst cell > 10 - Restart count after elapsed time > 8 s The following conditions may not be detected: - Modeled exhaust temperature near secondary O2S > 600° C	20 s - Continuous	2 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8. Checking", page 1656.

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			- Measured resistance of the secondary O2S > 40,000Ω - If both conditions are fulfilled the monitor is inhibited until - Measured resistance of the secondary O2S < 1,000Ω - Fuel system status (deceleration) = no fuel cut-off			
P0191 Fuel Rail Pressure Sensor Circuit Range/Performance Bank 1	- Fuel rail pressure sensor Range check high - Fuel rail pressure sensor Range check low	- Actual value fuel pressure ≥ 700 kPa - Actual value fuel pressure ≤ 250 kPa	- RPM > 20 rpm - All injection valves active = true	1.5 s - Continuous	2 DCY	- Check the fuel pressure. Refer to the repair manual for test procedure. - Check the Fuel Pressure Sensor - G247- . Refer to ⇒ "3.6.18 Fuel Pressure Sensor G247- Checking", page 1626 .
P0192 Fuel Rail Pressure Sensor Circuit Low Bank 1	Fuel rail pressure sensor Circuit continuity - short to GND	Mean voltage FRP sensor < 0.30 V	RPM > 480 to 600 revolutions	0.5 s - Continuous	2 DCY	Check the Fuel Pressure Sensor - G247- . Refer to ⇒ "3.6.18 Fuel Pressure Sensor G247- Checking", page 1626 .
P0193 Fuel Rail Pressure Sensor Circuit High Bank 1	Fuel rail pressure sensor Circuit continuity - short to battery	Mean voltage FRP sensor > 4.70 V	RPM > 480 to 600 revolutions	0.5 s - Continuous	2 DCY	Check the Fuel Pressure Sensor - G247- . Refer to ⇒ "3.6.18 Fuel Pressure Sensor G247- Checking", page 1626 .

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P0201 Cylinder 1 Injector "A" Cir- cuit	Fuel In- jection Valves Open cir- cuit	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel Injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0202 Cylinder 2 Injector "A" Cir- cuit	Fuel In- jection Valves Open cir- cuit	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0203 Cylinder 3 Injector "A" Cir- cuit	Fuel In- jection Valves Open cir- cuit	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0204 Cylinder 4 Injector "A" Cir- cuit	Fuel In- jection Valves Open cir- cuit	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0205 Cylinder 5 Injector "A" Cir- cuit	Fuel In- jection Valves Open cir- cuit	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .

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P0206 Cylinder 6 Injector "A" Cir- cuit	Fuel In- jection Valves Open cir- cuit	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0207 Cylinder 7 Injector "A" Cir- cuit	Fuel In- jection Valves Open cir- cuit	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0208 Cylinder 8 Injector "A" Cir- cuit	Fuel In- jection Valves Open cir- cuit	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0221 Throttle/ Pedal Po- sition Sensor/ Switch "B" Cir- cuit Range/ Perform- ance	TP sen- sor 1 / 2 Rationali- ty Check	- difference be- tween TP sen- sor 1 and sen- sor 2 > 6.3% - deviation of sensor 1 / 2 to the reference TP angle > 9.0% - active fault of MAF sensor = True - deviation of TP sensor 1 / 2 from refer- ence angle is greater than deviation of sensor 2 / 1 from refer- ence angle = true - difference be- tween TP sen- sor 1 and sen- sor 2 > 6.3%	- Engine speed > 480 RPM - Battery voltage > 6.5 V - Fuel system status = no safety fuel cut- off	0.3 s - Contin- uous	2 DCY	Check the EPC Throt- tle Drive - G186- . Re- fer to ⇒ "3.6.39 Throttle Valve Con- trol Module GX3, Checking", page 1671 .

P0222 Throttle/ Pedal Po- sition Sensor/ Switch "B" Cir- cuit Low	TP sen- sor 1 / 2 range check low	voltage TP sensor 1 / 2 < 0.176 / 0.156 V	- Battery voltage > 6.5 V - Fuel system status = no safety fuel cut-off - RPM > 0 RPM	0.2 s - Contin- uous	2 DCY	Check the EPC Throt- tle Drive - G186- . Re- fer to ⇒ "3.6.39 Throttle Valve Con- trol Module GX3, Checking", page 1671 .
P0223 Throttle/ Pedal Po- sition Sensor/ Switch "B" Cir- cuit High	TP sen- sor 1 / 2 range check high	voltage TP sensor 1 / 2 > 4.629 / 4.883 V	- Battery voltage > 6.5 V - Fuel system status = no safety fuel cut-off	0.2 s - Contin- uous	2 DCY	Check the EPC Throt- tle Drive - G186- . Re- fer to ⇒ "3.6.39 Throttle Valve Con- trol Module GX3, Checking", page 1671 .
P0234 Turbo- charger/ Super- charger "A" Over- boost Condition	Boost Pressure Control Negative control deviation check	Difference be- tween set point and cur- rent boost pressure > 27 - 112.5 kPa	Engine speed > 300 RPM	2.0 s - Contin- uous	2 DCY	- Check the Charge Pressure Control Sol- enoid 1 - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75, Checking", page 1677 . - Check the Combustion Air Valve - N44- . Refer to ⇒ "3.6.7 Combustion Air Valve N44, Checking", page 1605 .
P0236 Turbo- charger/ Super- charger Boost Sensor "A" Cir- cuit Range/ Perform- ance	TCB pressure sensor Rationali- ty check	- Measured val- ue from boost pressure sen- sor + 2 kPa < BARO -10 kPa - Measured val- ue from boost pressure sen- sor -2 kPa > BARO -20 kPa	- Engine speed < 1,000 RPM - Throttle angle < 5% - For a calibrated pe- riod of time > 3 s	3.0 s - Contin- uous 2.0 s - Contin- uous	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71, Checking", page 1640 .

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P0237 Turbo-charger/ Super-charger Boost Sensor "A" Cir- cuit Low	TCB pressure sensor Range check	• Measured value from pressure sensor < 37 kPa	• Signal voltage, pressure sensor < 4.88 V	• 2.0 s • Continuous	• 2 DCY	– Check the Manifold Absolute Pressure Sensor - G71-. Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71, Checking", page 1640
	TCB pressure sensor Circuit continuity - short to GND	• Pressure sensor voltage < 0.20 V	• Engine speed > 80 rpm	• 1.0 s • Continuous		
P0238 Turbo-charger/ Super-charger Boost Sensor "A" Cir- cuit High	TCB pressure sensor Range check	• Measured value from pressure sensor > 300 kPa	• Signal voltage, pressure sensor > 0.20 V	• 2.0 s • Continuous	• 2 DCY	– Check the Manifold Absolute Pressure Sensor - G71-. Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71, Checking", page 1640
	TCB pressure sensor Circuit continuity - short to battery	• Pressure sensor voltage > 4.879 V	• Engine speed > 80 rpm	• 1.0 s • Continuous		
P0243 Turbo-charger/ Super-charger Waste-gate Ac- tuator "A"	Boost Control Power Stage Circuit continuity - Open circuit	• Voltage IC internal	• Battery voltage > 9 V • Engine speed > 80 RPM	• Immediate • Continuous	• 2 DCY	– Check the Charge Pressure Control Solenoid 1 - N75-. Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75, Checking", page 1677
P0245 Turbo-charger/ Super-charger Waste-gate Ac- tuator "A" Low	Boost Control Power Stage Circuit continuity - short to GND	• Voltage IC internal	• Battery voltage > 9 V • Engine speed > 80 RPM	• Immediate • Continuous	• 2 DCY	– Check the Charge Pressure Control Solenoid 1 - N75-. Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75, Checking", page 1677

P0246 Turbo-charger/ Super-charger Waste-gate Ac- tuator "A" High	Boost Control Power Stage Circuit continuity - short to battery	Voltage IC in- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Charge Pressure Control Sol- enoid 1 - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75, Checking", page 1677 .
P0261 Cylinder 1 Injector "A" Cir- cuit Low	Fuel In- jection Valve Short To GND	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0262 Cylinder 1 Injector "A" Cir- cuit High	Fuel In- jection Valve short to battery voltage	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0264 Cylinder 2 Injector "A" Cir- cuit Low	Fuel In- jection Valve Short To GND	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0265 Cylinder 2 Injector "A" Cir- cuit High	Cylinder 2 Injector Circuit High	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .

P0267 Cylinder 3 Injector "A" Cir- cuit Low	Fuel In- jection Valve Short To GND	• Voltage IC In- ternal	• Battery voltage > 9 V • Engine speed > 80 RPM	• Imme- diate • Contin- uous	• 2 DCY	– Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0268 Cylinder 3 Injector "A" Cir- cuit High	Cylinder 3 Injector Circuit High	• Voltage IC In- ternal	• Battery voltage > 9 V • Engine speed > 80 RPM	• Imme- diate • Contin- uous	• 2 DCY	– Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0270 Cylinder 4 Injector "A" Cir- cuit Low	Fuel In- jection Valve Short To GND	• Voltage IC In- ternal	• Battery voltage > 9 V • Engine speed > 80 RPM	• Imme- diate • Contin- uous	• 2 DCY	– Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0271 Cylinder 4 Injector "A" Cir- cuit High	Cylinder 4 Injector Circuit High	• Voltage IC In- ternal	• Battery voltage > 9 V • Engine speed > 80 RPM	• Imme- diate • Contin- uous	• 2 DCY	– Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0273 Cylinder 5 Injector "A" Cir- cuit Low	Fuel In- jection Valve Short To GND	• Voltage IC In- ternal	• Battery voltage > 9 V • Engine speed > 80 RPM	• Imme- diate • Contin- uous	• 2 DCY	– Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .

P0274 Cylinder 5 Injector "A" Cir- cuit High	Cylinder 5 Injector Circuit High	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0276 Cylinder 6 Injector "A" Cir- cuit Low	Fuel In- jection Valve Short To GND	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0277 Cylinder 6 Injector "A" Cir- cuit High	Cylinder 6 Injector Circuit High	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0279 Cylinder 7 Injector "A" Cir- cuit Low	Fuel In- jection Valve Short To GND	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0280 Cylinder 7 Injector "A" Cir- cuit High	Cylinder 7 Injector Circuit High	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .

P0282 Cylinder 8 Injector "A" Cir- cuit Low	Fuel In- jection Valve Short To GND	• Voltage IC In- ternal	• Battery voltage > 9 V • Engine speed > 80 RPM	• Imme- diate • Contin- uous	• 2 DCY	– Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .
P0283 Cylinder 8 Injector "A" Cir- cuit High	Cylinder 8 Injector Circuit High	• Voltage IC In- ternal	• Battery voltage > 9 V • Engine speed > 80 RPM	• Imme- diate • Contin- uous	• 2 DCY	– Check the Fuel injec- tors - N30, N31, N32, N33, N84, N84, N85, N86- . Refer to ⇒ "3.6.17 Fuel Injec- tors, Checking", page 1624 .

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P0299 Turbo-charger/ Super-charger "A" Underboost Condition	Boost Pressure Control Positive control deviation check	• Difference between set point and current boost pressure > 20 kPa	• Condition boost control active, that means: Active • Setpoint exceeds current boost pressure > 4.8 kPa • Idle speed, that means: active • Either: status cruise control over rides AP < 0 • Or: AP propulsion demand status < 0 • Condition idle speed > 1 • Condition for TC response speed, that means: active • Engine speed > 2,240 – 2,760 • Setpoint exceeds current boost pressure > 15 kPa • BARO > 75 kPa • Condition locking diagnosis boost pressure control, not active • Condition air circulation valve open, not active • Gradient of AP angle > -2.34% • Either: Predicted delta MAP < 0 – 24.75 kPa • OR: Factor pressure at throttle blade to reference boost pressure < 1 – 1.23 • OR: Ratio TCB pressure to BARO < 1.35 – 3.90 1/(g/ sec)	• 2 s • Continuous	• 2 DCY	– Check the Charge Pressure Control Solenoid 1 - N75- . Refer to ⇒ “3.6.42 Wastegate Bypass Regulator Valve N75, Checking”, page 1677 . – Check the Combustion Air Valve - N44- . Refer to ⇒ “3.6.7 Combustion Air Valve N44, Checking”, page 1605

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P0300 Random/ Multiple Cylinder Misfire Detected	Crank- shaft speed fluctua- tion multi- ple mis- fire	- Emissions rel- evant misfire rate > 2.4% - No misfires > 96 /1,000rev. - Fault thresh- olds (no. mis- fires): > 82 / 1,000rev - Fault thresh- olds CSERS (no. misfires): > 75 /1,000rev	- Engine speed > 360 rpm - Engine load > 4.3 – 19.9% - IAT > -48° C During engine start on- ly: - ECT at start > -8.3° C - If ECT at engine start is below -8.25° C the monitor is re- leased when engine temperature > 19.5° C	1,000 Rev. - Contin- uous	2 DCY	If a Fuel system rich or lean fault exists, per- form the di- agnostic for those codes first. Use a scan tool and note whether the miss is spe- cific to a few cylinders or is random. If random, check for contamina- tion in the fuel by drawing a fuel sample.
		Catalyst dam- aging misfire rate > 14 – 47%	- RPM during start > 410 rpm - Ignition counter > 7 - Load change gradi- ent < 768 %/rev - RPM gradient < 25,600 rpm/sec - Fuel system status (deceleration) = no fuel cut-off - Fuel system status: no safety fuel cut-off	200 Rev. - Contin- uous	Imme- diately	- Check spark plugs for signs of fouling. - Check Fuel Pressure. Refer to ap- propriate repair man- ual for pro- cedure. - Check Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injec- tors . Checking", page 1624 . - Check Igni- tion Coils With Power Output Stage . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .

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P0301 Cylinder 1 Misfire Detected	Crank- shaft speed fluctua- tion sin- gle mis- fire cylin- der 1-8	- Emissions rel- evant misfire rate > 2.4% - No misfires > 96 /1,000rev. - Fault thresh- olds (no. mis- fires): > 82 / 1,000rev - Fault thresh- olds CSERS (no. misfires): > 75 /1,000rev - Catalyst dam- aging misfire rate > 14 – 47%	- Engine speed > 360 rpm - Engine load > 4.3 – 19.9% - IAT > -48° C During engine start on- ly: - ECT at start > -8.3° C - If ECT at engine start is below -8.25° C the monitor is re- leased when engine temperature > 19.5° C - RPM during start > 410 rpm - Ignition counter > 7 - Fuel system status (deceleration) = no fuel cut-off - Fuel system status: no safety fuel cut-off	1,000 Rev. - Contin- uous 200 Rev. - Contin- uous	2 DCY - Immed.	- Check fuel injector . Refer to ⇒ “3.6.17 Fuel Injec- tors . Checking”, page 1624 - Check Igni- tion Coil with Power Output Stage - N70- . Refer to ⇒ “3.6.21 Ignition Coils With Power Out- put Stage . Checking”, page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by per- forming a cylinder pressure test.
P0302 Cylinder 2 Misfire Detected	Crank- shaft speed fluctua- tion sin- gle mis- fire cylin- der 1-8	- Emissions rel- evant misfire rate > 2.4% - No misfires > 96 /1,000rev. - Fault thresh- olds (no. mis- fires): > 82 / 1,000rev - Fault thresh- olds CSERS (no. misfires): > 75 /1,000rev	- Engine speed > 360 rpm - Engine load > 4.3 – 19.9% - IAT > -48° C During engine start on- ly: - ECT at start > -8.3° C - If ECT at engine start is below -8.25° C the monitor is re- leased when engine temperature > 19.5° C - RPM during start > 410 rpm - Ignition counter > 7 - Fuel system status (deceleration) = no fuel cut-off - Fuel system status: no safety fuel cut-off	1,000 Rev. - Contin- uous	2 DCY	- Check fuel injector . Refer to ⇒ “3.6.17 Fuel Injec- tors . Checking”, page 1624 - Check Igni- tion Coil with Power Output Stage - N70- . Refer to ⇒ “3.6.21 Ignition Coils With Power Out- put Stage . Checking”, page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by per- forming a

		Catalyst damaging misfire rate > 14 – 47%		200 Rev. - Continuous	Immed.	cylinder pressure test.
P0303 Cylinder 3 Misfire Detected	Crankshaft speed fluctuation single misfire cylinder 1-8	- Emissions relevant misfire rate > 2.4% - No misfires > 96 /1,000rev. - Fault thresholds (no. misfires): > 82 / 1,000rev - Fault thresholds CSERS (no. misfires): > 75 /1,000rev - Catalyst damaging misfire rate > 14 – 47%	- Engine speed > 360 rpm - Engine load > 4.3 – 19.9% - IAT > -48° C During engine start only: - ECT at start > -8.3° C - If ECT at engine start is below -8.25° C the monitor is released when engine temperature > 19.5° C - RPM during start > 410 rpm - Ignition counter > 7 - Fuel system status (deceleration) = no fuel cut-off - Fuel system status: no safety fuel cut-off	1,000 Rev. - Continuous 200 Rev. - Continuous	2 DCY - Immed.	- Check fuel injector . Refer to ⇒ “3.6.17 Fuel Injectors, Checking”, page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage, Checking”, page 1633 - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.

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P0304 Cylinder 4 Misfire Detected	Crank- shaft speed fluctua- tion sin- gle mis- fire cylin- der 1-8	- Emissions rel- evant misfire rate > 2.4% - No misfires > 96 /1,000rev. - Fault thresh- olds (no. mis- fires): > 82 / 1,000rev - Fault thresh- olds CSERS (no. misfires): > 75 /1,000rev - Catalyst dam- aging misfire rate > 14 – 47%	- Engine speed > 360 rpm - Engine load > 4.3 – 19.9% - IAT > -48° C During engine start on- ly: - ECT at start > -8.3° C - If ECT at engine start is below -8.25° C the monitor is re- leased when engine temperature > 19.5° C - RPM during start > 410 rpm - Ignition counter > 7 - Fuel system status (deceleration) = no fuel cut-off - Fuel system status: no safety fuel cut-off	1000 Rev. - Contin- uous 200 Rev. - Contin- uous	2 DCY - Immed.	- Check fuel injector . Refer to ⇒ “3.6.17 Fuel Injec- tors . Checking”, page 1624 - Check Igni- tion Coil with Power Output Stage - N70- . Refer to ⇒ “3.6.21 Ignition Coils With Power Out- put Stage . Checking”, page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by per- forming a cylinder pressure test.
P0305 Cylinder 5 Misfire Detected	Crank- shaft speed fluctua- tion sin- gle mis- fire cylin- der 1-8	- Emissions rel- evant misfire rate > 2.4% - No misfires > 96 /1,000rev. - Fault thresh- olds (no. mis- fires): > 82 / 1,000rev - Fault thresh- olds CSERS (no. misfires): > 75 /1,000rev	- Engine speed > 360 rpm - Engine load > 4.3 – 19.9% - IAT > -48° C During engine start on- ly: - ECT at start > -8.3° C - If ECT at engine start is below -8.25° C the monitor is re- leased when engine temperature > 19.5° C - RPM during start > 410 rpm - Ignition counter > 7 - Load change gradi- ent < 768 %/rev - RPM gradient < 25,600 rpm/sec - Fuel system status (deceleration) = no fuel cut-off	1000 Rev. - Contin- uous	2 DCY	- Check fuel injector . Refer to ⇒ “3.6.17 Fuel Injec- tors . Checking”, page 1624 - Check Igni- tion Coil with Power Output Stage - N70- . Refer to ⇒ “3.6.21 Ignition Coils With Power Out- put Stage . Checking”, page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by per- forming a

		Catalyst damaging misfire rate > 14 – 47%	Fuel system status: no safety fuel cut-off	200 Rev. - Continuous	Immed.	cylinder pressure test.
P0306 Cylinder 6 Misfire Detected	Crankshaft speed fluctuation single misfire cylinder 1-8	- Emissions relevant misfire rate > 2.4% - No misfires > 96 /1,000rev. - Fault thresholds (no. misfires): > 82 / 1,000rev - Fault thresholds CSERS (no. misfires): > 75 /1,000rev - Catalyst damaging misfire rate > 14 – 47%	- Engine speed > 360 rpm - Engine load > 4.3 – 19.9% - IAT > -48° C During engine start only: - ECT at start > -8.3° C - If ECT at engine start is below -8.25° C the monitor is released when engine temperature > 19.5° C - RPM during start > 410 rpm - Ignition counter > 7 - Load change gradient < 768 %/rev - RPM gradient < 25,600 rpm/sec - Fuel system status (deceleration) = no fuel cut-off - Fuel system status: no safety fuel cut-off	1000 Rev. - Continuous 200 Rev. - Continuous	2 DCY - Immed.	- Check fuel injector . Refer to ⇒ “3.6.17 Fuel Injectors, Checking”, page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage, Checking”, page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.

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P0307 Cylinder 7 Misfire Detected	Crank- shaft speed fluctua- tion sin- gle mis- fire cylin- der 1-8	- Emissions rel- evant misfire rate > 2.4% - No misfires > 96 /1,000rev. - Fault thresh- olds (no. mis- fires): > 82 / 1,000rev - Fault thresh- olds CSERS (no. misfires): > 75 /1,000rev - Catalyst dam- aging misfire rate > 14 – 47%	- Engine speed > 360 rpm - Engine load > 4.3 – 19.9% - IAT > -48° C During engine start on- ly: - ECT at start > -8.3° C - If ECT at engine start is below -8.25° C the monitor is re- leased when engine temperature > 19.5° C - RPM during start > 410 rpm - Ignition counter > 7 - Fuel system status (deceleration) = no fuel cut-off - Fuel system status: no safety fuel cut-off	1000 Rev. - Contin- uous 200 Rev. - Contin- uous	2 DCY - Immed.	- Check fuel injector . Refer to ⇒ “3.6.17 Fuel Injec- tors , Checking”, page 1624 - Check Igni- tion Coil with Power Output Stage - N70- . Refer to ⇒ “3.6.21 Ignition Coils With Power Out- put Stage , Checking”, page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by per- forming a cylinder pressure test.
P0308 Cylinder 8 Misfire Detected	Crank- shaft speed fluctua- tion sin- gle mis- fire cylin- der 1-8	- Emissions rel- evant misfire rate > 2.4% - No misfires > 96 /1,000rev. - Fault thresh- olds (no. mis- fires): > 82 / 1,000rev - Fault thresh- olds CSERS (no. misfires): > 75 /1,000rev	- Engine speed > 360 rpm - Engine load > 4.3 – 19.9% - IAT > -48° C During engine start on- ly: - ECT at start > -8.3° C - If ECT at engine start is below -8.25° C the monitor is re- leased when engine temperature > 19.5° C - RPM during start > 410 rpm - Ignition counter > 7 - Fuel system status (deceleration) = no fuel cut-off - Fuel system status: no safety fuel cut-off	1000 Rev. - Contin- uous	2 DCY	- Check fuel injector . Refer to ⇒ “3.6.17 Fuel Injec- tors , Checking”, page 1624 - Check Igni- tion Coil with Power Output Stage - N70- . Refer to ⇒ “3.6.21 Ignition Coils With Power Out- put Stage , Checking”, page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by per- forming a

		Catalyst damaging misfire rate > 14 – 47%		200 Rev. - Continuous	Immed.	cylinder pressure test.
P0321 Ignition/Distributor Engine Speed Input Circuit Range/Performance	RPM sensor RPM signal check	Debounce counter wrong crankshaft signal > 80	- Engine speed > 520 RPM - Engine reverse running not detected - Vehicle speed < 0.8 or > 19.2 mph - Sync between cam and crank finished	- Immediate - Continuous	2 DCY	Check Engine Speed Sensor - G28- . Refer to "3.6.13 Engine Speed Sensor G28, Checking", page 1616 .
P0322 Ignition/Distributor Engine Speed Input Circuit No Signal	RPM sensor RPM signal check	- Crank gap found = not active - Waiting for crank gap = not active - Disable new synchronization = not active - Camshaft rotation counter > 1	- Engine speed > 520 RPM - Engine reverse running not detected - Vehicle speed < 0.8 or > 19.2 mph - Sync between cam and crank finished	- Immediate - Continuous	2 DCY	Check Engine Speed Sensor - G28- . Refer to "3.6.13 Engine Speed Sensor G28, Checking", page 1616 .
P0324 Knock Control System Error	KS signal evaluation Number of faults in a measuring time frame Number of faults per combustion	- Counter of knock control measuring window evaluation errors > 2 counts - Counter of knock control signal evaluation errors per combustion > 48 counts - Measurement window angle ≤ 0.40 rev.	- Detection range of determined number of ignitions passed at least once - Number of ignitions = 600 - Engine speed > 2,500 RPM	3 s - Continuous	2 DCY	- Check Knock Sensor 1 - G61- . Refer to "3.6.22 Knock Sensor 1 G61, Checking", page 1634 . - Check Knock Sensor 2 - G66- . Refer to "3.6.23 Knock Sensor 2 G66, Checking", page 1636 .

P0327 Knock/ Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	KS line diagnostic Bank 1 Reference signal check	Reference signal < -0.7 V	- Engine speed > 1,000 RPM - Transient condition of engine load is detected, false - Transient condition of RPM is detected, false	250 working cycles - Continuous	2 DCY	Check Knock Sensor 1 - G61-. Refer to ⇒ "3.6.22 Knock Sensor 1 G61, Checking", page 1634.
	Monitoring via knock-sensor-and-cylinder-based basic reference noise signal (voltage)	- Sensor individual signal value low < 0.4 – 10.9 V - For number of times > 20 counts	- Knock control is active, true - Cylinder identification is possible, false - Transient condition of engine load is detected, false - Transient condition of RPM is detected, false - Engine speed > 1,720 rpm	2.0 s - Continuous		
P0328 Knock/ Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	KS line diagnostic Bank 1 Reference signal check	Reference signal > 1.0 V	- Engine speed > 1,000 RPM - Transient condition of engine load is detected, false - Transient condition of RPM is detected, false	250 working cycles - Continuous	2 DCY	Check Knock Sensor 1 - G61-. Refer to ⇒ "3.6.22 Knock Sensor 1 G61, Checking", page 1634.
	Monitoring via knock-sensor-and-cylinder-based basic reference noise signal (voltage)	- Sensor individual signal value high > 14.4 – 285 V - For number of times > 20 counts	- Knock control is active, true - Cylinder identification is possible, false - Transient condition of engine load is detected, false - Transient condition of RPM is detected, false - Engine speed > 1,720 rpm	2.0 s - Continuous		
P0332 Knock/ Combustion Vibration Sensor 2 Circuit Low Bank 2	KS line diagnostic Bank 2 Reference signal check	Reference signal < -0.7 V	- Engine speed > 1,000 RPM - Transient condition of engine load is detected, false - Transient condition of RPM is detected, false	250 working cycles - Continuous	- Continuous 2 DCY	Check Knock Sensor 2 - G66-. Refer to ⇒ "3.6.23 Knock Sensor 2 G66, Checking", page 1636.

	Monitoring via knock-sensor-and-cylinder-based basic reference noise signal (voltage)	• Sensor individual signal value low < 0.4 – 10.9 V • For number of times > 20 counts	• Knock control is active, true • Cylinder identification is possible, false • Transient condition of engine load is detected, false • Transient condition of RPM is detected, false • Engine speed > 1,720 rpm	• 2.0 s • Continuous		
P0333 Knock/Combustion Vibration Sensor 2 Circuit High Bank 2	KS line diagnostic Bank 2 Reference signal check	• Reference signal > 1.0 V	• Engine speed > 1,000 RPM • Transient condition of engine load is detected, false • Transient condition of RPM is detected, false	• 250 working cycles • Continuous	• Continuous • 2 DCY	– Check Knock Sensor 2 - G66- . Refer to "3.6.23 Knock Sensor 2 G66, Checking", page 1636 .
	Monitoring via knock-sensor-and-cylinder-based basic reference noise signal (voltage)	• Sensor individual signal value high > 14.4 – 285 V • For number of times > 20 counts	• Knock control is active, true • Cylinder identification is possible, false • Transient condition of engine load is detected, false • Transient condition of RPM is detected, false • Engine speed > 1,720 rpm	• 2.0 s • Continuous		
P0341 Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	CMP Sensor rationality check	• invalid CMP sensor signal pattern for (no alternating signal pattern) > 80	• Crankshaft gap found	• Immediate • Continuous	• 2 DCY	– Check Intake Camshaft Position Sensor - G40- . Refer to "3.6.4 Camshaft Position Sensor G40, Checking", page 1599 .

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P0342 Camshaft Position Sensor "A" Cir- cuit Low Bank 1 or Single Sensor	CMP Sensor low check	CMP sensor signal pattern permanently low for ≥ 8	Crankshaft gap found	- Imme- diate - Contin- uous	2 DCY	Check In- take Cam- shaft Posi- tion Sensor - G40- . Re- fer to ⇒ "3.6.4 Camshaft Position Sensor G40 . Checking", page 1599 .
P0343 Camshaft Position Sensor "A" Cir- cuit High Bank 1 or Single Sensor	CMP Sensor high check	CMP sensor signal pattern permanently high for ≥ 8	Crankshaft gap found	- Imme- diate - Contin- uous	2 DCY	Check In- take Cam- shaft Posi- tion Sensor 1 - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40 . Checking", page 1599 .
P0351 Ignition Coil "A" Primary Control Circuit/ Open	Ignition coil Cir- cuit con- tinuity - open cir- cuit	IC internal - error flag for 'open circuit' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P0352 Ignition Coil "B" Primary Control Circuit/ Open	Ignition coil Cir- cuit con- tinuity - open cir- cuit	IC internal - error flag for 'open circuit' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N127- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P0353 Ignition Coil "C" Primary Control Circuit/ Open	Ignition coil Cir- cuit con- tinuity - open cir- cuit	IC internal - error flag for 'open circuit' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N291- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .

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P0354 Ignition Coil "D" Primary Control Circuit/ Open	Ignition coil Cir- cuit con- tinuity - open cir- cuit	IC internal - error flag for 'open circuit' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N292- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P0355 Ignition Coil "E" Primary Control Circuit/ Open	Ignition coil Cir- cuit con- tinuity - open cir- cuit	IC internal - error flag for 'open circuit' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N323- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P0356 Ignition Coil "F" Primary Control Circuit/ Open	Ignition coil Cir- cuit con- tinuity - open cir- cuit	IC internal - error flag for 'open circuit' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N324- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P0357 Ignition Coil "G" Primary Control Circuit/ Open	Ignition coil Cir- cuit con- tinuity - open cir- cuit	IC internal - error flag for 'open circuit' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N325- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .

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P0358 Ignition Coil "H" Primary Control Circuit/ Open	Ignition coil Cir- cuit con- tinuity - open cir- cuit	IC internal - error flag for 'open circuit' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N326- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking". page 1633 .
P0418 AIR Sys- tem Con- trol "A" Circuit	Power stage of AIR pump Bank 1 Circuit continuity - Open circuit	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check Sec- ondary Air Injection (AIR) Pump Relay 1 -- J299-- . Re- fer to ⇒ "3.6.34 Secondary Air Injection Pump Re- lay J299 / Secondary Air Injection Pump Mo- tor V101 . Checking". page 1661 .
P0419 AIR Sys- tem Con- trol "B" Circuit	Power stage of AIR pump Bank 2 Circuit continuity - Open circuit	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check Sec- ondary Air Injection (AIR) Pump Relay 2 -- J545-- . Re- fer to ⇒ "3.6.35 Secondary Air Injection Pump Re- lay 2 J545 / Secondary Air Injection Pump Mo- tor 2 V189 . Checking". page 1664 .

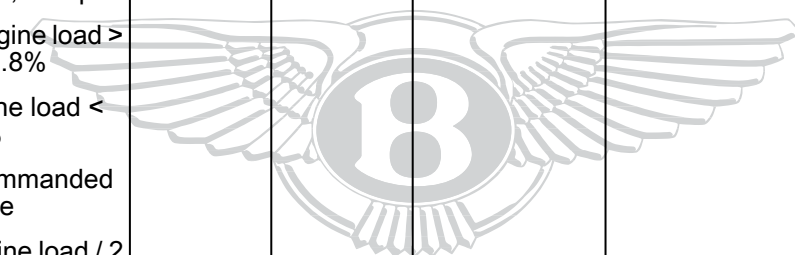
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P0420 Catalyst System Efficiency Below Thresh- old Bank 1	Catalyst Bank 1 Oxygen storage capacity (OSC)	Ratio: mean OSC of measured catalyst / OSC of defined border-line catalyst bank 1 / bank 2 < 1.0	- AAT > -9.8° C - AIR system, not active - Canister purge, not active - Diagnosis of canister purge system, not active - Current change in relative fuel amount < 30% - Fuel system status, Closed Loop - Secondary O2S is ready for operation: A: - Sensor is warm: - Either modeled EGT downstream main catalyst ≥ 700° C - Or a secondary O2S heater power ≥ 50% All for a time > 30 s B: - Secondary O2S voltage is moving into a plausible range: - Either secondary O2S voltage ≤ 0.401 V - Or secondary O2S voltage is within the voltage range of: - Lower voltage threshold ≥ 0.602 V - Upper voltage threshold ≤ 1.080 V - Integrated heat quantity dependant on MAF through exhaust system > 0 – 493.3 kJ - For a calibrated period of time > 90 s - Catalyst status, no active enrichment for clear out after a fuel cut - Exhaust gas mass flow through catalyst > 6.9; < 27.8 g/sec.	9 s - Once/DCY	1 DCY	- Check the exhaust system for leaks and correct any defects found. If any misfire or fuel trim codes are also set, correct those codes first. - Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 . - Check Three Way Catalytic Converter (TWC). Refer to "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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			- Modeled EGT near secondary O2S > 500; < 800° C - Engine speed > 1,000; < 2,520 rpm - Either engine load > 20.3 – 21.8% - and engine load < 30 – 60% - Or for commanded CD, active - Both engine load / 2 > 20.3 – 21.8% - And engine load / 2 < 30 – 60% - Absolute change of modeled catalyst temperature < 30° C - For a calibrated period of time > 10 Sec. - Absolute change of MAF < 6.94 g/sec - For a calibrated period of time > 1.6 s - Difference between lambda actual value and lambda set point value < 0.04 - For a calibrated period of time > 1 Sec. - Closed loop set point value not at limits: - Set point value > 0.75 – 0.85 - Set point value < 1.25 - Fuel System Status = Closed Loop			



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P0430 Catalyst System Efficiency Below Thresh- old Bank 2	Catalyst Bank 2 Oxygen storage capacity (OSC)	Ratio: mean OSC of measured catalyst / OSC of defined border-line catalyst bank 1 / bank 2 < 1.0	- AAT > -9.8° C - AIR system, not active - Canister purge, not active - Diagnosis of canister purge system, not active - Current change in relative fuel amount < 30% - Fuel system status, Closed Loop - Secondary O2S is ready for operation: A: - Sensor is warm: - Either modeled EGT downstream main catalyst ≥ 700° C - Or a secondary O2S heater power ≥ 50% - All for a time > 30 s B: - Secondary O2S voltage is moving into a plausible range: - Either secondary O2S voltage ≤ 0.401 V - Or secondary O2S voltage is within the voltage range of: - Lower voltage threshold ≥ 0.602 V - Upper voltage threshold ≤ 1.080 V - Integrated heat quantity dependant on MAF through exhaust system > 0 – 493.3 kJ - For a calibrated period of time > 90 s - Catalyst status, no active enrichment for clear out after a fuel cut - Exhaust gas mass flow through catalyst > 6.9; < 27.8 g/sec.	9 s - Once/DCY	1 DCY	- Check the exhaust system for leaks and correct any defects found. - Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check Oxygen Sensor 2 After Catalytic Converter - G131- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 . - Check Three Way Catalytic Converter (TWC). Refer to "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

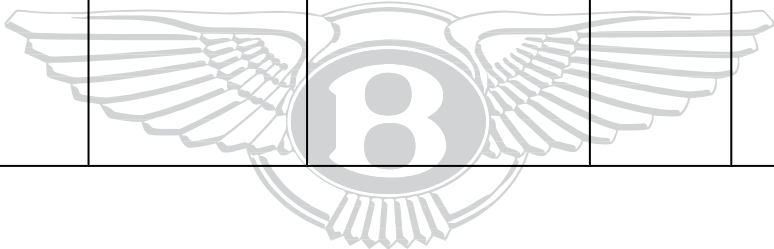
			- Modeled EGT near secondary O2S > 500; < 800° C - Engine speed > 1,000; < 2,520 rpm - Either engine load > 20.3 – 21.8% - and engine load < 30 – 60% - Or for commanded CD, active - Both engine load / 2 > 20.3 – 21.8% - And engine load / 2 < 30 – 60% - Absolute change of modeled catalyst temperature < 30°C - For a calibrated period of time > 10 s - Absolute change of MAF < 6.94 g/sec - For a calibrated period of time > 1.6 s - Difference between lambda actual value and lambda set point value < 0.04 - For a calibrated period of time > 1 s - Closed loop set point value not at limits: - Set point value > 0.75 – 0.85 - Set point value < 1.25 - Fuel System Status = Closed Loop		

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P0441 EVAP System Incorrect Purge Flow	Evapora- tive Sys- tem Lambda deviation check	• Absolute value of change of lambda control factor depending on MAF < 0.035 – 0.060 - OR • Difference between maximum and minimum value of lambda control factor depending on MAF • All for calibrated period of time > 10 s - OR • Required number of checks CPV detected not ok > number of checks CPV detected ok > 1 • Relative purge valve performance < 31% • Torque loss adaptation < 2%	• Altitude < 2800 m • Battery voltage ≥ 11; ≤ 16 V • AAT > 3.8° C • Active fault of AAT sensor active • ECT > 60° C • Modeled ECT > 60° C • Fuel system status; closed loop • Active fault of RPM sensor; not active • Closed loop control readiness for canister purge; true • Purged mass flow before first check of diagnosis ≥ 2 g • Purged mass flow between two diagnosis ≥ 2 g • Time after engine start > 600 s • Deviation of A/F-controller signal from its lower limit > 0.10 • Deviation of A/F-controller signal from its upper limit < -0.10 • Change of A/F-controller signal for detection of stable condition < 0.02 • RPM ≤ 700 rpm • RPM deviation from setpoint ≤ 100 rpm • Engine load ≤ 34.99% • Engine load > 15% • Change of engine load ≤ 4% • Desired torque change from the ISC < 0.5 • Ratio of maximal purge flow vs. current MAF ≥ 0.075 • Vehicle speed = 0 mph • ISC; active	• < 60 s • Once/DCY	• 2 DCY	– Check for restrictions or kinks in the EVAP pipes, including charcoal intrusion into the pipes. If pipes are free from obstruction: Check Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .

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			Diagnosis idle speed controller; not active			
P0442 EVAP System Leak Detected (small leak)	Evaporative System Small Leak Pressure Check	Time for pressure drop > 1.6 - 2.6 s	- Time after engine start > 5; < 1,200 s - ECT > 3.8 and < 110.3° C - Engine off time > 900 s - IAT > 3 and < 90° C - IAT drop after engine start < 8.25° C - Altitude, < 2700 m - Vehicle speed has exceeded at least once > 5.47 mph - Decrease in ECT during engine off period > 45° C - LDP, Activated - Driving downhill; not detected - Change in BARO > 0.25 kPa - Change in vehicle speed < 1.55 mph	81 s - Once/DCY	2 DCY	Check Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .
P0444 EVAP System Purge Control Valve "A" Circuit Open	Canister purge valve power-stage Circuit continuity - Open circuit	Voltage	- Battery voltage > 9 V - Engine speed > 80 RPM	- Immediate - Continuous	2 DCY	Check Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .



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P0455 EVAP System Leak De- tected (large leak)	Evapora- tive Sys- tem Gross Leak Pressure Check	• Time for pres- sure drop < 0.95 - 1.0 s	• Time after engine start > 5; < 1,200 s • ECT > 3.8 and < 110.3° C • Engine off time > 900 s • IAT > 3 and < 90° C • IAT drop after en- gine start < 8.25° C • Altitude, < 2700 m • Vehicle speed has exceeded at least once > 5.47 mph • Decrease in ECT during engine off period > 45° C • LDP, Activated • Driving downhill; not detected • Change in BARO > 0.25 kPa • Change in vehicle speed < 1.55 mph	• 78 s • Once/ DCY	• 2 DCY	– Inspect all the EVAP attaching pipes and hoses for damage. Check the gas cap for tightness. – Check the EVAP Sys- tem for Leaks. Re- fer to ⇒ "2.2.4 EVA P System, Checking for Leaks", page 6. – Check Evaporative Emission (EVAP) Canister Purge Reg- ulator Valve - N80- . Re- fer to ⇒ "3.6.14 EVAP Can- ister Purge Regulator Valve 1 N80, Checking", page 1619. – Check Leak Detection Pump (LDP) - V144- . Re- fer to ⇒ "3.6.24 Leak Detec- tion Pump V144, Checking", page 1638.

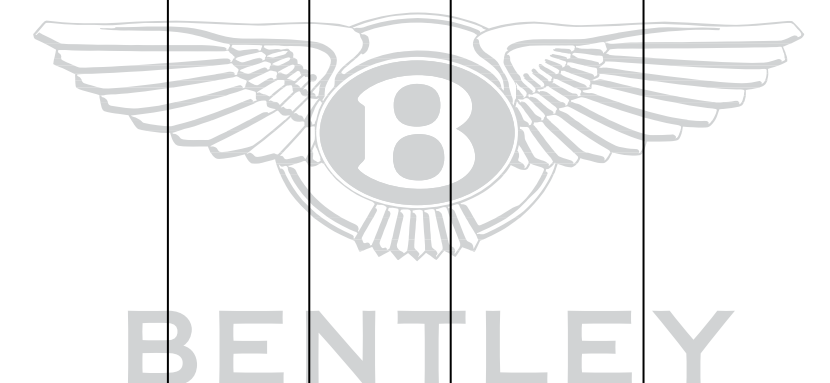
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P0456 EVAP System Leak De- tected (very small leak)	Very Small Leak pressure check	Time for pres- sure drop > 3 – 5.8 s	- Time after engine start > 5 and < 800 s - ECT > 3.8 and < 110.3° C - Engine off time > 900 s - IAT > 3 and < 69.8° C - IAT drop after en- gine start < 6.75° C - Altitude, < 2,700 m - Vehicle speed < 93.22 mph - Vehicle speed > 5.47 mph at least once - LDP, Activated - Driving downhill; not detected - Change in BARO > 0.25 kPa - Modulus of vehicle acceleration longi- tudinal direction < 4.5 m/sec	100 s - Once/ DCY	- Once/ DCY 2 DCY	- Check Evaporative Emission (EVAP) Canister Purge Reg- ulator Valve - N80- . Re- fer to ⇒ “3.6.14 EVAP Can- ister Purge Regulator Valve 1 N80 . Checking”, page 1619 . - Check Leak Detection Pump (LDP) - V144- . Re- fer to ⇒ “3.6.24 Leak Detec- tion Pump V144 . Checking”, page 1638 .
P0458 EVAP System Purge Control Valve "A" Circuit Low	Canister purge valve power- stage Cir- cuit con- tinuity - short to GND	Voltage	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check Evaporative Emission (EVAP) Canister Purge Reg- ulator Valve - N80- . Re- fer to ⇒ “3.6.14 EVAP Can- ister Purge Regulator Valve 1 N80 . Checking”, page 1619 .
P0459 EVAP System Purge Control Valve "A" Circuit High	Canister purge valve power- stage Cir- cuit con- tinuity - short to battery	Voltage	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check Evaporative Emission (EVAP) Canister Purge Reg- ulator Valve - N80- . Re- fer to ⇒ “3.6.14 EVAP Can- ister Purge Regulator Valve 1 N80 . Checking”, page 1619 .

P0491 AIR Sys- tem In- sufficient Flow Bank 1	AIR sys- tem Bank 1 Signal from AIR system pressure sensor not plau- sible Bank 1	• Difference of measured pressure between AIR pump and AIR valve during and before AIR injection > 2.0 kPa	• Pressure gradient in AIR system < 0.1016 • For a time > 5 s • Gradient of engine load change > -5; < 5%/rev • Engine speed > 480 to 600 RPM • Mass air flow > 1.94 and < 59.7 – 76.4 g/Sec. • For a time > 5 s • Diagnosis of AIR pressure sensor finished • AIR injection finished	• Imme- diate • Once/ DCY	• 2 DCY	– Check SAI attaching hoses to the exhaust for kinks damage or obstructions. – Check Secondary Air Injection (AIR) Pump Motor - - V101-- . Re-fer to ⇒ "3.6.34 Secondary Air Injection Pump Re-lay J299 / Secondary Air Injection Pump Motor V101 . Checking", page 1661 . – Check Secondary Air Injection Sensor 1 - G609- . Re-fer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609 . Checking", page 1666 .
	AIR sys- tem Bank 1 AIR system check during catalyst heating (determi- nation of AIR mass flow) Bank 1	• Gradient of AIR pressure sensor value during AIR injection phase < 0.3 – 1.0 kPa	• AIR injection active • Air injection measuring time > 5 s • RPM > 480 – 600 rpm • Status AIR pump active • Catalyst heating active • AAT > -9.8; < 60° C • Altitude < 2438 m • ECT > -10; < 60° C • Modeled EGT inside the catalyst < 700° C • Diagnosis of pressure sensor AIR system finished • Difference of measured pressure between AIR pump and AIR valve during and before AIR injection < 2 kPa • Gradient of engine load change > -5; < 5%/rev • MAF > 1.94; < 59.7 – 76.4 g/sec • For a time > 5 s			

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		OR • Ratio of measured to Modeled AIR pressure in measurement phase due to reduced flow < 0.250 OR • Ratio of measured to Modeled AIR pressure in measurement phase due to reduced flow < 0.297 – 0.398 OR • Ratio of measured to Modeled AIR pressure in measurement phase due to no flow < 0.102 OR • Ratio of measured to Modeled AIR pressure in measurement phase due to no flow < 0.102	• AIR pressure from pressure sensor during measuring phase < AIR pressure from model during measuring phase			
P0492 AIR System Insufficient Flow Bank 2	AIR system Bank 2 Signal from AIR system pressure sensor not plausible Bank 2	• Difference of measured pressure between AIR pump and AIR valve during and before AIR injection > 2.0 kPa	• Pressure gradient in AIR system < 0.1016 • For a time > 5 s • Gradient of engine load change > -5; < 5%/rev • Engine speed > 480 to 600 RPM • Mass air flow > 1.94 and < 59.7 – 76.4 g/Sec. • For a time > 5 s • Diagnosis of AIR pressure sensor finished • AIR injection finished	• Immediate • Once/DCY	• 2 DCY	– Check SAI attaching hoses to the exhaust for kinks damage or obstructions. – Check Secondary Air Injection Pump Motor 2 - - V189-- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .



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AIR system Bank 2 AIR system check during catalyst heating (determination of AIR mass flow) Bank 2		• Gradient of AIR pressure sensor value during AIR injection phase < 0.3 – 1.0 kPa	• AIR injection active • Air injection measuring time > 5 s • RPM > 480 – 600 rpm • Status AIR pump active • Catalyst heating active • AAT > -9.8; < 60° C • Altitude < 2438 m • ECT > -10; < 60° C • Modeled EGT inside the catalyst < 700° C • Diagnosis of pressure sensor AIR system finished • Difference of measured pressure between AIR pump and AIR valve during and before AIR injection < 2 kPa • Gradient of engine load change > -5; < 5%/rev • MAF > 1.94; < 59.7 – 76.4 g/sec • For a time > 5 s			– Check Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610, Checking", page 1668
		OR • Ratio of measured to Modeled AIR pressure in measurement phase due to reduced flow < 0.250	• AIR pressure from pressure sensor during measuring phase < AIR pressure from model during measuring phase			
		OR • Ratio of measured to Modeled AIR pressure in measurement phase due to reduced flow < 0.297 – 0.398				

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		OR • Ratio of measured to Modeled AIR pressure in measurement phase due to no flow < 0.102				
		OR • Ratio of measured to Modeled AIR pressure in measurement phase due to no flow < 0.102				
P0504 Brake Switch A / B Correlation	Brake switch Plausibility check	• Electrical connection of Brake Switch and redundant Brake Switch do not correlate • For a calibrated number of 10 counts	---	• Immediate • Continuous	• 2 DCY	– Check the brake switch. Refer to appropriate repair manual.
	Brake switch Circuit continuity	• Brake Switch Signal and redundant Brake Switch Signal do not correlate				
P0506 Idle Control System RPM - Lower Than Expected	Idle Speed Control Functional check	• Engine speed deviation between desired and actual > 100 RPM • Speed governor torque $\geq$ -80 Nm	• Engine speed > 20 RPM • Vehicle speed 0 MPH • Altitude < 2700 m • Time since engine start > 0 Sec. • Engine load < 36% • ECT > 59.3° C • IAT > 0° C • Catalyst heating not active • External torque demand not active • Fuel system status; no safety fuel cut-off • Throttle blade status; limp home mode not active • RPM sensor status; limp home mode not active	• 5.0 s • Continuous	• 2 DCY	– Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .

P0507 Idle Control System RPM - Higher Than Expected	Idle Speed Control Functional check	- Engine speed deviation between desired and actual < -100 RPM - Speed governor torque ≤ 80 Nm - Fuel cut-off active - Fuel cut-off activated for a calibrated number of times ≥ 5	- Engine speed > 20 RPM - Vehicle speed 0 MPH - Altitude < 2700 m - Time since engine start > 0 Sec. - Engine load < 36% - ECT > 59.3° C - IAT > 0° C - Catalyst heating not active - External torque demand not active - Fuel system status; no safety fuel cut-off - Throttle blade status; limp home mode not active - RPM sensor status; limp home mode not active	5.0 s - Continuous	2 DCY	Check the EPC Throttle Drive - G186- . Refer to "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P050A Cold Start Idle Control System Performance	Idle Speed Control During Catalyst Heating, Functional Check During Catalyst Heating	- Difference between desired RPM and actual RPM > 100 RPM - Speed governor torque ≥ -80 Nm - Difference between desired RPM and actual RPM < -200 RPM - Speed governor ≤ 80 Nm - Fuel cut-off active - Fuel cut off activated for a calibrated number of times ≥ 5	- Engine speed > 20 RPM - Vehicle speed = 0 MPH - Altitude < 2700 m - Engine temp at start < 69.8° C - Catalyst heating active - External torque demand not active - Not in fuel cutoff - Fuel system status; no safety fuel cut-off - Throttle blade status; limp home mode not active - RPM sensor status; limp home mode not active	4.0 s - Once/DCY	2 DCY	Check the EPC Throttle Drive - G186- . Refer to "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .

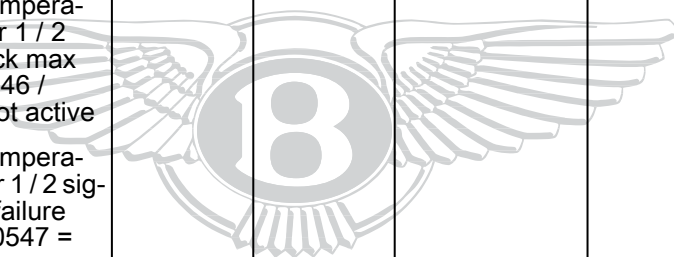
P050B Cold Start Igni- tion Tim- ing Per- formance	Ignition Timing During CSERS, Ignition timing at idle	Delta com- mand to ac- tual ignition retard > 85%	- Time during cata- lyst heating ≥ 4 Sec. - Fuel system status = no fuel cutoff - Altitude < 2,909 m - Desired ignition re- tard during catalyst heating < 97% - Delta engine load within 5 sec. < 100% - Delta engine speed within 5 sec. < 2,000 RPM - Vehicle speed = 0 mph	0.1 s - Once/ DCY	2 DCY	- Inspect the air cleaner element and the air intake sys- tem for leaks. - Inspect the PCV sys- tem for leaks. - Check En- gine Cool- ant Tem- perature (ECT) Sen- sor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Tempera- ture Sensor G62- Checking", page 1613 . - Check the EPC Throt- tle Drive - G186- . Re- fer to ⇒ "3.6.39 Throttle Valve Con- trol Module GX3- Checking", page 1671 . - Check In- take Cam- shaft Ad- justment Valve 1 - N205- . Re- fer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 . - Verify the latest En- gine Control Module - J623- soft- ware is be- ing used.
	Ignition Timing During CSERS, Ignition timing off idle		- Time during cata- lyst heating ≥ 4 s - Fuel system status = no fuel cutoff - Altitude < 2,909 m - Desired ignition re- tard during catalyst heating < 97% - Delta engine load within 5 sec. < 100% - Delta engine speed within 5 sec. < 2,000 RPM - Vehicle speed ≥ 0.62 mph			

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P0544 Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 1	EGT sensor 1 Model based rationality check	• Difference between EGT from model and sensor > 200° C • Difference between < 200° C • Magnitude of difference between mean value of IAT and ECT at engine start > 50° C • Magnitude of PWM period time error > 0.03 Sec	• RPM > 480 – 600 rpm • Fuel system status = no fuel cut-off • For a calibrated period of time > 25 s • Catalyst heating = not active • For a calibrated amount of time > 60 s • Exhaust temperature sensor 1 / 2 range check min failure P0545 / P0548 = not active • Exhaust temperature sensor 1 / 2 range check max failure P0546 / P0549 = not active • Exhaust temperature sensor 1 / 2 signal check failure P0544 / P0547 = not active • Engine off-time > 15,000 Sec • ECT at last engine shut-off > 80.3° C • IAT at start < 39.8° C • Absolute difference between IAT at engine start and ECT at start < 15° C • Modeled EGT pre=catalyst > 600° C	• 60 s • Continuous	• 2 DCY	– Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to "3.6.15 Exhaust Gas Temperature Sensor 1 G235, Checking", page 1621 .
P0545 Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 1	EGT sensor 1 Range check	• EGT from sensor < -37° C	• Battery voltage > 9.9 V • For time > 1 Sec.	• 60 s • Continuous	• 2 DCY	– Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to "3.6.15 Exhaust Gas Temperature Sensor 1 G235, Checking", page 1621 .

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P0546 Exhaust Gas Temperature Sensor Circuit High Bank 1 Sensor 1	EGT sensor 1 Range check	EGT from sensor > 1107° C	- Battery voltage > 9.9 V - For a calibrated period of time > 1 s	3 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
P0547 Exhaust Gas Temperature Sensor Circuit Bank 2 Sensor 1	EGT sensor 2 Model based rationality check	- Difference between EGT from model and sensor > 200° C - Difference between < 200° C - Magnitude of difference between mean value of IAT and ECT at engine start > 50° C - Magnitude of PWM period time error > 0.03 Sec	- RPM > 480 – 600 rpm - Fuel system status = no fuel cut-off - For a calibrated period of time > 25 s - Catalyst heating = not active - For a calibrated amount of time > 60 s - Exhaust temperature sensor 1 / 2 range check min failure P0545 / P0548 = not active - Exhaust temperature sensor 1 / 2 range check max failure P0546 / P0549 = not active - Exhaust temperature sensor 1 / 2 signal check failure P0544 / P0547 = not active - Engine off-time > 15,000 s - ECT at last engine shut-off > 80.3° C - IAT at start < 39.8° C - Absolute difference between IAT at engine start and ECT at start < 15° C - Modeled EGT pre=catalyst > 600° C	60 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448- Checking", page 1622 .



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P0548 Exhaust Gas Temperature Sensor Circuit Low Bank 2 Sensor 1	EGT sensor 2 Range check	EGT from sensor < -37° C	- Battery voltage > 9.9 V - For time > 1 s	60 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to "3.6.16 Exhaust Gas Temperature Sensor 2 G448- Checking", page 1622 .
P0549 Exhaust Gas Temperature Sensor Circuit High Bank 2 Sensor 1	EGT sensor 2 Range check	EGT from sensor > 1107° C	- Battery voltage > 9.9 V - For a calibrated period of time > 1 s	3 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to "3.6.16 Exhaust Gas Temperature Sensor 2 G448- Checking", page 1622 .
P0556 Brake Booster Pressure Sensor Circuit Range/Performance	Brake Booster Pressure Sensor Range check	- Max possible pressure in brake booster > 119 kPa - Minimal possible pressure in brake booster < 10 kPa	Brake switch signal = false	0.4 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to "3.6.2 Brake Pressure Sensor 1 G201- Checking", page 1595 .

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	Brake Booster Pressure Sensor Rationali- ty	EITHER: - Brake booster pressure minus ambient air pressure > 255 kPa OR: - Brake booster pressure minus required manifold pressure in case of not enough subpressure for brake system < 25 kPa - for a calibrated period of time > 5 s OR: - brake booster pressure at actuating brake minus brake booster pressure at releasing brake > 128 kPa				
P0557 Brake Booster Pressure Sensor Circuit Low	Brake Booster Pressure Sensor Circuit continuity - Short circuit to ground	Voltage from brake booster pressure sensor < 0.1 V	---	0.4 s - Contin- uous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201, Checking", page 1595 .
P0558 Brake Booster Pressure Sensor Circuit High In- put	Brake Booster Pressure Sensor Circuit continuity - Short circuit to battery	Voltage from brake booster pressure sensor > 4.9 V	---	0.4 s - Contin- uous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201, Checking", page 1595 .

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P0560 System Voltage	System Voltage Rationality - inoperative voltage (low)	System voltage < 2.54 V	Main relay = switched on	2.0 s - Continuous	2 DCY	Perform a charging system check and battery test to determine if the battery or charging system need to be serviced. Refer to the Repair Manual for battery/charging system diagnosis.
P0562 System Voltage Low	System Voltage Range check - low	System voltage < 9.99 V	- Engine speed > 480 to 600 RPM - For 180 s - System voltage > 2.54 V - Main relay switched on	2.0 s - Continuous	2 DCY	Perform a charging system check and battery test to determine if the battery or charging system need to be serviced. Refer to the Repair Manual for battery/charging system diagnosis.
P0563 System Voltage High	System Voltage Range check - high	System voltage > 15.92 V	- Engine speed > 480 to 600 RPM - For 180 s - Vehicle speed > 15.5 mph - Main relay switched on	2.0 s - Continuous	2 DCY	Perform a charging system check and battery test to determine if the battery or charging system need to be serviced. Refer to the Repair Manual for battery/charging system diagnosis.

P0606 Control Module Process- or	CAN commu- nication RAM	- CAN Control- ler RAM = de- fect - Internal 5V supply voltage < 4.3 V - Internal 5V supply voltage > 5.3 V - Drive by wire module check failed - EEPROM check failed - Engine torque out of range - Engine opera- tion condition out of range		- Imme- diately - Once / DCY	2 DCY	Check for any compo- nent or cir- cuit fault co- des and di- agnose them first. If no faults are found dur- ing diagno- sis, and the ECM has lost a driver output, re- place the Engine Control Module . Refer to Re- pair Man- ual.
	Evalua- tion IC primary O2S Bank 1 / Bank 2 Internal sensor-IC hardware check	- Self-check: communica- tion error of SPI interface to evaluation IC - Self-check: write error at INIT register of LSU evalua- tion IC - Operating voltage at pri- mary O2S evaluation IC < 9.0 V	- Battery voltage > 10.7 and < 16.1 V - Engine speed 480 – 600 RPM	10 s - Contin- uous		

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Function monitoring of ECM microcontroller Check of AD-converter signal	- Irreversible error in comparison with independent ADC converter, i.e. - Absolute voltage difference of both AP signals at the external ADC ≥ 0.155 V - Either: Stationary detection counter for internal ADC ≥ 4 - Or: Stationary detection counter for external ADC ≥ 4 - Counter of 'check of AD-converter signal' ≥ 12	System voltage > 8 V	0.1 s - Continuous		
Function monitoring of ECM Monitoring of ADC test voltage	- Irreversible error of AD-converter - test voltage monitoring = true - ADC test voltage input > 4.819 V - ADC test voltage input < 4.722 V - Counter of 'ADC - test voltage check' ≥ 15				
Function monitoring of ECM Verifying of ratio-metric correction factor plausibility	- Irreversible error of ADC - ratio metric correction, i.e. - Either: Ratio-metric correction factor in function monitoring < 0.600 - Or: Ratio-metric correction factor in function monitoring > 0.720 - Counter of 'ratio-metric correction factor plausibility check' ≥ 15				

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Function monitoring of ECM ADC timeout error	Power Up calibration in the ADC, not finished	Ignition key = on	0.2 s - Once/DCY		
Function monitoring of ECM ADC conversion timeout error	Change of the ADC channels, not finished	Power Up calibration = finished			
Function monitoring of ECM AP signal comparison	- Irreversible error of monitoring of APP i.e. = true - Comparison of signals from AP failed (plausibility check) i.e. = true - Either: Absolute difference between current voltage at signal 1 from AP and doubled current voltage at signal 2 from AP > 0.43 V - Or: Max acceptable difference between the 2 signals from AP above part load threshold = 0.547 V - Number of counts implausible APP ≥ 12		0.3 s - Continuous		
Plausibility check of the RPM	- Irreversible error of plausibility check of the RPM i.e. = true - Difference between calculated RPM from level 1 and level 2 ≥ 320 rpm - Counter of 'RPM comparison' ≥ 8	Engine speed ≥ 520 rpm			

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	Check of mixture correction factor	- Irreversible error of mixture correction factor check i.e. = true - Counter of 'adapted mixture correction factor out of range' ≥ 13 - Either Multiplicative correction value of fuel system > 1.28 - Additive correction value of fuel system $> 8.3\%$	- Engine speed $> 1,200$ rpm - System voltage > 8 V - Throttle blade limp home mode = false	0.5 s - Continuous		
	Check of relative fuel mass	- Irreversible error of engine load check i.e. = true - Counter of 'engine load check' ≥ 13 - Relative air charge - relative air charge predicted > 10.5; $< 10.5\%$				



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Fault re- action in- jection cut-off (ICO) from function (from lev- el 1)	• Irreversible error of failure reaction check (level 1) - Commanded fuel cut-off not executed, i.e. = true • Fault reactions monitored: • EITHER: • 'Injection cut-off' check is deactivated i.e. = true • Engine speed > 360 rpm • Final value for delay counter for PCP-feedback ≥ 2 • Counter of monitoring of ICO ≥ 2 • OR: • 'Ignition cut off' check is deactivated i.e. = true • Engine speed > 2,000 rpm • Final value for delay counter for PCP-feedback ≥ 2 • Counter of monitoring of ICO from level 1 ≥ 4	• System voltage > 8 V • Throttle blade limp home mode = false	• 0.1 s • Continuous		

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	Fault re- action in- jection cut-off (ICO) from function monitor- ing (from level 2)	- Irreversible error of failure reaction check (level 2) - Commanded fuel cut-off not executed, i.e. = true Fault reactions monitored: - EITHER: 'Injection cut-off' check is deactivated i.e. = TRUE - Engine speed > 360 rpm - Final value for delay counter for PCP-feed-back ≥ 2 - Counter of monitoring of ICO from level 2 ≥ 2 - OR: 'Ignition cut off' check is deactivated i.e. = true - Engine speed > 2,000 rpm - Final value for delay counter for PCP-feed-back ≥ 2 - Counter of monitoring of ICO from level 2 ≥ 4	- System voltage > 8 V - Throttle blade limp home mode = false			
	Monitor- ing of de- sired air/ fuel ratio	- Irreversible error of de-sired air/fuel ratio monitor- ing i.e. - Required lambda < 0.630; > 1.176 - Counter of 'adapted de- sired air/fuel ratio out of range' ≥ 13	Engine speed > 1,200 rpm	0.5 s - Contin- uous		

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Injected fuel mass comparison (rk-ti check)	- Irreversible error of injected fuel mass comparison (calculated injected and requested fuel mass out of range) = true - Counter injected and requested fuel mass out of range ≥ 104	- Engine speed > 1,200 rpm - System voltage > 8 V - Throttle blade limp home mode = false	0.6 s - Continuous		
Admissibility check of CD	- Irreversible error of CD = true - Counter for CD error ≥ 13	- Begin/End of CD synchronization = true - System voltage > 8 V - Throttle blade limp home mode = false	0.6 s - Continuous		
Torque comparison	- Irreversible error of torque comparison (current and maximum allowed engine torque out of range) i.e. = true - Counter of torque comparison > 10 - Permissible torque in function monitoring is below the current torque in function monitoring	Engine speed > 520 rpm	0.5 s - Continuous		
Check of ignition timing	- Irreversible error of comparison of ignition timing value (comparison of ignition timing value ignition timing value with its one's complement is wrong - monitoring out of range) = true - Counter of 'ignition timing check' ≥ 32		1.0 s - Continuous		

	Function controller inquiry/response check	- Faulty or missing inquiry-/response communication between the function controller and the monitoring module = true - Counter of 'inquiry/re-sponse communication check' ≥ 1	Condition for shut-down path test active = false	- Immediate - Continuous		
	Fault Detected by Active Watch-dog	- Irreversible error of monitoring of 'active Watch-dog' due to an unknown cause = true - Battery voltage > 8 V		0.4 s - Continuous		
	Fault Detected by Active Watch-dog	Irreversible error of monitoring of 'active Watch-dog' due to an unknown cause = true		- Immediate - Continuous		
P0627 Fuel Pump "A" Control Circuit/ Open	FP Circuit 1 Open circuit / or short to GND	Voltage IC Internal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Immediate - Continuous	2 DCY	Check the Fuel Pump Control Module. Refer to "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276, Checking", page 1628.
P0629 Fuel Pump "A" Control Circuit High	FP Circuit 1 short to battery voltage	Voltage IC Internal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Immediate - Continuous	2 DCY	Check the Fuel Pump Control Module. Refer to "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276, Checking", page 1628.

P0638 Throttle Actuator Control Range/Performance Bank 1	Check of electronic throttle return spring	- Switch off output stage and monitor the throttle blade return: - Either throttle angle > 3.0% - OR - Time counter throttle return spring check > 0.56 s	- Ignition on - Engine speed ≤ 250 RPM - Vehicle speed, ≤ 0 MPH - ECT ≥ 5.3° C - IAT ≥ 5.3° C - System voltage > 8.3 V - Fuel system status = no safety fuel cut-off	0.6 s - At key on and at key off	2 DCY	Check EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
	range check lower mechanical stop throttle blade during 1st init.	- Either TP sensor 1 at lower stop < 0.21 V - OR - TP sensor 1 at lower stop > 0.69 V - OR - TP sensor 2 at lower stop < 4.31 V - OR - TP sensor 2 at lower stop > 4.84 V	- System voltage 8.3 V - RPM < 250 RPM - Vehicle speed = 0 MPH - Normalized APP < 14.9% - System voltage > 10 V - ECT > 5.3° C - ECT < 100.5° C - IAT > 5.3° C - IAT < 143.3° C - Throttle blade limp home mode = false - Fuel system status = no safety fuel cut-off	5 s 30 Sec after key on and at key off (1st in-it.)	2 DCY	
P0641 Sensor Reference Voltage "A" Circuit/Open	ECU Internal sensor power supply Circuit Continuity	Sensor supply under voltage < 0.96 V or supply over voltage > 1.04 V	---	- Immediate - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module (ECM) - J623- . Refer to the Repair Manual.

P0651 Sensor Reference Voltage "B" Circuit/Open	ECU Internal sensor power supply Circuit Continuity	Sensor supply under voltage < 0.96 V or supply over voltage > 1.04 V	---	- Immediate - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module (ECM) - J623-. Refer to the Repair Manual.
P0657 Actuator Supply Voltage "A" Circuit/Open	Diagnosis power stage of engine relay Circuit continuity - Open circuit	Voltage IC Internal	---	- Immediate - Once/DCY	2 DCY	Check ECM Power Supply Relay . Refer to "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 .
P0658 Actuator Supply Voltage "A" Circuit Low	Diagnosis power stage of engine relay Circuit continuity - short to GND	Voltage IC Internal	Protected by copyright. Copying for private or company purposes, in part or in whole, is not permitted unless authorised by Bentley Motors. Bentley Motors does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright © Bentley Motors.	- Immediate - Once/DCY	2 DCY	Check ECM Power Supply Relay . Refer to "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 .
P0659 Actuator Supply Voltage "A" Circuit High	Diagnosis power stage of engine relay Circuit continuity - short to battery	Voltage IC Internal	---	0.3 s - Continuous	2 DCY	Check ECM Power Supply Relay . Refer to "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 .
P0688 ECM/PCM Power Relay Sense Circuit/Open	System voltage Rationality - inoperative voltage (high)	System voltage after main relay > 15.92 V	- Engine speed > 480 - 600 RPM - For 180 s - Vehicle speed > 15.5 mph	2 s - Continuous	2 DCY	Check ECM Power Supply Relay . Refer to "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 .

P0697 Sensor Reference Voltage "C" Circuit/Open	ECU Internal sensor power supply Circuit Continuity	Sensor supply under voltage < 0.96 V or supply over voltage > 1.04 V	---	- Immediate - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to the Repair Manual.
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	VVT Intake Powerstage Circuit Continuity - Short to Ground	Voltage IC Internal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Immediate - Continuous	2 DCY	Check Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .
P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	Camshaft Position Actuator Control Circuit High	Voltage IC Internal	- Battery voltage > 9 V - Engine speed > 80 RPM - Output stage status conducted	- Immediate - Continuous	2 DCY	Check Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .

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P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Rationality Check primary O2S Bank 1 Trim offset of secondary fuel controller: - trim: rich shift FT - correction below threshold	• Lambda offset secondary fuel control system, bank 1 / bank 2 < -0.030	• Lambda offset secondary fuel control system < 0.07 • Lambda offset secondary fuel control system > -0.07 • Electrical diagnosis of the secondary O2S finished • Aging diagnosis of the secondary O2S finished • Diagnosis of the power stage of the secondary O2S heater finished • Voltage diagnosis of primary O2S finished • Diagnosis for exchanged primary O2S finished • Modeled EGT upstream catalyst > 400; < 800° C • Exhaust gas mass flow upstream catalyst > 8.33; < 50.00 g/sec • Ceramic temperature of primary O2S > 655° C • RPM 480 - 600 rpm • Integrated exhaust gas mass flow > 100 g • Desired lambda value = 1 • Catalyst status = no active enrichment for clear out after a fuel cut off event • ECT > 50.3° C • Gradient of engine load exchange < 3%/rev • Catalyst heating = not active • Fuel system status (deceleration) no fuel cut-off • CL lambda controller = active Either • Condition for P-part lambda CL control	• < 80 s • Continuous	• 2 DCY	– Check the Bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. – Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . – Check Oxygen Sensor After Three Way Catalytic Converter - G130- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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			downstream catalyst = active - Desired lambda value = 1 Either: - Actual lambda value < 1 - Secondary O2S voltage < 0.4 - STFT < 0.75 – 0.85 - OR - Actual lambda value > 1 - Secondary O2S voltage > 0.6 - STFT > 1.25 - Lambda for component protection = not active - Accumulated time with released calculation of lambda offset and FT control active > 120 Sec. - Integrated exhaust gas mass flow ≥ 100 – 150 g - For a calibrated number of times > 15			

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P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Rationality Check primary O2S Bank 1 Trim offset of secondary fuel controller: - trim: lean shift FT - correction above threshold	• Lambda offset secondary fuel control system, bank 1 / bank 2 > 0.030	• Lambda offset secondary fuel control system < 0.07 • Lambda offset secondary fuel control system > -0.07 • Electrical diagnosis of the secondary O2S finished • Aging diagnosis of the secondary O2S finished • Diagnosis of the power stage of the secondary O2S heater finished • Voltage diagnosis of primary O2S finished • Diagnosis for exchanged primary O2S finished • Modeled EGT upstream catalyst > 400° < 800° C • Exhaust gas mass flow upstream catalyst > 8.33; < 50.00 g/sec • Ceramic temperature of primary O2S > 655° C • RPM 480 - 600 rpm • Integrated exhaust gas mass flow > 100 g • Desired lambda value = 1 • Catalyst status = no active enrichment for clear out after a fuel cut off event • ECT > 50.3° C • Gradient of engine load exchange < 3%/rev • Catalyst heating = not active • Fuel system status (deceleration) no fuel cut-off • CL lambda controller = active Either • Condition for P-part lambda CL control	• < 80 s • Continuous	• 2 DCY	- If a misfire code or injector fault is set, diagnose those codes first. - Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 . - Check Oxygen Sensor After Three Way Catalytic Converter - G130- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7- Checking", page 1650 . - Check Three Way Catalytic Converter (TWC). Refer to "3.6.38 Three Way Catalytic Converter (TWC) Checking", page 1670 .

			downstream catalyst = active - Desired lambda value = 1 Either: - Actual lambda value < 1 - Secondary O2S voltage < 0.4 - STFT < 0.75 – 0.85 - OR - Actual lambda value > 1 - Secondary O2S voltage > 0.6 - STFT > 1.25 - Lambda for component protection = not active - Accumulated time with released calculation of lambda offset and FT control active > 120 Sec. - Integrated exhaust gas mass flow ≥ 100 – 150 g - For a calibrated number of times > 15			



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P2098 Post Catalyst Fuel Trim System Too Lean Bank 2	Rationality Check primary O2S Bank 2 Trim offset of secondary fuel controller: - trim: rich shift FT - correction below threshold	• Lambda offset secondary fuel control system, bank 1 / bank 2 < -0.030	• Lambda offset secondary fuel control system < 0.07 • Lambda offset secondary fuel control system > -0.07 • Electrical diagnosis of the secondary O2S finished • Aging diagnosis of the secondary O2S finished • Diagnosis of the power stage of the secondary O2S heater finished • Voltage diagnosis of primary O2S finished • Diagnosis for exchanged primary O2S finished • Modeled EGT upstream catalyst > 400; < 800° C • Exhaust gas mass flow upstream catalyst > 8.33; < 50.00 g/sec • Ceramic temperature of primary O2S > 655° C • RPM 480 - 600 rpm • Integrated exhaust gas mass flow > 100 g • Desired lambda value = 1 • Catalyst status = no active enrichment for clear out after a fuel cut off event • ECT > 50.3° C • Gradient of engine load exchange < 3%/rev • Catalyst heating = not active • Fuel system status (deceleration) no fuel cut-off • CL lambda controller = active Either • Condition for P-part lambda CL control	• < 80 s • Continuous	• 2 DCY	- Check the Bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. - Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check Oxygen Sensor 2 After Catalytic Converter - G131- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 . - Check Three Way Catalytic Converter (TWC). Refer to "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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			downstream catalyst = active - Desired lambda value = 1 Either: - Actual lambda value < 1 - Secondary O2S voltage < 0.4 - STFT < 0.75 – 0.85 - OR - Actual lambda value > 1 - Secondary O2S voltage > 0.6 - STFT > 1.25 - Lambda for component protection = not active - Accumulated time with released calculation of lambda offset and FT control active > 120 s - Integrated exhaust gas mass flow ≥ 100 – 150 g - For a calibrated number of times > 15			



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P2099 Post Catalyst Fuel Trim System Too Rich Bank 2	Rationality Check primary O2S Bank 2 Trim offset of secondary fuel controller: - trim: lean shift FT - correction above threshold	• Lambda offset secondary fuel control system, bank 1 / bank 2 > 0.030	• Lambda offset secondary fuel control system < 0.07 • Lambda offset secondary fuel control system > -0.07 • Electrical diagnosis of the secondary O2S finished • Aging diagnosis of the secondary O2S finished • Diagnosis of the power stage of the secondary O2S heater finished • Voltage diagnosis of primary O2S finished • Diagnosis for exchanged primary O2S finished • Modeled EGT upstream catalyst > 400; < 800° C • Exhaust gas mass flow upstream catalyst > 8.33; < 50.00 g/sec • Ceramic temperature of primary O2S > 655° C • RPM 480 - 600 rpm • Integrated exhaust gas mass flow > 100 g • Desired lambda value = 1 • Catalyst status = no active enrichment for clear out after a fuel cut off event • ECT > 50.3° C • Gradient of engine load exchange < 3%/rev • Catalyst heating = not active • Fuel system status (deceleration) no fuel cut-off • CL lambda controller = active Either • Condition for P-part lambda CL control	• < 80 s • Continuous	• 2 DCY	- If a misfire code or injector fault is set, diagnose those codes first. - Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check Oxygen Sensor 2 After Catalytic Converter - G131- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 . - Check Three Way Catalytic Converter (TWC). Refer to "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

			downstream catalyst = active - Desired lambda value = 1 Either: - Actual lambda value < 1 - Secondary O2S voltage < 0.4 - STFT < 0.75 – 0.85 - OR - Actual lambda value > 1 - Secondary O2S voltage > 0.6 - STFT > 1.25 - Lambda for component protection = nt active - Accumulated time with released calculation of lambda offset and FT control active > 120 s - Integrated exhaust gas mass flow ≥ 100 – 150 g - For a calibrated number of times > 15			
P2101 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Blade Control Range Check	- Absolute value of the set-point value of throttle blade control > 80% - Deviation throttle valve angles vs. calculated values > 4 -50%	- System voltage > 8.3 V - Throttle blade powersave mode active = false - TB adaptation active = false	0.5 to 5 s - Continuous	2 DCY	– Check the Throttle Valve Control Module. Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671.
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Blade Control Operating state of electronic throttle power stage	Status flag of TB power stage = low	Active fault of throttle blade: - Either range check or deviation (P2101) = true - System voltage > 8.3 V - Throttle blade powersave mode active = false - TB adaptation active = false	0.5 s - Continuous	2 DCY	– Check the Throttle Valve Control Module. Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671.

P2122 Throttle/ Pedal Po- sition Sensor/ Switch "D" Cir- cuit Low	APP Sen- sor 1 Range check low	Voltage sen- sor 1 ≤ 0.606 V	---	- Imme- diate - Contin- uous	• 2 DCY	– Check Ac- celerator Pedal Mod- ule - GX2- . Refer to ⇒ "3.6.1 Ac- celerator Pedal Mod- ule GX2- Checking", page 1593 .
P2123 Throttle/ Pedal Po- sition Sensor/ Switch "D" Cir- cuit High	APP Sen- sor 1 Range check high	Voltage sen- sor 1 ≥ 4.794 V	---	- Imme- diate - Contin- uous	• 2 DCY	– Check Ac- celerator Pedal Mod- ule - GX2- . Refer to ⇒ "3.6.1 Ac- celerator Pedal Mod- ule GX2- Checking", page 1593 .
P2127 Throttle/ Pedal Po- sition Sensor/ Switch "E" Cir- cuit Low	APP Sen- sor 2 Range check low	Voltage sen- sor 2 ≤ 0.268 V	---	- Imme- diate - Contin- uous	• 2 DCY	– Check Ac- celerator Pedal Mod- ule - GX2- . Refer to ⇒ "3.6.1 Ac- celerator Pedal Mod- ule GX2- Checking", page 1593 .
P2128 Throttle/ Pedal Po- sition Sensor/ Switch "E" Cir- cuit High	APP Sen- sor 2 Range check High	Voltage sen- sor 2 ≥ 2.431 V	---	- Imme- diate - Contin- uous	• 2 DCY	– Check Ac- celerator Pedal Mod- ule - GX2- . Refer to ⇒ "3.6.1 Ac- celerator Pedal Mod- ule GX2- Checking", page 1593 .
P2138 Throttle/ Pedal Po- sition Sensor/ Switch "D"/"E" Voltage Correla- tion	APP Sen- sors 1 and 2 Plausibili- ty check	- Absolute dif- ference of the first sensor signal divided by a factor to the second sensor signal > 0.167 – 0.703 V - Raw value of APP sensor 1 divided by fac- tor > 0.480 V - Raw value of APP sensor 2 > 0.480 V		- Imme- diate - Contin- uous	• 2 DCY	– Check Ac- celerator Pedal Mod- ule - GX2- . Refer to ⇒ "3.6.1 Ac- celerator Pedal Mod- ule GX2- Checking", page 1593 .

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P2177 System Too Lean Off Idle Bank 1	Fuel System Adaption Bank 1 Adaptive Values Reach the Limit Bank 1 / Bank 2	• Multiplicative mixture adaptation factor system off idle too lean > 1.2	• Long term fuel trim completed = not detected • Time since long term fuel trim completed > 1,040 s • EVAP canister load factor > 37 and < -6 • Coordinated torque request for charge < 0 – 80% • Coordinated torque request for charge > 12.5 – 100% • Engine temperature 54.75° C • Injection counter > 1,000 • Increased tolerances of air charge determination expected, i.e., not active • Quotient MAP to BARO < 0.2 • Center value overlap angle gas change valve for re-aspirated residue gas > 0.1111 revolutions • Condition mass flow into manifold from brake booster, i.e, not active • Gradient of brake booster pressure > 0.199 kPa • For a calibrated period of time > 0.5 s • Difference of brake booster pressure and intake MAP > 0.5 kPa • Lambda sensor is not plausible, i.e. not active • Condition compulsory amplitude, active • Compulsory amplitude > 0.015 • Exhaust gas mass flow > 5.56 g/sec. • Condition transient control activated, not active	• 80 s • Continuous	• 2 DCY	– If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. – Check Bank 1 Heated Oxygen Sensor - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .

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			• Relative driver request torque from pedal > 99.5% • IAT < 65.3° C • Required lambda reference O2S fitting location > 0.8; < 1.05 • Fuel system status = Closed loop			



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P2178 System Too Rich Off Idle Bank 1	Fuel Sys- tem Adaption Bank 1 Adaptive Values Reach the Limit Bank 1 / Bank 2	• Multiplicative mixture adaption factor system off idle too rich < 0.8	• Long term fuel trim completed = not detected • Time since long term fuel trim completed > 1,040 s • EVAP canister load factor > 37 and < -6 • Coordinated torque request for charge < 0 – 80% • Coordinated torque request for charge > 12.5 – 100% • Engine temperature 54.75° C • Injection counter > 1,000 • Increased tolerances of air charge determination expected, i.e., not active • Quotient MAP to BARO < 0.2 • Center value overlap angle gas change valve for re-aspirated residue gas > 0.1111 revolutions • Condition mass flow into manifold from brake booster i.e., not active • Gradient of brake booster pressure > 0.199 kPa • For a calibrated period of time > 0.5 s • Difference of brake booster pressure and intake MAP > 0.5 kPa • Lambda sensor is not plausible, i.e. not active • Condition compulsory amplitude, active • Compulsory amplitude > 0.015 • Exhaust gas mass flow > 5.56 g/sec. • Condition transient control activated, not active	• 80 s • Continuous	• 2 DCY	– Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. – Check Bank 1 Heated Oxygen Sensor - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653.

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			- Relative driver request torque from pedal > 99.5% - IAT < 65.3° C - Required lambda reference O2S fitting location > 0.8; < 1.05 - Fuel system status = Closed loop			



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P2179 System Too Lean Off Idle Bank 2	Fuel Sys- tem Adaption Bank 2 Adaptive Values Reach the Limit Bank 1 / Bank 2	• Multiplicative mixture adaptation factor system off idle too lean > 1.2	• Long term fuel trim completed = not detected • Time since long term fuel trim completed > 1,040 s • EVAP canister load factor > 37 and < -6 • Coordinated torque request for charge < 0 – 80% • Coordinated torque request for charge > 12.5 – 100% • Engine temperature 54.75° C • Injection counter > 1,000 • Increased tolerances of air charge determination expected, i.e., not active • Quotient MAP to BARO < 0.2 • Center value overlap angle gas change valve for re-aspirated residue gas > 0.1111 revolutions • Condition mass flow into manifold from brake booster, i.e., not active • Gradient of brake booster pressure > 0.199 kPa • For a calibrated period of time > 0.5 s • Difference of brake booster pressure and intake MAP > 0.5 kPa • Lambda sensor is not plausible, i.e. not active • Condition compulsory amplitude, active • Compulsory amplitude > 0.015 • Exhaust gas mass flow > 5.56 g/sec. • Condition transient control activated, not active	• 80 s • Continuous	• 2 DCY	– If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. – Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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			• Relative driver request torque from pedal > 99.5% • IAT < 65.3° C • Required lambda reference O2S fitting location > 0.8; < 1.05 • Fuel system status = Closed loop			



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P2180 System Too Rich Off Idle Bank 2	Fuel Sys- tem Adaption Bank 2 Adaptive Values Reach the Limit Bank 1 / Bank 2	• Multiplicative mixture adaptation factor system off idle too rich < 0.8	• Long term fuel trim completed = not detected • Time since long term fuel trim completed > 1,040 s • EVAP canister load factor > 37 and < -6 • Coordinated torque request for charge < 0 – 80% • Coordinated torque request for charge > 12.5 – 100% • Engine temperature 54.75° C • Injection counter > 1,000 • Increased tolerances of air charge determination expected, i.e., not active • Quotient MAP to BARO < 0.2 • Center value overlap angle gas change valve for re-aspirated residue gas > 0.1111 revolutions • Condition mass flow into manifold from brake booster, i.e, not active • Gradient of brake booster pressure > 0.199 kPa • For a calibrated period of time > 0.5 s • Difference of brake booster pressure and intake MAP > 0.5 kPa • Lambda sensor is not plausible, i.e. not active • Condition compulsory amplitude, active • Compulsory amplitude > 0.015 • Exhaust gas mass flow > 5.56 g/sec. • Condition transient control activated, not active	• 80 s • Continuous	• 2 DCY	– Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. – Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

			- Relative driver request torque from pedal > 99.5% - IAT < 65.3° C - Required lambda reference O2S fitting location > 0.8; < 1.05 - Fuel system status = Closed loop			
P2181 Cooling System Performance	Thermostat rationality check	- difference ECT and radiator inlet temp < 7.5 – 18° C OR - ECT < 81.8° C	- Vehicle speed ≥ 6.2 mph - RPM ≥ 800 rpm - integrated MAF since engine start > 20,020 – 3,000 g - ECT at engine start - 9.7° C - ECT < 81.8° C - Modeled ECT > 87° C - Time since modeled ECT > threshold > 100 s - ECT at engine start < 60° C	2 s - Once per warm-up cycle	2 DCY	- Check Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.11 Engine Coolant Temperature Sensor G62- Checking”, page 1613 . - Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.12 Engine Coolant Temperature Sensor On Radiator Outlet G83- Checking”, page 1615 .

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P2187 System Too Lean at Idle Bank 1	Fuel System adaptation Bank 1 Adaptive values reach the limit Bank 1	- Additive mixture adaptation factor > 5.5% - System in idle too lean	- Coordinated torque request for charge < 0 – 24% - Coordinated torque request for charge > 5.5 – 100% - Driver request torque = 0% - Engine temperature > 54.75° C - Injection counter > 1,000 - Increased tolerances of air charge determination expected, i.e. not active - Quotient MAP to BARO < 0.2 - Center value overlap angle gas change valve for re-aspirated residue gas > 0.1111 revolutions - Condition mass flow into manifold from brake booster, i.e., not active - Gradient of brake booster pressure > 0.199 kPa - For a calibrated period of time > 0.5 s - Difference of brake booster pressure and intake MAP > 0.5 kPa - Lambda sensor is not plausible, i.e., not active - Condition compulsory amplitude, active - Compulsory amplitude > 0.015 - Exhaust gas mass flow > 5.56 g/sec. - Condition transient control activated, not active - Relative fuel mass transition compensation > 30% - Condition wide open throttle not active	80 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653

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			• Relative driver request torque from pedal > 99.5% • IAT < 65.3° C • Required lambda referred to O2S fitting location > 0.8 • Required lambda referred to O2S fitting location < 1.05 • Fuel system status, closed loop			



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P2188 System Too Rich at Idle Bank 1	Fuel System adaptation Bank 1 Adaptive values reach the limit Bank 1	- Additive mixture adaptation factor < -5.5% - System in idle too rich	- Coordinated torque request for charge < 0 – 24% - Coordinated torque request for charge > 5.5 – 100% - Driver request torque = 0% - Engine temperature > 54.75° C - Injection counter > 1,000 - Increased tolerances of air charge determination expected, i.e. not active - Quotient MAP to BARO < 0.2 - Center value overlap angle gas change valve for reaspirated residue gas > 0.1111 revolutions - Condition mass flow into manifold from brake booster, i.e., not active - Gradient of brake booster pressure > 0.199 kPa - For a calibrated period of time > 0.5 s - Difference of brake booster pressure and intake MAP > 0.5 kPa - Lambda sensor is not plausible, i.e., not active - Condition compulsory amplitude, active - Compulsory amplitude > 0.015 - Exhaust gas mass flow > 5.56 g/sec. - Condition transient control activated, not active - Relative fuel mass transition compensation > 30% - Condition wide open throttle not active	80 s - Continuous	2 DCY	- Check for correct fuel pressure. Refer to the Repair Manual for the procedure. - Check Bank 1 Heated Oxygen Sensor - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .

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			• Relative driver request torque from pedal > 99.5% • IAT < 65.3° C • Required lambda referred to O2S fitting location > 0.8 • Required lambda referred to O2S fitting location < 1.05 • Fuel system status, closed loop			



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P2189 System Too Lean at Idle Bank 2	Fuel System adaptation Bank 2 Adaptive values reach the limit Bank 2	• Additive mixture adaptation factor > 5.5% • System in idle too lean	• Coordinated torque request for charge < 0 – 24% • Coordinated torque request for charge > 5.5 – 100% • Driver request torque = 0% • Engine temperature > 54.75° C • Injection counter > 1,000 • Increased tolerances of air charge determination expected, i.e. not active • Quotient MAP to BARO < 0.2 • Center value overlap angle gas change valve for re-aspirated residue gas > 0.1111 revolutions • Condition mass flow into manifold from brake booster, i.e., not active • Gradient of brake booster pressure > 0.199 kPa • For a calibrated period of time > 0.5 s • Difference of brake booster pressure and intake MAP > 0.5 kPa • Lambda sensor is not plausible, i.e., not active • Condition compulsory amplitude, active • Compulsory amplitude > 0.015 • Exhaust gas mass flow > 5.56 g/sec. • Condition transient control activated, not active • Relative fuel mass transition compensation > 30% • Condition wide open throttle not active	• 80 s • Continuous	• 2 DCY	– Check for air leaks behind the Bank 1 MAF including intake manifold. Check the Bank 2 exhaust system for leaks before the upstream O2S. – Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11 Checking", page 1659 .

			• Relative driver request torque from pedal > 99.5% • IAT < 65.3° C • Required lambda referred to O2S fitting location > 0.8 • Required lambda referred to O2S fitting location < 1.05 • Fuel system status, closed loop			



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P2190 System Too Rich at Idle Bank 2	Fuel Sys- tem adapta- tion Bank 2 Adap- tive val- ues reach the limit Bank 2	- Additive mix- ture adapta- tion factor < -5.5% - System in idle too rich	- Coordinated torque request for charge < 0 – 24% - Coordinated torque request for charge > 5.5 – 100% - Driver request tor- que = 0% - Engine temperature > 54.75° C - Injection counter > 1,000 - Increased toleran- ces of air charge determination ex- pected, i.e. not ac- tive - Quotient MAP to BARO < 0.2 - Center value over- lap angle gas change valve for re- aspirated residue gas > 0.1111 revo- lutions - Condition mass flow into manifold from brake booster, i.e., not active - Gradient of brake booster pressure > 0.199 kPa - For a calibrated pe- riod of time > 0.5 s - Difference of brake booster pressure and intake MAP > 0.5 kPa - Lambda sensor is not plausible, i.e., not active - Condition compul- sory amplitude, ac- tive - Compulsory ampli- tude > 0.015 - Exhaust gas mass flow > 5.56 g/sec. - Condition transient control activated, not active - Relative fuel mass transition compen- sation > 30% - Condition wide open throttle not ac- tive	80 s - Contin- uous	2 DCY	- Check for correct fuel pressure. Refer to the Repair Manual for the proce- dure. - Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Re- fer to ⇒ "3.6.33 Oxygen Sensor 2 Before Cat- alytic Con- verter GX11 Checking", page 1659 .

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			• Relative driver request torque from pedal > 99.5% • IAT < 65.3° C • Required lambda referred to O2S fitting location > 0.8 • Required lambda referred to O2S fitting location < 1.05 • Fuel system status, closed loop			



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P2195 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 1	Rationality Check primary O2S Bank 1 Trim offset of secondary fuel controller: trim: rich shift of primary O2S - correction below threshold	• Lambda offset secondary fuel control system, bank 1 / bank 2 > 0.070	• Electrical diagnosis of secondary O2S finished • Aging diagnosis of secondary O2S finished • Diagnosis of the power stage of the secondary O2S heater finished • Voltage diagnosis of primary O2S finished • Diagnosis for exchanged primary O2Ss finished • Accumulated time with released calculation of lambda offset and FT control active > 60 s • Integrated exhaust gas mass flow $\geq 100 - 150$ g • For a calibrated number of times > 15 • Modeled EGT upstream catalyst > 400; < 800° C • Exhaust gas MAF upstream catalyst > 8.33; < 50.00 g/sec • Ceramic temperature of primary O2S > 665° C • RPM 480 – 600 rpm • Integrated exhaust gas mass flow > 100 g • Desired lambda value = 1 • Catalyst status; enrichment for clear out after a fuel cut off event = not active • ECT > 50.3° C • Gradient of engine load change < 3%/ rev • Catalyst heating not active	• < 80 s • Continuous	• 2 DCY	– Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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			- Fuel system status (deceleration) no fuel cut-off - Fuel system status CL Either: - Condition for P-part lambda CL control downstream catalyst = active - OR - Desired lambda value = 1 Either: - Actual lambda value < 1 - Secondary O2S voltage < 0.4 - STFT < 0.75 – 0.85 OR - Actual lambda value > 1 - Secondary O2S voltage > 0.6 - STFT > 1.25 - Lambda for component protection = not active			



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P2196 O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1	Rationality Check primary O2S Bank 1 Trim offset of secondary fuel controller: trim: rich shift of primary O2S - correction below threshold	• Lambda offset secondary fuel control system, bank 1 / bank 2 < -0.70	• Electrical diagnosis of secondary O2S finished • Aging diagnosis of secondary O2S finished • Diagnosis of the power stage of the secondary O2S heater finished • Voltage diagnosis of primary O2S finished • Diagnosis for exchanged primary O2Ss finished • Accumulated time with released calculation of lambda offset and FT control active > 60 Sec. • Integrated exhaust gas mass flow $\geq 100 - 150$ g • For a calibrated number of times > 15 • Modeled EGT upstream catalyst > 400; < 800° C • Exhaust gas MAF upstream catalyst > 8.33; < 50.00 g/sec • Ceramic temperature of primary O2S > 665° C • RPM 480 – 600 rpm • Integrated exhaust gas mass flow > 100 g • Desired lambda value = 1 • Catalyst status; enrichment for clear out after a fuel cut off event = not active • ECT > 50.3° C • Gradient of engine load change < 3%/rev • Catalyst heating not active	• < 80 s • Continuous	• 2 DCY	– Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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			- Fuel system status (deceleration) no fuel cut-off - Fuel system status CL Either: - Condition for P-part lambda CL control downstream catalyst = active - OR - Desired lambda value = 1 Either: - Actual lambda value < 1 - Secondary O2S voltage < 0.4 - STFT < 0.75 – 0.85 OR - Actual lambda value > 1 - Secondary O2S voltage > 0.6 - STFT > 1.25 - Lambda for component protection = not active			

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P2197 O2 Sensor Signal Biased/Stuck Lean Bank 2 Sensor 1	Rationality Check primary O2S Bank 2 Trim offset of secondary fuel controller: trim: rich shift of primary O2S - correction below threshold	• Lambda offset secondary fuel control system, bank 1 / bank 2 > 0.070	• Electrical diagnosis of secondary O2S finished • Aging diagnosis of secondary O2S finished • Diagnosis of the power stage of the secondary O2S heater finished • Voltage diagnosis of primary O2S finished • Diagnosis for exchanged primary O2Ss finished • Accumulated time with released calculation of lambda offset and FT control active > 60 Sec. • Integrated exhaust gas mass flow $\geq 100 - 150$ g • For a calibrated number of times > 15 • Modeled EGT upstream catalyst > 400; < 800° C • Exhaust gas MAF upstream catalyst > 8.33; < 50.00 g/sec • Ceramic temperature of primary O2S > 665° C • RPM 480 – 600 rpm • Integrated exhaust gas mass flow > 100 g • Desired lambda value = 1 • Catalyst status; enrichment for clear out after a fuel cut off event = not active • ECT > 50.3° C • Gradient of engine load change < 3%/rev • Catalyst heating not active	• < 80 s • Continuous	• 2 DCY	– Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11 Checking", page 1659 .

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			• Fuel system status (deceleration) no fuel cut-off • Fuel system status CL Either: • Condition for P-part lambda CL control downstream catalyst = active • OR • Desired lambda value = 1 Either: • Actual lambda value < 1 • Secondary O2S voltage < 0.4 • STFT < 0.75 – 0.85 OR • Actual lambda value > 1 • Secondary O2S voltage > 0.6 • STFT > 1.25 • Lambda for component protection = not active			

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P2198 O2 Sensor Signal Biased/Stuck Rich Bank 2 Sensor 1	Rationality Check primary O2S Bank 2 Trim offset of secondary fuel control-er: trim: rich shift of primary O2S - correction below threshold	• Lambda offset secondary fuel control system, bank 1 / bank 2 < -0.70	• Electrical diagnosis of secondary O2S finished • Aging diagnosis of secondary O2S finished • Diagnosis of the power stage of the secondary O2S heater finished • Voltage diagnosis of primary O2S finished • Diagnosis for exchanged primary O2Ss finished • Accumulated time with released calculation of lambda offset and FT control active > 60 s • Integrated exhaust gas mass flow $\geq 100 - 150$ g • For a calibrated number of times > 15 • Modeled EGT upstream catalyst > 400; < 800° C • Exhaust gas MAF upstream catalyst > 8.33; < 50.00 g/sec • Ceramic temperature of primary O2S > 665° C • RPM 480 – 600 rpm • Integrated exhaust gas mass flow > 100 g • Desired lambda value = 1 • Catalyst status, enrichment for clear out after a fuel cut off event = not active • ECT > 50.3° C • Gradient of engine load change < 3%/rev • Catalyst heating not active	• < 80 s • Continuous	• 2 DCY	– Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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			- Fuel system status (deceleration) no fuel cut-off - Fuel system status CL Either: - Condition for P-part lambda CL control downstream catalyst = active - OR - Desired lambda value = 1 Either: - Actual lambda value < 1 - Secondary O2S voltage < 0.4 - STFT < 0.75 – 0.85 OR - Actual lambda value > 1 - Secondary O2S voltage > 0.6 - STFT > 1.25 - Lambda for component protection = not active			
P2199 Intake Air Temperature Sensor 1/2 Correlation	IAT Sensor 2 Plausibility check	Difference of IAT sensor 1 and 2 > 39.8 and < -50.3 °C	- MAF > 22.22 and < 166.67 g/Sec. - Vehicle speed > 28 mph - Ratio of boost pressure and BARO < 1.10 g/Sec. - For a calibrated period of time > 15 s	5.0 s - Continuous	2 DCY	- Check both of the IAT's (in MAF 1 and 2) for accuracy. Refer to ⇒ "3.6.27 Mass Air-flow Sensor G70, Checking", page 1644. ⇒ "3.6.28 Mass Air-flow Sensor 2 G246, Checking", page 1646.

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P2226 Barometric Pressure Sensor Circuit Fault	BARO Sensor Range check	BARO < 50 or > 115 kPa		2 s - Continuous	2 DCY	The Baro sensor is located within the ECM and will require replacement of the ECM if the scan tool reading is off by more than 10% of actual Barometric pressure. Refer to the Repair Manual for ECM replacement.
P2227 Barometric Pressure Sensor "A" Circuit Range/Performance	BARO Sensor Rationality check	- Change in BARO > 5 kPa - within a period of time = 20 s - Difference between measured BARO and stored BARO of previous drive cycle > 10 kPa	- Engine speed < 1000 RPM - Throttle angle < 5% - For a calibrated period of time > 3 s	20 s - Continuous	2 DCY	The Baro sensor is located within the ECM and will require replacement of the ECM if the scan tool reading is off by more than 10% of actual Barometric pressure. Refer to the Repair Manual for ECM replacement.
		- Deviation between measured BARO and stored BARO of previous driving cycle > 10 kPa - Time since engine start < 5 s - Deviation between measured BARO and calculated BARO > 2 kPa - Deviation between measured BARO and calculated BARO < 2 kPa		2 s - Continuous		

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P2228 Barometric Pressure Sensor "A" Circuit Low	Barometric Pressure Circuit Low	BARO sensor voltage < 0.20 V	---	1 s - Continuous	2 DCY	The Baro sensor is located within the ECM and will require replacement of the ECM if the scan tool reading is off by more than 10% of actual Barometric pressure. Refer to the Repair Manual for ECM replacement.
P2229 Barometric Pressure Sensor "A" Circuit High	Barometric Pressure Circuit High	BARO sensor voltage > 4.80 V	---	1 s - Continuous	2 DCY	The Baro sensor is located within the ECM and will require replacement of the ECM if the scan tool reading is off by more than 10% of actual Barometric pressure. Refer to the Repair Manual for ECM replacement.



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P2237 O2 Sensor Positive Current Control Circuit/Open Bank 1 Sensor 1	Evaluation IC primary O2S Bank 1 Open circuit - pump current (IP)	- Absolute value of change of lambda control factor (of filtered set-point value lambda control) > 0.1 - For time > 1.5 s	- Battery voltage > 10.7; < 16.1 V - RPM < 480 – 600 rpm - Electrical adjustment of primary O2S, Not active - Ceramic temperature of primary O2S > 775° C - Relative heater output of primary O2S heater = 100% - Primary fuel control system status, Closed loop - Primary fuel control system not in initialization phase - P-part of secondary fuel control system status, no change of state of P-part (no switching on or off event - Catalyst heating no change of state (no switching on or off event) - Primary O2S voltage > 1.464; < 1.536 V - For time > 10 s - Absolute change in the compulsory amplitude of primary fuel control system ≥ 0.009 - For time > 5 s - Forced oscillation of A/F ratio controller, activated	5 s - Continuous	2 DCY	Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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		- Primary O2S voltage > 1.4654; < 1.536 V - For time > 10.0 Sec - Integrated MAF > 200.00 g	- Battery voltage > 10.7; < 16.1 V - RPM > 480 – 600 rpm - Primary fuel control system status, Closed loop - Ceramic temperature of primary O2S > 720° C - Electrical adjustment of primary O2S, not active - Required lambda from primary fuel control system < 0.96 - Required lambda from primary fuel control system > 1.09 - Pump voltage of primary O2S, no change of state (no switching on or off event)	10 s - Continuous		
		- Primary O2S voltage < 1.55 V - For time > 5.0 s	- Battery voltage > 10.7; < 16.1 V - RPM > 480 – 600 rpm - Ceramic temperature of primary O2S > 720° C - Fuel system status (deceleration), fuel cut-off - For time 3 s - Pump voltage of primary O2S, no change of state (no switching on or off event) - Diagnosis of canister purge valve, finished	10 s - Continuous		

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P2240 O2 Sensor Positive Current Control Circuit/Open Bank 2 Sensor 1	Evaluation IC primary O2S Bank 2 Open circuit - pump current (IP)	- Absolute value of change of lambda control factor (of filtered set-point value lambda control) > 0.1 - For time > 1.5 s	- Battery voltage > 10.7; < 16.1 V - RPM < 480 – 600 rpm - Electrical adjustment of primary O2S, Not active - Ceramic temperature of primary O2S > 775° C - Relative heater output of primary O2S heater = 100% - Primary fuel control system status, Closed loop - Primary fuel control system not in initialization phase - P-part of secondary fuel control system status, no change of state of P-part (no switching on or off event - Catalyst heating no change of state (no switching on or off event) - Primary O2S voltage > 1.464; < 1.536 V - For time > 10 s - Absolute change in the compulsory amplitude of primary fuel control system ≥ 0.009 - For time > 5 s - Forced oscillation of A/F ratio controller, activated	5 s - Continuous	2 DCY	Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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		• Primary O2S voltage > 1.4654; < 1.536 V • For time > 10.0 s • Integrated MAF > 200.00 g	• Battery voltage > 10.7; < 16.1 V • RPM > 480 – 600 rpm • Primary fuel control system status, Closed loop • Ceramic temperature of primary O2S > 720° C • Electrical adjustment of primary O2S, not active • Required lambda from primary fuel control system < 0.96 • Required lambda from primary fuel control system > 1.09 • Pump voltage of primary O2S, no change of state (no switching on or off event)	• 10 s • Continuous		
		• Primary O2S voltage < 1.55 V • For time > 5.0 s	• Battery voltage > 10.7; < 16.1 V • RPM > 480 – 600 rpm • Ceramic temperature of primary O2S > 720° C • Fuel system status (deceleration), fuel cut-off • For time 3 s • Pump voltage of primary O2S, no change of state (no switching on or off event) • Diagnosis of canister purge valve, finished	• 10 s • Continuous		

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P2243 O2 Sensor Reference Voltage Circuit/ Open Bank 1 Sensor 1	Evaluation IC primary O2S Bank 1 Open circuit - Nernst voltage (UN)	- Primary O2S voltage > 4.70 or < 0.20 V - Internal resistance of primary O2S > 950 Ω	- Battery voltage > 10.7; < 16.1 V - Engine speed > 480 - 600 RPM - Ceramic temperature of primary O2S > 775° C	5 s - Continuous	2 DCY	Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
P2247 O2 Sensor Reference Voltage Circuit/ Open Bank 2 Sensor 1	Evaluation IC primary O2S Bank 2 Open circuit - Nernst voltage (UN)	- Primary O2S voltage > 4.70 or < 0.20 V - Internal resistance of primary O2S > 950 Ω	- Battery voltage > 10.7; < 16.1 V - Engine speed > 480 - 600 RPM - Ceramic temperature of primary O2S > 775° C	5 s - Continuous	2 DCY	Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .
P2257 AIR System Control "A" Circuit Low	Power stage of AIR pump Bank 1 Circuit continuity - short to GND	Voltage IC Internal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Immediate - Continuous	2 DCY	Check Secondary Air Injection (AIR) Pump Relay - - J299-- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 Checking", page 1661 .
P2258 AIR System Control "A" Circuit High	Power stage of AIR pump Bank 1 / Bank 2 Circuit continuity - short to battery	Voltage IC Internal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Immediate - Continuous	2 DCY	Check Secondary Air Injection (AIR) Pump Relay - - J299-- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 Checking", page 1661 .

P2259 AIR Sys- tem Con- trol "B" Circuit Low	Power stage of AIR pump Bank 2 Circuit continuity - short to GND	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check Sec- ondary Air Injection Pump Re- lay 2 - J545- . Re- fer to ⇒ "3.6.35 Secondary Air Injection Pump Re- lay 2 J545 / Secondary Air Injection Pump Mo- tor 2 V189 . Checking", page 1664 .
P2260 AIR Sys- tem Con- trol "B" Circuit High	Power stage of AIR pump Bank 2 Circuit continuity - short to battery	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check Sec- ondary Air Injection Pump Re- lay 2 - J545- . Re- fer to ⇒ "3.6.35 Secondary Air Injection Pump Re- lay 2 J545 / Secondary Air Injection Pump Mo- tor 2 V189 . Checking", page 1664 .
P2270 O2 Sen- sor Sig- nal Biased/ Stuck Lean Bank 1 Sensor 2	O2 Sen- sor Sig- nal Stuck Lean Bank 1 Sensor 2	O2S signal rear < 0.620 V	- Battery voltage > 10.9 V - RPM > 20 - Mass air flow 24 to 120 kg/h - Modeled exhaust gas temperature > 420° C - O2S rear readiness > 10 s 2nd lambda control closed loop	100 s - Contin- uous	2 DCY	Check Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Re- fer to ⇒ "3.6.30 Oxygen Sensor 1 After Cata- lytic Con- verter GX7 . Checking", page 1650 .

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P2271 O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 2	O2 Sensor Signal Stuck Rich Bank 1 Sensor 2	- Response time at fuel cutoff > 2.5 s - Measurement range from fuel cutoff to voltage threshold <= 152 mV - Number of checks >= 1	- Mass air flow 24 to 120 kg/h - Modeled exhaust gas temperature > 350° C - O2S rear readiness > 10 Sec. - Fuel cutoff > 5 s 2nd lambda control closed loop OR - Rich voltage enable >= 602 mV - Lean voltage <= 150 mV - O2S rear ready - Rear O2S signal oscillating monitoring ready - EVAP purge valve diagnosis ready - Fuel cutoff active - Front O2 lambda signal > 2.0 - Modeled exhaust gas temperature > 500° C - Slope of exhaust mass < 60 kg/h	< 5 s during fuel cutoff - Continuous	2 DCY	Check Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7. Checking". page 1650 .
P2272 O2 Sensor Signal Biased/Stuck Lean Bank 2 Sensor 2	O2 Sensor Signal Stuck Lean Bank 2 Sensor 2	O2S signal rear < 0.620 V	- Battery voltage > 10.9 V - RPM > 20 - Mass air flow 24 to 120 kg/h - Modeled exhaust gas temperature > 420° C - O2S rear readiness > 10 s 2nd lambda control closed loop	100 s - Continuous	2 DCY	Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8. Checking". page 1656 .



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P2273 O2 Sensor Signal Biased/Stuck Rich Bank 2 Sensor 2	O2 Sensor Signal Stuck Rich Bank 2 Sensor 2	• Response time at fuel cutoff ≥ 2.5 s • Measurement range from fuel cutoff to voltage threshold ≤ 152 mV • Number of checks ≥ 1	• Mass air flow 24 to 120 kg/h • Modeled exhaust gas temperature $> 420^{\circ}\text{C}$ • O2S rear readiness > 10 s • Fuel cutoff > 5 s • 2nd lambda control closed loop OR • Rich voltage enable ≥ 602 mV • Lean voltage ≤ 150 mV • O2S rear ready • Rear O2S signal oscillating monitoring ready • EVAP purge valve diagnosis ready • Fuel cutoff active • Front O2 lambda signal > 2.0 • Modeled exhaust gas temperature $> 500^{\circ}\text{C}$ • Slope of exhaust mass < 60 kg/h	• < 5 s during fuel cutoff • Continuous	• 2 DCY	– Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8 Checking", page 1656 .

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P2279 Intake Air System Leak	IA system leak Ra- tionality	• Difference Modeled to measured MAP < 4.0 kPa	• Time since engine start > 10 sec • RPM > 400 rpm • condition mass flow into manifold from brake booster, i.e. not active • gradient of brake booster pressure > 0.199 kPa • for a calibrated period of time > 0.5 sec • difference of brake booster pressure and intake MAP > 0.500 kPa • purge valve diagnosis not active • not active for a calibrated period of time > 3 sec • MAF calculated at the throttle blade from the MAF sensor is valid, i.e: active • Condition mass flow from MAF measurement valid, i.e. active • MAF signal 1 > -27.8 g/sec • MAF signal 2 > -27.8 g/sec • Condition compressor surge, i.e. not active • Either: • Pressure upstream intercooler < 0.70 kPa • and: • Factor pressure upstream intercooler to pressure upstream booster (see Look-Up-Table #39) < 1 to 2.80 1/(g*sec) • OR • Condition suspect compressor surge: not active	• 2 s • Continuous	• 2 DCY	- This code will set if the calculated air intake is more than the MAF actual value. Check for air leaks after the MAF sensor. Check the MAF. Refer to ⇒ "3.6.27 Mass Air-flow Sensor G70, Checking", page 1644. Refer to ⇒ "3.6.28 Mass Air-flow Sensor 2 G246, Checking", page 1646.

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			• Pressure upstream intercooler < -0.6992 kPa • Factor pressure upstream intercooler to pressure upstream booster (see Look-Up-Table #39) < 1 to 2.80 1/ (g*sec) • Condition air circulation valve open, i.e not active • Gradient of AP angle > -2.34 % • Predicted delta MAP (see Look-Up-Table #10) < 0 to 24.75 kPa • OR • Factor pressure at throttle blade to reference boost pressure (see Look-Up-Table #11) < 1 to 1.23 • OR • Ratio TCB pressure to BARO (see Look-Up-Table #41) < 1.35 to 3.90 1/ (g*sec) • Condition MAF pulsation detected, i.e. • Factor pressure in front of throttle plate to BARO < 0.90 • OR • RPM > 800 rpm • MAF through throttle blade > 26.4 g/ sec • Ratio (delta MAF sensor 1 - sensor 2):MAF (see Look-Up-Table #23) < 0.185 to 0.225 • Time since last MAF deactivation < 30 sec • The MAF is deactivated if: • Throttle plate angle < 25 % • Gradient of desired MAP < -200 kPa/ sec			

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			- Ratio of TCB to BARO pressure > 0.9 - RPM > 560 rpm - MAF through throttle blade < 50 g/sec - Condition intake MAP valid, i.e. active - Condition release of model based intake MAP Diagnosis, i.e. - Gradient MAP < 10 kPa - Throttle plate angle < 6.0 % - RPM > 1500 rpm - Engine operation point reached at least = 1 - Throttle plate angle > 10.0 % - RPM < 1000 rpm - Engine operation point reached at least = 1 - condition TCB pressure valid, i.e. active - RPM > 300 rpm - fuel system status (deceleration) no fuel cut-off			
P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition coil Circuit continuity - short to GND	IC internal - error flag for 'short to GND' set, true	Engine speed > 680 RPM	< 2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N70- . Refer to "3.6.21 Ignition Coils With Power Output Stage - Checking", page 1633 .

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P2301 Ignition Coil "A" Primary Control Circuit High	Ignition coil Cir- cuit con- tinuity - short to battery	IC internal - error flag for 'short to bat- tery' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition coil Cir- cuit con- tinuity - short to GND	IC internal - error flag for 'short to GND' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N127- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition coil Cir- cuit con- tinuity - short to battery	IC internal - error flag for 'short to bat- tery' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N127- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition coil Cir- cuit con- tinuity - short to GND	IC internal - error flag for 'short to GND' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N291- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .

P2307 Ignition Coil "C" Primary Control Circuit High	Ignition coil Cir- cuit con- tinuity - short to battery	IC internal - error flag for 'short to bat- tery' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N291- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition coil Cir- cuit con- tinuity - short to GND	IC internal - error flag for 'short to GND' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N292- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition coil Cir- cuit con- tinuity - short to battery	IC internal - error flag for 'short to bat- tery' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N292- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P2312 Ignition Coil "E" Primary Control Circuit Low	Ignition coil Cir- cuit con- tinuity - short to GND	IC internal - error flag for 'short to GND' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N323- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .

P2313 Ignition Coil "E" Primary Control Circuit High	Ignition coil Cir- cuit con- tinuity - short to battery	IC internal - error flag for 'short to bat- tery' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N323- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P2315 Ignition Coil "F" Primary Control Circuit Low	Ignition coil Cir- cuit con- tinuity - short to GND	IC internal - error flag for 'short to GND' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N324- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P2316 Ignition Coil "F" Primary Control Circuit High	Ignition coil Cir- cuit con- tinuity - short to battery	IC internal - error flag for 'short to bat- tery' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N324- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .
P2318 Ignition Coil "G" Primary Control Circuit Low	Ignition coil Cir- cuit con- tinuity - short to GND	IC internal - error flag for 'short to GND' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N325- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking", page 1633 .

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P2319 Ignition Coil "G" Primary Control Circuit High	Ignition coil Cir- cuit con- tinuity - short to battery	IC internal - error flag for 'short to bat- tery' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N325- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking". page 1633 .
P2321 Ignition Coil "H" Primary Control Circuit Low	Ignition coil Cir- cuit con- tinuity - short to GND	IC internal - error flag for 'short to GND' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N326- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking". page 1633 .
P2322 Ignition Coil "H" Primary Control Circuit High	Ignition coil Cir- cuit con- tinuity - short to battery	IC internal - error flag for 'short to bat- tery' set, true	Engine speed > 680 RPM	< 2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Output Stage - N326- . Re- fer to ⇒ "3.6.21 Ignition Coils With Power Out- put Stage . Checking". page 1633 .
P2400 EVAP System Leak De- tection Pump Control Circuit/ Open	Evapora- tive Sys- tem Leak Detection Pump Power- stage Cir- cuit con- tinuity - Open Cir- cuit	Voltage IC in- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM - For a period of > 10 s	- Imme- diate - Contin- uous	2 DCY	Check Leak Detection Pump (LDP) - V144- . Re- fer to ⇒ "3.6.24 Leak Detec- tion Pump V144 . Checking". page 1638 .
P2401 EVAP System Leak De- tection Pump Control Circuit Low	Evapora- tive Sys- tem Leak Detection Pump Power- stage Cir- cuit con- tinuity - Short to GND	Voltage IC in- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM - For a period of > 10 s	- Imme- diate - Contin- uous	2 DCY	Check Leak Detection Pump (LDP) - V144- . Re- fer to ⇒ "3.6.24 Leak Detec- tion Pump V144 . Checking". page 1638 .

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P2402 EVAP System Leak De- tection Pump Control Circuit High	Evapora- tive Sys- tem Leak Detection Pump Power- stage Cir- cuit con- tinuity - Short to battery	Voltage IC in- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM - For a period of > 10 s	- Imme- diate - Contin- uous	2 DCY	Check Leak Detection Pump (LDP) - V144- . Re-fer to ⇒ "3.6.24 Leak Detec-tion Pump V144, Checking", page 1638 .
P2403 EVAP System Leak De- tection Pump Power- stage Sense Circuit/ Open	Evapora- tive Sys- tem Leak Detection Pump Power- stage reed sen- sor un- able to close	Low signal voltage > 0.5 Seconds	- Time after engine start, > 5; < 1,200 s - Preceding engine shut off time > 900 Sec. - ECT > 3.8; < 110.3° C - IAT > 3; < 90° C - Integrated purge flow > 39.8 g - Decrease in ECT during engine off period > 45° C - Altitude < 2700 m - Vehicle speed has exceeded, at least once > 5.47 mph - LDP Commanded off	- Imme- diate - Once/ DCY	2 DCY	Check Leak Detection Pump (LDP) - V144- . Re-fer to ⇒ "3.6.24 Leak Detec-tion Pump V144, Checking", page 1638 .
P2404 EVAP System Leak De- tection Pump Power- stage Sense Circuit Range/ Perform- ance	Evapora- tive Sys- tem Leak Detection Pump Power- stage reed sen- sor un- able to open	High signal voltage > 12 s	- Time after engine start, > 5; < 1,200 s - Preceding engine shut off time > 900 Sec. - ECT > 3.8; < 110.3° C - IAT > 3; < 90° C - Decrease in ECT during engine off period > 45° C - Altitude < 2700 m - Vehicle speed has exceeded, at least once > 5.47 mph - LDP Commanded on	- Imme- diate - Once/ DCY	2 DCY	Check Leak Detection Pump (LDP) - V144- . Re-fer to ⇒ "3.6.24 Leak Detec-tion Pump V144, Checking", page 1638 .

P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Evaluation IC primary O2S Voltage Bank 1 Signal range check	- Primary O2S voltage > 2.71 V - OR - Primary O2S voltage > 2.05 V required lambda from primary fuel control system < 0.950 - OR - required lambda from primary fuel control system < 1.050	- Primary O2S voltage < 4.81 V - Primary O2S voltage < 3.06 V - Either: required lambda from primary fuel control system < 0.95 - Or: required lambda from primary fuel control system > 1.05 - Fuel system status (deceleration) no fuel cut-off - Ceramic temperature of primary O2S exceeds calibrated threshold > 720° C - Primary O2S is ready for operation. That means: - Ceramic temperature of primary O2S > 665° C - RPM 480 – 600 rpm - Lambda set point value of primary fuel control system < 1.6	10 s - Continuous	2 DCY	Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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P2415 O2 Sensor Exhaust Sample Error Bank 2 Sensor 1	Evaluation IC primary O2S Voltage Bank 2 Signal range check	- Primary O2S voltage > 2.71 V - OR - Primary O2S voltage > 2.05 V required lambda from primary fuel control system < 0.950 - OR - required lambda from primary fuel control system < 1.050	- Primary O2S voltage < 4.81 V - Primary O2S voltage < 3.06 V - Either: required lambda from primary fuel control system < 0.95 - Or: required lambda from primary fuel control system > 1.05 - Fuel system status (deceleration) no fuel cut-off - Ceramic temperature of primary O2S exceeds calibrated threshold > 720° C - Primary O2S is ready for operation. That means: - Ceramic temperature of primary O2S > 665° C - RPM 480 – 600 rpm - Lambda set point value of primary fuel control system < 1.6	10 s - Continuous	2 DCY	Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .
P2431 AIR System Air Flow/ Pressure Sensor Circuit Range/ Performance Bank 1	AIR system pressure sensor Bank 1 Plausibility check	- Difference of AIR system pressure sensor and BARO sensor before activation of AIR > 6.0 kPa - Difference of AIR system pressure sensor and BARO sensor before activation of AIR < -6.0 kPa	- Engine off time > 5 s - BARO sensor voltage > 0.2 < 4.8 V - Air injection finished	- Immediate - Once/ DCY	2 DCY	Check Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609- Checking", page 1666 .
P2432 AIR System Air Flow/ Pressure Sensor Circuit Low Bank 1	AIR system pressure sensor Bank 1 Circuit continuity - short to GND	Voltage of AIR pressure sensor < 0.400 V		0.5 s - Continuous	2 DCY	Check Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609- Checking", page 1666 .

P2433 AIR System Air Flow/ Pressure Sensor Circuit High Bank 1	AIR system pressure sensor Bank 1 Circuit continuity - short to battery	Voltage of AIR pressure sensor > 4.605 V		0.5 s - Continuous	2 DCY	Check Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609- Checking", page 1666 .
P2436 AIR System Air Flow/ Pressure Sensor Circuit Range/ Performance Bank 2	AIR system pressure sensor Bank 2 Plausibility check	- Difference of AIR system pressure sensor and BARO sensor before activation of AIR > 6.0 kPa - Difference of AIR system pressure sensor and BARO sensor before activation of AIR < -6.0 kPa	- Engine off time > 5 s - BARO sensor voltage > 0.2 and < 4.8 V - Air injection finished	- Immediate - Continuous	2 DCY	Check Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .
P2437 AIR System Air Flow/ Pressure Sensor Circuit Low Bank 2	AIR system pressure sensor Bank 2 Circuit continuity - short to GND	Voltage of AIR pressure sensor < 0.400 V	---	0.5 s - Continuous	2 DCY	Check Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .
P2438 AIR System Air Flow/ Pressure Sensor Circuit High Bank 2	AIR system pressure sensor Bank 2 Circuit continuity - short to battery	Voltage of AIR pressure sensor > 4.605 V		0.5 s - Continuous	2 DCY	Check Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .

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P2440 AIR Sys- tem Switching Valve Stuck Open Bank 1	AIR sys- tem Bank 1 AIR system valve tightness check Bank 1	- Max. positive deviation of measured to Modeled AIR pressure during offset phase > 0.5 kPa - Min. positive deviation of measured to Modeled AIR pressure during offset phase < -0.7 kPa - Average AIR pressure during offset phase > 0.23 kPa	- Pressure gradient in AIR system < 0.1016 - For a time > 5 s - Gradient of engine load change > -5; < 5%/rev - Engine speed > 480 to 600 RPM - Mass air flow > 1.94 and < 59.7 – 76.4 g/Sec. - For a time > 5 s - Diagnosis of AIR pressure sensor finished - AIR injection finished	- Imme- diate - Once/ DCY	2 DCY	- Check Combina- tion valve for second- ary air in- jection (AIR). Refer to Repair Manual. - Check Sec- ondary Air Injection Pump Mo- tor - V101- Refer to ⇒ "3.6.34 Secondary Air Injection Pump Re- lay J299/ Secondary Air Injection Pump Mo- tor V101, Checking", page 1661.
P2442 AIR Sys- tem Switching Valve Stuck Open Bank 2	AIR sys- tem Bank 2 AIR system valve tightness check Bank 2	- Max. positive deviation of measured to Modeled AIR pressure during offset phase > 0.5 kPa - Min. positive deviation of measured to Modeled AIR pressure during offset phase < -0.7 kPa - Average AIR pressure during offset phase > 0.23 kPa	- Pressure gradient in AIR system < 0.1016 - For a time > 5 s - Gradient of engine load change > -5; < 5%/rev - Engine speed > 480 to 600 RPM - Mass air flow > 1.94 and < 59.7 – 76.4 g/Sec. - For a time > 5 s - Diagnosis of AIR pressure sensor finished - AIR injection finish- ed	- Imme- diate - Once/ DCY	2 DCY	- Check Combina- tion valve for second- ary air in- jection (AIR). Refer to Repair Manual. - Check Sec- ondary Air Injection Pump Mo- tor 2 - V189- . Re- fer to ⇒ "3.6.35 Secondary Air Injection Pump Re- lay 2 J545 / Secondary Air Injection Pump Mo- tor 2 V189, Checking", page 1664.
P2632 Fuel Pump "B" Control Circuit / Open	FP Circuit 2 Open circuit / or short to GND	Voltage IC In- ternal	- Battery voltage > 9 V - Engine speed > 80 RPM	- Imme- diate - Contin- uous	2 DCY	Check Fuel Pump 2 - V277- . Re- fer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277, Checking", page 1630.

P2634 Fuel Pump "B" Control Circuit High	FP Circuit 2 short to battery voltage	• Voltage IC Internal	• Battery voltage > 9 V • Engine speed > 80 RPM	• Immediate • Continuous	• 2 DCY	– Check Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277 . Checking", page 1630

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P30A3 Cylinder Deactivation Valve 1 Stuck Open	CD control valve cylinder 3 / 2 / 5 / 8 Rationality check - CD commanded on	Minimum air charge factor from non CD cylinders minus air charge factor from monitored CD cylinder < 0.150	- RPM > 500; < 2850 rpm - Quotient MAP / pressure before throttle plate > 0.2; < 0.95 - MAF at throttle calculated from MAF sensor signal is valid, i.e. active - MAF 1 > -27.78 g/sec - MAF 2 > -27.78 g/sec - Ignition = active - RPM > 20 rpm - Battery voltage > 11 V - MAF sensor pulsation detected, i.e. false - Gradient of the desired MAP > -200 kPa/sec. - Quotient pressure before throttle to BARO < 0.9 - For a calibrated period of time > 0 – 1.5 s - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 s OR - RPM > 800 rpm - MAF through throttle > 26.39 g/sec - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 - For a calibrated period of time > 1.55 s % throttle blade < 25.293% - Pressure upstream intercooler < 0.6992; > -0.6992 kPa - Either : Ratio TCB pressure to BARO < 1.35 – 3.90	0.5 s - Continuous	2 DCY	Check Inlet Deactivation Valve - N518- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .

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			• Or : Ratio TCB pressure to BARO > 1 – 1.05 • Quotient pressure upstream intercooler to pressure upstream booster < 1 • Time since engine start > 1 s			



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P30A4 Cylinder Deactivation Valve 1 Stuck Closed	CD control valve cylinder 3 / 2 / 5 / 8 Rationality check - CD commanded off	- Air charge factor in this cylinder > 0.15 and < 0.50 - Air charge factor in other CD cylinders < 0.35	- RPM > 500; < 2850 rpm - Quotient MAP / pressure before throttle plate > 0.2; < 0.95 - MAF at throttle calculated from MAF sensor signal is valid, i.e. active - MAF 1 > -27.78 g/sec - MAF 2 > -27.78 g/sec - Ignition = active - RPM > 20 rpm - Battery voltage > 11 V - MAF sensor pulsation detected, i.e. false - Gradient of the desired MAP > -200 kPa/sec. - Quotient pressure before throttle to BARO < 0.9 - For a calibrated period of time > 0 – 1.5 s - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 s OR - RPM > 800 rpm - MAF through throttle > 26.39 g/sec - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 - For a calibrated period of time > 1.55 s % throttle blade < 25.293% - Pressure upstream intercooler < 0.6992 – 0.6992 kPa - Either : Ratio TCB pressure to BARO < 1.35 – 3.90	0.5 s - Continuous	2 DCY	Check Inlet Deactivation Valve - N518- . Refer to "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .

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			• Or : Ratio TCB pressure to BARO > 1 – 1.05 • Quotient pressure upstream intercooler to pressure upstream booster < 1 • Time since engine start > 1 s			



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P30A5 Cylinder Deactivation Valve 2 Stuck Open	CD control valve cylinder 3 / 2 / 5 / 8 Rationality check - CD commanded on	Minimum air charge factor from non CD cylinders minus air charge factor from monitored CD cylinder < 0.150	- RPM > 500; < 2850 rpm - Quotient MAP / pressure before throttle plate > 0.2; < 0.95 - MAF at throttle calculated from MAF sensor signal is valid, i.e. active - MAF 1 > -27.78 g/sec - MAF 2 > -27.78 g/sec - Ignition = active - RPM > 20 rpm - Battery voltage > 11 V - MAF sensor pulsation detected, i.e. false - Gradient of the desired MAP > -200 kPa/sec. - Quotient pressure before throttle to BARO < 0.9 - For a calibrated period of time > 0 – 1.5 s - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 s OR - RPM > 800 rpm - MAF through throttle > 26.39 g/sec - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 - For a calibrated period of time > 1.55 s % throttle blade < 25.293% - Pressure upstream intercooler < 0.6992; > -0.6992 kPa - Either : Ratio TCB pressure to BARO < 1.35 – 3.90	0.5 s - Continuous	2 DCY	– Check Inlet Deactivation Valve - N519- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .

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			• Or : Ratio TCB pressure to BARO > 1 – 1.05 • Quotient pressure upstream intercooler to pressure upstream booster < 1 • Time since engine start > 1 s			



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P30A6 Cylinder Deactivation Valve 2 Stuck Closed	CD control valve cylinder 3 / 2 / 5 / 8 Rationality check - CD commanded off	- Air charge factor in this cylinder > 0.15 and < 0.50 - Air charge factor in other CD cylinders < 0.35	- RPM > 500; < 2850 rpm - Quotient MAP / pressure before throttle plate > 0.2; < 0.95 - MAF at throttle calculated from MAF sensor signal is valid, i.e. active - MAF 1 > -27.78 g/sec - MAF 2 > -27.78 g/sec - Ignition = active - RPM > 20 rpm - Battery voltage > 11 V - MAF sensor pulsation detected, i.e. false - Gradient of the desired MAP > -200 kPa/sec. - Quotient pressure before throttle to BARO < 0.9 - For a calibrated period of time > 0 – 1.5 Sec. - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 s OR - RPM > 800 rpm - MAF through throttle > 26.39 g/sec - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 - For a calibrated period of time > 1.55 s % throttle blade < 25.293% - Pressure upstream intercooler < 0.6992; > -0.6992 kPa - Either : Ratio TCB pressure to BARO < 1.35 – 3.90	0.5 s - Continuous	2 DCY	– Check Inlet Deactivation Valve - N519- . Refer to "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .

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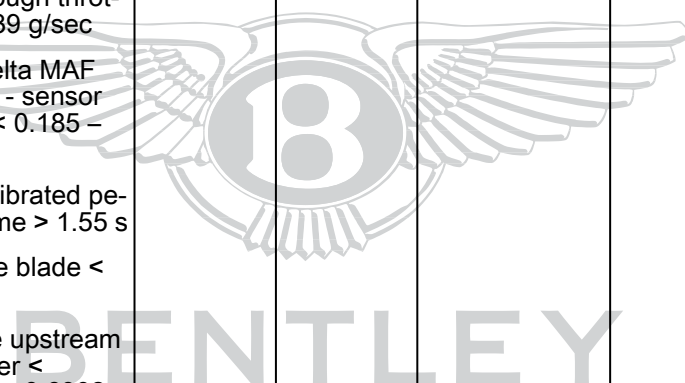
			• Or : Ratio TCB pressure to BARO > 1 – 1.05 • Quotient pressure upstream intercooler to pressure upstream booster < 1 • Time since engine start > 1 s			



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P30A7 Cylinder Deactivation Valve 3 Stuck Open	CD control valve cylinder 3 / 2 / 5 / 8 Rationality check - CD commanded on	Minimum air charge factor from non CD cylinders minus air charge factor from monitored CD cylinder < 0.150	- RPM > 500; < 2850 rpm - Quotient MAP / pressure before throttle plate > 0.2; < 0.95 - MAF at throttle calculated from MAF sensor signal is valid, i.e. active - MAF 1 > -27.78 g/sec - MAF 2 > -27.78 g/sec - Ignition = active - RPM > 20 rpm - Battery voltage > 11 V - MAF sensor pulsation detected, i.e. false - Gradient of the desired MAP > -200 kPa/sec. - Quotient pressure before throttle to BARO < 0.9 - For a calibrated period of time > 0 – 1.5 s - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 s OR - RPM > 800 rpm - MAF through throttle > 26.39 g/sec - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 - For a calibrated period of time > 1.55 s % throttle blade < 25.293% - Pressure upstream intercooler < 0.6992; > -0.6992 kPa - Either : Ratio TCB pressure to BARO < 1.35 – 3.90	0.5 s - Continuous	2 DCY	Check Inlet Deactivation Valve - N520- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .



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			• Or : Ratio TCB pressure to BARO > 1 – 1.05 • Quotient pressure upstream intercooler to pressure upstream booster < 1 • Time since engine start > 1 s			



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P30A8 Cylinder Deactivation Valve 3 Stuck Closed	CD control valve cylinder 3 / 2 / 5 / 8 Rationality check - CD commanded off	- Air charge factor in this cylinder > 0.15 and < 0.50 - Air charge factor in other CD cylinders < 0.35	- RPM > 500; < 2850 rpm - Quotient MAP / pressure before throttle plate > 0.2; < 0.95 - MAF at throttle calculated from MAF sensor signal is valid, i.e. active - MAF 1 > -27.78 g/sec - MAF 2 > -27.78 g/sec - Ignition = active - RPM > 20 rpm - Battery voltage > 11 V - MAF sensor pulsation detected, i.e. false - Gradient of the desired MAP > -200 kPa/sec. - Quotient pressure before throttle to BARO < 0.9 - For a calibrated period of time > 0 – 1.5 s - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 s OR - RPM > 800 rpm - MAF through throttle > 26.39 g/sec - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 - For a calibrated period of time > 1.55 s % throttle blade < 25.293% - Pressure upstream intercooler < 0.6992 > -0.6992 kPa - Either : Ratio TCB pressure to BARO < 1.35 – 3.90	0.5 s - Continuous	2 DCY	Check Inlet Deactivation Valve - N520- . Refer to "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .

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P30A9 Cylinder Deactivation Valve 4 Stuck Open	CD control valve cylinder 3 / 2 / 5 / 8 Rationality check - CD commanded on	Minimum air charge factor from non CD cylinders minus air charge factor from monitored CD cylinder < 0.150	- RPM > 500; < 2850 rpm - Quotient MAP / pressure before throttle plate > 0.2; < 0.95 - MAF at throttle calculated from MAF sensor signal is valid, i.e. active - MAF 1 > -27.78 g/sec - MAF 2 > -27.78 g/sec - Ignition = active - RPM > 20 rpm - Battery voltage > 11 V - MAF sensor pulsation detected, i.e. false - Gradient of the desired MAP > -200 kPa/sec. - Quotient pressure before throttle to BARO < 0.9 - For a calibrated period of time > 0 – 1.5 s - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 s - OR RPM > 800 rpm - MAF through throttle > 26.39 g/sec - Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 - For a calibrated period of time > 1.55 s % throttle blade < 25.293% - Pressure upstream intercooler < 0.6992; > -0.6992 kPa - Either : Ratio TCB pressure to BARO < 1.35 – 3.90	0.5 s - Continuous	2 DCY	Check Inlet Deactivation Valve - N521- . Refer to "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .

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			• Or : Ratio TCB pressure to BARO > 1 – 1.05 • Quotient pressure upstream intercooler to pressure upstream booster < 1 • Time since engine start > 1 s			



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P30AA Cylinder Deactivation Valve 4 Stuck Closed	CD control valve cylinder 3 / 2 / 5 / 8 Rationality check - CD commanded off	• Air charge factor in this cylinder > 0.15 and < 0.50 • Air charge factor in other CD cylinders < 0.35	• RPM > 500; < 2850 rpm • Quotient MAP / pressure before throttle plate > 0.2; < 0.95 • MAF at throttle calculated from MAF sensor signal is valid, i.e. active • MAF 1 > -27.78 g/sec • MAF 2 > -27.78 g/sec • Ignition = active • RPM > 20 rpm • Battery voltage > 11 V • MAF sensor pulsation detected, i.e. false • Gradient of the desired MAP > -200 kPa/sec. • Quotient pressure before throttle to BARO < 0.9 • For a calibrated period of time > 0 – 1.5 s • Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 s OR • RPM > 800 rpm • MAF through throttle > 26.39 g/sec • Ratio (delta MAF sensor 1 - sensor 2):MAF < 0.185 – 0.225 • For a calibrated period of time > 1.55 Sec. • % throttle blade < 25.293% • Pressure upstream intercooler < 0.6992; > -0.6992 kPa • Either : Ratio TCB pressure to BARO < 1.35 – 3.90	• 0.5 s • Continuous	• 2 DCY	– Check Inlet Deactivation Valve - N521- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .

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			• Or : Ratio TCB pressure to BARO > 1 – 1.05 • Quotient pressure upstream intercooler to pressure upstream booster < 1 • Time since engine start > 1 s			
P3409 Cylinder 2 Deactivation/Intake Valve Control Circuit/ Open	CD valve power stage cylinder 3 / 2 / 5 / 8 Circuit continuity - Open circuit	• Voltage IC internal	• Battery voltage > 10 V • For a calibrated period of time > 70 s	• Immediate • Continuous	• 2 DCY	– Check Inlet Deactivation Valve - N518- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .
P3411 Cylinder 2 Deactivation/Intake Valve Control Circuit Low	CD valve power stage cylinder 3 / 2 / 5 / 8 Circuit continuity - short to GND	• Voltage IC internal	• Battery voltage > 10 V	• Immediate • Continuous	• 2 DCY	– Check Inlet Deactivation Valve - N518- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .
P3412 Cylinder 2 Deactivation/Intake Valve Control Circuit High	CD valve power stage cylinder 3 / 2 / 5 / 8 Circuit continuity - short to battery	• Voltage IC internal	• Engine speed > 80 rpm	• Immediate • Continuous	• 2 DCY	– Check Inlet Deactivation Valve - N518- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .
P3417 Cylinder 3 Deactivation/Intake Valve Control Circuit/ Open	CD valve power stage cylinder 3 / 2 / 5 / 8 Circuit continuity - Open circuit	• Voltage IC internal	• Battery voltage > 10 V • For a calibrated period of time > 70 s	• Immediate • Continuous	• 2 DCY	– Check Inlet Deactivation Valve - N519- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .

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P3419 Cylinder 3 Deactivation/In- take Valve Control Circuit Low	CD valve power stage cyl- inder 3 / 2 / 5 / 8 Circuit continuity - short to GND	Voltage IC in- ternal	Battery voltage > 10 V	- Imme- diate - Contin- uous	2 DCY	Check Inlet Deactiva- tion Valve - N519- . Re- fer to ⇒ "3.6.8 Displace- ment On Demand Rotary Sol- enoid NX8, Checking", page 1607 .
P3420 Cylinder 3 Deactivation/In- take Valve Control Circuit High	CD valve power stage cyl- inder 3 / 2 / 5 / 8 Circuit continuity - short to battery	Voltage IC in- ternal	Engine speed > 80 rpm	- Imme- diate - Contin- uous	2 DCY	Check Inlet Deactiva- tion Valve - N519- . Re- fer to ⇒ "3.6.8 Displace- ment On Demand Rotary Sol- enoid NX8, Checking", page 1607 .
P3433 Cylinder 5 Deactivation/In- take Valve Control Circuit/ Open	CD valve power stage cyl- inder 3 / 2 / 5 / 8 Circuit continuity - Open circuit	Voltage IC in- ternal	- Battery voltage > 10 V - For a calibrated pe- riod of time > 70 s	- Imme- diate - Contin- uous	2 DCY	Check Inlet Deactiva- tion Valve - N520- . Re- fer to ⇒ "3.6.8 Displace- ment On Demand Rotary Sol- enoid NX8, Checking", page 1607 .
P3435 Cylinder 5 Deactivation/In- take Valve Control Circuit Low	CD valve power stage cyl- inder 3 / 2 / 5 / 8 Circuit continuity - short to GND	Voltage IC in- ternal	Battery voltage > 10 V	- Imme- diate - Contin- uous	2 DCY	Check Inlet Deactiva- tion Valve - N520- . Re- fer to ⇒ "3.6.8 Displace- ment On Demand Rotary Sol- enoid NX8, Checking", page 1607 .
P3436 Cylinder 5 Deactivation/In- take Valve Control Circuit High	CD valve power stage cyl- inder 3 / 2 / 5 / 8 Circuit continuity - short to battery	Voltage IC in- ternal	Engine speed > 80 rpm	- Imme- diate - Contin- uous	2 DCY	Check Inlet Deactiva- tion Valve - N520- . Re- fer to ⇒ "3.6.8 Displace- ment On Demand Rotary Sol- enoid NX8, Checking", page 1607 .

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P3457 Cylinder 8 Deactivation/In- take Valve Control Circuit/ Open	CD valve power stage cyl- inder 3 / 2 / 5 / 8 Circuit continuity - Open circuit	Voltage IC in- ternal	- Battery voltage > 10 V - For a calibrated pe- riod of time > 70 s	- Imme- diate - Contin- uous	2 DCY	Check Inlet Deactivation Valve - N521- . Refer to ⇒ "3.6.8 Displace- ment On Demand Rotary Sol- enoid NX8, Checking", page 1607 .
P3459 Cylinder 8 Deactivation/In- take Valve Control Circuit Low	CD valve power stage cyl- inder 3 / 2 / 5 / 8 Circuit continuity - short to GND	Voltage IC in- ternal	Battery voltage > 10 V	- Imme- diate - Contin- uous	2 DCY	Check Inlet Deactivation Valve - N521- . Refer to ⇒ "3.6.8 Displace- ment On Demand Rotary Sol- enoid NX8, Checking", page 1607 .
P3460 Cylinder 8 Deactivation/In- take Valve Control Circuit High	CD valve power stage cyl- inder 3 / 2 / 5 / 8 Circuit continuity - short to battery	Voltage IC in- ternal	Engine speed > 80 rpm	- Imme- diate - Contin- uous	2 DCY	Check Inlet Deactivation Valve - N521- . Refer to ⇒ "3.6.8 Displace- ment On Demand Rotary Sol- enoid NX8, Checking", page 1607 .
U0001 High Speed CAN Communi- cation Bus	CAN Communi- cation	CAN re-initial- ization coun- ter > 1	- Battery voltage > 9.5 V - Battery voltage < 16 V - Engine start finish- ed = true - RPM > 480 – 600 rpm	0.2 s - Contin- uous	2 DCY	Check ter- minal resist- ance of CAN-Bus ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601 .
U0002 High Speed CAN Communi- cation Bus Per- formance	CAN Communi- cation	CAN mes- sage cycle time > 0.28 s		0.3 s - Contin- uous	2 DCY	Check ter- minal resist- ance of CAN-Bus ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601 .

U0101 Lost Communication with TCM	CAN comms with TCM	CAN message cycle time > 0.20 s		0.2 s - Continuous	2 DCY	Check terminal resistance of CAN-Bus between Engine Control Module (ECM) - J623- and Transmission Control Module (TCM) - J217- . Refer to "3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 1603 .
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module	CAN comms with ABS	Message time out = true		- Immediate - Continuous	2 DCY	Check ABS CAN-Bus operation. Refer to appropriate repair manual.
U0140 Lost Communication With Body Control Module	CAN comms with Adaptive Cruise Control module	Message time out = true		- Immediate - Continuous	2 DCY	Check terminal resistance of CAN-Bus ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601 .
U0146 Lost Communication With Gateway "A"	CAN comms with Gateway CM	Message time out = true		- Immediate - Continuous	2 DCY	Check terminal resistance of CAN-Bus ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601 .
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	CAN comms with IPC CM	Message time out = true		- Immediate - Continuous	2 DCY	Check the Instrument Cluster CAN-Bus. Refer to appropriate repair manual..

U0402 Invalid Data Re- ceived From TCM	CAN comms with TCM	CAN mes- sage length < 8		- Imme- diate - Contin- uous	2 DCY	Check for correct VIN and soft- ware ID stored in TCM. If the software ID or VIN is in- correct, a reflash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to ⇒ "3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 1603.
U0415 Invalid Data Re- ceived From Anti-Lock Brake System (ABS) Control Module	CAN comms with ABS	- CAN mes- sage counter > 255 - CAN check- sum fault > 1 - CAN mes- sage length < 8		- Imme- diate - Contin- uous	2 DCY	Check for correct VIN and soft- ware ID stored in ABS. If the software ID or VIN is in- correct, a reflash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to appropriate repair manual.
	VSS Sig- nal range check	Sensed vehi- cle speed > 201.9 mph		3 s - Contin- uous		
	VSS Sen- sor signal check	Status of vehi- cle speed via CAN = 1		0.4 s - Contin- uous		
	VSS Initia- lization sensor check	Status of vehi- cle speed via CAN = 4				
U0423 Invalid Data Re- ceived From In- strument Panel Cluster Control Module	CAN comms with IPC CM	- CAN mes- sage 1 length < 8 - CAN mes- sage 2 length < 8		- Imme- diate - Contin- uous	2 DCY	Check the Instrument Cluster CAN-Bus. Refer to appropriate repair manual.

U0447 Invalid Data Received From Gateway "A"	CAN comms with Gateway CM	• Message length < 8		• Immediate • Continuous	• 2 DCY	– Check terminal resistance of CAN-Bus ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.

3.4.3 Engine Control Module , 2016 MY

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P000A "A" Camshaft Position Slow Response Bank 1	Variable Valve Timing (VVT) Intake Actuator slow response	• Difference between target and actual position > 7° CRK • For time > 1.5 – 3.0 s • Adjustment angle ≥ 3.00° CRK	• Time after engine start > 3.0 - 10.0 s • Engine speed 480 - 5,000 rpm • modeled oil temperature -11 - 125° C • Frequency (normal operation) 7 times	• 24.5 s • Multiple	• 2 DCY	– Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597.
P0010 "A" Camshaft Position Actuator Control Circuit/ Open Bank 1	Variable Valve Timing (VVT) Intake Actuator - Open Circuit	• Signal voltage 4.70 - 5.40 V	• Camshaft actuator solenoid valve commanded off	• 0.5 s • Continuous	• 2 DCY	– Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597.

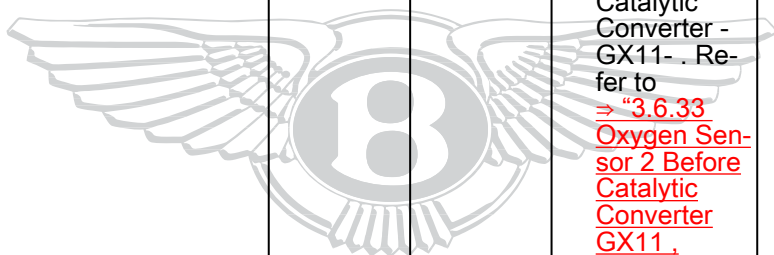


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P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	Variable Valve Timing (VVT) Intake Actuator - target error	- Difference between target and actual position > 7° CRK - For time > 1.5 – 3.0 s - Adjustment angle >= 3.00° CRK	- Time after engine start > 3.0 - 10.0 s - Engine speed 480 - 5000 rpm - Modeled oil temperature -11 - 125° C - Frequency (normal operation) 7 times	24.5 s - Multiple	• 2 DCY	- Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597. - Check Intake Camshaft Position (CMP) Sensor 1 - G40- Refer to ⇒ "3.6.4 Camshaft Position Sensor G40, Checking", page 1599.
P0012 "A" Camshaft Position - Timing Over-Retarded Bank 1	VVT Camshaft Locking Pin position check	- No. of registered angles for averaging of angle camshaft = 5 - Difference between measured CMPs (average) and camshaft locked position ≥ 10° CRK	- Camshaft to crankshaft adaptation completed - Frequency (normal operation) < 3 times - Time since engine start < 1 s - Set point VVT is in locking position; true - Diagnosis of VVT intake power stage finished	Once / DCY	• 2 DCY	- Check Intake Camshaft Position (CMP) Sensor 1 - G40- Refer to ⇒ "3.6.4 Camshaft Position Sensor G40, Checking", page 1599. - Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597.
P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Camshaft Position (CMP) Intake Sensor angular offset check	- Permissible deviation < 11.01° CRK - OR - Permissible deviation > 11.01° CRK		8 Revolutions - Multiple	• 2 DCY	Check Intake Camshaft Position (CMP) Sensor 1 - G40- Refer to ⇒ "3.6.4 Camshaft Position Sensor G40, Checking", page 1599.

P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater front Open circuit	Signal voltage 4.70 - 5.40 V	- Time after engine start > 5 s - O2S heater front commanded off	0.5 s - Continuous	2 DCY	Check Bank 1 Heated Oxygen Sensor - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater front short to ground	Signal voltage 0.0 - 3.26 V	- Time after engine start > 5 s - O2S heater front commanded off	0.5 s - Continuous	2 DCY	Check Bank 1 Heated Oxygen Sensor - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater front short to battery plus	Signal current driver stage internal value	- Time after engine start > 5 s - O2S heater front commanded on	0.5 s - Continuous	2 DCY	Check Bank 1 Heated Oxygen Sensor - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater rear open circuit	Signal voltage 4.70 - 5.40 V	- Engine speed > 80 rpm - O2S heater rear commanded off	0.5 s - Continuous	2 DCY	Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater rear short to ground	Signal voltage < 2.74 - 3.26 V	- Engine speed > 80 rpm - O2S heater rear commanded off	0.5 s - Continuous	2 DCY	Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650

P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater rear short to battery plus	Signal current driver stage internal value	- Engine speed > 80 rpm - O2S heater rear commanded on	0.5 s - Continuous	2 DCY	Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .
P0040 O2 Sensor Signals Swapped Bank 1 Sensor 1/Bank 2 Sensor 1	Oxygen Sensors (O2S) front signal range check (detection of exchange lambda sensors upstream catalyst)	- Lambda controllers exceed thresholds in opposite directions - Case 1: - Lambda control value bank 1 < 0.80 [-] and - Lambda control value bank 2 > 1.20 [-] - Case 2: - Lambda control value bank 1 > 1.20 [-] - AND - Lambda control value bank 2 < 0.80 [-]	- Lambda control closed loop - VVT ready	5 s - Multiple	2 DCY	- Using a scan tool with the engine running, check the Bank 1 and Bank 2 Long Term fuel trim - if one is above 10 negative and the other above 10 positive, swap the front HO2s sensor connectors and look for the long term values to move close to a zero or low single digit reading. - Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 - Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659



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P0050 HO2S Heater Control Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater front Open circuit	Signal voltage 4.70 - 5.40 V	- Time after engine start > 5 s - O2S heater front commanded off	0.5 s - Continuous	2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659
P0051 HO2S Heater Control Circuit Low Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater front short to ground	signal voltage 0.0 - 3.26 V	- time after engine start > 5 s - O2S heater front commanded off	0.5 s - Continuous	2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659
P0052 HO2S Heater Control Circuit High Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater front short to battery plus	Signal current driver stage internal value	- Time after engine start > 5 s - O2S heater front commanded on	0.5 s - Continuous	2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659
P0056 HO2S Heater Control Circuit Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater rear open circuit	Signal voltage 4.70 - 5.40 V	- Engine speed > 80 rpm - O2S heater rear commanded off	0.5 s - Continuous	2 DCY	Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656

P0057 HO2S Heater Control Circuit Low Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater rear short to ground	signal voltage < 2.74 - 3.26 V	- Engine speed > 80 rpm - O2S heater rear commanded off	0.5 s - Continuous	2 DCY	Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8 , Checking", page 1656
P0058 HO2S Heater Control Circuit High Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater rear short to battery plus	Signal current driver stage internal value	- Engine speed > 80 rpm - O2S heater rear commanded on	0.5 s - Continuous	2 DCY	Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8 , Checking", page 1656
P0071 Ambient Air Tem- perature Sensor Circuit "A" Range/ Per- for- mance	Ambient Air Temperature (AAT) Sensor rationality check Ambient Air Temperature (AAT) Sensor rationality check High Phase Ambient Air Temperature (AAT) Sensor rationality check Low Phase	- Diff. AAT vs. ECT at engine start > 20.3 [K] - Diff. AAT vs. ECT at engine start < -45.0 [K] - Diff. between max AAT vs. min AAT < 3.8 [K]	- ECT @ last engine stop <= 80° C - Diff. ECT @ last engine stop vs. ECT@start <= 39.8 [K] - ECT @ start <= -35; >= 41° C - Time in High Phase > 30.0 s - Number of checks >= 3.00 [-] - MAF < 40.00 [kg/h] - Vehicle speed < 20 [km/h] - ECT > 87° C - Integrated air mass > 7.01 - 16.84 [kg] - Time in Low Phase > 15.0 s - Number of checks >= 2.00 [-] - Vehicle speed >= 60 [km/h] - MAF >= 72.00; <= 180.00 [kg/h]	2.0 s - Once / DCY 10.0 s - Continuous 10.0 s - Continuous	2 DCY	Refer to appropriate repair manual.

P0072 Ambient Air Temperature Sensor Circuit "A" Low	Ambient Air Temperature (AAT) Sensor out of range low	Signal voltage < 0.10 V	- Conditions for Measurement Window - ECT > -48° C - Mass air flow n.a. - Vehicle speed n.a. - Monitor measurement window conditions fulfilled > 0.0 s	1.0 s - Continuous	2 DCY	Refer to appropriate repair manual.
P0073 Ambient Air Temperature Sensor Circuit "A" High	Ambient Air Temperature (AAT) Sensor out of range high	signal voltage > 3.0 V	- Conditions for Measurement Window - ECT > -48° C - Mass air flow n.a. - vehicle speed n.a. - Monitor measurement window conditions fulfilled > 0.0 s	1.0 s - Continuous	2 DCY	Refer to appropriate repair manual.
P0087 Fuel Rail/ System Pressure - Too Low Bank 1	FRP Sensor Signal check	Difference between fuel pressure and MAP < 250 kPa	- Engine speed > 20 RPM - Time after engine start > 2 s - Diagnosis of FRP sensor = finished	5 s - Continuous	2 DCY	- Perform a fuel pressure test. Refer to the Repair Manual for procedure and specification. If the fuel pressure is in range: - Check the Fuel Pressure Sensor - G247- . Refer to "3.6.18 Fuel Pressure Sensor G247, Checking", page 1626 .
P0088 Fuel Rail/ System Pressure - Too High Bank 1	FRP Sensor Signal check	Difference between fuel pressure and MAP > 550 kPa	- Engine speed > 20 RPM - Time after engine start > 2 s - Diagnosis of FRP sensor = finished	5 s - Continuous	2 DCY	- Perform a fuel pressure test. Refer to the Repair Manual for procedure and specification. If the fuel pressure is in range: - Check the Fuel Pressure Sensor - G247- . Refer to "3.6.18 Fuel Pressure Sensor G247, Checking", page 1626 .

P00A6 Intake Air Temperature Sensor 2 Circuit Range/Performance Bank 2	IAT Sensor 2 Low side check	IAT 2 vs. ECT at start > 20.3 or < -45° C	- ECT at last engine stop > 80.3° C - Difference of ECT at last engine stop and at recent start > 39.8° C - ECT at start < 40.5 and > -35.3° C - Block heater not detected - Conditions for block heater detection: - ECT < 50.3° C (ECT at start) - ECT > 3° C - Time after engine start < 200 s	5 s - Once / DCY	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246- . Checking", page 1646
P00A7 Intake Air Temperature Sensor 2 Circuit Low Bank 2	IAT Sensor 2 circuit continuity short to GND	Signal from IAT sensor 2 < 0.107 V	- ECT > -48° C - MAF < 283.33 g/ Sec. - Vehicle speed < 198.1 mph	1 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246- . Checking", page 1646
P00A8 Intake Air Temperature Sensor 2 Circuit High Bank 2	IAT Sensor 2 circuit continuity short to battery	Signal from IAT sensor 2 > 2.959 V	- ECT > -48° C - MAF < 283.33 g/ Sec. - Vehicle speed < 198.1 mph	1 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246- . Checking", page 1646
P00B2 Radiator Coolant Temperature Sensor Circuit Performance	Radiator Inlet Temperature Sensor Stuck Check	Difference of the maximum and minimum of radiator inlet temperature < 5.0° C	- Fuel system status = no fuel cut-off - Vehicle speed > 18.6 mph - Vehicle speed < 74.6 – 93.2 mph - RPM > 800 rpm - ECT > 81.1° C - AAT > -9.7° C - ECT at start < 60.0° C - Difference of coolant temperature between engine start and last engine shut off > 10.0 – 60.0° C	2 s - Continuous	2 DCY	Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ "3.6.12 Engine Coolant Temperature Sensor On Radiator Outlet G83- . Checking", page 1615

	Radiator Inlet Temperature Sensor high side check	Radiator inlet temperature minus ECT > 20.0° C		3 s - Continuous	2 DCY	
	Radiator Inlet Temperature Sensor low side check	Difference between IAT and Radiator Inlet Temperature > 20.0° C	Cold start detected: - Difference between IAT and IAT at start < 2.3° C - ECT at last shut-off > 81° C - Vehicle speed > 18.6 mph - For time 15 s - Integrated MAF since engine start > 1200g	- Immediately - Once per warm-up cycle	2 DCY	
P00B3 Radiator Coolant Temperature Sensor Circuit Low	Radiator Inlet Temperature Sensor Circuit continuity - short to GND	Raw voltage of radiator inlet temperature sensor < 0.227 V		2 s - Continuous	2 DCY	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83-. Refer to ⇒ “3.6.12 Engine Coolant Temperature Sensor On Radiator Outlet G83, Checking”, page 1615 .
P00B4 Radiator Coolant Temperature Sensor Circuit High	Radiator Inlet Temperature Sensor Circuit continuity - short to battery	Raw voltage of radiator inlet temperature sensor > 3.213 V		2 s - Continuous	2 DCY	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83-. Refer to ⇒ “3.6.12 Engine Coolant Temperature Sensor On Radiator Outlet G83, Checking”, page 1615 .

P00B6 Radiator Coolant Temperature/ Engine Coolant Temperature Correlation	Radiator inlet Temperature and ECT Correlation	Difference between ECT and Radiator Inlet Temperature > 20° C	- Modeled ECT > 85° C - Modeled ECT < 87° C - Engine run time > 125 s	5 s - Continuous	2 DCY	- Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ "3.6.12 Engine Coolant Temperature Sensor On Radiator Outlet G83, Checking", page 1615 . - Check Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613
P00BC Mass or Volume Air Flow "A" Circuit Range/ Performance - Air Flow Too Low	MAF Sensor Bank 1 Range Check	Measured MAF < -12.5 g/sec	Number of crankshaft revolutions > 150	3.5 s - Continuous	2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
P00BD Mass or Volume Air Flow "A" Circuit Range/ Performance - Air Flow Too High	MAF Sensor Bank 1 Range Check	Measured MAF > 305.5 g/sec	Number of crankshaft revolutions > 150	3.5 s - Continuous	2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
P00BE Mass or Volume Air Flow "B" Circuit Range/ Performance - Air Flow Too Low	Mass Air Flow (MAF) Sensor out of range low	Mass air flow too low < -45.00 [kg/h]	- Camshaft revolutions > 150.00 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246, Checking", page 1646

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P00BF Mass or Volume Air Flow "B" Circuit Range/Performance - Air Flow Too High	Mass Air Flow (MAF) Sensor out of range high	Mass air flow to high > 1100.00 [kg/h]	- Camshaft revolutions > 150.00 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246, Checking", page 1646
P0100 Mass or Volume Air Flow Sensor "A" Circuit	Mass Air Flow (MAF) Sensor internal check	MAF sensor signal 0 [µs]	Engine speed > 20 RPM	Continuous	2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
P0101 Mass or Volume Air Flow Sensor "A" Circuit Range/Performance	Mass Air Flow (MAF) Sensor out of range low	Mass air flow to low < -45.00 [kg/h]	- Camshaft revolutions > 150.00 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
	Mass Air Flow (MAF) Sensor out of range high	Mass air flow to high > 1100.00 [kg/h]				
	Mass Air Flow (MAF) Sensor rationality check low	- Max value of: - Diff. between measured MAF vs. modeled value < -47.00 [kg/h] - Ratio of measured MAF and modeled value < 0.65 [-]	- Idle not active - Engine speed 1000 - 4,000 [rpm] - ECT 40 - 120° C - IAT -30 - 100° C - BARO >= 68.00 [kPa] - Change in camshaft timing < 3.00° CRK - For time >= 50 s - Throttle position 5.00 - .50.00% - Vehicle speed 0 - 200 [km/h]	3.5 [s] - Continuous		

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	Mass Air Flow (MAF) Sensor rationality check high	- Max value of: - Diff. between measured MAF vs. modeled value > 47.00 [kg/h] - Ratio of measured MAF and modeled value > 1.35 [-]	- Idle not active - Engine speed 1000 - 4000 rpm - ECT 40 - 120° C - IAT -30 - 100° C - BARO >= 68.00 [kPa] - Change in camshaft timing < 3.00 [° CRK] - For time >= 50 s - Throttle position 5.00 - 50.00% - Vehicle speed 0 - 200 [km/h]			
P0102 Mass or Volume Air Flow Sensor "A" Circuit Low	Mass Air Flow (MAF) Sensor out of range low	- MAF sensor signal < 66 [μs] - MAF Sensor signal temp. correction < 44 [ms]	- Engine speed > 20 RPM - Engine speed n.a.	- Continuous 1.0 s - Multiple	2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
P0103 Mass or Volume Air Flow Sensor "A" Circuit High	Mass Air Flow (MAF) Sensor out of range high	- MAF sensor signal > 910 [μs] - MAF Sensor signal temp.-correction > 60 [ms]	- Engine speed > 20 RPM - Engine speed n.a.	- Continuous 1.0 s - Multiple	2 DCY	Check Mass Air Flow Sensor 1 - G70 - . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
P0106 Manifold Absolute Pressure Sensor Dynamic check	Manifold Absolute Pressure (MAP) Sensor Dynamic check	- Amplitude of MAP sensor < 0.3 - 4.4 kPa - For counts > 30 - Number of synchro events > 50	- Engine speed > 1200; < 3520 rpm - Ratio of MAP and boost pressure > 0.20; < 0.9	1.1 s - Continuous	2 DCY	Check Intake Manifold Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71, Checking", page 1640
	Manifold Absolute Pressure (MAP) Sensor Rationality check	Diff. barometric sensor signal vs. manifold pressure signal at engine start > 15 kPa	- Time after engine start < 25.0 s - Engine speed < 300 rpm	2.5 s - Multiple		
	Manifold Absolute Pressure (MAP) Sensor rationality check low	- Difference manifold pressure - lower threshold model < 0 [kPa] - Model range 90 - 2100 [kPa]				

	Manifold Absolute Pressure (MAP) Sensor rationality check high	- Difference manifold pressure - upper threshold model > 0 [kPa] - Model range 850 - 2700 [kPa]				
P0107 Manifold Absolute Pressure/Barometric Pressure Sensor Circuit Low	Manifold Absolute Pressure (MAP) Sensor Range check	Manifold pressure signal < 10 kPa		2.0 s - Multiple	2 DCY	Check Intake Manifold Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71, Checking", page 1640
P0108 Manifold Absolute Pressure/Barometric Pressure Sensor Circuit High	Manifold Absolute Pressure (MAP) Sensor - short to GND	Signal voltage < 0.20 V		1.0 s - Continuous		
	Manifold Absolute Pressure (MAP) Sensor Range check	Manifold pressure signal > 280 kPa		2.0 s - Multiple	2 DCY	Check Intake Manifold Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71, Checking", page 1640
	Manifold Absolute Pressure (MAP) Sensor - short to battery	Signal voltage > 4.88 V		1.0 s - Continuous		
P010A Mass or Volume Air Flow Sensor "B" Circuit	Mass Air Flow (MAF) Sensor internal check	MAF sensor signal 0 [μs]	Engine speed > 20 RPM	Continuous	2 DCY	Check Mass Air Flow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246, Checking", page 1646

P010B Mass or Volume Air Flow Sensor "B" Cir- cuit Range/ Per- for- mance	Mass Air Flow (MAF) Sensor ra- tionality check low	- Max value of: - Diff. between measured MAF vs. modeled value < -47.00 [kg/h] - Ratio of measured MAF and modeled value < 0.65 [-]	- Idle not active - Engine speed 1000 - 4000 rpm - ECT 40 - 120° C - IAT -30 - 100° C - BARO >= 68.00 [kPa] - Change in camshaft timing < 3.00 [° CRK] - For time >= 50 s - Throttle position 5.00 - 50.00% - Vehicle speed 0 - 200 [km/h]	3.5 s - Contin- uous	2 DCY	Check Mass Air Flow Sensor 2 - G246- . Re-fer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 . Checking", page 1646
	Mass Air Flow (MAF) Sensor ra- tionality check high	- Max value of: - Diff. between measured MAF vs. modeled value > 47.00 [kg/h] - Ratio of measured MAF and modeled value > 1.35 [-]	- Idle not active - Engine speed 1000 - 4000 rpm - ECT 40 - 120° C - IAT -30 - 100° C - BARO >= 68.00 [kPa] - Change in camshaft timing < 3.00 [° CRK] - For time >= 50 s - Throttle position 5.00 - 50.00% - Vehicle speed 0 - 200 [km/h]			
P010C Mass or Volume Air Flow Sensor "B" Cir- cuit Low	Mass Air Flow (MAF) Sensor out of range low	- MAF sensor signal < 66 [μs] - MAF Sensor signal temp.-correction < 44 [ms]	- Engine speed > 20 RPM - Engine speed n.a.	- Contin- uous 1.0 s - Multi- ple	2 DCY	Check Mass Air Flow Sensor 2 - G246- . Re-fer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 . Checking", page 1646
P010D Mass or Volume Air Flow Sensor "B" Cir- cuit High	Mass Air Flow (MAF) Sensor out of range high	- MAF sensor signal > 910 [μs] - MAF Sensor signal temp.-correction > 60 [ms]	- Engine speed > 20 RPM - Engine speed n.a.	- Contin- uous 1.0 s - Multi- ple	2 DCY	Check Mass Air Flow Sensor 2 - G246- . Re-fer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 . Checking", page 1646

P0111 Intake Air Temperature Sensor 1 Circuit Range/Performance Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold rationality check	• Difference IAT at intake manifold to modeled IAT $\geq 60.0 \dots 99.8$ [K]	• Conditions for Measurement Window • Mass air flow ≤ 152.00; ≥ 600.00 [kg/h] • Vehicle speed ≥ 45 [km/h] • Engine speed > 20 [rpm] • Monitor measurement window conditions fulfilled > 15.0 s	• 10 s • Continuous	• 2 DCY	– Check Mass Air Flow Sensor 1 - G70- . Refer to "3.6.27 Mass Airflow Sensor G70. Checking", page 1644
	Intake Air Temperature (IAT) Sensor @ Manifold stuck check	• Difference between maximum and minimum value of IAT $< 5.3^{\circ}\text{C}$	• ECT @ start $\leq 138^{\circ}\text{C}$ • Intake manifold high phase conditions • Mass air flow < 52.00 [kg/h] • Vehicle speed < 10 [km/h] • ECT $> 80^{\circ}\text{C}$ • Integrated air mass $> 1.00 - 4.00$ [kg] • Cumulated high manifold active time > 15.0 s • Number of checks > 2.00 [-] • Intake manifold low phase conditions • Mass air flow $152.00 - 600.00$ [kg/h] • Vehicle speed > 45 [km/h] • Cumulated low manifold active time > 15.0 s • Number of checks > 2.00 [-]	• 500 s • Continuous		
	Intake Air Temperature (IAT) Sensor @ Manifold cross check	• Diff. IAT vs. ECT at engine start ≥ 20.3 [K] • Diff. IAT vs. ECT at engine start < -45.0 [K]	• ECT @ engine shut-off $\geq 80^{\circ}\text{C}$ • ECT @ start ≥ -35; $\leq 41^{\circ}\text{C}$ • ECT restart temperature diff. ≥ 39.8 [K]	• 2 s • Once / DCY	• 2 DCY	

P0112 Intake Air Temperature Sensor 1 Circuit Low Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold short to ground	Signal voltage < 0.1 V	- Ratio commanded boost pressure and barometric pressure <= 1.2 [-] - Engine speed <= 3520 [rpm] - For time > 120.0 s	1 s - Continuous	2 DCY	Check Mass Air Flow Sensor 1 - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
P0113 Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold short to battery / open circuit	Signal voltage > 3 V	- ECT @ start n.a. - ECT >= -48° C - Vehicle speed n.a. MAF n.a. - For time > 0.0 s	1 s - Continuous	2 DCY	Check Mass Air Flow Sensor 1 - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644
P0116 Engine Coolant Temperature Sensor 1 Circuit Range/Performance	Engine Coolant Temperature (ECT) Sensor stuck high / low - no change on signal	Diff. between max. ECT and min. ECT < 2.3° C	- ECT @ start -39...138° C - Without 82...93° C - Substitute ECT > -45° C - Driving condition H: - Vehicle speed 45 - 150 [km/h] - Mass air flow (lower threshold) 8.00 [kg/h] - Mass air flow (upper threshold) 152.00 - 352.00 [kg/h] - OR - Fuel cut off active - FOR - Time required > 30.0 s - Frequency 1 times - Driving condition L: - Vehicle speed 0...20 [km/h] - Mass air flow (lower threshold) 8.00 [kg/h] - Mass air flow (upper threshold) 52.00...84.00 [kg/h] - FOR - Time required > 10.0 s - Frequency 3 times	62 s - Once / DCY	2 DCY	Check Engine Coolant Temperature Sensor 1 - G62- Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613

	Engine Coolant Temperature (ECT) Sensor stuck in range	- ECT @ start > 20 – 75° C - ECT @ start <= 143° C	Cold start detected	2.0 s - Once / DCY		
	Cold Start Detection of a not negative gradient of the intake air temp. after engine start	In.air.min - st.air (no mal-function) <= 2.3 K	- Engine off time > 300.0 s - ECT @ engine shut-off > 81° C - Time after engine start > 95.0 s - Mass air integral > 1.20 [kg] - IAT no fault - Driving condition: - Vehicle speed > 30 [km/h] - Time required > 15.0 s	95.0 [s] - Once / DCY		
P0117 Engine Coolant Temperature Sensor 1 Circuit Low	Engine Coolant Temperature (ECT) Sensor short to ground	ECT > 138° C		2 s - Continuous	2 DCY	– Check Engine Coolant Temperature Sensor 1 - G62- Refer to ⇒ “3.6.11 Engine Coolant Temperature Sensor G62 , Checking”, page 1613 .
P0118 Engine Coolant Temperature Sensor 1 Circuit High	Engine Coolant Temperature (ECT) Sensor short to battery / open circuit	ECT < - 39.0° C		2 s - Continuous	2 DCY	– Check Engine Coolant Temperature Sensor 1 - G62- Refer to ⇒ “3.6.11 Engine Coolant Temperature Sensor G62 , Checking”, page 1613 .
P0121 Throttle/ Pedal Position Sensor/ Switch "A" Circuit Range/ Performance	Throttle Position Sensor (TPS) rationality check	- TPS1-TPS2 > 6.30 [%] > - AND - actual TPS1- calc.value > actual TPS2- calc.value - OR - TPS1 - calc.value > 9.00 [%]	Engine speed > 480 RPM	0.3 s - Multiple	2 DCY	– Check the EPC Throttle Drive - G186- . Refer to ⇒ “3.6.39 Throttle Valve Control Module GX3 , Checking”, page 1671 .

P0122 Throttle/ Pedal Position Sensor/ Switch "A" Cir- cuit Low	Throttle Position Sensor (TPS) out of range low	signal voltage < 0.18 V		0.1 s - Multi- ple	2 DCY	Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0123 Throttle/ Pedal Position Sensor/ Switch "A" Cir- cuit High	Throttle Position Sensor (TPS) out of range high	signal voltage > 4.63 V		0.1 s - Multi- ple	2 DCY	Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0130 O2 Sen- sor Cir- cuit Bank 1 Sensor 1	Oxygen Sensors (O2S) front out of range	Ceramic tem- perature of pri- mary O2S < 690° C	- Modeled EGT > 350° C - Fuel cut off not ac- tive	20 s - Multi- ple	2 DCY	Check the Bank 1 Sen- sor 1 Heated Oxygen Sen- sor - GX10- Refer to ⇒ "3.6.31 Oxygen Sen- sor 1 Before Catalytic Converter GX10, Checking", page 1653 .
P0131 O2 Sen- sor Cir- cuit Low Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) front signal range check	- Short to ground - Virtual mass (VM) < 1.75 [V] - OR - Nernst voltage (UN) < 1.50 V - OR - Adjustment voltage (IA) < n.a. V - OR - Adjustment voltage (IP) < 0.30 V		2.0 s - Contin- uous	2 DCY	Check the Bank 1 Sen- sor 1 Heated Oxygen Sen- sor - GX10- Refer to ⇒ "3.6.31 Oxygen Sen- sor 1 Before Catalytic Converter GX10, Checking", page 1653 .

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P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) front signal range check	• Short to battery • Virtual mass (VM) > 3.25 V • OR • Nernst voltage (UN) > 4.40 V • OR • Adjustment voltage (IA) n.a. • OR • Adjustment voltage (IP) > 7.00 V		• 2.0 s • Continuous	• 2 DCY	– Check the Bank 1 Sensor 1 Heated Oxygen Sensor - GX10- Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653.



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P0133 O2 Sen- sor Cir- cuit Slow Re- sponse Bank 1 Sensor 1	Oxygen Sensors (O2S) front re- sponse rate moni- toring, area ratio and gradi- ent ratio	• SYMMETRIC FAULT: • Difference of R2L area ratio vs. L2R area ratio -0.30 - 0.55 [-] • Max value of both counters for area ratio R2L and L2R ≥ 6 times • Delay Time: • Gradient ratio n.a. • Lower value of both area ratios R2L and L2R n.a. • Transient Time: • Gradient ratio n.a. • Lower value of both area ratios R2L and L2R n.a. • Lower value of both gradient ratios R2L and L2R n.a. • AND ASYMMETRIC FAULT: • Difference of R2L area ratio vs. L2R area ratio < -0.30; > 0.55 [-] • Values of both counters for area ratio R2L and L2R ≥ 6 times • Delay Time: • Gradient ratio n.a. • Lower value of both area ratios R2L and L2R n.a. • Transient Time: • Gradient ratio n.a.	• O2S front - time since operation readiness > 30.0 s • O2S front - min. operation temperature is reached ≥ 720.0 [K] • Exhaust gas mass flow since engine first start n.a. • Heat supply $\geq$ n.a. [kJ] • OR • Time since engine first start n.a. • Check wire break pump current ready • ECT $\geq 60^\circ$ C • AND • Only Flex fuel systems • Ethanol concentration adaptation n.a. • AND • Ethanol value n.a. • AND • Ethanol value to start diagnosis n.a. • Only NG fuel systems • Total ng operating mode n.a. • OR • Total gasoline operating mode n.a. • Scavenging • Scavenging-rate $\leq$ n.a. [-] • Integrated air mass $>$ n.a. [kg] • Additional conditions: • Lambda value freeze not active • Relative fuel amount from wall applied compensation and evap purge ≤ 1.00 [-] • Split coefficient DFI/MFI-system is constant n.a.	• 48.0 s • Once per DCY	• 2 DCY	- Check the Bank 1 Sensor 1 Heated Oxygen Sensor - GX10- Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10 Checking", page 1653.

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		• Lower value of both area ratios R2L and L2R n.a. • R2L and L2R • OR • Lower value of both gradient ratios R2L and L2R n.a.	• Engine speed 1160 - 2520 rpm • All local injector active • Desired position lead boost pressure n.a. • Vehicle speed n.a. • Time since engine start ≥ 5.0 s • Engine load 27.00 - 79.99% • Catalyst heating not active • Evap purge valve case 1: • Gradient of factor tank ventilation ≤ 0.00 [-] • AND • Pulse duty factor of evap purge valve > 10.00 [%/s] • For time n.a. • OR • Evap purge valve case 2: • Pulse duty factor of evap purge valve ≤ 10.00 [%/s] • Additional conditions: • Evap purge ≥ 8.0 [g] • OR • Evap purge not active • OR • Lambda controller oscillation detected • Exhaust system lag time calculation 0.1 - 0.3 [s] • Catalyst temperature $\geq 500^{\circ}$ C • Lambda control set-point prior to diagnostic fuel steps 1.00 [-] • OR			

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			• Gradient of exhaust system lag time calculation ≤ 0.1 s • Gradient of engine load $\leq 3.00\%$ • Gear shifting not active • OR • Transition between half and full engine mode finished • Exhaust gas mass flow ≥ 15.00 [kg/h] • Gradient of exhaust gas mass flow n.a. • Evap purge in limp-home mode n.a. • OR • EVAP system diagnosis n.a. • OR • Evap purge load high n.a. • AIR n.a. • AIR system diagnosis n.a. • Time since last measurement > 2.0 s			
P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater front out of range high Oxygen Sensors (O2S) Heater front rationality check (sensor heating up)	• O2S ceramic temp. $< 725^{\circ}\text{C}$ • Heater duty cycle $> 95\%$	• Modeled exhaust gas temp. $> 350^{\circ}\text{C}$ • Heater control active	• 60 s • Multiple	• 2 DCY	– Check the Bank 1 Sensor 1 Heated Oxygen Sensor - GX10- Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10 Checking", page 1653.

P0136 O2 Sensor Circuit Bank 1 Sensor 2	Secondary O2S readiness Bank 1 Heater coupling	- Number of detected secondary O2S heater coupling events ≥ 4 - A heater coupling event at the secondary O2S is detected when: - During heater switch off for the secondary O2S, the change of the sensor voltage signal in between two samples ≥ 2.0 V - During a number of heater power signal switches ≥ 6	- Condition temp. Downstream cat exceeds dew point. That means: - Integrated heat quantity dependant on MAF through exhaust system $> 0 - 493.3$ kJ - Diagnosis of the power stage of the secondary O2S heater switched on/off	10 s - Continuous	2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) rear signal check - circuit continuity (short to ground, core connection signal wires)	- Secondary O2S voltage < 0.060 V - For time > 3.0 s - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	- Case 1: sensor ready for operation - Sensor voltage ≤ 0.40 V - OR - Sensor voltage $0.50 - 1.08$ V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature $\geq 700^{\circ}\text{C}$ - For time > 10.0 s - OR - Heater power $\geq 50.00\%$ - For time > 10.0 s - GENERAL: - Engine running dew point exceeded fuel cut off not active - Catalyst purge not active	3 s - Multiple	2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.

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P0138 O2 Sen- sor Cir- cuit High Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) rear O2S signal check - out of range high (short to battery plus)	- Signal voltage > 1.08 [V] - For time > 0.1 s	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - OR - Sensor voltage 0.50 - 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 700° C - For time > 10.0 s - OR - Heater power >= 50.00 [%] - For time > 10.0 s - GENERAL: - Engine running dew point exceeded - Lambda set value > 0.995 [-]	0.1 s - Contin- uous	2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.

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P013A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) rear check of differential transient time at fuel cut off	• Arithmetic filtered max differential transient time at fuel cut off n.a. • EWMA filtered max differential transient time at fuel cut off ≥ 0.60 s • Number of checks ≥ 3.00 [-]	• O2S front out of range ready, no fault • O2S rear ready • Fuel cut off active • Engine speed 520 - 3000 [rpm] • Integrated exhaust gas mass since O2S rear ready n.a. • Exhaust gas mass flow > 12.0 [kg/h] • Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C • Change of exhaust gas mass flow -80.00 - 80.00 [kg/h] • Time fuel cut off < 20.0 s • IF • Time fuel cut off > 20.0 s • Then disabling till next fuel cut off 60.0 s • Binary sensor front fitted • O2S front voltage n.a. • Linear sensor front fitted • Deviation between expected and measured lambda value < 12 [-] • OR • Lambda value > 5.0 [-] • Additional conditions: • Time after fuel cut off at first cylinder ≥ 1.5 s • O2S rear voltage before start of measurement > 0.55 V • O2S rear target voltage end of measurement ≤ 0.15 V • OR	• 10 s • Once / DCY	• 1 DCY	– Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.

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			• Integrated O2 mass during fuel cut off >= 1800 - 3000 [mg] • Time delay 0.5 s • Case 1: • (with scavenging) • If • Scavenging-rate n.a. • Then disabling until • Scavenging-rate n.a. • AND • Integrated air mass n.a. • Case 2: • (without scavenging) integrated air mass > 0.50 [kg] • Engine running			

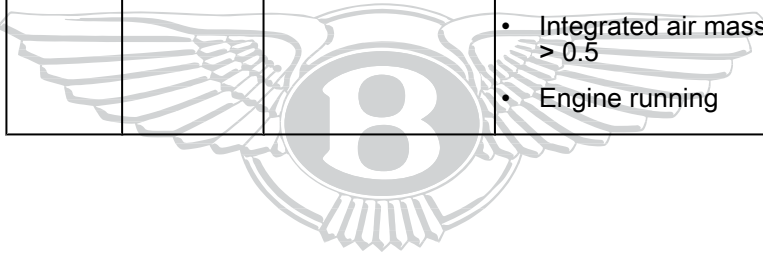
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P013B O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) rear check of differential transient time at fuel feed restart	- Arithmetic filtered max differential transient time at fuel feed restart n.a. - EWMA filtered max differential transient time at fuel feed restart ≥ 1.0 [s] - Number of checks ≥ 3.00 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel feed restart active - Engine speed 520 - 3000 rpm - Integrated exhaust gas mass since O2S rear ready n.a. - Exhaust gas mass flow > 12.0 [kg/h] - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow -80.00 - 80.00 [kg/h] - IF - Time fuel cut off > 20.0 s - Then - Disabling till next fuel feed restart 60.0 s - Additional conditions: - O2S rear voltage before start of measurement < 0.15 V - O2S rear target voltage end of measurement ≥ 0.60 [V] - OR - Integrated negative O2 mass during catalyst purge $\geq 2000 - 3000$ [mg] - Time delay 0.5 s - Case 1: (with scavenging) - IF - Scavenging-rate n.a. - Then disabling until - Scavenging-rate n.a. - AND	10 s - Once / DCY	1 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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			• Integrated air mass n.a. • Case 2: • (without scavenging) • Integrated air mass > 0.5 • Engine running			



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P013C O2 Sensor Slow Response - Rich to Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) rear check of differential transient time at fuel cut off	- Arithmetic filtered max differential transient time at fuel cut off n.a. - EWMA filtered max differential transient time at fuel cut off ≥ 0.6 s - Number of checks ≥ 3.00 [-]	- O2S front out of range ready, no fault - O2S rear ready - Engine speed 520 - 3000 [rpm] - Integrated exhaust gas mass since O2S rear ready n.a. - Exhaust gas mass flow > 12.0 [kg/h] - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow -80.00 - 80.00 [kg/h] - Time fuel cut off < 20.0 s - If time fuel cut off > 20.0 s - THEN - Disabling till next fuel cut off 60.0 s - Binary sensor front fitted - O2S front voltage n.a. - Linear sensor front fitted - Deviation between expected and measured lambda value < 12 [-] - OR - Lambda value > 5 [-] - Additional conditions: - Time after fuel cut off at first cylinder ≥ 1.5 s - O2S rear voltage before start of measurement > 0.55 V - O2S rear target voltage end of measurement ≤ 0.15 V - OR	10 s - Once / DCY	1 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.

			• Integrated O2 mass during fuel cut off >= 1800 - 3000 [mg] • Time delay 0.5 s • Case 1: • (with scavenging) n.a. • IF • Scavenging-rate n.a. • Then disabling until • Scavenging-rate n.a. • AND • Integrated air mass n.a. • Case 2: • (without scavenging) • Integrated air mass > 0.5 [kg] • Engine running			



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P013D O2 Sensor Slow Response - Lean to Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) rear check of differential transient time at fuel feed restart	• Arithmetic filtered max differential transient time at fuel feed restart n.a. • EWMA filtered max differential transient time at fuel feed restart ≥ 1.0 s • Number of checks ≥ 3	• O2S front out of range ready, no fault • O2S rear ready • Engine speed 520 - 3000 rpm • Integrated exhaust gas mass since O2S rear ready n.a. • Exhaust gas mass flow > 12.0 [kg/h] • Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C • Change of exhaust gas mass flow -80.00 - 80.00 [kg/h] • Fuel feed restart active • IF • time fuel cut off > 20.0 s • THEN • disabling till next fuel feed restart 60.0 s • Additional conditions: • O2S rear voltage before start of measurement < 0.15 V • O2S rear target voltage end of measurement ≥ 0.60 V • OR • Integrated negative O2 mass during catalyst purge $\geq 2000 - 3000$ [mg] • Time delay 0.5 s • Case 1: • (with scavenging) n.a. • IF • Scavenging-rate n.a. • Then disabling until • Scavenging-rate n.a.	• 10 s • Once / DCY	• 1 DCY	- Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.

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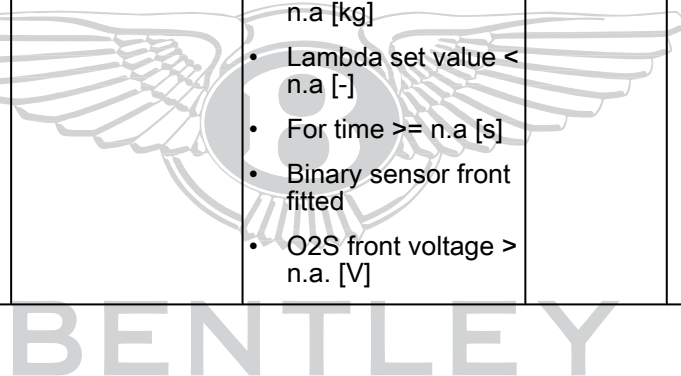
			• AND • Integrated air mass n.a. • Case 2: • (without scavenging) • Integrated air mass > 0.5 [kg] • Engine running			



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P013E O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) rear check of differential delay time at rich to lean transition	• Arithmetic filtered max differential delay time at rich to lean transition > n.a. [s] • OR • EWMA filtered max differential delay time at rich to lean transition > 0.6 s • AND • Number of checks >= 3.00 [-]	• O2S front out of range ready, no fault • Hat supply >= n.a. [kJ] • Integrated exhaust gas mass after O2S rear ready > 1.00 [kg] • Integrated exhaust gas mass during > 0.20 [kg] • Catalyst temperature 400 - 800° C • Exhaust gas mass flow 25.00 - 120.00 [kg/h] • Change of exhaust gas mass flow -10.00 - 20.00 [kg/h] • Engine speed 1120 - 3,000 rpm • O2S rear stuck lean / stuck rich ready, no fault • Vehicle speed >= 20 [km/h] • AND • Time after engine start n.a. • OR • Exhaust gas mass n.a. • Scavenging: • Scavenging-rate < n.a. [-] • Integrated air mass > n.a [kg/h] • Lambda control n.a • Lambda set value before n.a [-] • For integrated exhaust gas mass >= n.a [kg] • Lambda set value < n.a [-] • For time >= n.a [s] • Binary sensor front fitted • O2S front voltage > n.a. [V]	• 40 s • Once / DCY	• 1 DCY	- Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.



			• Linear sensor front fitted • Diff. between lambda setpoint value (combustion chamber) vs. expected lambda (front sensor fitting) n.a. • Diff. between lambda set value and actual lambda value n.a. • Threshold 1 • O2S rear voltage ≥ 0.72 V • Gradient O2S rear voltage $-0.01 \dots 0.05$ [V/s] • Integrated negative O2 mass ≥ 50 [mg] • OR • Threshold 2 • O2S rear voltage > 1.25 V			

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P013F O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) rear check of differential delay time at lean to rich transition	- Arithmetic filtered max differential delay time at lean to rich transition > n.a. [s] - EWMA filtered max differential delay time at lean to rich transition > 1.2 s - Number of checks >= 3.00 [-]	- O2S front out of range ready, no fault - General: - Heat supply >= n.a. [kJ] - Integrated exhaust gas mass after O2S rear ready > 1.00 [kg] - Integrated exhaust gas mass during > 0.20 [kg] - Catalyst temperature 400 - 800° C - Exhaust gas mass flow 25.00 - 120.00 [kg/h] - Change of exhaust gas mass flow -10.00 - 20.00 [kg/h] - Engine speed 1120 - 3000 rpm - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 [km/h] - AND - Time after engine start n.a. - OR - Exhaust gas mass n.a. - Scavenging: - Scavenging-rate < n.a. [-] - Integrated air mass > n.a. [kg/h] - Lambda control n.a. - Lambda set value >= n.a. [-] - For time n.a. [s] - Binary sensor front fitted - O2S front voltage < n.a. [V] - Linear sensor front fitted	40 s - Once / DCY	1 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.

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			• Diff. between lambda setpoint value (combustion chamber) vs. expected lambda (front sensor fitting) n.a. • Diff. between lambda set value and actual lambda value n.a. • CASE 1: • (Diagnosis in Catalyst State full) • Time after engine start > n.a. [s] • Threshold 1 • O2S rear voltage <= 0.20 V • Gradient O2S rear voltage -1.00 - 0.01 [V/s] • Integrated O2 mass n.a. • OR • Threshold 2 • O2S rear voltage n.a. • CASE 2: • (Diagnosis at Fuel Feed Restart) n.a. • Integrated exhaust gas mass n.a. • Integrated exhaust gas mass n.a. • Exhaust gas mass during n.a. • Catalyst temperature n.a. • Exhaust gas mass flow n.a. • Gradient of exhaust gas mass flow n.a. • Engine speed n.a. • O2S rear voltage n.a. • After fuel cut off n.a. • For time n.a. • AND • O2 mass n.a.			

P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Oxygen Sensors (O2S) rear O2S signal check - circuit continuity (sensor signal line open circuit)	- Signal voltage 0.40 - 0.60 V - For time > 3.0 s - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) >= 2.80 V	- CASE 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - OR - Sensor voltage 0.50 - 1.08 V - CASE 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 700° C - For time > 10.0 s - OR - Heater power >= 50.00% - For time > 10 s - GENERAL: - Engine running dew point exceeded	40 s - Multiple	2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.



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	Oxygen Sensors (O2S) rear signal check - circuit continuity (sensor ground line open circuit)	- Internal resistance > 40,000.00 [Ohm] - Exhaust temperature > 600° C	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - OR - Sensor voltage 0.50 - 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 700° C - For time > 10.0 s - OR - Heater power >= 50.00 [%] - For time > 10.0 s - GENERAL: - Engine running - Dew point exceeded valid Ri-measurements > 10 times			
P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater rear out of range (during normal heater operation after Dew Point is exceeded)	Internal resistance > 1,260.00 - 20,400.00 [Ohm]	- Dew point exceeded - Modeled exhaust gas temp. 350 - 650° C - IAT > -7° C - Engine shut-off-time > 5,000.0 s - Number of checks 10.00 - Fuel cut off not active - Heater commanded on	20 s - Multiple	2 DCY	Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.

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P014A O2 Sensor Delayed Response - Rich to Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) rear check of differential delay time at rich to lean transition	- Arithmetic filtered max differential delay time at rich to lean transition > n.a. [s] - EWMA filtered max differential delay time at rich to lean transition > 0.6 s - Number of checks >= 3.00 [-]	- O2S front out of range ready, no fault - Heat supply >= n.a. [kJ] - Integrated exhaust gas mass n.a. - Integrated exhaust gas mass after O2S rear ready > 1.00 [kg] - Integrated exhaust gas mass during > 0.20 [kg] - Catalyst temperature 400 - 800° C - Exhaust gas mass flow 25.00 - 120.00 [kg/h] - Change of exhaust gas mass flow -10.00 - 20.00 [kg/h] - Engine speed 1120 - 3000 rpm - O2S rear stuck lean / stuck rich ready, no fault - Scavenging: - Scavenging-rate < n.a. [-] - Integrated air mass > n.a. [kg/h] - Lambda control n.a. - Lambda set value before n.a. [-] - For integrated exhaust gas mass >= n.a. [kg] - Lambda set value < n.a. [-] - For time >= n.a. [s] - Binary sensor front fitted - O2S front voltage > n.a. [V] - Linear sensor front fitted - Lambda value n.a. - Threshold 1 - O2S rear voltage >= 0.72 V	40 s - Once / DCY	1 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.

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			• Gradient O2S rear voltage -0.01...0.05 [V/s] • Integrated negative O2 mass ≥ 50 [mg] • OR • Threshold 2 • O2S rear voltage > 1.25 V			



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P014B O2 Sensor Delayed Response - Lean to Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) rear check of differential delay time at lean to rich transition	• Arithmetic filtered max differential delay time at lean to rich transition > n.a. [s] • EWMA filtered max differential delay time at lean to rich transition > 1.2 s • Number of checks >= 3.00 [-]	• O2S front out of range ready, no fault • General: • Heat supply >= n.a. [kJ] • Integrated exhaust gas mass n.a. • Integrated exhaust gas mass after O2S rear ready > 1.00 [kg] • Integrated exhaust gas mass during > 0.20 [kg] • Catalyst temperature 400 - 800° C • Exhaust gas mass flow 25.00 - 120.00 [kg/h] • Change of exhaust gas mass flow -10.00 - 20.00 [kg/h] • Engine speed 1120 - 3000 rpm • O2S rear stuck lean / stuck rich ready, no fault • Scavenging: • Scavenging-rate < n.a. [-] • Integrated air mass > n.a. [kg/h] • Lambda control n.a. • Lambda set value >= n.a. [-] • For time n.a. [s] • Binary sensor front fitted • O2S front voltage < n.a. [V] • Linear sensor front fitted • Lambda value n.a. • CASE 1: • (Diagnosis in Catalyst State full) • Time after engine start > n.a. [s] • Threshold 1 • O2S rear voltage <= 0.20 [V]	• 40 s • Once / DCY	• 1 DCY	– Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.

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			• Gradient O2S rear voltage -1.00 - 0.01 [V/s] • Integrated O2 mass n.a. • OR • Threshold 2 • O2S rear voltage n.a. • CASE 2: • (Diagnosis at Fuel Feed Restart) n.a. • Integrated exhaust gas mass n.a. • Integrated exhaust gas mass n.a. • Exhaust gas mass during n.a. • Catalyst temperature n.a. • Exhaust gas mass flow n.a. • Gradient of exhaust gas mass flow n.a. • Engine speed n.a. • O2S rear voltage n.a. • After fuel cut off n.a. • For time n.a. • AND • O2 mass n.a.			
P0150 O2 Sensor Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) front out of range	• Ceramic temperature of primary O2S < 690° C	• Modeled EGT > 350° C • Fuel cut off not active	• 20 s • Multiple	• 2 DCY	– Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11 Checking", page 1659.

P0151 O2 Sensor Circuit Low Voltage Bank 2 Sensor 1	Oxygen Sensors (O2S) front signal range check	• Short to ground • Virtual mass (VM) < 1.75 V • OR • Nernst voltage (UN) < 1.50 [V] • OR • Adjustment voltage (IA) < n.a. [V] • OR • Adjustment voltage (IP) < 0.30 V		• 2.0 s • Continuous	• 2 DCY	– Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659.
P0152 O2 Sensor Circuit High Voltage Bank 2 Sensor 1	Oxygen Sensors (O2S) front signal range check	• Short to battery • Virtual mass (VM) > 3.25 V • OR • Nernst voltage (UN) > 4.40 V • OR • Adjustment voltage (IA) n.a. • OR • Adjustment voltage (IP) > 7.00 V		• 2.0 s • Continuous	• 2 DCY	– Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659.



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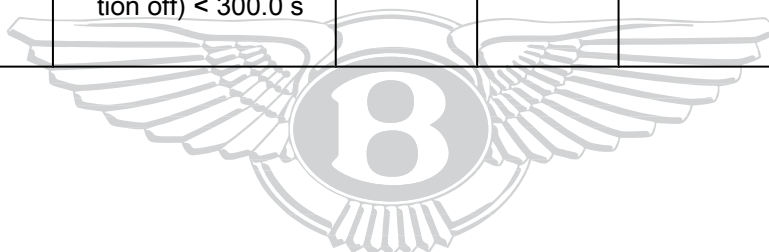
P0153 O2 Sensor Circuit Slow Response Bank 2 Sensor 1	Oxygen Sensors (O2S) front response rate monitoring, area ratio and gradient ratio	• SYMMETRIC FAULT: • Difference of R2L area ratio vs. L2R area ratio -0.30 - 0.55 [-] • Max value of both counters for area ratio R2L and L2R ≥ 6 times • Delay Time: • Gradient ratio n.a. • Lower value of both area ratios R2L and L2R n.a. • Transient Time: • Gradient ratio n.a. • Lower value of both area ratios R2L and L2R n.a. • Lower value of both gradient ratios R2L and L2R n.a. • AND ASYMMETRIC FAULT: • Difference of R2L area ratio vs. L2R area ratio < -0.30; > 0.55 [-] • Values of both counters for area ratio R2L and L2R ≥ 6 times • Delay Time: • Gradient ratio n.a. • Lower value of both area ratios R2L and L2R n.a. • Transient Time: • Gradient ratio n.a.	• O2S front - time since operation readiness > 30.0 s • O2S front - min. operation temperature is reached ≥ 720.0 [K] • Exhaust gas mass flow since engine first start n.a. • Heat supply $\geq$ n.a. [kJ] • OR • Time since engine first start n.a. • Check wire break pump current ready • ECT $\geq 60^\circ$ C • AND • Only Flex fuel systems • Ethanol concentration adaptation n.a. • AND • Ethanol value n.a. • AND • Ethanol value to start diagnosis n.a. • Only NG fuel systems • Total ng operating mode n.a. • OR • Total gasoline operating mode n.a. • Scavenging • Scavenging-rate $\leq$ n.a. [-] • Integrated air mass $>$ n.a. [kg] • Additional conditions: • Lambda value freeze not active • Relative fuel amount from wall applied compensation and evap purge ≤ 1.00 [-] • Split coefficient DFI/MFI-system is constant n.a.	• 48.0 s • Once/DCY	• 2 DCY	– Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11 Checking", page 1659.

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		• Lower value of both area ratios R2L and L2R n.a. • R2L and L2R • OR • Lower value of both gradient ratios R2L and L2R n.a.	• Engine speed 1160 - 2520 rpm • All local injector active • Desired position lead boost pressure n.a. • Vehicle speed n.a. • Time since engine start ≥ 5.0 s • Engine load 27.00...79.99 % • Catalyst heating not active • Evap purge valve case 1: • Gradient of factor tank ventilation ≤ 0.00 [-] • AND • Pulse duty factor of evap purge valve > 10.00 [%/s] • For time n.a. • OR • Evap purge valve case 2: • Pulse duty factor of evap purge valve ≤ 10.00 [%/s] • Additional conditions: • Evap purge ≥ 8.0 [g] • OR • Evap purge not active • OR • Lambda controller oscillation detected • Exhaust system lag time calculation 0.1 - 0.3 s • Catalyst temperature $\geq 500^{\circ}$ C • Lambda control set-point prior to diagnostic fuel steps 1.00 [-] • OR			

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			• Gradient of exhaust system lag time calculation ≤ 0.1 s • Gradient of engine load ≤ 3.00 % • Gear shifting not active • OR • Transition between half and full engine mode finished • Exhaust gas mass flow ≥ 15.00 [kg/h] • Gradient of exhaust gas mass flow n.a. • Evap purge in limp-home mode n.a. • OR • EVAP system diagnosis n.a. • OR • Evap purge load high n.a. • AIR n.a. • AIR system diagnosis n.a. • Time since last measurement > 2.0 s			
P0155 O2 Sensor Heater Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater front out of range high	• O2S ceramic temp. $< 725^{\circ}$ C • Heater duty cycle $> 95\%$	• Modeled exhaust gas temp. $> 350^{\circ}$ C • Heater control active	• 60 s • Multiple	• 2 DCY	– Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11 Checking" , page 1659 .
	Oxygen Sensors (O2S) Heater front rationality check (sensor heating up)	• O2S ceramic temp. $< 725^{\circ}$ C • Time after O2S heater on 40.0 s	• ECT @ start $> -10^{\circ}$ C • Engine shut-off-time > 10000.0 s • (during ECM keep alive-time after ignition off) < 300.0 s	• 40 s • Once / DCY	• 2 DCY	



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P0156 O2 Sensor Circuit Bank 2 Sensor 2	Secondary O2S readiness Bank 2 Heater coupling	- Number of detected secondary O2S heater coupling events ≥ 4 - A heater coupling event at the secondary O2S is detected when: - During heater switch off for the secondary O2S, the change of the sensor voltage signal in between two samples ≥ 2.0 V - During a number of heater power signal switches ≥ 6	- Condition temp. Downstream cat exceeds dew point. That means: - Integrated heat quantity dependant on MAF through exhaust system > 0 to 493.3 kJ - Diagnosis of the power stage of the secondary O2S heater switched on/off	10 s - Continuous	2 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.
P0157 O2 Sensor Circuit Low Voltage Bank 2 Sensor 2	Oxygen Sensors (O2S) rear signal check - circuit continuity (short to ground, core connection signal wires)	- Secondary O2S voltage < 0.060 V - For time > 3.0 s - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	- Case 1: - Sensor ready for operation - Sensor voltage ≤ 0.40 V - OR - Sensor voltage $0.50 - 1.08$ V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature $\geq 700^{\circ}\text{C}$ - For time > 10.0 s - OR - Heater power ≥ 50.00 % - For time > 10.0 s - GENERAL: - Engine running dew point exceeded fuel cut off not active - Catalyst purge not active	3 s - Multiple	2 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.

P0158 O2 Sen- sor Cir- cuit High Voltage Bank 2 Sensor 2	Oxygen Sensors (O2S) rear O2S signal check - out of range high (short to battery plus)	- Signal voltage > 1.08 V - For time > 0.1 s	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - OR - Sensor voltage 0.50...1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 700° C - For time > 10.0 s - OR - Heater power >= 50.00 % - For time > 10.0 s - GENERAL: - Engine running dew point exceeded - Lambda set value > 0.995 [-]	0.1 s - Contin- uous	2 DCY	Check the Bank 2 Sen- sor 2 Heated Oxygen Sen- sor - G131- Refer to ⇒ "3.6.32 Oxygen Sen- sor 2 After Catalytic Converter GX8 , Check- ing", page 1656 .



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P0160 O2 Sensor Circuit No Activity Detected Bank 2 Sensor 2	Oxygen Sensors (O2S) rear O2S signal check - circuit continuity (sensor signal line open circuit)	- Signal voltage 0.40 - 0.60 V - For time > 3.0 s - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) >= 2.80 V	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - OR - Sensor voltage 0.50...1.08 V - CASE 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 700° C - For time > 10.0 s - OR - Heater power >= 50.00 % - For time > 10 s - GENERAL: - Engine running dew point exceeded	40 s - Multiple	2 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.



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	Oxygen Sensors (O2S) rear signal check - circuit continuity (sensor ground line open circuit)	- Internal resistance > 40,000.00 [Ohm] - Exhaust temperature > 600° C	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - OR - Sensor voltage 0.50 - 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 700° C - For time > 10.0 s - OR - Heater power >= 50.00 % - For time > 10.0 s - GENERAL: - Engine running - Dew point exceeded valid Ri-measurements > 10 times			
P0161 O2 Sensor Heater Circuit Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater rear out of range (during normal heater operation after Dew Point is exceeded)	Internal resistance > 1,260.00 - 20,400.00 [Ohm]	- Dew point exceeded - Modeled exhaust gas temp. 350 - 650° C - IAT > -7° C - Engine shut-off-time > 5,000.0 s - Number of checks 10.00 - Fuel cut off not active - Heater commanded on	20 s - Multiple	2 DCY	Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.
P0169 Incorrect Fuel Composition	Engine Control Module (ECM): Electronic Throttle Control Module function monitoring: injection	- Corrections of fuel mass on single cylinders incorrect - Injection cut off incorrect		20 s - Continuous	2 DCY	Check for any component or circuit fault codes and diagnose them first. If no faults are found during diagnosis, and the ECM has lost a

	Engine Control Module (ECM): Electronic Throttle Control Module function monitoring: lambda mode	Internal check failed	Internal engine speed > 1200 [rpm]	0.5 s - Continuous		driver output, replace the Engine Control Module. Refer to Repair Manual.
	Engine Control Module (ECM): Electronic Throttle Control Module function monitoring: mixture control	- Correction factor incorrect OR - Fuel quantity incorrect	Internal engine speed > 1200 rpm			
	Engine Control Module (ECM): Electronic Throttle Control Module function monitoring: load plausibility	ABS difference between predicted and real air mass > 11.30 %				
P0171 System Too Lean Bank 1	Fuel System too lean	- Low pass filtered lambda controller output > 23.50% - For time > 10 s	- Number of injections after engine start ≥ 250.00 [-] - ECT $\geq 55^{\circ}\text{C}$ - Lambda control closed loop - AND - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass n.a. - Case 3: - Evap purge controller limitation ≥ 1.00 [-] - Evap purge flow ≤ 5.00 [kg/h]	15.0 s - Continuous	2 DCY	- Check the Bank 1 Sensor 1 Heated Oxygen Sensor - GX10- Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653. - Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650.

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P0172 System Too Rich Bank 1	Fuel System too rich	- Low pass filtered lambda controller output < -23.50% - For time > 10 s	- Number of injections after engine start ≥ 250.00 [-] - ECT $\geq 55^\circ \text{C}$ - Lambda control closed loop - High PCV purge load due to oil dilution n.a. - AND - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass n.a. - Case 3: - Evap purge controller limitation ≥ 1.00 [-] - Evap purge flow ≤ 5.00 [kg/h]	15.0 s - Continuous	2 DCY	- Check the Bank 1 Sensor 1 Heated Oxygen Sensor - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check the Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .
P0174 System Too Lean Bank 2	Fuel System too lean	- Low pass filtered lambda controller output > 23.50% - For time > 10 s	- Number of injections after engine start ≥ 250.00 [-] - ECT $\geq 55^\circ \text{C}$ - Lambda control closed loop - AND - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass n.a. - Case 3: - Evap purge controller limitation ≥ 1.00 [-] - Evap purge flow ≤ 5.00 [kg/h]	15.0 s - Continuous	2 DCY	- Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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P0175 System Too Rich Bank 2	Fuel System too rich	- Low pass filtered lambda controller output -23.50% - For time > 10 s	- Number of injections after engine start ≥ 250.00 [-] - ECT $\geq 55^{\circ}\text{C}$ - Lambda control closed loop - High PCV purge load due to oil dilution n.a. - AND - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass n.a. - Case 3: - Evap purge controller limitation ≥ 1.00 [-] - Evap purge flow ≤ 5.00 [kg/h]	15.0 s - Continuous	2 DCY	- Check the Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check the Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .
P0191 Fuel Rail Pressure Sensor Circuit Range/Performance Bank 1	FRP sensor Range check high FRP sensor Range check low	- Actual value fuel pressure ≥ 700 kPa - Actual value fuel pressure ≤ 250 kPa	- RPM > 20 rpm - All injection valves active = true	1.5 s - Continuous	2 DCY	- Check the fuel pressure. Refer to the repair manual for test procedure. - Check the Fuel Pressure Sensor - G247- . Refer to "3.6.18 Fuel Pressure Sensor G247, Checking", page 1626 .
P0192 Fuel Rail Pressure Sensor Circuit Low Bank 1	FRP sensor Circuit continuity - short to GND	Mean voltage FRP sensor < 0.30 V	RPM > 480 - 600 revolutions	0.5 s - Continuous	2 DCY	Check the Fuel Pressure Sensor - G247- . Refer to "3.6.18 Fuel Pressure Sensor G247, Checking", page 1626 .

P0193 Fuel Rail Pressure Sensor Circuit High Bank 1	FRP sen- sor Circuit continuity - short to battery	• Mean voltage FRP sensor > 4.70 V	• RPM > 480 - 600 revolutions	• 0.5 s • Contin- uous	• 2 DCY	– Check the Fuel Pres- sure Sensor - G247- . Re- fer to ⇒ “3.6.18 Fuel Pres- sure Sensor G247 , Checking” , page 1626 .
P0201 Cylinder 1 Injec- tor "A" Circuit	Fuel Injection Valves Open cir- cuit	• Signal voltage 4.70...5.40 V	• Injection valve com- manded off	• 0.5 s • Contin- uous	• 2 DCY	– Check the Fuel Injec- tors . Refer to ⇒ “3.6.17 Fuel Injec- tors , Check- ing” , page 1624 .
P0202 Cylinder 2 Injec- tor "A" Circuit	Fuel Injection Valves Open cir- cuit	• Signal voltage 4.70 - 5.40 V	• Injection valve com- manded off	• 0.5 s • Contin- uous	• 2 DCY	– Check the Fuel injec- tors . Refer to ⇒ “3.6.17 Fuel Injec- tors , Check- ing” , page 1624 .
P0203 Cylinder 3 Injec- tor "A" Circuit	Fuel Injection Valves Open cir- cuit	• Signal voltage 4.70...5.40 V	• Injection valve com- manded off	• 0.5 s • Contin- uous	• 2 DCY	– Check the Fuel injec- tors . Refer to ⇒ “3.6.17 Fuel Injec- tors , Check- ing” , page 1624 .
P0204 Cylinder 4 Injec- tor "A" Circuit	Fuel Injection Valves Open cir- cuit	• Signal voltage 4.70 - 5.40 V	• Injection valve com- manded off	• 0.5 s • Contin- uous	• 2 DCY	– Check the Fuel injec- tors . Refer to ⇒ “3.6.17 Fuel Injec- tors , Check- ing” , page 1624 .
P0205 Cylinder 5 Injec- tor "A" Circuit	Fuel Injection Valves Open cir- cuit	• Signal voltage 4.70 - 5.40 V	• Injection valve com- manded off	• 0.5 s • Contin- uous	• 2 DCY	– Check the Fuel injec- tors . Refer to ⇒ “3.6.17 Fuel Injec- tors , Check- ing” , page 1624 .
P0206 Cylinder 6 Injec- tor "A" Circuit	Fuel Injection Valves Open cir- cuit	• Signal voltage 4.70 - 5.40 V	• Injection valve com- manded off	• 0.5 s • Contin- uous	• 2 DCY	– Check the Fuel injec- tors . Refer to ⇒ “3.6.17 Fuel Injec- tors , Check- ing” , page 1624 .

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P0207 Cylinder 7 Injector "A" Circuit	Fuel Injection Valves Open circuit	Signal voltage 4.70 - 5.40 V	Injection valve commanded off	0.5 s - Continuous	2 DCY	Check the Fuel injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0208 Cylinder 8 Injector "A" Circuit	Fuel Injection Valves Open circuit	Signal voltage 4.70 - 5.40 V	Injection valve commanded off	0.5 s - Continuous	2 DCY	Check the Fuel injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0221 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Range/ Performance	Throttle Position Sensor (TPS) 2 rationality check	$TPS1-TPS2 > 6.30 [\%] >$ - AND $actual\ TPS2-calc.value > actual\ TPS1-calc.value$ - OR $TPS2 - calc.value > 9.00 [\%]$	Engine speed > 480 RPM	0.3 s - Multiple	2 DCY	Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0222 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Low	Throttle Position Sensor (TPS) 2 out of range low	Signal voltage < 0.16 V		0.1 s - Multiple	2 DCY	Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0223 Throttle/ Pedal Position Sensor/ Switch "B" Circuit High	Throttle Position Sensor (TPS) 2 out of range high	Signal voltage > 4.88 V		0.1 s - Multiple	2 DCY	Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .

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P0234 Turbo-charger/ Super-charger "A" Over-boost Condition	Turbo-charger (TC) Boost Control rationality check high	Diff. set value boost pressure vs. actual boost pressure value > 27 - 112.5 kPa	Barometric pressure > 75.00 kPa	2.0 s - Multiple	2 DCY	- Check the Charge Pressure Control Solenoid 1 - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 . - Check the Combustion Air Valve - N44- . Refer to ⇒ "3.6.7 Combustion Air Valve N44 , Checking", page 1605
P0236 Turbo-charger/ Super-charger Boost Sensor "A" Circuit Range/ Performance	Turbo-charger (TC) Boost Pressure Sensor plausibility check	- Diff. boost pressure signal vs. barometric sensor signal > 22.00 kPa - Diff. boost pressure signal vs. barometric sensor signal < -12.00 kPa	- Engine speed < 1,000 RPM - Throttle position < 5%	2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640
P0237 Turbo-charger/ Super-charger Boost Sensor "A" Circuit Low	Turbo-charger (TC) Boost Pressure Sensor out of range low Turbo-charger (TC) Boost Pressure Sensor - short to GND	- Pressure < 37 kPa - Signal voltage < 0.20 V	Engine speed > 80 rpm	2.0 s - Multiple 1.0 s - Continuous	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640
P0238 Turbo-charger/ Super-charger Boost Sensor "A" Circuit High	Turbo-charger (TC) Boost Pressure Sensor out of range high	Pressure > 300 kPa	Signal voltage, pressure sensor > 0.20 V	2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640

	Turbo-charger (TC) Boost Pressure Sensor short to battery / open circuit	Signal voltage > 4.88 V	- Engine speed > 80 rpm - Throttle position < 5.00 %	1.0 s - Continuous		
P0243 Turbo-charger/ Super-charger Wastegate Actuator "A"	Turbo-charger (TC) Bypass Actuator open circuit	Signal voltage > 4.70...5.40 V	- Boost pressure control valve commanded off - Engine speed > 80 RPM	0.5 s - Continuous	2 DCY	Check the Charge Pressure Control Solenoid 1 - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .
P0245 Turbo-charger/ Super-charger Wastegate Actuator "A" Low	Turbo-charger (TC) Bypass Actuator short to ground	Signal voltage < 2.74 - 3.26 V	- Boost pressure control valve commanded off - Engine speed > 80 RPM	0.5 s - Continuous	2 DCY	Check the Charge Pressure Control Solenoid 1 - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .
P0246 Turbo-charger/ Super-charger Wastegate Actuator "A" High	Turbo-charger (TC) Bypass Actuator short to battery plus	Signal current driver stage internal value	- Boost pressure control valve commanded on - Engine speed > 80 RPM	0.5 s - Continuous	2 DCY	Check the Charge Pressure Control Solenoid 1 - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .
P0261 Cylinder 1 Injector "A" Circuit Low	Fuel Injection Valve Short To GND	Signal voltage < 2.74 - 3.26 V	Injection valve commanded off	0.5 s - Continuous	2 DCY	Check the Fuel injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0262 Cylinder 1 Injector "A" Circuit High	Fuel Injection Valve short to battery plus	Signal current driver stage internal value	- Injection valve commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

P0264 Cylinder 2 Injector "A" Circuit Low	Fuel Injection Valve Short To GND	Signal voltage < 2.74 - 3.26 V	Injection valve commanded off	0.5 s - Continuous	2 DCY	Check the Fuel injectors . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 .
P0265 Cylinder 2 Injector "A" Circuit High	Fuel Injection Valve short to battery plus	Signal current driver stage internal value	- Injection valve commanded on - Engine speed $\geq$ 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel injectors . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 .
P0267 Cylinder 3 Injector "A" Circuit Low	Fuel Injection Valve Short To GND	Signal voltage < 2.74 - 3.26 V	Injection valve commanded off	0.5 s - Continuous	2 DCY	Check the Fuel injectors . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 .
P0268 Cylinder 3 Injector "A" Circuit High	Fuel Injection Valve short to battery plus	Signal current driver stage internal value	- Injection valve commanded on - Engine speed $\geq$ 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel injectors . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 .
P0270 Cylinder 4 Injector "A" Circuit Low	Fuel Injection Valve Short To GND	Signal voltage < 2.74 - 3.26 V	Injection valve commanded off	0.5 s - Continuous	2 DCY	Check the Fuel injectors . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 .
P0271 Cylinder 4 Injector "A" Circuit High	Fuel Injection Valve short to battery plus	Signal current driver stage internal value	- Injection valve commanded on - Engine speed $\geq$ 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel injectors . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 .
P0273 Cylinder 5 Injector "A" Circuit Low	Fuel Injection Valve Short To GND	Signal voltage < 2.74 - 3.26 V	Injection valve commanded off	0.5 s - Continuous	2 DCY	Check the Fuel injectors . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 .
P0274 Cylinder 5 Injector "A" Circuit High	Fuel Injection Valve short to battery plus	Signal current driver stage internal value	- Injection valve commanded on - Engine speed $\geq$ 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel injectors . Refer to "3.6.17 Fuel Injectors , Checking", page 1624 .

P0276 Cylinder 6 Injec- tor "A" Circuit Low	Fuel Injec- tion Valve Short To GND	Signal voltage < 2.74 - 3.26 V	Injection valve com- manded off	0.5 s - Contin- uous	2 DCY	Check the Fuel injec- tors . Refer to ⇒ "3.6.17 Fuel Injec- tors , Check- ing" , page 1624 .
P0277 Cylinder 6 Injec- tor "A" Circuit High	Fuel Injec- tion Valve short to battery plus	Signal current driver stage in- ternal value	- Injection valve com- manded on - Engine speed >= 80 RPM	0.5 s - Contin- uous	2 DCY	Check the Fuel injec- tors . Refer to ⇒ "3.6.17 Fuel Injec- tors , Check- ing" , page 1624 .
P0279 Cylinder 7 Injec- tor "A" Circuit Low	Fuel Injec- tion Valve Short To GND	Signal voltage < 2.74 - 3.26 V	Injection valve com- manded off	0.5 s - Contin- uous	2 DCY	Check the Fuel injec- tors . Refer to ⇒ "3.6.17 Fuel Injec- tors , Check- ing" , page 1624 .
P0280 Cylinder 7 Injec- tor "A" Circuit High	Fuel Injec- tion Valve short to battery plus	Signal current driver stage in- ternal value	- Injection valve com- manded on - Engine speed >= 80 RPM	0.5 s - Contin- uous	2 DCY	Check the Fuel injec- tors . Refer to ⇒ "3.6.17 Fuel Injec- tors , Check- ing" , page 1624 .
P0282 Cylinder 8 Injec- tor "A" Circuit Low	Fuel Injec- tion Valve Short To GND	Signal voltage < 2.74 - 3.26 V	Injection valve com- manded off	0.5 s - Contin- uous	2 DCY	Check the Fuel injec- tors . Refer to ⇒ "3.6.17 Fuel Injec- tors , Check- ing" , page 1624 .
P0283 Cylinder 8 Injec- tor "A" Circuit High	Fuel Injec- tion Valve short to battery plus	Signal current driver stage in- ternal value	- Injection valve com- manded on - Engine speed >= 80 RPM	0.5 s - Contin- uous	2 DCY	Check the Fuel injec- tors . Refer to ⇒ "3.6.17 Fuel Injec- tors , Check- ing" , page 1624 .



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P0299 Turbo-charger/ Super-charger "A" Under-boost Condition	Turbo-charger (TC) Boost Control rationality check low	Diff. set value boost pressure vs. actual boost pressure value (filtered) > 20 kPa	- Engine speed > 2240 - 2760 rpm - Barometric pressure > 75.00 kPa - Diff. set value boost pressure vs. basic boost pressure value > 15.00 kPa - Boost pressure control active - Turbo charger bypass valve closed	5 s - Multiple	2 DCY	- Check the Charge Pressure Control Solenoid 1 - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 . - Check the Combustion Air Valve - N44- . Refer to ⇒ "3.6.7 Combustion Air Valve N44 , Checking", page 1605
P0300 Random/ Multiple Cylinder Misfire Detected	Crankshaft speed fluctuation (single or multiple)	Emissions relevant misfire rate > 2.44%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle - 150 [rpm] + 1 camshaft [rev] - Time after engine start n.a. - Engine torque >= 0 - Fuel cut off not active - Rough road not detected	1,000 Rev. - Continuous	2 DCY	- If a Fuel system rich or lean fault exists, perform the diagnostic for those codes first. Use a scan tool and note whether the miss is specific to a few cylinders or is random. If random, check for contamination in the fuel by drawing a fuel sample. - Check spark plugs for signs of fouling. - Check Fuel Pressure. Refer to the Repair Manual for procedure. - Check Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

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		Catalyst damaging misfire rate > 7.77 - 24.78%		200 Rev. - Continuous	Immediately	Check Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage . Checking”, page 1633 .
P0301 Cylinder 1 Misfire Detected	Crankshaft speed fluctuation (single or multiple)	Emissions relevant misfire rate > 2.44%	- Case 1: • ECT @ start >= -8° C - Case 2: • ECT @ start < -8° C • Then activation if ECT > 20° C • General: • Active after engine start idle - 150 [rpm] + 1 camshaft [rev] • Time after engine start n.a.	1 000 Rev. - Continuous	2 DCY	- Check fuel injector . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ “3.6.21 Ignition Coils With Power Output

		Catalyst damaging misfire rate > 7.77 - 24.78%	- Engine torque ≥ 0 - Fuel cut off not active - Rough road not detected	200 Rev. - Continuous	Immediately	Stage, Checking", page 1633. - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.
P0302 Cylinder 2 Misfire Detected	Crankshaft speed fluctuation (single or multiple)	Protected by copyright. Copying for private or commercial purposes in part or in whole, is not permitted. Bentley Motors Ltd. Bentley Motors does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by Bentley Motors. - Emissions relevant misfire rate > 2.44% - Catalyst damaging misfire rate > 7.77 - 24.78%	- Case 1: ECT @ start $\geq -8^{\circ}\text{C}$ - Case 2: ECT @ start $< -8^{\circ}\text{C}$ - Then activation if ECT $> 20^{\circ}\text{C}$ - General: - Active after engine start idle - 150 [rpm] + 1 camshaft [rev] - Time after engine start n.a. - Engine torque ≥ 0 - Fuel cut off not active - Rough road not detected	1,000 Rev. - Continuous 200 Rev. - Continuous	2 DCY - Immediately	- Check fuel injector . Refer to "3.6.17 Fuel Injectors, Checking", page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633. - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.
P0303 Cylinder 3 Misfire Detected	Crankshaft speed fluctuation (single or multiple)	Emissions relevant misfire rate > 2.44%	- Case 1: ECT @ start $\geq -8^{\circ}\text{C}$ - Case 2: ECT @ start $< -8^{\circ}\text{C}$	1,000 Rev. - Continuous	2 DCY	Check fuel injector . Refer to "3.6.17 Fuel Injectors, Checking", page 1624

		Catalyst damaging misfire rate > 7.77 - 24.78%	- Then activation if ECT > 20° C - General: - Active after engine start idle - 150 [rpm] + 1 camshaft [rev] - Time after engine start n.a. - Engine torque >= 0 - Fuel cut off not active - Rough road not detected	200 Rev. - Continuous	Immediately	- Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage . Checking", page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.
P0304 Cylinder 4 Misfire Detected	Crankshaft speed fluctuation (single or multiple)	- Emissions relevant misfire rate > 2.44% - Catalyst damaging misfire rate > 7.77 - 24.78%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle - 150 [rpm] + 1 camshaft [rev] - Time after engine start n.a. - Engine torque >= 0 - Fuel cut off not active - Rough road not detected	1,000 Rev. - Continuous 200 Rev. - Continuous	2 DCY - Immediately	- Check fuel injector . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage . Checking", page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.
P0305 Cylinder 5 Misfire Detected	Crankshaft speed fluctuation (single or multiple)	Emissions relevant misfire rate > 2.44%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General:	1,000 Rev. - Continuous	2 DCY	- Check fuel injector . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 - Check Ignition Coil with Power Out-

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		Catalyst damaging misfire rate > 7.77 - 24.78%	- Active after engine start idle - 150 [rpm] + 1 camshaft [rev] - Time after engine start n.a. - Engine torque >= 0 - Fuel cut off not active - Rough road not detected	200 Rev. - Continuous	Immediately	put Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.
P0306 Cylinder 6 Misfire Detected	Crankshaft speed fluctuation (single or multiple)	- Emissions relevant misfire rate > 2.44% - Catalyst damaging misfire rate > 7.77 - 24.78%	Case 1: ECT @ start >= -8° C Case 2: ECT @ start < -8° C Then activation if ECT > 20° C General: - Active after engine start idle - 150 [rpm] + 1 camshaft [rev] - Time after engine start n.a. - Engine torque >= 0 - Fuel cut off not active - Rough road not detected	1,000 Rev. - Continuous 200 Rev. - Continuous	2 DCY - Immediately	Check fuel injector . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.
P0307 Cylinder 7 Misfire Detected	Crankshaft speed fluctuation (single or multiple)	Emissions relevant misfire rate > 2.44%	Case 1: ECT @ start >= -8° C Case 2: ECT @ start < -8° C	1,000 Rev. - Continuous	2 DCY	Check fuel injector . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624

		Catalyst damaging misfire rate > 7.77 - 24.78%	- Then activation if ECT > 20° C - General: - Active after engine start idle - 150 [rpm] + 1 camshaft [rev] - Time after engine start n.a. - Engine torque >= 0 - Fuel cut off not active - Rough road not detected	200 Rev. - Continuous	Immediately	- Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage . Checking", page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.
P0308 Cylinder 8 Misfire Detected	Crankshaft speed fluctuation (single or multiple)	- Emissions relevant misfire rate > 2.44% - Catalyst damaging misfire rate > 7.77 - 24.78%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - then activation if ECT > 20° C - General: - Active after engine start idle - 150 [rpm] + 1 camshaft [rev] - Time after engine start n.a. - Engine torque >= 0 - Fuel cut off not active - Rough road not detected	1,000 Rev. - Continuous 200 Rev. - Continuous	2 DCY - Immediately	- Check fuel injector . Refer to ⇒ "3.6.17 Fuel Injectors . Checking", page 1624 - Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage . Checking", page 1633 . - Check Spark plugs. - Check for an engine mechanical fault by performing a cylinder pressure test.
P0321 Ignition/Distributor Engine Speed Input Circuit Range/Performance	Crankshaft Position (CKP) Sensor rationality check	- Counted teeth vs. reference incorrect - OR - Monitoring reference gap failure		1.5 [s] - Multiple	2 DCY	Check Engine Speed Sensor - G28- . Refer to ⇒ "3.6.13 Engine Speed Sensor G28 . Checking", page 1616 .

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	Crank-shaft Position (CKP) Sensor functional check: DGI-sensor	- PWM-signal not plausible - OR - Engine stop position not plausible - OR - Reverse pulse length not plausible	DGI-sensor is powered during engine stop	0.5 [s] - Continuous		
P0322 Ignition/Distributor Engine Speed Input Circuit No Signal	Crank-shaft Position (CKP) Sensor signal activity check	- Camshaft signals > 1.00 [-] - AND - Engine speed no signal		2.5 [s] - Multiple	2 DCY	Check Engine Speed Sensor - G28- . Refer to ⇒ "3.6.13 Engine Speed Sensor G28, Checking", page 1616 .
P0324 Knock Control System Error	Knock Control internal hardware check	- Signal fault counter (combustion) > 48.00 [-] - Signal fault counter (measuring window) > 2.00 [-]	Engine speed > 2,500 RPM	0.5 s - Multiple	2 DCY	- Check Knock Sensor 1 - G61- . Refer to ⇒ "3.6.22 Knock Sensor 1 G61, Checking", page 1634 . - Check Knock Sensor 2 - G66- . Refer to ⇒ "3.6.23 Knock Sensor 2 G66, Checking", page 1636 .
P0327 Knock/Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	Knock Sensor (KS) short to ground Port B/ short to ground Port A Knock Sensor (KS) signal range check	- Reference signal < -0.7 V - Lower threshold < 1.02 - 9.88 V	- Engine speed > 1,000 RPM - Engine speed > 1,720 rpm - ECT > 40° C - Engine load > 40.50 - 49.50 %	0.5 s - Continuous 2.0 s - Multiple	2 DCY	Check Knock Sensor 1 - G61- . Refer to ⇒ "3.6.22 Knock Sensor 1 G61, Checking", page 1634 .
P0328 Knock/Combustion Vibration Sensor 1 Circuit High	Knock Sensor (KS) short to battery plus Port A/ short to battery plus Port B	Signal voltage > 1.0 V	Engine speed > 1,000 RPM	0.5 s - Continuous	2 DCY	Check Knock Sensor 1 - G61- . Refer to ⇒ "3.6.22 Knock Sensor 1 G61, Checking", page 1634 .

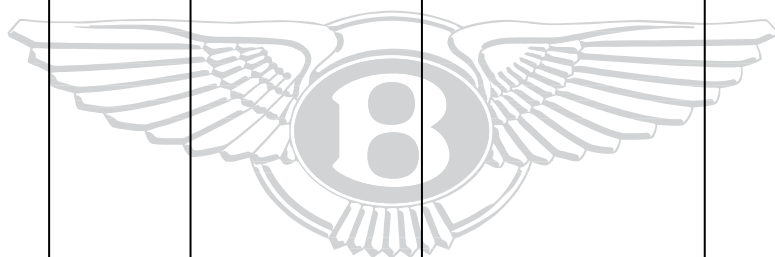
Bank 1 or Single Sensor	Knock Sensor (KS) signal range check	Upper threshold > 135.82 - 285.00 V	- Engine speed > 1,720 rpm - ECT > 40° C - Engine load > 40.50 - 49.50 [%]	2.0 s - Multiple		
P0332 Knock/Combustion Vibration Sensor 2 Circuit Low Bank 2	Knock Sensor (KS) short to ground Port B/ short to ground Port A	Reference signal < -0.7 V	Engine speed > 1,000 RPM	0.5 s - Continuous	2 DCY	Check Knock Sensor 2 - G66- . Refer to ⇒ “3.6.23 Knock Sensor 2 G66- . Checking”, page 1636 .
	Knock Sensor (KS) signal range check	Lower threshold < 1.02...9.88 [V]	- Engine speed > 1,720 rpm - ECT > 40° C - Engine load > 40.50 - 49.50 %	2.0 s - Multiple		
P0333 Knock/Combustion Vibration Sensor 2 Circuit High Bank 2	Knock Sensor (KS) short to battery plus Port A/ short to battery plus Port B	Signal voltage > 1.0 V	Engine speed > 1,000 RPM	0.5 s - Continuous	2 DCY	Check Knock Sensor 2 - G66- . Refer to ⇒ “3.6.23 Knock Sensor 2 G66- . Checking”, page 1636 .
	Knock Sensor (KS) signal range check	Upper threshold > 135.82 - 285.00 V	- Engine speed > 1,720 rpm - ECT > 40° C - Engine load > 40.50 - 49.50 %	2.0 s - Multiple		
P0341 Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	Phase Sensor 1 rationality check	- Signal pattern incorrect - Defect counter 8.00 [-]		0.5 s - Continuous	2 DCY	Check Intake Camshaft Position (CMP) Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40- . Checking”, page 1599 .
P0342 Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	Phase Sensor 1 rationality check	- Signal voltage permanently low - Crankshaft signals 8.00 [-]		0.5 s - Continuous	2 DCY	Check Intake Camshaft Position (CMP) Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40- . Checking”, page 1599 .

P0343 Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	Phase Sensor 1 rationality check	- Signal voltage permanently high - Crankshaft signals 8.00 [-]		0.5 s - Continuous	2 DCY	Check Intake Camshaft Position (CMP) Sensor 1 - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0351 Ignition Coil "A" Primary Control Circuit/ Open	Ignition coil - open circuit	- Signal current driver stage internal value OR - Internal check failed	Engine speed > 680 RPM	2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage Checking", page 1633 .
P0352 Ignition Coil "B" Primary Control Circuit/ Open	Ignition coil - open circuit	- Signal current driver stage internal value OR - Internal check failed	Engine speed > 680 RPM	< 2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N127- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage Checking", page 1633 .
P0353 Ignition Coil "C" Primary Control Circuit/ Open	Ignition coil - open circuit	- Signal current driver stage internal value OR - Internal check failed	Engine speed > 680 RPM	< 2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N291- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage Checking", page 1633 .
P0354 Ignition Coil "D" Primary Control Circuit/ Open	Ignition coil - open circuit	- Signal current driver stage internal value OR - Internal check failed	Engine speed > 680 RPM	< 2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N292- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage Checking", page 1633 .

P0355 Ignition Coil "E" Primary Control Circuit/ Open	Ignition coil - open circuit	- Signal current driver stage internal value OR - Internal check failed	Engine speed > 680 RPM	< 2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N323- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0356 Ignition Coil "F" Primary Control Circuit/ Open	Ignition coil - open circuit	- Signal current driver stage internal value OR - Internal check failed	Engine speed > 680 RPM	< 2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N324- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0357 Ignition Coil "G" Primary Control Circuit/ Open	Ignition coil - open circuit	- Signal current driver stage internal value OR - Internal check failed	Engine speed > 680 RPM	< 2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N325- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0358 Ignition Coil "H" Primary Control Circuit/ Open	Ignition coil - open circuit	- Signal current driver stage internal value OR - Internal check failed	Engine speed > 680 RPM	< 2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N326- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

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P0410 AIR System "A"	Secondary Air Injection (AIR) rationality check directly after catalyst heating	Diff. of measured AIR pressure before AIR injection vs. AIR pressure after AIR injection > 2.00 kPa	- ECT -10 - 130° C - IAT -10 - 100° C - Modeled catalyst temperature < 700° C - Mass air flow 7.00 - 275.00 [kg/h] - Difference engine load -10.0 - 10.0 [%/rev] - Barometric pressure > 74 kPa - AIR system commanded off	0.5 [s] - Once / DCY	2 DCY	Check Secondary Air Injection Pump Relay - J299- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 .
P0418 AIR System Control "A" Circuit	Secondary Air Injection (AIR) Pump Relay open circuit	Signal voltage 4.70 - 5.40 V	AIR pump relay commanded off	0.5 s - Continuous	2 DCY	Check Secondary Air Injection (AIR) Pump Relay 1 - -J299-- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 .
P0419 AIR System Control "B" Circuit	Secondary Air Injection (AIR) Pump Relay open circuit	Signal voltage 4.70 - 5.40 V	AIR pump relay commanded off	0.5 s - Continuous	2 DCY	Check Secondary Air Injection (AIR) Pump Relay 2 - -J545-- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .



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P0420 Catalyst System Efficien- cy Be- low Thresh- old Bank 1	Catalyst System measure of OSC compared to OSC of borderline catalyst	Measured OSC / OSC of borderline catalyst, Measured OSC EW-MA filter value for catalyst, corrected with measured delay and transient time of Oxygen Sensors rear < 1.00	- Time after engine start > n.a. [s] - Time after dew point > 90.0 s - Delta exhaust gas mass flow < 20.00 [kg/h] - Exhaust gas mass flow, lower range n.a. - Exhaust gas mass flow, upper range 25.00 - 100.00 [kg/h] - Modeled exhaust gas temp. dynamic < 30.0 [K] - Modeled exhaust gas temp. in catalyst system, lower range n.a. - Modeled exhaust gas temp. in catalyst system, upper range 500 - 800° C - Minimum modeled exhaust gas temp. in catalyst system > 470° C - For time > 100.0 s - Filtered minimum modeled exhaust gas temp. in catalyst system > 470° C - Engine load 9.80 - 60.00 % - Evap purge loading not high - Engine speed 1000 - 2520 rpm - Deviation between lambda setpoint and actual lambda value < 3.00 [%] - Lambda control closed loop - Lambda control not at min or max limit - AAT > -10° C - Number of checks, no step - Change suspicion 1 [-] number of checks, step change suspicion 4	10 s - Once / DCY	1 DCY	- Check the exhaust system for leaks and correct any defects found. If any misfire or fuel trim codes are also set, correct those codes first. - Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- , Checking", page 1653 . - Check Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 . - Check Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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			• O2S front ready • O2S rear ready • AIR not active • no misfire • O2S front plausibility check in current driving cycle ready • O2S front response monitoring in current driving cycle ready			



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P0430 Catalyst System Efficien- cy Be- low Thresh- old Bank 2	Catalyst System measure of OSC compared to OSC of borderline catalyst	Measured OSC / OSC of borderline catalyst, Measured OSC EW-MA filter value for catalyst, corrected with measured delay and transient time of Oxygen Sensors rear < 1.00	- Time after engine start > n.a. [s] - Time after dew point > 90.0 s - Delta exhaust gas mass flow < 20.00 [kg/h] - Exhaust gas mass flow, lower range n.a. - Exhaust gas mass flow, upper range 25.00 - 100.00 [kg/h] - Modeled exhaust gas temp. dynamic < 30.0 [K] - Modeled exhaust gas temp. in catalyst system, lower range n.a. - Modeled exhaust gas temp. in catalyst system, upper range 500 - 800 °C - Minimum modeled exhaust gas temp. in catalyst system > 470° C - For time > 100.0 s - Filtered minimum modeled exhaust gas temp. in catalyst system > 470° C - Engine load 9.80 - 60.00 % - Evap purge loading not high - Engine speed 1000 - 2520 rpm - Deviation between lambda setpoint and actual lambda value < 3.00 [%] - Lambda control closed loop - Lambda control not at min or max limit - AAT > -10° C - Number of checks, no step - Change suspicion 1 [-] number of checks, step change suspicion 4	10 s - Once / DCY	1 DCY	- Check the exhaust system for leaks and correct any defects found. - Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 . - Check Oxygen Sensor 2 After Catalytic Converter - G131- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8- Checking", page 1656 . - Check Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC) Checking", page 1670 .

			• O2S front ready • O2S rear ready • AIR not active • no misfire • O2S front plausibility check in current driving cycle ready • O2S front response monitoring in current driving cycle ready			
P0441 EVAP System Incorrect Purge Flow	Evaporative Emission (EVAP) System Function Check	• Deviation lambda control < 3.50...6.00 [%] AND • Deviation idle control < 31.00 [%]	• Integrated EVAP purge mass > 10.0 [g] • Or • Integrated air mass > 4.00 - 20.00 [kg] • AND • Choice of: • ECT > 60° C • OR • Substitute ECT > 60° C • AND • General: • Engine speed idle • Engine speed < n.a rpm • Engine speed deviation < 200 [rpm] • Engine load 12.00 - 34.99 % • Deviation engine load <= 4.01 [%] • AAT > 4° C • Barometric pressure > 72.00 • Lambda control closed loop	• 22.1 s • Once / DCY	• 2 DCY	– Check for restrictions or kinks in the EVAP pipes, including charcoal intrusion into the pipes. If pipes are free from obstruction: Check Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80-. Refer to "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking" page 1619.

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P0442 EVAP System Leak Detec- ted (small leak)	Evapora- tive Emis- sion (EVAP) System Small Leak	Time for pres- sure drop < 1.6 - 2.6 s	- General: - Time after engine start 5.0 - 1200.0 s - Preceding engine shut-off time > n.a. [s] - OR - Last ECM keep alive mode n.a. - Intake manifold vacuum > -100.00 kPa - BARO > 73.40 kPa - Vehicle speed 0 - 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temper- ature diff. > 45.0 [K] - Evap purge valve closed - LDP commanded on - ECT 4 - 110° C - ECT @ start 4...110° C - AND - Case 1: - AAT n.a. ° C - AAT drop after en- gine start < n.a. [K] - Case 2: - IAT 3 - 90° C - IAT drop after en- gine start < 8.3 K - Deep down hill driv- ing: - Delta barometric pressure < 0.25 kPa - OR - Engine load > n.a. [%] - AND - Delta vehicle speed < n.a. [km/h]	239 s - Once / DCY	2 DCY	Check Evap- orative Emis- sion (EVAP) Canister Purge Regu- lator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canis- ter Purge Regulator Valve 1 N80. Checking". page 1619 .

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P0444 EVAP System Purge Control Valve "A" Cir- cuit Open	Evapora- tive Emis- sion (EVAP) Canister Purge Valve open cir- cuit	Signal voltage 4.70...5.40 V	Evap purge valve commanded off	0.5 s - Contin- uous	2 DCY	Check Evap- orative Emis- sion (EVAP) Canister Purge Regu- lator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canis- ter Purge Regulator Valve 1 N80, Checking", page 1619 .



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P0455 EVAP System Leak Detec- ted (large leak)	Evapora- tive Sys- tem Gross Leak Pres- sure Check	Time for pres- sure drop < 1.0 s	- General: - Time after engine start 5.0 - 1200.0 s - Preceding engine shut-off time > n.a. [s] - OR - Last ECM keep alive mode n.a. - Intake manifold vacuum > -100.00 kPa - BARO > 73.40 kPa - Vehicle speed 0 - 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temper- ature diff. > 45.0 [K] - Evap purge valve closed - LDP commanded on - ECT 4 - 110° C - ECT @ start 4...110° C - AND - Case 1: - AAT n.a. ° C - AAT drop after en- gine start < n.a. [K] - Case 2: - IAT 3 - 90° C - IAT drop after en- gine start < 12.0 [K] - Deep down hill driv- ing - Delta barometric pressure < 0.25 kPa - OR - Engine load > n.a. [%] - AND - Delta vehicle speed < n.a. [km/h]	232.6 s - Once / DCY	2 DCY	- Inspect all the EVAP at- taching pipes and hoses for damage. Check the gas cap for tightness. - Check the EVAP Sys- tem for Leaks. Refer to ⇒ "2.2.4 EVAP System, Checking for Leaks", page 6. - Check Evap- orative Emis- sion (EVAP) Canister Purge Regu- lator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canis- ter Purge Regulator Valve 1 N80, Checking", page 1619. - Check Leak Detection Pump (LDP) - V144- . Re- fer to ⇒ "3.6.24 Leak Detec- tion Pump V144, Checking", page 1638.

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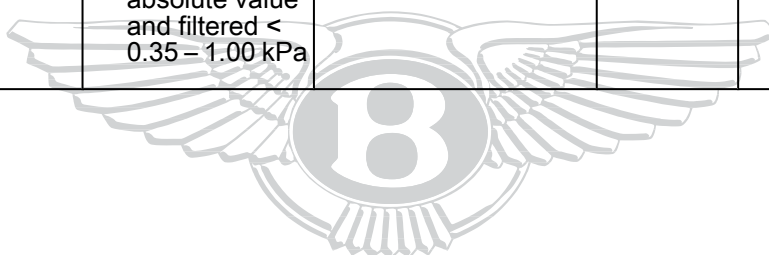
P0456 EVAP System Leak Detec- ted (very small leak)	Evapora- tive Emis- sion (EVAP) System Very Small Leak	Time for pres- sure drop < 3 – 5.8 s	- Time after engine start 5.0 - 800.0 s - Preceding engine shut-off time > n.a. [s] - OR - Last ECM keep alive mode n.a. - ECT 4...110° C - ECT @ start 4 - 110° C - IAT 3...70° C - IAT drop after en- gine start < 6.8 K - Intake manifold vacuum > -100.00 kPa - BARO > 73 kPa - Vehicle speed 0 - 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temper- ature diff > 50.3 [K] - Evap purge valve closed - LDP commanded on - Deep down hill driv- ing - Delta barometric pressure -0.39 - 0.20 kPa - OR - Engine load > n.a. [%] - AND - Delta vehicle speed < n.a. [km/h] - Additional: - Vehicle accelera- tion < 4.50 [m/s2] - Gradient engine load < 100.01 [%/ seg]	251.8 s - Once / DCY	2 DCY	- Check Evap- orative Emis- sion (EVAP) Canister Purge Regu- lator Valve - N80- . Refer to ⇒ “3.6.14 EVAP Canis- ter Purge Regulator Valve 1 N80, Checking”, page 1619 . - Check Leak Detection Pump (LDP) - V144- . Re- fer to ⇒ “3.6.24 Leak Detec- tion Pump V144, Checking”, page 1638 .

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P0458 EVAP System Purge Control Valve "A" Cir- cuit Low	Evapora- tive Emis- sion (EVAP) Canister Purge Valve short to ground	Signal voltage < 2.74...3.26 V	Evap purge valve commanded off	0.5 s - Contin- uous	2 DCY	Check Evap- orative Emis- sion (EVAP) Canister Purge Regu- lator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canis- ter Purge Regulator Valve 1 N80- Checking", page 1619 .
P0459 EVAP System Purge Control Valve "A" Cir- cuit High	Evapora- tive Emis- sion (EVAP) Canister Purge Valve short to battery plus	Signal current driver stage in- ternal value	- Evap purge valve commanded on - Engine speed >= 80 [rpm]	0.5 s - Contin- uous	2 DCY	Check Evap- orative Emis- sion (EVAP) Canister Purge Regu- lator Valve - N80- . Refer to ⇒ "3.6.14 EVAP Canis- ter Purge Regulator Valve 1 N80- Checking", page 1619 .

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P0491 AIR Sys- tem In- suffi- cient Flow Bank 1	Secondary Air Injec- tion (AIR) flow check during cat- alyst heat- ing	• Case 1: • Blockage: rela- tive AIR pres- sure measured with AIR pres- sure sensor vs. modeled < 0.51 [-] • Leakage: rela- tive AIR pres- sure measured with AIR pres- sure sensor vs. modeled < 0.25 [-] • Case 2: • Blockage: rela- tive AIR pres- sure measured with AIR pres- sure sensor vs. modeled < 0.70 [-] • Leakage: rela- tive AIR pres- sure measured with AIR pres- sure sensor vs. modeled < 0.59 [-] • Case 3: • Commanded on average pressure differ- ence between absolute value and filtered < 0.35 – 1.00 kPa	• IAT -10 - 100° C • Modeled catalyst temperature < 700° C • Mass air flow 7.00 - 275.00 kg/h • Difference engine load -10.0 - 10.0 [%/ rev] • Barometric pres- sure > 74.00 kPa • AIR system com- manded on	• 0 s • Once / DCY	• 2 DCY	– Check SAI attaching ho- ses to the ex- haust for kinks dam- age or ob- structions. – Check Sec- ondary Air In- jection (AIR) Pump Motor - -V101-- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Sec- ondary Air In- jection Pump Motor V101 . Checking", page 1661 . – Check Sec- ondary Air In- jection Sen- sor 1 - G609- . Re- fer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609 . Checking", page 1666



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P0492 AIR Sys- tem In- suffi- cient Flow Bank 2	Secondary Air Injec- tion (AIR) flow check during cat- alyst heat- ing	- Case 1: - Blockage: rela- tive AIR pres- sure measured with AIR pres- sure sensor vs. modeled < 0.51 [-] - Leakage: rela- tive AIR pres- sure measured with AIR pres- sure sensor vs. modeled < 0.25 [-] - Case 2: - Blockage: rela- tive AIR pres- sure measured with AIR pres- sure sensor vs. modeled < 0.70 [-] - Leakage: rela- tive AIR pres- sure measured with AIR pres- sure sensor vs. modeled < 0.59 [-] - Case 3: - Commanded on average pressure differ- ence between absolute value and filtered < 0.35 – 1.00 kPa	- IAT -10 - 100° C - Modeled catalyst temperature < 700° C - Mass air flow 7.00 - 275.00 kg/h - Difference engine load -10.0 - 10.0 [%/ rev] - Barometric pres- sure > 74.00 kPa - AIR system com- manded on	0 s - Once / DCY	2 DCY	- Check SAI attaching ho- ses to the ex- haust for kinks dam- age or ob- structions. - Check Sec- ondary Air In- jection Pump Motor 2 - - V189-- . Re- fer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Sec- ondary Air In- jection Pump Motor 2 V189 , Checking", page 1664 . - Check Sec- ondary Air In- jection Sen- sor 2 - G610- . Re- fer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610 , Checking", page 1668
P0504 Brake Switch A / B Correla- tion	Brake switch Plausibility check	- Electrical con- nection of Brake Switch and redundant Brake Switch do not correlate - For a calibrated number of 10 counts		- Imme- diate - Contin- uous	2 DCY	Check the brake switch. Refer to ap- propriate re- pair manual.
	Brake switch Cir- cuit con- tinuity	Brake Switch Signal and re- dundant Brake Switch Signal do not correlate				

P0506 Idle Speed Control System RPM - Lower Than Expected	Idle Speed Control (ISC) out of range low	- Engine speed deviation > 100 RPM - RPM controller torque value n.a.	- Time after engine start ≥ 5.0 s - Vehicle speed 0 km/h - Barometric pressure > 71.90 kPa - ECT 60...120° C - IAT > -11° C - Torque safety limitation not active - Driver request not active - For time > 1.0 s - For manual transmission: - Engine load < 34.50 %	5.0 s - Multiple	2 DCY	Check the EPC Throttle Drive - G186- . Refer to "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0507 Idle Speed Control System RPM - Higher Than Expected	Idle Speed Control (ISC) out of range high	- Engine speed deviation < -100 RPM - RPM controller torque value n.a. - Integrated number of fuel cut off transitions ≥ 3.00 [-]	- Time after engine start ≥ 5.0 s - Vehicle speed 0 km/h - Barometric pressure > 71.90 kPa - ECT 60...120° C - IAT > -11° C - Torque safety limitation not active - Driver request not active - For time > 1.0 s	5.0 s - Multiple	2 DCY	Check the EPC Throttle Drive - G186- . Refer to "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .

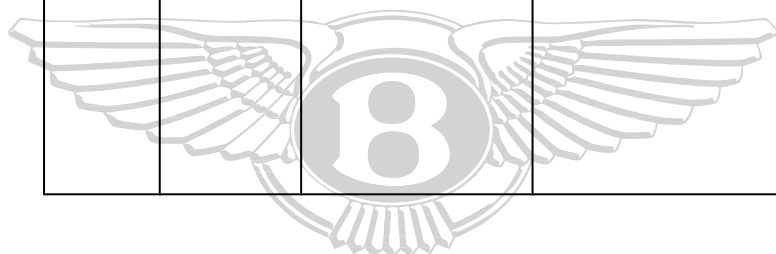
P050A Cold Start Idle Speed Control (ISC) System Per- for- mance	Cold Start Monitoring Idle Speed Control (ISC) out of range low	- Engine speed deviation > 100 RPM - RPM controller torque value n.a.	- Catalyst heating active - Time after engine start ≥ 5.0 s - Barometric pressure > 71.90 kPa - ECT -10...60° C - Torque safety limitation not active - Conditions vehicle speed: - Vehicle speed = 0 km/h - OR - Engine running and decoupled from powertrain (for hybrid) not equipped - Conditions driver request: - Driver request not active - OR - Engine running and decoupled from powertrain (for hybrid) not equipped - For time > 1.0 s - For manual transmission: - Engine load < 34.50 %	8.0 s - Multi- ple	2 DCY	Check the EPC Throttle Drive - G186- . Refer to "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .

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Cold Start Monitoring Idle Speed Control (ISC) out of range high	• Engine speed deviation < -200 rpm • AND • RPM controller torque value n.a. • OR • Integrated number of fuel cut off transitions >= n.a.	• Catalyst heating active • Time after engine start >= 5.0 s • Barometric pressure > 71.90 kPa • ECT -10 - 60° C • Torque safety limitation not active • Conditions vehicle speed: • Vehicle speed =0 km/h • OR • Engine running and decoupled from powertrain (for hybrid) not equipped • Conditions driver request: • Driver request not active • OR • Engine running and decoupled from powertrain (for hybrid) not equipped • For time > 1.0 s	• 4.0 s • Multiple		

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P050B Cold Start Ignition Timing Performance	Cold Start Monitoring Ignition Control (IC) idle ignition timing monitor	• Difference between commanded spark timing vs. actual value > 16.00 %	• General: • Commanded spark retard during catalyst heating < 84.0 % • Catalyst heating active • For time > 4.0 s • Fuel cut off not active • Barometric pressure > 7.30 kPa • Idle condition active • Diff. relative engine load vs. filtered relative engine load <= 15.00 [%] • (for relative engine load dynamic detection) • Diff. engine speed vs. filtered engine speed <= 300 [rpm] • (for engine speed dynamic detection) • Relative engine load <= 181.99 % • Conditions vehicle speed: • Vehicle speed = 0.0 km/h • OR • Engine running and decoupled from powertrain (for hybrid) not equipped	• 5 s • Once / DCY	• 2 DCY	– Inspect the air cleaner element and the air intake system for leaks. – Inspect the PCV system for leaks. – Check Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613 . – Check the EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 . – Check Intake Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597 . – Verify the latest Engine Control Module - J623- software is being used.



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P052A Cold Start "A" Cam- shaft Position Timing Over- Ad- vanced Bank 1	Variable Valve Tim- ing (VVT) Intake Ac- tuator Cold Start Mon- itoring tar- get error	• Difference be- tween target position vs. ac- tual position > 6.00° CRK	• Time after engine start >= 40.0 s • Engine speed >= 400 rpm • Modeled oil temper- ature >= -10° C • Commanded cam- shaft timing correc- tion for catalyst heating active	• 5.0 [s] • Once / DCY	• 2 DCY	– Check Intake Camshaft Adjustment Valve 1 - N205- Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597 .
P0544 Exhaust Gas Temper- ature Sensor Circuit Bank 1 Sensor 1	Exhaust Gas Tem- perature (EGT) Sensor during cold start rati- onality check	• Difference be- tween meas- ured and mod- eled exhaust gas temp. @ homogeneous running > 200.0 K	• Time after engine start 2 s • ECT @ engine shut-off > 80° C • IAT @ start < 40° C • ECT @ start < 40° C • Diff. between ECT @ start and IAT < 15.0 K	• 3 s • Once / DCY	• 2 DCY	– Check the Exhaust Gas Temperature Sensor 1 - G235- . Re- fer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235, Checking", page 1621 .
	Exhaust Gas Tem- perature (EGT) Sensor during warm en- gine run- ning rati- onality check	• Difference ex- haust tempera- ture to average of IAT and ECT @ start > 100.0 K	• Conditions for Measurement Win- dow • Engine running • Engine speed > 20 rpm • Catalyst heating not active • Fuel cut off not ac- tive • Modeled exhaust gas temperature > 600° C • Monitor measure- ment window condi- tions fulfilled > 60.0 s	• 3 s • Contin- uous		
	Exhaust Gas Tem- perature signal peri- od check	• Deviation of time period > 30 [ms]				
P0545 Exhaust Gas Temper- ature Sensor Circuit Low Bank 1 Sensor 1	Exhaust Gas Tem- perature (EGT) Sensor out of range low	• Exhaust gas temperature < -37° C		• 3.0 s • Contin- uous	• 2 DCY	– Check the Exhaust Gas Temperature Sensor 1 - G235- . Re- fer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235, Checking", page 1621 .

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P0546 Exhaust Gas Temperature Sensor Circuit High Bank 1 Sensor 1	Exhaust Gas Temperature (EGT) Sensor out of range high	Exhaust gas temperature > 1107° C		3 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235- , Checking", page 1621 .
P0547 Exhaust Gas Temperature Sensor Circuit Bank 2 Sensor 1	Exhaust Gas Temperature (EGT) Sensor during cold start rationality check	Difference between measured and modeled exhaust gas temp. @ homogeneous running > 200.0 K	- Time after engine start 2 s - ECT @ engine shut-off > 80° C - IAT @ start < 40° C - ECT @ start < 40° C - Diff. between ECT @ start and IAT < 15.0 K	3 s - Once / DCY	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448- , Checking", page 1622 .
	Exhaust Gas Temperature (EGT) Sensor during warm engine running rationality check	Difference exhaust temperature to average of IAT and ECT @ start > 100.0 K	- Conditions for Measurement Window - Engine running - Engine speed > 20 rpm - Catalyst heating not active - Fuel cut off not active - Modeled exhaust gas temperature > 600° C - Monitor measurement window conditions fulfilled > 60.0 s	3 s - Continuous		
	Exhaust Gas Temperature signal period check	Deviation of time period > 30 [ms]				
P0548 Exhaust Gas Temperature Sensor Circuit Low Bank 2 Sensor 1	Exhaust Gas Temperature (EGT) Sensor out of range low	Exhaust gas temperature < -37° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448- , Checking", page 1622 .

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P0549 Exhaust Gas Temperature Sensor Circuit High Bank 2 Sensor 1	Exhaust Gas Temperature (EGT) Sensor out of range high	Exhaust gas temperature > 1107° C		3 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448- Checking", page 1622 .
P0555 Brake Booster Pressure Sensor Circuit	Brake Booster Pressure Sensor - short to battery / open circuit	Signal voltage > 4.95 [V]	Time after ignition on > 500 ms	0.4 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201- Checking", page 1595 .
P0556 Brake Booster Pressure Sensor Circuit Range/Performance	Brake Booster Pressure Sensor out of range high Brake Booster Pressure Sensor out of range low Brake Booster Pressure Sensor Rationality check	- Brake booster pressure > 119.00 kPa - Brake booster pressure < 10.00 kPa - Brake booster pressure difference between measurement 1 and 2 < 1.50...4.50 kPa	- Brake light switch = off - Monitor Entry Conditions: - Vacuum pump commanded on - For time > 0.1 s - Brake light switch off - Brake booster pressure >= (barometric pressure * 0.20) + 15.00 kPa - Pressure Measurement 1: - Entry conditions fulfilled - Pressure Measurement 2: - Time after entry conditions fulfilled 1.0 s	0.2 s - Continuous - Multiple	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201- Checking", page 1595 .

P0557 Brake Booster Pres- sure Sensor Circuit Low	Brake Booster Pressure Sensor - Short to ground	Signal voltage < 0.10 V	Time after ignition on > 500 ms	0.4 s - Contin- uous	2 DCY	Check the Brake Pres- sure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pres- sure Sensor 1 G201- Checking", page 1595 .
P0558 Brake Booster Pres- sure Sensor Circuit High In- put	Brake Booster Pressure Sensor Circuit continuity - Short cir- cuit to bat- tery	Voltage from brake booster pressure sen- sor > 4.9 V		0.4 s - Contin- uous	2 DCY	Check the Brake Pres- sure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pres- sure Sensor 1 G201- Checking", page 1595 .
P0560 System Voltage	System Voltage Rationality - inopera- tive volt- age (low)	System voltage < 2.54 V	Main relay = switch- ed on	2.0 s - Contin- uous	2 DCY	Perform a charging system check and battery test to determine if the battery or charging system need to be serv- iced. Refer to the Repair Manual for battery/ charging system diag- nosis.
P0562 System Voltage Low	Engine Off Time check power supply for Engine Off Timer	Internal check failure	Power on reset on/ off	Once / DCY	1 DCY	Perform a charging system check and battery test to determine if the battery or charging system need to be serv- iced. Refer to the Repair Manual for battery/ charging system diag- nosis.

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P0563 System Voltage High	System Voltage Range check - high	System voltage > 15.92 V	- Engine speed > 480 - 600 RPM - For 180 s - Vehicle speed > 15.5 mph - Main relay switched on	2.0 s - Contin- uous	2 DCY	Perform a charging system check and battery test to determine if the battery or charging system need to be serviced. Refer to the Repair Manual for battery/ charging system diagnosis.
P068A ECM/ PCM Power Relay De- Ener- gized Per- for- mance - Too Ear- ly	Main Re- lay func- tional check - early opening	Defect counter >= 3.00 [-]	Ignition on	Once / DCY	2 DCY	Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 . Check the Motronic Engine Control Module Power Supply Relay 2 - J670- ⇒ "3.6.29 Motronic Engine Control Module Power Supply Relay 2 J670, Checking", page 1648 .

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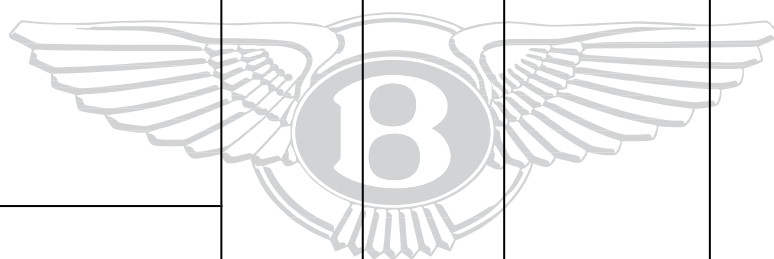
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P0606 Control Module Pro- cessor	CAN com- munica- tion RAM	- CAN Controller RAM = defect - Internal 5V supply voltage < 4.3 V - Internal 5V supply voltage > 5.3 V - Drive by wire module check failed - EEPROM check failed - Engine torque out of range - Engine operation condition out of range		- Imme- diately - Once / DCY	2 DCY	– Check for any compo- nent or circuit fault codes and diag- nose them first. If no faults are found during diagnosis, and the ECM has lost a driver output, replace the Engine Con- trol Module (ECM) . Re- fer to Repair Manual.
	Baromet- ric Pres- sure (BARO) Sensor plausibility check	- Diff. barometric sensor signal vs. boost pres- sure signal > 6.00 kPa - AND - Diff. barometric sensor vs. last driving cycle > 10.00 kPa	- Time after engine start < 5.0 s - Engine speed < 1000 rpm - Throttle position < 5.00 %	2.0 [s] - Once / DCY		
	Baromet- ric Pres- sure (BARO) Sensor plausibility check	- Diff. barometric sensor signal vs. boost pres- sure signal < -9.00 kPa - AND - Diff. barometric sensor vs. last driving cycle > 10.00 kPa				
	Baromet- ric Pres- sure (BARO) Sensor short to battery / open cir- cuit	Signal voltage > 4.80 [V]		1.0 s - Multi- ple		
	Baromet- ric Pres- sure (BARO) Sensor short to ground	Signal voltage < 0.20 [V]				

Barometric Pressure (BARO) Sensor out of range high	Measured barometric pressure > 115.00 kPa				
Barometric Pressure (BARO) Sensor out of range low	Measured barometric pressure < 50.00 kPa				
Ignition Control (IC) communication check	- Internal check failure - SPI communications check Identifier failure	Engine speed > n.a. rpm	0.5 s - Continuous		
Engine Control Module (ECM): 5V Supply Voltage	Internal hardware check under-/ overvoltage detection		2.0 s - Continuous		
Engine Control Module (ECM): Cylinder Deactivation (CD) function monitoring: half engine mode	- Injection pattern incorrect - OR - Ignition pattern incorrect - OR - Fade to full engine mode failed	- Half Engine Mode commanded on - Engine speed > 1200 [rpm]	0.2 [s] - Continuous		
Engine Control Module (ECM): EEPROM functional check	Internal checksum failed	Ignition on	0.5 s - Continuous		
Engine Control Module (ECM): Electronic Throttle Control Module function monitoring: A/D converter	- Comparison reference voltage with sensor voltage incorrect - Internal check failed - Test voltage / test pulse check failed				

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Engine Control Module (ECM): Electronic Throttle Control Module function monitoring: torque	Comparison with allowed engine torque incorrect	Internal engine speed > 1000 [rpm]			
Engine Control Module (ECM): Electronic Throttle Control Module function monitoring: engine speed deviation	Difference between calculated and internal engine speed > 320 rpm	Internal engine speed > 520 rpm			
Engine Control Module (ECM): Electronic Throttle Control Module function monitoring: coding	Internal check failed				
Engine Control Module (ECM): Electronic Throttle Control Module function monitoring: ignition timing	Internal check failed				
Engine Control Module (ECM): Electronic Throttle Control Module function monitoring: intern	System reaction incorrect				



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Engine Control Module (ECM): Electronic Throttle Control Module function monitoring: injection rate limitation	System reaction incorrect				
Engine Control Module (ECM): Electronic Throttle Control Module function monitoring: cylinder deactivation (CD)	- Injection on deactivated cylinders active - OR - Ignitions on deactivated cylinders active	Cylinder deactivation (CD) active	2.0 s - Continuous		
Engine Control Module (ECM): Electronic Throttle Control Module function monitoring: accelerator position	Comparison voltage sensor 1 with sensor 2 implausible		0.5 s - Continuous		
Engine Control Module (ECM): Electronic Throttle Control Module monitoring module	- Function controller check failed - AND - Monitoring module check no failure	SPI-interface no failure			
Engine Control Module (ECM): Processor CY150 communication check	Internal check incorrect		0.05 s - Continuous		

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	Engine Control Module (ECM): Sensor Integrated Circuit internal hardware check (electrical adjustment communication, voltage supply)	Check failed		0.5 s - Continuous		
	Engine Control Module (ECM): WDA function monitoring: WDA	- Over voltage detection failure - General cause failure - Internal check failure				
	Engine Control Module (ECM): RAM controller RAM check	Memory checksum error detected	ECM initialization phase active	- none - Once / DCY		
P0627 Fuel Pump "A" Control Circuit/ Open	Fuel Pump (FP) Relay Open circuit	Signal voltage driver stage internal value	Fuel pump relay commanded off	0.50 s - Continuous	2 DCY	Check the Fuel Pump Control Module. Refer to ⇒ "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276, Checking", page 1628.
P0629 Fuel Pump "A" Control Circuit High	Fuel Pump (FP) Relay short to battery plus	Signal voltage driver stage internal value	- Fuel pump relay commanded on - Engine speed > 80 RPM	0.50 s - Continuous	2 DCY	Check the Fuel Pump Control Module. Refer to ⇒ "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276, Checking", page 1628.

P0638 Throttle Actuator Control Range/ Performance Bank 1	Throttle Actuator rationality check close movement	- Time to close to reference point > 0.6 s - AND - Deviation to reference point > 3.00%	- Engine speed 0 rpm - Vehicle speed 0 km/h - ECT > 5° C - IAT > 5° C - Case 1: - Ignition on - Case 2: - Engine shut-off-time > 0.5 s - Number of checks 3.00 [-]	5 s - Multiple	2 DCY	Check EPC Throttle Drive - G186- . Refer to "3.6.39 Throttle Valve Control Module GX3 . Checking", page 1671 .
	Throttle Actuator signal range check @ mechanical stop low	- TPS 1 signal voltage < 0.21; > 0.87 [V] - OR - TPS 2 signal voltage < 4.14; > 4.84 [V]	- Engine speed 0 rpm - Vehicle speed 0 km/h - Case 1: - Ignition on - ECT 5 - 101° C - IAT 5 - 143° C - Case 2: - Engine shut-off-time n.a. - ECT n.a. - IAT n.a.	0.3 [s] - Multiple	2 DCY	
P0641 Sensor Reference Voltage "A" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit A short circuit	Signal voltage < 4.8; > 5.2 [V]		0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to the Repair Manual.
P0651 Sensor Reference Voltage "B" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit B short circuit	Signal voltage < 4.8; > 5.2 [V]	---	0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to the Repair Manual.

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P0657 Actuator Supply Voltage "A" Cir- cuit/ Open	Engine Compo- nents Sup- ply Volt- age Relay open cir- cuit	Signal voltage 4.70 - 5.40 V	Supply voltage re- lay commanded off	0.5 s - Contin- uous	2 DCY	Check ECM Power Sup- ply Relay . Refer to ⇒ "3.6.10 Engine Com- ponent Pow- er Supply Relay J757 . Checking", page 1611 .
P0658 Actuator Supply Voltage "A" Cir- cuit Low	Engine Compo- nents Sup- ply Volt- age Relay short to ground	Signal voltage < 2.74 - 3.26 V	Supply voltage re- lay commanded off	0.5 s - Contin- uous	2 DCY	Check ECM Power Sup- ply Relay . Refer to ⇒ "3.6.10 Engine Com- ponent Pow- er Supply Relay J757 . Checking", page 1611 .
P0659 Actuator Supply Voltage "A" Cir- cuit High	Engine Compo- nents Sup- ply Volt- age Relay short to battery plus	Signal current driver stage in- ternal value	Supply voltage re- lay commanded off	0.5 s - Contin- uous	2 DCY	Check ECM Power Sup- ply Relay . Refer to ⇒ "3.6.10 Engine Com- ponent Pow- er Supply Relay J757 . Checking", page 1611 .
P0688 ECM/ PCM Power Relay Sense Circuit/ Open	System voltage Rationality - inopera- tive volt- age (high)	System voltage after main relay > 15.92 V	- Engine speed > 480 - 600 RPM - For 180 s - Vehicle speed > 15.5 mph	2 s - Contin- uous	2 DCY	Check ECM Power Sup- ply Relay . Refer to ⇒ "3.6.10 Engine Com- ponent Pow- er Supply Relay J757 . Checking", page 1611 .
P0697 Sensor Refer- ence Voltage "C" Cir- cuit/ Open	Engine Control Module (ECM): Sensor Referer Circuit C short cir- cuit	Signal voltage < 4.8; > 5.2 V		0.5 s - Contin- uous	2 DCY	If a related sensor volt- age code is also set, re- fer to that sensor for di- agnosis. If no other related codes set, replace the Engine Con- trol Module - J623- . Refer to the Repair Manual.

P13EA Cold Start Ignition Timing Performance Off Idle	Cold Start Monitoring Ignition Control (IC) part load ignition timing monitor	Difference between commanded spark timing vs. actual value > 18.00 %	- General: - Commanded spark retard during catalyst heating < 90.0 % - Catalyst heating active - For time > 4.0 s - Fuel cut off not active - Barometric pressure > 7.30 kPa - Idle condition not active - Vehicle speed >= 2 km/h - Diff. relative engine load vs. filtered relative engine load <= 15.00 % (for relative engine load dynamic detection) - Diff. engine speed vs. filtered engine speed <= 300 rpm (for engine speed dynamic detection) - Additional (only for hybrid): - Engine running and decoupled from powertrain not equipped	2.5 s - Once / DCY	2 DCY	Check for any Engine Speed sensor or Ignition Coil faults and diagnose them first. If NO other faults are set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P1427 Brake vacuum pump activation Short circuit to B+	Brake Vacuum Pump short to battery plus	Signal current driver stage internal value	Engine speed >= 80 rpm	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to "3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22- . Checking", page 1674 .

P1428 Brake vacuum pump activation Short circuit to ground	Brake Vacuum Pump short to ground	Signal voltage < 2.15 V	Engine speed ≥ 80 rpm	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to "3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 , Checking", page 1674 .
P1429 Brake vacuum pump activation Open circuit	Brake Vacuum Pump open circuit	Signal voltage 4.4 - 5.6 V	Engine speed ≥ 80 rpm	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to "3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 , Checking", page 1674 .
P150A Engine Off Time comparison of engine off time from instrument cluster control unit with engine after run time	Engine Off Time comparison of engine off time from instrument cluster control unit with engine after run time	- Difference between engine-off time and ECM after-run time < -(12.0) s OR - Difference between engine-off time and ECM after-run time > 12.0 s	- Ignition on - CAN active	2 s - Once / DCY	2 DCY	If ignition off B+ is lost to ECM this code will set. Check power and ground inputs to ECM first. Refer to Wiring Diagrams for pin locations. If all power/ grounds to ECM are present, replace the Engine Control Module - J623- . Refer to the Repair Manual.

P166F Partial engine operation Deactivated	Engine Control Module (ECM): Cylinder Deactivation (CD) vehicle in cylinder deactivation service mode	Cylinder deactivation service mode active	Ignition on	0 s - Continuous	1 DCY	If a relative Cylinder Deactivation fault is also set diagnose and repair those faults first. If there are no other faults stored check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .
P169A Loading mode active	Engine Control Module (ECM): Transport Mode vehicle in transport mode	Transport mode active	- For activation: - During ECM keep alive-time after ignition off - Vehicle speed < 5 km/h - Engine speed 0 rpm - Max trip mileage since initial vehicle start-up < 100 km - Production mode not active - For hybrid: drive motor off	0.0 s	1 DCY	Perform readiness check.
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	Variable Valve Timing (VVT) Intake Actuator - Short to Ground	Signal voltage < 2.74 - 3.26 V	Camshaft actuator solenoid valve commanded off	0.5 s - Continuous	2 DCY	Check Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .
P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	Variable Valve Timing (VVT) Intake Actuator short to battery plus	Signal current driver stage internal value	- Camshaft actuator solenoid valve commanded on - Engine speed >= 80 [rpm]	0.5 s - Continuous	2 DCY	Check Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .

P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Fuel System out of range low	• I-part of 2nd lambda control loop < -0.030 [-]	• Modeled exhaust gas temp. 400 - 800° C • For time n.a. • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • AND • Integrated exhaust gas mass > 100.0 [g] • After the following mixture disturbances: • Time fuel cut off > 0.5 s • Deviation engine load > 6.0 [%/rev] • ECT < 50° C • Catalyst heating active • AIR active • Lambda setpoint < 1; > 1 [-] • Catalyst purge active • Engine speed n.a. • For time n.a. • Disabling the offset adaptation after repeated transients within a short time: • Acceleration enrichment active • OR • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.00 [-]	• 120.0 s • Continuous	• 2 DCY	- Check the Bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. - Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- , Checking", page 1653 . - Check Oxygen Sensor After Three Way Catalytic Converter - G130- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking", page 1650 .

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			• AND • Exhaust gas mass flow 30.00 - 180.00 kg/h • OR • Exhaust gas mass flow 30.00 kg/h • Within time n.a.			



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P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Fuel System out of range high	• I-part of 2nd lambda control loop > 0.030 [-]	• Modeled exhaust gas temp. 400 - 800° C • For time n.a. • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • AND • Integrated exhaust gas mass > 100.0 [g] • After the following mixture disturbances: • Time fuel cut off > 0.5 s • Deviation engine load > 6.0 [%/rev] • ECT < 50° C • Catalyst heating active • AIR active • Lambda setpoint < 1; > 1 [-] • Catalyst purge active • Engine speed n.a. • For time n.a. • Disabling the offset adaptation after repeated transients within a short time: • Acceleration enrichment active • OR • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.00 [-]	• 120 s • Continuous	• 2 DCY	– If a misfire code or injector fault is set, diagnose those codes first. – Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 . – Check Oxygen Sensor After Three Way Catalytic Converter - G130- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7- Checking", page 1650 . – Check Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC) Checking", page 1670 .

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			• AND • Exhaust gas mass flow 30.00 - 180.00 kg/h • OR • Exhaust gas mass flow 30.00 • Within time n.a.			



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P2098 Post Catalyst Fuel Trim System Too Lean Bank 2	Fuel System out of range low	• I-part of 2nd lambda control loop < -0.030 [-]	• Modeled exhaust gas temp. 400 - 800° C • For time n.a. • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • AND • Integrated exhaust gas mass > 100.0 g • After the following mixture disturbances: • Time fuel cut off > 0.5 s • Deviation engine load > 6.0 [%/rev] • ECT < 50° C • Catalyst heating active • AIR active • Lambda setpoint < 1; > 1 [-] • Catalyst purge active • Engine speed n.a. • For time n.a. • Disabling the offset adaptation after repeated transients within a short time: • Acceleration enrichment active • OR • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.00 [-] • AND	• 120.0 s • Continuous	• 2 DCY	- Check the Bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. - Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check Oxygen Sensor 2 After Catalytic Converter - G131- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 . - Check Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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			• Exhaust gas mass flow 30.00...180.00 [kg/h] • OR • Exhaust gas mass flow 30.00 [kg/h] • Within time n.a.			



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P2099 Post Catalyst Fuel Trim System Too Rich Bank 2	Fuel System out of range high	• I-part of 2nd lambda control loop > 0.030 [-]	• Modeled exhaust gas temp. 400 - 800° C • For time n.a. • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • AND • Integrated exhaust gas mass > 100.0 g • After the following mixture disturbances: • Time fuel cut off > 0.5 s • Deviation engine load > 6.0 [%/rev] • ECT < 50° C • Catalyst heating active • AIR active • Lambda setpoint < 1; > 1 [-] • Catalyst purge active • Engine speed n.a. • For time n.a. • Disabling the offset adaptation after repeated transients within a short time: • Acceleration enrichment active • OR • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.00 [-] • AND	• 120 s • Continuous	• 2 DCY	- If a misfire code or injector fault is set, diagnose those codes first. - Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 . - Check Oxygen Sensor 2 After Catalytic Converter - G131- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8- Checking", page 1656 . - Check Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC) Checking", page 1670 .

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			- Exhaust gas mass flow 30.00 - 180.00 kg/h - OR - Exhaust gas mass flow 30.00 - Within time n.a.			
P2101 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Actuator signal range check	- Duty cycle > 80 % - AND - ECM power stage no failure	- System voltage > 8.3 V - Throttle blade powersave mode active = false - TB adaptation active = false	5 s - Continuous	2 DCY	Check the Throttle Valve Control Module . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
	Throttle Actuator rationality check	Deviation throttle value angles vs. throttle value setpoint > 4.00 - 50.00 %		0.5 - Continuous		
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator short to battery plus/ short to ground	Internal check failed		0.5 s - Continuous	2 DCY	Check the Throttle Valve Control Module . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
	Throttle Actuator open circuit	- Duty cycle > 80 % - OR - Deviation throttle value angles vs. throttle value setpoint > 4.00 - 50.00 %				
	Throttle Actuator temperature / current monitoring					
	Throttle Actuator functional check					

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P2119 Throttle Actuator "A" Control Throttle Body Range/Performance	Throttle Actuator signal range check @ mechanical stop low	- TPS 1 signal voltage < 0.21; > 0.87 V - OR - TPS 2 signal voltage < 4.14; > 4.84 V	- Engine speed 0 rpm - Vehicle speed 0 km/h - Case 1: - Ignition on - ECT 5...101° C - IAT 5...143° C - Case 2: - Engine shut-off-time n.a. - ECT n.a. - IAT n.a.	0.3 [s] - Multiple	2 DCY	Check EPC Throttle Drive - G186- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P2122 Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	Accelerator Pedal Position (APP) Sensor 1 out of range low	Signal voltage < 0.61 V		0.50 s - Continuous	2 DCY	Check Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2123 Throttle/ Pedal Position Sensor/ Switch "D" Circuit High	Accelerator Pedal Position (APP) Sensor 1 out of range high	Signal voltage > 4.79 V		0.50 s - Continuous	2 DCY	Check Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2127 Throttle/ Pedal Position Sensor/ Switch "E" Circuit Low	Accelerator Pedal Position (APP) Sensor 2 out of range low	Signal voltage < 0.27 V		0.5 s - Continuous	2 DCY	Check Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2128 Throttle/ Pedal Position Sensor/ Switch "E" Circuit High	Accelerator Pedal Position (APP) Sensor 2 out of range high	Signal voltage > 2.43 V		0.5 s - Continuous	2 DCY	Check Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .

P2138 Throttle/ Pedal Position Sensor/ Switch "D"/"E" Voltage Correla- tion	Accelerator Pedal Position (APP) Sensor 1 and 2 rationality check	Signal voltage sensor 1 vs. 2 > 0.17 - 0.70 V	- Signal voltage sensor 1 > 445 mV - Signal voltage sensor 2 > 445 mV	0.24 s - Continuous	2 DCY	Check Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2177 System Too Lean Off Idle Bank 1	Fuel System system too lean @ part load	Adaptive value > 20.00 %	- Number of injections after engine start > 1000 [-] - Engine speed 520 - 4840 rpm - Engine load 10 - 60 % - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution n.a.	15 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check Bank 1 Heated Oxygen Sensor - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .
	Fuel System too lean @ part load in cylinder deactivation (CD) mode		- Number of injections after engine start > 1000 [-] - Engine speed 520 - 4840 rpm - Engine load 10 - 60 % - ECT > 55° C - IAT < 72° C - Ratio manifold pressure to barometric pressure > 0.20 [-] - OR - Valve overlap < 40.00° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution n.a.			

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P2178 System Too Rich Off Idle Bank 1	Fuel system too rich @ part load	Adaptive value < -20.00 %	- Number of injections after engine start > 1000 [-] - Engine speed 520 - 4840 rpm - Engine load 10 - 60 % - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution n.a.	15 s - Continuous	2 DCY	- Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. - Check Bank 1 Heated Oxygen Sensor - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
	Fuel system too rich @ part load in cylinder deactivation (CD) mode		- Number of injections after engine start > 1000 [-] - Engine speed 520 - 4840 rpm - Engine load 10 - 60 % - ECT > 55° C - IAT < 72° C - Ratio manifold pressure to barometric pressure > 0.20 [-] - OR - Valve overlap < 40.00 - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution n.a.			

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P2179 System Too Lean Off Idle Bank 2	Fuel System system too lean @ part load	Adaptive value > 20.00 %	- Number of injections after engine start > 1000 [-] - Engine speed 520 - 4840 rpm - Engine load 10 - 60 % - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution n.a.	15 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking" page 1659 .
	Fuel System too lean @ part load in cylinder deactivation (CD) mode		- Number of injections after engine start > 1000 [-] - Engine speed 520...4840 [rpm] - Engine load 10...60 [%] - ECT > 55° C - IAT < 72° C - Ratio manifold pressure to barometric pressure > 0.20 [-] - OR - Valve overlap < 40.00° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution n.a.			



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P2180 System Too Rich Off Idle Bank 2	Fuel system too rich @ part load	Adaptive value < -20.00 %	- Number of injections after engine start > 1000 [-] - Engine speed 520 - 4840 rpm - Engine load 10 - 60 % - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution n.a.	80 s - Continuous	2 DCY	- Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. - Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
	Fuel system too rich @ part load in cylinder deactivation (CD) mode		- Number of injections after engine start > 1000 [-] - Engine speed 520 - 4840 rpm - Engine load 10 - 60 % - ECT > 55° C - IAT < 72° C - Ratio manifold pressure to barometric pressure > 0.20 [-] - OR - Valve overlap < 40.00 - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution n.a.			

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P2181 Cooling System Performance	Engine Cooling System cooling system performance not in the expected range	- Cooling system temperature too low after a sufficient mass air flow integral < 82° C - For time >= 5.0 s	- Monitor entry conditions: - ECT @ start -8 - 60° C - AND - AAT -8 - 55° C - OR - IAT n.a. [°C] - Begin of air mass integration: - ECT > 40° C - Conditions for diagnosis: - Mass air flow < 400.00 kg/h - Delta barometric pressure < 1.50 kPa - Delta AAT n.a. [K] - AND - Accum. time required < 140.0 - 385.0 s - OR - Accum. integrated air mass < n.a. [kg] - Accumulation enable if - Fuel cut off active - OR - Engine load > 100.00 % - OR - Engine load < 14.00 - 30.00 % - Start of fault decision: - Integrated air mass > 8.40 - 17.90 kg - Conditions at fault decision: (average values since start) - Mass air flow (lower threshold) >= 32.00 - 86.40 kg/h - Mass air flow (upper threshold) <= 100.00 - 260.00 kg/h	0 (FTP 740.0) [s] - Once / DCY	2 DCY	Check Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613 .

			- Vehicle speed (lower threshold) $\geq 15 - 40$ km/h - Vehicle speed (upper threshold) ≤ 120 km/h			
P2187 System Too Lean at Idle Bank 1	Fuel System too lean @ idle	Adaptive value $> 5.48\%$	- Number of injections after engine start $> 1000 [-]$ - Engine speed $520 - 1040$ rpm - Engine load $4 - 16\%$ - ECT $> 55^\circ\text{C}$ - IAT $< 72^\circ\text{C}$ - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution n.a.	10 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
P2188 System Too Rich at Idle Bank 1	Fuel system too rich @ idle	Adaptive value $< -5.48\%$	- Number of injections after engine start $> 1000 [-]$ - Engine speed $520 - 1040$ rpm - Engine load $4 - 16\%$ - ECT $> 55^\circ\text{C}$ - IAT $< 72^\circ\text{C}$ - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution n.a.	10 s - Continuous	2 DCY	- Check for correct fuel pressure. Refer to the Repair Manual for the procedure. - Check Bank 1 Heated Oxygen Sensor - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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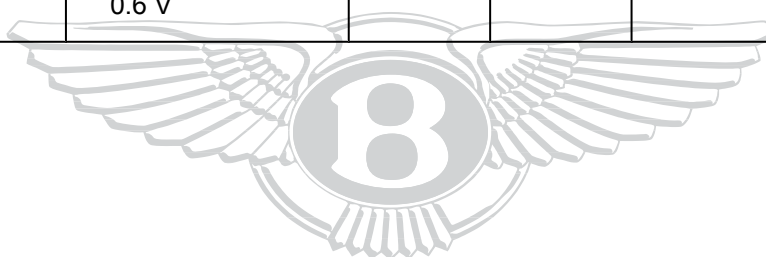
P2189 System Too Lean at Idle Bank 2	Fuel System too lean @ idle	Adaptive value > 5.48 %	- Number of injections after engine start > 1000 [-] - Engine speed 520 - 1040 rpm - Engine load 4 - 16 % - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution n.a.	10 s - Continuous	2 DCY	- Check for air leaks behind the Bank 1 MAF including intake manifold. Check the Bank 2 exhaust system for leaks before the upstream O2S. - Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking" page 1659 .
P2190 System Too Rich at Idle Bank 2	Fuel system too rich @ idle	Adaptive value < -5.48 %	- Number of injections after engine start > 1000 [-] - Engine speed 520 - 1040 rpm - Engine load 4 - 16 % - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution n.a.	10 s - Continuous	2 DCY	- Check for correct fuel pressure. Refer to the Repair Manual for the procedure. - Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking" page 1659 .

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P2195 O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1	Oxygen Sensors (O2S) front out of range high	Delta lambda of 2nd lambda control loop > 0.070 [-]	- Modeled exhaust gas temp. 400 - 800° C - For time n.a. - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - AND - Integrated exhaust gas mass > 100.0 [g] - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0 [%/rev] - ECT < 50° C - Catalyst heating active - AIR active - Lambda setpoint < 1; > 1 [-] - Catalyst purge active - Engine speed n.a. - For time n.a. - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - OR - Deceleration enrichment active - Then - LSU offset adaptation stops if event counter > 1.00 [-] - AND	120 s - Multiple	2 DCY	Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .

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			• Exhaust gas mass flow 30.00 - 180.00 kg/h • OR • Exhaust gas mass flow 30.00 kg/h • Within time n.a. • AND • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • OR • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • OR • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			



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P2196 O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1	Oxygen Sensors (O2S) front out of range low	Delta lambda of 2nd lambda control loop < -0.070	- Modeled exhaust gas temp. 400 - 800° C - For time n.a. - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - AND - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0 [%/rev] - ECT < 50° C - Catalyst heating active - AIR active - Lambda setpoint < 1; > 1 [-] - Catalyst purge active - Engine speed n.a. - For time n.a. - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - OR - Deceleration leanment active - AND THEN - LSU offset adaptation stops if event counter > 1.00 [-] - AND	120 s - Continuous	2 DCY	Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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			- Exhaust gas mass flow 30.00 - 180.00 kg/h - OR - Exhaust gas mass flow 30.00 kg/h - Within time n.a. - AND - Case 1: 1st lambda control loop not at min or max limit 2nd lambda control loop active - OR - Case 2: 1st lambda control loop at min limit - O2S front < 1.0 [-] - O2S rear voltage < 0.4 V - OR - Case 3: 1st lambda control loop at max limit - O2S front > 1.0 [-] - O2S rear voltage > 0.6 V			

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P2197 O2 Sensor Signal Biased/Stuck Lean Bank 2 Sensor 1	Oxygen Sensors (O2S) front out of range high	Delta lambda of 2nd lambda control loop > 0.070 [-]	- Modeled exhaust gas temp. 400 - 800° C - For time n.a. - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - AND - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0 [%/rev] - ECT < 50° C - Catalyst heating active - AIR active - Lambda setpoint < 1; > 1 [-] - Catalyst purge active - Engine speed n.a. - For time n.a. - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - OR - Deceleration enrichment active - Then - LSU offset adaptation stops if event counter > 1.00 [-] - AND	120 s - Multiple	2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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			- Exhaust gas mass flow 30.00 - 180.00 kg/h - OR - Exhaust gas mass flow 30.00 kg/h - Within time n.a. - AND - Case 1: 1st lambda control loop not at min or max limit 2nd lambda control loop active - OR - Case 2: 1st lambda control loop at min limit - O2S front < 1.0 [-] - O2S rear voltage < 0.4 V - OR - Case 3: 1st lambda control loop at max limit - O2S front > 1.0 [-] - O2S rear voltage > 0.6 V			

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P2198 O2 Sensor Signal Biased/Stuck Rich Bank 2 Sensor 1	Oxygen Sensors (O2S) front out of range low	Delta lambda of 2nd lambda control loop < -0.070	- Modeled exhaust gas temp. 400 - 800° C - For time n.a. - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - AND - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0 [%/rev] - ECT < 50° C - Catalyst heating active - AIR active - Lambda setpoint < 1; > 1 [-] - Catalyst purge active - Engine speed n.a. - For time n.a. - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - OR - Deceleration enrichment active - AND THEN - LSU offset adaptation stops if event counter > 1.00 [-] - AND	120 s - Continuous	2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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			- Exhaust gas mass flow 30.00 - 180.00 kg/h - OR - Exhaust gas mass flow 30.00 kg/h - Within time n.a. - AND - Case 1: 1st lambda control loop not at min or max limit 2nd lambda control loop active - OR - Case 2: 1st lambda control loop at min limit - O2S front $< 1.0 [-]$ - O2S rear voltage $< 0.4 \text{ V}$ - OR - Case 3: 1st lambda control loop at max limit - O2S front $> 1.0 [-]$ - O2S rear voltage $> 0.6 \text{ V}$			
P2199 Intake Air Temperature Sensor 1/2 Correlation	IAT Sensor 2 Plausibility check	Difference of IAT sensor 1 and 2 > 39.8 and $< -50.3^{\circ} \text{ C}$	- MAF > 22.22 and $< 166.67 \text{ g/Sec.}$ - Vehicle speed $> 28 \text{ mph}$ - Ratio of boost pressure and BARO $< 1.10 \text{ g/Sec.}$ - For a calibrated period of time $> 15 \text{ s}$	5.0 s - Continuous	2 DCY	- Check both of the IAT's (in MAF 1 and 2) for accuracy. Refer to "3.6.27 Mass Airflow Sensor G70, Checking", page 1644. ⇒ "3.6.28 Mass Airflow Sensor 2 G246, Checking", page 1646.

P219C Cylinder 1 Air- Fuel Ra- tio Im- balance	Fuel Sys- tem A/F cylinder imbal- ance: out of range low	Individual cylinder fuel correction based on measured enrichment for dedicated engine roughness increase < 0.87 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 kg - Misfire on currently lean shifted cylinder not detected	20 (does not run in FTP) s - Once / DCY	2 DCY	Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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	Fuel System A/F cylinder imbalance: out of range high	Individual cylinder fuel correction based on measured enrichment for dedicated engine roughness increase > 1.15 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 - Misfire on currently lean shifted cylinder not detected			

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P219D Cylinder 2 Air- Fuel Ra- tio Im- balance	Fuel Sys- tem A/F cylinder imbal- ance: out of range low	Individual cylinder fuel correction based on measured en-leanment for dedicated engine roughness increase < 0.87 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 kg - Misfire on currently lean shifted cylinder not detected	20 (does not run in FTP) s - Once / DCY	2 DCY	Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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	Fuel System A/F cylinder imbalance: out of range high	Individual cylinder fuel correction based on measured enrichment for dedicated engine roughness increase > 1.15 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 - Misfire on currently lean shifted cylinder not detected			

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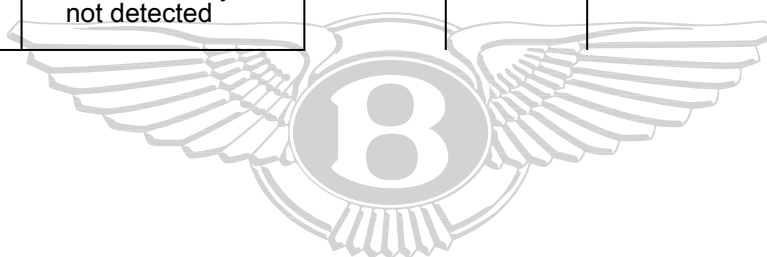
P219E Cylinder 3 Air- Fuel Ra- tio Im- balance	Fuel Sys- tem A/F cylinder imbal- ance: out of range low	Individual cylinder fuel correction based on measured en-leanment for dedicated engine roughness increase < 0.87 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 kg - Misfire on currently lean shifted cylinder not detected	20 (does not run in FTP)s - Once / DCY	2 DCY	Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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Fuel System A/F cylinder imbalance: out of range high	Individual cylinder fuel correction based on measured enrichment for dedicated engine roughness increase > 1.15 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 - Misfire on currently lean shifted cylinder not detected			

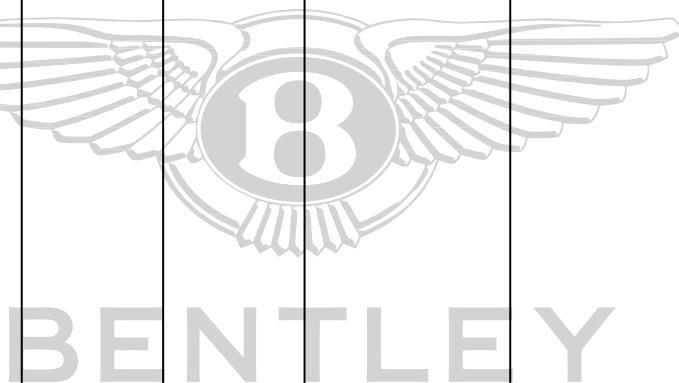
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P219F Cylinder 4 Air- Fuel Ra- tio Im- balance	Fuel Sys- tem A/F cylinder imbal- ance: out of range low	Individual cylinder fuel correction based on measured en-leanment for dedicated engine roughness increase < 0.87 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 kg - Misfire on currently lean shifted cylinder not detected	20 (does not run in FTP) s - Once / DCY	2 DCY	Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .



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	Fuel System A/F cylinder imbalance: out of range high	Individual cylinder fuel correction based on measured enrichment for dedicated engine roughness increase > 1.15 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 - Misfire on currently lean shifted cylinder not detected			



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P21A0 Cylinder 5 Air- Fuel Ra- tio Im- balance	Fuel Sys- tem A/F cylinder imbal- ance: out of range low	Individual cylin- der fuel correc- tion based on measured en- leanment for dedicated en- gine roughness increase < 0.87 [-]	- Camshaft adjust- ment not calibrated - Crankshaft adapta- tion completed - Rough road not de- tected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pres- sure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front comple- ted - Electrical check of O2S rear comple- ted - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25-13.00 kg - Misfire on currently lean shifted cylinder not detected	20 (does not run in FTP) s - Once / DCY	2 DCY	Check Bank 2 Sensor 1 Heated Oxy- gen Sensor - GX11- . Re- fer to ⇒ "3.6.33 Oxygen Sen- sor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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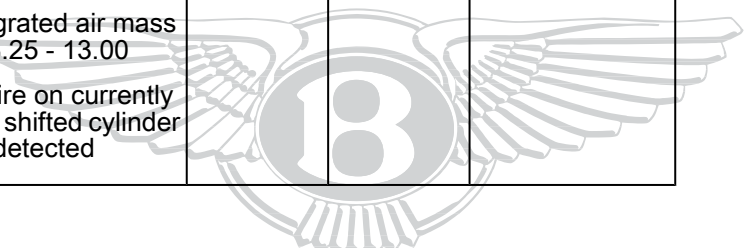
	Fuel System A/F cylinder imbalance: out of range high	Individual cylinder fuel correction based on measured enrichment for dedicated engine roughness increase > 1.15 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 - Misfire on currently lean shifted cylinder not detected			

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P21A1 Cylinder 6 Air- Fuel Ra- tio Im- balance	Fuel Sys- tem A/F cylinder imbal- ance: out of range low	Individual cylinder fuel correction based on measured enrichment for dedicated engine roughness increase < 0.87 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 kg - Misfire on currently lean shifted cylinder not detected	20 (does not run in FTP)s - Once / DCY	2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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	Fuel System A/F cylinder imbalance: out of range high	Individual cylinder fuel correction based on measured enrichment for dedicated engine roughness increase > 1.15 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 - Misfire on currently lean shifted cylinder not detected			



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P21A2 Cylinder 7 Air- Fuel Ra- tio Im- balance	Fuel Sys- tem A/F cylinder imbal- ance: out of range low	Individual cylinder fuel correction based on measured enrichment for dedicated engine roughness increase < 0.87 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 kg - Misfire on currently lean shifted cylinder not detected	20 (does not run in FTP)s - Once / DCY	2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

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	Fuel System A/F cylinder imbalance: out of range high	Individual cylinder fuel correction based on measured enrichment for dedicated engine roughness increase > 1.15 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 - Misfire on currently lean shifted cylinder not detected			

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P21A3 Cylinder 8 Air- Fuel Ra- tio Im- balance	Fuel Sys- tem A/F cylinder imbal- ance: out of range low	Individual cylinder fuel correction based on measured en-leanment for dedicated engine roughness increase < 0.87 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 kg - Misfire on currently lean shifted cylinder not detected	20 (does not run in FTP)s - Once / DCY	2 DCY	Check Bank 2 Sensor 1 Heated Oxygen Sensor - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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	Fuel System A/F cylinder imbalance: out of range high	Individual cylinder fuel correction based on measured enrichment for dedicated engine roughness increase > 1.15 [-]	- Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 72.0 % - Selected gear >= 6 [-] - Barometric pressure > 73.00 kPa] - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value not calibrated [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 - 13.00 - Misfire on currently lean shifted cylinder not detected			

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P2226 Baro- metric Pres- sure Sensor Circuit Fault	BARO Sensor Range check	BARO < 50 or > 115 kPa		2 s - Contin- uous	2 DCY	The Baro sensor is lo- cated within the ECM and will require replacement of the ECM if the scan tool reading is off by more than 10% of ac- tual Baro- metric pres- sure. Refer to the Repair Manual for ECM re- placement.
P2227 Baro- metric Pres- sure Sensor "A" Cir- cuit Range/ Per- for- mance	BARO Sensor Rationality check	- Change in BARO > 5 kPa - Within a period of time = 20 s - Difference be- tween meas- ured BARO and stored BARO of previ- ous drive cycle > 10 kPa	- Engine speed < 1000 RPM - Throttle angle < 5% - For a calibrated pe- riod of time > 3 s	20 s - Contin- uous	2 DCY	The Baro sensor is lo- cated within the ECM and will require replacement of the ECM if the scan tool reading is off by more than 10% of ac- tual Baro- metric pres- sure. Refer to the Repair Manual for ECM re- placement.
		- Deviation be- tween meas- ured BARO and stored BARO of previ- ous driving cy- cle > 10 kPa - Time since en- gine start < 5 s - Deviation be- tween meas- ured BARO and calculated BARO > 2 kPa - Deviation be- tween meas- ured BARO and calculated BARO < 2 kPa		2 s - Contin- uous		

P2228 Barometric Pressure Sensor "A" Circuit Low	Barometric Pressure Circuit Low	BARO sensor voltage < 0.20 V		1 s - Continuous	2 DCY	The Baro sensor is located within the ECM and will require replacement of the ECM if the scan tool reading is off by more than 10% of actual Barometric pressure. Refer to the Repair Manual for ECM replacement.
P2229 Barometric Pressure Sensor "A" Circuit High	Barometric Pressure Circuit High	BARO sensor voltage > 4.80 V		1 s - Continuous	2 DCY	The Baro sensor is located within the ECM and will require replacement of the ECM if the scan tool reading is off by more than 10% of actual Barometric pressure. Refer to the Repair Manual for ECM replacement.
P2237 O2 Sensor Positive Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) front open circuit pump current (IP)	- O2S voltage signal front 1.46 - 1.54 V - AND - Difference between maximum and minimum value of O2S voltage signal front < 0.01 V - AND - Delta lambda controller > 0.10 [-] - OR - Lambda control at min or max limit	- O2S ceramic temp > 720° C - Heater control closed loop - Case fuel cut off: - Electrical adjustment not active - Evap purge valve ready - Case else: - Lambda modulation > 0.01 [-] - Lambda control closed loop - If stepwise change lambda setpoint - Commanded delta lambda step 0.05 [-]	6.5 s - Continuous	2 DCY	Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking" page 1653 .

		• O2S voltage signal front 1.46 - 1.54 V • AND • Difference between maximum and minimum value of O2S voltage signal front < 0.01 [V] • AND • No reaction on commanded stepwise change of lambda setpoint <> 1				
		• O2S voltage signal front < 1.55 V • For time > 3.0 s		• 5.0 s • Continuous		
P2240 O2 Sensor Positive Current Control Circuit/ Open Bank 2 Sensor 1	Oxygen Sensors (O2S) front open circuit pump current (IP)	• O2S voltage signal front 1.46 - 1.54 V • AND • Difference between maximum and minimum value of O2S voltage signal front < 0.01 [V] • AND • Delta lambda controller > 0.10 [-] • OR • Lambda control at min or max limit	• O2S ceramic temp > 720° C • Heater control closed loop • Case fuel cut off: • Electrical adjustment not active • Evap purge valve ready • Case else: • Lambda modulation > 0.01 [-] • Lambda control closed loop • If stepwise change lambda setpoint • Commanded delta lambda step 0.05 [-]	• 6.5 s • Continuous	• 2 DCY	– Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

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		• O2S voltage signal front 1.46 - 1.54 V • AND • Difference between maximum and minimum value of O2S voltage signal front < 0.01 [V] • AND • No reaction on commanded stepwise change of lambda set-point <> 1				
		• O2S voltage signal front < 1.55 V • For time > 3.0 s		• 5.0 s • Continuous		
P2243 O2 Sensor Reference Voltage Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) front open circuit nernst voltage (UN)	• O2S voltage signal front > 4.70 or < 0.20 V • Internal resistance > 950 Ω	• Heater control active	• 20 s • Continuous	• 2 DCY	– Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
P2247 O2 Sensor Reference Voltage Circuit/ Open Bank 2 Sensor 1	Oxygen Sensors (O2S) front open circuit nernst voltage (UN)	• O2S voltage signal front > 4.70 or < 0.20 V • Internal resistance > 950 Ω	• Heater control active	• 20 s • Continuous	• 2 DCY	– Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

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P2257 AIR System Control "A" Circuit Low	Secondary Air Injection (AIR) Pump Relay short to ground	Signal voltage 0.0 – 3.26 V	AIR pump relay commanded off	0.5 s - Continuous	2 DCY	Check Secondary Air Injection (AIR) Pump Relay - J299- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 .
P2258 AIR System Control "A" Circuit High	Secondary Air Injection (AIR) Pump Relay short to battery plus	Signal current 0.60 – 2.40 A	- AIR pump relay commanded on - Engine speed >= 80 rpm	0.5 s - Continuous	2 DCY	Check Secondary Air Injection (AIR) Pump Relay - J299- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 .
P2259 AIR System Control "B" Circuit Low	Secondary Air Injection (AIR) Pump Relay short to ground	Signal voltage 0.0 – 3.26 V	AIR pump relay commanded off	0.5 s - Continuous	2 DCY	Check Secondary Air Injection Pump Relay 2 - J545- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .
P2260 AIR System Control "B" Circuit High	Secondary Air Injection (AIR) Pump Relay short to battery plus	Signal current 0.60 – 2.40 A	- AIR pump relay commanded on - Engine speed >= 80 rpm	0.5 s - Continuous	2 DCY	Check Secondary Air Injection Pump Relay 2 - J545- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .

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P2270 O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) rear stuck lean	• Sensor voltage < 0.72 [V]	• O2S rear ready • Integrated exhaust gas mass after O2S rear ready ≥ 0.30 [kg] • Injection valve commanded on • Engine running • IF • Integrated exhaust gas mass ≥ 1.50 kg • OR • Error suspicion set • THEN • Enabling lambda ramp slope of the lambda ramp 0.05 [1/s] • Target lambda of the lambda ramp 0.85 [-] • Exhaust gas mass during ≥ 0.07 kg • Target lambda reached ≤ 0.85 [-] • IF • Time fuel cut off > 5.0 s • Then disabling for • Time delay after fuel cut off 5.0 s • ADDITIONAL CONDITIONS: • Scavenging-rate n.a. • Integrated exhaust gas mass n.a. • Split factor DFI/MFI n.a. • Modeled exhaust gas temperature fitted position O2S rear $350 - 800^{\circ}\text{C}$ • Engine speed $1000 - 3520$ rpm • Vehicle speed n.a. • Lambda controller output n.a. [-] • Within time n.a. [s]	• 30 s • Once / DCY	• 2 DCY	– Check Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking" , page 1650 .

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			• Lambda controller adaptation n.a. • Mass air flow 50.00 - 260.00 kg/h • Within time 1.0 s			



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P2271 O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) rear stuck rich	Sensor voltage > 0.20 V	- General: - O2S rear ready - Integrated exhaust gas mass after O2S rear ready >= 0.30 kg - Injection valve commanded on - Engine running - CASE 1: (during lambda ramp activation) n.a. - IF - Integrated exhaust gas mass n.a. - OR - Error suspicion n.a. - THEN - Enabling lambda ramp n.a. - Slope of the lambda ramp n.a. - Target lambda of the lambda ramp n.a. - Exhaust gas mass during n.a. - Target lambda reached n.a. - IF - Time fuel cut off n.a. - Then disabling for - Time delay after fuel cut off n.a. - ADDITIONAL CONDITIONS: - Scavenging-rate n.a. - Integrated exhaust gas mass n.a. - Split factor DFI/MFI n.a. - modeled exhaust gas temperature fitted position O2S rear n.a. - Engine speed n.a. - Vehicle speed n.a.	30 s - Once / DCY	2 DCY	Check Bank 1 Sensor 2 Heated Oxygen Sensor - G130- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking" , page 1650 .

			• Lambda controller output n.a. [-] • Within time n.a. [s] • Lambda controller adaptation n.a. • Mass air flow n.a. • Within time n.a. • CASE 2: • (during fuel cut off) • Modeled exhaust gas temperature fitted position O2S rear 350 - 800° C • O2S front lambda value (for wide range sensor) > 8.00 [-] • O2S front voltage (for binary sensor) < n.a. [V] • Fuel cut off active • Integrated O2 mass during fuel cut off >= 6.0 g • Time delay n.a. [s]			



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P2272 O2 Sensor Signal Biased/Stuck Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) rear stuck lean	• Sensor voltage < 0.72 [V]	• O2S rear ready • Integrated exhaust gas mass after O2S rear ready ≥ 0.30 kg • Injection valve commanded on • Engine running • IF • Integrated exhaust gas mass ≥ 1.50 kg • OR • Error suspicion set • THEN • Enabling lambda ramp slope of the lambda ramp 0.05 [1/s] • Target lambda of the lambda ramp 0.85 [-] • Exhaust gas mass during ≥ 0.07 kg • Target lambda reached ≤ 0.85 [-] • IF • Time fuel cut off > 5.0 s • Then disabling for • Time delay after fuel cut off 5.0 s • ADDITIONAL CONDITIONS: • Scavenging-rate n.a. • Integrated exhaust gas mass n.a. • Split factor DFI/MFI n.a. • Modeled exhaust gas temperature fitted position O2S rear 350 - 800° C • Engine speed 1000 - 3520 rpm • Vehicle speed n.a. • Lambda controller output n.a. [-] • Within time n.a. [s]	• 30 s • Once / DCY	• 2 DCY	– Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8 , Checking" , page 1656

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			• Lambda controller adaptation n.a. • Mass air flow 50.00 - 260.00 kg/h • Within time 1.0 s			



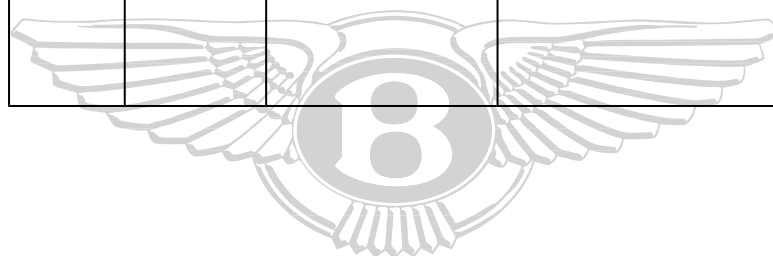
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P2273 O2 Sensor Signal Biased/Stuck Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) rear stuck rich	Sensor voltage > 0.20 V	- General: - O2S rear ready - Integrated exhaust gas mass after O2S rear ready >= 0.30 kg - Injection valve commanded on - Engine running - CASE 1: (during lambda ramp activation) n.a. - IF - Integrated exhaust gas mass n.a. - OR - Error suspicion n.a. - THEN - Enabling lambda ramp n.a. - Slope of the lambda ramp n.a. - Target lambda of the lambda ramp n.a. - Exhaust gas mass during n.a. - Target lambda reached n.a. - IF - Time fuel cut off n.a. - Then disabling for - Time delay after fuel cut off n.a. - ADDITIONAL CONDITIONS: - Scavenging-rate n.a. - Integrated exhaust gas mass n.a. - Split factor DFI/MFI n.a. - Modeled exhaust gas temperature fitted position O2S rear n.a. - Engine speed n.a. - Vehicle speed n.a.	30 s - Once / DCY	2 DCY	Check Bank 2 Sensor 2 Heated Oxygen Sensor - G131- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8 , Checking", page 1656

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			• Lambda controller output n.a. [-] • Within time n.a. [s] • Lambda controller adaptation n.a. • Mass air flow n.a. • Within time n.a. • CASE 2: • (during fuel cut off) • Modeled exhaust gas temperature fitted position O2S rear 350 - 800° C • O2S front lambda value (for wide range sensor) > 8.00 [-] • O2S front voltage (for binary sensor) < n.a. [V] • Fuel cut off active • Integrated O2 mass during fuel cut off >= 6.0 g • Time delay n.a. [s]			
P2279 Intake Air System Leak	Intake Manifold adaptation value monitoring	• Offset value throttle mass flow > 13.00 kg/h • AND • Correction factor > 0.97 [-]	• Desired mass air flow 5.00 – 50.00 kg/h • ECT -48 – 143° C • Barometric pressure n.a. • Evap purge valve closed • EGR n.a.	• 3 s • Multiple	• 2 DCY	– This code will set if the calculated air intake is more than the MAF actual value. Check for air leaks after the MAF sensor. Check the MAF. Refer to "3.6.27 Mass Airflow Sensor G70, Checking", page 1644. – Refer to "3.6.28 Mass Airflow Sensor 2 G246, Checking", page 1646.



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P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition coil - short to GND	Signal current driver stage internal value	Engine speed > 680 RPM	2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2301 Ignition Coil "A" Primary Control Circuit High	Ignition coil - short to battery plus	Signal voltage > 5.10...7.10 [V]	Engine speed > 680 RPM	2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N70- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition coil - short to GND	Signal current driver stage internal value	Engine speed > 680 RPM	2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N127- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition coil - short to battery plus	Signal voltage > 5.10 - 7.10 V	Engine speed > 680 RPM	2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N127- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition coil - short to GND	Signal current driver stage internal value	Engine speed > 680 RPM	2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N291- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

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P2307 Ignition Coil "C" Primary Control Circuit High	Ignition coil - short to battery plus	Signal voltage > 5.10 - 7.10 V	Engine speed > 680 RPM	2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Out- put Stage - N291- . Refer to ⇒ "3.6.21 Ig- nition Coils With Power Output Stage , Checking", page 1633 .
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition coil - short to GND	Signal current driver stage in- ternal value	Engine speed > 680 RPM	2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Out- put Stage - N292- . Refer to ⇒ "3.6.21 Ig- nition Coils With Power Output Stage , Checking", page 1633 .



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P230A Cylinder 1 Air- Fuel Ra- tio Im- balance - Adjust- ment At Limit During Balance	Fuel Sys- tem misfire monitor- ing: ration- ality check	• Cylinder mis- fire counter > 2.00 [-]	• Camshaft adjust- ment ready • Engine roughness signal valid • Engine speed 1360 - 2200 rpm • Engine load 25.5 - 75.0 % • Barometric pres- sure > 73.00 kPa • AAT > -15° C • ECT 50...120° C • Modeled catalyst temperature 330 - 870° C • Fuel adaptation completed • Electrical check of O2S completed • Fuel trim diagnosis n.a. • Lambda control closed loop • Homogeneous sto- chiometric lambda operation active catalyst heating not active • Evap purge loading < 0.50 [-] • Selected gear >= 6.00 [-] • Rough road not de- tected mass air flow integral >= 8.25 - 13.00 kg • Additional condi- tions: • Cylinder balancing diagnosis of all cyl- inders active	• 20 (does not run in FTP) [s] • Once / DCY	• 2 DCY	- Check Oxy- gen Sensor 1 Before Cata- lytic Convert- er - GX10- . Refer to ⇒ "3.6.31 Oxygen Sen- sor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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P230B Cylinder 2 Air- Fuel Ra- tio Im- balance - Adjust- ment At Limit During Balance	Fuel Sys- tem misfire monitor- ing: ration- ality check	• Cylinder mis- fire counter > 2.00 [-]	• Camshaft adjust- ment ready • Engine roughness signal valid • Engine speed 1360 - 2200 rpm • Engine load 25.5 - 75.0 % • Barometric pres- sure > 73.00 kPa • AAT > -15° C • ECT 50 - 120° C • Modeled catalyst temperature 330 - 870° C • Fuel adaptation completed • Electrical check of O2S completed • Fuel trim diagnosis na • Lambda control closed loop • Homogeneous sto- chiometric lambda operation active catalyst heating not active • Evap purge loading < 0.50 [-] • Selected gear >= 6.00 [-] • Rough road not de- tected mass air flow integral >= 8.25 - 13.00 kg • Additional condi- tions: • Cylinder balancing diagnosis of all cyl- inders active	• 20 (does not run in FTP) [s] • Once / DCY	• 2 DCY	- Check Oxy- gen Sensor 1 Before Cata- lytic Convert- er - GX10- . Refer to ⇒ "3.6.31 Oxygen Sen- sor 1 Before Catalytic Converter GX10, Checking", page 1653 .

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P230C Cylinder 3 Air- Fuel Ra- tio Im- balance - Adjust- ment At Limit During Balance	Fuel Sys- tem misfire monitor- ing: ration- ality check	Cylinder mis- fire counter > 2.00 [-]	- Camshaft adjust- ment ready - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 75.0 % - Barometric pres- sure > 73.00 kPa - AAT > -15° C - ECT 50...120° C - Modeled catalyst temperature 330 - 870° C - Fuel adaptation completed - Electrical check of O2S completed - Fuel trim diagnosis n.a. - Lambda control closed loop - Homogeneous sto- chiometric lambda operation active catalyst heating not active - Evap purge loading < 0.50 [-] - Selected gear >= 6.00 [-] - Rough road not de- tected mass air flow integral >= 8.25 - 13.00 kg - Additional condi- tions: - Cylinder balancing diagnosis of all cyl- inders active	20 (does not run in FTP) [s] - Once / DCY	2 DCY	Check Oxy- gen Sensor 1 Before Cata- lytic Convert- er - GX10- . Refer to ⇒ "3.6.31 Oxygen Sen- sor 1 Before Catalytic Converter GX10 Checking", page 1653 .

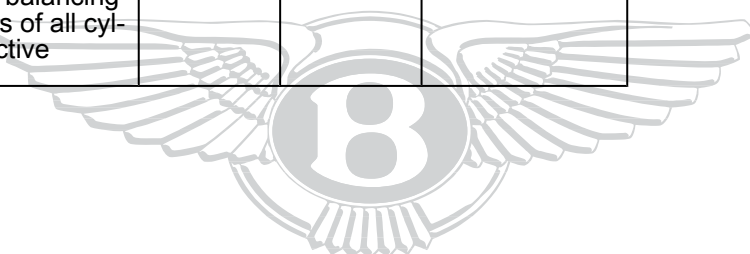


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P230D Cylinder 4 Air- Fuel Ra- tio Im- balance - Adjust- ment At Limit During Balance	Fuel Sys- tem misfire monitor- ing: ration- ality check	• Cylinder mis- fire counter > 2.00 [-]	• Camshaft adjust- ment ready • Engine roughness signal valid • Engine speed 1360 - 2200 rpm • Engine load 25.5 - 75.0 % • Barometric pres- sure > 73.00 kPa • AAT > -15° C • ECT 50...120° C • Modeled catalyst temperature 330 - 870° C • Fuel adaptation completed • Electrical check of O2S completed • Fuel trim diagnosis n.a. • Lambda control closed loop • Homogeneous sto- chiometric lambda operation active catalyst heating not active • Evap purge loading < 0.50 [-] • Selected gear >= 6.00 [-] • Rough road not de- tected mass air flow integral >= 8.25 - 13.00 kg • Additional condi- tions: • Cylinder balancing diagnosis of all cyl- inders active	• 20 (does not run in FTP) [s] • Once / DCY	• 2 DCY	- Check Oxy- gen Sensor 1 Before Cata- lytic Convert- er - GX10- . Refer to ⇒ "3.6.31 Oxygen Sen- sor 1 Before Catalytic Converter GX10, Checking", page 1653 .

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P230E Cylinder 5 Air- Fuel Ra- tio Im- balance - Adjust- ment At Limit During Balance	Fuel Sys- tem misfire monitor- ing: ration- ality check	Cylinder mis- fire counter > 2.00 [-]	- Camshaft adjust- ment ready - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 75.0 % - Barometric pres- sure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Fuel adaptation completed - Electrical check of O2S completed - Fuel trim diagnosis n.a. - Lambda control closed loop - Homogeneous sto- chiometric lambda operation active catalyst heating not active - Evap purge loading < 0.50 [-] - Selected gear >= 6.00 [-] - Rough road not de- tected mass air flow integral >= 8.25 - 13.00 kg - Additional condi- tions: - Cylinder balancing diagnosis of all cyl- inders active	20 (does not run in FTP) [s] - Once / DCY	2 DCY	Check Oxy- gen Sensor 2 Before Cata- lytic Convert- er - GX11- . Refer to ⇒ "3.6.33 Oxygen Sen- sor 2 Before Catalytic Converter GX11 Checking", page 1659 .



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P230F Cylinder 6 Air- Fuel Ra- tio Im- balance - Adjust- ment At Limit During Balance	Fuel Sys- tem misfire monitor- ing: ration- ality check	• Cylinder mis- fire counter > 2.00 [-]	• Camshaft adjust- ment ready • Engine roughness signal valid • Engine speed 1360 -2200 rpm • Engine load 25.5 - 75.0 % • Barometric pres- sure > 73.00 kPa • AAT > -15° C • ECT 50 - 120° C • Modeled catalyst temperature 330 - 870° C • Fuel adaptation completed • Electrical check of O2S completed • Fuel trim diagnosis n.a. • Lambda control closed loop • Homogeneous sto- chiometric lambda operation active catalyst heating not active • Evap purge loading < 0.50 [-] • Selected gear >= 6.00 [-] • Rough road not de- tected mass air flow integral >= 8.25 - 13.00 kg • Additional condi- tions: • Cylinder balancing diagnosis of all cyl- inders active	• 20 (does not run in FTP) [s] • Once / DCY	• 2 DCY	- Check Oxy- gen Sensor 2 Before Cata- lytic Convert- er - GX11- . Refer to ⇒ "3.6.33 Oxygen Sen- sor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition coil - short to battery plus	• Signal voltage > 5.10-7.10V	• Engine speed > 680 RPM	• 2 s • Contin- uous	• 2 DCY	- Check Igni- tion Coil with Power Out- put Stage - N292- . Refer to ⇒ "3.6.21 Ig- nition Coils With Power Output Stage, Checking", page 1633 .

P2312 Ignition Coil "E" Primary Control Circuit Low	Ignition coil - short to GND	Signal current driver stage internal value	Engine speed > 680 RPM	2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N323-. Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2313 Ignition Coil "E" Primary Control Circuit High	Ignition coil - short to battery plus	Signal voltage > 5.10 - 7.10 V	Engine speed > 680 RPM	2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N323-. Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2315 Ignition Coil "F" Primary Control Circuit Low	Ignition coil - short to GND	Signal current driver stage internal value	Engine speed > 680 RPM	2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N324-. Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2316 Ignition Coil "F" Primary Control Circuit High	Ignition coil - short to battery plus	Signal voltage > 5.10 - 7.10 V	Engine speed > 680 RPM	2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N324-. Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P2318 Ignition Coil "G" Primary Control Circuit Low	Ignition coil - short to GND	Signal current driver stage internal value	Engine speed > 680 RPM	2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N325-. Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.

P2319 Ignition Coil "G" Primary Control Circuit High	Ignition coil - short to battery plus	Signal voltage > 5.10 - 7.10 V	Engine speed > 680 RPM	2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N325- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P231A Cylinder 7 Air- Fuel Ra- tio Im- balance Adjust- ment At Limit During Balance	Fuel Sys- tem misfire monitor- ing: ration- ality check	Cylinder mis- fire counter > 2.00 [-]	- Camshaft adjust- ment ready - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 75.0 % - Barometric pres- sure > 73.00 kPa - AAT > -15° C - ECT 50 - 120° C - Modeled catalyst temperature 330 - 870° C - Fuel adaptation completed - Electrical check of O2S completed - Fuel trim diagnosis n.a. - Lambda control closed loop - Homogeneous sto- chiometric lambda operation active catalyst heating not active - Evap purge loading < 0.50 [-] - Selected gear >= 6.00 [-] - Rough road not de- tected mass air flow integral >= 8.25 - 13.00 kg - Additional condi- tions: - Cylinder balancing diagnosis of all cyl- inders active	20 (does not run in FTP) [s] - Once / DCY	2 DCY	Check Oxy- gen Sensor 2 Before Cata- lytic Convert- er - GX11- . Refer to ⇒ "3.6.33 Oxygen Sen- sor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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P231B Cylinder 8 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System misfire monitoring: rationality check	Cylinder misfire counter > 2.00 [-]	- Camshaft adjustment ready - Engine roughness signal valid - Engine speed 1360 - 2200 rpm - Engine load 25.5 - 75.0 % - Barometric pressure > 73.00 kPa - AAT > -15° C - ECT 50...120° C - Modeled catalyst temperature 330 - 870° C - Fuel adaptation completed - Electrical check of O2S completed - Fuel trim diagnosis n.a. - Lambda control closed loop - Homogeneous stoichiometric lambda operation active - catalyst heating not active - Evap purge loading < 0.50 [-] - Selected gear >= 6.00 [-] - Rough road not detected mass air flow integral >= 8.25 - 13.00 kg - Additional conditions: - Cylinder balancing diagnosis of all cylinders active	20 (does not run in FTP) [s] - Once / DCY	2 DCY	Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P2321 Ignition Coil "H" Primary Control Circuit Low	Ignition coil - short to GND	Signal current driver stage internal value	Engine speed > 680 RPM	2 s - Continuous	2 DCY	Check Ignition Coil with Power Output Stage - N326- . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

P2322 Ignition Coil "H" Primary Control Circuit High	Ignition coil - short to battery plus	Signal voltage > 5.10 - 7.10 V	Engine speed > 680 RPM	2 s - Contin- uous	2 DCY	Check Igni- tion Coil with Power Out- put Stage - N326- . Refer to ⇒ "3.6.21 Ig- nition Coils With Power Output Stage , Checking", page 1633 .
P2400 EVAP System Leak Dete- ction Pump Control Circuit/ Open	Evapora- tive Emis- sion (EVAP) Leak De- tection Pump (LDP) Open Cir- cuit	Signal voltage 4.70 - 5.40 V	- LDP commanded off - Engine speed >= 80 [rpm]	0.50 s - Contin- uous	2 DCY	Check Leak Detection Pump (LDP) - V144- . Re- fer to ⇒ "3.6.24 Leak Detec- tion Pump V144 , Checking", page 1638 .
P2401 EVAP System Leak Dete- ction Pump Control Circuit Low	Evapora- tive Emis- sion (EVAP) Leak De- tection Pump (LDP) short to ground	Signal voltage < 2.74 - 3.26 V	- LDP commanded off - Engine speed >= 80 [rpm]	0.50 s - Contin- uous	2 DCY	Check Leak Detection Pump (LDP) - V144- . Re- fer to ⇒ "3.6.24 Leak Detec- tion Pump V144 , Checking", page 1638 .
P2402 EVAP System Leak Dete- ction Pump Control Circuit High	Evapora- tive Emis- sion (EVAP) Leak De- tection Pump (LDP) Short to battery plus	Signal current driver stage in- ternal value	- LDP commanded on - engine speed >= 80 rpm	0.50 s - Contin- uous	2 DCY	Check Leak Detection Pump (LDP) - V144- . Re- fer to ⇒ "3.6.24 Leak Detec- tion Pump V144 , Checking", page 1638 .

P2403 EVAP System Leak Detection Pump Sense Circuit/ Open	Leak De- tection Pump (LDP) Reed Sen- sor rati- onality check unable to close	Low signal volt- age > 0.5 Sec- onds	- Time after engine start 5.0 - 1,200.0 s - Preceding engine shut-off time > n.a. [s] - OR - Last ECM keep alive mode n.a. - BARO > 73.40 kPa - Integrated EVAP purge mass > 39.8 g - Vehicle speed 0 - 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temper- ature diff. > 45.0 [K] - Evap purge valve ready - LDP commanded off - ECT 4 - 110° C - ECT @ start 4 - 110° C - Case:1 - AAT n.a. °C - Case:2 - IAT 3 - 90° C	0.5 s - Once / DCY	2 DCY	Check Leak Detection Pump (LDP) - V144- . Re- fer to ⇒ "3.6.24 Leak Detec- tion Pump V144, Checking", page 1638 .
P2404 EVAP System Leak Detection Pump Sense Circuit Range/ Per- for- mance	Leak De- tection Pump (LDP) Reed Sen- sor rati- onality check unable to open	- High signal voltage > 12 s - AND - Number of checks 30	- Time after engine start 5.0 - 1,200.0 s - Preceding engine shut-off time > n.a. [s] - Last ECM keep alive mode n.a. - BARO > 73.40 kPa - Vehicle speed 0 - 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temper- ature diff. > 45.0 [K] - Intake manifold vacuum > -100.00 kPa	12.0 s - Once / DCY	2 DCY	Check Leak Detection Pump (LDP) - V144- . Re- fer to ⇒ "3.6.24 Leak Detec- tion Pump V144, Checking", page 1638 .

		Cumulative time of high signal voltage during pumping > not calibrated [s]	- Evap purge valve closed, ready - LDP commanded on - ECT 4 - 110° C - ECT @ start 4 - 110° C - Case:1 - AAT n.a. [°C] - Case:2 - IAT 3 - 70° C	- Not calibrated - Once / DCY		
P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Oxygen Sensors (O2S) front signal range check (check for sensor at ambient air)	- Threshold 1: signal voltage 2.71...5.00 V - Threshold 2: signal voltage 2.05...3.06 V - Depending on gain factor, that actual is used for sensor characteristic, the threshold is switched	- Lambda set value < 1.6 [-] - O2S ceramic temp. > 665° C - Fuel cut off not active - Heater control closed loop - If low fuel signal then wait > 600.0 s - Only AIR system - AIR not active	10 s - Multiple	2 DCY	Check Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
P2415 O2 Sensor Exhaust Sample Error Bank 2 Sensor 1	Oxygen Sensors (O2S) front signal range check (check for sensor at ambient air)	- Threshold 1: signal voltage 2.71...5.00 V - Threshold 2: signal voltage 2.05...3.06 V - Depending on gain factor, that actual is used for sensor characteristic, the threshold is switched	- Lambda set value < 1.6 [-] - O2S ceramic temp. > 665° C - Fuel cut off not active - Heater control closed loop - If low fuel signal then wait > 600.0 s - Only AIR system - AIR not active	10 s - Multiple	2 DCY	Check Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

P2431 AIR System Air Flow/ Pressure Sensor Circuit Range/ Performance Bank 1	Secondary Air Injection (AIR) Pressure Sensor rationality check	Difference between AIR pressure and barometric pressure < -6.00; > 6.00 kPa	- AIR system commanded off - Barometric pressure valid	0.01 s - Once / DCY	2 DCY	Check Secondary Air Injection Sensor 1 - G609- . Refer to "3.6.36 Secondary Air Injection Sensor 1 G609- , Checking", page 1666 .
P2432 AIR System Air Flow/ Pressure Sensor Circuit Low Bank 1	Secondary Air Injection (AIR) Pressure Sensor signal range check	Signal voltage < 0.40 V		0.5 s - Continuous	2 DCY	Check Secondary Air Injection Sensor 1 - G609- . Refer to "3.6.36 Secondary Air Injection Sensor 1 G609- , Checking", page 1666 .
P2433 AIR System Air Flow/ Pressure Sensor Circuit High Bank 1	Secondary Air Injection (AIR) Pressure Sensor signal range check	Signal voltage > 4.60 V		0.5 s - Continuous	2 DCY	Check Secondary Air Injection Sensor 1 - G609- . Refer to "3.6.36 Secondary Air Injection Sensor 1 G609- , Checking", page 1666 .
P2436 AIR System Air Flow/ Pressure Sensor Circuit Range/ Performance Bank 2	Secondary Air Injection (AIR) Pressure Sensor rationality check	Difference between AIR pressure and barometric pressure < -6.00; > 6.00 kPa	- AIR system commanded off - Barometric pressure valid	0.01 s - Once / DCY	2 DCY	Check Secondary Air Injection Sensor 2 - G610- . Refer to "3.6.37 Secondary Air Injection Sensor 2 G610- , Checking", page 1668 .
P2437 AIR System Air Flow/ Pressure Sensor Circuit Low Bank 2	Secondary Air Injection (AIR) Pressure Sensor signal range check	Signal voltage < 0.40 V		0.5 s - Continuous	2 DCY	Check Secondary Air Injection Sensor 2 - G610- . Refer to "3.6.37 Secondary Air Injection Sensor 2 G610- , Checking", page 1668 .

P2438 AIR Sys- tem Air Flow/ Pres- sure Sensor Circuit High Bank 2	Secondary Air Injec- tion (AIR) Pressure Sensor signal range check	Signal voltage > 4.60 V		0.5 s - Contin- uous	2 DCY	Check Sec- ondary Air In- jection Sen- sor 2 - G610- . Re- fer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .
P2440 AIR Sys- tem Switch- ing Valve Stuck Open Bank 1	Secondary Air Injec- tion (AIR) stuck open	- Case 1: - Relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while AIR valve closed) > 1.50 - Case 2: aver- age pressure difference be- tween absolute value and fil- tered value while AIR valve closed > 0.30 kPa	- ECT -10 - 130° C - IAT -10 - 100° C - Modeled catalyst temperature < 700° C - Mass air flow 7.00 - 275.00 kg/h - Difference engine load -10.0 - 10.0 [%/ rev] - Barometric pres- sure > 74 kPa - AIR system com- manded on - Additional condi- tions: - Blockage: relative AIR pressure meas- ured with AIR pres- sure sensor vs. modeled >= 0.70 [-] - Leakage: relative AIR pressure meas- ured with AIR pres- sure sensor vs. modeled >= 0.59 [-]	0 s - Once / DCY	2 DCY	- Check Com- bination valve for sec- ondary air in- jection (AIR). Refer to Re- pair Manual. - Check Sec- ondary Air In- jection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Sec- ondary Air In- jection Pump Motor V101- Checking", page 1661 .



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P2442 AIR System Switching Valve Stuck Open Bank 2	Secondary Air Injection (AIR) stuck open	- Case 1: - Relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while AIR valve closed) > 1.50 - Case 2: average pressure difference between absolute value and filtered value while AIR valve closed > 0.30 kPa	- ECT -10 - 130° C - IAT -10 - 100° C - Modeled catalyst temperature < 700° C - Mass air flow 7.00 - 275.00 kg/h - Difference engine load -10.0 - 10.0 [%/rev] - Barometric pressure > 74 kPa - AIR system commanded on - Additional conditions: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.59 [-]	0 s - Once / DCY	2 DCY	- Check Combination valve for secondary air injection (AIR). Refer to Repair Manual. - Check Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .
P25F6 AIR System "B"	Secondary Air Injection (AIR) rationality check directly after catalyst heating	Diff. of measured AIR pressure before AIR injection vs. AIR pressure after AIR injection > 2.00 kPa	- ECT -10 - 130° C - IAT -10...100° C - Modeled catalyst temperature < 700° C - Mass air flow 7.00 - 275.00 kg/h - Difference engine load -10.0 - 10.0 [%/rev] - Barometric pressure > 74 kPa - AIR system commanded off	0.5 [s] - Once / DCY	2 DCY	Check Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .
P2632 Fuel Pump "B" Control Circuit / Open	Fuel Pump (FP) Relay Open circuit	Signal voltage driver stage internal value	Fuel pump relay commanded off	0.50 s - Continuous	2 DCY	Check Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277, Checking", page 1630

P2633 Fuel Pump "B" Control Circuit Low	Fuel Pump (FP) Relay short to ground	Signal voltage driver stage internal value	Fuel pump relay commanded off	0.50 s - Continuous	2 DCY	Check Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277, Checking", page 1630
P2634 Fuel Pump "B" Control Circuit High	Fuel Pump (FP) Relay short to battery plus	Signal voltage driver stage internal value	- Fuel pump relay commanded on - Engine speed > 80 RPM	0.50 s - Continuous	2 DCY	Check Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277, Checking", page 1630
P3081 Engine Temperature Too Low	Engine Coolant Temperature (ECT) Sensor rationality check	Diff. between reference model temperature and measured ECT > 15.0 K		4.0 s - Continuous	2 DCY	Check Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613



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P30A3 Cylinder Deactivation Valve 1 Stuck Open	CD control valve cyl- inder 3 / 2 / 5 / 8 Ra- tionality check - CD commanded on	Minimum air charge factor from non CD cylinders minus air charge factor from monitored CD cylinder < 0.15	- Case 1: - Engine speed > 500; < 2850 rpm - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - Mass air flow at throttle calculated from MAF sensor signal valid - Mass air flow 1 > 27.78 [g/s] - Mass air flow 2 > 27.78 [g/s] - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 [kPa/s] - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 [s] - OR - Case 2: - Engine speed > 800 [rpm] - Mass air flow at throttle > 26,39 [g/s] - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 - 0.225 [-] - For time > 1.55 [s] - Throttle position < 25.293 [%] - Pressure upstream intercooler < 0.699; > -0.699 [kPa] - Ratio of boost pressure and BARO < 1.35 - 3.90 [-] - OR - Ratio of boost pressure and BARO > 1.00 - 1.05 [-]	0.5 s - Continuous	2 DCY	Check Cylinder 3 Shut-Off Intake Deactivation Valve - N519-. Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607.

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			• Ratio of pressure upstream intercooler and pressure upstream booster < 1 [-] • Time since engine start > 1 [s]			

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P30A4 Cylinder Deactivation Valve 1 Stuck Closed	CD control valve cyl- inder 3 / 2 / 5 / 8 Ra- tionality check - CD comman- ded off ra- tionality check	• Air charge fac- tor in this cylin- der > 0.15 and < 0.50 • Air charge fac- tor in other CD cylinders < 0.35	• Case 1: • Engine speed > 500; < 2850 [rpm] • Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] • Mass air flow at throttle calculated from MAF sensor signal valid • Mass air flow 1 > 27.78 [g/s] • Mass air flow 2 > 27.78 [g/s] • Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] • Time dependent conditions • MAF sensor pulsa- tion not detected • Gradient of desired MAP > -200 [kPa/s] • Ratio of pressure upstream throttle and BARO < 0.9 [-] • For time > 0; < 1.5 [s] • OR • Case 2: • Engine speed > 800 [rpm] • Mass air flow at throttle > 26,39 [g/s] • Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 - 0.225 [-] • For time > 1.55 [s] • Throttle position < 25.293 [%] • Pressure upstream intercooler < 0.699; > -0.699 [kPa] • Ratio of boost pres- sure and BARO < 1.35 - 3.90 [-] • OR • Ratio of boost pres- sure and BARO > 1.00 - 1.05 [-]	• 0.5 s • Contin- uous	• 2 DCY	– Check Cylin- der 3 Shut- Off Intake Deactivation Valve - N519- . Refer to ⇒ “3.6.8 Dis- placement On Demand Rotary Sole- noid NX8, Checking”, page 1607 .

			- Ratio of pressure upstream intercooler and pressure upstream booster < 1 [-] - Time since engine start > 1 [s]			



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P30A5 Cylinder Deactivation Valve 2 Stuck Open	CD control valve cyl- inder 3 / 2 / 5 / 8 Ra- tionality check - CD comman- ded on	Minimum air charge factor from non CD cylinders minus air charge factor from monitored CD cylinder < 0.150	- Case 1: - Engine speed > 500; < 2850 [rpm] - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - Mass air flow at throttle calculated from MAF sensor signal valid - Mass air flow 1 > 27.78 [g/s] - Mass air flow 2 > 27.78 [g/s] - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 [kPa/s] - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 [s] - OR - Case 2: - Engine speed > 800 rpm - Mass air flow at throttle > 26,39 [g/s] - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 - 0.225 [-] - For time > 1.55 [s] - Throttle position < 25.293 % - Pressure upstream intercooler < 0.699; > -0.699 [kPa] - Ratio of boost pressure and BARO < 1.35 - 3.90 [-] - OR - Ratio of boost pressure and BARO > 1.00 - 1.05 [-]	0.5 s - Continuous	2 DCY	Check Cylinder 2 Shut-Off Intake Deactivation Valve - N518-. Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607.

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			• Ratio of pressure upstream intercooler and pressure upstream booster < 1 [-] • Time since engine start > 1 [s]			



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P30A6 Cylinder Deactivation Valve 2 Stuck Closed	CD control valve cyl- inder 3 / 2 / 5 / 8 Ra- tionality check - CD comman- ded off ra- tionality check	- Air charge fac- tor in this cylin- der > 0.15 and < 0.50 - Air charge fac- tor in other CD cylinders < 0.35	- Case 1: - Engine speed > 500; < 2850 [rpm] - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - Mass air flow at throttle calculated from MAF sensor signal valid - Mass air flow 1 > 27.78 [g/s] - Mass air flow 2 > 27.78 [g/s] - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsa- tion not detected - Gradient of desired MAP > -200 [kPa/s] - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 [s] - OR - Case 2: - Engine speed > 800 [rpm] - Mass air flow at throttle > 26.39 [g/s] - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185...0.225 [-] - For time > 1.55 [s] - Throttle position < 25.293 [%] - Pressure upstream intercooler < 0.699; > -0.699 [kPa] - Ratio of boost pres- sure and BARO < 1.35 - 3.90 [-] - OR - Ratio of boost pres- sure and BARO > 1.00 - 1.05 [-]	0.5 s - Contin- uous	2 DCY	Check Cylin- der 2 Shut- Off Intake Deactivation Valve - N518-. Refer to ⇒ "3.6.8 Dis- placement On Demand Rotary Sole- noid NX8, Checking", page 1607.

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			- Ratio of pressure upstream intercooler and pressure upstream booster < 1 [-] - Time since engine start > 1 [s]			



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P30A7 Cylinder Deactivation Valve 3 Stuck Open	CD control valve cylinder 3 / 2 / 5 / 8 Rationality check - CD commanded on	Minimum air charge factor from non CD cylinders minus air charge factor from monitored CD cylinder < 0.150	- Case 1: - Engine speed > 500; < 2850 [rpm] - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - Mass air flow at throttle calculated from MAF sensor signal valid - Mass air flow 1 > 27.78 [g/s] - Mass air flow 2 > 27.78 [g/s] - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 [kPa/s] - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 [s] - OR - Case 2: - Engine speed > 800 [rpm] - Mass air flow at throttle > 26,39 [g/s] - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 - 0.225 [-] - For time > 1.55 [s] - Throttle position < 25.293 [%] - Pressure upstream intercooler < 0.699; > -0.699 [kPa] - Ratio of boost pressure and BARO < 1.35 - 3.90 [-] - OR - Ratio of boost pressure and BARO > 1.00 - 1.05 [-]	0.5 s - Continuous	2 DCY	Check Cylinder 5 Shut-Off Intake Deactivation Valve - N520-. Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607.

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			• Ratio of pressure upstream intercooler and pressure upstream booster < 1 [-] • Time since engine start > 1 [s]			



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P30A8 Cylinder Deactivation Valve 3 Stuck Closed	CD control valve cyl- inder 3 / 2 / 5 / 8 Ra- tionality check - CD comman- ded off ra- tionality check	- Air charge fac- tor in this cylin- der > 0.15 and < 0.50 - Air charge fac- tor in other CD cylinders < 0.35	- Case 1: - Engine speed > 500; < 2850 [rpm] - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - Mass air flow at throttle calculated from MAF sensor signal valid - Mass air flow 1 > 27.78 [g/s] - Mass air flow 2 > 27.78 [g/s] - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsa- tion not detected - Gradient of desired MAP > -200 [kPa/s] - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 [s] - OR - Case 2: - Engine speed > 800 [rpm] - Mass air flow at throttle > 26,39 [g/s] - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 - 0.225 [-] - For time > 1.55 [s] - Throttle position < 25.293 [%] - Pressure upstream intercooler < 0.699; > -0.699 [kPa] - Ratio of boost pres- sure and BARO < 1.35 - 3.90 [-] - OR - Ratio of boost pres- sure and BARO > 1.00 - 1.05 [-]	0.5 s - Contin- uous	2 DCY	Check Cylin- der 5 Shut- Off Intake Deactivation Valve - N520- . Refer to 3.6.8 Dis- placement On Demand Rotary Sole- noid NX8, Checking", page 1607 .

			- Ratio of pressure upstream intercooler and pressure upstream booster < 1 [-] - Time since engine start > 1 [s]			

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P30A9 Cylinder Deactivation Valve 4 Stuck Open	CD control valve cylinder 3 / 2 / 5 / 8 Rationality check - CD commanded on	Minimum air charge factor from non CD cylinders minus air charge factor from monitored CD cylinder < 0.150	- Case 1: - Engine speed > 500; < 2850 [rpm] - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - Mass air flow at throttle calculated from MAF sensor signal valid - Mass air flow 1 > 27.78 [g/s] - Mass air flow 2 > 27.78 [g/s] - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 [kPa/s] - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 [s] - OR - Case 2: - Engine speed > 800 [rpm] - Mass air flow at throttle > 26,39 [g/s] - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185...0.225 [-] - For time > 1.55 [s] - Throttle position < 25.293 [%] - Pressure upstream intercooler < 0.699; > -0.699 [kPa] - Ratio of boost pressure and BARO < 1.35 - 3.90 [-] - OR - Ratio of boost pressure and BARO > 1.00 - 1.05 [-]	0.5 s - Continuous	2 DCY	Check Cylinder 8 Shut-Off Intake Deactivation Valve - N521-. Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607.

			• Ratio of pressure upstream intercooler and pressure upstream booster < 1 [-] • Time since engine start > 1 [s]			



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P30AA Cylinder Deactivation Valve 4 Stuck Closed	CD control valve cyl- inder 3 / 2 / 5 / 8 Ra- tionality check - CD comman- ded off ra- tionality check	• Air charge fac- tor in this cylin- der > 0.15 and < 0.50 • Air charge fac- tor in other CD cylinders < 0.35	• Case 1: • Engine speed > 500; < 2850 [rpm] • Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] • Mass air flow at throttle calculated from MAF sensor signal valid • Mass air flow 1 > 27.78 [g/s] • Mass air flow 2 > 27.78 [g/s] • Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] • Time dependent conditions • MAF sensor pulsa- tion not detected • Gradient of desired MAP > -200 [kPa/s] • Ratio of pressure upstream throttle and BARO < 0.9 [-] • For time > 0; < 1.5 [s] • OR • Case 2: • Engine speed > 800 [rpm] • Mass air flow at throttle > 26,39 [g/s] • Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 - 0.225 [-] • For time > 1.55 [s] • Throttle position < 25.293 [%] • Pressure upstream intercooler < 0.699; > -0.699 [kPa] • Ratio of boost pres- sure and BARO < 1.35 - 3.90 [-] • OR • Ratio of boost pres- sure and BARO > 1.00 - 1.05 [-]	• 0.5 s • Contin- uous	• 2 DCY	– Check Cylin- der 8 Shut- Off Intake Deactivation Valve - N521- . Refer to ⇒ “3.6.8 Dis- placement On Demand Rotary Sole- noid NX8, Checking”, page 1607 .

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			- Ratio of pressure upstream intercooler and pressure upstream booster < 1 [-] - Time since engine start > 1 [s]			
P3401 Cylinder Deactivation Intake Valve 1 Control Circuit/ Open	Cylinder Deactivation (CD) valve actuator (cyl. 3 / 2 / 5 / 8) open circuit	Signal voltage driver stage internal value		0.5 s - Continuous	2 DCY	Check Cylinder 3 Shut-Off Intake Deactivation Valve - N519-. Refer to "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607.
P3403 Cylinder Deactivation Intake Valve 1 Control Circuit Low	Cylinder Deactivation (CD) valve actuator (cyl. 3 / 2 / 5 / 8) short to ground	Signal voltage driver stage internal value		0.5 s - Continuous	2 DCY	Check Cylinder 3 Shut-Off Intake Deactivation Valve - N519-. Refer to "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607.
P3404 Cylinder Deactivation Intake Valve 1 Control Circuit High	Cylinder Deactivation (CD) valve actuator (cyl. 3 / 2 / 5 / 8) short to battery plus	Signal voltage driver stage internal value	Engine speed >= 80 rpm	0.5 s - Continuous	2 DCY	Check Cylinder 3 Shut-Off Intake Deactivation Valve - N519-. Refer to "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607.
P3409 Cylinder Deactivation Intake Valve 2 Control Circuit/ Open	Cylinder Deactivation (CD) valve actuator (cyl. 3 / 2 / 5 / 8) open circuit	Signal voltage driver stage internal value		0.5 s - Continuous	2 DCY	Check Cylinder 2 Shut-Off Intake Deactivation Valve - N518-. Refer to "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607.

P3411 Cylinder Deactivation Intake Valve 2 Control Circuit Low	Cylinder Deactivation (CD) valve actuator (cyl. 3 / 2 / 5 / 8) short to ground	Signal voltage driver stage internal value		0.5 s - Continuous	2 DCY	Check Cylinder 2 Shut-Off Intake Deactivation Valve - N518-. Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607.
P3412 Cylinder Deactivation Intake Valve 2 Control Circuit High	Cylinder Deactivation (CD) valve actuator (cyl. 3 / 2 / 5 / 8) short to battery plus	Signal voltage driver stage internal value	Engine speed ≥ 80 rpm	0.5 s - Continuous	2 DCY	Check Cylinder 2 Shut-Off Intake Deactivation Valve - N518-. Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607.
P3417 Cylinder Deactivation Intake Valve 3 Control Circuit/ Open	Cylinder Deactivation (CD) valve actuator (cyl. 3 / 2 / 5 / 8) open circuit	Signal voltage driver stage internal value		0.5 s - Continuous	2 DCY	Check Cylinder 5 Shut-Off Intake Deactivation Valve - N520-. Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607.
P3419 Cylinder Deactivation Intake Valve 3 Control Circuit Low	Cylinder Deactivation (CD) valve actuator (cyl. 3 / 2 / 5 / 8) short to ground	Signal voltage driver stage internal value		0.5 s - Continuous	2 DCY	Check Cylinder 5 Shut-Off Intake Deactivation Valve - N520-. Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607.

P3420 Cylinder Deactivation Intake Valve 3 Control Circuit High	Cylinder Deactivation (CD) valve actuator (cyl. 3 / 2 / 5 / 8) short to battery plus	Signal voltage driver stage internal value	Engine speed ≥ 80 rpm	0.5 s - Continuous	2 DCY	Check Cylinder 5 Shut-Off Intake Deactivation Valve - N520- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .
P3425 Cylinder Deactivation Intake Valve 4 Control Circuit/ Open	Cylinder Deactivation (CD) valve actuator (cyl. 3 / 2 / 5 / 8) open circuit	Signal voltage driver stage internal value		0.5 s - Continuous	2 DCY	Check Cylinder 8 Shut-Off Intake Deactivation Valve - N521- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .
P3427 Cylinder Deactivation Intake Valve 4 Control Circuit Low	Cylinder Deactivation (CD) valve actuator (cyl. 3 / 2 / 5 / 8) short to ground	Signal voltage driver stage internal value		0.5 s - Continuous	2 DCY	Check Cylinder 8 Shut-Off Intake Deactivation Valve - N521- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .
P3428 Cylinder Deactivation Intake Valve 4 Control Circuit High	Cylinder Deactivation (CD) valve actuator (cyl. 3 / 2 / 5 / 8) short to battery plus	Signal voltage driver stage internal value	Engine speed ≥ 80 rpm	0.5 s - Continuous	2 DCY	Check Cylinder 8 Shut-Off Intake Deactivation Valve - N521- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .
P3433 Cylinder 5 Deactivation/ Intake Valve Control Circuit/ Open	CD valve power stage cylinder 3 / 2 / 5 / 8 Circuit continuity - Open circuit	Voltage IC internal	- Battery voltage > 10 V - For a calibrated period of time > 70 s	- Immediate - Continuous	2 DCY	Check Inlet Deactivation Valve - N520- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .

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P3435 Cylinder 5 Deactivation/ Intake Valve Control Circuit Low	CD valve power stage cylinder 3 / 2 / 5 / 8 Circuit continuity - short to GND	Voltage IC internal	Battery voltage > 10 V	- Immediate - Continuous	2 DCY	Check Inlet Deactivation Valve - N520- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .
P3436 Cylinder 5 Deactivation/ Intake Valve Control Circuit High	CD valve power stage cylinder 3 / 2 / 5 / 8 Circuit continuity - short to battery	Voltage IC internal	Engine speed > 80 rpm	- Immediate - Continuous	2 DCY	Check Inlet Deactivation Valve - N520- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .
P3457 Cylinder 8 Deactivation/ Intake Valve Control Circuit/ Open	CD valve power stage cylinder 3 / 2 / 5 / 8 Circuit continuity - Open circuit	Voltage IC internal	- Battery voltage > 10 V - For a calibrated period of time > 70 s	- Immediate - Continuous	2 DCY	Check Inlet Deactivation Valve - N521- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .
P3459 Cylinder 8 Deactivation/ Intake Valve Control Circuit Low	CD valve power stage cylinder 3 / 2 / 5 / 8 Circuit continuity - short to GND	Voltage IC internal	Battery voltage > 10 V	- Immediate - Continuous	2 DCY	Check Inlet Deactivation Valve - N521- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .
P3460 Cylinder 8 Deactivation/ Intake Valve Control Circuit High	CD valve power stage cylinder 3 / 2 / 5 / 8 Circuit continuity - short to battery	Voltage IC internal	Engine speed > 80 rpm	- Immediate - Continuous	2 DCY	Check Inlet Deactivation Valve - N521- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .

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U0001 High Speed CAN Communication Bus	CAN: Powertrain reading back sent message	Message no feedback	Time after ignition on > 500 ms	0.25 s - Continuous	2 DCY	Check terminal resistance of CAN-Bus ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.
U0002 High Speed CAN Communication Bus Performance	CAN: Powertrain communication check	Global time out receiving no message	Time after ignition on > 500 ms	0.45 s - Continuous	2 DCY	Check terminal resistance of CAN-Bus ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.
U0101 Lost Communication with TCM	COM: Transmission Control Module (TCM) communication with TCM	Received message no message	Time after ignition on > 500 ms	0.5 s - Continuous	2 DCY	Check terminal resistance of CAN-Bus. Refer to ⇒ "3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 1603.
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module	COM: Brake System Control Module (BSCM) communication with BSCM	Received message no message	Time after ignition on > 500 ms	0.5 s - Continuous	2 DCY	Check ABS CAN-Bus operation. Refer to appropriate repair manual.
U0140 Lost Communication With Body Control Module	COM: Body Control Module (BCM) communication with BCM	Time out no message	Time after ignition on > 500 ms	2.0 s - Continuous	2 DCY	Check terminal resistance of CAN-Bus ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.
U0146 Lost Communication With Gateway "A"	COM: Gateway communication with Gateway	Received message no message	Time after ignition on > 500 ms	0.5 s - Continuous	2 DCY	Check terminal resistance of CAN-Bus ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.

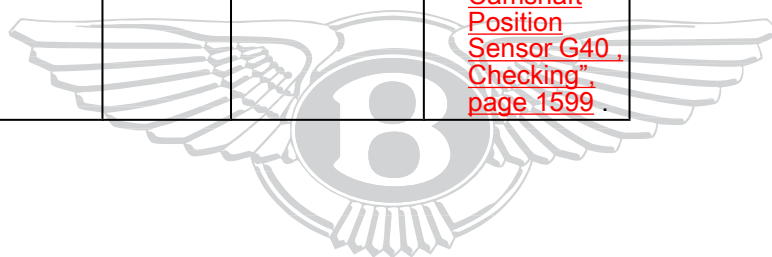
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	COM: Instrument Panel Cluster (IPC) communication with IPC	Received message no message	Time after ignition on > 500 ms	2.0 s - Continuous	2 DCY	Check the Instrument Cluster CAN-Bus. Refer to appropriate repair manual..
U0402 Invalid Data Received From TCM	COM: Transmission Control Module (TCM) communication with TCM	Received data implausible message	Time after ignition on > 500 ms	0.3 s - Continuous	2 DCY	Check for correct VIN and software ID stored in TCM. If the software ID or VIN is incorrect, a re-flash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to ⇒ "3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 1603.
U0415 Invalid Data Received From Anti-Lock Brake System (ABS) Control Module	COM: Brake System Control Module (BSCM) communication with BSCM	Received data implausible message	Time after ignition on > 500 ms	0.4 s - Continuous	2 DCY	Check for correct VIN and software ID stored in ABS. If the software ID or VIN is incorrect, a re-flash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to appropriate repair manual.
	COM: Vehicle Speed Sensor (VSS) communication with VSS	Speed sensor signal: low voltage error 655.33 km/h	Time after ignition on > 500 ms	1.98 s - Continuous		
	COM: Vehicle Speed Sensor (VSS) communication with VSS	Speed sensor signal: sensor error 655.35 km/h	Time after ignition on > 500 ms	0.48 s - Continuous		

	COM: Vehicle Speed Sensor (VSS) communication with VSS	Speed sensor signal: initialization error 655.34 km/h	Time after ignition on > 500 ms	1.98 s - Continuous		
U0423 Invalid Data Received From Instrument Panel Cluster Control Module	COM: Instrument Panel Cluster (IPC) communication with IPC	Received data implausible message	Time after ignition on > 500 ms	3 s - Continuous	2 DCY	Check the Instrument Cluster CAN-Bus. Refer to appropriate repair manual.
U0447 Invalid Data Received From Gateway "A"	COM: Gateway communication with Gateway	Received data implausible message	Time after ignition on > 500 ms	0.3 s - Continuous	2 DCY	Check terminal resistance of CAN-Bus ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.

3.4.4 Engine Control Module , 2017 MY

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P000 A "A" Camshaft Position Slow Response Bank 1	Variable Valve Timing (VVT) Intake Actuator Slow Response	- Difference between target position vs actual position > 3° CRK - For time > 1.5 – 3.0 s - And - Adjustment angle > 3.0° CRK - And - Number of checks 7 times	- Time after engine start > 3.0 – 10.0 s - Engine speed 480 – 5,000 RPM - Modeled oil temperature -11 – 125° C - Change of target position > 7.0° CRK	3.5 s - Multiple	2 DCY	Check the Camshaft Adjustment Valve 1 - N205-. Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205-, Checking", page 1597.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0010 "A" Camshaft Position Actuator "A" Control Circuit/Open Bank 1	Variable Valve Timing (VVT) Intake Actuator Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .
P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	Variable Valve Timing (VVT) Intake Actuator Target Error	- Difference between target position vs actual position > 3° CRK - For time > 1.5 – 3.0 s - And - Adjustment angle ≤ 3.0° CRK - And - Number of checks 7 times	- Time after engine start > 3.0 – 10.0 s - Engine speed 480 – 5,000 RPM - Modeled oil temperature -11 – 125° C - Change of target position > 7.0° CRK	3.5 s - Multiple	2 DCY	- Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 . - Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0012 "A" Camshaft Position - Timing Over-Retarded Bank 1						– Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40, Checking", page 1599 .
P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Camshaft Position (CMP) Intake Sensor Angular Offset Check	• Permissible deviation < -11.01° CRK	• Camshaft adaptation not active • Engine speed > 80 RPM	• 8 rev Multiple	• 2 DCY	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40, Checking", page 1599 .
P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Open Circuit	• Signal voltage 4.70 – 5.40 V	• Time after engine start > 5.0 s • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Ground	Signal voltage 0.0 – 3.26 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking”, page 1653 .
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Time after engine start > 5.0 s - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking”, page 1653 .
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Open Circuit	Signal voltage 4.70 – 5.40 V	- Engine speed > 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7- Checking”, page 1650 .
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Ground	Signal voltage < 2.74 – 3.26 V	- Engine speed >= 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7- Checking”, page 1650 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Engine speed >= 80 RPM - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking”, page 1650 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0040 O2 Sensor Signals Swapped Bank 1 Sensor 1 / Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check (Detection Of Exchange Lambda Sensors Upstream Catalyst)	• Lambda controllers exceed thresholds in opposite directions • Case 1: • Lambda control value bank 1 < 0.80 [-] • And • Lambda control value bank 2 > 1.20 [-] • Case 2: • Lambda control value bank 1 > 1.20 [-] • And • Lambda control value bank 2 < 0.80 [-]	• Lambda control closed loop • VVT ready	• 5.0 s • Multiple	• 2 DCY	- Using a scan tool with the engine running, check the Bank 1 and Bank 2 Long Term fuel trim - if one is above 10 negative and the other above 10 positive, swap the front HO2s sensor connectors and look for the long term values to move close to a zero or low single digit reading. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 . - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0050 HO2S Heater Control Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Open Circuit	Signal voltage 4.70 – 5.40 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
P0051 HO2S Heater Control Circuit Low Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Ground	Signal voltage < 2.74 – 3.26 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
P0052 HO2S Heater Control Circuit High Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Time after engine start > 5.0 s - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
P0056 HO2S Heater Control Circuit Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Open Circuit	Signal voltage 4.70 – 5.40 V	- Engine speed > 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0057 HO2S Heater Control Circuit Low Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Ground	Signal voltage < 2.74 – 3.26 V	- Engine speed >= 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .
P0058 HO2S Heater Control Circuit High Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Engine speed >= 80 RPM - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .
P0071 Ambient Air Temperature Sensor Circuit "A" Range/Performance	Intake Air Temperature (IAT) Sensor @ MAF Sensor Rationality Check Intake Air Temperature (IAT) Sensor @ MAF Sensor Low Phase Rationality Check	- Diff. IAT2 vs. ECT @ start > 20.3 K - Diff. IAT2 vs. ECT @ start < -45.0 K - Diff. max IAT2 vs. min IAT2 < 3.8 K	- ECT @ last engine stop <= 80° C - Diff. ECT @ last engine stop vs. ECT @ start <= 39.8 K - ECT @ start <= -35; >= 41° C - Time in low phase > 15.0 s - Number of checks >= 2.0 [-1] - Vehicle speed >= 60 km/h - MAF >= 72.00; <= 180.0 kg/h	2.0 s - Once / DCY 10.0 s - Continuous	2 DCY	Check the Outside Air Temperature Sensor - G17- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Intake Air Temperature (IAT) Sensor @ MAF Sensor High Phase Rationality Check		- Time in high phase > 30.0 s - Number of checks >= 3.0 [-] - MAF < 40.0 kg/h - Vehicle speed < 20 km/h - ECT > 87° C - Integrated air mass > 7.01 – 16.84 kg			
P0072 Ambient Air Temperature Sensor Circuit "A" Low	Intake Air Temperature (IAT) Sensor @ MAF Sensor Out Of Range Low	Signal voltage < 0.10 V	- Conditions for measurement window - ECT > -48° C - MAF <= 1,020.0 kg/h - Vehicle speed <= 319 km/h - Monitor measurement window conditions fulfilled > 0.0 s	1.0 s - Continuous	2 DCY	Check the Outside Air Temperature Sensor - G17- . Refer to appropriate repair manual.
P0073 Ambient Air Temperature Sensor Circuit "A" High	Intake Air Temperature (IAT) Sensor @ MAF Sensor Out Of Range High	Signal voltage > 2.95 V	- Conditions for measurement window - ECT > -48° C - MAF <= 1,020.0 kg/h - Vehicle speed <= 319 km/h - Monitor measurement window conditions fulfilled > 0.0 s	1.0 s - Continuous	2 DCY	Check the Outside Air Temperature Sensor - G17- . Refer to appropriate repair manual.
P00B E Mass or Volume Air Flow "B" Circuit Range/Performance - Air Flow Too Low	Mass Air Flow (MAF) Sensor Out Of Range Low	Mass air flow to low < -45.0 kg/h	- Camshaft revolutions > 150.0 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to "3.6.28 Mass Airflow Sensor 2 G246 - Checking", page 1646 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P00BF Mass or Volume Air Flow "B" Circuit Range/Performance - Air Flow Too High	Mass Air Flow (MAF) Sensor Out Of Range High	Mass air flow to high > 1,100.0 kg/h	- Camshaft revolutions > 150.0 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246, Checking", page 1646 .
P0100 Mass or Volume Air Flow Sensor "A" Circuit	Mass Air Flow (MAF) Sensor Internal Check	MAF sensor signal 0 µs	Engine speed not active RPM	0.2 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644 .
P0101 Mass or Volume Air Flow Sensor "A" Circuit Range/Performance	Mass Air Flow (MAF) Sensor Out Of Range Low	Mass air flow to low < -45.00 kg/h	- Camshaft revolutions > 150.0 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644 .
	Mass Air Flow (MAF) Sensor Out Of Range High	Mass air flow to high > 1,100.0 kg/h				
	Mass Air Flow (MAF) Sensor Rationality Check Low	- Max value of: - Diff. between measured MAF vs. modeled value < -47.0 kg/h - Or - Ratio of measured MAF and modeled value < 0.65 [-]	- Idle not active - Engine speed 1,000 – 4,000 RPM - ECT 40 – 120° C - IAT -30 – 100° C - BARO >= 68.0 kPa - Change in camshaft timing < 3.0° CRK - For time >= 50.0 s - Throttle position 5.0 – .50.0% - Vehicle speed 0 – 200 km/h			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Mass Air Flow (MAF) Sensor Rationality Check High	- Max value of: - Diff. between measured MAF vs. modeled value > 47.0 kg/h - Or - Ratio of measured MAF and modeled value > 1.35 [-]				
P0102 Mass or Volume Air Flow Sensor "A" Circuit Low	Mass Air Flow (MAF) Sensor Out Of Range Low	- MAF sensor signal < 66 µs - MAF sensor signal temp.-correction < 44.0 ms	Engine speed not active RPM	0.2 s - Continuous 1.0 s - Multiple	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644 .
P0103 Mass or Volume Air Flow Sensor "A" Circuit High	Mass Air Flow (MAF) Sensor Out Of Range High	- MAF sensor signal > 910 µs - MAF Sensor signal temp.-correction > 60.0 ms	Engine speed not active RPM	0.2 s - Continuous 1.0 s - Multiple	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644 .
P0106 Manifold Absolute Pressure (MAP) Sensor Dynamic Check	Manifold Absolute Pressure (MAP) Sensor Dynamic Check	- Amplitude of MAP sensor < 0.3 – 4.4 kPa - For counts > 30 [-] - Number of synchro events > 50 [-]	- Engine speed > 1,200; < 3,520 RPM - Ratio of MAP and boost pressure > 0.20; < 0.9 [-]	1.1 s - Continuous	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71, Checking", page 1640 .
	Manifold Absolute Pressure (MAP) Sensor Rationality Check	Diff. barometric sensor signal vs. manifold pressure signal @ engine start > 15.0 kPa	- Time after engine start < 25.0 s - Engine speed < 300 RPM	2.5 s - Multiple		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Manifold Absolute Pressure (MAP) Sensor Rationality Check Low	- Difference manifold pressure - lower threshold model < 0 kPa - Model range 90 – 2,100 kPa				
	Manifold Absolute Pressure (MAP) Sensor Rationality Check High	- Difference manifold pressure - upper threshold model > 0 kPa - Model range 850 – 2,700 kPa				
P0107 Manifold Absolute Pressure/Barometric Pressure Sensor Circuit Low	Manifold Absolute Pressure (MAP) Sensor Range Check	Manifold pressure signal < 10.0 kPa		2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ “3.6.25 Manifold Absolute Pressure Sensor G71, Checking”, page 1640 .
	Manifold Absolute Pressure (MAP) Sensor Short To Ground	Signal voltage < 0.20 V		1.0 s - Continuous		
P0108 Manifold Absolute Pressure/Barometric Pressure Sensor Circuit High	Manifold Absolute Pressure (MAP) Sensor Range Check	Manifold pressure signal > 280.0 kPa		2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ “3.6.25 Manifold Absolute Pressure Sensor G71, Checking”, page 1640 .
	Manifold Absolute Pressure (MAP) Sensor Short To Battery / Open Circuit	Signal voltage > 4.88 V		1.0 s - Continuous		
	Manifold Absolute Pressure (MAP) Sensor Out Of Range @ Start	Manifold pressure > 140.0 kPa	- Engine off time > 5.0 s - Engine speed < 400 RPM	0.5 s - Once / DCY		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P010 A Mass or Volume Air Flow Sensor "B" Circuit	Mass Air Flow (MAF) Sensor Internal Check	MAF sensor signal 0 μs	Engine speed not active RPM	0.2 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 . Checking", page 1646 .
P010 B Mass or Volume Air Flow Sensor "B" Circuit Range/Performance	Mass Air Flow (MAF) Sensor Rationality Check Low	- Max value of: - Diff. between measured MAF vs. modeled value < -47.0 kg/h - Or - Ratio of measured MAF and modeled value < 0.65 [-]	- Idle not active - Engine speed 1,000 – 4,000 RPM - ECT 40 – 120° C - IAT -30 – 100° C - BARO >= 68.0 kPa - Change in camshaft timing < 3.0° CRK - For time >= 50.0 s - Throttle position 5.0 – 50.0% - Vehicle speed 0 – 200 km/h	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 . Checking", page 1646 .
	Mass Air Flow (MAF) Sensor Rationality Check High	- Max value of: - Diff. between measured MAF vs. modeled value > 47.0 kg/h - Or - Ratio of measured MAF and modeled value > 1.35 [-]				
P010 C Mass or Volume Air Flow Sensor "B" Circuit Low	Mass Air Flow (MAF) Sensor Out Of Range Low	- MAF sensor signal < 66 μs - MAF Sensor signal temp.-correction < 44.0 ms	Engine speed not active RPM	0.2 s - Continuous 1.0 s - Multiple	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 . Checking", page 1646 .
P010 D Mass or Volume Air Flow Sensor	Mass Air Flow (MAF) Sensor Out Of Range High	MAF sensor signal > 910 μs	Engine speed not active RPM	0.2 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 . Checking", page 1646 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
"B" Circuit High		MAF Sensor signal temp.-correction > 60.0 ms		1.0 s - Multiple		Checking", page 1646 .
P0111 Intake Air Temperature (IAT) Sensor @ Manifold Rationality Check Sensor 1 Circuit Range/Performance Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold Rationality Check	Difference IAT at intake manifold to modeled IAT >= 60.0 – 99.8 K	- Conditions for measurement window - MAF <= 152.0; >= 600.0 kg/h - Vehicle speed >= 45 km/h - Engine speed > 20 RPM - Monitor measurement window conditions fulfilled > 15.0 s	10.0 s - Continuous	2 DCY	– Check the Mass Airflow Sensor - G70- . Refer to "3.6.27 Mass Airflow Sensor G70. Checking", page 1644 .
	Intake Air Temperature (IAT) Sensor @ Manifold Stuck Check	Difference between maximum and minimum value of IAT < 5.3° C	- ECT @ start <= 138° C - Intake manifold high phase conditions - MAF < 52.0 kg/h - Vehicle speed < 10 km/h - ECT > 80° C - Integrated air mass > 1.0 – 4.0 kg - Cumulated high manifold active time > 15.0 s - Number of checks > 2.0 [-] - Intake manifold low phase conditions - MAF 152.0 – 600.0 kg/h - Vehicle speed > 45 km/h - Cumulated low manifold active time > 15.0 s - Number of checks > 2.0 [-]	500.0 s - Continuous		
	Intake Air Temperature (IAT) Sensor @	Diff. IAT vs. ECT at engine start >= 20.3 K	ECT @ engine shut-off >= 80° C	2.0 s - Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Manifold Cross Check	Diff. IAT vs. ECT at engine start < -45.0 K	- ECT @ start >= -35; <= 41° C - ECT restart temperature diff. >= 39.8 K			
P0112 Intake Air Temperature (IAT) Sensor @ Manifold Short To Ground Circuit Low Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold Signal Range Check	- Signal voltage < 0.11 V - IAT < -39° C		1.0 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644 .
P0113 Intake Air Temperature (IAT) Sensor @ Manifold Short To Battery / Open Circuit Circuit High Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold Signal Range Check	Signal voltage > 4.50 V	- ECT @ start not calibrated ° C - Or - Time after engine start not calibrated s - ECT >= -48° C - Vehicle speed <= 319 km/h - MAF <= 1,020.0 kg/h	1.0 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0116 Engine Coolant Temperature (ECT) Sensor Stuck High / Low - No Change On Signal Circuit Range/Performance	Engine Coolant Temperature (ECT) Sensor Stuck High / Low - No Change On Signal	Diff. between max. ECT and min. ECT < 2.3° C	- ECT @ start -39 – 138° C - Without 81.8 – 93.0° C - Substitute ECT > -45° C - Driving condition H: - Vehicle speed 45 – 150 km/h - MAF (lower threshold) 8.0 kg/h - MAF (upper threshold) 152.0 – 352.0 kg/h - Or - Fuel cut off active - For time required > 30.0 s - Frequency 1 times - Driving condition L: - Vehicle speed 0 – 20 km/h - Mass air flow (lower threshold) 8.0 kg/h - Mass air flow (upper threshold) 52.0 – 84.0 kg/h - For time required > 10.0 s - Frequency 3 times	62.0 s - Once / DCY	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.11 Engine Coolant Temperature Sensor G62 , Checking”, page 1613 .
	Engine Coolant Temperature (ECT) Sensor Stuck In Range	- ECT @ start >= 20 – 75° C - And - ECT @ start <= 143° C	Cold start detected	2.0 s - Once / DCY		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0117 Engine Coolant Temperature (ECT) Sensor 1 Circuit Low	Engine Coolant Temperature (ECT) Sensor Short To Ground	ECT > 138° C		2.0 s - Continuous	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613 .
P0118 Engine Coolant Temperature (ECT) Sensor 1 Circuit High	Engine Coolant Temperature (ECT) Sensor Short To Battery / Open Circuit	ECT < - 39.0° C		2.0 s - Continuous	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613 .
P0121 Throttle/Pedal Position Sensor (TPS) Circuit Range/Performance	Throttle Position Sensor (TPS) Rationality Check	- TPS1-TPS2 > 6.30% > - And - Actual TPS1 - calc.value > actual TPS2 - calc. value - Or - TPS1 - calc. value > 9.0%	Engine speed > 480 RPM	0.3 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0122 Throttle/Pedal Position Sensor (TPS) Circuit Low	Throttle Position Sensor (TPS) Out Of Range Low	Signal voltage < 0.18 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0123 Throttle/Pedal Position Sensor/Switch "A" Circuit High	Throttle Position Sensor (TPS) Out Of Range High	Signal voltage > 4.63 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0130 O2 Sensor Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range	O2S ceramic temperature < 690° C	- Modeled EGT > 350° C - Fuel cut off not active	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .
P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	- Short to ground - Virtual mass (VM) < 1.75 V - Or - Nernst voltage (UN) < 1.50 V - Or - Adjustment voltage (IA) not calibrated V - Or - Adjustment voltage (IP) < 0.30 V		2.0 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	• Short to battery • Virtual mass (VM) > 3.25 V • Or • Nernst voltage (UN) > 4.40 V • Or • Adjustment voltage (IA) not calibrated V • Or • Adjustment voltage (IP) > 7.0 V		• 2.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking”, page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Response Rate Monitoring, Area Ratio And Gradient Ratio	- Symmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio -0.30 – 0.55 [-] - Max value of both counters for area ratio rich to lean and lean to rich ≥ 6 times - Delay Time: - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Transient Time: - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-] - Asymmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio < -0.30; > 0.55 [-]	- O2S front - time since operation readiness > 30.0 s - O2S front - min. operation temperature is reached ≥ 720.0 K - Exhaust gas mass flow since engine first start not calibrated kg - Heat supply not calibrated kJ - Or - Time since engine first start not calibrated s - Check wire break pump current ready - And - Only Flex fuel systems - Ethanol concentration adaptation not calibrated - And - Ethanol value not calibrated [-] - And - Ethanol value to start diagnosis not calibrated [-] - Only NG fuel systems - Total ng operating mode not calibrated - Or - Total gasoline operating mode not calibrated - Scavenging - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg	48.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		- Values of both counters for area ratio rich to lean and lean to rich ≥ 6 times - Delay Time: - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Transient Time: - Gradient ratio not calibrated [-] - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Or - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-]	- Additional conditions: - Lambda value freeze not active - Relative fuel amount from wall applied compensation and evap purge ≤ 1.0 [-] - Split coefficient DFI/MFI-system is constant not calibrated [-] - Engine speed 1,160 – 2,520 RPM - All local injector active - Desired position lead boost pressure not calibrated - Vehicle speed not calibrated km/h - Time since engine start ≥ 5.0 s - Engine load 27.0 – 79.99% - Catalyst heating not active - Evap purge valve case 1: - Gradient of factor tank ventilation ≤ 0.0 [-] - And - Pulse duty factor of evap purge valve $> 10.0\%/s$ - For time not calibrated s - Or - Evap purge valve case 2: - Pulse duty factor of evap purge valve $\leq 10.0\%/s$ - Additional conditions:			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Evap purge ≥ 8.0 g - Or - Evap purge not active - Or - Lambda controller oscillation detected - Exhaust system lag time calculation $0.1 - 0.3$ s - Catalyst temperature $\geq 500^{\circ}$ C - Lambda control set-point prior to diagnostic fuel steps 1.0 [-] - Or - Gradient of exhaust system lag time calculation ≤ 0.1 s - Gradient of engine load $\leq 3.0\%$ - Gear shifting not active - Or - Transition from cylinder deactivation (CD) to normal operation mode finished - Exhaust gas mass flow ≥ 15.0 kg/h - Gradient of exhaust gas mass flow not calibrated kg/h - Evap purge in limp-home mode not calibrated - Or - EVAP system diagnosis not calibrated - Or			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Evap purge load high not calibrated - AIR not calibrated - AIR system diagnosis not calibrated - Time since last measurement > 2.0 s			
P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Out Of Range High	- O2S ceramic temperature < 725° C - And - Heater duty cycle > 95.0%	- Modeled EGT > 350° C - Heater control active	60.0 s - Multiple	• 2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
	Oxygen Sensors (O2S) Heater Front Rationality Check (Sensor Heating Up)	- O2S ceramic temperature < 725° C - And - Time after O2S heater on 40.0 s	- ECT @ start > -10° C - Engine shut-off-time > 10,000.0 s (During ECM keep alive-time after ignition off) < 300.0 s	40.0 s - Once / DCY		



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	- Signal voltage < 0.06 V - For time > 3.0 s - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Fuel cut off not active - Catalyst purge not active	3.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Out Of Range High (Short To Battery Plus)	- Signal voltage > 1.08 V - For time > 0.1 s	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Lambda set value > 0.995 [-]	0.1 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking”, page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Cut Off	- Arithmetic filtered max differential transient time at fuel cut off not calibrated s - Or - EWMA filtered max differential transient time at fuel cut off ≥ 0.60 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel cut off active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow -80.0 – 80.0 kg/h - Time fuel cut off < 20.0 s - If - Time fuel cut off > 20.0 s - Then disabling till next fuel cut off 60.0 s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Deviation between expected and measured lambda value < 12.0 [-] - Or - Lambda value > 5.0 [-] - Additional conditions: - Time after fuel cut off at first cylinder > 1.5 s	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• O2S rear voltage before start of measurement > 0.55 V • O2S rear target voltage end of measurement <= 0.15 V • Or • Integrated O2 mass during fuel cut off >= 1,800 – 3,000 mg • Time delay 0.5 s • Case 1: • (With scavenging) • If • Scavenging-rate not calibrated [-] • Then disabling until • Scavenging-rate not calibrated [-] • And • Integrated air mass not calibrated [-] • Case 2: • (Without scavenging) • Integrated air mass > 0.50 kg • Engine running			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 B O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Feed Restart	- Arithmetic filtered max differential transient time at fuel feed restart not calibrated s - Or - EWMA filtered max differential transient time at fuel feed restart ≥ 1.0 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel feed restart active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow $-80.0 - 80.0$ kg/h - If - Time fuel cut off > 20.0 s - Then - Disabling till next fuel feed restart 60.0 s - Additional conditions: - O2S rear voltage before start of measurement < 0.15 V - O2S rear target voltage end of measurement ≥ 0.60 V - Or - Integrated negative O2 mass during catalyst purge $\geq 2,000 - 3,000$ mg - Time delay 0.5 s - Case 1:	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• (With scavenging) • If • Scavenging-rate not calibrated [-] • Then disabling until • Scavenging-rate not calibrated [-] • And • Integrated air mass not calibrated kg • Case 2: • (Without scavenging) • Integrated air mass > 0.5 kg • Engine running			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 C O2 Sensor Slow Response - Rich to Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Cut Off	- Arithmetic filtered max differential transient time at fuel cut off not calibrated s - Or - EWMA filtered max differential transient time at fuel cut off ≥ 0.60 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel cut off active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow $80.0 - 80.0$ kg/h - Time fuel cut off < 20.0 s - If - Time fuel cut off > 20.0 s - Then disabling till next fuel cut off 60.0 s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Deviation between expected and measured lambda value < 12.0 [-] - Or - Lambda value > 5.0 [-] - Additional conditions: - Time after fuel cut off at first cylinder ≥ 1.5 s	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• O2S rear voltage before start of measurement > 0.55 V • O2S rear target voltage end of measurement <= 0.15 V • Or • Integrated O2 mass during fuel cut off >= 1,800 – 3,000 mg • Time delay 0.5 s • Case 1: • (With scavenging) • If • Scavenging-rate not calibrated [-] • Then disabling until • Scavenging-rate not calibrated [-] • And • Integrated air mass not calibrated [-] • Case 2: • (Without scavenging) • Integrated air mass > 0.50 kg • Engine running			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 D O2 Sensor Slow Response - Lean to Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Feed Restart	- Arithmetic filtered max differential transient time at fuel feed restart not calibrated s - Or - EWMA filtered max differential transient time at fuel feed restart ≥ 1.0 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel feed restart active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}\text{C}$ - Change of exhaust gas mass flow $-80.0 - 80.0$ kg/h - If - Time fuel cut off > 20.0 s - Then - Disabling till next fuel feed restart 60.0 s - Additional conditions: - O2S rear voltage before start of measurement < 0.15 V - O2S rear target voltage end of measurement ≥ 0.60 V - Or - Integrated negative O2 mass during catalyst purge $\geq 2,000 - 3,000$ mg - Time delay 0.5 s - Case 1:	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• (With scavenging) • If • Scavenging-rate not calibrated [-] • Then disabling until • Scavenging-rate not calibrated [-] • And • Integrated air mass not calibrated kg • Case 2: • (Without scavenging) • Integrated air mass > 0.5 kg • Engine running			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 E O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Rich To Lean Transition	- Arithmetic filtered max differential delay time at rich to lean transition > not calibrated s - Or - EWMA filtered max differential delay time at rich to lean transition > 0.6 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value before not calibrated [-]	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- For integrated exhaust gas mass not calibrated kg - Lambda set value not calibrated [-] - For time not calibrated s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated - Diff. between lambda set value and actual lambda value ≤ 16.0 [-] - Threshold 1 - O2S rear voltage ≥ 0.72 V - Gradient O2S rear voltage $-0.01 - 0.05$ V/s - Integrated negative O2 mass ≥ 50 mg - Or - Threshold 2 - O2S rear voltage > 1.25 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 F O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Lean To Rich Transition	- Arithmetic filtered max differential delay time at lean to rich transition not calibrated s - EWMA filtered max differential delay time at lean to rich transition > 1.2 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - General: - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value not calibrated [-] - For time not calibrated s	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Binary sensor front fitted • O2S front voltage not equipped V • Linear sensor front fitted • Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated [-] • Diff. between lambda set value and actual lambda value ≤ 16.0 [-] • Case 1: • (Diagnosis in Catalyst State full) true • Time after engine start not calibrated s • Threshold 1 • O2S rear voltage ≤ 0.20 V • Gradient O2S rear voltage $-1.0 - 0.01$ V/s • Integrated O2 mass not calibrated mg • Or • Threshold 2 • O2S rear voltage not calibrated V • Case 2: • (Diagnosis at Fuel Feed Restart) false • Integrated exhaust gas mass not calibrated kg • Integrated exhaust gas mass not calibrated kg			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Exhaust gas mass during not calibrated kg - Catalyst temperature not calibrated ° C - Exhaust gas mass flow not calibrated kg/h - Gradient of exhaust gas mass flow not calibrated kg/h - Engine speed not calibrated RPM - O2S rear voltage after fuel cut off not calibrated V - For time not calibrated s - And - O2 mass not calibrated mg			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	- Signal voltage 0.40 – 0.60 V - For time > 3.0 s - And - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) >= 2.80 V	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded	40.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking”, page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	- Internal resistance > 40,000.0 Ω - And - Exhaust temperature > 600° C	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded - Valid Ri-measurements > 10 times			
P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Out Of Range (During Normal Heater Operation After Dew Point Is Exceeded)	Internal resistance > 1,260.0 – 20,400.0 Ω	- Dew point exceeded - Modeled EGT 350 – 650° C - IAT > -7° C - Engine shut-off-time > 5,000.0 s - Number of checks 10.0 [-] - Fuel cut off not active - Actuator commanded on	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P014 A O2 Sensor Delayed Response - Rich to Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Rich To Lean Transition	- Arithmetic filtered max differential delay time at rich to lean transition > not calibrated s - Or - EWMA filtered max differential delay time at rich to lean transition > 0.6 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value before not calibrated [-]	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- For integrated exhaust gas mass not calibrated kg - Lambda set value not calibrated [-] - For time not calibrated s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated - Diff. between lambda set value and actual lambda value ≤ 16.0 [-] - Threshold 1 - O2S rear voltage ≥ 0.72 V - Gradient O2S rear voltage $-0.01 - 0.05$ V/s - Integrated negative O2 mass ≥ 50 mg - Or - Threshold 2 - O2S rear voltage > 1.25 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P014 B O2 Sensor Delayed Response - Lean to Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Lean To Rich Transition	- Arithmetic filtered max differential delay time at lean to rich transition not calibrated s - EWMA filtered max differential delay time at lean to rich transition > 1.2 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - General: - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value not calibrated [-] - For time not calibrated s	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated [-] - Diff. between lambda set value and actual lambda value ≤ 16.0 [-] - Case 1: (Diagnosis in Catalyst State full) true - Time after engine start not calibrated s - Threshold 1 - O2S rear voltage ≤ 0.20 V - Gradient O2S rear voltage $-1.0 - 0.01$ V/s - Integrated O2 mass not calibrated mg - Or - Threshold 2 - O2S rear voltage not calibrated V - Case 2: (Diagnosis at Fuel Feed Restart) false - Integrated exhaust gas mass not calibrated kg - Integrated exhaust gas mass not calibrated kg			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Exhaust gas mass during not calibrated kg - Catalyst temperature not calibrated ° C - Exhaust gas mass flow not calibrated kg/h - Gradient of exhaust gas mass flow not calibrated kg/h - Engine speed not calibrated RPM - O2S rear voltage after fuel cut off not calibrated V - For time not calibrated s - And - O2 mass not calibrated mg			
P0150 O2 Sensor Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range	O2S ceramic temperature < 690° C	- Modeled EGT > 350° C - Fuel cut off not active	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0151 O2 Sensor Circuit Low Voltage Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	- Short to ground - Virtual mass (VM) < 1.75 V - Or - Nernst voltage (UN) < 1.50 V - Or - Adjustment voltage (IA) not calibrated V - Or - Adjustment voltage (IP) < 0.30 V		2.0 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P0152 O2 Sensor Circuit High Voltage Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	- Short to battery - Virtual mass (VM) > 3.25 V - Or - Nernst voltage (UN) > 4.40 V - Or - Adjustment voltage (IA) not calibrated V - Or - Adjustment voltage (IP) > 7.0 V		2.0 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0153 O2 Sensor Circuit Slow Response Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Response Rate Monitoring, Area Ratio And Gradient Ratio	- Symmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio -0.30 – 0.55 [-] - Max value of both counters for area ratio rich to lean and lean to rich ≥ 6 times - Delay Time: - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Transient Time: - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-] - Asymmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio < -0.30; > 0.55 [-]	- O2S front - time since operation readiness > 30.0 s - O2S front - min. operation temperature is reached ≥ 720.0 K - Exhaust gas mass flow since engine first start not calibrated kg - Heat supply not calibrated kJ - Or - Time since engine first start not calibrated s - Check wire break pump current ready - And - Only Flex fuel systems - Ethanol concentration adaptation not calibrated - And - Ethanol value not calibrated [-] - And - Ethanol value to start diagnosis not calibrated [-] - Only NG fuel systems - Total ng operating mode not calibrated - Or - Total gasoline operating mode not calibrated - Scavenging - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg	48.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		- Values of both counters for area ratio rich to lean and lean to rich ≥ 6 times - Delay Time: - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Transient Time: - Gradient ratio not calibrated [-] - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Or - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-]	- Additional conditions: - Lambda value freeze not active - Relative fuel amount from wall applied compensation and evap purge ≤ 1.0 [-] - Split coefficient DFI/MFI-system is constant not calibrated [-] - Engine speed 1,160 – 2,520 RPM - All local injector active - Desired position lead boost pressure not calibrated - Vehicle speed not calibrated km/h - Time since engine start ≥ 5.0 s - Engine load 27.0 – 79.99% - Catalyst heating not active - Evap purge valve case 1: - Gradient of factor tank ventilation ≤ 0.01 [-] - And - Pulse duty factor of evap purge valve $> 10.0\%/s$ - For time not calibrated s - Or - Evap purge valve case 2: - Pulse duty factor of evap purge valve $\leq 10.0\%/s$ - Additional conditions:			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Evap purge ≥ 8.0 g • Or • Evap purge not active • Or • Lambda controller oscillation detected • Exhaust system lag time calculation $0.1 - 0.3$ s • Catalyst temperature $\geq 500^{\circ}\text{C}$ • Lambda control set-point prior to diagnostic fuel steps 1.0 [-] • Or • Gradient of exhaust system lag time calculation ≤ 0.1 s • Gradient of engine load $\leq 3.0\%$ • Gear shifting not active • Or • Transition from cylinder deactivation (CD) to normal operation mode finished • Exhaust gas mass flow ≥ 15.0 kg/h • Gradient of exhaust gas mass flow not calibrated kg/h • Evap purge in limp-home mode not calibrated • Or • EVAP system diagnosis not calibrated • Or			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Evap purge load high not calibrated - AIR not calibrated - AIR system diagnosis not calibrated - Time since last measurement > 2.0 s			
P0155 O2 Sensor Heater Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Out Of Range High	- O2S ceramic temperature < 725° C - And - Heater duty cycle > 95.0%	- Modeled EGT > 350° C - Heater control active	60.0 s - Multiple	2 DCY	– Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking”, page 1659 .
	Oxygen Sensors (O2S) Heater Front Rationality Check (Sensor Heating Up)	- O2S ceramic temperature < 725° C - And - Time after O2S heater on 40.0 s	- ECT @ start > -10° C - Engine shut-off-time > 10,000.0 s (During ECM keep alive-time after ignition off) < 300.0 s	40.0 s - Once / DCY	2 DCY	

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0157 O2 Sensor Circuit Low Voltage Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	- Signal voltage < 0.06 V - For time > 3.0 s - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Fuel cut off not active - Catalyst purge not active	3.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0158 O2 Sensor Circuit High Voltage Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Out Of Range High (Short To Battery Plus)	- Signal voltage > 1.08 V - For time > 0.1 s	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Lambda set value > 0.995 [-]	0.1 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0160 O2 Sensor Circuit No Activity Detected Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	- Signal voltage 0.40 – 0.60 V - For time > 3.0 s - And - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) >= 2.80 V	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded	40.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	- Internal resistance > 40,000.0 Ω - And - Exhaust temperature > 600° C	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded - Valid Ri-measurements > 10 times			
P0161 O2 Sensor Heater Circuit Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Out Of Range (During Normal Heater Operation After Dew Point Is Exceeded)	Internal resistance > 1,260.0 – 20,400.0 Ω	- Dew point exceeded - Modeled EGT 350 – 650° C - IAT > -7° C - Engine shut-off-time > 5,000.0 s - Number of checks 10.0 [-] - Fuel cut off not active - Actuator commanded on	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8- , Checking", page 1656 .
P0169 Incorrect Fuel Composition	Engine Control Module (ECM): Electronic Throttle Control	Corrections of fuel mass on single cylinders incorrect		2.0 s - Continuous	2 DCY	Check for any component or circuit fault codes and diagnose them first. If no

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Module Function Monitoring: Injection	Injection cut off incorrect				faults are found during diagnosis, and the ECM has lost a driver output, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Lambda Mode	Internal check failed	Internal engine speed > 1,200 RPM	0.5 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Mixture Control	- Correction factor incorrect - Fuel quantity incorrect				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Load Plausibility	Abs. difference between predicted and real air mass > 11.30%	Engine speed >= 1,200 RPM			

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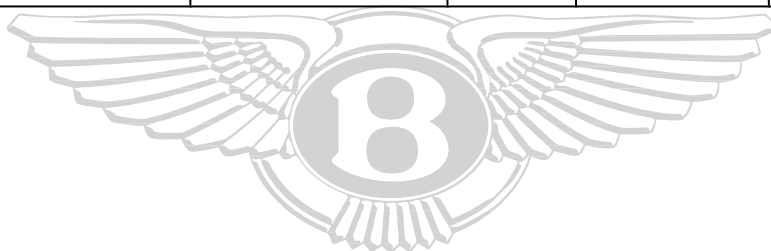
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0171 System Too Lean Bank 1	Fuel System Too Lean	- Low pass filtered lambda controller output > 23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}$ C - Lambda control closed loop - And - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0172 System Too Rich Bank 1	Fuel System Too Rich	- Low pass filtered lambda controller output < -23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}\text{C}$ - Lambda control closed loop - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0174 System Too Lean Bank 2	Fuel System Too Lean	- Low pass filtered lambda controller output > 23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}$ C - Lambda control closed loop - And - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0175 System Too Rich Bank 2	Fuel System Too Rich	- Low pass filtered lambda controller output < -23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}\text{C}$ - Lambda control closed loop - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .
P0201 Cylinder 1 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to "3.6.17 Fuel Injectors, Checking", page 1624 .
P0202 Cylinder 2 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to "3.6.17 Fuel Injectors, Checking", page 1624 .
P0203 Cylinder 3 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to "3.6.17 Fuel Injectors, Checking", page 1624 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0204 Cylinder 4 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Signal voltage 4.70 – 5.40 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking” , page 1624 .
P0205 Cylinder 5 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Signal voltage 4.70 – 5.40 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking” , page 1624 .
P0206 Cylinder 6 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Signal voltage 4.70 – 5.40 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking” , page 1624 .
P0207 Cylinder 7 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Signal voltage 4.70 – 5.40 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking” , page 1624 .
P0208 Cylinder 8 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Signal voltage 4.70 – 5.40 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking” , page 1624 .
P0221 Throttle/Pedal Position Sensor/ Switch "B" Circuit Range/Performance	Throttle Position Sensor (TPS) 2 Rationality Check	• TPS1 - TPS2 > 6.30% > • And • Actual TPS2 - calc. value > actual TPS1 - calc. value • Or • TPS2 - calc value > 9.0%	• Engine speed > 480 RPM	• 0.3 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.39 Throttle Valve Control Module GX3 , Checking” , page 1671 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0222 Throttle/Pedal Position Sensor (TPS) 2 Out Of Range Low Circuit Low	Throttle Position Sensor (TPS) 2 Out Of Range Low	Signal voltage < 0.16 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0223 Throttle/Pedal Position Sensor (TPS) 2 Out Of Range High Circuit High	Throttle Position Sensor (TPS) 2 Out Of Range High	Signal voltage > 4.88 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0234 Turbocharger (TC) Boost Control Functional Check Turbocharger "A" Overboost Condition	Turbocharger (TC) Boost Control Functional Check	Diff. set value boost pressure vs. actual boost pressure value > 27.0 – 112.5 kPa	BARO > 75.0 kPa	2.0 s - Multiple	2 DCY	- Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75, Checking", page 1677 . - Check the Combustion Air Valve - N44- . Refer to ⇒ "3.6.7 Combustion Air Valve N44, Checking", page 1605 .
P0236 Turbocharger (TC) Boost Pressure Sensor Rationality Check Boost Sensor "A" Circuit	Turbocharger (TC) Boost Pressure Sensor Rationality Check	Diff. boost pressure signal vs. barometric sensor signal > 22.0 kPa	- Engine speed < 1,000 RPM - Throttle position < 5.0%	2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71, Checking", page 1640 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
Range/Performance		Diff. boost pressure signal vs. barometric sensor signal < -12.0 kPa				
P0237 Turbo-charger/Super-charger Boost Sensor "A" Circuit Low	Turbo-charger (TC) Boost Pressure Sensor Out Of Range Low Turbo-charger (TC) Boost Pressure Sensor Short To Ground	- Pressure < 37.0 kPa - Signal voltage < 0.20 V	Engine speed > 80 RPM	2.0 s - Multiple 1.0 s - Continuous	2 DCY	– Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
P0238 Turbo-charger/Super-charger Boost Sensor "A" Circuit High	Turbo-charger (TC) Boost Pressure Sensor Out Of Range High Turbo-charger (TC) Boost Pressure Sensor Short To Battery / Open Circuit	- Pressure > 300.0 kPa - Signal voltage > 4.88 V	- Signal voltage pressure sensor > 0.20 V - Engine speed > 80 RPM	2.0 s - Multiple 1.0 s - Continuous	2 DCY	– Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
P0243 Turbo-charger/Super-charger Waste gate Actuator "A"	Turbo-charger (TC) Bypass Actuator Open Circuit	Signal voltage 4.70 – 5.40 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	– Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0245 Turbo-charger (TC) Bypass Actuator/Super-charger Waste gate Actuator "A" Low	Turbo-charger (TC) Bypass Actuator Short To Ground	Signal voltage < 2.74 – 3.26 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .
P0246 Turbo-charger (TC) Bypass Actuator/Super-charger Waste gate Actuator "A" High	Turbo-charger (TC) Bypass Actuator Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .
P0261 Fuel Injection Valves Cylinder 1 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0262 Fuel Injection Valves Cylinder 1 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0264 Fuel Injection Valves Cylinder 2 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0265 Fuel Injection Valves Cylinder 2 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0267 Cylinder 3 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 – 3.26 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0268 Cylinder 3 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Actuator commanded on • Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0270 Cylinder 4 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 – 3.26 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0271 Cylinder 4 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Actuator commanded on • Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0273 Cylinder 5 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 – 3.26 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0274 Cylinder 5 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Actuator commanded on • Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0276 Cylinder 6 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 – 3.26 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0277 Cylinder 6 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0279 Cylinder 7 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0280 Cylinder 7 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0282 Cylinder 8 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0283 Cylinder 8 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0299 Turbo-charger/Super-charger "A" Under-boost Condition	Turbo-charger (TC) Boost Pressure Control Functional Check	Diff. set value boost pressure vs. actual boost pressure value (filtered) > 20.0 kPa	- Engine speed > 2,240 – 2,760 RPM - BARO > 75.0 kPa - Diff. set value boost pressure vs. basic boost pressure value > 15.0 kPa - Boost pressure control active - Turbo charger bypass valve closed	5.0 s - Multiple	2 DCY	- Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 . - Check the Combustion Air Valve - N44- . Refer to ⇒ "3.6.7 Combustion Air Valve N44 , Checking", page 1605 .
P0300 Random/Multiple Cylinder Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 2.0%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous	2 DCY	- If a fuel system rich or lean fault exists, perform the diagnostic for those codes first. Use a scan tool and note whether the miss is specific to a few cylinders or is random. If random, check for contamination in the fuel by drawing a fuel sample. Refer to appropriate repair manual. - Check the spark plugs visually for signs of fouling. - Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Pre-

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%		200 rev - Continuous	Immediately	Preliminary Check, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . – Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0301 Cylinder 1 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	- Emission threshold misfire rate (MR) > 2.0% - Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous 200 rev - Continuous	2 DCY - Immediately	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0302 Cylinder 2 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 2.0%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%		200 rev - Continuous	Immediately	With Power Output Stage, Checking", page 1633 .
P0303 Cylinder 3 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	- Emission threshold misfire rate (MR) > 2.0% - Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous 200 rev - Continuous	2 DCY - Immediately	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. - Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0304 Cylinder 4 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	- Emission threshold misfire rate (MR) > 2.0% - Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous 200 rev - Continuous	2 DCY - Immediately	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0305 Cylinder 5 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 2.0%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%		200 rev - Continuous	Immediately	With Power Output Stage, Checking", page 1633 .
P0306 Cylinder 6 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	- Emission threshold misfire rate (MR) > 2.0% - Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous 200 rev - Continuous	2 DCY - Immediately	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. - Check the Fuel Injectors . Refer to "3.6.17 Fuel Injectors, Checking", page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0307 Cylinder 7 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	- Emission threshold misfire rate (MR) > 2.0% - Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous 200 rev - Continuous	2 DCY - Immediately	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0308 Cylinder 8 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 2.0%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%		200 rev - Continuous	Immediately	With Power Output Stage, Checking", page 1633 .
P0321 Ignition/Distributor Engine Speed Input Circuit Range/Performance	Crankshaft Position (CKP) Sensor Rationality Check	- Counted teeth vs. reference incorrect - Or - Monitoring reference gap failure		1.5 s - Multiple	2 DCY	Check the Engine Speed Sensor - G28- . Refer to ⇒ "3.6.13 Engine Speed Sensor G28, Checking", page 1616 .
	Crankshaft Position (CKP) Sensor Rationality Check: DGI Sensor	- PWM-signal not plausible - Or - Engine stop position not plausible - Or - Reverse pulse length not plausible	DGI sensor is powered during engine stop	0.5 s - Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0322 Ignition/Distributor Engine Speed Input Circuit No Signal	Crankshaft Position (CKP) Sensor Signal Activity Check	- Camshaft signals > 1.0 [-] - And - Engine speed no signal		2.5 s - Multiple	2 DCY	Check the Engine Speed Sensor - G28-. Refer to ⇒ "3.6.13 Engine Speed Sensor G28, Checking", page 1616.
P0324 Knock /Combustion Vibration Control System Error	Knock Control Internal Hardware Check	- Signal fault counter (combustion) > 48.0 [-] - Or - Signal fault counter (measuring window) > 2.0 [-]	Engine speed > 2,500 RPM	0.5 s - Multiple	2 DCY	- Check the Knock Sensor 1 - G61-. Refer to ⇒ "3.6.22 Knock Sensor 1 G61, Checking", page 1634. - Check the Knock Sensor 2 - G66-. Refer to ⇒ "3.6.23 Knock Sensor 2 G66, Checking", page 1636.
P0327 Knock /Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	Knock Sensor (KS) Short To Ground Port A Knock Sensor (KS) Short To Ground Port B Knock Sensor (KS) Signal Range Check	- Reference signal < -0.7 V - Lower threshold < 1.02 – 9.88 V	- Engine speed > 1,000 RPM - ECT > 40°C - Engine load > 49.50%	0.5 s - Continuous 2.0 s - Multiple	2 DCY	Check the Knock Sensor 1 - G61-. Refer to ⇒ "3.6.22 Knock Sensor 1 G61, Checking", page 1634.
P0328 Knock /Combustion Vibration Sensor 1 Circuit High Bank 1 or Single	Knock Sensor (KS) Short To Battery Plus Port A Knock Sensor (KS) Short To Battery Plus Port B	Signal voltage > 1.0 V	Engine speed > 1,000 RPM	0.5 s - Continuous	2 DCY	Check the Knock Sensor 1 - G61-. Refer to ⇒ "3.6.22 Knock Sensor 1 G61, Checking", page 1634.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
Sensor	Knock Sensor (KS) Signal Range Check	Upper threshold > 135.82 – 285.0 V	- Engine speed > 1,720 RPM - ECT > 40° C - Engine load > 49.50%	2.0 s - Multiple		
P0332 Knock /Combustion Vibration Sensor 2 Circuit Low Bank 2	Knock Sensor (KS) Short To Ground Port A	Reference signal < -0.7 V	Engine speed > 1,000 RPM	0.5 s - Continuous	2 DCY	Check the Knock Sensor 2 - G66- . Refer to ⇒ "3.6.23 Knock Sensor 2 G66- , Checking", page 1636 .
	Knock Sensor (KS) Short To Ground Port B					
	Knock Sensor (KS) Signal Range Check	Lower threshold < 1.02 – 9.88 V	- Engine speed > 1,720 RPM - ECT > 40° C - Engine load > 49.50%	2.0 s - Multiple		
P0333 Knock /Combustion Vibration Sensor 2 Circuit High Bank 2	Knock Sensor (KS) Short To Battery Plus Port A	Signal voltage > 1.0 V	Engine speed > 1,000 RPM	0.5 s - Continuous	2 DCY	Check the Knock Sensor 2 - G66- . Refer to ⇒ "3.6.23 Knock Sensor 2 G66- , Checking", page 1636 .
	Knock Sensor (KS) Short To Battery Plus Port B					
	Knock Sensor (KS) Signal Range Check	Upper threshold > 135.82 – 285.0 V	- Engine speed > 1,720 RPM - ECT > 40° C - Engine load > 49.50%	2.0 s - Multiple		
P0341 Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	- Signal pattern incorrect - Defect counter 8.0 [-]		0.5 s - Continuous	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- , Checking", page 1599 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0342 Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	- Signal voltage permanently low - And - Crankshaft signals 8.0 [-]		0.5 s - Continuous	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- . Checking", page 1599 .
P0343 Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	- Signal voltage permanently high - And - Crankshaft signals 8.0 [-]		0.5 s - Continuous	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- . Checking", page 1599 .
P0351 Ignition Coil "A" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage . Checking", page 1633 .
P0352 Ignition Coil "B" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage . Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0353 Ignition Coil "C" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P0354 Ignition Coil "D" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P0355 Ignition Coil "E" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P0356 Ignition Coil "F" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0357 Ignition Coil "G" Primary Control Circuit/Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0358 Ignition Coil "H" Primary Control Circuit/Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0410 AIR System "A"	Secondary Air Injection (AIR) Rationality Check Directly After Catalyst Heating	Diff. of measured AIR pressure before AIR injection vs. AIR pressure after AIR injection > 2.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - BARO > 74 kPa - AIR system commanded off	0.5 s - Once / DCY	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0418 AIR System Control "A" Circuit	Secondary Air Injection (AIR) Pump Relay Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 .
P0419 AIR System Control "B" Circuit	Secondary Air Injection (AIR) Pump Relay Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0420 Catalyst System Efficiency Below Threshold Bank 1	Catalyst System Measure Of OSC Compared To OSC Of Borderline Catalyst	- Measured OSC / OSC of borderline catalyst - Measured OSC EWMA filter value for catalyst, corrected with measured delay and transient time of oxygen sensors rear < 1.0 [-]	- Time after engine start not calibrated s - Or - Time after dew point > 90.0 s - Delta exhaust gas mass flow < 20.0 kg/h - Exhaust gas mass flow, lower range not calibrated kg/h - Exhaust gas mass flow, upper range 25.0 – 100.0 kg/h - Modeled EGT dynamic < 30.0 K - Modeled EGT in catalyst system, lower range not calibrated ° C - Modeled EGT in catalyst system, upper range 500 – 800° C - Minimum modeled EGT in catalyst system > 470° C - For time > 100.0 s - Filtered minimum modeled EGT in catalyst system > 470° C - Engine load 9.80 – 60.0% - Evap purge loading not high - Engine speed 1 000 – 2 520 RPM - Lambda enable condition monitor - Monitoring stops if lambda deviation >= 5.01 – 7.01% - With delay time >= 0.02 – 0.2 s	10.0 s - Once / DCY	1 DCY	- Check the exhaust system for leaks and correct any defects found. If any misfire or fuel trim codes are also set, correct those codes first. - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda control closed loop • Lambda control not at min or max limit • AAT > -10° C • Number of checks, no step change suspicion 1.0 [-] • Number of checks, step change suspicion 4.0 [-] • O2S front ready • O2S rear ready • AIR not active • No misfire • O2S front plausibility check in current driving cycle ready • O2S front response monitoring in current driving cycle ready			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0430 Catalyst System Efficiency Below Thresh Bank 2	Catalyst System Measure Of OSC Compared To OSC Of Borderline Catalyst	- Measured OSC / OSC of borderline catalyst - Measured OSC EWMA filter value for catalyst, corrected with measured delay and transient time of oxygen sensors rear < 1.0 [-]	- Time after engine start not calibrated s - Or - Time after dew point > 90.0 s - Delta exhaust gas mass flow < 20.0 kg/h - Exhaust gas mass flow, lower range not calibrated kg/h - Exhaust gas mass flow, upper range 25.0 – 100.0 kg/h - Modeled EGT dynamic < 30.0 K - Modeled EGT in catalyst system, lower range not calibrated ° C - Modeled EGT in catalyst system, upper range 500 – 800° C - Minimum modeled EGT in catalyst system > 470° C - For time > 100.0 s - Filtered minimum modeled EGT in catalyst system > 470° C - Engine load 9.80 – 60.0% - Evap purge loading not high - Engine speed 1,000 – 2,520 RPM - Lambda enable condition monitor - Monitoring stops if lambda deviation >= 5.01 – 7.01% - With delay time >= 0.02 – 0.2 s	10.0 s - Once / DCY	1 DCY	- Check the exhaust system for leaks and correct any defects found. If any misfire or fuel trim codes are also set, correct those codes first. - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda control closed loop • Lambda control not at min or max limit • AAT > -10° C • Number of checks, no step change suspicion 1.0 [-] • Number of checks, step change suspicion 4.0 [-] • O2S front ready • O2S rear ready • AIR not active • No misfire • O2S front plausibility check in current driving cycle ready • O2S front response monitoring in current driving cycle ready			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0441 EVAP System Incorrect Purge Flow	Evaporative Emission (EVAP) System Functional Check	- Deviation lambda control < 3.50 – 6.0% - And - Deviation idle control < 31.0%	- Choice of: - Integrated EVAP purge mass > 10.0 g - Or - Integrated air mass > 4.0 – 20.0 kg - And - Choice of: - ECT > 60° C - Or - Substitute ECT > 60° C - And - General: - Engine speed idle RPM - Engine speed not calibrated RPM - Engine speed deviation < 200 RPM - Engine load 12.0 – 34.99% - Deviation engine load <= 4.01% - AAT > 4° C - BARO > 72.0 kPa - Lambda control closed loop	22.1 s - Once / DCY	2 DCY	Check for restrictions or kinks in the EVAP pipes, including charcoal intrusion into the pipes. If pipes are free from obstruction: Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0442 EVAP System Leak Detected (Small Leak)	Evaporative Emission (EVAP) System Small Leak Pressure Check	Time for pressure drop < 1.6 – 2.6 s	- General: - Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - Intake manifold vacuum > -100.0 kPa - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Evap purge valve closed - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - And - Case 1: - AAT not calibrated ° C - AAT drop after engine start not calibrated K - Case 2: - IAT 3 – 90° C - IAT drop after engine start < 8.3 K - Deep down hill driving: - Delta BARO < 0.25 kPa - Or	239.0 s - Once / DCY	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80- Checking", page 1619 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Engine load not calibrated % - And - Delta vehicle speed not calibrated km/h			
P0444 EVAP System Purge Control Valve "A" Circuit Open	Evaporative Emission (EVAP) Canister Purge Valve Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to "3.6.14 EVAP Canister Purge Regulator Valve 1 N80- Checking" page 1619

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0455 EVAP System Leak Detected (Large Leak)	Evaporative Emission (EVAP) System Large Leak Pressure Check	Time for pressure drop < 1.0 s	- General: - Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - Intake manifold vacuum > -100.0 kPa - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Evap purge valve closed - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - And - Case 1: - AAT not calibrated ° C - AAT drop after engine start not calibrated K - Case 2: - IAT 3 – 90° C - IAT drop after engine start < 12.0 K - Deep down hill driving - Delta BARO < 0.25 kPa - Or	232.6 s - Once / DCY	2 DCY	- Inspect all the EVAP attaching pipes and hoses visually for damage. Check the gas cap for tightness. - Check the EVAP System for Leaks. Refer to ⇒ “2.2.4 EVAP System, Checking for Leaks”, page 6. - Check the EVAP Canister Purge Regulator Valve 1 - N80-. Refer to ⇒ “3.6.14 EVAP Canister Purge Regulator Valve 1 N80-, Checking”, page 1619. - Check the Leak Detection Pump - V144-. Refer to ⇒ “3.6.24 Leak Detection Pump V144-, Checking”, page 1638.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Engine load not calibrated % • And • Delta vehicle speed not calibrated km/h			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0456 EVAP System Leak Detected (Very Small Leak)	Evaporative Emission (EVAP) System Very Small Leak Pressure Check	Time for pressure drop < 3.0 – 5.8 s	- General: - Time after engine start 5.0 – 800.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - Intake manifold vacuum > -100.0 kPa - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 50.3 K - Evap purge valve closed - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - And - Case 1: - AAT not calibrated ° C - AAT drop after engine start not calibrated K - Case 2: - IAT 3 – 70° C - IAT drop after engine start < 6.8 K - Deep down hill driving - Delta BARO -0.39 – 0.20 kPa - Or	251.8 s - Once / DCY	2 DCY	- Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.14 EVAP Canister Purge Regulator Valve 1 N80- Checking”, page 1619 . - Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.24 Leak Detection Pump V144- Checking”, page 1638 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Engine load not calibrated % - And - Delta vehicle speed not calibrated km/h - Additional: - Vehicle acceleration < 4.50 m/s² - Gradient engine load < 100.01 %/seg			
P0458 EVAP System Purge Control Valve "A" Circuit Low	Evaporative Emission (EVAP) Canister Purge Valve Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80-. Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80. Checking", page 1619.
P0459 EVAP System Purge Control Valve "A" Circuit High	Evaporative Emission (EVAP) Canister Purge Valve Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80-. Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80. Checking", page 1619.



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0491 AIR System Insufficient Flow Bank 1	Secondary Air Injection (AIR) Flow Check During Catalyst Heating	- Case 1: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.51 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.25 [-] - Case 2: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.59 [-] - Case 3: - Average pressure difference between absolute value and < 0.35 - 1.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - For time > 1.0 s - BARO > 74.0 kPa - AIR system commanded on	0.0 s - Once / DCY	2 DCY	- Check the secondary air injection attaching hoses to the exhaust visually for kinks damage or obstructions. - Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 . - Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609, Checking", page 1666 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0492 AIR System Insufficient Flow Bank 2	Secondary Air Injection (AIR) Flow Check During Catalyst Heating	- Case 1: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.51 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.25 [-] - Case 2: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.59 [-] - Case 3: - Average pressure difference between absolute value and < 0.35 – 1.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - For time > 1.0 s - BARO > 74.0 kPa - AIR system commanded on	0.0 s - Once / DCY	2 DCY	- Check the secondary air injection attaching hoses to the exhaust visually for kinks damage or obstructions. - Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189- Checking", page 1664 . - Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0506 Idle Speed Control System RPM - Lower Than Expected	Idle Speed Control (ISC) Out Of Range Low	- Engine speed deviation > 100 RPM - And - RPM controller torque value $\geq$ calculated max. value Nm	- Time after engine start $\geq$ 5.0 s - Vehicle speed 0 km/h - BARO > 71.90 kPa - ECT 60 – 120° C - IAT > -11° C - Torque safety limitation not active - Accelerator pedal released by driver - For time > 1.0 s - For manual transmission: - Engine load < 34.50%	5.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0507 Idle Speed Control System RPM - Higher Than Expected	Idle Speed Control (ISC) Out Of Range High	- Engine speed deviation < -100 RPM - And - RPM controller torque value $\leq$ calculated min. value Nm - Or - Integrated number of fuel cut off transitions $\geq$ 3.0 [-]	- Time after engine start $\geq$ 5.0 s - Vehicle speed 0 km/h - BARO > 71.90 kPa - ECT 60 – 120° C - IAT > -11° C - Torque safety limitation not active - Accelerator pedal released by driver - For time > 1.0 s	5.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050A Cold Start Idle Control System Performance	Cold Start Monitoring Idle Speed Control (ISC) Out Of Range Low	- Engine speed deviation > 100 RPM - And - RPM controller torque value >= calculated max. value Nm	- Catalyst heating active - Time after engine start >= 5.0 s - BARO > 71.90 kPa - ECT -10 – 60° C - Torque safety limitation not active - Conditions vehicle speed: - Vehicle speed 0 km/h - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - Conditions driver request: - Accelerator pedal released by driver - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - For time > 1.0 s - For manual transmission: - Engine load not calibrated %	8.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Cold Start Monitoring Idle Speed Control (ISC) Out Of Range High	- Engine speed deviation < -200 RPM - And - RPM controller torque value <= calculated min. value Nm - Or - Integrated number of fuel cut off transitions not calibrated [-]	- Catalyst heating active - Time after engine start >= 5.0 s - BARO > 71.90 kPa - ECT -10 – 60° C - Torque safety limitation not active - Conditions vehicle speed: - Vehicle speed 0 km/h - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - Conditions driver request: - Accelerator pedal released by driver - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - For time > 1.0 s	4.0 s - Multiple		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050B Cold Start Ignition Timing Performance	Cold Start Monitoring Ignition Control (IC) Idle Ignition Timing Monitor	Difference between commanded spark timing vs. actual value > 16.0%	- General: - Commanded spark retard during catalyst heating < 84.0% - Catalyst heating active - For time > 4.0 s - Fuel cut off not active - BARO > 73.0 kPa - Idle condition active - Diff. relative engine load vs. filtered relative engine load <= 15.0% (For relative engine load dynamic detection) - Diff. engine speed vs. filtered engine speed <= 300 RPM (For engine speed dynamic detection) - Relative engine load <= 181.99% - Conditions vehicle speed: - Vehicle speed 0.0 km/h - Or - Engine running and decoupled from powertrain (for hybrid) not equipped	5.0 s - Once / DCY	2 DCY	- Inspect the air cleaner element and the air intake system visually for leaks. - Inspect the PCV system visually for leaks. - Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613 . - Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 . - Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597 . - Verify the latest Engine Control Module - J623- software is being used. Refer to appropriate scan tool.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P052 A Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	Cold Start Monitoring Variable Valve Timing (VVT) Intake Actuator Target Error	Difference between target position vs. actual position > 6.0° CRK	- Time after engine start >= 1.5 – 40.0 s - Engine speed >= 400 RPM - Modeled oil temperature >= -10 – 160° C - Commanded camshaft timing correction for catalyst heating active	5.0 s - Once / DCY	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .
P0544 Exhaust Gas Temperature (EGT) Sensor During Cold Start Rationality Check	Exhaust Gas Temperature (EGT) Sensor During Cold Start Rationality Check	Difference between measured and modeled exhaust gas temp. @ homogeneous running > 200.0 K	- Time after engine start 2.0 s - ECT @ engine shut-off > 80° C - IAT @ start < 40° C - ECT @ start < 40° C - Diff. between ECT @ start and IAT < 15.0 K	3.0 s - Once / DCY	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
	Exhaust Gas Temperature (EGT) Sensor During Warm Engine Running Rationality Check	Difference exhaust temperature to average of IAT and ECT @ start > 100.0 K	- Conditions for measurement window - Engine running - Engine speed > 20 RPM - Catalyst heating not active - Fuel cut off not active - Modeled exhaust gas temperature > 600° C - Monitor measurement window conditions fulfilled > 60.0 s	3.0 s - Continuous		
	Exhaust Gas Temperature (EGT) Sensor Signal Period Check	Deviation of time period > 30.0 ms				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0545 Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 1	Exhaust Gas Temperature (EGT) Sensor Out Of Range Low	Exhaust gas temperature < -37° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
P0546 Exhaust Gas Temperature Sensor Circuit High Bank 1 Sensor 1	Exhaust Gas Temperature (EGT) Sensor Out Of Range High	Exhaust gas temperature > 1,107° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
P0547 Exhaust Gas Temperature Sensor Circuit Bank 2 Sensor 1	Exhaust Gas Temperature (EGT) Sensor During Cold Start Rationality Check	Difference between measured and modeled exhaust gas temp. @ homogeneous running > 200.0 K	- Time after engine start 2.0 s - ECT @ engine shut-off > 80° C - IAT @ start < 40° C - ECT @ start < 40° C - Diff. between ECT @ start and IAT < 15.0 K	3.0 s - Once / DCY	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448- Checking", page 1622 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Exhaust Gas Temperature (EGT) Sensor During Warm Engine Running Rationality Check	Difference exhaust temperature to average of IAT and ECT @ start > 100.0 K	- Conditions for measurement window - Engine running - Engine speed > 20 RPM - Catalyst heating not active - Fuel cut off not active - Modeled exhaust gas temperature > 600° C - Monitor measurement window conditions fulfilled > 60.0 s	3.0 s - Continuous		
	Exhaust Gas Temperature (EGT) Sensor Signal Period Check	Deviation of time period > 30.0 ms				
P0548 Exhaust Gas Temperature Sensor Circuit Low Bank 2 Sensor 1	Exhaust Gas Temperature (EGT) Sensor Out Of Range Low	Exhaust gas temperature < -37° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448- . Checking", page 1622 .
P0549 Exhaust Gas Temperature Sensor Circuit High Bank 2 Sensor 1	Exhaust Gas Temperature (EGT) Sensor Out Of Range High	Exhaust gas temperature > 1,107° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448- . Checking", page 1622 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0555 Brake Booster Pressure Sensor Short To Battery / Open Circuit	Brake Booster Pressure Sensor Short To Battery / Open Circuit	Signal voltage > 4.95 V	Time after ignition on > 500.0 ms	0.4 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ “3.6.2 Brake Pressure Sensor 1 G201, Checking”, page 1595 .
P0556 Brake Booster Pressure Sensor Out Of Range Low Brake Booster Pressure Sensor Out Of Range High Brake Booster Pressure Sensor Rationality Check Brake Vacuum Pump Functional Check	Brake Booster Pressure Sensor Out Of Range Low	Brake booster pressure < 10.0 kPa	Brake light switch off	0.2 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ “3.6.2 Brake Pressure Sensor 1 G201, Checking”, page 1595 .
	Brake Booster Pressure Sensor Out Of Range High	Brake booster pressure > 119.0 kPa		0.2 s - Multiple		
	Brake Booster Pressure Sensor Rationality Check	- Diff. brake booster pressure vs. BARO > 255.0 kPa - Or - Gradient brake booster pressure > 1278.98 kPa/s				
	Brake Vacuum Pump Functional Check	Brake booster pressure difference between measurement 1 and 2 < 1.50 – 4.50 kPa	- Monitor entry conditions: - Vacuum pump commanded on - For time > 0.1 s - Brake light switch off - Brake booster pressure >= (barometric pressure * 0.20) + 15.0 kPa - Pressure measurement 1: - Entry conditions fulfilled - Pressure measurement 2: - Time after entry conditions fulfilled 1.0 s	0.0 s - Multiple		

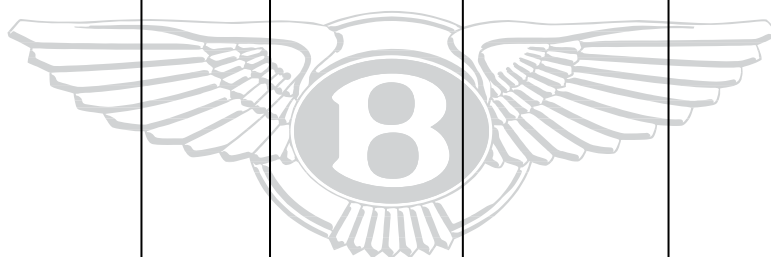
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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0557 Brake Booster Pressure Sensor Circuit Low	Brake Booster Pressure Sensor Short To Ground	Signal voltage < 0.10 V	Time after ignition on > 500.0 ms	0.4 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201, Checking", page 1595 .
P0562 System Voltage Low	Engine Control Module (ECM): Internal Timer Check Power Supply For ECM Internal Time	Internal check failure	Power on reset on/off	Once / DCY	1 DCY	Perform a charging system check and battery test to determine if the battery or charging system need to be serviced. Refer to appropriate repair manual.
P0606 Control Module Processor	Barometric Pressure (BARO) Sensor Rationality Check	- Diff. barometric sensor signal vs. boost pressure signal > 6.0 kPa - And - Diff. barometric sensor vs. last driving cycle > 10.0 kPa - Diff. barometric sensor signal vs. boost pressure signal < -9.0 kPa - And - Diff. barometric sensor vs. last driving cycle > 10.0 kPa - Signal gradient > 0.25 kPa/s - Signal gradient < -0.25 kPa/s	- Time after engine start < 5.0 s - Engine speed < 1,000 RPM - Throttle position < 5.0%	2.0 s - Once / DCY 2.0 s - Continuous	2 DCY	Check for any component or circuit fault codes and diagnose them first. If no faults are found during diagnosis, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Barometric Pressure (BARO) Sensor Out Of Range Low	Measured barometric pressure < 50.0 kPa				
	Barometric Pressure (BARO) Sensor Out Of Range High	Measured barometric pressure > 115.0 kPa				
	Barometric Pressure (BARO) Sensor Short To Ground	Signal voltage < 0.20 V		1.0 s - Multiple		
	Barometric Pressure (BARO) Sensor Short To Battery / Open Circuit	Signal voltage > 4.80 V				
	Ignition Control (IC) Communication Check	- Internal check failure - SPI communications check identifier failure	Engine speed not calibrated RPM	0.5 s - Continuous		
	Engine Control Module (ECM): 5V Supply Voltage	Internal hardware check under- / over-voltage detection		2.0 s - Continuous		
	Engine Control Module (ECM): Cylinder Deactivation (CD) Function Monitoring: Cylinder Deactivation (CD)	- Injection pattern incorrect - Or - Ignition pattern incorrect - Or - Transition from cylinder deactivation (CD) to normal operation mode failed	- Cylinder deactivation (CD) commanded on - Engine speed > 1,200 RPM	0.2 s - Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): EEPROM Functional Check	Internal checksum failed	Ignition on	0.5 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: A/D Converter	- Comparison reference voltage with sensor voltage incorrect - Internal check failed - Test voltage check failed				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Torque	- Torque deviation for time > 0.5 s - Or - Integrated relative torque deviation > 8.0%*s	Internal engine speed > 1,000 RPM	0.0 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Engine Speed Deviation	Difference between calculated and internal engine speed > 320 RPM	Internal engine speed > 520 RPM	0.5 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Coding	Internal check failed				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Ignition Timing					
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Intern	System reaction incorrect				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Injection Rate Limitation					
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Cylinder Deactivation (CD)	- Injection on deactivated cylinders active - Or - Ignitions on deactivated cylinders active	Cylinder deactivation (CD) active	2.0 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Accelerator Position	Comparison voltage sensor 1 with sensor 2 implausible		0.5 s - Continuous		



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): Electronic Throttle Control Module Monitoring Module	- Function controller check failed - And - Monitoring module check no failure	SPI - interface no failure			
	Engine Control Module (ECM): Processor CY150 Communication Check	Internal check incorrect		0.05 s - Continuous		
	Engine Control Module (ECM): RAM Controller RAM Check	Memory checksum error detected	ECM initialization phase active	- None [-] - Once / DCY		
	Engine Control Module (ECM): Sensor Integrated Circuit Internal Hardware Check (Electrical Adjustment Communication, Voltage Supply)	Check failed		0.5 s - Continuous		
	Engine Control Module (ECM): WDA Function Monitoring: WDA	- Over voltage detection failure - Internal check failure - General cause failure				
P0627 Fuel Pump "A" Control Circuit/ Open	Fuel Pump (FP) Relay Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay - J17- / Fuel Pump 1 - V276- . Refer to ⇒ "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276- . Checking", page 1628 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Pump (FP) Relay Short To Ground	Signal voltage < 2.74 – 3.26 V				
P0629 Fuel Pump "A" Control Circuit High	Fuel Pump (FP) Relay Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed > 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay - J17- / Fuel Pump 1 - V276- . Refer to ⇒ "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276- Checking", page 1628 .
P0638 Throttle Actuator Range/Performance Bank 1	Throttle Actuator Rationality Check Close Movement	- Time to close to reference point > 0.6 s - AND - Deviation to reference point > 3.00%	- Engine speed 0 RPM - Vehicle speed 0 km/h - ECT > 5° C - IAT > 5° C - First start of DCY - Ignition on - Or - Engine stop - Engine after run active - Number of checks 3.0 [-]	5.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3- Checking", page 1671 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Throttle Actuator Signal Range Check @ Mechanical Stop Low (Only Once After EE-PROM Reset)	- TPS 1 signal voltage < 0.21; > 0.87 V - Or - TPS 2 signal voltage < 4.14; > 4.84 V	- Engine speed 0 RPM - Vehicle speed 0 km/h - First start of DCY - Ignition on - ECT 5 – 101° C - IAT 5 – 143° C - Or - Engine stop - Engine after run active - ECT 5 – 101° C - IAT 5 – 143° C	0.3 s - Multiple		
P0641 Sensor Reference Voltage "A" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit A Short Circuit	Signal voltage < 4.8; > 5.2 V		0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0651 Sensor Reference Voltage "B" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit B Short Circuit	Signal voltage < 4.8; > 5.2 V		0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0657 Actuator Supply Voltage "A" Circuit/Open	Engine Components Supply Voltage Relay Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 .
P0658 Actuator Supply Voltage "A" Circuit Low	Engine Components Supply Voltage Relay Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 .
P0659 Actuator Supply Voltage "A" Circuit High	Engine Components Supply Voltage Relay Short To Battery Plus	Signal current > 0.06 – 10.0 A	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P068 A ECM / PCM Power Relay De-Energized Performance - Too Early	Main Relay Functional Check - Early Opening	Defect counter ≥ 3.0 [-]	Ignition on	0.0 s - Once / DCY	2 DCY	- Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 . - Check the Motronic Engine Control Module Power Supply Relay 2 - J670- . Refer to ⇒ "3.6.29 Motronic Engine Control Module Power Supply Relay 2 J670, Checking", page 1648 .
P0697 Sensor Reference Voltage "C" Circuit / Open	Engine Control Module (ECM): Sensor Reference Circuit C Short Circuit	Signal voltage < 4.8; > 5.2 V		0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P13E A Cold Start Ignition Timing Performance Off Idle	Cold Start Monitoring Ignition Control (IC) Part Load Ignition Timing Monitor	Difference between commanded spark timing vs. actual value > 18.0%	- General: - Commanded spark retard during catalyst heating < 90.0% - Catalyst heating active - For time > 4.0 s - Fuel cut off not active - BARO > 73.0 kPa - Diff. relative engine load vs. filtered relative engine load <= 15.0% (For relative engine load dynamic detection) - Diff. engine speed vs. filtered engine speed <= 300 RPM (For engine speed dynamic detection) - Idle condition not active - Vehicle speed >= 2 km/h - Additional (only for hybrid): - Engine running and decoupled from powertrain not equipped	2.5 s - Once / DCY	2 DCY	Check for any engine speed sensor or ignition coil faults and diagnose them first. If no other faults are set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P1427 Brake Vacuum Pump Activation Short Circuit To B+	Brake Vacuum Pump Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Engine speed >= 80 RPM - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to ⇒ "3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 - Checking", page 1674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P1428 Brake Vacuum Pump Activation Short Circuit To Ground	Brake Vacuum Pump Short To Ground	Signal voltage < 2.74 – 3.26 V	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to ⇒ “3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 , Checking”, page 1674 .
P1429 Brake Vacuum Pump Activation Open Circuit	Brake Vacuum Pump Open Circuit	Signal voltage 4.70 – 5.40 V	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to ⇒ “3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 , Checking”, page 1674 .
P150 A Engine Off Timer Performance	Engine Off Time Comparison Of Engine Off Time From Instrument Cluster Control Unit With Engine After Run Time	- Difference between engine-off time and ECM after-run time < -12.0 s - Difference between engine-off time and ECM after-run time > 12.0 s	- Ignition on - CAN active - Ignition on - CAN active (during ECM keep alive time)	2.0 s - Once / DCY	2 DCY	If ignition off B+ is lost to ECM, this code will set. Check power and ground inputs to ECM first. Refer to appropriate wiring diagram. If all power/grounds to ECM are present, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P166 F Partial Engine Operation Deactivated	Engine Control Module (ECM): Cylinder Deactivation (CD) Vehicle In Cylinder Deactivation Service Mode	Cylinder deactivation service mode active	Ignition on	0.0 s - Continuous	1 DCY	If a relative cylinder deactivation fault is also set diagnose and repair those faults first. If there are no other faults stored, check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .
P169 A Loading Mode Active	Engine Control Module (ECM): Transport Mode Function Monitoring: Mode Change	Transport mode active	- For activation: - During ECM keep alive-time after ignition off - Vehicle speed ≤ 5 km/h - Engine speed 0 RPM - Max trip mileage since initial vehicle start-up < 100.0 km - Production mode not active - For hybrid: - Drive motor off	0.0 s - Continuous	1 DCY	Vehicle in transport mode. Refer to appropriate repair manual. May need to perform readiness check. Refer to ⇒ "3.2 Readiness Code", page 14 .
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	Variable Valve Timing (VVT) Intake Actuator Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	Variable Valve Timing (VVT) Intake Actuator Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Fuel System Out Of Range Low	I-part of 2nd lambda control loop < -0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0 %/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 . - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Fuel System Out Of Range High	• I-part of 2nd lambda control loop > 0.030 [-]	• General: • Modeled EGT 400 – 800° C • For time not calibrated s • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • And • Integrated exhaust gas mass > 100.0 g • After the following mixture disturbances: • Time fuel cut off > 0.5 s • Deviation engine load > 6.0 %/rev • ECT < 50° C • Catalyst heating active • AIR active • Lambda set point < 1; > 1 [-] • Catalyst purge active • Engine speed not calibrated RPM • For time not calibrated s • Disabling the offset adaptation after repeated transients within a short time: • Acceleration enrichment active	• 120.0 s • Continuous	• 2 DCY	– Check the bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking”, page 1650 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 1653 . – Check the Three Way Catalytic Converter (TWC). Refer to ⇒ “3.6.38 Three Way Catalytic Converter (TWC), Checking”, page 1670 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration leanment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 • Within time not calibrated s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2098 Post Catalyst Fuel Trim System Too Lean Bank 2	Fuel System Out Of Range Low	I-part of 2nd lambda control loop < -0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0 %/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 2 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 . - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 . - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ “3.6.38 Three Way Catalytic Converter (TWC), Checking”, page 1670 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2099 Post Catalyst Fuel Trim System Too Rich Bank 2	Fuel System Out Of Range High	I-part of 2nd lambda control loop > 0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0 %/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 2 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 . - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration enleanment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 • Within time not calibrated s			
P2101 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Actuator Signal Range Check	• Duty cycle > 80% • And • ECM power stage no failure		• 5.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
	Throttle Actuator Rationality Check	• Deviation throttle value angles vs. throttle value set point > 4.0 – 50.0%		• 0.5 • Continuous		
P2106 Throttle Actuator Short To Battery Plus / Short To Ground Control System - Forced Limited Power	Throttle Actuator Open Circuit	• Internal check failed	• Duty cycle > 80% • Or • Deviation throttle value angles vs. throttle value set point > 4.0 – 50.0%	• 0.5 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
	Throttle Actuator Temperature / Current Monitoring					
	Throttle Actuator Functional Check					

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2119 Throttle Actuator Signal Range "A" Control Throttle Body Range/Performance	Throttle Actuator Signal Range Check @ Mechanical Stop Low	- TPS 1 signal voltage < 0.21; > 0.87 V - Or - TPS 2 signal voltage < 4.14; > 4.84 V	- Engine speed 0 RPM - Vehicle speed 0 km/h - First start of DCY - Ignition on - ECT 5 – 101° C - IAT 5 – 143° C - Or - Engine stop - Engine after run active - ECT 5 – 101° C - IAT 5 – 143° C	0.3 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P2122 Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	Accelerator Pedal Position (APP) Sensor 1 Out Of Range Low	Signal voltage < 0.61 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2 , Checking", page 1593 .
P2123 Throttle/ Pedal Position Sensor/ Switch "D" Circuit High	Accelerator Pedal Position (APP) Sensor 1 Out Of Range High	Signal voltage > 4.79 V	Protected by copyright. Copying for private or commercial purposes, in whole, is not permitted unless authorised by Bentley Motors. Bentley Motors does not accept any liability with respect to the correctness of information in this document. Copyright by Bentley Motors.	0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2 , Checking", page 1593 .
P2127 Throttle/ Pedal Position Sensor/ Switch "E" Circuit Low	Accelerator Pedal Position (APP) Sensor 2 Out Of Range Low	Signal voltage < 0.27 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2 , Checking", page 1593 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2128 Throttle/Pedal Position Sensor/Switch "E" Circuit High	Accelerator Pedal Position (APP) Sensor 2 Out Of Range High	Signal voltage > 2.43 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2138 Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	Accelerator Pedal Position (APP) Sensor 1 And 2 Rationality Check	Signal voltage sensor 1 vs. 2 > 0.17 – 0.70 V	- Signal voltage sensor 1 > 445.0 mV - Signal voltage sensor 2 > 445.0 mV	0.24 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2177 Fuel System Too Lean @ Part Load 1	Fuel System Too Lean @ Part Load	Adaptive value > 20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10 – 60% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Lean @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10 – 60% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			
P2178 System Too Rich Off Idle Bank 1	Fuel System Too Rich @ Part Load	Adaptive value < -20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10 – 60% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. Refer to appropriate repair manual. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Rich @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10 – 60% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			
P2179 System Too Lean Off Idle Bank 2	Fuel System Too Lean @ Part Load	Adaptive value > 20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10 – 60% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Lean @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10 – 60% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			
P2180 System Too Rich @ Idle Bank 2	Fuel system Too Rich @ Part Load	Adaptive value < -20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10 – 60% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	80.0 s - Continuous	2 DCY	- Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. Refer to appropriate repair manual. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Rich @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10 – 60% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2181 Cooling System Performance	Engine Cooling System Performance Not In The Expected Range	- Cooling system temperature too low after a sufficient MAF integral < 82° C - For time >= 5.0 s	- Monitor entry conditions: - ECT @ start -8 – 60° C - And - AAT -8 – 55° C - Or - IAT not calibrated ° C - Begin of air mass integration: - ECT > 40° C - Conditions for diagnosis: - MAF < 400.0 kg/h - Delta BARO < 1.50 kPa - Delta AAT K - And - Accum. time required < 140.0 s - Or - Accum. integrated air mass not calibrated kg - Accumulation enable if - Fuel cut off active - Or - Engine load > 100.0% - Or - Engine load < 14.0 – 30.0% - Start of fault decision: - Integrated air mass > 9.24 – 19.69 kg - Conditions at fault decision: (Average values since start)	0.0 (Unified 740.0) s - Once / DCY	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- MAF (lower threshold) $\geq$ 32.0 – 86.40 kg/h - MAF (upper threshold) $\leq$ 100.0 – 260.0 kg/h - Vehicle speed (lower threshold) $\geq$ 15 – 40 km/h - Vehicle speed (upper threshold) $\leq$ 120 km/h			
P2187 System Too Lean at Idle Bank 1	Fuel System Too Lean @ Idle	Adaptive value $>$ 5.48%	- Number of injections after engine start $>$ 1,000 [-] - Engine speed 520 – 1,040 RPM - Engine load 4 – 16% - ECT $>$ 55° C - IAT $<$ 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- . Checking", page 1653.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2188 System Too Rich at Idle Bank 1	Fuel System Too Rich @ Idle	Adaptive value < -5.48%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 1,040 RPM - Engine load 4 – 16% - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
P2189 System Too Lean at Idle Bank 2	Fuel System Too Lean @ Idle	Adaptive value > 5.48%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 1,040 RPM - Engine load 4 – 16% - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- Check for air leaks behind the Bank 1 MAF including intake manifold. Check the Bank 2 exhaust system for leaks before the upstream O2S. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2190 System Too Rich at Idle Bank 2	Fuel System Too Rich @ Idle	Adaptive value < -5.48%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 1,040 RPM - Engine load 4 – 16% - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11-. Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659.

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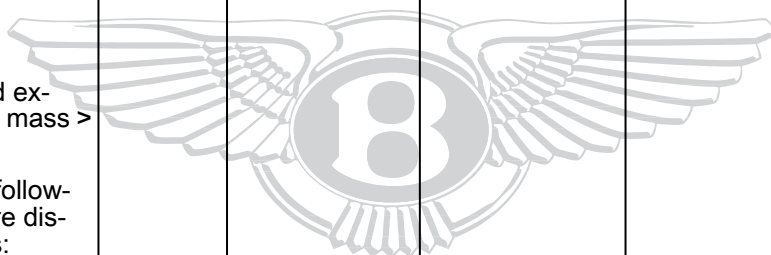
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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2195 O2 Sensor Signal Biased / Stuck Lean Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range High	Delta lambda of 2nd lambda control loop > 0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0 %/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking”, page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.00 - 180.0 kg/h • Or • Exhaust gas mass flow 30.0 - 180.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2196 O2 Sensor Signal Biased / Stuck Rich Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range Low	Delta lambda of 2nd lambda control loop < -0.070	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0 %/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• And • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2197 O2 Sensor Signal Biased / Stuck Lean Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range High	Delta lambda of 2nd lambda control loop > 0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0 %/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.00 - 180.0 kg/h • Or • Exhaust gas mass flow 30.0 - 180.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2198 O2 Sensor Signal Biased / Stuck Rich Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range Low	Delta lambda of 2nd lambda control loop < -0.070	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0 %/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• And • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 C Cylinder 1 Air-Fuel Ratio Imbalance	Fuel System A/F cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to → "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 D Cylinder 2 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 E Cylinder 3 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 F Cylinder 4 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.11 - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A0 Cylinder 5 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A1 Cylinder 6 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A2 Cylinder 7 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A3 Cylinder 8 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range high	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2237 O2 Sensor Positive Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Pump Current (IP)	• O2S voltage signal front 1.46 – 1.54 V • And • Difference between maximum and minimum value of O2S voltage signal front < 0.01 V • And • Delta lambda controller > 0.10 [-] • Or • Lambda control at min or max limit	• General: • O2S ceramic temp > 725° C • Heater control closed loop • Case fuel cut off: • Electrical adjustment not active • Evap purge valve ready • Case else: • Lambda modulation > 0.01 [-] • Lambda control closed loop • If stepwise change lambda set point • Commanded delta lambda step 0.05 [-]	• 6.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking”, page 1653 .
		• O2S voltage signal front 1.46 – 1.54 V • And • Difference between maximum and minimum value of O2S voltage signal front < 0.01 V • And • No reaction on commanded stepwise change of lambda set point <> 1		• 5.0 s • Continuous		
		• O2S voltage signal front < 1.55 V • And • Fuel cut off > 3.0 s				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2240 O2 Sensor Positive Current Control Circuit/ Open Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Pump Current (IP)	- O2S voltage signal front 1.46 – 1.54 V - And - Difference between maximum and minimum value of O2S voltage signal front < 0.01 V - And - Delta lambda controller > 0.10 [-] - Or - Lambda control at min or max limit	- General: - O2S ceramic temp > 725° C - Heater control closed loop - Case fuel cut off: - Electrical adjustment not active - Evap purge valve ready - Case else: - Lambda modulation > 0.01 [-] - Lambda control closed loop - If stepwise change lambda set point - Commanded delta lambda step 0.05 [-]	6.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .
		- O2S voltage signal front 1.46 – 1.54 V - And - Difference between maximum and minimum value of O2S voltage signal front < 0.01 V - And - No reaction on commanded stepwise change of lambda set point <> 1		5.0 s - Continuous		
		- O2S voltage signal front < 1.55 V - And - Fuel cut off > 3.0 s				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2243 O2 Sensor Reference Voltage Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Nernst Voltage (UN)	- O2S voltage signal front < 0.20; > 4.70 V - Internal resistance > 950.0 Ω	Heater control active	20.0 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
P2247 O2 Sensor Reference Voltage Circuit/ Open Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Nernst Voltage (UN)	- O2S voltage signal front < 0.20; > 4.70 V - Internal resistance > 950.0 Ω	Heater control active	20.0 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .
P2257 AIR System Control "A" Circuit Low	Secondary Air Injection (AIR) Pump Relay Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- Checking", page 1661 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2258 AIR System Control "A" Circuit High	Secondary Air Injection (AIR) Pump Relay Short To Battery Plus	Signal current > 0.60 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- . Checking", page 1661 .
P2259 AIR System Control "B" Circuit Low	Secondary Air Injection (AIR) Pump Relay Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189- . Checking", page 1664 .
P2260 AIR System Control "B" Circuit High	Secondary Air Injection (AIR) Pump Relay Short To Battery Plus	Signal current > 0.60 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189- . Checking", page 1664 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2270 O2 Sensor Signal Biased / Stuck Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Lean	Sensor voltage < 0.72 V	- O2S rear ready - Integrated exhaust gas mass after O2S rear ready ≥ 0.30 kg - Injection valve commanded on - Engine running - If - Integrated exhaust gas mass ≥ 1.50 kg - Or - Error suspicion set - Then - Enabling lambda ramp slope of the lambda ramp 0.05 1/s - Target lambda of the lambda ramp 0.85 [-] - Exhaust gas mass during ≥ 0.07 kg - Target lambda reached ≤ 0.85 [-] - If - Time fuel cut off > 5.0 s - Then disabling for - Time delay after fuel cut off 5.0 s - Additional Conditions: - Scavenging-rate not calibrated [-] - Integrated exhaust gas mass not calibrated kg - Split factor DFI/MFI not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - Engine speed 1,000 – 3,520 RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF 50.0 – 260.0 kg/h - Within time 1.0 s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2271 O2 Sensor Signal Biased / Stuck Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Rich	Sensor voltage > 0.20 V	- General: - O2S rear ready - Integrated exhaust gas mass after O2S rear ready >= 0.30 kg - Injection valve commanded on - Engine running - Case 1: (During lambda ramp activation) false - If - Integrated exhaust gas mass not calibrated kg - Or - Error suspicion not calibrated - Then - Enabling lambda ramp not calibrated - Slope of the lambda ramp not calibrated 1/s - Target lambda of the lambda ramp not calibrated [-] - Exhaust gas mass during not calibrated kg - Target lambda reached not calibrated [-] - If - Time fuel cut off not calibrated s - Then disabling for - Time delay after fuel cut off not calibrated s - Additional conditions: - Scavenging-rate not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Integrated exhaust gas mass not calibrated kg - Split factor DFI/ MFI not calibrated [-] - modeled exhaust gas temperature fitted position O2S rear not calibrated ° C - Engine speed not calibrated RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF not calibrated kg/h - Within time not calibrated s - Case 2: (During fuel cut off) true - Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - O2S front lambda value (for wide range sensor) > 8.0 [-] - O2S front voltage (for binary sensor) not calibrated V - Fuel cut off active - Integrated O2 mass during fuel cut off >= 6.0 g - Time delay not calibrated s			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2272 O2 Sensor Signal Biased / Stuck Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Lean	Sensor voltage < 0.72 V	- O2S rear ready - Integrated exhaust gas mass after O2S rear ready ≥ 0.30 kg - Injection valve commanded on - Engine running - If - Integrated exhaust gas mass ≥ 1.50 kg - Or - Error suspicion set - Then - Enabling lambda ramp slope of the lambda ramp 0.05 1/s - Target lambda of the lambda ramp 0.85 [-] - Exhaust gas mass during ≥ 0.07 kg - Target lambda reached ≤ 0.85 [-] - If - Time fuel cut off > 5.0 s - Then disabling for - Time delay after fuel cut off 5.0 s - Additional Conditions: - Scavenging-rate not calibrated [-] - Integrated exhaust gas mass not calibrated kg - Split factor DFI/MFI not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - Engine speed 1,000 – 3,520 RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF 50.0 – 260.0 kg/h - Within time 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2273 O2 Sensor Signal Biased / Stuck Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Rich	Sensor voltage > 0.20 V	- General: - O2S rear ready - Integrated exhaust gas mass after O2S rear ready >= 0.30 kg - Injection valve commanded on - Engine running - Case 1: (During lambda ramp activation) false - If - Integrated exhaust gas mass not calibrated kg - Or - Error suspicion not calibrated - Then - Enabling lambda ramp not calibrated - Slope of the lambda ramp not calibrated 1/s - Target lambda of the lambda ramp not calibrated [-] - Exhaust gas mass during not calibrated kg - Target lambda reached not calibrated [-] - If - Time fuel cut off not calibrated s - Then disabling for - Time delay after fuel cut off not calibrated s - Additional conditions: - Scavenging-rate not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Integrated exhaust gas mass not calibrated kg - Split factor DFI/ MFI not calibrated [-] - modeled exhaust gas temperature fitted position O2S rear not calibrated ° C - Engine speed not calibrated RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF not calibrated kg/h - Within time not calibrated s - Case 2: (During fuel cut off) true - Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - O2S front lambda value (for wide range sensor) > 8.0 [-] - O2S front voltage (for binary sensor) not calibrated V - Fuel cut off active - Integrated O2 mass during fuel cut off >= 6.0 g - Time delay not calibrated s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2279 MAP/MAF - Throttle Position Correlation	Intake Manifold Adaptation Value Monitoring	- Offset value throttle mass flow > 13.0 kg/h - And - Correction factor > 0.97 [-]	- Desired MAF 5.0 – 50.0 kg/h - ECT -48 – 143° C - BARO not calibrated kPa - Evap purge valve closed - EGR not equipped	3.0 s - Multiple	2 DCY	- This code will set if the calculated air intake is more than the MAF actual value. Check visually for air leaks after the MAF sensor. Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70 . Checking", page 1644 . - Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 . Checking", page 1646 .
P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage . Checking", page 1633 .
P2301 Ignition Coil "A" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage . Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2307 Ignition Coil "C" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230A Cylinder 1 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 B Cylinder 2 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230C Cylinder 3 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230D Cylinder 4 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230E Cylinder 5 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 F Cylinder 6 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P2312 Ignition Coil "E" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P2313 Ignition Coil "E" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P2315 Ignition Coil "F" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2316 Ignition Coil "F" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2318 Ignition Coil "G" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2319 Ignition Coil "G" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P231 A Cylinder 7 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P231 B Cylinder 8 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2321 Ignition Coil "H" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2322 Ignition Coil "H" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2400 EVAP System Leak Detection Pump Control Circuit/ Open	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Open Circuit	Signal voltage 4.70 – 5.40 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.24 Leak Detection Pump V144, Checking", page 1638 .
P2401 EVAP System Leak Detection Pump Control Circuit Low	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Ground	Signal voltage < 2.74 – 3.26 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.24 Leak Detection Pump V144, Checking", page 1638 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2402 EVAP System Leak Detection Pump Control Circuit High	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Leak Detection Pump - V144-. Refer to ⇒ “3.6.24 Leak Detection Pump V144-. Checking”, page 1638 .
P2403 EVAP System Leak Detection Pump Sense Circuit/Open	Leak Detection Pump (LDP) Reed Sensor Rationality Check Unable To Close	Low signal voltage > 0.5 s	- Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - BARO > 73.40 kPa - Integrated EVAP purge mass > 39.8 g - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Evap purge valve ready - LDP commanded off - ECT 4 – 110° C - ECT @ start 4 – 110° C - Case 1: - AAT not calibrated ° C - Case 2: - IAT 3 – 90° C	0.5 s - Once / DCY	2 DCY	Check the Leak Detection Pump - V144-. Refer to ⇒ “3.6.24 Leak Detection Pump V144-. Checking”, page 1638 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2404 EVAP System Leak Detection Pump Sense Circuit Range/Performance	Leak Detection Pump (LDP) Reed Sensor Rationality Check Unable To Open	- High signal voltage > 12.0 s - And - Number of checks 30.0 [-] - Cumulative time of high signal voltage during pumping not calibrated s	- Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Intake manifold vacuum > -100.0 kPa - Evap purge valve closed, ready - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - Case 1: - AAT not calibrated ° C - Case 2: - IAT 3 – 70° C	12.0 s - Once / DCY - Not calibrated s - Once / DCY	2 DCY	Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.24 Leak Detection Pump V144 , Checking", page 1638 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check (Check For Sensor At Ambient Air)	- Threshold 1: signal voltage 2.71 – 5.0 V - Threshold 2: signal voltage 2.05 – 3.06 V - Depending on gain factor, that actual is used for sensor characteristic, the threshold is	- Lambda set value < 1.6 [-] - O2S ceramic temperature > 665° C - Fuel cut off not active - Heater control closed loop - If low fuel signal then wait > 600.0 s - Only AIR system - AIR not active	10.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking”, page 1653 .
P2415 O2 Sensor Exhaust Sample Error Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check (Check For Sensor At Ambient Air)	- Threshold 1: signal voltage 2.71 – 5.0 V - Threshold 2: signal voltage 2.05 – 3.06 V - Depending on gain factor, that actual is used for sensor characteristic, the threshold is	- Lambda set value < 1.6 [-] - O2S ceramic temperature > 665° C - Fuel cut off not active - Heater control closed loop - If low fuel signal then wait > 600.0 s - Only AIR system - AIR not active	10.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking”, page 1659 .
P2431 AIR System Air Flow/Pressure Sensor Circuit Range/Performance Bank 1	Secondary Air Injection (AIR) Pressure Sensor Rationality Check	Diff. between AIR pressure and BARO < -6.0; > 6.0 kPa	- Actuator commanded off - BARO valid	0.01 s - Once / DCY	2 DCY	Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ “3.6.36 Secondary Air Injection Sensor 1 G609- Checking”, page 1666 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2432 AIR System Air Flow/Pressure Sensor Circuit Low Bank 1	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage < 0.40 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609- Checking", page 1666 .
P2433 AIR System Air Flow/Pressure Sensor Circuit High Bank 1	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage > 4.60 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609- Checking", page 1666 .
P2436 AIR System Air Flow/Pressure Sensor Circuit Range/Performance Bank 2	Secondary Air Injection (AIR) Pressure Sensor Rationality Check	Diff. between AIR pressure and BARO < -6.0; > 6.0 kPa	- Actuator commanded off - BARO valid	0.01 s Once / DCY	2 DCY	Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .
P2437 AIR System Air Flow/Pressure Sensor Circuit Low Bank 2	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage < 0.40 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2438 AIR System Air Flow/Pressure Sensor Circuit High Bank 2	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage > 4.60 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .
P2440 AIR System Switching Valve Stuck Open Bank 1	Secondary Air Injection (AIR) Stuck Open	- Case 1: - Relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while AIR valve closed) > 1.50 [-] - Case 2: - Average pressure difference between absolute value and filtered value while AIR valve closed > 0.30 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - BARO > 74 kPa - AIR system commanded on - Additional conditions: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.59 [-]	0.0 s - Once / DCY	2 DCY	- Check the combination valve for correct secondary air injection operation. Refer to appropriate repair manual. - Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- Checking", page 1661 .



DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2442 AIR System Switching Valve Stuck Open Bank 2	Secondary Air Injection (AIR) Stuck Open	- Case 1: - Relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while AIR valve closed) > 1.50 [-] - Case 2: - Average pressure difference between absolute value and filtered value while AIR valve closed > 0.30 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - BARO > 74 kPa - AIR system commanded on - Additional conditions: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.59 [-]	0.0 s - Once / DCY	2 DCY	- Check the combination valve for correct secondary air injection operation. Refer to appropriate repair manual. - Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189- Checking", page 1664 .
P25F6 AIR System "B"	Secondary Air Injection (AIR) Rationality Check Directly After Catalyst Heating	Diff. of measured AIR pressure before AIR injection vs. AIR pressure after AIR injection > 2.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - For time > 1.0 s - BARO > 74 kPa - AIR system commanded off	0.5 s - Once / DCY	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189- Checking", page 1664 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2632 Fuel Pump (FP) Relay "B" Control Circuit / Open	Fuel Pump (FP) Relay Open Circuit	• Signal voltage 4.70 – 5.40 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Pump Relay 2 - J49- / Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277 - Checking", page 1630 .
P2633 Fuel Pump (FP) Relay "B" Control Circuit Low	Fuel Pump (FP) Relay Short To Ground	• Signal voltage < 2.74 – 3.26 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Pump Relay 2 - J49- / Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277 - Checking", page 1630 .
P2634 Fuel Pump (FP) Relay "B" Control Circuit High	Fuel Pump (FP) Relay Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Actuator commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Pump Relay 2 - J49- / Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277 - Checking", page 1630 .
P3081 Engine Coolant Temperature (ECT) Sensor Rationality Too Low	Engine Coolant Temperature (ECT) Sensor Rationality Check	• Diff. between reference model temperature and measured ECT > 15.0 K		• 4.0 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A3 Cylinder Shut-Off Valve 1 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF at throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > 200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26,39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A4 Cylinder Shut-Off Valve 1 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF at throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 - 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking", page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1 [-] - Time since engine start > 1.0 s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A5 Cylinder Shut-Off Valve 2 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF at throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26,39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1 [-]			

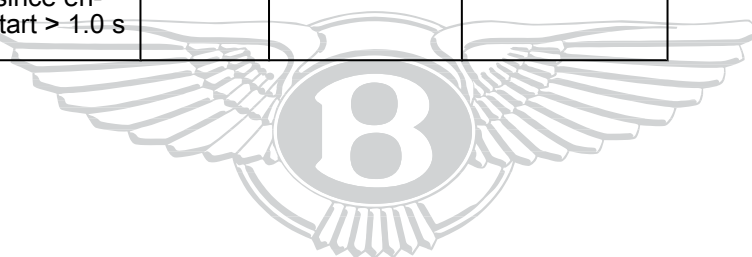
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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A6 Cylinder Shut-Off Valve 2 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF at throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A7 Cylinder Shut-Off Valve 3 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF at throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26,39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A8 Cylinder Shut-Off Valve 3 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF at throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1 [-] - Time since engine start > 1.0 s			



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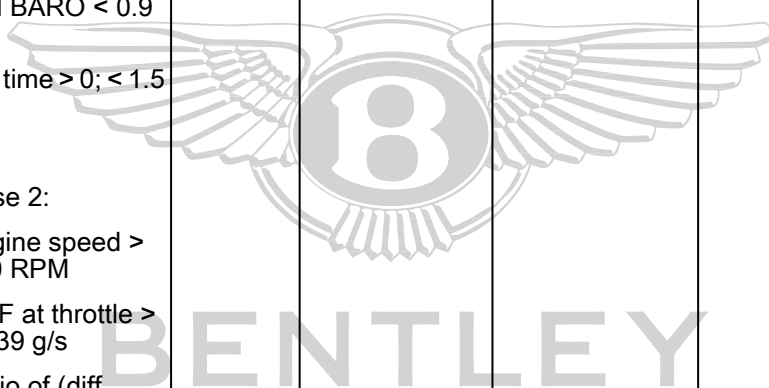
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A9 Cylinder Shut-Off Valve 4 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF at throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26,39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking”, page 1607 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A A Cylinder Shut- Off Valve 4 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF at throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1 [-] - Time since engine start > 1.0 s			
P3401 Cylinder 1 Deactivation/ Intake Valve Control Circuit/ Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	Signal voltage 4.70 – 5.40 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .
P3403 Cylinder 1 Deactivation/ Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	Signal voltage < 2.74 – 3.26 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .
P3404 Cylinder 1 Deactivation/ Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	Signal current > 0.06 – 10.0 A	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3409 Cylinder 2 Deactivation/ Intake Valve Control Circuit/ Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	Signal voltage 4.70 – 5.40 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .
P3411 Cylinder 2 Deactivation/ Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	Signal voltage < 2.74 – 3.26 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .
P3412 Cylinder 2 Deactivation/ Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	Signal current > 0.06 – 10.0 A	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .
P3417 Cylinder 3 Deactivation/ Intake Valve Control Circuit/ Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	Signal voltage 4.70 – 5.40 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3419 Cylinder 3 Deactivation/Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	Signal voltage < 2.74 – 3.26 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking", page 1607 .
P3420 Cylinder 3 Deactivation/Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	Signal current > 0.06 – 10.0 A	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking", page 1607 .
P3425 Cylinder 4 Deactivation/Intake Valve Control Circuit Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	Signal voltage 4.70 – 5.40 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking", page 1607 .
P3427 Cylinder 4 Deactivation/Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	Signal voltage < 2.74 – 3.26 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking", page 1607 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3428 Cylinder 4 Deactivation/Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	Signal current > 0.06 – 10.0 A	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8-. Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607.
U0001 High Speed CAN Communication Bus	CAN: Powertrain Reading Back Sent Message	Message no feedback	Time after ignition on > 500.0 ms	0.25 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance Checking", page 1601.
U0002 High Speed CAN Communication Bus Performance	CAN: Powertrain Communication Check	Global time out receiving no message	Time after ignition on > 500.0 ms	0.45 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance Checking", page 1601.
U0101 Lost Communication With TCM	COM: Transmission Control Module (TCM) Communication With TCM	Received message no message	Time after ignition on >= 0.5 s	1.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance Checking", page 1601.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module	COM: Brake System Control Module (BSCM) Communication With BSCM	Received message no message	Time after ignition on > 500.0 ms	2.0 s - Continuous	2 DCY	Check the ABS CAN-Bus operation. Refer to appropriate repair manual.
U0140 Lost Communication With Body Control Module	COM: Body Control Module (BCM) Communication With BCM	Time out no message	Time after ignition on > 500.0 ms	5.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.
U0146 Lost Communication With Gateway "A"	COM: Gateway Communication With Gateway	Received message no message	Time after ignition on > 500.0 ms	1.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	COM: Instrument Panel Cluster (IPC) Communication With IPC	Received message no message	Time after ignition on >= 0.5 s	5.0 s - Continuous	2 DCY	Check the Instrument Cluster CAN-Bus. Refer to appropriate repair manual.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0402 Invalid Data Received From TCM	COM: Transmission Control Module (TCM) Communication With TCM	Received data implausible message	Time after ignition on > 500.0 ms	0.3 s - Continuous	2 DCY	Check for correct VIN and software ID stored in TCM. If the software ID or VIN is incorrect, a re-flash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to "3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 1603.
U0415 Invalid Data Received From Anti-Lock Brake System (ABS) Control Module	COM: Brake System Control Module (BSCM) Communication With BSCM	Received data implausible message	Time after ignition on > 500.0 ms	2.0 s - Continuous	2 DCY	Check for correct VIN and software ID stored in ABS. If the software ID or VIN is incorrect, a re-flash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to appropriate repair manual.
	COM: Vehicle Speed Sensor (VSS) Communication With VSS	Speed sensor signal: initialization error 655.34 km/h		1.98 s - Continuous		
		Speed sensor signal: low voltage error 655.33 km/h				
		Speed sensor signal: sensor error 655.35 km/h		0.48 s - Continuous		
	Vehicle Speed Sensor (VSS) Out Of Range High	Vehicle speed > 325 km/h		3.0 s - Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0423 Invalid Data Received From Instrument Panel Cluster Control Module	COM: Instrument Panel Cluster (IPC) Communication With IPC	Received data implausible message	Time after ignition on > 500.0 ms	3.0 s - Continuous	2 DCY	Check the Instrument Cluster CAN-Bus. Refer to appropriate repair manual.
U0447 Invalid Data Received From Gateway "A"	COM: Gateway Communication With Gateway	Received data implausible message	Time after ignition on > 500.0 ms	1.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P000A "A" Camshaft Position Slow Response Bank 1	Variable Valve Timing (VVT) Intake Actuator Slow Response	- Difference between target position vs actual position > 3.0° CRK - For time > 1.5 – 3.0 s - And - Adjustment angle > 3.0° CRK - And - Number of checks 7 times	- Time after engine start > 3.0 – 10.0 s - Engine speed 480 – 5,000 RPM - Modeled oil temperature -11 – 125° C - Change of target position > 7.0° CRK	3.5 s - Multiple	2 DCY	Check the Camshaft Adjustment Valve 1 - N205-. Refer to "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0010 "A" Camshaft Position Actuator "A" Control Circuit/ Open Bank 1	Variable Valve Timing (VVT) Intake Actuator Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .
P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	Variable Valve Timing (VVT) Intake Actuator Target Error	- Difference between target position vs actual position > 3.0° CRK - For time > 1.5 – 3.0 s - And - Adjustment angle ≤ 3.0° CRK - And - Number of checks 7 times	- Time after engine start > 3.0 – 10.0 s - Engine speed 480 – 5,000 RPM - Modeled oil temperature -11 – 125° C - Change of target position > 7.0° CRK	3.5 s - Multiple	2 DCY	- Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 . - Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0012 "A" Camshaft Position - Timing Over-Retarded Bank 1						- Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 . - Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Camshaft Position (CMP) Intake Sensor Angular Offset Check	Permissible deviation < -11.01° CRK	- Camshaft adaptation not active - Engine speed > 80 RPM	8.0 rev - Multiple	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Open Circuit	Signal voltage 4.70 - 5.40 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Ground	Signal voltage < 2.74 – 3.26 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 1653.
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Time after engine start > 5.0 s - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 1653.
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Open Circuit	Signal voltage 4.70 – 5.40 V	- Engine speed > 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ “3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking”, page 1650.
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Ground	Signal voltage < 2.74 – 3.26 V	- Engine speed >= 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ “3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking”, page 1650.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0038 HO2S Heater Control Circuit High Bank 1 Sen- sor 2	Oxygen Sensors (O2S) Heat- er Rear Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Engine speed >= 80 RPM - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0040 O2 Sensor Signals Swapped Bank 1 Sensor 1 / Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check (Detection Of Exchange Lambda Sensors Upstream Catalyst)	• Lambda controllers exceed thresholds in opposite directions • Case 1: • Lambda control value bank 1 < 0.80 [-] • And • Lambda control value bank 2 > 1.20 [-] • Case 2: • Lambda control value bank 1 > 1.20 [-] • And • Lambda control value bank 2 < 0.80 [-]	• Lambda control closed loop • VVT ready	• 5.0 s • Multiple	• 2 DCY	- Using a scan tool with the engine running, check the Bank 1 and Bank 2 Long Term fuel trim - if one is above 10 negative and the other above 10 positive, swap the front HO2s sensor connectors and look for the long term values to move close to a zero or low single digit reading. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10 - . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10 - Checking", page 1653 . - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11 - . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11 - Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0050 HO2S Heater Control Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Open Circuit	Signal voltage 4.70 – 5.40 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
P0051 HO2S Heater Control Circuit Low Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Ground	Signal voltage < 2.74 – 3.26 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
P0052 HO2S Heater Control Circuit High Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Time after engine start > 5.0 s - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
P0056 HO2S Heater Control Circuit Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Open Circuit	Signal voltage 4.70 – 5.40 V	- Engine speed > 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0057 HO2S Heater Control Circuit Low Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Ground	Signal voltage < 2.74 – 3.26 V	- Engine speed >= 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .
P0058 HO2S Heater Control Circuit High Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Engine speed >= 80 RPM - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .
P0071 Ambient Air Temperature (IAT) Sensor @ MAF Sensor Rationality Check Circuit "A" Range/Performance	Intake Air Temperature (IAT) Sensor @ MAF Sensor Rationality Check	- Diff. IAT2 vs. ECT @ start > 20.3 K - Diff. IAT2 vs. ECT @ start < -45.0 K	- ECT @ last engine stop <= 80° C - Diff. ECT @ last engine stop vs. ECT @ start <= 39.8 K - ECT @ start <= -35; >= 41° C	2.0 s - Once / DCY	2 DCY	Check the Outside Air Temperature Sensor - G17- . Refer to appropriate repair manual.
	Intake Air Temperature (IAT) Sensor @ MAF Sensor Low Phase Rationality Check	Diff. max IAT2 vs. min IAT2 < 3.8 K	- Time in low phase > 15.0 s - Number of checks >= 2.0 [-] - Vehicle speed >= 60 km/h - MAF >= 72.0; <= 180.0 kg/h	10.0 s - Continuous		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Intake Air Temperature (IAT) Sensor @ MAF Sensor High Phase Rationality Check		- Time in high phase > 30.0 s - Number of checks >= 3.0 [-] - MAF < 40.0 kg/h - Vehicle speed < 20 km/h - ECT > 87° C - Integrated air mass > 7.01 – 16.84 kg			
P0072 Ambient Air Temperature Sensor Circuit "A" Low	Intake Air Temperature (IAT) Sensor @ MAF Sensor Out Of Range Low	Signal voltage < 0.10 V	- Conditions for measurement window - ECT > -48° C - MAF <= 1,020.0 kg/h - Vehicle speed <= 319 km/h - Monitor measurement window conditions fulfilled > 0.0 s	1.0 s - Continuous	2 DCY	Check the Outside Air Temperature Sensor - G17- . Refer to appropriate repair manual.
P0073 Ambient Air Temperature Sensor Circuit "A" High	Intake Air Temperature (IAT) Sensor @ MAF Sensor Out Of Range High	Signal voltage > 2.95 V	- Conditions for measurement window - ECT > -48° C - MAF <= 1,020.0 kg/h - Vehicle speed <= 319 km/h - Monitor measurement window conditions fulfilled > 0.0 s	1.0 s - Continuous	2 DCY	Check the Outside Air Temperature Sensor - G17- . Refer to appropriate repair manual.
P00B E Mass or Volume Air Flow "B" Circuit Range/Performance - Air Flow Too Low	Mass Air Flow (MAF) Sensor Out Of Range Low	Mass air flow to low < -45.0 kg/h	- Camshaft revolutions > 150.0 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to "3.6.28 Mass Airflow Sensor 2 G246 - Checking", page 1646 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P00BF Mass or Volume Air Flow "B" Circuit Range/Performance - Air Flow Too High	Mass Air Flow (MAF) Sensor Out Of Range High	Mass air flow to high > 1,100.0 kg/h	- Camshaft revolutions > 150.0 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246- . Checking", page 1646 .
P0100 Mass or Volume Air Flow Sensor "A" Circuit	Mass Air Flow (MAF) Sensor Internal Check	MAF sensor signal 0 µs	Engine speed not active RPM	0.2 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70- . Checking", page 1644 .
P0101 Mass or Volume Air Flow Sensor "A" Circuit Range/Performance	Mass Air Flow (MAF) Sensor Out Of Range Low	Mass air flow to low < -45.0 kg/h	- Camshaft revolutions > 150.0 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70- . Checking", page 1644 .
	Mass Air Flow (MAF) Sensor Out Of Range High	Mass air flow to high > 1,100.0 kg/h				
	Mass Air Flow (MAF) Sensor Rationality Check Low	- Max value of: - Diff. between measured MAF vs. modeled value < -47.0 kg/h - Or - Ratio of measured MAF and modeled value < 0.65 [-]	- Idle not active - Engine speed 1,000 – 4,000 RPM - ECT 40 – 120° C - IAT -30 – 100° C - BARO >= 68.0 kPa - Change in camshaft timing < 3.0° CRK - For time >= 50.0 s - Throttle position 5.0 – 50.0% - Vehicle speed 0 – 200 km/h			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Mass Air Flow (MAF) Sensor Rationality Check High	- Max value of: - Diff. between measured MAF vs. modeled value > 47.0 kg/h - Or - Ratio of measured MAF and modeled value > 1.35 [-]				
P0102 Mass or Volume Air Flow Sensor "A" Circuit Low	Mass Air Flow (MAF) Sensor Out Of Range Low	- MAF sensor signal < 66 μs - MAF sensor signal temp.-correction < 44.0 ms	Engine speed not active RPM	0.2 s - Continuous 1.0 s - Multiple	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70 , Checking", page 1644 .
P0103 Mass or Volume Air Flow Sensor "A" Circuit High	Mass Air Flow (MAF) Sensor Out Of Range High	- MAF sensor signal > 910 μs - MAF sensor signal temp.-correction > 60.0 ms	Engine speed not active RPM	0.2 s - Continuous 1.0 s - Multiple	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70 , Checking", page 1644 .
P0106 Manifold Absolute Pressure (MAP) Sensor Dynamic Check	Manifold Absolute Pressure (MAP) Sensor Dynamic Check	- Amplitude of MAP sensor < 0.3 – 4.4 kPa - For counts > 30.0 [-] - Number of synchro events > 50.0 [-]	- Engine speed > 1,200; < 3,520 RPM - Ratio of MAP and boost pressure > 0.20; < 0.9 [-]	1.1 s - Continuous	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
P0106 Manifold Absolute Pressure (MAP) Sensor Range/Performance	Manifold Absolute Pressure (MAP) Sensor Rationality Check	Diff. barometric sensor signal vs. manifold pressure signal @ engine start > 15.0 kPa	- Time after engine start < 25.0 s - Engine speed < 300 RPM	2.5 s - Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Manifold Absolute Pressure (MAP) Sensor Rationality Check Low	- Difference manifold pressure - lower threshold model < 0.0 kPa - Model range 90.0 – 2,100.0 kPa				
	Manifold Absolute Pressure (MAP) Sensor Rationality Check High	- Difference manifold pressure - upper threshold model > 0.0 kPa - Model range 850.0 – 2,700.0 kPa				
P0107 Manifold Absolute Pressure (MAP) Sensor Range Check	Manifold Absolute Pressure (MAP) Sensor Range Check	Manifold pressure signal < 10.0 kPa		2.0 s - Multiple	• 2 DCY	– Check the Manifold Absolute Pressure Sensor-G71-. Refer to ⇒ “3.6.25 Manifold Absolute Pressure Sensor G71, Checking” , page 1640 .
	Manifold Absolute Pressure (MAP) Sensor Short To Ground	Signal voltage < 0.20 V		1.0 s - Continuous		
P0108 Manifold Absolute Pressure (MAP) Sensor Range Check	Manifold Absolute Pressure (MAP) Sensor Range Check	Manifold pressure signal > 280.0 kPa		2.0 s - Multiple	• 2 DCY	– Check the Manifold Absolute Pressure Sensor-G71-. Refer to ⇒ “3.6.25 Manifold Absolute Pressure Sensor G71, Checking” , page 1640 .
	Manifold Absolute Pressure (MAP) Sensor Short To Battery / Open Circuit	Signal voltage > 4.88 V		1.0 s - Continuous		
	Manifold Absolute Pressure (MAP) Sensor Out Of Range @ Start	Manifold pressure > 140.0 kPa	- Engine off time > 5.0 s - Engine speed < 400 RPM	0.5 s - Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P010 A Mass or Volume Air Flow Sensor "B" Circuit	Mass Air Flow (MAF) Sensor Internal Check	MAF sensor signal 0 μs	Engine speed not active RPM	0.2 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to "3.6.28 Mass Airflow Sensor 2 G246, Checking", page 1646 .
P010 B Mass or Volume Air Flow Sensor "B" Circuit Range/Performance	Mass Air Flow (MAF) Sensor Rationality Check Low	- Max value of: - Diff. between measured MAF vs. modeled value < -47.0 kg/h - Or - Ratio of measured MAF and modeled value < 0.65 [-]	- Idle not active - Engine speed 1,000 – 4,000 RPM - ECT 40 – 120° C - IAT -30 – 100° C - BARO >= 68.0 kPa - Change in camshaft timing < 3.0° CRK - For time >= 50.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to "3.6.28 Mass Airflow Sensor 2 G246, Checking", page 1646 .
	Mass Air Flow (MAF) Sensor Rationality Check High	- Max value of: - Diff. between measured MAF vs. modeled value > 47.0 kg/h - Or - Ratio of measured MAF and modeled value > 1.35 [-]				
P010 C Mass or Volume Air Flow Sensor "B" Circuit Low	Mass Air Flow (MAF) Sensor Out Of Range Low	- MAF sensor signal < 66 μs - MAF sensor signal temp.-correction < 44.0 ms	Engine speed not active RPM	0.2 s - Continuous 1.0 s - Multiple	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to "3.6.28 Mass Airflow Sensor 2 G246, Checking", page 1646 .
P010 D Mass or Volume Air Flow Sensor	Mass Air Flow (MAF) Sensor Out Of Range High	MAF sensor signal > 910 μs	Engine speed not active RPM	0.2 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to "3.6.28 Mass Airflow Sensor 2 G246, Checking", page 1646 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
"B" Circuit High		MAF sensor signal temp.-correction > 60.0 ms		1.0 s - Multiple		Checking", page 1646 .
P0111 Intake Air Temperature (IAT) Sensor @ Manifold Rationality Check Circuit Range/Performance Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold Rationality Check	Difference IAT at intake manifold to modeled IAT >= 60.0 – 99.8 K	- Conditions for measurement window - MAF <= 152.0; >= 600.0 kg/h - Vehicle speed >= 45 km/h - Engine speed > 20 RPM - Monitor measurement window conditions fulfilled > 15.0 s	10.0 s - Continuous	2 DCY	– Check the Mass Airflow Sensor - G70-. Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644 .
	Intake Air Temperature (IAT) Sensor @ Manifold Stuck Check	Difference between maximum and minimum value of IAT < 5.3 K	- ECT @ start <= 138° C - Intake manifold high phase conditions - MAF < 52.0 kg/h - Vehicle speed < 10 km/h - ECT > 80° C - Integrated air mass > 1.0 – 4.0 kg - Cumulated high manifold active time > 15.0 s - Number of checks > 2.0 [-] - Intake manifold low phase conditions - MAF 152.0 – 600.0 kg/h - Vehicle speed > 45 km/h - Cumulated low manifold active time > 15.0 s - Number of checks > 2.0 [-]	500.0 s - Continuous		
	Intake Air Temperature (IAT) Sensor @	Diff. IAT vs. ECT at engine start >= 20.3 K	ECT @ engine shut-off >= 80° C	2.0 s - Once / DCY		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Manifold Cross Check	Diff. IAT vs. ECT at engine start < -45.0 K	- ECT @ start >= -35; <= 41° C - ECT restart temperature diff. >= 39.8 K			
P0112 Intake Air Temperature Sensor 1 Circuit Low Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold Short To Ground	Signal voltage < 0.11 V		1.0 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70 . Checking", page 1644 .
P0113 Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold Short To Battery / Open Circuit	Signal voltage > 4.50 V	- ECT @ start not calibrated ° C - Or - Time after engine start not calibrated s - ECT >= -48° C - Vehicle speed <= 319 km/h - MAF <= 1,020.0 kg/h	1.0 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70 . Checking", page 1644 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0116 Engine Coolant Temperature (ECT) Sensor Stuck High / Low - No Change On Signal Circuit Range/Performance	Engine Coolant Temperature (ECT) Sensor Stuck High / Low - No Change On Signal	Diff. between max. ECT and min. ECT < 2.3 K	- ECT @ start -39 – 138° C - Without 81.8 – 93.0° C - Substitute ECT > -45° C - Driving condition H: - Vehicle speed 45 – 150 km/h - MAF (lower threshold) 8.0 kg/h - MAF (upper threshold) 152.0 – 352.0 kg/h - Or - Fuel cut off active - For time required > 30.0 s - Frequency 1 times [-] - Driving condition L - Vehicle speed 0 – 20 km/h - MAF (lower threshold) 8.0 kg/h - MAF (upper threshold) 52.0 – 84.0 kg/h - For time required > 10.0 s - Frequency 3 times [-]	62.0 s - Once / DCY	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.11 Engine Coolant Temperature Sensor G62 , Checking”, page 1613 .
	Engine Coolant Temperature (ECT) Sensor Stuck In Range	- ECT @ start >= 20 – 75° C - And - ECT @ start <= 143° C	Cold start detected	2.0 s - Once / DCY		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0117 Engine Coolant Temperature (ECT) Sensor 1 Circuit Low	Engine Coolant Temperature (ECT) Sensor Short To Ground	ECT > 138° C		2.0 s - Continuous	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613 .
P0118 Engine Coolant Temperature (ECT) Sensor 1 Circuit High	Engine Coolant Temperature (ECT) Sensor Short To Battery / Open Circuit	ECT < - 39.0° C		2.0 s - Continuous	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613 .
P0121 Throttle/Pedal Position Sensor (TPS) Rationality Check	Throttle Position Sensor (TPS) Rationality Check	- TPS1-TPS2 > 6.30% - And - Actual TPS1 - calc.value > actual TPS2 - calc. value - Or - TPS1 - calc. value > 9.0%	Engine speed > 480 RPM	0.3 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P0122 Throttle/Pedal Position Sensor (TPS) Out Of Range Low	Throttle Position Sensor (TPS) Out Of Range Low	Signal voltage < 0.18 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0123 Throttle/ Pedal Position Sensor/ Switch "A" Circuit High	Throttle Position Sensor (TPS) Out Of Range High	Signal voltage > 4.63 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0130 O2 Sensor Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range	O2S ceramic temperature < 690° C	- Modeled EGT > 350° C - Fuel cut off not active	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .
P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	- Short to ground - Virtual mass (VM) < 1.75 V - Or - Nernst voltage (UN) < 1.50 V - Or - Adjustment voltage (IA) not calibrated V - Or - Adjustment voltage (IP) < 0.30 V		2.0 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	• Short to battery • Virtual mass (VM) > 3.25 V • Or • Nernst voltage (UN) > 4.40 V • Or • Adjustment voltage (IA) not calibrated V • Or • Adjustment voltage (IP) > 7.0 V		• 2.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Response Rate Monitoring, Area Ratio And Gradient Ratio	- Symmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio -0.30 – 0.55 [-] - Max value of both counters for area ratio rich to lean and lean to rich ≥ 6 times [-] - Delay Time: - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Transient Time: - Gradient ratio not calibrated [-] - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Or - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-] - Asymmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio < -0.30; > 0.55 [-]	- O2S front - time since operation readiness > 30.0 s - O2S front - min. operation temperature is reached ≥ 720.0 K - Exhaust gas mass flow since engine first start not calibrated kg - Heat supply not calibrated kJ - Or - Time since engine first start not calibrated s - Check wire break pump current ready - ECT $\geq 60^{\circ}$ C - And - Only Flex fuel systems - Ethanol concentration adaptation not calibrated - And - Ethanol value not calibrated [-] - And - Ethanol value to start diagnosis not calibrated [-] - Only NG fuel systems - Total ng operating mode not calibrated - Or - Total gasoline operating mode not calibrated - Scavenging - Scavenging-rate not calibrated [-]	48.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		- Values of both counters for area ratio rich to lean and lean to rich ≥ 6 times [-] - Delay Time: - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Transient Time: - Gradient ratio not calibrated [-] - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Or - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-]	- Integrated air mass not calibrated kg - Additional conditions: - Lambda value freeze not active - Relative fuel amount from wall applied compensation and evap purge ≤ 1.0 [-] - Split coefficient DFI/MFI-system is constant not calibrated [-] - Engine speed 1,160 – 2,520 RPM - All local injector active - Desired position lead boost pressure not calibrated - Vehicle speed not calibrated km/h - Time since engine start ≥ 5.0 s - Engine load 27.0 – 79.99% - Catalyst heating not active - Evap purge valve case 1: - Gradient of factor tank ventilation ≤ 0.0 [-] - And - Pulse duty factor of evap purge valve $> 10.0\%/s$ - For time not calibrated s - Or - Evap purge valve case 2: - Pulse duty factor of evap purge valve $\leq 10.0\%/s$			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Additional conditions: • Evap purge ≥ 8.0 g • Or • Evap purge not active • Or • Lambda controller oscillation detected • Exhaust system lag time calculation $0.1 - 0.3$ s • Catalyst temperature $\geq 500^{\circ}$ C • Lambda control set-point prior to diagnostic fuel steps $1.0 [-]$ • Or • Gradient of exhaust system lag time calculation ≤ 0.1 s • Gradient of engine load $\leq 3.0\%$ • Gear shifting not active • Or • Transition from cylinder deactivation (CD) to normal operation mode finished • Exhaust gas mass flow ≥ 15.0 kg/h • Gradient of exhaust gas mass flow not calibrated kg/h • Evap purge in limp-home mode not calibrated • Or • EVAP system diagnosis not calibrated • Or			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Evap purge load high not calibrated - AIR not calibrated - AIR system diagnosis not calibrated - Time since last measurement > 2.0 s			
P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Out Of Range High Oxygen Sensors (O2S) Heater Front Rationality Check (Sensor Heating Up)	- O2S ceramic temperature < 725° C - And - Heater duty cycle > 95.0%	- Modeled EGT > 350° C - Heater control active	60.0 s - Multiple	2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking”, page 1653 .
		- O2S ceramic temperature < 725° C - And - Time after O2S heater on 40.0 s	- ECT @ start > -10° C - Engine shut-off-time > 10,000.0 s (During ECM keep alive-time after ignition off) < 300.0 s	40.0 s - Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	- Signal voltage < 0.06 V - For time > 3.0 s - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Fuel cut off not active - Catalyst purge not active	3.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking”, page 1650 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Out Of Range High (Short To Battery Plus)	- Signal voltage > 1.08 V - For time > 0.1 s	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Lambda set value > 0.995 [-]	0.1 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Cut Off	- Arithmetic filtered max differential transient time at fuel cut off not calibrated s - Or - EWMA filtered max differential transient time at fuel cut off ≥ 0.60 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel cut off active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow $-80.0 - 80.0$ kg/h - Time fuel cut off < 20.0 s - If - Time fuel cut off > 20.0 s - Then disabling till next fuel cut off 60.0 s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Deviation between expected and measured lambda value < 12.0 [-] - Or - Lambda value > 5.0 [-] - Additional conditions: - Time after fuel cut off at first cylinder ≥ 1.5 s	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- O2S rear voltage before start of measurement > 0.55 V - O2S rear target voltage end of measurement ≤ 0.15 V - Or - Integrated O2 mass during fuel cut off ≥ 1,800 – 3,000 mg - Time delay 0.5 s - Case 1: (With scavenging) - If - Scavenging-rate not calibrated [-] - Then disabling until - Scavenging-rate not calibrated [-] - And - Integrated air mass not calibrated [-] - Case 2: (Without scavenging) - Integrated air mass > 0.50 kg - Engine running			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 B O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Feed Restart	- Arithmetic filtered max differential transient time at fuel feed restart not calibrated s - Or - EWMA filtered max differential transient time at fuel feed restart ≥ 1.0 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel feed restart active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow -80.0 – 80.0 kg/h - If - Time fuel cut off > 20.0 s - Then - Disabling till next fuel feed restart 60.0 s - Additional conditions: - O2S rear voltage before start of measurement < 0.15 V - O2S rear target voltage end of measurement ≥ 0.60 V - Or - Integrated negative O2 mass during catalyst purge $\geq 2,000 - 3,000$ mg - Time delay 0.5 s - Case 1:	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• (With scavenging) • If • Scavenging-rate not calibrated [-] • Then disabling until • Scavenging-rate not calibrated [-] • And • Integrated air mass not calibrated kg • Case 2: • (Without scavenging) • Integrated air mass > 0.5 kg • Engine running			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 C O2 Sensor Slow Response - Rich to Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Cut Off	- Arithmetic filtered max differential transient time at fuel cut off not calibrated s - Or - EWMA filtered max differential transient time at fuel cut off ≥ 0.60 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel cut off active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow -80.0 – 80.0 kg/h - Time fuel cut off < 20.0 s - If - Time fuel cut off > 20.0 s - Then disabling till next fuel cut off 60.0 s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Deviation between expected and measured lambda value < 12.0 [-] - Or - Lambda value > 5.0 [-] - Additional conditions: - Time after fuel cut off at first cylinder ≥ 1.5 s	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking" page 1656

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• O2S rear voltage before start of measurement > 0.55 V • O2S rear target voltage end of measurement <= 0.15 V • Or • Integrated O2 mass during fuel cut off >= 1,800 – 3,000 mg • Time delay 0.5 s • Case 1: • (With scavenging) • If • Scavenging-rate not calibrated [-] • Then disabling until • Scavenging-rate not calibrated [-] • And • Integrated air mass not calibrated [-] • Case 2: • (Without scavenging) • Integrated air mass > 0.50 kg • Engine running			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 D O2 Sensor Slow Response - Lean to Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Feed Restart	- Arithmetic filtered max differential transient time at fuel feed restart not calibrated s - Or - EWMA filtered max differential transient time at fuel feed restart ≥ 1.0 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel feed restart active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow $-80.0 - 80.0$ kg/h - If - Time fuel cut off > 20.0 s - Then - Disabling till next fuel feed restart 60.0 s - Additional conditions: - O2S rear voltage before start of measurement < 0.15 V - O2S rear target voltage end of measurement ≥ 0.60 V - Or - Integrated negative O2 mass during catalyst purge $\geq 2,000 - 3,000$ mg - Time delay 0.5 s - Case 1:	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• (With scavenging) • If • Scavenging-rate not calibrated [-] • Then disabling until • Scavenging-rate not calibrated [-] • And • Integrated air mass not calibrated kg • Case 2: • (Without scavenging) • Integrated air mass > 0.5 kg • Engine running			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013E O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Rich To Lean Transition	- Arithmetic filtered max differential delay time at rich to lean transition > not calibrated s - Or - EWMA filtered max differential delay time at rich to lean transition > 0.6 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value before not calibrated [-]	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- For integrated exhaust gas mass not calibrated kg - Lambda set value not calibrated [-] - For time not calibrated s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated - Diff. between lambda set value and actual lambda value ≤ 16.0 [-] - Threshold 1 - O2S rear voltage ≥ 0.72 V - Gradient O2S rear voltage $-0.01 - 0.05$ V/s - Integrated negative O2 mass ≥ 50 mg - Or - Threshold 2 - O2S rear voltage > 1.25 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 F O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Lean To Rich Transition	- Arithmetic filtered max differential delay time at lean to rich transition not calibrated s - EWMA filtered max differential delay time at lean to rich transition > 1.2 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - General: - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value not calibrated [-] - For time not calibrated s	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated [-] - Diff. between lambda set value and actual lambda value ≤ 16.0 [-] - Case 1: (Diagnosis in Catalyst State full) true - Time after engine start not calibrated s - Threshold 1 - O2S rear voltage ≤ 0.20 V - Gradient O2S rear voltage $-1.0 - 0.01$ V/s - Integrated O2 mass not calibrated mg - Or - Threshold 2 - O2S rear voltage not calibrated V - Case 2: (Diagnosis at Fuel Feed Restart) false - Integrated exhaust gas mass not calibrated kg - Integrated exhaust gas mass not calibrated kg			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Exhaust gas mass during not calibrated kg - Catalyst temperature not calibrated ° C - Exhaust gas mass flow not calibrated kg/h - Gradient of exhaust gas mass flow not calibrated kg/h - Engine speed not calibrated RPM - O2S rear voltage after fuel cut off not calibrated V - For time not calibrated s - And - O2 mass not calibrated mg			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	- Signal voltage 0.40 – 0.60 V - For time > 3.0 s - And - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) >= 2.80 V	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650°C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded	40.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	- Internal resistance > 40,000.0 Ω - And - Exhaust temperature > 600° C	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded - Valid Ri-measurements > 10 times			
P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Out Of Range (During Normal Heater Operation After Dew Point Is Exceeded)	Internal resistance > 1,260.0 – 20,400.0 Ω	- Dew point exceeded - Modeled EGT 350 – 650° C - IAT > -7° C - Engine shut-off-time > 5,000.0 s - Number of checks 10.0 [-] - Fuel cut off not active - Actuator commanded on	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7- , Checking", page 1650 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P014 A O2 Sensor Delayed Response - Rich to Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Rich To Lean Transition	- Arithmetic filtered max differential delay time at rich to lean transition > not calibrated s - Or - EWMA filtered max differential delay time at rich to lean transition > 0.6 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value before not calibrated [-]	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8- , Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- For integrated exhaust gas mass not calibrated kg - Lambda set value not calibrated [-] - For time not calibrated s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated - Diff. between lambda set value and actual lambda value ≤ 16.0 [-] - Threshold 1 - O2S rear voltage ≥ 0.72 V - Gradient O2S rear voltage $-0.01 - 0.05$ V/s - Integrated negative O2 mass ≥ 50 mg - Or - Threshold 2 - O2S rear voltage > 1.25 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P014 B O2 Sensor Delayed Response - Lean to Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Lean To Rich Transition	- Arithmetic filtered max differential delay time at lean to rich transition not calibrated s - EWMA filtered max differential delay time at lean to rich transition > 1.2 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - General: - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value not calibrated [-] - For time not calibrated s	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Binary sensor front fitted • O2S front voltage not equipped V • Linear sensor front fitted • Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated [-] • Diff. between lambda set value and actual lambda value ≤ 16.0 [-] • Case 1: • (Diagnosis in Catalyst State full) true • Time after engine start not calibrated s • Threshold 1 • O2S rear voltage ≤ 0.20 V • Gradient O2S rear voltage -1.0 – 0.01 V/s • Integrated O2 mass not calibrated mg • Or • Threshold 2 • O2S rear voltage not calibrated V • Case 2: • (Diagnosis at Fuel Feed Restart) false • Integrated exhaust gas mass not calibrated kg • Integrated exhaust gas mass not calibrated kg			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Exhaust gas mass during not calibrated kg - Catalyst temperature not calibrated ° C - Exhaust gas mass flow not calibrated kg/h - Gradient of exhaust gas mass flow not calibrated kg/h - Engine speed not calibrated RPM - O2S rear voltage after fuel cut off not calibrated V - For time not calibrated s - And - O2 mass not calibrated mg			
P0150 O2 Sensor Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range	O2S ceramic temperature < 690° C	- Modeled EGT > 350° C - Fuel cut off not active	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0151 O2 Sensor Circuit Low Voltage Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	• Short to ground • Virtual mass (VM) < 1.75 V • Or • Nernst voltage (UN) < 1.50 V • Or • Adjustment voltage (IA) not calibrated V • Or • Adjustment voltage (IP) < 0.30 V		• 2.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
P0152 O2 Sensor Circuit High Voltage Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	• Short to battery • Virtual mass (VM) > 3.25 V • Or • Nernst voltage (UN) > 4.40 V • Or • Adjustment voltage (IA) not calibrated V • Or • Adjustment voltage (IP) > 7.0 V	Copyright by Bentley Motors.	• 2.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0153 O2 Sensor Circuit Slow Response Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Response Rate Monitoring, Area Ratio And Gradient Ratio	- Symmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio -0.30 – 0.55 [-] - Max value of both counters for area ratio rich to lean and lean to rich >= 6 times - Delay Time: - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Transient Time: - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-] - Asymmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio < -0.30; > 0.55 [-]	- O2S front - time since operation readiness > 30.0 s - O2S front - min. operation temperature is reached >= 720.0 K - Exhaust gas mass flow since engine first start not calibrated kg - Heat supply not calibrated kJ - Or - Time since engine first start not calibrated s - Check wire break pump current ready - And - Only Flex fuel systems - Ethanol concentration adaptation not calibrated - And - Ethanol value not calibrated [-] - And - Ethanol value to start diagnosis not calibrated [-] - Only NG fuel systems - Total ng operating mode not calibrated - Or - Total gasoline operating mode not calibrated - Scavenging - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg	48.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		- Values of both counters for area ratio rich to lean and lean to rich ≥ 6 times - Delay Time: - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Transient Time: - Gradient ratio not calibrated [-] - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Or - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-]	- Additional conditions: - Lambda value freeze not active - Relative fuel amount from wall applied compensation and evap purge ≤ 1.0 [-] - Split coefficient DFI/MFI-system is constant not calibrated [-] - Engine speed 1,160 – 2,520 RPM - All local injector active - Desired position lead boost pressure not calibrated - Vehicle speed not calibrated km/h - Time since engine start ≥ 5.0 s - Engine load 27.0 – 79.99% - Catalyst heating not active - Evap purge valve case 1: - Gradient of factor tank ventilation ≤ 0.0 [-] - And - Pulse duty factor of evap purge valve $> 10.0\%/s$ - For time not calibrated s - Or - Evap purge valve case 2: - Pulse duty factor of evap purge valve $\leq 10.0\%/s$ - Additional conditions:			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Evap purge ≥ 8.0 g • Or • Evap purge not active • Or • Lambda controller oscillation detected • Exhaust system lag time calculation $0.1 - 0.3$ s • Catalyst temperature $\geq 500^{\circ}$ C • Lambda control set-point prior to diagnostic fuel steps 1.0 [-] • Or • Gradient of exhaust system lag time calculation ≤ 0.1 s • Gradient of engine load $\leq 3.0\%$ • Gear shifting not active • Or • Transition from cylinder deactivation (CD) to normal operation mode finished • Exhaust gas mass flow ≥ 15.0 kg/h • Gradient of exhaust gas mass flow not calibrated kg/h • Evap purge in limp-home mode not calibrated • Or • EVAP system diagnosis not calibrated • Or			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Evap purge load high not calibrated - AIR not calibrated - AIR system diagnosis not calibrated - Time since last measurement > 2.0 s			
P0155 O2 Sensor Heater Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Out Of Range High	- O2S ceramic temperature < 725° C - And - Heater duty cycle > 95.0%	- Modeled EGT > 350° C - Heater control active	60.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .
	Oxygen Sensors (O2S) Heater Front Rationality Check (Sensor Heating Up)	- O2S ceramic temperature < 725° C - And - Time after O2S heater on 40.0 s	- ECT @ start > -10° C - Engine shut-off-time > 10,000.0 s (During ECM keep alive-time after ignition off) < 300.0 s	40.0 s - Once / DCY	2 DCY	

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0157 O2 Sensor Circuit Low Voltage Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	- Signal voltage < 0.06 V - For time > 3.0 s - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Fuel cut off not active - Catalyst purge not active	3.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8- , Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0158 O2 Sensor Circuit High Voltage Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Out Of Range High (Short To Battery Plus)	- Signal voltage > 1.08 V - For time > 0.1 s	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650°C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Lambda set value > 0.995 [-]	0.1 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0160 O2 Sensor Circuit No Activity Detected Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	- Signal voltage 0.40 – 0.60 V - For time > 3.0 s - And - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) >= 2.80 V	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded	40.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8- , Checking”, page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	- Internal resistance > 40,000.0 Ω - And - Exhaust temperature > 600° C	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded - Valid Ri-measurements > 10 times			
P0161 O2 Sensor Heater Circuit Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Out Of Range (During Normal Heater Operation After Dew Point Is Exceeded)	Internal resistance > 1,260.0 – 20,400.0 Ω	- Dew point exceeded - Modeled EGT 350 – 650° C - IAT > -7° C - Engine shut-off-time > 5,000.0 s - Number of checks 10.0 [-] - Fuel cut off not active - Actuator commanded on	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .
P0169 Incorrect Fuel Composition	Engine Control Module (ECM): Electronic Throttle Control Module	Corrections of fuel mass on single cylinders incorrect		2.0 s - Continuous	2 DCY	Check for any component or circuit fault codes and diagnose them first. If no faults are

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Function Monitoring: Injection	Injection cut off incorrect				found during diagnosis, and the ECM has lost a driver output, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Lambda Mode	Internal check failed	Internal engine speed > 1,200 RPM	0.5 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Mixture Control	- Correction factor incorrect - Fuel quantity incorrect				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Load Plausibility	Abs. difference between predicted and real air mass > 11.30%	Engine speed >= 1,200 RPM			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0171 System Too Lean Bank 1	Fuel System Too Lean	- Low pass filtered lambda controller output > 23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}$ C - Lambda control closed loop - And - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0172 System Too Rich Bank 1	Fuel System Too Rich	- Low pass filtered lambda controller output < -23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}$ C - Lambda control closed loop - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0174 System Too Lean Bank 2	Fuel System Too Lean	- Low pass filtered lambda controller output > 23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}$ C - Lambda control closed loop - And - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0175 System Too Rich Bank 2	Fuel System Too Rich	- Low pass filtered lambda controller output < -23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}$ C - Lambda control closed loop - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .
P0201 Cylinder 1 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624 .
P0202 Cylinder 2 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624 .
P0203 Cylinder 3 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0204 Cylinder 4 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624.
P0205 Cylinder 5 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624.
P0206 Cylinder 6 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624.
P0207 Cylinder 7 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624.
P0208 Cylinder 8 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624.
P0221 Throttle/Pedal Position Sensor (TPS) 2 Circuit Range/Performance	Throttle Position Sensor (TPS) 2 Rationality Check	- TPS1 - TPS2 > 6.30% > - And - Actual TPS2 - calc. value > actual TPS1 - calc. value - Or - TPS2 - calc value > 9.0%	Engine speed > 480 RPM	0.3 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3. Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0222 Throttle/Pedal Position Sensor/Switch "B" Circuit Low	Throttle Position Sensor (TPS) 2 Out Of Range Low	Signal voltage < 0.16 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P0223 Throttle/Pedal Position Sensor/Switch "B" Circuit High	Throttle Position Sensor (TPS) 2 Out Of Range High	Signal voltage > 4.88 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P0234 Turbo-charger (TC) Boost Control Functional Check	Turbo-charger (TC) Boost Control Functional Check	Diff. set value boost pressure vs. actual boost pressure value > 27.0 – 112.5 kPa	BARO > 75.0 kPa	2.0 s - Multiple	2 DCY	- Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 . - Check the Combustion Air Valve - N44- . Refer to ⇒ "3.6.7 Combustion Air Valve N44 , Checking", page 1605 .
P0236 Turbo-charger (TC) Boost Pressure Sensor Rationality Check	Turbo-charger (TC) Boost Pressure Sensor Rationality Check	Diff. boost pressure signal vs. barometric sensor signal > 22.0 kPa	- Engine speed < 1,000 RPM - Throttle position < 5.0%	2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
Range/Performance		Diff. boost pressure signal vs. barometric sensor signal < -12.0 kPa				
P0237 Turbo-charger (TC) Boost Pressure Sensor Out Of Range Low	Turbo-charger (TC) Boost Pressure Sensor "A" Circuit Low	Pressure < 37.0 kPa		2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
P0238 Turbo-charger (TC) Boost Pressure Sensor Out Of Range High	Turbo-charger (TC) Boost Pressure Sensor "A" Circuit High	Signal voltage < 0.20 V	Engine speed > 80 RPM	1.0 s - Continuous	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
P0238 Turbo-charger (TC) Boost Pressure Sensor Out Of Range High	Turbo-charger (TC) Boost Pressure Sensor "A" Circuit High	Pressure > 300.0 kPa		2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
P0238 Turbo-charger (TC) Boost Pressure Sensor Out Of Range High	Turbo-charger (TC) Boost Pressure Sensor "A" Circuit High	Signal voltage > 4.88 V	Engine speed > 80 RPM	1.0 s - Continuous	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
P0243 Turbo-charger (TC) Bypass Actuator Open Circuit	Turbo-charger (TC) Bypass Actuator "A" Circuit	Signal voltage 4.70 – 5.40 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0245 Turbo-charger (TC) Bypass Actuator/Super-charger Waste gate Actuator "A" Low	Turbo-charger (TC) Bypass Actuator Short To Ground	Signal voltage < 2.74 – 3.26 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .
P0246 Turbo-charger (TC) Bypass Actuator/Super-charger Waste gate Actuator "A" High	Turbo-charger (TC) Bypass Actuator Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .
P0261 Cylinder 1 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0262 Cylinder 1 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0264 Cylinder 2 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0265 Cylinder 2 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0267 Cylinder 3 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0268 Cylinder 3 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0270 Cylinder 4 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0271 Cylinder 4 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0273 Cylinder 5 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0274 Cylinder 5 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0276 Cylinder 6 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0277 Cylinder 6 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0279 Cylinder 7 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0280 Cylinder 7 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0282 Cylinder 8 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0283 Cylinder 8 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0299 Turbo-charger/Super-charger "A" Under-boost Condition	Turbo-charger (TC) Boost Pressure Control Functional Check	Diff. set value boost pressure vs. actual boost pressure value (filtered) > 20.0 kPa	- Engine speed > 2,240 – 2,760 RPM - BARO > 75.0 kPa - Diff. set value boost pressure vs. basic boost pressure value > 15.0 kPa - Boost pressure control active - Turbo charger bypass valve closed	5.0 s - Multiple	2 DCY	- Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 . - Check the Combustion Air Valve - N44- . Refer to ⇒ "3.6.7 Combustion Air Valve N44 , Checking", page 1605 .
P0300 Random/Multiple Cylinder Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 2.0%	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by Bentley Motors. Bentley Motors does not accept any liability with respect to the correctness of information in this document. Copyright by Bentley Motors. - Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous	2 DCY	If a fuel system rich or lean fault exists, perform the diagnostic for those codes first. Use a scan tool and note whether the miss is specific to a few cylinders or is random. If random, check for contamination in the fuel by drawing a fuel sample. Refer to appropriate repair manual. - Check the spark plugs visually for signs of fouling. - Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Pre-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%		200 rev - Continuous	Immediately	liminary Check", page 13 and/or to appropriate repair manual. - Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0301 Cylinder 1 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	- Emission threshold misfire rate (MR) > 2.0% - Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous 200 rev - Continuous	2 DCY - Immediately	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors. Refer to "3.6.17 Fuel Injectors, Checking", page 1624. - Check the Ignition Coils With Power Output Stage. Refer to "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633.
P0302 Cylinder 2 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 2.0%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	sion test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0303 Cylinder 3 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 2.0%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Re-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0304 Cylinder 4 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 2.0%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors . Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage . Checking”, page 1633 .
P0305 Cylinder 5 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 2.0%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0306 Cylinder 6 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 2.0%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors . Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage . Checking”, page 1633 .
P0307 Cylinder 7 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 2.0%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors. Refer to ⇒ “3.6.17 Fuel Injectors, Checking”, page 1624. - Check the Ignition Coils With Power Output Stage. Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage, Checking”, page 1633.
P0308 Cylinder 8 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 2.0%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors . Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage . Checking”, page 1633 .
P0321 Ignition/Distributor Engine Speed Input Circuit Range/Performance	Crankshaft Position (CKP) Sensor Rationality Check	- Counted teeth vs. reference incorrect - Or - Monitoring reference gap failure		1.5 s - Multiple	2 DCY	Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.13 Engine Speed Sensor G28 . Checking”, page 1616 .

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speed > RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 - G61 - Refer to ⇒ <u>“3.6.22 Knock Sensor 2 G66 Checking”</u>, <u>page 1636</u>.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0328 Knock /Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	Knock Sensor (KS) Short To Battery Plus Port A	• Signal voltage > 1.0 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 - G61-. Refer to ⇒ “3.6.22 Knock Sensor 1 G61, Checking”, page 1634 .
	Knock Sensor (KS) Short To Battery Plus Port B					
	Knock Sensor (KS) Signal Range Check	• Upper threshold > 135.82 – 285.0 V	• Engine speed > 1,720 RPM • ECT > 40° C • Engine load > 49.50%	• 2.0 s • Multiple		
P0332 Knock /Combustion Vibration Sensor 2 Circuit Low Bank 2	Knock Sensor (KS) Short To Ground Port A	• Reference signal < -0.7 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 2 - G66-. Refer to ⇒ “3.6.23 Knock Sensor 2 G66, Checking”, page 1636 .
	Knock Sensor (KS) Short To Ground Port B					
	Knock Sensor (KS) Signal Range Check	• Lower threshold < 1.02 – 9.88 V	• Engine speed > 1,720 RPM • ECT > 40° C • Engine load > 49.50%	• 2.0 s • Multiple		
P0333 Knock /Combustion Vibration Sensor 2 Circuit High Bank 2	Knock Sensor (KS) Short To Battery Plus Port A	• Signal voltage > 1.0 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 2 - G66-. Refer to ⇒ “3.6.23 Knock Sensor 2 G66, Checking”, page 1636 .
	Knock Sensor (KS) Short To Battery Plus Port B					
	Knock Sensor (KS) Signal Range Check	• Upper threshold > 135.82 – 285.0 V	• Engine speed > 1,720 RPM • ECT > 40° C • Engine load > 49.50%	• 2.0 s • Multiple		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0341 Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	- Signal pattern incorrect - Defect counter 8.0 [-]		0.5 s - Continuous	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0342 Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	- Signal voltage permanently low - And - Crankshaft signals 8.0 [-]		0.5 s - Continuous	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0343 Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	- Signal voltage permanently high - And - Crankshaft signals 8.0 [-]		0.5 s - Continuous	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0351 Ignition Coil "A" Primary Control Circuit/Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage Checking", page 1633 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0352 Ignition Coil "B" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0353 Ignition Coil "C" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0354 Ignition Coil "D" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0355 Ignition Coil "E" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0356 Ignition Coil "F" Primary Control Circuit/Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P0357 Ignition Coil "G" Primary Control Circuit/Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P0358 Ignition Coil "H" Primary Control Circuit/Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P0410 AIR System "A"	Secondary Air Injection (AIR) Rationality Check Directly After Catalyst Heating	Diff. of measured AIR pressure before AIR injection vs. AIR pressure after AIR injection > 2.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - BARO > 74.0 kPa - AIR system commanded off	0.5 s - Once / DCY	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking", page 1661 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0418 AIR System Control "A" Circuit	Secondary Air Injection (AIR) Pump Relay Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 .
P0419 AIR System Control "B" Circuit	Secondary Air Injection (AIR) Pump Relay Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0420 Catalyst System Efficiency Below Threshold Bank 1	Catalyst System Measure Of OSC Compared To OSC Of Borderline Catalyst	- Measured OSC / OSC of borderline catalyst - Measured OSC EWMA filter value for catalyst, corrected with measured delay and transient time of oxygen sensors rear < 1.0 [-]	- Time after engine start not calibrated s - Or - Time after dew point > 90.0 s - Delta exhaust gas mass flow < 20.0 kg/h - Exhaust gas mass flow, lower range not calibrated kg/h - Exhaust gas mass flow, upper range 25.0 – 100.0 kg/h - Modeled EGT dynamic < 30.0 K - Modeled EGT in catalyst system, lower range not calibrated ° C - Modeled EGT in catalyst system, upper range 500 – 800° C - Minimum modeled EGT in catalyst system > 470° C - For time > 100.0 s - Filtered minimum modeled EGT in catalyst system > 470° C - Engine load 9.80 – 60.0% - Evap purge loading not high - Engine speed 1,000 – 2,520 RPM - Lambda enable condition monitor - Monitoring stops if lambda deviation >= 5.01 – 7.01% - With delay time >= 0.02 – 0.2 s	10.0 s - Once / DCY	1 DCY	- Check the exhaust system for leaks and correct any defects found. If any misfire or fuel trim codes are also set, correct those codes first. - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda control closed loop • Lambda control not at min or max limit • AAT > -10° C • Number of checks, no step change suspicion 1.0 [-] • Number of checks, step change suspicion 4.0 [-] • O2S front ready • O2S rear ready • AIR not active • No misfire • O2S front plausibility check in current driving cycle ready • O2S front response monitoring in current driving cycle ready			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0430 Catalyst System Efficiency Below Threshold Bank 2	Catalyst System Measure Of OSC Compared To OSC Of Borderline Catalyst	- Measured OSC / OSC of borderline catalyst - Measured OSC EWMA filter value for catalyst, corrected with measured delay and transient time of oxygen sensors rear < 1.0 [-]	- Time after engine start not calibrated s - Or - Time after dew point > 90.0 s - Delta exhaust gas mass flow < 20.0 kg/h - Exhaust gas mass flow, lower range not calibrated kg/h - Exhaust gas mass flow, upper range 25.0 – 100.0 kg/h - Modeled EGT dynamic < 30.0 K - Modeled EGT in catalyst system, lower range not calibrated ° C - Modeled EGT in catalyst system, upper range 500 – 800° C - Minimum modeled EGT in catalyst system > 470° C - For time > 100.0 s - Filtered minimum modeled EGT in catalyst system > 470° C - Engine load 9.80 – 60.0% - Evap purge loading not high - Engine speed 1,000 – 2,520 RPM - Lambda enable condition monitor - Monitoring stops if lambda deviation >= 5.01 – 7.01% - With delay time >= 0.02 – 0.2 s	10.0 s - Once / DCY	1 DCY	- Check the exhaust system for leaks and correct any defects found. If any misfire or fuel trim codes are also set, correct those codes first. - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Lambda control closed loop - Lambda control not at min or max limit - AAT > -10° C - Number of checks, no step change suspicion 1.0 [-] - Number of checks, step change suspicion 4.0 [-] - O2S front ready - O2S rear ready - AIR not active - No misfire - O2S front plausibility check in current driving cycle ready - O2S front response monitoring in current driving cycle ready			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0441 EVAP System Incorrect Purge Flow	Evaporative Emission (EVAP) System Functional Check	- Deviation lambda control < 3.50 – 6.0% - And - Deviation idle control < 31.0%	- Choice of: - Integrated EVAP purge mass > 10.0 g - Or - Integrated air mass > 4.0 – 20.0 kg - And - Choice of: - ECT > 60° C - Or - Substitute ECT > 60° C - And - General: - Engine speed idle RPM - Engine speed not calibrated RPM - Engine speed deviation < 200 RPM - Engine load 12.0 – 34.99% - Deviation engine load <= 4.01% - AAT > 4° C - BARO > 72.0 kPa - Lambda control closed loop	22.1 s - Once / DCY	2 DCY	Check for restrictions or kinks in the EVAP pipes, including charcoal intrusion into the pipes. If pipes are free from obstruction: Check the EVAP Canister Purge Regulator Valve 1 - N80-. Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0442 EVAP System Leak Detected (Small Leak)	Evaporative Emission (EVAP) System Small Leak Pressure Check	Time for pressure drop < 1.6 – 2.6 s	- General: - Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - Intake manifold vacuum > -100.0 kPa - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Evap purge valve closed - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - And - Case 1: - AAT not calibrated ° C - AAT drop after engine start not calibrated K - Case 2: - IAT 3 – 90° C - IAT drop after engine start < 8.3 K - Deep down hill driving: - Delta BARO < 0.25 kPa - Or	239.0 s - Once / DCY	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80- Checking", page 1619 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Engine load not calibrated % • And • Delta vehicle speed not calibrated km/h			
P0444 EVAP System Purge Control Valve "A" Circuit Open	Evaporative Emission (EVAP) Canister Purge Valve Open Circuit	• Signal voltage 4.70 – 5.40 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80. Checking", page 1619 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0455 EVAP System Leak Detected (Large Leak)	Evaporative Emission (EVAP) System Large Leak Pressure Check	Time for pressure drop < 1.0 s	- General: - Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - Intake manifold vacuum > -100.0 kPa - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Evap purge valve closed - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - And - Case 1: - AAT not calibrated ° C - AAT drop after engine start not calibrated K - Case 2: - IAT 3 – 90° C - IAT drop after engine start < 12.0 K - Deep down hill driving - Delta BARO < 0.25 kPa - Or	232.6 s - Once / DCY	2 DCY	- Inspect all the EVAP attaching pipes and hoses visually for damage. Check the gas cap for tightness. - Check the EVAP System for Leaks. Refer to "2.2.4 EVAP System, Checking for Leaks", page 6. - Check the EVAP Canister Purge Regulator Valve 1 - N80-. Refer to "3.6.14 EVAP Canister Purge Regulator Valve 1 N80-, Checking", page 1619. - Check the Leak Detection Pump - V144-. Refer to "3.6.24 Leak Detection Pump V144-, Checking", page 1638.

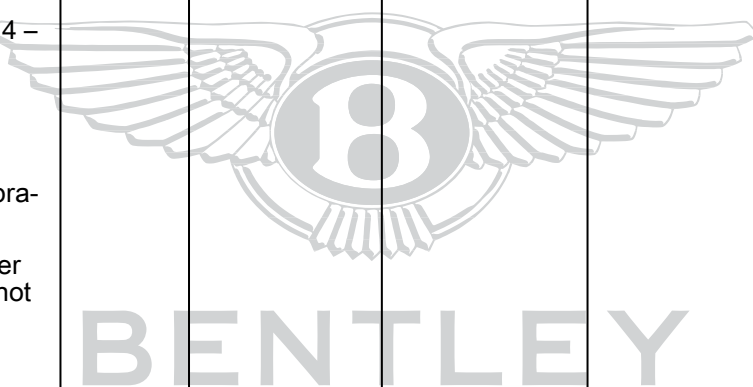
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Engine load not calibrated % - And - Delta vehicle speed not calibrated km/h			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0456 EVAP System Leak Detected (Very Small Leak)	Evaporative Emission (EVAP) System Very Small Leak Pressure Check	Time for pressure drop < 3.0 – 5.8 s	- General: - Time after engine start 5.0 – 800.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - Intake manifold vacuum > -100.0 kPa - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 50.3 K - Evap purge valve closed - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - And - Case 1: - AAT not calibrated ° C - AAT drop after engine start not calibrated K - Case 2: - IAT 3 – 70° C - IAT drop after engine start < 6.8 K - Deep down hill driving - Delta BARO -0.39 – 0.20 kPa - Or	251.8 s - Once / DCY	2 DCY	- Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking”, page 1619 . - Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.24 Leak Detection Pump V144, Checking”, page 1638 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Engine load not calibrated % - And - Delta vehicle speed not calibrated km/h - Additional: - Vehicle acceleration < 4.50 m/s² - Gradient engine load < 100.01 %/seg			
P0458 EVAP System Purge Control Valve "A" Circuit Low	Evaporative Emission (EVAP) Canister Purge Valve Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .
P0459 EVAP System Purge Control Valve "A" Circuit High	Evaporative Emission (EVAP) Canister Purge Valve Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0491 AIR System Insufficient Flow Bank 1	Secondary Air Injection (AIR) Flow Check During Catalyst Heating	- Case 1: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.51 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.25 [-] - Case 2: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.59 [-] - Case 3: - Average pressure difference between absolute value and < 0.35 – 1.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - For time > 1.0 s - BARO > 74.0 kPa - AIR system commanded on	0.0 s - Once / DCY	2 DCY	- Check the secondary air injection attaching hoses to the exhaust visually for kinks damage or obstructions. - Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101-. Refer to ⇒ “3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- Checking”, page 1661. - Check the Secondary Air Injection Sensor 1 - G609-. Refer to ⇒ “3.6.36 Secondary Air Injection Sensor 1 G609- Checking”, page 1666.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0492 AIR System Insufficient Flow Bank 2	Secondary Air Injection (AIR) Flow Check During Catalyst Heating	- Case 1: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.51 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.25 [-] - Case 2: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.59 [-] - Case 3: - Average pressure difference between absolute value and < 0.35 - 1.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - For time > 1.0 s - BARO > 74.0 kPa - AIR system commanded on	0.0 s - Once / DCY	2 DCY	- Check the secondary air injection attaching hoses to the exhaust visually for kinks damage or obstructions. - Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 . - Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610, Checking", page 1668 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0506 Idle Control System RPM - Lower Than Expected	Idle Speed Control (ISC) Out Of Range Low	- Engine speed deviation > 100 RPM - And - RPM controller torque value >= calculated max. value Nm	- Time after engine start >= 5.0 s - Vehicle speed 0 km/h - BARO > 71.90 kPa - ECT 60 – 120° C - IAT > -11° C - Torque safety limitation not active - Accelerator pedal released by driver - For time > 1.0 s - For manual transmission: - Engine load < 34.50%	5.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P0507 Idle Control System RPM - Higher Than Expected	Idle Speed Control (ISC) Out Of Range High	- Engine speed deviation < -100 RPM - And - RPM controller torque value <= calculated min. value Nm - Or - Integrated number of fuel cut off transitions >= 3.0 [-]	- Time after engine start >= 5.0 s - Vehicle speed 0 km/h - BARO > 71.90 kPa - ECT 60 – 120° C - IAT > -11° C - Torque safety limitation not active - Accelerator pedal released by driver - For time > 1.0 s	5.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050A Cold Start Idle Control System Performance	Cold Start Monitoring Idle Speed Control (ISC) Out Of Range Low	- Engine speed deviation > 100 RPM - And - RPM controller torque value $\geq$ calculated max. value Nm	- Catalyst heating active - Time after engine start $\geq$ 5.0 s - BARO > 71.90 kPa - ECT -10 – 60° C - Torque safety limitation not active - Conditions vehicle speed: - Vehicle speed 0 km/h - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - Conditions driver request: - Accelerator pedal released by driver - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - For time > 1.0 s - For manual transmission: - Engine load not calibrated %	8.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Cold Start Monitoring Idle Speed Control (ISC) Out Of Range High	- Engine speed deviation < -200 RPM - And - RPM controller torque value <= calculated min. value Nm - Or - Integrated number of fuel cut off transitions not calibrated [-]	- Catalyst heating active - Time after engine start >= 5.0 s - BARO > 71.90 kPa - ECT -10 – 60° C - Torque safety limitation not active - Conditions vehicle speed: - Vehicle speed 0 km/h - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - Conditions driver request: - Accelerator pedal released by driver - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - For time > 1.0 s	4.0 s - Multiple		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050B Cold Start Ignition Timing Performance	Cold Start Monitoring Ignition Control (IC) Idle Ignition Timing Monitor	Difference between commanded spark timing vs. actual value > 16.0%	- General: - Commanded spark retard during catalyst heating < 84.0% - Catalyst heating active - For time > 4.0 s - Fuel cut off not active - BARO > 73.0 kPa - Idle condition active - Diff. relative engine load vs. filtered relative engine load <= 15.0% (For relative engine load dynamic detection) - Diff. engine speed vs. filtered engine speed <= 300 RPM (For engine speed dynamic detection) - Relative engine load <= 181.99% - Conditions vehicle speed: - Vehicle speed 0.0 km/h - Or - Engine running and decoupled from powertrain (for hybrid) not equipped	5.0 s - Once / DCY	2 DCY	- Inspect the air cleaner element and the air intake system visually for leaks. - Inspect the PCV system visually for leaks. - Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613 . - Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 . - Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205 , Checking", page 1597 . - Verify the latest Engine Control Module - J623- software is being used. Refer to appropriate scan tool.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P052 A Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	Cold Start Monitoring Variable Valve Timing (VVT) Intake Actuator Target Error	Difference between target position vs. actual position > 6.0° CRK	- Time after engine start >= 1.5 – 40.0 s - Engine speed >= 400 RPM - Modeled oil temperature >= -10 – 160° C - Commanded camshaft timing correction for catalyst heating active	5.0 s - Once / DCY	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .
P0544 Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 1	Exhaust Gas Temperature (EGT) Sensor During Cold Start Rationality Check	Difference between measured and modeled exhaust gas temp. @ homogeneous running > 200.0 K	- Time after engine start 2.0 s - ECT @ engine shut-off > 80° C - IAT @ start < 40° C - ECT @ start < 40° C - Diff. between ECT @ start and IAT < 15.0 K	3.0 s - Once / DCY	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
	Exhaust Gas Temperature (EGT) Sensor During Warm Engine Running Rationality Check	Difference exhaust temperature to average of IAT and ECT @ start > 100.0 K	- Conditions for measurement window - Engine running - Engine speed > 20 RPM - Catalyst heating not active - Fuel cut off not active - Modeled exhaust gas temperature > 600° C - Monitor measurement window conditions fulfilled > 60.0 s	3.0 s - Continuous		
	Exhaust Gas Temperature (EGT) Sensor Signal Period Check	Deviation of time period > 30.0 ms				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0545 Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 1	Exhaust Gas Temperature (EGT) Sensor Out Of Range Low	Exhaust gas temperature < -37° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
P0546 Exhaust Gas Temperature Sensor Circuit High Bank 1 Sensor 1	Exhaust Gas Temperature (EGT) Sensor Out Of Range High	Exhaust gas temperature > 1,107° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
P0547 Exhaust Gas Temperature Sensor During Cold Start Rationality Check	Exhaust Gas Temperature (EGT) Sensor During Cold Start Rationality Check	Difference between measured and modeled exhaust gas temp. @ homogeneous running > 200.0 K	- Time after engine start 2.0 s - ECT @ engine shut-off > 80° C - IAT @ start < 40° C - ECT @ start < 40° C - Diff. between ECT @ start and IAT < 15.0 K	3.0 s - Once / DCY	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448- Checking", page 1622 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Exhaust Gas Temperature (EGT) Sensor During Warm Engine Running Rationality Check	Difference exhaust temperature to average of IAT and ECT @ start > 100.0 K	- Conditions for measurement window - Engine running - Engine speed > 20 RPM - Catalyst heating not active - Fuel cut off not active - Modeled exhaust gas temperature > 600° C - Monitor measurement window conditions fulfilled > 60.0 s	3.0 s - Continuous		
	Exhaust Gas Temperature (EGT) Sensor Signal Period Check	Deviation of time period > 30.0 ms				
P0548 Exhaust Gas Temperature Sensor Out Of Range Low	Exhaust Gas Temperature (EGT) Sensor Out Of Range Low	Exhaust gas temperature < -37° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448, Checking", page 1622 .
P0549 Exhaust Gas Temperature Sensor Out Of Range High	Exhaust Gas Temperature (EGT) Sensor Out Of Range High	Exhaust gas temperature > 1,107° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448, Checking", page 1622 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0555 Brake Booster Pressure Sensor Short To Battery / Open Circuit	Brake Booster Pressure Sensor Short To Battery / Open Circuit	Signal voltage > 4.95 V	Time after ignition on > 500.0 ms	0.4 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ “3.6.2 Brake Pressure Sensor 1 G201, Checking”, page 1595 .
P0556 Brake Booster Pressure Sensor Circuit Range/Performance	Brake Booster Pressure Sensor Out Of Range Low	Brake booster pressure < 10.0 kPa	Brake light switch off	0.2 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ “3.6.2 Brake Pressure Sensor 1 G201, Checking”, page 1595 .
	Brake Booster Pressure Sensor Out Of Range High	Brake booster pressure > 119.0 kPa				
	Brake Booster Pressure Sensor Rationality Check	- Diff. brake booster pressure vs. BARO > 255.0 kPa - Or - Gradient brake booster pressure > 1,278.98 kPa/s		0.2 s - Multiple		
	Brake Vacuum Pump Functional Check	Brake booster pressure difference between measurement 1 and 2 < 1.50 – 4.50 kPa	- Monitor entry conditions: - Vacuum pump commanded on - For time > 0.1 s - Brake light switch off - Brake booster pressure >= (barometric pressure * 0.20) + 15.0 kPa - Pressure measurement 1: - Entry conditions fulfilled - Pressure measurement 2: - Time after entry conditions fulfilled 1.0 s	0.0 s - Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0557 Brake Booster Pressure Sensor Circuit Low	Brake Booster Pressure Sensor Short To Ground	Signal voltage < 0.10 V	Time after ignition on > 500.0 ms	0.4 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201, Checking", page 1595 .
P0562 System Voltage Low	Engine Control Module (ECM): Internal Timer Check Power Supply For ECM Internal Time	Internal check failure	Power on reset on/off	Once / DCY	1 DCY	Perform a charging system check and battery test to determine if the battery or charging system need to be serviced. Refer to appropriate repair manual.
P0606 Control Module Processor	Barometric Pressure (BARO) Sensor Rationality Check	- Diff. barometric sensor signal vs. boost pressure signal > 6.0 kPa - And - Diff. barometric sensor vs. last driving cycle > 10.0 kPa	- Time after engine start < 5.0 s - Engine speed < 1,000 RPM - Throttle position < 5.0%	2.0 s - Once / DCY	2 DCY	Check for any component or circuit fault codes and diagnose them first. If no faults are found during diagnosis, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
		- Diff. barometric sensor signal vs. boost pressure signal < -9.0 kPa - And - Diff. barometric sensor vs. last driving cycle > 10.0 kPa		2.0 s - Continuous		
		Signal gradient > 0.25 kPa/s				
		Signal gradient < -0.25 kPa/s				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Barometric Pressure (BARO) Sensor Out Of Range Low	Measured BARO < 50.0 kPa				
	Barometric Pressure (BARO) Sensor Out Of Range High	Measured BARO > 115.0 kPa				
	Barometric Pressure (BARO) Sensor Short To Ground	Signal voltage < 0.20 V		1.0 s - Multiple		
	Barometric Pressure (BARO) Sensor Short To Battery / Open Circuit	Signal voltage > 4.80 V				
	Ignition Control (IC) Communication Check	- Internal check failure - SPI communications check identifier failure	Engine speed not calibrated RPM	0.5 s - Continuous		
	Engine Control Module (ECM): 5V Supply Voltage	Internal hardware check under- / over-voltage detection		2.0 s - Continuous		
	Engine Control Module (ECM): Cylinder Deactivation (CD) Function Monitoring: Cylinder Deactivation (CD)	- Injection pattern incorrect - Or - Ignition pattern incorrect - Or - Transition from cylinder deactivation (CD) to normal operation mode failed	- Cylinder deactivation (CD) commanded on - Engine speed > 1200 RPM	0.2 s - Continuous		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): EEPROM Functional Check	Internal checksum failed	Ignition on	0.5 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: A/D Converter	- Comparison reference voltage with sensor voltage incorrect - Internal check failed - Test voltage check failed				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Torque	- Torque deviation for time > 0.5 s - Or - Integrated relative torque deviation > 8.0%*s	Internal engine speed > 1,000 RPM			
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Engine Speed Deviation	Difference between calculated and internal engine speed > 320 RPM	Internal engine speed > 520 RPM	0.5 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Coding	Internal check failed				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Ignition Timing					
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Intern	System reaction incorrect				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Injection Rate Limitation					
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Cylinder Deactivation (CD)	- Injection on deactivated cylinders active - Or - Ignitions on deactivated cylinders active	Cylinder deactivation (CD) active	2.0 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Accelerator Position	Comparison voltage sensor 1 with sensor 2 implausible		0.5 s - Continuous		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): Electronic Throttle Control Module Monitoring Module	- Function controller check failed - And - Monitoring module check no failure	SPI - interface no failure			
	Engine Control Module (ECM): Processor CY150 Communication Check	Internal check incorrect		0.05 s - Continuous		
	Engine Control Module (ECM): RAM Controller RAM Check	Memory checksum error detected	ECM initialization phase active	- None [-] - Once / DCY		
	Engine Control Module (ECM): Sensor Integrated Circuit Internal Hardware Check (Electrical Adjustment Communication, Voltage Supply)	Check failed		0.5 s - Continuous		
	Engine Control Module (ECM): WDA Function Monitoring: WDA	- Over voltage detection failure - Internal check failure - General cause failure				
P0627 Fuel Pump "A" Control Circuit/Open	Fuel Pump (FP) Relay Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay - J17- / Fuel Pump 1 - V276- . Refer to → "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276, Checking", page 1628 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Pump (FP) Relay Short To Ground	Signal voltage < 2.74 – 3.26 V				
P0629 Fuel Pump "A" Control Circuit High	Fuel Pump (FP) Relay Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed > 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay - J17- / Fuel Pump 1 - V276- . Refer to ⇒ "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276 . Checking", page 1628 .
P0638 Throttle Actuator Control Range/Performance Bank 1	Throttle Actuator Rationality Check Close Movement	- Time to close to reference point > 0.6 s - And - Deviation to reference point > 3.0%	- Engine speed 0 RPM - Vehicle speed 0 km/h - ECT > 5° C - IAT > 5° C - First start of DCY - Ignition on - Or - Engine stop - Engine after run active - Number of checks 3.0 [-]	5.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Throttle Actuator Signal Range Check @ Mechanical Stop Low (Only Once After EE-PROM Reset)	- TPS 1 signal voltage < 0.21; > 0.87 V - Or - TPS 2 signal voltage < 4.14; > 4.84 V	- Engine speed 0 RPM - Vehicle speed 0 km/h - First start of DCY - Ignition on - ECT 5 – 101° C - IAT 5 – 143° C - Or - Engine stop - Engine after run active - ECT 5 – 101° C - IAT 5 – 143° C	0.3 s - Multiple		
P0641 Sensor Reference Voltage "A" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit A Short Circuit	Signal voltage < 4.8; > 5.2 V		0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0651 Sensor Reference Voltage "B" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit B Short Circuit	Signal voltage < 4.8; > 5.2 V		0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0657 Actuator Supply Voltage "A" Circuit/ Open	Engine Components Supply Voltage Relay Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757 . Checking", page 1611 .
P0658 Actuator Supply Voltage "A" Circuit Low	Engine Components Supply Voltage Relay Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757 . Checking", page 1611 .
P0659 Actuator Supply Voltage "A" Circuit High	Engine Components Supply Voltage Relay Short To Battery Plus	Signal current > 0.06 – 10.0 A	Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757 . Checking", page 1611 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P068 A ECM / PCM Power Relay De-Energized Performance - Too Early	Main Relay Functional Check - Early Opening	Defect counter ≥ 3.0 [-]	Ignition on	0.0 s - Once / DCY	2 DCY	- Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 . - Check the Motronic Engine Control Module Power Supply Relay 2 - J670- . Refer to ⇒ "3.6.29 Motronic Engine Control Module Power Supply Relay 2 J670, Checking", page 1648 .
P0697 Sensor Reference Voltage "C" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit C Short Circuit	Signal voltage < 4.8; > 5.2 V		0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P13E A Cold Start Ignition Timing Performance Off Idle	Cold Start Monitoring Ignition Control (IC) Part Load Ignition Timing Monitor	Difference between commanded spark timing vs. actual value > 18.0%	- General: - Commanded spark retard during catalyst heating < 90.0% - Catalyst heating active - For time > 4.0 s - Fuel cut off not active - BARO > 73.0 kPa - Diff. relative engine load vs. filtered relative engine load <= 15.0% (For relative engine load dynamic detection) - Diff. engine speed vs. filtered engine speed <= 300 RPM (For engine speed dynamic detection) - Idle condition not active - Vehicle speed >= 2 km/h - Additional (only for hybrid): - Engine running and decoupled from powertrain not equipped	2.5 s - Once / DCY	2 DCY	Check for any engine speed sensor or ignition coil faults and diagnose them first. If no other faults are set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P1427 Brake Vacuum Pump Activation Short Circuit To B+	Brake Vacuum Pump Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Engine speed >= 80 RPM - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to "3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 - Checking", page 1674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P1428 Brake Vacuum Pump Activation Short Circuit To Ground	Brake Vacuum Pump Short To Ground	Signal voltage < 2.74 – 3.26 V	Engine speed $\geq$ 80 RPM	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to ⇒ "3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 , Checking", page 1674 .
P1429 Brake Vacuum Pump Activation Open Circuit	Brake Vacuum Pump Open Circuit	Signal voltage 4.70 – 5.40 V	Engine speed $\geq$ 80 RPM	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to ⇒ "3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 , Checking", page 1674 .
P150 A Engine Off Timer Performance	Engine Off Time Comparison Of Engine Off Time From Instrument Cluster Control Unit With Engine After Run Time	- Difference between engine-off time and ECM after-run time < -12.0 s - Difference between engine-off time and ECM after-run time > 12.0 s	- Ignition on - CAN active - Ignition on - CAN active (during ECM keep alive-time)	2.0 s - Once / DCY	2 DCY	If ignition off B+ is lost to ECM, this code will set. Check power and ground inputs to ECM first. Refer to appropriate wiring diagram. If all power/grounds to ECM are present, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P166 F Partial Engine Operation Deactivated	Engine Control Module (ECM): Cylinder Deactivation (CD) Vehicle In Cylinder Deactivation Service Mode	Cylinder deactivation service mode active	Ignition on	0.0 s - Continuous	1 DCY	If a relative cylinder deactivation fault is also set diagnose and repair those faults first. If there are no other faults stored, check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .
P169 A Loading Mode Active	Engine Control Module (ECM): Transport Mode Function Monitoring: Mode Change	Transport mode active	- For activation: - During ECM keep alive-time after ignition off - Vehicle speed ≤ 5 km/h - Engine speed 0 RPM - Max trip mileage since initial vehicle start-up < 100.0 km - Production mode not active - For hybrid: - Drive motor off	0.0 s - Continuous	1 DCY	Vehicle in transport mode. Refer to appropriate repair manual. May need to perform readiness check. Refer to ⇒ "3.2 Readiness Code", page 14 .
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	Variable Valve Timing (VVT) Intake Actuator Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .

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P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	Variable Valve Timing (VVT) Intake Actuator Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Fuel System Out Of Range Low	I-part of 2nd lambda control loop < -0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 . - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Fuel System Out Of Range High	I-part of 2nd lambda control loop > 0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 . - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2098 Post Catalyst Fuel Trim System Too Lean Bank 2	Fuel System Out Of Range Low	I-part of 2nd lambda control loop < -0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 2 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 . - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2099 Post Catalyst Fuel Trim System Too Rich Bank 2	Fuel System Out Of Range High	I-part of 2nd lambda control loop > 0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 2 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 2 After Catalytic Converter - GX8-. Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11-. Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659. - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Or - Deceleration enrichment active - Then - LSU offset adaptation stops if event counter > 1.0 [-] - And - Exhaust gas mass flow 30.0 – 180.0 kg/h - Or - Exhaust gas mass flow 30.0 kg/h - Within time not calibrated s			
P2101 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Actuator Signal Range Check	- Duty cycle > 80.0% - And - ECM power stage no failure		5.0 s - Continuous	2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
	Throttle Actuator Rationality Check	Deviation throttle value angles vs. throttle value set point > 4.0 – 50.0%		0.5 - Continuous		
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Short To Battery Plus / Short To Ground	Internal check failed		0.5 s - Continuous	2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
	Throttle Actuator Open Circuit		- Duty cycle > 80.0% - Or - Deviation throttle value angles vs. throttle value set point > 4.0 – 50.0%			
	Throttle Actuator Temperature / Current Monitoring					

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Throttle Actuator Functional Check					
P2119 Throttle Actuator "A" Control Throttle Body Range/Performance	Throttle Actuator Signal Range Check @ Mechanical Stop Low	- TPS 1 signal voltage < 0.21; > 0.87 V - Or - TPS 2 signal voltage < 4.14; > 4.84 V	- Engine speed 0 RPM - Vehicle speed 0 km/h - First start of DCY - Ignition on - ECT 5 – 101° C - IAT 5 – 143° C - Or - Engine stop - Engine after run active - ECT 5 – 101° C - IAT 5 – 143° C	0.3 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P2122 Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	Accelerator Pedal Position (APP) Sensor 1 Out Of Range Low	Signal voltage < 0.61 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2123 Throttle/ Pedal Position Sensor/ Switch "D" Circuit High	Accelerator Pedal Position (APP) Sensor 1 Out Of Range High	Signal voltage > 4.79 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2127 Throttle/ Pedal Position Sensor/ Switch "E" Circuit Low	Accelerator Pedal Position (APP) Sensor 2 Out Of Range Low	Signal voltage < 0.27 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2128 Throttle/Pedal Position Sensor/Switch "E" Circuit High	Accelerator Pedal Position (APP) Sensor 2 Out Of Range High	Signal voltage > 2.43 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2138 Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	Accelerator Pedal Position (APP) Sensor 1 And 2 Rationality Check	Signal voltage sensor 1 vs. 2 > 0.17 – 0.70 V	- Signal voltage sensor 1 > 445.0 mV - Signal voltage sensor 2 > 445.0 mV	0.24 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2177 System Too Lean @ Part Load Bank 1	Fuel System Too Lean @ Part Load	Adaptive value > 20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Lean @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			
P2178 System Too Rich Off Idle Bank 1	Fuel System Too Rich @ Part Load	Adaptive value < -20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. Refer to appropriate repair manual. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Rich @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			
P2179 System Too Lean Off Idle Bank 2	Fuel System Too Lean @ Part Load	Adaptive value > 20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Lean @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			
P2180 System Too Rich Off Idle Bank 2	Fuel System Too Rich @ Part Load	Adaptive value < -20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. Refer to appropriate repair manual. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11-. Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Rich @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,840 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2181 Cooling System Performance	Engine Cooling System Performance Not In The Expected Range	- Cooling system temperature too low after a sufficient MAF integral < 82° C - For time >= 5.0 s	- Monitor entry conditions: - ECT @ start -8 – 60° C - And - AAT -8 – 55° C - Or - IAT not calibrated ° C - Begin of air mass integration: - ECT > 40° C - Conditions for diagnosis: - MAF < 400.0 kg/h - Delta BARO < 1.50 kPa - Delta AAT K - And - Accum. time required < 140.0 – 385.0 s - Or - Accum. integrated air mass not calibrated kg - Accumulation enable if - Fuel cut off active - Or - Engine load > 100.0% - Or - Engine load < 14.0 – 30.0% - Start of fault decision: - Integrated air mass > 9.24 – 19.69 kg - Conditions at fault decision: (Average values since start)	0.0 (Unified 740.0) s - Once / DCY	2 DCY	Check the Engine Coolant Temperature Sensor - G62-. Refer to ⇒ “3.6.11 Engine Coolant Temperature Sensor G62-, Checking”, page 1613 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- MAF (lower threshold) $\geq 32.0 - 86.40$ kg/h - MAF (upper threshold) $\leq 100.0 - 260.0$ kg/h - Vehicle speed (lower threshold) $\geq 15 - 40$ km/h - Vehicle speed (upper threshold) ≤ 120 km/h			
P2187 System Too Lean at Idle Bank 1	Fuel System Too Lean @ Idle	Adaptive value $> 5.48\%$	- Number of injections after engine start $> 1,000$ [-] - Engine speed $520 - 1,040$ RPM - Engine load $4.0 - 16.0\%$ - ECT $> 55^\circ$ C - IAT $< 72^\circ$ C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2188 System Too Rich at Idle Bank 1	Fuel System Too Rich @ Idle	Adaptive value < -5.48%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 1,040 RPM - Engine load 4.0 – 16.0% - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10-, Checking", page 1653.
P2189 System Too Lean at Idle Bank 2	Fuel System Too Lean @ Idle	Adaptive value > 5.48%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 1,040 RPM - Engine load 4.0 – 16.0% - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- Check for air leaks behind the Bank 1 MAF including intake manifold. Check the Bank 2 exhaust system for leaks before the upstream O2S. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11-. Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11-, Checking", page 1659.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2190 System Too Rich at Idle Bank 2	Fuel System Too Rich @ Idle	Adaptive value < -5.48%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 1,040 RPM - Engine load 4.0 – 16.0% - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2195 O2 Sensor Signal Biased / Stuck Lean Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range High	Delta lambda of 2nd lambda control loop > 0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 – 180.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2196 O2 Sensor Signal Biased / Stuck Rich Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range Low	Delta lambda of 2nd lambda control loop < -0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking”, page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• And • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2197 O2 Sensor Signal Biased / Stuck Lean Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range High	Delta lambda of 2nd lambda control loop > 0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11-. Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 – 180.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2198 O2 Sensor Signal Biased / Stuck Rich Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range Low	Delta lambda of 2nd lambda control loop < -0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking”, page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• And • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 C Cylinder 1 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-]	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 D Cylinder 2 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 E Cylinder 3 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected	20.0 (does not run in FTP) s - Once / DCY	• 2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 F Cylinder 4 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A0 Cylinder 5 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A1 Cylinder 6 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A2 Cylinder 7 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]				

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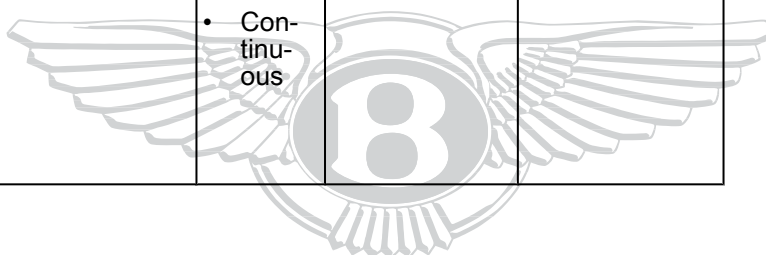
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A3 Cylinder 8 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2237 O2 Sensor Positive Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Pump Current (IP)	- O2S voltage signal front 1.46 – 1.54 V - And - Difference between maximum and minimum value of O2S voltage signal front < 0.01 V - And - Delta lambda controller > 0.10 [-] - Or - Lambda control at min or max limit	- General: - O2S ceramic temp > 725° C - Heater control closed loop - Case fuel cut off: - Electrical adjustment not active - Evap purge valve ready - Case else: - Lambda modulation > 0.01 [-] - Lambda control closed loop - If stepwise change lambda set point - Commanded delta lambda step 0.05 [-]	6.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
		- O2S voltage signal front 1.46 – 1.54 V - And - Difference between maximum and minimum value of O2S voltage signal front < 0.01 V - And - No reaction on commanded stepwise change of lambda set point <> 1		5.0 s - Continuous		
		- O2S voltage signal front < 1.55 V - And - Fuel cut off > 3.0 s				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2240 O2 Sensor Positive Current Control Circuit/ Open Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Pump Current (IP)	- O2S voltage signal front 1.46 – 1.54 V - And - Difference between maximum and minimum value of O2S voltage signal front < 0.01 V - And - Delta lambda controller > 0.10 [-] - Or - Lambda control at min or max limit	- General: - O2S ceramic temp > 725° C - Heater control closed loop - Case fuel cut off: - Electrical adjustment not active - Evap purge valve ready - Case else: - Lambda modulation > 0.01 [-] - Lambda control closed loop - If stepwise change lambda set point - Commanded delta lambda step 0.05 [-]	6.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
		- O2S voltage signal front 1.46 – 1.54 V - And - Difference between maximum and minimum value of O2S voltage signal front < 0.01 V - And - No reaction on commanded stepwise change of lambda set point <> 1		5.0 s - Continuous		
		- O2S voltage signal front < 1.55 V - And - Fuel cut off > 3.0 s				



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2243 O2 Sensor Reference Voltage Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Nernst Voltage (UN)	- O2S voltage signal front < 0.20; > 4.70 V - Internal resistance > 950.0 Ω	Heater control active	20.0 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
P2247 O2 Sensor Reference Voltage Circuit/ Open Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Nernst Voltage (UN)	- O2S voltage signal front < 0.20; > 4.70 V - Internal resistance > 950.0 Ω	Heater control active	20.0 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .
P2257 AIR System Control "A" Circuit Low	Secondary Air Injection (AIR) Pump Relay Short To Ground	Signal voltage < 2.74 - 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- Checking", page 1661 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2258 AIR System Control "A" Circuit High	Secondary Air Injection (AIR) Pump Relay Short To Battery Plus	Signal current > 0.60 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 .
P2259 AIR System Control "B" Circuit Low	Secondary Air Injection (AIR) Pump Relay Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .
P2260 AIR System Control "B" Circuit High	Secondary Air Injection (AIR) Pump Relay Short To Battery Plus	Signal current > 0.60 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2270 O2 Sensor Signal Biased / Stuck Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Lean	Sensor voltage < 0.72 V	- O2S rear ready - Integrated exhaust gas mass after O2S rear ready ≥ 0.30 kg - Injection valve commanded on - Engine running - If - Integrated exhaust gas mass ≥ 1.50 kg - Or - Error suspicion set - Then - Enabling lambda ramp slope of the lambda ramp 0.05 1/s - Target lambda of the lambda ramp 0.85 [-] - Exhaust gas mass during ≥ 0.07 kg - Target lambda reached ≤ 0.85 [-] - If - Time fuel cut off > 5.0 s - Then disabling for - Time delay after fuel cut off 5.0 s - Additional Conditions: - Scavenging-rate not calibrated [-] - Integrated exhaust gas mass not calibrated kg - Split factor DFI/MFI not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7- , Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - Engine speed 1,000 – 3,520 RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF 50.0 – 260.0 kg/h - Within time 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2271 O2 Sensor Signal Biased / Stuck Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Rich	Sensor voltage > 0.20 V	- General: - O2S rear ready - Integrated exhaust gas mass after O2S rear ready >= 0.30 kg - Injection valve commanded on - Engine running - Case 1: (During lambda ramp activation) false - If - Integrated exhaust gas mass not calibrated kg - Or - Error suspicion not calibrated - Then - Enabling lambda ramp not calibrated - Slope of the lambda ramp not calibrated 1/s - Target lambda of the lambda ramp not calibrated [-] - Exhaust gas mass during not calibrated kg - Target lambda reached not calibrated [-] - If - Time fuel cut off not calibrated s - Then disabling for - Time delay after fuel cut off not calibrated s - Additional conditions: - Scavenging-rate not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Integrated exhaust gas mass not calibrated kg - Split factor DFI/MFI not calibrated [-] - Modeled exhaust gas temperature fitted position O2S rear not calibrated ° C - Engine speed not calibrated RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF not calibrated kg/h - Within time not calibrated s - Case 2: (During fuel cut off) true - Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - O2S front lambda value (for wide range sensor) > 8.0 [-] - O2S front voltage (for binary sensor) not calibrated V - Fuel cut off active - Integrated O2 mass during fuel cut off >= 6.0 g - Time delay not calibrated s			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2272 O2 Sensor Signal Biased / Stuck Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Lean	Sensor voltage < 0.72 V	- O2S rear ready - Integrated exhaust gas mass after O2S rear ready ≥ 0.30 kg - Injection valve commanded on - Engine running - If - Integrated exhaust gas mass ≥ 1.50 kg - Or - Error suspicion set - Then - Enabling lambda ramp slope of the lambda ramp 0.05 1/s - Target lambda of the lambda ramp 0.85 [-] - Exhaust gas mass during ≥ 0.07 kg - Target lambda reached ≤ 0.85 [-] - If - Time fuel cut off > 5.0 s - Then disabling for - Time delay after fuel cut off 5.0 s - Additional Conditions: - Scavenging rate not calibrated [-] - Integrated exhaust gas mass not calibrated kg - Split factor DFI/ MFI not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - Engine speed 1,000 – 3,520 RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF 50.0 – 260.0 kg/h - Within time 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2273 O2 Sensor Signal Biased / Stuck Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Rich	Sensor voltage > 0.20 V	- General: - O2S rear ready - Integrated exhaust gas mass after O2S rear ready ≥ 0.30 kg - Injection valve commanded on - Engine running - Case 1: (During lambda ramp activation) false - If - Integrated exhaust gas mass not calibrated kg - Or - Error suspicion not calibrated - Then - Enabling lambda ramp not calibrated - Slope of the lambda ramp not calibrated 1/s - Target lambda of the lambda ramp not calibrated [-] - Exhaust gas mass during not calibrated kg - Target lambda reached not calibrated [-] - If - Time fuel cut off not calibrated s - Then disabling for - Time delay after fuel cut off not calibrated s - Additional conditions: - Scavenging-rate not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Integrated exhaust gas mass not calibrated kg - Split factor DFI/MFI not calibrated [-] - Modeled exhaust gas temperature fitted position O2S rear not calibrated ° C - Engine speed not calibrated RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF not calibrated kg/h - Within time not calibrated s - Case 2: (During fuel cut off) true - Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - O2S front lambda value (for wide range sensor) > 8.0 [-] - O2S front voltage (for binary sensor) not calibrated V - Fuel cut off active - Integrated O2 mass during fuel cut off >= 6.0 g - Time delay not calibrated s			

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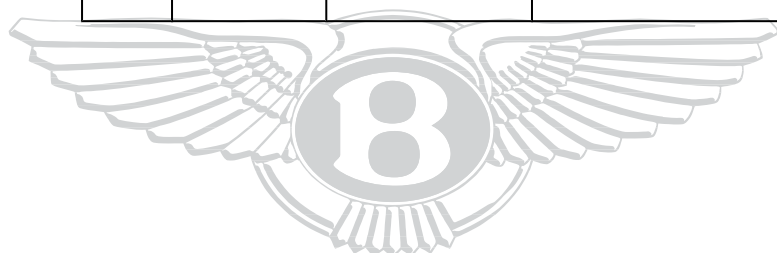
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2279 MAP/MAF - Throttle Position Correlation	Intake Manifold Adaptation Value Monitoring	- Offset value throttle mass flow > 13.0 kg/h - And - Correction factor > 0.97 [-]	- Desired MAF 5.0 – 50.0 kg/h - ECT -48 – 143° C - BARO not calibrated kPa - Evap purge valve closed - EGR not equipped	3.0 s - Multiple	2 DCY	- This code will set if the calculated air intake is more than the MAF actual value. Check visually for air leaks after the MAF sensor. Check the Mass Airflow Sensor - G70- . Refer to ⇒ “3.6.27 Mass Airflow Sensor G70, Checking”, page 1644 . - Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ “3.6.28 Mass Airflow Sensor 2 G246, Checking”, page 1646 .
P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage, Checking”, page 1633 .
P2301 Ignition Coil "A" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage, Checking”, page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2307 Ignition Coil "C" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 A Cylinder 1 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230B Cylinder 2 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 C Cylinder 3 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230D Cylinder 4 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230E Cylinder 5 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 F Cylinder 6 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2312 Ignition Coil "E" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2313 Ignition Coil "E" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2315 Ignition Coil "F" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2316 Ignition Coil "F" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P2318 Ignition Coil "G" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P2319 Ignition Coil "G" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P231 A Cylinder 7 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P231 B Cylinder 8 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2321 Ignition Coil "H" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2322 Ignition Coil "H" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2400 EVAP System Leak Detection Pump Control Circuit/Open	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Open Circuit	Signal voltage 4.70 – 5.40 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.24 Leak Detection Pump V144, Checking", page 1638 .
P2401 EVAP System Leak Detection Pump Control Circuit Low	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Ground	Signal voltage < 2.74 – 3.26 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.24 Leak Detection Pump V144, Checking", page 1638 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2402 EVAP System Leak Detection Pump Control Circuit High	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Leak Detection Pump - V144-. Refer to ⇒ “3.6.24 Leak Detection Pump V144- Checking”, page 1638.
P2403 EVAP System Leak Detection Pump Sense Circuit/Open	Leak Detection Pump (LDP) Reed Sensor Rationality Check Unable To Close	Low signal voltage > 0.5 s	- Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - BARO > 73.40 kPa - Integrated EVAP purge mass > 39.8 g - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Evap purge valve ready - LDP commanded off - ECT 4 – 110° C - ECT @ start 4 – 110° C - Case 1: - AAT not calibrated ° C - Case 2: - IAT 3 – 90° C	0.5 s - Once / DCY	2 DCY	Check the Leak Detection Pump - V144-. Refer to ⇒ “3.6.24 Leak Detection Pump V144- Checking”, page 1638.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2404 EVAP System Leak Detection Pump Sense Circuit Range/Performance	Leak Detection Pump (LDP) Reed Sensor Rationality Check Unable To Open	- High signal voltage > 12.0 s - And - Number of checks 30.0 [-]	- Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Intake manifold vacuum > -100.0 kPa - Evap purge valve closed, ready - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - Case 1: - AAT not calibrated ° C - Case 2: - IAT 3 – 70° C	12.0 s - Once / DCY	2 DCY	Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.24 Leak Detection Pump V144 . Checking”, page 1638 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check (Check For Sensor At Ambient Air)	- Threshold 1: - Signal voltage 2.71 – 5.0 V - Threshold 2: - Signal voltage 2.05 – 3.06 V - Depending on gain factor, that actual is used for sensor characteristic, the threshold is	- Lambda set value < 1.6 [-] - O2S ceramic temperature > 665° C - Fuel cut off not active - Heater control closed loop - If low fuel signal then wait > 600.0 s - Only AIR system - AIR not active	10.0 s - Multiple	• 2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
P2415 O2 Sensor Exhaust Sample Error Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check (Check For Sensor At Ambient Air)	- Threshold 1: - Signal voltage 2.71 – 5.0 V - Threshold 2: - Signal voltage 2.05 – 3.06 V - Depending on gain factor, that actual is used for sensor characteristic, the threshold is	- Lambda set value < 1.6 [-] - O2S ceramic temperature > 665° C - Fuel cut off not active - Heater control closed loop - If low fuel signal then wait > 600.0 s - Only AIR system - AIR not active	10.0 s - Multiple	• 2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .
P2431 AIR System Air Flow/Pressure Sensor Circuit Range/Performance Bank 1	Secondary Air Injection (AIR) Pressure Sensor Rationality Check	Diff. between AIR pressure and BARO < -6.0; > 6.0 kPa	- Actuator commanded off - BARO valid	0.01 s - Once / DCY	• 2 DCY	Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609- Checking", page 1666 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2432 AIR System Air Flow/Pressure Sensor Circuit Low Bank 1	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage < 0.40 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609 Checking", page 1666 .
P2433 AIR System Air Flow/Pressure Sensor Circuit High Bank 1	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage > 4.60 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609 Checking", page 1666 .
P2436 AIR System Air Flow/Pressure Sensor Circuit Range/Performance Bank 2	Secondary Air Injection (AIR) Pressure Sensor Rationality Check	Diff. between AIR pressure and BARO < -6.0; > 6.0 kPa	- Actuator commanded off - BARO valid	0.01 s - Once / DCY	2 DCY	Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610 Checking", page 1668 .
P2437 AIR System Air Flow/Pressure Sensor Circuit Low Bank 2	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage < 0.40 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610 Checking", page 1668 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2438 AIR System Air Flow/Pressure Sensor Circuit High Bank 2	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage > 4.60 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .
P2440 AIR System Switching Valve Stuck Open Bank 1	Secondary Air Injection (AIR) Stuck Open	- Case 1: - Relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while AIR valve closed) > 1.50 [-] - Case 2: - Average pressure difference between absolute value and filtered value while AIR valve closed > 0.30 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - BARO > 74.0 kPa - AIR system commanded on - Additional conditions: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.59 [-]	0.0 s - Once / DCY	2 DCY	- Check the secondary air combination valve visually. Replace if necessary. Refer to appropriate repair manual. - Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- Checking", page 1661 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2442 AIR System Switching Valve Stuck Open Bank 2	Secondary Air Injection (AIR) Stuck Open	- Case 1: - Relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while AIR valve closed) > 1.50 [-] - Case 2: - Average pressure difference between absolute value and filtered value while AIR valve closed > 0.30 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - BARO > 74.0 kPa - AIR system commanded on - Additional conditions: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.59 [-]	0.0 s - Once / DCY	2 DCY	- Check the secondary air combination valve visually. Replace if necessary. Refer to appropriate repair manual. - Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .
P25F6 AIR System "B"	Secondary Air Injection (AIR) Rationality Check Directly After Catalyst Heating	Diff. of measured AIR pressure before AIR injection vs. AIR pressure after AIR injection > 2.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - For time > 1.0 s - BARO > 74.0 kPa - AIR system commanded off	0.5 s - Once / DCY	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2632 Fuel Pump "B" Control Circuit / Open	Fuel Pump (FP) Relay Open Circuit	Signal voltage 4.70 – 5.40 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay 2 - J49- / Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277- Checking", page 1630 .
P2633 Fuel Pump "B" Control Circuit Low	Fuel Pump (FP) Relay Short To Ground	Signal voltage < 2.74 – 3.26 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay 2 - J49- / Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277- Checking", page 1630 .
P2634 Fuel Pump "B" Control Circuit High	Fuel Pump (FP) Relay Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed > 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay 2 - J49- / Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277- Checking", page 1630 .
P3081 Engine Temperature Too Low	Engine Coolant Temperature (ECT) Sensor Rationality Check	Diff. between reference model temperature and measured ECT > 15.0 K		4.0 s - Continuous	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 3 Cylinder Shut-Off Valve 1 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .

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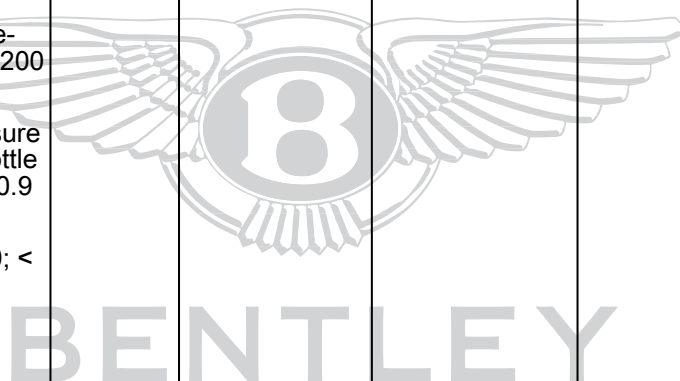
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 4 Cylinder Shut-Off Valve 1 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF @ throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 5 Cylinder Shut-Off Valve 2 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 6 Cylinder Shut-Off Valve 2 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > 200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF @ throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 7 Cylinder Shut-Off Valve 3 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking”, page 1607 .

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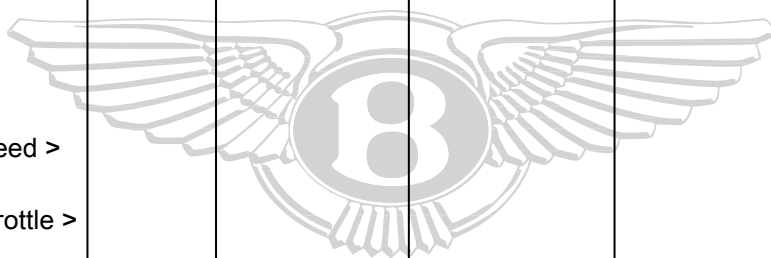
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 8 Cylinder Shut- Off Valve 3 Sticks Close d	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF @ throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 9 Cylinder Shut-Off Valve 4 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A A Cylinder Shut-Off Valve 4 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF @ throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			
P3401 Cylinder 1 Deactivation/ Intake Valve Control Circuit/ Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	Signal voltage 4.70 – 5.40 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking”, page 1607 .
P3403 Cylinder 1 Deactivation/ Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	Signal voltage < 2.74 – 3.26 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking”, page 1607 .
P3404 Cylinder 1 Deactivation/ Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	Signal current > 0.06 – 10.0 A	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking”, page 1607 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3409 Cylinder 2 Deactivation/ Intake Valve Control Circuit/ Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	• Signal voltage 4.70 – 5.40 V		• 0.5 s • Continuous	• 2 DCY	– Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .
P3411 Cylinder 2 Deactivation/ Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	• Signal voltage < 2.74 – 3.26 V		• 0.5 s • Continuous	• 2 DCY	– Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .
P3412 Cylinder 2 Deactivation/ Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Engine speed ≥ 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .
P3417 Cylinder 3 Deactivation/ Intake Valve Control Circuit/ Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	• Signal voltage 4.70 – 5.40 V		• 0.5 s • Continuous	• 2 DCY	– Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3419 Cylinder 3 Deactivation/Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	Signal voltage < 2.74 – 3.26 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8-. Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking”, page 1607.
P3420 Cylinder 3 Deactivation/Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	Signal current > 0.06 – 10.0 A	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8-. Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking”, page 1607.
P3425 Cylinder 4 Deactivation/Intake Valve Control Circuit/Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	Signal voltage 4.70 – 5.40 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8-. Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking”, page 1607.
P3427 Cylinder 4 Deactivation/Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	Signal voltage < 2.74 – 3.26 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8-. Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking”, page 1607.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3428 Cylinder 4 Deactivation/Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	Signal current > 0.06 – 10.0 A	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking”, page 1607 .
U0001 High Speed CAN Communication Bus	CAN: Powertrain Reading Back Sent Message	Message no feedback	Time after ignition on > 500.0 ms	0.25 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 1601 .
U0002 High Speed CAN Communication Bus Performance	CAN: Powertrain Communication Check	Global time out receiving no message	Time after ignition on > 500.0 ms	0.45 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 1601 .
U0101 Lost Communication With TCM	COM: Transmission Control Module (TCM) Communication With TCM	Received message no message	Time after ignition on >= 0.5 s	1.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance between the Transmission Control Module to the Engine Control Module - J623- . Refer to ⇒ “3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking”, page 1603 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module	COM: Brake System Control Module (BSCM) Communication With BSCM	Received message no message	Time after ignition on > 500.0 ms	2.0 s - Continuous	2 DCY	Check the ABS CAN-Bus operation. Refer to appropriate repair manual.
U0140 Lost Communication With Body Control Module	COM: Body Control Module (BCM) Communication With BCM	Time out no message	Time after ignition on > 500.0 ms	5.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.
U0146 Lost Communication With Gateway "A"	COM: Gateway Communication With Gateway	Received message no message	Time after ignition on > 500.0 ms	1.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	COM: Instrument Panel Cluster (IPC) Communication With IPC	Received message no message	Time after ignition on >= 0.5 s	5.0 s - Continuous	2 DCY	Check the Instrument Cluster CAN-Bus. Refer to appropriate repair manual.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0402 Invalid Data Received From TCM	COM: Transmission Control Module (TCM) Communication With TCM	Received data implausible message	Time after ignition on > 500.0 ms	0.3 s - Continuous	2 DCY	Check for correct VIN and software ID stored in TCM. If the software ID or VIN is incorrect, a re-flash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to ⇒ "3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 1603.
U0415 Invalid Data Received From Anti-Lock Brake System (ABS) Control Module	COM: Brake System Control Module (BSCM) Communication With BSCM COM: Vehicle Speed Sensor (VSS) Communication With VSS	Received data implausible message	Time after ignition on > 500.0 ms	2.0 s - Continuous	2 DCY	Check for correct VIN and software ID stored in ABS. If the software ID or VIN is incorrect, a re-flash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to appropriate repair manual.
	COM: Vehicle Speed Sensor (VSS) Communication With VSS	- Speed sensor signal: initialization error 655.34 km/h - Speed sensor signal: low voltage error 655.33 km/h - Speed sensor signal: sensor error 655.35 km/h		1.98 s - Continuous		
	Vehicle Speed Sensor (VSS) Out Of Range High	Vehicle speed > 325 km/h		0.48 s - Continuous		
				3.0 s - Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U042 3 Invalid Data Received From Instrument Panel Cluster Control Module	COM: Instrument Panel Cluster (IPC) Communication With IPC	Received data implausible message	Time after ignition on > 500.0 ms	3.0 s - Continuous	2 DCY	Check the Instrument Cluster CAN-Bus. Refer to appropriate repair manual.
U044 7 Invalid Data Received From Gateway "A"	COM: Gateway Communication With Gateway	Received data implausible message	Time after ignition on > 500.0 ms	1.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P000 A "A" Camshaft Position Slow Response Bank 1	Variable Valve Timing (VVT) Intake Actuator Slow Response	- Difference between target position vs actual position > 3.0° CRK - For time > 1.5 – 3.0 s - And - Adjustment angle > 3.0° CRK - And - Number of checks 7 times	- Time after engine start > 3.0 – 10.0 s - Engine speed 480 – 5,000 RPM - Modeled oil temperature -11 – 125° C - Change of target position > 7.0 CRK	3.5 s - Multiple	2 DCY	Check the Camshaft Adjustment Valve 1 - N205-. Refer to "3.6.3 Camshaft Adjustment Valve 1 N205-, Checking", page 1597.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0010 "A" Camshaft Position Actuator "A" Control Circuit/ Open Bank 1	Variable Valve Timing (VVT) Intake Actuator Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .
P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	Variable Valve Timing (VVT) Intake Actuator Target Error	- Difference between target position vs actual position > 3.0° CRK - For time > 1.5 – 3.0 s - And - Adjustment angle <= 3.0° CRK - And - Number of checks 7 times	- Time after engine start > 3.0 – 10.0 s - Engine speed 480 – 5,000 RPM - Modeled oil temperature -11 – 125° C - Change of target position > 7.0° CRK	3.5 s - Multiple	2 DCY	- Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 . - Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0012 "A" Camshaft Position - Timing Over-Retarded Bank 1						– Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Camshaft Position (CMP) Intake Sensor Angular Offset Check	• Permissible deviation < -11.01° CRK	• Camshaft adaptation not active • Engine speed > 80 RPM	• 8.0 rev • Multiple	• 2 DCY	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Open Circuit	• Signal voltage 3.26 – 4.70 V	• Time after engine start > 5.0 s • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Ground	Signal voltage < 2.74 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- , Checking", page 1653 .
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Time after engine start > 5.0 s - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- , Checking", page 1653 .
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Open Circuit	Signal voltage 3.26 – 4.70 V	- Engine speed > 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7- , Checking", page 1650 .
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Ground	Signal voltage < 2.74 V	- Engine speed >= 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7- , Checking", page 1650 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Engine speed >= 80 RPM - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0040 O2 Sensor Signals Swapped Bank 1 Sensor 1 / Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check (Detection Of Exchange Lambda Sensors Upstream Catalyst)	• Lambda controllers exceed thresholds in opposite directions • Case 1: • Lambda control value bank 1 < 0.80 [-] • And • Lambda control value bank 2 > 1.20 [-] • Case 2: • Lambda control value bank 1 > 1.20 [-] • And • Lambda control value bank 2 < 0.80 [-]	• Lambda control closed loop • VVT ready	• 5.0 s • Multiple	• 2 DCY	- Using a scan tool with the engine running, check the Bank 1 and Bank 2 Long Term fuel trim - if one is above 10 negative and the other above 10 positive, swap the front HO2s sensor connectors and look for the long term values to move close to a zero or low single digit reading. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 . - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0050 HO2S Heater Control Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Open Circuit	Signal voltage 3.26 – 4.70 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
P0051 HO2S Heater Control Circuit Low Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Ground	Signal voltage < 2.74 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
P0052 HO2S Heater Control Circuit High Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Time after engine start > 5.0 s - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
P0056 HO2S Heater Control Circuit Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Open Circuit	Signal voltage 3.26 – 4.70 V	- Engine speed > 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0057 HO2S Heater Control Circuit Low Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Ground	Signal voltage < 2.74 V	- Engine speed >= 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .
P0058 HO2S Heater Control Circuit High Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Engine speed >= 80 RPM - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .
P0071 Ambient Air Temperature Sensor Circuit "A" Range/Performance	Intake Air Temperature (IAT) Sensor @ MAF Sensor Rationality Check Intake Air Temperature (IAT) Sensor @ MAF Sensor Low Phase Rationality Check	- Diff. IAT2 vs. ECT @ start > 20.3 K - Diff. IAT2 vs. ECT @ start < -45.0 K - Diff. max IAT2 vs. min IAT2 < 3.8 K	- ECT @ last engine stop <= 80° C - Diff. ECT @ last engine stop vs. ECT @ start <= 39.8 K - ECT @ start <= -35; >= 41° C - Time in low phase > 15.0 s - Number of checks >= 2.0 [1] - Vehicle speed >= 60 km/h - MAF >= 72.0; <= 180.0 kg/h	2.0 s - Once / DCY 10.0 s - Continuous	2 DCY	Check the Outside Air Temperature Sensor - G17- . Refer to appropriate repair manual.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Intake Air Temperature (IAT) Sensor @ MAF Sensor High Phase Rationality Check		- Time in high phase > 30.0 s - Number of checks >= 3.0 [-] - MAF < 40.0 kg/h - Vehicle speed < 20 km/h - ECT > 87° C - Integrated air mass > 7.01 – 16.84 kg			
P0072 Ambient Air Temperature Sensor Circuit "A" Low	Intake Air Temperature (IAT) Sensor @ MAF Sensor Out Of Range Low	Signal voltage < 0.11 V	- Conditions for measurement window - ECT > -48° C - MAF <= 1,020.0 kg/h - Vehicle speed <= 319 km/h - Monitor measurement window conditions fulfilled > 0.0 s	1.0 s - Continuous	2 DCY	Check the Outside Air Temperature Sensor - G17- . Refer to appropriate repair manual.
P0073 Ambient Air Temperature Sensor Circuit "A" High	Intake Air Temperature (IAT) Sensor @ MAF Sensor Out Of Range High	Signal voltage > 2.96 V	- Conditions for measurement window - ECT > -48° C - MAF <= 1,020.0 kg/h - Vehicle speed <= 319 km/h - Monitor measurement window conditions fulfilled > 0.0 s	1.0 s - Continuous	2 DCY	Check the Outside Air Temperature Sensor - G17- . Refer to appropriate repair manual.
P00B E Mass or Volume Air Flow "B" Circuit Range/Performance - Air Flow Too Low	Mass Air Flow (MAF) Sensor Out Of Range Low	Mass air flow to low < -45.0 kg/h	- Camshaft revolutions > 150.0 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to "3.6.28 Mass Airflow Sensor 2 G246- Checking", page 1646 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P00BF Mass or Volume Air Flow "B" Circuit Range/Performance - Air Flow Too High	Mass Air Flow (MAF) Sensor Out Of Range High	Mass air flow to high > 1,100.0 kg/h	- Camshaft revolutions > 150.0 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246, Checking", page 1646 .
P0100 Mass or Volume Air Flow Sensor "A" Circuit	Mass Air Flow (MAF) Sensor Internal Check	MAF sensor signal 0 µs	- Engine speed not active RPM - battery voltage > 11.00 [V]	0.2 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644 .
P0101 Mass or Volume Air Flow Sensor "A" Circuit Range/Performance	Mass Air Flow (MAF) Sensor Out Of Range Low Mass Air Flow (MAF) Sensor Out Of Range High Mass Air Flow (MAF) Sensor Rationality Check Low	- Mass air flow to low < -45.0 kg/h - Mass air flow to high > 1,100.0 kg/h	- Camshaft revolutions > 150.0 [-] - Time after engine start > 2.0 s - Idle not active - Engine speed 1,000 – 4,000 RPM - ECT 40 – 120° C - IAT -30 – 100° C - BARO >= 68.0 kPa - Change in camshaft timing < 3.0° CRK - For time >= 50.0 s - Throttle position 5.0 – 50.0% - Vehicle speed 0 – 200 km/h	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Mass Air Flow (MAF) Sensor Rationality Check High	- Max value of: - Diff. between measured MAF vs. modeled value > 47.0 kg/h - Or - Ratio of measured MAF and modeled value > 1.35 [-]				
P0102 Mass or Volume Air Flow Sensor "A" Circuit Low	Mass Air Flow (MAF) Sensor Out Of Range Low	- MAF sensor signal < 66 μs - MAF sensor signal temp.-correction < 44.0 ms	Engine speed not active RPM	0.2 s - Continuous 1.0 s - Multiple	2 DCY	Check the Mass Airflow Sensor - G70-. Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644.
P0103 Mass or Volume Air Flow Sensor "A" Circuit High	Mass Air Flow (MAF) Sensor Out Of Range High	- MAF sensor signal > 910 μs - MAF sensor signal temp.-correction > 60.0 ms	Engine speed not active RPM	0.2 s - Continuous 1.0 s - Multiple	2 DCY	Check the Mass Airflow Sensor - G70-. Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644.
P0106 Manifold Absolute Pressure (MAP) Sensor Dynamic Pressure/Barometric Pressure Sensor Circuit Range/Performance	Manifold Absolute Pressure (MAP) Sensor Dynamic Check Manifold Absolute Pressure (MAP) Sensor Rationality Check	- Amplitude of MAP sensor < 0.3 – 4.4 kPa - For counts > 30.0 [-] - Number of synchro events > 50.0 [-] - Diff. barometric sensor signal vs. manifold pressure signal @ engine start > 15.0 kPa	- Engine speed > 1,200; < 3,520 RPM - Ratio of MAP and boost pressure > 0.20; < 0.9 [-] - Time after engine start < 25.0 s - Engine speed < 300 RPM	1.1 s - Continuous 2.5 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71-. Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71, Checking", page 1640.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Manifold Absolute Pressure (MAP) Sensor Rationality Check Low	- Difference manifold pressure - lower threshold model < 0.0 kPa - Model range 90 – 210 kPa				
	Manifold Absolute Pressure (MAP) Sensor Rationality Check High	- Difference manifold pressure - upper threshold model > 0.0 kPa - Model range 85 – 270 kPa				
P0107 Manifold Absolute Pressure/Barometric Pressure Sensor Circuit Low	Manifold Absolute Pressure (MAP) Sensor Range Check	Manifold pressure signal < 10.0 kPa		2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
	Manifold Absolute Pressure (MAP) Sensor Short To Ground	Signal voltage < 0.20 V		1.0 s - Continuous		
P0108 Manifold Absolute Pressure/Barometric Pressure Sensor Circuit High	Manifold Absolute Pressure (MAP) Sensor Range Check	Manifold pressure signal > 280.0 kPa		2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
	Manifold Absolute Pressure (MAP) Sensor Short To Battery / Open Circuit	Signal voltage > 4.88 V		1.0 s - Continuous		
	Manifold Absolute Pressure (MAP) Sensor Out Of Range @ Start	Manifold pressure > 140.0 kPa	- Engine off time > 5.0 s - Engine speed < 400 RPM	0.5 s - Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P010 A Mass or Volume Air Flow Sensor "B" Circuit	Mass Air Flow (MAF) Sensor Internal Check	MAF sensor signal 0 μs	- Engine speed not active RPM - battery voltage > 11.00 [V]	0.2 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 . Checking", page 1646 .
P010 B Mass or Volume Air Flow Sensor "B" Circuit Range/Performance	Mass Air Flow (MAF) Sensor Rationality Check Low	- Max value of: - Diff. between measured MAF vs. modeled value < -47.0 kg/h - Or - Ratio of measured MAF and modeled value < 0.65 [-]	- Idle not active - Engine speed 1,000 – 4,000 RPM - ECT 40 – 120° C - IAT -30 – 100° C - BARO >= 68.0 kPa - Change in camshaft timing < 3.0° CRK - For time >= 50.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 . Checking", page 1646 .
	Mass Air Flow (MAF) Sensor Rationality Check High	- Max value of: - Diff. between measured MAF vs. modeled value > 47.0 kg/h - Or - Ratio of measured MAF and modeled value > 1.35 [-]	- Throttle position 5.0 – 50.0% - Vehicle speed 0 – 200 km/h			
P010 C Mass or Volume Air Flow Sensor "B" Circuit Low	Mass Air Flow (MAF) Sensor Out Of Range Low	- MAF sensor signal < 66 μs - MAF sensor signal temp.-correction < 44.0 ms	Engine speed not active RPM	0.2 s - Continuous 1.0 s - Multiple	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 . Checking", page 1646 .
P010 D Mass or Volume Air Flow Sensor	Mass Air Flow (MAF) Sensor Out Of Range High	MAF sensor signal > 910 μs	Engine speed not active RPM	0.2 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 . Checking", page 1646 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
"B" Circuit High		MAF sensor signal temp.-correction > 60.0 ms		1.0 s - Multiple		Checking", page 1646 .
P0111 Intake Air Temperature (IAT) Sensor @ Manifold Rationality Check Sensor 1 Circuit Range/Performance Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold Rationality Check	Difference IAT at intake manifold to modeled IAT >= 60.0 – 99.8 K	- Conditions for measurement window - MAF <= 152.0; >= 600.0 kg/h - Vehicle speed >= 45 km/h - Engine speed > 20 RPM - Monitor measurement window conditions fulfilled > 15.0 s	10.0 s - Continuous	• 2 DCY	– Check the Mass Airflow Sensor - G70- . Refer to "3.6.27 Mass Airflow Sensor G70. Checking", page 1644 .
	Intake Air Temperature (IAT) Sensor @ Manifold Stuck Check	Difference between maximum and minimum value of IAT < 5.3 K	- ECT @ start <= 138° C - Intake manifold high phase conditions - MAF < 52.0 kg/h - Vehicle speed < 10 km/h - ECT > 80° C - Integrated air mass > 1.0 – 4.0 kg - Cumulated high manifold active time > 15.0 s - Number of checks > 2.0 [-]	500.0 s - Continuous		
	Intake Air Temperature (IAT) Sensor @	Diff. IAT vs. ECT at engine start >= 20.3 K	ECT @ engine shut-off >= 80° C	2.0 s - Once / DCY		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Manifold Cross Check	Diff. IAT vs. ECT at engine start < -45.0 K	- ECT @ start >= -35; <= 41° C - ECT restart temperature diff. >= 39.8 K			
P0112 Intake Air Temperature Sensor @ Manifold Short To Ground Circuit Low Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold Signal Range Check	- Signal voltage < 0.11 V - IAT < -39° C		1.0 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ “3.6.27 Mass Airflow Sensor G70, Checking”, page 1644 .
P0113 Intake Air Temperature Sensor @ Manifold Short To Battery / Open Circuit Circuit High Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold Signal Range Check	Signal voltage > 4.50 V	- ECT @ start not calibrated ° C - Or - Time after engine start not calibrated s - ECT >= -48° C - Vehicle speed <= 319 km/h - MAF <= 1,020.0 kg/h	1.0 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ “3.6.27 Mass Airflow Sensor G70, Checking”, page 1644 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0116 Engine Coolant Temperature (ECT) Sensor Stuck High / Low - No Change On Signal Circuit Range/Performance	Engine Coolant Temperature (ECT) Sensor Stuck High / Low - No Change On Signal	Diff. between max. ECT and min. ECT < 2.3 K	- ECT @ start -39 – 138° C - Without 81.8 – 93.0° C - Substitute ECT > -45° C - Driving condition H: - Vehicle speed 45 – 150 km/h - MAF (lower threshold) 8.0 kg/h - MAF (upper threshold) 152.0 – 352.0 kg/h - Or - Fuel cut off active - For time required > 30.0 s - Frequency 1 times [-] - Driving condition L: - Vehicle speed 0 – 20 km/h - MAF (lower threshold) 8.0 kg/h - MAF (upper threshold) 52.0 – 84.0 kg/h - For time required > 10.0 s - Frequency 3 times [-]	62.0 s - Once / DCY	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613 .
	Engine Coolant Temperature (ECT) Sensor Stuck In Range	- ECT @ start >= 20 – 75° C - And - ECT @ start <= 143° C	Cold start detected	2.0 s - Once / DCY		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0117 Engine Coolant Temperature (ECT) Sensor 1 Circuit Low	Engine Coolant Temperature (ECT) Sensor Short To Ground	ECT > 138° C		2.0 s - Continuous	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613 .
P0118 Engine Coolant Temperature (ECT) Sensor 1 Circuit High	Engine Coolant Temperature (ECT) Sensor Short To Battery / Open Circuit	ECT < - 39.0° C		2.0 s - Continuous	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613 .
P0121 Throttle Position Sensor (TPS) Pedal Position Sensor/ Switch "A" Circuit Range/Performance	Throttle Position Sensor (TPS) Rationality Check	- TPS1-TPS2 > 6.27% - And - Actual TPS1 - calc.value > actual TPS2 - calc. value - Or - TPS1 - calc. value > 9.2%	Engine speed > 480 RPM	0.3 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P0122 Throttle Position Sensor (TPS) Pedal Position Sensor/ Switch "A" Circuit Low	Throttle Position Sensor (TPS) Out Of Range Low	Signal voltage < 0.18 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0123 Throttle/Pedal Position Sensor/Switch "A" Circuit High	Throttle Position Sensor (TPS) Out Of Range High	Signal voltage > 4.63 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0130 O2 Sensor Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range	O2S ceramic temperature < 690° C	- Modeled EGT > 350° C - Fuel cut off not active	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .
P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	- Short to ground - Virtual mass (VM) < 1.75 V - Or - Nernst voltage (UN) < 1.50 V - Or - Adjustment voltage (IA) not calibrated V - Or - Adjustment voltage (IP) < 0.30 V		2.0 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	• Short to battery • Virtual mass (VM) > 3.25 V • Or • Nernst voltage (UN) > 4.40 V • Or • Adjustment voltage (IA) not calibrated V • Or • Adjustment voltage (IP) > 7.0 V		• 2.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Response Rate Monitoring, Area Ratio And Gradient Ratio	- Symmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio -0.30 – 0.55 [-] - Max value of both counters for area ratio rich to lean and lean to rich ≥ 6 times [-] - Delay Time: - Gradient ratio ≥ 0.00 [-] - Lower value of both area ratios rich to lean and lean to rich < 0.27 [-] - Transient Time: - Gradient ratio not calibrated [-] - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Or - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-] - Asymmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio < -0.30; > 0.55 [-]	- O2S front - time since operation readiness > 30.0 s - O2S front - min. operation temperature is reached ≥ 720.0 K - Exhaust gas mass flow since engine first start not calibrated kg - Heat supply not calibrated kJ - Or - Time since engine first start not calibrated s - Check wire break pump current ready - ECT $\geq 60^\circ$ C - And - Only Flex fuel systems - Ethanol concentration adaptation not calibrated - And - Ethanol value not calibrated [-] - And - Ethanol value to start diagnosis not calibrated [-] - Only NG fuel systems - Total ng operating mode not calibrated - Or - Total gasoline operating mode not calibrated - Scavenging - Scavenging-rate not calibrated [-]	48.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		- Values of both counters for area ratio rich to lean and lean to rich ≥ 6 times [-] - Delay Time: - Gradient ratio ≥ 0.00 [-] - Lower value of both area ratios rich to lean and lean to rich < 0.27 [-] - Transient Time: - Gradient ratio not calibrated [-] - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Or - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-]	- Integrated air mass not calibrated kg - Additional conditions: - Lambda value freeze not active - Relative fuel amount from wall applied compensation and evap purge ≤ 1.0 [-] - Split coefficient DFI/MFI-system is constant not calibrated [-] - Engine speed 1,160 – 2,520 RPM - All local injector active - Desired position lead boost pressure not calibrated - Vehicle speed not calibrated km/h - Time since engine start ≥ 5.0 s - Engine load 27.0 – 79.99% - Catalyst heating not active - Evap purge valve case 1: - Gradient of factor tank ventilation ≤ 0.0 [-] - And - Pulse duty factor of evap purge valve $> 10.0\%/s$ - For time not calibrated s - Or - Evap purge valve case 2: - Pulse duty factor of evap purge valve $\leq 10.0\%/s$			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Additional conditions: - Evap purge ≥ 8.0 g - Or - Evap purge not active - Or - Lambda controller oscillation detected - Exhaust system lag time calculation $0.1 - 0.3$ s - Catalyst temperature $\geq 500^{\circ}$ C - Lambda control set-point prior to diagnostic fuel steps 1.0 [-] - Or - Gradient of exhaust system lag time calculation ≤ 0.1 s - Gradient of engine load $\leq 3.0\%$ - Gear shifting not active - Or - Transition from cylinder deactivation (CD) to normal operation mode finished - Exhaust gas mass flow ≥ 15.0 kg/h - Gradient of exhaust gas mass flow not calibrated kg/h - Evap purge in limp-home mode not calibrated - Or - EVAP system diagnosis not calibrated - Or			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Evap purge load high not calibrated - AIR not calibrated - AIR system diagnosis not calibrated - Time since last measurement > 2.0 s			
P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Out Of Range High	- O2S ceramic temperature < 725° C - And - Heater duty cycle > 95.0%	- Modeled EGT > 350° C - Heater control active	60.0 s - Multiple	• 2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
	Oxygen Sensors (O2S) Heater Front Rationality Check (Sensor Heating Up)	- O2S ceramic temperature < 725° C - And - Time after O2S heater on 40.0 s	- ECT @ start > -10° C - Engine shut-off-time > 10,000.0 s (During ECM keep alive-time after ignition off) < 300.0 s	40.0 s - Once / DCY		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	- Signal voltage < 0.06 V - For time > 3.0 s - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Fuel cut off not active - Catalyst purge not active	3.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Out Of Range High (Short To Battery Plus)	- Signal voltage > 1.08 V - For time > 0.1 s	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650°C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Lambda set value > 0.995 [-]	0.1 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7-, Checking", page 1650.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Cut Off	- Arithmetic filtered max differential transient time at fuel cut off not calibrated s - Or - EWMA filtered max differential transient time at fuel cut off ≥ 0.60 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel cut off active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow -80.0 – 80.0 kg/h - Time fuel cut off < 20.0 s - If - Time fuel cut off > 20.0 s - Then disabling till next fuel cut off 60.0 s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Deviation between expected and measured lambda value < 12.0 [-] - Or - Lambda value > 5.0 [-] - Additional conditions: - Time after fuel cut off at first cylinder ≥ 1.5 s	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• O2S rear voltage before start of measurement > 0.55 V • O2S rear target voltage end of measurement <= 0.15 V • Or • Integrated O2 mass during fuel cut off >= 1,800 – 3,000 mg • Time delay 0.5 s • Case 1: • (With scavenging) • If • Scavenging-rate not calibrated [-] • Then disabling until • Scavenging-rate not calibrated [-] • And • Integrated air mass not calibrated [-] • Case 2: • (Without scavenging) • Integrated air mass > 0.50 kg • Engine running			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 B O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Feed Restart	- Arithmetic filtered max differential transient time at fuel feed restart not calibrated s - Or - EWMA filtered max differential transient time at fuel feed restart ≥ 1.0 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel feed restart active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow -80.0 – 80.0 kg/h - If - Time fuel cut off > 20.0 s - Then - Disabling till next fuel feed restart 60.0 s - Additional conditions: - O2S rear voltage before start of measurement < 0.15 V - O2S rear target voltage end of measurement ≥ 0.60 V - Or - Integrated negative O2 mass during catalyst purge $\geq 2,000 - 3,000$ mg - Time delay 0.5 s - Case 1:	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• (With scavenging) • If • Scavenging-rate not calibrated [-] • Then disabling until • Scavenging-rate not calibrated [-] • And • Integrated air mass not calibrated kg • Case 2: • (Without scavenging) • Integrated air mass > 0.5 kg • Engine running			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 C O2 Sensor Slow Response - Rich to Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Cut Off	- Arithmetic filtered max differential transient time at fuel cut off not calibrated s - Or - EWMA filtered max differential transient time at fuel cut off ≥ 0.60 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel cut off active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow $-80.0 - 80.0$ kg/h - Time fuel cut off < 20.0 s - If - Time fuel cut off > 20.0 s - Then disabling till next fuel cut off 60.0 s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Deviation between expected and measured lambda value < 12.0 [-] - Or - Lambda value > 5.0 [-] - Additional conditions: - Time after fuel cut off at first cylinder ≥ 1.5 s	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• O2S rear voltage before start of measurement > 0.55 V • O2S rear target voltage end of measurement <= 0.15 V • Or • Integrated O2 mass during fuel cut off >= 1,800 – 3,000 mg • Time delay 0.5 s • Case 1: • (With scavenging) • If • Scavenging-rate not calibrated [-] • Then disabling until • Scavenging-rate not calibrated [-] • And • Integrated air mass not calibrated [-] • Case 2: • (Without scavenging) • Integrated air mass > 0.50 kg • Engine running			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 D O2 Sensor Slow Response - Lean to Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Feed Restart	- Arithmetic filtered max differential transient time at fuel feed restart not calibrated s - Or - EWMA filtered max differential transient time at fuel feed restart ≥ 1.0 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel feed restart active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow $-80.0 - 80.0$ kg/h - If - Time fuel cut off > 20.0 s - Then - Disabling till next fuel feed restart 60.0 s - Additional conditions: - O2S rear voltage before start of measurement < 0.15 V - O2S rear target voltage end of measurement ≥ 0.60 V - Or - Integrated negative O2 mass during catalyst purge $\geq 2,000 - 3,000$ mg - Time delay 0.5 s - Case 1:	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• (With scavenging) • If • Scavenging-rate not calibrated [-] • Then disabling until • Scavenging-rate not calibrated [-] • And • Integrated air mass not calibrated kg • Case 2: • (Without scavenging) • Integrated air mass > 0.5 kg • Engine running			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 E O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Rich To Lean Transition	- Arithmetic filtered max differential delay time at rich to lean transition > not calibrated s - Or - EWMA filtered max differential delay time at rich to lean transition > 0.6 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value before not calibrated [-]	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7- , Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- For integrated exhaust gas mass not calibrated kg - Lambda set value not calibrated [-] - For time not calibrated s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated - Diff. between lambda set value and actual lambda value ≤ 16.0 [-] - Threshold 1 - O2S rear voltage ≥ 0.72 V - Gradient O2S rear voltage $-0.01 - 0.05$ V/s - Integrated negative O2 mass ≥ 50 mg - Or - Threshold 2 - O2S rear voltage > 1.25 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 F O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Lean To Rich Transition	- Arithmetic filtered max differential delay time at lean to rich transition not calibrated s - EWMA filtered max differential delay time at lean to rich transition > 1.2 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - General: - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value not calibrated [-] - For time not calibrated s	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7- , Checking”, page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Binary sensor front fitted • O2S front voltage not equipped V • Linear sensor front fitted • Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated [-] • Diff. between lambda set value and actual lambda value ≤ 16.0 [-] • Case 1: • (Diagnosis in Catalyst State full) true • Time after engine start not calibrated s • Threshold 1 • O2S rear voltage ≤ 0.20 V • Gradient O2S rear voltage -1.0 – 0.01 V/s • Integrated O2 mass not calibrated mg • Or • Threshold 2 • O2S rear voltage not calibrated V • Case 2: • (Diagnosis at Fuel Feed Restart) false • Integrated exhaust gas mass not calibrated kg • Integrated exhaust gas mass not calibrated kg			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Exhaust gas mass during not calibrated kg - Catalyst temperature not calibrated ° C - Exhaust gas mass flow not calibrated kg/h - Gradient of exhaust gas mass flow not calibrated kg/h - Engine speed not calibrated RPM - O2S rear voltage after fuel cut off not calibrated V - For time not calibrated s - And - O2 mass not calibrated mg			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	- Signal voltage 0.40 – 0.60 V - For time > 3.0 s - And - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) >= 2.80 V	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded	40.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7- , Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	- Internal resistance > 40,000.0 Ω - And - Exhaust temperature > 600° C	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded - Valid Ri-measurements > 10 times			
P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Out Of Range (During Normal Heater Operation After Dew Point Is Exceeded)	Internal resistance > 1,260.0 – 20,400.0 Ω	- Dew point exceeded - Modeled EGT 350 – 650° C - IAT > -7° C - Engine shut-off-time > 5,000.0 s - Number of checks 10.0 [-] - Fuel cut off not active - Actuator commanded on	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P014 A O2 Sensor Delayed Response - Rich to Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Rich To Lean Transition	- Arithmetic filtered max differential delay time at rich to lean transition > not calibrated s - Or - EWMA filtered max differential delay time at rich to lean transition > 0.6 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1 120 – 3 000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value before not calibrated [-]	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .

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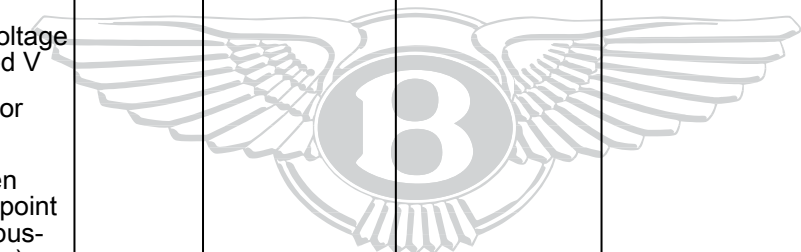
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- For integrated exhaust gas mass not calibrated kg - Lambda set value not calibrated [-] - For time not calibrated s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated - Diff. between lambda set value and actual lambda value ≤ 16.0 [-] - Threshold 1 - O2S rear voltage ≥ 0.72 V - Gradient O2S rear voltage $-0.01 - 0.05$ V/s - Integrated negative O2 mass ≥ 50 mg - Or - Threshold 2 - O2S rear voltage > 1.25 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P014 B O2 Sensor Delayed Response - Lean to Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Lean To Rich Transition	- Arithmetic filtered max differential delay time at lean to rich transition not calibrated s - EWMA filtered max differential delay time at lean to rich transition > 1.2 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - General: - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value not calibrated [-] - For time not calibrated s	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated [-] - Diff. between lambda set value and actual lambda value ≤ 16.0 [-] - Case 1: (Diagnosis in Catalyst State full) true - Time after engine start not calibrated s - Threshold 1 - O2S rear voltage ≤ 0.20 V - Gradient O2S rear voltage $-1.0 - 0.01$ V/s - Integrated O2 mass not calibrated mg - Or - Threshold 2 - O2S rear voltage not calibrated V - Case 2: (Diagnosis at Fuel Feed Restart) false - Integrated exhaust gas mass not calibrated kg - Integrated exhaust gas mass not calibrated kg			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Exhaust gas mass during not calibrated kg - Catalyst temperature not calibrated ° C - Exhaust gas mass flow not calibrated kg/h - Gradient of exhaust gas mass flow not calibrated kg/h - Engine speed not calibrated RPM - O2S rear voltage after fuel cut off not calibrated V - For time not calibrated s - And - O2 mass not calibrated mg			
P0150 O2 Sensor Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range	O2S ceramic temperature < 690° C	- Modeled EGT > 350° C - Fuel cut off not active	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11. Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0151 O2 Sensor Circuit Low Voltage Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	- Short to ground - Virtual mass (VM) < 1.75 V - Or - Nernst voltage (UN) < 1.50 V - Or - Adjustment voltage (IA) not calibrated V - Or - Adjustment voltage (IP) < 0.30 V		2.0 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P0152 O2 Sensor Circuit High Voltage Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	- Short to battery - Virtual mass (VM) > 3.25 V - Or - Nernst voltage (UN) > 4.40 V - Or - Adjustment voltage (IA) not calibrated V - Or - Adjustment voltage (IP) > 7.0 V		2.0 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0153 O2 Sensor Circuit Slow Response Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Response Rate Monitoring, Area Ratio And Gradient Ratio	- Symmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio -0.30 – 0.55 [-] - Max value of both counters for area ratio rich to lean and lean to rich ≥ 6 times - Delay Time: - Gradient ratio ≥ 0.00 [-] - Lower value of both area ratios rich to lean and lean to rich < 0.27 [-] - Transient Time: - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-] - Asymmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio < -0.30 > 0.55 [-]	- O2S front - time since operation readiness > 30.0 s - O2S front - min. operation temperature is reached ≥ 720.0 K - Exhaust gas mass flow since engine first start not calibrated kg - Heat supply not calibrated kJ - Or - Time since engine first start not calibrated s - Check wire break pump current ready - And - Only Flex fuel systems - Ethanol concentration adaptation not calibrated - And - Ethanol value not calibrated [-] - And - Ethanol value to start diagnosis not calibrated [-] - Only NG fuel systems - Total ng operating mode not calibrated - Or - Total gasoline operating mode not calibrated - Scavenging - Scavenging rate not calibrated [-] - Integrated air mass not calibrated kg	48.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		- Values of both counters for area ratio rich to lean and lean to rich ≥ 6 times - Delay Time: - Gradient ratio ≥ 0.00 [-] - Lower value of both area ratios rich to lean and lean to rich < 0.27 [-] - Transient Time: - Gradient ratio not calibrated [-] - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Or - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-]	- Additional conditions: - Lambda value freeze not active - Relative fuel amount from wall applied compensation and evap purge ≤ 1.0 [-] - Split coefficient DFI/MFI-system is constant not calibrated [-] - Engine speed 1,160 – 2,520 RPM - All local injector active - Desired position lead boost pressure not calibrated - Vehicle speed not calibrated km/h - Time since engine start ≥ 5.0 s - Engine load 27.0 – 79.99% - Catalyst heating not active - Evap purge valve case 1: - Gradient of factor tank ventilation ≤ 0.0 [-] - And - Pulse duty factor of evap purge valve $> 10.0\%/s$ - For time not calibrated s - Or - Evap purge valve case 2: - Pulse duty factor of evap purge valve $\leq 10.0\%/s$ - Additional conditions:			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Evap purge ≥ 8.0 g - Or - Evap purge not active - Or - Lambda controller oscillation detected - Exhaust system lag time calculation $0.1 - 0.3$ s - Catalyst temperature $\geq 500^{\circ}\text{C}$ - Lambda control set-point prior to diagnostic fuel steps 1.0 [-] - Or - Gradient of exhaust system lag time calculation ≤ 0.1 s - Gradient of engine load $\leq 3.0\%$ - Gear shifting not active - Or - Transition from cylinder deactivation (CD) to normal operation mode finished - Exhaust gas mass flow ≥ 15.0 kg/h - Gradient of exhaust gas mass flow not calibrated kg/h - Evap purge in limp-home mode not calibrated - Or - EVAP system diagnosis not calibrated - Or			

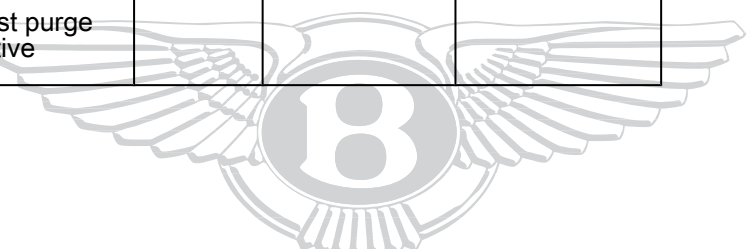
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Evap purge load high not calibrated - AIR not calibrated - AIR system diagnosis not calibrated - Time since last measurement > 2.0 s			
P0155 O2 Sensor Heater Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Out Of Range High	- O2S ceramic temperature < 725° C - And - Heater duty cycle > 95.0%	- Modeled EGT > 350° C - Heater control active	60.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
	Oxygen Sensors (O2S) Heater Front Rationality Check (Sensor Heating Up)	- O2S ceramic temperature < 725° C - And - Time after O2S heater on 40.0 s	- ECT @ start > -10° C - Engine shut-off-time > 10,000.0 s (During ECM keep alive-time after ignition off) < 300.0 s	40.0 s - Once / DCY	2 DCY	



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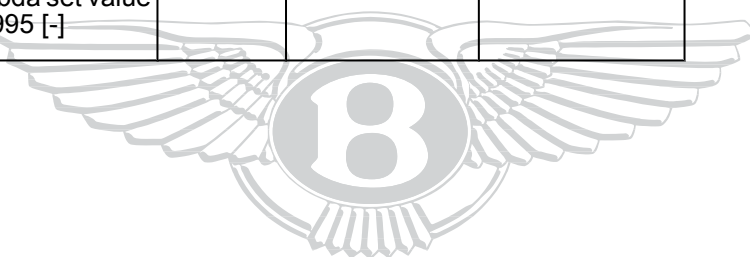
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0157 O2 Sensor Circuit Low Voltage Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	- Signal voltage < 0.06 V - For time > 3.0 s - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Fuel cut off not active - Catalyst purge not active	3.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0158 O2 Sensor Circuit High Voltage Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Out Of Range High (Short To Battery Plus)	- Signal voltage > 1.08 V - For time > 0.1 s	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Lambda set value > 0.995 [-]	0.1 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0160 O2 Sensor Circuit No Activity Detected Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	- Signal voltage 0.40 – 0.60 V - For time > 3.0 s - And - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) >= 2.80 V	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded	40.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	- Internal resistance > 40,000.0 Ω - And - Exhaust temperature > 600° C	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded - Valid Ri-measurements > 10 times			
P0161 O2 Sensor Heater Circuit Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Out Of Range (During Normal Heater Operation After Dew Point Is Exceeded)	Internal resistance > 1,260.0 – 20,400.0 Ω	- Dew point exceeded - Modeled EGT 350 – 650° C - IAT > -7° C - Engine shut-off time > 5,000.0 s - Number of checks 10.0 [-] - Fuel cut off not active - Actuator commanded on	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to 3.632 Oxygen Sensor 2 After Catalytic Converter GX8 , Checking” , page 1656 .
P0169 Incorrect Fuel Composition	Engine Control Module (ECM): Electronic Throttle Control Module	Corrections of fuel mass on single cylinders incorrect		2.0 s - Continuous	2 DCY	Check for any component or circuit fault codes and diagnose them first. If no faults are

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Function Monitoring: Injection	Injection cut off incorrect				found during diagnosis, and the ECM has lost a driver output, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Lambda Mode	Internal check failed	Internal engine speed > 1,200 RPM	0.5 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Mixture Control	- Correction factor incorrect - Fuel quantity incorrect				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Load Plausibility	Abs. difference between predicted and real air mass > 11.30%	Engine speed >= 1,200 RPM			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0171 System Too Lean Bank 1	Fuel System Too Lean	- Low pass filtered lambda controller output > 23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}$ C - Lambda control closed loop - And - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0172 System Too Rich Bank 1	Fuel System Too Rich	- Low pass filtered lambda controller output < -23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}$ C - Lambda control closed loop - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 . - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7- Checking", page 1650 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0174 System Too Lean Bank 2	Fuel System Too Lean	- Low pass filtered lambda controller output > 23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}$ C - Lambda control closed loop - And - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0175 System Too Rich Bank 2	Fuel System Too Rich	- Low pass filtered lambda controller output < -23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}$ C - Lambda control closed loop - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 2 Before Catalytic Converter - GX11-. Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659. - Check the Oxygen Sensor 2 After Catalytic Converter - GX8-. Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.
P0201 Cylinder 1 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors. Refer to "3.6.17 Fuel Injectors, Checking", page 1624.
P0202 Cylinder 2 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors. Refer to "3.6.17 Fuel Injectors, Checking", page 1624.
P0203 Cylinder 3 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors. Refer to "3.6.17 Fuel Injectors, Checking", page 1624.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0204 Cylinder 4 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Signal voltage 3.26 – 4.70 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0205 Cylinder 5 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Signal voltage 3.26 – 4.70 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0206 Cylinder 6 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Signal voltage 3.26 – 4.70 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0207 Cylinder 7 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Signal voltage 3.26 – 4.70 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0208 Cylinder 8 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Signal voltage 3.26 – 4.70 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0221 Throttle/Pedal Position Sensor (TPS) 2 Rationality Check	Throttle Position Sensor (TPS) 2 Rationality Check	• TPS1 - TPS2 > 6.27% > • And • Actual TPS2 - calc. value > actual TPS1 - calc. value • Or • TPS2 - calc value > 9.2%	• Engine speed > 480 RPM	• 0.3 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking" , page 1671 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0222 Throttle/Pedal Position Sensor/Switch "B" Circuit Low	Throttle Position Sensor (TPS) 2 Out Of Range Low	Signal voltage < 0.16 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P0223 Throttle/Pedal Position Sensor/Switch "B" Circuit High	Throttle Position Sensor (TPS) 2 Out Of Range High	Signal voltage > 4.88 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P0234 Turbo-charger (TC) Boost Control Functional Check	Turbo-charger (TC) Boost Control Functional Check	Diff. set value boost pressure vs. actual boost pressure value > 27.0 – 112.5 kPa	BARO > 75.0 kPa	2.0 s - Multiple	2 DCY	- Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 . - Check the Combustion Air Valve - N44- . Refer to ⇒ "3.6.7 Combustion Air Valve N44 , Checking", page 1605 .
P0236 Turbo-charger (TC) Boost Pressure Sensor Rationality Check	Turbo-charger (TC) Boost Pressure Sensor Rationality Check	Diff. boost pressure signal vs. barometric sensor signal > 22.0 kPa	- Engine speed < 1,000 RPM - Throttle position < 5.0%	2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
Range/Performance		Diff. boost pressure signal vs. barometric sensor signal < -12.0 kPa				
P0237 Turbo-charger (TC) Boost Pressure Sensor Out Of Range Low	Turbo-charger (TC) Boost Pressure Sensor "A" Circuit Low	Pressure < 37.0 kPa	Engine speed > 80 RPM	2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
P0238 Turbo-charger (TC) Boost Pressure Sensor Out Of Range High	Turbo-charger (TC) Boost Pressure Sensor "A" Circuit High	Pressure > 300.0 kPa	Engine speed > 80 RPM	2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
P0243 Turbo-charger (TC) Bypass Actuator Open Circuit		Signal voltage 3.26 – 4.70 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0245 Turbo-charger (TC) Bypass Actuator/Super-charger Wastegate Actuator "A" Low		Signal voltage < 2.74 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .
P0246 Turbo-charger (TC) Bypass Actuator/Super-charger Wastegate Actuator "A" High		Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .
P0261 Fuel Injection Valves Short To Ground		Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0262 Fuel Injection Valves Short To Battery Plus		Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0264 Fuel Injection Valves Short To Ground		Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0265 Fuel Injection Valves Short To Battery Plus		Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0267 Cylinder 3 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0268 Cylinder 3 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Actuator commanded on • Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0270 Cylinder 4 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0271 Cylinder 4 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Actuator commanded on • Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0273 Cylinder 5 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0274 Cylinder 5 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Actuator commanded on • Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0276 Cylinder 6 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .

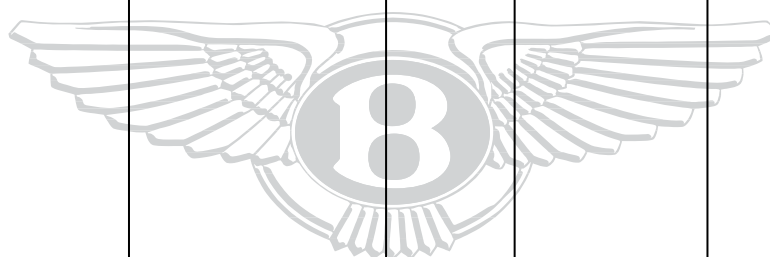
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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0277 Cylinder 6 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0279 Cylinder 7 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0280 Cylinder 7 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0282 Cylinder 8 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0283 Cylinder 8 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0299 Turbo-charger/Super-charger "A" Under-boost Condition	Turbo-charger (TC) Boost Pressure Control Functional Check	Diff. set value boost pressure vs. actual boost pressure value (filtered) > 20.0 kPa	- Engine speed > 2,240 – 2,760 RPM - BARO > 75.0 kPa - Diff. set value boost pressure vs. basic boost pressure value > 15.0 kPa - Boost pressure control active - Turbo charger bypass valve closed	5.0 s - Multiple	2 DCY	- Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 . - Check the Combustion Air Valve - N44- . Refer to ⇒ "3.6.7 Combustion Air Valve N44 , Checking", page 1605 .
P0300 Random/ Multiple Cylinder Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous	2 DCY	- If a fuel system rich or lean fault exists, perform the diagnostic for those codes first. Use a scan tool and note whether the miss is specific to a few cylinders or is random. If random, check for contamination in the fuel by drawing a fuel sample. Refer to appropriate repair manual. - Check the spark plugs visually for signs of fouling. - Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Pre-

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%		200 rev - Continuous	Immediately	liminary Check", page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 . – Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0301 Cylinder 1 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	- Emission threshold misfire rate (MR) > 1.88% - Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous 200 rev - Continuous	2 DCY - Immediately	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0302 Cylinder 2 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	sion test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0303 Cylinder 3 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Re-

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0304 Cylinder 4 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors. Refer to ⇒ “3.6.17 Fuel Injectors, Checking”, page 1624. - Check the Ignition Coils With Power Output Stage. Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage, Checking”, page 1633.
P0305 Cylinder 5 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors . Checking”, page 1624 . – Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage . Checking”, page 1633 .
P0306 Cylinder 6 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1,000 rev - Continuous	2 DCY	– Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors. Refer to ⇒ “3.6.17 Fuel Injectors, Checking”, page 1624. - Check the Ignition Coils With Power Output Stage. Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage, Checking”, page 1633.
P0307 Cylinder 7 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: ECT @ start >= -8° C - Case 2: ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors . Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage . Checking”, page 1633 .
P0308 Cylinder 8 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1 000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0321 Ignition/ Distributor Engine Speed Input Circuit Range/Performance	Crankshaft Position (CKP) Sensor Rationality Check	- Counted teeth vs. reference incorrect - Or - Monitoring reference gap failure	- vehicle speed < 1; > 25 [km/h] - or - engine speed > 520 [rpm] - or - actual engine state cranking - or - engine speed gradient > -8000.00 [rpm/s]	8 [rev] - continuous	2 DCY	Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.13 Engine Speed Sensor G28 , Checking”, page 1616 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Crankshaft Position (CKP) Sensor Rationality Check: DGI Sensor	- PWM-signal not plausible - Or - Engine stop position not plausible - Or - Reverse pulse length not plausible	DGI sensor is powered during engine stop	0.5 s - Continuous		
P0322 Ignition/Distributor Engine Speed Input Circuit No Signal	Crankshaft Position (CKP) Sensor Signal Activity Check	- Camshaft signals > 1.0 [-] - And - Engine speed no signal	- vehicle speed < 1; > 25 [km/h] - or - engine speed > 520 [rpm] - or - actual engine state cranking - or - engine speed gradient > -8000.00 [rpm/s]	1 [rev] - continuous	2 DCY	Check the Engine Speed Sensor - G28. Refer to ⇒ "3.6.13 Engine Speed Sensor G28, Checking", page 1616.
P0324 Knock/Combustion Vibration Control System Error	Knock Control Internal Hardware Check	- Signal fault counter (combustion) > 48.0 [-] - Or - Signal fault counter (measuring window) > 2.0 [-]	- Engine speed > 1000 RPM - or - engine speed > 2500 [rpm]	0.5 s - Multiple	2 DCY	- Check the Knock Sensor 1 - G61. Refer to ⇒ "3.6.22 Knock Sensor 1 G61, Checking", page 1634. - Check the Knock Sensor 2 - G66. Refer to ⇒ "3.6.23 Knock Sensor 2 G66, Checking", page 1636.
P0327 Knock/Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single	Knock Sensor (KS) Short To Ground Port A Knock Sensor (KS) Short To Ground Port B	Reference signal < -0.7 V	Engine speed > 1,000 RPM	0.5 s - Continuous	2 DCY	Check the Knock Sensor 1 - G61. Refer to ⇒ "3.6.22 Knock Sensor 1 G61, Checking", page 1634.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
Sensor	Knock Sensor (KS) Signal Range Check	Lower threshold < 0.88 – 9.88 V	- Engine speed > 1,720 RPM - ECT > 40° C - Engine load > 49.50%	2.0 s - Multiple		
P0328 Knock /Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	Knock Sensor (KS) Short To Battery Plus Port A	Signal voltage > 1.0 V	Engine speed > 1,000 RPM	0.5 s - Continuous	2 DCY	Check the Knock Sensor 1 - G61- . Refer to ⇒ "3.6.22 Knock Sensor 1 G61- Checking", page 1634 .
	Knock Sensor (KS) Short To Battery Plus Port B					
	Knock Sensor (KS) Signal Range Check	Upper threshold > 132.22 – 285.0 V	- Engine speed > 1,720 RPM - ECT > 40° C - Engine load > 49.50%	2.0 s - Multiple		
P0332 Knock /Combustion Vibration Sensor 2 Circuit Low Bank 2	Knock Sensor (KS) Short To Ground Port A	Reference signal < -0.7 V	Engine speed > 1,000 RPM	0.5 s - Continuous	2 DCY	Check the Knock Sensor 2 - G66- . Refer to ⇒ "3.6.23 Knock Sensor 2 G66- Checking", page 1636 .
	Knock Sensor (KS) Short To Ground Port B					
	Knock Sensor (KS) Signal Range Check	Lower threshold < 0.88 – 9.88 V	- Engine speed > 1,720 RPM - ECT > 40° C - Engine load > 49.50%	2.0 s - Multiple		
P0333 Knock /Combustion Vibration Sensor 2 Circuit High Bank 2	Knock Sensor (KS) Short To Battery Plus Port A	Signal voltage > 1.0 V	Engine speed > 1,000 RPM	0.5 s - Continuous	2 DCY	Check the Knock Sensor 2 - G66- . Refer to ⇒ "3.6.23 Knock Sensor 2 G66- Checking", page 1636 .
	Knock Sensor (KS) Short To Battery Plus Port B					
	Knock Sensor (KS) Signal Range Check	Upper threshold > 132.22 – 285.0 V	- Engine speed > 1,720 RPM - ECT > 40° C - Engine load > 49.50%	2.0 s - Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0341 Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	- Signal pattern incorrect - Defect counter 8.0 [-]		0.5 s - Continuous	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0342 Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	- Signal voltage permanently low - And - Crankshaft signals 8.0 [-]		0.5 s - Continuous	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0343 Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	- Signal voltage permanently high - And - Crankshaft signals 8.0 [-]		0.5 s - Continuous	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0351 Ignition Coil Open Circuit	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0352 Ignition Coil "B" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P0353 Ignition Coil "C" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P0354 Ignition Coil "D" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P0355 Ignition Coil "E" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0356 Ignition Coil "F" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0357 Ignition Coil "G" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0358 Ignition Coil "H" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0410 AIR System "A"	Secondary Air Injection (AIR) Rationality Check Directly After Catalyst Heating	Diff. of measured AIR pressure before AIR injection vs. AIR pressure after AIR injection > 2.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - BARO > 74.0 kPa - AIR system commanded off	0.5 s - Once / DCY	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0418 AIR System Control "A" Circuit	Secondary Air Injection (AIR) Pump Relay Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 .
P0419 AIR System Control "B" Circuit	Secondary Air Injection (AIR) Pump Relay Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0420 Catalyst System Efficiency Below Threshold Bank 1	Catalyst System Measure Of OSC Compared To OSC Of Borderline Catalyst	- Measured OSC / OSC of borderline catalyst - Measured OSC EWMA filter value for catalyst, corrected with measured delay and transient time of oxygen sensors rear < 1.0 [-]	- Time after engine start not calibrated s - Or - Time after dew point > 90.0 s - Delta exhaust gas mass flow < 20.0 kg/h - Exhaust gas mass flow, lower range not calibrated kg/h - Exhaust gas mass flow, upper range 25.0 – 100.0 kg/h - Modeled EGT dynamic < 30.0 K - Modeled EGT in catalyst system, lower range not calibrated ° C - Modeled EGT in catalyst system, upper range 500 – 800° C - Minimum modeled EGT in catalyst system > 470° C - For time > 100.0 s - Filtered minimum modeled EGT in catalyst system > 470° C - Engine load 9.80 – 60.0% - Evap purge loading not high - Engine speed 1,000 – 2,520 RPM - Lambda enable condition monitor - Monitoring stops if lambda deviation >= 5.01 – 7.01% - With delay time >= 0.02 – 0.2 s	10.0 s - Once / DCY	1 DCY	- Check the exhaust system for leaks and correct any defects found. If any misfire or fuel trim codes are also set, correct those codes first. - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda control closed loop • Lambda control not at min or max limit • AAT > -10° C • Number of checks, no step change suspicion 1.0 [-] • Number of checks, step change suspicion 4.0 [-] • O2S front ready • O2S rear ready • AIR not active • No misfire • O2S front plausibility check in current driving cycle ready • O2S front response monitoring in current driving cycle ready			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0430 Catalyst System Efficiency Below Threshold Bank 2	Catalyst System Measure Of OSC Compared To OSC Of Borderline Catalyst	- Measured OSC / OSC of borderline catalyst - Measured OSC EWMA filter value for catalyst, corrected with measured delay and transient time of oxygen sensors rear < 1.0 [-]	- Time after engine start not calibrated s - Or - Time after dew point > 90.0 s - Delta exhaust gas mass flow < 20.0 kg/h - Exhaust gas mass flow, lower range not calibrated kg/h - Exhaust gas mass flow, upper range 25.0 – 100.0 kg/h - Modeled EGT dynamic < 30.0 K - Modeled EGT in catalyst system, lower range not calibrated °C - Modeled EGT in catalyst system, upper range 500 – 800° C - Minimum modeled EGT in catalyst system > 470° C - For time > 100.0 s - Filtered minimum modeled EGT in catalyst system > 470° C - Engine load 9.80 – 60.0% - Evap purge loading not high - Engine speed 1,000 – 2,520 RPM - Lambda enable condition monitor - Monitoring stops if lambda deviation >= 5.01 – 7.01% - With delay time >= 0.02 – 0.2 s	10.0 s - Once / DCY	1 DCY	- Check the exhaust system for leaks and correct any defects found. If any misfire or fuel trim codes are also set, correct those codes first. - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda control closed loop • Lambda control not at min or max limit • AAT > -10° C • Number of checks, no step change suspicion 1.0 [-] • Number of checks, step change suspicion 4.0 [-] • O2S front ready • O2S rear ready • AIR not active • No misfire • O2S front plausibility check in current driving cycle ready • O2S front response monitoring in current driving cycle ready			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0441 EVAP System Incorrect Purge Flow	Evaporative Emission (EVAP) System Functional Check	- Deviation lambda control < 3.50 – 6.0% - And - Deviation idle control < 31.0%	- Choice of: - Integrated EVAP purge mass > 10.0 g - Or - Integrated air mass > 4.0 – 20.0 kg - And - Choice of: - ECT > 60° C - Or - Substitute ECT > 60° C - And - General: - Engine speed idle RPM - Engine speed not calibrated RPM - Engine speed deviation < 200 RPM - Engine load 12.0 – 34.99% - Deviation engine load <= 4.01% - AAT > 4° C - BARO > 72.0 kPa - Lambda control closed loop	22.1 s - Once / DCY	2 DCY	Check for restrictions or kinks in the EVAP pipes, including charcoal intrusion into the pipes. If pipes are free from obstruction: Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80- Checking", page 1619 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0442 EVAP System Leak Detected (Small Leak)	Evaporative Emission (EVAP) System Small Leak Pressure Check	Time for pressure drop < 1.6 – 2.6 s	- General: - Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - Intake manifold vacuum > -100.0 kPa - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Evap purge valve closed - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - And - Case 1: - AAT not calibrated ° C - AAT drop after engine start not calibrated K - Case 2: - IAT 3 – 90° C - IAT drop after engine start < 8.3 K - Deep down hill driving: - Delta BARO < 0.25 kPa - Or	239.0 s - Once / DCY	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80- Checking", page 1619 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Engine load not calibrated % - And - Delta vehicle speed not calibrated km/h			
P0444 EVAP System Purge Control Valve "A" Circuit Open	Evaporative Emission (EVAP) Canister Purge Valve Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0455 EVAP System Leak Detected (Large Leak)	Evaporative Emission (EVAP) System Large Leak Pressure Check	Time for pressure drop < 1.0 s	- General: - Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - Intake manifold vacuum > -100.0 kPa - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Evap purge valve closed - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - And - Case 1: - AAT not calibrated ° C - AAT drop after engine start not calibrated K - Case 2: - IAT 3 – 90° C - IAT drop after engine start < 12.0 K - Deep down hill driving - Delta BARO < 0.25 kPa - Or	232.6 s - Once / DCY	2 DCY	- Inspect all the EVAP attaching pipes and hoses visually for damage. Check the gas cap for tightness. - Check the EVAP System for Leaks. Refer to ⇒ “2.2.4 EVAP System, Checking for Leaks”, page 6. - Check the EVAP Canister Purge Regulator Valve 1 - N80-. Refer to ⇒ “3.6.14 EVAP Canister Purge Regulator Valve 1 N80-, Checking”, page 1619. - Check the Leak Detection Pump - V144-. Refer to ⇒ “3.6.24 Leak Detection Pump V144-, Checking”, page 1638.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Engine load not calibrated % • And • Delta vehicle speed not calibrated km/h			



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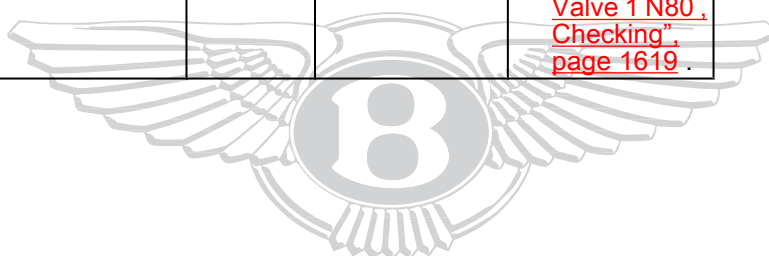
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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0456 EVAP System Leak Detected (Very Small Leak)	Evaporative Emission (EVAP) System Very Small Leak Pressure Check	Time for pressure drop < 3.0 – 5.8 s	- General: - Time after engine start 5.0 – 800.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - Intake manifold vacuum > -100.0 kPa - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 50.3 K - Evap purge valve closed - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - And - Case 1: - AAT not calibrated ° C - AAT drop after engine start not calibrated K - Case 2: - IAT 3 – 70° C - IAT drop after engine start < 6.8 K - Deep down hill driving - Delta BARO -0.39 – 0.20 kPa - Or	251.8 s - Once / DCY	2 DCY	- Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.14 EVAP Canister Purge Regulator Valve 1 N80- Checking”, page 1619 . - Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.24 Leak Detection Pump V144- Checking”, page 1638 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Engine load not calibrated % - And - Delta vehicle speed not calibrated km/h - Additional: - Vehicle acceleration < 4.50 m/s² - Gradient engine load < 100.01 %/seg			
P0458 EVAP System Purge Control Valve "A" Circuit Low	Evaporative Emission (EVAP) Canister Purge Valve Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80-. Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80. Checking", page 1619.
P0459 EVAP System Purge Control Valve "A" Circuit High	Evaporative Emission (EVAP) Canister Purge Valve Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80-. Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80. Checking", page 1619.



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0491 AIR System Insufficient Flow Bank 1	Secondary Air Injection (AIR) Flow Check During Catalyst Heating	- Case 1: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.51 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.25 [-] - Case 2: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.59 [-] - Case 3: - Average pressure difference between absolute value and < 0.35 – 1.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - For time > 1.0 s - BARO > 74.0 kPa - AIR system commanded on	0.0 s - Once / DCY	2 DCY	- Check the secondary air injection attaching hoses to the exhaust visually for kinks damage or obstructions. - Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101-. Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661. - Check the Secondary Air Injection Sensor 1 - G609-. Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609, Checking", page 1666.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0492 AIR System Insufficient Flow Bank 2	Secondary Air Injection (AIR) Flow Check During Catalyst Heating	- Case 1: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.51 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.25 [-] - Case 2: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.59 [-] - Case 3: - Average pressure difference between absolute value and < 0.35 – 1.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - For time > 1.0 s - BARO > 74.0 kPa - AIR system commanded on	0.0 s - Once / DCY	2 DCY	- Check the secondary air injection attaching hoses to the exhaust visually for kinks damage or obstructions. - Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ “3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189 . Checking”, page 1664 . - Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ “3.6.37 Secondary Air Injection Sensor 2 G610 . Checking”, page 1668 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0506 Idle Speed Control (ISC) Out Of Range Low RPM - Lower Than Expected	Idle Speed Control (ISC) Out Of Range Low	- Engine speed deviation > 100 RPM - And - RPM controller torque value >= calculated max. value Nm	- Time after engine start >= 5.0 s - Vehicle speed 0 km/h - BARO > 71.88 kPa - ECT 60 – 120° C - IAT > -11° C - Torque safety limitation not active - Accelerator pedal released by driver - For time > 1.0 s - For manual transmission: - Engine load < 34.50%	5.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0507 Idle Speed Control (ISC) Out Of Range High RPM - Higher Than Expected	Idle Speed Control (ISC) Out Of Range High	- Engine speed deviation < -100 RPM - And - RPM controller torque value <= calculated min. value Nm - Or - Integrated number of fuel cut off transitions >= 3.0 [1]	- Time after engine start >= 5.0 s - Vehicle speed 0 km/h - BARO > 71.88 kPa - ECT 60 – 120° C - IAT > -11° C - Torque safety limitation not active - Accelerator pedal released by driver - For time > 1.0 s	5.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050A Cold Start Idle Control System Performance	Cold Start Monitoring Idle Speed Control (ISC) Out Of Range Low	- Engine speed deviation > 100 RPM - And - RPM controller torque value >= calculated max. value Nm	- Catalyst heating active - Time after engine start >= 5.0 s - BARO > 71.88 kPa - ECT -10 – 60° C - Torque safety limitation not active - Conditions vehicle speed: - Vehicle speed 0 km/h - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - Conditions driver request: - Accelerator pedal released by driver - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - For time > 1.0 s - For manual transmission: - Engine load not calibrated %	8.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Cold Start Monitoring Idle Speed Control (ISC) Out Of Range High	- Engine speed deviation < -200 RPM - And - RPM controller torque value <= calculated min. value Nm - Or - Integrated number of fuel cut off transitions not calibrated [-]	- Catalyst heating active - Time after engine start >= 5.0 s - BARO > 71.88 kPa - ECT -10 – 60° C - Torque safety limitation not active - Conditions vehicle speed: - Vehicle speed 0 km/h - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - Conditions driver request: - Accelerator pedal released by driver - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - For time > 1.0 s	4.0 s - Multiple		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050B Cold Start Ignition Timing Performance	Cold Start Monitoring Ignition Control (IC) Idle Ignition Timing Monitor	Difference between commanded spark timing vs. actual value > 16.0%	- General: - Commanded spark retard during catalyst heating < 84.0% - Catalyst heating active - For time > 4.0 s - Fuel cut off not active - BARO > 73.0 kPa - Idle condition active - Diff. relative engine load vs. filtered relative engine load <= 15.0% (For relative engine load dynamic detection) - Diff. engine speed vs. filtered engine speed <= 300 RPM (For engine speed dynamic detection) - Relative engine load <= 181.99% - Conditions vehicle speed: - Vehicle speed 0.0 km/h - Or - Engine running and decoupled from powertrain (for hybrid) not equipped	5.0 s - Once / DCY	2 DCY	- Inspect the air cleaner element and the air intake system visually for leaks. - Inspect the PCV system visually for leaks. - Check the Engine Coolant Temperature Sensor - G62- . Refer to "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613 . - Check the Throttle Valve Control Module - GX3- . Refer to "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 . - Check the Camshaft Adjustment Valve 1 - N205- . Refer to "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597 . - Verify the latest Engine Control Module - J623- software is being used. Refer to appropriate scan tool.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P052 A Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	Cold Start Monitoring Variable Valve Timing (VVT) Intake Actuator Target Error	Difference between target position vs. actual position > 6.0° CRK	- Time after engine start >= 1.5 – 40.0 s - Engine speed >= 400 RPM - Modeled oil temperature >= -10 – 160° C - Commanded camshaft timing correction for catalyst heating active	5.0 s - Once / DCY	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .
P0544 Exhaust Gas Temperature (EGT) Sensor During Cold Start Rationality Check	Exhaust Gas Temperature (EGT) Sensor During Cold Start Rationality Check	Difference between measured and modeled exhaust gas temp. @ homogeneous running > 200.0 K	- Conditions for measurement window - Engine running - Engine speed > 20 RPM - Catalyst heating not active - Fuel cut off not active - Modeled exhaust gas temperature > 600° C - Monitor measurement window conditions fulfilled > 60.0 s	3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
	Exhaust Gas Temperature (EGT) Sensor During Warm Engine Running Rationality Check	Difference exhaust temperature to average of IAT and ECT @ start > 100.0 K	- Time after engine start 2.0 s - ECT @ engine shut-off > 80° C - IAT @ start < 40° C - ECT @ start < 40° C - Diff. between ECT @ start and IAT < 15.0 K	3.0 s - Once / DCY		
	Exhaust Gas Temperature (EGT) Sensor Signal Period Check	Deviation of time period > 30.0 ms	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by Bentley Motors. Bentley Motors does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by Bentley Motors.	3.0 s - Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0545 Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 1	Exhaust Gas Temperature (EGT) Sensor Out Of Range Low	Exhaust gas temperature < -37° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235, Checking", page 1621 .
P0546 Exhaust Gas Temperature Sensor Circuit High Bank 1 Sensor 1	Exhaust Gas Temperature (EGT) Sensor Out Of Range High	Exhaust gas temperature > 1,107° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235, Checking", page 1621 .
P0547 Exhaust Gas Temperature Sensor Circuit Bank 2 Sensor 1	Exhaust Gas Temperature (EGT) Sensor During Cold Start Rationality Check	Difference between measured and modeled exhaust gas temp. @ homogeneous running > 200.0 K	- Time after engine start 2.0 s - ECT @ engine shut-off > 80° C - IAT @ start < 40° C - ECT @ start < 40° C - Diff. between ECT @ start and IAT < 15.0 K	3.0 s - Once / DCY	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448, Checking", page 1622 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Exhaust Gas Temperature (EGT) Sensor During Warm Engine Running Rationality Check	Difference exhaust temperature to average of IAT and ECT @ start > 100.0 K	- Conditions for measurement window - Engine running - Engine speed > 20 RPM - Catalyst heating not active - Fuel cut off not active - Modeled exhaust gas temperature > 600° C - Monitor measurement window conditions fulfilled > 60.0 s	3.0 s - Continuous		
	Exhaust Gas Temperature (EGT) Sensor Signal Period Check	Deviation of time period > 30.0 ms				
P0548 Exhaust Gas Temperature Sensor Circuit Low Bank 2 Sensor 1	Exhaust Gas Temperature (EGT) Sensor Out Of Range Low	Exhaust gas temperature < -37° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448- . Checking", page 1622 .
P0549 Exhaust Gas Temperature Sensor Circuit High Bank 2 Sensor 1	Exhaust Gas Temperature (EGT) Sensor Out Of Range High	Exhaust gas temperature > 1,107° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448- . Checking", page 1622 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0555 Brake Booster Pressure Sensor Short To Battery / Open Circuit	Brake Booster Pressure Sensor Short To Battery / Open Circuit	Signal voltage > 4.95 V	Time after ignition on > 500.0 ms	0.4 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201, Checking", page 1595 .
P0556 Brake Booster Pressure Sensor Out Of Range Low	Brake Booster Pressure Sensor Out Of Range Low	Brake booster pressure < 10.0 kPa	Brake light switch off	0.2 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201, Checking", page 1595 .
	Brake Booster Pressure Sensor Out Of Range High	Brake booster pressure > 119.0 kPa				
	Brake Booster Pressure Sensor Rationality Check	- Diff. brake booster pressure vs. BARO > 255.0 kPa - Or - Gradient brake booster pressure > 1,278.98 kPa/s		0.2 s - Multiple		
	Brake Vacuum Pump Functional Check	Brake booster pressure difference between measurement 1 and 2 < 1.50 – 4.50 kPa	- Monitor entry conditions: - Vacuum pump commanded on - For time > 0.1 s - Brake light switch off - Brake booster pressure >= (barometric pressure * 0.20) + 15.0 kPa - Pressure measurement 1: - Entry conditions fulfilled - Pressure measurement 2: - Time after entry conditions fulfilled 1.0 s	0.0 s - Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0557 Brake Booster Pressure Sensor Circuit Low	Brake Booster Pressure Sensor Short To Ground	Signal voltage < 0.10 V	Time after ignition on > 500.0 ms	0.4 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201, Checking", page 1595 .
P0562 System Voltage Low	Engine Control Module (ECM): Internal Timer Check Power Supply For ECM Internal Time	ECM power supply check signal voltage <= 1.5...2.0 [V]	ECM initialization active	3 [events] - Once / DCY	1 DCY	Perform a charging system check and battery test to determine if the battery or charging system need to be serviced. Refer to appropriate repair manual.
P0606 Control Module Processor	Barometric Pressure (BARO) Sensor Rationality Check	- Diff. barometric sensor signal vs. boost pressure signal > 6.0 kPa - And - Diff. barometric sensor vs. last driving cycle > 10.0 kPa	- Time after engine start < 5.0 s - Engine speed < 1,000 RPM - Throttle position < 5.0%	2.0 s - Once / DCY	2 DCY	Check for any component or circuit fault codes and diagnose them first. If no faults are found during diagnosis, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
		- Diff. barometric sensor signal vs. boost pressure signal < -9.0 kPa - And - Diff. barometric sensor vs. last driving cycle > 10.0 kPa		2.0 s - Continuous		
		Signal gradient > 0.25 kPa/s				
		Signal gradient < -0.25 kPa/s				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Barometric Pressure (BARO) Sensor Out Of Range Low	Measured BARO < 50.0 kPa		1.0 s - Multiple		
	Barometric Pressure (BARO) Sensor Out Of Range High	Measured BARO > 115.0 kPa				
	Barometric Pressure (BARO) Sensor Short To Ground	Signal voltage < 0.20 V				
	Barometric Pressure (BARO) Sensor Short To Battery / Open Circuit	Signal voltage > 4.80 V				
	Ignition Control (IC) Communication Check	- Internal check failure - SPI communications check identifier failure	Engine speed not calibrated RPM	0.5 s - Continuous		
	Engine Control Module (ECM): 5V Supply Voltage	Internal hardware check under- / over-voltage detection	2.0 s - Continuous			
	Engine Control Module (ECM): Cylinder Deactivation (CD) Function Monitoring: Cylinder Deactivation (CD)	- Injection pattern incorrect - Or - Ignition pattern incorrect - Or - Transition from cylinder deactivation (CD) to normal operation mode failed	- Cylinder deactivation (CD) commanded on - Engine speed > 1,200 RPM	0.2 s - Continuous		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): EEPROM Functional Check	Internal checksum failed	Ignition on	0.5 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: A/D Converter	- Comparison reference voltage with sensor voltage incorrect - Internal check failed - Test voltage check failed				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Torque	- Torque deviation for time > 0.5 s - Or - Integrated relative torque deviation > 8.0%*s	Internal engine speed > 1,000 RPM			
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Engine Speed Deviation	Difference between calculated and internal engine speed > 320 RPM	Internal engine speed > 520 RPM	0.5 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Coding	Internal check failed				

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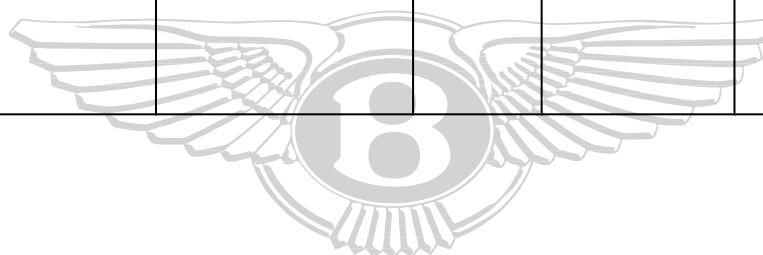
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Ignition Timing					
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Intern	System reaction incorrect				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Injection Rate Limitation					
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Cylinder Deactivation (CD)		Cylinder deactivation (CD) active	2.0 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Accelerator Position	Comparison voltage sensor 1 with sensor 2 implausible		0.5 s - Continuous		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): Electronic Throttle Control Module Monitoring Module	- Function controller check failed - And - Monitoring module check no failure	SPI - interface no failure			
	Engine Control Module (ECM): Processor CY150 Communication Check	Internal check incorrect		0.05 s - Continuous		
	Engine Control Module (ECM): RAM Controller RAM Check	Memory checksum error detected	ECM initialization phase active	- None [-] - Once / DCY		
	Engine Control Module (ECM): Sensor Integrated Circuit Internal Hardware Check (Electrical Adjustment Communication, Voltage Supply)	Check failed		0.5 s - Continuous		
	Engine Control Module (ECM): WDA Function Monitoring: WDA	- Over voltage detection failure - Internal check failure - General cause failure				
P0627 Fuel Pump "A" Control Circuit/ Open	Fuel Pump (FP) Relay Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay - J17- / Fuel Pump 1 - V276- . Refer to ⇒ "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276- . Checking", page 1628 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Pump (FP) Relay Short To Ground	Signal voltage < 2.74 V				
P0629 Fuel Pump "A" Control Circuit High	Fuel Pump (FP) Relay Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed > 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay - J17- / Fuel Pump 1 - V276- . Refer to ⇒ "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276- Checking", page 1628 .
P0638 Throttle Actuator Control Range/Performance Bank 1	Throttle Actuator Rationality Check Close Movement	- Time to close to reference point > 0.6 s - And - Deviation to reference point > 3.0%	- Engine speed 0 RPM - Vehicle speed 0 km/h - ECT > 5° C - IAT > 5° C - First start of DCY - Ignition on - Or - Engine stop - Engine after run active - Number of checks 3.0 [-]	5.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3- Checking", page 1671 .

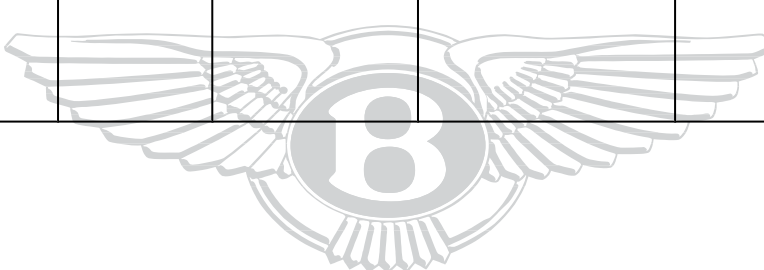
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Throttle Actuator Signal Range Check @ Mechanical Stop Low (Only Once After EE-PROM Reset)	- TPS 1 signal voltage < 0.21; > 0.87 V - Or - TPS 2 signal voltage < 4.14; > 4.84 V	- Engine speed 0 RPM - Vehicle speed 0 km/h - First start of DCY - Ignition on - ECT 5 – 101° C - IAT 5 – 143° C - Or - Engine stop - Engine after run active - ECT 5 – 101° C - IAT 5 – 143° C	0.3 s - Multiple		
P0641 Sensor Reference Voltage "A" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit A Short Circuit	Signal voltage < 4.8; > 5.2 V		0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0651 Sensor Reference Voltage "B" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit B Short Circuit	Signal voltage < 4.8; > 5.2 V		0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0657 Actuator Supply Voltage "A" Circuit/ Open	Engine Components Supply Voltage Relay Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 .
P0658 Actuator Supply Voltage "A" Circuit Low	Engine Components Supply Voltage Relay Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 .
P0659 Actuator Supply Voltage "A" Circuit High	Engine Components Supply Voltage Relay Short To Battery Plus	Signal current > 0.06 – 10.0 A	Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 .
P0688 ECM/ PCM Power Relay Sense Circuit/ Open	Battery Voltage out of range high	battery voltage > 15.92 [V]	- vehicle speed > 25 [km/h] - ortime after system ready for drive> 120.0 [s]	2.0 s - Continuous	2 DCY	Check the charging system. refer to the appropriate repair manual section.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P068 A ECM / PCM Power Relay De-Energized Performance - Too Early	Main Relay Functional Check - Early Opening	Defect counter ≥ 3.0 [-]	Ignition on	0.0 s - Once / DCY	2 DCY	- Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 . - Check the Motronic Engine Control Module Power Supply Relay 2 - J670- . Refer to ⇒ "3.6.29 Motronic Engine Control Module Power Supply Relay 2 J670, Checking", page 1648 .
P0697 Sensor Reference Voltage "C" Circuit / Open	Engine Control Module (ECM): Sensor Reference Circuit C Short Circuit	Signal voltage < 4.8; > 5.2 V		0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P13E A Cold Start Ignition Timing Performance Off Idle	Cold Start Monitoring Ignition Control (IC) Part Load Ignition Timing Monitor	Difference between commanded spark timing vs. actual value > 18.0%	- General: - Commanded spark retard during catalyst heating < 90.0% - Catalyst heating active - For time > 4.0 s - Fuel cut off not active - BARO > 73.0 kPa - Diff. relative engine load vs. filtered relative engine load <= 15.0% (For relative engine load dynamic detection) - Diff. engine speed vs. filtered engine speed <= 300 RPM (For engine speed dynamic detection) - Idle condition not active - Vehicle speed >= 2 km/h - Additional (only for hybrid): - Engine running and decoupled from powertrain not equipped	2.5 s - Once / DCY	2 DCY	Check for any engine speed sensor or ignition coil faults and diagnose them first. If no other faults are set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P1427 Brake Vacuum Pump Activation Short Circuit To B+	Brake Vacuum Pump Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Engine speed >= 80 RPM - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to ⇒ "3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 - Checking", page 1674 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P1428 Brake Vacuum Pump Activation Short Circuit To Ground	Brake Vacuum Pump Short To Ground	Signal voltage < 2.74 V	Engine speed $\geq$ 80 RPM	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to "3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 , Checking", page 1674 .
P1429 Brake Vacuum Pump Activation Open Circuit	Brake Vacuum Pump Open Circuit	Signal voltage 3.26 – 4.70 V	Engine speed $\geq$ 80 RPM	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to "3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 , Checking", page 1674 .
P150 A Engine Off Timer Performance	Engine Off Time Comparison Of Engine Off Time From Instrument Cluster Control Unit With Engine After Run Time	- Difference between engine-off time and ECM after-run time < -12.0 s - Difference between engine-off time and ECM after-run time > 12.0 s	- Ignition on - CAN active - Ignition on - CAN active (during ECM keep alive-time)	2.0 s - Once / DCY	2 DCY	If ignition off B+ is lost to ECM, this code will set. Check power and ground inputs to ECM first. Refer to appropriate wiring diagram. If all power/grounds to ECM are present, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P1609 Crash shut-off was triggered	COM: Airbag communication with Airbag	received data: crash intensity for shut down Fuel Injection detected		0 s - Continuous	2 DCY	Check the air bag system. Refer to the appropriate repair manual section.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P166 F Partial Engine Operation Deactivated	Engine Control Module (ECM): Cylinder Deactivation (CD) Vehicle In Cylinder Deactivation Service Mode	Cylinder deactivation service mode active	Ignition on	0.0 s - Continuous	1 DCY	If a relative cylinder deactivation fault is also set diagnose and repair those faults first. If there are no other faults stored, check the Displacement On Demand Rotary Solenoid NX8. Refer to "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607.
P169 A Loading Mode Active	Engine Control Module (ECM): Transport Mode Function Monitoring: Mode Change	Transport mode active	- For activation: - During ECM keep alive-time after ignition off - Vehicle speed $\leq$ 5 km/h - Engine speed 0 RPM - Max trip mileage since initial vehicle start-up < 100.0 km - Production mode not active - For hybrid: - Drive motor off	0.0 s - Continuous	1 DCY	Vehicle in transport mode. Refer to appropriate repair manual. May need to perform readiness check. Refer to "3.2 Readiness Code", page 14.
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	Variable Valve Timing (VVT) Intake Actuator Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Camshaft Adjustment Valve 1 - N205-. Refer to "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	Variable Valve Timing (VVT) Intake Actuator Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Fuel System Out Of Range Low	I-part of 2nd lambda control loop < -0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 . - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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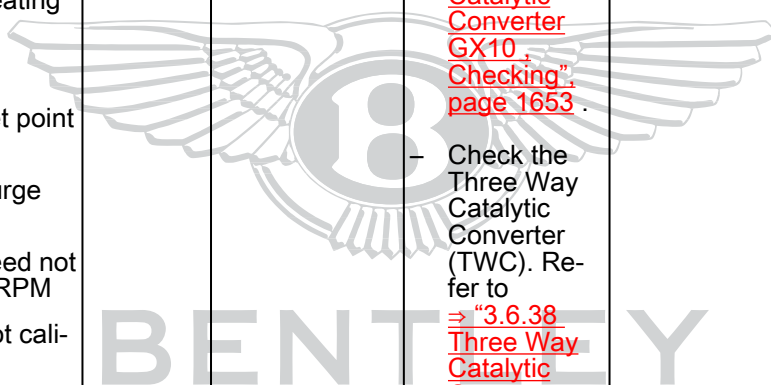
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Fuel System Out Of Range High	I-part of 2nd lambda control loop > 0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the off-set adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 . - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2098 Post Catalyst Fuel Trim System Too Lean Bank 2	Fuel System Out Of Range Low	I-part of 2nd lambda control loop < -0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 2 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 . - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2099 Post Catalyst Fuel Trim System Too Rich Bank 2	Fuel System Out Of Range High	I-part of 2nd lambda control loop > 0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 2 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 . - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration leanment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s			
P2101 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Actuator Signal Range Check	• Duty cycle > 80.0% • And • ECM power stage no failure		• 5.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to "3.6.39 Throttle Valve Control Module GX3, Checking" , page 1671 .
	Throttle Actuator Rationality Check	• Deviation throttle value angles vs. throttle value set point > 4.0 – 50.0%		• 0.5 • Continuous		
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Short To Battery Plus / Short To Ground	• Internal check failed		• 0.5 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to "3.6.39 Throttle Valve Control Module GX3, Checking" , page 1671 .
	Throttle Actuator Open Circuit		• Duty cycle > 80.0% • Or • Deviation throttle value angles vs. throttle value set point > 4.0 – 50.0%			
	Throttle Actuator Temperature / Current Monitoring					

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Throttle Actuator Functional Check					
P2119 Throttle Actuator "A" Control Throttle Body Range/Performance	Throttle Actuator Signal Range Check @ Mechanical Stop Low	- TPS 1 signal voltage < 0.21; > 0.87 V - Or - TPS 2 signal voltage < 4.14; > 4.84 V	- Engine speed 0 RPM - Vehicle speed 0 km/h - First start of DCY - Ignition on - ECT 5 – 101° C - IAT 5 – 143° C - Or - Engine stop - Engine after run active - ECT 5 – 101° C - IAT 5 – 143° C	0.3 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P2122 Throttle/Pedal Position Sensor/Switch "D" Circuit Low	Accelerator Pedal Position (APP) Sensor 1 Out Of Range Low	Signal voltage < 0.61 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2123 Throttle/Pedal Position Sensor/Switch "D" Circuit High	Accelerator Pedal Position (APP) Sensor 1 Out Of Range High	Signal voltage > 4.79 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2127 Throttle/Pedal Position Sensor/Switch "E" Circuit Low	Accelerator Pedal Position (APP) Sensor 2 Out Of Range Low	Signal voltage < 0.27 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2128 Throttle/Pedal Position Sensor/Switch "E" Circuit High	Accelerator Pedal Position (APP) Sensor 2 Out Of Range High	Signal voltage > 2.43 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2138 Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	Accelerator Pedal Position (APP) Sensor 1 And 2 Rationality Check	Signal voltage sensor 1 vs. 2 > 0.17 – 0.70 V	- Signal voltage sensor 1 > 445.0 mV - Signal voltage sensor 2 > 445.0 mV	0.24 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2177 Fuel System Too Lean @ Part Load 1	Fuel System Too Lean @ Part Load	Adaptive value > 20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Lean @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			
P2178 System Too Rich Off Idle Bank 1	Fuel System Too Rich @ Part Load	Adaptive value < -20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. Refer to appropriate repair manual. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Rich @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			
P2179 System Too Lean @ Idle Bank 2	Fuel System Too Lean @ Part Load	Adaptive value > 20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Lean @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			
P2180 System Too Rich Off Idle Bank 2	Fuel System Too Rich @ Part Load	Adaptive value < -20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. Refer to appropriate repair manual. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Rich @ Part Load In Cylinder Deactivation (CD) Mode		• Number of injections after engine start > 1,000 [-] • Engine speed 520 – 4,600 RPM • Engine load 10.0 – 60.0% • ECT > 55° C • IAT < 72° C • Ratio MAP to BARO > 0.20 [-] • Or • Valve overlap < 40.0° CRK • Lambda control closed loop • Evap purge valve closed • High PCV purge load due to oil dilution not calibrated			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2181 Cooling System Performance	Engine Cooling System Performance Not In The Expected Range	- Cooling system temperature too low after a sufficient MAF integral < 82° C - For time >= 5.0 s	- Monitor entry conditions: - ECT @ start -8 – 60° C - And - AAT -8 – 55° C - Or - IAT not calibrated ° C - Begin of air mass integration: - ECT > 40° C - Conditions for diagnosis: - MAF < 400.0 kg/h - Delta BARO < 1.50 kPa - Delta AAT K - And - Accum. time required < 140.0 – 385.0 s - Or - Accum. integrated air mass not calibrated kg - Accumulation enable if - Fuel cut off active - Or - Engine load > 100.0% - Or - Engine load < 14.0 – 30.0% - Start of fault decision: - Integrated air mass > 9.24 – 19.69 kg - Conditions at fault decision: (Average values since start)	0.0 (Unified 740.0) s - Once / DCY	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- MAF (lower threshold) $\geq 32.0 - 86.40$ kg/h - MAF (upper threshold) $\leq 100.0 - 260.0$ kg/h - Vehicle speed (lower threshold) $\geq 15 - 40$ km/h - Vehicle speed (upper threshold) ≤ 120 km/h			
P2187 System Too Lean at Idle Bank 1	Fuel System Too Lean @ Idle	Adaptive value $> 5.48\%$	- Number of injections after engine start $> 1,000 [-]$ - Engine speed $520 - 1,040$ RPM - Engine load $4.0 - 16.0\%$ - ECT $> 55^{\circ}\text{C}$ - IAT $< 72^{\circ}\text{C}$ - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2188 System Too Rich at Idle Bank 1	Fuel System Too Rich @ Idle	Adaptive value < -5.48%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 1,040 RPM - Engine load 4.0 – 16.0% - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
P2189 System Too Lean at Idle Bank 2	Fuel System Too Lean @ Idle	Adaptive value > 5.48%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 1,040 RPM - Engine load 4.0 – 16.0% - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- Check for air leaks behind the Bank 1 MAF including intake manifold. Check the Bank 2 exhaust system for leaks before the upstream O2S. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2190 System Too Rich at Idle Bank 2	Fuel System Too Rich @ Idle	Adaptive value < -5.48%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 1,040 RPM - Engine load 4.0 – 16.0% - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11-. Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2195 O2 Sensor Signal Biased / Stuck Lean Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range High	Delta lambda of 2nd lambda control loop > 0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 – 180.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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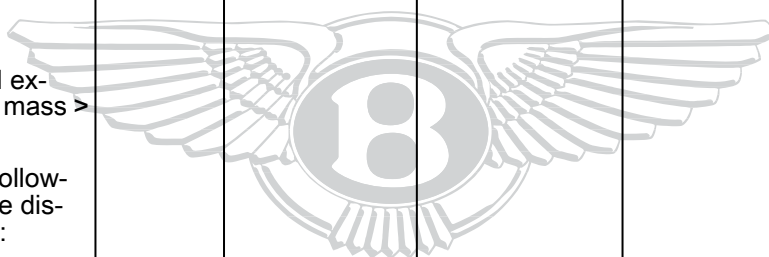
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2196 O2 Sensor Signal Biased / Stuck Rich Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range Low	Delta lambda of 2nd lambda control loop < -0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• And • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2197 O2 Sensor Signal Biased / Stuck Lean Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range High	Delta lambda of 2nd lambda control loop > 0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 – 180.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2198 O2 Sensor Signal Biased / Stuck Rich Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range Low	Delta lambda of 2nd lambda control loop < -0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• And • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 C Cylinder 1 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 D Cylinder 2 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 E Cylinder 3 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking” , page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > 15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 F Cylinder 4 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A0 Cylinder 5 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A1 Cylinder 6 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A2 Cylinder 7 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A3 Cylinder 8 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2237 O2 Sensor Positive Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Pump Current (IP)	- O2S voltage signal front 1.46 – 1.54 V - And - Difference between maximum and minimum value of O2S voltage signal front < 0.01 V - And - Delta lambda controller > 0.10 [-] - Or - Lambda control at min or max limit	- General: - O2S ceramic temp > 725° C - Heater control closed loop - Case fuel cut off: - Electrical adjustment not active - Evap purge valve ready - Case else: - Lambda modulation > 0.01 [-] - Lambda control closed loop - If stepwise change lambda set point - Commanded delta lambda step 0.05 [-]	6.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
		- O2S voltage signal front 1.46 – 1.5 V - And - Difference between maximum and minimum value of O2S voltage signal front < 0.01 V - And - No reaction on commanded stepwise change of lambda set point <> 1		5.0 s - Continuous		
		- O2S voltage signal front < 1.55 V - And - Fuel cut off > 3.0 s				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2240 O2 Sensor Positive Current Control Circuit/Open Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Pump Current (IP)	• O2S voltage signal front 1.46 – 1.54 V • And • Difference between maximum and minimum value of O2S voltage signal front < 0.01 V • And • Delta lambda controller > 0.10 [-] • Or • Lambda control at min or max limit	• General: • O2S ceramic temp > 725° C • Heater control closed loop • Case fuel cut off: • Electrical adjustment not active • Evap purge valve ready • Case else: • Lambda modulation > 0.01 [-] • Lambda control closed loop • If stepwise change lambda set point • Commanded delta lambda step 0.05 [-]	• 6.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
		• O2S voltage signal front 1.46 – 1.54 V • And • Difference between maximum and minimum value of O2S voltage signal front < 0.01 V • And • No reaction on commanded stepwise change of lambda set point <> 1		• 5.0 s • Continuous		
		• O2S voltage signal front < 1.55 V • And • Fuel cut off > 3.0 s				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2243 O2 Sensor Reference Voltage Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Nernst Voltage (UN)	- O2S voltage signal front < 0.20; > 4.70 V - Internal resistance > 950.0 Ω	Heater control active	20.0 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
P2247 O2 Sensor Reference Voltage Circuit/ Open Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Nernst Voltage (UN)	- O2S voltage signal front < 0.20; > 4.70 V - Internal resistance > 950.0 Ω	Heater control active	20.0 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .
P2257 AIR System Control "A" Circuit Low	Secondary Air Injection (AIR) Pump Relay Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- Checking", page 1661 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2258 AIR System Control "A" Circuit High	Secondary Air Injection (AIR) Pump Relay Short To Battery Plus	Signal current > 0.60 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- Checking", page 1661 .
P2259 AIR System Control "B" Circuit Low	Secondary Air Injection (AIR) Pump Relay Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189- Checking", page 1664 .
P2260 AIR System Control "B" Circuit High	Secondary Air Injection (AIR) Pump Relay Short To Battery Plus	Signal current > 0.60 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189- Checking", page 1664 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2270 O2 Sensor Signal Biased / Stuck Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Lean	Sensor voltage < 0.72 V	- O2S rear ready - Integrated exhaust gas mass after O2S rear ready ≥ 0.30 kg - Injection valve commanded on - Engine running - If - Integrated exhaust gas mass ≥ 1.50 kg - Or - Error suspicion set - Then - Enabling lambda ramp slope of the lambda ramp 0.05 1/s - Target lambda of the lambda ramp 0.85 [-] - Exhaust gas mass during ≥ 0.07 kg - Target lambda reached ≤ 0.85 [-] - If - Time fuel cut off > 5.0 s - Then disabling for - Time delay after fuel cut off 5.0 s - Additional Conditions: - Scavenging-rate not calibrated [-] - Integrated exhaust gas mass not calibrated kg - Split factor DFI/MFI not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - Engine speed 1,000 – 3,520 RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF 50.0 – 260.0 kg/h - Within time 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2271 O2 Sensor Signal Biased / Stuck Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Rich	Sensor voltage > 0.20 V	- General: - O2S rear ready - Integrated exhaust gas mass after O2S rear ready >= 0.30 kg - Injection valve commanded on - Engine running - Case 1: (During lambda ramp activation) false - If - Integrated exhaust gas mass not calibrated kg - Or - Error suspicion not calibrated - Then - Enabling lambda ramp not calibrated - Slope of the lambda ramp not calibrated 1/s - Target lambda of the lambda ramp not calibrated [-] - Exhaust gas mass during not calibrated kg - Target lambda reached not calibrated [-] - If - Time fuel cut off not calibrated s - Then disabling for - Time delay after fuel cut off not calibrated s - Additional conditions: - Scavenging-rate not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Integrated exhaust gas mass not calibrated kg - Split factor DFI/ MFI not calibrated [-] - Modeled exhaust gas temperature fitted position O2S rear not calibrated ° C - Engine speed not calibrated RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF not calibrated kg/h - Within time not calibrated s - Case 2: (During fuel cut off) true - Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - O2S front lambda value (for wide range sensor) > 8.0 [-] - O2S front voltage (for binary sensor) not calibrated V - Fuel cut off active - Integrated O2 mass during fuel cut off >= 6.0 g - Time delay not calibrated s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2272 O2 Sensor Signal Biased / Stuck Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Lean	Sensor voltage < 0.72 V	- O2S rear ready - Integrated exhaust gas mass after O2S rear ready ≥ 0.30 kg - Injection valve commanded on - Engine running - If - Integrated exhaust gas mass ≥ 1.50 kg - Or - Error suspicion set - Then - Enabling lambda ramp slope of the lambda ramp 0.05 1/s - Target lambda of the lambda ramp 0.85 [-] - Exhaust gas mass during ≥ 0.07 kg - Target lambda reached ≤ 0.85 [-] - If - Time fuel cut off > 5.0 s - Then disabling for - Time delay after fuel cut off 5.0 s - Additional Conditions: - Scavenging-rate not calibrated [-] - Integrated exhaust gas mass not calibrated kg - Split factor DFI/MFI not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - Engine speed 1,000 – 3,520 RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF 50.0 – 260.0 kg/h - Within time 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2273 O2 Sensor Signal Biased / Stuck Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Rich	Sensor voltage > 0.20 V	- General: - O2S rear ready - Integrated exhaust gas mass after O2S rear ready >= 0.30 kg - Injection valve commanded on - Engine running - Case 1: (During lambda ramp activation) false - If - Integrated exhaust gas mass not calibrated kg - Or - Error suspicion not calibrated - Then - Enabling lambda ramp not calibrated - Slope of the lambda ramp not calibrated 1/s - Target lambda of the lambda ramp not calibrated [-] - Exhaust gas mass during not calibrated kg - Target lambda reached not calibrated [-] - If - Time fuel cut off not calibrated s - Then disabling for - Time delay after fuel cut off not calibrated s - Additional conditions: - Scavenging-rate not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8- , Checking", page 1656 .

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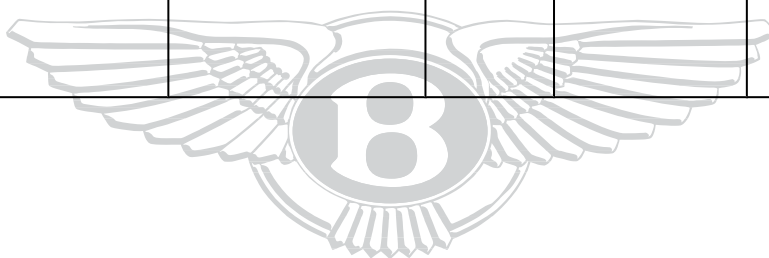
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Integrated exhaust gas mass not calibrated kg - Split factor DFI/ MFI not calibrated [-] - Modeled exhaust gas temperature fitted position O2S rear not calibrated ° C - Engine speed not calibrated RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF not calibrated kg/h - Within time not calibrated s - Case 2: (During fuel cut off) true - Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - O2S front lambda value (for wide range sensor) > 8.0 [-] - O2S front voltage (for binary sensor) not calibrated V - Fuel cut off active - Integrated O2 mass during fuel cut off >= 6.0 g - Time delay not calibrated s			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2279 MAP/MAF - Throttle Position Correlation	Intake Manifold Adaptation Value Monitoring	- Offset value throttle mass flow > 13.0 kg/h - And - Correction factor > 0.97 [-]	- Desired MAF 5.0 – 50.0 kg/h - ECT -48 – 143° C - BARO not calibrated kPa - Evap purge valve closed - EGR not equipped	3.0 s - Multiple	2 DCY	- This code will set if the calculated air intake is more than the MAF actual value. Check visually for air leaks after the MAF sensor. Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70 . Checking", page 1644 . - Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246 . Checking", page 1646 .
P2300 Ignition Coil Short To Ground	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage . Checking", page 1633 .
P2301 Ignition Coil Short To Battery Plus	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage . Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2307 Ignition Coil "C" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 A Cylinder 1 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 B Cylinder 2 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 C Cylinder 3 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to => "3.6.17 Fuel Injectors , Checking", page 1624 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 D Cylinder 4 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

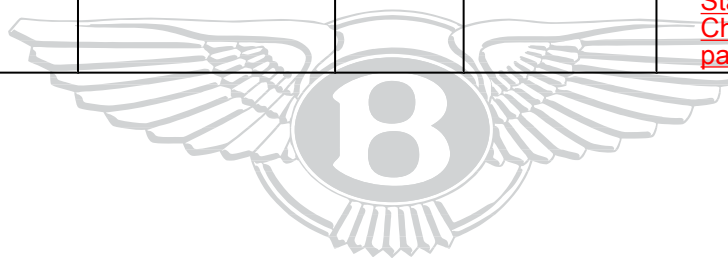
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P230E Cylinder 5 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 F Cylinder 6 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2312 Ignition Coil "E" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2313 Ignition Coil "E" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2315 Ignition Coil "F" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2316 Ignition Coil "F" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2318 Ignition Coil "G" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2319 Ignition Coil "G" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P231 A Cylinder 7 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P231 B Cylinder 8 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2321 Ignition Coil "H" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2322 Ignition Coil "H" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2400 EVAP System Leak Detection Pump Control Circuit/ Open	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Open Circuit	Signal voltage 3.26 – 4.70 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.24 Leak Detection Pump V144, Checking", page 1638 .
P2401 EVAP System Leak Detection Pump Control Circuit Low	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Ground	Signal voltage < 2.74 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.24 Leak Detection Pump V144, Checking", page 1638 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2402 EVAP System Leak Detection Pump Control Circuit High	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Leak Detection Pump - V144-. Refer to ⇒ “3.6.24 Leak Detection Pump V144-. Checking”, page 1638.
P2403 EVAP System Leak Detection Pump Sense Circuit/Open	Leak Detection Pump (LDP) Reed Sensor Rationality Check Unable To Close	Low signal voltage > 0.5 s	- Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - BARO > 73.44 kPa - Integrated EVAP purge mass > 39.8 g - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Evap purge valve ready - LDP commanded off - ECT 4 – 110° C - ECT @ start 4 – 110° C - Case 1: - AAT not calibrated ° C - Case 2: - IAT 3 – 90° C	0.5 s - Once / DCY	2 DCY	Check the Leak Detection Pump - V144-. Refer to ⇒ “3.6.24 Leak Detection Pump V144-. Checking”, page 1638.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2404 EVAP System Leak Detection Pump Sense Circuit Range/Performance	Leak Detection Pump (LDP) Reed Sensor Rationality Check Unable To Open	- High signal voltage > 12.0 s - And - Number of checks 30.0 [-] - Cumulative time of high signal voltage during pumping not calibrated s	- Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - BARO > 73.44 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Intake manifold vacuum > -100.0 kPa - Evap purge valve closed, ready - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - Case 1: - AAT not calibrated ° C - Case 2: - IAT 3 – 70° C	12.0 s - Once / DCY - Not calibrated s - Once / DCY	2 DCY	Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.24 Leak Detection Pump V144 , Checking", page 1638 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check (Check For Sensor At Ambient Air)	- Threshold 1: - Signal voltage 2.71 – 5.0 V - Threshold 2: - Signal voltage 2.05 – 3.06 V - Depending on gain factor, that actual is used for sensor characteristic, the threshold is	- Lambda set value < 1.6 [-] - O2S ceramic temperature > 665° C - Fuel cut off not active - Heater control closed loop - If low fuel signal then wait > 600.0 s - Only AIR system - AIR not active	10.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking”, page 1653 .
P2415 O2 Sensor Exhaust Sample Error Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check (Check For Sensor At Ambient Air)	- Threshold 1: - Signal voltage 2.71 – 5.0 V - Threshold 2: - Signal voltage 2.05 – 3.06 V - Depending on gain factor, that actual is used for sensor characteristic, the threshold is	- Lambda set value < 1.6 [-] - O2S ceramic temperature > 665° C - Fuel cut off not active - Heater control closed loop - If low fuel signal then wait > 600.0 s - Only AIR system - AIR not active	10.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking”, page 1659 .
P2431 AIR System Air Flow/Pressure Sensor Circuit Range/Performance Bank 1	Secondary Air Injection (AIR) Pressure Sensor Rationality Check	Diff. between AIR pressure and BARO < -6.0; > 6.0 kPa	- Actuator commanded off - BARO valid	0.01 s - Once / DCY	2 DCY	Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ “3.6.36 Secondary Air Injection Sensor 1 G609- Checking”, page 1666 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2432 AIR System Air Flow/Pressure Sensor Circuit Low Bank 1	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage < 0.40 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609- Checking", page 1666 .
P2433 AIR System Air Flow/Pressure Sensor Circuit High Bank 1	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage > 4.60 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609- Checking", page 1666 .
P2436 AIR System Air Flow/Pressure Sensor Circuit Range/Performance Bank 2	Secondary Air Injection (AIR) Pressure Sensor Rationality Check	Diff. between AIR pressure and BARO < -6.0; > 6.0 kPa	- Actuator commanded off - BARO valid	0.01 s - Once / DCY	2 DCY	Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .
P2437 AIR System Air Flow/Pressure Sensor Circuit Low Bank 2	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage < 0.40 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2438 AIR System Air Flow/Pressure Sensor Circuit High Bank 2	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage > 4.60 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .
P2440 AIR System Switching Valve Stuck Open Bank 1	Secondary Air Injection (AIR) Stuck Open	- Case 1: - Relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while AIR valve closed) > 1.50 [-] - Case 2: - Average pressure difference between absolute value and filtered value while AIR valve closed > 0.30 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - BARO > 74.0 kPa - AIR system commanded on - Additional conditions: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.59 [-]	0.0 s - Once / DCY	2 DCY	- Check the secondary air combination valve visually. Replace if necessary. Refer to appropriate repair manual. - Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- Checking", page 1661 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2442 AIR System Switching Valve Stuck Open Bank 2	Secondary Air Injection (AIR) Stuck Open	- Case 1: - Relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while AIR valve closed) > 1.50 [-] - Case 2: - Average pressure difference between absolute value and filtered value while AIR valve closed > 0.30 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - BARO > 74.0 kPa - AIR system commanded on - Additional conditions: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.59 [-]	0.0 s - Once / DCY	2 DCY	- Check the secondary air combination valve visually. Replace if necessary. Refer to appropriate repair manual. - Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189- Checking", page 1664 .
P25F6 AIR System "B"	Secondary Air Injection (AIR) Rationality Check Directly After Catalyst Heating	Diff. of measured AIR pressure before AIR injection vs. AIR pressure after AIR injection > 2.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - For time > 1.0 s - BARO > 74.0 kPa - AIR system commanded off	0.5 s - Once / DCY	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189- Checking", page 1664 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2632 Fuel Pump (FP) Relay "B" Control Circuit / Open	Fuel Pump (FP) Relay Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay 2 - J49- / Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277- . Checking", page 1630 .
P2633 Fuel Pump (FP) Relay "B" Control Circuit Low	Fuel Pump (FP) Relay Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay 2 - J49- / Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277- . Checking", page 1630 .
P2634 Fuel Pump (FP) Relay "B" Control Circuit High	Fuel Pump (FP) Relay Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed > 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay 2 - J49- / Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277- . Checking", page 1630 .
P3081 Engine Temperature Too Low	Engine Coolant Temperature (ECT) Sensor Rationality Check	Diff. between reference model temperature and measured ECT > 15.0 K		4.0 s - Continuous	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62- . Checking", page 1613 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A3 Cylinder Shut-Off Valve 1 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 - 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A4 Cylinder Shut-Off Valve 1 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF @ throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185; > 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 5 Cylinder Shut-Off Valve 2 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A6 Cylinder Shut-Off Valve 2 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > 200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF @ throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 7 Cylinder Shut-Off Valve 3 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A8 Cylinder Shut-Off Valve 3 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF @ throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 - 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A9 Cylinder Shut-Off Valve 4 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 - 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking", page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A A Cylinder Shut- Off Valve 4 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF @ throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 - 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			
P3401 Cylinder 1 Deactivation/ Intake Valve Control Circuit/ Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	• Signal voltage 4.70 – 5.40 V		0.5 s - Continuous	• 2 DCY	– Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .
P3403 Cylinder 1 Deactivation/ Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	• Signal voltage < 2.74 V		0.5 s - Continuous	• 2 DCY	– Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .
P3404 Cylinder 1 Deactivation/ Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Engine speed >= 80 RPM	0.5 s - Continuous	• 2 DCY	– Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3409 Cylinder 2 Deactivation/ Intake Valve Control Circuit/ Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	Signal voltage 4.70 – 5.40 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .
P3411 Cylinder 2 Deactivation/ Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	Signal voltage < 2.74 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .
P3412 Cylinder 2 Deactivation/ Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	Signal current > 0.06 – 10.0 A	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .
P3417 Cylinder 3 Deactivation/ Intake Valve Control Circuit/ Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	Signal voltage 4.70 – 5.40 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3419 Cylinder 3 Deactivation/ Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	• Signal voltage < 2.74 V		• 0.5 s • Continuous	• 2 DCY	– Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking” , page 1607 .
P3420 Cylinder 3 Deactivation/ Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking” , page 1607 .
P3425 Cylinder 4 Deactivation/ Intake Valve Control Circuit Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	• Signal voltage 4.70 – 5.40 V		• 0.5 s • Continuous	• 2 DCY	– Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking” , page 1607 .
P3427 Cylinder 4 Deactivation/ Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	• Signal voltage < 2.74 V		• 0.5 s • Continuous	• 2 DCY	– Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking” , page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3428 Cylinder 4 Deactivation/Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	Signal current > 0.06 – 10.0 A	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking”, page 1607 .
U0001 High Speed CAN Communication Bus	CAN: Powertrain Reading Back Sent Message	Message no feedback	Time after ignition on > 500.0 ms	0.25 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 1601 .
U0002 High Speed CAN Communication Bus Performance	CAN: Powertrain Communication Check	Global time out receiving no message	Time after ignition on > 500.0 ms	0.45 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 1601 .
U0101 Lost Communication With TCM	COM: Transmission Control Module (TCM) Communication With TCM	Received message no message	Time after ignition on >= 0.5 s	1.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance between the Transmission Control Module to the Engine Control Module - J623- . Refer to ⇒ “3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking”, page 1603 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module	COM: Brake System Control Module (BSCM) Communication With BSCM	Received message no message	Time after ignition on > 500.0 ms	2.0 s - Continuous	2 DCY	Check the ABS CAN-Bus operation. Refer to appropriate repair manual.
U0140 Lost Communication With Body Control Module	COM: Body Control Module (BCM) Communication With BCM	Time out no message	Time after ignition on > 500.0 ms	5.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.
U0146 Lost Communication With Gateway "A"	COM: Gateway Communication With Gateway	Received message no message	Time after ignition on > 500.0 ms	1.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	COM: Instrument Panel Cluster (IPC) Communication With IPC	Received message no message	Time after ignition on >= 0.5 s	5.0 s - Continuous	2 DCY	Check the Instrument Cluster CAN-Bus. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0402 Invalid Data Received From TCM	COM: Transmission Control Module (TCM) Communication With TCM	Received data implausible message	Time after ignition on > 500.0 ms	0.3 s - Continuous	2 DCY	Check for correct VIN and software ID stored in TCM. If the software ID or VIN is incorrect, a re-flash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to ⇒ "3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 1603.
U0415 Invalid Data Received From Anti-Lock Brake System (ABS) Control Module	COM: Brake System Control Module (BSCM) Communication With BSCM	Received data implausible message	Time after ignition on > 500.0 ms	2.0 s - Continuous	2 DCY	Check for correct VIN and software ID stored in ABS. If the software ID or VIN is incorrect, a re-flash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to appropriate repair manual.
	COM: Vehicle Speed Sensor (VSS) Communication With VSS	- Speed sensor signal: initialization error 655.34 km/h - Speed sensor signal: low voltage error 655.33 km/h - Speed sensor signal: sensor error 655.35 km/h		1.98 s - Continuous		
	Vehicle Speed Sensor (VSS) Out Of Range High	Vehicle speed > 325 km/h		0.48 s - Continuous 3.0 s - Continuous		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0423 Invalid Data Received From Instrument Panel Cluster Control Module	COM: Instrument Panel Cluster (IPC) Communication With IPC	Received data implausible message	Time after ignition on > 500.0 ms	3.0 s - Continuous	2 DCY	Check the Instrument Cluster CAN-Bus. Refer to appropriate repair manual.
U0447 Invalid Data Received From Gateway "A"	COM: Gateway Communication With Gateway	Received data implausible message	Time after ignition on > 500.0 ms	1.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.

3.4.7 Engine Control Module , 2020 MY

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P000A "A" Camshaft Position Slow Response Bank 1	Variable Valve Timing (VVT) Intake Actuator Slow Response	- Difference between target position vs actual position > 3.0° CRK - For time > 1.5 – 3.0 s - And - Adjustment angle > 3.0° CRK - And - Number of checks 7 times	- Time after engine start > 3.0 – 10.0 s - Engine speed 480 – 5,000 RPM - Modeled oil temperature -11 – 125° C - Change of target position > 7.0° CRK	3.5 s - Multiple	2 DCY	Check the Camshaft Adjustment Valve 1 - N205-. Refer to "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0010 "A" Camshaft Position Actuator "A" Control Circuit/ Open Bank 1	Variable Valve Timing (VVT) Intake Actuator Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .
P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	Variable Valve Timing (VVT) Intake Actuator Target Error	- Difference between target position vs actual position > 3.0° CRK - For time > 1.5 – 3.0 s - And - Adjustment angle ≤ 3.0° CRK - And - Number of checks 7 times	- Time after engine start > 3.0 – 10.0 s - Engine speed 480 – 5,000 RPM - Modeled oil temperature -11 – 125° C - Change of target position > 7.0° CRK	3.5 s - Multiple	2 DCY	- Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 . - Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0012 "A" Camshaft Position - Timing Over-Retarded Bank 1						- Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 . - Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Camshaft Position (CMP) Intake Sensor Angular Offset Check	Permissible deviation < -11.01° CRK	- Camshaft adaptation not active - Engine speed > 80 RPM	8.0 rev - Multiple	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Open Circuit	Signal voltage 3.26 – 4.70 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Ground	Signal voltage < 2.74 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10-, Checking", page 1653.
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Time after engine start > 5.0 s - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10-, Checking", page 1653.
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Open Circuit	Signal voltage 3.26 – 4.70 V	- Engine speed > 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7-, Checking", page 1650.
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Ground	Signal voltage < 2.74 V	- Engine speed >= 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7-, Checking", page 1650.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Engine speed >= 80 RPM - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking”, page 1650 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0040 O2 Sensor Signals Swapped Bank 1 Sensor 1 / Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check (Detection Of Exchange Lambda Sensors Upstream Catalyst)	• Lambda controllers exceed thresholds in opposite directions • Case 1: • Lambda control value bank 1 < 0.80 [-] • And • Lambda control value bank 2 > 1.20 [-] • Case 2: • Lambda control value bank 1 > 1.20 [-] • And • Lambda control value bank 2 < 0.80 [-]	• Lambda control closed loop • VVT ready	• 5.0 s • Multiple	• 2 DCY	- Using a scan tool with the engine running, check the Bank 1 and Bank 2 Long Term fuel trim - if one is above 10 negative and the other above 10 positive, swap the front HO2s sensor connectors and look for the long term values to move close to a zero or low single digit reading. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 . - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0050 HO2S Heater Control Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Open Circuit	Signal voltage 3.26 – 4.70 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P0051 HO2S Heater Control Circuit Low Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Ground	Signal voltage < 2.74 V	- Time after engine start > 5.0 s - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P0052 HO2S Heater Control Circuit High Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Time after engine start > 5.0 s - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 .
P0056 HO2S Heater Control Circuit Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Open Circuit	Signal voltage 3.26 – 4.70 V	- Engine speed > 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0057 HO2S Heater Control Circuit Low Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Ground	Signal voltage < 2.74 V	- Engine speed $\geq$ 80 RPM - Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .
P0058 HO2S Heater Control Circuit High Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Engine speed $\geq$ 80 RPM - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .
P0071 Ambient Air Temperature Sensor Circuit "A" Range/Performance	Intake Air Temperature (IAT) Sensor @ MAF Sensor Rationality Check Intake Air Temperature (IAT) Sensor @ MAF Sensor Low Phase Rationality Check	- Diff. IAT2 vs. ECT @ start > 20.3 K - Diff. IAT2 vs. ECT @ start < -45.0 K - Diff. max IAT2 vs. min IAT2 < 3.8 K	- ECT @ last engine stop $\leq$ 80° C - Diff. ECT @ last engine stop vs. ECT @ start $\leq$ 39.8 K - ECT @ start $\leq$ -35; $\geq$ 41° C - Time in low phase > 15.0 s - Number of checks $\geq$ 2.0 [-] - Vehicle speed $\geq$ 60 km/h - MAF $\geq$ 72.0; $\leq$ 180.0 kg/h	2.0 s - Once / DCY 10.0 s - Continuous	2 DCY	Check the Outside Air Temperature Sensor - G17- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Intake Air Temperature (IAT) Sensor @ MAF Sensor High Phase Rationality Check		- Time in high phase > 30.0 s - Number of checks >= 3.0 [-] - MAF < 40.0 kg/h - Vehicle speed < 20 km/h - ECT > 87° C - Integrated air mass > 7.01 – 16.84 kg			
P0072 Ambient Air Temperature Sensor Circuit "A" Low	Intake Air Temperature (IAT) Sensor @ MAF Sensor Out Of Range Low	Signal voltage < 0.11 V	- Conditions for measurement window - ECT > -48° C - MAF <= 1,020.0 kg/h - Vehicle speed <= 319 km/h - Monitor measurement window conditions fulfilled > 0.0 s	1.0 s - Continuous	2 DCY	Check the Outside Air Temperature Sensor - G17- . Refer to appropriate repair manual.
P0073 Ambient Air Temperature Sensor Circuit "A" High	Intake Air Temperature (IAT) Sensor @ MAF Sensor Out Of Range High	Signal voltage > 2.96 V	- Conditions for measurement window - ECT > -48° C - MAF <= 1,020.0 kg/h - Vehicle speed <= 319 km/h - Monitor measurement window conditions fulfilled > 0.0 s	1.0 s - Continuous	2 DCY	Check the Outside Air Temperature Sensor - G17- . Refer to appropriate repair manual.
P00B E Mass or Volume Air Flow "B" Circuit Range/Performance - Air Flow Too Low	Mass Air Flow (MAF) Sensor Out Of Range Low	Mass air flow to low < -45.0 kg/h	- Camshaft revolutions > 150.0 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to "3.6.28 Mass Airflow Sensor 2 G246 - Checking", page 1646 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P00BF Mass or Volume Air Flow "B" Circuit Range/Performance - Air Flow Too High	Mass Air Flow (MAF) Sensor Out Of Range High	Mass air flow to high > 1,100.0 kg/h	- Camshaft revolutions > 150.0 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246- . Refer to ⇒ "3.6.28 Mass Airflow Sensor 2 G246- . Checking", page 1646 .
P0100 Mass or Volume Air Flow Sensor "A" Circuit	Mass Air Flow (MAF) Sensor Internal Check	MAF sensor signal 0 µs	- Engine speed not active RPM - battery voltage > 11.00 [V]	0.2 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70- . Checking", page 1644 .
P0101 Mass or Volume Air Flow Sensor "A" Circuit Range/Performance	Mass Air Flow (MAF) Sensor Out Of Range Low	Mass air flow to low < -45.0 kg/h	- Camshaft revolutions > 150.0 [-] - Time after engine start > 2.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70- . Checking", page 1644 .
	Mass Air Flow (MAF) Sensor Out Of Range High	Mass air flow to high > 1,100.0 kg/h				
	Mass Air Flow (MAF) Sensor Rationality Check Low	- Max value of: - Diff. between measured MAF vs. modeled value < -47.0 kg/h - Or - Ratio of measured MAF and modeled value < 0.65 [-]	- Idle not active - Engine speed 1,000 – 4,000 RPM - ECT 40 – 120° C - IAT -30 – 100° C - BARO >= 68.0 kPa - Change in camshaft timing < 3.0 CRK - For time >= 50.0 s - Throttle position 5.0 – 50.0% - Vehicle speed 0 – 200 km/h			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Mass Air Flow (MAF) Sensor Rationality Check High	- Max value of: - Diff. between measured MAF vs. modeled value > 47.0 kg/h - Or - Ratio of measured MAF and modeled value > 1.35 [-]				
P0102 Mass or Volume Air Flow Sensor "A" Circuit Low	Mass Air Flow (MAF) Sensor Out Of Range Low	- MAF sensor signal < 66 μs - MAF sensor signal temp.-correction < 44.0 ms	Engine speed not active RPM	0.2 s - Continuous 1.0 s - Multiple	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70 , Checking", page 1644 .
P0103 Mass or Volume Air Flow Sensor "A" Circuit High	Mass Air Flow (MAF) Sensor Out Of Range High	- MAF sensor signal > 910 μs - MAF sensor signal temp.-correction > 60.0 ms	Engine speed not active RPM	0.2 s - Continuous 1.0 s - Multiple	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70 , Checking", page 1644 .
P0106 Manifold Absolute Pressure (MAP) Sensor Dynamic Check	Manifold Absolute Pressure (MAP) Sensor Dynamic Check	- Amplitude of MAP sensor < 0.3 – 4.4 kPa - For counts > 30.0 [-] - Number of synchro events > 50.0 [-]	- Engine speed > 1,200; < 3,520 RPM - Ratio of MAP and boost pressure > 0.20; < 0.9 [-]	1.1 s - Continuous	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
	Manifold Absolute Pressure (MAP) Sensor Rationality Check	Diff. barometric sensor signal vs. manifold pressure signal @ engine start > 15.0 kPa	- Time after engine start < 25.0 s - Engine speed < 300 RPM	2.5 s - Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Manifold Absolute Pressure (MAP) Sensor Rationality Check Low	- Difference manifold pressure - lower threshold model < 0.0 kPa - Model range 90 – 210 kPa				
	Manifold Absolute Pressure (MAP) Sensor Rationality Check High	- Difference manifold pressure - upper threshold model > 0.0 kPa - Model range 85 – 270 kPa				
P0107 Manifold Absolute Pressure (MAP) Sensor Range Check	Manifold Absolute Pressure (MAP) Sensor Range Check	Manifold pressure signal < 10.0 kPa		2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71-. Refer to ⇒ “3.6.25 Manifold Absolute Pressure Sensor G71, Checking”, page 1640 .
	Manifold Absolute Pressure (MAP) Sensor Short To Ground	Signal voltage < 0.20 V		1.0 s - Continuous		
P0108 Manifold Absolute Pressure (MAP) Sensor Range Check	Manifold Absolute Pressure (MAP) Sensor Range Check	Manifold pressure signal > 280.0 kPa		2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71-. Refer to ⇒ “3.6.25 Manifold Absolute Pressure Sensor G71, Checking”, page 1640 .
	Manifold Absolute Pressure (MAP) Sensor Short To Battery / Open Circuit	Signal voltage > 4.88 V		1.0 s - Continuous		
	Manifold Absolute Pressure (MAP) Sensor Out Of Range @ Start	Manifold pressure > 140.0 kPa	- Engine off time > 5.0 s - Engine speed < 400 RPM	0.5 s - Once / DCY		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P010A Mass or Volume Air Flow Sensor "B" Circuit	Mass Air Flow (MAF) Sensor Internal Check	MAF sensor signal 0 μs	- Engine speed not active RPM - battery voltage > 11.00 [V]	0.2 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246-. Refer to "3.6.28 Mass Airflow Sensor 2 G246-. Checking", page 1646.
P010B Mass or Volume Air Flow Sensor "B" Circuit Range/Performance	Mass Air Flow (MAF) Sensor Rationality Check Low	- Max value of: - Diff. between measured MAF vs. modeled value < -47.0 kg/h - Or - Ratio of measured MAF and modeled value < 0.65 [-]	- Idle not active - Engine speed 1,000 – 4,000 RPM - ECT 40 – 120° C - IAT -30 – 100° C - BARO >= 68.0 kPa - Change in camshaft timing < 3.0° CRK - For time >= 50.0 s	3.5 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246-. Refer to "3.6.28 Mass Airflow Sensor 2 G246-. Checking", page 1646.
	Mass Air Flow (MAF) Sensor Rationality Check High	- Max value of: - Diff. between measured MAF vs. modeled value > 47.0 kg/h - Or - Ratio of measured MAF and modeled value > 1.35 [-]				
P010C Mass or Volume Air Flow Sensor "B" Circuit Low	Mass Air Flow (MAF) Sensor Out Of Range Low	MAF sensor signal < 66 μ s	Engine speed not active RPM	0.2 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246-. Refer to "3.6.28 Mass Airflow Sensor 2 G246-. Checking", page 1646.
		MAF sensor signal temp.-correction < 44.0 ms		1.0 s - Multiple		
P010D Mass or Volume Air Flow Sensor	Mass Air Flow (MAF) Sensor Out Of Range High	MAF sensor signal > 910 μ s	Engine speed not active RPM	0.2 s - Continuous	2 DCY	Check the Mass Airflow Sensor 2 - G246-. Refer to "3.6.28 Mass Airflow Sensor 2 G246-. Checking", page 1646.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
"B" Circuit High		MAF sensor signal temp.-correction > 60.0 ms		1.0 s - Multiple		Checking", page 1646 .
P0111 Intake Air Temperature (IAT) Sensor @ Manifold Rationality Check Circuit Range/Performance Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold Rationality Check	Difference IAT at intake manifold to modeled IAT >= 60.0 – 99.8 K	- Conditions for measurement window - MAF <= 152.0; >= 600.0 kg/h - Vehicle speed >= 45 km/h - Engine speed > 20 RPM - Monitor measurement window conditions fulfilled > 15.0 s	10.0 s - Continuous	2 DCY	– Check the Mass Airflow Sensor - G70- . Refer to ⇒ "3.6.27 Mass Airflow Sensor G70, Checking", page 1644 .
	Intake Air Temperature (IAT) Sensor @ Manifold Stuck Check	Difference between maximum and minimum value of IAT < 5.3 K	- ECT @ start <= 138° C - Intake manifold high phase conditions - MAF < 52.0 kg/h - Vehicle speed < 10 km/h - ECT > 80° C - Integrated air mass > 1.0 – 4.0 kg - Cumulated high manifold active time > 15.0 s - Number of checks > 2.0 [-] - Intake manifold low phase conditions - MAF 152.0 – 600.0 kg/h - Vehicle speed > 45 km/h - Cumulated low manifold active time > 15.0 s - Number of checks > 2.0 [-]	500.0 s - Continuous		
	Intake Air Temperature (IAT) Sensor @	Diff. IAT vs. ECT at engine start >= 20.3 K	ECT @ engine shut-off >= 80° C	2.0 s - Once / DCY		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Manifold Cross Check	Diff. IAT vs. ECT at engine start < -45.0 K	- ECT @ start >= -35; <= 41° C - ECT restart temperature diff. >= 39.8 K			
P0112 Intake Air Temperature Sensor 1 Circuit Low Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold Short To Ground	Signal voltage < 0.11 V		1.0 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to "3.6.27 Mass Airflow Sensor G70 . Checking", page 1644 .
P0113 Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake Air Temperature (IAT) Sensor @ Manifold Short To Battery / Open Circuit	Signal voltage > 4.50 V	- ECT @ start not calibrated ° C - Or - Time after engine start not calibrated s - ECT >= -48° C - Vehicle speed <= 319 km/h - MAF <= 1,020.0 kg/h	1.0 s - Continuous	2 DCY	Check the Mass Airflow Sensor - G70- . Refer to "3.6.27 Mass Airflow Sensor G70 . Checking", page 1644 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0116 Engine Coolant Temperature (ECT) Sensor Stuck High / Low - No Change On Signal Circuit Range/Performance	Engine Coolant Temperature (ECT) Sensor Stuck High / Low - No Change On Signal	Diff. between max. ECT and min. ECT < 2.3 K	- ECT @ start -39 – 138° C - Without 81.8 – 93.0° C - Substitute ECT > -45° C - Driving condition H: - Vehicle speed 45 – 150 km/h - MAF (lower threshold) 8.0 kg/h - MAF (upper threshold) 152.0 – 352.0 kg/h - Or - Fuel cut off active - For time required > 30.0 s - Frequency 1 times [-] - Driving condition L: - Vehicle speed 0 – 20 km/h - MAF (lower threshold) 8.0 kg/h - MAF (upper threshold) 52.0 – 84.0 kg/h - For time required > 10.0 s - Frequency 3 times [-]	62.0 s - Once / DCY	2 DCY	Check the Engine Coolant Temperature Sensor - G62-. Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613.
	Engine Coolant Temperature (ECT) Sensor Stuck In Range	- ECT @ start >= 20 – 75° C - And - ECT @ start <= 143° C	Cold start detected	2.0 s - Once / DCY		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0117 Engine Coolant Temperature (ECT) Sensor 1 Circuit Low	Engine Coolant Temperature (ECT) Sensor Short To Ground	ECT > 138° C		2.0 s - Continuous	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613 .
P0118 Engine Coolant Temperature (ECT) Sensor 1 Circuit High	Engine Coolant Temperature (ECT) Sensor Short To Battery / Open Circuit	ECT < - 39.0° C		2.0 s - Continuous	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613 .
P0121 Throttle/Pedal Position Sensor (TPS) Circuit Range/Performance	Throttle Position Sensor (TPS) Rationality Check	- TPS1-TPS2 > 6.27% - And - Actual TPS1 - calc.value > actual TPS2 - calc. value - Or - TPS1 - calc. value > 9.2%	Engine speed > 480 RPM	0.3 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P0122 Throttle/Pedal Position Sensor (TPS) Circuit Low	Throttle Position Sensor (TPS) Out Of Range Low	Signal voltage < 0.18 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0123 Throttle/Pedal Position Sensor/Switch "A" Circuit High	Throttle Position Sensor (TPS) Out Of Range High	Signal voltage > 4.63 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P0130 O2 Sensor Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range	O2S ceramic temperature < 690° C	- Modeled EGT > 350° C - Fuel cut off not active	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .
P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	- Short to ground - Virtual mass (VM) < 1.75 V - Or - Nernst voltage (UN) < 1.50 V - Or - Adjustment voltage (IA) not calibrated V - Or - Adjustment voltage (IP) < 0.30 V		2.0 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	• Short to battery • Virtual mass (VM) > 3.25 V • Or • Nernst voltage (UN) > 4.40 V • Or • Adjustment voltage (IA) not calibrated V • Or • Adjustment voltage (IP) > 7.0 V		• 2.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Response Rate Monitoring, Area Ratio And Gradient Ratio	- Symmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio -0.30 – 0.55 [-] - Max value of both counters for area ratio rich to lean and lean to rich ≥ 6 times [-] - Delay Time: - Gradient ratio ≥ 0.00 [-] - Lower value of both area ratios rich to lean and lean to rich < 0.27 [-] - Transient Time: - Gradient ratio not calibrated [-] - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Or - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-] - Asymmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio < -0.30; > 0.55 [-]	- O2S front - time since operation readiness > 30.0 s - O2S front - min. operation temperature is reached ≥ 720.0 K - Exhaust gas mass flow since engine first start not calibrated kg - Heat supply not calibrated kJ - Or - Time since engine first start not calibrated s - Check wire break pump current ready - ECT $\geq 60^{\circ}$ C - And - Only Flex fuel systems - Ethanol concentration adaptation not calibrated - And - Ethanol value not calibrated [-] - And - Ethanol value to start diagnosis not calibrated [-] - Only NG fuel systems - Total ng operating mode not calibrated - Or - Total gasoline operating mode not calibrated - Scavenging - Scavenging-rate not calibrated [-]	48.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		- Values of both counters for area ratio rich to lean and lean to rich ≥ 6 times [-] - Delay Time: - Gradient ratio ≥ 0.00 [-] - Lower value of both area ratios rich to lean and lean to rich < 0.27 [-] - Transient Time: - Gradient ratio not calibrated [-] - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Or - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-]	- Integrated air mass not calibrated kg - Additional conditions: - Lambda value freeze not active - Relative fuel amount from wall applied compensation and evap purge ≤ 1.0 [-] - Split coefficient DFI/MFI-system is constant not calibrated [-] - Engine speed 1,160 – 2,520 RPM - All local injector active - Desired position lead boost pressure not calibrated - Vehicle speed not calibrated km/h - Time since engine start ≥ 5.0 s - Engine load 27.0 – 79.99% - Catalyst heating not active - Evap purge valve case 1: - Gradient of factor tank ventilation ≤ 0.0 [-] - And - Pulse duty factor of evap purge valve $> 10.0\%/s$ - For time not calibrated s - Or - Evap purge valve case 2: - Pulse duty factor of evap purge valve $\leq 10.0\%/s$			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Additional conditions: • Evap purge ≥ 8.0 g • Or • Evap purge not active • Or • Lambda controller oscillation detected • Exhaust system lag time calculation $0.1 - 0.3$ s • Catalyst temperature $\geq 500^{\circ}$ C • Lambda control set-point prior to diagnostic fuel steps $1.0 [-]$ • Or • Gradient of exhaust system lag time calculation ≤ 0.1 s • Gradient of engine load $\leq 3.0\%$ • Gear shifting not active • Or • Transition from cylinder deactivation (CD) to normal operation mode finished • Exhaust gas mass flow ≥ 15.0 kg/h • Gradient of exhaust gas mass flow not calibrated kg/h • Evap purge in limp-home mode not calibrated • Or • EVAP system diagnosis not calibrated • Or			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Evap purge load high not calibrated - AIR not calibrated - AIR system diagnosis not calibrated - Time since last measurement > 2.0 s			
P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Out Of Range High	- O2S ceramic temperature < 725° C - And - Heater duty cycle > 95.0%	- Modeled EGT > 350° C - Heater control active	60.0 s - Multiple	• 2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
	Oxygen Sensors (O2S) Heater Front Rationality Check (Sensor Heating Up)	- O2S ceramic temperature < 725° C - And - Time after O2S heater on 40.0 s	- ECT @ start > -10° C - Engine shut-off-time > 10,000.0 s (During ECM keep alive-time after ignition off) < 300.0 s	40.0 s - Once / DCY		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	- Signal voltage < 0.06 V - For time > 3.0 s - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Fuel cut off not active - Catalyst purge not active	3.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Out Of Range High (Short To Battery Plus)	- Signal voltage > 1.08 V - For time > 0.1 s	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Lambda set value > 0.995 [-]	0.1 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Cut Off	- Arithmetic filtered max differential transient time at fuel cut off not calibrated s - Or - EWMA filtered max differential transient time at fuel cut off ≥ 0.60 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel cut off active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow -80.0 – 80.0 kg/h - Time fuel cut off < 20.0 s - If - Time fuel cut off > 20.0 s - Then disabling till next fuel cut off 60.0 s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Deviation between expected and measured lambda value < 12.0 [-] - Or - Lambda value > 5.0 [-] - Additional conditions: - Time after fuel cut off at first cylinder ≥ 1.5 s	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- O2S rear voltage before start of measurement > 0.55 V - O2S rear target voltage end of measurement <= 0.15 V - Or - Integrated O2 mass during fuel cut off >= 1,800 – 3,000 mg - Time delay 0.5 s - Case 1: (With scavenging) - Scavenging-rate not calibrated [-] - Then disabling until - Scavenging-rate not calibrated [-] - And - Integrated air mass not calibrated [-] - Case 2: (Without scavenging) - Integrated air mass > 0.50 kg - Engine running			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 B O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Feed Restart	- Arithmetic filtered max differential transient time at fuel feed restart not calibrated s - Or - EWMA filtered max differential transient time at fuel feed restart ≥ 1.0 s - And - Number of checks $\geq 3.0 [-]$	- O2S front out of range ready, no fault - O2S rear ready - Fuel feed restart active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}\text{C}$ - Change of exhaust gas mass flow $-80.0 - 80.0$ kg/h - If - Time fuel cut off > 20.0 s - Then - Disabling till next fuel feed restart 60.0 s - Additional conditions: - O2S rear voltage before start of measurement < 0.15 V - O2S rear target voltage end of measurement ≥ 0.60 V - Or - Integrated negative O2 mass during catalyst purge $\geq 2,000 - 3,000$ mg - Time delay 0.5 s - Case 1:	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• (With scavenging) • If • Scavenging-rate not calibrated [-] • Then disabling until • Scavenging-rate not calibrated [-] • And • Integrated air mass not calibrated kg • Case 2: • (Without scavenging) • Integrated air mass > 0.5 kg • Engine running			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013 C O2 Sensor Slow Response - Rich to Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Cut Off	- Arithmetic filtered max differential transient time at fuel cut off not calibrated s - Or - EWMA filtered max differential transient time at fuel cut off ≥ 0.60 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel cut off active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow $-80.0 - 80.0$ kg/h - Time fuel cut off < 20.0 s - If - Time fuel cut off > 20.0 s - Then disabling till next fuel cut off 60.0 s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Deviation between expected and measured lambda value < 12.0 [-] - Or - Lambda value > 5.0 [-] - Additional conditions: - Time after fuel cut off at first cylinder ≥ 1.5 s	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- O2S rear voltage before start of measurement > 0.55 V - O2S rear target voltage end of measurement <= 0.15 V - Or - Integrated O2 mass during fuel cut off >= 1,800 – 3,000 mg - Time delay 0.5 s - Case 1: (With scavenging) - If - Scavenging-rate not calibrated [-] - Then disabling until - Scavenging-rate not calibrated [-] - And - Integrated air mass not calibrated [-] - Case 2: (Without scavenging) - Integrated air mass > 0.50 kg - Engine running			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013D O2 Sensor Slow Response - Lean to Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Transient Time At Fuel Feed Restart	- Arithmetic filtered max differential transient time at fuel feed restart not calibrated s - Or - EWMA filtered max differential transient time at fuel feed restart ≥ 1.0 s - And - Number of checks ≥ 3.0 [-]	- O2S front out of range ready, no fault - O2S rear ready - Fuel feed restart active - Engine speed 520 – 3,000 RPM - Integrated exhaust gas mass since O2S rear ready not calibrated kg - Exhaust gas mass flow > 12.0 kg/h - Modeled exhaust gas temperature fitted position O2S rear $\geq 500^{\circ}$ C - Change of exhaust gas mass flow $-80.0 - 80.0$ kg/h - If - Time fuel cut off > 20.0 s - Then - Disabling till next fuel feed restart 60.0 s - Additional conditions: - O2S rear voltage before start of measurement < 0.15 V - O2S rear target voltage end of measurement ≥ 0.60 V - Or - Integrated negative O2 mass during catalyst purge $\geq 2,000 - 3,000$ mg - Time delay 0.5 s - Case 1:	10.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• (With scavenging) • If • Scavenging-rate not calibrated [-] • Then disabling until • Scavenging-rate not calibrated [-] • And • Integrated air mass not calibrated kg • Case 2: • (Without scavenging) • Integrated air mass > 0.5 kg • Engine running			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013E O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Rich To Lean Transition	- Arithmetic filtered max differential delay time at rich to lean transition > not calibrated s - Or - EWMA filtered max differential delay time at rich to lean transition > 0.6 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value before not calibrated [-]	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- For integrated exhaust gas mass not calibrated kg - Lambda set value not calibrated [-] - For time not calibrated s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated - Diff. between lambda set value and actual lambda value ≤ 16.0 [-] - Threshold 1 - O2S rear voltage ≥ 0.72 V - Gradient O2S rear voltage $-0.01 - 0.05$ V/s - Integrated negative O2 mass ≥ 50 mg - Or - Threshold 2 - O2S rear voltage > 1.25 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013F O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Lean To Rich Transition	- Arithmetic filtered max differential delay time at lean to rich transition not calibrated s - EWMA filtered max differential delay time at lean to rich transition > 1.2 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - General: - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value not calibrated [-] - For time not calibrated s	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated [-] - Diff. between lambda set value and actual lambda value ≤ 16.0 [-] - Case 1: (Diagnosis in Catalyst State full) true - Time after engine start not calibrated s - Threshold 1 - O2S rear voltage ≤ 0.20 V - Gradient O2S rear voltage $+1.0 - 0.01$ V/s - Integrated O2 mass not calibrated mg - Or - Threshold 2 - O2S rear voltage not calibrated V - Case 2: (Diagnosis at Fuel Feed Re-start) false - Integrated exhaust gas mass not calibrated kg - Integrated exhaust gas mass not calibrated kg			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Exhaust gas mass during not calibrated kg - Catalyst temperature not calibrated ° C - Exhaust gas mass flow not calibrated kg/h - Gradient of exhaust gas mass flow not calibrated kg/h - Engine speed not calibrated RPM - O2S rear voltage after fuel cut off not calibrated V - For time not calibrated s - And - O2 mass not calibrated mg			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	- Signal voltage 0.40 – 0.60 V - For time > 3.0 s - And - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) >= 2.80 V	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded	40.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	- Internal resistance > 40,000.0 Ω - And - Exhaust temperature > 600° C	- Case 1: - Sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded - Valid Re-measurements > 10 times			
P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Out Of Range (During Normal Heater Operation After Dew Point Is Exceeded)	Internal resistance > 1,260.0 – 20,400.0 Ω	- Dew point exceeded - Modeled EGT 350 – 650° C - IAT > -7° C - Engine shut-off-time > 5,000.0 s - Number of checks 10.0 [-] - Fuel cut off not active - Actuator commanded on	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P014 A O2 Sensor Delayed Response - Rich to Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Rich To Lean Transition	- Arithmetic filtered max differential delay time at rich to lean transition > not calibrated s - Or - EWMA filtered max differential delay time at rich to lean transition > 0.6 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value before not calibrated [-]	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- For integrated exhaust gas mass not calibrated kg - Lambda set value not calibrated [-] - For time not calibrated s - Binary sensor front fitted - O2S front voltage not equipped V - Linear sensor front fitted - Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated - Diff. between lambda set value and actual lambda value ≤ 16.0 [-] - Threshold 1 - O2S rear voltage ≥ 0.72 V - Gradient O2S rear voltage $-0.01 - 0.05$ V/s - Integrated negative O2 mass ≥ 50 mg - Or - Threshold 2 - O2S rear voltage > 1.25 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P014 B O2 Sensor Delayed Response - Lean to Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Check Of Differential Delay Time At Lean To Rich Transition	- Arithmetic filtered max differential delay time at lean to rich transition not calibrated s - EWMA filtered max differential delay time at lean to rich transition > 1.2 s - And - Number of checks >= 3.0 [-]	- O2S front out of range ready, no fault - General: - Heat supply not calibrated kJ - Integrated exhaust gas mass after O2S rear ready > 1.0 kg - Integrated exhaust gas mass during > 0.20 kg - Catalyst temperature 400 – 800° C - Exhaust gas mass flow 25.0 – 120.0 kg/h - Change of exhaust gas mass flow -10.0 – 20.0 kg/h - Engine speed 1,120 – 3,000 RPM - O2S rear stuck lean / stuck rich ready, no fault - Vehicle speed >= 20 km/h - And - Time after engine start not calibrated s - Or - Exhaust gas mass not calibrated kg - Scavenging: - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg/h - Lambda control not calibrated - Lambda set value not calibrated [-] - For time not calibrated s	40.0 s - Once / DCY	1 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8- , Checking”, page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Binary sensor front fitted • O2S front voltage not equipped V • Linear sensor front fitted • Diff. between lambda set point value (combustion chamber) vs. expected lambda (front sensor fitting) not calibrated [-] • Diff. between lambda set value and actual lambda value ≤ 16.0 [-] • Case 1: • (Diagnosis in Catalyst State full) true • Time after engine start not calibrated s • Threshold 1 • O2S rear voltage ≤ 0.20 V • Gradient O2S rear voltage $-1.0 - 0.01$ V/s • Integrated O2 mass not calibrated mg • Or • Threshold 2 • O2S rear voltage not calibrated V • Case 2: • (Diagnosis at Fuel Feed Restart) false • Integrated exhaust gas mass not calibrated kg • Integrated exhaust gas mass not calibrated kg			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Exhaust gas mass during not calibrated kg - Catalyst temperature not calibrated ° C - Exhaust gas mass flow not calibrated kg/h - Gradient of exhaust gas mass flow not calibrated kg/h - Engine speed not calibrated RPM - O2S rear voltage after fuel cut off not calibrated V - For time not calibrated s - And - O2 mass not calibrated mg			
P0150 O2 Sensor Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range	O2S ceramic temperature < 690° C	- Modeled EGT > 350° C - Fuel cut off not active	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0151 O2 Sensor Circuit Low Voltage Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	• Short to ground • Virtual mass (VM) < 1.75 V • Or • Nernst voltage (UN) < 1.50 V • Or • Adjustment voltage (IA) not calibrated V • Or • Adjustment voltage (IP) < 0.30 V		• 2.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
P0152 O2 Sensor Circuit High Voltage Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check	• Short to battery • Virtual mass (VM) > 3.25 V • Or • Nernst voltage (UN) > 4.40 V • Or • Adjustment voltage (IA) not calibrated V • Or • Adjustment voltage (IP) > 7.0 V		• 2.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0153 O2 Sensor Circuit Slow Response Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Response Rate Monitoring, Area Ratio And Gradient Ratio	- Symmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio -0.30 – 0.55 [-] - Max value of both counters for area ratio rich to lean and lean to rich >= 6 times - Delay Time: - Gradient ratio >= 0.00 [-] - Lower value of both area ratios rich to lean and lean to rich < 0.27 [-] - Transient Time: - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-] - Asymmetric fault: - Diff of rich to lean area ratio vs. lean to rich area ratio < -0.30; > 0.55 [-]	- O2S front - time since operation readiness > 30.0 s - O2S front - min. operation temperature is reached >= 720.0 K - Exhaust gas mass flow since engine first start not calibrated kg - Heat supply not calibrated kJ - Or - Time since engine first start not calibrated s - Check wire break pump current ready - And - Only Flex fuel systems - Ethanol concentration adaptation not calibrated - And - Ethanol value not calibrated [-] - And - Ethanol value to start diagnosis not calibrated [-] - Only NG fuel systems - Total ng operating mode not calibrated - Or - Total gasoline operating mode not calibrated - Scavenging - Scavenging-rate not calibrated [-] - Integrated air mass not calibrated kg	48.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		- Values of both counters for area ratio rich to lean and lean to rich ≥ 6 times - Delay Time: - Gradient ratio ≥ 0.00 [-] - Lower value of both area ratios rich to lean and lean to rich < 0.27 [-] - Transient Time: - Gradient ratio not calibrated [-] - Gradient ratio not calibrated [-] - Lower value of both area ratios rich to lean and lean to rich not calibrated [-] - Or - Lower value of both gradient ratios rich to lean and lean to rich not calibrated [-]	- Additional conditions: - Lambda value freeze not active - Relative fuel amount from wall applied compensation and evap purge ≤ 1.0 [-] - Split coefficient DFI/MFI-system is constant not calibrated [-] - Engine speed 1,160 – 2,520 RPM - All local injector active - Desired position lead boost pressure not calibrated - Vehicle speed not calibrated km/h - Time since engine start ≥ 5.0 s - Engine load 27.0 – 79.99% - Catalyst heating not active - Evap purge valve case 1: - Gradient of factor tank ventilation ≤ 0.0 [-] - And - Pulse duty factor of evap purge valve $> 10.0\%/s$ - For time not calibrated s - Or - Evap purge valve case 2: - Pulse duty factor of evap purge valve $\leq 10.0\%/s$ - Additional conditions:			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Evap purge ≥ 8.0 g - Or - Evap purge not active - Or - Lambda controller oscillation detected - Exhaust system lag time calculation $0.1 - 0.3$ s - Catalyst temperature $\geq 500^{\circ}$ C - Lambda control set-point prior to diagnostic fuel steps 1.0 [-] - Or - Gradient of exhaust system lag time calculation ≤ 0.1 s - Gradient of engine load $\leq 3.0\%$ - Gear shifting not active - Or - Transition from cylinder deactivation (CD) to normal operation mode finished - Exhaust gas mass flow ≥ 15.0 kg/h - Gradient of exhaust gas mass flow not calibrated kg/h - Evap purge in limp-home mode not calibrated - Or - EVAP system diagnosis not calibrated - Or			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Evap purge load high not calibrated - AIR not calibrated - AIR system diagnosis not calibrated - Time since last measurement > 2.0 s			
P0155 O2 Sensor Heater Circuit Bank 2 Sensor 1	Oxygen Sensors (O2S) Heater Front Out Of Range High	- O2S ceramic temperature < 725° C - And - Heater duty cycle > 95.0%	- Modeled EGT > 350° C - Heater control active	60.0 s - Multiple	• 2 DCY	– Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking”, page 1659 .
	Oxygen Sensors (O2S) Heater Front Rationality Check (Sensor Heating Up)	- O2S ceramic temperature < 725° C - And - Time after O2S heater on 40.0 s	- ECT @ start > -10° C - Engine shut-off-time > 10,000.0 s (During ECM keep alive-time after ignition off) < 300.0 s	40.0 s - Once / DCY	• 2 DCY	



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0157 O2 Sensor Circuit Low Voltage Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	- Signal voltage < 0.06 V - For time > 3.0 s - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Fuel cut off not active - Catalyst purge not active	3.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0158 O2 Sensor Circuit High Voltage Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Out Of Range High (Short To Battery Plus)	- Signal voltage > 1.08 V - For time > 0.1 s	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running dew point exceeded - Lambda set value > 0.995 [-]	0.1 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0160 O2 Sensor Circuit No Activity Detected Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	- Signal voltage 0.40 – 0.60 V - For time > 3.0 s - And - Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) >= 2.80 V	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: - Sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded	40.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ “3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking”, page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors (O2S) Rear Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	- Internal resistance > 40,000.0 Ω - And - Exhaust temperature > 600° C	- Case 1: sensor ready for operation - Sensor voltage <= 0.40 V - Or - Sensor voltage 0.50 – 1.08 V - Case 2: sensor theoretical ready for operation - For time > 30.0 s - Sensor sufficient heated up if exhaust temperature >= 650° C - For time > 10.0 s - Or - Heater power >= 50.0% - For time > 10.0 s - General: - Engine running - Dew point exceeded - Valid Ri-measurements > 10 times			
P0161 O2 Sensor Heater Circuit Bank 2 Sensor 2	Oxygen Sensors (O2S) Heater Rear Out Of Range (During Normal Heater Operation After Dew Point Is Exceeded)	Internal resistance > 1,260.0 – 20,400.0 Ω	- Dew point exceeded - Modeled EGT 350 – 650° C - IAT > -7° C - Engine shut-off-time > 5,000.0 s - Number of checks 10.0 [-] - Fuel cut off not active - Actuator commanded on	20.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8- , Checking", page 1656 .
P0169 Incorrect Fuel Composition	Engine Control Module (ECM): Electronic Throttle Control Module	Corrections of fuel mass on single cylinders incorrect		2.0 s - Continuous	2 DCY	Check for any component or circuit fault codes and diagnose them first. If no faults are

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Function Monitoring: Injection	Injection cut off incorrect				found during diagnosis, and the ECM has lost a driver output, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Lambda Mode	Internal check failed	Internal engine speed > 1,200 RPM	0.5 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Mixture Control	- Correction factor incorrect - Fuel quantity incorrect				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Load Plausibility	Abs. difference between predicted and real air mass > 11.30%	Engine speed >= 1,200 RPM			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0171 System Too Lean Bank 1	Fuel System Too Lean	- Low pass filtered lambda controller output > 23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}\text{C}$ - Lambda control closed loop - And - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0172 System Too Rich Bank 1	Fuel System Too Rich	- Low pass filtered lambda controller output < -23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}$ C - Lambda control closed loop - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 . - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0174 System Too Lean Bank 2	Fuel System Too Lean	- Low pass filtered lambda controller output > 23.50% - For time > 10.0 s	- General: - Number of injections after engine start ≥ 250.0 [-] - ECT $\geq 55^{\circ}\text{C}$ - Lambda control closed loop - And - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation ≥ 1.0 [-] - Evap purge flow ≤ 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0175 System Too Rich Bank 2	Fuel System Too Rich	- Low pass filtered lambda controller output < -23.50% - For time > 10.0 s	- General: - Number of injections after engine start >= 250.0 [-] - ECT >= 55° C - Lambda control closed loop - High PCV purge load due to oil dilution not calibrated - And - Case 1: - Evap purge not active - Case 2: - Integrated EVAP purge mass not calibrated g - Case 3: - Evap purge controller limitation >= 1.0 [-] - Evap purge flow <= 5.0 kg/h	15.0 s - Continuous	2 DCY	- Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659 . - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .
P0201 Cylinder 1 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624 .
P0202 Cylinder 2 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624 .
P0203 Cylinder 3 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0204 Cylinder 4 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0205 Cylinder 5 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0206 Cylinder 6 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0207 Cylinder 7 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0208 Cylinder 8 Injector "A" Circuit	Fuel Injection Valves Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0221 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Range/Performance	Throttle Position Sensor (TPS) 2 Rationality Check	- TPS1 - TPS2 > 6.27% > - And - Actual TPS2 - calc. value > actual TPS1 - calc. value - Or - TPS2 - calc value > 9.2%	Engine speed > 480 RPM	0.3 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0222 Throttle/Pedal Position Sensor/Switch "B" Circuit Low	Throttle Position Sensor (TPS) 2 Out Of Range Low	Signal voltage < 0.16 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P0223 Throttle/Pedal Position Sensor/Switch "B" Circuit High	Throttle Position Sensor (TPS) 2 Out Of Range High	Signal voltage > 4.88 V		0.1 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P0234 Turbo-charger (TC) Boost Control Functional Check	Turbo-charger (TC) Boost Control Functional Check	Diff. set value boost pressure vs. actual boost pressure value > 27.0 – 112.5 kPa	BARO > 75.0 kPa	2.0 s - Multiple	2 DCY	- Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 . - Check the Combustion Air Valve - N44- . Refer to ⇒ "3.6.7 Combustion Air Valve N44 , Checking", page 1605 .
P0236 Turbo-charger (TC) Boost Pressure Sensor Rationality Check	Turbo-charger (TC) Boost Pressure Sensor Rationality Check	Diff. boost pressure signal vs. barometric sensor signal > 22.0 kPa	- Engine speed < 1,000 RPM - Throttle position < 5.0%	2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
Range/Performance		Diff. boost pressure signal vs. barometric sensor signal < -12.0 kPa				
P0237 Turbo-charger (TC) Boost Pressure Sensor Out Of Range Low	Turbo-charger (TC) Boost Pressure Sensor Out Of Range Low	Pressure < 37.0 kPa		2.0 s - Multiple	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
P0238 Turbo-charger (TC) Boost Pressure Sensor Out Of Range High	Turbo-charger (TC) Boost Pressure Sensor Short To Ground	Signal voltage < 0.20 V	Engine speed > 80 RPM	1.0 s - Continuous		
P0238 Turbo-charger (TC) Boost Pressure Sensor Out Of Range High	Turbo-charger (TC) Boost Pressure Sensor Short To Battery / Open Circuit	Signal voltage > 4.88 V	Engine speed > 80 RPM	2.0 s - Multiple 1.0 s - Continuous	2 DCY	Check the Manifold Absolute Pressure Sensor - G71- . Refer to ⇒ "3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640 .
P0243 Turbo-charger (TC) Bypass Actuator Open Circuit	Turbo-charger (TC) Bypass Actuator Open Circuit	Signal voltage 3.26 – 4.70 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0245 Turbo-charger (TC) Bypass Actuator/Super-charger Waste gate Actuator "A" Low	Turbo-charger (TC) Bypass Actuator Short To Ground	• Signal voltage < 2.74 V	• Actuator commanded off • Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking" , page 1677 .
P0246 Turbo-charger (TC) Bypass Actuator/Super-charger Waste gate Actuator "A" High	Turbo-charger (TC) Bypass Actuator Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Actuator commanded on • Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking" , page 1677 .
P0261 Cylinder 1 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0262 Cylinder 1 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Actuator commanded on • Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0264 Cylinder 2 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .
P0265 Cylinder 2 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Actuator commanded on • Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking" , page 1624 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0267 Cylinder 3 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking" , page 1624.
P0268 Cylinder 3 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Actuator commanded on • Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking" , page 1624.
P0270 Cylinder 4 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking" , page 1624.
P0271 Cylinder 4 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Actuator commanded on • Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking" , page 1624.
P0273 Cylinder 5 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking" , page 1624.
P0274 Cylinder 5 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Signal current > 0.06 – 10.0 A	• Actuator commanded on • Engine speed >= 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking" , page 1624.
P0276 Cylinder 6 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Signal voltage < 2.74 V	• Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking" , page 1624.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0277 Cylinder 6 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0279 Cylinder 7 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0280 Cylinder 7 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0282 Cylinder 8 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
P0283 Cylinder 8 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0299 Turbo-charger/Super-charger "A" Under-boost Condition	Turbo-charger (TC) Boost Pressure Control Functional Check	Diff. set value boost pressure vs. actual boost pressure value (filtered) > 20.0 kPa	- Engine speed > 2,240 – 2,760 RPM - BARO > 75.0 kPa - Diff. set value boost pressure vs. basic boost pressure value > 15.0 kPa - Boost pressure control active - Turbo charger bypass valve closed	5.0 s - Multiple	2 DCY	- Check the Wastegate Bypass Regulator Valve - N75- . Refer to ⇒ "3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677 . - Check the Combustion Air Valve - N44- . Refer to ⇒ "3.6.7 Combustion Air Valve N44 , Checking", page 1605 .
P0300 Random/Multiple Cylinder Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous	2 DCY	- If a fuel system rich or lean fault exists, perform the diagnostic for those codes first. Use a scan tool and note whether the miss is specific to a few cylinders or is random. If random, check for contamination in the fuel by drawing a fuel sample. Refer to appropriate repair manual. - Check the spark plugs visually for signs of fouling. - Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Pre-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%		200 rev - Continuous	Immediately	<u>liminary Check</u>, <u>page 13</u> and/or to appropriate repair manual. - Check the Fuel Injectors . Refer to ⇒ <u>"3.6.17 Fuel Injectors , Checking"</u>, <u>page 1624</u> . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ <u>"3.6.21 Ignition Coils With Power Output Stage , Checking"</u>, <u>page 1633</u> .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0301 Cylinder 1 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	- Emission threshold misfire rate (MR) > 1.88% - Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	1,000 rev - Continuous 200 rev - Continuous	2 DCY - Immediately	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0302 Cylinder 2 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	sion test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0303 Cylinder 3 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev - Time after engine start not calibrated s	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Re-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0304 Cylinder 4 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors . Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage . Checking”, page 1633 .
P0305 Cylinder 5 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage , Checking”, page 1633 .
P0306 Cylinder 6 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors . Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage . Checking”, page 1633 .
P0307 Cylinder 7 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1,000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors. Refer to ⇒ “3.6.17 Fuel Injectors, Checking”, page 1624. - Check the Ignition Coils With Power Output Stage. Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage, Checking”, page 1633.
P0308 Cylinder 8 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	Emission threshold misfire rate (MR) > 1.88%	- Case 1: - ECT @ start >= -8° C - Case 2: - ECT @ start < -8° C - Then activation if ECT > 20° C - General: - Active after engine start idle – 150 RPM + 1 camshaft rev	1000 rev - Continuous	2 DCY	- Check the spark plugs visually for signs of fouling. - Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		Catalyst damaging misfire rate (MR) > 7.77 – 24.78%	- Time after engine start not calibrated s - Engine torque >= 0 Nm - Fuel cut off not active - Rough road not detected	200 rev - Continuous	Immediately	reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. - Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors . Checking”, page 1624 . - Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage . Checking”, page 1633 .
P0321 Ignition/ Distributor Engine Speed Input Circuit Range/Performance	Crankshaft Position (CKP) Sensor Rationality Check	- Counted teeth vs. reference incorrect - Or - Monitoring reference gap failure	- vehicle speed < 1; > 25 [km/h] - or - engine speed > 520 [rpm] - or - actual engine state cranking - or - engine speed gradient > -8000.00 [rpm/s]	8 [rev] - continuous	2 DCY	Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.13 Engine Speed Sensor G28 . Checking”, page 1616 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Crankshaft Position (CKP) Sensor Rationality Check: DGI Sensor	- PWM-signal not plausible - Or - Engine stop position not plausible - Or - Reverse pulse length not plausible	DGI sensor is powered during engine stop	0.5 s - Continuous		
P0322 Ignition/Distributor Engine Speed Input Circuit No Signal	Crankshaft Position (CKP) Sensor Signal Activity Check	- Camshaft signals > 1.0 [-] - And - Engine speed no signal	- vehicle speed < 1; > 25 [km/h] - or - engine speed > 520 [rpm] - or - actual engine state cranking - or - engine speed gradient > -8000.00 [rpm/s]	1 [rev] - continuous	2 DCY	Check the Engine Speed Sensor - G28. Refer to ⇒ "3.6.13 Engine Speed Sensor G28, Checking", page 1616.
P0324 Knock/Combustion Vibration Control System Error	Knock Control Internal Hardware Check	- Signal fault counter (combustion) > 48.0 [-] - Or - Signal fault counter (measuring window) > 2.0 [-]	- Engine speed > 1000 RPM - or - engine speed > 2500 [rpm]	0.5 s - Multiple	2 DCY	- Check the Knock Sensor 1 - G61. Refer to ⇒ "3.6.22 Knock Sensor 1 G61, Checking", page 1634. - Check the Knock Sensor 2 - G66. Refer to ⇒ "3.6.23 Knock Sensor 2 G66, Checking", page 1636.
P0327 Knock/Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single	Knock Sensor (KS) Short To Ground Port A Knock Sensor (KS) Short To Ground Port B	Reference signal < -0.7 V	Engine speed > 1,000 RPM	0.5 s - Continuous	2 DCY	Check the Knock Sensor 1 - G61. Refer to ⇒ "3.6.22 Knock Sensor 1 G61, Checking", page 1634.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
Sensor	Knock Sensor (KS) Signal Range Check	Lower threshold < 0.88 – 9.88 V	- Engine speed > 1,720 RPM - ECT > 40° C - Engine load > 49.50%	2.0 s - Multiple		
P0328 Knock /Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	Knock Sensor (KS) Short To Battery Plus Port A Knock Sensor (KS) Short To Battery Plus Port B Knock Sensor (KS) Signal Range Check	- Signal voltage > 1.0 V - Upper threshold > 132.22 – 285.0 V	- Engine speed > 1,000 RPM - Engine speed > 1,720 RPM - ECT > 40° C - Engine load > 49.50%	0.5 s - Continuous 2.0 s - Multiple	2 DCY	– Check the Knock Sensor 1 - G61-. Refer to ⇒ “3.6.22 Knock Sensor 1 G61, Checking”, page 1634 .
P0332 Knock /Combustion Vibration Sensor 2 Circuit Low Bank 2	Knock Sensor (KS) Short To Ground Port A Knock Sensor (KS) Short To Ground Port B Knock Sensor (KS) Signal Range Check	- Reference signal < -0.7 V - Lower threshold < 0.88 – 9.88 V	- Engine speed > 1,000 RPM - Engine speed > 1,720 RPM - ECT > 40° C - Engine load > 49.50%	0.5 s - Continuous 2.0 s - Multiple	2 DCY	– Check the Knock Sensor 2 - G66-. Refer to ⇒ “3.6.23 Knock Sensor 2 G66, Checking”, page 1636 .
P0333 Knock /Combustion Vibration Sensor 2 Circuit High Bank 2	Knock Sensor (KS) Short To Battery Plus Port A Knock Sensor (KS) Short To Battery Plus Port B Knock Sensor (KS) Signal Range Check	- Signal voltage > 1.0 V - Upper threshold > 132.22 – 285.0 V	- Engine speed > 1,000 RPM - Engine speed > 1,720 RPM - ECT > 40° C - Engine load > 49.50%	0.5 s - Continuous 2.0 s - Multiple	2 DCY	– Check the Knock Sensor 2 - G66-. Refer to ⇒ “3.6.23 Knock Sensor 2 G66, Checking”, page 1636 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0341 Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	- Signal pattern incorrect - Defect counter 8.0 [-]		0.5 s - Continuous	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0342 Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	- Signal voltage permanently low - And - Crankshaft signals 8.0 [-]		0.5 s - Continuous	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0343 Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	- Signal voltage permanently high - And - Crankshaft signals 8.0 [-]		0.5 s - Continuous	2 DCY	Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40- Checking", page 1599 .
P0351 Ignition Coil "A" Primary Control Circuit/Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0352 Ignition Coil "B" Primary Control Circuit/Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0353 Ignition Coil "C" Primary Control Circuit/Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0354 Ignition Coil "D" Primary Control Circuit/Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0355 Ignition Coil "E" Primary Control Circuit/Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0356 Ignition Coil "F" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0357 Ignition Coil "G" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0358 Ignition Coil "H" Primary Control Circuit/ Open	Ignition Coil Open Circuit	- Signal current -0.25 – -2.0 mA - Or - Internal check failed	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P0410 AIR System "A"	Secondary Air Injection (AIR) Rationality Check Directly After Catalyst Heating	Diff. of measured AIR pressure before AIR injection vs. AIR pressure after AIR injection > 2.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - BARO > 74.0 kPa - AIR system commanded off	0.5 s - Once / DCY	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 1661 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0418 AIR System Control "A" Circuit	Secondary Air Injection (AIR) Pump Relay Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- . Checking", page 1661
P0419 AIR System Control "B" Circuit	Secondary Air Injection (AIR) Pump Relay Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189- . Checking", page 1664 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0420 Catalyst System Efficiency Below Threshold Bank 1	Catalyst System Measure Of OSC Compared To OSC Of Borderline Catalyst	- Measured OSC / OSC of borderline catalyst - Measured OSC EWMA filter value for catalyst, corrected with measured delay and transient time of oxygen sensors rear < 1.0 [-]	- Time after engine start not calibrated s - Or - Time after dew point > 90.0 s - Delta exhaust gas mass flow < 20.0 kg/h - Exhaust gas mass flow, lower range not calibrated kg/h - Exhaust gas mass flow, upper range 25.0 – 100.0 kg/h - Modeled EGT dynamic < 30.0 K - Modeled EGT in catalyst system, lower range not calibrated ° C - Modeled EGT in catalyst system, upper range 500 – 800° C - Minimum modeled EGT in catalyst system > 470° C - For time > 100.0 s - Filtered minimum modeled EGT in catalyst system > 470° C - Engine load 9.80 – 60.0% - Evap purge loading not high - Engine speed 1,000 – 2,520 RPM - Lambda enable condition monitor - Monitoring stops if lambda deviation >= 5.01 – 7.01% - With delay time >= 0.02 – 0.2 s	10.0 s - Once / DCY	1 DCY	- Check the exhaust system for leaks and correct any defects found. If any misfire or fuel trim codes are also set, correct those codes first. - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda control closed loop • Lambda control not at min or max limit • AAT > -10° C • Number of checks, no step change suspicion 1.0 [-] • Number of checks, step change suspicion 4.0 [-] • O2S front ready • O2S rear ready • AIR not active • No misfire • O2S front plausibility check in current driving cycle ready • O2S front response monitoring in current driving cycle ready			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0430 Catalyst System Efficiency Below Threshold Bank 2	Catalyst System Measure Of OSC Compared To OSC Of Borderline Catalyst	- Measured OSC / OSC of borderline catalyst - Measured OSC EWMA filter value for catalyst, corrected with measured delay and transient time of oxygen sensors rear < 1.0 [-]	- Time after engine start not calibrated s - Or - Time after dew point > 90.0 s - Delta exhaust gas mass flow < 20.0 kg/h - Exhaust gas mass flow, lower range not calibrated kg/h - Exhaust gas mass flow, upper range 25.0 – 100.0 kg/h - Modeled EGT dynamic < 30.0 K - Modeled EGT in catalyst system, lower range not calibrated ° C - Modeled EGT in catalyst system, upper range 500 – 800° C - Minimum modeled EGT in catalyst system > 470° C - For time > 100.0 s - Filtered minimum modeled EGT in catalyst system > 470° C - Engine load 9.80 – 60.0% - Evap purge loading not high - Engine speed 1,000 – 2,520 RPM - Lambda enable condition monitor - Monitoring stops if lambda deviation >= 5.01 – 7.01% - With delay time >= 0.02 – 0.2 s	10.0 s - Once / DCY	1 DCY	- Check the exhaust system for leaks and correct any defects found. If any misfire or fuel trim codes are also set, correct those codes first. - Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda control closed loop • Lambda control not at min or max limit • AAT > -10° C • Number of checks, no step change suspicion 1.0 [-] • Number of checks, step change suspicion 4.0 [-] • O2S front ready • O2S rear ready • AIR not active • No misfire • O2S front plausibility check in current driving cycle ready • O2S front response monitoring in current driving cycle ready			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0441 EVAP System Incorrect Purge Flow	Evaporative Emission (EVAP) System Functional Check	- Deviation lambda control < 3.50 – 6.0% - And - Deviation idle control < 31.0%	- Choice of: - Integrated EVAP purge mass > 10.0 g - Or - Integrated air mass > 4.0 – 20.0 kg - And - Choice of: - ECT > 60° C - Or - Substitute ECT > 60° C - And - General: - Engine speed idle RPM - Engine speed not calibrated RPM - Engine speed deviation < 200 RPM - Engine load 12.0 – 34.99% - Deviation engine load <= 4.01% - AAT > 4° C - BARO > 72.0 kPa - Lambda control closed loop	22.1 s - Once / DCY	2 DCY	Check for restrictions or kinks in the EVAP pipes, including charcoal intrusion into the pipes. If pipes are free from obstruction: Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0442 EVAP System Leak Detected (Small Leak)	Evaporative Emission (EVAP) System Small Leak Pressure Check	Time for pressure drop < 1.6 – 2.6 s	- General: - Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - Intake manifold vacuum > -100.0 kPa - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Evap purge valve closed - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - And - Case 1: - AAT not calibrated ° C - AAT drop after engine start not calibrated K - Case 2: - IAT 3 – 90° C - IAT drop after engine start < 8.3 K - Deep down hill driving: - Delta BARO < 0.25 kPa - Or	239.0 s - Once / DCY	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking”, page 1619 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Engine load not calibrated % - And - Delta vehicle speed not calibrated km/h			
P0444 EVAP System Purge Control Valve "A" Circuit Open	Evaporative Emission (EVAP) Canister Purge Valve Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80. Checking", page 1619 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0455 EVAP System Leak Detected (Large Leak)	Evaporative Emission (EVAP) System Large Leak Pressure Check	Time for pressure drop < 1.0 s	- General: - Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - Intake manifold vacuum > -100.0 kPa - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Evap purge valve closed - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - And - Case 1: - AAT not calibrated ° C - AAT drop after engine start not calibrated K - Case 2: - IAT 3 – 90° C - IAT drop after engine start < 12.0 K - Deep down hill driving - Delta BARO < 0.25 kPa - Or	232.6 s - Once / DCY	2 DCY	- Inspect all the EVAP attaching pipes and hoses visually for damage. Check the gas cap for tightness. - Check the EVAP System for Leaks. Refer to ⇒ “2.2.4 EVAP System, Checking for Leaks”, page 6. - Check the EVAP Canister Purge Regulator Valve 1 - N80-. Refer to ⇒ “3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking”, page 1619. - Check the Leak Detection Pump - V144-. Refer to ⇒ “3.6.24 Leak Detection Pump V144, Checking”, page 1638.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Engine load not calibrated % • And • Delta vehicle speed not calibrated km/h			



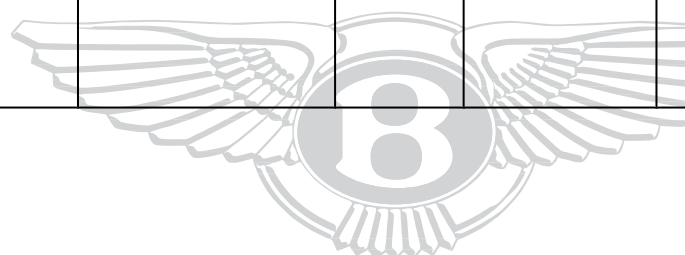
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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0456 EVAP System Leak Detected (Very Small Leak)	Evaporative Emission (EVAP) System Very Small Leak Pressure Check	Time for pressure drop < 3.0 – 5.8 s	- General: - Time after engine start 5.0 – 800.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - Intake manifold vacuum > -100.0 kPa - BARO > 73.40 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 50.3 K - Evap purge valve closed - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - And - Case 1: - AAT not calibrated ° C - AAT drop after engine start not calibrated K - Case 2: - IAT 3 – 70° C - IAT drop after engine start < 6.8 K - Deep down hill driving - Delta BARO -0.39 – 0.20 kPa - Or	251.8 s - Once / DCY	2 DCY	- Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking”, page 1619 . - Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.24 Leak Detection Pump V144, Checking”, page 1638 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Engine load not calibrated % - And - Delta vehicle speed not calibrated km/h - Additional: - Vehicle acceleration < 4.50 m/s² - Gradient engine load < 100.01 %/seg			
P0458 EVAP System Purge Control Valve "A" Circuit Low	Evaporative Emission (EVAP) Canister Purge Valve Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .
P0459 EVAP System Purge Control Valve "A" Circuit High	Evaporative Emission (EVAP) Canister Purge Valve Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.14 EVAP Canister Purge Regulator Valve 1 N80, Checking", page 1619 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0491 AIR System Insufficient Flow Bank 1	Secondary Air Injection (AIR) Flow Check During Catalyst Heating	- Case 1: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.51 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.25 [-] - Case 2: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.59 [-] - Case 3: - Average pressure difference between absolute value and < 0.35 – 1.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - For time > 1.0 s - BARO > 74.0 kPa - AIR system commanded on	0.0 s - Once / DCY	2 DCY	- Check the secondary air injection attaching hoses to the exhaust visually for kinks damage or obstructions. - Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101-. Refer to ⇒ “3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- Checking”, page 1661. - Check the Secondary Air Injection Sensor 1 - G609-. Refer to ⇒ “3.6.36 Secondary Air Injection Sensor 1 G609- Checking”, page 1666.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0492 AIR System Insufficient Flow Bank 2	Secondary Air Injection (AIR) Flow Check During Catalyst Heating	- Case 1: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.51 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.25 [-] - Case 2: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.59 [-] - Case 3: - Average pressure difference between absolute value and < 0.35 – 1.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - For time > 1.0 s - BARO > 74.0 kPa - AIR system commanded on	0.0 s - Once / DCY	2 DCY	- Check the secondary air injection attaching hoses to the exhaust visually for kinks damage or obstructions. - Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 . - Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610, Checking", page 1668 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0506 Idle Control System RPM - Lower Than Expected	Idle Speed Control (ISC) Out Of Range Low	- Engine speed deviation > 100 RPM - And - RPM controller torque value >= calculated max. value Nm	- Time after engine start >= 5.0 s - Vehicle speed 0 km/h - BARO > 71.88 kPa - ECT 60 – 120° C - IAT > -11° C - Torque safety limitation not active - Accelerator pedal released by driver - For time > 1.0 s - For manual transmission: - Engine load < 34.50%	5.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .
P0507 Idle Control System RPM - Higher Than Expected	Idle Speed Control (ISC) Out Of Range High	- Engine speed deviation < -100 RPM - And - RPM controller torque value <= calculated min. value Nm - Or - Integrated number of fuel cut off transitions >= 3.0 [-]	- Time after engine start >= 5.0 s - Vehicle speed 0 km/h - BARO > 71.88 kPa - ECT 60 – 120° C - IAT > -11° C - Torque safety limitation not active - Accelerator pedal released by driver - For time > 1.0 s	5.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050A Cold Start Idle Control System Performance	Cold Start Monitoring Idle Speed Control (ISC) Out Of Range Low	- Engine speed deviation > 100 RPM - And - RPM controller torque value >= calculated max. value Nm	- Catalyst heating active - Time after engine start >= 5.0 s - BARO > 71.88 kPa - ECT -10 – 60° C - Torque safety limitation not active - Conditions vehicle speed: - Vehicle speed 0 km/h - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - Conditions driver request: - Accelerator pedal released by driver - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - For time > 1.0 s - For manual transmission: - Engine load not calibrated %	8.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Cold Start Monitoring Idle Speed Control (ISC) Out Of Range High	- Engine speed deviation < -200 RPM - And - RPM controller torque value <= calculated min. value Nm - Or - Integrated number of fuel cut off transitions not calibrated [-]	- Catalyst heating active - Time after engine start >= 5.0 s - BARO > 71.88 kPa - ECT -10 – 60° C - Torque safety limitation not active - Conditions vehicle speed: - Vehicle speed 0 km/h - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - Conditions driver request: - Accelerator pedal released by driver - Or - Engine running and decoupled from powertrain (for hybrid) not equipped - For time > 1.0 s	4.0 s - Multiple		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050B Cold Start Ignition Timing Performance	Cold Start Monitoring Ignition Control (IC) Idle Ignition Timing Monitor	Difference between commanded spark timing vs. actual value > 16.0%	- General: - Commanded spark retard during catalyst heating < 84.0% - Catalyst heating active - For time > 4.0 s - Fuel cut off not active - BARO > 73.0 kPa - Idle condition active - Diff. relative engine load vs. filtered relative engine load <= 15.0% (For relative engine load dynamic detection) - Diff. engine speed vs. filtered engine speed <= 300 RPM (For engine speed dynamic detection) - Relative engine load <= 181.99% - Conditions vehicle speed: - Vehicle speed 0.0 km/h - Or - Engine running and decoupled from powertrain (for hybrid) not equipped	5.0 s - Once / DCY	2 DCY	- Inspect the air cleaner element and the air intake system visually for leaks. - Inspect the PCV system visually for leaks. - Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62- Checking", page 1613 . - Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 . - Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205, Checking", page 1597 . - Verify the latest Engine Control Module - J623- software is being used. Refer to appropriate scan tool.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P052 A Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	Cold Start Monitoring Variable Valve Timing (VVT) Intake Actuator Target Error	Difference between target position vs. actual position > 6.0° CRK	- Time after engine start >= 1.5 – 40.0 s - Engine speed >= 400 RPM - Modeled oil temperature >= -10 – 160° C - Commanded camshaft timing correction for catalyst heating active	5.0 s - Once / DCY	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .
P0544 Exhaust Gas Temperature (EGT) Sensor During Cold Start Rationality Check Sensor 1	Exhaust Gas Temperature (EGT) Sensor During Cold Start Rationality Check	Difference between measured and modeled exhaust gas temp. @ homogeneous running > 200.0 K	- Conditions for measurement window - Engine running - Engine speed > 20 RPM - Catalyst heating not active - Fuel cut off not active - Modeled exhaust gas temperature > 600° C - Monitor measurement window conditions fulfilled > 60.0 s	3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
	Exhaust Gas Temperature (EGT) Sensor During Warm Engine Running Rationality Check	Difference exhaust temperature to average of IAT and ECT @ start > 100.0 K	- Time after engine start 2.0 s - ECT @ engine shut-off > 80° C - IAT @ start < 40° C - ECT @ start < 40° C - Diff. between ECT @ start and IAT < 15.0 K	3.0 s - Once / DCY		
	Exhaust Gas Temperature (EGT) Sensor Signal Period Check	Deviation of time period > 30.0 ms		3.0 s - Continuous		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0545 Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 1	Exhaust Gas Temperature (EGT) Sensor Out Of Range Low	Exhaust gas temperature < -37° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
P0546 Exhaust Gas Temperature Sensor Circuit High Bank 1 Sensor 1	Exhaust Gas Temperature (EGT) Sensor Out Of Range High	Exhaust gas temperature > 1,107° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 1 - G235- . Refer to ⇒ "3.6.15 Exhaust Gas Temperature Sensor 1 G235- Checking", page 1621 .
P0547 Exhaust Gas Temperature Sensor During Cold Start Rationality Check	Exhaust Gas Temperature (EGT) Sensor During Cold Start Rationality Check	Difference between measured and modeled exhaust gas temp. @ homogeneous running > 200.0 K	- Time after engine start 2.0 s - ECT @ engine shut-off > 80° C - IAT @ start < 40° C - ECT @ start < 40° C - Diff. between ECT @ start and IAT < 15.0 K	3.0 s - Once / DCY	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448- . Refer to ⇒ "3.6.16 Exhaust Gas Temperature Sensor 2 G448- Checking", page 1622 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Exhaust Gas Temperature (EGT) Sensor During Warm Engine Running Rationality Check	Difference exhaust temperature to average of IAT and ECT @ start > 100.0 K	- Conditions for measurement window - Engine running - Engine speed > 20 RPM - Catalyst heating not active - Fuel cut off not active - Modeled exhaust gas temperature > 600° C - Monitor measurement window conditions fulfilled > 60.0 s	3.0 s - Continuous		
	Exhaust Gas Temperature (EGT) Sensor Signal Period Check	Deviation of time period > 30.0 ms				
P0548 Exhaust Gas Temperature Sensor Out Of Range Low	Exhaust Gas Temperature (EGT) Sensor Out Of Range Low	Exhaust gas temperature < -37° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 2 G448. Refer to "3.6.16 Exhaust Gas Temperature Sensor 2 G448, Checking", page 1622.
P0549 Exhaust Gas Temperature Sensor Out Of Range High	Exhaust Gas Temperature (EGT) Sensor Out Of Range High	Exhaust gas temperature > 1,107° C		3.0 s - Continuous	2 DCY	Check the Exhaust Gas Temperature Sensor 2 - G448. Refer to "3.6.16 Exhaust Gas Temperature Sensor 2 G448, Checking", page 1622.

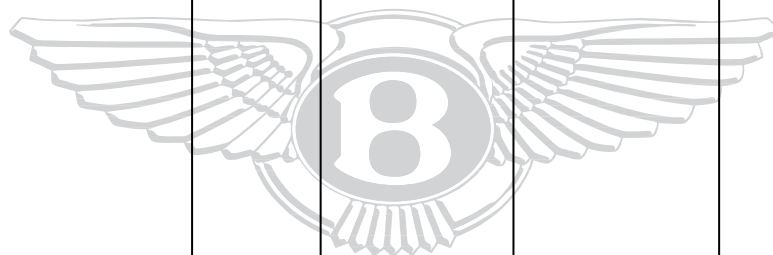
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0555 Brake Booster Pressure Sensor Short To Battery / Open Circuit	Brake Booster Pressure Sensor Short To Battery / Open Circuit	Signal voltage > 4.95 V	Time after ignition on > 500.0 ms	0.4 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201, Checking", page 1595 .
P0556 Brake Booster Pressure Sensor Circuit Range/Performance	Brake Booster Pressure Sensor Out Of Range Low	Brake booster pressure < 10.0 kPa	Brake light switch off	0.2 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201, Checking", page 1595 .
	Brake Booster Pressure Sensor Out Of Range High	Brake booster pressure > 119.0 kPa				
	Brake Booster Pressure Sensor Rationality Check	- Diff. brake booster pressure vs. BARO > 255.0 kPa - Or - Gradient brake booster pressure > 1,278.98 kPa/s		0.2 s - Multiple		
	Brake Vacuum Pump Functional Check	Brake booster pressure difference between measurement 1 and 2 < 1.50 – 4.50 kPa	- Monitor entry conditions: - Vacuum pump commanded on - For time > 0.1 s - Brake light switch off - Brake booster pressure ≥ (barometric pressure * 0.20) + 15.0 kPa - Pressure measurement 1: - Entry conditions fulfilled - Pressure measurement 2: - Time after entry conditions fulfilled 1.0 s	0.0 s - Multiple		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0557 Brake Booster Pressure Sensor Circuit Low	Brake Booster Pressure Sensor Short To Ground	Signal voltage < 0.10 V	Time after ignition on > 500.0 ms	0.4 s - Continuous	2 DCY	Check the Brake Pressure Sensor 1 - G201- . Refer to ⇒ "3.6.2 Brake Pressure Sensor 1 G201, Checking", page 1595 .
P0562 System Voltage Low	Engine Control Module (ECM): Internal Timer Check Power Supply For ECM Internal Time	ECM power supply check signal voltage ≤ 1.5...2.0 [V]	ECM initialization active	3 [events] - Once / DCY	1 DCY	Perform a charging system check and battery test to determine if the battery or charging system need to be serviced. Refer to appropriate repair manual.
P0606 Control Module Processor	Barometric Pressure (BARO) Sensor Rationality Check	- Diff. barometric sensor signal vs. boost pressure signal > 6.0 kPa - And - Diff. barometric sensor vs. last driving cycle > 10.0 kPa	- Time after engine start < 5.0 s - Engine speed < 1,000 RPM - Throttle position < 5.0%	2.0 s - Once / DCY	2 DCY	Check for any component or circuit fault codes and diagnose them first. If no faults are found during diagnosis, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
		- Diff. barometric sensor signal vs. boost pressure signal < -9.0 kPa - And - Diff. barometric sensor vs. last driving cycle > 10.0 kPa				
		Signal gradient > 0.25 kPa/s		2.0 s		
		Signal gradient < -0.25 kPa/s		Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Barometric Pressure (BARO) Sensor Out Of Range Low	Measured BARO < 50.0 kPa		1.0 s - Multiple		
	Barometric Pressure (BARO) Sensor Out Of Range High	Measured BARO > 115.0 kPa				
	Barometric Pressure (BARO) Sensor Short To Ground	Signal voltage < 0.20 V				
	Barometric Pressure (BARO) Sensor Short To Battery / Open Circuit	Signal voltage > 4.80 V				
	Ignition Control (IC) Communication Check	Internal check failure	Engine speed not calibrated RPM	0.5 s - Continuous		
		SPI communications check identifier failure				
	Engine Control Module (ECM): 5V Supply Voltage	Internal hardware check under- / over-voltage detection		2.0 s - Continuous		
Engine Control Module (ECM): Cylinder Deactivation (CD) Function Monitoring: Cylinder Deactivation (CD)	- Injection pattern incorrect - Or - Ignition pattern incorrect - Or - Transition from cylinder deactivation (CD) to normal operation mode failed	- Cylinder deactivation (CD) commanded on - Engine speed > 1,200 RPM	0.2 s - Continuous			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): EEPROM Functional Check	Internal checksum failed	Ignition on	0.5 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: A/D Converter	- Comparison reference voltage with sensor voltage incorrect - Internal check failed - Test voltage check failed				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Torque	- Torque deviation for time > 0.5 s - Or - Integrated relative torque deviation > 8.0 %	Internal engine speed > 1,000 RPM	0.0 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Engine Speed Deviation	Difference between calculated and internal engine speed > 320 RPM	Internal engine speed > 520 RPM	0.5 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Coding	Internal check failed				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Ignition Timing					
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Intern	System reaction incorrect				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Injection Rate Limitation					
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Cylinder Deactivation (CD)	- Injection on deactivated cylinders active - Or - Ignitions on deactivated cylinders active	Cylinder deactivation (CD) active	2.0 s - Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Accelerator Position	Comparison voltage sensor 1 with sensor 2 implausible		0.5 s - Continuous		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): Electronic Throttle Control Module Monitoring Module	- Function controller check failed - And - Monitoring module check no failure	SPI - interface no failure			
	Engine Control Module (ECM): Processor CY150 Communication Check	Internal check incorrect		0.05 s - Continuous		
	Engine Control Module (ECM): RAM Controller RAM Check	Memory checksum error detected	ECM initialization phase active	- None [-] - Once / DCY		
	Engine Control Module (ECM): Sensor Integrated Circuit Internal Hardware Check (Electrical Adjustment Communication, Voltage Supply)	Check failed		0.5 s - Continuous		
	Engine Control Module (ECM): WDA Function Monitoring: WDA	Over voltage detection failure				
		Internal check failure				
		General cause failure				
P0627 Fuel Pump "A" Control Circuit/Open	Fuel Pump (FP) Relay Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay - J17- / Fuel Pump 1 - V276- . Refer to "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276, Checking", page 1628 .

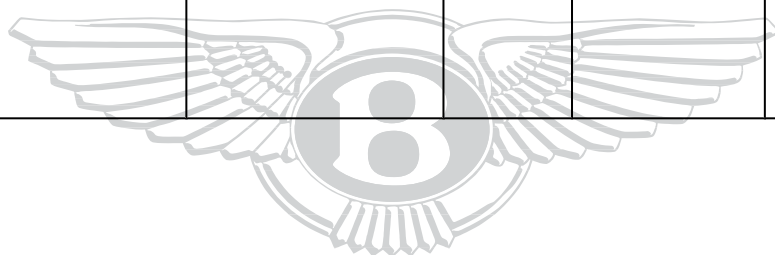
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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Pump (FP) Relay Short To Ground	Signal voltage < 2.74 V				
P0629 Fuel Pump "A" Control Circuit High	Fuel Pump (FP) Relay Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed > 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay - J17- / Fuel Pump 1 - V276- . Refer to ⇒ "3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276 . Checking", page 1628 .
P0638 Throttle Actuator Control Range/Performance Bank 1	Throttle Actuator Rationality Check Close Movement	- Time to close to reference point > 0.6 s - And - Deviation to reference point > 3.0%	- Engine speed 0 RPM - Vehicle speed 0 km/h - ECT > 5° C - IAT > 5° C - First start of DCY - Ignition on - Or - Engine stop - Engine after run active - Number of checks 3.0 [-]	5.0 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Throttle Actuator Signal Range Check @ Mechanical Stop Low (Only Once After EE-PROM Reset)	- TPS 1 signal voltage < 0.21; > 0.87 V - Or - TPS 2 signal voltage < 4.14; > 4.84 V	- Engine speed 0 RPM - Vehicle speed 0 km/h - First start of DCY - Ignition on - ECT 5 – 101° C - IAT 5 – 143° C - Or - Engine stop - Engine after run active - ECT 5 – 101° C - IAT 5 – 143° C	0.3 s - Multiple		
P0641 Sensor Reference Voltage "A" Circuit/Open	Engine Control Module (ECM): Sensor Reference Circuit A Short Circuit	Signal voltage < 4.8; > 5.2 V		0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623-. Refer to appropriate repair manual.
P0651 Sensor Reference Voltage "B" Circuit/Open	Engine Control Module (ECM): Sensor Reference Circuit B Short Circuit	Signal voltage < 4.8; > 5.2 V		0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623-. Refer to appropriate repair manual.



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0657 Actuator Supply Voltage "A" Circuit/Open	Engine Components Supply Voltage Relay Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 .
P0658 Actuator Supply Voltage "A" Circuit Low	Engine Components Supply Voltage Relay Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 .
P0659 Actuator Supply Voltage "A" Circuit High	Engine Components Supply Voltage Relay Short To Battery Plus	Signal current > 0.06 – 10.0 A	Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Engine Component Power Supply Relay - J757- . Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611 .
P0688 Battery ECM/PCM Power Relay Sense Circuit/Open	Battery Voltage out of range high	battery voltage > 15.92 [V]	- vehicle speed > 25 [km/h] - ortime after system ready for drive> 120.0 [s]	2.0 s - Continuous	2 DCY	Check the charging system. refer to the appropriate repair manual section.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P068 A ECM / PCM Power Relay De-Energized Performance - Too Early	Main Relay Functional Check - Early Opening	Defect counter ≥ 3.0 [-]	Ignition on	0.0 s - Once / DCY	2 DCY	- Check the Engine Component Power Supply Relay - J757-. Refer to ⇒ "3.6.10 Engine Component Power Supply Relay J757, Checking", page 1611. - Check the Motronic Engine Control Module Power Supply Relay 2 - J670-. Refer to ⇒ "3.6.29 Motronic Engine Control Module Power Supply Relay 2 J670, Checking", page 1648.
P0697 Sensor Reference Voltage "C" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit C Short Circuit	Signal voltage < 4.8; > 5.2 V		0.5 s - Continuous	2 DCY	If a related sensor voltage code is also set, refer to that sensor for diagnosis. If no other related codes set, replace the Engine Control Module - J623-. Refer to appropriate repair manual.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P13E A Cold Start Ignition Timing Performance Off Idle	Cold Start Monitoring Ignition Control (IC) Part Load Ignition Timing Monitor	Difference between commanded spark timing vs. actual value > 18.0%	- General: - Commanded spark retard during catalyst heating < 90.0% - Catalyst heating active - For time > 4.0 s - Fuel cut off not active - BARO > 73.0 kPa - Diff. relative engine load vs. filtered relative engine load <= 15.0% (For relative engine load dynamic detection) - Diff. engine speed vs. filtered engine speed <= 300 RPM (For engine speed dynamic detection) - Idle condition not active - Vehicle speed >= 2 km/h - Additional (only for hybrid): - Engine running and decoupled from powertrain not equipped	2.5 s - Once / DCY	2 DCY	Check for any engine speed sensor or ignition coil faults and diagnose them first. If no other faults are set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P1427 Brake Vacuum Pump Activation Short Circuit To B+	Brake Vacuum Pump Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Engine speed >= 80 RPM - Actuator commanded on	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to "3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22- , Checking", page 1674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P1428 Brake Vacuum Pump Activation Short Circuit To Ground	Brake Vacuum Pump Short To Ground	Signal voltage < 2.74 V	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to ⇒ "3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 , Checking", page 1674 .
P1429 Brake Vacuum Pump Activation Open Circuit	Brake Vacuum Pump Open Circuit	Signal voltage 3.26 – 4.70 V	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Vacuum Pump Relay - J57- / Vacuum Pump - V22- . Refer to ⇒ "3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 , Checking", page 1674 .
P150 A Engine Off Timer Performance	Engine Off Time Comparison Of Engine Off Time From Instrument Cluster Control Unit With Engine After Run Time	- Difference between engine-off time and ECM after-run time < -12.0 s - Difference between engine-off time and ECM after-run time > 12.0 s	- Ignition on - CAN active - Ignition on - CAN active (during ECM keep alive-time)	2.0 s - Once / DCY	2 DCY	If ignition off B+ is lost to ECM, this code will set. Check power and ground inputs to ECM first. Refer to appropriate wiring diagram. If all power/grounds to ECM are present, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P1609 Crash shut-off was triggered	COM: Airbag communication with Airbag	received data: crash intensity for shut down Fuel Injection detected		0 s - Continuous	2 DCY	Check the air bag system. Refer to the appropriate repair manual section.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P166 F Partial Engine Operation Deactivated	Engine Control Module (ECM): Cylinder Deactivation (CD) Vehicle In Cylinder Deactivation Service Mode	Cylinder deactivation service mode active	Ignition on	0.0 s - Continuous	1 DCY	If a relative cylinder deactivation fault is also set diagnose and repair those faults first. If there are no other faults stored, check the Displacement On Demand Rotary Solenoid - NX8-. Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607.
P169 A Loading Mode Active	Engine Control Module (ECM): Transport Mode Function Monitoring: Mode Change	Transport mode active	- For activation: - During ECM keep alive-time after ignition off - Vehicle speed ≤ 5 km/h - Engine speed 0 RPM - Max trip mileage since initial vehicle start-up < 100.0 km - Production mode not active - For hybrid: - Drive motor off	0.0 s - Continuous	1 DCY	Vehicle in transport mode. Refer to appropriate repair manual. May need to perform readiness check. Refer to ⇒ "3.2 Readiness Code", page 14.
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	Variable Valve Timing (VVT) Intake Actuator Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Camshaft Adjustment Valve 1 - N205-. Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2089 "A" Camshaft Position Actuator Control High Bank 1	Variable Valve Timing (VVT) Intake Actuator Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Camshaft Adjustment Valve 1 - N205- . Refer to ➔ "3.6.3 Camshaft Adjustment Valve 1 N205- Checking", page 1597 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Fuel System Out Of Range Low	I-part of 2nd lambda control loop < -0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking”, page 1650 . - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 1653 . - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ “3.6.38 Three Way Catalytic Converter (TWC), Checking”, page 1670 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Fuel System Out Of Range High	I-part of 2nd lambda control loop > 0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 1 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653. - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2098 Post Catalyst Fuel Trim System Too Lean Bank 2	Fuel System Out Of Range Low	I-part of 2nd lambda control loop < -0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 2 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 2 After Catalytic Converter - GX8-. Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11-. Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659. - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration enrichment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2099 Post Catalyst Fuel Trim System Too Rich Bank 2	Fuel System Out Of Range High	I-part of 2nd lambda control loop > 0.030 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop - Lambda control not at min or max limit 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front active - O2S heater rear active - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active	120.0 s - Continuous	2 DCY	- Check the bank 2 exhaust system for leaks before the catalyst. If a misfire code or injector fault is set, diagnose those codes first. Refer to appropriate repair manual. - Check the Oxygen Sensor 2 After Catalytic Converter - GX8-. Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11-. Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking", page 1659. - Check the Three Way Catalytic Converter (TWC). Refer to ⇒ "3.6.38 Three Way Catalytic Converter (TWC), Checking", page 1670.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Deceleration en-leanment active • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s			
P2101 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Actuator Signal Range Check	• Duty cycle > 80.0% • And • ECM power stage no failure	Protected by copyright. Copying for private or commercial purposes, in part or in whole, without the prior written permission of Bentley Motors, Ltd. Bentley Motors does not guarantee the accuracy of any information in this document. Copyright by Bentley Motors.	• 5.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
	Throttle Actuator Rationality Check	• Deviation throttle value angles vs. throttle value set point > 4.0 – 50.0%		• 0.5 • Continuous		
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Short To Battery Plus / Short To Ground	• Internal check failed	• Duty cycle > 80.0% • Or • Deviation throttle value angles vs. throttle value set point > 4.0 – 50.0%	• 0.5 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
	Throttle Actuator Open Circuit					
	Throttle Actuator Temperature / Current Monitoring					

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Throttle Actuator Functional Check					
P2119 Throttle Actuator "A" Control Throttle Body Range/Performance	Throttle Actuator Signal Range Check @ Mechanical Stop Low	- TPS 1 signal voltage < 0.21; > 0.87 V - Or - TPS 2 signal voltage < 4.14; > 4.84 V	- Engine speed 0 RPM - Vehicle speed 0 km/h - First start of DCY - Ignition on - ECT 5 – 101° C - IAT 5 – 143° C - Or - Engine stop - Engine after run active - ECT 5 – 101° C - IAT 5 – 143° C	0.3 s - Multiple	2 DCY	Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.39 Throttle Valve Control Module GX3, Checking", page 1671 .
P2122 Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	Accelerator Pedal Position (APP) Sensor 1 Out Of Range Low	Signal voltage < 0.61 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2123 Throttle/ Pedal Position Sensor/ Switch "D" Circuit High	Accelerator Pedal Position (APP) Sensor 1 Out Of Range High	Signal voltage > 4.79 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2127 Throttle/ Pedal Position Sensor/ Switch "E" Circuit Low	Accelerator Pedal Position (APP) Sensor 2 Out Of Range Low	Signal voltage < 0.27 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2128 Throttle/Pedal Position Sensor Switch "E" Circuit High	Accelerator Pedal Position (APP) Sensor 2 Out Of Range High	Signal voltage > 2.43 V		0.5 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2138 Throttle/Pedal Position Sensor Switch "D"/"E" Voltage Correlation	Accelerator Pedal Position (APP) Sensor 1 And 2 Rationality Check	Signal voltage sensor 1 vs. 2 > 0.17 – 0.70 V	- Signal voltage sensor 1 > 445.0 mV - Signal voltage sensor 2 > 445.0 mV	0.24 s - Continuous	2 DCY	Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2, Checking", page 1593 .
P2177 Fuel System Too Lean @ Part Load Idle Bank 1	Fuel System Too Lean @ Part Load	Adaptive value > 20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Lean @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			
P2178 System Too Rich Off Idle Bank 1	Fuel System Too Rich @ Part Load	Adaptive value < -20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. Refer to appropriate repair manual. - Check the Oxygen Sensor 1 Before Catalytic Converter - Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10 Checking", page 1653.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Rich @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			
P2179 System Too Lean Off Idle Bank 2	Fuel System Too Lean @ Part Load	Adaptive value > 20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Lean @ Part Load In Cylinder Deactivation (CD) Mode		- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Ratio MAP to BARO > 0.20 [-] - Or - Valve overlap < 40.0° CRK - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated			
P2180 System Too Rich Off Idle Bank 2	Fuel System Too Rich @ Part Load	Adaptive value < -20.0%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 4,600 RPM - Engine load 10.0 – 60.0% - ECT > 55° C - IAT < 72° C - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	15.0 s - Continuous	2 DCY	- Check for any fuel pressure or misfire fault codes also set. Perform those diagnostics first. Refer to appropriate repair manual. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11-. Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Too Rich @ Part Load In Cylinder Deactivation (CD) Mode		• Number of injections after engine start > 1,000 [-] • Engine speed 520 – 4,600 RPM • Engine load 10.0 – 60.0% • ECT > 55° C • IAT < 72° C • Ratio MAP to BARO > 0.20 [-] • Or • Valve overlap < 40.0° CRK • Lambda control closed loop • Evap purge valve closed • High PCV purge load due to oil dilution not calibrated			

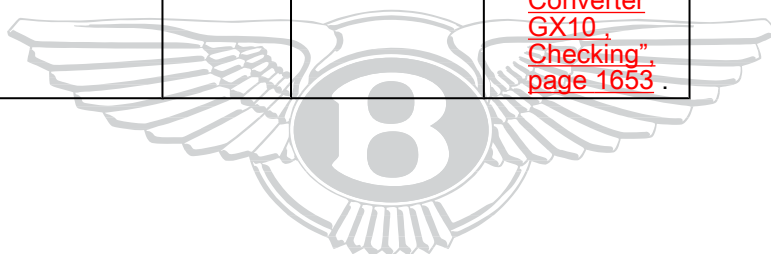


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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2181 Cooling System Performance	Engine Cooling System Performance Not In The Expected Range	- Cooling system temperature too low after a sufficient MAF integral < 82° C - For time >= 5.0 s	- Monitor entry conditions: - ECT @ start -8 – 60° C - And - AAT -8 – 55° C - Or - IAT not calibrated ° C - Begin of air mass integration: - ECT > 40° C - Conditions for diagnosis: - MAF < 400.0 kg/h - Delta BARO < 1.50 kPa - Delta AAT K - And - Accum. time required < 140.0 – 385.0 s - Or - Accum. integrated air mass not calibrated kg - Accumulation enable if - Fuel cut off active - Or - Engine load > 100.0% - Or - Engine load < 14.0 – 30.0% - Start of fault decision: - Integrated air mass > 9.24 – 19.69 kg - Conditions at fault decision: (Average values since start)	0.0 (Unified 740.0) s - Once / DCY	2 DCY	Check the Engine Coolant Temperature Sensor - G62-. Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- MAF (lower threshold) $\geq 32.0 - 86.40$ kg/h - MAF (upper threshold) $\leq 100.0 - 260.0$ kg/h - Vehicle speed (lower threshold) $\geq 15 - 40$ km/h - Vehicle speed (upper threshold) ≤ 120 km/h			
P2187 System Too Lean at Idle Bank 1	Fuel System Too Lean @ Idle	Adaptive value $> 5.48\%$	- Number of injections after engine start $> 1,000$ [-] - Engine speed $520 - 1,040$ RPM - Engine load $4.0 - 16.0\%$ - ECT $> 55^{\circ} \text{C}$ - IAT $< 72^{\circ} \text{C}$ - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- If any fault codes are set for MAF, injector, ignition coil or fuel pressure perform those diagnostics first. Check for leaks in the exhaust system before the upstream O2 sensor. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2188 System Too Rich at Idle Bank 1	Fuel System Too Rich @ Idle	Adaptive value < -5.48%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 1,040 RPM - Engine load 4.0 – 16.0% - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. - Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653.
P2189 System Too Lean at Idle Bank 2	Fuel System Too Lean @ Idle	Adaptive value > 5.48%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 1,040 RPM - Engine load 4.0 – 16.0% - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- Check for air leaks behind the Bank 1 MAF including intake manifold. Check the Bank 2 exhaust system for leaks before the upstream O2S. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11-. Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2190 System Too Rich at Idle Bank 2	Fuel System Too Rich @ Idle	Adaptive value < -5.48%	- Number of injections after engine start > 1,000 [-] - Engine speed 520 – 1,040 RPM - Engine load 4.0 – 16.0% - ECT > 55° C - IAT < 72° C - Delta part load adaptation completed - Lambda control closed loop - Evap purge valve closed - High PCV purge load due to oil dilution not calibrated	10.0 s - Continuous	2 DCY	- Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. - Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2195 O2 Sensor Signal Biased / Stuck Lean Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range High	Delta lambda of 2nd lambda control loop > 0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 – 180.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2196 O2 Sensor Signal Biased / Stuck Rich Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range Low	Delta lambda of 2nd lambda control loop < -0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the off-set adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• And • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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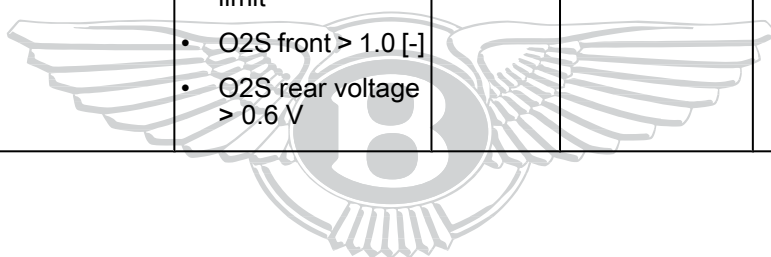
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2197 O2 Sensor Signal Biased / Stuck Lean Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range High	Delta lambda of 2nd lambda control loop > 0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration leanment active	120.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking”, page 1659 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 – 180.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2198 O2 Sensor Signal Biased / Stuck Rich Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Out Of Range Low	Delta lambda of 2nd lambda control loop < -0.070 [-]	- General: - Modeled EGT 400 – 800° C - For time not calibrated s - Lambda control closed loop 2nd lambda control closed loop - O2S front ready - O2S rear ready - O2S heater front ready - O2S heater rear ready - And - Integrated exhaust gas mass > 100.0 g - After the following mixture disturbances: - Time fuel cut off > 0.5 s - Deviation engine load > 6.0%/rev - ECT < 50° C - Catalyst heating active - AIR active - Lambda set point < 1; > 1 [-] - Catalyst purge active - Engine speed not calibrated RPM - For time not calibrated s - Disabling the offset adaptation after repeated transients within a short time: - Acceleration enrichment active - Or - Deceleration enrichment active	120.0 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• And • Then • LSU offset adaptation stops if event counter > 1.0 [-] • And • Exhaust gas mass flow 30.0 – 180.0 kg/h • Or • Exhaust gas mass flow 30.0 kg/h • Within time not calibrated s • And • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Or • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Or • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 C Cylinder 1 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 D Cylinder 2 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 E Cylinder 3 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219 F Cylinder 4 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > 15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A0 Cylinder 5 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C	20.0 (does not run in FTP) s - Once / DCY	• 2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A1 Cylinder 6 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]				

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A2 Cylinder 7 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624.
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P21A3 Cylinder 8 Air-Fuel Ratio Imbalance	Fuel System A/F Cylinder Imbalance: Out Of Range Low	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase < 0.87 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .
	Fuel System A/F Cylinder Imbalance: Out Of Range High	Individual cylinder fuel correction based on measured enleanment for dedicated engine roughness increase > 1.15 [-]	- Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Misfire on currently lean shifted cylinder not detected			

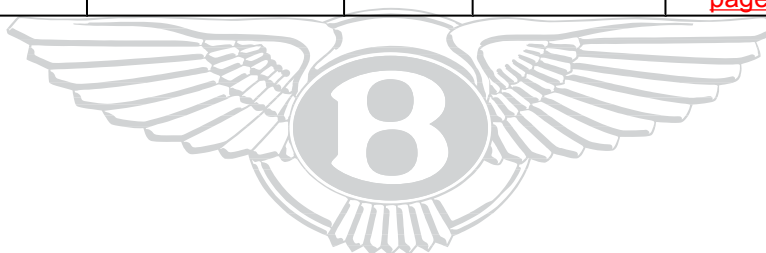
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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2237 O2 Sensor Positive Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Pump Current (IP)	- O2S voltage signal front 1.46 – 1.54 V - And - Difference between maximum and minimum value of O2S voltage signal front < 0.01 V - And - Delta lambda controller > 0.10 [-] - Or - Lambda control at min or max limit - O2S voltage signal front 1.46 – 1.5 V - And - Difference between maximum and minimum value of O2S voltage signal front < 0.01 V - And - No reaction on commanded stepwise change of lambda set point <> 1	- General: - O2S ceramic temp > 725° C - Heater control closed loop - Case fuel cut off: - Electrical adjustment not active - Evap purge valve ready - Case else: - Lambda modulation > 0.01 [-] - Lambda control closed loop - If stepwise change lambda set point - Commanded delta lambda step 0.05 [-]	6.5 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
		- O2S voltage signal front < 1.55 V - And - Fuel cut off > 3.0 s		5.0 s - Continuous		

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2240 O2 Sensor Positive Current Control Circuit/ Open Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Pump Current (IP)	- O2S voltage signal front 1.46 – 1.54 V - And - Difference between maximum and minimum value of O2S voltage signal front < 0.01 V - And - Delta lambda controller > 0.10 [-] - Or - Lambda control at min or max limit	- General: - O2S ceramic temp > 725° C - Heater control closed loop - Case fuel cut off: - Electrical adjustment not active - Evap purge valve ready - Case else: - Lambda modulation > 0.01 [-] - Lambda control closed loop - If stepwise change lambda set point - Commanded delta lambda step 0.05 [-]	6.5 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11, Checking”, page 1659 .
		- O2S voltage signal front 1.46 – 1.54 V - And - Difference between maximum and minimum value of O2S voltage signal front < 0.01 V - And - No reaction on commanded stepwise change of lambda set point <> 1		5.0 s - Continuous		
		- O2S voltage signal front < 1.55 V - And - Fuel cut off > 3.0 s				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2243 O2 Sensor Reference Voltage Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Nernst Voltage (UN)	- O2S voltage signal front < 0.20; > 4.70 V - Internal resistance > 950.0 Ω	Heater control active	20.0 s - Continuous	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking", page 1653 .
P2247 O2 Sensor Reference Voltage Circuit/ Open Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Nernst Voltage (UN)	- O2S voltage signal front < 0.20; > 4.70 V - Internal resistance > 950.0 Ω	Heater control active	20.0 s - Continuous	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ "3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking", page 1659 .
P2257 AIR System Control "A" Circuit Low	Secondary Air Injection (AIR) Pump Relay Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- Checking", page 1661 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2258 AIR System Control "A" Circuit High	Secondary Air Injection (AIR) Pump Relay Short To Battery Plus	Signal current > 0.60 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- . Checking", page 1661 .
P2259 AIR System Control "B" Circuit Low	Secondary Air Injection (AIR) Pump Relay Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189- . Checking", page 1664 .
P2260 AIR System Control "B" Circuit High	Secondary Air Injection (AIR) Pump Relay Short To Battery Plus	Signal current > 0.60 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to ⇒ "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189- . Checking", page 1664 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2270 O2 Sensor Signal Biased / Stuck Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Lean	Sensor voltage < 0.72 V	- O2S rear ready - Integrated exhaust gas mass after O2S rear ready ≥ 0.30 kg - Injection valve commanded on - Engine running - If - Integrated exhaust gas mass ≥ 1.50 kg - Or - Error suspicion set - Then - Enabling lambda ramp slope of the lambda ramp 0.05 1/s - Target lambda of the lambda ramp 0.85 [-] - Exhaust gas mass during ≥ 0.07 kg - Target lambda reached ≤ 0.85 [-] - If - Time fuel cut off > 5.0 s - Then disabling for - Time delay after fuel cut off 5.0 s - Additional Conditions: - Scavenging rate not calibrated [-] - Integrated exhaust gas mass not calibrated kg - Split factor DFI/MFI not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7, Checking", page 1650 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - Engine speed 1,000 – 3,520 RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF 50.0 – 260.0 kg/h - Within time 1.0 s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2271 O2 Sensor Signal Biased / Stuck Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Rich	Sensor voltage > 0.20 V	- General: - O2S rear ready - Integrated exhaust gas mass after O2S rear ready >= 0.30 kg - Injection valve commanded on - Engine running - Case 1: (During lambda ramp activation) false - If - Integrated exhaust gas mass not calibrated kg - Or - Error suspicion not calibrated - Then - Enabling lambda ramp not calibrated - Slope of the lambda ramp not calibrated 1/s - Target lambda of the lambda ramp not calibrated [-] - Exhaust gas mass during not calibrated kg - Target lambda reached not calibrated [-] - If - Time fuel cut off not calibrated s - Then disabling for - Time delay after fuel cut off not calibrated s - Additional conditions: - Scavenging-rate not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7- , Checking", page 1650 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Integrated exhaust gas mass not calibrated kg - Split factor DFI/MFI not calibrated [-] - Modeled exhaust gas temperature fitted position O2S rear not calibrated ° C - Engine speed not calibrated RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF not calibrated kg/h - Within time not calibrated s - Case 2: (During fuel cut off) true - Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - O2S front lambda value (for wide range sensor) > 8.0 [-] - O2S front voltage (for binary sensor) not calibrated V - Fuel cut off active - Integrated O2 mass during fuel cut off >= 6.0 g - Time delay not calibrated s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2272 O2 Sensor Signal Biased / Stuck Lean Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Lean	Sensor voltage < 0.72 V	- O2S rear ready - Integrated exhaust gas mass after O2S rear ready ≥ 0.30 kg - Injection valve commanded on - Engine running - If - Integrated exhaust gas mass ≥ 1.50 kg - Or - Error suspicion set - Then - Enabling lambda ramp slope of the lambda ramp 0.05 1/s - Target lambda of the lambda ramp 0.85 [-] - Exhaust gas mass during ≥ 0.07 kg - Target lambda reached ≤ 0.85 [-] - If - Time fuel cut off > 5.0 s - Then disabling for - Time delay after fuel cut off 5.0 s - Additional Conditions: - Scavenging-rate not calibrated [-] - Integrated exhaust gas mass not calibrated kg - Split factor DFI/MFI not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - Engine speed 1,000 – 3,520 RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF 50.0 – 260.0 kg/h - Within time 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2273 O2 Sensor Signal Biased / Stuck Rich Bank 2 Sensor 2	Oxygen Sensors (O2S) Rear Stuck Rich	Sensor voltage > 0.20 V	- General: - O2S rear ready - Integrated exhaust gas mass after O2S rear ready >= 0.30 kg - Injection valve commanded on - Engine running - Case 1: (During lambda ramp activation) false - If - Integrated exhaust gas mass not calibrated kg - Or - Error suspicion not calibrated - Then - Enabling lambda ramp not calibrated - Slope of the lambda ramp not calibrated 1/s - Target lambda of the lambda ramp not calibrated [-] - Exhaust gas mass during not calibrated kg - Target lambda reached not calibrated [-] - If - Time fuel cut off not calibrated s - Then disabling for - Time delay after fuel cut off not calibrated s - Additional conditions: - Scavenging-rate not calibrated [-]	30.0 s - Once / DCY	2 DCY	Check the Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to ⇒ "3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8, Checking", page 1656.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Integrated exhaust gas mass not calibrated kg - Split factor DFI/MFI not calibrated [-] - Modeled exhaust gas temperature fitted position O2S rear not calibrated ° C - Engine speed not calibrated RPM - Vehicle speed not calibrated km/h - Lambda controller output not calibrated [-] - Within time not calibrated s - Lambda controller adaptation not calibrated - MAF not calibrated kg/h - Within time not calibrated s - Case 2: (During fuel cut off) true - Modeled exhaust gas temperature fitted position O2S rear 350 – 800° C - O2S front lambda value (for wide range sensor) > 8.0 [-] - O2S front voltage (for binary sensor) not calibrated V - Fuel cut off active - Integrated O2 mass during fuel cut off >= 6.0 g - Time delay not calibrated s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2279 MAP/MAF - Throttle Position Correlation	Intake Manifold Adaptation Value Monitoring	- Offset value throttle mass flow > 13.0 kg/h - And - Correction factor > 0.97 [-]	- Desired MAF 5.0 – 50.0 kg/h - ECT -48 – 143° C - BARO not calibrated kPa - Evap purge valve closed - EGR not equipped	3.0 s - Multiple	2 DCY	- This code will set if the calculated air intake is more than the MAF actual value. Check visually for air leaks after the MAF sensor. Check the Mass Airflow Sensor - G70-. Refer to ⇒ “3.6.27 Mass Airflow Sensor G70. Checking”, page 1644. - Check the Mass Airflow Sensor 2 - G246-. Refer to ⇒ “3.6.28 Mass Airflow Sensor 2 G246. Checking”, page 1646.
P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage. Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage. Checking”, page 1633.
P2301 Ignition Coil "A" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage. Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage. Checking”, page 1633.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2307 Ignition Coil "C" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 A Cylinder 1 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 B Cylinder 2 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors. Refer to ⇒ "3.6.17 Fuel Injectors, Checking", page 1624.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 C Cylinder 3 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230D Cylinder 4 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230E Cylinder 5 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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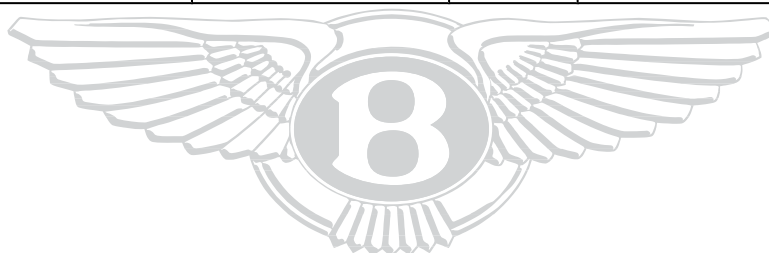
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230 F Cylinder 6 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ "3.6.17 Fuel Injectors , Checking", page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition Coil Short To Battery Plus	• Signal voltage > 5.0 – 7.0 V	• Engine speed > 680 RPM	• 2.0 s • Continuous	• 2 DCY	– Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage, Checking” , page 1633 .
P2312 Ignition Coil "E" Primary Control Circuit Low	Ignition Coil Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 2.0 s • Continuous	• 2 DCY	– Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage, Checking” , page 1633 .
P2313 Ignition Coil "E" Primary Control Circuit High	Ignition Coil Short To Battery Plus	• Signal voltage > 5.0 – 7.0 V	• Engine speed > 680 RPM	• 2.0 s • Continuous	• 2 DCY	– Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage, Checking” , page 1633 .
P2315 Ignition Coil "F" Primary Control Circuit Low	Ignition Coil Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 2.0 s • Continuous	• 2 DCY	– Check the Ignition Coils With Power Output Stage . Refer to ⇒ “3.6.21 Ignition Coils With Power Output Stage, Checking” , page 1633 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2316 Ignition Coil "F" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P2318 Ignition Coil "G" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .
P2319 Ignition Coil "G" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P231 A Cylinder 7 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P231 B Cylinder 8 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System A/F Cylinder Imbalance: Backstop Monitor	Cylinder misfire counter > 2.0 [-]	- General: - Camshaft adjustment not calibrated - Crankshaft adaptation completed - Rough road not detected - Engine roughness signal valid - Engine speed 1,360 – 2,200 RPM - Engine load 25.5 – 75.0% - Selected gear >= 6.0 [-] - BARO > 73.0 kPa - AAT > -15° C - ECT 50 – 120° C - Modeled catalyst temperature 330 – 870° C - Electrical check of O2S front completed - Electrical check of O2S rear completed - Lambda control closed loop - Lambda set value 1.0 [-] - Catalyst heating not active - Ratio fuel mass from evap purge system to fuel mass through injectors < 0.50 [-] - Integrated air mass >= 8.25 – 13.0 kg - Additional conditions: - A/F cylinder imbalance monitor active	20.0 (does not run in FTP) s - Once / DCY	2 DCY	Check the Fuel Injectors . Refer to ⇒ “3.6.17 Fuel Injectors , Checking”, page 1624 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2321 Ignition Coil "H" Primary Control Circuit Low	Ignition Coil Short To Ground	Signal current > 24.0 mA	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2322 Ignition Coil "H" Primary Control Circuit High	Ignition Coil Short To Battery Plus	Signal voltage > 5.0 – 7.0 V	Engine speed > 680 RPM	2.0 s - Continuous	2 DCY	Check the Ignition Coils With Power Output Stage . Refer to ⇒ "3.6.21 Ignition Coils With Power Output Stage, Checking", page 1633 .
P2400 EVAP System Leak Detection Pump Control Circuit/ Open	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Open Circuit	Signal voltage 3.26 – 4.70 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.24 Leak Detection Pump V144, Checking", page 1638 .
P2401 EVAP System Leak Detection Pump Control Circuit Low	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Ground	Signal voltage < 2.74 V	- Actuator commanded off - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.24 Leak Detection Pump V144, Checking", page 1638 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2402 EVAP System Leak Detection Pump Control Circuit High	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Leak Detection Pump - V144-. Refer to ⇒ "3.6.24 Leak Detection Pump V144-. Checking", page 1638.
P2403 EVAP System Leak Detection Pump Sense Circuit/Open	Leak Detection Pump (LDP) Reed Sensor Rationality Check Unable To Close	Low signal voltage > 0.5 s	- Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - BARO > 73.44 kPa - Integrated EVAP purge mass > 39.8 g - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Evap purge valve ready - LDP commanded off - ECT 4 – 110° C - ECT @ start 4 – 110° C - Case 1: - AAT not calibrated ° C - Case 2: - IAT 3 – 90° C	0.5 s - Once / DCY	2 DCY	Check the Leak Detection Pump - V144-. Refer to ⇒ "3.6.24 Leak Detection Pump V144-. Checking", page 1638.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2404 EVAP System Leak Detection Pump Sense Circuit Range/Performance	Leak Detection Pump (LDP) Reed Sensor Rationality Check Unable To Open	- High signal voltage > 12.0 s - And - Number of checks 30.0 [-]	- Time after engine start 5.0 – 1,200.0 s - Preceding engine shut-off time not calibrated s - Or - Last ECM keep alive mode not calibrated - BARO > 73.44 kPa - Vehicle speed 0 – 150 km/h - Vehicle speed once > 9 km/h - Selected gear any drive - ECT restart temperature diff. > 45.0 K - Intake manifold vacuum > -100.0 kPa - Evap purge valve closed, ready - LDP commanded on - ECT 4 – 110° C - ECT @ start 4 – 110° C - Case 1: - AAT not calibrated ° C - Case 2: - IAT 3 – 70° C	12.0 s - Once / DCY	2 DCY	Check the Leak Detection Pump - V144- . Refer to "3.6.24 Leak Detection Pump V144 . Checking", page 1638 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check (Check For Sensor At Ambient Air)	- Threshold 1: - Signal voltage 2.71 – 5.0 V - Threshold 2: - Signal voltage 2.05 – 3.06 V - Depending on gain factor, that actual is used for sensor characteristic, the threshold is	- Lambda set value < 1.6 [-] - O2S ceramic temperature > 665° C - Fuel cut off not active - Heater control closed loop - If low fuel signal then wait > 600.0 s - Only AIR system - AIR not active	10.0 s - Multiple	2 DCY	Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10- Checking”, page 1653 .
P2415 O2 Sensor Exhaust Sample Error Bank 2 Sensor 1	Oxygen Sensors (O2S) Front Signal Range Check (Check For Sensor At Ambient Air)	- Threshold 1: - Signal voltage 2.71 – 5.0 V - Threshold 2: - Signal voltage 2.05 – 3.06 V - Depending on gain factor, that actual is used for sensor characteristic, the threshold is	- Lambda set value < 1.6 [-] - O2S ceramic temperature > 665° C - Fuel cut off not active - Heater control closed loop - If low fuel signal then wait > 600.0 s - Only AIR system - AIR not active	10.0 s - Multiple	2 DCY	Check the Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to ⇒ “3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11- Checking”, page 1659 .
P2431 AIR System Air Flow/Pressure Sensor Circuit Range/Performance Bank 1	Secondary Air Injection (AIR) Pressure Sensor Rationality Check	Diff. between AIR pressure and BARO < -6.0; > 6.0 kPa	- Actuator commanded off - BARO valid	0.01 s - Once / DCY	2 DCY	Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ “3.6.36 Secondary Air Injection Sensor 1 G609- Checking”, page 1666 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2432 AIR System Air Flow/Pressure Sensor Circuit Low Bank 1	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage < 0.40 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609 Checking", page 1666 .
P2433 AIR System Air Flow/Pressure Sensor Circuit High Bank 1	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage > 4.60 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.36 Secondary Air Injection Sensor 1 G609 Checking", page 1666 .
P2436 AIR System Air Flow/Pressure Sensor Circuit Range/Performance Bank 2	Secondary Air Injection (AIR) Pressure Sensor Rationality Check	Diff. between AIR pressure and BARO < -6.0; > 6.0 kPa	- Actuator commanded off - BARO valid	0.01 s - Once / DCY	2 DCY	Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610 Checking", page 1668 .
P2437 AIR System Air Flow/Pressure Sensor Circuit Low Bank 2	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage < 0.40 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610 Checking", page 1668 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2438 AIR System Air Flow/Pressure Sensor Circuit High Bank 2	Secondary Air Injection (AIR) Pressure Sensor Signal Range Check	Signal voltage > 4.60 V		0.5 s - Continuous	2 DCY	Check the Secondary Air Injection Sensor 2 - G610- . Refer to ⇒ "3.6.37 Secondary Air Injection Sensor 2 G610- Checking", page 1668 .
P2440 AIR System Switching Valve Stuck Open Bank 1	Secondary Air Injection (AIR) Stuck Open	- Case 1: - Relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while AIR valve closed) > 1.50 [-] - Case 2: - Average pressure difference between absolute value and filtered value while AIR valve closed > 0.30 kPa	- ECT -10 – 130° C - IAT 10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - BARO > 74.0 kPa - AIR system commanded on - Additional conditions: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.59 [-]	0.0 s - Once / DCY	2 DCY	- Check the secondary air combination valve visually. Replace if necessary. Refer to appropriate repair manual. - Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101- Checking", page 1661 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2442 AIR System Switching Valve Stuck Open Bank 2	Secondary Air Injection (AIR) Stuck Open	- Case 1: - Relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while AIR valve closed) > 1.50 [-] - Case 2: - Average pressure difference between absolute value and filtered value while AIR valve closed > 0.30 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - BARO > 74.0 kPa - AIR system commanded on - Additional conditions: - Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.70 [-] - Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled >= 0.59 [-]	0.0 s - Once / DCY	2 DCY	- Check the secondary air combination valve visually. Replace if necessary. Refer to appropriate repair manual. - Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .
P25F6 AIR System "B"	Secondary Air Injection (AIR) Rationality Check Directly After Catalyst Heating	Diff. of measured AIR pressure before AIR injection vs. AIR pressure after AIR injection > 2.0 kPa	- ECT -10 – 130° C - IAT -10 – 100° C - Modeled catalyst temperature < 700° C - MAF 7.0 – 275.0 kg/h - For time > 1.0 s - Difference engine load -10.0 – 10.0 %/rev - For time > 1.0 s - BARO > 74.0 kPa - AIR system commanded off	0.5 s - Once / DCY	2 DCY	Check the Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- . Refer to "3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189, Checking", page 1664 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2632 Fuel Pump "B" Control Circuit / Open	Fuel Pump (FP) Relay Open Circuit	Signal voltage 3.26 – 4.70 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay 2 - J49- / Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277, Checking", page 1630 .
P2633 Fuel Pump "B" Control Circuit Low	Fuel Pump (FP) Relay Short To Ground	Signal voltage < 2.74 V	Actuator commanded off	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay 2 - J49- / Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277, Checking", page 1630 .
P2634 Fuel Pump "B" Control Circuit High	Fuel Pump (FP) Relay Short To Battery Plus	Signal current > 0.06 – 10.0 A	- Actuator commanded on - Engine speed > 80 RPM	0.5 s - Continuous	2 DCY	Check the Fuel Pump Relay 2 - J49- / Fuel Pump 2 - V277- . Refer to ⇒ "3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277, Checking", page 1630 .
P3081 Engine Temperature Too Low	Engine Coolant Temperature (ECT) Sensor Rationality Check	Diff. between reference model temperature and measured ECT > 15.0 K		4.0 s - Continuous	2 DCY	Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ "3.6.11 Engine Coolant Temperature Sensor G62, Checking", page 1613 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 3 Cylinder Shut-Off Valve 1 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A4 Cylinder Shut-Off Valve 1 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF @ throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 5 Cylinder Shut-Off Valve 2 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking", page 1607 .

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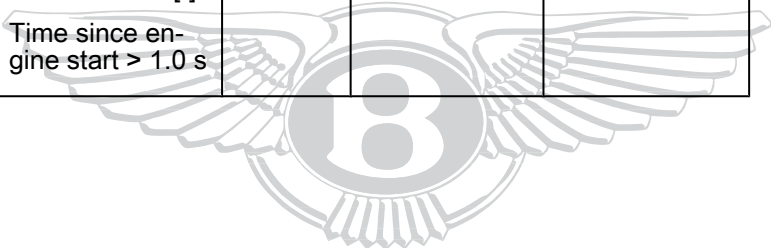
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 6 Cylinder Shut- Off Valve 2 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF @ throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 7 Cylinder Shut-Off Valve 3 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- Checking", page 1607 .

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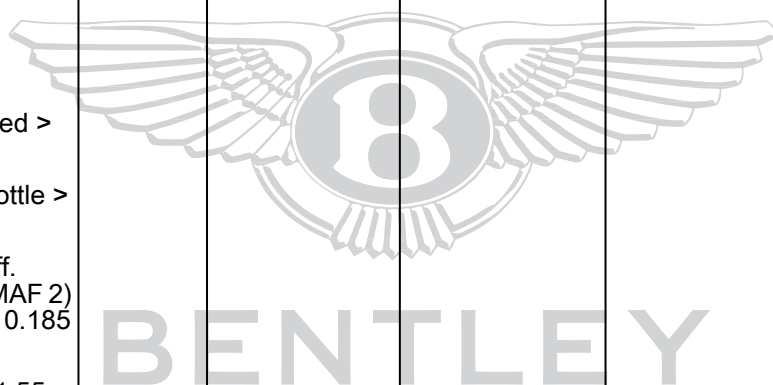
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 8 Cylinder Shut- Off Valve 3 Sticks Close d	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF @ throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking”, page 1607 .



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A 9 Cylinder Shut-Off Valve 4 Sticks Open	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded On Functional Check	- Minimum air charge factor from non CD cylinders - Minus - Air charge factor from monitored CD cylinder < 0.15 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF at throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking”, page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure and BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P30A A Cylinder Shut-Off Valve 4 Sticks Closed	Cylinder Deactivation (CD) Control Valve (Cyl. 3 / 2 / 5 / 8) CD Commanded Off Functional Check	- Air charge factor in this cylinder > 0.15; < 0.5 [-] - Or - Air charge factor in other CD cylinder < 0.35 [-]	- Case 1: - Engine speed > 500; < 2,850 RPM - Ratio of MAP and pressure upstream throttle > 0.2; < 0.95 [-] - MAF @ throttle calculated from MAF sensor signal valid - MAF 1 > 27.78 g/s - MAF 2 > 27.78 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF > 0.185; < 0.225 [-] - Time dependent conditions - MAF sensor pulsation not detected - Gradient of desired MAP > -200 kPa/s - Ratio of pressure upstream throttle and BARO < 0.9 [-] - For time > 0.0; < 1.5 s - Or - Case 2: - Engine speed > 800 RPM - MAF @ throttle > 26.39 g/s - Ratio of (diff. MAF 1 vs. MAF 2) and MAF < 0.185 – 0.225 [-] - For time > 1.55 s - Throttle position < 25.293% - Pressure upstream intercooler < 0.699; > -0.699 kPa	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking", page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			- Ratio of boost pressure and BARO < 1.35 – 3.90 [-] - Or - Ratio of boost pressure And BARO > 1.0 – 1.05 [-] - Ratio of pressure upstream inter-cooler and pressure upstream booster < 1.0 [-] - Time since engine start > 1.0 s			
P3401 Cylinder 1 Deactivation/ Intake Valve Control Circuit Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	Signal voltage 4.70 – 5.40 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .
P3403 Cylinder 1 Deactivation/ Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	Signal voltage < 2.74 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .
P3404 Cylinder 1 Deactivation/ Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	Signal current > 0.06 – 10.0 A	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8, Checking”, page 1607 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3409 Cylinder 2 Deactivation/ Intake Valve Control Circuit/ Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	Signal voltage 4.70 – 5.40 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking", page 1607 .
P3411 Cylinder 2 Deactivation/ Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	Signal voltage < 2.74 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking", page 1607 .
P3412 Cylinder 2 Deactivation/ Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	Signal current > 0.06 – 10.0 A	Engine speed ≥ 80 RPM	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking", page 1607 .
P3417 Cylinder 3 Deactivation/ Intake Valve Control Circuit/ Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	Signal voltage 4.70 – 5.40 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking", page 1607 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3419 Cylinder 3 Deactivation/Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	Signal voltage < 2.74 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking", page 1607 .
P3420 Cylinder 3 Deactivation/Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	Signal current > 0.06 – 10.0 A	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking", page 1607 .
P3425 Cylinder 4 Deactivation/Intake Valve Control Circuit/Open	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Open Circuit	Signal voltage 4.70 – 5.40 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking", page 1607 .
P3427 Cylinder 4 Deactivation/Intake Valve Control Circuit Low	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Ground	Signal voltage < 2.74 V		0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ "3.6.8 Displacement On Demand Rotary Solenoid NX8 . Checking", page 1607 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3428 Cylinder 4 Deactivation/Intake Valve Control Circuit High	Cylinder Deactivation (CD) Valve Actuator (Cyl. 3 / 2 / 5 / 8) Short To Battery Plus	Signal current > 0.06 – 10.0 A	Engine speed >= 80 RPM	0.5 s - Continuous	2 DCY	Check the Displacement On Demand Rotary Solenoid - NX8- . Refer to ⇒ “3.6.8 Displacement On Demand Rotary Solenoid NX8- . Checking”, page 1607 .
U0001 High Speed CAN Communication Bus	CAN: Powertrain Reading Back Sent Message	Message no feedback	Time after ignition on > 500.0 ms	0.25 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 1601 .
U0002 High Speed CAN Communication Bus Performance	CAN: Powertrain Communication Check	Global time out receiving no message	Time after ignition on > 500.0 ms	0.45 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 1601 .
U0101 Lost Communication With TCM	COM: Transmission Control Module (TCM) Communication With TCM	Received message no message	Time after ignition on >= 0.5 s	1.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance between the Transmission Control Module to the Engine Control Module - J623- . Refer to ⇒ “3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking”, page 1603 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module	COM: Brake System Control Module (BSCM) Communication With BSCM	Received message no message	Time after ignition on > 500.0 ms	2.0 s - Continuous	2 DCY	Check the ABS CAN-Bus operation. Refer to appropriate repair manual.
U0140 Lost Communication With Body Control Module	COM: Body Control Module (BCM) Communication With BCM	Time out no message	Time after ignition on > 500.0 ms	5.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.
U0146 Lost Communication With Gateway "A"	COM: Gateway Communication With Gateway	Received message no message	Time after ignition on > 500.0 ms	1.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	COM: Instrument Panel Cluster (IPC) Communication With IPC	Received message no message	Time after ignition on $\geq$ 0.5 s	5.0 s - Continuous	2 DCY	Check the Instrument Cluster CAN-Bus. Refer to appropriate repair manual.

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U040 2 Invalid Data Received From TCM	COM: Transmission Control Module (TCM) Communication With TCM	Received data implausible message	Time after ignition on > 500.0 ms	0.3 s - Continuous	2 DCY	Check for correct VIN and software ID stored in TCM. If the software ID or VIN is incorrect, a re-flash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to ⇒ "3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 1603.
U041 5 Invalid Data Received From Anti-Lock Brake System (ABS) Control Module	COM: Brake System Control Module (BSCM) Communication With BSCM COM: Vehicle Speed Sensor (VSS) Communication With VSS	Received data implausible message	Time after ignition on > 500.0 ms	2.0 s - Continuous	2 DCY	Check for correct VIN and software ID stored in ABS. If the software ID or VIN is incorrect, a re-flash will need to be performed to correct the data. If software and VIN are OK, check CAN bus for intermittent issue. Refer to appropriate repair manual.
	Vehicle Speed Sensor (VSS) Out Of Range High	- Speed sensor signal: initialization error 655.34 km/h - Speed sensor signal: low voltage error 655.33 km/h - Speed sensor signal: sensor error 655.35 km/h - Vehicle speed > 325 km/h		1.98 s - Continuous 0.48 s - Continuous 3.0 s - Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U042 3 Invalid Data Received From Instrument Panel Cluster Control Module	COM: Instrument Panel Cluster (IPC) Communication With IPC	Received data implausible message	Time after ignition on > 500.0 ms	3.0 s - Continuous	2 DCY	Check the Instrument Cluster CAN-Bus. Refer to appropriate repair manual.
U044 7 Invalid Data Received From Gateway "A"	COM: Gateway Communication With Gateway	Received data implausible message	Time after ignition on > 500.0 ms	1.0 s - Continuous	2 DCY	Check the CAN-Bus terminal resistance. Refer to "3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601.

3.5 Transmission DTC Tables

- ◆ ⇒ ["3.5.1 Transmission Control Module , 8 Spd \(2011 – 2016 MY\)", page 1382](#)
- ◆ ⇒ ["3.5.2 Transmission Control Module , 8 Spd \(2017 MY\)", page 1422](#)
- ◆ ⇒ ["3.5.3 Transmission Control Module , 8 Spd \(2018 MY\)", page 1465](#)
- ◆ ⇒ ["3.5.4 Transmission Control Module , 8 Spd \(2019 MY\)", page 1507](#)
- ◆ ⇒ ["3.5.5 Transmission Control Module , 8 Spd \(2020 MY\)", page 1549](#)

3.5.1 Transmission Control Module , 8 Spd (2011 – 2016 MY)

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0603	Internal Control Module Keep Alive Memory (KAM) Error	The diagnostic is monitoring EEPROM checksums and hardware failures of the Flash Control Unit	- Number of sector groups with valid checksum < 2 - OR - Read or write operation not possible (Flash Control Unit defective) = true		An EEPROM read or write operation has occurred = true	< 1 s	immediate
P0605	Internal Control Module Read Only Memory (ROM) Error	A checksum is calculated for each memory block and compared with a stored reference checksum	Calculated checksum unequal to reference checksum = true		TCM is in power-on state = true	< 30 s	2 DCY
P0613	TCM Processor	- signal check - plausibility check	- signal read back from the CAN Bus 2 is unequal to the send out signal - two signals representing the same value but calculated in two different ways are unequal		no failure detected on CAN Bus 2	continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0667	Control Module Internal Temperature Sensor "A" Range/Performance	Circuit continuity	- Voltage at sensor plus pin U pin hi > 4.7 V - Voltage at sensor plus pin U pin hi < 0.508 V - Voltage at sensor minus pin U pin lo > 0.423 V - Voltage at sensor minus pin U pin lo < 0.005 V - Difference voltage at sensor pins U sensor > 4.512 V - Difference voltage at sensor pins U sensor < 0.135 V - Resistor ratio $\frac{U_{\text{supply}} - U_{\text{sensor}}}{U_{\text{pin lo}}} > 15.5$ - Resistor ratio $\frac{U_{\text{supply}} - U_{\text{sensor}}}{U_{\text{pin lo}}} < 10$			1 s	2 DCY
		Rationality check	Transmission oil temperature delta between 2 measurements > 20° C		No failure detected in Other oil temperature sensor monitors		

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Rationality check	IN THERMO-DYNAMIC STABLE CONDITIONS: (Absolute differences between) Oil temperature value and Chip 1 temperature value and oil temperature value and Chip 2 temperature value > 15° C		- No failure detected in Other oil temperature sensor monitors - No failure detected in Input speed signal and engine speed signal - Engine speed or input speed > 400 rpm and >= 300 s	300 s	
			IN THERMO-DYNAMIC STABLE CONDITIONS: (Absolute differences between) Oil temperature value and Chip 1 temperature value and oil temperature value and Chip 2 temperature value > 30° C				
		Signal range check	- Out of range low < - 45.9° C - Out of range high > 167.8° C			1 s	
		ASIC monitoring	Plausibility to internal comparator outputs violated				

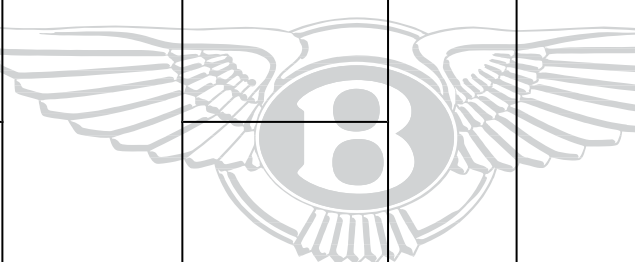
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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Rationality check	- Absolute differences between Chip 1 and Chip 2 temperature value > 10° C AND IN THERMO-DYNAMIC STABLE CONDITIONS: (Absolute differences between) - Oil temperature value and Chip 1 temperature value > 15° C IN THERMO-DYNAMIC STABLE CONDITIONS: (Absolute differences between) - Oil temperature value and Chip1 temperature value > 30° C		- No failure detected in Other oil temperature sensor monitors - No failure detected in Input speed signal and engine speed signal - Engine speed or input speed > 400 rpm and >= 300 Sec	300 s	
		Signal range check	- Out of range low < -45° C - Out of range high > 192° C			1 s	
		ASIC monitoring	Timeout during init				

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Rationality check	- Absolute differences between Chip 1 and Chip 2 temperature value > 10° C AND IN THERMO-DYNAMIC STABLE CONDITIONS: (Absolute differences between) - Oil temperature value and Chip 2 temperature value > 15° C IN THERMO-DYNAMIC STABLE CONDITIONS: (Absolute differences between) - Oil temperature value and Chip 2 temperature value > 30° C		- No failure detected in Other oil temperature sensor monitors - No failure detected in Input speed signal and engine speed signal - Engine speed or input speed > 400 rpm and >= 300 Sec	300 s	
P060 A	Internal Control Module Monitoring Processor Performance	Calculation check of input speed for functional use	Difference in calculation of input speed for functional use and monitoring use > 650 rpm		- No failure detected in sensor voltage supply = True - No failure detected in output speed and input speed monitoring True - No failure detected in engine speed CAN message True	continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		• functional check	• inhibit path test of safety relevant power supplies during init failed				
			• monitoring of the DN reset line failed				
		• plausibility check	• hardware doesn't report any error although the peripheral clock is switched off		• peripheral clock active • delay time passed		
			OR • peripheral is switched on and there are hardware error reports for at least two cycles				
		• plausibility check	• failure in program flow control				
		• software check	• SW - or configuration fault in WDOG SW-Modul				
		• plausibility check	• a ASIC status failure has been detected				
			• a monitored module status failure has been detected				



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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P060 B	Internal Control Module A/D Processing Performance	• ADC monitoring	• measured ADC signals inconsistent to configured voltage limits or other hardware signals			• continuous	• 2 DCY
		• SPI monitoring	• SPI communication error				
		• "RAM ECC monitoring, RAM ECC interrupt monitoring, ROM ECC monitoring"	• ECC test failed				
		• CPU configuration register monitoring	• content of registers inconsistent to the requested values				
P0715	ISO/SAE Reserved Input Turbine/ Speed Sensor "A" Circ.	• ASIC HW monitoring	• ASIC CG124 indicates open circuit or short to ground =	• True	• No failure detected in sensor voltage supply = True	• 200 ms	• 2 DCY
P0716	Input/Turbine Shaft Speed Sensor "A" Circuit Range/ Performance	• Double failure monitoring to determine more than one defective sensor	• More than one of the following speed signals are defective: input speed, output speed or wheel speed		• No failure detected in sensor voltage supply = True • Engine speed > 430 rpm • No failure detected in engine speed CAN message = True	• 300 ms	• 2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Double failure monitoring of engine speed signal and input speed signal	- Any failure on engine speed signal from CAN = True - input speed signal is invalid because of an electrical or rationality failure = True		No failure detected in sensor voltage supply = True		
		Double failure monitoring of output speed signal and wheel speed signal	Absolute difference between output speed and output speed calculated from wheel speed > 350 rpm		- No failure detected in sensor voltage supply = True - Gear shift in progress = True - Engine speed > 450 rpm - No failure detected in engine speed CAN message = True		
		Rationality to other sensor speed signals	- Rationality to other sensor speed signals > 250 rpm - Difference between measured output speed and output speed calculated from input speed > 250 rpm		- No failure detected in sensor voltage supply, wheel speed signal or electrical input speed sensor monitoring = True - No failure detected in sensor voltage supply, output speed signal or electrical input speed sensor monitoring = True	500 ms	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0717	Input/Turbine Shaft Speed Sensor "A" Circuit No Signal	input direction	implausible direction of input speed sensor = True		No failure detected in sensor voltage supply = True	200 ms	2 DCY
P0720	Output Shaft Speed Sensor Circuit	ASIC HW monitoring	ASIC CG124 indicates	open circuit or short to ground = True	No failure detected in sensor voltage supply = True	continuous	2 DCY
P0721	Output Shaft Speed Sensor Circuit Range/Performance	Rationality to other sensor speed signals	- Difference between measured output speed and output speed calculated from wheel speed - Difference between measured output speed and output speed calculated from input speed	> 350 rpm > 250 rpm	- No failure detected in sensor voltage supply, wheel speed signal or electrical output speed sensor monitoring = True - No failure detected in sensor voltage supply, input speed signal or electrical output speed sensor monitoring = True	continuous	2 DCY
P0727	Engine Speed Input Circuit No Signal	CAN message with engine speed signal check	failure value received		- and no failure detected on CAN Bus - and battery voltage >9 [V]	continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0730	Incorrect Gear Ratio	rationality check	ratio detected is outside of defined limits. fault code for up to 3 corresponding clutches may be set. additional rationality checks using a substitute gear (s) is initiated. Depending on the behavior in the substitute gear(s), an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem.		GENERAL ENABLE CONDITIONS: - oil-temperature > 0° C - engine speed > 400 rpm or if engine speed < threshold, output speed > 2,500 rpm - input speed > 0 rpm - transmission lever position D or R - timer elapsed > 200 ms - no malfunction in input speed signal - no malfunction in output speed signal ADDITIONAL ENABLE CONDITIONS FOR GEARSHIFTS: - output speed gradient > CC Ratio XYZ xy rpm ADDITIONAL ENABLE CONDITIONS FOR ENGAGING GEARS: - input speed gradient > 5,000 rpm - throttle > 5.09803921568628 %	3 times 30 ms	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
					GENERAL ENABLE CONDITIONS: - oil-temperature > 0 °C - engine speed > 400 rpm or if engine speed < threshold, output speed > 2,500 rpm - input speed > 0 rpm - transmission lever position D or R - timer elapsed > 200 ms - no malfunction in input speed signal - no malfunction in output speed signal ADDITIONAL ENABLE CONDITIONS FOR GEARSHIFTS: - output speed gradient > CC Ratio XYZ xy rpm ADDITIONAL ENABLE CONDITIONS FOR ENGAGING GEARS: - input speed gradient > 5000 rpm - throttle > 5.09803921568628 %		

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0741	Torque Converter Clutch Circuit Performance/ Stuck Off	rationality check	absolute difference of actual slip and target slip	> 40 rpm	- status of torque converter clutch closed or closed loop control - engine torque < 1000 Nm - tcc-pressure > 3 bar	20 s - continuous	2 DCY
P0746	Pressure Control Solenoid "A" Performance/ Stuck Off	- short to ground - short to ground or open pin	- ASIC (SPI register) faulty - feedback (PWM) 100%		- power supply activated - power supply voltage >= 6.5 V and < 19.2 V .	continuous	2 DCY
P0747	Pressure Control Solenoid "A" Stuck On	short to battery	- ASIC (SPI register) faulty - feedback (PWM) 0%		- power supply activated - power supply voltage >= 6.5 V and < 19.2 V .	continuous	2 DCY
P0748	Pressure Control Solenoid "A" Electrical	- static bypass to ground - dynamic bypass to ground	ASIC (SPI register) faulty		- power supply activated - power supply voltage >= 6.5 V and < 19.2 V .	continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		current too low	- SW (calculation) feedback PWM - no shifting: - measured current $\leq$ 0.85 - 0.12 A - during shifting: - measured current $\leq$ calculated limits, depending on incoming current gradient mA				
		current too high	- SW (calculation) feedback PWM - no shifting: - measured current $\geq$ 0.5 + 0.17 A - during shifting: - measured current $\geq$ calculated limits, depending on incoming current gradient mA				

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		SPI communication monitoring	- checkbyte of message wrong - read back of send message failed - PWM feedback period > sync-period + 20 µs or < sync-period - 20 µs				
P0749	Pressure Control Solenoid "A" Intermittent	open circuit	ASIC (SPI register) faulty		- power supply activated - power supply voltage ≥ 6.5 V and < 19.2 V	continuous	2 DCY
P0750	Shift Solenoid "A"	- static bypass to ground - dynamic bypass to ground - current too low	- ASIC (SPI register) faulty - SW (calculation) feedback PWM - no shifting: - measured current $\leq 0.85 - 0.12$ A - during shifting: - measured current $\leq$ calculated limits, depending on incoming current gradient mA		- power supply activated - power supply voltage ≥ 6.5 V and < 19.2 V	continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		current too high	- SW (calculation) feedback PWM - no shifting: - measured current $\geq 0.5 + 0.17 \text{ A}$ - during shifting: - measured current $\geq$ calculated limits, depending on incoming current gradient mA				
		SPI communication monitoring	- checkbyte of message wrong - read back of send message failed - PWM feedback period $> \text{sync-period} + 20 \mu\text{s}$ or $< \text{sync-period} - 20 \mu\text{s}$				
P0751	Shift Solenoid "A" Performance/ Stuck Off	- short to ground - short to ground or open pin	- ASIC (SPI register) faulty - feedback (PWM) 100%		- power supply activated - power supply voltage $\geq 6.5 \text{ V}$ and $< 19.2 \text{ V}$	continuous	2 DCY
P0752	Shift Solenoid "A" Stuck On	short to battery	- ASIC (SPI register) faulty - feedback (PWM) 0%		- power supply activated - power supply voltage $\geq 6.5 \text{ V}$ and $< 19.2 \text{ V}$	continuous	2 DCY

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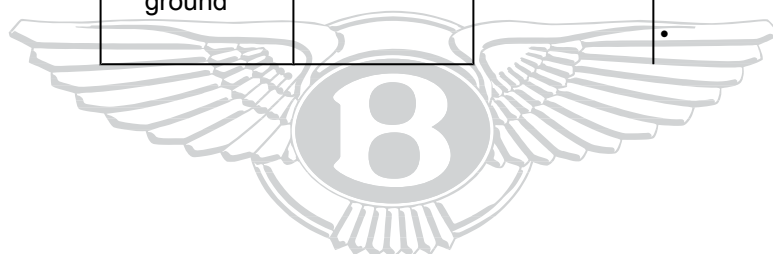
AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0754	Shift Solenoid "A" Intermittent	open circuit	ASIC (SPI register) faulty		- power supply activated - power supply voltage ≥ 6.5 V and < 19.2 V .	continuous	2 DCY
P0776	Pressure Control Solenoid "B" Performance/ Stuck Off	- short to ground - short to ground or open pin	- ASIC (SPI register) faulty - feedback (PWM) 100%		- power supply activated - power supply voltage ≥ 6.5 V and < 19.2 V .	continuous	2 DCY
P0777	Pressure Control Solenoid "B" Stuck On	short to battery	- ASIC (SPI register) faulty - feedback (PWM) 0%		- power supply activated - power supply voltage ≥ 6.5 V and < 19.2 V .	continuous	2 DCY
P0778	Pressure Control Solenoid "B" Electrical	- static bypass to ground - dynamic bypass to ground - current too low	- ASIC (SPI register) faulty - SW (calculation) feedback PWM - no shifting: - measured current $\leq 0.85 - 0.12$ A - during shifting: - measured current $\leq$ calculated limits, depending on incoming current gradient mA		- power supply activated - power supply voltage ≥ 6.5 V and < 19.2 V .	continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		current too high	- SW (calculation) feedback PWM - no shifting: - measured current $\geq 0.5 + 0.17 \text{ A}$ - during shifting: - measured current $\geq$ calculated limits, depending on incoming current gradient mA				
		SPI communication monitoring	- checkbyte of message wrong - read back of send message failed - PWM feedback period $> \text{sync-period} + 20 \mu\text{s}$ or $< \text{sync-period} - 20 \mu\text{s}$				
P0779	Pressure Control Solenoid "B" Inter-mittent	open circuit	ASIC (SPI register) faulty		- power supply activated - power supply voltage $\geq 6.5 \text{ V}$ and $< 19.2 \text{ V}$	continuous	2 DCY
P077C	Output Shaft Speed Sensor Circuit Low	ASIC HW monitoring	ASIC CG124 indicates short to battery voltage	= True	No failure detected in sensor voltage supply = True	continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0780	Shift Error	rationality check	While shifting from gear X to gear Y the ratio is outside the defined limits is detected.	- actual ratio > gear X ratio + CC Ratio THUP x + CC Ratio OFTHUP xy - OR - actual ratio < gear Y ratio - CC Ratio THLO y - CC Ratio OFTHLO xy	UPSHIFT - shifting from gear X to gear Y in progress AND - output speed >= 50 rpm DOWNSHIFT - shifting from gear X to gear Y in progress AND - output speed >= 50 rpm	3 times 30 ms - continuous	2 DCY
P0796	Pressure Control Solenoid "C" Performance/ Stuck Off	- short to ground - short to ground or open pin	- ASIC (SPI register) faulty - feedback (PWM) 100%		- power supply activated - shifting from gear X to gear Y in progress	continuous	2 DCY
P0797	Pressure Control Solenoid "C" Stuck On	short to battery	- ASIC (SPI register) faulty - feedback (PWM) 0%		- power supply activated - power supply voltage >= 6.5 V and < 19.2 V	continuous	2 DCY
P0798	Pressure Control Solenoid "C" Electrical	- static bypass to ground - dynamic bypass to ground	ASIC (SPI register) faulty		- power supply activated - power supply voltage >= 6.5 V and < 19.2 V	continuous	2 DCY

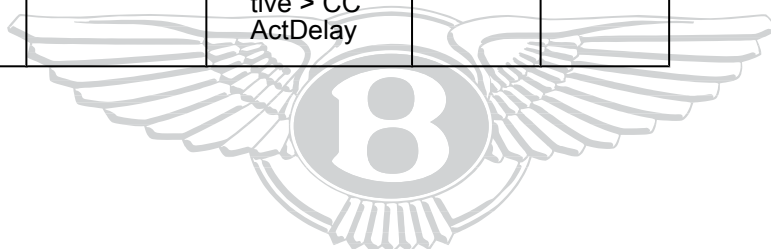


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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		current too low	- SW (calculation) feedback PWM - no shifting: - measured current $\leq 0.85 - 0.12$ A - during shifting: - measured current $\leq$ calculated limits, depending on incoming current gradient mA				
		current too high	- SW (calculation) feedback PWM - no shifting: - measured current $\geq 0.5 + 0.17$ A - during shifting: - measured current $\geq$ calculated limits, depending on incoming current gradient mA				

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		SPI communication monitoring	- checkbyte of message wrong - read back of sended message failed - PWM feedback period > sync-period + 20 µs or < sync-period - 20 µs				
P0799	Pressure Control Solenoid "C" Intermittent	open circuit	ASIC (SPI register) faulty		- power supply activated - power supply voltage ≥ 6.5 V and < 19.2 V	continuous	2 DCY
P07A5	Transmission Friction Element "B" Stuck On	signal check	- clutch slip < CD Th Detect Slip - check for engine load CD Eng Stall > CC Th Detect No Open eng" - permanently true for CC Err-Delay NO		- position D or R - gear 1 – 5 R - no other error detected on drive clutch - no Ratio monitoring error - throttle $\leq$ CC Throttle - break pressure > CC BreakP NO - delay timer 'survey active > CC ActDelay	continuous	2 DCY



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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P07A C	Transmission Friction Element "F" Performance/ Stuck Off	"Observe the combustion engine actual speed during the combustion engine starting procedure"	actual combustion engine speed < 10 rpm		- Target clutch torque capacity > 200 Nm - Actual electric motor speed > 500 rpm - Change from electric driving to hybrid driving commanded = True	0.5 s	2 DCY
P07A D	Transmission Friction Element "F" Stuck On	"Observe the combustion engine actual speed during the combustion engine starting procedure"	actual combustion engine speed > 5 rpm		- Target clutch torque capacity > 0 Nm - Actual combustion engine torque < 0 Nm - Actual combustion engine speed gradient NGS VMK00EFF-NICHT DIHO rpm - Change from hybrid driving to electric driving = True OR electric driving commanded = True	300 ms	2 DCY
P07B F	Input/Turbine Shaft Speed Sensor "A" Circuit Low	ASIC HW monitoring	ASIC CG124 indicates short to battery voltage	= True	No failure detected in sensor voltage supply = True	100 ms	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P081 E	Excessive Clutch "B" Slip-page	signal check	- hybrid mode (combustion mod) > targeted engine rev. CC FRev NC - engine speed CC Rev NC - engine rev acceleration > CC RevAcc NC - clutch slip > CC Max-Slip NC - desired clutch torque > eng torque CC FTrq NC		- position D or R - gear 1 – 5 R - no gear change in progress - wheel speed direction according to pos - engine not in stall - no other error detected on drive clutch - no Ratio monitoring error - gearbox temperature > CC MinTemp NC - delay timer 'survey active > CC ActDelay	continuous	2 DCY
P0863	TCM Communication Circuit	signal check	signal read back from the CAN Bus 1 is unequal to the send out signal		no failure detected on CAN Bus 1	continuous	2 DCY
P0C2 F	Internal Control Module Drive Motor/Generator - Engine Speed Sensor Performance	signal check	failure value received		- no failure detected on CAN Bus AND - battery voltage > 9 V	continuous	2 DCY
P2637	Torque Management Feedback Signal "A"	signal check	failure value received		- no failure detected on CAN Bus AND - battery voltage > 9 V	continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2700	Transmission Friction Element "A" Apply Time Range/Performance	rationality check	ratio detected is outside of defined limits. fault code for up to 3 corresponding clutches may be set. additional rationality checks using a substitute gear(s) is initiated. Depending on the behavior in the substitute gear(s). an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem.		GENERAL ENABLE CONDITIONS: - oil-temperature > 0 °C - engine speed > 400 rpm or if engine speed < threshold. output speed > 2500 rpm - input speed > 0 rpm - transmission lever position D or R - timer elapsed > 200 ms - no malfunction in input speed signal - no malfunction in output speed signal ADDITIONAL ENABLE CONDITIONS FOR GEARSHIFTS: - output speed gradient > CC Ratio XYZ xy rpm ADDITIONAL ENABLE CONDITIONS FOR ENGAGING GEARS: - input speed gradient > 5,000 rpm - throttle > 50%	3 times 30 ms - continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2701	Transmission Friction Element "B" Apply Time Range/Performance	rationality check	ratio detected is outside of defined limits. fault code for up to 3 corresponding clutches may be set. additional rationality checks using a substitute gear(s) is initiated. Depending on the behavior in the substitute gear(s). an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem.		GENERAL ENABLE CONDITIONS: - oil-temperature > 0° C - engine speed > 400 rpm or if engine speed < threshold. output speed > 2,500 rpm - input speed > 0 rpm - transmission lever position D or R - timer elapsed > 200 ms - no malfunction in input speed signal - no malfunction in output speed signal ADDITIONAL ENABLE CONDITIONS FOR GEARSHIFTS: - output speed gradient > CC Ratio XYZ xy rpm ADDITIONAL ENABLE CONDITIONS FOR ENGAGING GEARS: - input speed gradient > 5,000 rpm - throttle > 5.09803921568628 %	3 times 30 ms - continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2702	Transmission Friction Element "C" Apply Time Range/Performance	rationality check	ratio detected is outside of defined limits. fault code for up to 3 corresponding clutches may be set. additional rationality checks using a substitute gear (s) is initiated. Depending on the behavior in the substitute gear(s). an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem.		GENERAL ENABLE CONDITIONS: - oil-temperature > 0° C - engine speed > 400 rpm or if engine speed < threshold. output speed > 2,500 rpm - input speed > 0 rpm - transmission lever position D or R - timer elapsed > 200 ms - no malfunction in input speed signal - no malfunction in output speed signal ADDITIONAL ENABLE CONDITIONS FOR GEARSHIFTS: - output speed gradient > CC Ratio XYZ xy rpm ADDITIONAL ENABLE CONDITIONS FOR ENGAGING GEARS: - input speed gradient > 5,000 rpm - throttle > 5.09803921568628 %	3 times 30 ms - continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2703	Transmission Friction Element "D" Apply Time Range/Performance	rationality check	ratio detected is outside of defined limits. fault code for up to 3 corresponding clutches may be set. additional rationality checks using a substitute gear(s) is initiated. Depending on the behavior in the substitute gear(s) an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem.		GENERAL ENABLE CONDITIONS: - oil-temperature > 0° C - engine speed > 400 rpm or if engine speed < threshold. output speed > 2,500 rpm - input speed > 0 rpm - transmission lever position D or R - timer elapsed > 200 ms - no malfunction in input speed signal - no malfunction in output speed signal ADDITIONAL ENABLE CONDITIONS FOR GEARSHIFTS: - output speed gradient > CC Ratio XYZ xy rpm ADDITIONAL ENABLE CONDITIONS FOR ENGAGING GEARS: - input speed gradient > 5,000 rpm - throttle > 5.09803921568628 %	3 times 30 ms - continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2704	Transmission Friction Element "E" Apply Time Range/Performance	rationality check	ratio detected is outside of defined limits. fault code for up to 3 corresponding clutches may be set. additional rationality checks using a substitute gear(s) is initiated. Depending on the behavior in the substitute gear(s). an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem.		GENERAL ENABLE CONDITIONS: - oil-temperature > 0° C - engine speed > 400 rpm or if engine speed < threshold. output speed > 2,500 rpm - input speed > 0 rpm - transmission lever position D or R - timer elapsed > 200 ms - no malfunction in input speed signal - no malfunction in output speed signal ADDITIONAL ENABLE CONDITIONS FOR GEARSHIFTS: - output speed gradient > CC Ratio XYZ xy rpm ADDITIONAL ENABLE CONDITIONS FOR ENGAGING GEARS: - input speed gradient > 5,000 rpm - throttle > 5.09803921568628 %	3 times 30 ms - continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P270 F	Transmission Friction Element "F" Temperature Too High	- Ensure if clutch slip remains in between predetermined limits - observe the calculated clutch temperature	"clutch slip" - calculated clutch temperature	> CC Th DetectOverSlip C0 rpm > CC Th DetectOverTemp C0 °C	- No failure detected in combustion engine speed and electric motor speed signals via CAN = True - Target clutch pressure >1.5 bar - Actual combustion engine torque <450 Nm	5000 + 500 ms	2 DCY
P2714	Pressure Control Solenoid "D" Performance/ Stuck Off	- short to ground - short to ground or open pin	- ASIC (SPI register) faulty - feedback (PWM) 100%		- power supply activated - power supply voltage >= 6.5 V and < 19.2 V .	continuous	2 DCY
P2715	Pressure Control Solenoid "D" Stuck On	short to battery	- ASIC (SPI register) faulty - feedback (PWM) 0%		- power supply activated - power supply voltage >= 6.5 V and < 19.2 V .	continuous	2 DCY
P2716	Pressure Control Solenoid "D" Electrical	- static bypass to ground - dynamic bypass to ground	ASIC (SPI register) faulty		- power supply activated - power supply voltage >= 6.5 V and < 19.2 V .	continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		current too low	- SW (calculation) feedback PWM - no shifting: - measured current $\leq 0.85 - 0.12$ A - during shifting: - measured current $\leq$ calculated limits. depending on incoming current gradient mA				
		current too high	- SW (calculation) feedback PWM - no shifting: - measured current $\geq 0.5 + 0.17$ A - during shifting: - measured current $\geq$ calculated limits. depending on incoming current gradient mA				

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		SPI communication monitoring	- checkbyte of message wrong - read back of sended message failed - PWM feedback period > sync-period + 20 μs or < sync-period - 20 μs				
P2717	Pressure Control Solenoid "D" Intermittent	open circuit	ASIC (SPI register) faulty		- power supply activated - power supply voltage $\geq$ 6.5 V and < 19.2 V .	continuous	2 DCY
P2723	Pressure Control Solenoid "E" Performance/ Stuck Off	- short to ground - short to ground or open pin	- ASIC (SPI register) faulty - feedback (PWM) 100%		- power supply activated - power supply voltage $\geq$ 6.5 V and < 19.2 V .	continuous	2 DCY
P2724	Pressure Control Solenoid "E" Stuck On	short to battery	- ASIC (SPI register) faulty - feedback (PWM) 0%		- power supply activated - power supply voltage $\geq$ 6.5 V and < 19.2 V .	continuous	2 DCY
P2725	Pressure Control Solenoid "E" Electrical	- static bypass to ground - dynamic bypass to ground	ASIC (SPI register) faulty		- power supply activated - power supply voltage $\geq$ 6.5 V and < 19.2 V .	continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		current too low	- SW (calculation) feedback PWM - no shifting: - measured current $\leq 0.85 - 0.12$ A - during shifting: - measured current $\leq$ calculated limits. depending on incoming current gradient mA				
		current too high	- SW (calculation) feedback PWM - no shifting: - measured current $\geq 0.5 + 0.17$ A - during shifting: - measured current $\geq$ calculated limits. depending on incoming current gradient mA				

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		SPI communication monitoring	- checkbyte of message wrong - read back of sended message failed - PWM feedback period > sync-period + 20 µs or < sync-period - 20 µs				
P2726	Pressure Control Solenoid "E" Intermittent	open circuit	ASIC (SPI register) faulty		- power supply activated - power supply voltage >= 6.5 V and < 19.2 V .	continuous	2 DCY
P2732	Pressure Control Solenoid "F" Performance/ Stuck Off	- short to ground - short to ground or open pin	- ASIC (SPI register) faulty - feedback (PWM) 100%		- power supply activated - power supply voltage >= 6.5 V and < 19.2 V .	continuous	2 DCY
P2733	Pressure Control Solenoid "F" Stuck On	short to battery	- ASIC (SPI register) faulty - feedback (PWM) 0%		- power supply activated - power supply voltage >= 6.5 V and < 19.2 V .	continuous	2 DCY
P2734	Pressure Control Solenoid "F" Electrical	- static bypass to ground - dynamic bypass to ground	ASIC (SPI register) faulty		- power supply activated - power supply voltage >= 6.5 V and < 19.2 V .	continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		current too low	- SW (calculation) feedback PWM - no shifting: - measured current $\leq 0.85 - 0.12$ A - during shifting: - measured current $\leq$ calculated limits. depending on incoming current gradient mA				
		current too high	- SW (calculation) feedback PWM - no shifting: - measured current $\geq 0.5 + 0.17$ A - during shifting: - measured current $\geq$ calculated limits. depending on incoming current gradient mA				

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		SPI communication monitoring	- checkbyte of message wrong - read back of send message failed - PWM feedback period > sync-period + 20 µs or < sync-period - 20 µs				
P2735	Pressure Control Solenoid "F" Intermittent	open circuit	ASIC (SPI register) faulty		- power supply activated - power supply voltage ≥ 6.5 V and < 19.2 V	continuous	2 DCY
P2753	Transmission Fluid Cooler Control Circuit/ Open	open pin	- PWM output duty cycle range 5 -95 % - measured voltage in duty phase - and in no duty phase - PWM output duty cycle range 0 - 5 % - measured voltage in no duty phase	≤ 2.4 V > 2.4 V < 4 V ≤ 4 V	- power supply activated - power supply voltage ≥ 6.5 V and ≤ 23.5; 18.69; 23.5; 18.69; 18.69 V	continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		short to ground or open pin	ASIC. (SPI register)	faulty	- power supply activated - PWM output duty cycle range 100% - solenoid supply voltage ≥ 6.5 V and ≤ 23.5; 18.69 23.5; 18.69; 18.69 V		
P2754	Transmission Fluid Cooler Control Circuit Low	short to ground	- feedback (PWM) - measured voltage no duty phase	≤ 2.4 V	- power supply activated - PWM output duty cycle range 0 - 95 % - solenoid supply voltage ≥ 6.5 V and ≤ 23.5 18.69 V	10 ms - continuous	2 DCY
		short to ground or open pin	- ASIC. feedback (PWM) - status information of feedback signal = 0 OR = 1 OR = 2		- power supply activated - PWM output duty cycle range 100% - solenoid supply voltage ≥ 6.5 V and ≤ 23.5, 18.69 V		
		dynamic bypass to ground	- ASIC. hardware detection - measured voltage in duty / no duty phase ≤ 2.4 V AND - in no duty phase ≥ 4 V AND - in no duty phase - 2 V		- power supply activated - PWM output duty cycle range 5 – 95% - solenoid supply voltage ≥ 6.5 V and ≤ 23.5, 18.69 V		

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2755	Transmission Fluid Cooler Control Circuit High	short to battery	measured voltage from feedback (PWM) in duty phase	$\geq 3.5 \text{ V}$	- power supply activated - PWM output duty cycle range 5 - 100 % - power supply voltage $\leq 6.5 \text{ V}$ and ≤ 23.5; 18.69; 23.5; 18.69; 18.69 V16V	continuous	2 DCY
P2808	Pressure Control Solenoid "G" Performance/ Stuck Off	short to ground or open pin	ASIC (SPI register) faulty		- power supply activated - power supply voltage $\geq 6.5 \text{ V}$ and $< 19.2 \text{ V}$.	continuous	2 DCY
P2812	Pressure Control Solenoid "G" Control Circuit/Open	open circuit	ASIC (SPI register) faulty		- power supply activated - power supply voltage $\geq 6.5 \text{ V}$ and $< 19.2 \text{ V}$.	continuous	2 DCY
P2813	Pressure Control Solenoid "G" Control Circuit Range/ Performance	- static bypass to ground - dynamic bypass to ground	ASIC (SPI register) faulty		- power supply activated - power supply voltage $\geq 6.5 \text{ V}$ and $< 19.2 \text{ V}$.	continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		current too low	- SW (calculation) feedback PWM - no shifting: - measured current $\leq 0.85 - 0.12$ A - during shifting: - measured current $\leq$ calculated limits. depending on incoming current gradient mA				
		current too high	- SW (calculation) feedback PWM - no shifting: - measured current $\geq 0.5 + 0.17$ A - during shifting: - measured current $\geq$ calculated limits. depending on incoming current gradient mA				

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		SPI communication monitoring	- checkbyte of message wrong - read back of sended message failed - PWM feedback period > sync-period + 20 µs or < sync-period - 20 µs				
P2814	Pressure Control Solenoid "G" Control Circuit Low	short to ground	- ASIC (SPI register) faulty - feedback (PWM) 100%		- power supply activated - power supply voltage ≥ 6.5 V and < 19.2 V	continuous	2 DCY
P2815	Pressure Control Solenoid "G" Control Circuit High	short to battery	- ASIC (SPI register) faulty - feedback (PWM) 0%		- power supply activated - power supply voltage ≥ 6.5 V and < 19.2 V	continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2873	Clutch "B" Pressure Engagement Too High	signal check	- gearbox output shaft acceleration > CC Th DetectClosure acc OR - check for engine load CD EngStall > CC Th DetectClosure eng		- position D or R - gear 1 – 5 R - no gear change running - no other error detected on drive clutch - no Ratio monitoring error - throttle <= CC Throttle - break pressure > CC BreakP - gerbox output rev < CC OutShaft-Speed C - demand clutch torque <= CC MaxTrq C - delay timer 'survey active' > CC ActDelay	continuous	2 DCY
U0001	High Speed CAN Communication Bus	rationality check	CAN Bus state off			continuous	2 DCY
U0002	High Speed CAN Communication Bus Performance	timeout	timeout for all received messages on A-CAN		- battery voltage > 9 V AND - battery voltage < 17 V	continuous	2 DCY
U0028	Vehicle Communication Bus A	rationality check	CAN Bus state off			continuous	2 DCY
U0029	Vehicle Communication Bus A Performance	timeout	timeout for all received messages on H-CAN		- battery voltage > 9 V AND - battery voltage < 17 V	continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
U0100	Lost Communication With ECM/PCM "A"	timeout	message specific time expired		- no fault detected on CAN Bus AND - battery voltage > 9 V AND - battery voltage < 17 V	continuous	immediate
U0110	Lost Communication With Drive Motor Control Module "A"	timeout	message specific time expired		- no fault detected on CAN Bus AND - battery voltage > 9 V AND - battery voltage < 17 V	continuous	immediate
U0401	Invalid Data Received From ECM/PCM "A"	- signal check - signal activity check - data field check	- checksum false - alive counter doesn't count - data length code false		- no fault detected on CAN Bus AND - battery voltage > 9 V AND - battery voltage < 17 V	continuous	immediate
U0411	Invalid Data Received From Drive Motor Control Module "A"	- signal check - signal activity check - data field check	- checksum false - alive counter doesn't count - data length code false		- no fault detected on CAN Bus AND - battery voltage > 9 V AND - battery voltage < 17 V	continuous	immediate
U10E7	Manufacturer Controlled DTC Engine control module on hybrid CAN No communication	timeout	message specific time expired		- no fault detected on CAN Bus AND - battery voltage > 9 V AND - battery voltage < 17 V	continuous	immediate

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
U10E8	Manufacturer Controlled DTC Engine control module on hybrid CAN Implausible signal	- signal check - signal activity check - data field check	- checksum false - alive counter doesn't count - data length code false		- no fault detected on CAN Bus AND - battery voltage > 9 V AND - battery voltage < 17 V	continuous	immediate

3.5.2 Transmission Control Module , 8 Spd (2017 MY)

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0603	Internal Control Module Keep Alive Memory (KAM) Error	The diagnostic is monitoring EEPROM check sums and hardware failures of the Flash Control Unit	- Number of sector groups with valid checksum - Or - Read or write operation not possible (Flash Control Unit defective)	< 2 - Or = True	An EEPROM read or write operation has occurred = true	< 1.0 s	Immediate
P0605	Internal Control Module Read Only Memory (ROM) Error	A checksum is calculated for each memory block and compared with a stored reference checksum	Calculated checksum unequal to reference checksum	= True	TCM is in power-on state = true	< 30.0 s	2 DCY
P060A	Internal Control Module Monitoring Processor Performance	Output Safety System Functional check	Inhibit path test of safety relevant power supplies during initialization failed			Continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Monitoring of the DN reset line failed				
		Peripheral Clock Plausibility Check	- Hardware doesn't report any error although the peripheral clock is switched off - Or - Peripheral is switched on - And - There are hardware error reports for at least two cycles		- Peripheral clock active on - And - Delay time passed		
		Program Flow Control Plausibility Check	Failure in program flow control				
		Program Flow Control Software Check	SW - or configuration fault in WDOG SW-Modul				
		Watchdog Monitoring Plausibility Check	An ASIC status failure has been detected				
		A monitored module status failure has been detected					
P060 B	Internal Control Module A/D Processing Performance	Core Monitoring (Microcontroller) ADC Monitoring	Measured ADC signals	Inconsistent to configured voltage limits or other hardware signals		Continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- Core Monitoring (Microcontroller) SPI Monitoring - Core Monitoring (Microcontroller) RAM ECC monitoring, RAM ECC Interrupt Monitoring, ROM ECC Monitoring - Core Monitoring (Microcontroller) CPU Configuration Register Monitoring	- SPI - ECC test - Content of registers	- Communication error - Failed - Inconsistent to the requested values			
P0613	TCM Processor	- Core Monitoring (Microcontroller) Plausibility Check - Pressure Regulator Short To Battery - Pressure Regulator Open Pin - Pressure Regulator Short To Ground - Pressure Regulator Short To Ground Or Open Pin	- Two signals representing the same value but calculated in two different ways are - ASIC (SPI register) - Feedback (PWM) - ASIC (SPI register) - ASIC (SPI register) - Feedback (PWM)	- Unequal - Faulty 0% - Faulty - Faulty 100%	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V	Continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- Pressure Regulator Static Bypass To Ground - Pressure Regulator Dynamic Bypass To Ground	ASIC (SPI register)	Faulty			
		- Pressure Regulator Current Too Low - Pressure Regulator Current Too High	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	$\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - And $< 19.2 \text{ V}$		
		- Pressure Regulator SPI Communication Monitoring - Pressure Regulator PWM Frequency	- Check byte of message wrong - Read back of sent message failed - PWM feedback period	$> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$		
		CAN Bus 1 Feedback Signal Monitoring (Positive Torque Request) Signal Check	Signal read back from the CAN Bus is unequal to the send out signal		No failure detected on CAN Bus		

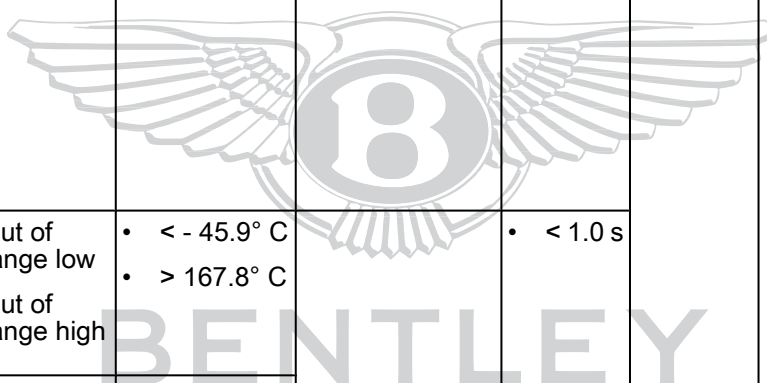
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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0667	Control Module Internal Temperature Sensor "A" Range/Performance	Temperature Signal With Only One Defective Sensor, The Transmission Uses One Of The Remaining Sensor Signals As Substitute Value And Is Therefore Fully Functional (No MIL Illumination And Fault Code Storage). The Monitoring Of The 3 Sensors Is Described Below. If At Least One Of The Described Monitoring Strategies For Each Sensor Detects A Malfunction, The Respective Sensor Is Considered Defective. If More Than One Temperature Sensor Is Defect A Fault Is Stored And The MIL Is Illuminated.	Number of defective temperature sensor signals	> 1		< 300.0 s	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Transmission Oil Temperature Sensor Circuit Continuity	- Voltage at sensor plus pin (U pin hi) - Voltage at sensor plus pin (U pin hi) - Voltage at sensor minus pin (U pin lo) - Voltage at sensor minus pin (U pin lo) - Difference voltage at sensor pins (U sensor) - Difference voltage at sensor pins (U sensor) - Resistor ratio (U supply - U sensor) / U pin lo - Resistor ratio (U supply - U sensor) / U pin lo	> 4.7 V < 0.508 V > 0.423 V < 0.005 V > 4.512 V < 0.135 V > 15.5 < 10.0		< 1.0 s	
		Transmission Oil Temperature Sensor Rationality Check	- Transmission oil temperature delta between 2 measurements > 20° C - In thermodynamic stable conditions: - Absolute differences between:	> 20° C > 15° C	- No failure detected in other oil temperature sensor monitors - No failure detected in other oil temperature sensor monitors - No failure detected in Input speed signal and engine speed signal	< 1.0 s 300.0 s	

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Oil temperature value and chip 1 temperature value and oil temperature value and chip 2 temperature value	> 30° C	- Engine speed or input speed > 400 RPM - And >= 300.0 s		
		Chip 1 Temperature Sensor Signal Range Check	- Out of range low - Out of range high	< - 45.9° C > 167.8° C		< 1.0 s	
		Chip 1 Temperature Sensor ASIC Monitoring	Plausibility to internal comparator outputs violated				



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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Chip 1 Temperature Sensor Rationality Check	- Absolute differences between Chip 1 and Chip 2 temperature value - And - In thermodynamic stable conditions: - Absolute differences between: - Oil temperature value and chip 1 temperature value - In thermodynamic instable conditions: - Absolute differences between: - Oil temperature value and chip 1 temperature value	> 10° C > 15° C > 30° C	- No failure detected in other chip temperature sensor monitors - No failure detected in input speed signal and engine speed signal - Engine speed or input speed > 400 RPM - And >= 300.0 s	300.0 s	
		Chip 2 Temperature Sensor Signal Range Check	- Out of range low - Out of range high	< - 45.9° C > 192° C		< 1.0 s	
		Chip 2 Temperature Sensor ASIC Monitoring	Time out during initialization				

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Chip 2 Temperature Sensor Rationality Check	- Absolute differences between Chip 1 and Chip 2 temperature value - And - In thermodynamic stable conditions: - Absolute differences between: - Oil temperature value and chip 2 temperature value - In thermodynamic instable conditions: - Absolute differences between: - Oil temperature value and chip 2 temperature value	> 10° C > 15° C > 30° C	- No failure detected in other chip temperature sensor monitors - No failure detected in input speed signal and engine speed signal - Engine speed or input speed > 400 RPM - And >= 300.0 s	300.0 s	
P0715	Input/Turbine Shaft Speed Sensor "A" Circuit	Input Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Open circuit or short circuit to ground	No failure detected in sensor voltage supply	200.0 ms	2 DCY
P0716	Input/Turbine Shaft Speed Sensor "A" Circuit Range/Performance	Speed Signals Rationality Check	More than one of the following speed signals is defect	- Input speed, output speed - Or wheel speed	- No failure detected in sensor voltage supply - Engine speed > 430 RPM - No failure detected in engine speed CAN message	300.0 ms	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Input speed sensor and engine speed signal are faulty	Input speed and engine speed CAN message	No failure detected in sensor voltage supply		
			Absolute difference between output speed and output speed calculated from wheel speed	> 350 RPM	- No failure detected in sensor voltage supply - Transmission status no power flow or during shifting - Engine speed > 430 RPM - No failure detected in engine speed CAN message		
		Input Speed Sensor Rationality Check	Implausible negative gradient in fixed gear	> 500 RPM	No failure detected in sensor voltage supply		
			- Difference to output speed calculated from wheel speed - And difference to output speed	> 250 RPM > 250 RPM	- No failure detected in sensor voltage supply, wheel speed signal, output speed signal - And electrical output speed sensor monitoring		
P0720	Output Shaft Speed Sensor Circuit	Output Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Open circuit or short to ground	No failure detected in sensor voltage supply	Continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0721	Output Shaft Speed Sensor Circuit Range/Performance	Output Speed Sensor Rationality Check	- Difference to output speed calculated from wheel speed - And difference to output speed calculated from input speed	> 350 RPM > 250 RPM	- No failure detected in sensor voltage supply, wheel speed signal, input speed signal - And - No failure detected in electrical output speed sensor monitoring	Continuous	2 DCY
P0727	Engine Speed Input Circuit No Signal	CAN Message With Engine Speed Signal Check	Failure value received		- And no failure detected on CAN Bus - And battery voltage > 9.0 V	Continuous	2 DCY
P0730	Incorrect Gear Ratio	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B	General description:			3 times 30.0 ms - Continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or D	- The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:				

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or D	- Actual ratio - Or actual ratio	> CC_Ratio_THU < CC_Ratio_THL	- Fixed gear Engaged - And output Speed >= 50 RPM		
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or E					
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or D					
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or E	Output speed times gear ratio - input speed	> 320 RPM	- Fixed gear engaged - And output speed < 50 RPM		
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or C					
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C					

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or C - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or D or E	- Actual ratio - Or actual ratio	> Ratio at start of gear engagement + gage in CD_Ratio_OFTHLProgress < Gear X ratio And output CC_Ratio_THLSpced >= 50 CD_Ratio_OFTHLProgress	And ratio at start of gear engagement > gear X ratio		
				< Ratio at start of gear engagement + gage in CD_Ratio_OFTHLProgress > Gear X ratio And output CC_Ratio_THLSpced >= 50 CD_Ratio_OFTHLProgress	And ratio at start of gear engagement <= gear X ratio		

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or D					
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or D or E					
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or C or D	- Last input speed value - actual input speed - Or last input speed value - actual input speed	< 40 RPM > -40 RPM	- Gear engagement in progress - And time after start of gear engagement < 1.5 s - And output speed < 50 RPM		
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or D or E	(Time between measurements: 30.0 ms)				
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or D					
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or C					

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or C or D					

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or D					
P0741	Torque Converter Clutch Circuit Performance/ Stuck Off	Torque Converter Clutch Rationality Check	Absolute difference of actual slip and target slip	> CC ConvClutch MAX OFF XD RPM	- Torque converter clutch closed or closed loop control - Engine torque < 1,000 Nm - TCC-pressure > 3 bar	20,000 ms - Continuous	2 DCY
P0746	Pressure Control Solenoid "A" Performance/ Stuck Off	- Out 0 Short To Ground - Out 0 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100%	- Power supply activated - Power supply voltage >= 6.5 V - And < 19.2 V	Continuous	2 DCY
P0747	Pressure Control Solenoid "A" Stuck On	Out 0 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0%	- Power supply activated - Power supply voltage >= 6.5 V - And < 19.2 V	Continuous	2 DCY
P0748	Pressure Control Solenoid "A" Electrical	- Out 0 Static Bypass To Ground - Out 0 Dynamic Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V - And < 19.2 V	Continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 0 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	$\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on incoming current gradient	- Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - And $< 19.2 \text{ V}$		
		Out 0 Current Too High	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	$\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient			
		Out 0 SPI Communication Monitoring PWM Frequency	- Checksum of message wrong - Read back of sent message failed - PWM feedback period	$> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$		
P0749	Pressure Control Solenoid "A" Intermittent	Out 0 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$	Continuous	2 DCY
P0750	Shift Solenoid "A"	- Out 7 Static Bypass To Ground - Out 7 Dynamic Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$	Continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		• Out 7 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	$\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on incoming current gradient	- Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - And $< 19.2 \text{ V}$		
		• Out 7 Current Too High	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	$\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient			
		• Out 7 SPI Communication Monitoring	- Checksum of message wrong - Read back of sent message failed - PWM feedback period	$> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$		
P0751	Shift Solenoid "A" Performance/ Stuck Off	- Out 7 Short To Ground - Out 7 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$	• Continuous	• 2 DCY
P0752	Shift Solenoid "A" Stuck On	• Out 7 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$	• Continuous	• 2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0754	Shift Solenoid "A" Intermit-tent	• Out 7 Open Circuit	• ASIC (SPI register)	• Faulty	• Power supply activated • Power supply voltage ≥ 6.5 V • And < 19.2 V	• Continuous	• 2 DCY
P0776	Pressure Control Solenoid "B" Performance/ Stuck Off	• Out 2 Short To Ground	• ASIC (SPI register)	• Faulty • 100%	• Power supply activated • Power supply voltage ≥ 6.5 V • And < 19.2 V	• Continuous	• 2 DCY
		• Out 2 Short To Ground Or Open Pin	• Feedback (PWM)				
P0777	Pressure Control Solenoid "B" Stuck On	• Out 2 Short To Battery	• ASIC (SPI register) • Feedback (PWM)	• Faulty • 0%	• Power supply activated • Power supply voltage ≥ 6.5 V • And < 19.2 V	• Continuous	• 2 DCY
P0778	Pressure Control Solenoid "B" Electrical	• Out 2 Static Bypass To Ground	• ASIC (SPI register)	• Faulty	• Power supply activated • Power supply voltage ≥ 6.5 V • And < 19.2 V	• Continuous	• 2 DCY
		• Out 2 Dynamic Bypass To Ground					
		• Out 2 Current Too Low	• SW (calculation) feedback PWM • No shifting: • Measured current • During shifting: • Measured current	• $\leq 850.0 - 120.0$ mA • $\leq$ Calculated limits, depending on incoming current gradient	• Power supply activated • Power supply voltage ≥ 8.4 V • And < 19.2 V		

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- Out 2 Current Too High - Out 2 SPI Communication Monitoring	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current - Checksum of message wrong - Read back of sent message failed - PWM feedback period	$\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient $> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$		
P0779	Pressure Control Solenoid "B" Intermittent	Out 2 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$	Continuous	2 DCY
P077C	Output Shaft Speed Sensor Circuit Low	Output Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Short circuit to battery voltage	No failure detected in sensor voltage supply	Continuous	2 DCY
P0780	Shift Error	- During Gear Change (Shifting) From Gear: 1 - During Gear Change (Shifting) From Gear: 2	General description:			3 times 30.0 ms - Continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		During Gear Change (Shifting) From Gear: 3	While shifting from gear X to gear Y the ratio also has to stay in defined bounds. While shifting it is not possible to relate the reason of the malfunction to specific clutches. If one of the following malfunction criteria is detected, a fault code is stored, that corresponds to the starting gear of the shifting.				
		During Gear Change (Shifting) From Gear: 4					
		During Gear Change (Shifting) From Gear: 5	- Actual ratio - Or actual ratio	> Gear X ratio - Shifting from Gear X to Gear Y in progress X < Y < Gear Y ratio (Upshift) CC_Ratio_THLO_y - CC_Ratio_OFTHLO_y AND output speed >= 50 RPM			
		During Gear Change (Shifting) From Gear: 6					
		During Gear Change (Shifting) From Gear: 7					
		During Gear Change (Shifting) From Gear: 8					
P0796	Pressure Control Solenoid "C" Per-	Out 4 Short To Ground	ASIC (SPI register)	- Faulty 100%	Power supply activated	Continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
	for- mance/ Stuck Off	Out 4 Short To Ground Or Open Pin	Feedback (PWM)		- Power supply voltage ≥ 6.5 V - And < 19.2 V		
P0797	Pressure Control Solenoid "C" Stuck On	Out 4 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V	Continuous	2 DCY
P0798	Pressure Control Solenoid "C" Electrical	- Out 4 Static Bypass To Ground - Out 4 Dynamic Bypass To Ground - Out 4 Current Too Low - Out 4 Current Too High	- ASIC (SPI register) - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	- Faulty $\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on incoming current gradient $\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V - Power supply activated - Power supply voltage ≥ 8.4 V - And < 19.2 V	Continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 4 SPI Communication Monitoring	- Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	> Sync-period + 20 µs < Sync-period - 20 µs	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V		
P0799	Pressure Control Solenoid "C" Intermittent	Out 4 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V	Continuous	2 DCY
P07BF	Input/Turbine Shaft Speed Sensor "A" Circuit Low	Input Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Short circuit to battery voltage	No failure detected in sensor voltage supply	100.0 ms	2 DCY
P2637	Torque Management Feedback Signal "A"	CAN Message With Engine Torque Signal Check	Failure value received		- No failure detected on CAN Bus - And battery voltage > 9.0 V	Continuous	2 DCY

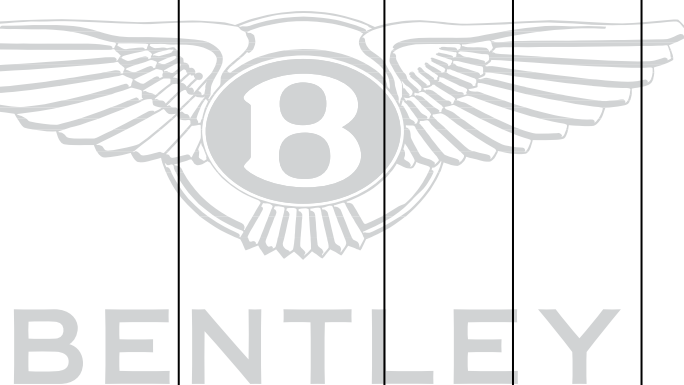
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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2700	Transmission Friction Element "A" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 times 30.0 ms - Continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

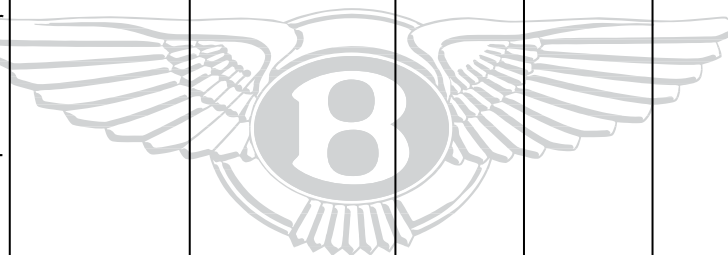


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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2701	Transmission Friction Element "B" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 times 30.0 ms - Continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				



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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2702	Transmission Friction Element "C" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 times 30.0 ms - Continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear). ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2703	Transmission Friction Element "D" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: D	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 times 30.0 ms - Continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2704	Transmission Friction Element "E" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: E	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 times 30.0 ms - Continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				
P2714	Pressure Control Solenoid "D" Perform-	Out 1 Short to ground	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100%	Power supply activated	Continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
	mance/ Stuck Off	Out 1 Short to ground or open pin			- Power supply voltage ≥ 6.5 V - And < 19.2 V		
P2715	Pressure Control Solenoid "D" Stuck On	Out 1 Short to battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V	Continuous	2 DCY
P2716	Pressure Control Solenoid "D" Electrical	- Out 1 Static Bypass To Ground - Out 1 Dynamic Bypass To Ground - Out 1 Current Too Low - Out 1 Current Too High	- ASIC (SPI register) - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	- Faulty $\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on incoming current gradient $\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V - Power supply activated - Power supply voltage ≥ 8.4 V - And < 19.2 V	Continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 1 SPI Communication Monitoring	- Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	> Sync-period + 20 μs < Sync-period - 20 μs	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V		
P2717	Pressure Control Solenoid "D" Intermittent	Out 1 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V	Continuous	2 DCY
P2723	Pressure Control Solenoid "E" Performance/ Stuck Off	- Out 3 Short To Ground - Out 3 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100%	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V	Continuous	2 DCY
P2724	Pressure Control Solenoid "E" Stuck On	Out 3 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V	Continuous	2 DCY
P2725	Pressure Control Solenoid "E" Electrical	- Out 3 Static Bypass To Ground - Out 3 Dynamic Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V	Continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 3 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	$\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - And $< 19.2 \text{ V}$		
		Out 3 Current Too High	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	$\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient			
		Out 3 SPI Communication Monitoring	- Checksum of message wrong - Read back of sent message failed - PWM feedback period	$> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$		
P2726	Pressure Control Solenoid "E" Inter-mittent	Out 3 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$	Continuous	2 DCY
P2732	Pressure Control Solenoid "F" Performance/ Stuck Off	- Out 5 Short To Ground - Out 5 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$	Continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2733	Pressure Control Solenoid "F" Stuck On	Out 5 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V	Continuous	2 DCY
P2734	Pressure Control Solenoid "F" Electrical	- Out 5 Static Bypass To Ground - Out 5 Dynamic Bypass To Ground - Out 5 Current Too Low - Out 5 Current Too High - Out 5 SPI Communication Monitoring	- ASIC (SPI register) - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current - Checksum of message wrong - Read back of sent message failed - PWM feedback period	- Faulty $\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient $> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V - Power supply activated - Power supply voltage ≥ 8.4 V - And < 19.2 V - Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V	Continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2735	Pressure Control Solenoid "F" Intermittent	Out 5 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And < 19.2 V	Continuous	2 DCY
P2753	Transmission Fluid Cooler Control Circuit/Open	Solenoid Regulator Open Pin	- PWM output duty cycle range 5 – 95% - Measured voltage in duty phase - And in no duty phase - PWM output duty cycle range 0 – 5% - Measured voltage in no duty phase	≤ 2.4 V > 2.4 V < 4.0 V ≤ 4.0 V	- Power supply activated - Power supply voltage ≥ 6.5 V $\leq \begin{matrix} \square \\ \square \end{matrix} 23.5; 18.69; 23.5; 18.69; 18.69$ V	Continuous	2 DCY
		Solenoid Regulator Short To Ground Or Open Pin	ASIC (SPI register)	Faulty	- Power supply activated - PWM output duty cycle range 100% - Power supply voltage ≥ 6.5 V $\leq \begin{matrix} \square \\ \square \end{matrix} 23.5; 18.69; 23.5; 18.69; 18.69$ V		
P2754	Transmission Fluid Cooler Control Circuit Low	Solenoid Regulator Short To Ground	- Feedback (PWM) - Measured voltage in no duty phase	≤ 2.4 V	- Power supply activated - PWM output duty cycle range 0 – 95% - Power supply voltage ≥ 6.5 V $\leq \begin{matrix} \square \\ \square \end{matrix} 23.5; 18.69; 23.5; 18.69; 18.69$ V	Continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2755	Transmission Fluid Cooler Control Circuit High	Solenoid Regulator Short To Battery	Measured voltage from feedback (PWM) in duty phase	$\geq 3.5 \text{ V}$	- Power supply activated - PWM output duty cycle range 5 – 100% - Power supply voltage $\geq 6.5 \text{ V}$ - And $\leq 23.5; 18.69; 23.5; 18.69; 18.69 \text{ V}$	Continuous	2 DCY
P2808	Pressure Control Solenoid "G" Performance/ Stuck Off	Out 6 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$	Continuous	2 DCY
P2812	Pressure Control Solenoid "G" Control Circuit/Open	Out 6 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$	Continuous	2 DCY
P2813	Pressure Control Solenoid "G" Control Circuit Range/ Performance	- Out 6 Static Bypass To Ground - Out 6 Dynamic Bypass To Ground - Out 6 Current Too Low	- ASIC (SPI register) - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	- Faulty $\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$ - Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - And $< 19.2 \text{ V}$	Continuous	2 DCY

AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 6 Current Too High	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	$\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient			
		Out 6 SPI Communication Monitoring	- Checksum of message wrong - Read back of sent message failed - PWM feedback period	$> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$		
P2814	Pressure Control Solenoid "G" Control Circuit Low	Out 6 Short To Ground	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$	Continuous	2 DCY
P2815	Pressure Control Solenoid "G" Control Circuit High	Out 6 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And $< 19.2 \text{ V}$	Continuous	2 DCY
U0001	High Speed CAN Communication Bus	CAN Bus Rationality Check	CAN Bus state	Off		Continuous	2 DCY
U0002	High Speed CAN Communication Bus Performance	CAN Bus Time Out	Time out for all received messages on A-CAN		- Battery voltage $> 9.0 \text{ V}$ - And - Battery voltage $< 17.0 \text{ V}$	Continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
U0100	Lost Communication With ECM/PCM "A"	CAN Message From DME Time Out (Only Activated For IDs: 80, 81, 105, 30E, 640, 641)	Message specific time	Expired	- No fault detected on CAN Bus - And - Battery voltage > 9.0 V - And - Battery voltage < 17.0 V	Continuous	2 DCY
		CAN Message With OBD Signals Time-out (Only Activated For ID: 391)					Immediate
U0401	Invalid Data Received From ECM/PCM "A"	- CAN Message From DME Signal Check (Only Activated For IDs: 80, 81, 105, 30E, 640, 641) - CAN Message From DME Signal Activity Check (Only Activated For IDs: 80, 81, 105, 30E, 640, 641) - CAN Message From DME Data Field Check (Only Activated For IDs: 80, 81, 105, 30E, 640, 641)	- Checksum - Alive counter - Data length code	- False - Doesn't count - False	- No fault detected on CAN Bus - And - Battery voltage > 9.0 V - And - Battery voltage < 17.0 V	Continuous	2 DCY

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AL-951-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- CAN Message With OBD Signals Signal Check (Only Activated For ID: 391) - CAN Message With OBD Signals Signal Activity Check (Only Activated For ID: 391) - CAN Message With OBD Signals Data Field Check (Only Activated For ID: 391)					Immediate

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3.5.3 Transmission Control Module , 8 Spd (2018 MY)

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0603	Internal Control Module Keep Alive Memory (KAM) Error	EEPROM The diagnostic is monitoring EEPROM check sums and hardware failures of the flash control unit	- Number of sector groups with valid checksum - Or - Read or write operation not possible (flash control unit defective)	< 2.0 [-] - Or = True	An EEPROM read or write operation has occurred = true	< 1.0 s	Immediate
P0605	Internal Control Module Read Only Memory (ROM) Error	EPROM A checksum is calculated for each memory block and compared with a stored reference checksum	Calculated checksum unequal to reference checksum	= True	TCM is in power-on state = true	< 30.0 s	2 DCY

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P060 A	Internal Control Module Monitoring Processor Performance	• Output Safety System Functional Check	• Inhibit path test of safety relevant power supplies during init failed			• Continuous	• 2 DCY
			• Monitoring of the DN reset line failed				
		• Peripheral Clock Plausibility Check	• Hardware doesn't report any error although the peripheral clock is switched off		• Peripheral clock active on • And • Delay time passed		
			• Or				
			• Peripheral is switched on				
			• And				
			• There are hardware error reports for at least two cycles				
		• Program Flow Control Plausibility Check	• Failure in program flow control				
		• Program Flow Control Software Check	• SW - or configuration fault in WDOG SW-Modul				
		• Watchdog Monitoring Plausibility Check	• An ASIC status failure has been detected				
			• A monitored module status failure has been detected				

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P060 B	Internal Control Module A/D Processing Performance	• Core Monitoring (Microcontroller) ADC Monitoring	• Measured ADC signals	• Inconsistent to configured voltage limits or other hardware signals		• Continuous	• 2 DCY
		• Core Monitoring (Microcontroller) SPI Monitoring	• SPI	• Communication error			
		• Core Monitoring (Microcontroller) RAM ECC monitoring, RAM ECC Interrupt Monitoring, ROM ECC Monitoring	• ECC test	• Failed			
		• Core Monitoring (Microcontroller) CPU Configuration Register Monitoring	• Content of registers	• Inconsistent to the requested values			
P0613	TCM Processor	• Core Monitoring (Microcontroller) Plausibility Check	• Two signals representing the same value but calculated in two different ways are	• Unequal		• Continuous	• 2 DCY
		• CAN Bus 1 Feedback Signal Monitoring (Positive Torque Request) Signal Check	• Signal read back from the CAN Bus is unequal to the send out signal				

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0667	Control Module Internal Temperature Sensor "A" Range/Performance	Temperature Signal With Only One Defective Sensor, The Transmission Uses One Of The Remaining Sensor Signals As Substitute Value And Is Therefore Fully Functional (No MIL Illumination And Fault Code Storage). The Monitoring Of The 3 Sensors Is Described Below. If At Least One Of The Described Monitoring Strategies For Each Sensor Detects A Malfunction, The Respective Sensor Is Considered Defective. If More Than One Temperature Sensor Is Defect A Fault Is Stored And The MIL Is Illuminated.	Number of defective temperature sensor signals	> 1.0 [-]		< 300.0 s	2 DCY



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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Transmission Oil Temperature Sensor Circuit Continuity	- Voltage at sensor plus pin (U pin hi) - Voltage at sensor plus pin (U pin hi) - Voltage at sensor minus pin (U pin lo) - Voltage at sensor minus pin (U pin lo) - Difference voltage at sensor pins (U sensor) - Difference voltage at sensor pins (U sensor) - Resistor ratio (U supply - U sensor) / U pin lo - Resistor ratio (U supply - U sensor) / U pin lo	> 4.7 V < 0.508 V > 0.423 V < 0.005 V > 4.512 V < 0.135 V > 15.5 < 10.0		< 1.0 s	
		Transmission Oil Temperature Sensor Rationality Check	Transmission oil temperature delta between 2 measurements	> 20° C	No failure detected in other oil temperature sensor monitors	< 1.0 s	
			- In thermodynamic stable conditions: - Absolute differences between:	> 15° C	- No failure detected in other oil temperature sensor monitors - No failure detected in input speed signal and engine speed signal	300.0 s	

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Oil temperature value and chip 1 temperature value and oil temperature value and chip 2 temperature value	> 30° C	- Engine speed or input speed > 400 RPM - And >= 300.0 s		
		Chip 1 Temperature Sensor Signal Range Check	- Out of range low - Out of range high	< - 45.9° C > 167.8° C		< 1.0 s	
		Chip 1 Temperature Sensor ASIC Monitoring	Plausibility to internal comparator outputs violated				



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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Chip 1 Temperature Sensor Rationality Check	- Absolute differences between Chip 1 and Chip 2 temperature value - And - In thermodynamic stable conditions: - Absolute differences between: - Oil temperature value and chip 1 temperature value - In thermodynamic instable conditions: - Absolute differences between: - Oil temperature value and chip 1 temperature value	> 10° C > 15° C > 30° C	- No failure detected in other chip temperature sensor monitors - No failure detected in input speed signal and engine speed signal - Engine speed or input speed > 400 RPM - And >= 300.0 s	300.0 s	
		Chip 2 Temperature Sensor Signal Range Check	- Out of range low - Out of range high	< - 45.9° C > 192° C		< 1.0 s	
		Chip 2 Temperature Sensor ASIC Monitoring	Time out during init				

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AL-9521-8H OBLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Chip 2 Temperature Sensor Rationality Check	- Absolute differences between Chip 1 and Chip 2 temperature value - And - In thermodynamic stable conditions: - Absolute differences between: - Oil temperature value and chip 2 temperature value - In thermodynamic instable conditions: - Absolute differences between: - Oil temperature value and chip 2 temperature value	> 10° C > 15° C > 30° C	- No failure detected in other chip temperature sensor monitors - No failure detected in input speed signal and engine speed signal - Engine speed or input speed > 400 RPM - And >= 300.0 s	300.0 s	
P0715	Input/ Turbine Shaft Speed Sensor "A" Circuit	Input Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Open circuit or short circuit to ground	No failure detected in sensor voltage supply	200.0 ms	2 DCY
P0716	Input/ Turbine Shaft Speed Sensor "A" Circuit Range/ Performance	Speed Signals Rationality Check	More than one of the following speed signals is defect	- Input speed, output speed - Or - Wheel speed	- No failure detected in sensor voltage supply - Engine speed > 430 RPM - No failure detected in engine speed CAN message	300.0 ms	2 DCY

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Input speed sensor and engine speed signal are faulty	- Input speed - And - Engine speed CAN message	No failure detected in sensor voltage supply		
			Absolute difference between output speed and output speed calculated from wheel speed	> 350 RPM	- No failure detected in sensor voltage supply - Transmission status no power flow or during shifting - Engine speed > 430 RPM - No failure detected in engine speed CAN message		
			Input Speed Sensor Rationality Check	> 500 RPM	No failure detected in sensor voltage supply	500.0 ms	
			- Implausible negative gradient in fixed gear - Difference to output speed calculated from wheel speed - And difference to output speed	> 250 RPM > 250 RPM	- No failure detected in sensor voltage supply, wheel speed signal, output speed signal - And electrical output speed sensor monitoring		
P0720	Output Shaft Speed Sensor Circuit	Output Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Open circuit or short circuit to ground	No failure detected in sensor voltage supply	Continuous	2 DCY

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AL-9521-8H OBLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0721	Output Shaft Speed Sensor Circuit Range/Performance	Output Speed Sensor Rationality Check	- Difference to output speed calculated from wheel speed - And difference to output speed calculated from input speed	> 350 RPM > 250 RPM	- No failure detected in sensor voltage supply, wheel speed signal, input speed signal - And - No failure detected in electrical output speed sensor monitoring	Continuous	2 DCY
P0727	Engine Speed Input Circuit No Signal	CAN Message With Engine Speed Signal Check	Failure value received		- And no failure detected on CAN Bus - And battery voltage > 9.0 V	Continuous	2 DCY
P0730	Incorrect Gear Ratio	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B	General description:			3 times 30.0 ms - Continuous	2 DCY

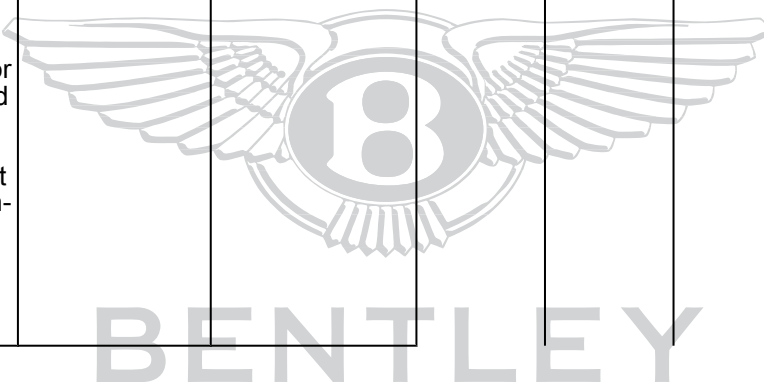
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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or D	- The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:				

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				



AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or D	- Actual ratio - Or - Actual ratio	> CC_Ratio_THUPengaged < CC_Ratio_THLOspeed >= 50 RPM	- Fixed gear engaged - And output speed >= 50 RPM		
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or C - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C	Output speed times gear ratio - input speed	> 320 RPM	- Fixed gear engaged - And output speed < 50 RPM		

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or E	- Actual ratio - Or actual ratio	> Ratio at start of gear engagement + gear engagement in CD_Ratio_OFTHProgress < Gear X ratio • - And output CC_Ratio_THLOS speed >= 50 CD_Ratio_OFTHRPMx - And ratio at start of gear engagement > gear X ratio			
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: D or E					
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or C					
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or E					
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or E					
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or D or E					

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or C or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or C	- Last input speed value - actual input speed - Or last input speed value - actual input speed (Time between measurements: 30.0 ms)	< 40 RPM > -40 RPM	- Gear engagement in progress - And time after start of gear engagement < 1.5 s - And output speed < 50 RPM		

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or C or D					

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or D					
P0741	Torque Converter Clutch Circuit Performance/ Stuck Off	Torque Converter Clutch Rationality Check	Absolute difference of actual slip and target slip	> CC Conv Clutch MAX OFF XD RPM	- Torque converter clutch closed or closed loop control - Engine torque < 1,000 Nm - TCC-pressure > 3 bar	20,000 ms - Continuous	2 DCY
P0746	Pressure Control Solenoid "A" Performance/ Stuck Off	- Out 0 Short To Ground - Out 0 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0747	Pressure Control Solenoid "A" Stuck On	Out 0 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0748	Pressure Control Solenoid "A"	Out 0 Static Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V	Continuous	2 DCY

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
	Electrical	• Out 0 Dynamic Bypass To Ground			• And • Power supply voltage < 19.2 V		
		• Out 0 Current Too Low	• SW (calculation) feedback PWM • No shifting: • Measured current	• <= 850.0 – 120.0 mA • <= Calculated limits, depending on incoming mA current gradient	• Power supply activated • Power supply voltage >= 8.4 V • And • Power supply voltage < 19.2 V		
		• Out 0 Current Too High	• During shifting: • Measured current	• >= 50.0 + 170.0 mA • >= Calculated limits, depending on mA incoming current gradient			
		• Out 0 SPI Communication Monitoring PWM Frequency	• Checkbyte of message wrong • Read back of sent message failed • PWM feedback period	• > Sync-period + 20 µs • < Sync-period - 20 µs	• Power supply activated • Power supply voltage >= 6.5 V • And • Power supply voltage < 19.2 V		
P0749	Pressure Control Solenoid "A" Intermittent	• Out 0 Open Circuit	• ASIC (SPI register)	• Faulty	• Power supply activated • Power supply voltage >= 6.5 V • And • Power supply voltage < 19.2 V	• Continuous	• 2 DCY
P0750	Shift Solenoid "A"	• Out 7 Static Bypass To Ground	• ASIC (SPI register)	• Faulty	• Power supply activated • Power supply voltage >= 6.5 V • And • Power supply voltage < 19.2 V	• Continuous	• 2 DCY

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 7 Dynamic Bypass To Ground					
		Out 7 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current	$\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - Power supply voltage $< 19.2 \text{ V}$		
		Out 7 Current Too High	- During shifting: - Measured current	$\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient			
		Out 7 SPI Communication Monitoring PWM Frequency	- Checksum of message wrong - Read back of sent message failed - PWM feedback period	$> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - Power supply voltage $< 19.2 \text{ V}$		
P0751	Shift Solenoid "A" Performance/Stuck Off	- Out 7 Short To Ground - Out 7 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0752	Shift Solenoid "A" Stuck On	Out 7 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0754	Shift Solenoid "A" Intermittent	Out 7 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0776	Pressure Control Solenoid "B" Performance/ Stuck Off	- Out 2 Short To Ground - Out 2 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0777	Pressure Control Solenoid "B" Stuck On	Out 2 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0778	Pressure Control Solenoid "B" Electrical	- Out 2 Static Bypass To Ground - Out 2 Dynamic Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 2 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	$\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$		
		Out 2 Current Too High	Measured current	$\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient			
		Out 2 SPI Communication Monitoring PWM Frequency	- Checksum of message wrong - Read back of sent message failed - PWM feedback period	$> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$		
P0779	Pressure Control Solenoid "B" Intermit-tent	Out 2 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY
P077C	Output Shaft Speed Sensor Circuit Low	Output Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Short circuit to battery voltage	No failure detected in sensor voltage supply	Continuous	2 DCY
P0780	Shift Error	During Gear Change (Shifting) From Gear: 1	General description:			3 * 30.0 ms - Continuous	2 DCY

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		During Gear Change (Shifting) From Gear: 2	While shifting from gear X to gear Y the ratio also has to stay in defined bounds. While shifting it is not possible to relate the reason of the malfunction to specific clutches. If one of the following malfunction criteria is detected, a fault code is stored, that corresponds to the starting gear of the shifting.				
		During Gear Change (Shifting) From Gear: 3					
		During Gear Change (Shifting) From Gear: 4					
		During Gear Change (Shifting) From Gear: 5	- Actual ratio - Or actual ratio	> Gear X ratio + Shifting from gear X to gear Y in progress X < Y (upshift) < gear Y ratio - (downshift)	And output speed >= 50 RPM		
		During Gear Change (Shifting) From Gear: 6					
		During Gear Change (Shifting) From Gear: 7					
		During Gear Change (Shifting) From Gear: 8					
P0796	Pressure Control Solenoid	Out 4 Short To Ground	ASIC (SPI register)	- Faulty 100.0%	Power supply activated	Continuous	2 DCY

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
	noid "C" Performance/Stuck Off	Out 4 Short To Ground Or Open Pin	Feedback (PWM)		- Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V		
P0797	Pressure Control Solenoid "C" Stuck On	Out 4 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0798	Pressure Control Solenoid "C" Electrical	Out 4 Static Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
		Out 4 Dynamic Bypass To Ground					
		Out 4 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current	$\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage ≥ 8.4 V - And - Power supply voltage < 19.2 V		
		Out 4 Current Too High	- During shifting: - Measured current	$\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient			

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 4 SPI Communication Monitoring PWM Frequency	- Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	> Sync-period + 20 μs < Sync-period - 20 μs	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V		
P0799	Pressure Control Solenoid "C" Intermit-tent	Out 4 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P07BF	Input/ Turbine Shaft Speed Sensor "A" Circuit Low	Input Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Short circuit to battery voltage	No failure detected in sensor voltage supply	100.0 ms	2 DCY
P2637	Torque Management Feedback Signal "A"	CAN Message With Engine Torque Signal Check	Failure value received		- No failure detected on CAN Bus - And battery voltage > 9.0 V	Continuous	2 DCY

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2700	Transmission Friction Element "A" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2701	Transmission Friction Element "B" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2702	Transmission Friction Element "C" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY



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AL-9521-8H OBLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2703	Transmission Friction Element "D" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: D	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2704	Transmission Friction Element "E" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: E	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				
P2714	Pressure Control Solenoid "D" Per-	Out 1 Short To Ground	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	Power supply activated	Continuous	2 DCY

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
	for- mance/ Stuck Off	Out 1 Short To Ground Or Open Pin			- Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V		
P2715	Pressure Control Solenoid "D" Stuck On	Out 1 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2716	Pressure Control Solenoid "D" Electrical	- Out 1 Static Bypass To Ground - Out 1 Dynamic Bypass To Ground - Out 1 Current Too Low - Out 1 Current Too High	- ASIC (SPI register) - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	- Faulty $\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V - Power supply activated - Power supply voltage ≥ 8.4 V - Power supply voltage < 19.2 V	Continuous	2 DCY

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 1 SPI Communication Monitoring PWM Frequency	- Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	> Sync-period + 20 µs < Sync-period - 20 µs	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V		
P2717	Pressure Control Solenoid "D" Intermit-tent	Out 1 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2723	Pressure Control Solenoid "E" Performance/ Stuck Off	- Out 3 Short To Ground - Out 3 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2724	Pressure Control Solenoid "E" Stuck On	Out 3 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2725	Pressure Control Solenoid "E" Electrical	- Out 3 Static Bypass To Ground - Out 3 Dynamic Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- Out 3 Current Too Low - Out 3 Current Too High - Out 3 SPI Communication Monitoring PWM Frequency	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current - Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	$\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient $> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$ - Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$		
P2726	Pressure Control Solenoid "E" Intermit-tent	Out 3 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY
P2732	Pressure Control Solenoid "F" Performance/ Stuck Off	- Out 5 Short To Ground - Out 5 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2733	Pressure Control Solenoid "F" Stuck On	Out 5 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2734	Pressure Control Solenoid "F" Electrical	Out 5 Static Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
		Out 5 Dynamic Bypass To Ground			- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V		
		Out 5 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current	$\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage ≥ 8.4 V - And - Power supply voltage < 19.2 V		
		Out 5 Current Too High	- During shifting: - Measured current	$\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage ≥ 8.4 V - And - Power supply voltage < 19.2 V		
		Out 5 SPI Communication Monitoring PWM Frequency	- Checksum of message wrong - Read back of sent message failed - PWM feedback period	$> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V		

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2735	Pressure Control Solenoid "F" Intermit-tent	Out 5 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2753	Transmission Fluid Cooler Control Circuit/ Open	Solenoid Regulator Open Pin	- PWM output duty cycle range 5.0 – 95.0% - Measured voltage in duty phase - And in no duty phase - PWM output duty cycle range 0.0 – 5.0% - Measured voltage in no duty phase	≤ 2.4 V > 2.4 V < 4.0 V ≤ 4.0 V	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage $\leq \begin{matrix} 23.5; \\ 18.69; 23.5; \\ 18.69; 18.69 \end{matrix}$ V	Continuous	2 DCY
		Solenoid Regulator Short To Ground Or Open Pin	ASIC (SPI register)	Faulty	- Power supply activated - PWM output duty cycle range 100.0% - Power supply voltage ≥ 6.5 V - And - Power supply voltage $\leq \begin{matrix} 23.5; \\ 18.69; 23.5; \\ 18.69; 18.69 \end{matrix}$ V		

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2754	Transmission Fluid Cooler Control Circuit Low	Solenoid Regulator Short To Ground	- Feedback (PWM) - Measured voltage in no duty phase	$\leq 2.4 \text{ V}$	- Power supply activated - PWM output duty cycle range 0.0 – 95.0% - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $\leq 23.5; 18.69; 23.5; 18.69; 18.69 \text{ V}$	Continuous	2 DCY
P2755	Transmission Fluid Cooler Control Circuit High	Solenoid Regulator Short To Battery	Measured voltage from feedback (PWM) in duty phase	$\geq 3.5 \text{ V}$	- Power supply activated - PWM output duty cycle range 5.0 – 100.0% - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $\leq 23.5; 18.69; 23.5; 18.69; 18.69 \text{ V}$	Continuous	2 DCY
P2808	Pressure Control Solenoid "G" Performance/Stuck Off	Out 6 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY

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AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2812	Pressure Control Solenoid "G" Control Circuit/ Open	Out 6 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2813	Pressure Control Solenoid "G" Control Circuit Range/ Performance	- Out 6 Static Bypass To Ground - Out 6 Dynamic Bypass To Ground - Out 6 Current Too Low - Out 6 Current Too High - Out 6 SPI Communication Monitoring PWM Frequency	- ASIC (SPI register) - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current - Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	- Faulty $\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient $> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V - Power supply activated - Power supply voltage ≥ 8.4 V - And - Power supply voltage < 19.2 V - Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY

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AL-9521-8H OBLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2814	Pressure Control Solenoid "G" Control Circuit Low	Out 6 Short To Ground	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2815	Pressure Control Solenoid "G" Control Circuit High	Out 6 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
U0001	High Speed CAN Communication Bus	CAN Bus Rationality Check	CAN Bus state	Off		Continuous	2 DCY
U0002	High Speed CAN Communication Bus Performance	CAN Bus Time Out	Time out for all received messages on A-CAN		- Battery voltage > 9.0 V - And - Battery voltage < 17.0 V	Continuous	2 DCY
U0100	Lost Communication With ECM/PCM "A"	- CAN Message From DME Time Out (Only Activated For IDs: 80, 81, 105, 30E, 640, 641) - CAN Message With OBD Signals Time-out (Only Activated For ID: 391)	Message specific time	Expired	- No fault detected on CAN Bus - And - Battery voltage > 9.0 V - And - Battery voltage < 17.0 V	Continuous	2 DCY

AL-9521-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
U0401	Invalid Data Received From ECM/PCM "A"	- CAN Message From DME Time Out (Only Activated For IDs: 80, 81, 105, 30E, 640, 641) - CAN Message With OBD Signals Time-out (Only Activated For ID: 391)	- Checksum - Alive counter - Data length code	- False - Doesn't count - False	- No fault detected on CAN Bus - And - Battery voltage > 9.0 V - And - Battery voltage < 17.0 V	Continuous	2 DCY

3.5.4 Transmission Control Module , 8 Spd (2019 MY)

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0603	Internal Control Module Keep Alive Memory (KAM) Error	EEPROM The diagnostic is monitoring EEPROM checksums and hardware failures of the flash control unit	- Number of sector groups with valid checksum - Or - Read or write operation not possible (flash control unit defective)	< 2.0 [-] - Or = True	An EEPROM read or write operation has occurred = true	< 1.0 s	Immediate
P0605	Internal Control Module Read Only Memory (ROM) Error	EPROM A checksum is calculated for each memory block and compared with a stored reference checksum	Calculated checksum unequal to reference checksum	= True	TCM is in power-on state = true	< 30.0 s	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P060 A	Internal Control Module Monitoring Processor Performance	• Output Safety System Functional Check	• Inhibit path test of safety relevant power supplies during init failed			• Continuous	• 2 DCY
			• Monitoring of the DN reset line failed				
		• Peripheral Clock Plausibility Check	• Hardware doesn't report any error although the peripheral clock is switched off		• Peripheral clock active on		
			• Or		• And		
			• Peripheral is switched on		• Delay time passed		
			• And				
	• There are hardware error reports for at least two cycles						
	• Program Flow Control Plausibility Check	• Failure in program flow control					
	• Program Flow Control Software Check	• SW - or configuration fault in WDOG SW-Modul					
	• Watchdog Monitoring Plausibility Check	• An ASIC status failure has been detected					
• A monitored module status failure has been detected							

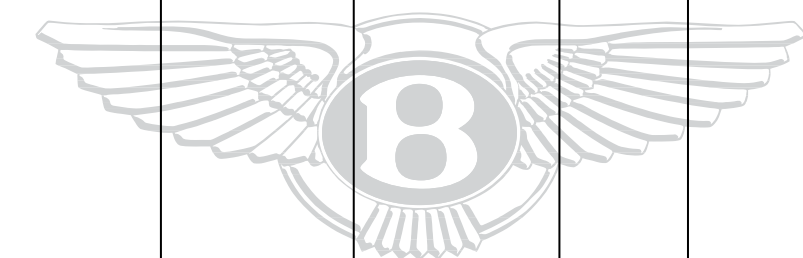
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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P060 B	Internal Control Module A/D Processing Performance	• Core Monitoring (Microcontroller) ADC Monitoring	• Measured ADC signals	• Inconsistent to configured voltage limits or other hardware signals		• Continuous	• 2 DCY
		• Core Monitoring (Microcontroller) SPI Monitoring	• SPI	• Communication error			
		• Core Monitoring (Microcontroller) RAM ECC monitoring, RAM ECC Interrupt Monitoring, ROM ECC Monitoring	• ECC test	• Failed			
		• Core Monitoring (Microcontroller) CPU Configuration Register Monitoring	• Content of registers	• Inconsistent to the requested values			
P0613	TCM Processor	• Core Monitoring (Microcontroller) Plausibility Check	• Two signals representing the same value but calculated in two different ways are	• Unequal		• Continuous	• 2 DCY
		• CAN Bus 1 Feedback Signal Monitoring (Positive Torque Request) Signal Check	• Signal read back from the CAN Bus is unequal to the send out signal		• No failure detected on CAN Bus		

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0667	Control Module Internal Temperature Sensor "A" Range/Performance	Temperature Signal With Only One Defective Sensor, The Transmission Uses One Of The Remaining Sensor Signals As Substitute Value And Is Therefore Fully Functional (No MIL Illumination And Fault Code Storage). The Monitoring Of The 3 Sensors Is Described Below. If At Least One Of The Described Monitoring Strategies For Each Sensor Detects A Malfunction, The Respective Sensor Is Considered Defective. If More Than One Temperature Sensor Is Defect A Fault Is Stored And The MIL Is Illuminated.	Number of defective temperature sensor signals	> 1.0 [-]		< 300.0 s	2 DCY



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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Transmission Oil Temperature Sensor Circuit Continuity	- Voltage at sensor plus pin (U pin hi) - Voltage at sensor plus pin (U pin hi) - Voltage at sensor minus pin (U pin lo) - Voltage at sensor minus pin (U pin lo) - Difference voltage at sensor pins (U sensor) - Difference voltage at sensor pins (U sensor) - Resistor ratio (U supply - U sensor) / U pin lo - Resistor ratio (U supply - U sensor) / U pin lo	> 4.7 V < 0.508 V > 0.423 V < 0.005 V > 4.512 V < 0.135 V > 15.5 < 10.0		< 1.0 s	
		Transmission Oil Temperature Sensor Rationality Check	- Transmission oil temperature delta between 2 measurements - In thermodynamic stable conditions: - Absolute differences between:	> 20° C > 15° C	- No failure detected in other oil temperature sensor monitors - No failure detected in other oil temperature sensor monitors - No failure detected in input speed signal and engine speed signal	< 1.0 s 300.0 s	

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Oil temperature value and chip 1 temperature value and oil temperature value and chip 2 temperature value	> 30° C	- Engine speed or input speed > 400 RPM - And >= 300.0 s		
		Chip 1 Temperature Sensor Signal Range Check	- Out of range low - Out of range high	< - 45.9° C > 167.8° C		< 1.0 s	
		Chip 1 Temperature Sensor ASIC Monitoring	Plausibility to internal comparator outputs violated				



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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Chip 1 Temperature Sensor Rationality Check	- Absolute differences between Chip 1 and Chip 2 temperature value - And - In thermodynamic stable conditions: - Absolute differences between: - Oil temperature value and chip 1 temperature value - In thermodynamic instable conditions: - Absolute differences between: - Oil temperature value and chip 1 temperature value	> 10° C > 15° C > 30° C	- No failure detected in other chip temperature sensor monitors - No failure detected in input speed signal and engine speed signal - Engine speed or input speed > 400 RPM - And >= 300.0 s	300.0 s	
		Chip 2 Temperature Sensor Signal Range Check	- Out of range low - Out of range high	< - 45.9° C > 192° C		< 1.0 s	
		Chip 2 Temperature Sensor ASIC Monitoring	Time out during init				

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Chip 2 Temperature Sensor Rationality Check	- Absolute differences between Chip 1 and Chip 2 temperature value - And - In thermodynamic stable conditions: - Absolute differences between: - Oil temperature value and chip 2 temperature value - In thermodynamic instable conditions: - Absolute differences between: - Oil temperature value and chip 2 temperature value	> 10° C > 15° C > 30° C	- No failure detected in other chip temperature sensor monitors - No failure detected in input speed signal and engine speed signal - Engine speed or input speed > 400 RPM - And >= 300.0 s	300.0 s	
P0715	Input/Turbine Shaft Speed Sensor "A" Circuit	Input Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Open circuit or short circuit to ground	No failure detected in sensor voltage supply	200.0 ms	2 DCY
P0716	Input/Turbine Shaft Speed Sensor "A" Circuit Range/Performance	Speed Signals Rationality Check	More than one of the following speed signals is defect	- Input speed, output speed - Or - Wheel speed	- No failure detected in sensor voltage supply - Engine speed > 430 RPM - No failure detected in engine speed CAN message	300.0 ms	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Input speed sensor and engine speed signal are faulty	- Input speed - And - Engine speed CAN message	No failure detected in sensor voltage supply		
			Absolute difference between output speed and output speed calculated from wheel speed	> 350 RPM	- No failure detected in sensor voltage supply - Transmission status no power flow or during shifting - Engine speed > 430 RPM - No failure detected in engine speed CAN message		
		Input Speed Sensor Rationality Check	Implausible negative gradient in fixed gear	> 500 RPM	No failure detected in sensor voltage supply	500.0 ms	
			- Difference to output speed calculated from wheel speed - And difference to output speed	> 250 RPM > 250 RPM	- No failure detected in sensor voltage supply, wheel speed signal, output speed signal - And electrical output speed sensor monitoring		
P0720	Output Shaft Speed Sensor Circuit	Output Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Open circuit or short circuit to ground	No failure detected in sensor voltage supply	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0721	Output Shaft Speed Sensor Circuit Range/Performance	Output Speed Sensor Rationality Check	- Difference to output speed calculated from wheel speed - And difference to output speed calculated from input speed	> 350 RPM > 250 RPM	- No failure detected in sensor voltage supply, wheel speed signal, input speed signal - And - No failure detected in electrical output speed sensor monitoring	Continuous	2 DCY
P0727	Engine Speed Input Circuit No Signal	CAN Message With Engine Speed Signal Check	Failure value received		- And no failure detected on CAN Bus - And battery voltage > 9.0 V	Continuous	2 DCY
P0730	Incorrect Gear Ratio	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B	General description:			3 times 30.0 ms - Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or D	- The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:				

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				



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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or D	- Actual ratio - Or - Actual ratio	> CC_Ratio_THUPengaged < CC_Ratio_THLOspeed	- Fixed gear engaged - And output speed >= 50 RPM		
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or C - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C	Output speed times gear ratio - input speed	> 320 RPM	- Fixed gear engaged - And output speed < 50 RPM		

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or E	- Actual ratio - Or actual ratio	> Ratio at start of gear engagement + CD_Ratio_OFTHProgress < Gear X ratio - CC_Ratio_THLSpeed >= 50 RPM	- And output speed >= 50 RPM - And ratio at start of gear engagement > gear X ratio		
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: D or E					
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or C					
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or E					
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or E		< Ratio at start of gear engagement + CD_Ratio_OFTHProgress > Gear X ratio + CC_Ratio_THLSpeed >= 50 RPM	- And output speed >= 50 RPM - And ratio at start of gear engagement <= gear X ratio		
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or D or E					

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or C or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or C	- Last input speed value - actual input speed - Or last input speed value - actual input speed (Time between measurements: 30.0 ms)	< 40 RPM > -40 RPM	- Gear engagement in progress - And time after start of gear engagement < 1.5 s - And output speed < 50 RPM		

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or C or D					

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or D					
P0741	Torque Converter Clutch Circuit Performance/ Stuck Off	Torque Converter Clutch Rationality Check	Absolute difference of actual slip and target slip	> CC Conv Clutch MAX OFF XD RPM	- Torque converter clutch closed or closed loop control - Engine torque < 1,000 Nm - TCC-pressure > 3 bar	20,000 ms - Continuous	2 DCY
P0746	Pressure Control Solenoid "A" Performance/ Stuck Off	- Out 0 Short To Ground - Out 0 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0747	Pressure Control Solenoid "A" Stuck On	Out 0 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0748	Pressure Control Solenoid "A"	Out 0 Static Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
	Electrical	Out 0 Dynamic Bypass To Ground			- And - Power supply voltage < 19.2 V		
		Out 0 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current	<= 850.0 – 120.0 mA <= Calculated limits, depending on incoming mA current gradient	- Power supply activated - Power supply voltage >= 8.4 V - And - Power supply voltage < 19.2 V		
		Out 0 Current Too High	- During shifting: - Measured current	>= 50.0 + 170.0 mA >= Calculated limits, depending on mA incoming current gradient			
		Out 0 SPI Communication Monitoring PWM Frequency	- Checksum of message wrong - Read back of sent message failed - PWM feedback period	> Sync-period + 20 µs < Sync-period - 20 µs	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V		
P0749	Pressure Control Solenoid "A" Intermittent	Out 0 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0750	Shift Solenoid "A"	Out 7 Static Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 7 Dynamic Bypass To Ground					
		Out 7 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current	$\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - Power supply voltage $< 19.2 \text{ V}$		
		Out 7 Current Too High	- During shifting: - Measured current	$\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient			
		Out 7 SPI Communication Monitoring PWM Frequency	- Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	$> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - Power supply voltage $< 19.2 \text{ V}$		
P0751	Shift Solenoid "A" Performance/Stuck Off	- Out 7 Short To Ground - Out 7 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0752	Shift Solenoid "A" Stuck On	Out 7 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0754	Shift Solenoid "A" Intermit-tent	Out 7 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0776	Pressure Control Solenoid "B" Performance/ Stuck Off	- Out 2 Short To Ground - Out 2 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0777	Pressure Control Solenoid "B" Stuck On	Out 2 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0778	Pressure Control Solenoid "B" Electrical	- Out 2 Static Bypass To Ground - Out 2 Dynamic Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- Out 2 Current Too Low - Out 2 Current Too High - Out 2 SPI Communication Monitoring PWM Frequency	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current - Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	$\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient $> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$ - Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$		
P0779	Pressure Control Solenoid "B" Intermit-tent	Out 2 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY
P077C	Output Shaft Speed Sensor Circuit Low	Output Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Short circuit to battery voltage	No failure detected in sensor voltage supply	Continuous	2 DCY
P0780	Shift Error	During Gear Change (Shifting) From Gear: 1	General description:			3 - 30.0 ms - Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- During Gear Change (Shifting) From Gear: 2 - During Gear Change (Shifting) From Gear: 3 - During Gear Change (Shifting) From Gear: 4 - During Gear Change (Shifting) From Gear: 5 - During Gear Change (Shifting) From Gear: 6 - During Gear Change (Shifting) From Gear: 7 - During Gear Change (Shifting) From Gear: 8	- While shifting from gear X to gear Y the ratio also has to stay in defined bounds. While shifting it is not possible to relate the reason of the malfunction to specific clutches. If one of the following malfunction criteria is detected, a fault code is stored, that corresponds to the starting gear of the shifting. - Actual ratio - Or actual ratio	> Gear X ratio + Shifting from gear X to gear Y in progress X < Y (upshift) < gear Y ratio - (downshift)	And output speed >= 50 RPM		
P0796	Pressure Control Solenoid	Out 4 Short To Ground	ASIC (SPI register)	- Faulty 100.0%	Power supply activated	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
	no "C" Performance/Stuck Off	Out 4 Short To Ground Or Open Pin	Feedback (PWM)		- Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V		
P0797	Pressure Control Solenoid "C" Stuck On	Out 4 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0798	Pressure Control Solenoid "C" Electrical	- Out 4 Static Bypass To Ground - Out 4 Dynamic Bypass To Ground - Out 4 Current Too Low - Out 4 Current Too High	- ASIC (SPI register) - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	- Faulty $\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V - Power supply activated - Power supply voltage ≥ 8.4 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 4 SPI Communication Monitoring PWM Frequency	- Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	> Sync-period + 20 µs < Sync-period - 20 µs	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V		
P0799	Pressure Control Solenoid "C" Intermit-tent	Out 4 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P07BF	Input/Turbine Shaft Speed Sensor "A" Circuit Low	Input Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Short circuit to battery voltage	No failure detected in sensor voltage supply	100.0 ms	2 DCY
P2637	Torque Management Feedback Signal "A"	CAN Message With Engine Torque Signal Check	Failure value received		- No failure detected on CAN Bus - And battery voltage > 9.0 V	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2700	Transmission Friction Element "A" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2701	Transmission Friction Element "B" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2702	Transmission Friction Element "C" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

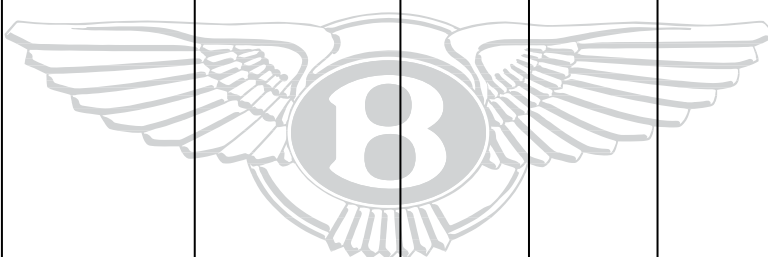
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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2703	Transmission Friction Element "D" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: D	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				



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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2704	Transmission Friction Element "E" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: E	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				
P2714	Pressure Control Solenoid "D" Per-	Out 1 Short To Ground	- ASIC (SPI register) - Feedback (PWM)	Faulty 100.0%	Power supply activated	Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
	for- mance/ Stuck Off	Out 1 Short To Ground Or Open Pin			- Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V		
P2715	Pressure Control Solenoid "D" Stuck On	Out 1 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2716	Pressure Control Solenoid "D" Electrical	- Out 1 Static Bypass To Ground - Out 1 Dynamic Bypass To Ground - Out 1 Current Too Low - Out 1 Current Too High	- ASIC (SPI register) - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	- Faulty $\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V - Power supply activated - Power supply voltage ≥ 8.4 V - Power supply voltage < 19.2 V	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 1 SPI Communication Monitoring PWM Frequency	- Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	> Sync-period + 20 µs < Sync-period - 20 µs	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V		
P2717	Pressure Control Solenoid "D" Intermit-tent	Out 1 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2723	Pressure Control Solenoid "E" Performance/ Stuck Off	- Out 3 Short To Ground - Out 3 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2724	Pressure Control Solenoid "E" Stuck On	Out 3 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2725	Pressure Control Solenoid "E" Electrical	- Out 3 Static Bypass To Ground - Out 3 Dynamic Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY

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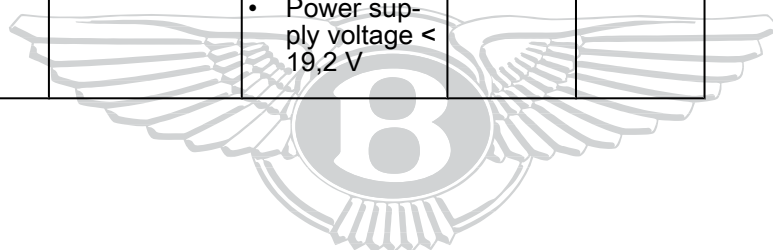
AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 3 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current	$\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$		
		Out 3 Current Too High	- During shifting: - Measured current	$\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient			
		Out 3 SPI Communication Monitoring PWM Frequency	- Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	$> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$		
P2726	Pressure Control Solenoid "E" Intermittent	Out 3 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY
P2732	Pressure Control Solenoid "F" Performance/Stuck Off	- Out 5 Short To Ground - Out 5 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2733	Pressure Control Solenoid "F" Stuck On	Out 5 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2734	Pressure Control Solenoid "F" Electrical	- Out 5 Static Bypass To Ground - Out 5 Dynamic Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
		Out 5 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current	$\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage ≥ 8.4 V - And - Power supply voltage < 19.2 V		
		Out 5 Current Too High	- During shifting: - Measured current	$\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient			
		Out 5 SPI Communication Monitoring PWM Frequency	- Checksum of message wrong - Read back of sent message failed - PWM feedback period	$> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V		

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2735	Pressure Control Solenoid "F" Intermittent	Out 5 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2753	Transmission Fluid Cooler Control Circuit/ Open	Solenoid Regulator Open Pin	- PWM output duty cycle range 5.0 – 95.0% - Measured voltage in duty phase - And in no duty phase - PWM output duty cycle range 0.0 – 5.0% - Measured voltage in no duty phase	≤ 2.4 V > 2.4 V < 4.0 V ≤ 4.0 V	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage $\leq \begin{matrix} 23.5; \\ 18.69; 23.5; \\ 18.69; 18.69 \end{matrix}$ V	Continuous	2 DCY
		Solenoid Regulator Short To Ground Or Open Pin	ASIC (SPI register)	Faulty	- Power supply activated - PWM output duty cycle range 100.0% - Power supply voltage ≥ 6.5 V - And - Power supply voltage $\leq \begin{matrix} 23.5; \\ 18.69; 23.5; \\ 18.69; 18.69 \end{matrix}$ V		

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2754	Transmission Fluid Cooler Control Circuit Low	Solenoid Regulator Short To Ground	- Feedback (PWM) - Measured voltage in no duty phase	$\leq 2.4 \text{ V}$	- Power supply activated - PWM output duty cycle range 0.0 – 95.0% - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $\leq$ [23.5; 18.69; 23.5; 18.69; 18.69 V	Continuous	2 DCY
P2755	Transmission Fluid Cooler Control Circuit High	Solenoid Regulator Short To Battery	Measured voltage from feedback (PWM) in duty phase	$\geq 3.5 \text{ V}$	- Power supply activated - PWM output duty cycle range 5.0 – 100.0% - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $\leq$ 23.5; 18.69; 23.5; 18.69; 18.69 V	Continuous	2 DCY
P2808	Pressure Control Solenoid "G" Performance/ Stuck Off	Out 6 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY



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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2812	Pressure Control Solenoid "G" Control Circuit/ Open	Out 6 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2813	Pressure Control Solenoid "G" Control Circuit Range/ Performance	- Out 6 Static Bypass To Ground - Out 6 Dynamic Bypass To Ground - Out 6 Current Too Low - Out 6 Current Too High - Out 6 SPI Communication Monitoring PWM Frequency	- ASIC (SPI register) - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current - Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	- Faulty $\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient $> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V - Power supply activated - Power supply voltage ≥ 8.4 V - And - Power supply voltage < 19.2 V - Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2814	Pressure Control Solenoid "G" Control Circuit Low	Out 6 Short To Ground	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2815	Pressure Control Solenoid "G" Control Circuit High	Out 6 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
U0001	High Speed CAN Communication Bus	CAN Bus Rationality Check	CAN Bus state	Off		Continuous	2 DCY
U0002	High Speed CAN Communication Bus Performance	CAN Bus Time Out	Time out for all received messages on A-CAN		- Battery voltage > 9.0 V - And - Battery voltage < 17.0 V	Continuous	2 DCY
U0100	Lost Communication With ECM/PCM "A"	- CAN Message From DME Time Out (Only Activated For IDs: 80, 81, 105, 30E, 640, 641) - CAN Message With OBD Signals Time-out (Only Activated For ID: 391)	Message specific time	Expired	- No fault detected on CAN Bus - And - Battery voltage > 9.0 V - And - Battery voltage < 17.0 V	Continuous	2 DCY

AL-952-8H OBLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
U0401	Invalid Data Received From ECM/PCM "A"	- CAN Message From DME Time Out (Only Activated For IDs: 80, 81, 105, 30E, 640, 641) - CAN Message With OBD Signals Time-out (Only Activated For ID: 391)	- Checksum - Alive counter - Data length code	- False - Doesn't count - False	- No fault detected on CAN Bus - And - Battery voltage > 9.0 V - And - Battery voltage < 17.0 V	Continuous	2 DCY

3.5.5 Transmission Control Module , 8 Spd (2020 MY)

AL-952-8H OBLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0603	Internal Control Module Keep Alive Memory (KAM) Error	EEPROM The diagnostic is monitoring EEPROM check sums and hardware failures of the flash control unit	- Number of sector groups with valid checksum - Or - Read or write operation not possible (flash control unit defective)	< 2.0 [-] - Or = True	An EEPROM read or write operation has occurred = true	< 1.0 s	Immediate
P0605	Internal Control Module Read Only Memory (ROM) Error	EPROM A checksum is calculated for each memory block and compared with a stored reference checksum	Calculated checksum unequal to reference checksum	= True	TCM is in power-on state = true	< 30.0 s	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P060 A	Internal Control Module Monitoring Processor Performance	• Output Safety System Functional Check	• Inhibit path test of safety relevant power supplies during init failed			• Continuous	• 2 DCY
			• Monitoring of the DN reset line failed				
		• Peripheral Clock Plausibility Check	• Hardware doesn't report any error although the peripheral clock is switched off		• Peripheral clock active on • And • Delay time passed		
			• Or				
			• Peripheral is switched on				
			• And				
			• There are hardware error reports for at least two cycles				
		• Program Flow Control Plausibility Check	• Failure in program flow control				
		• Program Flow Control Software Check	• SW - or configuration fault in WDOG SW-Modul				
		• Watchdog Monitoring Plausibility Check	• An ASIC status failure has been detected				
• A monitored module status failure has been detected							

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P060B	Internal Control Module A/D Processing Performance	• Core Monitoring (Microcontroller) ADC Monitoring	• Measured ADC signals	• Inconsistent to configured voltage limits or other hardware signals		• Continuous	• 2 DCY
		• Core Monitoring (Microcontroller) SPI Monitoring	• SPI	• Communication error			
		• Core Monitoring (Microcontroller) RAM ECC monitoring, RAM ECC Interrupt Monitoring, ROM ECC Monitoring	• ECC test	• Failed			
		• Core Monitoring (Microcontroller) CPU Configuration Register Monitoring	• Content of registers	• Inconsistent to the requested values			
P0613	TCM Processor	• Core Monitoring (Microcontroller) Plausibility Check	• Two signals representing the same value but calculated in two different ways are	• Unequal		• Continuous	• 2 DCY
		• CAN Bus 1 Feedback Signal Monitoring (Positive Torque Request) Signal Check	• Signal read back from the CAN Bus is unequal to the send out signal				
					• No failure detected on CAN Bus		

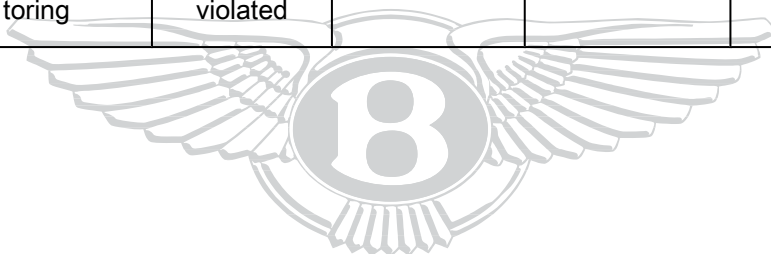
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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0667	Control Module Internal Temperature Sensor "A" Range/Performance	Temperature Signal With Only One Defective Sensor, The Transmission Uses One Of The Remaining Sensor Signals As Substitute Value And Is Therefore Fully Functional (No MIL Illumination And Fault Code Storage). The Monitoring Of The 3 Sensors Is Described Below. If At Least One Of The Described Monitoring Strategies For Each Sensor Detects A Malfunction, The Respective Sensor Is Considered Defective. If More Than One Temperature Sensor Is Defect A Fault Is Stored And The MIL Is Illuminated.	Number of defective temperature sensor signals	> 1.0 [-]		< 300.0 s	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Transmission Oil Temperature Sensor Circuit Continuity	- Voltage at sensor plus pin (U pin hi) - Voltage at sensor plus pin (U pin hi) - Voltage at sensor minus pin (U pin lo) - Voltage at sensor minus pin (U pin lo) - Difference voltage at sensor pins (U sensor) - Difference voltage at sensor pins (U sensor) - Resistor ratio (U supply - U sensor) / U pin lo - Resistor ratio (U supply - U sensor) / U pin lo	> 4.7 V < 0.508 V > 0.423 V < 0.005 V > 4.512 V < 0.135 V > 15.5 < 10.0		< 1.0 s	
		Transmission Oil Temperature Sensor Rationality Check	Transmission oil temperature delta between 2 measurements	> 20° C	No failure detected in other oil temperature sensor monitors	< 1.0 s	
			- In thermodynamic stable conditions: - Absolute differences between:	> 15° C	- No failure detected in other oil temperature sensor monitors - No failure detected in input speed signal and engine speed signal	300.0 s	

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Oil temperature value and chip 1 temperature value and oil temperature value and chip 2 temperature value	> 30° C	- Engine speed or input speed > 400 RPM - And >= 300.0 s		
		Chip 1 Temperature Sensor Signal Range Check	- Out of range low - Out of range high	< - 45.9° C > 167.8° C		< 1.0 s	
		Chip 1 Temperature Sensor ASIC Monitoring	Plausibility to internal comparator outputs violated				



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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Chip 1 Temperature Sensor Rationality Check	- Absolute differences between Chip 1 and Chip 2 temperature value - And - In thermodynamic stable conditions: - Absolute differences between: - Oil temperature value and chip 1 temperature value - In thermodynamic instable conditions: - Absolute differences between: - Oil temperature value and chip 1 temperature value	> 10° C > 15° C > 30° C	- No failure detected in other chip temperature sensor monitors - No failure detected in input speed signal and engine speed signal - Engine speed or input speed > 400 RPM - And >= 300.0 s	300.0 s	
		Chip 2 Temperature Sensor Signal Range Check	- Out of range low - Out of range high	< - 45.9° C > 192° C		< 1.0 s	
		Chip 2 Temperature Sensor ASIC Monitoring	Time out during init				

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Chip 2 Temperature Sensor Rationality Check	- Absolute differences between Chip 1 and Chip 2 temperature value - And - In thermodynamic stable conditions: - Absolute differences between: - Oil temperature value and chip 2 temperature value - In thermodynamic instable conditions: - Absolute differences between: - Oil temperature value and chip 2 temperature value	> 10° C > 15° C > 30° C	- No failure detected in other chip temperature sensor monitors - No failure detected in input speed signal and engine speed signal - Engine speed or input speed > 400 RPM - And >= 300.0 s	300.0 s	
P0715	Input/Turbine Shaft Speed Sensor "A" Circuit	Input Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Open circuit or short circuit to ground	No failure detected in sensor voltage supply	200.0 ms	2 DCY
P0716	Input/Turbine Shaft Speed Sensor "A" Circuit Range/Performance	Speed Signals Rationality Check	More than one of the following speed signals is defect	- Input speed, output speed - Or - Wheel speed	- No failure detected in sensor voltage supply - Engine speed > 430 RPM - No failure detected in engine speed CAN message	300.0 ms	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Input speed sensor and engine speed signal are faulty	- Input speed - And - Engine speed CAN message	No failure detected in sensor voltage supply		
			Absolute difference between output speed and output speed calculated from wheel speed	> 350 RPM	- No failure detected in sensor voltage supply - Transmission status no power flow or during shifting - Engine speed > 430 RPM - No failure detected in engine speed CAN message		
		Input Speed Sensor Rationality Check	Implausible negative gradient in fixed gear	> 500 RPM	No failure detected in sensor voltage supply	500.0 ms	
			- Difference to output speed calculated from wheel speed - And difference to output speed	> 250 RPM > 250 RPM	- No failure detected in sensor voltage supply, wheel speed signal, output speed signal - And electrical output speed sensor monitoring		
P0720	Output Shaft Speed Sensor Circuit	Output Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Open circuit or short circuit to ground	No failure detected in sensor voltage supply	Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0721	Output Shaft Speed Sensor Circuit Range/Performance	Output Speed Sensor Rationality Check	- Difference to output speed calculated from wheel speed - And difference to output speed calculated from input speed	> 350 RPM > 250 RPM	- No failure detected in sensor voltage supply, wheel speed signal, input speed signal - And - No failure detected in electrical output speed sensor monitoring	Continuous	2 DCY
P0727	Engine Speed Input Circuit No Signal	CAN Message With Engine Speed Signal Check	Failure value received		- And no failure detected on CAN Bus - And battery voltage > 9.0 V	Continuous	2 DCY
P0730	Incorrect Gear Ratio	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B	General description:			3 times 30.0 ms - Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or D	- The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:				

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

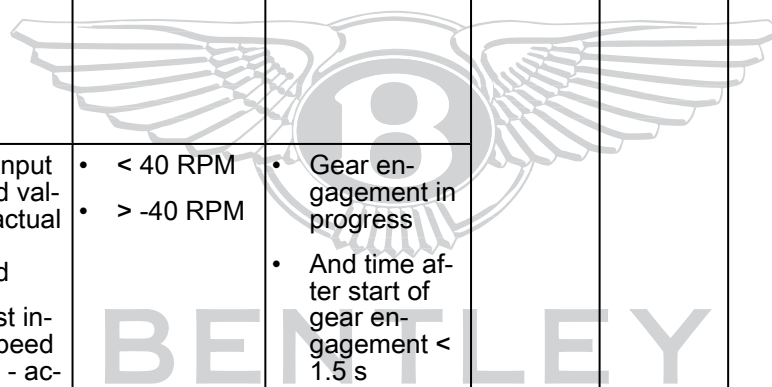
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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or D	- Actual ratio - Or - Actual ratio	> CC_Ratio_THUPengaged < CC_Ratio_THLOspeed	- Fixed gear engaged - And output speed >= 50 RPM		
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or C - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C	Output speed times gear ratio - input speed	> 320 RPM	- Fixed gear engaged - And output speed < 50 RPM		

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AL-952-8H 0BLB									
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum		
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or E	- Actual ratio - Or actual ratio	> Ratio at start of gear engagement + gear engagement in CD_Ratio_OFTHProgress < Gear X ratio • - And output CC_Ratio_THLOS speed >= 50 CD_Ratio_OFTHRPMx	And ratio at start of gear engagement > gear X ratio				
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: D or E							
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or C							
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or E							
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or E			< Ratio at start of gear engagement + gear engagement in CD_Ratio_OFTHProgress > Gear X ratio • + And output CC_Ratio_THLOS speed >= 50 CD_Ratio_OFTHRPMx			And ratio at start of gear engagement <= gear X ratio	
		With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or D or E							

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or C or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or C	- Last input speed value - actual input speed - Or last input speed value - actual input speed (Time between measurements: 30.0 ms)	< 40 RPM > -40 RPM	- Gear engagement in progress - And time after start of gear engagement < 1.5 s - And output speed < 50 RPM		



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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B or C or D - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or C or D					

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or D or E - With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A or B or D					
P0741	Torque Converter Clutch Circuit Performance/Stuck Off	Torque Converter Clutch Rationality Check	Absolute difference of actual slip and target slip	> CC Conv Clutch MAX OFF XD RPM	- Torque converter clutch closed or closed loop control - Engine torque < 1,000 Nm - TCC-pressure > 3 bar	20,000 ms - Continuous	2 DCY
P0746	Pressure Control Solenoid "A" Performance/Stuck Off	- Out 0 Short To Ground - Out 0 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0747	Pressure Control Solenoid "A" Stuck On	Out 0 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0748	Pressure Control Solenoid "A"	Out 0 Static Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V	Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
	Electrical	Out 0 Dynamic Bypass To Ground			- And - Power supply voltage < 19.2 V		
		Out 0 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current	<= 850.0 – 120.0 mA <= Calculated limits, depending on incoming mA current gradient	- Power supply activated - Power supply voltage >= 8.4 V - And - Power supply voltage < 19.2 V		
		Out 0 Current Too High	- During shifting: - Measured current	>= 50.0 + 170.0 mA >= Calculated limits, depending on mA incoming current gradient			
		Out 0 SPI Communication Monitoring PWM Frequency	- Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	> Sync-period + 20 µs < Sync-period - 20 µs	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V		
P0749	Pressure Control Solenoid "A" Intermittent	Out 0 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0750	Shift Solenoid "A"	Out 7 Static Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 7 Dynamic Bypass To Ground					
		Out 7 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current	$\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - Power supply voltage $< 19.2 \text{ V}$		
		Out 7 Current Too High	- During shifting: - Measured current	$\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient			
		Out 7 SPI Communication Monitoring PWM Frequency	- Checksum of message wrong - Read back of sent message failed - PWM feedback period	$> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - Power supply voltage $< 19.2 \text{ V}$		
P0751	Shift Solenoid "A" Performance/Stuck Off	- Out 7 Short To Ground - Out 7 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0752	Shift Solenoid "A" Stuck On	Out 7 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0754	Shift Solenoid "A" Intermittent	Out 7 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0776	Pressure Control Solenoid "B" Performance/ Stuck Off	- Out 2 Short To Ground - Out 2 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0777	Pressure Control Solenoid "B" Stuck On	Out 2 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0778	Pressure Control Solenoid "B" Electrical	- Out 2 Static Bypass To Ground - Out 2 Dynamic Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- Out 2 Current Too Low - Out 2 Current Too High - Out 2 SPI Communication Monitoring PWM Frequency	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current - Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	$\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient $> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$ - Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$		
P0779	Pressure Control Solenoid "B" Intermit-tent	Out 2 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY
P077C	Output Shaft Speed Sensor Circuit Low	Output Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Short circuit to battery voltage	No failure detected in sensor voltage supply	Continuous	2 DCY
P0780	Shift Error	During Gear Change (Shifting) From Gear: 1	General description:			3 * 30.0 ms - Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		During Gear Change (Shifting) From Gear: 2	While shifting from gear X to gear Y the ratio also has to stay in defined bounds. While shifting it is not possible to relate the reason of the malfunction to specific clutches. If one of the following malfunction criteria is detected, a fault code is stored, that corresponds to the starting gear of the shifting.				
		During Gear Change (Shifting) From Gear: 3					
		During Gear Change (Shifting) From Gear: 4					
		During Gear Change (Shifting) From Gear: 5	- Actual ratio - Or actual ratio	> Gear X ratio + Shifting from gear X to gear Y in progress X < Y (upshift) < gear Y ratio - (downshift)	And output speed >= 50 RPM		
		During Gear Change (Shifting) From Gear: 6					
		During Gear Change (Shifting) From Gear: 7					
		During Gear Change (Shifting) From Gear: 8					
P0796	Pressure Control Solenoid	Out 4 Short To Ground	ASIC (SPI register)	- Faulty 100.0%	Power supply activated	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
	noid "C" Performance/Stuck Off	Out 4 Short To Ground Or Open Pin	Feedback (PWM)		- Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V		
P0797	Pressure Control Solenoid "C" Stuck On	Out 4 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P0798	Pressure Control Solenoid "C" Electrical	- Out 4 Static Bypass To Ground - Out 4 Dynamic Bypass To Ground - Out 4 Current Too Low - Out 4 Current Too High	- ASIC (SPI register) - SW (calculation) feedback PWM - No shifting - Measured current - During shifting: - Measured current	- Faulty $\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V - Power supply activated - Power supply voltage ≥ 8.4 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 4 SPI Communication Monitoring PWM Frequency	- Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	> Sync-period + 20 µs < Sync-period - 20 µs	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V		
P0799	Pressure Control Solenoid "C" Intermit-tent	Out 4 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P07BF	Input/ Turbine Shaft Speed Sensor "A" Circuit Low	Input Speed Sensor ASIC HW Monitoring	ASIC CG124 indicates	Short circuit to battery voltage	No failure detected in sensor voltage supply	100.0 ms	2 DCY
P2637	Torque Management Feedback Signal "A"	CAN Message With Engine Torque Signal Check	Failure value received		- No failure detected on CAN Bus - And battery voltage > 9.0 V	Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2700	Transmission Friction Element "A" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: A	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2701	Transmission Friction Element "B" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: B	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY



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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2702	Transmission Friction Element "C" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: C	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY

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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2703	Transmission Friction Element "D" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: D	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				

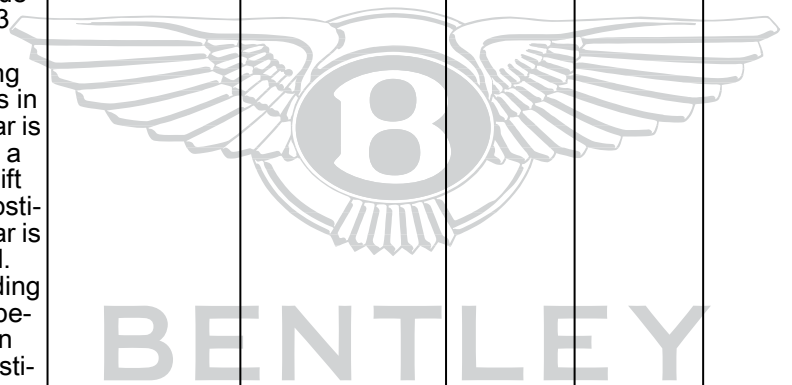


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AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2704	Transmission Friction Element "E" Apply Time Range/Performance	With Fixed Gear Engaged Or During Gear Engagement Affected Clutches: E	- General description: - The actual ratio has to stay in defined bounds. If one of the following malfunction criteria is detected, the fault code for the 3 corresponding clutches in that gear is set and a gear shift to a substitute gear is initiated. Depending on the behavior in the substitute gear, an additional fault code for only one or two clutches may be set to better distinguish the root cause of the problem. Shifting to further substitute gears is possible with the goal to identify a single defective clutch. - Example:			3 * 30.0 ms - Continuous	2 DCY



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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			Malfunction criteria detection in 4th gear --> DTC for clutches "B or D or E" set and shifting to 5th gear (substitute gear). IF malfunction criteria in 5th gear still active --> DTC for clutches "B or D" set and shifting to 6th gear (substitute gear), ELSE --> DTC for clutch "E" set IF malfunction criteria in 6th gear still active --> DTC for clutch "D" set and shifting to 3rd gear (substitute gear), ELSE --> DTC for clutch "B" set IF malfunction criteria in 3rd gear still active --> DTC for "undefined clutches" is set because root cause cannot be related to a single clutch.				
P2714	Pressure Control Solenoid "D" Per-	Out 1 Short To Ground	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	Power supply activated	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
	formance/ Stuck Off	Out 1 Short To Ground Or Open Pin			- Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V		
P2715	Pressure Control Solenoid "D" Stuck On	Out 1 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2716	Pressure Control Solenoid "D" Electrical	- Out 1 Static Bypass To Ground - Out 1 Dynamic Bypass To Ground - Out 1 Current Too Low - Out 1 Current Too High	- ASIC (SPI register) - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current	- Faulty $\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V - Power supply activated - Power supply voltage ≥ 8.4 V - Power supply voltage < 19.2 V	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		Out 1 SPI Communication Monitoring PWM Frequency	- Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	> Sync-period + 20 µs < Sync-period - 20 µs	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V		
P2717	Pressure Control Solenoid "D" Intermit-tent	Out 1 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2723	Pressure Control Solenoid "E" Performance/ Stuck Off	- Out 3 Short To Ground - Out 3 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2724	Pressure Control Solenoid "E" Stuck On	Out 3 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2725	Pressure Control Solenoid "E" Electrical	- Out 3 Static Bypass To Ground - Out 3 Dynamic Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage >= 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		- Out 3 Current Too Low - Out 3 Current Too High - Out 3 SPI Communication Monitoring PWM Frequency	- SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current - Checkbyte of message wrong - Read back of sent message failed - PWM feedback period	$\leq 850.0 - 120.0 \text{ mA}$ $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0 \text{ mA}$ $\geq$ Calculated limits, depending on mA incoming current gradient $> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage $\geq 8.4 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$ - Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$		
P2726	Pressure Control Solenoid "E" Intermittent	Out 3 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY
P2732	Pressure Control Solenoid "F" Performance/Stuck Off	- Out 5 Short To Ground - Out 5 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2733	Pressure Control Solenoid "F" Stuck On	Out 5 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2734	Pressure Control Solenoid "F" Electrical	Out 5 Static Bypass To Ground	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
		Out 5 Dynamic Bypass To Ground					
		Out 5 Current Too Low	- SW (calculation) feedback PWM - No shifting: - Measured current	$\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on mA incoming current gradient	- Power supply activated - Power supply voltage ≥ 8.4 V - And - Power supply voltage < 19.2 V		
		Out 5 Current Too High	- During shifting: - Measured current	$\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient			
		Out 5 SPI Communication Monitoring PWM Frequency	- Checksum of message wrong - Read back of sent message failed - PWM feedback period	$> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V		

AL-952-8H 0BLB							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2735	Pressure Control Solenoid "F" Intermittent	Out 5 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2753	Transmission Fluid Cooler Control Circuit/ Open	Solenoid Regulator Open Pin	- PWM output duty cycle range 5.0 – 95.0% - Measured voltage in duty phase - And in no duty phase - PWM output duty cycle range 0.0 – 5.0% - Measured voltage in no duty phase	≤ 2.4 V > 2.4 V < 4.0 V ≤ 4.0 V	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage $\leq \begin{matrix} 23.5; \\ 18.69; 23.5; \\ 18.69; 18.69 \end{matrix}$ V	Continuous	2 DCY
		Solenoid Regulator Short To Ground Or Open Pin	ASIC (SPI register)	Faulty	- Power supply activated - PWM output duty cycle range 100.0% - Power supply voltage ≥ 6.5 V - And - Power supply voltage $\leq \begin{matrix} 23.5; \\ 18.69; 23.5; \\ 18.69; 18.69 \end{matrix}$ V		

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2754	Transmission Fluid Cooler Control Circuit Low	Solenoid Regulator Short To Ground	- Feedback (PWM) - Measured voltage in no duty phase	$\leq 2.4 \text{ V}$	- Power supply activated - PWM output duty cycle range 0.0 – 95.0% - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $\leq$ [23.5; 18.69; 23.5; 18.69; 18.69 V	Continuous	2 DCY
P2755	Transmission Fluid Cooler Control Circuit High	Solenoid Regulator Short To Battery	Measured voltage from feedback (PWM) in duty phase	$\geq 3.5 \text{ V}$	- Power supply activated - PWM output duty cycle range 5.0 – 100.0% - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $\leq$ 23.5; 18.69; 23.5; 18.69; 18.69 V	Continuous	2 DCY
P2808	Pressure Control Solenoid "G" Performance/ Stuck Off	Out 6 Short To Ground Or Open Pin	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage $\geq 6.5 \text{ V}$ - And - Power supply voltage $< 19.2 \text{ V}$	Continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2812	Pressure Control Solenoid "G" Control Circuit/ Open	Out 6 Open Circuit	ASIC (SPI register)	Faulty	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2813	Pressure Control Solenoid "G" Control Circuit Range/ Performance	- Out 6 Static Bypass To Ground - Out 6 Dynamic Bypass To Ground - Out 6 Current Too Low - Out 6 Current Too High - Out 6 SPI Communication Monitoring PWM Frequency	- ASIC (SPI register) - SW (calculation) feedback PWM - No shifting: - Measured current - During shifting: - Measured current - Checksum of message wrong - Read back of sent message failed - PWM feedback period	- Faulty $\leq 850.0 - 120.0$ mA $\leq$ Calculated limits, depending on mA incoming current gradient $\geq 50.0 + 170.0$ mA $\geq$ Calculated limits, depending on mA incoming current gradient $> \text{Sync-period} + 20 \mu\text{s}$ $< \text{Sync-period} - 20 \mu\text{s}$	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V - Power supply activated - Power supply voltage ≥ 8.4 V - And - Power supply voltage < 19.2 V - Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2814	Pressure Control Solenoid "G" Control Circuit Low	Out 6 Short To Ground	- ASIC (SPI register) - Feedback (PWM)	- Faulty 100.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
P2815	Pressure Control Solenoid "G" Control Circuit High	Out 6 Short To Battery	- ASIC (SPI register) - Feedback (PWM)	- Faulty 0.0%	- Power supply activated - Power supply voltage ≥ 6.5 V - And - Power supply voltage < 19.2 V	Continuous	2 DCY
U0001	High Speed CAN Communication Bus	CAN Bus Rationality Check	CAN Bus state	Off		Continuous	2 DCY
U0002	High Speed CAN Communication Bus Performance	CAN Bus Time Out	Time out for all received messages on A-CAN		- Battery voltage > 9.0 V - And - Battery voltage < 17.0 V	Continuous	2 DCY
U0100	Lost Communication With ECM/PCM "A"	- CAN Message From DME Time Out (Only Activated For IDs: 80, 81, 105, 30E, 640, 641) - CAN Message With OBD Signals Time-out (Only Activated For ID: 391)	Message specific time	Expired	- No fault detected on CAN Bus - And - Battery voltage > 9.0 V - And - Battery voltage < 17.0 V	Continuous	2 DCY

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DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
U0401	Invalid Data Received From ECM/PCM "A"	- CAN Message From DME Time Out (Only Activated For IDs: 80, 81, 105, 30E, 640, 641) - CAN Message With OBD Signals Timeout (Only Activated For ID: 391)	- Checksum - Alive counter - Data length code	- False - Doesn't count - False	- No fault detected on CAN Bus - And - Battery voltage > 9.0 V - And - Battery voltage < 17.0 V	Continuous	2 DCY

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3.6 Diagnostic Procedures

- ◆ ⇒ ["3.6.1 Accelerator Pedal Module GX2 , Checking", page 1593](#)
- ◆ ⇒ ["3.6.2 Brake Pressure Sensor 1 G201 , Checking", page 1595](#)
- ◆ ⇒ ["3.6.3 Camshaft Adjustment Valve 1 N205 , Checking", page 1597](#)
- ◆ ⇒ ["3.6.4 Camshaft Position Sensor G40 , Checking", page 1599](#)
- ◆ ⇒ ["3.6.5 CAN-Bus Terminal Resistance, Checking", page 1601](#)
- ◆ ⇒ ["3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 1603](#)
- ◆ ⇒ ["3.6.7 Combustion Air Valve N44 , Checking", page 1605](#)
- ◆ ⇒ ["3.6.8 Displacement On Demand Rotary Solenoid NX8 , Checking", page 1607](#)
- ◆ ⇒ ["3.6.9 Engine Compartment Fan V116 , Checking", page 1609](#)
- ◆ ⇒ ["3.6.10 Engine Component Power Supply Relay J757 , Checking", page 1611](#)
- ◆ ⇒ ["3.6.11 Engine Coolant Temperature Sensor G62 , Checking", page 1613](#)
- ◆ ⇒ ["3.6.12 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking", page 1615](#)
- ◆ ⇒ ["3.6.13 Engine Speed Sensor G28 , Checking", page 1616](#)
- ◆ ⇒ ["3.6.14 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 1619](#)
- ◆ ⇒ ["3.6.15 Exhaust Gas Temperature Sensor 1 G235 , Checking", page 1621](#)

- ◆ ⇒ ["3.6.16 Exhaust Gas Temperature Sensor 2 G448 , Checking", page 1622](#)
- ◆ ⇒ ["3.6.17 Fuel Injectors , Checking", page 1624](#)
- ◆ ⇒ ["3.6.18 Fuel Pressure Sensor G247 , Checking", page 1626](#)
- ◆ ⇒ ["3.6.19 Fuel Pump Relay J17 / Fuel Pump 1 V276 , Checking", page 1628](#)
- ◆ ⇒ ["3.6.20 Fuel Pump Relay 2 J49 / Fuel Pump 2 V277 , Checking", page 1630](#)
- ◆ ⇒ ["3.6.21 Ignition Coils With Power Output Stage , Checking", page 1633](#)
- ◆ ⇒ ["3.6.22 Knock Sensor 1 G61 , Checking", page 1634](#)
- ◆ ⇒ ["3.6.23 Knock Sensor 2 G66 , Checking", page 1636](#)
- ◆ ⇒ ["3.6.24 Leak Detection Pump V144 , Checking", page 1638](#)
- ◆ ⇒ ["3.6.25 Manifold Absolute Pressure Sensor G71 , Checking", page 1640](#)
- ◆ ⇒ ["3.6.26 Manifold Absolute Pressure Sensor 2 G429 , Checking", page 1642](#)
- ◆ ⇒ ["3.6.27 Mass Airflow Sensor G70 , Checking", page 1644](#)
- ◆ ⇒ ["3.6.28 Mass Airflow Sensor 2 G246 , Checking", page 1646](#)
- ◆ ⇒ ["3.6.29 Motronic Engine Control Module Power Supply Relay 2 J670 , Checking", page 1648](#)
- ◆ ⇒ ["3.6.30 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking", page 1650](#)
- ◆ ⇒ ["3.6.31 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking", page 1653](#)
- ◆ ⇒ ["3.6.32 Oxygen Sensor 2 After Catalytic Converter GX8 , Checking", page 1656](#)
- ◆ ⇒ ["3.6.33 Oxygen Sensor 2 Before Catalytic Converter GX11 , Checking", page 1659](#)
- ◆ ⇒ ["3.6.34 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking", page 1661](#)
- ◆ ⇒ ["3.6.35 Secondary Air Injection Pump Relay 2 J545 / Secondary Air Injection Pump Motor 2 V189 , Checking", page 1664](#)
- ◆ ⇒ ["3.6.36 Secondary Air Injection Sensor 1 G609 , Checking", page 1666](#)
- ◆ ⇒ ["3.6.37 Secondary Air Injection Sensor 2 G610 , Checking", page 1668](#)
- ◆ ⇒ ["3.6.38 Three Way Catalytic Converter \(TWC\), Checking", page 1670](#)
- ◆ ⇒ ["3.6.39 Throttle Valve Control Module GX3 , Checking", page 1671](#)
- ◆ ⇒ ["3.6.40 Vacuum Pump Relay J57 / Vacuum Pump V22 , Checking", page 1674](#)
- ◆ ⇒ ["3.6.41 Vehicle Speed Signal, Checking", page 1676](#)
- ◆ ⇒ ["3.6.42 Wastegate Bypass Regulator Valve N75 , Checking", page 1677](#)

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3.6.1 Accelerator Pedal Module - GX2- , Checking

General Description

The Accelerator Pedal Position Sensor - G79- and Accelerator Pedal Position Sensor 2 - G185- are combined in one component and integrated into the Accelerator Pedal Module - GX2- . They are used to detect the position of the accelerator pedal throughout the entire adjustment range. The Engine Control Module - J623- detects the driver's request from these signals and uses them to calculate the injection quantity and EPC Throttle valve operation.

The Accelerator Pedal Module - GX2- contains the following components:

- ◆ Accelerator Pedal Position Sensor - G79-
- ◆ Accelerator Pedal Position Sensor 2 - G185-

The Accelerator Pedal Module - GX2- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

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Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1594 . – NO: ◆ GATHER more information from customer about the complaint.

Step	Procedure	Result / Action to Take
2	• IGNITION: OFF. • CONNECT: Scan Tool. • IGNITION: ON. • CHECK: Throttle valve position closed: • SPECIFIED VALUE: 3 – 25%. • DEPRESS: Accelerator pedal slowly to WOT while observing the percentage display. The percentage display must increase uniformly. • CHECK: Throttle valve position at WOT: • SPECIFIED VALUE: 84 – 97%. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ Condition may be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1595 . – NO: ◆ GO TO: Step 3 ⇒ page 1594 .
3	• DISCONNECT: Accelerator Pedal Module - GX2- harness connector. • IGNITION: ON. • CHECK: Accelerator Pedal Module - GX2- harness connector terminals T6aq / 1 to T6aq / 5 and T6aq / 2 to T6aq / 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Were Values obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1594 . – NO: ◆ GO TO: Step 5 ⇒ page 1595 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal T6aq / 4 to the Engine Control Module - J623- harness connector T91ca / 82 for resistance. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal T6aq / 6 to the Engine Control Module - J623- harness connector T91ca / 65 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Accelerator Pedal Module - GX2- . Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 1595 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1595 .

Step	Procedure	Result / Action to Take
5	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Accelerator Pedal Module - GX2- harness connector terminal T6aq / 1 to the Engine Control Module - J623- harness connector T91ca / 66 for resistance. - CHECK: Accelerator Pedal Module - GX2- harness connector terminal T6aq / 2 to the Engine Control Module - J623- harness connector T91ca / 83 for resistance. - CHECK: Accelerator Pedal Module - GX2- harness connector terminal T6aq / 3 to the Engine Control Module - J623- harness connector T91ca / 81 for resistance. - CHECK: Accelerator Pedal Module - GX2- harness connector terminal T6aq / 5 to the Engine Control Module - J623- harness connector T91ca / 64 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Were Values obtained?	- YES: - GO TO: Step 6 ⇒ page 1595 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1595 .
6	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

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3.6.2 Brake Pressure Sensor 1 - G201- , Checking

General Description

Using the signal from the Brake Pressure Sensor 1 - G201- , the precise position of the brake pedal is determined. The Engine Control Module - J623- uses this signal to determine other necessary outputs.

Special tools and workshop equipment required

- ◆ Multimeter.

◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1596 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Brake Pressure Sensor 1 - G201- harness connector. • IGNITION: ON. • CHECK: Brake Pressure Sensor 1 - G201- harness connector terminals T4an / 1 to T4an / 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1596 . – NO: ◆ GO TO: Step 4 ⇒ page 1597 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Brake Pressure Sensor 1 - G201- harness connector terminal T4an / 4 to the Engine Control Module - J623- harness connector T91ca / 28 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Brake Pressure Sensor 1 - G201- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1597 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1597 .

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Step	Procedure	Result / Action to Take
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Brake Pressure Sensor 1 - G201- harness connector terminal T4an / 1 to the Engine Control Module - J623- harness connector T91ca / 45 for resistance. • CHECK: Brake Pressure Sensor 1 - G201- harness connector terminal T4an / 3 to the Engine Control Module - J623- harness connector T91ca / 67 for resistance. • SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). – Were Values obtained?	– YES: ◆ GO TO: Step 5 ⇒ page 1597 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1597 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.3 Camshaft Adjustment Valve 1 - N205- , Checking

General Description

The camshaft's task is to operate the valves at the right time and in the right order to control the charge cycle. Camshaft adjustment using the Camshaft Adjustment Valve 1 - N205- varies the opening times of the valves to suit all operating conditions. This ensures ideal charge cycles within a wide range of engine speeds and loads. Fuel consumption and pollutant emissions are reduced, torque and smoothness increased. In engines with a double overhead camshaft the size and positioning of the valve opening overlap can be influenced, enhancing characteristics in full-load and part-load operation. In continuous camshaft adjustment, the adjustment is infinitely variable within specific parameters.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.

◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1598 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Camshaft Adjustment Valve 1 - N205- harness connector. • CHECK: Camshaft Adjustment Valve 1 - N205- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 5 – 20 Ω (+/- 3 Ω @ approx. 20° C). – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1598 . – NO: ◆ REPLACE: Camshaft Adjustment Valve 1 - N205- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1599 .
3	• IGNITION: ON. • CHECK: Camshaft Adjustment Valve 1 - N205- harness connector terminal 1 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1599 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1599 .

Step	Procedure	Result / Action to Take
4	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Camshaft Adjustment Valve 1 - N205- harness connector terminal 2 to the Engine Control Module - J623- harness connector T91ca / 90 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Was Value obtained?	- YES: - TIP: The Camshaft Adjustment Valve 1 - N205- may fail under loaded operation; please swap a known good Camshaft Adjustment Valve 1 - N205- prior to continuing to the next step. - GO TO: Step 5 ⇒ page 1599 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 5 ⇒ page 1599 .
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.4 Camshaft Position Sensor - G40- , Checking

General Description

Using the signal from the Camshaft Position Sensor - G40- , the precise position of the camshaft relative to the crankshaft is determined very quickly when the engine is started. Used in combination with the signal from the Engine Speed Sensor - G28- , the signal from the Camshaft Position Sensor - G40- allows the Engine Control Module - J623- to detect which cylinder is at TDC. The fuel can be injected into the corresponding cylinder and ignited.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.

◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions:
⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1600 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Camshaft Position Sensor - G40- harness connector. • IGNITION: ON. • CHECK: Camshaft Position Sensor - G40- harness connector terminals 1 to 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1600 . – NO: ◆ GO TO: Step 4 ⇒ page 1601 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Camshaft Position Sensor - G40- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / 36 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Camshaft Position Sensor - G40- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1601 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1601 .

Step	Procedure	Result / Action to Take
4	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Camshaft Position Sensor - G40- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105ca / 55 for resistance. - CHECK: Camshaft Position Sensor - G40- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105ca / 20 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Were Values obtained?	- YES: - GO TO: Step 5 ⇒ page 1601 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 5 ⇒ page 1601 .
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.5 CAN-Bus Terminal Resistance, Checking

General Description

The Engine Control Module - J623- communicates with other CAN-Bus capable control modules.

The control modules are connected by two data bus wires which are twisted together (CAN_High and CAN_Low), and exchange information (messages). Missing information on the CAN-bus is recognized as a malfunction by the Engine Control Module - J623- and the other control modules connected to the CAN-bus.

Trouble-free operation of the CAN-Bus requires that it have a terminal resistance. This central terminal resistance is located in the Engine Control Module - J623- .

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1602 . – NO: ◆ GATHER more information from customer about the complaint
2	• IGNITION: OFF. • DISCONNECT: Data Bus On Board Diagnostic Interface - J533- harness connector. • The Engine Control Module - J623- must remain connected for the following step. • CHECK: Data Bus On Board Diagnostic Interface - J533- harness connector T32ae / 5 to T32ae / 21 for resistance. • SPECIFIED VALUE: 60 – 72 Ω (@ approx. 20° C). – Was Value obtained?	– YES: ◆ CONDITION: May be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 1603 . – NO: ◆ GO TO: Step 3 ⇒ page 1602 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Data Bus On Board Diagnostic Interface - J533- harness connector T32ae / 5 to the Engine Control Module - J623- harness connector T91ca / 80 for resistance. • CHECK: Data Bus On Board Diagnostic Interface - J533- harness connector T32ae / 21 to the Engine Control Module - J623- harness connector T91ca / 79 for resistance. • SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ GO TO: Step 4 ⇒ page 1603 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 1603 .

Step	Procedure	Result / Action to Take
4	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	– YES: ◆ CHECK: Data Bus On Board Diagnostic Interface - J533- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Data Bus On Board Diagnostic Interface - J533- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

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3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking

General Description

The Engine Control Module - J623- communicates with all databus capable control modules via a CAN databus.

These databus capable control modules are connected via two data bus wires which are twisted together (CAN_High and CAN_Low), and exchange information (messages). Missing information on the databus is recognized as a malfunction and stored.

Trouble-free operation of the CAN-bus requires that it have a terminal resistance. The central terminal resistor is located in the Engine Control Module - J623- .

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .

- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1604 . – NO: ◆ GATHER more information from customer about the complaint.
2	• The Engine Control Module - J623- must remain connected for the following step. The central terminal resistor is located in the Engine Control Module - J623- . • REMOVE: Transmission Control Module - J217- . Refer to appropriate repair manual. • CHECK: Transmission Control Module - J217- harness connector T16ak / 6 to T16ak / 5 for resistance. • SPECIFIED VALUE: 60 – 72 Ω (@ approx. 20° C). – Was Value obtained?	– YES: ◆ CONDITION: May be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 1605 . – NO: ◆ GO TO: Step 3 ⇒ page 1604 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: CAN bus circuit between the Transmission Control Module - J217- harness connector T16ak / 6 and the Engine Control Module - J623- harness connector T91ca / 80 for resistance. • CHECK: CAN bus circuit between the Transmission Control Module - J217- harness connector T16ak / 5 and the Engine Control Module - J623- harness connector T91ca / 79 for resistance. • SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ GO TO: Step 4 ⇒ page 1605 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 1605 .

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Step	Procedure	Result / Action to Take
4	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	– YES: ◆ CHECK: Transmission Control Module - J217- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Transmission Control Module - J217- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.7 Combustion Air Valve - N44- , Checking

General Description

The dump valves are used to recirculate the charged air when boost pressure is no longer required. The Combustion Air Valve - N44- is activated to redirect the boost pressure. The Engine Control Module - J623- sends a pulse-width modulated signal to the Combustion Air Valve - N44- to control the boost pressure.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
[⇒ "1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
[⇒ "1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	- PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . - Was Complaint verified?	- YES: - GO TO: Step 2 ⇒ page 1606 . - NO: - GATHER more information from customer about the complaint.
2	- IGNITION: OFF. - DISCONNECT: Combustion Air Valve - N44- harness connector. - IGNITION: ON. - CHECK: Combustion Air Valve - N44- harness connector terminal T2cp / 1 to ground for voltage. - IGNITION: OFF. - SPECIFIED VALUE: Battery voltage. - Was Value obtained?	- YES: - GO TO: Step 3 ⇒ page 1606 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 4 ⇒ page 1607 .
3	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Combustion Air Valve - N44- harness connector terminal T2cp / 2 to the Engine Control Module - J623- harness connector terminals T105ca / 54 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). - Was Value obtained?	- YES: - TIP: The Combustion Air Valve - N44- may fail under loaded operation; please swap a known good Combustion Air Valve - N44- prior to continuing to the next step. - GO TO: Step 4 ⇒ page 1607 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 4 ⇒ page 1607 .

Step	Procedure	Result / Action to Take
4	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.8 Displacement On Demand Rotary Solenoid - NX8- , Checking

General Description

The following procedure is used to diagnose the Displacement On Demand Rotary Solenoid - NX8- , which is controlled by the Engine Control Module - J623- .

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .



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Test Procedure

Step	Procedure	Result / Action to Take
1	- PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . - Was Complaint verified?	- YES: - GO TO: Step 2 ⇒ page 1608 . - NO: - GATHER more information from customer about the complaint.
2	- IGNITION: OFF. - DISCONNECT: Displacement On Demand Rotary Solenoid - NX8- harness connector. - IGNITION: ON - CHECK: Displacement On Demand Rotary Solenoid - NX8- harness connector terminal 4 to ground for voltage. - IGNITION: OFF. - SPECIFIED VALUE: Battery voltage - Was Value obtained?	- YES: - GO TO: Step 3 ⇒ page 1608 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 4 ⇒ page 1609 .
3	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Displacement On Demand Rotary Solenoid - NX8- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105ca / 68 for resistance. - CHECK: Displacement On Demand Rotary Solenoid - NX8- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / 90 for resistance. - CHECK: Displacement On Demand Rotary Solenoid - NX8- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105ca / 48 for resistance. - CHECK: Displacement On Demand Rotary Solenoid - NX8- harness connector terminal 6 to the Engine Control Module - J623- harness connector T105ca / 69 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω) - Were Values obtained?	- YES: - REPLACE: Displacement On Demand Rotary Solenoid - NX8- . Refer to appropriate repair manual. - GO TO: Step 4 ⇒ page 1609 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 4 ⇒ page 1609 .

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Step	Procedure	Result / Action to Take
4	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.9 Engine Compartment Fan - V116- , Checking

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General Description

Using the signal from the Engine Control Module - J623- , the Engine Compartment Fan - V116- starts and stops the engine coolant fan when necessary to maintain the engine coolant at the correct operating temperature. The engine coolant in turn cools the engine in order to maintain the engine at the correct operating temperature.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
[⇒ "1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
[⇒ "1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1610 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Engine Compartment Fan - V116- harness connector. • IGNITION: ON. • CHECK: Engine Compartment Fan - V116- harness connector terminals 2 and 3 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1610 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1611 .
3	• CHECK: Engine Compartment Fan - V116- harness connector terminal 1 to ground for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1610 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1611 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Engine Compartment Fan - V116- harness connector terminal 4 to the Engine Control Module - J623- harness connector T91ca / 38 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Engine Compartment Fan - V116- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1611 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1611 .

Step	Procedure	Result / Action to Take
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.10 Engine Component Power Supply Relay - J757- , Checking

General Description

The following procedure is used to diagnose the Engine Component Power Supply Relay - J757- and the power supply voltage that is provided to the Ignition Coils With Power Output Stage .

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
[⇒ "1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
[⇒ "1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	- PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . - Was Complaint verified?	- YES: ◆ GO TO: Step 2 ⇒ page 1612 . - NO: ◆ GATHER more information from customer about the complaint.
2	- IGNITION: OFF. - DISCONNECT: Engine Component Power Supply Relay - J757- from the fuse box in the engine compartment. - IGNITION: ON. - CHECK: Engine Component Power Supply Relay - J757- socket terminals 1 and 3 to ground for voltage. - IGNITION: OFF. - SPECIFIED VALUE: Battery voltage. - Were Values obtained?	- YES: ◆ GO TO: Step 3 ⇒ page 1612 . - NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1613 .
3	- CONNECT: Jumper wire, between the Engine Component Power Supply Relay - J757- socket terminals 3 and 5. - DISCONNECT: Ignition Coils With Power Output Stage harness connectors. - CHECK: Ignition Coils With Power Output Stage harness connector terminals 4 to ground for voltage. - SPECIFIED VALUE: Battery voltage. - Were Values obtained?	- YES: ◆ GO TO: Step 4 ⇒ page 1612 . - NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1613 .
4	- REMOVE: Jumper wire, between the Engine Component Power Supply Relay - J757- socket terminals 3 and 5. - REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Engine Component Power Supply Relay - J757- harness connector terminal 2 to the Engine Control Module - J623- harness connector T91ca / 87 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). - Was Value obtained?	- YES: ◆ REPLACE: Engine Component Power Supply Relay - J757- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1613 . - NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1613 .

Step	Procedure	Result / Action to Take
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.11 Engine Coolant Temperature Sensor - G62- , Checking

General Description

The Engine Coolant Temperature Sensor - G62- sends information about the current coolant temperature to the Engine Control Module - J623- . It uses the coolant temperature as a correction value for calculating the injection quantity.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
[⇒ "1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
[⇒ "1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	- PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . - Was Complaint verified?	- YES: - GO TO: Step 2 ⇒ page 1614 . - NO: - GATHER more information from customer about the complaint.
2	- IGNITION: OFF. - DISCONNECT: Engine Coolant Temperature Sensor - G62- harness connector. - CHECK: Engine Coolant Temperature Sensor - G62- component connector terminals 1 to 2 for resistance. - SPECIFIED VALUE: 2,250 Ω (+/- 750 Ω @ approx. 20° C). - Was Value obtained?	- YES: - GO TO: Step 3 ⇒ page 1614 . - NO: - REPLACE: Engine Coolant Temperature Sensor - G62- . Refer to appropriate repair manual. - GO TO: Step 4 ⇒ page 1614 .
3	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Engine Coolant Temperature Sensor - G62- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105ca / 97 for resistance. - CHECK: Engine Coolant Temperature Sensor - G62- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / 105 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). - Were Values obtained?	- YES: - TIP: The Engine Coolant Temperature Sensor - G62- may fail under loaded operation; please swap a known good Engine Coolant Temperature Sensor - G62- prior to continuing to the next step. - GO TO: Step 4 ⇒ page 1614 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 4 ⇒ page 1614 .
4	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.12 Engine Coolant Temperature Sensor On Radiator Outlet - G83- , Checking

General Description

The Engine Coolant Temperature Sensor On Radiator Outlet - G83- sends information about the current coolant temperature to the Engine Control Module - J623- . It uses the coolant temperature as a correction value for calculating the injection quantity.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1615 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Engine Coolant Temperature Sensor On Radiator Outlet - G83- harness connector. • CHECK: Engine Coolant Temperature Sensor On Radiator Outlet - G83- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 2,250 Ω (+/- 750 Ω @ approx. 20° C). – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1616 . – NO: ◆ REPLACE: Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to appropriate repair manual. ◆ GO TO: Step 4 ⇒ page 1616 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Engine Coolant Temperature Sensor On Radiator Outlet - G83- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 56 for resistance. • CHECK: Engine Coolant Temperature Sensor On Radiator Outlet - G83- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 76 for resistance. • SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). – Were Values obtained?	– YES: ◆ TIP: The Engine Coolant Temperature Sensor On Radiator Outlet - G83- may fail under loaded operation; please swap a known good Engine Coolant Temperature Sensor On Radiator Outlet - G83- prior to continuing to the next step. ◆ GO TO: Step 4 ⇒ page 1616 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 1616 .
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.13 Engine Speed Sensor - G28- , Checking

General Description

The Engine Speed Sensor - G28- detects rpm and reference marks from a toothed wheel on the crankshaft. Without an engine speed signal, the engine will not start. If the engine speed signal fails while the engine is running, the engine will stop immediately.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1617 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • CONNECT: Scan Tool. • START or CRANK: Engine. • CHECK: Engine rpm. • SPECIFIED VALUE: Cranking or Idle rpm. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ CONDITION: May be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1618 . – NO: ◆ GO TO: Step 3 ⇒ page 1617 .
3	• DISCONNECT: Engine Speed Sensor - G28-harness connector. • IGNITION: ON. • CHECK: Engine Speed Sensor - G28- harness connector terminals 1 to 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1618 . – NO: ◆ GO TO: Step 5 ⇒ page 1618 .

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Step	Procedure	Result / Action to Take
4	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Engine Speed Sensor - G28- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / 18 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Was Value obtained?	- YES: - REMOVE: Engine Speed Sensor - G28- . Refer to appropriate repair manual. - CHECK: Engine Speed Sensor - G28- sensor wheel for proper seating, damage and/or run - out. Refer to appropriate repair manual. - Sensor wheel OK. - REPLACE: Engine Speed Sensor - G28- . Refer to appropriate repair manual. - GO TO: Step 6 ⇒ page 1618 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1618 .
5	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Engine Speed Sensor - G28- harness connector terminal 1 to the Engine Control Module - J623- harness connector T91ca / 85 for resistance. - CHECK: Engine Speed Sensor - G28- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105ca / 19 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Were Values obtained?	- YES: - GO TO: Step 6 ⇒ page 1618 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1618 .
6	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.14 EVAP Canister Purge Regulator Valve 1 - N80- , Checking

General Description

The EVAP system is designed so that the admission of fuel vapors takes place only at idle and at light part-throttle. The EVAP Canister Purge Regulator Valve 1 - N80- is activated by the Engine Control Module - J623- to accomplish this task.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1619 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: EVAP Canister Purge Regulator Valve 1 - N80- harness connector. • CHECK: EVAP Canister Purge Regulator Valve 1 - N80- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 15 – 35 Ω (+/- 5 Ω). – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1620 . – NO: ◆ REPLACE: EVAP Canister Purge Regulator Valve 1 - N80- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1620 .

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Step	Procedure	Result / Action to Take
3	- IGNITION: ON. - CHECK: EVAP Canister Purge Regulator Valve 1 - N80- harness connector terminal 1 to ground for voltage. - IGNITION: OFF. - SPECIFIED VALUE: Battery voltage. - Was Value obtained?	- YES: ◆ GO TO: Step 4 ⇒ page 1620 . - NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1620 .
4	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: EVAP Canister Purge Regulator Valve 1 - N80- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / 8 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). - Was Value obtained?	- YES: ◆ TIP: The EVAP Canister Purge Regulator Valve 1 - N80- may fail under loaded operation; please swap a known good EVAP Canister Purge Regulator Valve 1 - N80- prior to continuing to the next step. ◆ GO TO: Step 5 ⇒ page 1620 . - NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1620 .
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. - NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

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3.6.15 Exhaust Gas Temperature Sensor 1 - G235- , Checking

General Description

Exhaust gas temperature sensors are positive temperature coefficient (PTC) sensors. They measure the temperature of the exhaust gas. The Engine Control Module - J623- uses the signals from exhaust gas temperature sensors to calculate the amount of contamination in the diesel particulate filter, also to protect the turbocharger from unacceptably high exhaust gas temperatures. The diesel particulate filter contamination status is calculated using these signals from the exhaust gas temperature sensors, together with the signals from the Mass Airflow Sensor - G70- , and the Heated Oxygen Sensors . The signal also serves as component protection in order to protect the diesel particulate filter and turbocharger from excessively high exhaust gas temperatures.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1621 . – NO: ◆ GATHER more Information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Exhaust Gas Temperature Sensor 1 - G235- harness connector. • IGNITION: ON. • CHECK: Exhaust Gas Temperature Sensor 1 - G235- harness connector terminals 2 to 3 and 3 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1622 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 1622 .

Step	Procedure	Result / Action to Take
3	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Exhaust Gas Temperature Sensor 1 - G235- harness connector terminal 1 to the Engine Control Module - J623- harness connector terminal T91ca / 14 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Was Value obtained?	- YES: - REPLACE: Exhaust Gas Temperature Sensor 1 - G235- . Refer to appropriate repair manual. - GO TO: Step 4 ⇒ page 1622 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 4 ⇒ page 1622 .
4	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.16 Exhaust Gas Temperature Sensor 2 - G448- , Checking

General Description

Exhaust gas temperature sensors are positive temperature coefficient (PTC) sensors. They measure the temperature of the exhaust gas. The Engine Control Module - J623- uses the signals from exhaust gas temperature sensors to calculate the amount of contamination in the diesel particulate filter, also to protect the turbocharger from unacceptably high exhaust gas temperatures. The diesel particulate filter contamination status is calculated using these signals from the exhaust gas temperature sensors, together with the signals from the Mass Airflow Sensor - G70- , and the Heated Oxygen Sensors . The signal also serves as component protection in order to protect the diesel particulate filter and turbocharger from excessively high exhaust gas temperatures.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions:
⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1623 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Exhaust Gas Temperature Sensor 2 - G448- harness connector. • IGNITION: ON. • CHECK: Exhaust Gas Temperature Sensor 2 - G448- harness connector terminals 2 to 3 and 3 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1623 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 1624 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Exhaust Gas Temperature Sensor 2 - G448- harness connector terminal 1 to the Engine Control Module - J623- harness connector terminal T91ca / 32 for resistance. • SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω) – Was Value obtained?	– YES: ◆ REPLACE: Exhaust Gas Temperature Sensor 2 - G448- . Refer to appropriate repair manual. ◆ GO TO: Step 4 ⇒ page 1624 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 1624 .

Step	Procedure	Result / Action to Take
4	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.17 Fuel Injectors , Checking

General Description

The Fuel Injectors are controlled by the Engine Control Module - J623- and are mounted normally in the cylinder head. The fuel injectors spray high-pressure atomized fuel directly into the combustion chamber.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.
- ◆ LED Test Lamp.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	- PERFORM: Preliminary Check to verify the customers complaint. Refer to page 13. - Was Complaint verified?	- YES: - GO TO: Step 2 page 1625. - NO: - GATHER more information from customer about the complaint.
2	- IGNITION: OFF. - DISCONNECT: Harness connector from suspect Fuel Injector. - CHECK: Suspect Fuel Injector component connector terminals 1 to 2 for resistance (refer to appropriate wiring diagram for correct terminal and connector locations). - SPECIFIED VALUE: 0.5 – 15 Ω (@ approx. 20° C). - Was Value obtained?	- YES: - GO TO: Step 3 page 1625. - NO: - REPLACE: Suspect Fuel Injector (s). Refer to appropriate repair manual. - GO TO: Step 5 page 1626.
3	- IGNITION: ON. - CHECK: Suspect Fuel Injector harness connector terminal 1 to ground for voltage. - IGNITION: OFF. - SPECIFIED VALUE: Battery voltage. - Was Value obtained?	- YES: - GO TO: Step 4 page 1625. - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 5 page 1626.
4	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Suspect Fuel Injector harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / xx for resistance (refer to appropriate wiring diagram for correct terminal and connector locations). - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Was Value obtained?	- YES: - TIP: The Fuel Injector may fail under loaded operation; please swap a known good Fuel Injector prior to continuing to the next step. - GO TO: Step 5 page 1626. - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 5 page 1626.



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Step	Procedure	Result / Action to Take
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.18 Fuel Pressure Sensor - G247- , Checking

General Description

The Fuel Pressure Sensor - G247- measures the fuel pressure in the high-pressure fuel system.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- **Battery voltage OK.**
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	- PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13. - Was Complaint verified?	- YES: ◆ GO TO: Step 2 ⇒ page 1627. - NO: ◆ GATHER more information from customer about the complaint.
2	- IGNITION: OFF. - DISCONNECT: Fuel Pressure Sensor - G247- harness connector. - IGNITION: ON. - CHECK: Fuel Pressure Sensor - G247- harness connector terminals 1 to 3 for voltage. - SPECIFIED VALUE: About 5.0 V. - IGNITION: OFF. - Was Value obtained?	- YES: ◆ GO TO: Step 3 ⇒ page 1627. - NO: ◆ GO TO: Step 4 ⇒ page 1627.
3	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Fuel Pressure Sensor - G247- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 62 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). - Was Value obtained?	- YES: ◆ REPLACE: Fuel Pressure Sensor - G247- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1628. - NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1628.
4	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Fuel Pressure Sensor - G247- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 97 for resistance. - CHECK: Fuel Pressure Sensor - G247- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105 / 20 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). - Were Values obtained?	- YES: ◆ GO TO: Step 5 ⇒ page 1628. - NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1628.

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Step	Procedure	Result / Action to Take
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.19 Fuel Pump Relay - J17- / Fuel Pump 1 - V276- , Checking

General Description

The Engine Control Module - J623- controls the Fuel Pump Relay - J17- , to activate the Fuel Pump 1 - V276- . The Fuel Pump 1 - V276- transfers fuel to the rest of the fuel system, where it is monitored by the Engine Control Module - J623- through sensors, and controlled through regulators and/or metering valves.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
[⇒ "1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
[⇒ "1.2 Clean Working Conditions", page 3](#) .



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Test Procedure



Note

When the door is opened or the Ignition is turned to the ON position the fuel pump is activated for 2 seconds to build up the pressure in the fuel system.

Step	Procedure	Result / Action to Take
1	- PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13. - Was Complaint verified?	- YES: - GO TO: Step 2 ⇒ page 1629. - NO: - GATHER more information from customer about the complaint.
2	- IGNITION: OFF. - REMOVE: Fuel Pump Relay - J17- . Refer to appropriate repair manual. - IGNITION: ON. - CHECK: Fuel Pump Relay - J17- socket terminals 1 and 3 to ground for voltage. - IGNITION: OFF. - SPECIFIED VALUE: Battery voltage. - Were Values obtained?	- YES: - GO TO: Step 3 ⇒ page 1629. - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1630.
3	- CONNECT: Jumper wire, between the Fuel Pump Relay - J17- socket terminals 3 and 5. - IGNITION ON. - LISTEN: Fuel Pump 1 - V276- should be heard running for 2 s. - IGNITION: OFF. - SPECIFIED VALUE: Fuel Pump 1 - V276- ON for 2 s. - Was Value obtained?	- YES: - GO TO: Step 4 ⇒ page 1629. - NO: - GO TO: Step 5 ⇒ page 1630.
4	- REMOVE: Jumper wire, between the Fuel Pump Relay - J17- socket terminals 3 and 5. - REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Fuel Pump Relay - J17- socket terminal 2 to the Engine Control Module - J623- harness connector T91ca / 18 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). - Was Value obtained?	- YES: - REPLACE: Fuel Pump Relay - J17- . Refer to appropriate repair manual. - GO TO: Step 6 ⇒ page 1630. - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1630.

Step	Procedure	Result / Action to Take
5	• REMOVE: Jumper wire, between the Fuel Pump Relay - J17- socket terminals 3 and 5. • DISCONNECT: Fuel Pump 1 - V276- harness connector. • CHECK: Fuel Pump 1 - V276- harness connector terminal 1 (RT/GR) to the Fuel Pump Relay - J17- socket terminal 5 for resistance. • CHECK: Fuel Pump 1 - V276- harness connector terminal 1 (BR) to ground for resistance. • SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω) – Were Values obtained?	– YES: ◆ REPLACE: Fuel Pump 1 - V276- . Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 1630 . – NO: ◆ PERFORM: Visual Inspection of wiring and component ◆ CHECK: Wiring for open, high resistance, short or electrical connector for damage, corrosion, loose or broken terminals ◆ REPAIR: Faulty wiring or connector ◆ GO TO: Step 6 ⇒ page 1630 .
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.20 Fuel Pump Relay 2 - J49- / Fuel Pump 2 - V277- , Checking

General Description

The Engine Control Module - J623- controls the Fuel Pump Relay 2 - J49- , to activate the Fuel Pump 2 - V277- . The Fuel Pump 2 - V277- transfers fuel to the rest of the fuel system, where it is monitored by the Engine Control Module - J623- through sensors, and controlled through regulators and/or metering valves.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.

- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions:
⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure



Note

When the door is opened or the Ignition is turned to the ON position the fuel pump is activated for 2 seconds to build up the pressure in the fuel system.

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1631 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • REMOVE: Fuel Pump Relay 2 - J49- . Refer to appropriate repair manual. • IGNITION: ON. • CHECK: Fuel Pump Relay 2 - J49- socket terminals 1 and 3 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1631 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1632 .
3	• CONNECT: Jumper wire, between the Fuel Pump Relay 2 - J49- socket terminals 3 and 5. • IGNITION: ON. • LISTEN: Fuel Pump 2 - V277- should be heard running for 2 s. • IGNITION: OFF. • SPECIFIED VALUE: Fuel Pump 2 - V277- ON for 2 s. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1632 . – NO: ◆ GO TO: Step 5 ⇒ page 1632 .

Step	Procedure	Result / Action to Take
4	- REMOVE: Jumper wire, between the Fuel Pump Relay 2 - J49- socket terminals 3 and 5. - REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Fuel Pump Relay 2 - J49- socket terminal 2 to the Engine Control Module - J623- harness connector T105ca / 50 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Was Value obtained?	- YES: - REPLACE: Fuel Pump Relay 2 - J49- . Refer to appropriate repair manual. - GO TO: Step 6 ⇒ page 1632 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1632 .
5	- REMOVE: Jumper wire, between the Fuel Pump Relay 2 - J49- socket terminals 3 and 5. - DISCONNECT: Fuel Pump 2 - V277- harness connector. Protected by copyright. Copying for private or internal use only is not permitted unless authorised by Bentley Motors. Bentley Motors does not guarantee or accept liability for any errors or omissions in this document. - CHECK: Fuel Pump 2 - V277- harness connector terminal 1 (RT/SW) to the Fuel Pump Relay 2 - J49- socket terminal 5 for resistance. - CHECK: Fuel Pump 2 - V277- harness connector terminal 1 (BR) to ground for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω) - Were Values obtained?	- YES: - REPLACE: Fuel Pump 2 - V277- . Refer to appropriate repair manual. - GO TO: Step 6 ⇒ page 1632 . - NO: - PERFORM: Visual Inspection of wiring and component - CHECK: Wiring for open, high resistance, short or electrical connector for damage, corrosion, loose or broken terminals - REPAIR: Faulty wiring or connector - GO TO: Step 6 ⇒ page 1632 .
6	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.21 Ignition Coils With Power Output Stage , Checking

General Description

The ignition coil must transform the relatively low 12 V on-board vehicle voltage to the high ignition voltage required and supply the energy stored in that voltage to the spark plug. The functional principle of the ignition coil is relatively simple. It has a primary winding (small number of turns) and a secondary winding (lots of turns). The turn ratio between the number of primary and secondary winding turns determines the level of the voltage generated at the output. The Ignition Coils With Power Output Stage are plugged directly into the spark plug. This means the ignition energy can be transferred directly to the spark plug with virtually zero power loss.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.
- ◆ LED Test Lamp.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions:
⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1633 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Suspect Ignition Coil With Power Output Stage harness connector. • IGNITION: ON. • CHECK: Suspect Ignition Coil With Power Output Stage harness connector terminals 4 to 1 and 3 for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1634 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1634 .

Step	Procedure	Result / Action to Take
3	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Suspect Ignition Coil With Power Output Stage harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / xx for resistance (refer to appropriate wiring diagram for proper terminal locations). - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Was Value obtained?	- YES: ◆ GO TO: Step 4 ⇒ page 1634 . - NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1634 .
4	- DISCONNECT: All of the Fuel Injectors . Refer to appropriate wiring diagram. - DISCONNECT: Cold Start Injector (If applicable). - CONNECT: Engine Control Module - J623- harness connector. - CONNECT: LED Test Lamp to Suspect Ignition Coil With Power Output Stage harness connector terminals 2 to 3. - CRANK: Engine. - SPECIFIED VALUE: LED Test Lamp should Flicker ON & OFF. - Was Value obtained?	- YES: ◆ REPLACE: Ignition Coil With Power Output Stage . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1634 . - NO: ◆ GO TO: Step 5 ⇒ page 1634 .
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. - NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.22 Knock Sensor 1 - G61- , Checking

General Description

The Knock Sensor 1 - G61- is a tuned accelerometer on the engine which converts engine vibration to an electrical signal. The

Engine Control Module - J623- uses this signal to determine the presence of engine knock and to retard spark timing, if necessary.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure



Note

- ◆ *Prior to beginning the test procedure, make sure to check the items listed below:*
- ◆ *Poor fuel quality*
- ◆ *Ignition timing malfunction*
- ◆ *Loose components on the engine block*
- ◆ *Engine temperature must be in the normal range*

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1635 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • CONNECT: Scan tool . • START: Engine and let Idle. • CHECK: The ignition advance timing value. • TAP: Near the Knock Sensor 1 - G61- area and monitor for any fluctuations in the ignition timing advance value. • IGNITION: OFF. • SPECIFIED VALUE: 1 – 10 degrees of ignition timing fluctuation. – Was Value obtained?	– YES: ◆ CONDITION: May be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 1636 . – NO: ◆ REPLACE: Knock Sensor 1 - G61- . Refer to appropriate repair manual. ◆ GO TO: Step 3 ⇒ page 1636 .

Step	Procedure	Result / Action to Take
3	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Knock Sensor 1 - G61- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105ca / 79 for resistance. - CHECK: Knock Sensor 1 - G61- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / 100 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Were Values obtained?	- YES: - TIP: The Knock Sensor 1 - G61- may fail under loaded operation; please swap a known good Knock Sensor 1 - G61- prior to continuing to the next step. - GO TO: Step 4 ⇒ page 1636 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 4 ⇒ page 1636 .
4	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.23 Knock Sensor 2 - G66- , Checking

General Description

The Knock Sensor 2 - G66- is a tuned accelerometer on the engine which converts engine vibration to an electrical signal. The Engine Control Module - J623- uses this signal to determine the presence of engine knock and to retard spark timing.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.

- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure



Note

- ◆ *Prior to beginning the test procedure, make sure to check the items listed below:*
- ◆ *Poor fuel quality*
- ◆ *Ignition timing malfunction*
- ◆ *Loose components on the engine block*
- ◆ *Engine temperature must be in the normal range*

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1637 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • CONNECT: Scan tool . • START: Engine and let Idle. • CHECK: The ignition advance timing value. • TAP: Near the Knock Sensor 1 - G61- area and monitor for any fluctuations in the ignition timing advance value. • IGNITION: OFF. • SPECIFIED VALUE: 1 – 10 degrees of ignition timing fluctuation. – Was Value obtained?	– YES: ◆ CONDITION: May be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 1638 . – NO: ◆ REPLACE: Knock Sensor 2 - G66- . Refer to appropriate repair manual. ◆ GO TO: Step 3 ⇒ page 1638 .

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Step	Procedure	Result / Action to Take
3	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Knock Sensor 2 - G66- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105ca / 101 for resistance. - CHECK: Knock Sensor 2 - G66- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / 80 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Were Values obtained?	- YES: - TIP: The Knock Sensor 2 - G66- may fail under loaded operation; please swap a known good Knock Sensor 2 - G66- prior to continuing to the next step. - GO TO: Step 4 ⇒ page 1638 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 4 ⇒ page 1638 .
4	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.24 Leak Detection Pump - V144- , Checking

General Description

Whenever the engine is running, vacuum is applied to the Vacuum Switch. This switch applies vacuum to the Upper Chamber of the pump when it receives a ground signal from the Engine Control Module - J623- . This signal is a duty cycle pulse of approximately 40%. When vacuum is applied to the Upper Chamber, fresh air flows in through the One-way Inlet Valve, compressing the spring above the diaphragm. When the Diaphragm begins to rise, the Reed Switch, attached to the Diaphragm Rod, opens. When the Vacuum Switch closes, the vacuum in the Upper Chamber is released. As a result, the spring pushes the Diaphragm down. As the Diaphragm is pushed down, the air in the Lower Chamber is pushed out of the One-way Outlet Valve into the EVAP system. This process continues until the pressure in the EVAP system no longer allows the spring to push

the Diaphragm down. With tension on the Diaphragm, the ECM waits for a certain period of time to watch for the Diaphragm to fall. The Reed Switch closing signals that the Diaphragm has fallen to its lowest point. When the Reed Switch closes, the ECM may cycle the LDP to build up system pressure again. The ECM measures the time it takes for the Reed Switch to close once the Leak Detection Pump - V144- has stopped running to determine if there is a leak in the system. The slower the Diaphragm falls after the pump stops running, the less air is leaking out of the EVAP system.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.
- ◆ Hand Vacuum Pump.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#).
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#).

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to "3.1 Preliminary Check", page 13. – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1639. – NO: ◆ GATHER more information from customer about the complaint.
2	• REMOVE: Evaporative Canister. Refer to appropriate repair manual. • Plug or Cap off the Leak Detection Pump - V144- hose going to the vent filter. • CONNECT: Hand vacuum pump to the Leak Detection Pump - V144- and apply 0.700 bar and see if the vacuum holds. – Did the vacuum hold?	– YES: ◆ GO TO: Step 3 ⇒ page 1640. – NO: ◆ REPLACE: Leak Detection Pump - V144-. Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1640.

Step	Procedure	Result / Action to Take
3	- IGNITION: OFF. - DISCONNECT: Leak Detection Pump - V144- harness connector. - IGNITION: ON. - CHECK: Leak Detection Pump - V144- harness connector terminal 1 to ground for voltage. - IGNITION: OFF. - SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1640 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1640 .
4	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Leak Detection Pump - V144- harness connector terminal 2 to the Engine Control Module - J623- harness connector T91ca / 89 for resistance. - CHECK: Leak Detection Pump - V144- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91ca / 13 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Leak Detection Pump - V144- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1640 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1640 .
5	- Final Procedure - Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.25 Manifold Absolute Pressure Sensor - G71- , Checking

General Description

The Engine Control Module - J623- uses the Manifold Absolute Pressure Sensor - G71- signal to calculate a correction value for

the charge air pressure. Evaluation of the signal gives consideration to the influence of temperature on the density of the charge air.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.

- Observe all safety precautions:
⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions:
⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1641 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Manifold Absolute Pressure Sensor - G71- harness connector. • IGNITION: ON. • CHECK: Manifold Absolute Pressure Sensor - G71- harness connector terminals 1 to 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1641 . – NO: ◆ GO TO: Step 4 ⇒ page 1642 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Manifold Absolute Pressure Sensor - G71- harness connector terminal 4 to the Engine Control Module - J623- harness connector T105ca / 63 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Manifold Absolute Pressure Sensor - G71- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1642 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1642 .

Step	Procedure	Result / Action to Take
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Manifold Absolute Pressure Sensor - G71- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105ca / 76 for resistance. • CHECK: Manifold Absolute Pressure Sensor - G71- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105ca / 41 for resistance. • SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). – Were Values obtained?	– YES: ◆ GO TO: Step 5 ⇒ page 1642 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1642 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.26 Manifold Absolute Pressure Sensor 2 - G429- , Checking

General Description

The Manifold Absolute Pressure Sensor 2 - G429- is located downstream of the throttle on the intake manifold, and measures the pressure in the intake manifold and transmits the value to the Engine Control Module - J623- .

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.

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- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1643 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Manifold Absolute Pressure Sensor 2 - G429- harness connector. • IGNITION: ON. • CHECK: Manifold Absolute Pressure Sensor 2 - G429- harness connector terminals 1 to 3 for voltage. • IGNITION: OFF. • SPECIFIED VALUE: About 5.0 V. – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1643 . – NO: ◆ GO TO: Step 4 ⇒ page 1643 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Manifold Absolute Pressure Sensor 2 - G429- harness connector terminal 2 to the Engine Control Module - J623- harness connector T91ca / 11 for resistance. • CHECK: Manifold Absolute Pressure Sensor 2 - G429- harness connector terminal 4 to the Engine Control Module - J623- harness connector T91ca / 47 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω) – Were Values obtained?	– YES: ◆ REPLACE: Manifold Absolute Pressure Sensor 2 - G429- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1644 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1644 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Manifold Absolute Pressure Sensor 2 - G429- harness connector terminal 1 to the Engine Control Module - J623- harness connector T91ca / 45 for resistance. • CHECK: Manifold Absolute Pressure Sensor 2 - G429- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91ca / 84 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ GO TO: Step 5 ⇒ page 1644 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1644 .

Step	Procedure	Result / Action to Take
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.27 Mass Airflow Sensor - G70- , Checking

General Description

The signal from the Mass Airflow Sensor - G70- is used in the Engine Control Module - J623- to calculate the volumetric efficiency. Based on the volumetric efficiency, and taking into consideration the lambda value and ignition timing, the Engine Control Module - J623- calculates the engine torque.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	- PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13. - Was complaint verified?	- YES: - GO TO: Step 2 ⇒ page 1645. - NO: - GATHER more information from customer about the complaint.
2	- IGNITION: OFF. - CONNECT: Scan tool. - START: Engine and let Idle. - CHECK: The air flow quantity of the Mass Air-flow Sensor - G70-. - SPECIFIED VALUE: About 2.0 to 5.0 g/s. - IGNITION: OFF. - Was Value obtained?	- YES: - Condition may be intermittent. - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 5 ⇒ page 1646. - NO: - GO TO: Step 3 ⇒ page 1645.
3	- DISCONNECT: Mass Airflow Sensor - G70- harness connector. - IGNITION: ON. - CHECK: Mass Airflow Sensor - G70- harness connector terminal 5 to ground for voltage. - IGNITION: OFF. - SPECIFIED VALUE: Battery voltage. - Was Value obtained?	- YES: - GO TO: Step 4 ⇒ page 1645. - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 5 ⇒ page 1646.
4	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Mass Airflow Sensor - G70- harness connector terminal 1 to the Engine Control Module - J623- harness connector T91ca / 15 for resistance. - CHECK: Mass Airflow Sensor - G70- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / 34 for resistance. - CHECK: Mass Airflow Sensor - G70- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91ca / 42 for resistance. - CHECK: Mass Airflow Sensor - G70- harness connector terminal 4 to the Engine Control Module - J623- harness connector T91ca / 69 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). - Were Values obtained?	- YES: - REPLACE: Mass Airflow Sensor - G70- . Refer to appropriate repair manual. - GO TO: Step 5 ⇒ page 1646. - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 5 ⇒ page 1646.

Step	Procedure	Result / Action to Take
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.28 Mass Airflow Sensor 2 - G246- , Checking

General Description

The signal from the Mass Airflow Sensor 2 - G246- is used in the Engine Control Module - J623- to calculate the volumetric efficiency. Based on the volumetric efficiency, and taking into consideration the lambda value and ignition timing, the Engine Control Module - J623- calculates the engine torque.

Special tools and workshop equipment required

- ◆ Multimeter
- ◆ Wiring Diagram
- ◆ Scan Tool

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	- PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13. - Was complaint verified?	- YES: - GO TO: Step 2 ⇒ page 1647. - NO: - GATHER more information from customer about the complaint.
2	- IGNITION: OFF. - CONNECT: Scan tool. - START: Engine and let Idle. - CHECK: The air flow quantity of the Mass Air-flow Sensor 2 - G246-. - SPECIFIED VALUE: About 2.0 to 5.0 g/s. - IGNITION: OFF. - Was Value obtained?	- YES: - Condition may be intermittent. - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 5 ⇒ page 1648. - NO: - GO TO: Step 3 ⇒ page 1647.
3	- DISCONNECT: Mass Airflow Sensor 2 - G246- harness connector. - IGNITION: ON. - CHECK: Mass Airflow Sensor 2 - G246- harness connector terminal 5 to ground for voltage. - IGNITION: OFF. - SPECIFIED VALUE: Battery voltage. - Was Value obtained?	- YES: - GO TO: Step 4 ⇒ page 1647. - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 5 ⇒ page 1648.
4	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Mass Airflow Sensor 2 - G246- harness connector terminal 1 to the Engine Control Module - J623- harness connector T91ca / 31 for resistance. - CHECK: Mass Airflow Sensor 2 - G246- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / 37 for resistance. - CHECK: Mass Airflow Sensor 2 - G246- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91ca / 58 for resistance. - CHECK: Mass Airflow Sensor 2 - G246- harness connector terminal 4 to the Engine Control Module - J623- harness connector T91ca / 69 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Were Values obtained?	- YES: - REPLACE: Mass Airflow Sensor 2 - G246- . Refer to appropriate repair manual. - GO TO: Step 5 ⇒ page 1648. - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 5 ⇒ page 1648.

Step	Procedure	Result / Action to Take
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.29 Motronic Engine Control Module Power Supply Relay 2 - J670- , Checking

General Description

The following procedure is used to diagnose the Motronic Engine Control Module Power Supply Relay 2 - J670- and the power supply voltage that is provided by the Motronic Engine Control Module Power Supply Relay 2 - J670- .

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
[⇒ "1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
[⇒ "1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1649 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Motronic Engine Control Module Power Supply Relay 2 - J670- . Refer to appropriate repair manual. • IGNITION: ON. • CHECK: Motronic Engine Control Module Power Supply Relay 2 - J670- socket terminals 1 and 3 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1649 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1650 .
3	• REMOVE: Appropriate fuse. Refer to appropriate wiring diagram for correct fuse. • CONNECT: Jumper wire, between the Motronic Engine Control Module Power Supply Relay 2 - J670- socket terminals 3 and 5. • IGNITION: ON. • CHECK: Upstream (input) side of appropriate fuse. Refer to appropriate wiring diagram for correct fuse to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1649 . – NO: ◆ GO TO: Step 5 ⇒ page 1650 .
4	• REMOVE: Jumper wire, between the Motronic Engine Control Module Power Supply Relay 2 - J670- socket terminals 3 and 5. • CHECK: Motronic Engine Control Module Power Supply Relay 2 - J670- socket terminal 2 to the Engine Control Module - J623- harness connector T91ca / 35 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Motronic Engine Control Module Power Supply Relay 2 - J670- . Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 1650 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1650 .

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Step	Procedure	Result / Action to Take
5	- REMOVE: Jumper wire, between the Motronic Engine Control Module Power Supply Relay 2 - J670- socket terminals 3 and 5. - CHECK: Fuse Panel A - SA- harness connector KL87a / 1 (back-probed) to the Motronic Engine Control Module Power Supply Relay 2 - J670- socket terminal 5 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Was Value obtained?	- YES: - REPLACE: Fuse Panel A - SA- . Refer to appropriate repair manual. - GO TO: Step 6 ⇒ page 1650 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1650 .
6	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

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3.6.30 Oxygen Sensor 1 After Catalytic Converter - GX7- , Checking

General Description

The Oxygen Sensor 1 After Catalytic Converter - GX7- is positioned downstream of the primary catalytic converter and it supplies the Engine Control Module - J623- with a voltage signal (nonlinear) indicating a "rich" or a "lean" condition is present. If the primary catalytic converter is supersaturated with oxygen (indicating a lean mixture is present), the Oxygen Sensor 1 After Catalytic Converter - GX7- will send the Engine Control Module - J623- a nonlinear signal indicating the lean mixture condition. The mixture is then enriched with fuel until the oxygen has been "displaced" from the catalytic converter. This new condition, in turn, is registered by the Oxygen Sensor 1 After Catalytic Converter - GX7- as a nonlinear signal indicating the rich mixture condition. The mixture is then leaned out by the Engine Control Module - J623- . If the nonlinear signal is received again, the mixture will again be enriched. The frequency, or period, during which the

mixture is enriched or leaned out is variable, being dependent on the gas flow rate (engine load) at that moment.

Note the Oxygen Sensor 1 After Catalytic Converter - GX7- is also known as the Oxygen Sensor After Three Way Catalytic Converter - G130- .

The Oxygen Sensor 1 After Catalytic Converter - GX7- contains the following components:

- ◆ Oxygen Sensor After Three Way Catalytic Converter - G130-
- ◆ Heater For Oxygen Sensor 1 After Catalytic Converter - Z29-

The Oxygen Sensor 1 After Catalytic Converter - GX7- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions:
⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1651 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Oxygen Sensor 1 After Catalytic Converter - GX7- harness connector. • CHECK: Oxygen Sensor 1 After Catalytic Converter - GX7- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 2 – 4 Ω (+/- 0.5 Ω @ 25° C). – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1652 . – NO: ◆ REPLACE: Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 1653 .

Step	Procedure	Result / Action to Take
3	- IGNITION: ON. - CHECK: Oxygen Sensor 1 After Catalytic Converter - GX7- harness connector terminal 1 to ground for voltage. - IGNITION: OFF. - SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1652 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1653 .
4	- RECONNECT: Oxygen Sensor 1 After Catalytic Converter - GX7- harness connector. - CONNECT: Scan Tool. - START: Engine and let Idle. - Perform the function test located in diagnostic mode 06. Refer to appropriate Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, ⇒ “3.3 Diagnostic Modes 01 – 0A”, page 16 . - SPECIFIED VALUE: Mode 6 Pass. - IGNITION: OFF. – Were Values obtained?	– YES: ◆ FAULT: Is intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1653 . – NO: ◆ GO TO: Step 5 ⇒ page 1652 .
5	- REMOVE: Engine Control Module - J623- Refer to appropriate repair manual. - DISCONNECT: Oxygen Sensor 1 After Catalytic Converter - GX7- harness connector. - CHECK: Oxygen Sensor 1 After Catalytic Converter - GX7- harness connector terminal 2 to the Engine Control Module - J623- harness connector T91ca / 91 for resistance. - CHECK: Oxygen Sensor 1 After Catalytic Converter - GX7- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91ca / 76 for resistance. - CHECK: Oxygen Sensor 1 After Catalytic Converter - GX7- harness connector terminal 4 to the Engine Control Module - J623- harness connector T91ca / 75 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 1653 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1653 .

Step	Procedure	Result / Action to Take
6	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.31 Oxygen Sensor 1 Before Catalytic Converter - GX10- , Checking

General Description

The Oxygen Sensor 1 Before Catalytic Converter - GX10- does not actually measure oxygen concentration, but rather the difference between the amount of oxygen in the exhaust gas and the amount of oxygen in the air. A rich mixture causes an oxygen demand. This demand causes a voltage to build up, due to transportation of oxygen ions through the Oxygen Sensor 1 Before Catalytic Converter - GX10- layer. A lean mixture causes a low voltage, since there is an oxygen excess. The Oxygen Sensor 1 Before Catalytic Converter - GX10- and catalytic converters are used in order to reduce exhaust emissions. Information on oxygen concentration is sent to the Engine Control Module - J623- , which adjusts the amount of fuel injected into the engine to compensate for excess air or excess fuel. The Engine Control Module - J623- attempts to maintain, on average, a certain air-fuel ratio by interpreting the information it gains from the Oxygen Sensor 1 Before Catalytic Converter - GX10- . The primary goal is a compromise between power, fuel economy, and emissions. The heater for the Oxygen Sensor 1 Before Catalytic Converter - GX10- is designed to minimize the time-to-readiness for closed-loop operation by heating the Oxygen Sensor 1 Before Catalytic Converter - GX10- as quickly as possible.

Note the Oxygen Sensor 1 Before Catalytic Converter - GX10- is also known as the Heated Oxygen Sensor - G39- .

The Oxygen Sensor 1 Before Catalytic Converter - GX10- contains the following components:

- ◆ Heated Oxygen Sensor - G39-
- ◆ Oxygen Sensor Heater - Z19-

The Oxygen Sensor 1 Before Catalytic Converter - GX10- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#).
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#).

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13. – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1654. – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector. • CHECK: Oxygen Sensor 1 Before Catalytic Converter - GX10- component connector terminals 3 to 4 for resistance. • SPECIFIED VALUE: 2 – 4 Ω (+/- 0.5 Ω @ 25° C). – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1654. – NO: ◆ REPLACE: Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 1656.
3	• IGNITION: ON. • CHECK: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector terminal 4 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1655. – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1656.

Step	Procedure	Result / Action to Take
4	• RECONNECT: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector. • CONNECT: Scan Tool. • START: Engine and let Idle. • Perform the function test located in diagnostic mode 06. Refer to appropriate Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, ⇒ "3.3 Diagnostic Modes 01 – 0A", page 16 . • IGNITION: OFF. • SPECIFIED VALUE: Mode 6 Pass. – Were Values obtained?	– YES: ◆ FAULT: Is intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1656 . – NO: ◆ GO TO: Step 5 ⇒ page 1655 .
5	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • DISCONNECT: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector. • CHECK: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector terminal 1 to the Engine Control Module - J623- harness connector T91ca / 27 for resistance. • CHECK: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector terminal 2 to the Engine Control Module - J623- harness connector T91ca / 25 for resistance. • CHECK: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91ca / 23 for resistance. • CHECK: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector terminal 5 to the Engine Control Module - J623- harness connector T91ca / 26 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 1656 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1656 .

Step	Procedure	Result / Action to Take
6	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. - NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.32 Oxygen Sensor 2 After Catalytic Converter - GX8- , Checking

General Description

The Oxygen Sensor 2 After Catalytic Converter - GX8- is positioned downstream of the primary catalytic converter and it supplies the Engine Control Module - J623- with a voltage signal (nonlinear) indicating a "rich" or a "lean" condition is present. If the primary catalytic converter is supersaturated with oxygen (indicating a lean mixture is present), the Oxygen Sensor 2 After Catalytic Converter - GX8- will send the Engine Control Module - J623- a nonlinear signal indicating the lean mixture condition. The mixture is then enriched with fuel until the oxygen has been "displaced" from the catalytic converter. This new condition, in turn, is registered by the Oxygen Sensor 2 After Catalytic Converter - GX8- as a nonlinear signal indicating the rich mixture condition. The mixture is then leaned out by the Engine Control Module - J623- . If the nonlinear signal is received again, the mixture will again be enriched. The frequency, or period, during which the mixture is enriched or leaned out is variable, being dependent on the gas flow rate (engine load) at that moment.

Note the Oxygen Sensor 2 After Catalytic Converter - GX8- is also known as the Oxygen Sensor 2 After Catalytic Converter - G131- .

The Oxygen Sensor 2 After Catalytic Converter - GX8- contains the following components:

- ◆ Oxygen Sensor 2 After Catalytic Converter - G131-
- ◆ Heater For Oxygen Sensor 2 After Catalytic Converter - Z30-

The Oxygen Sensor 2 After Catalytic Converter - GX8- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions:
⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1657 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Oxygen Sensor 2 After Catalytic Converter - GX8- harness connector. • CHECK: Oxygen Sensor 2 After Catalytic Converter - GX8- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 2 – 4 Ω (+/- 0.5 Ω @ 25° C). – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1657 . – NO: ◆ REPLACE: Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 1658 .
3	• IGNITION: ON. • DISCONNECT: Oxygen Sensor 2 After Catalytic Converter - GX8- harness connector. • CHECK: Oxygen Sensor 2 After Catalytic Converter - GX8- harness connector terminal 1 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1658 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1658 .

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Step	Procedure	Result / Action to Take
4	• RECONNECT: Oxygen Sensor 2 After Catalytic Converter - GX8- harness connector. • CONNECT: Scan Tool. • START: Engine, let Idle. • Perform the function test located in diagnostic mode 06. Refer to appropriate Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, ⇒ "3.3 Diagnostic Modes 01 – 0A", page 16 . • SPECIFIED VALUE: Mode 6 Pass. • IGNITION: OFF. – Were Values obtained?	– YES: ◆ FAULT: Is intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1658 . – NO: ◆ GO TO: Step 5 ⇒ page 1658 .
5	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • DISCONNECT: Oxygen Sensor 2 After Catalytic Converter - GX8- harness connector. • CHECK: Oxygen Sensor 2 After Catalytic Converter - GX8- harness connector terminal 2 to the Engine Control Module - J623- harness connector T91ca / 57 for resistance. • CHECK: Oxygen Sensor 2 After Catalytic Converter - GX8- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91ca / 43 for resistance. • CHECK: Oxygen Sensor 2 After Catalytic Converter - GX8- harness connector terminal 4 to the Engine Control Module - J623- harness connector T91ca / 41 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Oxygen Sensor 2 After Catalytic Converter - GX8- . Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 1658 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1658 .
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.33 Oxygen Sensor 2 Before Catalytic Converter - GX11- , Checking

General Description

The Oxygen Sensor 2 Before Catalytic Converter - GX11- does not actually measure oxygen concentration, but rather the difference between the amount of oxygen in the exhaust gas and the amount of oxygen in the air. A rich mixture causes an oxygen demand. This demand causes a voltage to build up, due to transportation of oxygen ions through the Oxygen Sensor 2 Before Catalytic Converter - GX11- layer. A lean mixture causes a low voltage, since there is an oxygen excess. The Oxygen Sensor 2 Before Catalytic Converter - GX11- and catalytic converters are used in order to reduce exhaust emissions. Information on oxygen concentration is sent to the Engine Control Module - J623- , which adjusts the amount of fuel injected into the engine to compensate for excess air or excess fuel. The Engine Control Module - J623- attempts to maintain, on average, a certain air-fuel ratio by interpreting the information it gains from the Oxygen Sensor 2 Before Catalytic Converter - GX11- . The primary goal is a compromise between power, fuel economy, and emissions. The heater for the Oxygen Sensor 2 Before Catalytic Converter - GX11- is designed to minimize the time-to-readiness for closed-loop operation by heating the Oxygen Sensor 2 Before Catalytic Converter - GX11- as quickly as possible.

Note the Oxygen Sensor 2 Before Catalytic Converter - GX11- is also known as the Heated Oxygen Sensor 2 - G108- .

The Oxygen Sensor 2 Before Catalytic Converter - GX11- contains the following components:

- ◆ Heated Oxygen Sensor 2 - G108-
- ◆ Oxygen Sensor 2 Heater - Z28-

The Oxygen Sensor 2 Before Catalytic Converter - GX11- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1660 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Oxygen Sensor 2 Before Catalytic Converter - GX11- harness connector. • CHECK: Oxygen Sensor 2 Before Catalytic Converter - GX11- component connector terminals 3 to 4 for resistance. • SPECIFIED VALUE: 2 – 4 Ω (+/- 0.5 Ω @ 25° C). – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1660 . – NO: ◆ REPLACE: Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 1661 .
3	• IGNITION: ON. • CHECK: Oxygen Sensor 2 Before Catalytic Converter - GX11- harness connector terminal 4 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1660 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1661 .
4	• RECONNECT: Oxygen Sensor 2 Before Catalytic Converter - GX11- harness connector. • CONNECT: Scan Tool. • START: Engine and let Idle. • Perform the function test located in diagnostic mode 06. Refer to Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions. • Perform the function test located in diagnostic mode 06. Refer to appropriate Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, ⇒ "3.3 Diagnostic Modes 01 – 0A", page 16 . • IGNITION: OFF. • SPECIFIED VALUE: Mode 6 Pass. – Were Values obtained?	– YES: ◆ FAULT: Is intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1661 . – NO: ◆ GO TO: Step 5 ⇒ page 1661 .

Step	Procedure	Result / Action to Take
5	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - DISCONNECT: Oxygen Sensor 2 Before Catalytic Converter - GX11- harness connector. - CHECK: Oxygen Sensor 2 Before Catalytic Converter - GX11- harness connector terminal 1 to the Engine Control Module - J623- harness connector T91ca / 7 for resistance. - CHECK: Oxygen Sensor 2 Before Catalytic Converter - GX11- harness connector terminal 2 to the Engine Control Module - J623- harness connector T91ca / 8 for resistance. - CHECK: Oxygen Sensor 2 Before Catalytic Converter - GX11- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91ca / 22 for resistance. - CHECK: Oxygen Sensor 2 Before Catalytic Converter - GX11- harness connector terminal 5 to the Engine Control Module - J623- harness connector T91ca / 10 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Were Values obtained?	- YES: - REPLACE: Oxygen Sensor 2 Before Catalytic Converter - GX11- . Refer to appropriate repair manual. - GO TO: Step 6 ⇒ page 1661 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1661 .
6	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.34 Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101-, Checking

General Description

The secondary air injection system sends air into the exhaust, behind the exhaust valves, using passages in the cylinder head. This extra air injection takes place using the Secondary Air Injection Pump Motor - V101- that is powered by the Secondary Air

Injection Pump Relay - J299- on a cold-start of the engine for about 45 – 100 s. and serves to quickly heat the catalytic converter (s) for improved emissions.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1662 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Secondary Air Injection Pump Relay - J299- . Refer to appropriate repair manual. • IGNITION: ON. • CHECK: Secondary Air Injection Pump Relay - J299- socket terminals 1 and 3 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1662 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1663 .
3	• CONNECT: Jumper wire, between the Secondary Air Injection Pump Relay - J299- socket terminals 1 and 2. • IGNITION: ON. • SPECIFIED VALUE: The Secondary Air Injection Pump Motor - V101- should be heard running. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1663 . – NO: ◆ GO TO: Step 5 ⇒ page 1663 .

Step	Procedure	Result / Action to Take
4	- DISCONNECT: Jumper wire, between the Secondary Air Injection Pump Relay - J299- socket terminals 1 and 2. - REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Secondary Air Injection Pump Relay - J299- socket terminal 4 to the Engine Control Module - J623- harness connector T91ca / 54 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Was Value obtained?	- YES: - REPLACE: Secondary Air Injection Pump Relay - J299- . Refer to appropriate repair manual. - GO TO: Step 6 ⇒ page 1663 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1663 .
5	- DISCONNECT: Jumper wire, between the Secondary Air Injection Pump Relay - J299- socket terminals 1 and 2. - DISCONNECT: Secondary Air Injection Pump Motor - V101- harness connector. - CHECK: Secondary Air Injection Pump Relay - J299- socket terminal 2 to the Secondary Air Injection Pump Motor - V101- harness connector T2ct / 2 for resistance. - CHECK: Secondary Air Injection Pump Motor - V101- harness connector T2ct / 1 to ground for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Were Values obtained?	- YES: - REPLACE: Secondary Air Injection Pump Motor - V101- . Refer to appropriate repair manual. - GO TO: Step 6 ⇒ page 1663 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1663 .
6	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.35 Secondary Air Injection Pump Relay 2 - J545- / Secondary Air Injection Pump Motor 2 - V189- , Checking

General Description

The secondary air injection system sends air into the exhaust using passages in the cylinder head. This extra air injection takes place using the Secondary Air Injection Pump Motor 2 - V189- that is powered by the Secondary Air Injection Pump Relay 2 - J545- on a cold-start of the engine for about 45 – 100 s and serves to quickly heat the catalytic converter(s) for improved emissions.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1664 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Secondary Air Injection Pump Relay 2 - J545- . Refer to appropriate repair manual. • IGNITION: ON. • CHECK: Secondary Air Injection Pump Relay 2 - J545- socket terminals 1 and 3 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1665 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1666 .

Step	Procedure	Result / Action to Take
3	- CONNECT: Jumper wire, between the Secondary Air Injection Pump Relay 2 - J545- socket terminals 1 and 2. - IGNITION: ON. - SPECIFIED VALUE: The Secondary Air Injection Pump Relay 2 - J545- should be heard running. - IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1665 . – NO: ◆ GO TO: Step 5 ⇒ page 1665 .
4	- DISCONNECT: Jumper wire, between the Secondary Air Injection Pump Relay 2 - J545- socket terminals 1 and 2. - REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Secondary Air Injection Pump Relay 2 - J545- socket terminal 4 to the Engine Control Module - J623- harness connector terminal T91ca / 56 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Secondary Air Injection Pump Relay 2 - J545- . Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 1666 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1666 .
5	- DISCONNECT: Jumper wire, between the Secondary Air Injection Pump Relay 2 - J545- socket terminals 1 and 2. - DISCONNECT: Secondary Air Injection Pump Motor 2 - V189- harness connector. - CHECK: Secondary Air Injection Pump Relay 2 - J545- socket terminal 2 to the Secondary Air Injection Pump Motor 2 - V189- harness connector T2cu / 2 for resistance. - CHECK: Secondary Air Injection Pump Motor 2 - V189- harness connector T2cu / 1 to ground for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Secondary Air Injection Pump Motor 2 - V189- . Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 1666 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1666 .

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Step	Procedure	Result / Action to Take
6	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTCs. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.36 Secondary Air Injection Sensor 1 - G609- , Checking

General Description

The secondary air injection system injects air into the exhaust on a cold-start of the engine for 45 – 100 s and serves to quickly heat the catalytic converter(s) for improved emissions. A pressure based secondary air diagnostic function is used. In this system, the signal from the Secondary Air Injection Sensor 1 - G609- is evaluated by the Engine Control Module - J623- . The injected air quantity is determined from the pressure level.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
[⇒ "1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
[⇒ "1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	- PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13. - Was Complaint verified?	- YES: ◆ GO TO: Step 2 ⇒ page 1667. - NO: ◆ GATHER more information from customer about the complaint.
2	- IGNITION: OFF. - DISCONNECT: Secondary Air Injection Sensor 1 - G609- harness connector. - IGNITION: ON. - CHECK: Secondary Air Injection Sensor 1 - G609- harness connector terminals 1 to 3 for voltage. - IGNITION: OFF. - SPECIFIED VALUE: About 5.0 V. - Was Value obtained?	- YES: ◆ GO TO: Step 3 ⇒ page 1667. - NO: ◆ GO TO: Step 4 ⇒ page 1667.
3	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Secondary Air Injection Sensor 1 - G609- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / 104 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). - Was Value obtained?	- YES: ◆ REPLACE: Secondary Air Injection Sensor 1 - G609- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1668. - NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1668.
4	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Secondary Air Injection Sensor 1 - G609- harness connector terminal 1 to the Engine Control Module - J623- harness connector T91ca / 67 for resistance. - CHECK: Secondary Air Injection Sensor 1 - G609- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91ca / 45 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). - Were Values obtained?	- YES: ◆ GO TO: Step 5 ⇒ page 1668. - NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1668.

Step	Procedure	Result / Action to Take
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.37 Secondary Air Injection Sensor 2 - G610- , Checking

General Description

The secondary air injection system injects air into the exhaust on a cold-start of the engine for 45 – 100 s and serves to quickly heat the catalytic converter(s) for improved emissions. A pressure based secondary air diagnostics function is used. In this system, the signal from the Secondary Air Injection Sensor 2 - G610- is evaluated by the Engine Control Module - J623- . The injected air quantity is determined from the pressure level.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1669 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Secondary Air Injection Sensor 2 - G610- harness connector. • IGNITION: ON. • CHECK: Secondary Air Injection Sensor 2 - G610- harness connector terminals 1 to 3 for voltage. • IGNITION: OFF. • SPECIFIED VALUE: About 5.0 V. – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1669 . – NO: ◆ GO TO: Step 4 ⇒ page 1669 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Secondary Air Injection Sensor 2 - G610- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / 84 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω) – Was Value obtained?	– YES: ◆ REPLACE: Secondary Air Injection Sensor 2 - G610- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1670 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1670 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Secondary Air Injection Sensor 2 - G610- harness connector terminal 1 to the Engine Control Module - J623- harness connector T91ca / 84 for resistance. • CHECK: Secondary Air Injection Sensor 2 - G610- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91ca / 46 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ GO TO: Step 5 ⇒ page 1670 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1670 .

Step	Procedure	Result / Action to Take
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. - NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.38 Three Way Catalytic Converter (TWC), Checking

General Description

A catalytic converter is a vehicle emissions control device that converts toxic pollutants in exhaust gas to less toxic pollutants by catalyzing a redox reaction (oxidation or reduction). Catalytic converters are used in internal combustion engines.

General recommendations

Oxygen sensors OK.

No leaks or damage to exhaust system.

Prior to repair work, perform a preliminary check to verify the condition. Refer to [⇒ "3.1 Preliminary Check", page 13](#) .

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
[⇒ "1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
[⇒ "1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	Activate Monitors: - Perform the function test in Diagnostic Mode 06. Refer to ⇒ "3.3 Diagnostic Modes 01 – 0A", page 16 . - End diagnosis and switch the ignition off. - If the specified values are exceeded:	- Check the exhaust system for leaks. - If necessary, repair the leak(s) in the exhaust system. - GO TO: Step 2 ⇒ page 1671 .
2	O2 Sensor Monitoring: - Erase the DTC memory. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Perform a road test to verify repair. - If the DTC does not return:	- Generate readiness code. Refer to ⇒ "3.2 Readiness Code", page 14 . - If no leaks are found in the exhaust system: - Replace the catalytic converter with front exhaust pipe. Refer to appropriate repair manual. - GO TO: Step 3 ⇒ page 1671 .
3	Final procedure: Perform a road test to verify repair.	- After the repair work, the following work steps must be performed in the following sequence: - Check the DTC memory. Refer to ⇒ "3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21 . - If necessary, erase the DTC memory. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - If the DTC memory was erased, generate readiness code. Refer to ⇒ "3.2 Readiness Code", page 14 . - Return vehicle to Customer.

3.6.39 Throttle Valve Control Module - GX3- , Checking

General Description

Throttle valve operation occurs by an electric motor identified as the EPC Throttle Drive - G186- located within the Throttle Valve Control Module - GX3- . It is controlled by the Engine Control Module - J623- with primary inputs from the Accelerator Pedal Module - GX2- as well as other peripheral inputs from the EPC Throttle Drive Angle Sensor 1 - G187- and the EPC Throttle Drive Angle Sensor 2 - G188- .

The Throttle Valve Control Module - GX3 / J338- contains the following components:

- ◆ EPC Throttle Drive - G186-
- ◆ EPC Throttle Drive Angle Sensor 1 - G187-
- ◆ EPC Throttle Drive Angle Sensor 2 - G188-

The Throttle Valve Control Module - GX3 / J338- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.

◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#).
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#).

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Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13. – Was Complaint Verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1672. – NO: ◆ GATHER more information from customer about the complaint.
2	• CONNECT: Scan Tool. • IGNITION: ON. • CHECK: Throttle valve position closed: • SPECIFIED VALUE: 3 – 25%. • DEPRESS: Accelerator pedal slowly to WOT while observing the percentage display. The percentage display must increase uniformly. • CHECK: Throttle valve position at WOT: • SPECIFIED VALUE: 84 – 97%. • IGNITION: OFF. – Were Values obtained?	– YES: ◆ CONDITION: May be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1673. – NO: ◆ GO TO: Step 3 ⇒ page 1672.
3	• REMOVE: Throttle Valve Control Module - GX3- far enough so that the harness connector terminals are accessible. • DISCONNECT: Throttle Valve Control Module - GX3- harness connector. • IGNITION: ON. • CHECK: Throttle Valve Control Module - GX3- harness connector terminals 2 to 6 for voltage. • IGNITION: OFF. • SPECIFIED VALUE: About 5.0 V. – Were Values obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1673. – NO: ◆ GO TO: Step 5 ⇒ page 1673.

Step	Procedure	Result / Action to Take
4	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Throttle Valve Control Module - GX3- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105ca / 60 for resistance. - CHECK: Throttle Valve Control Module - GX3- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105ca / 88 for resistance. - CHECK: Throttle Valve Control Module - GX3- harness connector terminal 4 to the Engine Control Module - J623- harness connector T105ca / 61 for resistance. - CHECK: Throttle Valve Control Module - GX3- harness connector terminal 5 to the Engine Control Module - J623- harness connector T105ca / 66 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω) - Were Values obtained?	- YES: - REPLACE: Throttle Valve Control Module - GX3- . Refer to appropriate repair manual. - GO TO: Step 6 ⇒ page 1673 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1673 .
5	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Throttle Valve Control Module - GX3- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / 21 for resistance. - CHECK: Throttle Valve Control Module - GX3- harness connector terminal 6 to the Engine Control Module - J623- harness connector T105ca / 102 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω) - Were Values obtained?	- YES: - GO TO: Step 6 ⇒ page 1673 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1673 .
6	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

3.6.40 Vacuum Pump Relay - J57- / Vacuum Pump - V22- , Checking

General Description

The following procedure is used to diagnose the Vacuum Pump Relay - J57- and the Vacuum Pump - V22- that it powers.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1674 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Vacuum Pump Relay - J57- . Refer to appropriate repair manual. • IGNITION: ON. • CHECK: Vacuum Pump Relay - J57- socket terminals B1 and B3 to ground for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Were Values obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 1674 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 1675 .
3	• CONNECT: Jumper wire, between the Vacuum Pump Relay - J57- socket terminals B3 and B5. • IGNITION: ON. • SPECIFIED VALUE: The Vacuum Pump - V22- should be heard running. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 1675 . – NO: ◆ GO TO: Step 5 ⇒ page 1675 .

Step	Procedure	Result / Action to Take
4	- DISCONNECT: Jumper wire, between the Vacuum Pump Relay - J57- socket terminals B3 and B5. - REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Vacuum Pump Relay - J57- harness connector terminal B2 to the Engine Control Module - J623- harness connector T91ca / 71 for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Was Value obtained?	- YES: - REPLACE: Vacuum Pump Relay - J57- . Refer to appropriate repair manual. - GO TO: Step 6 ⇒ page 1675 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1675 .
5	- DISCONNECT: Jumper wire, between the Vacuum Pump Relay - J57- socket terminals B3 and B5. - DISCONNECT: Vacuum Pump - V22- harness connector. - CHECK: Vacuum Pump - V22- harness connector terminal 2 to the Vacuum Pump Relay - J57- socket terminal B5 for resistance. - CHECK: Vacuum Pump - V22- harness connector terminal 1 to ground for resistance. - SPECIFIED VALUE: 0.5 Ω ($\pm$ 0.3 Ω). - Were Values obtained?	- YES: - REPLACE: Vacuum Pump - V22- . Refer to appropriate repair manual. - GO TO: Step 6 ⇒ page 1675 . - NO: - PERFORM: Visual Inspection of wiring and component. - CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. - REPAIR: Faulty wiring or connector. - GO TO: Step 6 ⇒ page 1675 .
6	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

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3.6.41 Vehicle Speed Signal, Checking

General Description

The Vehicle Speed Signal or VSS measures Transmission / Transaxle output or Wheel Speed from the ABS System. The signal is broadcasted over the CAN Bus. The Engine Control Module - J623- uses this information to modify engine functions such as ignition timing, A/F ratio, transmission shift points, and to initiate diagnostic routines.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions", page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions", page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 1676 . – NO: ◆ GATHER more information from customer about the complaint.
2	• CONNECT: Scan Tool. • ROAD TEST: Vehicle. • CHECK: Scan Tool to Speedometer for accuracy. • SPECIFIED VALUE: Difference ≤ 10%. – Was Value obtained?	– YES: ◆ CONDITION: May be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 1677 . – NO: ◆ GO TO: Step 3 ⇒ page 1677 .

Step	Procedure	Result / Action to Take
3	• CHECK: ABS. • CHECK: ABS DTC's. – Was the ABS OK?	– YES: ◆ CHECK: CAN Bus wiring from the Instrument Cluster Control Module - J285- to the ABS Control Module - J104- . ◆ GO TO: Step 4 ⇒ page 1677 . – NO: ◆ REPAIR: Any ABS concerns 1st. ◆ GO TO: Step 4 ⇒ page 1677 .
4	• Final Procedure • Perform a road test to verify repair. • Do any DTC's return:	– YES: ◆ Check the DTC memory. Refer to ⇒ "3.3.3 Diagnostic Mode 03 – Read DTC Memory", page 21 . ◆ Perform the diagnostic procedure for that DTC. – NO: ◆ Repair is complete. Generate readiness code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer.

3.6.42 Wastegate Bypass Regulator Valve - N75- , Checking

General Description

Both the boost and intake pressures are used to control the wastegate of the turbocharger. These pressure signals are supplied to the Engine Control Module - J623- , which then sends a pulse-width modulated signal to the Wastegate Bypass Regulator Valve - N75- . As a result, the Wastegate Bypass Regulator Valve - N75- controls the vacuum supply to the pressure unit, which directly acts on the wastegate via a connecting rod. This control system regulates the turbine speed and sets the maximum boost pressure.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.

◆ Scan Tool

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions:
⇒ ["1.1 Safety Precautions"](#), [page 2](#) .
- View clean working conditions:
⇒ ["1.2 Clean Working Conditions"](#), [page 3](#) .

Test Procedure

Step	Procedure	Result / Action to Take
1	- PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . - Was Complaint verified?	- YES: ◆ GO TO: Step 2 ⇒ page 1678 . - NO: ◆ GATHER more information from customer about the complaint.
2	- IGNITION: OFF. - DISCONNECT: Wastegate Bypass Regulator Valve - N75- harness connector. - CHECK: Wastegate Bypass Regulator Valve - N75- component connector terminals 1 to 2 for resistance. - SPECIFIED VALUE: 5 – 25 Ω (@ approx. 20° C). - Was Value obtained?	- YES: ◆ GO TO: Step 3 ⇒ page 1678 . - NO: ◆ REPLACE: Wastegate Bypass Regulator Valve - N75- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 1679 .
3	- IGNITION: ON. - CHECK: Wastegate Bypass Regulator Valve - N75- harness connector terminal 1 to ground for voltage. - IGNITION: OFF. - SPECIFIED VALUE: Battery voltage. - Was Value obtained?	- YES: ◆ GO TO: Step 4 ⇒ page 1678 . - NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1679 .
4	- REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. - CHECK: Wastegate Bypass Regulator Valve - N75- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105ca / 26 for resistance. - SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). - Was Value obtained?	- YES: ◆ TIP: The Wastegate Bypass Regulator Valve - N75- may fail under loaded operation; please swap a known good Wastegate Bypass Regulator Valve - N75- prior to continuing to the next step. ◆ GO TO: Step 5 ⇒ page 1679 . - NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 1679 .

Step	Procedure	Result / Action to Take
5	- Final Procedure - Perform a road test to verify repair. - Does the original DTC return?	- YES: - CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. - REPAIR: As necessary. - If all electrical connections are OK: - REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. - Clear the DTC's. Refer to "3.3.4 Diagnostic Mode 04 – Erase DTC Memory", page 22 . - Repair is complete. Generate Readiness Code. Refer to "3.2 Readiness Code", page 14 . - Return vehicle to Customer. - NO: - Perform the diagnostic procedure for any DTC's. - If no DTC's return, the repair is complete. - Return vehicle to customer.

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