

ENGINE PERFORMANCE**3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)****ST GENERIC SCAN TOOL****GENERAL INFORMATION**

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 09 with a hand held scan tool.

This information 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.

SAFETY PRECAUTIONS

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

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 information 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.**
- **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: 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 electrical harness connectors is strictly prohibited and may cause damage to the electrical 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 electrical harness connectors.

Do not use sealants containing silicone. Particles of silicone drawn into the engine, will not be burnt 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 injector.

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 electrical harness connector terminals.

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

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 over 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 replacement parts immediately prior to installation. Do not use parts that have been stored unpacked (e.g. in tool boxes etc.).
- Separated electrical connectors: Protect from dirt and moisture. Make sure connections are dry when reconnecting.

ON BOARD DIAGNOSTIC SYSTEMS

California OBD-II applies to all gasoline engine vehicles up to 14, 000 lbs. Gross Vehicle Weight Rating (GVWR) starting in the 1996 MY and all diesel engine vehicles up to 14, 000 lbs. GVWR starting in the 1997

MY.

Several states in the northeastern United States have chosen to adopt the California emission regulations starting in the 1998 MY and are known as "Green States".

Green States receive California-certified vehicles for passenger cars and light trucks up to 6,000 lbs. GVWR. Starting in the 2004 MY, Federal vehicle over 8,500 lbs. will start phasing in OBD-II.

Starting in 2004 MY, gasoline-fueled medium duty passenger vehicles are required to have OBD-II. Federal OBD-II applies to all gasoline engine vehicles up to 8,500 lbs. GVWR starting in the 1996 MY and all diesel engine vehicles up to 8,500 lbs. GVWR starting in the 1997 MY.

OBD-II system implementation and operation is described in the remainder of this document.

MALFUNCTION INDICATOR LAMP ILLUMINATION

If the engine control module (ECM) recognizes a malfunction that leads to increased emission values, it indicates them by illuminating the malfunction indicator lamp (MIL) which is located in the instrument cluster.

The ECM switches on the MIL after the ignition is switched on. Shortly after the engine is started, the MIL goes out if the ECM does not detect a malfunction that increases the emission values.

If the ECM recognizes a malfunction that leads to increased emissions during the operation of the engine, the ECM switches on the MIL and an entry is stored in the DTC memory of the ECM.

CONTROLLER AREA NETWORK DATA LINK

The engine control module (ECM) communicates with data bus capable control modules via a CAN Data Link.

The databus capable control modules are connected via data bus wires, which are twisted together (CAN high and CAN low), and exchange information with the ECM. Missing or implausible information on the databus is recognized and stored as a malfunction based on specific DTC criteria.

The malfunction indicator lamp (MIL) is illuminated as a result of a CAN message sent by the ECM. The MIL can be turned on, turned off, or blink, depending on the message received.

ELECTRONIC POWER CONTROL WARNING LAMP

The engine control module (ECM) monitors electronic power control (EPC) components when the ignition is switched on.

If a malfunction is recognized in the EPC system, the ECM switches on the EPC warning lamp, which is located in the instrument cluster, and an entry is stored in the DTC memory of the ECM.

DESCRIPTION AND OPERATION

NOTE: All manufacturers special tools as well as common tools may contain a

manufacturer specific part number. These tools may be substituted with an equivalent aftermarket tool or are available for purchase through the manufacturer.

Manufacturers special tools as well as common tools that contain a manufacturer specific part number may be referenced in the test procedure illustrations showing the tool use or installation. If the manufacturer specific tool is not being used, an equivalent aftermarket tool may be installed in the same manner as the manufacturers special tool.

FUEL SUPPLY SYSTEM

For all fuel supply system component locations, removal/installation procedures and torque specifications, refer to the service information.

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 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 system.

- When leak detection is activated, a pump pressurizes the evaporative system.
- During the leak diagnosis, the system is monitored for a specific time period. If the pressure does not drop a specific amount during the time period, the system is considered to be sealed.
- If the pressure drops greater than a specified amount during a specific time period, the system is pressurized once more. The engine control module measures the time until the pressure drops again. The control module uses the measured value to determine the size of the leak.

Leak diagnosis is activated automatically shortly following every engine start. If a malfunction is determined, an entry is made to the DTC memory. The Malfunction Indicator Lamp in the instrument cluster is illuminated if the malfunction is recognized for two subsequent starts.

For all evaporative system component locations, hose routing, removal/installation procedures and torque specifications, refer to the service information.

ELECTRONIC ENGINE POWER CONTROL

For EPC, the throttle valve is not operated by a cable from the accelerator pedal. There is no mechanical connection between the accelerator pedal and the throttle valve.

The position of the accelerator pedal is communicated to engine control module (ECM) by the throttle position sensor / accelerator pedal position sensor 2 (variable resistances; stored in one housing) that are connected with the accelerator pedal.

The accelerator pedal position (driver's intention) is a main input unit for the ECM.

Operation of the throttle valve occurs via an electric motor, the throttle drive for in the throttle valve control module. This is true across the entire engine speed and engine load spectrum.

The throttle valve is operated by the EPC according to specifications of engine control module (ECM).

With engine off and ignition switched on, the ECM controls the throttle drive according to specifications of throttle position sensor / accelerator pedal position sensor 2. This means, if the accelerator pedal is pressed half way, the throttle drive opens the throttle valve to the same degree; i.e. throttle valve is then opened approximately half way.

With engine running under load, ECM can open or close the throttle valve independently of the throttle position sensor / accelerator pedal position sensor 2.

This means, for example, that the throttle valve could be fully opened even though the accelerator pedal has only been pressed half way. This has the advantage of preventing torque losses at the throttle valve.

In addition, it results in a significant reduction in emissions and fuel consumption under certain load conditions.

It would be incorrect to think that EPC consists of only one or two components. EPC is much more of a system containing all components that contribute to recognizing, controlling and monitoring the position of the throttle valve.

FUEL INJECTION SYSTEM

For all fuel injection system component locations, removal/installation procedures and torque specifications, refer to the service information.

ENGINE CONTROL MODULE

The ECM regulates fuel injection, throttle valve control module, oxygen sensor regulation, ignition, knock control, evaporative emission purge valve, engine speed limitation through the fuel injectors or the power supply relay, as well as OBD functions. For locations, removal/installation procedures, refer to the service information.

EXHAUST SYSTEM COMPONENTS

For all exhaust system, emission control component locations, removal/installation procedures and torque specifications, refer to the service information.

SECONDARY AIR INJECTION SYSTEM

The secondary air injection system improves the secondary oxidation within the catalytic converter which are due to the rich mixture during the cold start phase where the exhaust emissions contain an increased level of unburned hydrocarbons, thereby reducing harmful emissions. The heat released by secondary oxidation shortens the startup time of the catalytic converter considerably, as well as significantly improves emissions quality during the cold-running phase.

- During a cold start, the secondary air injection system injects air behind the exhaust valves. This produces

an oxygen rich exhaust gas, causes the after burning and reduces the heating-up phase of the catalytic converter.

- In addition, the secondary air injection system is switched on (after a delay) during idle after every subsequent engine start (up to a maximum coolant temperature) and is checked through on board diagnostic functions.

For all secondary air injection system component locations, removal/installation procedures and torque specifications, refer to the service information.

IGNITION SYSTEM

For all ignition and glow plug system component locations, removal/installation procedures and torque specifications, refer to the service information.

AUTOMATIC TRANSMISSION

The transmission control module receives information from transmission related components and uses this information to control shifting and operation of the transmission.

For all automatic transmission component locations, removal/installation procedures and torque specifications, refer to the service information.

DIAGNOSIS AND TESTING

PRELIMINARY CHECK

Prior to component diagnosis, a preliminary check must be performed.

- Connect the scan tool.
- Switch the ignition on.
- Using the scan tool, check for any stored or related DTCs.

If other DTCs are stored:

- Repair these DTCs first before performing the following procedure.

If no other DTCs are stored:

- Using the scan tool, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.

- Perform a road test to attempt to duplicate the customers complaint.

If the DTC returns:

-- Perform the diagnostic procedure.

If the DTC does not return:

-- The fault is intermittent or a sporadic condition may exist.

-- Check the suspected component, electrical harness and electrical harness connectors for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

-- Perform a road test to verify the repair.

If the DTC returns:

-- Perform the diagnostic procedure.

If the DTC does not return:

The fault may have been the result of a loose electrical connection.

-- Generate readiness code. Refer to **READINESS CODE**.

READINESS CODE

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 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, cruise, and acceleration modes.

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).

Test requirements

- Erase the DTC memory.
- Coolant temperature must be between 80° C and 110° C.
- The intake air temperature must be between 10° C and 35° C.
- Battery voltage must be a minimum of 12.5 volts.
- Fuel tank level 1/4 to 3/4 full.

Drive Cycle Procedure

-- Connect the scan tool.

-- Switch the ignition on and start the vehicle.

-- Idle the vehicle for 2-3 minutes. This executes the O2 heater, misfire, secondary air injection, fuel trim, and purge system monitors.

-- Drive the vehicle at 45-55 mph for a continuous 7-minute period - avoid stopping. This executes the evaporative, O2 sensor, fuel trim, and misfire monitors.

-- Accelerate the vehicle to an engine speed of 5000 RPM; lift off the throttle until the engine speed is around 1200 rpm. This executes the fuel cut off.

-- Accelerate the vehicle smoothly to 60-65 mph, cruise constantly for 5 min, this executes the catalyst; O2 sensor, misfire, fuel trim, and purge system monitors.

-- Decelerate and idle the vehicle again for 3 minutes. This executes the misfire, secondary air injection, fuel trim, and purge system monitors.

-- Check the status of the readiness code.

NOTE: **Depending on the scan tool used. The readiness code status may be displayed as complete, passed or OK.**

-- 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 no greater than 4° C and repeat the drive cycle operation.**

If the drive cycle operation fails again.

-- Check the DTC memory for stored DTCs.

Repair the vehicle if necessary.

-- Repeat the drive cycle operation until all engine monitors have successfully run through and passed.

-- Remove the scan tool and switch the ignition off.

DIAGNOSTIC MODES 01 - 0A

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 PIDs and Test-IDs used within the modes to monitor the engine, and emission related component parameters.

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, Component-ID (CID), or On-Board Diagnostic Monitor Identifier (OBDMID).

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 the "PID" that is to be monitored, e.g. "PID \$05 Coolant temperature".

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

PID	Component or System
	supported

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00:	definition PIDs 01 thru 20
01:	Monitoring status since erasing DTC memory
03:	Condition of fuel system
04:	Calculated load value
05:	Coolant temperature
06:	Short term air fuel ratio Bank 1
07:	Long term air fuel ratio Bank 1
08:	Short term air fuel ratio Bank 2
09:	Long term air fuel ratio Bank 2
12:	Engine RPM
13:	Vehicle speed
14:	Ignition timing advance for #1 cylinder
15:	Intake air temperature
16:	Air flow rate from mass air flow sensor
17:	Absolute throttle position
18:	Secondary Air Injection
19:	Oxygen Sensor Bank

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	1 Sensor 1
21:	Oxygen Sensor Bank 1 Sensor 2
25:	Oxygen Sensor Bank 2 Sensor 2
28:	OBD requirements
31:	Time after engine start
32:	supported definition PIDs \$21 thru \$40
33:	Distance covered with MIL ON
35:	Fuel printing
46:	tank ventilation valve
51:	Ambient air
52:	actual value of bank 1 - sensor 1
56:	actual value of bank 2 - sensor 1
60:	Catalyst temp. Bank 1 - Sensor 1
61:	Catalyst temp. Bank 2 - Sensor 1
64:	supported definition PIDs \$41 thru \$60
65:	Monitor status in this operating cycle
66:	Controller system

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	tension
67:	Absolute load factor
68:	Lambda desired value
69:	Relative throttle valve position
70:	Ambient temperature
71:	Absolute throttle valve position 2
73:	Absolute accelerator pedal position 1
74:	Absolute accelerator pedal position 2
76:	Throttle valve specified position
86:	Offset oxygen sensor control behind cat. Bank 1 - Bank 3
88:	Offset oxygen sensor control behind cat. Bank 2 - Bank 4
80:	supported definition PIDs \$61 thru \$80
104:	Intake Air Temp. (IAT) Bank 1 Sens.

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111:	Turbocharger Compressor Inlet Pressure Sensor A
112:	Boost Pressure Sensor A Boost Pressure Sensor B
119:	Charger Air Cooler Temp. (CACT) Bank 1 Sensor 1 Bank 2 Sensor 1

-- Switch the ignition off.

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, Component-ID (CID), 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.

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-- Select "Diagnostic Mode 2: Obtain operating conditions."

-- From the following table, select the desired the "PID", e.g. "PID 05-Coolant temperature" that is to be 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
00:	Supported definition pids, \$01 thru \$20
02:	Fault code that caused the freeze frame to be stored
03:	Fuel system status
04:	Calculated load value
05:	Coolant temperature
06:	Oxygen sensor integrator Bank 1
07:	Oxygen sensor adaptation value Bank 1
08:	Oxygen sensor integrator Bank 2
09:	Oxygen sensor adaptation value Bank 2
11:	Intake manifold pressure
12:	Engine RPM
13:	Vehicle speed

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14:	Ignition angle
15:	Intake air temperature (IAT)
16:	Air mass
17:	Throttle valve position 1 absolute (Throttle valve position 1)
18:	Secondary air injection
31:	Time after engine start
32:	Supported definition pids, \$21 thru \$40
35:	Fuel pressure (rail pressure)
46:	Activation of tank vent valve
51:	Ambient pressure
64:	Supported definition pids, \$41 thru \$60
66:	Control modules system voltage
67:	Absolute Load Value
68:	Oxygen sensor specified value
69:	Relative Throttle Position

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70:	Ambient air temperature
71:	Throttle valve position 2 absolute (Throttle valve position 2)
73:	Accelerator pedal position 1 absolute (Accelerator pedal position signal 1)
74:	Accelerator pedal position 2 absolute (Accelerator pedal position signal 2)
76:	Specified throttle valve position
86	Offset oxygen sensor regulation after catalytic converter bank 1 or bank 3
88:	Offset oxygen sensor regulation after catalytic converter bank 2 or bank 4
	supported

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64:	definition PIDs \$61 thru \$80
104:	Intake Air Temp. (IAT) Bank 1 Sensor 1
111:	Turbocharger Compressor Inlet Press. Sensor A
112:	Boost Pressure Sensor A Boost Pressure Sensor B
119:	Charger Air Cooler Temperature (CACT) Bank 1 Sensor 1 Bank 2 Sensor 1

-- Switch the ignition off.

DIAGNOSTIC MODE 03 - READ DTC MEMORY

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

When the ECM recognizes an emission related fault it turns on the malfunction indicator lamp. If an electronic throttle malfunction is recognized, the ECM turns on the electronic power control warning lamp. Both are located in the instrument cluster.

The DTCs 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

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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 DTCs provided by the manufacturer
P	2	x	x	x	DTCs defined by SAE with specified texts, from MY 2000
P	3	x	x	x	Additional emission relevant DTCs 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
					Ignition

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P	x	3	x	x	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

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

Procedure

- Connect the scan tool.
- Switch the ignition to the ON position.
- Select Diagnostic Mode 03: Interrogating fault memory.
- The stored DTC or DTCs will be displayed on the scan tool screen.

The following table is an example of the DTC information that may be displayed on the scan tool screen:

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Indication example	Explanation
P0444	SAE Diagnostic Trouble Code
Evaporative emission canister purge regulator valve	Malfunctioning wiring path or malfunctioning component
Circuit open	Malfunction type as next

-- Refer to the DTC tables for the diagnostic repair procedures.

-- Switch the ignition off.

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 and TCM are erased. The adaptation values may also be reset.

Emissions-related diagnostic data includes (as applicable):

- -MIL Status
- -Number of DTCs
- -Readiness bits
- -Confirmed DTCs
- -Pending DTCs
- -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 on.

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-- 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.

DIAGNOSTIC MODE 05 - READ OXYGEN SENSOR MONITORING TEST RESULTS

NOTE: Mode 05 may not be supported on all systems. On systems where Diagnostic Mode 05 is not supported, refer to Diagnostic Mode 6 for oxygen sensor Monitoring Test Results.

Test requirement

Procedure

DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS

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 min & max values for each individual test in Mode 06 represent the min & max operating values for a properly operating system. This data is provided to the individual aftermarket scan tool companies for development of their scan tool. Depending on the scan tool being used, the min & max values shown may vary, or be rounded up or down to the nearest decimal point depending on the aftermarket scan tool company's development process. e.g.:

	Minimum Value
GST manual documentation	0.3499
Aftermarket scan tool display	0.35

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, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and may be referenced by only a number.

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, Component-ID (CID), or On-Board Diagnostic Monitor Identifier (OBDMID).

Test requirements

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- Exhaust system must be properly sealed between the catalytic converter and the cylinder heads.
- No DTCs stored 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.

The following table is a numerical list of all "Test-IDs" or "Hex-IDs" that may be selected.

Test-ID (Hex-ID)	Component or System
01 (\$01): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Oxygen Sensor Monitor Bank 1 - Sensor 1
02 (\$02): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Oxygen Sensor Monitor Bank 1 - Sensor 2
33 (\$21): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Catalytic Converter Monitoring Bank 1
34 (\$22): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Catalytic Converter Monitoring Bank 2
53 (\$35): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Cam shaft adjustment/IVVT diagnosis bank 1
54 (\$36): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Cam shaft adjustment/IVVT diagnosis bank 2
58 (\$3A): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Fuel Tank EVAP System Integrity / LeakTest (0.90")
	Fuel Tank EVAP

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59 (\$3B): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	System Integrity / LeakTest (0.40/1.0mm)
60 (\$3C): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Fuel Tank EVAP System Integrity / LeakTest (0.20/0.5mm)
61 (\$3D): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	EVAP Valve Function Check
65 (\$41): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Oxygen Sensor Heater Monitor Bank 1 - Sensor 1
66 (\$42): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Oxygen Sensor Heater Monitor Bank 1 - Sensor 2
69 (\$45): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Oxygen Sensor Heater Monitor Bank 2- Sensor 1
70 (\$46): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Oxygen Sensor Heater Monitor Bank 2- Sensor 2
113 (\$71): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Secondary air system 1 (bank 1)
114 (\$72): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Secondary air system 2 (bank 2)
162 (\$A2): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Mis-Fire Cylinder 1 Data
163 (\$A3): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Mis-Fire Cylinder 2 Data
164 (\$A4): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Mis-Fire Cylinder 3 Data
165 (\$A5): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Mis-Fire Cylinder 4 Data
166 (\$A6): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Mis-Fire Cylinder 5 Data
167 (\$A7): <u>DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS.</u>	Mis-Fire Cylinder 6 Data

Monitor-ID 01 (\$01): Oxygen Sensor Monitor Bank 1 - Sensor 1

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-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 01 (\$01)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
131 (\$83)	P0133	Response Check.	---	0.9 V	Refer to DTC P0133 in the <u>DTC TABLES</u> .

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

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

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 02 (\$02)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
05 (\$05)	P0139	Output Voltage (signal activity) Check.	0	2.0 V	Refer to DTC P0139 in <u>DTC TABLES</u> .

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129 (\$81)	P0136	Output Voltage (signal activity) Check.	0 mV	9.7 mV	Refer to DTC P0136 in the DTC summary table.
130 (\$82)	P0136	Output Voltage (signal activity) Check.	9.7 mV	7995 mV	Refer to DTC P0136 in the DTC summary table.
131 (\$83)	P0136	Output Voltage (signal activity) Check.	0 mV	151.5 mV	Refer to DTC P0136 in the DTC summary table.
135 (\$87)	P0139	Output Voltage (signal activity) Check.	0 mV	500 mV	Refer to DTC P0139 in the DTC summary table.

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

Monitor-ID33 (\$21): Catalyst monitoring bank 1

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID33 (\$21)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
132 (\$84)	P0420	Catalytic converter monitoring bank 1.	0 mV	1.5 mV	Refer to DTC P0420 in <u>DTC TABLES</u> .

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-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure
DIAGNOSTIC MODE 03 - READ DTC MEMORY.

Monitor-ID34 (\$22): Catalyst monitoring bank 2

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID34 (\$22)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
132 (\$84)	P0430	Catalytic converter monitoring bank 2.	0 mV	1.5 mV	Refer to DTC P0430 in <u>DTC TABLES.</u>

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure
DIAGNOSTIC MODE 03 - READ DTC MEMORY.

-- Switch the ignition off.

Monitor-ID 53 (\$35): Cam Shaft Adjustment IVVT diagnosis bank 1

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 53 (\$35)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information

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128 (\$80)	P0011	Intake (A) Camshaft Position Timing - Over- Advanced (Bank 1)	0	10.125	Refer to DTC P0011 in the DTC summary table.
129 (\$81)	P000A	Intake (A) Camshaft Position Slow Response (Bank 1)	4.8 °KW	655 °KW	Refer to DTC P000A in the DTC summary table.
130 (\$82)	P0014	Exhaust (B) Camshaft Position Timing - Over- Advanced (Bank 1)	0	10.125	Refer to DTC P0014 in the DTC summary table.
131 (\$83)	P000B	Exhaust (B) Camshaft Position Slow Response (Bank 1)	4.8 °KW	655 °KW	Refer to DTC P000B in the DTC summary table.

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY.**

-- Switch the ignition off.

Monitor-ID 54 (\$36): Cam Shaft Adjustment IVVT diagnosis bank 2

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 54 (\$36)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

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Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
128 (\$80)	P0021	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 2).	0	10.125	Refer to DTC P0021 in the DTC summary table.
129 (\$81)	P000C	Intake (A) Camshaft Position Slow Response (Bank 2)	4.875	655	Refer to DTC P000C in the DTC summary table.
130 (\$82)	P0024	Exhaust (B) Camshaft Position Timing - Over-Advanced (Bank 2)	0	10.125	Refer to DTC P0024 in the DTC summary table.
131 (\$83)	P000D	Exhaust (B) Camshaft Position Slow Response (Bank 2)	4.875	655	Refer to DTC P000D in the DTC summary table.

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure
DIAGNOSTIC MODE 03 - READ DTC MEMORY.

-- Switch the ignition off.

Monitor-ID 58 (\$3A): Fuel Tank EVAP System Integrity/Leak Test (0.90"

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 58 (\$3A)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

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-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
129 (\$81)	P0455	Tank leak test: Large leak.	650 mSec	65535 mSec	Refer to DTC P0455 in <u>DTC TABLES</u> .

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

Monitor-ID 59 (\$3B): Fuel Tank EVAP System Integrity/Leak Test (0.40/1.0mm)

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 59 (\$3B)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
129 (\$81)	P0442	Fuel Tank Leak Test: Small leak.	1060 mSec	65535 mSec	Refer to DTC P0442 in <u>DTC TABLES</u> .

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

Monitor-ID 60 (\$3C): Fuel Tank EVAP System Integrity/Leak Test (0.20/0.5mm)

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 60 (\$3C)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
129 (\$81)	P0456	Tank leak test: Pinhole leak (0.5 mm).	4000 mSec	65535 mSec	Refer to DTC P0456 in <u>DTC TABLES</u> .

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

Monitor-ID 61 (\$3D): EVAP Valve Function Check

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 61 (\$3D)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
128 (\$80)	P0441	Tank vent valve check from % DTEV: Active test Air balance at idle OK, (Normal operation and short	0 %	100%	Refer to DTC P0441 in <u>DTC TABLES</u> .

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		test 70).			
130 (\$82)	P0441	Tank vent valve check from % DTEV: Active test, Oxygen sensor regulator deviating in lean direction (can only test OK), (Normal operation and short test 70).	0 %	100%	Refer to DTC P0441 in <u>DTC TABLES</u>
131 (\$83)	---	Tank vent valve check from % DTEV: Active test, Oxygen sensor regulator deviation in rich direction (can only test OK), (Normal operation and short test 70).	0.020	1.999	---
138 (\$8A)	P0441	mean I-value of the closed loop control	0 kPa	327 kPa	Refer to DTC P0441 in <u>DTC TABLES</u>

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

Monitor-ID 65 (\$41): Oxygen Sensor Heater Monitor Bank 1 - Sensor 1

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-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 65 (\$41)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
133 (\$85)	P0135	Oxygen sensor heating in front of catalytic converter, diagnosis, Bank 1. Ceramic temperature monitoring.	680° C	965° C	Refer to DTC P0135 in <u>DTC TABLES</u> .

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

Monitor-ID 66 (\$42): Oxygen Sensor Heater Monitor Bank 1 - Sensor 2

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 66 (\$42)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

	Component		Additional
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Test-ID (TID) (Hex-ID)	DTC	or System	Min.	Max.	Information
129 (\$81)	P0141	Oxygen sensor heating behind catalytic converter, diagnosis, Bank 1 Nernst cell internal resistance test.	0 ohms	6700 ohms	Refer to DTC P0141 in <u>DTC TABLES</u> .

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

Monitor-ID 70 (\$46): Oxygen Sensor Heater Monitor Bank 2- Sensor 2

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 70 (\$46)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
129 (\$81)	P0161	Diagnosis of Sensor 2 behind catalytic convertor.	0 ohms	6700 ohms	Refer to DTC P0161 in <u>DTC TABLES</u>

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

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Monitor-ID 69 (\$45): Oxygen Sensor Heater Monitor Bank 2- Sensor 1

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 69 (\$45)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
133 (\$85)	P0155	Diagnosis of Sensor 1 behind catalytic convertor.	680°	965°	Refer to DTC P0155 in <u>DTC TABLES</u>

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

Monitor-ID 113 (\$71): Secondary air system ((Bank 1))

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 113 (\$71)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
		Examination secondary air system,			

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130 (\$82)	P0491	examination for reduced secondary air mass.	0.4 ohms	65535 ohms	---
131 (\$83)	P0491	Examination secondary air valve leakage (combination valve does not close).	0.4 ohms	65535 ohms	---
132 (\$84)	P0491	Examination secondary air system, bank 1 (bank 3),	1.5 ohms	65535 ohms	
133 (\$85)	P0491	Examination secondary air system, bank 1 (bank 3),	0 hPa	30 hPa	
138 (\$8A)	P2440	Examination secondary air valve, bank 1 (bank 3),	0	1.25	

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY.**

-- Switch the ignition off.

Monitor-ID 114 (\$72): Secondary air system ((Bank 2)

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID 114 (\$72)".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

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Test-ID (TID) (Hex-ID)	DTC	Component or System	Min.	Max.	Additional Information
130 (\$82)	P0492	Examination secondary air system, examination for reduced secondary air mass.	0.4 ohms	65535 ohms	---
131 (\$83)	P0492	Examination secondary air valve leakage (combination valve does not close).	0.4 ohms	65535 ohms	---
132 (\$84)	P0492	Examination secondary air system, bank 2 (bank 4),	2.4 ohms	65535 ohms	
133 (\$85)	P0492	Examination secondary air system, bank 2 (bank 4),	0 hPa	30 hPa	
138 (\$8A)	P2442	Examination secondary air valve, bank 2 (bank 4),	0	1.25	

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

Monitor-ID A2 : Mis-Fire Cylinder 1 Data

-- Connect the scan tool.

-- Start the engine and run at idle.

-- Select "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 (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min./Max. Values	Additional Information
11 (\$0B)	P0301	Misfire cylinder 1, Average value over 10 Driving Cycles.	0 - 65535 (counts)	Refer to DTC P0301 in <u>DTC TABLES</u> .
12 (\$0C)	P0301	Misfire cylinder 1, in this Driving Cycle.	0 - 65535 (counts)	Refer to DTC P0301 in <u>DTC TABLES</u> .

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

Monitor-ID A3: Mis-Fire Cylinder 2 Data

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID A3:".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min./Max. Values	Additional Information
11 (\$0B)	P0302	Misfire cylinder 2, Average value over 10 Driving Cycles.	0 - 65535 (counts)	Refer to DTC P0302 in <u>DTC TABLES</u> .

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12 (\$0C)	P0302	Misfire cylinder 2, in this Driving Cycle.	0 - 65535 (counts)	Refer to DTC P0302 in <u>DTC TABLES</u> .
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-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

Monitor-ID A4: Mis-Fire Cylinder 3 Data

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID A4".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min./Max. Values	Additional Information
11 (\$0B)	P0303	Misfire cylinder 3, Average value over 10 Driving Cycles.	0 - 65535 (counts)	Refer to DTC P0303 in <u>DTC TABLES</u> .
12 (\$0C)	P0303	Misfire cylinder 3, in this Driving Cycle.	0 - 65535 (counts)	Refer to DTC P0303 in <u>DTC TABLES</u> .

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- Switch the ignition off.

Monitor-ID A5 : Mis-Fire Cylinder 4 Data

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-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID A5".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min./Max. Values	Additional Information
11 (\$0B)	P0304	Misfire cylinder 4, Average value over 10 Driving Cycles.	0 - 65535 (counts)	Refer to DTC P0304 in <u>DTC TABLES</u> .
12 (\$0C)	P0304	Misfire cylinder 4, in this Driving Cycle.	0 - 65535 (counts)	Refer to DTC P0304 in <u>DTC TABLES</u> .

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- 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 DTCs or the corresponding diagnostic repair procedure.

-- Switch the ignition off.

Monitor-ID A6 : Mis-Fire Cylinder 5 Data

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID A6".

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-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min./Max. Values	Additional Information
11 (\$0B)	P0304	Misfire cylinder 5, Average value over 10 Driving Cycles.	0 - 65535 (counts)	Refer to DTC P0304 in <u>DTC TABLES</u> .
12 (\$0C)	P0304	Misfire cylinder 5, in this Driving Cycle.	0 - 65535 (counts)	Refer to DTC P0304 in <u>DTC TABLES</u> .

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

-- 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 DTCs or the corresponding diagnostic repair procedure.

Monitor-ID A7 : Mis-Fire Cylinder 6 Data

-- Connect the scan tool.

-- Start the engine and run at idle.

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

Select "Monitor-ID A7".

-- Select the desired "Test-ID (TID)" or "Hex-ID".

-- Check specified values at idle.

Test-ID (TID) (Hex-ID)	DTC	Component or System	Min./Max. Values	Additional Information
11 (\$0B)	P0304	Misfire cylinder 6, Average value over	0 - 65535 (counts)	Refer to DTC P0304 in <u>DTC</u>

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		10 Driving Cycles.		<u>TABLES.</u>
12 (\$0C)	P0304	Misfire cylinder 6, in this Driving Cycle.	0 - 65535 (counts)	Refer to DTC P0304 in <u>DTC TABLES.</u>

-- If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC or the corresponding diagnostic repair procedure
DIAGNOSTIC MODE 03 - READ DTC MEMORY.

-- 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 DTCs or the corresponding diagnostic repair procedure.

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 DTCs).

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.

-- 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 DTCs or 0 malfunctions detected will be displayed on the scan tool screen.

-- Refer to the DTC tables for the diagnostic repair procedures.

-- Switch the ignition off.

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.

Test requirements

- No DTCs stored in the DTC memory.
- Intake Air Temperature (IAT) maximum 60° C.
- Coolant temperature 80 -110° C.
- Throttle valve angle 12.0 - 16.0%.

Function test

NOTE: If the accelerator pedal is depressed during the test, the test will be aborted.

-- 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 OK

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- Test aborted

-- Switch the ignition off.

If the specified result is obtained:

System OK.

If the specified result is not obtained:

-- Repeat the tank leak test, switch the ignition off and start the engine again and let run for 15 minutes at idle.

-- Switch the ignition off.

If the specified result is again not obtained:

-- A leak may be present. Refer to **EVAPORATIVE SYSTEM, CHECKING FOR LEAKS**.

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 DTCs 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-IDs that may be selected.

Test-ID	Diagnostic text
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02:	Vehicle identification number e.g.
	• A different 17 digit number will be displayed for each vehicle
04:	Calibration identification e.g.
	• Engine Control Module (ECM) --
	• Transmission Control Module (TCM) --
06:	CVN (check sum) e.g.
	• EC5AE460 the check sum is different for every control module version
	• 000D105

-- Switch the ignition off.

DIAGNOSTIC MODE 0A - CHECK PERMANENT DTC MEMORY

NOTE: **The following is a generic explanation of the requirements, coverage, and operation of Mode 0A.**

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" [(g) (4.4.6) (D)]. 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 the service tester is NOT affected by implementation of the Permanent Fault Codes.

NOTE: After MIL off during the 40 warm-up cycle self-healing process, the fault may not be reported as Permanent Fault Code anymore

NOTE: Permanent Fault Codes for all OBD-relevant components and systems in Engine Control Modules, Transmission Control Modules, Battery Energy Control Modules, and Drive Motor Control Modules

• Service \$07: Pending Fault Codes • Service \$03: Confirmed Fault Codes • Service \$0A: Permanent Fault Codes The Permanent Fault Codes requirements have NO effect on Service \$07, \$03 or enhanced customer specific services. Vehicles with Permanent Fault Codes stored and reported to a GST via Service \$0A will NOT pass Inspection / Maintenance (I/M) !

Procedure

- Erasing Permanent Fault Codes after code clear Service \$0A - Permanent Fault Codes: can only be erased at the end of a driving cycle (during ECU keep alive time) if all the following conditions are fulfilled:
- • NO FAIL since code clear
- • Monitor result PASS

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- Minimum trip conditions fulfilled....600 sec. (cumulative) engine on -
- 300 sec. (cumulative) vehicle speed > 25 mph (40 km/h)
- 30 sec. (continuous) idle
- To erase Permanent Fault Codes after code clear, the vehicle needs to be driven !

DTC TABLES**Fuel, air mixture, and additional emissions regulations**

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameter with Enable Condition
P000A	Intake (A) Camshaft Position Response check Bank 1 Bank 2	-- Check the Camshaft Adjustment Valve 1 -N205-. Refer to <u>CAMSHAFT ADJUSTMENT VALVE 1, CHECKING.</u>	• adjustment angle difference < 5° CA • number of checks 10 times	• engine speed > 700 RPM • setpoint change before check < 3° CA for 1.2 Sec • setpoint change > 3° CA
P000C	Intake (A) Camshaft Position Response check Bank 1 Bank 2	-- Check the Camshaft Adjustment Valve 1 -N205-. Refer to <u>CAMSHAFT ADJUSTMENT VALVE 1, CHECKING.</u>	• adjustment angle difference < 5° CA • number of checks 10 times	• engine speed > 700 RPM • setpoint change before check < 3° CA for 1.2 Sec • setpoint change > 3° CA
P00A2	Intake Air Temperature Sensor after intercooler 2 short to ground	-- Check the Intake Air Temperature (IAT) Sensor - G42- Refer to <u>MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING</u>	IAT < 0.1 V	---
P00A3	Intake Air Temperature Sensor after intercooler 2 open circuit	-- Check the Intake Air Temperature (IAT) Sensor - G42- Refer to <u>MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING</u>	IAT > 3.20 V	---
P007C	Intake Air Temperature Sensor after intercooler 1	-- Check the Intake Air Temperature (IAT) Sensor - G42- Refer to <u>MANIFOLD ABSOLUTE PRESSURE</u>	IAT < 0.099 V	---

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		<u>SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING</u>		
P007D	Intake Air Temperature Sensor after intercooler 1	-- Check the Intake Air Temperature (IAT) Sensor - G42- Refer to <u>MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING</u>	IAT > 3.20 V	---
P008A	Fuel Pressure Sensor (LP) out of range low	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING</u>	< 0.08 MPa	- engine speed 500...6000 RPM - time after engine start > 30 Sec
P008B	Fuel Pressure Sensor (LP) out of range high	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING</u>	actual press > 0.8 MPa	- engine speed 500...6000 RPM - time after engine start > 30 Sec
P0010	Intake (A) Camshaft Position Actuator Circuit / Open (Bank 1)	-- Check the Camshaft Adjustment Valve 1 -N205-. Refer to <u>CAMSHAFT ADJUSTMENT VALVE 1, CHECKING.</u>	signal current< 0.8mA	camshaft valve, or
P0011	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 1)	-- Check the Camshaft Adjustment Valve 1 -N205-. Refer to <u>CAMSHAFT ADJUSTMENT VALVE 1, CHECKING.</u>	- adjustment angle difference > 10° CA - number of checks 3 times	- modeled oil temp. 10...130° C - engine speed > 700 RPM - delta set point > 1° CA - then wait 6 Sec
P0016	Crankshaft Position - Camshaft Position Correlation Bank 1 Bank 2	-- Check the Camshaft Position (CMP) Sensor -G40-. Refer to <u>CAMSHAFT POSITION SENSOR, CHECKING.</u>	adaptive value > 139° CA	engine speed > 700 RPM
P0018	Crankshaft Position - Camshaft Position Correlation Bank 1 Bank 2	-- Check the Camshaft Position (CMP) Sensor -G40-. Refer to <u>CAMSHAFT POSITION SENSOR, CHECKING.</u>	adaptive value < 75° CA	engine speed > 700 RPM
P0020	Intake (A) Camshaft Position Actuator Circuit / Open (Bank 1)	-- Check the Camshaft Adjustment Valve 1 -N205-. Refer to <u>CAMSHAFT ADJUSTMENT VALVE 1, CHECKING.</u>	signal current< 0.8mA	camshaft valve, or

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		<u>CHECKING.</u>		
P0021	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 1)	-- Check the Camshaft Adjustment Valve 1 -N205-. Refer to <u>CAMSHAFT ADJUSTMENT VALVE 1, CHECKING.</u>	• adjustment angle difference > 10° CA • number of checks 3 times	• modeled oil temp. 10...130° C • engine speed > 700 RPM • delta set point > 1° CA • than wait 6 Sec
P025A	Fuel Pump Open circuit	-- Check the fuel pump. Refer to <u>FUEL PUMP ELECTRICAL, TESTING.</u>	Signal current < 0.8 mA	• fuel pump commanded on
P025C	Fuel Pump Short to ground	-- Check the fuel pump. Refer to <u>FUEL PUMP ELECTRICAL, TESTING.</u>	Signal voltage < 2.0 V	• fuel pump commanded off
P025D	Fuel Pump Short to B+	-- Check the fuel pump. Refer to <u>FUEL PUMP ELECTRICAL, TESTING.</u>	Signal current > 1.0 A	• fuel pump commanded on
P0030	HO2S Heater Control Circuit (Bank 1, Sensor 1) Open circuit	-- Check the Oxygen Sensor (O2S) Heater -Z19-. Refer to <u>OXYGEN SENSOR O2S HEATER, CHECKING.</u>	Heater current < 8...40 mA	• duty cycle 0.4...99.6% • heater commanded on
P0031	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) Short to ground	-- Check the Oxygen Sensor (O2S) Heater -Z19-. Refer to <u>OXYGEN SENSOR O2S HEATER, CHECKING.</u>	Heater voltage < 1.9...2.22 V	• duty cycle < 99.6% • heater commanded off
P0032	HO2S Heater Control Circuit High (Bank 1, Sensor 1) Short to B+	-- Check the Oxygen Sensor (O2S) Heater -Z19-. Refer to <u>OXYGEN SENSOR O2S HEATER, CHECKING.</u>	Heater current > 8...11 A	• duty cycle > 0.4% • heater commanded on
P0036	HO2S Heater Control Circuit (Bank 1, Sensor 2) open circuit	-- Check the Oxygen Sensor (O2S) Heater -Z29-. Refer to <u>OXYGEN SENSOR O2S HEATER 1 BEHIND CATALYTIC CONVERTER, CHECKING.</u>	Heater current < 8...40 mA	• duty cycle 0.4...99.6% • heater commanded on
P0037	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) short to ground	-- Check the Oxygen Sensor (O2S) Heater -Z29-. Refer to <u>OXYGEN SENSOR O2S HEATER 1 BEHIND CATALYTIC CONVERTER, CHECKING.</u>	• heater voltage < 1.9...2.22 V	• duty cycle < 99.6% • heater commanded off
		-- Check the Oxygen Sensor (O2S) Heater -Z29-. Refer to		

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P0038	HO2S Heater Control Circuit High (Bank 1, Sensor 2) Short to B+	<u>OXYGEN SENSOR O2S HEATER 1 BEHIND CATALYTIC CONVERTER, CHECKING.</u>	Heater current Bank 1, > 8.11 A	- duty cycle > 0.4% - heater command on
P0043	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) short to ground	-- Check the Oxygen Sensor (O2S) Heater -Z29-. Refer to <u>OXYGEN SENSOR O2S HEATER 1 BEHIND CATALYTIC CONVERTER, CHECKING.</u>	- SULEV Heater voltage < 3 V - ULEV Heater voltage < 3 V	- SULEV Time after engine start, >5 Sec - heater command off - ULEV engine speed >80 RPM - heater, command off
P0044	HO2S Heater Control Circuit High (Bank 1, Sensor 2) Short to B+	-- Check the Oxygen Sensor (O2S) Heater -Z29-. Refer to <u>OXYGEN SENSOR O2S HEATER 1 BEHIND CATALYTIC CONVERTER, CHECKING.</u>	Heater current, > 2.70...5.50 A	- engine speed, >80 RPM - heater command on
P0050	HO2S Heater Control Circuit (Bank 1, Sensor 1) Open circuit	-- Check the Oxygen Sensor (O2S) Heater -Z19-. Refer to <u>OXYGEN SENSOR O2S HEATER, CHECKING.</u>	Heater current < 8...40 mA	- duty cycle 0.4...99.6% - heater command on
P050A	Idle Air Control System RPM Lower Or Higher Than Expected	-- Check the Throttle Valve Control Module -J338-. Refer to <u>THROTTLE VALVE CONTROL MODULE, CHECKING.</u>	Out of range-low - engine speed deviation <80 RPM Out of range-high - engine speed	- time after engine start >0.0 Sec - driver torque demand none - vehicle speed 0 km/h - altitude <2700 m - IAT >-48 °C - evap purge valve closed - catalyst heating active - FOR MANUAL TRANSMISSION - engine load <40...75% - catalyst heating active

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			deviation >80 RPM	- time after engine start >0.0 Sec - driver torque demand none - vehicle speed 0 km/h - altitude <2700 m - IAT >-48 °C - catalyst heating active
P0051	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) Short to ground	-- Check the Oxygen Sensor (O2S) Heater -Z19-. Refer to <u>OXYGEN SENSOR O2S HEATER, CHECKING.</u>	Heater voltage < 1.9...2.22 V	- duty cycle < 99.6% - heater commandec off
P0052	HO2S Heater Control Circuit High (Bank 1, Sensor 1) Short to B+	-- Check the Oxygen Sensor (O2S) Heater -Z19-. Refer to <u>OXYGEN SENSOR O2S HEATER, CHECKING.</u>	Heater current > 8...11 A	- duty cycle > 0.4% - heater commandec on
P0056	HO2S Heater Control Circuit (Bank 1, Sensor 2) open circuit	-- Check the Oxygen Sensor (O2S) Heater -Z29-. Refer to <u>OXYGEN SENSOR O2S HEATER 1 BEHIND CATALYTIC CONVERTER, CHECKING.</u>	Heater current < 8...40 mA	- duty cycle 0.4...99.6% - heater commandec on
P0057	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) short to ground	-- Check the Oxygen Sensor (O2S) Heater -Z29-. Refer to <u>OXYGEN SENSOR O2S HEATER 1 BEHIND CATALYTIC CONVERTER, CHECKING.</u>	heater voltage < 1.9...2.22 V	- duty cycle < 99.6% - heater commandec off
P0058	HO2S Heater Control Circuit High (Bank 1, Sensor 2) Short to B+	-- Check the Oxygen Sensor (O2S) Heater -Z29-. Refer to <u>OXYGEN SENSOR O2S HEATER 1 BEHIND CATALYTIC CONVERTER, CHECKING.</u>	Heater current, > 3..5 A	- duty cycle > 0.4% - heater commandec on
		-- Check the Manifold Absolute Pressure (MAP)		- modeled pressure quotient < 0.53 - engine speed 600...3600 RPM

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P0068	MAP/MAF - Throttle Position Correlation	Sensor -G71-. Refer to <u>MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING.</u>	deviation throttle controller < -43 or > 43%	- time after engine start > 70 Sec - fuel cut-off not active - throttle position > 4.5% - fuel trim activity - 15...15%
P0070	Ambient Temperature Sensor only S4 short to B+plus	-- Check the Outside Air Temperature Sensor -G17-. Refer to <u>AMBIENT AIR TEMPERATURE SENSOR, CHECKING.</u>	ambient temp. < -50° C	CAN active
P0071	Ambient Temperature Sensor only S4 rationality check	-- Check the Outside Air Temperature Sensor -G17-. Refer to <u>AMBIENT AIR TEMPERATURE SENSOR, CHECKING.</u>	- ambient temperature > 34...26K minus engine temperature @ engine start - ambient temperature minus intake air temperature @ engine start (1)	- engine off time>8l - engine temperature @ engine start < 34..26 K minus intake air temperature @ engine start - engine temperature @ engine start< 1.5° C minus engine temperature @ condition: - time since engine start>90 Sec - ambient temperature @ engine start<= 10.25° C minus ambient temperature @ condition: - vehicle speed> 20mph - for time> 30 Sec - intake air temperature @ engine start<= 10.25° C minus intake air temperature @ condition:

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				• vehicle speed > 20mph • for time > 30 Sec
P0072	Ambient Temperature Sensor only S4 short to ground	-- Check the Outside Air Temperature Sensor -G17-. Refer to <u>AMBIENT AIR TEMPERATURE SENSOR, CHECKING.</u>	• ambient temperature > 87° C	• CAN active
P0087	Fuel Rail/System Pressure - Too Low	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING</u>	• deviation fuel rail pressure control > 0.120 g/Rev • AND • deviation lambda control - 15...15% • actual pressure > below target pressure • target pressure-actual pressure > 2 MPa • and • deviation lambda control -25.. 25 %	• engine speed, 580...3480 RPM • time after engine start > 5 Sec • fuel cut off, not active • lambda control, closed loop • high press. pump setpoint 0.015...0.105 g/Rev • catalyst heating not active • engine speed, 580...3480 RPM • time after engine start > 5 Sec • fuel cut off, not active • lambda control, closed loop • high press. pump setpoint 0.06...0.10 g/Rev • catalyst heating not active • evap canister load 25 % • control valve commanded closed • engine speed, 640...3480 RPM • time after engine

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				- start > 5 Sec - fuel cut off, not active - lambda control, closed loop - high press. pump setpoint 0.015...0.105 g/R€ - evap canister load 25 %
P0088	Fuel Rail/System Pressure - Too High	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING</u>	Fuel rail pressure > 13.9 MPa	---
P0089	Fuel Pressure Regulator 1 Performance	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	Actual pressure Deviation - deviation fuel press control < 28% > 35% - target press actual press > 0.17 MPa - target press actual press > 0.17 MPa	- engine speed 500...3000 RPM - Time after engine start > 30 Sec - ECT 70...95° C - delta fuel press lov < 25kPa - fuel cut-off not active - engine speed 500...4500 RPM - Time after engine start > 80 Sec - ECT 70...95° C - engine speed 500...4500 RPM - Time after engine start > 80 Sec - ECT 70...95° C - high press pump setpoint 0.01g - fuel cut-off not active
			pressure difference in cross check between	

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P012B	Charger inlet pressure rationality check	-- Check the Charge Air Pressure Sensor -G31-. Refer <u>CHARGE AIR PRESSURE SENSOR/INTAKE AIR TEMPERATURE SENSOR, CHECKING</u>	boost pressure sensor 1/2; charger inlet pressure, ambient pressure sensor > 7 kPa pressure difference in cross check between boost pressure sensor 1/2 and charger inlet pressure (1) > 12...27 kPa	- engine speed 0 RPM - time after engine stop 10 Sec - vehicle speed 0 MPH - modeled pressure quotient 0.25...0.8 - engine speed 600...6000 RPM - time after engine start > 10 Sec
P012C	Charger inlet pressure short to ground	-- Check the Charge Air Pressure Sensor -G31-. Refer <u>CHARGE AIR PRESSURE SENSOR/INTAKE AIR TEMPERATURE SENSOR, CHECKING</u>	signal voltage < 0.2 V	---
P012D	Charger inlet pressure short to B+	-- Check the Charge Air Pressure Sensor -G31-. Refer <u>CHARGE AIR PRESSURE SENSOR/INTAKE AIR TEMPERATURE SENSOR, CHECKING</u>	signal voltage >4.8 V	---
P0100	Mass or Volume Air Flow A Circuit	-- Check the Manifold Absolute Pressure (MAP) Sensor -G71-. Refer to <u>MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING.</u>	MAF sensor signal, 0 u Sec	----
				- time after engine start, >150 camshaft revs - time after engine start, >150 camshaft revs

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P0101	Mass or Volume Air Flow A Circuit Range/Performance	-- Check the Manifold Absolute Pressure (MAP) Sensor -G71-. Refer to <u>MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING.</u>	• mass air flow vs lower threshold model <12% • mass air flow vs upper threshold <12% • load calculation >21%. 23 for ULEV only • AND • fuel system (mult) <-19%. -23 ULEV only • load calculation <21%. -23 for ULEV only • AND • fuel system (mult) >19%. 23 ULEV only	• throttle position <99.6% • engine speed 1320...5000 RPM • ECT >60.0 °C • IAT <90.0°C • mass air flow 0.0...450kg/h • engine load 20...100% • lambda control closed loop • evap purge valve closed • if low fuel signal then wait until ma: fuel integral >0.0k
P0102	Mass or Volume Air Flow A Circuit Low Input	-- Check the Manifold Absolute Pressure (MAP) Sensor -G71-. Refer to <u>MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING.</u>	MAF sensor signal, <66 u Sec	---

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P0103	Mass or Volume Air Flow A Circuit High Input	-- Check the Manifold Absolute Pressure (MAP) Sensor -G71-. Refer to <u>MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING.</u>	MAF sensor signal, >4500 u Sec	---
P0106	Manifold Absolute Pressure/BARO Sensor Range/Performance	-- Check the Charge Air Pressure Sensor -G31-. Refer to <u>CHARGE AIR PRESSURE SENSOR/INTAKE AIR TEMPERATURE SENSOR, CHECKING.</u> -- If the Charge Air Pressure Sensor -G31- has no faults, check the altitude sensor co-located within the ECM.-- Check TSB's for related information.	Boost pressure signal <Altitude sensor -210 hPa >Altitude sensor +230 hPa	- Altitude sensor, No DTC - Boost pressure sensor, No DTC - Engine speed, <1000 RPM AND - Throttle position, <7.01% DK for 3 Sec. - Throttle position sensor, No DTC
P0111	Intake Air Temperature Sensor 1 Rationality check ULEV only	-- Check the Intake Air Temperature (IAT) Sensor - G42- Refer to <u>MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING</u>	- difference value: IAT-ECT @ engine start (depending on engine-off time, >25...40 K - AND - difference value: IAT-AAT @ engine start (depending on engine-off time), >25...40 K	- engine-off time, >1 h - ECT @ engine start minus AAT @ engine start, <=25...40 °C - ECT @ engine start <1.5 °C minus EC @ time after engine start, 60 Sec - AAT @ engine start, <=5.2 °C minus AAT @ condition - vehicle speed, >25 MPH - for time >30 Sec
P0112	Intake Air Temperature Sensor 1 Circuit Low Input	-- Check the Intake Air Temperature (IAT) Sensor - G42- Refer to <u>MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE</u>	IAT, < 0.099 V °C	---

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		<u>AIR TEMPERATURE SENSOR, CHECKING</u>		
P0113	Intake Air Temperature Sensor 1 Circuit High Input	-- Check the Intake Air Temperature (IAT) Sensor - G42- Refer to <u>MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING</u>	IAT, > 3.20 V °C	---
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/Performance.	-- Check Engine Coolant Temperature (ECT) Sensor - G62-. Refer to <u>ENGINE COOLANT TEMPERATURE SENSOR, CHECKING</u> -- Check the coolant regulator. Refer to Engine Mechanical, Fuel Injection and Ignition, Cooling System Components.	Stuck high: no change of signal, < 2.5K	- ECT @ start, 75...141° C - Driving condition > 36 Sec - vehicle speed, > 12.5mph - engine speed > 2500 RPM - mass air flow > 60 kg/h - Driving condition > 36 Sec - fuel cut-off active - vehicle speed, > 6: mph - engine speed idle and if - ignition off > 400 Sec - ECT @ start 85...105° C - delta modeled EC 13K
P0117	Engine Coolant Temperature Sensor 1 Circuit Low Input	-- Check Engine Coolant Temperature (ECT) Sensor - G62-. Refer to <u>ENGINE COOLANT TEMPERATURE SENSOR, CHECKING</u> -- Check the coolant regulator. Refer to Engine Mechanical, Fuel Injection and Ignition, Cooling System Components.	ECT, < 0.25 V	---

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P0118	Engine Coolant Temperature Sensor 1 Circuit Open	-- Check Engine Coolant Temperature (ECT) Sensor - G62-. Refer to <u>ENGINE COOLANT TEMPERATURE SENSOR, CHECKING.</u> -- Check the coolant regulator. Refer to Engine Mechanical, Fuel Injection and Ignition, Cooling System Components.	ECT, > 3.20 V	---
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance	-- Check the Throttle Position (TP) Sensor -G79- /Accelerator Pedal Position Sensor 2 -G185-. Refer to <u>THROTTLE POSITION SENSOR/ACCELERATOR PEDAL POSITION SENSOR 2, CHECKING.</u>	• TPS 1-TPS 2, > 5.79° • AND • relative mass air inequal > 100... at 0.45 Sec	• Engine start completed • TPS no fault
P0122	Throttle/Pedal Position Sensor A Circuit Low Input	-- Check the Throttle Position (TP) Sensor -G79- /Accelerator Pedal Position Sensor 2 -G185-. Refer to <u>THROTTLE POSITION SENSOR/ACCELERATOR PEDAL POSITION SENSOR 2, CHECKING.</u>	Signal voltage, <0.117 V	---
P0123	Throttle/Pedal Position Sensor A Circuit High Input	-- Check the Throttle Position (TP) Sensor -G79- /Accelerator Pedal Position Sensor 2 -G185-. Refer to <u>THROTTLE POSITION SENSOR/ACCELERATOR PEDAL POSITION SENSOR 2, CHECKING.</u>	Signal voltage, > 4.6 V	---
P0130	O2 Sensor Circuit (Bank 1, Sensor 1)	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	• O2S ceramic temp. <640.0° C	• Modeled exhaust temp>300 °C • fuel cut-off not active
P0131	O2 Sensor Circuit, Bank 1 Bank 2 Low Voltage	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	• signal voltage < 0.13 V	---
P0132	O2 Sensor Circuit, Bank 1	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN</u>	• signal voltage > 5.5	---

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	Bank 2 High Voltage	<u>SENSOR HO2S, CHECKING.</u>	V	
P0133	O2 Circuit Slow Response (Bank 1, Bank 2)	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	• response check-lambda value vs modeled lambda value > 0.9	• Engine speed, 1184...3000 RPM • ECT > 20° C • lambda0.9..1.1 • engine speed deviation 1670 RPM/s • EVAP canister loa < 40% • mass air flow 125...375 g/Rev • delta mass air flow < 0.167 g/Rev
P0135	O2 Heater Circuit (Bank 1, Sensor 1)	-- Check the Oxygen Sensor (O2S) Heater -Z19-. Refer to <u>OXYGEN SENSOR O2S HEATER, CHECKING.</u>	• O2S not ready after dewpoint exceeded > 30Sec	• O2S front dewpoint exceeded • heater control active • O2S front no other faults
P0136	O2 Circuit (Bank 1, Sensor 2)	-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	• O2S signal rear- O2S setpoint 1 V • not oscillating at reference +/- 10 mV	• O2S rear ready • trim control post closed loop > 340 Sec • engine speed > 1200 RPM • "lambda-set value (no map, just bottom and top limit)"0, 9 ... 1, 1
P0137	O2 Circuit Low Voltage (Bank 1, Sensor 2)	-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	• Signal voltage, < 20mV • AND • internal resistance < 10ohms	• O2S rear-fully heated up • mass air flow > 12 kg/h • O2S rear dewpoint exceeded
	O2 Circuit High Voltage	-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to <u>OXYGEN</u>	Signal voltage >1.2	

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P0138	(Bank 1, Sensor 2)	<u>SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	V	---
P0139	O2 Circuit Slow Response (Bank 1, Sensor 2)	-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	O2S signal rear- signal too slow- 1	- ECT > 60° C - mass air flow 12...120 kg/h - O2S rear signal voltage 0.6...0.28 V - fuel cut-off, enable - modeled exhaust gas temp. > 450° C - internal resistance 3000ohms
P0140	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	- Signal voltage, 0.376...0.474 V - O2S rear internal resistance >60 Kohms	Modeled exhaust temp. > 450° C
P0141	O2 Heater Circuit (Bank 1, Sensor 2) out of range	-- Check the Oxygen Sensor (O2S) Heater -Z29-. Refer to <u>OXYGEN SENSOR O2S HEATER 1 BEHIND CATALYTIC CONVERTER, CHECKING.</u>	internal resistance, > 10K ohms	- Modeled exhaust gas temp, 300-400 C - heater duty cycle 0.8...99.2%.
			EWMA filtered transient time at fuel	- rich voltage, >=547.9 mV - lean voltage <=152.3 mV - OR - Max O2 mass flow (disable), >=6000 mg - O2S rear, ready - fuel cut-off, active - front O2 sensor, lambda signal, >2.00

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P0145	O2 Circuit Slow Response (Bank 1, Sensor 2)	-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	- cut-off, >0.4 Sec - in voltage range, 401.4...201.2 mV - number of checks (initial phase), >3 - number of checks (step function), >3	- modeled exhaust gas temp. >400° C - exhaust gas mass flow, >25.0 kg/h - rear O2 sensor internal resistance, <=131 Kohms - or resistance measurement, reac - front O2 sensor, sensor cross chang no fault - rear O2 sensor heater, wires and oscillating check, no fault - purge valve, no fault - trigger for step change, delta transient time, READ ERROR
P0150A	Engine-Off-Time only S4	Comparing engine off time from instrument cluster control unit with engine after run time	difference between engine-off-time < 12 Sec	- key-on after ECM after run time activ - CAN active
P0151	O2 Sensor Circuit, Bank 1 Bank 2 Low Voltage	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	signal voltage < 0.13 V	---
P0152	O2 Sensor Circuit, Bank 1 Bank 2 High Voltage	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	signal voltage > 5.5 V	---
P0153	O2 Circuit Slow Response	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN</u>	response check-lambda value vs	- Engine speed, 1184...3000 RPM - ECT > 20° C - lambda0.9..1.1 - engine speed deviation 1670 RPM/s

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

	(Bank 1, Bank 2)	<u>SENSOR HO2S, CHECKING.</u>	modeled lambda value > 0.9	• EVAP canister loa < 40% • mass air flow 125...375 g/Rev • delta mass air flow < 0.167 g/Rev
P0155	O2 Heater Circuit (Bank 1, Sensor 1)	-- Check the Oxygen Sensor (O2S) Heater -Z19-. Refer to <u>OXYGEN SENSOR O2S HEATER, CHECKING.</u>	• UEGO ceramic temperature< 680 or > 965° C	• O2S front dewpoint exceeded • heater control active • lambda control active • O2S front no other faults
P0156	O2 Circuit (Bank 1, Sensor 2)	-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	• O2S signal rear- O2S setpoint 1 V • not oscillating at reference +- 10 mV • signal voltage > 0.15 V	• O2S rear ready • trim control post closed loop > 340 Sec • engine speed > 1200 RPM • integrated mass air flow 20...75 g • fuel cut-off active
P0157	O2 Circuit Low Voltage (Bank 1, Sensor 2)	-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	• Signal voltage, < 20mV • AND • internal resistance < 10ohms	• O2S rear-fully heated up • mass air flow > 12kg/h • O2S rear dewpoint exceeded
P0158	O2 Circuit High Voltage (Bank 1, Sensor 2)	-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	signal voltage > 1.2 V	---
		-- Check the Oxygen Sensor		• ECT > 60° C • mass air flow

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P0159	O2 Circuit Slow Response (Bank 1, Sensor 2)	(O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	O2S signal rear- signal too slow- 1	12...120 kg/h - O2S rear signal voltage 0.6...0.28 V - fuel cut-off, enable - modeled exhaust gas temp. > 450° C - internal resistance 3000ohms
P0160	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	- Signal voltage, 0.376...0.474 V - O2S rear internal resistance >60 Kohms	Modeled exhaust temp. > 450° C
P0161	O2 Heater Circuit (Bank 1, Sensor 2) out of range	-- Check the Oxygen Sensor (O2S) Heater -Z29-. Refer to <u>OXYGEN SENSOR O2S HEATER 1 BEHIND CATALYTIC CONVERTER, CHECKING.</u>	Heater resistance, > 10K ohms	- Modeled exhaust gas temp, 300-400 C - heater duty cycle 0.8...99.2%.
P0171	Fuel System Too Lean, Additive (Bank 1, Bank 2)	-- Check the fuel pressure --. Refer to <u>FUEL PRESSURE TEST.</u> -- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u> -- Check the Fuel injectors - N30, N31, N32, N33-. Refer to <u>FUEL INJECTORS, CHECKING.</u> -- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u> -- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC</u>	lean @ idle Adaptive value > 0.0063 g/Rev	- Engine speed, < 800 RPM - delta mass air flow < 7.5 g/rev/s - ECT, > 70° C - mass fuel flow < 0.0375 g/rev - substitute ECT > 70° C - accelerator PP value < 250 % - integrated mass air flow > 25g

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		<u>CONVERTER, CHECKING.</u>-- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. Refer to <u>EVAPORATIVE PURGE REGULATOR VALVE, CHECKING.</u>-- Check the intake system for leaks (false air).-- Check the vacuum lines for leaks		• lambda control, closed loop • evap purge valve, closed
P0172	System Too Rich-Additive (Bank 1, Bank 2)	-- Check the fuel pressure --. Refer to <u>FUEL PRESSURE TEST.</u>-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>-- Check the Fuel injectors - N30, N31, N32, N33-. Refer to <u>FUEL INJECTORS, CHECKING.</u>-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>-- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. Refer to <u>EVAPORATIVE PURGE REGULATOR VALVE, CHECKING.</u>-- Check the intake system for leaks (false air).-- Check the vacuum lines for leaks	• too rich at idle Adaptive value <.0075 g/Rev	• Engine speed, < 800 RPM • delta mass air flow < 7.5 g/rev/s • ECT, > 70° C • mass fuel flow < 0.0375 g/rev • substitute ECT > 70° C • accelerator PP value < 250 % • integrated mass air flow > 25g • lambda control, closed loop • evap purge valve, closed
		-- Check the fuel pressure --. Refer to <u>FUEL PRESSURE TEST.</u>-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>-- Check the Fuel injectors - N30, N31, N32, N33-. Refer to <u>FUEL INJECTORS, CHECKING.</u>-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>-- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. Refer to <u>EVAPORATIVE PURGE REGULATOR VALVE, CHECKING.</u>-- Check the intake system for leaks (false air).-- Check the vacuum lines for leaks		

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P0174	Fuel System Too Lean, Additive (Bank 1, Bank 2)	Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>-- Check the Fuel injectors - N30, N31, N32, N33-. Refer to <u>FUEL INJECTORS, CHECKING.</u>-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>-- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. Refer to <u>EVAPORATIVE PURGE REGULATOR VALVE, CHECKING.</u>-- Check the intake system for leaks (false air).-- Check the vacuum lines for leaks	lean @ idle Adaptive value > 0.0063 g/Rev	- Engine speed, < 800 RPM - delta mass air flow < 7.5 g/rev/s - ECT, > 70° C - mass fuel flow < 0.0375 g/rev - substitute ECT > 70° C - accelerator PP valve < 250 % - integrated mass air flow > 25g - lambda control, closed loop - evap purge valve, closed
P0175	System Too Rich-Additive (Bank 1, Bank 2)	-- Check the fuel pressure --. Refer to <u>FUEL PRESSURE TEST.</u>-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>-- Check the Fuel injectors - N30, N31, N32, N33-. Refer to <u>FUEL INJECTORS, CHECKING.</u>-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-. Refer to <u>OXYGEN</u>	too rich at idle Adaptive value < 0.0075	- Engine speed, < 800 RPM - delta mass air flow < 7.5 g/rev/s - ECT, > 70° C - mass fuel flow < 0.0375 g/rev - substitute ECT > 70° C - accelerator PP valve

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		<u>SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u> -- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. Refer to <u>EVAPORATIVE PURGE REGULATOR VALVE, CHECKING.</u> -- Check the intake system for leaks (false air).-- Check the vacuum lines for leaks	g/Rev)	< 250 % - integrated mass air flow > 25g - lambda control, closed loop - evap purge valve, closed
P0190	Fuel Rail Pressure Sensor A Circuit	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	Signal voltage > 4.6 V	---
P0191	Fuel Rail Control Valve, high pressure side	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	actual pressure >16.85 mPa	- time after engine start, > 30 Sec - engine speed, 500...6500 RPM
P0192	Fuel Rail Pressure Sensor A Circuit Low Input	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	Signal voltage < 0.2 V	---
P0201	Injector Circuit / Open - Cylinder 1	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	- signal current < 10 A - signal voltage > 3.5 V	- injector command on - injector command off
P0202	Injector Circuit / Open - Cylinder 2	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	- signal current < 10 A - signal voltage > 3.5 V	- injector command on - injector command off
P0203	Injector Circuit / Open - Cylinder 3	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	- signal current < 10 A - signal voltage > 3.5 V	- injector command on - injector command off

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P0204	Injector Circuit / Open - Cylinder 4	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• signal current < 10 A • signal voltage > 3.5 V	• injector command on • injector command off
P0205	Injector Circuit / Open - Cylinder 5	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• signal current < 10 A • signal voltage > 3.5 V	• injector command on • injector command off
P0206	Injector Circuit / Open - Cylinder 6	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• signal current < 10 A • signal voltage > 3.5 V	• injector command on • injector command off
P0221	Throttle/Pedal Position Sensor/Switch B Circuit Range/Performance	-- Check the Throttle Position (TP) Sensor -G79-/Accelerator Pedal Position Sensor 2 -G185-. Refer to <u>THROTTLE POSITION SENSOR/ACCELERATOR PEDAL POSITION SENSOR 2, CHECKING.</u>	• TPS 1-TPS 2, > 5.79° • AND • relative mass air inequal > 100... at 0.45 Sec	• Engine start completed • TPS no fault
P0222	Throttle/Pedal Position Sensor/Switch B Circuit Low Input	-- Check the Throttle Position (TP) Sensor -G79-/Accelerator Pedal Position Sensor 2 -G185-. Refer to <u>THROTTLE POSITION SENSOR/ACCELERATOR PEDAL POSITION SENSOR 2, CHECKING.</u>	Signal voltage, <0.117 V	---
P0223	Throttle/Pedal Position Sensor/Switch B Circuit High Input	-- Check the Throttle Position (TP) Sensor -G79-/Accelerator Pedal Position Sensor 2 -G185-. Refer to <u>THROTTLE POSITION SENSOR/ACCELERATOR PEDAL POSITION SENSOR 2, CHECKING.</u>	Signal voltage, > 4.6 V	---
		-- Check the Charge Air Pressure Sensor -G31-. Refer to <u>CHARGE AIR</u>	• diff. set	

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P0234	Turbocharger/Supercharger Overboost Condition Rationality check high	<u>PRESSURE</u> <u>SENSOR/INTAKE AIR</u> <u>TEMPERATURE</u> <u>SENSOR, CHECKING.</u> -- Check the charge air system for proper seal. Refer to <u>Charge Air Pressure Sensor</u> <u>G31 / Charge Air Pressure</u> <u>Sensor 2 G447</u>	value boost pressure vs actual boost pressure value, >200...1275 hPa	Altitude, <2700 m
P0235	Boost pressure control	-- Check the Charge Air Pressure Sensor -G31-. Refer to <u>CHARGE AIR</u> <u>PRESSURE</u> <u>SENSOR/INTAKE AIR</u> <u>TEMPERATURE</u> <u>SENSOR, CHECKING.</u> -- Check the charge air system for proper seal. Refer to Engine Mechanical, Fuel Injection and Ignition, Charge Air System	Boost pressure sensor signal vs target value • > 27....50 kPa, depending on altitude	- time after start 70 Sec - engine speed 4000...7200 RPM - ECT > 5° C - TIA > 5° C - modeled charge pressure quotient 1.25...2.2 - mass air flow > 2. g/Rev
P0236	Turbocharger/Supercharger Boost Sensor A Plausibility check.	-- Check the Charge Air Pressure Sensor -G31-. Refer to <u>CHARGE AIR</u> <u>PRESSURE</u> <u>SENSOR/INTAKE AIR</u> <u>TEMPERATURE</u> <u>SENSOR, CHECKING.</u> -- Check the charge air system for proper seal. Refer to Engine Mechanical, Fuel Injection and Ignition, Charge	- pressure difference in cross check between boost pressure sensor 1/2; charger inlet pressure, ambient pressure > 7 kPa - pressure difference in cross check between boost pressure sensor 1/2; charger inlet pressure (1) > 12...27 kPa - pressure difference in	- engine speed, < 1 RPM - vehicle speed 0 MPH - time after engine stop 10 Sec - modeled pressure quotient 0.25...0.3 - engine speed 600...6000 RPM - time after engine start > 10 Sec - modeled charge

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		Air System	cross check between pressure sensor 1 and 2 > 12.51 kPa • AND • fuel trim activity (bank with deviation is considered to be defective) > 151%	pressure quotient 1.2 • engine speed 600...6000 RPM • time after engine start > 10 Sec
P0237	Turbocharger/Supercharger Boost Sensor A Circuit Low	-- Check the Charge Air Pressure Sensor -G31-. Refer to <u>CHARGE AIR PRESSURE SENSOR/INTAKE AIR TEMPERATURE SENSOR, CHECKING</u>-- Check the charge air system for proper seal. Refer to appropriate service information.	Signal voltage, < 0.2 V	---
P0238	Turbocharger/Supercharger Boost Sensor A Circuit High	-- Check the Charge Air Pressure Sensor -G31-. Refer to <u>CHARGE AIR PRESSURE SENSOR/INTAKE AIR TEMPERATURE SENSOR, CHECKING</u>-- Check the charge air system for proper seal. Refer to appropriate service information.	Signal voltage, > 4.8 V	---
			• pressure difference in cross check between boost pressure sensor 1/2; IM pressure, ambient pressure > 7	• engine speed 0

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

			kPa	RPM
P0240	Turbocharger/Supercharger Boost Sensor rationality check	-- Check the Charge Air Pressure Sensor -G31-. Refer to <u>CHARGE AIR PRESSURE SENSOR/INTAKE AIR TEMPERATURE SENSOR, CHECKING.</u> -- Check the charge air system for proper seal. Refer to appropriate service information.	- pressure difference in cross check between boost pressure sensor 1/2; IM pressure > 12...27 kPa - pressure difference in cross check between pressure sensor 1 and 2 > 12.51 kPa - AND - fuel trim activity (bank with deviation is considered to be defective > 151%	- time after engine stop 10 Sec - vehicle speed 0 MPH - modeled pressure quotient 0.25...0.3 - engine speed 600...6000 RPM - time after engine start > 10 Sec - modeled charge pressure quotient 1.2 - engine speed 600...6000 RPM - time after engine start > 10 Sec
P0241	Turbocharger/Supercharger Boost Sensor -short to ground	-- Check the Charge Air Pressure Sensor -G31-. Refer to <u>CHARGE AIR PRESSURE SENSOR/INTAKE AIR TEMPERATURE SENSOR, CHECKING.</u> -- Check the charge air system for proper seal. Refer to appropriate service information.	signal voltage < 0.2 V	---
P0242	Turbocharger/Supercharger Boost Sensor short to B+	-- Check the Charge Air Pressure Sensor -G31-. Refer to <u>CHARGE AIR PRESSURE SENSOR/INTAKE AIR TEMPERATURE SENSOR, CHECKING.</u> --	signal voltage > 4.8 V	---

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		Check the charge air system for proper seal. Refer to appropriate service information.		
P0243	Turbocharger/Supercharger Wastegate Solenoid A	-- Check the Wastegate Bypass Regulator Valve - N75-.	Signal voltage, > 4.40...5.60 V	• boost pressure control valve, commanded off • Engine speed, > 800 RPM
P0245	Turbocharger/Supercharger Wastegate Solenoid A Low	-- Check the Wastegate Bypass Regulator Valve - N75-.	Signal voltage, < 2.15...3.25 V	• boost pressure control valve, commanded off • Engine speed, > 800 RPM
P0246	Turbocharger/Supercharger Wastegate Solenoid A High	-- Check the Wastegate Bypass Regulator Valve - N75-.	Signal current, >2.20 A	• boost pressure control valve, commanded on • Engine speed, > 800 RPM
P0261	Cylinder 1 Injector Circuit short to ground	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• Signal current < 10 A • AND • signal voltage < 3.5 V	• injector commanded on • injector commanded off
P0262	Cylinder 1 Injector Circuit short to b+	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• Signal current > 16 A	• injector commanded on
P0264	Cylinder 2 Injector Circuit short to ground	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• Signal current < 10 A • AND • signal voltage < 3.5 V	• injector commanded on • injector commanded off
P0265	Cylinder 2 Injector Circuit short to b+	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• Signal current > 16 A	• injector commanded on
			• Signal current < 10	

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P0267	Cylinder 3 Injector Circuit short to ground	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• A • AND • signal voltage < 3.5 V	• injector command on • injector command off
P0268	Cylinder 3 Injector Circuit short to b+	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• Signal current > 16 A	• Injection valve, Commanded on
P0270	Cylinder 4 Injector Circuit short to ground	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• Signal current < 10 A • AND • signal voltage < 3.5 V	• injector command on • injector command off
P0271	Cylinder 4 Injector Circuit short to b+	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• Signal current > 16 A	• Injection valve, Commanded on
P0273	Cylinder 5 Injector Circuit short to ground	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• Signal current < 10 A • AND • signal voltage < 3.5 V	• injector command on • injector command off
P0274	Cylinder 5 Injector Circuit short to b+	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• Signal current > 16 A	• injector command on
P0276	Cylinder 6 Injector Circuit short to ground	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	• Signal current < 10 A • AND • signal voltage < 3.5 V	• injector command on • injector command off
P0277	Cylinder 6 Injector Circuit short to b+	-- Check the Fuel injectors - N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL</u>	• Signal current > 16	• injector command on

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		<u>INJECTORS, CHECKING.</u>	A	
P0299	Turbocharger/Supercharger Underboost Rationality check low	-- Check the charge air system for proper seal. Refer to <u>Charge Air Cooler Overview</u>	diff. set value boost pressure vs actual boost pressure value, >150 hPa	- Engine speed, 220 2800 RPM - altitude <2700 m - diff. set value boost pressure vs actual boost pressure value - Boost pressure control, active - turbo charger bypass valve, closed

Ignition system

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0300	Random Misfire Detected	-- Check the Spark plugs.-- Check the intake system for leaks.-- Check the fuel pressure. Refer to <u>FUEL PRESSURE TEST.</u> -- Check the Fuel injectors -N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u> -- - Check the Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324-. Refer to <u>IGNITION</u>	- emission threshold misfire rate (MR) 1st interval > 1.5% - emission threshold misfire rate (MR) > 1.5% - catalyst damage, misfire rate (MR) > 1.5... 15 %	- Engine speed range, idle 150...-6850 RPM - Engine torque, >=0 Nm - time after engine start idle 150 RPM +1 Rev - Fuel cutoff, Not active	1000 Rev. 200 Rev.	2 DCY - continuous

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

		<u>COIL WITH POWER OUTPUT STAGE, CHECKING.</u>				
P0301	Cylinder 1 Misfire Detected	-- Check the Spark plugs.-- Check the intake system for leaks.-- Check the fuel pressure. Refer to <u>FUEL PRESSURE TEST.</u>-- Check the Fuel injectors -N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>- - Check the Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	• emission threshold misfire rate (MR) 1st interval > 1.5% • emission threshold misfire rate (MR) > 1.5% • catalyst damage, misfire rate (MR) > 1.5... 15 %	• Engine speed range, idle 150...-6850 RPM • Engine torque, >=0 Nm • time after engine start idle 150 RPM +1 Rev • Fuel cutoff, Not active	• 1000 Rev. • 200 Rev.	• 2 DCY • continu
		-- Check the Spark plugs.-- Check the intake system for leaks.-- Check the fuel pressure. Refer to <u>FUEL PRESSURE TEST.</u>-- Check the Fuel	• emission	• Engine speed		

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

P0302	Cylinder 2 Misfire Detected	injectors -N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>- - Check the Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	threshold misfire rate (MR) 1st interval > 1.5% • emission threshold misfire rate (MR) > 1.5% • catalyst damage, misfire rate (MR) > 1.5... 15 %	range, idle 150...-6850 RPM • Engine torque, >=0 Nm • time after engine start idle 150 RPM +1 Rev • Fuel cutoff, Not active	• 1000 Rev. • 200 Rev.	• 2 DCY • continuac
P0303	Cylinder 3 Misfire Detected	-- Check the Spark plugs.-- Check the intake system for leaks.-- Check the fuel pressure. Refer to <u>FUEL PRESSURE TEST.</u>-- Check the Fuel injectors -N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>- - Check the Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324-. Refer to <u>IGNITION</u>	threshold misfire rate (MR) 1st interval > 1.5% • emission threshold misfire rate (MR) > 1.5% • catalyst damage, misfire rate (MR) > 1.5... 15 %	range, idle 150...-6850 RPM • Engine speed range, idle 150...-6850 RPM • Engine torque, >=0 Nm • time after engine start idle 150 RPM +1 Rev • Fuel cutoff, Not active	• 1000 Rev. • 200 Rev.	• 2 DCY • continuac

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

		<u>COIL WITH POWER OUTPUT STAGE, CHECKING.</u>				
P0304	Cylinder 4 Misfire Detected	-- Check the Spark plugs.-- Check the intake system for leaks.-- Check the fuel pressure. Refer to <u>FUEL PRESSURE TEST.</u>-- Check the Fuel injectors -N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>- - Check the Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	• emission threshold misfire rate (MR) 1st interval > 1.5% • emission threshold misfire rate (MR) > 1.5% • catalyst damage, misfire rate (MR) > 1.5... 15 %	• Engine speed range, idle 150...-6850 RPM • Engine torque, >=0 Nm • time after engine start idle 150 RPM +1 Rev • Fuel cutoff, Not active	• 1000 Rev. • 200 Rev.	• 2 DCY continuous
		-- Check the Spark plugs.-- Check the intake system for leaks.-- Check the fuel pressure. Refer to <u>FUEL PRESSURE TEST.</u>-- Check the Fuel	• emission	• Engine speed		

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

P0305	Cylinder 5 Misfire Detected	injectors -N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>- - Check the Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	threshold misfire rate (MR) 1st interval > 1.5% • emission threshold misfire rate (MR) > 1.5% • catalyst damage, misfire rate (MR) > 1.5... 15 %	range, idle 150...-6850 RPM • Engine torque, >=0 Nm • time after engine start idle 150 RPM +1 Rev • Fuel cutoff, Not active	• 1000 Rev. • 200 Rev.	• 2 DCY continuous
P0306	Cylinder 6 Misfire Detected	-- Check the Spark plugs.-- Check the intake system for leaks.-- Check the fuel pressure. Refer to <u>FUEL PRESSURE TEST.</u>-- Check the Fuel injectors -N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>- - Check the Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324-. Refer to <u>IGNITION</u>	threshold misfire rate (MR) 1st interval > 1.5% • emission threshold misfire rate (MR) > 1.5% • catalyst damage, misfire rate (MR) > 1.5... 15 %	range, idle 150...-6850 RPM • Engine speed range, idle 150...-6850 RPM • Engine torque, >=0 Nm • time after engine start idle 150 RPM +1 Rev • Fuel cutoff, Not active	• 1000 Rev. • 200 Rev.	• 2 DCY continuous

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

		<u>COIL WITH POWER OUTPUT STAGE, CHECKING.</u>				
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance	-- Check the Engine Speed (RPM) Sensor -G28-. Refer to <u>ENGINE SPEED SENSOR, CHECKING.</u>	- counted teeth versus reference, incorrect - OR - monitoring reference gap, failure	---	0.50 Sec	- Continu 2 DCY
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	-- Check the Engine Speed (RPM) Sensor -G28-. Refer to <u>ENGINE SPEED SENSOR, CHECKING.</u>	- camshaft signals >3 - Engine speed, no signal	---	0.50 Sec	- Continu 2 DCY
P0324	Knock Control System Error	-- Check the Knock Sensors -G61, G66-. Refer to <u>KNOCK SENSOR 1, CHECKING</u> or <u>KNOCK SENSOR 2, CHECKING.</u>	- signal fault counter (combustion), >24.0 - OR - signal fault counter (measuring window), >2.00 - Communication errors - SPI communication > 25	engine speed, 0 RPM	0.5 Sec	- Continu 2 DCY
P0326	Knock Control System	-- Check the Knock Sensor -G61-. Refer to <u>KNOCK SENSOR 1, CHECKING</u> or <u>KNOCK SENSOR 2, CHECKING.</u>	- lower threshold < 0.029 V - upper threshold > 1.992 V	- engine speed > 2656 RPM - mass air flow > 0.75 g/Rev	40 times	- Continu 2 DCY
		-- Check the				

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P0327	Knock Sensor 1 Circuit Low Input (Bank 1) Short to ground	Knock Sensor -G61-. Refer to <u>KNOCK SENSOR 1, CHECKING</u> or <u>KNOCK SENSOR 2, CHECKING.</u>	Lower threshold, 0.18 V	• Engine speed, > 2656 RPM • mass air flow > 0.75 g/Rev	40 times	• Continuu • 2 DCY
P0328	Knock Sensor 1 Circuit short to B+	-- Check the Knock Sensor -G61-. Refer to <u>KNOCK SENSOR 1, CHECKING</u> or <u>KNOCK SENSOR 2, CHECKING.</u>	upper threshold >1.00 V	• engine speed > 2656 RPM • mass air flow > 0.75 g/Rev	40 times	• Continuu • 2 DCY
P0331	Knock Control System	-- Check the Knock Sensor -G61-. Refer to <u>KNOCK SENSOR 1, CHECKING</u> or <u>KNOCK SENSOR 2, CHECKING.</u>	• lower threshold < 0.029 V • upper threshold > 1.992 V	• engine speed > 2656 RPM • mass air flow > 0.75 g/Rev	40 times	• Continuu • 2 DCY
P0332	Knock Sensor 1 Circuit Low Input (Bank 1) Short to ground	-- Check the Knock Sensor -G61-. Refer to <u>KNOCK SENSOR 1, CHECKING</u> or <u>KNOCK SENSOR 2, CHECKING.</u>	Lower threshold, 0.18 V	• engine speed > 2656 RPM • mass air flow > 0.75 g/Rev	40 times	• Continuu • 2 DCY
P0333	Knock Sensor 1 Circuit short to B+	-- Check the Knock Sensor -G61-. Refer to <u>KNOCK SENSOR 1, CHECKING</u> or <u>KNOCK SENSOR 2, CHECKING.</u>	upper threshold >1.00 V	• engine speed > 2656 RPM • mass air flow > 0.75 g/Rev	40 times	• Continuu • 2 DCY
		-- Check the Engine Speed (RPM) Sensor	• open circuit > 1 V • short to grnd <			

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P0335	Engine speed sensor	-G28- Refer to <u>ENGINE SPEED SENSOR, CHECKING</u>	1.5 V • short to B+ > 3.5 V • signal check no signal	---	0.4	• Continuu • 2 DCY
P0335	Engine speed sensor S4 only	-- Check the Engine Speed (RPM) Sensor -G28- Refer to <u>ENGINE SPEED SENSOR, CHECKING</u>	no signal -no signal for 2Rev	engine speed > 32 RPM	0.4	• Continuu • 2 DCY
P0336	Engine speed sensor	-- Check the Engine Speed (RPM) Sensor -G28- Refer to <u>ENGINE SPEED SENSOR, CHECKING</u>	• RPM signal comparison with phase sensor not synchronous • counted versus reference teeth > 1 • actual time value vs modeled time value > 1.375	• engine speed > 416 RPM • engine speed > 416 RPM • engine speed > 480 RPM	• 0.4 Sec • 3 Sec • 25 Sec	• Continuu • 2 DCY
P0336	Engine speed sensor S4 only	-- Check the Engine Speed (RPM) Sensor -G28- Refer to <u>ENGINE SPEED SENSOR, CHECKING</u>	• RPM signal comparison with phase sensor not synchronous • counted versus reference teeth > 1 • actual time value vs modeled time value > 1.375	• engine speed > 416 RPM • engine speed > 416 RPM • engine speed > 480 RPM	• 0.4 Sec • 3 Sec • 25 Sec	• Continuu • 2 DCY
P0340	Camshaft Position Sensor A Circuit	-- Check the Camshaft Position (CMP) Sensor -G40-. Refer to	signal activity check • signal voltage	• Engine speed > 32	0.4 Sec	• Continuu

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	(Bank 1 or single sensor)	<u>CAMSHAFT POSITION SENSOR, CHECKING.</u>	no altering @ 4 Rev	RPM		• 2 DCY
P0341	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or single sensor)	-- Check the Camshaft Position (CMP) Sensor -G40-. Refer to <u>CAMSHAFT POSITION SENSOR, CHECKING.</u>	actual time value vs min. time value < 1	engine speed > 32 RPM	0.1 Sec	---
P0342	Camshaft Position Sensor A Circuit Low Input (Bank 1 or single sensor)	-- Check the Camshaft Position (CMP) Sensor -G40-. Refer to <u>CAMSHAFT POSITION SENSOR, CHECKING.</u>	signal voltage low and crankshaft signals, 8.0	---	0.50 Sec	- Continu 2 DCY
P0343	Camshaft Position Sensor A Circuit High Input (Bank 1 or single sensor)	-- Check the Camshaft Position (CMP) Sensor -G40-. Refer to <u>CAMSHAFT POSITION SENSOR, CHECKING.</u>	signal voltage low and crankshaft signals, 8.0	---	0.50 Sec	- Continu 2 DCY
P0345	Camshaft Position Sensor A Circuit (Bank 1 or single sensor)	-- Check the Camshaft Position (CMP) Sensor -G40-. Refer to <u>CAMSHAFT POSITION SENSOR, CHECKING.</u>	signal activity check signal voltage no altering @ 4 Rev	Engine speed > 32 RPM	0.4 Sec	- Continu 2 DCY
P0346	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or single sensor)	-- Check the Camshaft Position (CMP) Sensor -G40-. Refer to <u>CAMSHAFT POSITION</u>	- adaptive value vs target value > 12.4 ° CA - actual time value vs modeled time	- engine speed > 416 RPM - duty cycle commanded	2 Sec	- Continu 2 DCY

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		<u>SENSOR, CHECKING.</u>	value > 3.5	off		
P0351	Ignition Coil A Primary/Secondary Circuit	-- Check the Ignition Coils with Power Output Stage - N70-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	open circuit • Signal current, < -0.05...0.2mA	• Engine speed, > 512 RPM	2 Sec	• Continuu • 2 DCY
P0352	Ignition Coil B Primary/Secondary Circuit	-- Check the Ignition Coils with Power Output Stage - N127-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	short to ground • Signal current, >0.04...0. mA	• Engine speed, > 512 RPM	2 Sec	• Continuu • 2 DCY
P0353	Ignition Coil C Primary/Secondary Circuit	-- Check the Ignition Coils with Power Output Stage - N291-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	short to B+ • Signal current, >0.04...0. mA	• Engine speed, > 512 RPM	2 Sec	• Continuu • 2 DCY
P0354	Ignition Coil D Primary/Secondary Circuit	-- Check the Ignition Coils with Power Output Stage - N292-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	open circuit • Signal current, < -0.05...0.2mA	• Engine speed, > 512 RPM	2 Sec	• Continuu • 2 DCY
		-- Check the				

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P0355	Ignition Coil E Primary/Secondary Circuit	Ignition Coils with Power Output Stage - N323-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	short to ground • Signal current, >0.04...0. mA	• Engine speed, > 512 RPM	2 Sec	• Continu • 2 DCY
P0356	Ignition Coil F Primary/Secondary Circuit	-- Check the Ignition Coils with Power Output Stage - N324-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	short to B+ • Signal current, >0.04...0. mA	• Engine speed, > 512 RPM	2 Sec	• Continu • 2 DCY

Additional exhaust regulation

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0410	rationality check	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION PUMP RELAY, CHECKING OR SECONDARY AIR INJECTION PUMP MOTOR, CHECKING</u>	• difference of SAIR pressure during phase 3 to SAIR pressure before SAIR injection > 30 mbar	• mass air flow, 9.5...200 kg/h • Delta engine load, < 10% rev • ECT, 4.5...39.8° C • IAT, > 4.5° C • altitude, <2500 m	30...60 Sec	• Once/DCY • 2 DCY
		Check the Secondary Air System. Refer to <u>SECONDARY AIR</u>				

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P0413	open circuit	<u>INJECTION PUMP RELAY, CHECKING OR SECONDARY AIR INJECTION PUMP MOTOR, CHECKING</u>	signal voltage < 0.8 mA	- air valve, commanded on - ign on	0.1 Sec	- Continuous 2 DCY
P0414	Air valve short to ground	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION PUMP RELAY, CHECKING OR SECONDARY AIR INJECTION PUMP MOTOR, CHECKING</u>	signal current >3.00 A	- air valve, commanded on - ign on	0.1 Sec	- Continuous 2 DCY
P0415	short to B+	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION PUMP RELAY, CHECKING OR SECONDARY AIR INJECTION PUMP MOTOR, CHECKING</u>	signal current > 3 A	- air valve, commanded on - engine speed, >80 RPM	0.1 Sec	- Continuous 2 DCY
P0416	open circuit	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION PUMP RELAY, CHECKING OR SECONDARY AIR INJECTION PUMP MOTOR, CHECKING</u>	signal voltage < 0.8 mA	- air valve, commanded on - ign on	0.1 Sec	- Continuous 2 DCY

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P0417	Air valve short to ground	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION PUMP RELAY, CHECKING OR SECONDARY AIR INJECTION PUMP MOTOR, CHECKING</u>	signal current >3.00 A	- air valve, commanded on - ign on	0.1 Sec	- Continuous 2 DCY
P0418	Air pump relay. Open circuit.	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION PUMP RELAY, CHECKING OR SECONDARY AIR INJECTION PUMP MOTOR, CHECKING</u>	signal voltage > 3 V	- pump relay commanded off - ign on	0.1 Sec	- Continuous 2 DCY
P0420	Catalyst System Bank 1	-- Check the Heated Oxygen Sensor (HO2S) - G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING</u> -- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING</u> -- Check the Three	amplitude ratio O2S > 1.5	- ECT > 70° C - integrated mass flow 2.3...8 kg - engine speed 1100...3500 RPM - modeled exhaust gas temp. 550...900° C - delta engine speed <350 RPMs - mass air flow 0.6...1.57 g/Rev	70 Sec	- Once/DCY 2 DCY

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

		Way Catalytic Converter (TWC). Refer to <u>CATALYTIC CONVERTER, CHECKING.</u>		- delta mass air flow < 2.25 g/Revs - evap canister load low...0.4		
P0430	Catalyst System Bank 2	-- Check the Heated Oxygen Sensor (HO2S) - G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u> -- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u> -- Check the Three Way Catalytic Converter (TWC). Refer to <u>CATALYTIC CONVERTER, CHECKING.</u>	amplitude ratio O2S > 1.5	- ECT > 70° C - integrated mass flow 2.3...8 kg - engine speed 1100...3500 RPM - modeled exhaust gas temp. 550...900° C - delta engine speed <350 RPMs - mass air flow 0.6...1.57 g/Rev - delta mass air flow < 2.25 g/Revs - evap canister load low...0.4	70 Sec	- Once/DCY 2 DCY
		-- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve -	Deviation lambda control < 4%	- Engine speed, Idle RPM - Engine speed Deviation, < 80 RPM - ECT, > 69.75° C or Substitute ECT, > 69.75° C		

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

P0441	Evaporative Emission System Incorrect Purge Flow	N80-. Refer to <u>EVAPORATIVE PURGE REGULATOR VALVE, CHECKING.</u>-- Check the Leak Detection Pump (LDP) -V144-. Refer to <u>LEAK DETECTION PUMP, CHECKING.</u>	• OR • deviation throttle controller < 8.0% • deviation press. control < 2.2 kpa	• IAT, > 5.0° C • IAT at engine start > 5.0° C • Altitude, < 2500 m • lambda control, closed loop • for press quotient (intake) / ambient < 0.58 • for press quotient (intake) / ambient > 0.58	25 Sec	• Once/ DCY • 2 DCY
P0442	Evaporative Emission System Leak Detected (Small Leak)	-- Check the EVAP System, for Leaks. Refer to <u>EVAPORATIVE SYSTEM, CHECKING FOR LEAKS.</u>-- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80-. Refer to <u>EVAPORATIVE PURGE REGULATOR VALVE,</u>	Time for pressure drop < 1.0...1.3 Sec.	• Time after engine start> 225...1200 Sec. • altitude < 2500 m • ECT at start, 5.3...35° C • engine off time, >21600 Sec • number of diagnostic attempts <= 2 • ambient air temp 3.8...59.3° C • delta ambient pressure 0.5 kpa • Altitude, < 2500 m	140 Sec	• once DCY • 2 DCY

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

		<u>CHECKING.--</u> Check the Leak Detection Pump (LDP) -V144-. Refer to <u>LEAK DETECTION PUMP, CHECKING.</u>		• Vehicle speed, > 0 MPH • IAT > 5.25° C • IAT drop after engine start < 6k • Evap purge valve closed • LDP, Activated • Delta ambient pressure, 0.5 hPa		
P0444	Evaporative Emission System Purge Control Valve Circuit Open	-- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80-. Refer to <u>EVAPORATIVE PURGE REGULATOR VALVE, CHECKING.</u>	Signal current < 0.8mA	• EVAP purge valve, Commanded on • Engine start completed	2.0 Sec	• Continuous • 2 DCY
P0445	Evaporative Emission System Purge Control Valve short to ground	-- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80-. Refer to <u>EVAPORATIVE PURGE REGULATOR VALVE, CHECKING.</u>	Signal voltage < 2.0 V	• EVAP purge valve, Commanded off • Engine start completed	2.0 Sec	• Continuous • 2 DCY
P0445	Evaporative Emission System Purge Control Valve short	-- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80-. Refer to <u>EVAPORATIVE PURGE</u>	Signal current >1.0 A	• EVAP purge valve, Commanded on • Engine start	2.0 Sec	• Continuous • 2 DCY

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	to battery plus	<u>REGULATOR VALVE, CHECKING.</u>		completed		
P0455	Evaporative Emission System Leak Detected (gross leak/no flow)	-- Check the EVAP System, for Leaks. Refer to <u>EVAPORATIVE SYSTEM, CHECKING FOR LEAKS.</u>-- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80-. Refer to <u>EVAPORATIVE PURGE REGULATOR VALVE, CHECKING.</u>-- Check the Leak Detection Pump (LDP) -V144-. Refer to <u>LEAK DETECTION PUMP, CHECKING.</u>	Time for pressure drop < 0.65...0.7 Sec.	• Time after engine start> 225...1200 Sec. • altitude < 2500 m • ECT at start, 5.3...35° C • number of diagnostic attempts <= 2 • delta ambient pressure 0.5 kpa • Altitude, < 2500 m • Vehicle speed, > 0 MPH • IAT > 5.25° C • IAT drop after engine start < 6k • Evap purge valve closed • LDP, Activated • Delta ambient pressure, - 1.523...1.523 hPa	140 Sec	• Once/DCY • 2 DCY
				• Time after engine start> 225...1200 Sec. • altitude < 2500 m		

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P0456	Evaporative Emission System Leak Detected (very small leak)	-- Check the EVAP System, for Leaks. Refer to <u>EVAPORATIVE SYSTEM, CHECKING FOR LEAKS.</u> -- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80-. Refer to <u>EVAPORATIVE PURGE REGULATOR VALVE, CHECKING.</u> -- Check the Leak Detection Pump (LDP) -V144-. Refer to <u>LEAK DETECTION PUMP, CHECKING.</u>	time for press drop <4.0-5.5 Sec.	- ECT at start, 5.3...35° C - engine off time, >21600 Sec - number of diagnostic attempts <= 5 - ambient air temp 3.8...59.3° C - delta ambient pressure 0.3 kpa - Altitude, < 2500 m - Vehicle speed, 0...80.7 MPH - Vehicle acceleration < 4 mSec - IAT > 5.25° C - IAT drop after engine start < 6k - Evap purge valve closed - LDP, Activated - Delta ambient pressure, - 1.523...1.523 hPa	140 Sec	- once DCY 2 DCY
	Evaporative Emission System Purge	-- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve -	Signal voltage,	EVAP purge valve, Commanded		Continuous

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P0458	Control Valve Circuit Low	N80-. Refer to <u>EVAPORATIVE PURGE REGULATOR VALVE, CHECKING.</u>	<2.15...3.25 V	off • Engine speed, >80 RPM	0.5 Sec	• 2 DCY
P0459	Evaporative Emission System Purge Control Valve Circuit High	-- Check the Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80-. Refer to <u>EVAPORATIVE PURGE REGULATOR VALVE, CHECKING.</u>	Signal current, > 2.20 A	• EVAP purge valve, Commanded on • Engine speed, >80 RPM	0.5 Sec	• Continuous • 2 DCY
			• blockage: relative SAIR pressure (phase 1) - no flow < 0.102 • leakage: relative SAIR pressure (phase 1) - no flow < 0.102 OR • blockage: relative SAIR pressure (phase 1) < 0.453 • leakage: relative SAIR pressure (phase 1) < 0.297	• mass air		

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

P0491	Secondary Air System Insufficient Flow. Bank 1	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION COMBINATION VALVE, CHECKING</u>	OR - blockage: relative SAIR pressure (phase 1) < 0.453 - leakage: relative SAIR pressure (phase 21) < 0.398 - relative SAIR pressure (phase 2) < 0.75 OR - average pressure difference between absolute value and filtered value (phase 21) < 3.398...6.758 hPa - relative SAIR pressure (phase 2) < 0.75	flow, 9.5...200 kg/h - ECT, 4.5...39.8° C - IAT, > 4.5° C - altitude, < 2700 m	30...60 Sec	- Once/DCY 2 DCY
			- blockage: relative SAIR pressure (phase 1) - no flow 0.102 - leakage:			

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

P0492	Secondary Air System Insufficient Flow. Bank 2	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION COMBINATION VALVE, CHECKING</u>	relative SAIR pressure (phase 1) - no flow 0.102 OR • blockage: relative SAIR pressure (phase 1) < 0.453 • leakage: relative SAIR pressure (phase 1) < 0.297 OR • blockage: relative SAIR pressure (phase 1) < 0.453 • leakage: relative SAIR pressure (phase 21) < 0.398 • relative SAIR pressure (phase 2) < 0.75 OR • average pressure difference	• mass air flow, 9.5...200 kg/h • ECT, 4.5...39.8° C • IAT, > 4.5° C • altitude, < 2700 m	30...60 Sec	• Once/DCY • 2 DCY
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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

			between absolute value and filtered value (phase 21) < 3.398...6.758 hPa relative SAIR pressure (phase 2) <0.75			
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Speed and idle control

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0501	Vehicle Speed Sensor A Range/Performance	-- Check vehicle speed signal. Refer to <u>SPEED SIGNAL, CHECKING.</u>	VSS signal, < 4 km/h	- engine torque >150 Nm - Engine speed, >2500 RPM - vehicle speed sensor, no fault	5 Sec	- multiple 2 DCY
P0503	Vehicle Speed Sensor A Out of range high	-- Check vehicle speed signal. Refer to <u>SPEED SIGNAL, CHECKING.</u>	vehicle speed >200km/h	---	0.5 Sec	- Continu 2 DCY
P0506	Idle Air Control System RPM Lower Than Expected	-- Check the Throttle Valve Control Module -J338-. Refer to <u>THROTTLE VALVE</u>	engine speed deviation <-80 RPM	- engine speed idle - Time after engine start 25 Sec. - Vehicle speed, 0 MPH - mass air flow < 1.05 g/Rev - EVAP purge	13 Sec	- multiple 2 DCY

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

		<u>CONTROL MODULE, CHECKING.</u>		- flow < 4 kg/h - idle controller > 40 Nm - ECT, > 80...110° C - IM press/ambient press. 0.5		
P0507	Idle Air Control System RPM Higher Than Expected	-- Check the Throttle Valve Control Module -J338-. Refer to <u>THROTTLE VALVE CONTROL MODULE, CHECKING.</u>	engine speed deviation >-80 RPM	- engine speed idle - Time after engine start 25 Sec. - Vehicle speed, 0 MPH - mass air flow < 1.05 g/Rev - EVAP purge flow < 4 kg/h - idle controller > 40 Nm - ECT, > 80...110° C - IM press/ambient press. 0.5	13 Sec	- multiple 2 DCY
P050A	Idle Air Control System RPM Higher Or Lower Than Expected	-- Check the Throttle Valve Control Module -J338-. Refer to <u>THROTTLE VALVE CONTROL MODULE, CHECKING.</u>	- out of range low - engine speed deviation < 80...250 RPM - out of range high - engine speed deviation > 80...250 RPM	- engine speed idle - Vehicle speed, 0 MPH - EVAP purge flow < 4 kg/h - idle controller > 40 Nm - ECT, > -9° C - catalyst heating active	13 Sec	- multiple 2 DCY

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

P052A	Intake (A) Camshaft Position Response check Bank 1 Bank 2	-- Check the Camshaft Adjustment Valve 1 -N205-. Refer to <u>CAMSHAFT ADJUSTMENT VALVE 1, CHECKING.</u>	• adjustment angle difference> 10° CA • number of checks 2 times	• modeled oil temp. - 10...130° C • engine speed > 700 RPM • delta set point > 0° CA • than wait 0 Sec	2 Sec	• Continuc • 2 DCY
P052C	Intake (A) Camshaft Position Response check Bank 1 Bank 2	-- Check the Camshaft Adjustment Valve 1 -N205-. Refer to <u>CAMSHAFT ADJUSTMENT VALVE 1, CHECKING.</u>	• adjustment angle difference> 10° CA • number of checks 2 times	• modeled oil temp. - 10...130° C • engine speed > 700 RPM • delta set point > 0° CA • than wait 0 Sec	2 Sec	• Continuc • 2 DCY
P053F	Fuel Rail Pressure Control Valve	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING</u>	Functional check • target pressure- actual pressure >1.5 mPa<-1.5 mPa •	• catalyst heating active • time after engine start> 5 Sec	5 Sec	• Continuc • 2 DCY

Control module and output signals

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0601	Internal Control Module Memory Check Sum Error	-- Replace the Motronic Engine Control Module (ECM) -J623- . Refer to	Internal check sum, incorrect	---	2 Sec	• Continuous • 2 DCY

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

		appropriate service information.				
P0603	internal hardware check	-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.	SPI communication lost	---	1.5 Sec	- Continuous 2 DCY
P0604	Internal Control Module Random Access Memory (RAM) Error	-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.	Write ability check, failed	---	1 Sec	- Once/DCY 2 DCY
P0605	Internal Control Module Read Only Memory (ROM) Error	-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.	Checksum Incorrect	---	---	- Continuous 2 DCY
P0606	ECM fault	-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.	Check sum error bit check failed	---	2 Sec	- Continuous 2 DCY
			Internal error fuel pump control unit			

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

P0627	Fuel Pump "A" Control Circuit /Open	-- Check the fuel pressure - -. Refer to <u>FUEL PRESSURE TEST.</u>	Feedback from fuel pump control unit Pump blocked short circuit to battery +, ground or open circuit	- Battery voltage, > 9-16 V - Engine start, Completed	15 Sec	No Mil
P0638	Throttle Actuator Control Range/Performance - Bank 1	-- Check the Throttle Valve Control Module - J338-. Refer to <u>THROTTLE VALVE CONTROL MODULE, CHECKING.</u>	Rationality check: - duty cycle >0.4 Sec at 98% - AND - actual TPS-calc value - ref. point < 1.5°	engine start not active	.045 Sec	- Continuous 2 DCY
P0641	Sensor Reference Voltage A Circuit/Open	-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.	signal voltage, deviation +/- 0.3 V	---	0.5 Sec	- Continuous 2 DCY
P0642	Sensor Reference Voltage A Circuit Low	-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.	Signal voltage, < 4.615 V	---	0.15 Sec	- Continuous 2 DCY
P0643	Sensor Reference Voltage A Circuit	-- Replace the Motronic Engine Control Module (ECM) -J623-	5 V supply voltage >5.434 V	---	0.15 Sec	- Continuous 2 DCY

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	High	. Refer to appropriate service information.				
P0651	Sensor Reference Voltage B Circuit/Open	-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.	signal voltage, deviation +/- 0.3 V	---	0.5 Sec	• Continuous • 2 DCY
P0652	Sensor Reference Voltage B Circuit Low	-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.	Signal voltage, < 4.615 V	---	0.15 Sec	• Continuous • 2 DCY
P0653	Sensor Reference Voltage B Circuit High	-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.	5 V supply voltage >5.434 V	---	0.15 Sec	• Continuous • 2 DCY
P0657	Actuator Supply Voltage A Circuit / Open	-- Check the Motronic Engine Control Module (ECM) Power Supply Relay -J271-. Refer to <u>VOLTAGE SUPPLY, CHECKING.</u>	Signal current < 0.8 mA	• Relay, commanded on	1.5 Sec	• Continuous • 2 DCY
		-- Check the				

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

P0658	Actuator Supply Voltage A Circuit Low	Motronic Engine Control Module (ECM) Power Supply Relay -J271-. Refer to <u>VOLTAGE SUPPLY, CHECKING.</u>	Signal voltage, > 2.0 V	Relay, commanded off	1.5 Sec	- Continuous 2 DCY
P0659	Actuator Supply Voltage "A" Circuit High	-- Check the Motronic Engine Control Module (ECM) Power Supply Relay -J271-. Refer to <u>VOLTAGE SUPPLY, CHECKING.</u>	Signal current > 1.0 A	Relay, commanded on	1.5 Sec	- Continuous 2 DCY
P0685	ECM/PCM Power Relay Control Circuit/Open	-- Check the Motronic Engine Control Module (ECM) Power Supply Relay -J271-. Refer to <u>VOLTAGE SUPPLY, CHECKING.</u>	- Signal voltage, 2.6-3.7 V - Sense circuit voltage, >6 V	ECM keep alive time main relay, Commanded on (Test pulse)	0.5 Sec	2 DCY
P0686	ECM/PCM Power Relay Control Circuit Low	-- Check the Motronic Engine Control Module (ECM) Power Supply Relay -J271-. Refer to <u>VOLTAGE SUPPLY, CHECKING.</u>	Sense circuit voltage, > 6.0 V	main relay, Commanded off (Test pulse)	0.25 Sec	- once 2 DCY

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P0687	ECM/PCM Power Relay Control Circuit High	-- Check the Motronic Engine Control Module (ECM) Power Supply Relay -J271-. Refer to <u>VOLTAGE SUPPLY, CHECKING.</u>	Sense circuit voltage, < 5.0 V	main relay, Commanded on (Test pulse)	0.25 Sec	- Continuous 2 DCY
P0688	ECM/PCM Power Relay Sense Circuit	-- Check the Motronic Engine Control Module (ECM) Power Supply Relay -J271-. Refer to <u>VOLTAGE SUPPLY, CHECKING.</u>	- Sense voltage, <3.0 V - Difference sense circuit voltage with camshaft actuator commanded off and on >2.5 V - Battery voltage > 3 V	- Main relay, commanded on - ECM keep alive time - Switch off test - Failed	1 Sec 4 Sec 2 Sec	2 DCY
P0697	Sensor Reference Voltage C Circuit / Open	-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.	signal voltage, deviation +/- 0.3 V	---	0.5 Sec	- Continuous 2 DCY
P0698	Sensor Reference Voltage C Circuit Low	-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to	Signal voltage, < 4.6-5 V	Threshold values dep. on internal 5 V rev voltage	0.4 Sec	2 DCY

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		appropriate service information.				
P0699	Sensor Reference Voltage C Circuit High	-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.	5 V supply voltage>4.99-5.41 V	Threshold values dep. on internal 5 V rev voltage	0.4 Sec	2 DCY

Fuel and Air ratios, control module

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P10A0	RFP-Power stage	Check the Fuel Pressure Sensor -G247- Refer to <u>FUEL PRESSURE SENSOR, CHECKING</u>	- ECM power stage failure - or duty cycle<95%	engine start completed	0.5 Sec	- Continuous 2 DCY
P10A4	RFP-Actuator	Check the Fuel Pressure Sensor -G247- Refer to <u>FUEL PRESSURE SENSOR, CHECKING</u>	absolute value of maximum deviation between predicted and real value> 8%	engine start completed	0.3 Sec	- Continuous 2 DCY
P10A5	RFP-Sensor	Check the Fuel Pressure Sensor -G247- Refer to <u>FUEL PRESSURE SENSOR, CHECKING</u>	signal voltage > 4.0 V	---	0.1 Sec	- Continuous 2 DCY
P10A6	RFP-Sensor	Check the Fuel Pressure Sensor -G247- Refer to <u>FUEL PRESSURE SENSOR, CHECKING</u>	signal voltage < 0.1 V	---	0.1 Sec	- Continuous 2 DCY

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		<u>CHECKING</u>				
P1114	Internal resistance too large (Bank 1, sensor 2)	-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	Heater resistance, (128-648)*(8-40)1.02-25.9 k ohms (dep. on mod. exhaust temp. and heater power)	- Battery voltage, 10.7-16.1 V - Modeled exhaust gas temp, 300-600° C - Engine shutoff time, 300 Sec. - IAT, >6.75° C	15 Sec	2 DCY
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	- deviation fuel rail pressure control > 0.60 g/Rev - AND - deviation lambda control < 22.5%	- engine speed 640...3480 RPM - time after engine start > 5 Sec - evap canister load < 25% - lambda control closed loop - fuel cut off not active - high pressure pump setpoint 0.015...0.15 g/Rev - catalyst heating not active	5 Sec	- Continuous 2 DCY
			deviation	- engine speed 640...3480 RPM - time after engine start > 5 Sec - evap canister		

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P12A2	Fuel Rail Pressure Sensor Inappropriately High	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	fuel rail pressure control < 0.51 g/Rev • AND • deviation lambda control > 30%	load < 25% • lambda control closed loop • fuel cut off not active • high pressure pump setpoint 0.015...0.15 g/Rev • catalyst heating not active	• 5 Sec	• Continuous • 2 DCY
P12A4	Fuel Rail Pump Control Valve Stuck Closed	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	• deviation fuel rail pressure control < 0.120 g/Rev • AND • actual press. above target press. - 15...15%	• engine speed 580...3480 RPM • time after engine start > 5 Sec • evap canister load < 25% • lambda control closed loop • fuel cut off not active • high pressure pump setpoint 0.015...0.105 g/Rev • catalyst heating not active	5 Sec	• Continuous • 2 DCY

Fuel and air mixture, additional emissions regulations

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum

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P200A	Intake Manifold Runner Control out of range	-- Check the Intake Flap Motor -V157-/Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	signal voltage < 0.7 V	time after engine start 1 Sec	2 Sec	- Continuous 2 DCY
P200B	Intake Manifold Runner Control overtravel	-- Check the Intake Flap Motor -V157-/Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	signal voltage < 0.7 V	time after engine start 1 Sec	2 Sec	- Continuous 2 DCY
P2004	Intake Manifold Runner Control Stuck Closed Bank 1	-- Check the Intake Flap Motor -V157-/Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	Signal voltage, <2.9 V	- time after engine start 15 Sec - duty cycle commanded open	4 Sec	- Continuous 2 DCY
P2005	Intake Manifold Runner Control Stuck Closed Bank 1	-- Check the Intake Flap Motor -V157-/Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE</u>	Signal voltage, <2.9 V	- time after engine start 15 Sec - duty cycle commanded	4 Sec	- Continuous 2 DCY

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

		<u>MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>		open		
P2006	Intake Manifold Runner Control Stuck Open Bank 1	-- Check the Intake Flap Motor -V157- /Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	Signal voltage, > 2.5 V	- time after engine start 15 Sec - duty cycle commanded closed	4 Sec	- Continuous 2 DCY
P2007	Intake Manifold Runner Control Stuck Open Bank 1	-- Check the Intake Flap Motor -V157- /Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	Signal voltage, > 2.5 V	- time after engine start 15 Sec - duty cycle commanded closed	4 Sec	- Continuous 2 DCY
P2008	Intake Manifold Runner Control Circuit/Open Bank 1	-- Check the Intake Flap Motor -V157- /Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	signal current < 0.8 mA	duty cycle commanded on	2 Sec	- Continuous 2 DCY
		-- Check the Intake Flap Motor -V157-				

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P2009	Intake Manifold Runner Control Circuit/Shorted Bank 1	/Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	signal voltage < 2.0 V	duty cycle commanded off	2Sec	- Continuous 2 DCY
P2010	Intake Manifold Runner Control Circuit/Shorted to B+ Bank 1	-- Check the Intake Flap Motor -V157- /Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	signal current > 1 A	duty cycle commanded on	2Sec	- Continuous 2 DCY
P2014	Intake Manifold Runner Position Sensor/Switch Circuit Bank 1 Short to ground	-- Check the Intake Flap Motor -V157- /Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	Signal voltage, < 0.2 V	---	2 Sec	- Continuous 2 DCY
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance Bank 1	-- Check the Intake Flap Motor -V157- /Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION</u>	Deviation runner flap position vs actual position >25 %	---	1.5 Sec	- multiple 2 DCY

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

		<u>SENSOR, CHECKING.</u>				
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 1)	-- Check the Intake Flap Motor -V157-/Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	Signal voltage, <0.25 V	---	0.3 Sec	• Continuous • 2 DCY
P2017	Intake Manifold Runner Position Sensor/Switch Circuit Bank 1 Short to B+	-- Check the Intake Flap Motor -V157-/Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	Signal voltage, > 4.8 V	---	2 Sec	• Continuous • 2 DCY
P2019	Intake Manifold Runner Position Sensor/Switch Circuit Bank 1 Open circuit	-- Check the Intake Flap Motor -V157-/Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	Signal voltage, < 0.2 V	---	2 Sec	• Continuous • 2 DCY
	Intake Manifold Runner Position	-- Check the Intake Flap Motor -V157-/Intake Manifold Runner Position Sensor -G336-. Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	Signal voltage,			• Continuous

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

P2022	Sensor/Switch Circuit Bank 1 Short to B+	Refer to <u>INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING.</u>	> 4.8 V	---	2 Sec	• 2 DCY
P2088	A Camshaft Position Actuator Control Circuit Low Bank 1 short to ground	-- Check the Camshaft Adjustment Valve 1 -N205-. Refer to <u>CAMSHAFT ADJUSTMENT VALVE 1, CHECKING.</u>	Signal voltage, < 2 V	• camshaft valve off	2 Sec	• Continuous • 2 DCY
P2089	A Camshaft Position Actuator Control Circuit High Bank 1 short to B+	-- Check the Camshaft Adjustment Valve 1 -N205-. Refer to <u>CAMSHAFT ADJUSTMENT VALVE 1, CHECKING.</u>	Signal current, > 3 A	• camshaft valve on	2 Sec	• Continuous • 2 DCY
P2092	A Camshaft Position Actuator Control Circuit Low Bank 1 short to ground	-- Check the Camshaft Adjustment Valve 1 -N205-. Refer to <u>CAMSHAFT ADJUSTMENT VALVE 1, CHECKING.</u>	Signal voltage, < 2 V	• camshaft valve off	2 Sec	• Continuous • 2 DCY
P2093	A Camshaft Position Actuator Control Circuit High Bank 1 short to B+	-- Check the Camshaft Adjustment Valve 1 -N205-. Refer to <u>CAMSHAFT ADJUSTMENT VALVE 1, CHECKING.</u>	Signal current, > 3 A	• camshaft valve on	2 Sec	• Continuous • 2 DCY
				• modeled cat temp., > 400° C • trim control		

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P2096	Post Catalyst Fuel Trim System out of range high Bank 1 Bank 2	-- Check the Heated Oxygen Sensor (HO2S) - G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u> -- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	• integral part of trim control, post cat > 10%	• post cat-closed loop • engine speed 640...3488 RPM • lambda control, closed loop • engine load 15...70% • delta set value 0.985...1.005 • delta engine speed < 7500 RPM • delta mass air flow < 15 g/Rev • accelerator PP value < 1000% • mass air flow 33...212 kg/h	120 Sec	• Continuous • 2 DCY
P2097	Post Catalyst Fuel Trim System out of range low Bank 1 Bank 2	-- Check the Heated Oxygen Sensor (HO2S) - G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u> -- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter	• integral part of trim control, post cat < 10%	• modeled cat temp., > 400° C • trim control post cat-closed loop • engine speed 640...3488 RPM • lambda control, closed loop • engine load 15...70% • delta set value 0.985...1.005 • delta engine	120 Sec	• continuous • 2 DCY

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		(TWC) -G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>		speed < 7500 RPM • delta mass air flow < 15 g/Rev • accelerator PP value < 1000% • mass air flow 33...212 kg/h		
P2098	Post Catalyst Fuel Trim System out of range high Bank 1 Bank 2	-- Check the Heated Oxygen Sensor (HO2S) - G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u> -- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	• integral part of trim control, post cat > 10%	• modeled cat temp., > 400° C • trim control post cat- closed loop • engine speed 640...3488 RPM • lambda control, closed loop • engine load 15...70% • delta set value 0.985...1.005 • delta engine speed < 7500 RPM • delta mass air flow < 15 g/Rev • accelerator PP value < 1000% • mass air flow 33...212 kg/h	120 Sec	• Continuous • 2 DCY
				• modeled cat temp., >		

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P2099	Post Catalyst Fuel Trim System out of range low Bank 1 Bank 2	-- Check the Heated Oxygen Sensor (HO2S) - G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u> -- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	• integral part of trim control, post cat < 10%	400° C • trim control post cat-closed loop • engine speed 640...3488 RPM • lambda control, closed loop • engine load 15...70% • delta set value 0.985...1.005 • delta engine speed < 7500 RPM • delta mass air flow < 15 g/Rev • accelerator PP value < 1000% • mass air flow 33...212 kg/h	120 Sec	• Continuous • 2 DCY
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Fuel and air ratio

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Moni Ti Le
P2101	Throttle Actuator Control Motor Circuit Range/Performance	-- Check the Throttle Valve Control Module -J338-. Refer to <u>THROTTLE VALVE CONTROL MODULE, CHECKING.</u>	• Duty cycle > 0.4 Sec at > 98% • AND • actual TPS reference point > 1.5° • actual TPS calc value >	engine start not completed	0.45 ;

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			0.4 Sec at > 8°		
P2106	Throttle Actuator Control System - short to B+ or ground	-- Check the Throttle Valve Control Module -J338-. Refer to <u>THROTTLE VALVE CONTROL MODULE, CHECKING.</u>	ECM power stage	engine start completed	0.45 s
P2122	Throttle/Pedal Position Sensor/Switch D Circuit Low Input	-- Check the Throttle Position (TP) Sensor -G79-/Accelerator Pedal Position Sensor 2 -G185-. Refer to <u>THROTTLE POSITION SENSOR/ACCELERATOR PEDAL POSITION SENSOR 2, CHECKING.</u>	Signal voltage < 0.4 V	---	0.25 s
P2123	Throttle/Pedal Position Sensor/Switch D Circuit High Input	-- Check the Throttle Position (TP) Sensor -G79-/Accelerator Pedal Position Sensor 2 -G185-. Refer to <u>THROTTLE POSITION SENSOR/ACCELERATOR PEDAL POSITION SENSOR 2, CHECKING.</u>	Signal voltage >4.82 V	---	0.25 s
P2127	Throttle/Pedal Position Sensor/Switch E Circuit Low Input	-- Check the Throttle Position (TP) Sensor -G79-/Accelerator Pedal Position Sensor 2 -G185-. Refer to <u>THROTTLE POSITION SENSOR/ACCELERATOR PEDAL POSITION SENSOR 2, CHECKING.</u>	Signal voltage < 0.2 V	---	0.25 s
P2128	Throttle/Pedal Position Sensor/Switch E Circuit High Input	-- Check the Throttle Position (TP) Sensor -G79-/Accelerator Pedal Position Sensor 2 -G185-. Refer to <u>THROTTLE POSITION SENSOR/ACCELERATOR PEDAL POSITION SENSOR 2, CHECKING.</u>	Signal voltage >2.8 V	---	0.25 s
P2138	Throttle/Pedal Position Sensor/Switch D / E Voltage Correlation	-- Check the Throttle Position (TP) Sensor -G79-/Accelerator Pedal Position Sensor 2 -G185-. Refer to <u>THROTTLE POSITION SENSOR/ACCELERATOR PEDAL POSITION SENSOR 2, CHECKING.</u>	Signal voltage sensor 1 vs 2, > 0.2...0.24 V	---	•

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P2146	Fuel Injector Group A Supply Voltage Circuit / short to ground	-- Check the Fuel injectors - N30, N31, N32, N33-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	Signal current, >14.90 A	Engine speed >80 RPM	0.5 S
P2147	Injector Circuit short to ground	-- Check the Fuel injectors - N30, N31, N32, N33-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	signal current > 12 A	injector commanded on	3 Sec
P2148	Injector Circuit short to b+	-- Check the Fuel injectors - N30, N31, N32, N33-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	Signal current > 33 A	injector commanded on	3 Sec
P2149	Fuel Injector Group B Supply Voltage Circuit / Short to ground	-- Check the Fuel injectors - N30, N31, N32, N33-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	Signal current >14.90 A	Engine speed >80 RPM	0.5 S
P2150	Injector Circuit short to ground	-- Check the Fuel injectors - N30, N31, N32, N33-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	signal current > 12 A	injector commanded on	3 Sec
P2151	Injector Circuit short to b+	-- Check the Fuel injectors - N30, N31, N32, N33-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	Signal current > 33 A	injector commanded on	3 Sec
P2153	Injector Circuit short to ground	-- Check the Fuel injectors - N30, N31, N32, N33-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	signal current > 12 A	injector commanded on	3 Sec
P2154	Injector Circuit short to b+	-- Check the Fuel injectors - N30, N31, N32, N33-. Refer to <u>FUEL INJECTORS, CHECKING.</u>	Signal current > 33 A	injector commanded on	3 Sec
P2181	Cooling System Performance	-- Check Engine Coolant Temperature (ECT) Sensor - G62-. Refer to <u>ENGINE COOLANT TEMPERATURE SENSOR, CHECKING.</u> -- Check the Coolant Pump - V50- Refer to the appropriate service information.-- Check the Coolant Thermostat. Refer to the appropriate service information..	- ECT < 75 °C - mass air integral 3.5...26.0 kg	- ECT at start, -7...57° C - delta ambient pressure < 1.5 kPa - vehicle speed 21...75 mph - accumulated fuel cut-off < 140 Sec - mass air flow 40...200 kg/h	500 S
				modeled	

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P2195	O2 Sensor rationality check high - Bank 1, Bank 2	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	• lambda value > 1.1 V	• exhaust gas temp., 300.00... 640.00° C • ECT > 60° C • exhaust gas mass flow, 20.00... 180.00 kg/h • engine speed > 992 RPM • lambda control, closed loop • lambda control, post cat-closed loop • deviation engine speed < 150 Rev • engine load 30...300 kg/h • delta engine load < 0.15 g/Rev • lambda deviation < 3% • integrated mass air flow 100 g • O2S signal rear > 0.752 V • deviation lambda control > 35%	
				• modeled exhaust gas temp., 300.00... 640.00° C	

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P2196	O2 Sensor rationality check Low- Bank 1, Bank 2	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	• lambda value < 0.9 V	• ECT > 60° C • exhaust gas mass flow, 20.00... 180.00 kg/h • engine speed > 992 RPM • lambda control, closed loop • lambda control, post cat-closed loop • deviation engine speed < 150 Rev • engine load 30...300 kg/h • delta engine load < 0.15 g/Rev • lambda deviation < 3% • integrated mass air flow 100 g • O2S signal rear <0.151 V • deviation lambda control > 35%
				• modeled exhaust gas temp., 300.00... 640.00° C • ECT > 60° C • exhaust gas mass flow, 20.00...

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P2197	O2 Sensor rationality check high - Bank 1, Bank 2	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	• lambda value > 1.1 V	• 180.00 kg/h • engine speed > 992 RPM • lambda control, closed loop • lambda control, post cat-closed loop • deviation engine speed < 150 Rev • engine load 30...300 kg/h • delta engine load < 0.15 g/Rev • lambda deviation < 3% • integrated mass air flow 100 g • O2S signal rear > 0.752 V • deviation lambda control > 35%
				• modeled exhaust gas temp., 300.00... 640.00° C • ECT > 60° C • exhaust gas mass flow, 20.00... 180.00 kg/h • engine speed > 992 RPM • lambda

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P2198	O2 Sensor rationality check Low- Bank 1, Bank 2	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	lambda value < 0.9 V	- control, closed loop - lambda control, post cat-closed loop - deviation engine speed < 150 Rev - engine load 30...300 kg/h - delta engine load < 0.15 g/Rev - lambda deviation < 3% - integrated mass air flow 100 g - O2S signal rear <0.151 V - deviation lambda control > 35%	
P219C	Cylinder imbalance	-- Check the Spark plugs.-- Check the intake system for leaks.-- Check the fuel pressure. Refer to <u>FUEL PRESSURE TEST.</u> -- Check the Fuel injectors -N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u> -- Check the Ignition Coils with Power Output Stage -N70, N127, N291, N292, N323, N324-.	adaptive value < 10% or > 10%	- ECT > 70° C - trim control post cat-closed loop - engine speed 1200...2600 RPM - lambda control, closed loop - canister load < 0.15 - substitute ECT > 70° C - mass fuel flow > 0.045...0.090	300 S

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		Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>		- g/Rev15 g/Rev - pwm evap purge valve < 60% - ambient pressure > 70 kPa	
P219D	Cylinder imbalance	-- Check the Spark plugs.-- Check the intake system for leaks.-- Check the fuel pressure. Refer to <u>FUEL PRESSURE TEST.</u>-- Check the Fuel injectors -N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING.</u>-- Check the Ignition Coils with Power Output Stage -N70, N127, N291, N292, N323, N324-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	adaptive value < 10% or > 10%	- ECT > 70° C - trim control post cat-closed loop - engine speed 1200...2600 RPM - lambda control, closed loop - canister load < 0.15 - substitute ECT > 70° C - mass fuel flow > 0.045...0.090 g/Rev15 g/Rev - pwm evap purge valve < 60% - ambient pressure > 70 kPa	300 S
		-- Check the Spark plugs.-- Check the intake system for leaks.-- Check the fuel pressure. Refer to <u>FUEL PRESSURE TEST.</u>-- Check		- ECT > 70° C - trim control post cat-closed loop - engine speed 1200...2600 RPM - lambda control, closed loop	

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P219E	Cylinder imbalance	the Fuel injectors -N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING</u> -- Check the Ignition Coils with Power Output Stage -N70, N127, N291, N292, N323, N324-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING</u> .	adaptive value < 10% or > 10%	- canister load < 0.15 - substitute ECT > 70° C - mass fuel flow > 0.045...0.090 g/Rev15 g/Rev - pwm evap purge valve < 60% - ambient pressure > 70 kPa	300 S
P219F	Cylinder imbalance	-- Check the Spark plugs.-- Check the intake system for leaks.-- Check the fuel pressure. Refer to <u>FUEL PRESSURE TEST</u> -- Check the Fuel injectors -N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING</u> -- Check the Ignition Coils with Power Output Stage -N70, N127, N291, N292, N323, N324-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING</u> .	adaptive value < 10% or > 10%	- ECT > 70° C - trim control post cat-closed loop - engine speed 1200...2600 RPM - lambda control, closed loop - canister load < 0.15 - substitute ECT > 70° C - mass fuel flow > 0.045...0.090 g/Rev15 g/Rev - pwm evap purge valve < 60% - ambient pressure > 70 kPa	300 S
				- ECT > 70° C - trim control post cat-	

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P21A0	Cylinder imbalance	-- Check the Spark plugs.-- Check the intake system for leaks.-- Check the fuel pressure. Refer to <u>FUEL PRESSURE TEST</u>.-- Check the Fuel injectors -N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING</u>.-- Check the Ignition Coils with Power Output Stage -N70, N127, N291, N292, N323, N324-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING</u>.	adaptive value < 10% or > 10%	closed loop - engine speed 1200...2600 RPM - lambda control, closed loop - canister load < 0.15 - substitute ECT > 70° C - mass fuel flow > 0.045...0.090 g/Rev15 g/Rev - pwm evap purge valve < 60% - ambient pressure > 70 kPa	300 S
P21A1	Cylinder imbalance	-- Check the Spark plugs.-- Check the intake system for leaks.-- Check the fuel pressure. Refer to <u>FUEL PRESSURE TEST</u>.-- Check the Fuel injectors -N30, N31, N32, N33, N83, N84-. Refer to <u>FUEL INJECTORS, CHECKING</u>.-- Check the Ignition Coils with Power Output Stage -N70, N127, N291, N292, N323, N324-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING</u>.	adaptive value < 10% or > 10%	- ECT > 70° C - trim control post cat-closed loop - engine speed 1200...2600 RPM - lambda control, closed loop - canister load < 0.15 - substitute ECT > 70° C - mass fuel flow > 0.045...0.090 g/Rev15 g/Rev - pwm evap purge valve < 60%	300 S

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				ambient pressure > 70 kPa	
P2227	Turbocharger/Supercharger Boost Sensor A Plausibility check.	-- Check the Charge Air Pressure Sensor -G31-. Refer to <u>CHARGE AIR PRESSURE SENSOR/INTAKE AIR TEMPERATURE SENSOR, CHECKING.</u> -- Check the charge air system for proper seal. Refer to appropriate service information.	press. diff. in cross check between boost press. sensor 1/2; IM press., abient press. >7 kPa	- engine speed 0 RPM - time after engine stop 10 Sec	3 Sec
P2231	O2 Sensor Signal Circuit Shorted to Heater Circuit	-- Check the Oxygen Sensor (O2S) Heater -Z19-. Refer to <u>OXYGEN SENSOR O2S HEATER, CHECKING.</u>	Delta O2S signal front, >190uA	- Engine speed, <2700 RPM - engine load, <60% - heater duty cycle, 20.0...80.0% - Modeled exhaust, <800.1° C - lambda set value READ ERROR - lambda, 0.95...1.05 - O2S Heater no fault	15 Se
P2237	O2 Sensor Positive Current Control Circuit / Open - Bank 1, Bank 2	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	signal activity check-failed	O2S front-no other faults	•
P2240	O2 Sensor Positive Current Control Circuit / Open - Bank 1, Bank 2	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	signal activity check-failed	O2S front-no other faults	•
			functional check heater failed		

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P2243	O2 Sensor Reference Voltage Circuit / Open - Bank 1, Bank 2	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	• AND • intrusive check temperature measurement failed	---	35 Se
P2247	O2 Sensor Nernst Voltage Open - Bank 1, Bank 2	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	• functional check heater failed • AND • intrusive check temperature measurement failed	---	35 Se
P2251	O2 Sensor Signal open circuit - Bank 1, Bank 2	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	• functional check heater failed • AND • signal activity check failed	---	45 Se
P2254	O2 Sensor Signal open circuit - Bank 1, Sensor 1	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	• functional check heater failed • AND • signal activity check failed	---	45 Se
P2257	Air pump relay. short to grnd.	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION PUMP RELAY, CHECKING</u>	signal voltage < 2.00 V	• pump relay commanded off • ign on	0.1 S
P2258	Air pump relay. sort to B+.	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION PUMP RELAY, CHECKING</u>	signal current < 0.8 mA	• pump relay commanded on • ign on	0.1 S
		-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to <u>OXYGEN</u>	Rationality check,	• mass air flow, >25kg/h • O2S rear	

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P2270	O2 Circuit Slow Response (Bank 1, Sensor 2 SULEV)	<u>SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	O2S signal rear, <0.557...0.630 mV	- readiness,>10 Sec - modeled exhaust gas temp. > 350° C	100 s
P2271	O2 Circuit (Bank 1, Sensor 2 SULEV)	-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to <u>OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING.</u>	Rationality check, O2S signal rear, <0.557...0.630 mV	- mass air flow, >25kg/h - O2S rear readiness,>10 Sec - modeled exhaust gas temp. > 350° C	100 s
P2279	Intake air system leak	-- Check the Intake Air Temperature (IAT) Sensor - G42- Refer to <u>MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING</u>	- threshold to detect a defective system >1.33....1.6 - AND - ratio of the tie system defective during the measurement window to the whole duration of the measurement window >0.60000	- time after engine start >60.0 Sec - engine load <40% - mass air flow <6553.50 kg/h - ECT >49.50° C - IAT <99.80° C - lambda control value >0.95 - lambda set value 0.95...1.05 - vehicle speed < 1.00km/h - lambda control active - engine speed idle - altitude < 2700m - O2S front no	23 Se

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				fault • number of checks 3	
P2293	Fuel Pressure Regulator 2 Performance	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	• difference between target pressure vs. actual pressure, >1.50mPa • difference between target pressure vs. actual pressure, < - 1.50 mPa	• time after engine start, 10.0 Sec • fuel cut off, not active	3.5 S
P2294	Fuel Pressure Regulator 2 Control Circuit open circuit	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	Signal current < 0.8 mA	---	1.5 S
P2295	Fuel Pressure Regulator 2 Control Circuit Low short to ground	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	< 2.0 V	---	1.5 S
P2296	Fuel Pressure Regulator 2 Control Circuit High	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	Signal current > 8 A	• time after engine start 5...15 Sec	1.5 S

Ignition System

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2300	Ignition Coil A Primary Control Circuit Low	-- Check the Ignition Coils with Power Output Stage -N70-. Refer to <u>IGNITION COIL WITH POWER</u>	Signal current >24.0 mA	• Engine speed, >680 RPM	0.5 Sec	• continuous • 2 DCY

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		<u>OUTPUT STAGE, CHECKING.</u>				
P2301	Ignition Coil A Primary Control Circuit High	-- Check the Ignition Coils with Power Output Stage -N70-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	Signal current >5.1...7.0 mA	• Engine speed, >680 RPM	0.50 Sec	• continuous • 2 DCY
P2303	Ignition Coil B Primary Control Circuit Low	-- Check the Ignition Coils with Power Output Stage - N127-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	Signal current >24.0 mA	• Engine speed, >680 RPM	0.50 Sec	• continuous • 2 DCY
P2304	Ignition Coil B Primary Control Circuit High	-- Check the Ignition Coils with Power Output Stage - N127-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	Signal current >5.1...7.0 mA	• Engine speed, >680 RPM	0.50 Sec	• continuous • 2 DCY
P2306	Ignition Coil C Primary Control Circuit Low	-- Check the Ignition Coils with Power Output Stage -N291-. Refer to <u>IGNITION COIL WITH</u>	Signal current >24.0 mA	• Engine speed, >680 RPM	0.50 Sec	• continuous • 2 DCY

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		<u>POWER OUTPUT STAGE, CHECKING.</u>				
P2307	Ignition Coil C Primary Control Circuit High	-- Check the Ignition Coils with Power Output Stage -N291-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	Signal voltage >5.1...7.0 mA	Engine speed, >680 RPM	---	- continuous 2 DCY
P2309	Ignition Coil D Primary Control Circuit Low	-- Check the Ignition Coils with Power Output Stage -N292-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	Signal current >24.0 mA	Engine speed, >680 RPM	0.5 Sec	- continuous 2 DCY
P2310	Ignition Coil D Primary Control Circuit High	-- Check the Ignition Coils with Power Output Stage -N292-. Refer to <u>IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING.</u>	Signal voltage >5.1...7.0 mA	Engine speed, >680 RPM	0.5 Sec	- continuous 2 DCY

Additional emission regulations

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	-- Check the Leak Detection Pump (LDP) - V144-. Refer to <u>LEAK DETECTION PUMP, CHECKING.</u>	Signal current < 0.8 mA	- LDP, commanded on - Engine speed, >416 RPM	0.27 Sec	- Continuous 2 DCY
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	-- Check the Leak Detection Pump (LDP) - V144-. Refer to <u>LEAK DETECTION PUMP, CHECKING.</u>	Signal voltage < 2 V	- LDP, commanded off - Engine speed, >416 RPM	0.27 Sec	- Continuous 2 DCY
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	-- Check the Leak Detection Pump (LDP) - V144-. Refer to <u>LEAK DETECTION PUMP, CHECKING.</u>	Signal current > 1.0 A	- LDP, commanded on - Engine speed, >416 RPM	0.27 Sec	- continuous 2 DCY
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	-- Check the Leak Detection Pump (LDP) - V144-. Refer to <u>LEAK DETECTION PUMP, CHECKING.</u>	Low signal voltage time > 1 Sec	- LDP, commanded off - same as for P0442	10 Sec	- Once/DCY 2 DCY
P2404	Evaporative Emission System Leak Detection Pump Sense Range/Performance	-- Check the Leak Detection Pump (LDP) - V144-. Refer to <u>LEAK DETECTION PUMP, CHECKING.</u>	- High signal voltage - AND - time > 0.36 Sec	- LDP, commanded on - same as for P0442	10 Sec	- Once/DCY 2 DCY
P2414	O2 Sensor signal range check - Bank 1, Bank 2	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR</u>	O2S signal front > 3.1 V	- lambda control active - engine torque positive	25 Sec	- Continuous 2 DCY

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

		<u>HO2S, CHECKING.</u>		engine speed no idle		
P2415	O2 Sensor signal range check - Bank 1, Bank 2	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	O2S signal front > 3.1 V	- lambda control active - engine torque positive - engine speed no idle	25 Sec	- Continuous 2 DCY
P2431	rationality check	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION PUMP RELAY, CHECKING OR SECONDARY AIR INJECTION PUMP MOTOR, CHECKING</u>	difference between SAIR pressure, AMP, and MAP > 60.0 hPa	- ambient press. sensor no fault - manifold air press. sensor no fault - SAI done	60 Sec	- Continuous 2 DCY
P2432	signal range check	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION PUMP RELAY, CHECKING OR SECONDARY AIR INJECTION PUMP MOTOR, CHECKING</u>	signal voltage, < 0.5 V	ambient press. sensor no fault	0.50 Sec	- Continuous 2 DCY

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

P2433	signal range check	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION PUMP RELAY, CHECKING</u> OR <u>SECONDARY AIR INJECTION PUMP MOTOR, CHECKING</u>	signal voltage, >4.5 V	ambient press. sensor no fault	0.50 Sec	- Continuous 2 DCY
P2440	air valve bank 1	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION PUMP RELAY, CHECKING</u> OR <u>SECONDARY AIR INJECTION PUMP MOTOR, CHECKING</u>	- blockage: relative SAIR pressure (phase 1) ≥ 0.453 - leakage: relative SAIR Bank 1 pressure (phase 1) ≥ 0.297 - relative SAIR pressure (phase 2) < 0.75	- air valve commanded off - air pump commanded on	20 Sec	- once/DCY 2 DCY
P2442	air valve bank 2	Check the Secondary Air System. Refer to <u>SECONDARY AIR INJECTION PUMP RELAY, CHECKING</u> OR	- blockage: relative SAIR pressure (phase 1) ≥ 0.453 - leakage: relative SAIR Bank 1 pressure	- air valve commanded off - air pump commanded	20 Sec	- once/DCY 2 DCY

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

		<u>SECONDARY</u> <u>AIR</u> <u>INJECTION</u> <u>PUMP</u> <u>MOTOR,</u> <u>CHECKING</u>	(phase 1) >= 0.297 relative SAIR pressure (phase 2) < 0.75	on		
P2539	Low Pressure Fuel System Sensor Circuit	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	Signal voltage > 4.6 V	---	5 Sec	- Continuous 2 DCY
P2540	Low Pressure Fuel System Sensor Circuit Range/Performance	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	Actual pressure Deviation < 800 kPa <80 kPa	---	5 Sec	2 DCY
P2541	Low Pressure Fuel System Sensor Circuit Low	-- Check the Fuel Pressure Sensor -G247-. Refer to <u>FUEL PRESSURE SENSOR, CHECKING.</u>	Signal voltage < 0.2 V	---	1 Sec	2 DCY
P2626	O2 Sensor Pumping Current Trim Circuit/Open Bank 1 Sensor 1	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	O2S signal front > 4.7 V	- Modeled exhaust temp, > 380° C - Fuel cut off, > 2 Sec	4 Sec	- Continuous 2 DCY
P2629	O2 Sensor Pumping Current Trim Circuit/Open Bank 1 Sensor 1	-- Check the Heated Oxygen Sensor (HO2S) -G39-. Refer to <u>HEATED OXYGEN SENSOR HO2S, CHECKING.</u>	O2S signal front > 4.7 V	- Modeled exhaust temp, > 380° C - Fuel cut off, > 2 Sec	4 Sec	- Continuous 2 DCY

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

Fuel and air mixture, additional emissions regulations

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P3081	Engine Temperature Too Low	-- Check Engine Coolant Temperature (ECT) Sensor - G62-. Refer to <u>ENGINE COOLANT TEMPERATURE SENSOR, CHECKING.</u>	step 1 - modeled ECT > 30° C - AND - ECT < 30° C and - modeled ECT > 30° C - ECT < 25° C	---	2 Sec	- Continuous 2 DCY

Control module and output signals

DTC	Error Message	Diagnostic Procedure	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
U0001	High Speed CAN Communication Bus	-- Check the CAN-Bus terminal resistance. Refer to <u>CAN BUS TERMINAL RESISTANCE, CHECKING.</u>	CAN message, No feedback	- battery voltage 9...17 V - time after ignition on 0.5 Sec	0.5 Sec	- Continuous 2 DCY
U0002	High Speed CAN Communication Bus	-- Check the CAN-Bus terminal resistance. Refer to <u>CAN BUS TERMINAL</u>	Global time out...receiving no messages	- battery voltage 9...17 V - time after ignition	0.5 Sec	- Continuous 2 DCY

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

		<u>RESISTANCE, CHECKING.</u>		on0.5 Sec		
U0100	Lost Communication with ECM/PCM A	-- Check the CAN-Bus terminal resistance. Refer to <u>CAN BUS TERMINAL RESISTANCE, CHECKING.</u>	• Failure of all CAN engine messages, Time out more than 490 mSec • Failure of all CAN engine messages but not all CAN messages, Time out more than 1010 mSec	• No bus off error • No error failure of all CAN messages • No error failure of all CAN engine messages • Terminal 15 Voltage, > 9 V for more than 500 mSec • > 500 mSec after reset	1 Sec	---
U0101	Lost Communication with TCM	-- Check the CAN-Bus terminal resistance, Direct Shift Gearbox (DSG) Mechatronic - J743- to Motronic Engine Control Module (ECM) - J623-. Refer to <u>CAN BUS TERMINAL RESISTANCE, CHECKING.</u>	• No message received from TCM	• battery voltage 9...17 V • time after ignition on0.5 Sec	0.5 Sec	• Continuous • 2 DCY
U0121	CAN ABS brake unit	-- Check the CAN-Bus terminal resistance. Refer to <u>CAN BUS TERMINAL RESISTANCE, CHECKING.</u>	no CAN communication with TCU, time-out	• battery voltage 9...17 V • time after ignition on0.5 Sec	0.5 Sec	• Continuous • 2 DCY

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

		<u>CHECKING.</u>				
U0140	CAN communication with BCM	-- Check the CAN-Bus terminal resistance. Refer to <u>CAN BUS TERMINAL RESISTANCE, CHECKING.</u>	CAN message no message	• battery voltage (no map, bottom and top limit) 9...17 V • time after ignition on0.5	2 Sec	• Continuous • 2 DCY
U0146	CAN gateway A	-- Check the CAN-Bus terminal resistance. Refer to <u>CAN BUS TERMINAL RESISTANCE, CHECKING.</u>	CAN communication with gateway, time-out	• battery voltage (no map, bottom and top limit) 9...17 V • time after ignition on0.5	1 Sec	• Continuous • 2 DCY
U0155	communication with ICL	-- Check the CAN-Bus terminal resistance. Refer to <u>CAN BUS TERMINAL RESISTANCE, CHECKING.</u>	no CAN message received from ICL no message	• battery voltage (no map, bottom and top limit) 9...17 V • time after ignition on0.5	0.5 Sec	• Continuous • 2 DCY
U0302	Software Incompatibility with Transmission Control Module	-- Replace the Direct Shift Gearbox (DSG) Mechatronic - J743-. Refer to appropriate service information.	• MT vehicle ECM coded as AT vehicle • OR • AT vehicle ECM coded as MT vehicle	• battery voltage 9...17 V • time after ignition on0.5 Sec	5.0 Sec	• Continuous • 2 DCY
U0323	CAN: Instrument	-- Check the CAN-Bus terminal resistance. Refer to <u>CAN</u>	ambient temp value module not encoded for	• key on • status ambient	2 Sec	• multiple

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

	cluster Audi only	<u>BUS TERMINAL RESISTANCE, CHECKING.</u>	ambient temp sensor, 00h	temp from instrument cluster, no fault		• 2 DCY
U0402	CAN communication with TCM	-- Check the CAN-Bus terminal resistance, Selector Lever - E313- to Motronic Engine Control Module (ECM) - J623-	invalid data received from TCM • implausible message	• battery voltage 9...17 V • time after ignition on 0.5 Sec	0.3 Sec	• Continuous • 2 DCY
U0404	Invalid Data Received From Gear Shift Control Module	-- Check the CAN-Bus terminal resistance, Selector Lever - E313- to Motronic Engine Control Module (ECM) - J623-.	• If the value of message counter is permanent, constant, or change exceeds a threshold, increment an event counter • maximum change of message counter > 5	• No failure of selector lever CAN messages • Terminal 15 voltage > 4 V for more than 500 mSec	50 mSec	• Continuous • 2 DCY
U0415 CAN	CAN link to speed sensor	-- Check the Engine Speed (RPM) Sensor - G28- Refer to <u>ENGINE SPEED SENSOR, CHECKING</u>	invalid data received from TCU • implausible message	• battery voltage 9...17 V • time after ignition on 0.5 Sec	0.1 Sec	• Continuous • 2 DCY
U0415 CAN (only S4)	CAN link to speed sensor	-- Check the Engine Speed (RPM) Sensor - G28- Refer to <u>ENGINE</u>	invalid data received from TCU	• engine on time since engine start • engine on > 3 Sec • engine on and fuel cut off	0.5 Sec	• Continuous • 2 DCY

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

Vehicle Speed		<u>SPEED SENSOR, CHECKING</u>	implausible message	- engine on time since engine start - engine on>3 Sec		
U0422	CAN: Instrument cluster	-- Check the CAN-Bus terminal resistance. Refer to <u>CAN BUS TERMINAL RESISTANCE, CHECKING.</u>	ambient temp. value (initialization), Audi, 01h	- key on - status ambient temp from instrument cluster no fault - electrical check ambient temp. sensor, no fault	2.0 Sec	- multiple 2 DCY
U0423	communication with ICL	-- Check the CAN-Bus terminal resistance. Refer to <u>CAN BUS TERMINAL RESISTANCE, CHECKING.</u>	invalid data received from ICL implausible message	- battery voltage 9...17 V - time after ignition on0.5 Sec	3 Sec	- Continuous 2 DCY
U0447	CAN gateway	-- Check the CAN-Bus terminal resistance. Refer to <u>CAN BUS TERMINAL RESISTANCE, CHECKING.</u>	received data from Gateway implausible message	- battery voltage 9...17 V - time after ignition on0.5 Sec	0.3 Sec	- Continuous 2 DCY

DIAGNOSTIC PROCEDURES

CAMSHAFT ADJUSTMENT VALVE 1, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- Multimeter
- Wiring diagram

Test requirements

- The Camshaft Adjustment Valve 1 -N205- fuse OK.

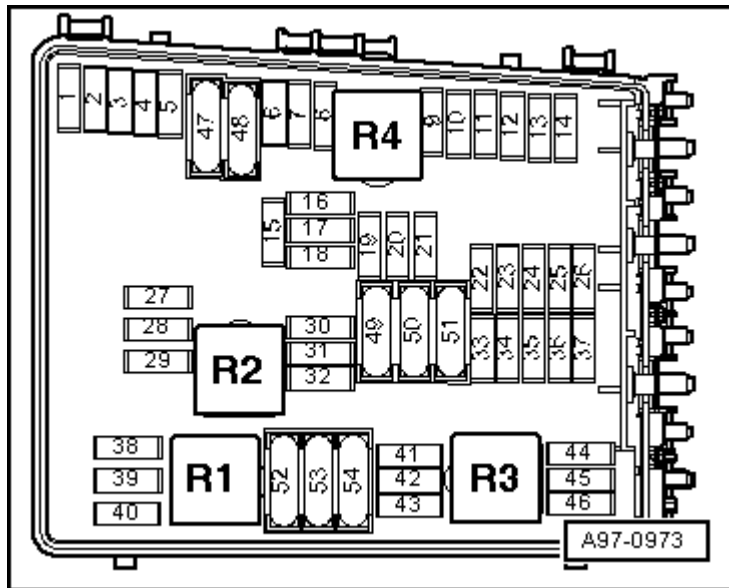


Fig. 1: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- Motronic Engine Control Module (ECM) Power Supply Relay J271 OK.
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the engine cover with air filter. Refer to appropriate service information.

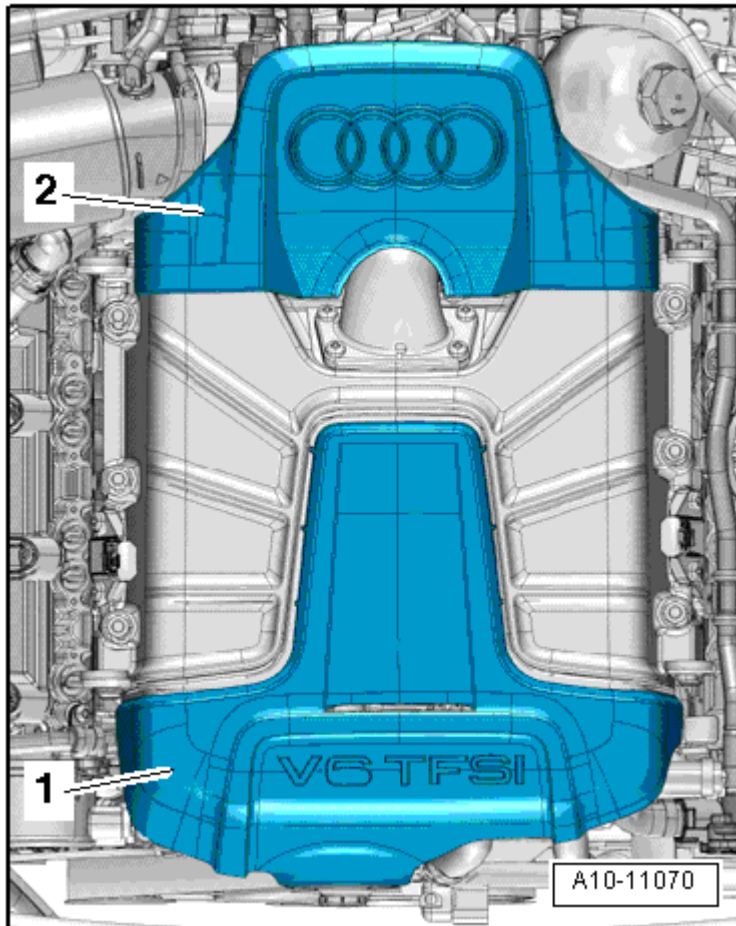


Fig. 2: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect Camshaft Adjustment Valve 1 -N205- electrical harness connector -1-.

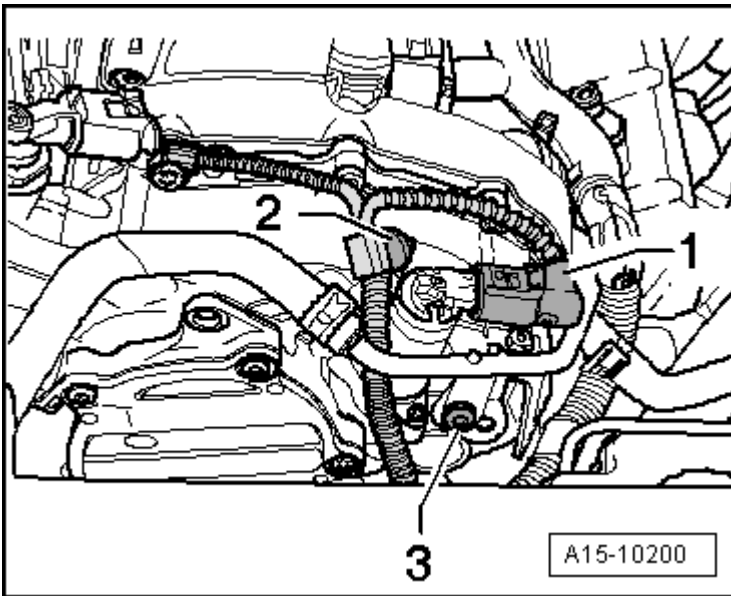


Fig. 3: Identifying Camshaft Adjustment Valve 1 Connector, Wiring Harness & Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Using a multimeter, check the Camshaft Adjustment Valve 1 -N205- 1 and 2 for resistance.

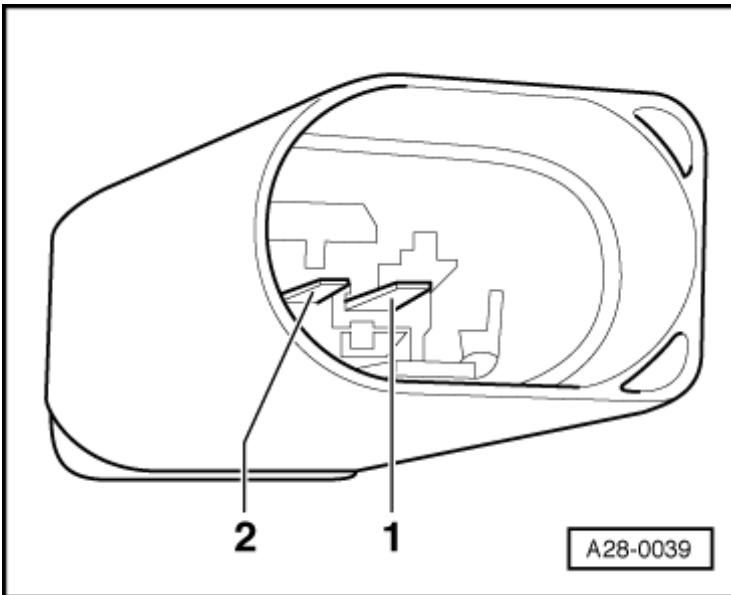


Fig. 4: Checking Camshaft Adjustment Valve (exhaust) -N318 For Resistance
Courtesy of AUDI OF AMERICA, LLC

Specified value: 5.0 to 8.0 ohms (at approx. 20° C)

If the specified value was not obtained:

-- Replace the Camshaft Adjustment Valve 1 -N205-. Refer to appropriate service information.

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

If the specified value was obtained:

Checking voltage

-- Switch the ignition on.

-- Using a multimeter, Check the Camshaft Adjustment Valve 1 -N205- electrical harness connector terminal 1 to the Engine Component Power Supply Relay -J757- terminal 8 for voltage.

Specified value: battery voltage.

-- Switch the ignition off.

If the specified value was not obtained:

-- Check the wiring connections for an open circuit.

-- Check the wiring connection for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If the specified value was obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, Check the Camshaft Adjustment Valve 1 -N205- electrical harness connector terminal 2 to the Motronic Engine Control Module (ECM) electrical harness connector T60 terminal 54 for an open circuit.

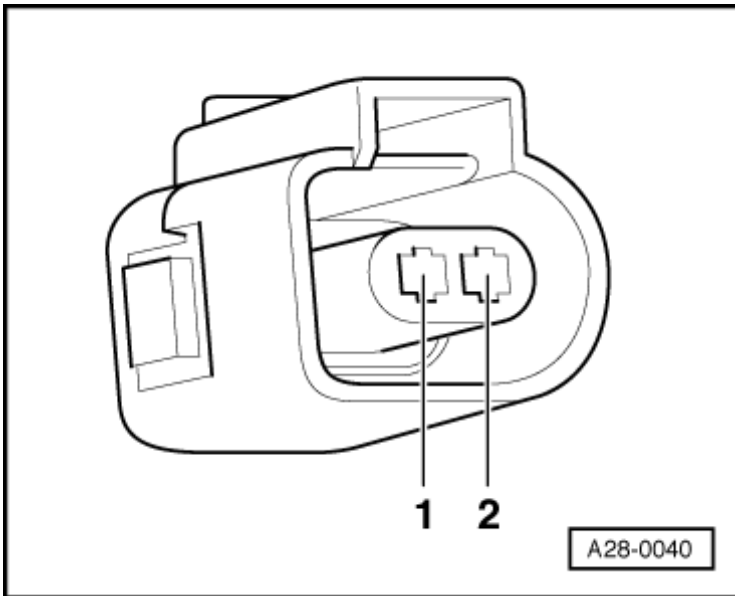


Fig. 5: 2-Pin Electrical Connector & Terminals

Courtesy of AUDI OF AMERICA, LLC

Camshaft Adjustment Valve 1 -N205- electrical harness connector terminal

**Motronic
Engine
Control
Module
(ECM)
electrical
harness
connector
T60
terminal
or test
box
socket**

2

54

Specified value: 1.5 ohms Max.

If the specified value was not obtained:

- Check the wiring connection for an open circuit.
- Check the wiring connection for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring and voltage supply was not OK:

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Install the engine cover with air filter. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

CAMSHAFT ADJUSTMENT VALVE 2, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- Multimeter
- Wiring diagram

Test requirements

- The Camshaft Adjustment Valve 2 -N208- fuse OK.

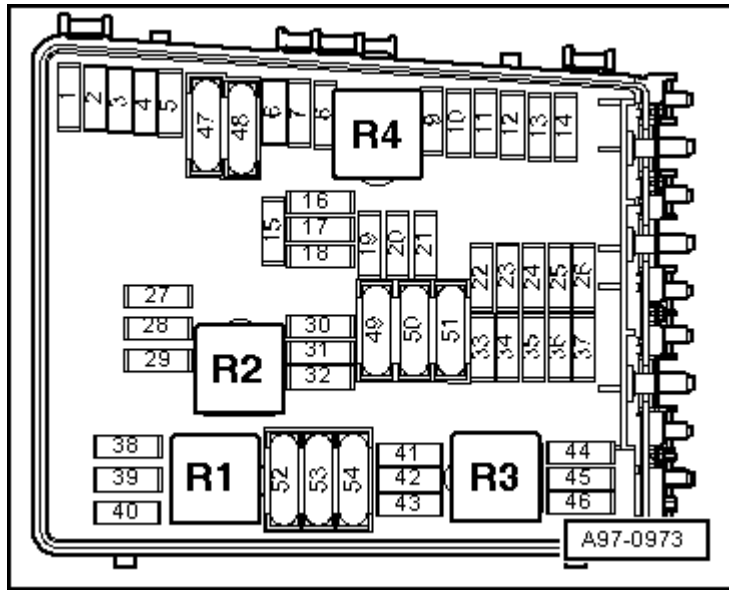


Fig. 6: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- Motronic Engine Control Module (ECM) Power Supply Relay J271 OK.
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the engine cover with air filter. Refer to appropriate service information.

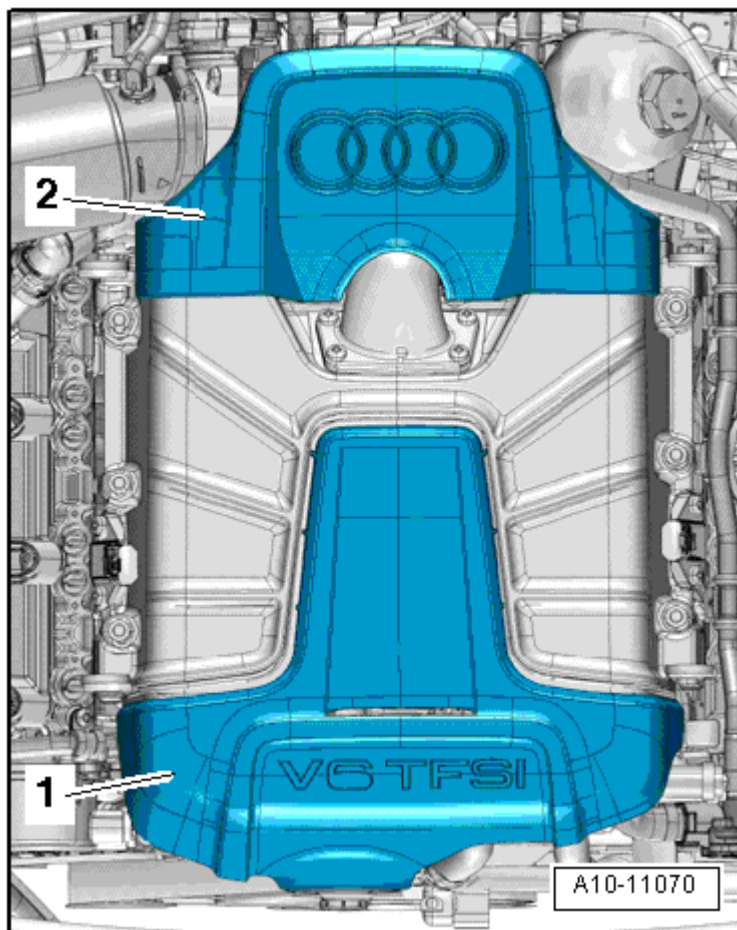


Fig. 7: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect Camshaft Adjustment Valve 2 -N208- electrical harness connector -1-.

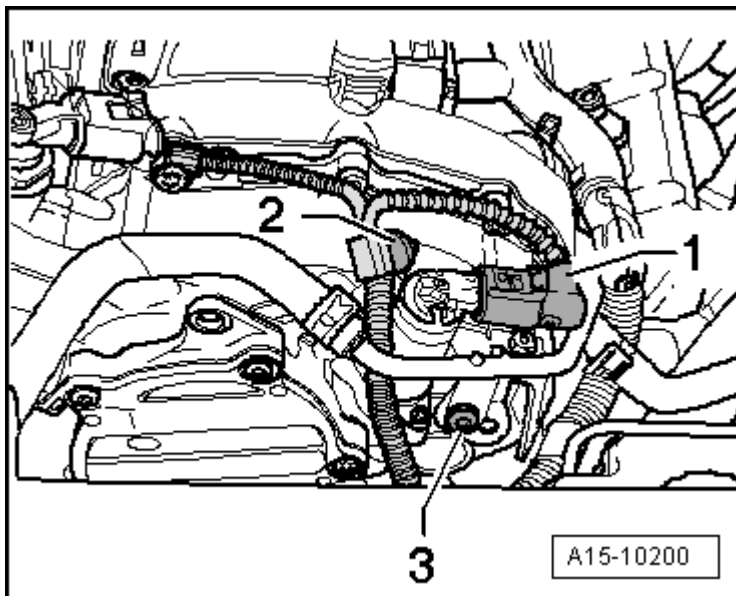


Fig. 8: Identifying Camshaft Adjustment Valve 1 Connector, Wiring Harness & Bolts
 Courtesy of AUDI OF AMERICA, LLC

-- Using a multimeter, check the Camshaft Adjustment Valve 2 -N208- 1 and 2 for resistance.

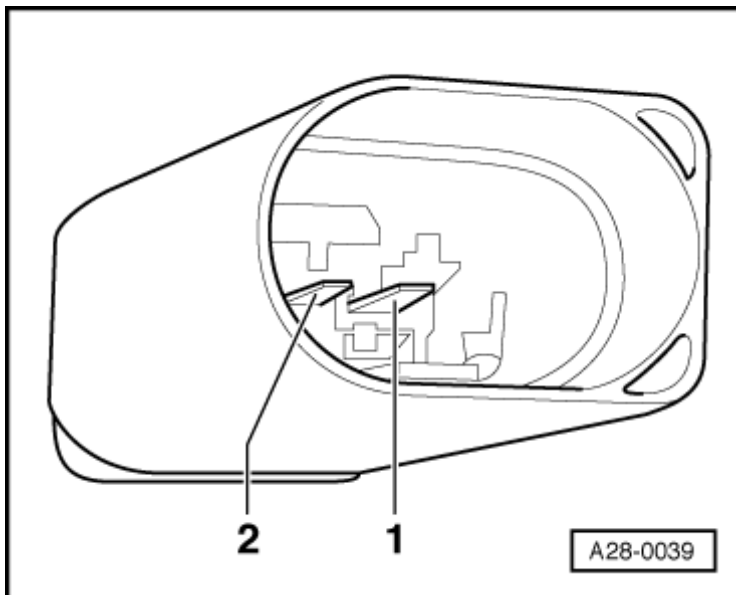


Fig. 9: Checking Camshaft Adjustment Valve (exhaust) -N318 For Resistance
 Courtesy of AUDI OF AMERICA, LLC

Specified value: 5.0 to 8.0 ohms (at approx. 20° C)

If the specified value was not obtained:

-- Replace the Camshaft Adjustment Valve 2 -N205-. Refer to appropriate service information.

If the specified value was obtained:

Checking voltage

-- Switch the ignition on.

-- Using a multimeter, Check the Camshaft Adjustment Valve 2 -N208- electrical harness connector terminal 1 to the Engine Component Power Supply Relay -J757- terminal 8 for voltage.

Specified value: battery voltage.

-- Switch the ignition off.

If the specified value was not obtained:

-- Check the wiring connections for an open circuit.

-- Check the wiring connection for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If the specified value was obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, Check the Camshaft Adjustment Valve 2 -N208- electrical harness connector terminal 2 to the Motronic Engine Control Module (ECM) electrical harness connector T60 terminal 39 for an open circuit.

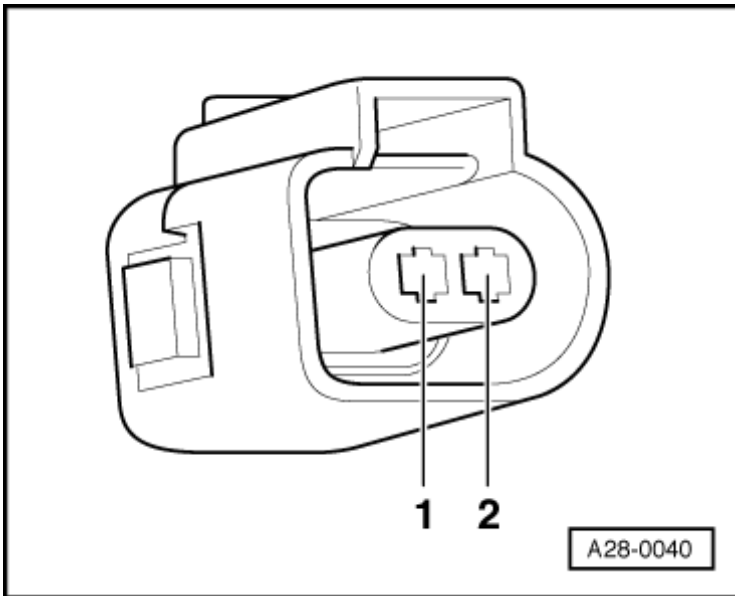


Fig. 10: 2-Pin Electrical Connector & Terminals

Courtesy of AUDI OF AMERICA, LLC

Camshaft Adjustment Valve 2 -N208- electrical harness connector terminal

**Motronic
Engine
Control
Module
(ECM)
electrical
harness
connector
T60
terminal
or test
box
socket**

2

39

Specified value: 1.5 ohms Max.

If the specified value was not obtained:

- Check the wiring connection for an open circuit.
- Check the wiring connection for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring and voltage supply was not OK:

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Install the engine cover with air filter. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

CAMSHAFT POSITION SENSOR, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- Multimeter
- Wiring diagram

Test requirements

- The Motronic Engine Control Module (ECM) - J623- fuses OK.

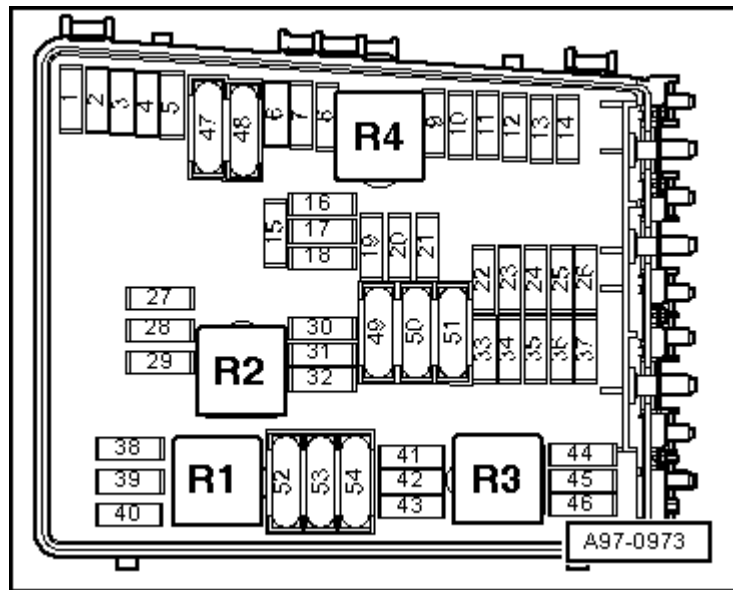


Fig. 11: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the engine cover with air filter. Refer to appropriate service information.

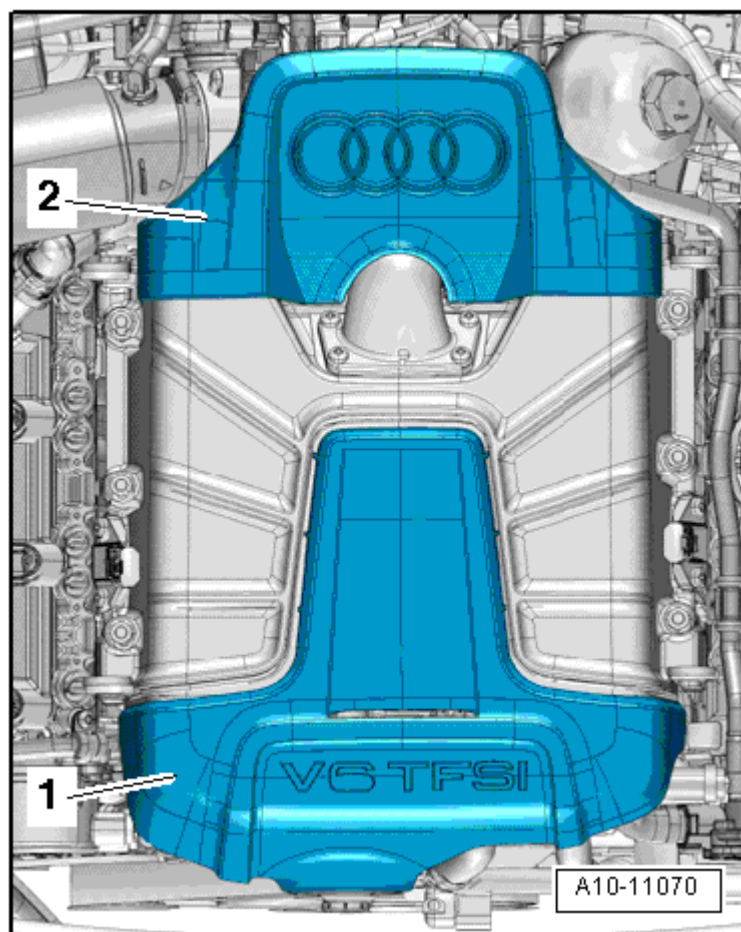


Fig. 12: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the Camshaft Position (CMP) Sensor -G40- electrical harness connector -1-.

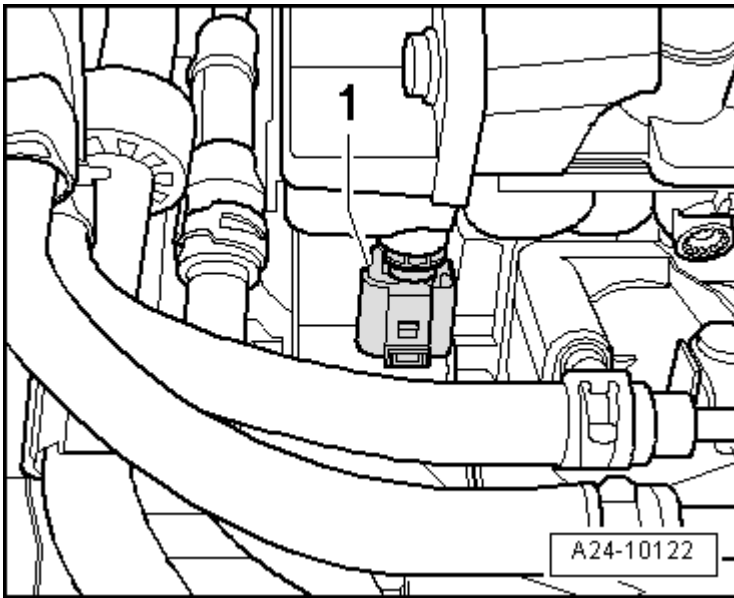


Fig. 13: Camshaft Position (CMP) Sensor G163
Courtesy of AUDI OF AMERICA, LLC

Checking voltage

- Switch the ignition on.
- Using a multimeter, Check the Camshaft Position (CMP) Sensor -G40- electrical harness connector terminals 1 to 3 for voltage.

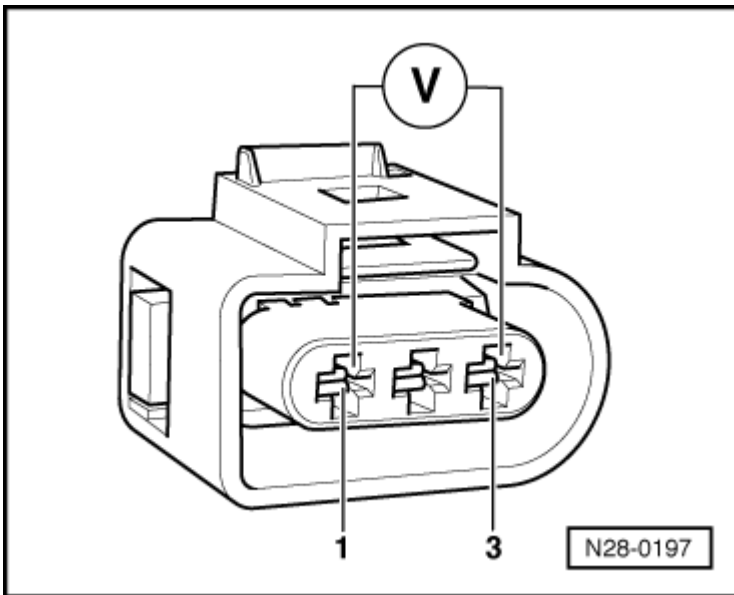


Fig. 14: Checking Camshaft Position (CMP) Sensor G163 Electrical Harness Connector Terminals 1 To 3 For Voltage
Courtesy of AUDI OF AMERICA, LLC

Specified value: about 5.0 V

-- Switch the ignition off.

If the specification was not obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, Check the Camshaft Position (CMP) Sensor -G40- electrical harness connector to the Motronic Engine Control Module (ECM) electrical harness connector T60 for an open circuit.

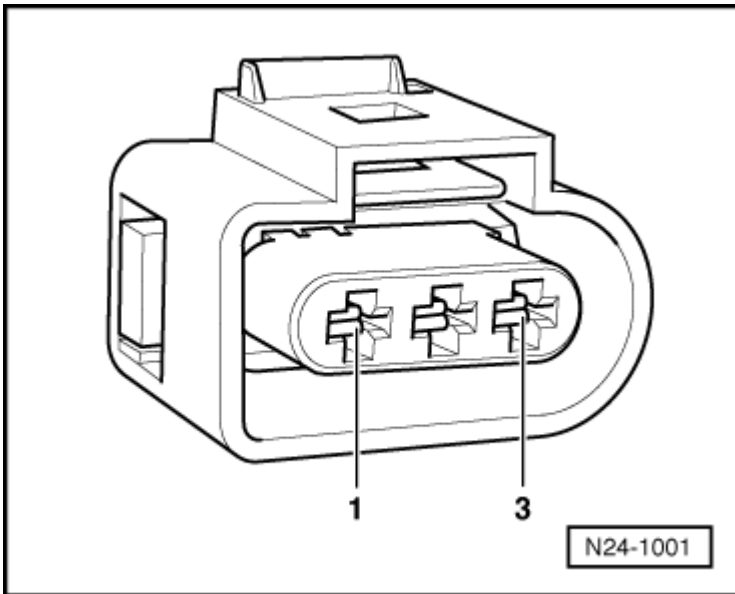


Fig. 15: 3-Pin Electrical Harness Connector
Courtesy of AUDI OF AMERICA, LLC

Camshaft Position (CMP) Sensor -G40- electrical harness connector terminals

Motronic
Engine
Control
Module
(ECM)
electrical
harness
connector

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

	T60 terminals or test box sockets
1	35
2	55
3	50

Specified value: 1.5 ohms Max.

If the specified value was not obtained:

- Check the wiring for a short circuit to Battery (+), or an open circuit.
- Check the wiring connection for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring and voltage supply was OK:

- Replace the Camshaft Position (CMP) Sensor -G40-. Refer to appropriate service information.

If no malfunction is found in the wiring and voltage supply was not OK:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.
- Install the engine cover with air filter. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code **READINESS CODE**.

CAMSHAFT POSITION SENSOR 2, CHECKING

The following procedure is used to diagnose Camshaft Position (CMP) Sensor 2 -G163- which is controlled by Engine Control Module - J623-.

NOTE: Use only gold-plated when servicing the electrical harness connector terminals of the Camshaft Position (CMP) Sensor 2 -G163-.

Special tools and workshop equipment required

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

- multimeter.
- Wiring diagram.
- Diode test lamp

Test requirements

- The Engine Control Module - J623- fuses OK.
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.
- Remove the engine cover with air filter. Refer to appropriate service information.

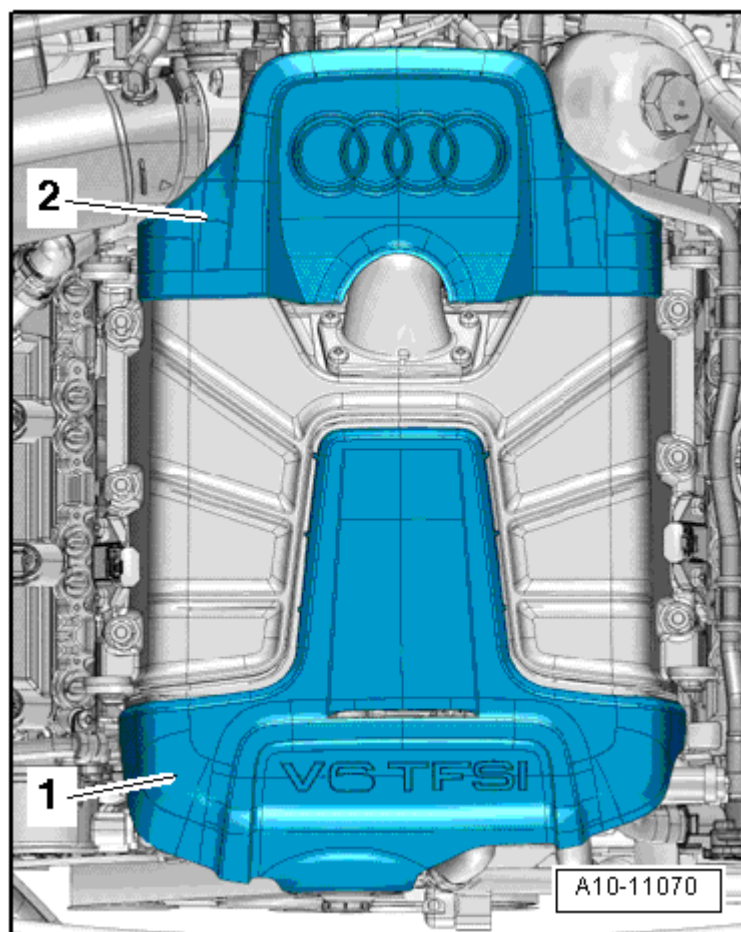


Fig. 16: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

-- Remove the sensor connector -1-

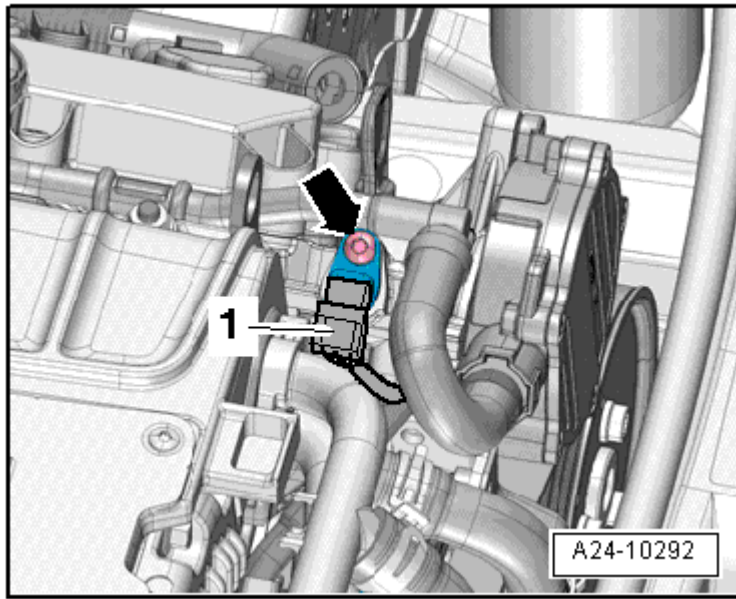


Fig. 17: Connector -1- From (CMP) Sensor
Courtesy of AUDI OF AMERICA, LLC

Checking activation

- Connect diode test lamp between terminal 2 and terminal 1.
- Turn key on
- Operate starter for a few Sec.
- LED in test lamp must blink
- Turn key off

Checking voltage

- Disconnect the Camshaft Position (CMP) Sensor 2 -G163- electrical harness connector.
- Switch the ignition on.
- Using a multimeter, Check the Camshaft Position (CMP) Sensor -G163- electrical harness connector terminals 1 to 3 for voltage.

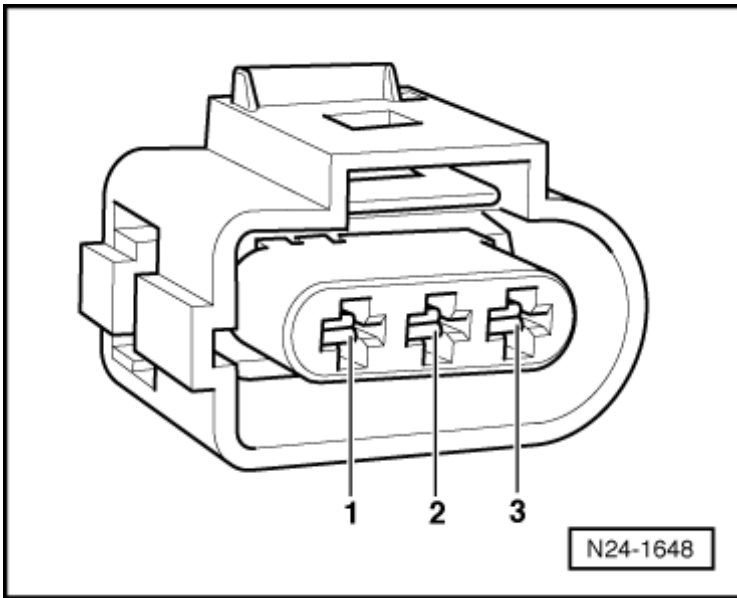


Fig. 18: 3-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: about 5.0 V

-- Switch the ignition off.

If the specification was not obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Engine Control Module -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Camshaft Position (CMP) Sensor 2 -G163- electrical harness connector to the Engine Control Module -J623- electrical harness connector.

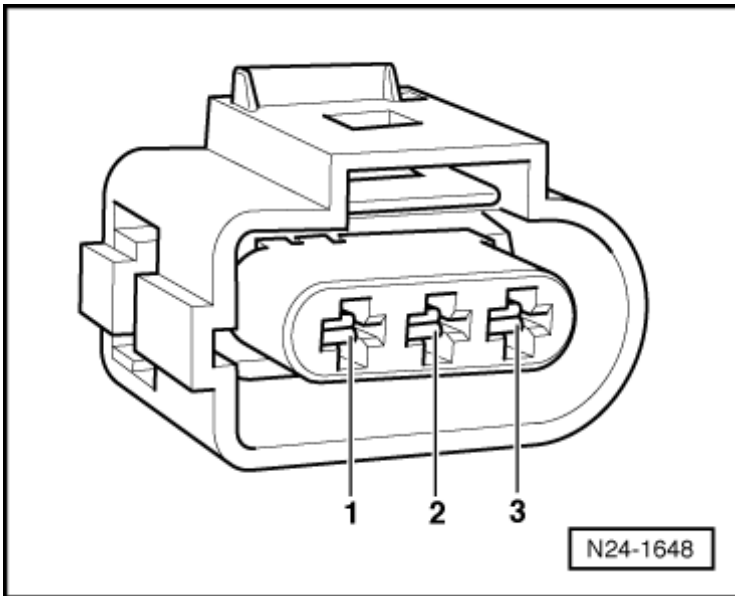


Fig. 19: 3-Pin Electrical Harness Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

Camshaft Position (CMP) Sensor 2 -G163- electrical harness connector terminals	Engine Control Module - J623- electrical harness connector terminals or test box sockets
1	T94 /63
2	T60 /40
3	T60 /50

Specified value: 1.5 ohms Max.

If the specified value was not obtained:

- Check the wiring connection for an open circuit, short circuit to Battery (+) or Ground (GND).
- Check the wiring connection for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring and voltage supply was OK:

-- Replace Camshaft Position (CMP) Sensor 2 -G163-. Refer to.

If no malfunction is found in the wiring and voltage supply was not OK:

-- Replace the Engine Control Module -J623-. Refer to appropriate service information..

Assembly is performed in the reverse order of the removal, note the following:

Final procedures

After repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

SPEED SIGNAL, CHECKING

The following procedure requires a test drive. Observe all safety precautions.

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- The Speedometer -G21- OK.
- The Motronic Engine Control Module (ECM) -J623- fuses OK.

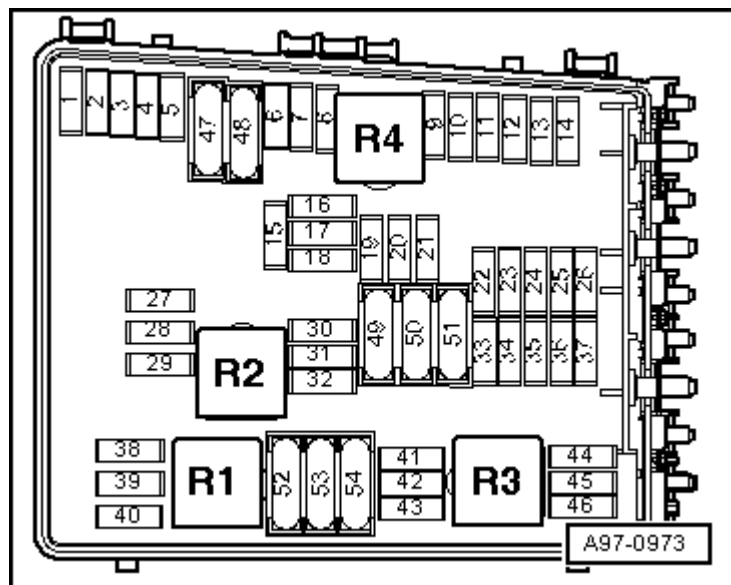


Fig. 20: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

- Connect the scan tool.
- Perform a road test with a vehicle speed greater than 5 Km/h.
- Using the scan tool, Check the vehicle speed:

Diagnostic text	Specified value
Vehicle Speed	Approx. Vehicle Speed

-- Compare the vehicle speed on the scan tool to the Speedometer -G21-.

Specified value: a difference of no greater than 10%.

If the specified value was not obtained or no speed was displayed:

- Check the wiring from the Motronic Engine Control Module (ECM) -J623- to the Instrument Cluster Control Module -J285- for an open circuit, Short to Battery (+), or to Ground (GND).
- Check the wiring connection for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

CAN BUS TERMINAL RESISTANCE, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- Multimeter
- Wiring diagram

Test requirement

- A CAN-Bus malfunction was recognized.
- The Motronic Engine Control Module (ECM) - J623- fuses OK.

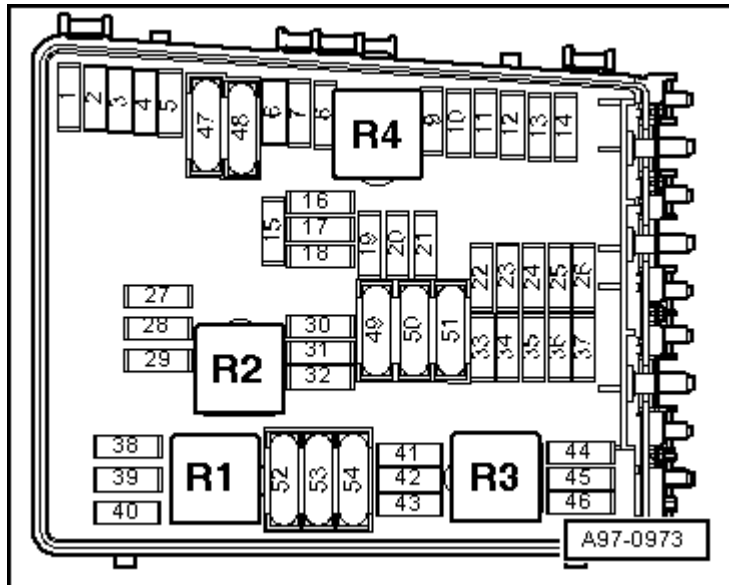


Fig. 21: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.

- Ignition switched off.

Function

The Motronic Engine Control Module (ECM) -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 Motronic Engine Control Module (ECM) -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 Motronic Engine Control Module (ECM) -J623-.

Test procedure

- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

- Disconnect the Data Bus On Board Diagnostic Interface -J533- electrical harness connector.

NOTE: **The Motronic Engine Control Module (ECM) -J623- must remain connected for the following step.**

- Using a multimeter, check the Data Bus On Board Diagnostic Interface -J533- electrical harness connector terminals 6 to 16 for resistance.

Specified value: 60 to 72 ohms (at approx. 20° C)

If the specified value was not obtained:

- Check the wiring for a short circuit to Battery (+), or an open circuit.
- Check the wiring connection for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

If the specified value was obtained:

Checking wiring

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Using a multimeter, check the Data Bus On Board Diagnostic Interface -J533- electrical harness connector to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T94 for resistance.

Data Bus On Board Diagnostic Interface -J533- electrical harness connector terminals	Motronic Engine Control Module (ECM) - J623- electrical connector T94 terminals or test box sockets
6 (Can_Bus Low)	67
16(Can_Bus High)	68

Specified value: 1.5 ohms Max.

If the specified value was not obtained:

- Check the wiring for a short circuit to Battery (+), or an open circuit.
- Check the wiring connection for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring:

-- Replace the Data Bus On Board Diagnostic Interface -J533-. Refer to the appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.

3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

CATALYTIC CONVERTER, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

Prior to repair work, perform a preliminary check to verify the condition. Refer to **PRELIMINARY CHECK**.

Special tools and workshop equipment required

- Generic scan tool

Test requirements

- Battery voltage at least 12.5 volts.
- Oxygen Sensors OK.
- No leaks or damage to exhaust system.

Function test

-- Perform the function test in Diagnostic Mode 06. Refer to **DIAGNOSTIC MODE 06 - READ TEST RESULTS FOR SPECIFIC DIAGNOSTIC FUNCTIONS**.

-- End diagnosis and switch the ignition off.

If the specified values are exceeded:

-- Check the exhaust system for leaks.

-- If necessary, repair the leak in the exhaust system.

-- Erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.

-- Perform a road test to verify Repair.

If the DTC does not return:

Repair complete, Generate readiness code. Refer to **READINESS CODE**.

-- End diagnosis.

If no leaks are found in the exhaust system:

-- Replace the catalytic converter with front exhaust pipe. Refer to the appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

TURBOCHARGER, G-CHARGER**NOTE:**

- Charge air system must be properly sealed.
- Always replace self-locking nuts.
- Charge air hoses and pipes as well as their connections must be free of oil and grease before re-installing.
- Do not assemble charge air hoses and lines with lubricants containing oils, only coat with water (without additives) if necessary.
- Note installation marks on hoses and components.
- All hose connections for charge air system are secured by spring-type clamps or by connector couplings.
- Install only approved clamps for securing hose connections.
- Pliers for spring clamps or hose clamp pliers are recommended for installing spring clamps.
- For connector couplings, always note the following points:

-- Disengage connector coupling by pulling securing clip -arrow-.

-- Disconnect hose and pipe without the assistance of tools.

-- When assembling, make sure the retaining tabs -A- are engaged securely.

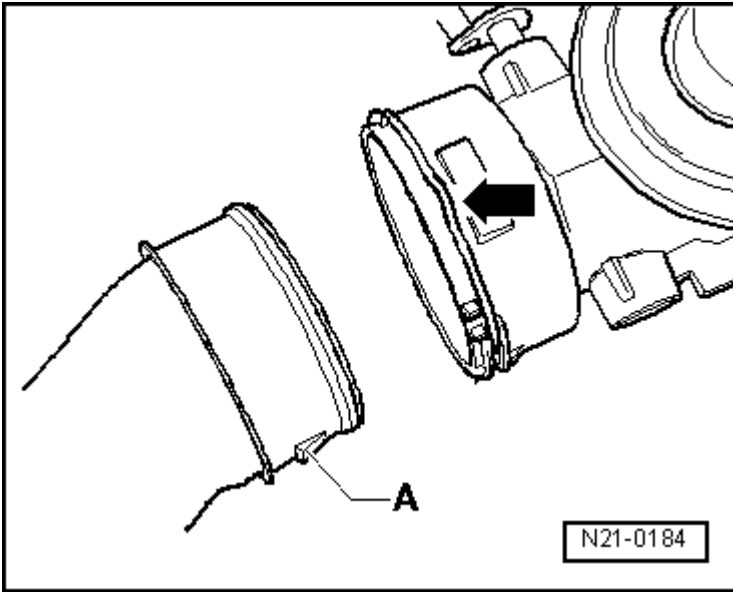


Fig. 22: Checking For Secure Fit Of Lugs When Installing
Courtesy of AUDI OF AMERICA, LLC

Before screwing on oil supply line, fill turbocharger with engine oil at filler tube.

After installing turbocharger, let engine idle for approx. 1 minute without increasing engine speed. This ensures adequate oil supply to the turbocharger.

CHARGE AIR PRESSURE SENSOR/INTAKE AIR TEMPERATURE SENSOR, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- Multimeter
- Wiring diagram

Test requirements

- The Motronic Engine Control Module (ECM) - J623- fuses OK.

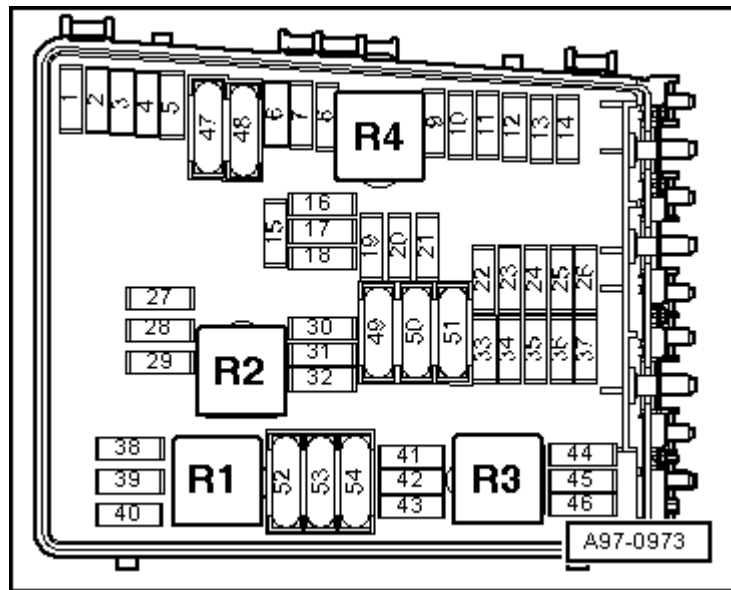


Fig. 23: Fuses On E-Box In Engine Compartment, Left Side
 Courtesy of AUDI OF AMERICA, LLC

- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- On vehicles with automatic transmission, selector lever in position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the engine cover with air filter. Refer to appropriate service information.

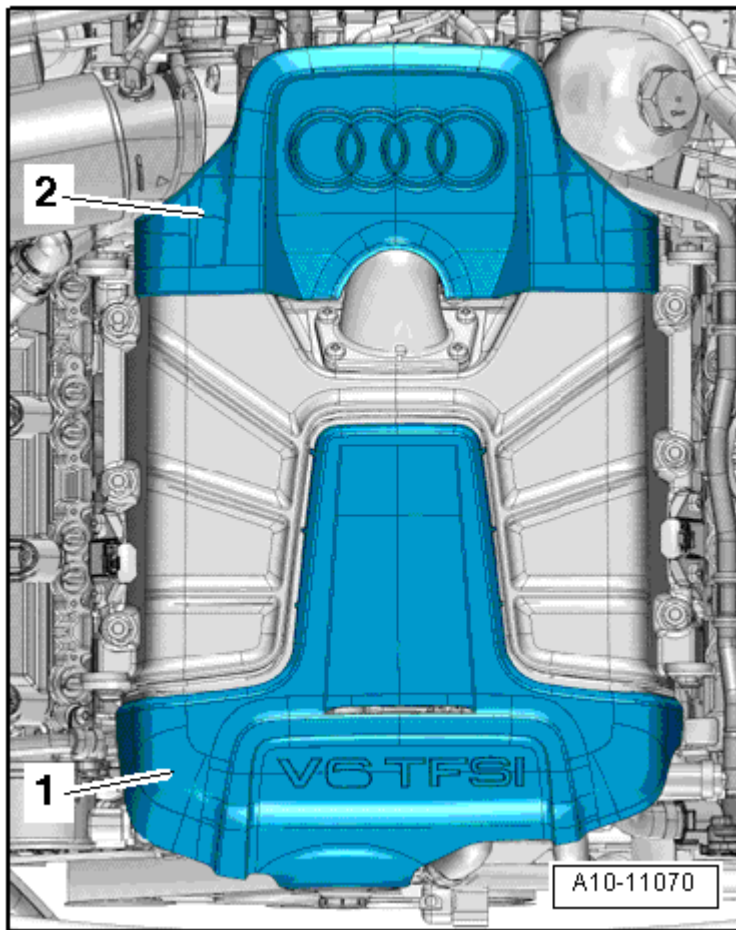


Fig. 24: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

Test sequence

-- Disconnect the Charge Air Pressure Sensor/Intake Air Temperature Sensor -G31/G72- electrical harness connector -1-.

On the right side, on the compressor with the charge air cooler. Note: The intake air temperature sensor 2 - G430- / charge air pressure sensor 2 -G447- are arranged as mirror images of each other.

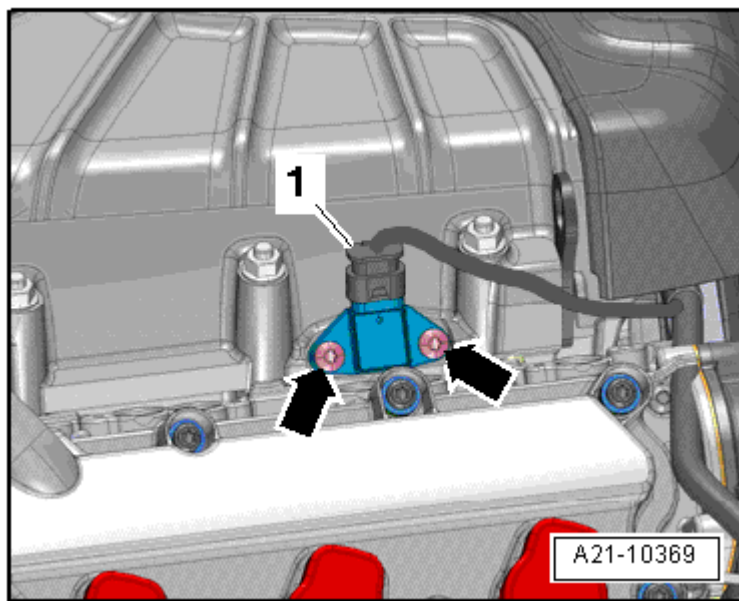


Fig. 25: Installation Location Charge Air Pressure Sensor -G31- /Intake Manifold Temperature Sensor - G72-
Courtesy of AUDI OF AMERICA, LLC

-- Start engine and let it run at idle.

-- Using a multimeter, check the Charge Air Pressure Sensor/Intake Air Temperature Sensor -G31/G72- electrical harness connector terminals 1 to 2 for voltage.

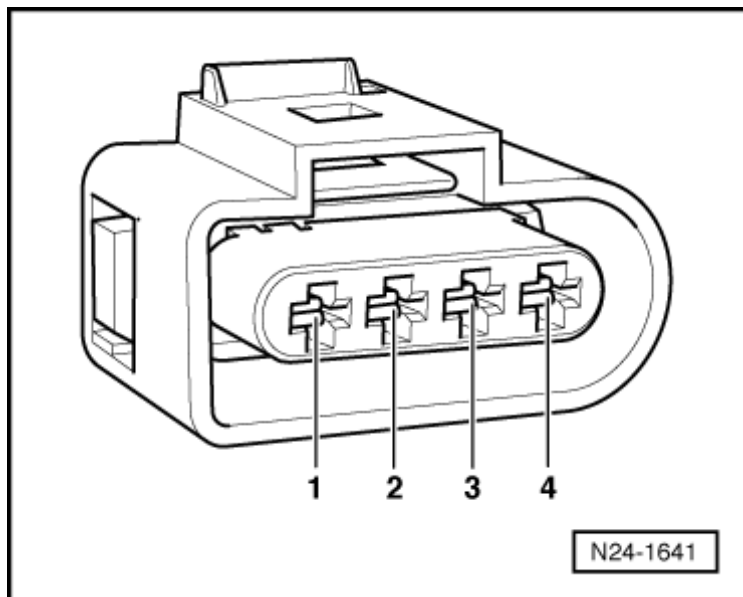


Fig. 26: 4-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: min. 4.5 V

-- Switch the ignition off.

If the specification was obtained:

-- Replace the Charge Air Pressure Sensor/Intake Air Temperature Sensor -G31/G72-.

If the specification was not obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Charge Air Pressure Sensor/Intake Air Temperature Sensor -G31/G72- electrical harness connector terminals to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T94 terminals for an open circuit according to wiring diagram.

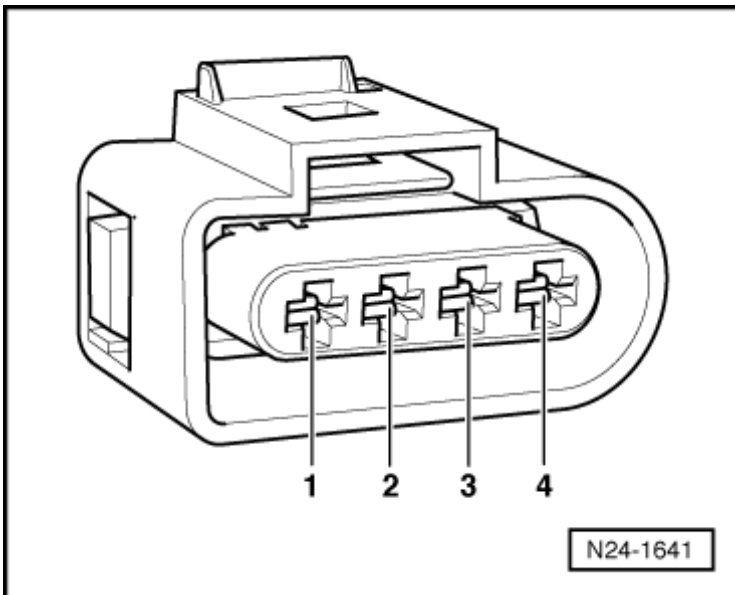


Fig. 27: 4-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

**Motronic
Engine
Control
Module
(ECM) -**

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

Charge Air Pressure Sensor/Intake Air Temperature Sensor -G31/G72- electrical harness connector terminals	J623- electrical connector T94 terminals or test box sockets
1	7
2	63
3	86
4	38

Specified value: 1.5 ohms max.

If the specification was not obtained:

- Check the wiring for a short circuit to each other, Battery (+), and Ground (GND).
- If necessary, repair the faulty wiring connection.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

If no malfunction is detected in the wiring and if the voltage supply was OK:

- Replace the Charge Air Pressure Sensor/Intake Air Temperature Sensor -G31/G72-.

If no malfunction is detected in the wiring and if the voltage supply was not OK:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.
- Install the engine cover with air filter. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

ENGINE COOLANT TEMPERATURE SENSOR, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

Prior to repair work, perform a preliminary check to verify the condition. Refer to **PRELIMINARY CHECK**.

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- Generic scan tool
- Multimeter
- Wiring diagram

Test requirements

- The Motronic Engine Control Module (ECM) - J623- fuses OK.

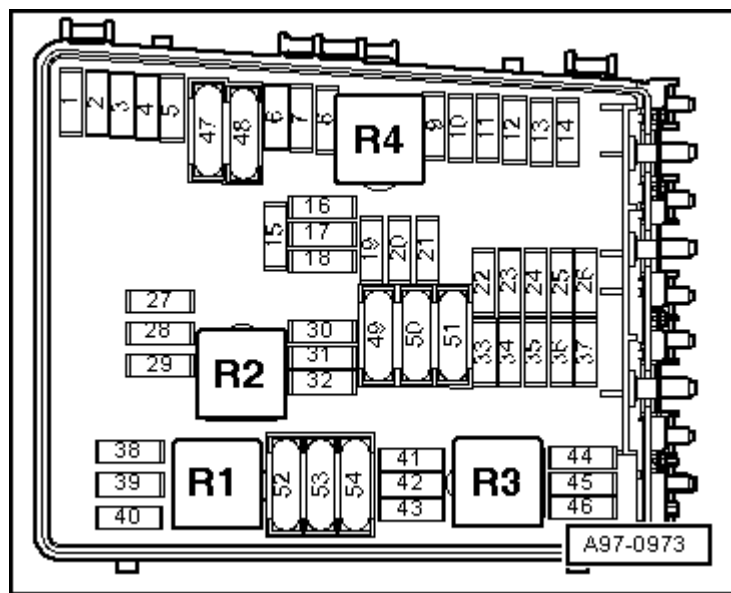


Fig. 28: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.
- Engine cold.

Test procedure

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

Start diagnosis

- Connect the scan tool.
- Switch the ignition on.
- Using the scan tool, check the coolant temperature:

Diagnostic text	Specified value
Coolant temperature	Approx. coolant temperature

If the specified value is not obtained:

- Continue test according to the following table:

Indicated	Cause	Test
approx. - 40.0° C	Open circuit or short circuit to (B+)	<u>ENGINE COOLANT TEMPERATURE SENSOR, CHECKING.</u>
approx. 140.0° C	Short circuit to Ground (GND)	<u>ENGINE COOLANT TEMPERATURE SENSOR, CHECKING.</u>

If the specified value was obtained:

- Start the engine and let it run at idle.

The temperature value must increase uniformly in increments of 1.0° C.

If the engine shows problems in certain temperature ranges and if the temperature does not climb uniformly, the temperature signal is intermittent.

- Replace the Engine Coolant Temperature (ECT) Sensor - G62-. Refer to the appropriate service information

Checking internal resistance

- Disconnect the Engine Coolant Temperature (ECT) Sensor -G62- electrical harness connector -arrow-.

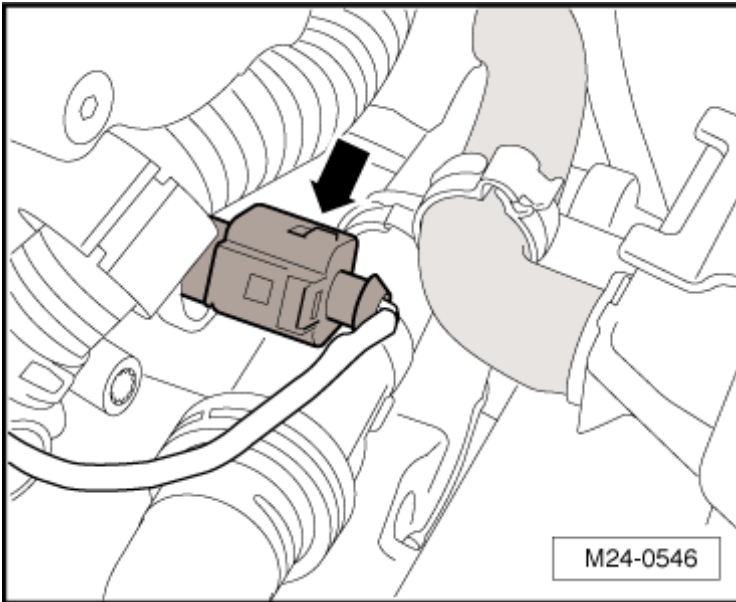


Fig. 29: Identifying Engine Coolant Temperature (ECT) Sensor G62 Electrical Harness Connector
Courtesy of AUDI OF AMERICA, LLC

-- Using a multimeter, check the Engine Coolant Temperature (ECT) Sensor -G62- terminals 1 to 2 for resistance.

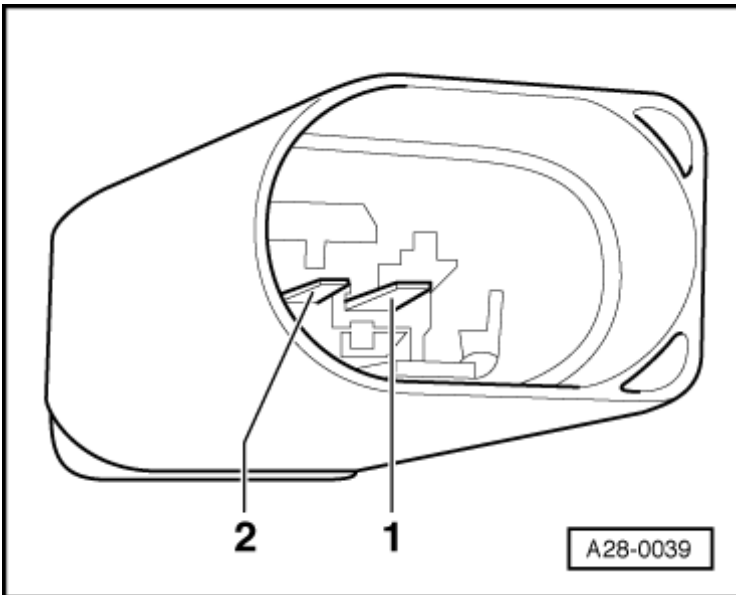


Fig. 30: Checking Camshaft Adjustment Valve (exhaust) -N318 For Resistance
Courtesy of AUDI OF AMERICA, LLC

Use the chart below for the specified values:

Specified values:

ECT Temperature vs Resistance

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

Temp (C)	min value ohms	max value ohms
- 40	36816	43714
- 35	28840	33978
- 25	17680	20530
- 15	10940	12534
- 5	6897	7804
0	5535	6226
5	4443	4970
15	2923	3235
25	1978	2167
35	1369	1486
45	965	1039
55	692	738
65	503	533
75	372	392
85	279	292
95	213	223
105	164	172
115	127	134
125	99	106
135	78	84

If any of the specified values was not obtained:

-- Replace the Engine Coolant Temperature (ECT) Sensor - G62-. Refer to appropriate service information.

Testing if display is approx. - 40.0°C

-- Disconnect the Engine Coolant Temperature (ECT) Sensor -G62- electrical harness connector -arrow-.

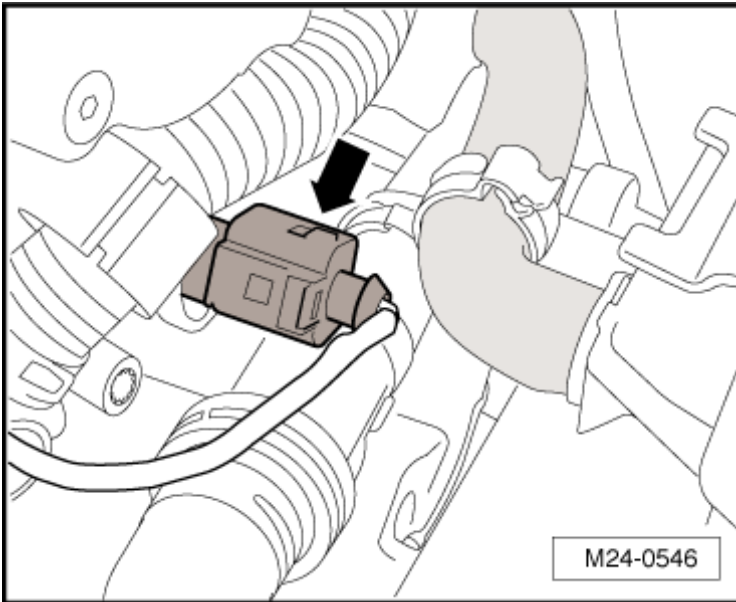


Fig. 31: Identifying Engine Coolant Temperature (ECT) Sensor G62 Electrical Harness Connector
Courtesy of AUDI OF AMERICA, LLC

-- Using a jumper wire, connect the Engine Coolant Temperature (ECT) Sensor -G62- electrical harness connector terminals 1 to 2.

-- Check the value indicated on the scan tool display.

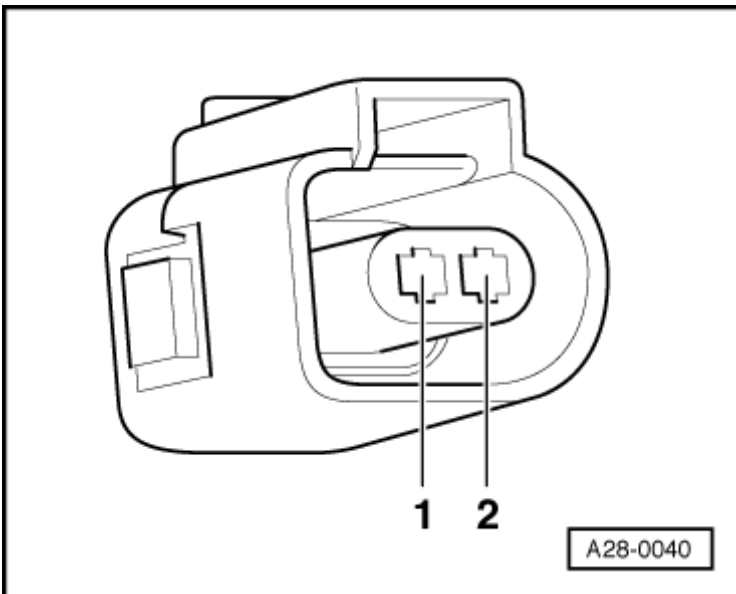


Fig. 32: 2-Pin Electrical Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

If the value jumps to approx. 140.0° C

-- End diagnosis and switch the ignition off.

-- Replace the Engine Coolant Temperature (ECT) Sensor - G62-. Refer to appropriate service information.

If indication remains at approx. -40.0° C:

Testing if display approx. 140.0°C

-- Disconnect the Engine Coolant Temperature (ECT) Sensor -G62- electrical harness connector -arrow-.

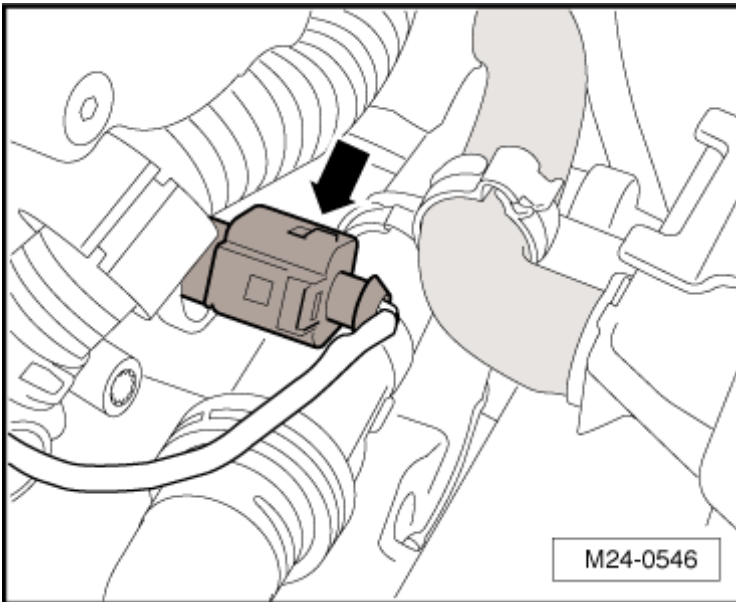


Fig. 33: Identifying Engine Coolant Temperature (ECT) Sensor G62 Electrical Harness Connector
Courtesy of AUDI OF AMERICA, LLC

If indication jumps to approx. -40.0° C:

-- End diagnosis and switch ignition off.

-- Replace the Engine Coolant Temperature (ECT) Sensor - G62-. Refer to appropriate service information.

If indication remains at approx. 140.0° C:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Engine Coolant Temperature (ECT) Sensor - G62- electrical harness connector terminals to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T60 terminals for

an open circuit according to the wiring diagram.

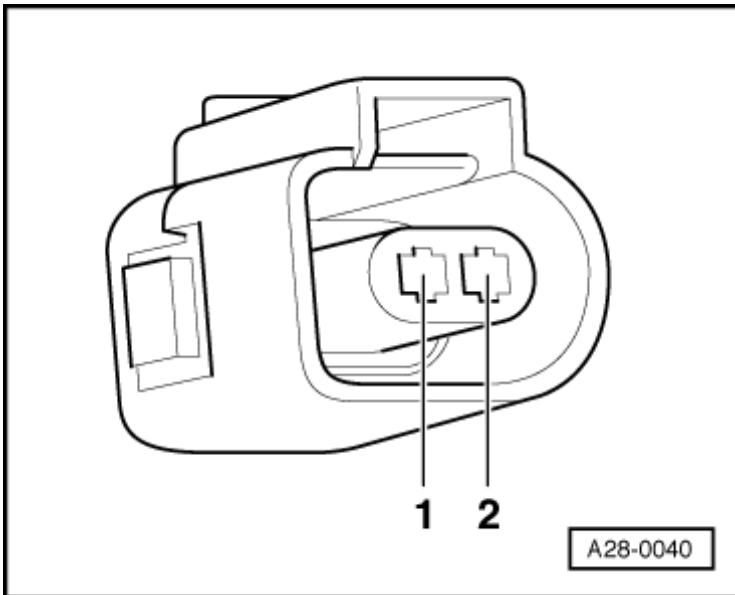


Fig. 34: 2-Pin Electrical Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Engine Coolant Temperature (ECT) Sensor - G62- electrical harness connector terminals		Motronic Engine Control Module (ECM) - J623- electrical connector T60 terminals or test box socket
1		50
2		27

Specified value: 1.5 ohms Max.

If the specification was not obtained:

- Check the wiring for a short circuit to Battery (+), or an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring:

-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

ENGINE SPEED SENSOR, CHECKING

NOTE: Use only gold-plated terminals when servicing terminals in the electrical harness connector of the Engine Speed (RPM) Sensor -G28-.

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- The Motronic Engine Control Module (ECM) - J623- fuses OK.

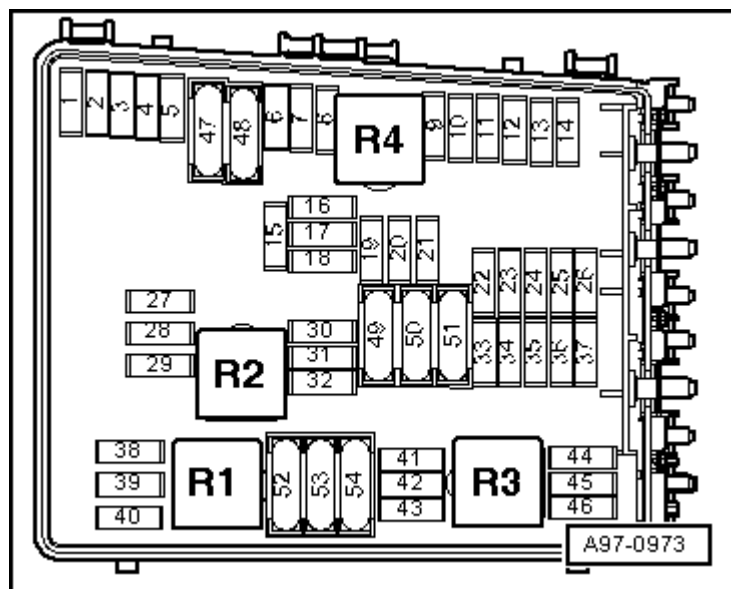


Fig. 35: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- Battery voltage at least 12.5 volts.

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- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Function

The Engine Speed (RPM) Sensor -G28- detects RPM and reference marks. 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.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

- Connect the scan tool.
- Switch the ignition on.
- Using the scan tool, check the engine speed:

Diagnostic text	Specified value
Engine rotations per minute (RPM)	Idle speed

-- End diagnosis and switch ignition off.

If the specified value was not obtained:

Checking internal resistance

- Disconnect the Engine Speed (RPM) Sensor -G28- electrical harness connector.
- Using a multimeter, check the Engine Speed (RPM) Sensor -G28- terminals 1 to 2 for resistance.

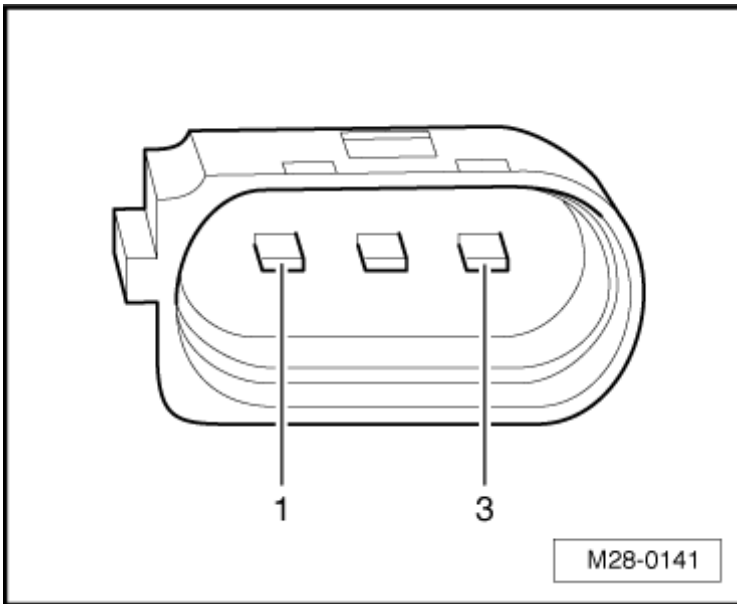


Fig. 36: Identifying Engine Speed (RPM) Sensor G28 Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: 450 to 1200 ohms

If the specified value is not obtained:

-- Replace the Engine Speed (RPM) Sensor -G28-. Refer to appropriate service information.

If the specified values are obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Engine Speed (RPM) Sensor -G28- electrical harness connector terminals to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T60 terminals for an open circuit.

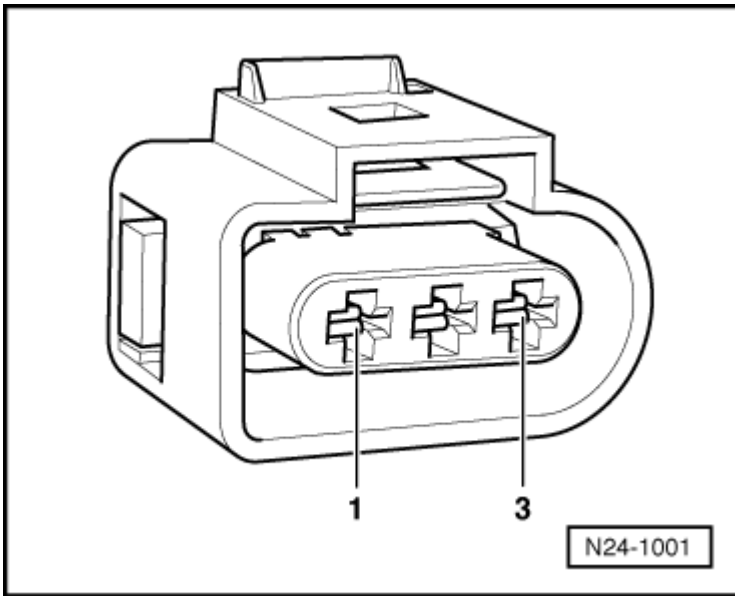


Fig. 37: 3-Pin Electrical Harness Connector
 Courtesy of AUDI OF AMERICA, LLC

Engine Speed (RPM) Sensor - G28- electrical harness connector terminals	Motronic Engine Control Module (ECM) -J623- electrical connector T60 terminals or test box socket
1	14
2	53
3	50

Specified value: 1.5 ohms Max.

If the specification was not obtained:

- Check the wiring for a short circuit to Battery (+), or an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring:

- Remove the Engine Speed (RPM) Sensor -G28- and check the sensor wheel for proper seating, damage and run-out. Refer to appropriate service information.

If the sensor wheel is OK:

-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

EVAPORATIVE PURGE REGULATOR VALVE, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- multimeter
- Wiring diagram.

Test requirements

- The Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- fuse OK.

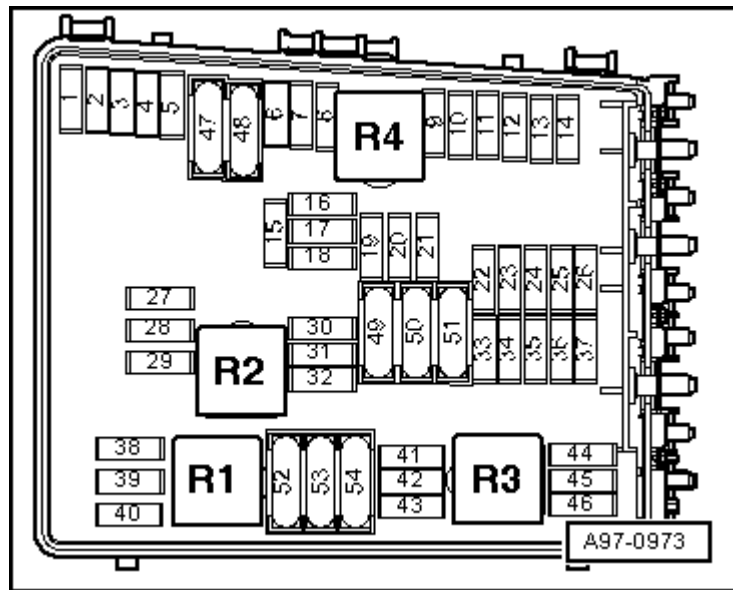


Fig. 38: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- The ignition switched off.

NOTE: Voltage for the Evaporative Emission (EVAP) Canister Purge Regulator Valve - N80- is supplied via the Engine Component Power Supply Relay -J757-.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the engine cover with air filter. Refer to appropriate service information.

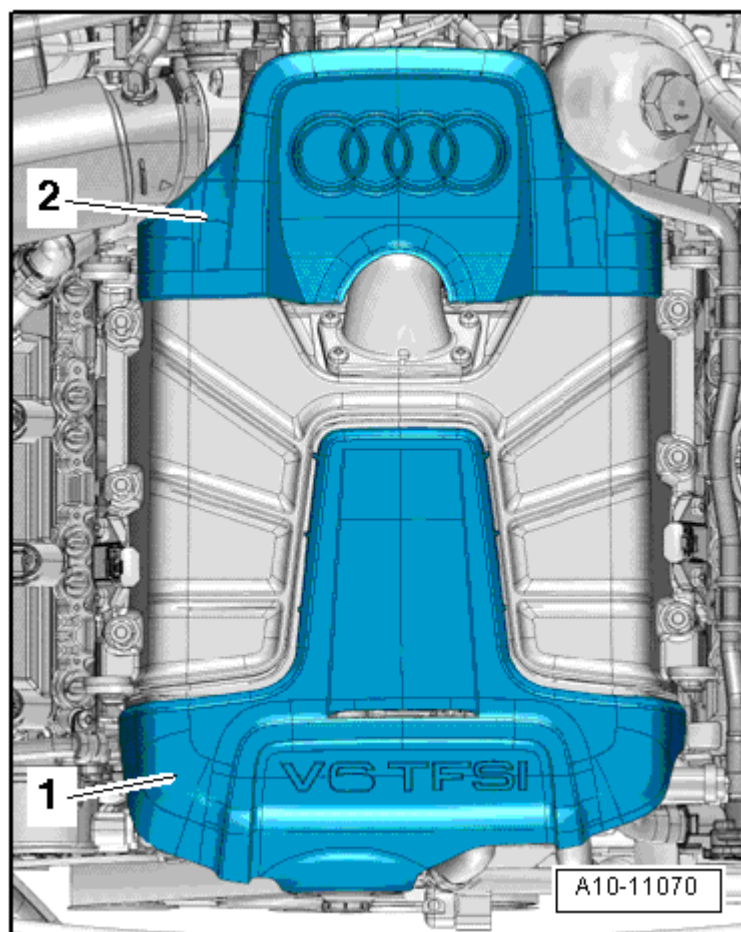


Fig. 39: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- electrical harness connector -1-.

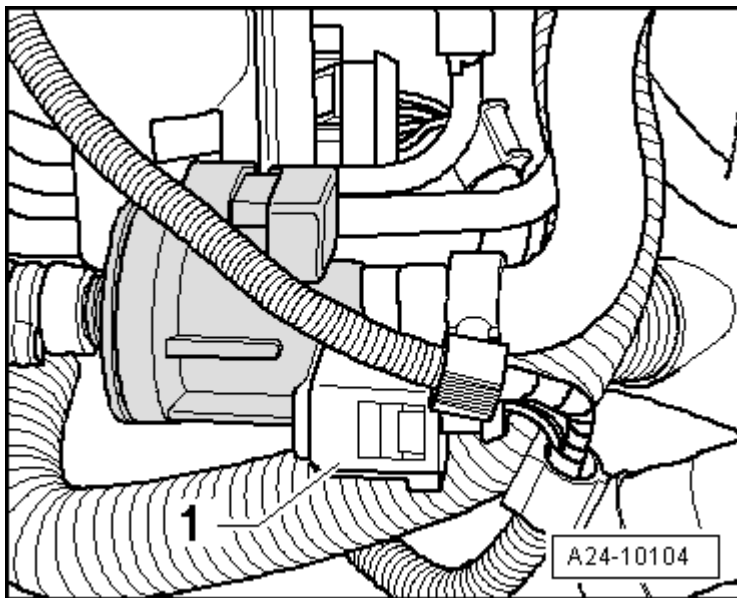


Fig. 40: Identifying Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 Electrical Harness Connector

Courtesy of AUDI OF AMERICA, LLC

Checking internal resistance

-- Using a multimeter, check the Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- terminals 1 and 2 for resistance.

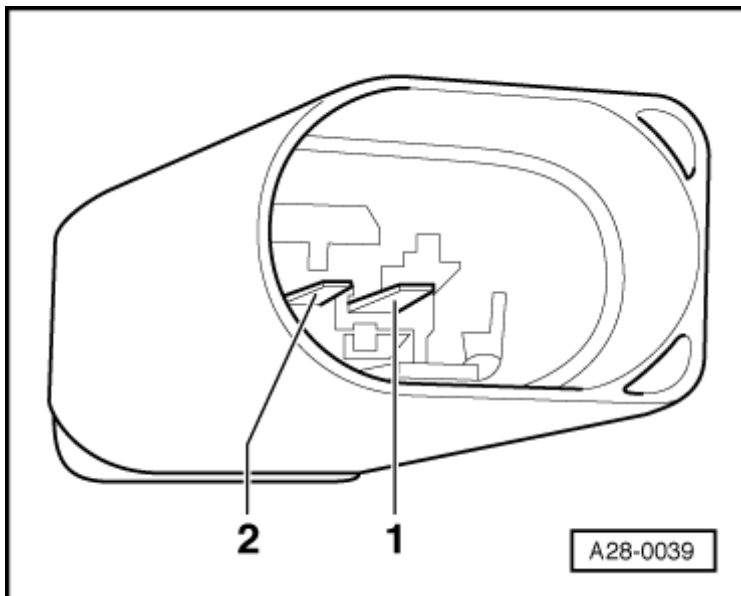


Fig. 41: Checking Camshaft Adjustment Valve (exhaust) -N318 For Resistance

Courtesy of AUDI OF AMERICA, LLC

Specified value: 22.0 to 30.0 ohms.

If the specified value is not obtained:

-- Replace the Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-.

If the specification is obtained:

Checking voltage supply

-- Using a multimeter, check the electrical harness connector terminal 1 to 2 for voltage.

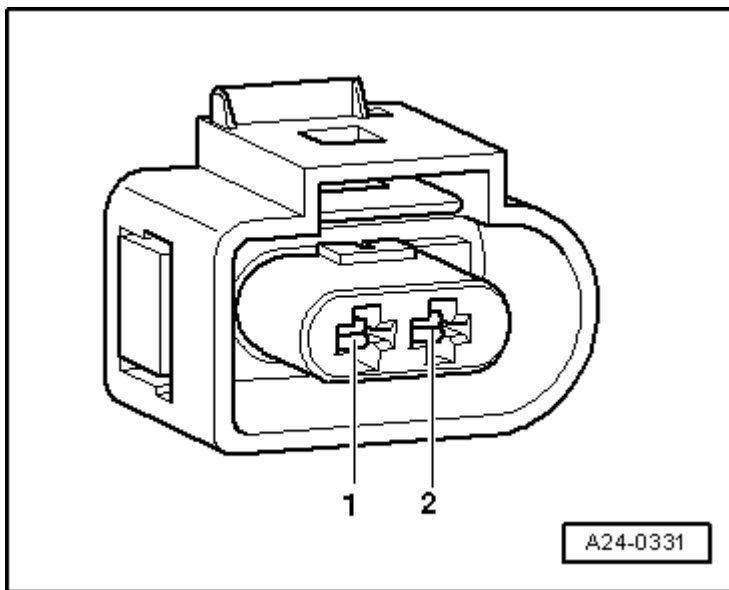


Fig. 42: 2-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

-- Operate the starter briefly.

Specified value: battery voltage.

If the specified value was not obtained:

-- Using a multimeter, check the electrical harness connector terminal 1 for voltage.

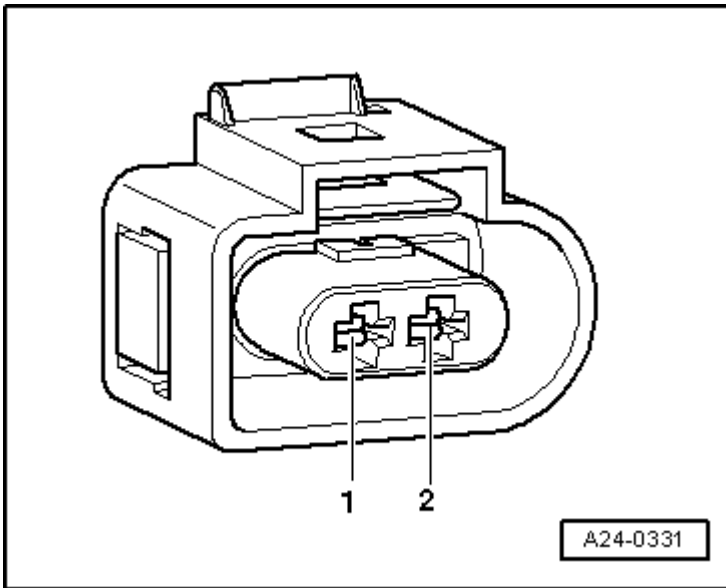


Fig. 43: 2-Pin Electrical Harness Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

**Evaporative
 Emission
 (EVAP)
 Canister
 Purge
 Regulator
 Valve -N80-
 electrical
 harness
 connector
 terminal**

Measure to

1	Engine Ground (GND)
---	---------------------

-- Operate the starter briefly.

Specified value: battery voltage.

If the specified value is not obtained:

-- Check the wiring connection from the electrical harness connector terminal 1 to the Engine Component Power Supply Relay -J757- terminal 8 for an open circuit.

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the wiring connection.

If the specified value was obtained:

Check Ground (GND) activation

-- Using a multimeter, check the electrical harness connector for voltage.

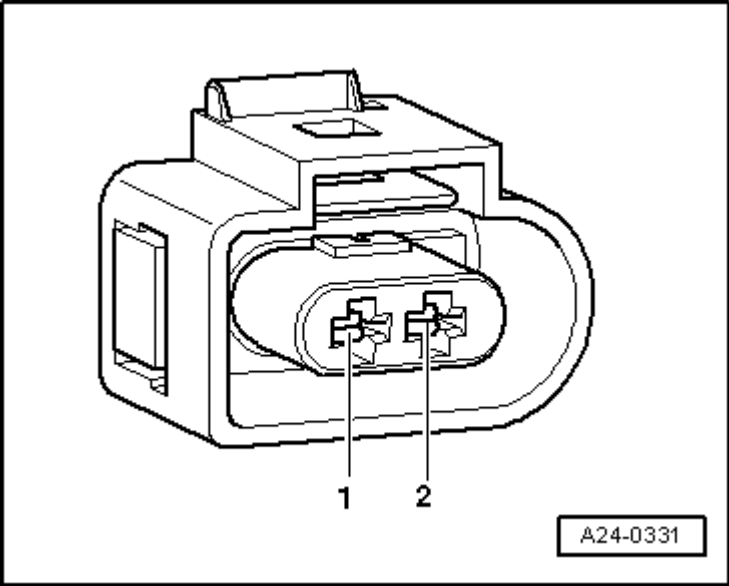


Fig. 44: 2-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- electrical harness connector terminal	Measure to
2	Battery positive (+)

-- Operate the starter briefly.

Specified value: battery voltage.

-- Switch the ignition off.

If the specified value was not obtained:

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.
- Using a multimeter, check the Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- electrical connector terminal 2 to Motronic Engine Control Module (ECM) -J623- electrical connector T94 terminal 75 for an open circuit.

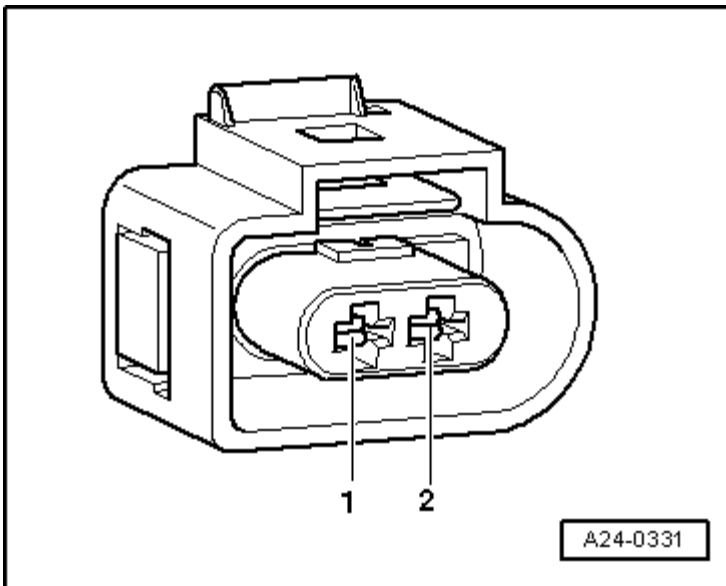


Fig. 45: 2-Pin Electrical Harness Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- electrical harness connector terminal	Motronic Engine Control Module (ECM) -J623- electrical connector T94 terminal test box socket
2	75

Specified value: 1.5 ohms max.

If the specification is not obtained:

- Check the wiring for a short circuit to Battery positive (+) or an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the wiring connection.

If the specification was obtained:

-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Install the engine cover with air filter. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

EVAPORATIVE SYSTEM, CHECKING FOR LEAKS

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

Perform a preliminary check to verify the condition: **PRELIMINARY CHECK**.

Special tools and workshop equipment required

- Smoke tester
- Evaporative and fuel supply system vacuum hose and line routing diagram

Test procedure

-- Using a smoke tester, check the evaporative emission system for leaks.

NOTE: Always follow the manufacturers directions for the proper installation and operation of the smoke tester being used.

NOTE: Secure all hose connections using hose clamps appropriate for the model type.

Replace seals and gaskets when performing repair work.

If a leak is detected:

-- Check the fuel filler cap seal for damage and for proper installation. Replace if necessary.

-- Check the seals under the locking flanges and the union nuts are properly tightened on the fuel tank.

-- Check all hose connections of the evaporative system and replace or repair any leaking lines.

-- Repair or replace any damaged component.

If no leaks are found:

-- Erase the DTC memory if a DTC was set.

-- Perform a road test to verify repair.

-- Generate readiness code.

If a DTC was set and does not return:

-- Repair complete, generate readiness code.

If the DTC does return and no leaks are found in the evaporative and fuel supply system:

-- Check the DTC memory for any DTC codes pertaining to the evaporative and fuel supply systems. If a DTC is stored, perform the diagnostic test procedure for the suspected component.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

FUEL INJECTORS, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- multimeter.
- Diode test lamp (12V).
- Wiring diagram.

Test requirements

- The Engine Speed (RPM) Sensor -G28- OK.
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

-- Observe safety precautions.

-- Observe rules for cleanliness.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the engine cover and air intake duct. Refer to appropriate service information.

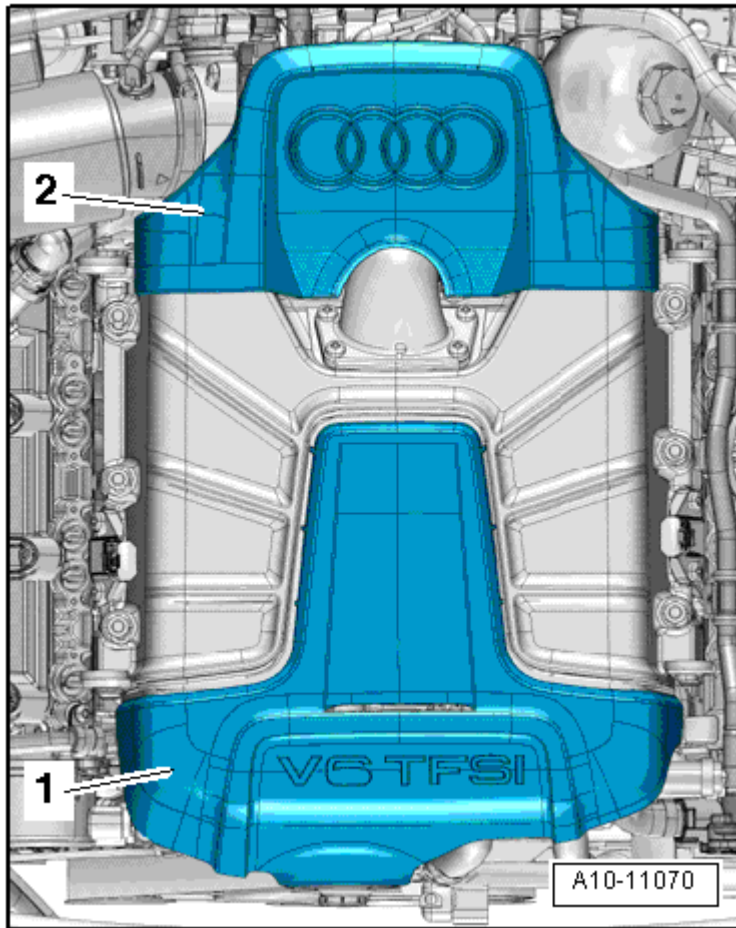


Fig. 46: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the 8 pin connector from the fuel injector assembly harness (located just below and to the right of the electronic throttle motor assembly).

-- Using a multimeter connected to ground, check terminals 2, 4, 6, 8 for the correct voltage.

Specified value: 22 - 25 V.

If voltage is below specification:

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Fuel Injector -- electrical harness connector terminals to the Motronic Engine

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Control Module (ECM) -J623- electrical harness connector T60 terminals for an open or short to ground circuit.

Component	Fuel Injector -- electrical harness connector terminals	Motronic Engine Control Module (ECM) -J623- electrical connector T60 terminals or test box sockets
Cylinder 1 Fuel Injector -N30-	1	3
Cylinder 1 Fuel Injector -N30-	2	31
Cylinder 2 Fuel Injector -N31-	1	19
Cylinder 2 Fuel Injector -N31-	2	33
Cylinder 3 Fuel Injector -N32-	1	1
Cylinder 3 Fuel Injector -N32-	2	46
Cylinder 4 Fuel Injector -N33-	1	4
Cylinder 4 Fuel Injector -N33-	2	34
Cylinder 5 Fuel Injector -N83-	1	16
Cylinder 5 Fuel Injector -N83-	2	47
Cylinder 6 Fuel Injector -N84-	1	18
Cylinder 6 Fuel Injector -N84-	2	32

Specified values: 1.5 ohms max. for wire continuity, and for circuit to ground check; Infinite or "OL" is displayed

If the specification is not obtained:

- Check the wiring for an open, high resistance or short to ground.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If voltage is within specification:

Checking internal resistance

- Using a multimeter, check the Fuel Injector -- electrical terminals (1 to 2 for N30, 3-4 for N31, 5-6 for N32 or 7 to 8 for N33) for resistance.

Specified value: 1.4 - 2.6 ohms (at approx. 20° C)

If the specified value was not obtained:

- Replace the malfunctioning Fuel injector(s). Refer to appropriate service information.

If the specified value was obtained:

Checking activation and wiring

-- Connect a diode test lamp (12V) from Battery + to the injector harness connector terminal (1 for N30, 3 for N31, 5 for N32 or 7 for N33) of the Fuel Injector -- to be tested.

-- Operate the starter and test the activation of the Fuel Injector --.

LED should flicker.

-- Switch the ignition off.

If LED does not flicker:

-- Replace the malfunctioning Fuel injector(s). Refer to appropriate service information.

If no malfunction is detected in the wiring:

-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Install the engine cover with air filter. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

FUEL PRESSURE SENSOR, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- multimeter
- Wiring diagram.

Test requirements

- The Fuel Pump (FP) Control Module -J538- OK.
- The Motronic Engine Control Module (ECM) - J623- fuses OK.

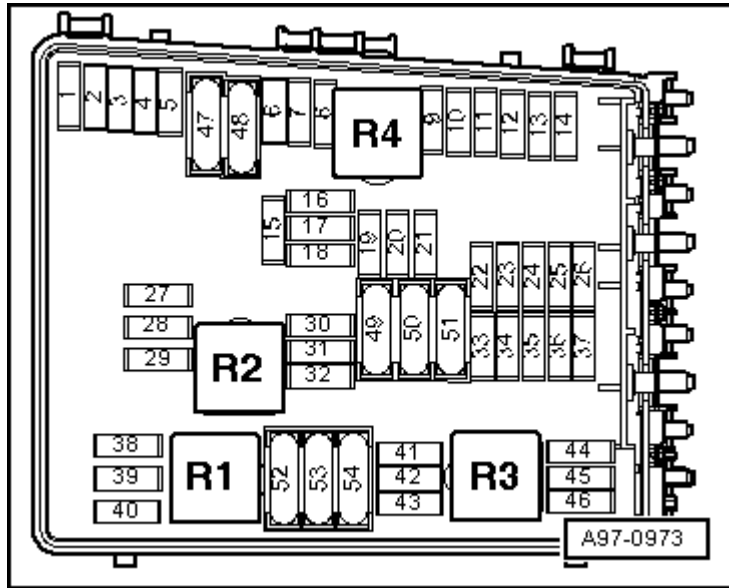


Fig. 47: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- The fuel filter OK.
- The battery voltage at least 12.5 V.
- All electrical consumers switched off (radiator fan must NOT run during test).
- A/C switched off.
- The fuel tank at least $\frac{1}{4}$ filled.
- The ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the engine cover with air filter. Refer to appropriate service information.

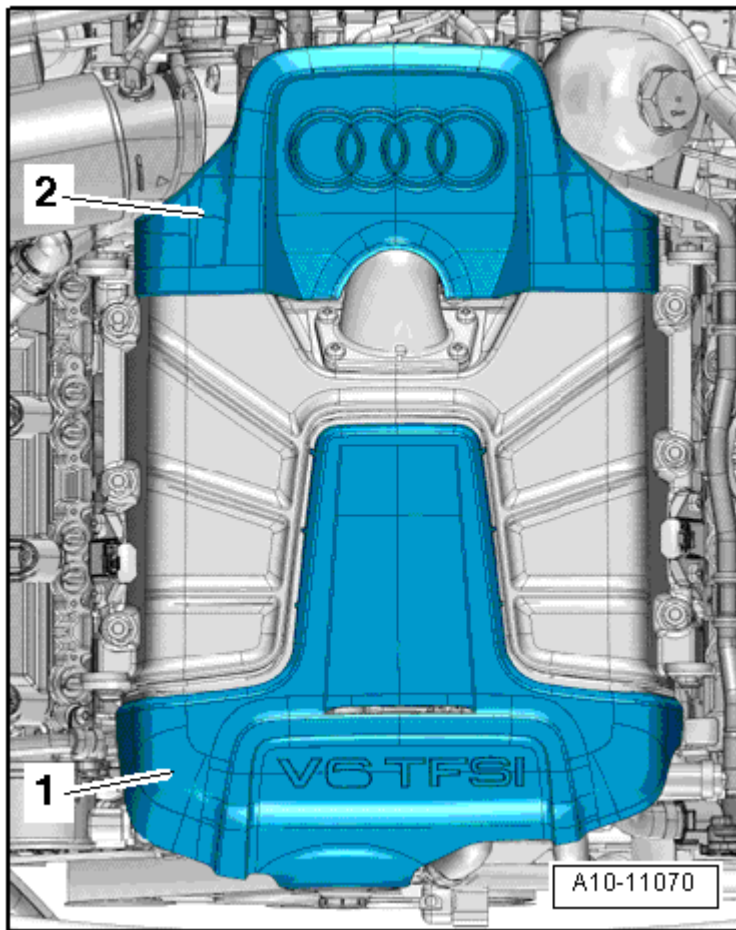


Fig. 48: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

Checking voltage

-- Disconnect the Fuel Pressure Sensor -G247- electrical harness connector. -4-

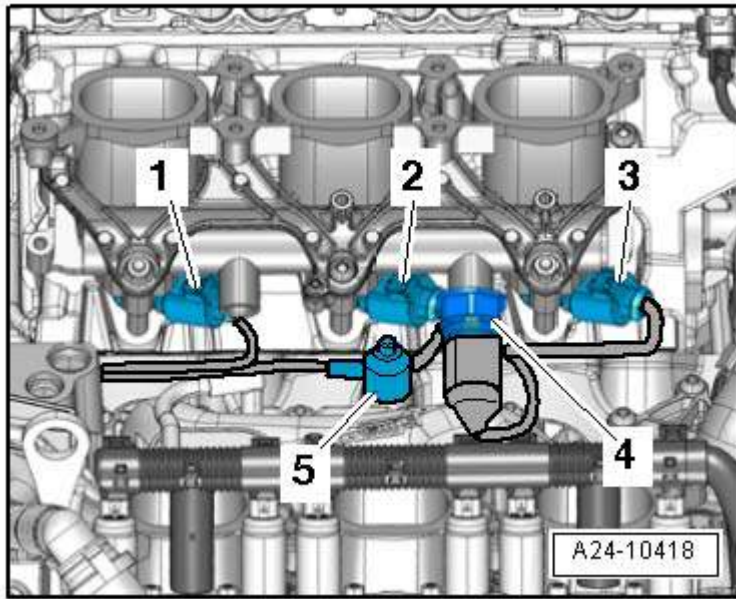


Fig. 49: Component Location Under Intake Manifold Lower Section, Cylinder Bank 2 (Left)
 Courtesy of AUDI OF AMERICA, LLC

-- Switch the ignition on.

-- Using a multimeter, check the Fuel Pressure Sensor -G247- electrical harness connector terminals for voltage.

Fuel Pressure Sensor - G247- electrical harness connector terminals	Specified value
1 to Battery positive (+)	Battery voltage
3 to Ground (GND)	about 5 V

-- Switch the ignition off.

If the specified value was obtained:

-- Replace the Fuel Pressure Sensor -G247-. Refer to appropriate service information.

If the specified value was not obtained:

Checking wiring connections

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Fuel Pressure Sensor -G247- electrical harness connector terminals to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T60 terminals for an open circuit according to the wiring diagram.

Fuel Pressure Sensor -G247- electrical harness connector terminals		Motronic Engine Control Module (ECM) - J623- electrical connector T60 terminals or test box socket
1		50
2		59
3		35

Specified value: 1.5 ohms Max.

If the specification is not obtained:

-- Check the wiring for a short circuit to each other, Battery (+), and Ground (GND).

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring:

-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Install the engine cover with air filter. Refer to appropriate service Information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

FUEL PUMP DELIVERY QUANTITY, CHECKING**Special tools and workshop equipment required**

- Switched remote control (jumper).
- multimeter.
- Electrical connector test lead set.
- Fuel pressure test set.
- Measuring container, fuel-resistant.

Test conditions

- Battery voltage 12.5 V
- Fuel filter OK
- Fuel tank at least $\frac{1}{4}$ filled.
- Fuel pressure regulator OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

- Remove the fuel filler cap from fuel filler tube.
- Remove rear seat bench. Refer to appropriate service information.
- Remove the floor sealing cover -1-.

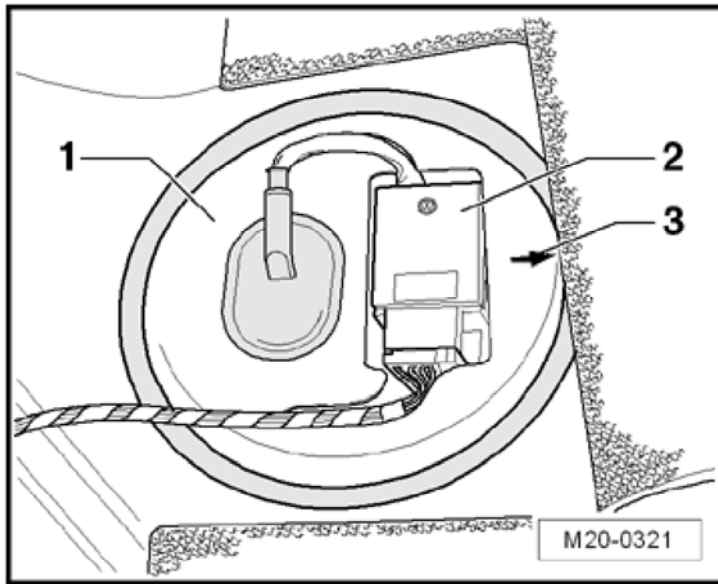


Fig. 50: Fuel Pump Control Module, Retaining Clips & Floor Sealing Cover
 Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the electrical harness connector -arrow- from the fuel delivery unit.

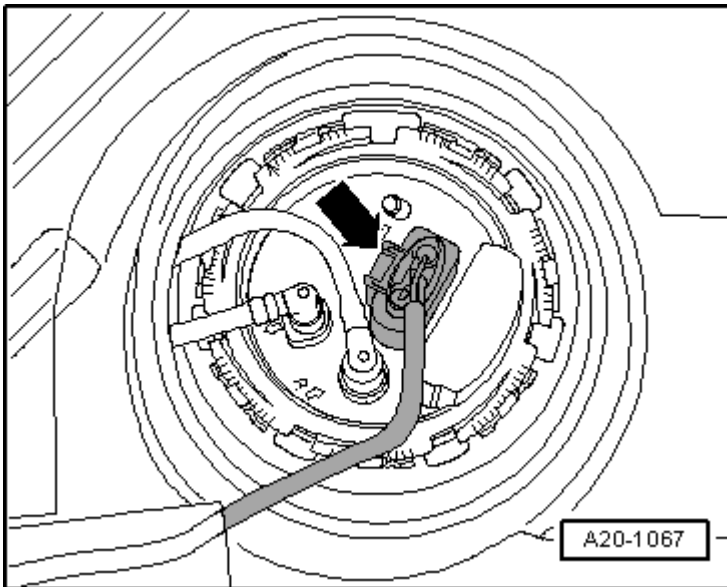


Fig. 51: Identifying Fuel Delivery Unit Connector
 Courtesy of AUDI OF AMERICA, LLC

-- Connect a switched remote control (jumper) to terminal -1- of the fuel delivery unit and to vehicle battery (+).

-- Connect a jumper wire from terminal -5- of the fuel delivery unit to vehicle Ground (GND).

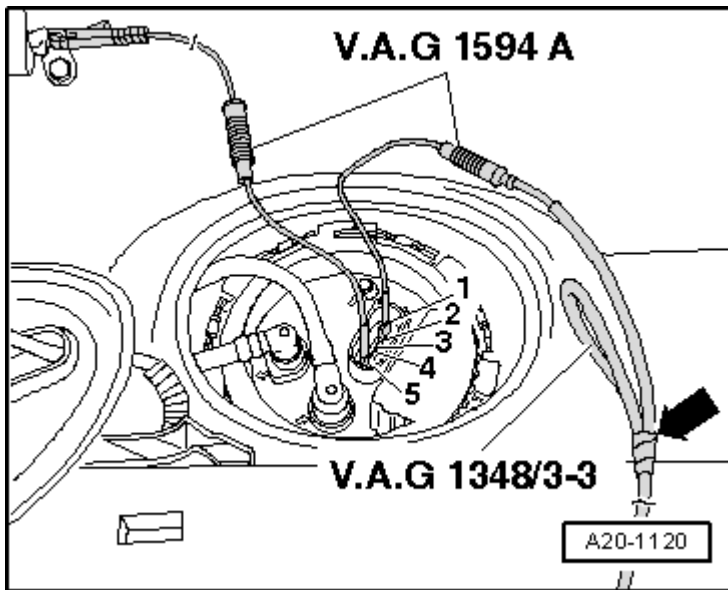


Fig. 52: A Jumper Cable From A Electrical Connector Test Lead Set Connected To Terminal Of Fuel Delivery Unit And To Vehicle Ground
 Courtesy of AUDI OF AMERICA, LLC

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

-- Disconnect the fuel return line -arrow- by pressing release buttons.

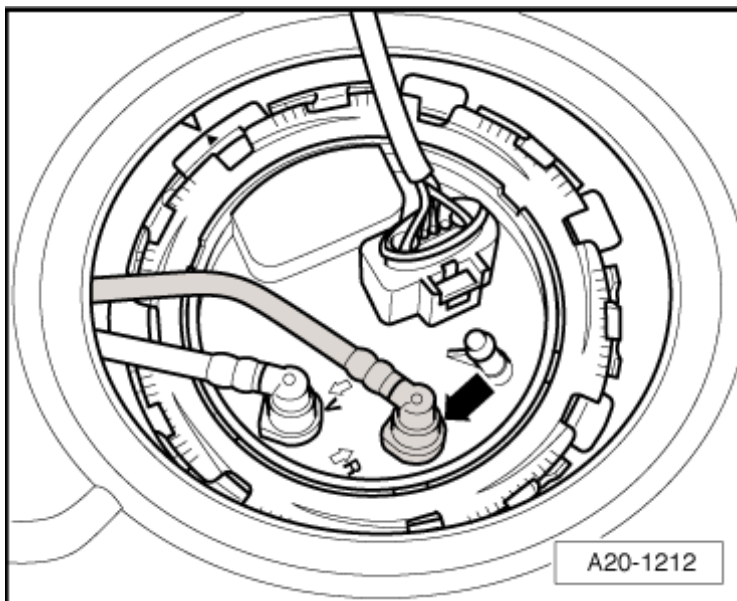


Fig. 53: Disconnecting Fuel Return Line By Pressing Release Buttons
 Courtesy of AUDI OF AMERICA, LLC

-- Connect a fuel line from the fuel pressure test set to the disconnected fuel return line and hold it in the

measuring container.

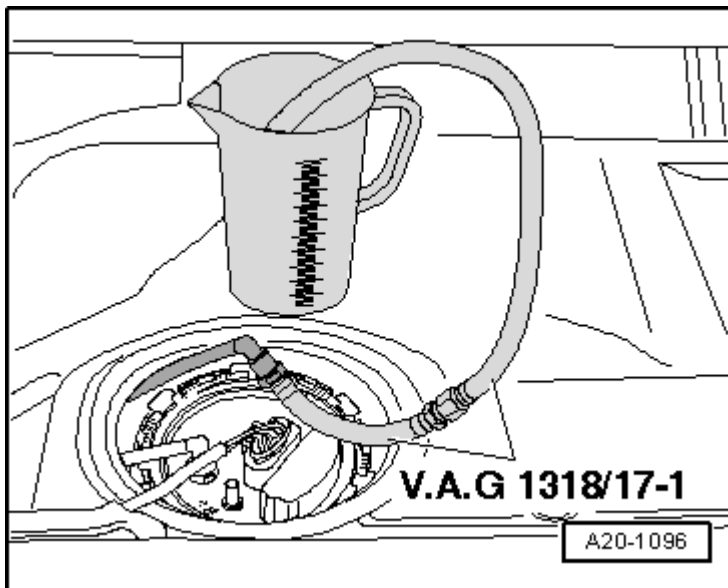


Fig. 54: Adapter V.A.G 1318/17-1 Connected To Disconnected Fuel Return Line And Placed In Measuring Container

Courtesy of AUDI OF AMERICA, LLC

- Press the switch on the remote control (jumper) and operate the fuel pump for 15 seconds.
- Compare quantity of fuel delivered with minimum delivery rate in the diagram ($\text{cm}^3 / 30 \text{ sec.}$).

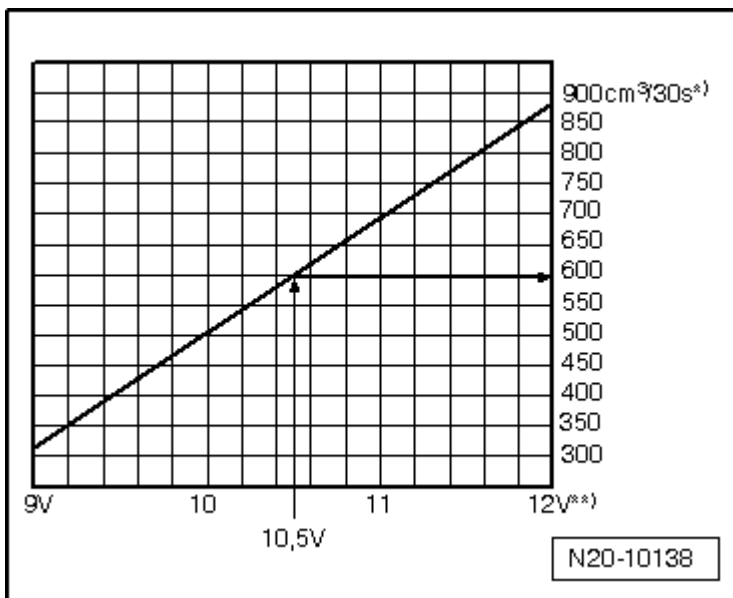


Fig. 55: Fuel Quantity Graph

Courtesy of AUDI OF AMERICA, LLC

NOTE: Voltage at the fuel pump with engine stopped and fuel pump running is approx.

2 volts less than battery voltage.

If minimum delivery quantity is not obtained, the following malfunctions may be present:

- Fuel lines pinched.
- Fuel filter plugged.
- Fuel pump faulty.

-- If necessary, repair any pinched or plugged lines.

If the filter is restricted;

-- Replace the fuel filter. Refer to appropriate service information.

If the fuel pump is faulty;

-- Replace the fuel pump. Refer to appropriate service information.

Assembly is performed in reverse order of removal. Note the following:

-- Install the rear seat bench. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

FUEL PRESSURE TEST**Special tools and workshop equipment required**

- multimeter.
- fuel line adapter set V.A.G. 1318/17A. These tools may be substituted with an equivalent aftermarket tool and are also available for rental or purchase through Audi.
- In- line fuel pressure gauge with shutoff valve. (high pressure).

Test conditions

- Battery voltage 12.5 V
- Function and voltage supply for the Fuel Pump is OK.
- Fuel tank at least $\frac{1}{4}$ filled.

- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

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

Start diagnosis

-- Disconnect fuel supply line -3- at the supply location and catch any fuel coming out with a shop towel

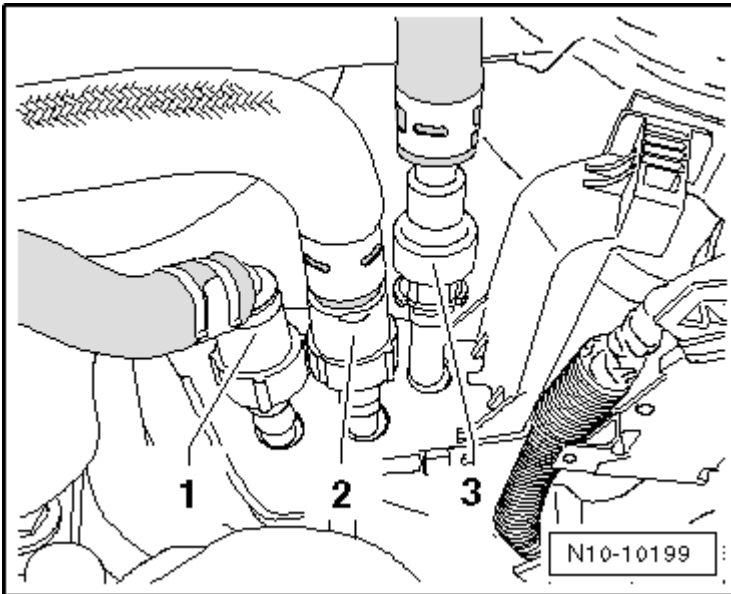


Fig. 56: Identifying Breather Line, Vacuum Line & Fuel Supply Line
Courtesy of AUDI OF AMERICA, LLC

NOTE: Pull circlip upward to unlock fuel line

- Install a fuel pressure gauge with appropriate adapters.
- Open shut off valve on fuel gauge.
- Switch ignition on and off repeatedly until fuel pressure stops increasing pressure.
- Read fuel pressure on the gauge.
 - Specified value: 3.5 to 6 bar

If specification is exceeded:

-- Check return line between fuel filter and fuel pump for kinks or blockage.

If no malfunction in fuel return line is found:

-- Pressure relief valve in fuel filter is malfunctioning.

-- Replace the fuel filter. Refer to appropriate service information.

If reading was below the specification:

-- Check fuel pressure at the fuel filter between fuel pump and fuel filter using appropriate adapters

-- Open shut off valve on gauge and start the engine. Allow to idle.

-- Slowly close the pressure gauge shut off and note the fuel pressure.

- Pressure must increase to 6 bar.

When 6 bar is reached: Open shut off tap immediately!

If pressure has increased during test:

-- Fuel pump is OK. Pressure relief valve in fuel filter is malfunctioning.

-- Replace the fuel filter. Refer to appropriate service information.

If pressure did not increase:

-- Fuel pump is faulty

-- Replace the fuel pump. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

FUEL PUMP ELECTRICAL, TESTING

Special tools and workshop equipment required

- multimeter.
- Electrical connector test lead set.

Test conditions

- Battery voltage 12.5 V.
- Fuse -27- in Fuse Panel C is OK.

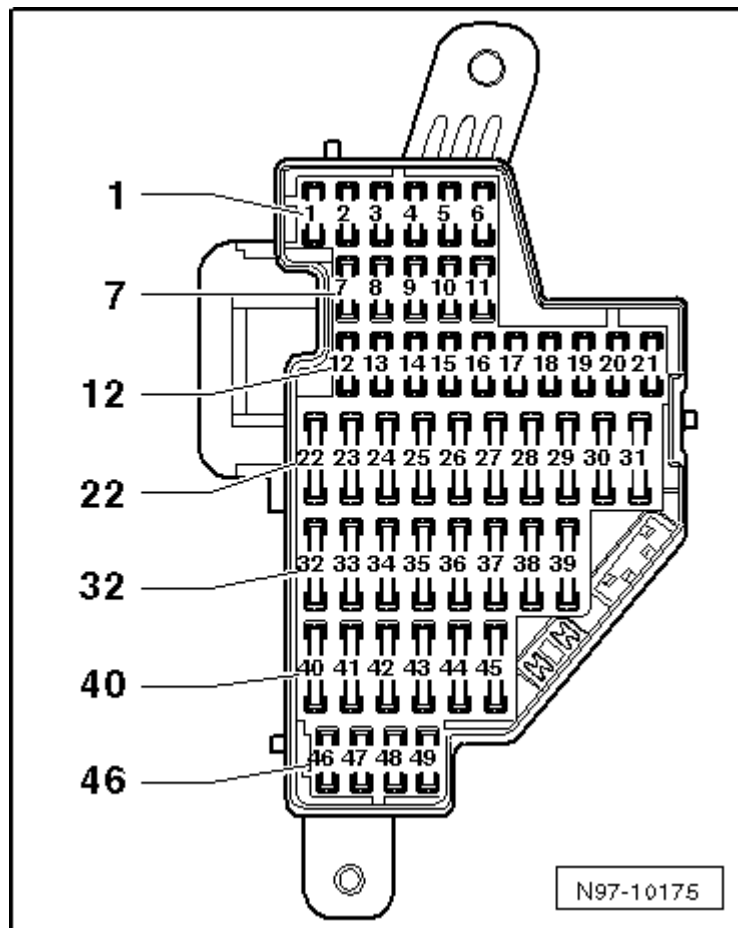


Fig. 57: Identifying Fuse Holder In Instrument Panel (Rabbit/GTI, EOS)
 Courtesy of AUDI OF AMERICA, LLC

- Fuel filter OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

- Remove rear seat bench. Refer to appropriate service information.
- Remove the Fuel Pump Control Module from the retaining clips on the floor sealing cover.

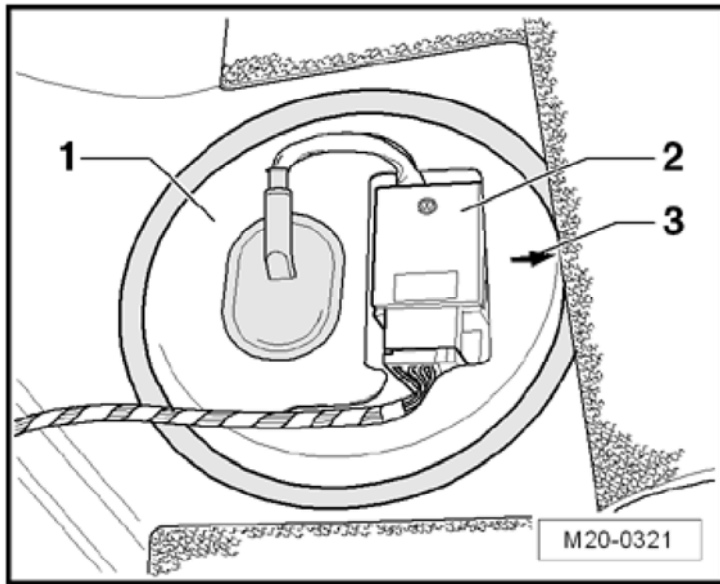


Fig. 58: Fuel Pump Control Module, Retaining Clips & Floor Sealing Cover
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the electrical harness connector -arrow- from the Fuel Pump Control Module.

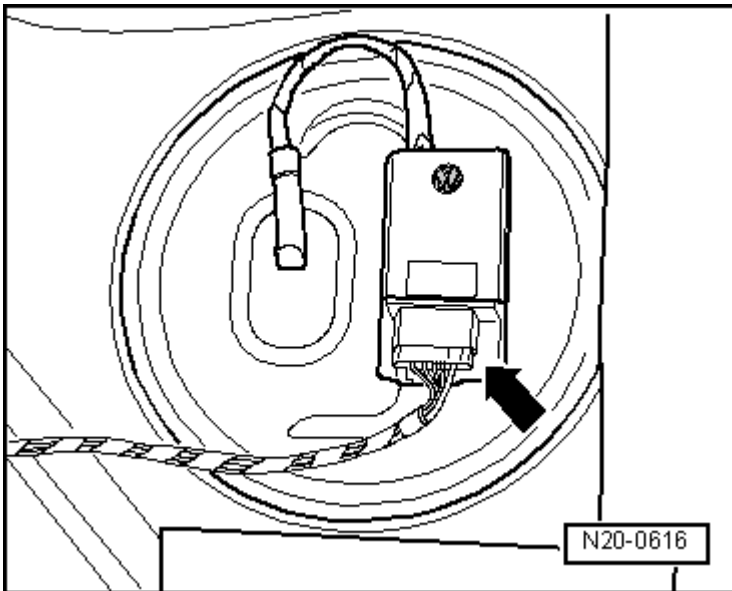


Fig. 59: Identifying Fuel Pump (FP) Control Module J538 Connector
Courtesy of AUDI OF AMERICA, LLC

- Connect the multimeter ground lead to terminal -6- of the Fuel Pump Control Module harness connector.
- Connect the multimeter positive lead to terminal -1- of the Fuel Pump Control Module harness connector.

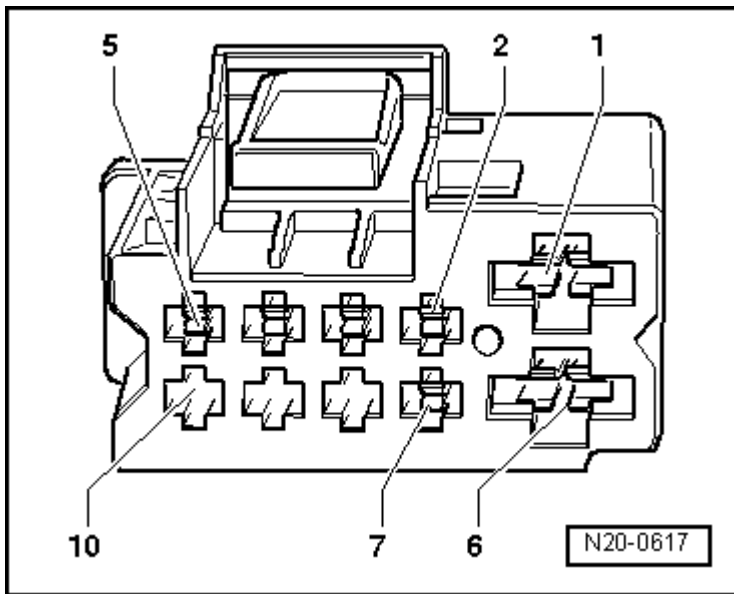


Fig. 60: Checking Fuel Pump (FP) Control Module J538 Electrical Harness Connector Terminals 1 To 6 For Voltage

Courtesy of AUDI OF AMERICA, LLC

- Turn the Ignition key to the ON position.
- The meter should read within 1 volt of battery voltage.
- If voltage is below specification, locate wiring fault in ground or power circuit. Refer to wiring diagram for location.
- If voltage is OK, connect multimeter positive lead to terminal -3- of the Fuel Pump Control Module harness connector. The ground lead remains on terminal -6-
- Crank the engine and note voltage displayed on multimeter during crank. Voltage should be within 2.5 volts of battery voltage.
- If voltage is below specification, locate wiring fault in the power circuit. Refer to wiring diagram for location.
- If voltage is OK, connect multimeter positive lead to terminal -2- of the Fuel Pump Control Module harness connector. The ground lead remains on terminal -6-
- Crank the engine and note voltage displayed on multimeter during crank. Voltage should be 3.2 volts (+/- .4)
- If voltage is below specification, check circuit from Fuel Pump Control Module to ECM for open, short or high resistance and repair as necessary. If no circuit fault is found, replace ECM.
- If voltage is OK, reconnect the wiring harness to the Fuel Pump control Module.

Test procedure for Fuel Pump Control Module

- Remove the floor sealing cover to access the Fuel Delivery Unit (fuel pump).
- Disconnect the harness connector from the Fuel Delivery Unit.
- Connect the multimeter positive lead to terminal -1- of the Fuel Delivery Unit harness connector.
- Connect the multimeter ground lead to terminal -5- of the Fuel Delivery Unit harness connector.

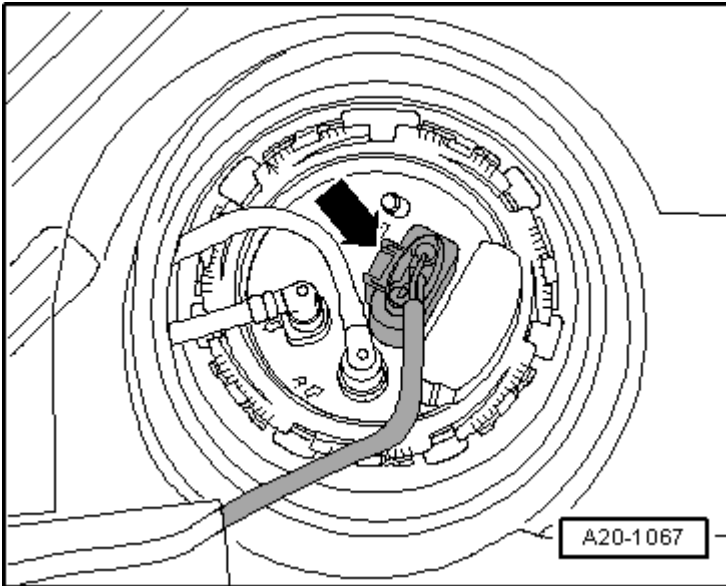


Fig. 61: Identifying Fuel Delivery Unit Connector
Courtesy of AUDI OF AMERICA, LLC

- Crank the engine and note voltage displayed on multimeter during crank. Voltage should be within 2.5 volts of battery voltage.
- If voltage is below specification, replace the Fuel Pump Control Module.
- If voltage is within specification, replace the Fuel Delivery Unit (Fuel Pump). Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

TRANSFER FUEL PUMP, CHECKING

NOTE: Models with an airbag are installed with a crash fuel shut-off system. It reduces

the danger of a fire in a crash as the fuel pump is switched off via the fuel pump relay.

When the door is opened the fuel pump is activated for 2 seconds to build up the pressure in the fuel system.

Special tools and workshop equipment required

- Hand held remote control (jumper).
- Multimeter.
- Electrical connector test lead set.

Test conditions

- Battery voltage at least 12.5 volts..
- Fuel Pump (FP) Relay -J17- OK.
- Fuel filter OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Test sequence

- Remove the rear seat bench. Refer to the appropriate service information.
- Remove cover retainers from the right sealing flange.
- Disconnect the electrical harness connector from the Transfer Fuel Pump (FP) -G6- fuel delivery unit.
- Connect a hand-held remote control (jumper) to terminal 5 of the fuel delivery unit and to vehicle battery (+).
- Connect a jumper cable from an Electrical connector test lead set to terminal 1 of the fuel delivery unit and to vehicle Ground (GND).

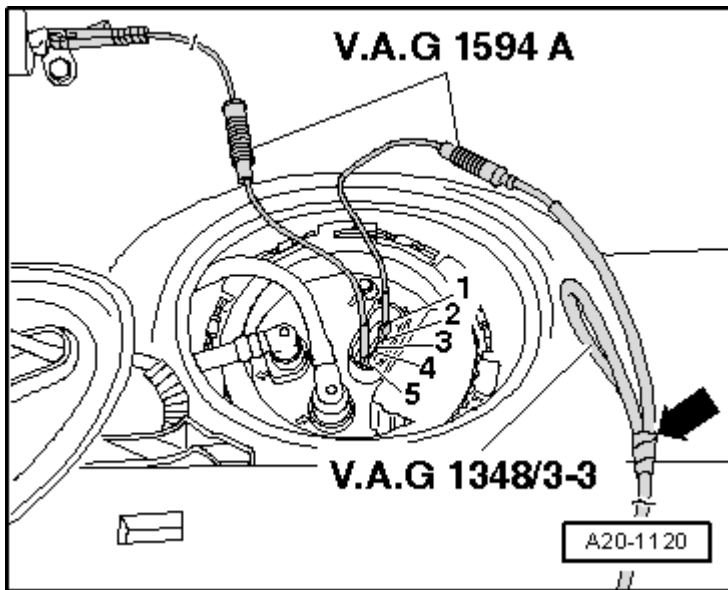


Fig. 62: A Jumper Cable From A Electrical Connector Test Lead Set Connected To Terminal Of Fuel Delivery Unit And To Vehicle Ground
Courtesy of AUDI OF AMERICA, LLC

-- Press switch on the hand-held remote control (jumper).

NOTE: **The Fuel Pump (FP) runs quietly. Avoid surrounding noises while testing the fuel pump.**

-- Listen for an operating noise from the fuel pump.

If no operating noise is heard:

-- Remove the fuel delivery unit.

-- Using a multimeter, check the electrical circuit between terminals 1 to and 5 of the fuel delivery unit pump motor for resistance.

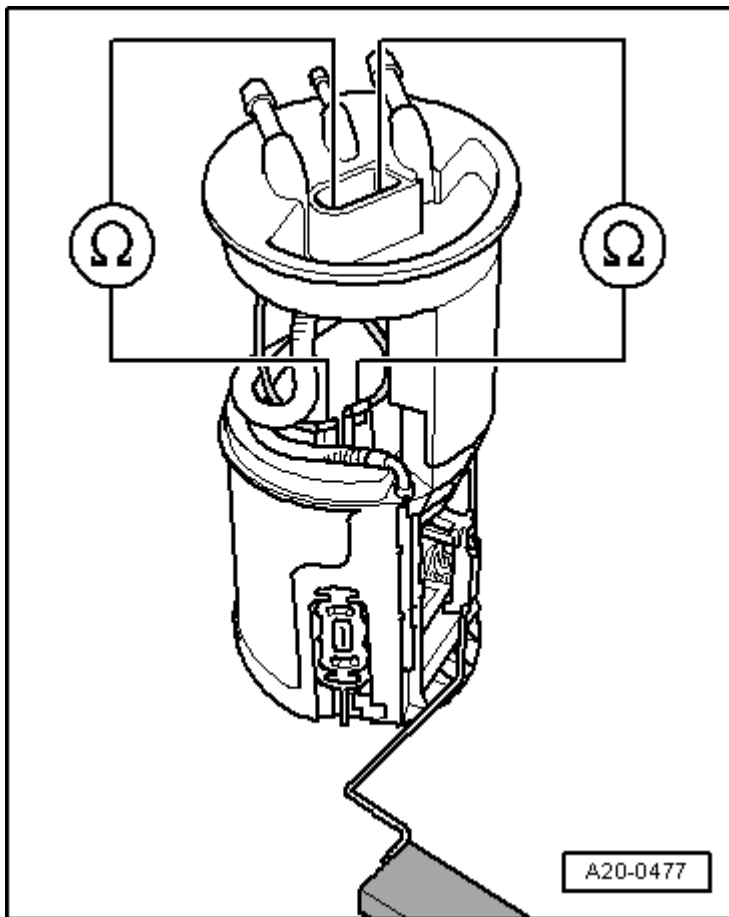


Fig. 63: Checking Electrical Circuit Between Terminals And Of Fuel Delivery Unit For Resistance
Courtesy of AUDI OF AMERICA, LLC

Specified value: 1.5 ohms max.

If the specification was not obtained:

- Check the wiring for an open circuit, a short circuit to Battery positive (+) or to Ground (GND).
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the wiring connection.

If the specification was obtained:

- Replace the fuel delivery unit.

Final procedures

After repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.

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2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

FUEL PUMP CONTROL MODULE, CHECKING

Special tools and workshop equipment required

- multimeter
- Wiring diagram.

Test requirements

- Motronic Engine Control Module (ECM) Power Supply Relay -J271- OK
- Fuse -SC3- OK.
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, selector lever in position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customer's complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove rear seat assembly. Refer to the appropriate service information.

Checking voltage

Switch the ignition on.

-- Using a multimeter, check the following wiring connection for voltage.

Fuel Pump (FP) Control Module J538 Terminal	Measure to
3	Chassis Ground (GND)

Specified value: Battery voltage

-- Switch the ignition off.

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If the specified value was not obtained:

-- Check the Fuel Pump (FP) Control Module -J538- wiring harness terminal 3 to the Motronic Engine Control Module (ECM) Power Supply Relay -J271- terminal 8 for an open circuit or short to Ground (GND).

-- Check the electrical harness connectors for damage, corrosion, loose or broken terminals.

-- If necessary, repair the wiring connection.

Checking Ground (GND)

-- Using a multimeter, check the Fuel Pump (FP) Control Module -J538- wiring harness terminal 1 to T5a/1, black 5 pin connector, for resistance.

Fuel Pump (FP) Control Module J538 Terminal	Measure to
1	T5e/1, black 5 pin connector
2	T5e/5, black 5 pin connector
5	T94/42

Specified value: 1.5 ohms maximum.

If the specified value was not obtained:

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the wiring connection.

If no malfunctions are found in the wiring and the voltage supply was OK:

-- Replace the Fuel Pump (FP) Control Module -J538-. Refer to the appropriate service information.

-- Perform a road test to verify repair.

If the fault does not return:

Generate readiness code. Refer to **READINESS CODE**.

If the fault does return and no malfunction is detected in the wiring and the voltage supply was OK:

-- Replace the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Assembly is performed in the reverse of the removal.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

FUEL METERING VALVE, CHECKING

The following procedure is used to diagnose the Fuel Metering Valve -N290- which is controlled by Engine Control Module -J623-.

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- The Engine Component Power Supply Relay -J757- OK.
- The Fuse -SB5- OK.
- The fuel filter OK.
- The parking brake engaged.
- The battery voltage at least 12.5 V.
- The selector lever of automatic transmission in position "P" or "N".
- All electrical consumers switched off.
- A/C switched off.
- The fuel tank at least $\frac{1}{4}$ filled.
- The ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start diagnosis

-- Located on the high pressure pump, right side of cylinder head.

-- Disconnect the Fuel Metering Valve -N290- electrical harness connector -2-.

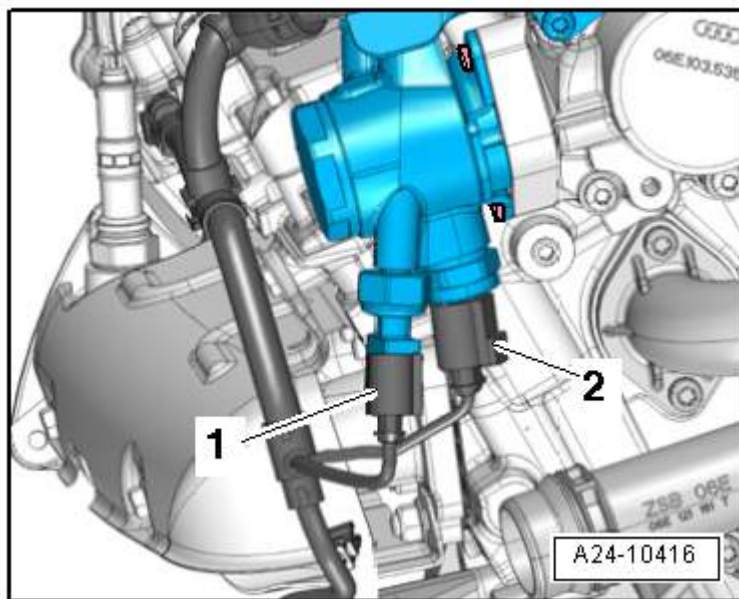


Fig. 64: Component Location On High Pressure Pump
Courtesy of AUDI OF AMERICA, LLC

Checking internal resistance

-- Using a multimeter, check the Fuel Metering Valve -N290- terminals 1 to 2 for resistance

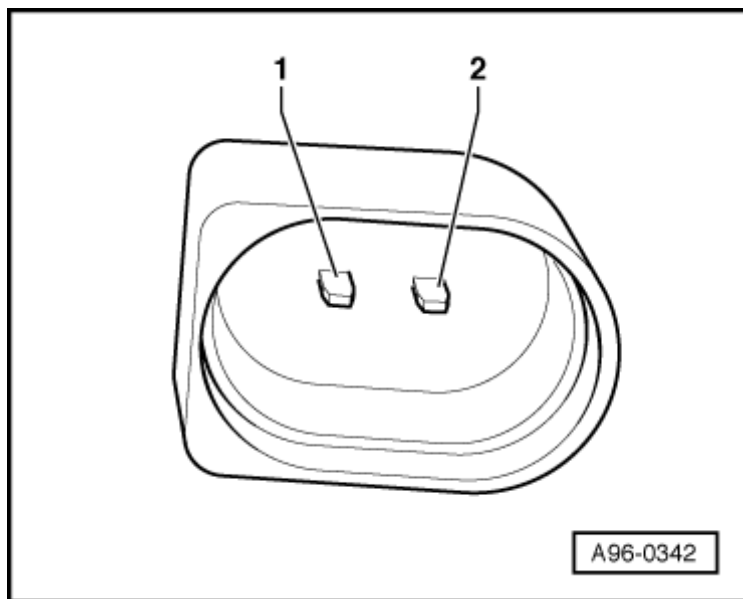


Fig. 65: Identifying Engine Coolant Temperature (ECT) Sensor G62 Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: 450 to 1000 ohms.

If the specified value was not obtained:

-- Replace the Fuel Metering Valve -N290-. Refer to the appropriate service information

If the specified value was obtained:

Checking voltage

Crank the engine.

-- Using a multimeter, check the Fuel Metering Valve -N290- electrical harness connector terminal 1 to Ground (GND) for voltage.

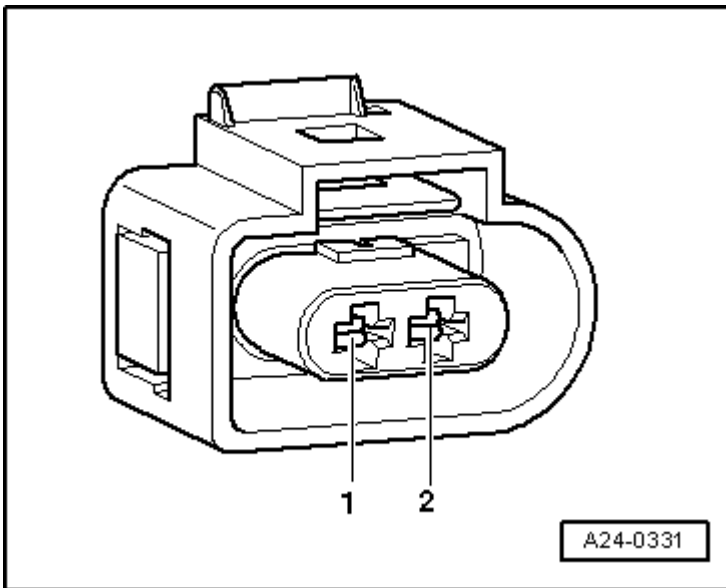


Fig. 66: 2-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: battery voltage.

-- Switch the ignition off.

If the specified value was not obtained:

-- Check the wiring from the Fuel Metering Valve -N290- electrical harness connector terminal 1 to the Engine Component Power Supply Relay -J757- socket 8 for an open circuit or a short circuit to Ground (GND).

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the wiring connection.

If no malfunctions are found in the wiring:

Checking wiring connections

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Fuel Metering Valve -N290- electrical harness connector terminal 2 to the Engine Control Module (ECM) -J623- electrical harness connector T60 terminal 60 for resistance.

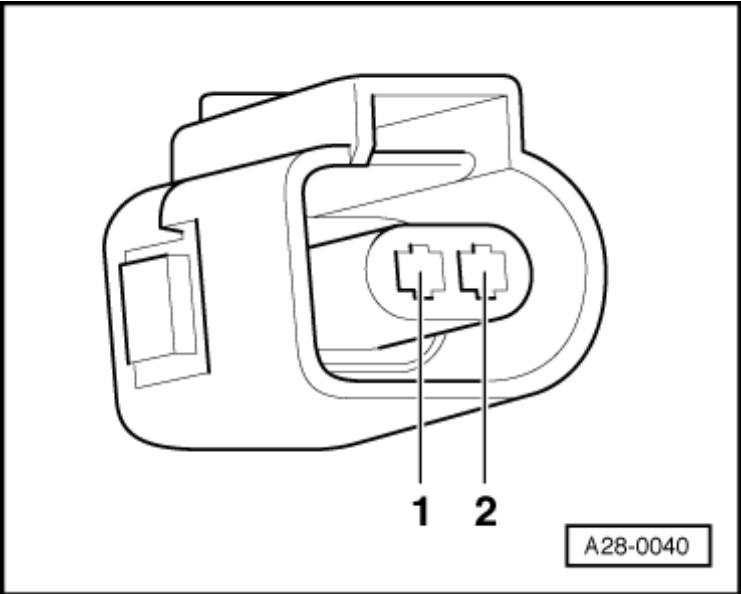


Fig. 67: 2-Pin Electrical Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Fuel Metering Valve -N290- electrical harness connector terminal		Engine Control Module (ECM) - J623- electrical connector T60 terminal or test box socket
2		60

Specified value: 1.5 ohms Max.

If the specification was not obtained:

- Check the wiring for an open circuit, a short circuit to each other, Battery (+) or Ground (GND).
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring:

- Erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
- Perform a road test to verify repair.

If the DTC does not return:

Repair complete, Generate readiness code. Refer to **READINESS CODE**.

- End diagnosis.

If the DTC returns and no malfunction is found in the wiring and voltage supply was OK:

- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

Assembly is performed in the reverse order of the removal, note the following:

Final procedures

After repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

IGNITION COIL WITH POWER OUTPUT STAGE, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- multimeter.

- Diode test lamp.
- Wiring diagram.

Test requirements

- The Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324- fuses OK.

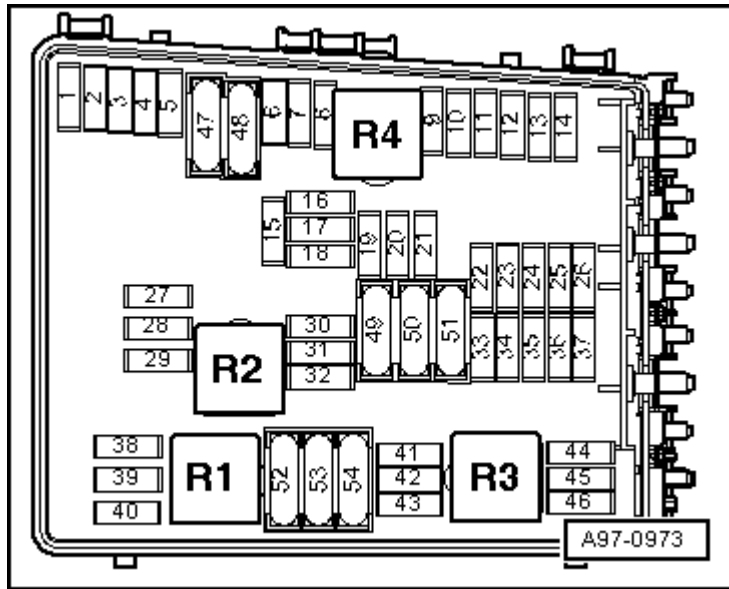


Fig. 68: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- The Motronic Engine Control Module (ECM) Power Supply Relay -J271- OK.
- The Engine Speed (RPM) Sensor -G28- OK.
- The Camshaft Position (CMP) Sensor -G40- OK.
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the engine cover with air filter. Refer to appropriate service information.

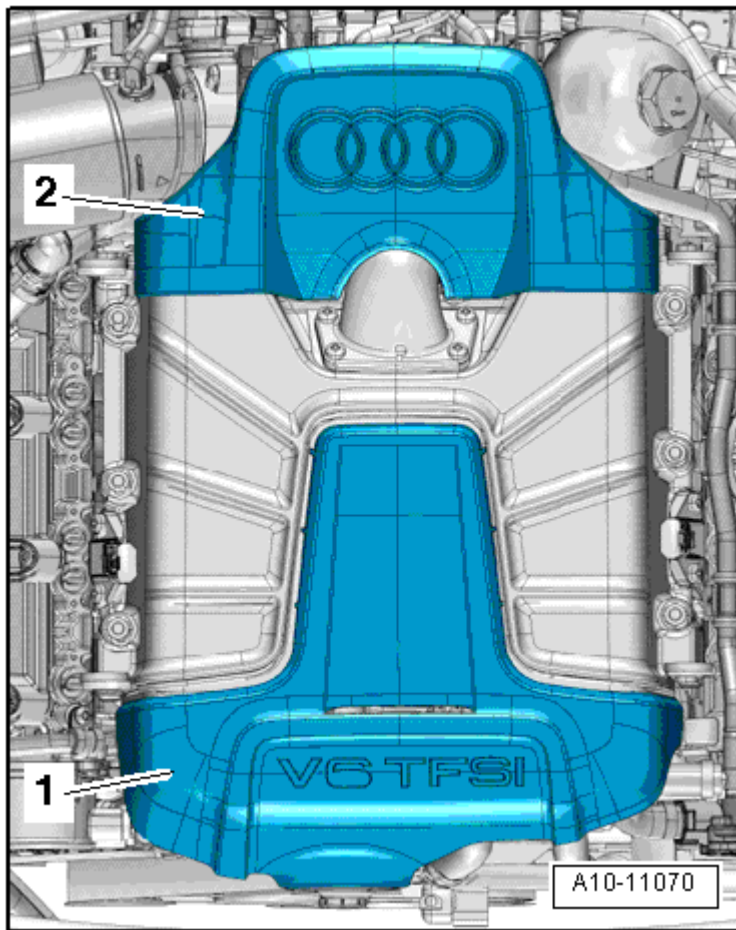


Fig. 69: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

-- Remove the Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324- electrical harness screws -1-.

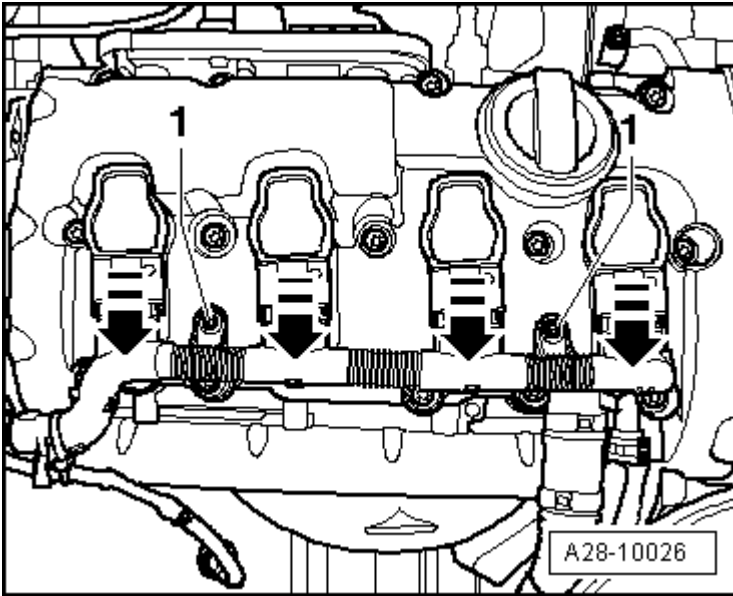


Fig. 70: Identifying Removal Of Ignition Coils Electrical Harness Screws
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324- electrical harness connectors -arrows- from the Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324-.

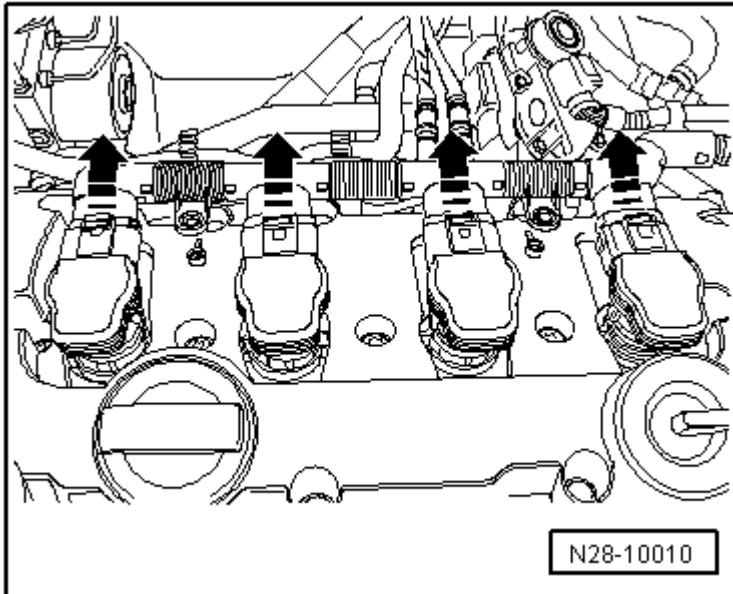


Fig. 71: Disconnecting Connectors Of Ignition Coils
Courtesy of AUDI OF AMERICA, LLC

Checking voltage supply

-- Switch the ignition on.

-- Using a multimeter, check the Ignition Coil -- electrical harness connector terminals 1 to 4 for voltage.

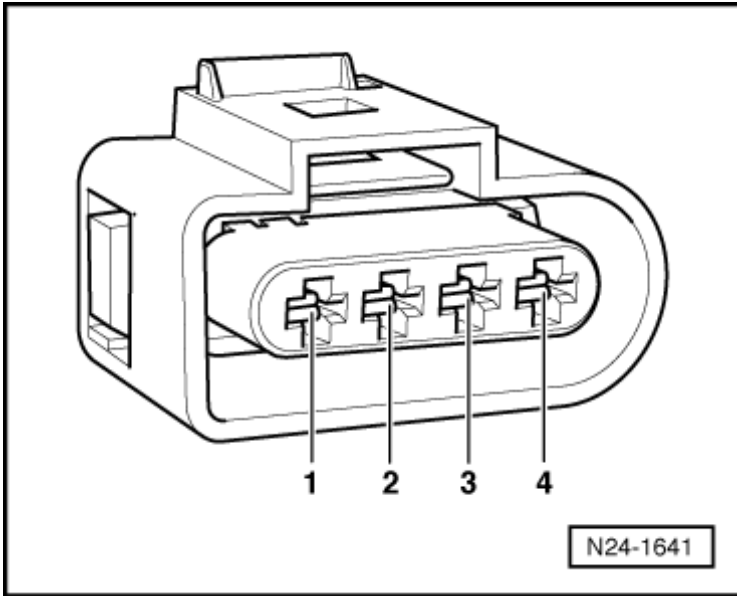


Fig. 72: 4-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: battery voltage.

-- Switch the ignition off.

If the specified value was not obtained:

-- Check the Ignition Coil -- electrical harness connector terminal 1 to the Motronic Engine Control Module (ECM) Power Supply Relay -J271 - terminal 8 for an open circuit.

Specified value: 1.5 ohms Max.

If the specified value was not obtained:

-- Check the wiring connection for an open circuit.

-- Check the wiring connection for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If the specified values were obtained:

Checking activation

WARNING: Do not touch the Ignition Coils -- connecting parts or adapter cables during the following test.

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-- Disable the power supply to the Fuel Injectors -N30, N31, N32, N33, N83, N84- by removing Fuse 29 (on fuse panel B) from the fuse holder SB29, in the E-box, plenum chamber.

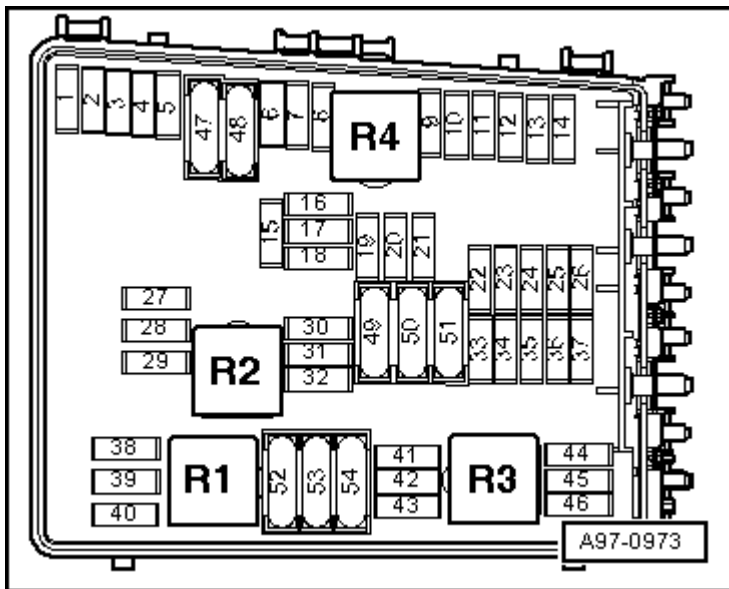


Fig. 73: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

-- Using a diode test lamp, check the Ignition Coil -- electrical harness connector terminals 2 to 3 for voltage.

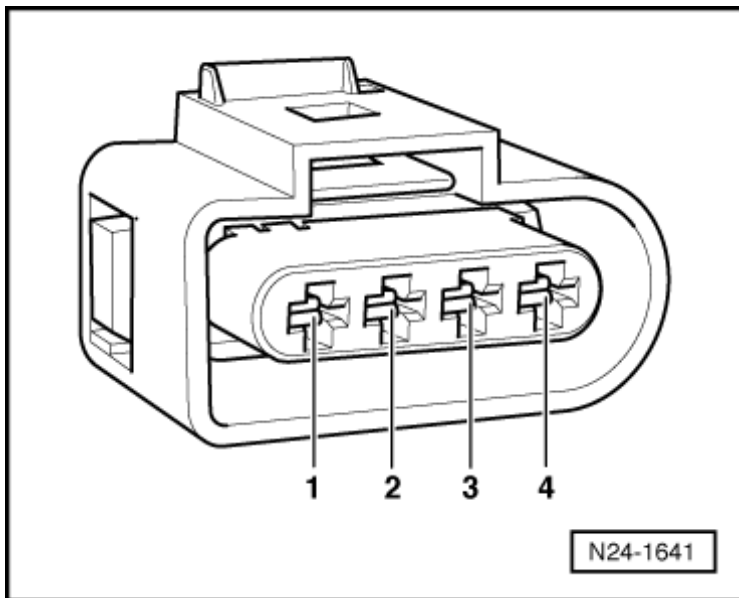


Fig. 74: 4-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

-- Operate the starter.

The LED should flicker.

-- Switch the ignition off.

If the LED flickers and the voltage was OK:

-- Replace the faulty Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324-. Refer to appropriate service information.

If the LED does not flicker:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, Check the Ignition Coil -- electrical harness connector to the Motronic Engine Control Module (ECM)J623 electrical harness connector T60 for an open circuit.

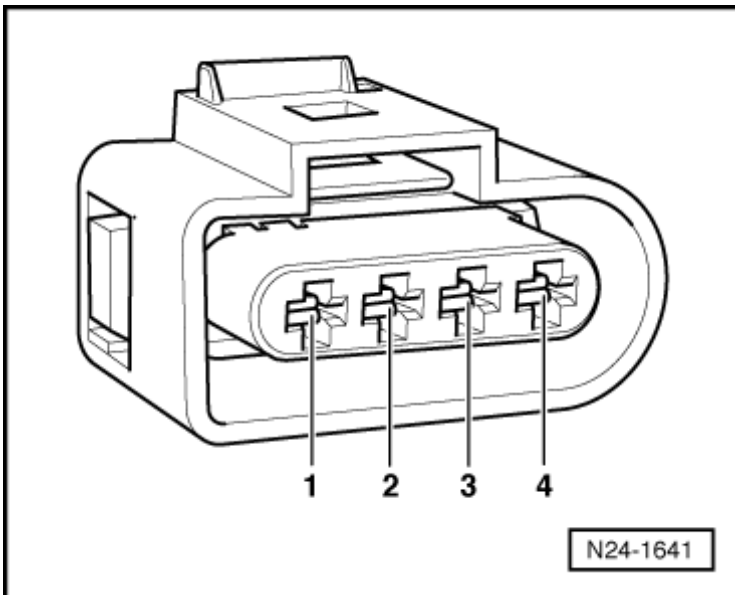


Fig. 75: 4-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

**Motronic
Engine
Control
Module
(ECM)**

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324- electrical harness connector terminal	electrical harness connector T60 terminal or test box socket
N70-3	21
N127-3	23
N291-3	8
N292-3	6
N323-3	22
N324-3	7

Specified value: 1.5 ohms Max.

If the specified value was not obtained:

- Check the wiring connection for an open circuit.
- Check the wiring connection for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If the specified values were obtained:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.
- Connect the Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324- electrical harness connectors -arrows- to the Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324-.

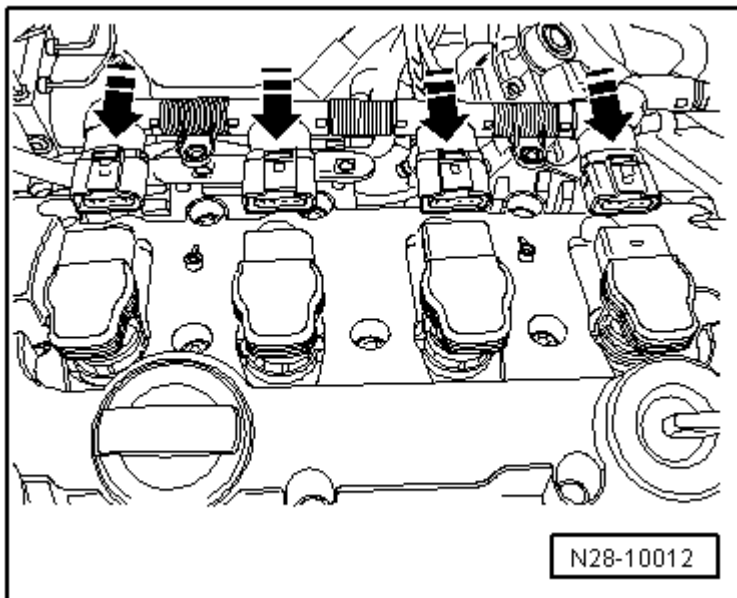


Fig. 76: Connecting Connectors To Ignition Coils
 Courtesy of AUDI OF AMERICA, LLC

-- Install the Ignition Coils with Power Output Stage - N70, N127, N291, N292, N323, N324- electrical harness screws -1-.

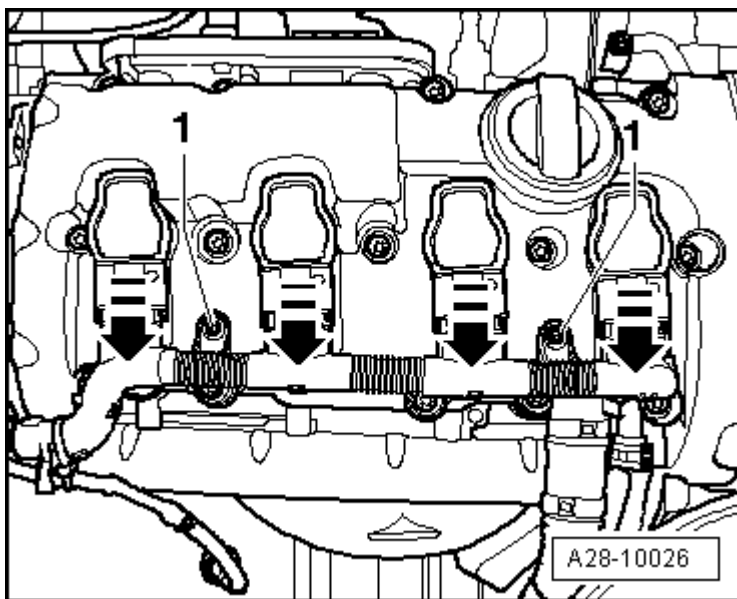


Fig. 77: Identifying Removal Of Ignition Coils Electrical Harness Screws
 Courtesy of AUDI OF AMERICA, LLC

-- Install the engine cover with air filter. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

INTAKE MANIFOLD RUNNER POSITION SENSOR, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- multimeter
- Wiring diagram.

Test requirements

- The Motronic Engine Control Module (ECM) - J623- fuses OK.

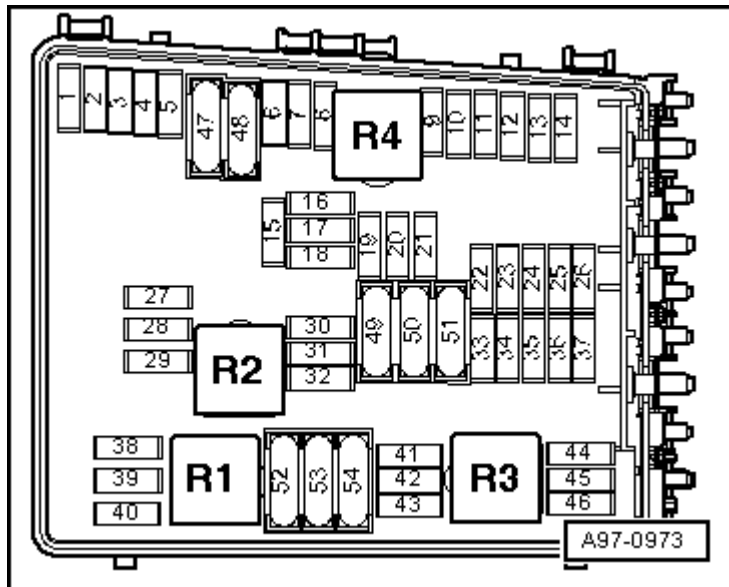


Fig. 78: Fuses On E-Box In Engine Compartment, Left Side
 Courtesy of AUDI OF AMERICA, LLC

- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.

- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the engine cover with air filter. Refer to appropriate service information.

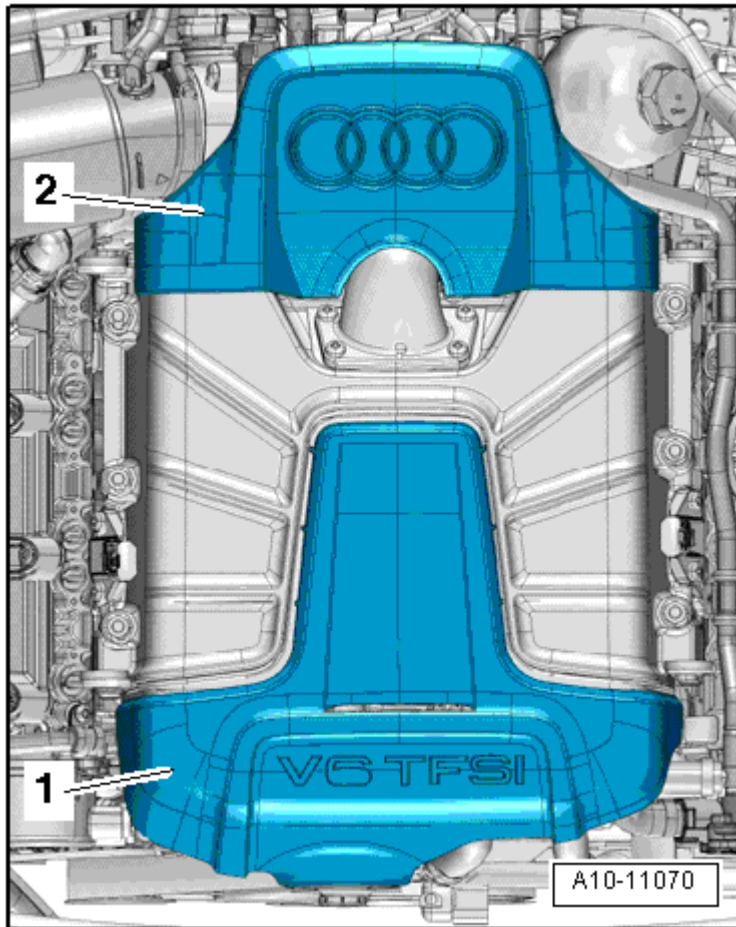


Fig. 79: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the Intake Manifold Runner Position Sensor -G336- electrical harness connector -1-.

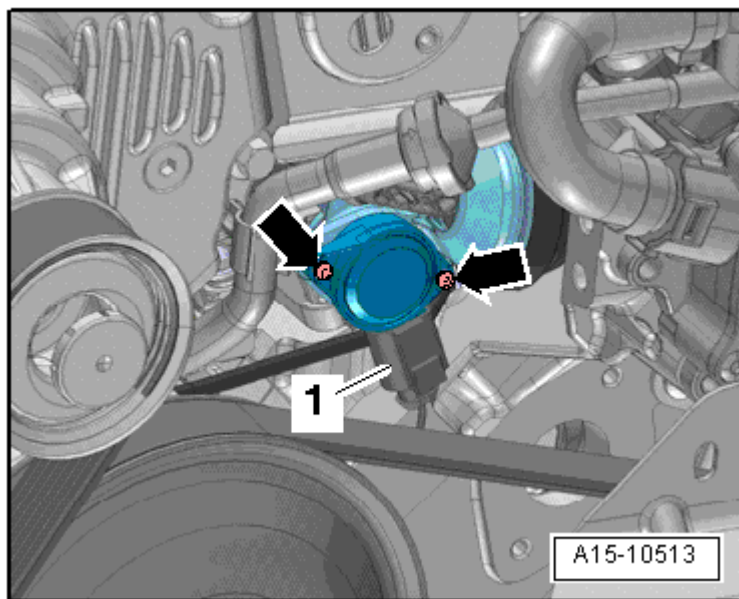


Fig. 80: Intake Manifold Runner Position Sensor -G336-
Courtesy of AUDI OF AMERICA, LLC

-- Switch the ignition on.

-- Using a multimeter, check the Intake Manifold Runner Position Sensor -G336- electrical harness connector terminals 1 to 3 for voltage.

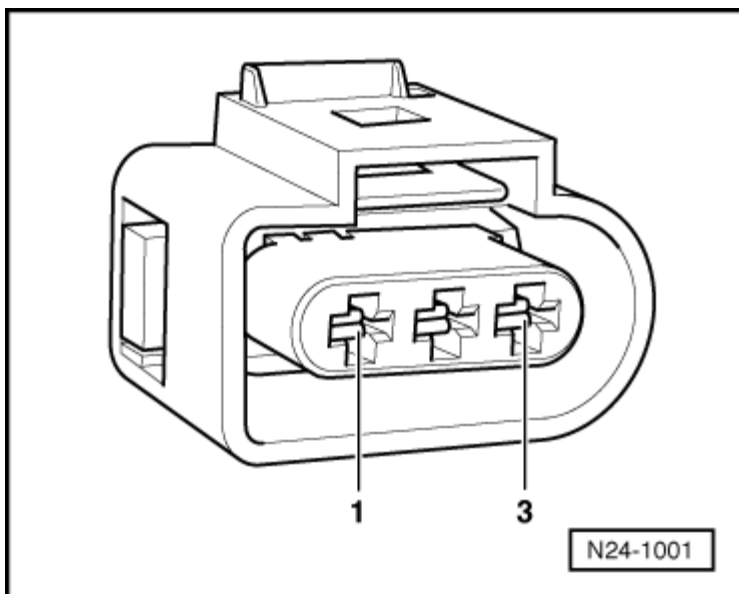


Fig. 81: 3-Pin Electrical Harness Connector
Courtesy of AUDI OF AMERICA, LLC

Specified value: about 5 V

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

-- Switch ignition off.

If the specified value was not obtained:

-- Check and/or repair wiring as required.

If the specified value was obtained:

Checking internal resistance

-- Using a multimeter, check the Intake Manifold Runner Position Sensor -G336- electrical terminals 2 to 3 for resistance.

Specified value: 7-25 ohms (at approx. 20° C)

-- Using a multimeter, check the Intake Manifold Runner Position Sensor -G336- electrical terminals 1 to 3 for resistance.

Specified value: 244 [+/- 40] ohms (at approx. 20° C)

If the specified values were not obtained:

-- Replace the Intake Manifold Runner Position Sensor -G336-. Refer to appropriate service information.

If the specified value was obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Intake Manifold Runner Position Sensor -G336- electrical harness connector terminals to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T94 terminals for an open circuit.

Intake Manifold Runner Position Sensor -G336- electrical harness connector terminals

**Motronic
Engine
Control
Module
(ECM) -
J623-
electrical**

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

	connector T94 terminals or test box socket
1	T60/35
2	T94/13
3	T94/39

Specified value: 1.5 ohms Max.

If the specification was not obtained:

- Check the wiring for a short circuit to Battery (+), or an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.
- Install the engine cover with air filter. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

INTAKE MANIFOLD RUNNER POSITION SENSOR 2, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- multimeter
- Wiring diagram.

Test requirements

- The Motronic Engine Control Module (ECM) - J623- fuses OK.

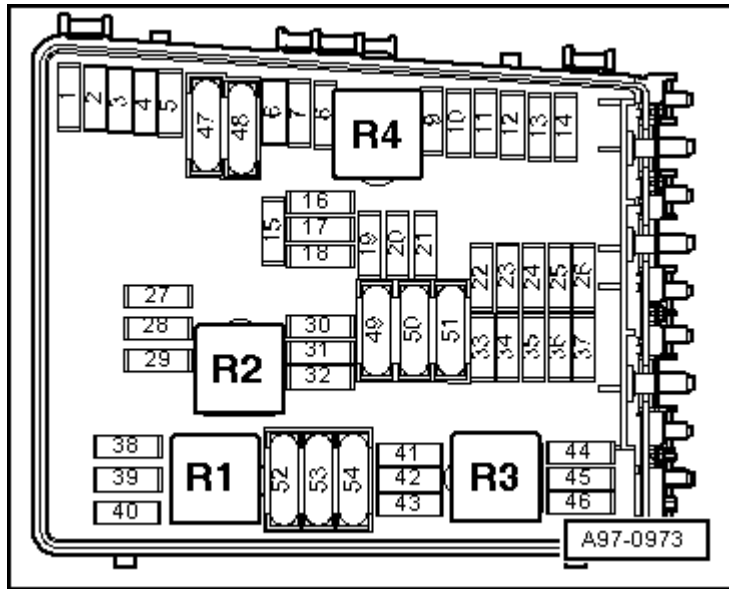


Fig. 82: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the engine cover with air filter. Refer to appropriate service information.

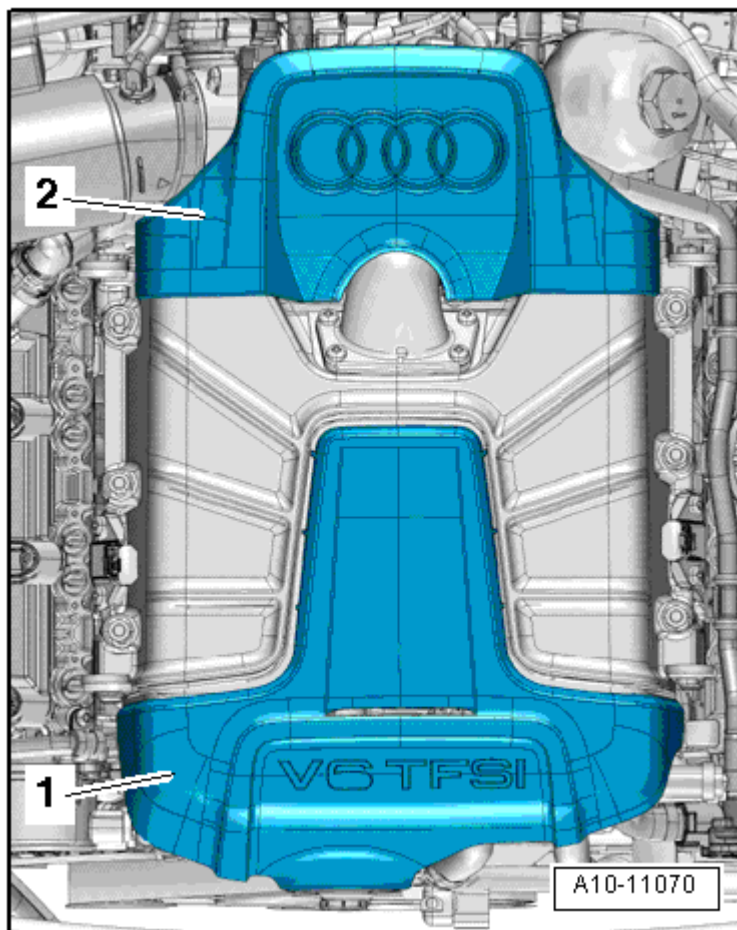


Fig. 83: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the Intake Manifold Runner Position Sensor 2 -G512- electrical harness connector -1-.

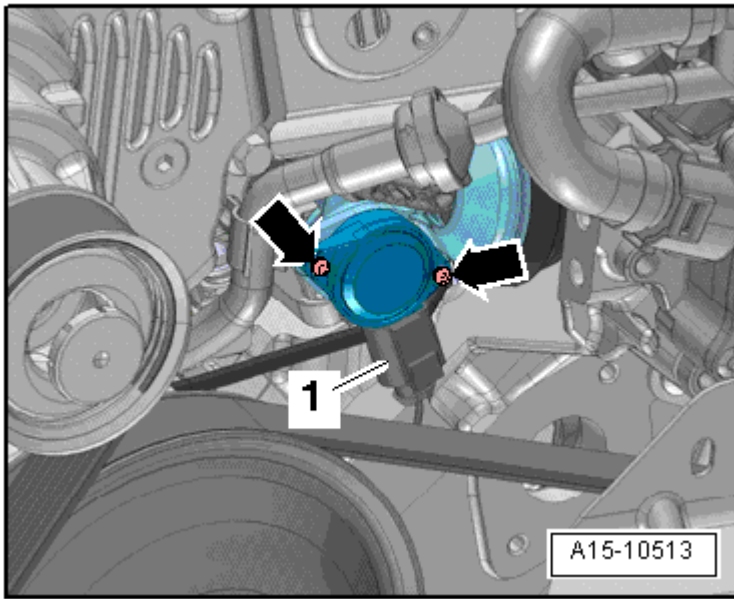


Fig. 84: Intake Manifold Runner Position Sensor -G336-
Courtesy of AUDI OF AMERICA, LLC

-- Switch the ignition on.

-- Using a multimeter, check the Intake Manifold Runner Position Sensor 2 -G512- electrical harness connector terminals 1 to 3 for voltage.

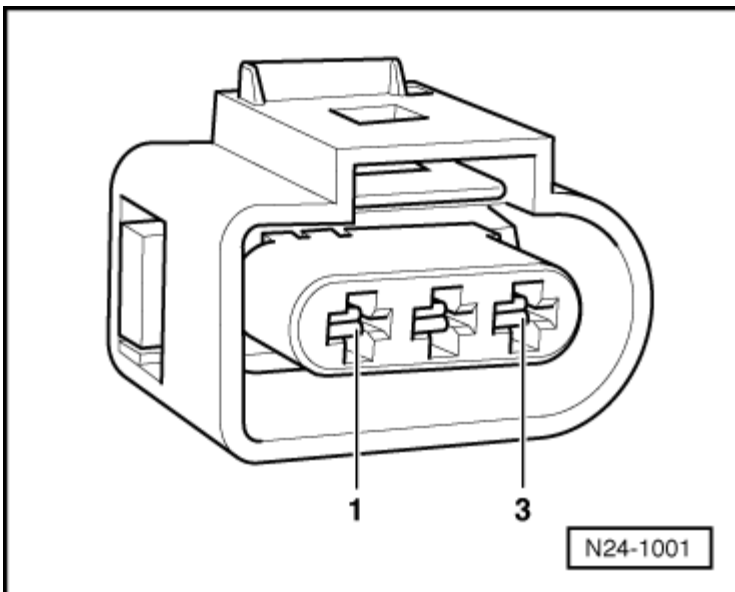


Fig. 85: 3-Pin Electrical Harness Connector
Courtesy of AUDI OF AMERICA, LLC

Specified value: about 5 V

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

-- Switch ignition off.

If the specified value was not obtained:

-- Check and/or repair wiring as required.

If the specified value was obtained:

Checking internal resistance

-- Using a multimeter, check the Intake Manifold Runner Position Sensor 2 -G512- electrical terminals 2 to 3 for resistance.

Specified value: 7-25 ohms (at approx. 20° C)

-- Using a multimeter, check the Intake Manifold Runner Position Sensor 2 -G512- electrical terminals 1 to 3 for resistance.

Specified value: 244 [+/- 40] ohms (at approx. 20° C)

If the specified values were not obtained:

-- Replace the Intake Manifold Runner Position Sensor 2 -G512-. Refer to appropriate service information.

If the specified value was obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Intake Manifold Runner Position Sensor 2 -G512- electrical harness connector terminals to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T94 terminals for an open circuit.

Intake Manifold Runner Position Sensor 2 -G512- electrical harness connector terminals

**Motronic
Engine
Control
Module
(ECM) -
J623-
electrical**

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

	connector T94 terminals or test box socket
1	T60/35
2	T94/35
3	T94/39

Specified value: 1.5 ohms Max.

If the specification was not obtained:

- Check the wiring for a short circuit to Battery (+), or an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.
- Install the engine cover with air filter. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

INTAKE MANIFOLD RUNNER CONTROL VALVE, CHECKING

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- Fuse -SA5- OK.
- The Secondary Air Injection (AIR) Pump Relay -J299- OK.

- The parking brake engaged.
- The battery voltage at least 12.5 V.
- The selector lever of automatic transmission in position "P" or "N".
- All electrical consumers switched off (radiator fan must NOT run during test).
- A/C switched off.
- The fuel tank at least $\frac{1}{4}$ filled.
- The ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start diagnosis

-- Disconnect the Intake Manifold Runner Control (IMRC) Valve -N316- electrical harness connector. -2-

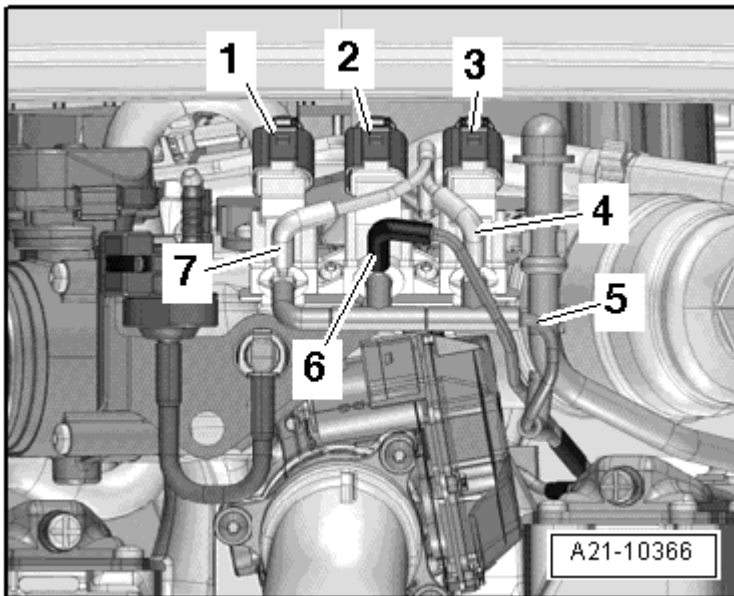


Fig. 86: Installed Location: Secondary Air Injection Solenoid Valve and Intake Manifold Runner Control (IMRC) Valve -N316-

Courtesy of AUDI OF AMERICA, LLC

Checking internal resistance

-- Using a multimeter, check the Intake Manifold Runner Control (IMRC) Valve -N316- terminals 1 to 2 for resistance.

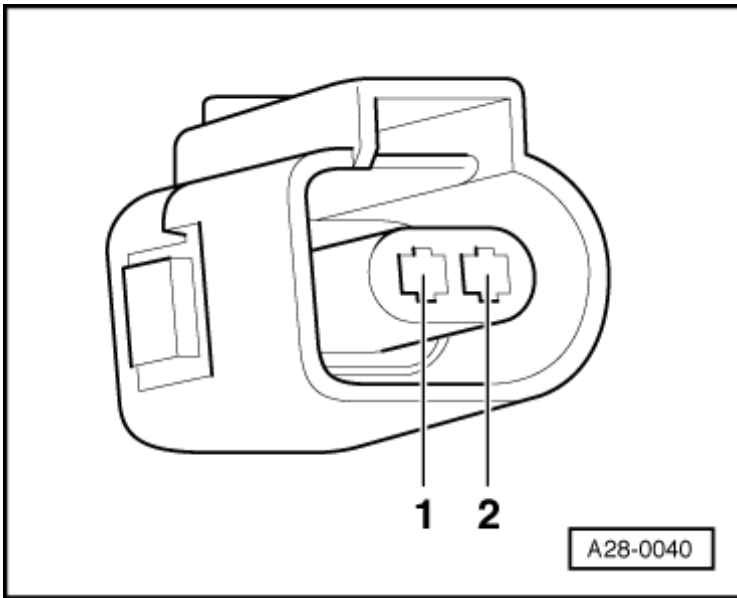


Fig. 87: 2-Pin Electrical Connector & Terminals

Courtesy of AUDI OF AMERICA, LLC

Specified value: 25 [+/-] 10 ohms.

If the specified value was not obtained:

-- Replace the Intake Manifold Runner Control (IMRC) Valve -N316-. Refer to the appropriate service information.

If the specified value was obtained:

Checking voltage

Switch the ignition on.

-- Using a multimeter, check the Intake Manifold Runner Control (IMRC) Valve -N316- electrical harness connector terminal 2 to ground (GND) for voltage.

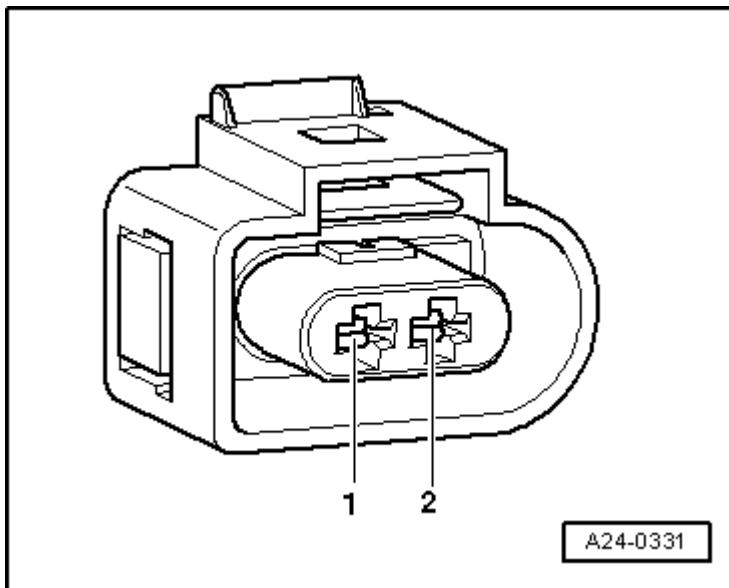


Fig. 88: 2-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: battery voltage.

-- Switch the ignition off.

If the specified value was not obtained:

-- Check the wiring from the Intake Manifold Runner Control (IMRC) Valve -N316- electrical harness connector terminal 2 to fuse SB5 on fuse panel B.

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the wiring connection.

If no malfunctions are found in the wiring:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Using a multimeter, check the Intake Manifold Runner Control (IMRC) Valve -N316- electrical harness connector terminal 1 to the Engine Control Module (ECM) -J623- electrical harness connector.

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

Intake Manifold Runner Control (IMRC) Valve - N316- electrical harness connector terminal	Engine Control Module (ECM) -J623- electrical harness connector terminal or test box socket
1	36

Specified value: 1.5 ohms Max.

If the specification was not obtained:

- Check the wiring for a open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring:

- Erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
- Perform a road test to verify repair.

If the DTC does not return:

Generate readiness code. Refer to **READINESS CODE**.

If the DTC does return and no malfunction is detected in the wiring and the voltage supply was OK:

- Replace the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

KNOCK SENSOR 1, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- Multimeter.
- Wiring diagram.

Test requirements

- The mounting bolt of Knock Sensor (KS) 1 -G61- tightened to 20 Nm.
- The Motronic Engine Control Module (ECM) - J623- fuses OK.

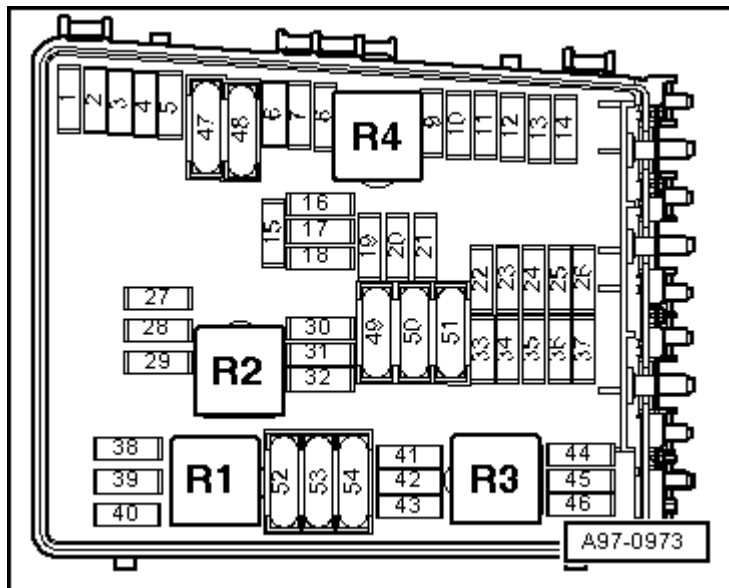


Fig. 89: Fuses On E-Box In Engine Compartment, Left Side
 Courtesy of AUDI OF AMERICA, LLC

- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the engine cover with air filter. Refer to appropriate service information.

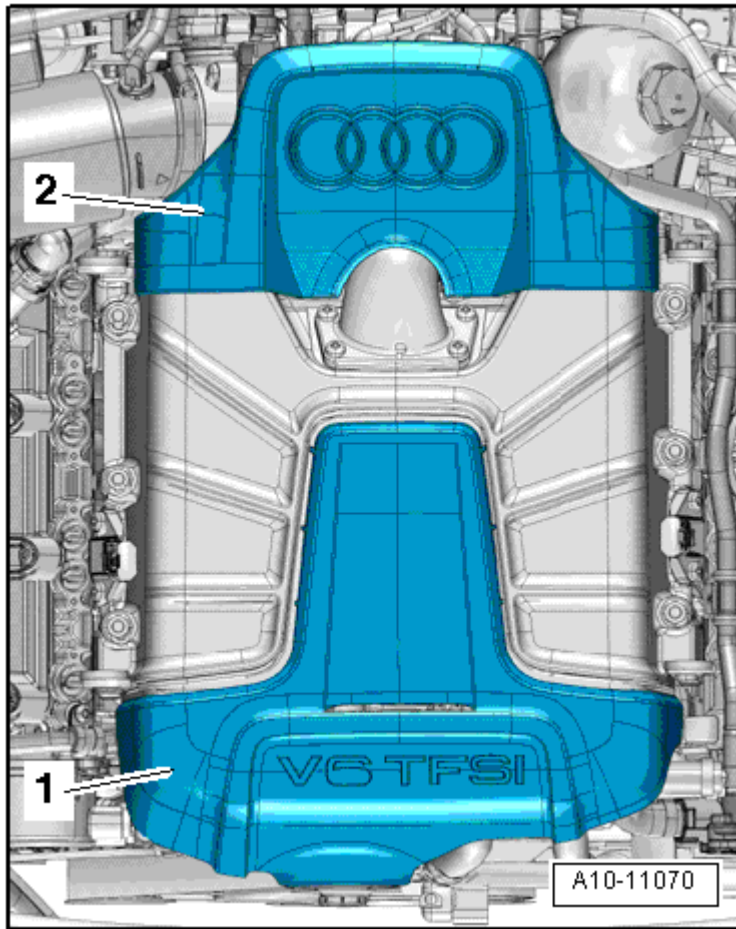


Fig. 90: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

NOTE: Before disconnecting the Knock Sensor -- electrical harness connectors, mark the component location.

-- Disconnect the Knock Sensor (KS) 1 -G61- electrical harness connector -1-.

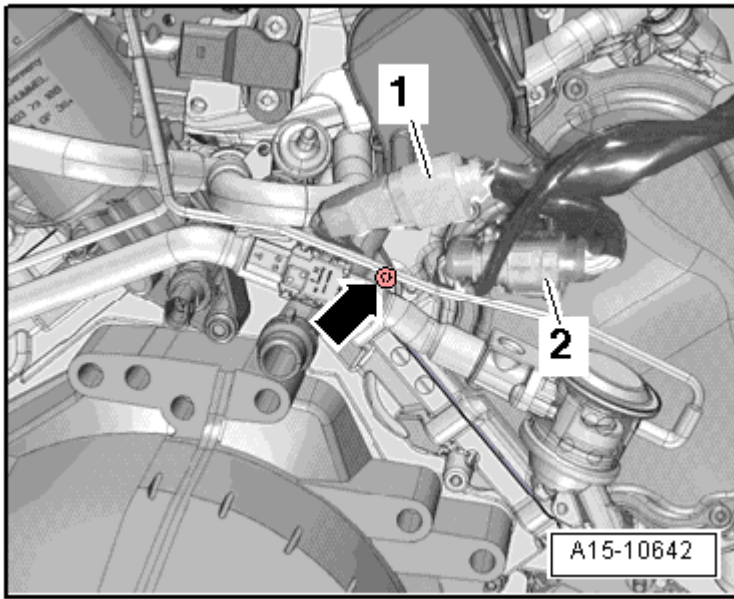


Fig. 91: Disconnecting Knock Sensor (KS) 1 -G61- Electrical Harness Connector -1-
Courtesy of AUDI OF AMERICA, LLC

Checking internal resistance

-- Using a multimeter, check the Knock Sensor -- terminals 1 to 2 for an internal short.

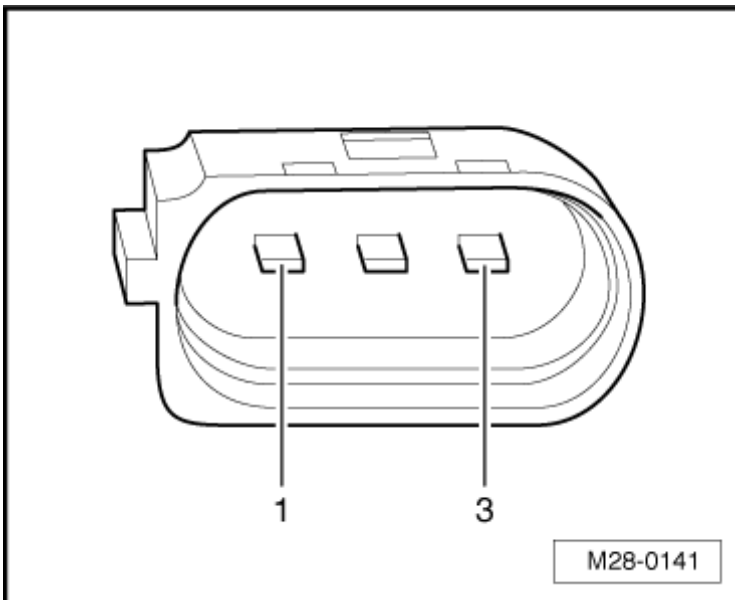


Fig. 92: Identifying Engine Speed (RPM) Sensor G28 Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: infinity (Infinity).

If the specified value was not obtained:

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

-- Replace the faulty Knock Sensor (KS) 1 -G61-. Refer to appropriate service information.

If the specified value was obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, Check the Knock Sensor -- electrical harness connector to the Motronic Engine Control Module (ECM)J623 electrical harness connector T60 for an open circuit.

Knock Sensor (KS) 1 -G61- electrical harness connector terminals		Motronic Engine Control Module (ECM) electrical harness connector T60 terminals or test box sockets
1		58
2		57
3		42

Specified value: 1.5 ohms Max.

If the specified value was not obtained:

-- Check the wiring connection for an open circuit.

-- Check the wiring connection for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring and the resistance was not OK:

-- Replace the faulty Knock Sensor (KS) 1 -G61-. Refer to appropriate service information.

If no malfunction is found in the wiring and the resistance was OK:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.
- Install the engine cover with air filter. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

KNOCK SENSOR 2, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- The mounting bolt of Knock Sensor (KS) 2 -G66- tightened to 20 Nm.
- The Motronic Engine Control Module (ECM) - J623- fuses OK.

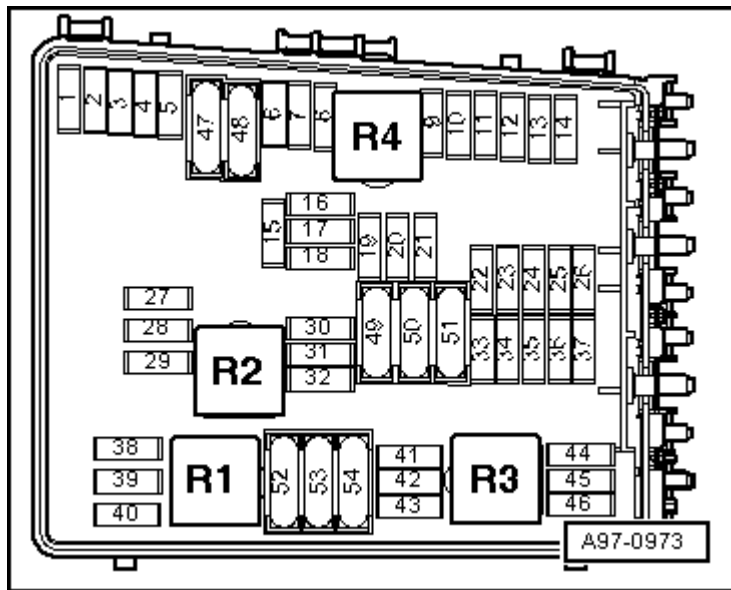


Fig. 93: Fuses On E-Box In Engine Compartment, Left Side
 Courtesy of AUDI OF AMERICA, LLC

- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the engine cover with air filter. Refer to appropriate service information.

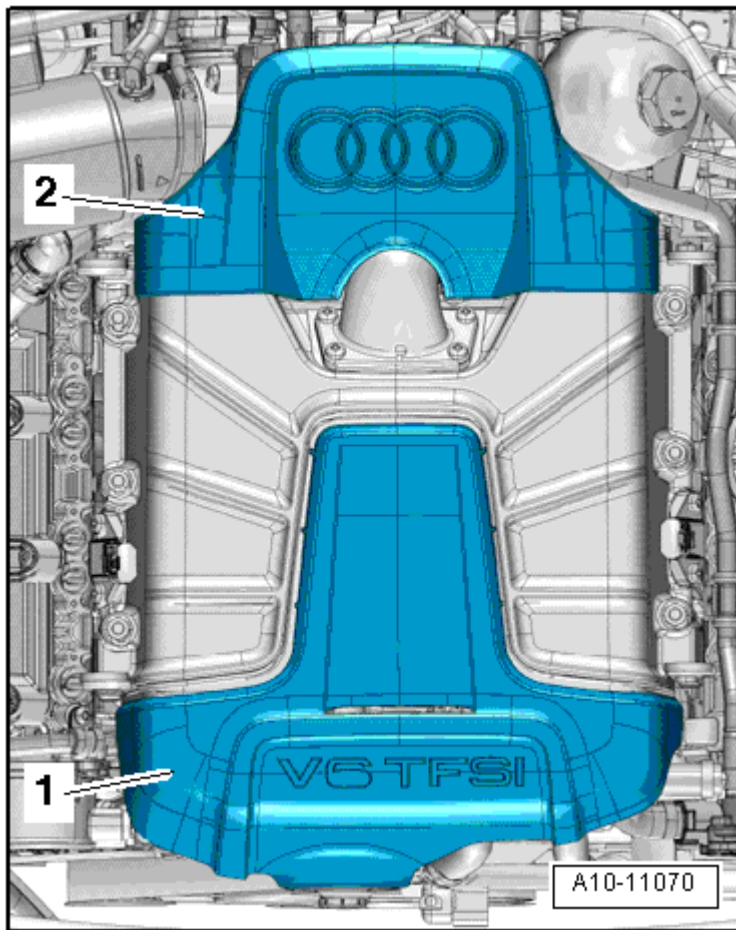


Fig. 94: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

NOTE: Before disconnecting the Knock Sensor -- electrical harness connectors, mark the component location.

-- Disconnect the electrical harness connector Knock Sensor (KS) 2 -G66- -2-.

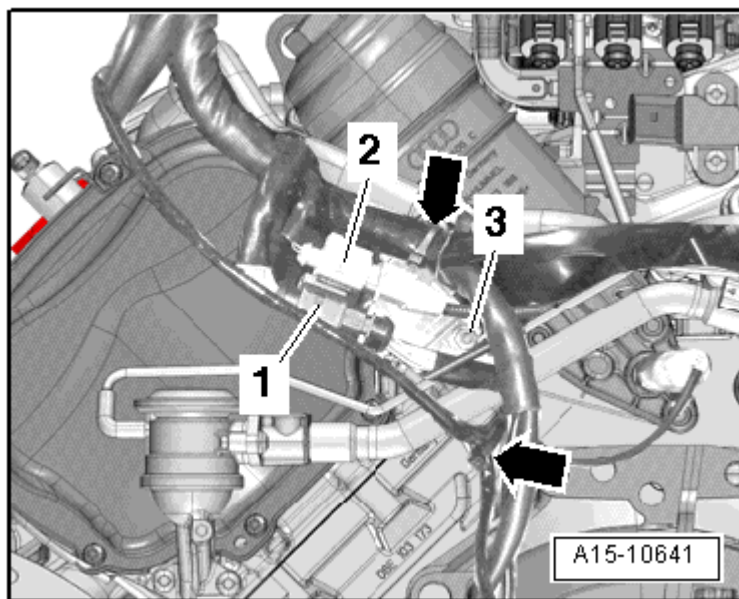


Fig. 95: Electrical Connectors On Left Rear Of Engine
Courtesy of AUDI OF AMERICA, LLC

Checking internal resistance

-- Using a multimeter, check the Knock Sensor -- terminals 1 to 2 for an internal short.

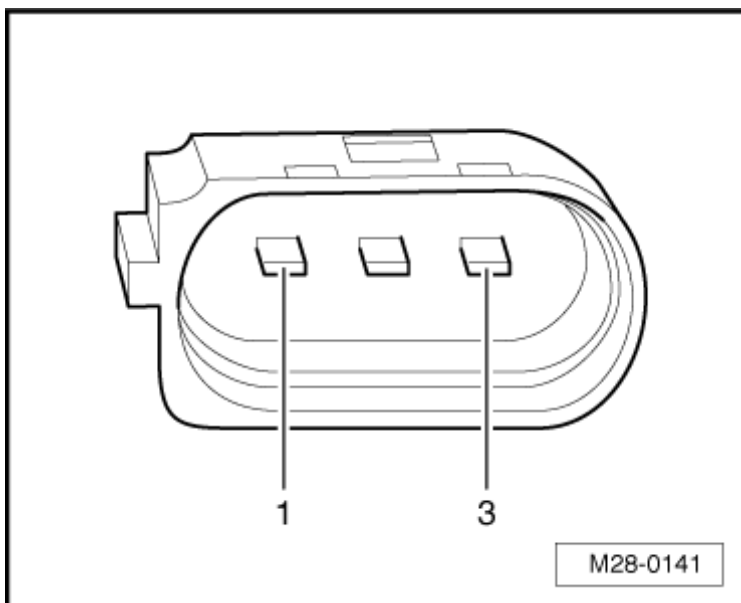


Fig. 96: Identifying Engine Speed (RPM) Sensor G28 Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: infinity (Infinity).

If the specified value was not obtained:

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

-- Replace the faulty Knock Sensor (KS) 2 -G66-. Refer to appropriate service information.

If the specified value was obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, Check the Knock Sensor -- electrical harness connector to the Motronic Engine Control Module (ECM)J623 electrical harness connector T60 for an open circuit.

Knock Sensor (KS) 2 -G66- electrical harness connector terminals		Motronic Engine Control Module (ECM) electrical harness connector T60 terminals or test box sockets
1		56
2		57
3		42

Specified value: 1.5 ohms Max.

If the specified value was not obtained:

-- Check the wiring connection for an open circuit.

-- Check the wiring connection for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring and the resistance was not OK:

-- Replace the faulty Knock Sensor (KS) 2 -G66-. Refer to appropriate service information.

If no malfunction is found in the wiring and the resistance was OK:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.
- Install the engine cover with air filter. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

LEAK DETECTION PUMP, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- multimeter
- Wiring diagram.

Test requirements

- The Leak Detection Pump (LDP) -V144- fuse OK.
- The ignition switched off.

Test procedure

- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

- Remove the left rear wheel housing liner. Refer to appropriate service information.
- Disconnect the Leak Detection Pump (LDP) -V144- electrical harness connector -2-.

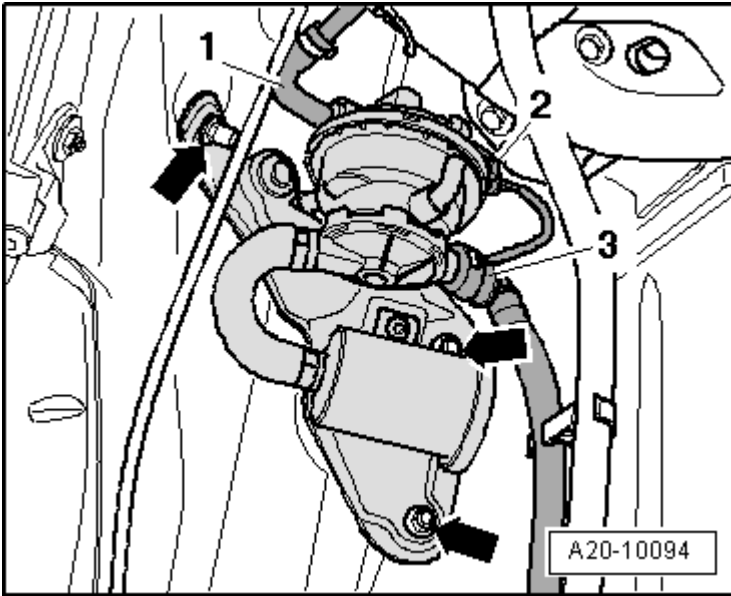


Fig. 97: Disconnecting Leak Detection Pump (LDP) V144 Electrical Harness Connector
Courtesy of AUDI OF AMERICA, LLC

Checking internal resistance

-- Using a multimeter, check the Leak Detection Pump (LDP) -V144- for resistance as follows:

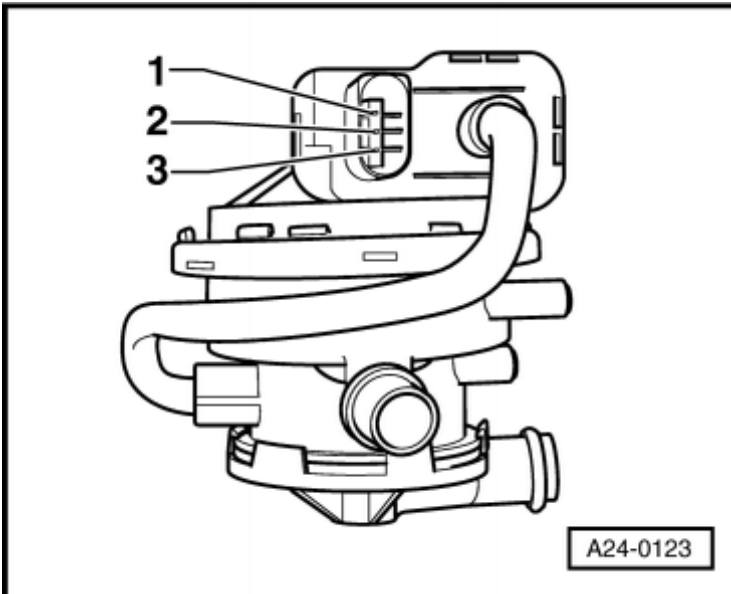


Fig. 98: Checking Leak Detection Pump (LDP) V144 For Resistance
Courtesy of AUDI OF AMERICA, LLC

Leak Detection Pump (LDP) -V144- electrical harness connector terminals	Specified values
1 + 3	640 to 720 ohms

2 + 3

15 to 17 ohms

If any of the specifications are not obtained:

-- Replace the Leak Detection Pump (LDP) --V144--. Refer to appropriate service information.

If the specified values are obtained:

Checking voltage supply

NOTE: The voltage for the Leak Detection Pump (LDP) --V144-- is supplied via the 15 amp fuse SB5.

-- Check the Leak Detection Pump (LDP) --V144-- for voltage.

-- Using a multimeter, check the Leak Detection Pump (LDP) --V144-- electrical harness connector terminal 3 for voltage.

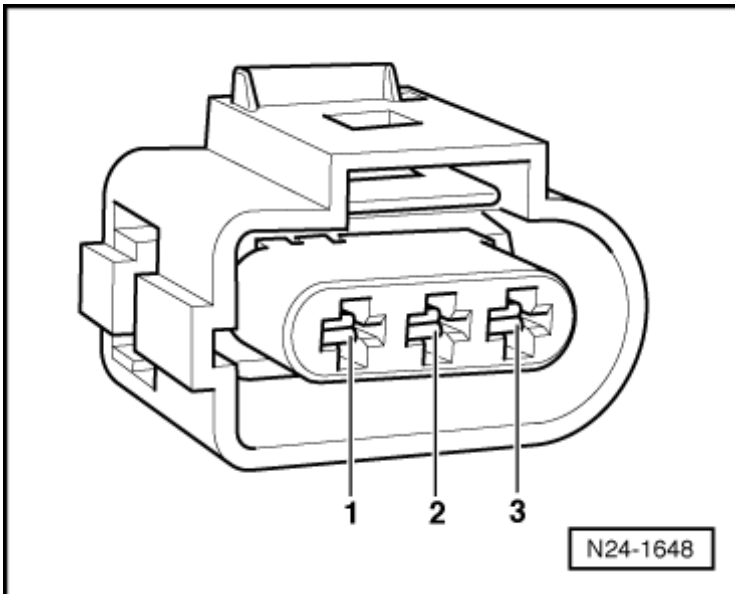


Fig. 99: 3-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Leak Detection Pump (LDP) --V144-- electrical harness connector terminal	Measure to
3	Engine Ground (GND)

-- Operate the starter briefly.

Specified value: battery voltage.

-- Switch the ignition off.

If the specified value was not obtained:

-- Using a multimeter, check the Leak Detection Pump (LDP) --V144-- electrical harness connector terminal 3 to the Engine Component Power Supply Relay -J757- terminal 8 for an open circuit.

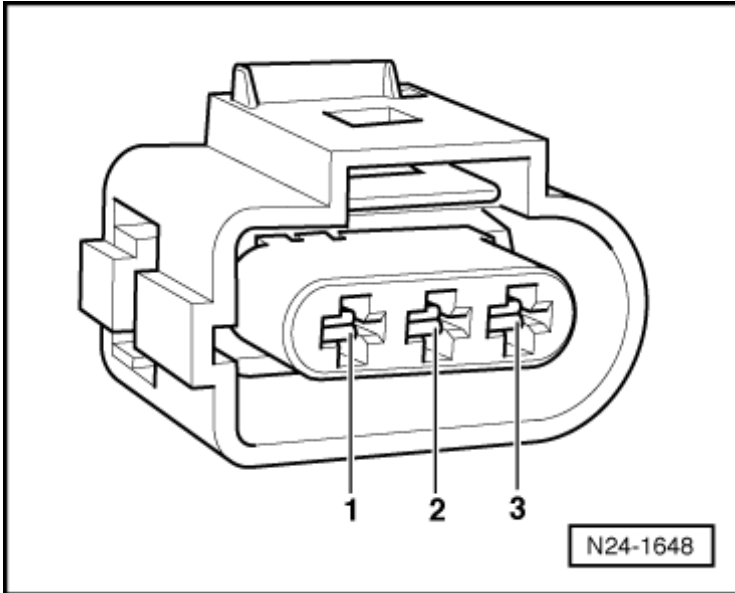


Fig. 100: 3-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: Wire resistance max 1.5 ohms.

If the specification is not obtained:

- Check the wiring for a short circuit to Battery positive (+) or an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring and if the voltage supply was OK:

Checking wiring

If the manufacturers test box is being used, perform the following step.

- Install the test box.

If the manufacturers test box is not being used, perform the following step.

- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

-- Using a multimeter, check the Leak Detection Pump (LDP) --V144-- electrical connector terminals to Motronic Engine Control Module (ECM) -J623- electrical connector T94.

Leak Detection Pump (LDP) --V144-- electrical harness connector terminals	Motronic Engine Control Module (ECM) - J623- electrical connector T94 terminals or test box socket
1	9
2	69

Specified value: 1.5 ohms max.

If the specification is not obtained:

- Check the wiring for a short circuit to Battery positive (+) or an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in wiring:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

Assembly is performed in the reverse order of the removal, note the following:

- Install the left rear wheel housing liner. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

CHARGE AIR COOLING PUMP, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- multimeter
- Wiring diagram.

Test requirements

- The Charge Air Cooling Pump -V188- fuse SA3 OK.
- The ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

- Charge Air Cooling Pump -V188-
- Disconnect the Charge Air Cooling Pump -V188- electrical harness connector -1-.

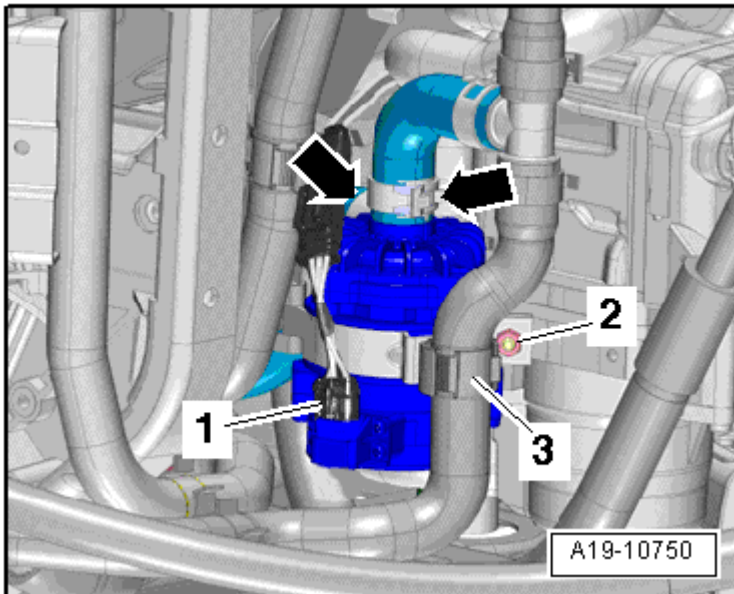


Fig. 101: Disconnecting Charge Air Cooling Pump -V188- Electrical Harness Connector -1
Courtesy of AUDI OF AMERICA, LLC

Checking internal resistance

- Using a multimeter, check the Charge Air Cooling Pump -V188- for resistance as follows:

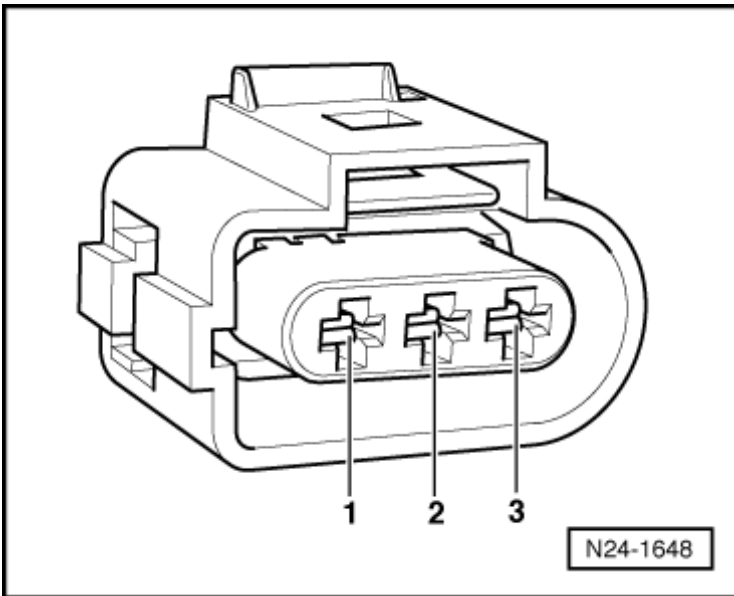


Fig. 102: 3-Pin Electrical Harness Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

Charge Air Cooling Pump -V188- electrical harness connector terminals	Specified values
1 + 2	640 to 720 ohms
3 to ground	15 to 17 ohms

If any of the specifications are not obtained:

-- Replace the Charge Air Cooling Pump -V188-. Refer to appropriate service information.

If the specified values are obtained:

Checking voltage supply

NOTE: The voltage for the Charge Air Cooling Pump -V188- is supplied via the 15A fuse SB7.

-- Check the Charge Air Cooling Pump -V188- for voltage.

-- Turn the key on.

-- Using a multimeter, check the Charge Air Cooling Pump -V188- electrical harness connector terminal 1 for voltage.

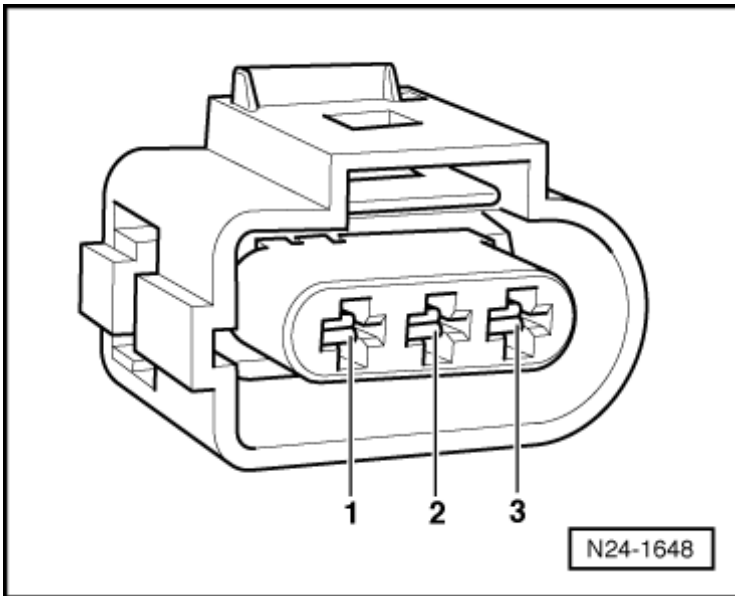


Fig. 103: 3-Pin Electrical Harness Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

Charge Air Cooling Pump -V188- electrical harness connector terminal	Measure to
1	Engine Ground (GND)

-- Operate the starter briefly.

Specified value: battery voltage.

-- Switch the ignition off.

If the specified value was not obtained:

-- Using a multimeter, check the Charge Air Cooling Pump -V188- electrical harness connector terminal 1 to the Engine Component Power Supply Relay -J757- terminal 8 for an open circuit.

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Charge Air Cooling Pump -V188- electrical connector terminals to Motronic Engine Control Module (ECM) -J623- electrical connector T60.

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

Charge Air Cooling Pump -V188- electrical harness connector terminals	Motronic Engine Control Module (ECM) - J623- electrical connector T60 terminals or test box socket
1	To fuse SB7
2	10
3	to engine ground

Specified value: 1.5 ohms max.

If the specification is not obtained:

- Check the wiring for a short circuit to Battery positive (+) or an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in wiring:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

Assembly is performed in the reverse order of the removal, note the following:

- Install the left rear wheel housing liner. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

LOW FUEL PRESSURE SENSOR, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

- multimeter.
- Wiring diagram.

Test requirements

- The Fuel Pump (FP) Control Module -J538- OK.
- The Motronic Engine Control Module (ECM) - J623- fuses OK.
- The fuel filter OK.
- The battery voltage at least 12.5 V.
- All electrical consumers switched off (radiator fan must NOT run during test).
- A/C switched off.
- The fuel tank at least $\frac{1}{4}$ filled.
- The ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the engine cover with air filter. Refer to appropriate service information.

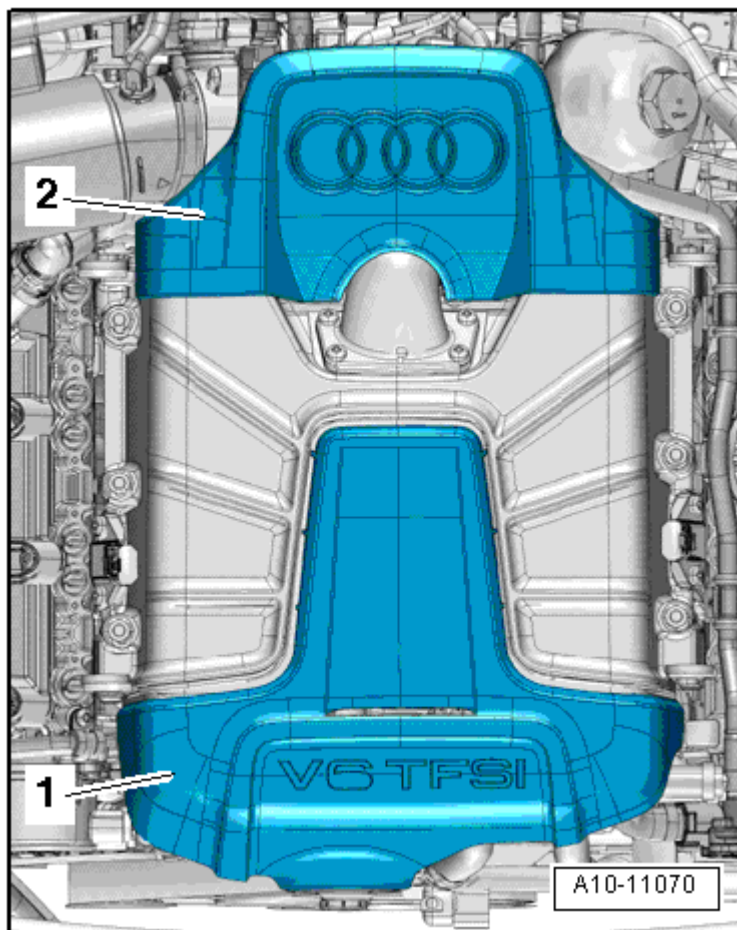


Fig. 104: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

Checking voltage

-- Disconnect the Low Fuel Pressure Sensor -G410- electrical harness connector -1-.

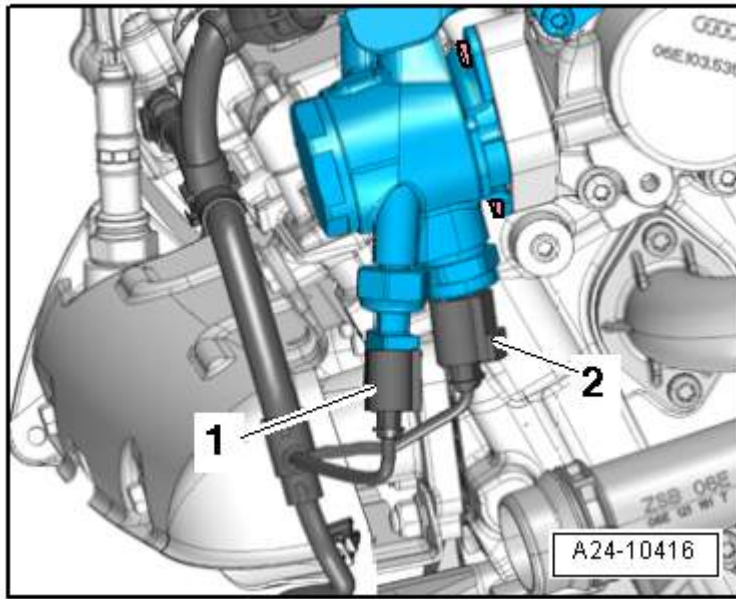


Fig. 105: Component Location On High Pressure Pump
 Courtesy of AUDI OF AMERICA, LLC

-- Switch the ignition on.

-- Using a multimeter, check the Low Fuel Pressure Sensor -G410- electrical harness connector for voltage.

Low Fuel Pressure Sensor - G410- electrical harness connector terminals	Specified value
1 to Battery positive (+)	Battery voltage
2 to Ground (GND)	Near 0 volts
3 to Ground (GND)	5 V

-- Switch the ignition off.

If the specified value was obtained:

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

-- Replace the Low Fuel Pressure Sensor -G410-. Refer to appropriate service information.

If the specified value was Not obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Low Fuel Pressure Sensor -G410- electrical harness connector terminals to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T60 terminals for an open circuit according to the wiring diagram.

Low Fuel Pressure Sensor - G410- electrical harness connector terminals	Motronic Engine Control Module (ECM) -J623- electrical connector T60 terminals or test box socket
1	GND
2	44
3	35

Specified value: 1.5 ohms Max.

If the specified value was Not obtained:

-- Check the wiring for an open, high resistance, short to Battery (+) or Ground (GND).

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring:

-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Install the engine cover with air filter. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING

The following procedure is used to diagnose the Manifold Absolute Pressure (MAP) Sensor -G71- and Intake Air Temperature (IAT) Sensor -G42- which is controlled by Engine Control Module -J623-.

NOTE: **The Intake Air Temperature (IAT) Sensor -G42- is part of the Manifold Absolute Pressure (MAP) Sensor -G71- and cannot be replaced separately**

Use only gold-plated terminals when servicing terminals in harness connector of Manifold Absolute Pressure (MAP) Sensor -G71- /Intake Air Temperature (IAT) Sensor -G42-.

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- The Engine Control Module (ECM) -J623- fuse OK.
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Coolant Temperature at least 80° C.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start diagnosis

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

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

-- Using the scan tool, Check the temperature of the Manifold Absolute Pressure (MAP) Sensor -G71- and Intake Air Temperature (IAT) Sensor -G42- at idle:

Diagnostic text	Specified value
Intake air temperature sensor • Engine running at idle	approx. ambient temperature

-- End diagnosis and switch ignition off.

If the specified value was obtained, but the DTC memory has a DTC indicating a Manifold Absolute Pressure (MAP) Sensor -G71- /Intake Air Temperature (IAT) Sensor -G42- fault:

-- Check the voltage supply of the Manifold Absolute Pressure (MAP) Sensor -G71- /Intake Air Temperature (IAT) Sensor -G42- **MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING.**

If specified value was not obtained:

-- Check the wiring of the Manifold Absolute Pressure (MAP) Sensor -G71- /Intake Air Temperature (IAT) Sensor -G42- **MANIFOLD ABSOLUTE PRESSURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR, CHECKING.**

Checking voltage supply

-- Remove the engine cover. Refer to appropriate service information.

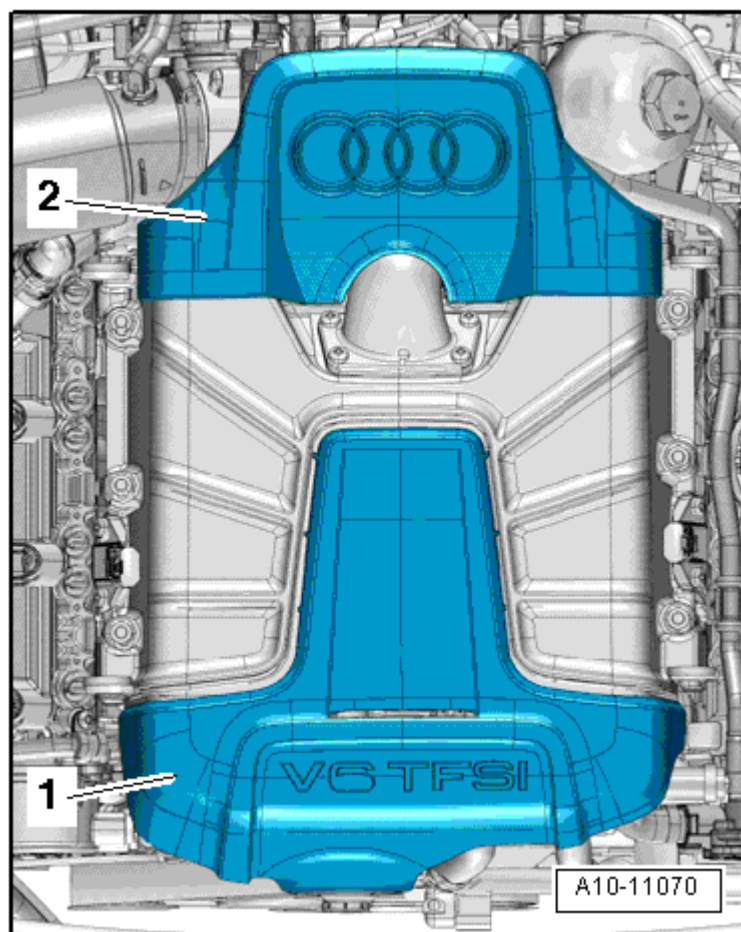


Fig. 106: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the Manifold Absolute Pressure (MAP) Sensor -G71- and Intake Air Temperature (IAT) Sensor -G42- electrical harness connector -1-.

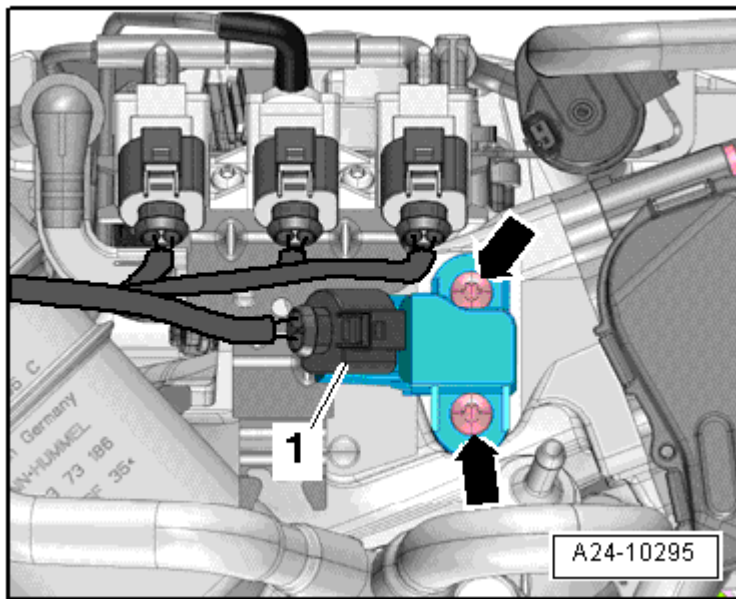


Fig. 107: Intake Air Temperature (IAT) Sensor -G42- /Manifold Absolute Pressure (MAP) Sensor -G71- - Tightening Specification

Courtesy of AUDI OF AMERICA, LLC

-- Crank the engine.

-- Using a multimeter, check the Manifold Absolute Pressure (MAP) Sensor -G71- /Intake Air Temperature (IAT) Sensor -G42- electrical harness connector terminal 3 to engine Ground (GND) for voltage.

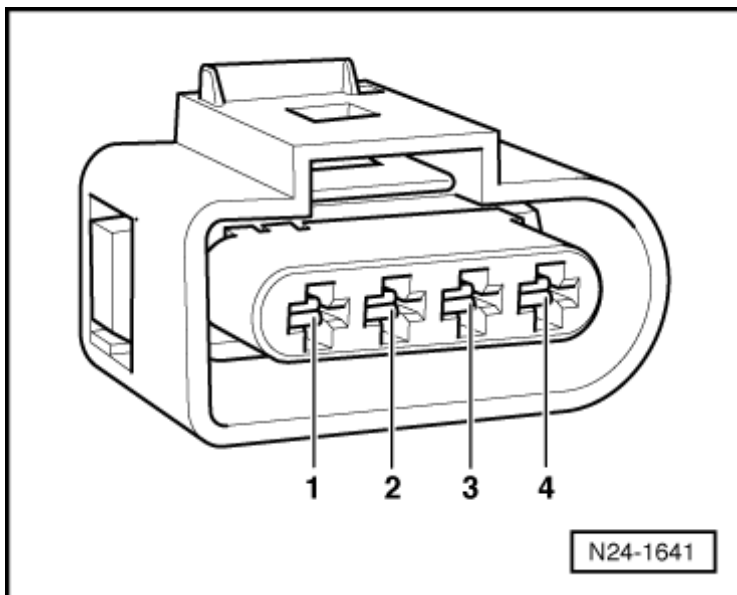


Fig. 108: 4-Pin Electrical Harness Connector & Terminals

Courtesy of AUDI OF AMERICA, LLC

Specified value: approx 5 V.

-- Switch the ignition off.

If specified value was not obtained:

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

If no malfunction is detected in the wiring and the voltage supply was OK:

Checking electrical circuit

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Engine Control Module -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Manifold Absolute Pressure (MAP) Sensor -G71- /Intake Air Temperature (IAT) Sensor -G42- electrical harness connector terminals to the Engine Control Module -J623- electrical harness connector T60 terminals for resistance.

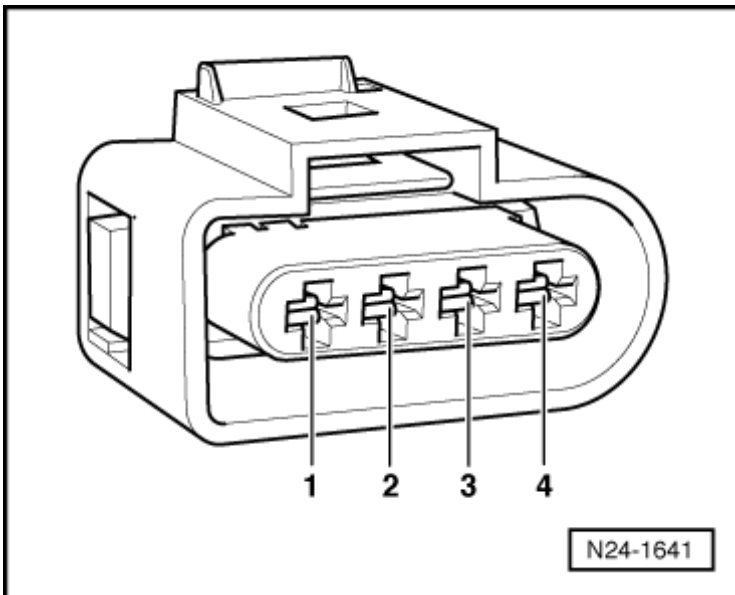


Fig. 109: 4-Pin Electrical Harness Connector & Terminals

Courtesy of AUDI OF AMERICA, LLC

**Manifold
Absolute
Pressure
(MAP)
Sensor -G71-
/Intake Air**

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

Temperature (IAT) Sensor -G42- electrical harness connector terminals	Engine Control Module -J623- electrical connector T60 terminals or test box socket
1	50
2	41
3	35
4	37

Specified value: 1.5 ohms max.

If any of the specified values were not obtained:

- Check the wiring for an open circuit, a short circuit to each other, Battery (+), or Ground (GND).
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring and if the voltage supply was OK:

- Replace the Manifold Absolute Pressure (MAP) Sensor -G71- /Intake Air Temperature (IAT) Sensor -G42-.
- Erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
- Perform a road test to verify repair.

If the DTC does not return:

Repair complete, Generate readiness code. Refer to **READINESS CODE**.

- End diagnosis.

If the DTC returns and no malfunction is found in the wiring and voltage supply was OK:

- Replace the Engine Control Module -J623-. Refer to the service information for removal and installation procedures.

Assembly is performed in the reverse order of the removal, note the following:

Final procedures

After repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

AMBIENT AIR TEMPERATURE SENSOR, CHECKING**Special tools and workshop equipment required**

- multimeter.
- Wiring diagram.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

- Connect the scan tool.
- Engine MUST be at room temperature.
- Switch the ignition on.
- Using the scan tool, check the ambient air temperature:

Diagnostic text	Specified value
Ambient Air Temperature (AAT)	approx. ambient air temperature

If the specified value was obtained:

- Fault may be intermittent. Check for proper connection, damaged wiring or loose terminals.

NOTE: **The reading will default to 419° F if the circuit is open or shorted to ground.**

If the specified value was Not obtained:

Checking internal resistance

- Turn the key off.
- Disconnect the Ambient Air Temperature Sensor -G17- electrical harness connector.

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

-- Using a multimeter, check the Ambient Air Temperature Sensor -G17- terminals 1 to 2 for resistance.

Use the chart below for the specified values:

Specified values:

AAT Temperature vs Resistance		
Temp (C)	min. value ohms	max. value ohms
- 40	31811	37560
- 35	22941	26863
- 25	12415	14289
- 15	6958	7880
- 5	4036	4495
0	3120	3442
5	2422	2655
15	1519	1623
25	968	1031
35	629	676
45	419	455
55	286	314
65	195	217
75	136	155

If the specified values were Not obtained:

-- Replace the Ambient Air Temperature Sensor -G17-. Refer to the appropriate service information.

If the specified values are obtained, continue the test according to the following table:

Checking wiring

-- Turn the key on.

-- Connect a multimeter to terminals 1 and 2 of the Ambient Air Temperature Sensor -G17- electrical harness connector.

Specified value: near 5.02 V

If the specified value was Not obtained:

-- Turn the key off.

-- Remove the Instrument Cluster. Refer to the appropriate service information.

-- Disconnect the Instrument Cluster harness.

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ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

-- Using a multimeter, check the Ambient Air Temperature Sensor -G17- electrical harness connector terminals 1 and 2 to the Instrument Cluster electrical harness connector T36 for an open circuit or a short, refer to the appropriate wiring diagram.

Ambient Air Temperature Sensor -G17- electrical harness connector terminals	Instrument Cluster - J285- electrical connector T32 terminals
1	28
2	24

Specified value: 1.5 ohms max.

If the specified value was obtained:

Replace the Instrument Cluster. Refer to the appropriate service information.

If the specified value was Not obtained:

- Check the wiring for an open, high resistance or short circuit to Battery (+) or ground.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

OXYGEN SENSOR AFTER CATALYTIC CONVERTER, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

Prior to repair work, perform a preliminary check to verify the condition. Refer to **PRELIMINARY CHECK**.

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- Generic scan tool
- Multimeter
- Wiring diagram

Test requirements

- The oxygen sensor properly installed
- Exhaust system free of leaks
- The oxygen sensor fuses OK
- Ground connections between engine/transmission/chassis OK
- Battery voltage at least 12.5 volts
- Coolant temperature at least 80° C
- All electrical consumers switched off
- Vehicles with automatic transmission, shift selector lever in park or neutral
- A/C switched off
- Engine running

NOTE: The oxygen sensor compares the oxygen content of the outside air with the residual oxygen content in the exhaust gas, and generates a voltage input signal to the engine control module.

If oxygen sensor voltage does not fluctuate, the sensor does not respond, or responds too slowly, the following causes are possible:

Slits in the oxygen sensor tip are plugged

Sensor not up to operating temperature

Sensor has been thermally overloaded

Transition resistance in signal wire or reference ground connection

Sensor has been damaged by electrical contact cleaner or similar contaminant (drawn through signal wire by capillary action due to thermal fluctuation)

Sensor has been damaged by exposure to silicone. When using silicone sprays and sealants, silicone residue is drawn into the engine where it passes unburned into the exhaust and can damage the oxygen sensor

Test procedure

-- Using a generic scan tool, refer to Diagnostic Mode 05 - Read Current System Data.

NOTE: **Mode 05 may not be supported on all systems. On systems where Diagnostic Mode 05 is not supported, refer to Diagnostic Mode 6 for oxygen sensor monitoring test results.**

-- Review the mode data test results.

If any of the test results indicate a monitor failure:

-- Refer to the monitor support documentation as indicated in the mode test procedure to diagnose and repair the cause of the failure.

If the test results indicate no monitor failures:

Checking primary voltage

-- Disconnect the oxygen sensor electrical harness connector. Refer to the service information for removal and installation procedures.

-- Switch ignition on.

-- Using a multimeter, measure the voltage between the sensor signal and reference ground circuits.

- Specification: 0.400 to 0.500 V

-- Switch ignition off.

If specified value is not obtained:

-- Check the oxygen sensor wiring and connections.

If specified value is obtained:

-- Replace the oxygen sensor. Refer to the appropriate service information for removal and installation procedures.

Checking wiring and connections

-- Remove the engine control module. Refer to the service information for removal and installation procedures.

-- Using a multimeter, measure the resistance of the signal and reference ground circuits between the oxygen sensor and the engine control module. Refer to the applicable wiring diagram.

Specified value: 1.5 ohms max.

If the specification was not obtained:

- Check the circuits for a short to each other, short to battery voltage, and short to ground.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- Repair the wiring or connection as necessary.

If no malfunction is detected in the wiring:

- Replace the engine control module. Refer to the service information for removal and installation procedures.

Final procedures

After repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

HEATED OXYGEN SENSOR HO2S, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

NOTE: **Use only gold-plated terminals when servicing terminals in the electrical harness connector of the Heated Oxygen Sensor (HO2S) -G39-.**

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- The Heated Oxygen Sensor (HO2S) -G39- fuse OK.

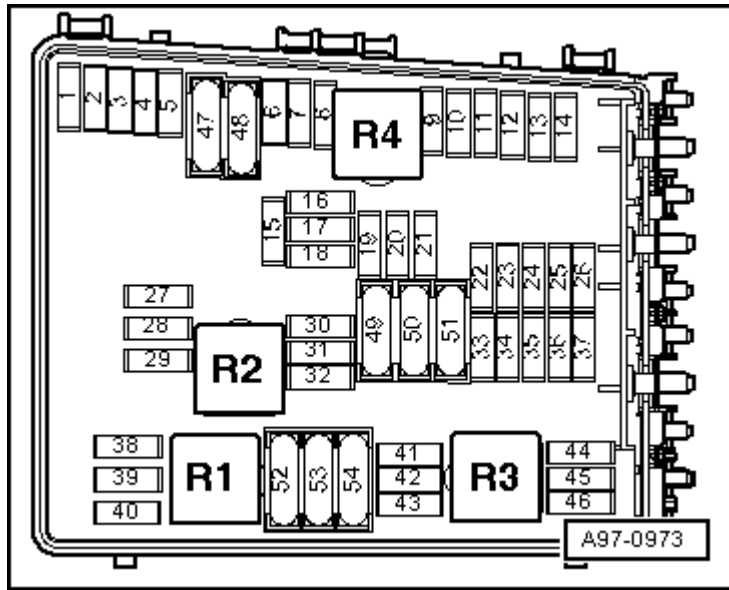


Fig. 110: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- The Oxygen Sensor (O2S) Heater -Z19- before catalytic converter OK. Refer to **OXYGEN SENSOR O2S HEATER, CHECKING.**
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Exhaust system between catalytic converter and cylinder head properly sealed.
- Coolant Temperature at least 80° C.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

- Connect scan tool.
- Start the engine and let it run at idle.
- Select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select "Test-ID 01: Oxygen sensor monitoring before catalytic converter".
- Select "Test-ID 131: Dynamic test".
- Check the specified values at idle.

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

Dynamic test	Specified value	
	min.	max.
Normal operation	0.35009	-
Reduced threshold upon suspicion of malfunction in catalytic converter	0.39990	-

If specified values are obtained:

-- End diagnosis and switch the ignition off.

If the specified values are not obtained:

Checking primary voltage

-- Disconnect the Heated Oxygen Sensor (HO2S) -G39- electrical harness connector -1-.

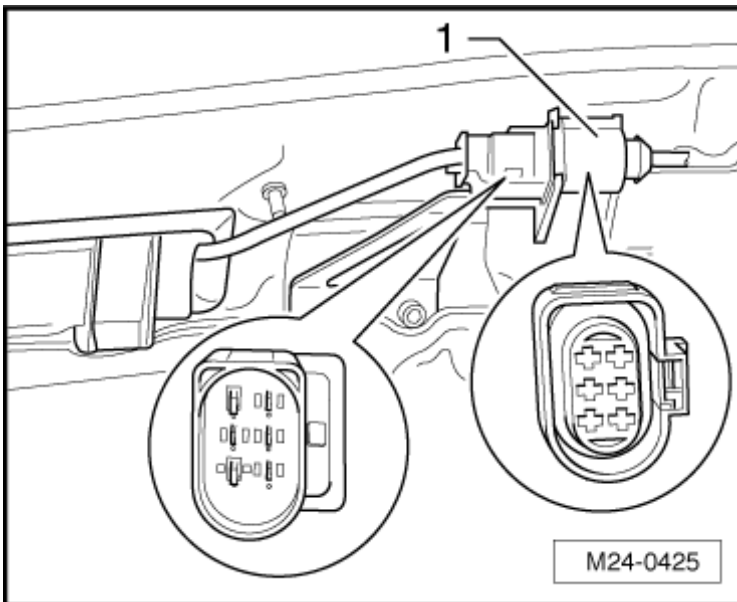


Fig. 111: Identifying Heated Oxygen Sensor (HO2S) G39 Electrical Harness Connector
Courtesy of AUDI OF AMERICA, LLC

-- Using a multimeter, check the Heated Oxygen Sensor (HO2S) -G39- electrical harness connector -1- terminals 1 to 4 for voltage.

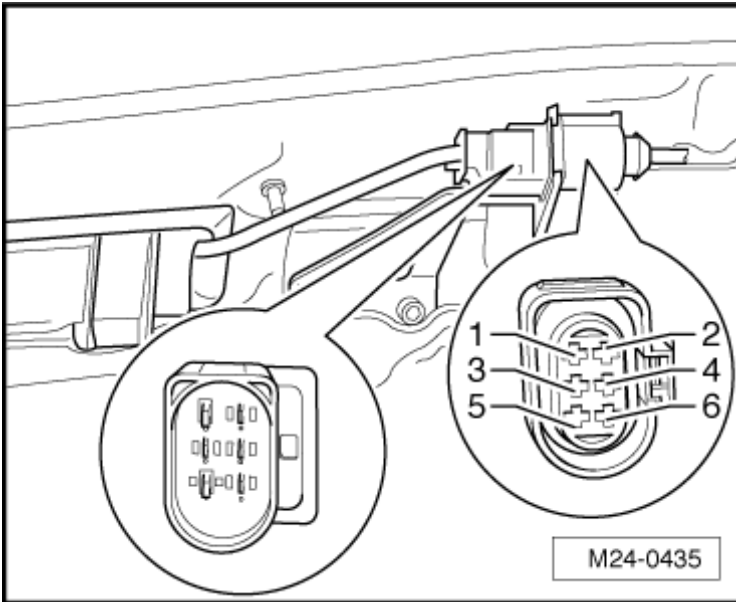


Fig. 112: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: 0.400 to 0.500 Volts

-- Switch the ignition off.

If the specified value was not obtained:

-- Replace the Heated Oxygen Sensor (HO2S) -G39-. Refer to the appropriate service information.

If the specified value was obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Using a multimeter, check the Heated Oxygen Sensor (HO2S) -G39- electrical harness connector terminals to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T94 terminals for an open circuit.

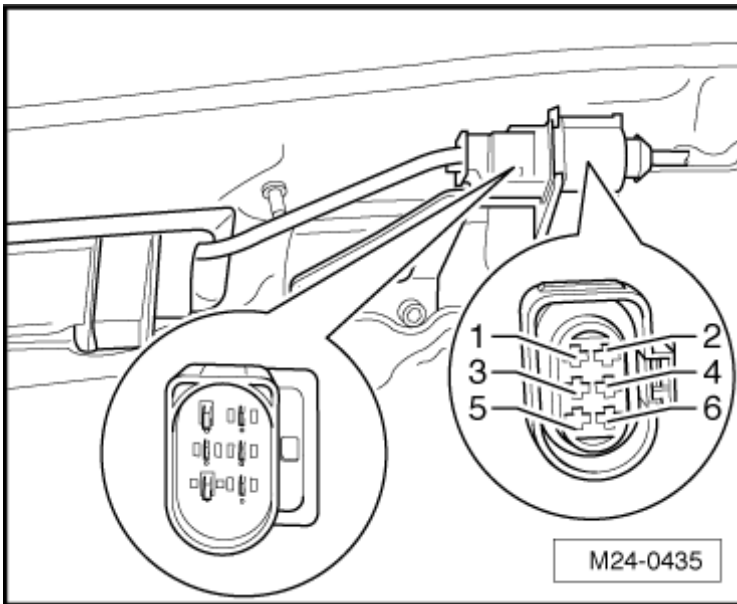


Fig. 113: Identifying 6-Pin Electrical Harness Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

Heated Oxygen Sensor (HO2S) -G39- electrical harness connector terminals

**Motronic
 Engine
 Control
 Module
 (ECM) -
 J623-
 electrical
 connector
 T94
 terminals
 or test
 box
 sockets**

1	82
2	61
4	83
6	84

Specified value: 1.5 ohms Max.

If the specification was not obtained:

- Check the wiring for a short circuit to Battery (+), or an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring:

-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

HEATED OXYGEN SENSOR HO2S 2, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

NOTE: **Use only gold-plated terminals when servicing terminals in the electrical harness connector of the Heated Oxygen Sensor (HO2S) -G108-.**

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- The Heated Oxygen Sensor (HO2S) -G108- fuse OK.

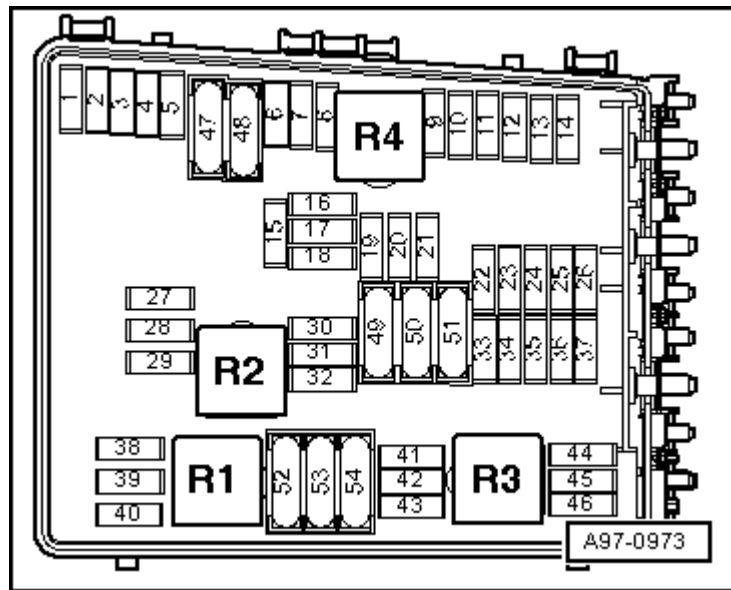


Fig. 114: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- The Oxygen Sensor (O2S) Heater -Z28- before catalytic converter OK. Refer to **OXYGEN SENSOR O2S HEATER 2, CHECKING**.
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Exhaust system between catalytic converter and cylinder head properly sealed.
- Coolant Temperature at least 80° C.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

- Connect scan tool.
- Start the engine and let it run at idle.
- Select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select "Test-ID 01: Oxygen sensor monitoring before catalytic converter".
- Select "Test-ID 131: Dynamic test".
- Check the specified values at idle.

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

Dynamic test	Specified value	
	min.	max.
Normal operation	0.35009	-
Reduced threshold upon suspicion of malfunction in catalytic converter	0.39990	-

If specified values are obtained:

-- End diagnosis and switch the ignition off.

If the specified values are not obtained:

Checking primary voltage

-- Disconnect the Heated Oxygen Sensor (HO2S) -G108- electrical harness connector -1-.

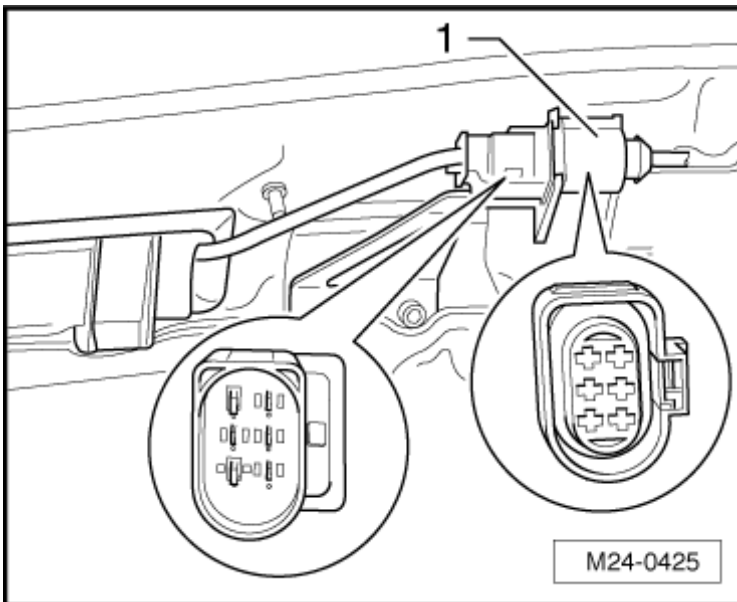


Fig. 115: Identifying Heated Oxygen Sensor (HO2S) G39 Electrical Harness Connector
Courtesy of AUDI OF AMERICA, LLC

-- Using a multimeter, check the Heated Oxygen Sensor (HO2S) -G108- electrical harness connector -1- terminals 1 to 4 for voltage.

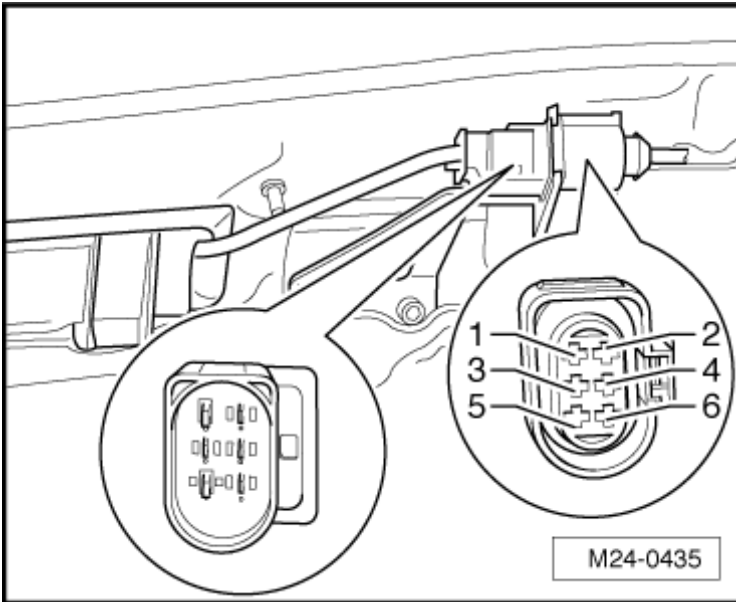


Fig. 116: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: 0.400 to 0.500 Volts

-- Switch the ignition off.

If the specified value was not obtained:

-- Replace the Heated Oxygen Sensor (HO2S) -G108-. Refer to the appropriate service information.

If the specified value was obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Using a multimeter, check the Heated Oxygen Sensor (HO2S) -G108- electrical harness connector terminals to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T94 terminals for an open circuit.

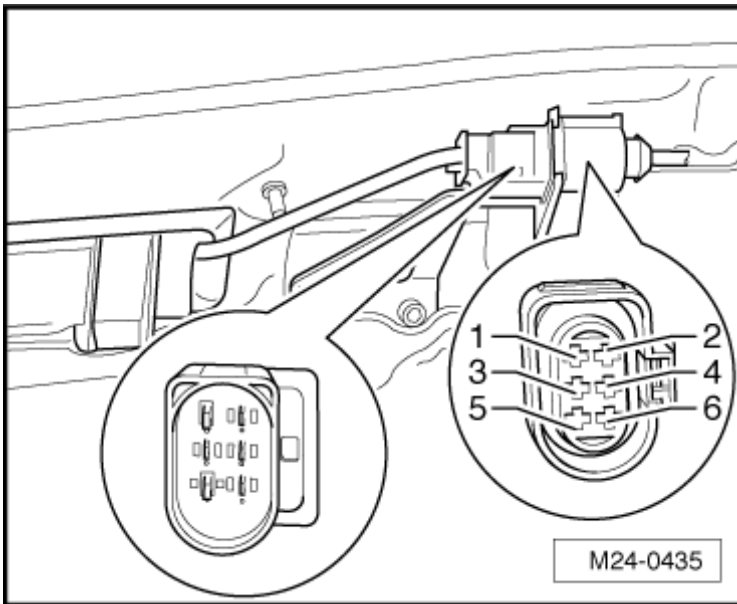


Fig. 117: Identifying 6-Pin Electrical Harness Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

Heated Oxygen Sensor (HO2S) -G108- electrical harness connector terminals

**Motronic
 Engine
 Control
 Module
 (ECM) -
 J623-
 electrical
 connector
 T94
 terminals
 or test
 box
 sockets**

1	81
2	59
4	60
6	62

Specified value: 1.5 ohms Max.

If the specification was not obtained:

- Check the wiring for a short circuit to Battery (+), or an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring:

-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

OXYGEN SENSOR O2S BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

NOTE: **Vehicle must be raised before the electrical connector for the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- is accessible.**

When servicing terminals 3 and 4 in the electrical harness connector of the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-, use only gold-plated terminals.

Special tools and workshop equipment required

- Generic scan tool
- multimeter.
- Wiring diagram.

Test requirements

- The Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- fuse Ok.

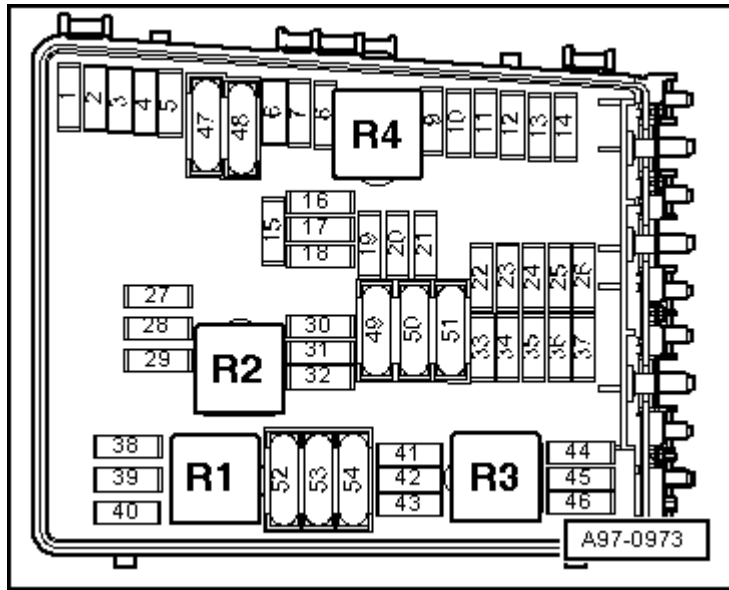


Fig. 118: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- Oxygen Sensor O2S Behind Three Way Catalytic Converter Heater - Z29- OK. Refer to **OXYGEN SENSOR O2S HEATER 1 BEHIND CATALYTIC CONVERTER, CHECKING.**
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, selector lever in position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Exhaust system between catalytic converter and cylinder head properly sealed.
- Coolant Temperature at least 80° C.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

- Connect scan tool.
- Start the engine and let it run at idle.
- Select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select "Test-ID 02: Oxygen sensor monitoring behind catalytic converter".
- Select following Test-IDs.

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

-- Check the specified values at idle.

Test-ID		Specified value	
		min.	max.
1	Rich to lean sensor barrier voltage	---	0.6241 V
2	Lean to rich sensor barrier voltage	---	0.6241 V
7	Minimum voltage at sensor for test cycle	---	0.450 V
8	Maximum voltage at sensor for test cycle	0.450 V	---
129	Sensor voltage lean	0	0.6241 V
130	Sensor voltage rich	0.6241 V	1.2998 V
131	Deceleration test	0 V	0.1599 V

If the specified values are obtained:

-- End diagnosis and switch ignition off.

If the specified values are not obtained:

-- Remove the right vehicle floor cover -arrows-. Refer to the appropriate service information.

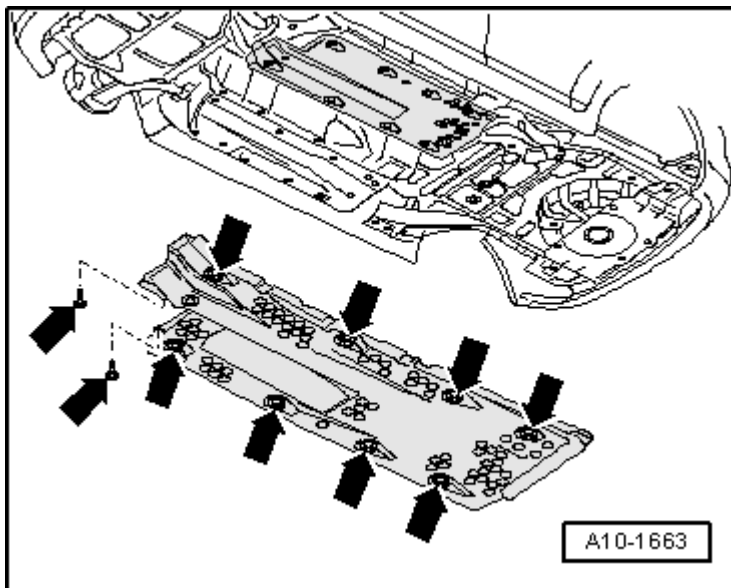


Fig. 119: Identifying Right Vehicle Floor Cover

Courtesy of AUDI OF AMERICA, LLC

Checking primary voltage

-- Disconnect the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- electrical harness connector -arrow-.

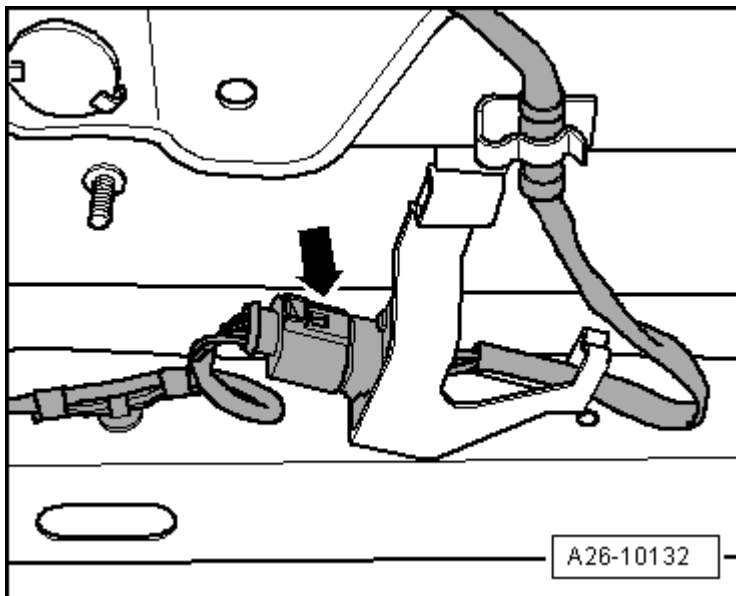


Fig. 120: Disconnecting Connector For Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130

Courtesy of AUDI OF AMERICA, LLC

-- Switch the ignition on.

-- Using a multimeter, check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- electrical harness connector terminals 3 to 4 for voltage.

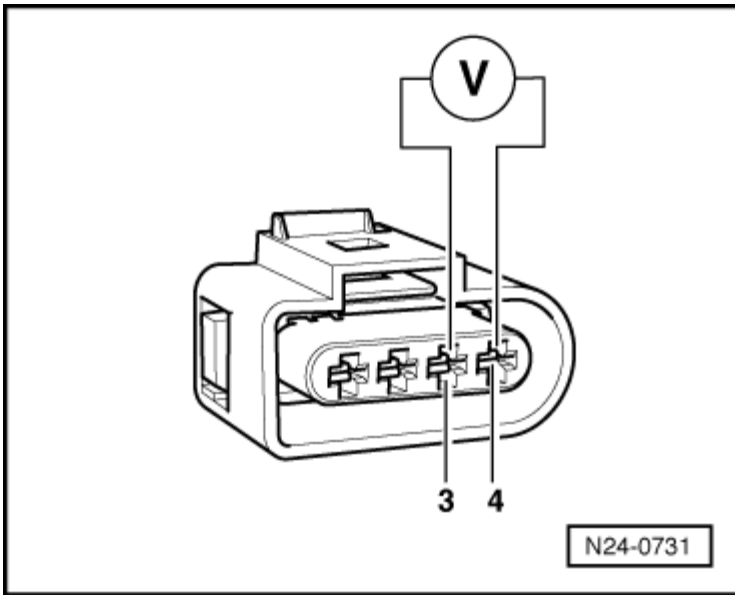


Fig. 121: Checking Component Terminals 3 To 4 For Voltage
Courtesy of AUDI OF AMERICA, LLC

Specified value: 0.400 to 0.500 Volts

-- Switch the ignition off.

If the specified value was not obtained:

-- Replace the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130-. Refer to the appropriate service information.

If the specified value was obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Using a multimeter, check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) - G130- electrical harness connector terminals to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T94 terminals for an open circuit according to the wiring diagram.

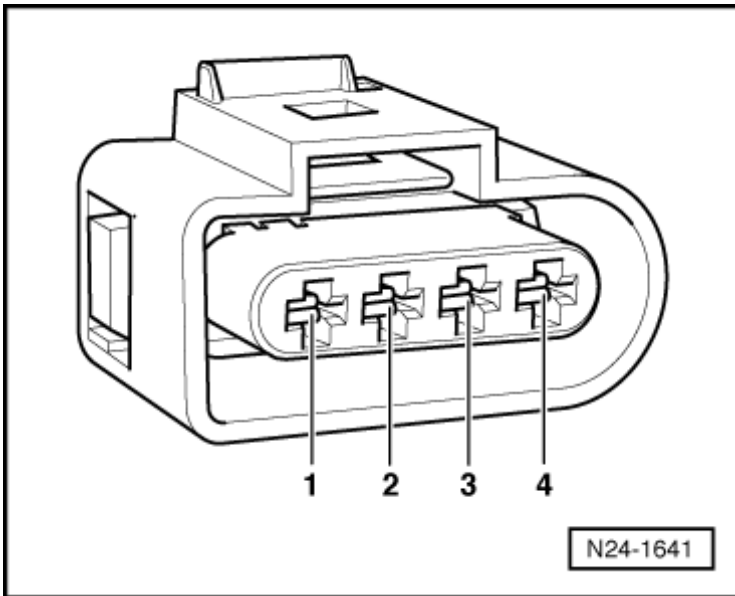


Fig. 122: 4-Pin Electrical Harness Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- electrical harness connector terminals

Motronic Engine Control Module (ECM) - J623- electrical connector T94 terminals or test box sockets

3	76
4	32

Specified value: 1.5 ohms Max.

If the specification was not obtained:

- Check the wiring for a short circuit to Battery (+), or an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.
- Install the right vehicle floor cover -arrows-. Refer to the appropriate service information.

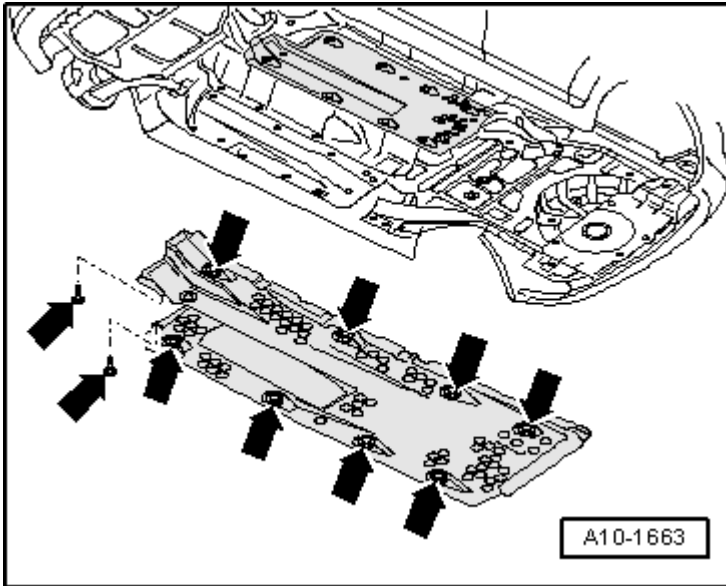


Fig. 123: Identifying Right Vehicle Floor Cover
Courtesy of AUDI OF AMERICA, LLC

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

OXYGEN SENSOR O2S 2 BEHIND THREE WAY CATALYTIC CONVERTER, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

NOTE: Vehicle must be raised before the electrical connector for the Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) -G131- is accessible.

When servicing terminals 3 and 4 in the electrical harness connector of the Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) -G131-, use only gold-plated terminals.

Special tools and workshop equipment required

- Generic scan tool
- multimeter.
- Wiring diagram.

Test requirements

- The Oxygen Sensor (O2S)2 Behind Three Way Catalytic Converter (TWC) -G131- fuse Ok.

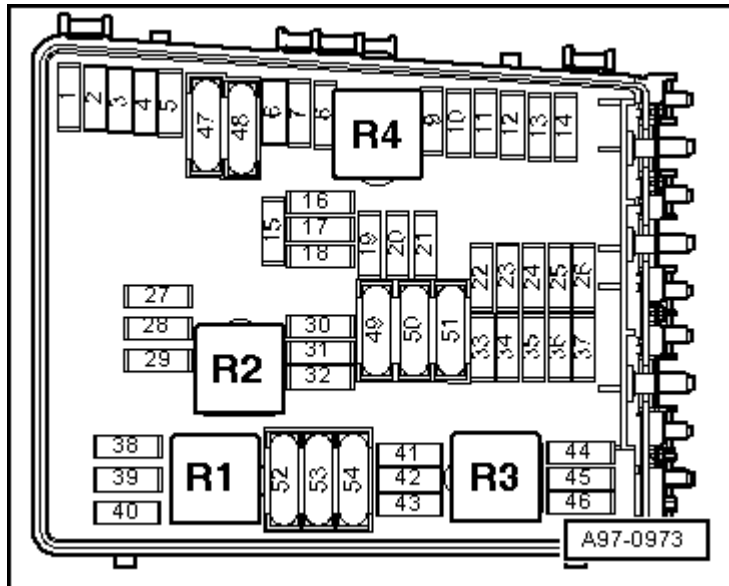


Fig. 124: Fuses On E-Box In Engine Compartment, Left Side
 Courtesy of AUDI OF AMERICA, LLC

- Oxygen Sensor O2S Behind Three Way Catalytic Converter Heater 2 - Z30- OK. Refer to **OXYGEN SENSOR O2S HEATER 2 BEHIND CATALYTIC CONVERTER, CHECKING.**
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, selector lever in position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Exhaust system between catalytic converter and cylinder head properly sealed.
- Coolant Temperature at least 80° C.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

- Connect scan tool.
- Start the engine and let it run at idle.
- Select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select "Test-ID 02: Oxygen sensor monitoring behind catalytic converter".
- Select following Test-IDs.
- Check the specified values at idle.

Test-ID		Specified value	
		min.	max.
1	Rich to lean sensor barrier voltage	---	0.6241 V
2	Lean to rich sensor barrier voltage	---	0.6241 V
7	Minimum voltage at sensor for test cycle	---	0.450 V
8	Maximum voltage at sensor for test cycle	0.450 V	---
129	Sensor voltage lean	0	0.6241 V
130	Sensor voltage rich	0.6241 V	1.2998 V
131	Deceleration test	0 V	0.1599 V

If the specified values are obtained:

- End diagnosis and switch ignition off.

If the specified values are not obtained:

- Remove the right vehicle floor cover -arrows-. Refer to the appropriate service information.

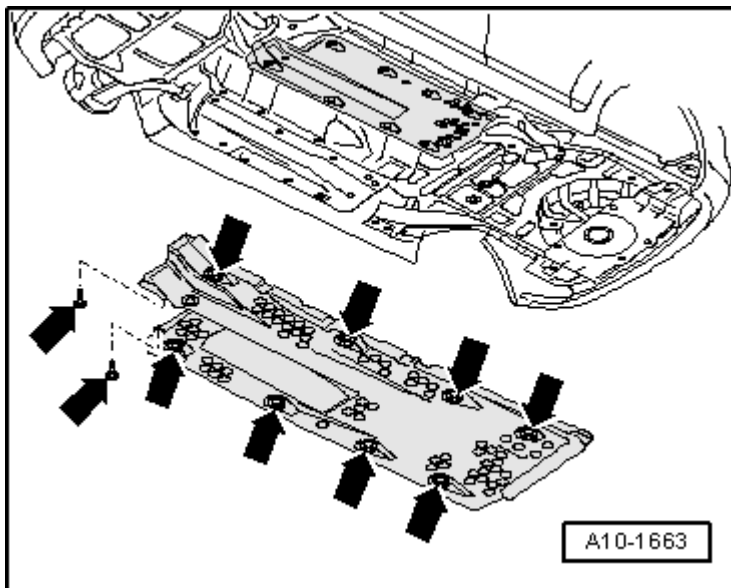


Fig. 125: Identifying Right Vehicle Floor Cover

Courtesy of AUDI OF AMERICA, LLC

Checking primary voltage

-- Disconnect the Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) -G131- electrical harness connector -arrow-.

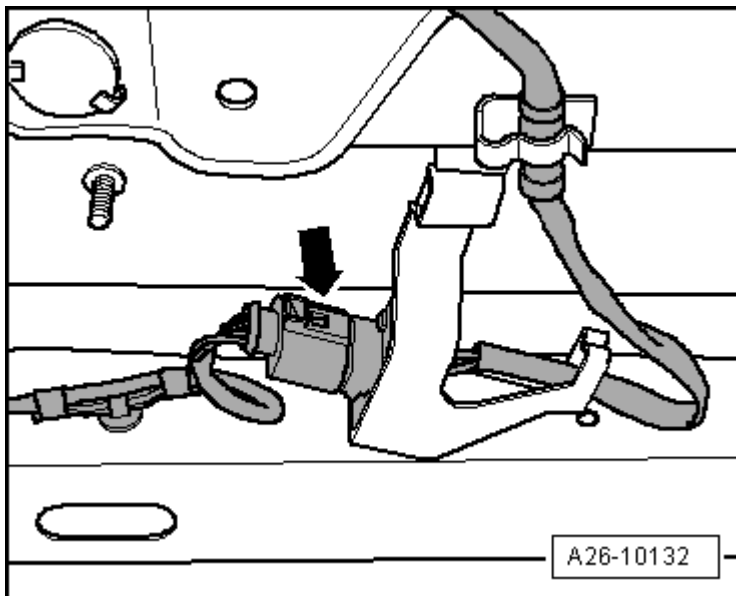


Fig. 126: Disconnecting Connector For Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130

Courtesy of AUDI OF AMERICA, LLC

-- Switch the ignition on.

-- Using a multimeter, check the Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) - G131- electrical harness connector terminals 3 to 4 for voltage.

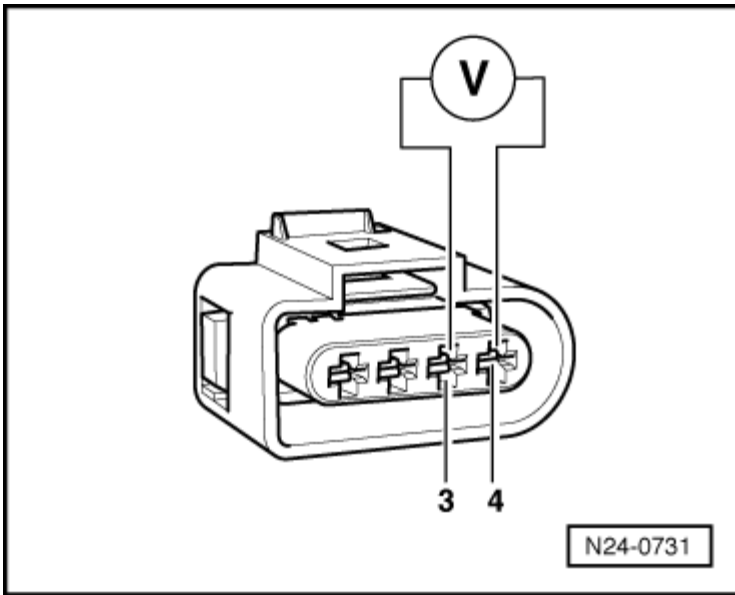


Fig. 127: Checking Component Terminals 3 To 4 For Voltage
Courtesy of AUDI OF AMERICA, LLC

Specified value: 0.400 to 0.500 Volts

-- Switch the ignition off.

If the specified value was not obtained:

-- Replace the Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) - G131-. Refer to the appropriate service information.

If the specified value was obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Using a multimeter, check the Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) - G131- electrical harness connector terminals to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T94 terminals for an open circuit according to the wiring diagram.

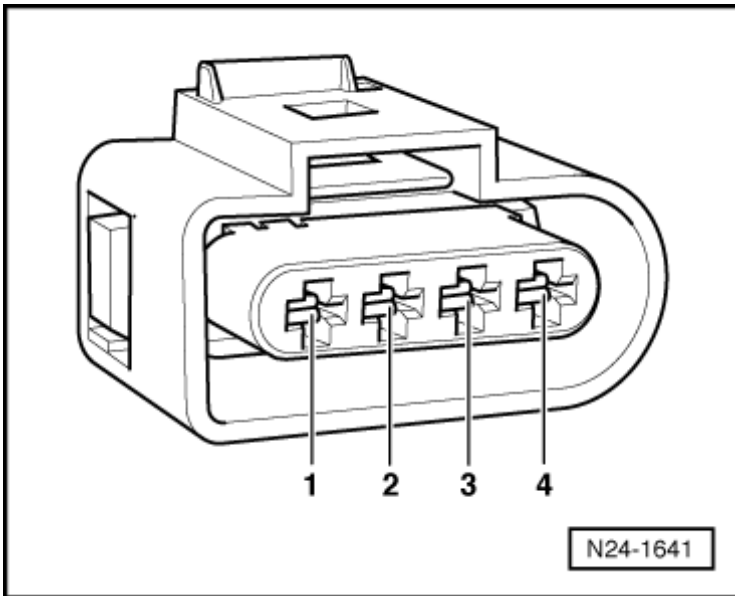


Fig. 128: 4-Pin Electrical Harness Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC) -G131- electrical harness connector terminals

**Motronic
 Engine
 Control
 Module
 (ECM) -
 J623-
 electrical
 connector
 T94
 terminals
 or test
 box
 sockets**

3	54
4	55

Specified value: 1.5 ohms Max.

If the specification was not obtained:

- Check the wiring for a short circuit to Battery (+), or an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.
- Install the right vehicle floor cover -arrows-. Refer to the appropriate service information.

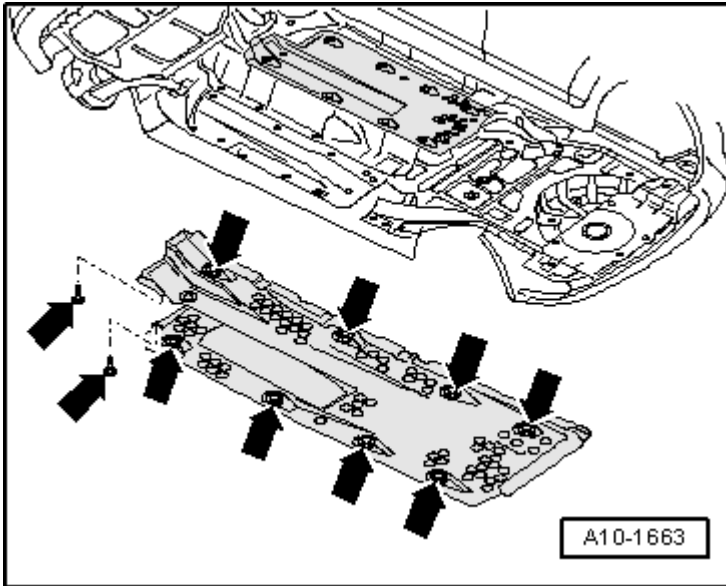


Fig. 129: Identifying Right Vehicle Floor Cover
Courtesy of AUDI OF AMERICA, LLC

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

OXYGEN SENSOR O2S HEATER, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Oxygen Sensor (O2S) Heater -Z19- is part of Heated Oxygen Sensor (HO2S) -G39- and cannot be replaced separately.

Special tools and workshop equipment required

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

- multimeter.
- Wiring diagram.

Test requirements

- Fuse -SB10- OK.
- Engine Component Power Supply Relay -J757- OK.
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start diagnosis

-- Remove the engine cover with air filter. Refer to the appropriate service information.

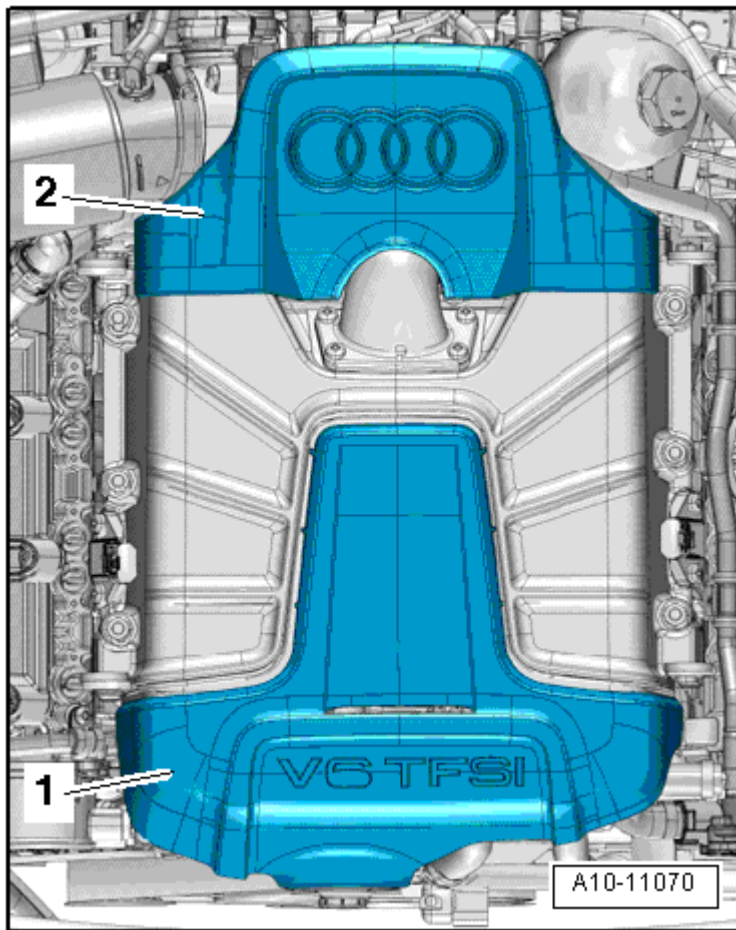


Fig. 130: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

Checking internal resistance

-- Disconnect the Heated Oxygen Sensor (HO2S) -G39- electrical harness connector -1-.

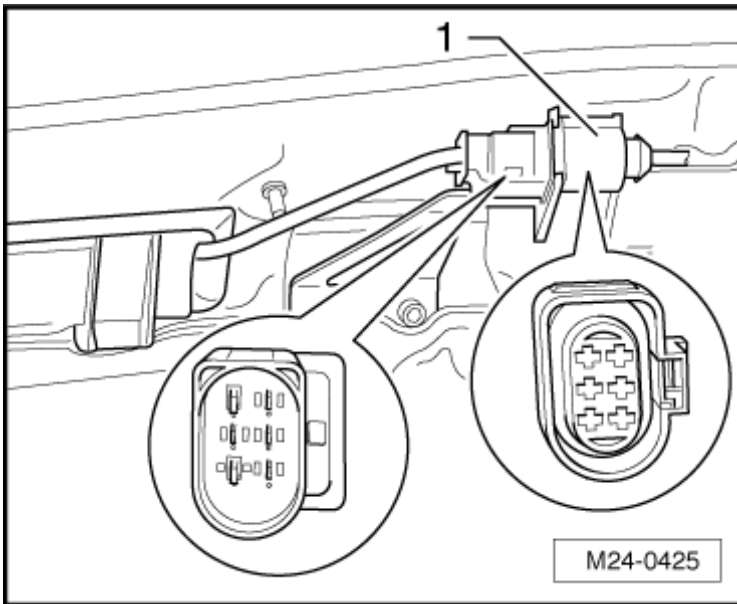


Fig. 131: Identifying Heated Oxygen Sensor (HO2S) G39 Electrical Harness Connector
Courtesy of AUDI OF AMERICA, LLC

-- Using a multimeter, check the Heated Oxygen Sensor (HO2S) -G39- terminals 3 to 5 for resistance.

Specified value: 2.5 to 10.0 ohms (at approx. 20° C)

If the specification was not obtained:

-- Replace the Heated Oxygen Sensor (HO2S) -G39-. Refer to the appropriate service information.

If the specification was obtained:

Checking voltage supply

-- Crank the engine (engine may run).

-- Using a multimeter, check the Heated Oxygen Sensor (HO2S) -G39- electrical harness connector terminal 5 to Ground (GND) for voltage.

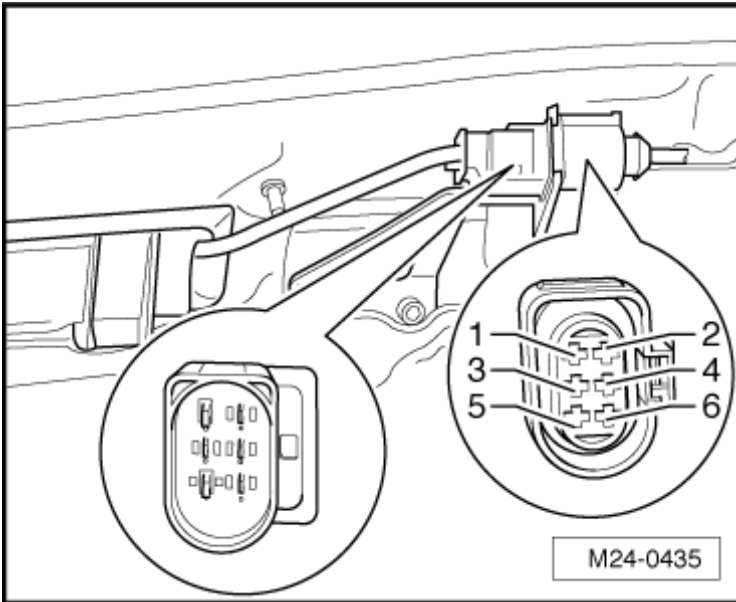


Fig. 132: Identifying 6-Pin Electrical Harness Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

Heated Oxygen Sensor (HO2S) -G39- electrical harness connector terminal

**Engine
Control
Module
(ECM) -
J623-
electrical
harness
connector
T94
terminal
or test
box
socket**

5

**Ground
(GND)**

-- Switch the ignition off.

Specified value: Battery voltage.

If the specification was not obtained:

-- Check the Heated Oxygen Sensor (HO2S) -G39- electrical harness connector terminal 5 to the Engine Component Power Supply Relay -J757- socket 8 an open circuit, a short circuit to each other, Battery (+), or Ground (GND).

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If the specification was obtained:

Checking Ground (GND) activation

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Using a multimeter, check the Heated Oxygen Sensor (HO2S) -G39- electrical harness connector terminal 3 to the Engine Control Module (ECM) -J623- electrical harness connector T94 terminal 73 for resistance.

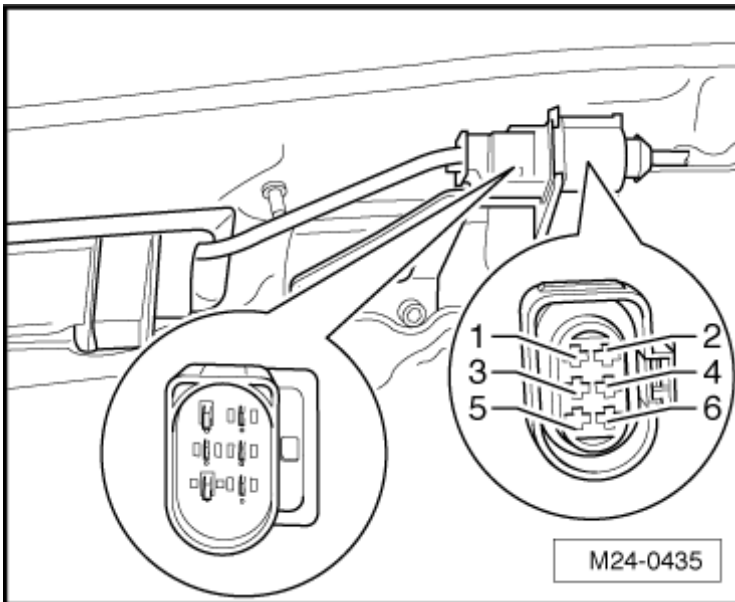


Fig. 133: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Heated Oxygen Sensor (HO2S) -G39- electrical harness connector terminal

Engine
Control
Module
(ECM) -
J623-
electrical
harness
connector
T94
terminal

2012 Audi S4

ENGINE PERFORMANCE 3.0 Liter - Generic Scan Tool - Engine Code(s): CCBA (Sedan)

	or test box socket
3	73

Specified value: 1.5 ohms max.

If the specification was not obtained:

- Check the wiring for a short circuit to each other, Battery (+), and Ground (GND).
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring and if the voltage supply was OK:

- Erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
- Perform a road test to verify repair.

If the DTC does not return:

Generate readiness code. Refer to **READINESS CODE**.

If the DTC does return and no malfunction is detected in the wiring and the voltage supply was OK:

- Replace the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

OXYGEN SENSOR O2S HEATER 2, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Oxygen Sensor (O2S) Heater -Z28- is part of Heated Oxygen Sensor (HO2S) -G108- and cannot be replaced separately.

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- Fuse -SB10- OK.
- Engine Component Power Supply Relay -J757- OK.
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start diagnosis

-- Remove the engine cover with air filter. Refer to the appropriate service information.

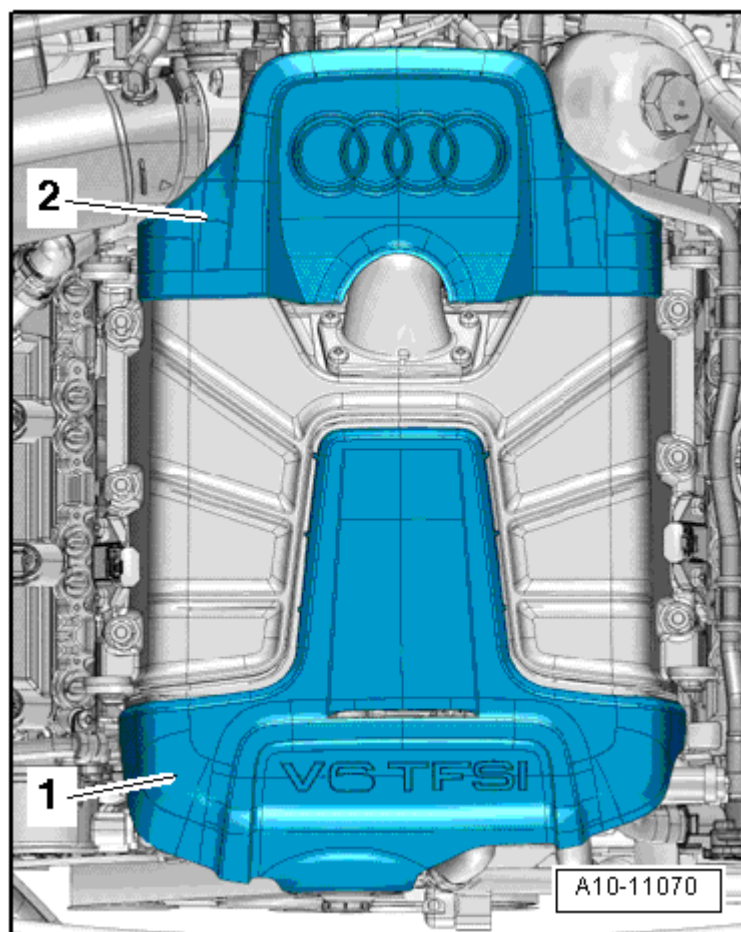


Fig. 134: Engine Cover -1- and -2-
Courtesy of AUDI OF AMERICA, LLC

Checking internal resistance

-- Disconnect the Heated Oxygen Sensor (HO2S) -G108- electrical harness connector -1-.

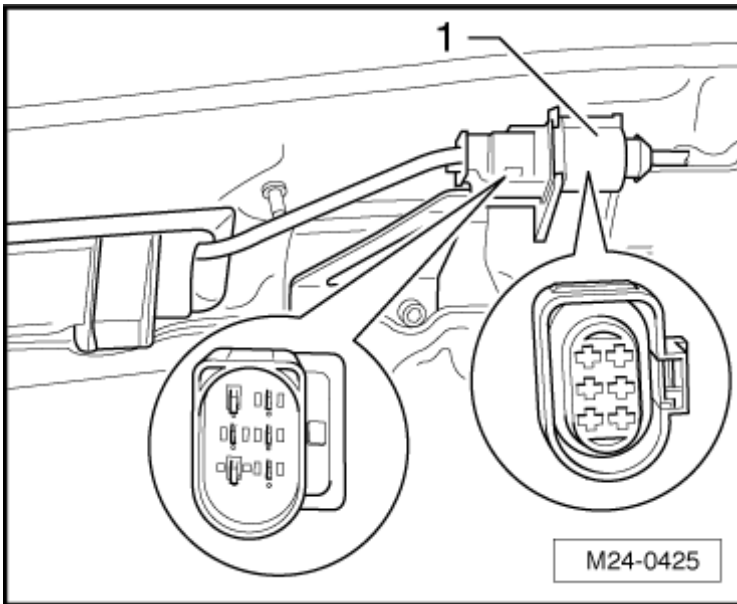


Fig. 135: Identifying Heated Oxygen Sensor (HO2S) G39 Electrical Harness Connector
Courtesy of AUDI OF AMERICA, LLC

-- Using a multimeter, check the Heated Oxygen Sensor (HO2S) -G108- terminals 3 to 5 for resistance.

Specified value: 2.5 to 10.0 ohms (at approx. 20° C)

If the specification was not obtained:

-- Replace the Heated Oxygen Sensor (HO2S) -G108-. Refer to the appropriate service information.

If the specification was obtained:

Checking voltage supply

-- Crank the engine (engine may run).

-- Using a multimeter, check the Heated Oxygen Sensor (HO2S) -G108- electrical harness connector terminal 5 to Ground (GND) for voltage.

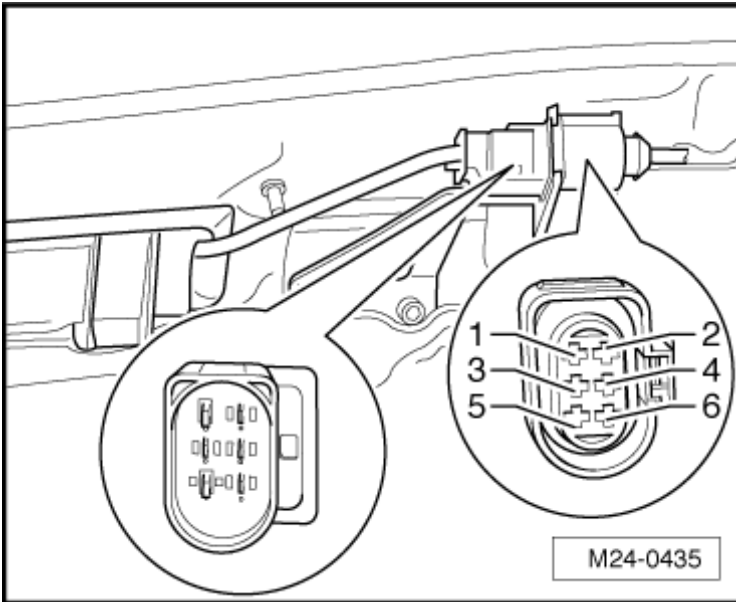


Fig. 136: Identifying 6-Pin Electrical Harness Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

Heated Oxygen Sensor (HO2S) -G108- electrical harness connector terminal	Engine Control Module (ECM) - J623- electrical harness connector T94 terminal or test box socket
5	Ground (GND)

-- Switch the ignition off.

Specified value: Battery voltage.

If the specification was not obtained:

-- Check the Heated Oxygen Sensor (HO2S) -G39- electrical harness connector terminal 5 to the Engine Component Power Supply Relay -J757- terminal 8 an open circuit, a short circuit to each other, Battery (+), or Ground (GND).

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If the specification was obtained:

Checking Ground (GND) activation

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Using a multimeter, check the Heated Oxygen Sensor (HO2S) -G39- electrical harness connector terminal 3 to the Engine Control Module (ECM) -J623- electrical harness connector T94 terminal 51 for resistance.

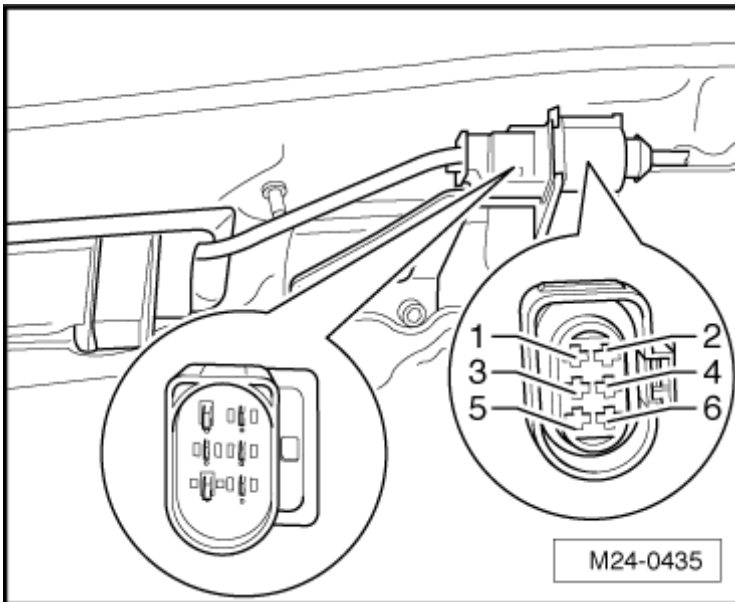


Fig. 137: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Heated Oxygen Sensor (HO2S) -G39- electrical harness connector terminal

Engine
Control
Module
(ECM) -
J623-
electrical
harness
connector
T94
terminal

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	or test box socket
3	51

Specified value: 1.5 ohms max.

If the specification was not obtained:

- Check the wiring for a short circuit to each other, Battery (+), and Ground (GND).
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring and if the voltage supply was OK:

- Erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
- Perform a road test to verify repair.

If the DTC does not return:

Generate readiness code. Refer to **READINESS CODE**.

If the DTC does return and no malfunction is detected in the wiring and the voltage supply was OK:

- Replace the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

OXYGEN SENSOR O2S HEATER 1 BEHIND CATALYTIC CONVERTER, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

NOTE: **Oxygen Sensor (O2S) 1 Before Catalytic Converter Heater - Z29- is part of Oxygen Sensor (O2S) Before Three Way Catalytic Converter -G130- and cannot be replaced separately.**

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- Fuse -SB9- OK.
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start diagnosis

-- Remove right cover from vehicle underbody. Refer to the appropriate service information.

Checking internal resistance

-- Disconnect the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- electrical harness connector -1-.

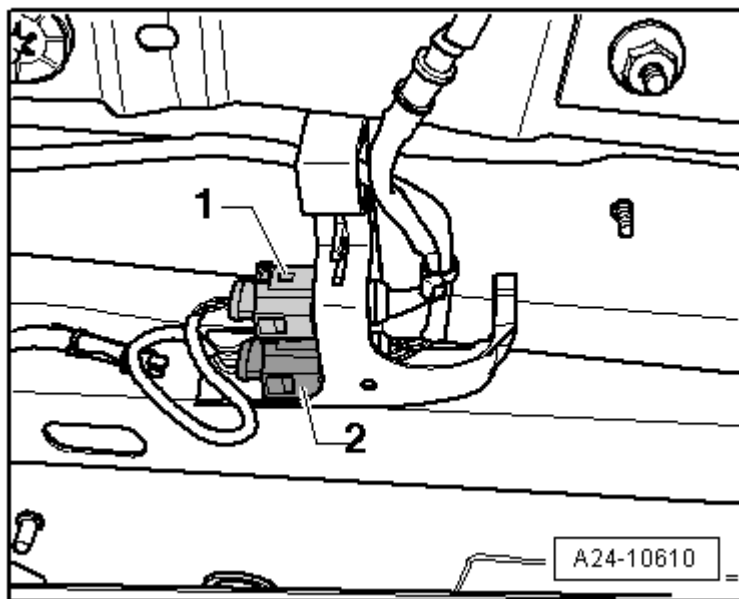


Fig. 138: Electrical Connector For Oxygen Sensors - CBFA
Courtesy of AUDI OF AMERICA, LLC

-- Using a multimeter, check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- terminals 1 to 2 for resistance.

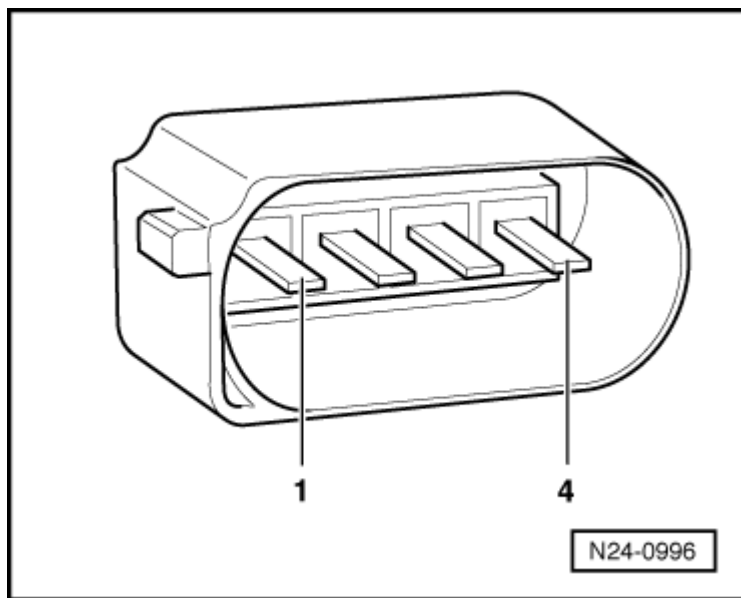


Fig. 139: Identifying 4-Pin Harness Connector Terminals 1 & 4
Courtesy of AUDI OF AMERICA, LLC

Specified value: 2.5 to 14.0 ohms (at approx. 20° C)

If the specification was not obtained:

-- Replace the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130-. Refer to the appropriate service information.

If the specification was obtained:

Checking voltage supply

-- Using a multimeter, check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- electrical harness connector terminal 1 to ground (GND) for voltage.

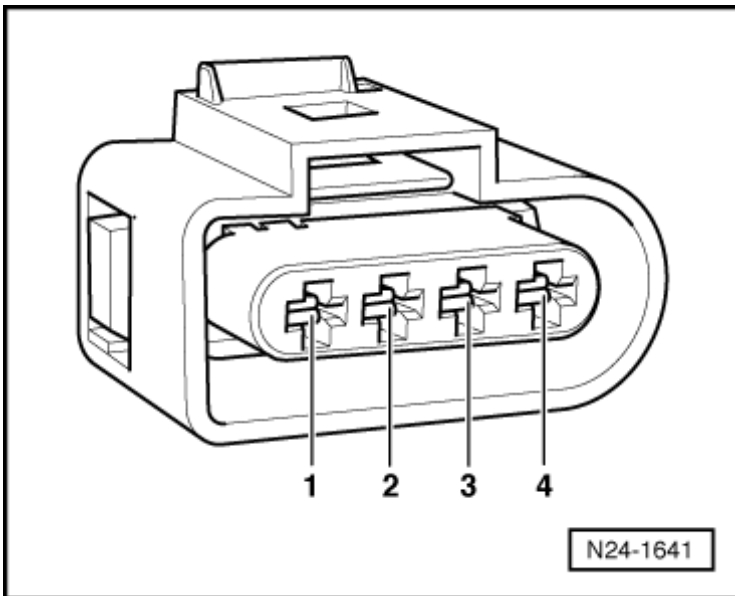


Fig. 140: 4-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: Battery voltage.

If the specification was not obtained:

-- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- electrical harness connector terminal 1 to the Engine Component Power Supply Relay -J757- terminal 8 for an open circuit, a short circuit to each other, or Ground (GND).

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If the specification was obtained:

Checking Ground (GND) activation

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Using a multimeter, check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- electrical harness connector to the Engine Control Module (ECM) -J623- electrical harness connector T94 for resistance.

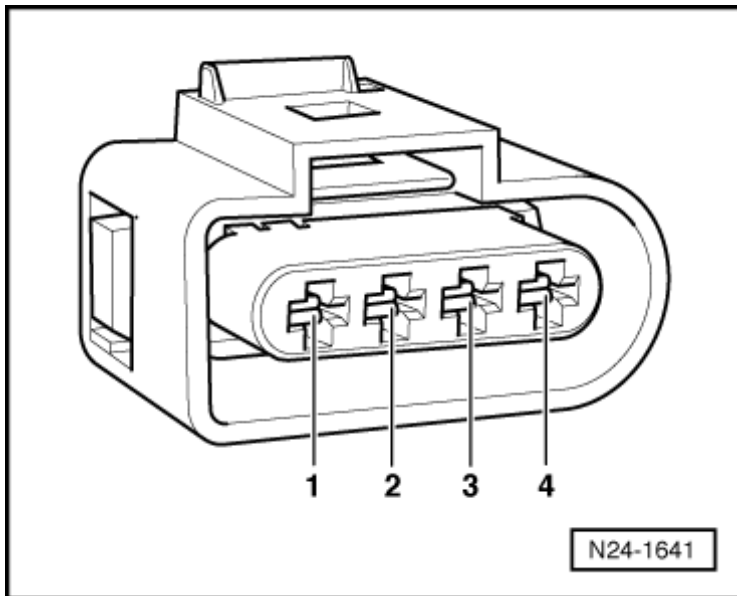


Fig. 141: 4-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- electrical harness connector terminal	Engine Control Module (ECM) - J623- electrical connector T94 terminal or test box socket
2	46

Specified value: 1.5 ohms max.

If the specification was not obtained:

- Check the wiring for a open circuit or short to Ground (GND).
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring and if the voltage supply was OK:

- Erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**
- Perform a road test to verify repair.

If the DTC does not return:

Generate readiness code. Refer to **READINESS CODE**.

If the DTC does return and no malfunction is detected in the wiring and the voltage supply was OK:

- Replace the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

Final procedures

After repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

OXYGEN SENSOR O2S HEATER 2 BEHIND CATALYTIC CONVERTER, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

NOTE: **Oxygen Sensor (O2S) 2 (behind Three Way Catalytic Converter (TWC)) Heater - Z30- is part of Oxygen Sensor (O2S) Before Three Way Catalytic Converter - G131- and cannot be replaced separately.**

Special tools and workshop equipment required

- multimeter.

- Wiring diagram.

Test requirements

- Fuse -SB9- OK.
- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start diagnosis

-- Remove right cover from vehicle underbody. Refer to the appropriate service information.

Checking internal resistance

-- Disconnect the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G131- electrical harness connector -1-.

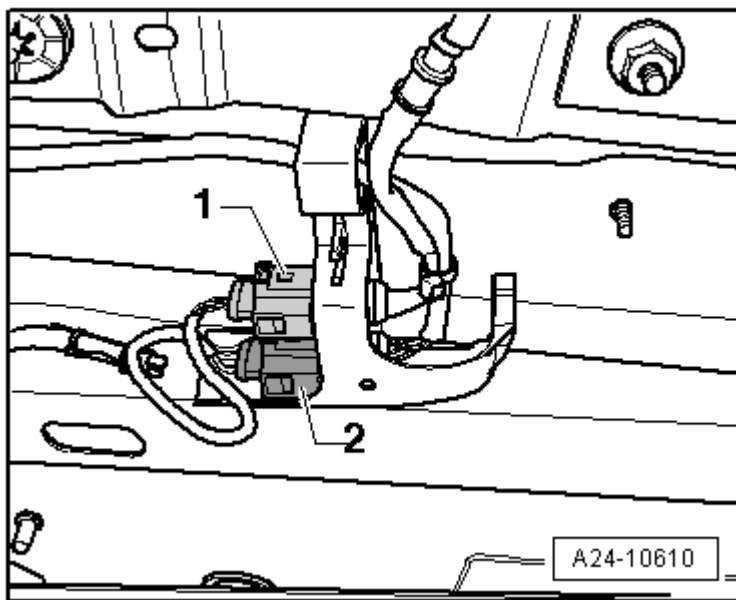


Fig. 142: Electrical Connector For Oxygen Sensors - CBFA
Courtesy of AUDI OF AMERICA, LLC

-- Using a multimeter, check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G131- terminals 1 to 2 for resistance.

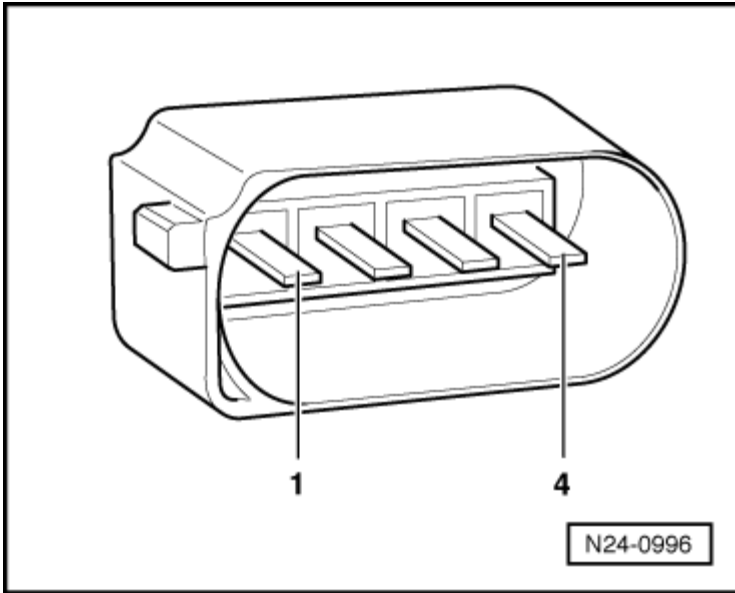


Fig. 143: Identifying 4-Pin Harness Connector Terminals 1 & 4
Courtesy of AUDI OF AMERICA, LLC

Specified value: 2.5 to 14.0 ohms (at approx. 20° C)

If the specification was not obtained:

-- Replace the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G131-. Refer to the appropriate service information.

If the specification was obtained:

Checking voltage supply

-- Using a multimeter, check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G131- electrical harness connector terminal 1 to ground (GND) for voltage.

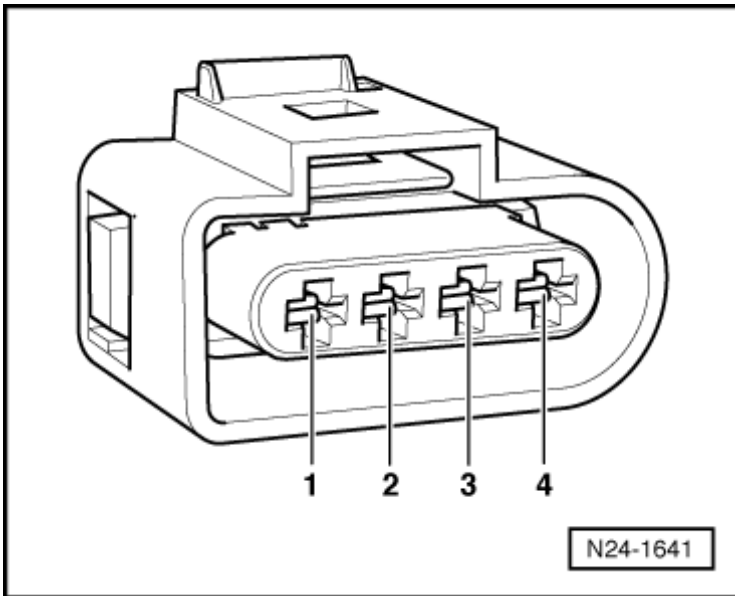


Fig. 144: 4-Pin Electrical Harness Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: Battery voltage.

If the specification was not obtained:

- Check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G131- electrical harness connector terminal 1 to the Engine Component Power Supply Relay -J757- terminal 8 for an open circuit, a short circuit to each other, or Ground (GND).
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If the specification was obtained:

Checking Ground (GND) activation

If the manufacturers test box is being used, perform the following step.

- Install the test box.

If the manufacturers test box is not being used, perform the following step.

- Remove the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.
- Using a multimeter, check the Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G131- electrical harness connector to the Engine Control Module (ECM) -J623- electrical harness connector T94 for resistance.

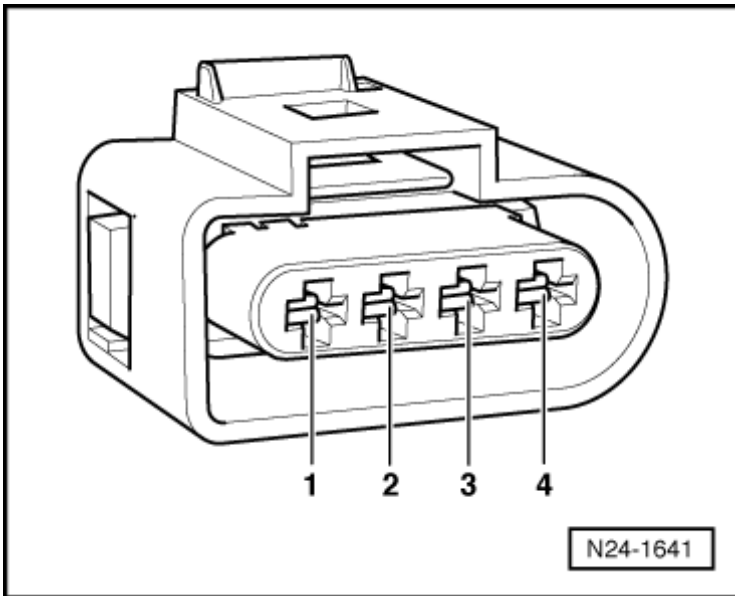


Fig. 145: 4-Pin Electrical Harness Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G131- electrical harness connector terminal

Engine Control Module (ECM) - J623- electrical connector T94 terminal or test box socket

2

41

Specified value: 1.5 ohms max.

If the specification was not obtained:

- Check the wiring for a open circuit or short to Ground (GND).
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring and if the voltage supply was OK:

- Erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**

-- Perform a road test to verify repair.

If the DTC does not return:

Generate readiness code. Refer to **READINESS CODE**.

If the DTC does return and no malfunction is detected in the wiring and the voltage supply was OK:

-- Replace the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

Final procedures

After repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

SECONDARY AIR INJECTION SENSOR 1, CHECKING

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- Fuse -SB10- OK.
- The Motronic Engine Control Module (ECM) Power Supply Relay -J271- OK.
- The ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start diagnosis

-- Disconnect the Secondary Air Injection Sensor 1 -G609- electrical harness connector -1-.

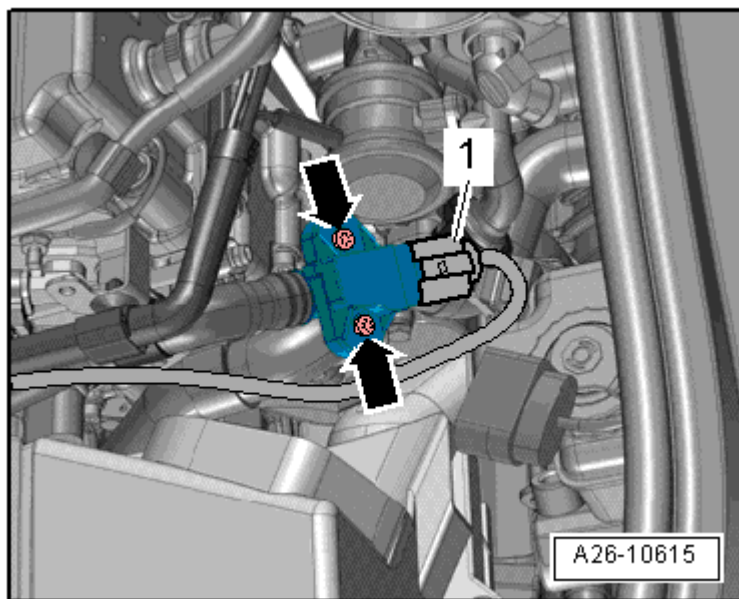


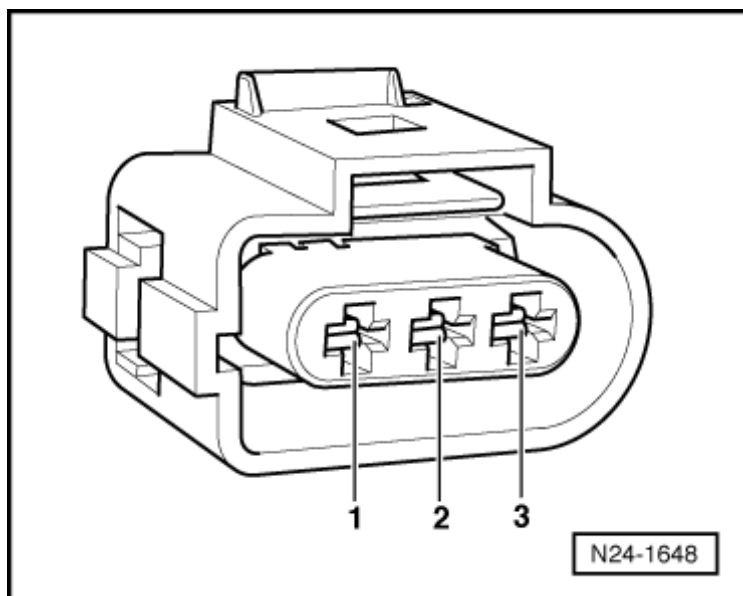
Fig. 146: Component Location Secondary Air Injection Sensor 1 G609 - Engine Code CBRA
Courtesy of AUDI OF AMERICA, LLC

Checking voltage supply

NOTE: The voltage for the Secondary Air Injection Sensor 1 -G609- is supplied by the Motronic Engine Control Module (ECM) Power Supply Relay -J271-.

-- Turn the ignition on.

-- Using a multimeter, check the Secondary Air Injection Sensor 1 -G609- electrical harness connector terminal 1 for voltage.



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Fig. 147: 3-Pin Electrical Harness Connector & Terminals

Courtesy of AUDI OF AMERICA, LLC

Secondary Air Injection Sensor 1 -G609- electrical harness connector terminal	Measure to
-1-	Engine Ground (GND)

-- Operate the engine briefly.

Specified value: approx. 5 V.

-- Switch the ignition off.

If the specified value was not obtained:

-- Using a multimeter, check the Secondary Air Injection Sensor 1 -G609- electrical harness connector terminal 1 to the Motronic Engine Control Module (ECM) -J623- terminal T60-35 for resistance.

Specified value: 1.5 ohms max

If the specification was not obtained:

-- Check the wiring for a short circuit to Battery positive (+) or an open circuit.

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring and if the voltage supply was OK:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Secondary Air Injection Sensor 1 -G609- electrical harness connector terminals to Engine Control Module (ECM) -J623- electrical harness connector T60 terminals.

Secondary Air Injection Sensor 1 -G609- electrical harness connector terminals	Engine Control Module (ECM) -J623- electrical connector T60 terminals or test box sockets

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1	35
2	12
3	50

Specified value: 1.5 ohms max.

If the specification is not obtained:

- Check the wiring for a short circuit to Battery positive (+), or an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is found in wiring:

- Erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
- Perform a road test to verify repair.

If the DTC does not return:

Generate readiness code. Refer to **READINESS CODE**.

If the DTC does return and no malfunction is detected in the wiring and the voltage supply was OK:

- Replace the Engine Control Module (ECM) -J623-. Refer to appropriate service information.
- Assembly is performed in the reverse of the removal.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

SECONDARY AIR INJECTION SOLENOID VALVE, CHECKING

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- The Secondary Air Injection (AIR) Solenoid Valve --N112-- fuse OK.
- The Secondary Air Injection (AIR) Pump Fuse -S130- fuse OK.
- Battery voltage at least 12.5 V.
- All electrical consumers switched off (radiator fan must NOT run during test).
- A/C switched off.
- The ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start diagnosis

NOTE: Voltage is supplied to the Secondary Air Injection (AIR) Solenoid Valve -N112- from the Secondary Air Injection (AIR) Pump Fuse -S130-.

Procedure

-- Disconnect the Secondary Air Injection (AIR) Solenoid Valve -N112- electrical harness connector -1-.

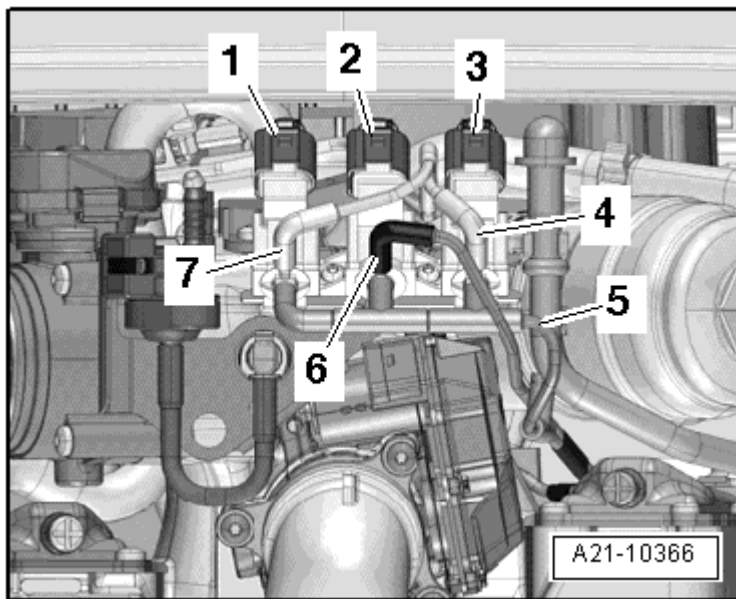


Fig. 148: Installed Location: Secondary Air Injection Solenoid Valve and Intake Manifold Runner Control (IMRC) Valve -N316-
Courtesy of AUDI OF AMERICA, LLC

Checking internal resistance

-- Using a multimeter, check the Secondary Air Injection (AIR) Solenoid Valve -N112- terminals 1 to 2 for resistance.

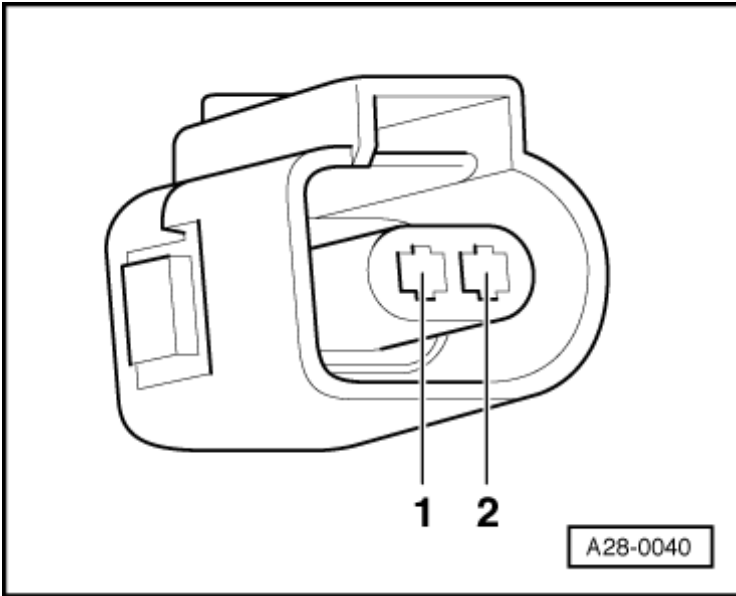


Fig. 149: 2-Pin Electrical Connector & Terminals

Courtesy of AUDI OF AMERICA, LLC

Specified value: 25 to 35 ohms (at approx. 20° C)

If the specified value was not obtained:

-- Replace the Secondary Air Injection (AIR) Solenoid Valve -N112- : Refer to appropriate service information.

If the specified value was obtained:

Checking voltage supply

Switch the ignition on.

-- Using a multimeter, check the Secondary Air Injection (AIR) Solenoid Valve -N112- electrical connector terminal 1 to Ground (GND) for voltage.

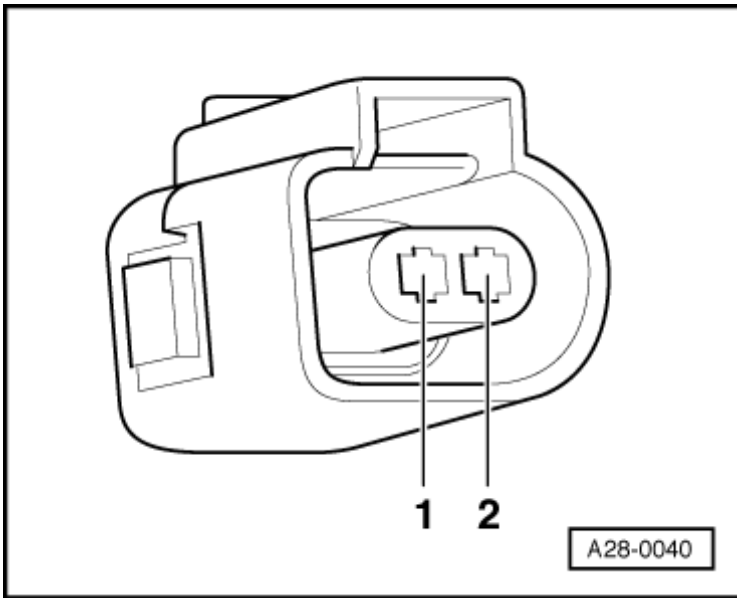


Fig. 150: 2-Pin Electrical Connector & Terminals

Courtesy of AUDI OF AMERICA, LLC

Specified value: battery voltage.

Switch the ignition off.

If the specified value was not obtained:

-- Check the wiring from the Secondary Air Injection (AIR) Solenoid Valve -N112- electrical connector terminal 1 to the Secondary Air Injection (AIR) Pump Fuse -S130- for an open circuit.

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the wiring connection.

If no malfunctions are found in the wiring:

Checking wiring

If the manufacturer's test box is being used. Perform the following step.

-- Install the test box.

If the manufacturer's test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Using a multimeter, check the Secondary Air Injection (AIR) Solenoid Valve -N112- electrical harness connector terminal 2 to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T94 terminal 49 for an open circuit.

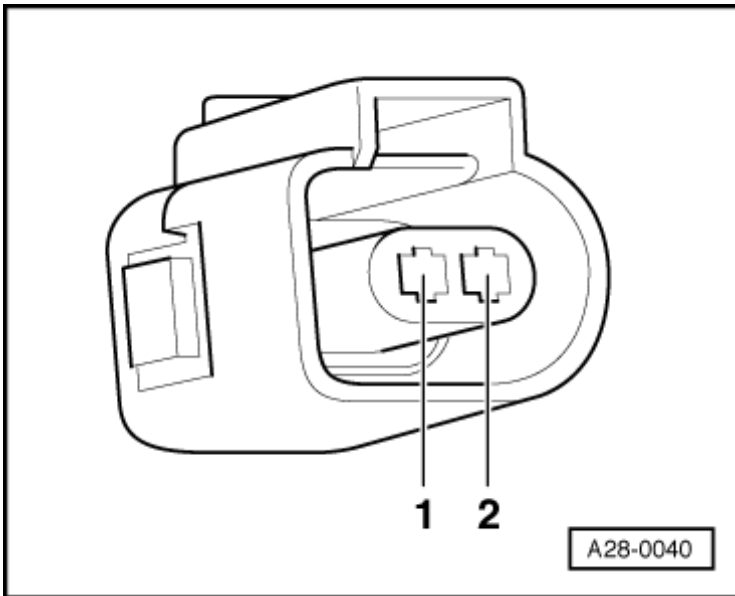


Fig. 151: 2-Pin Electrical Connector & Terminals

Courtesy of AUDI OF AMERICA, LLC

Secondary Air Injection (AIR) Solenoid Valve -N112- electrical harness connector terminal

**Motronic
Engine
Control
Module (ECM) -
J623-
electrical
connector
T94
terminal
or test
box
socket**

2

49

Specified value: 1.5 ohms Max.

If the specification was not obtained:

- Check the wiring for a short circuit to each other, Battery (+), and Ground (GND).
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring:

-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

Final procedures

After repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

SECONDARY AIR INJECTION SOLENOID VALVE 2, CHECKING

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- The Secondary Air Injection (AIR) Solenoid Valve 2 --N320-- fuse OK.
- The Secondary Air Injection (AIR) Pump Fuse -S130- fuse OK.
- Battery voltage at least 12.5 V.
- All electrical consumers switched off (radiator fan must NOT run during test).
- A/C switched off.
- The ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start diagnosis

NOTE: Voltage is supplied to the Secondary Air Injection (AIR) Solenoid Valve 2 -N320- from the Secondary Air Injection (AIR) Pump Fuse -S130-.

Procedure

-- Disconnect the Secondary Air Injection (AIR) Solenoid Valve 2 -N320- electrical harness connector -3-.

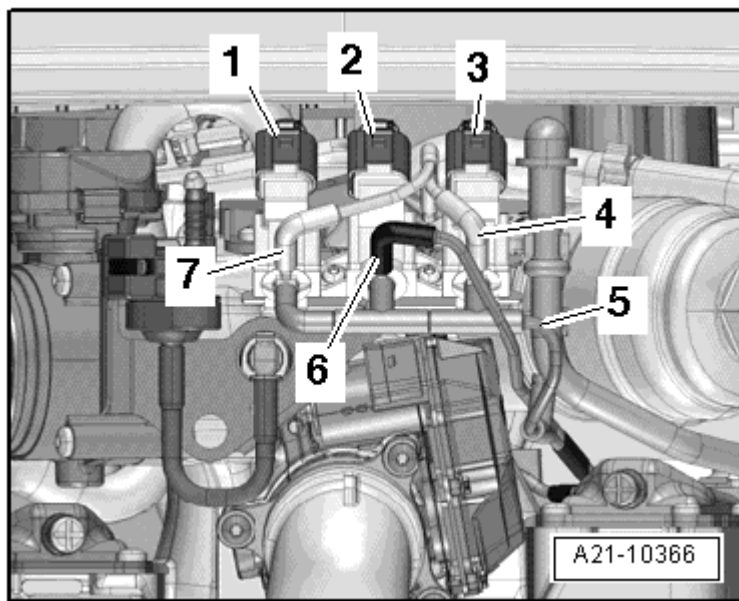


Fig. 152: Installed Location: Secondary Air Injection Solenoid Valve and Intake Manifold Runner Control (IMRC) Valve -N316-
 Courtesy of AUDI OF AMERICA, LLC

Checking internal resistance

-- Using a multimeter, check the Secondary Air Injection (AIR) Solenoid Valve 2 -N320- terminals 1 to 2 for resistance.

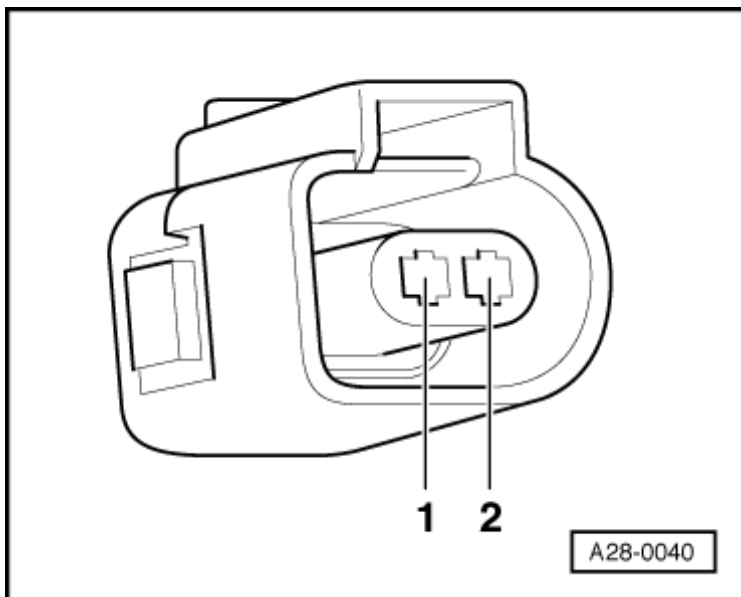


Fig. 153: 2-Pin Electrical Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

Specified value: 25 to 35 ohms (at approx. 20° C)

If the specified value was not obtained:

-- Replace the Secondary Air Injection (AIR) Solenoid Valve 2 -N320- : Refer to appropriate service information.

If the specified value was obtained:

Checking voltage supply

Switch the ignition on.

-- Using a multimeter, check the Secondary Air Injection (AIR) Solenoid Valve 2 -N320- electrical connector terminal 1 to Ground (GND) for voltage.

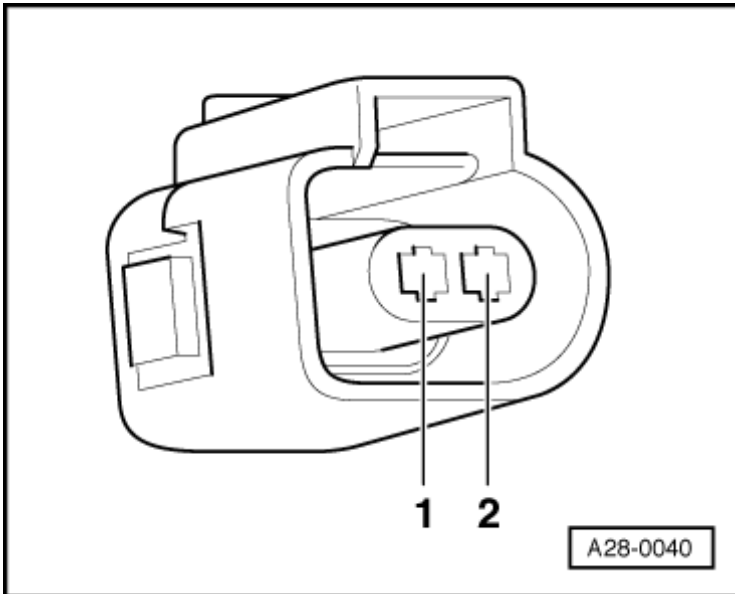


Fig. 154: 2-Pin Electrical Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: battery voltage.

Switch the ignition off.

If the specified value was not obtained:

-- Check the wiring from the Secondary Air Injection (AIR) Solenoid Valve 2 -N320- electrical connector terminal 1 to the Secondary Air Injection (AIR) Pump Fuse -S130- for an open circuit.

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the wiring connection.

If no malfunctions are found in the wiring:

Checking wiring

If the manufacturers test box is being used. Perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information. Using a multimeter, check the Secondary Air Injection (AIR) Solenoid Valve 2 -N320- electrical harness connector terminal 2 to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T94 terminal 28 for an open circuit.

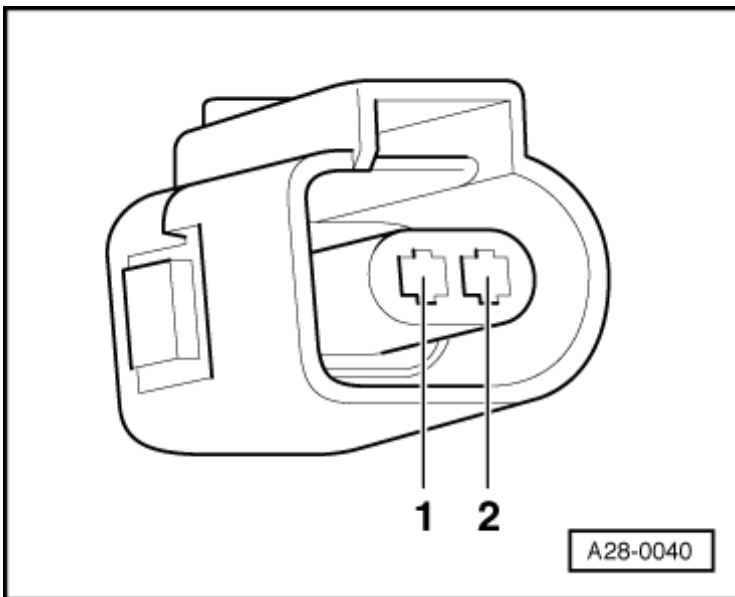


Fig. 155: 2-Pin Electrical Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Secondary Air Injection (AIR) Solenoid Valve 2 -N320- electrical harness connector terminal	Motronic Engine Control Module (ECM) - J623- electrical connector T94 terminal or test box socket
2	28

Specified value: 1.5 ohms Max.

If the specification was not obtained:

- Check the wiring for an open circuit.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

Final procedures

After repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

SECONDARY AIR INJECTION PUMP RELAY, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- Secondary Air Injection (AIR) Pump Relay --J299-- fuses OK.
- Secondary Air Injection (AIR) Pump Fuse -S130- fuse OK..
- Battery voltage at least 12.5 V.
- All electrical consumers switched off.
- A/C switched off.

- The ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start diagnosis

-- Remove the Secondary Air Injection (AIR) Pump Relay -J299-. Refer to the appropriate service information.

Checking voltage

-- Using a Multimeter, check the Secondary Air Injection (AIR) Pump Relay -J299- socket 2 to Ground (GND).

Specified value: battery voltage.

If the specified value was not obtained:

-- Check the wiring connection from the Secondary Air Injection (AIR) Pump Relay -J299- socket 2 to the Battery -A- (+) terminal for an open circuit or a short circuit to Ground (GND).

-- Check the wiring connections for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If the specified value was obtained:

-- Switch the ignition on.

-- Using a multimeter, check the Secondary Air Injection (AIR) Pump Relay -J299- socket 8 to Ground (GND) for voltage.

Specified value: battery voltage.

-- Switch the ignition off.

If the specified value was not obtained:

-- Check the wiring connection from the Secondary Air Injection (AIR) Pump Relay -J299- socket 8 to the Secondary Air Injection (AIR) Pump Motor -V101- socket 2 for an open circuit.

-- Check the wiring connections for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If the specified value was obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Using a multimeter, check the Secondary Air Injection (AIR) Pump Relay -J299- socket 6 to the Engine Control Module (ECM) -J623- electrical harness connector T94 terminal 23 for resistance.

Secondary Air Injection (AIR) Pump Relay -J299- socket terminal	Engine Control Module (ECM) - J623- electrical connector T94 terminal or test box socket
6	23

Specified value: 1.5 ohms Max.

If the specification was not obtained:

-- Check the wiring for a short circuit to Battery (+), or an open circuit.

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring and voltage supply was OK:

-- Replace the Secondary Air Injection (AIR) Pump Relay -J299-. Refer to the appropriate service information.

-- Erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.

-- Perform a road test to verify repair.

If the DTC does not return:

Generate readiness code. Refer to **READINESS CODE**.

If the DTC returns and no malfunction is found in the wiring and the voltage supply was OK:

-- Replace the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

Final procedures

After repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

SECONDARY AIR INJECTION COMBINATION VALVE, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

Special tools and workshop equipment required

- Hand vacuum pump.

Test conditions

- Vacuum lines and hose connections free of leaks.
- Vacuum lines not plugged.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start procedure

-- Remove the vacuum hose from the combination valve.

-- Connect hand vacuum pump to combination valve vacuum connection.

-- Remove the air duct hose from the Throttle Valve Control Module -J338- and position aside.

-- Disconnect the Secondary Air Injection hose.

-- Inject a light air pressure into the in Secondary Air Injection hose to close the combination valve. (do not use compressed air).

The combination valve should close and seal. Air should not be able to pass through the combination valve.

-- Operate the hand vacuum pump.

The combination valve should open. Air should be able to pass through the combination valve.

If combination valve does not open:

-- Replace the faulty combination valve. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

SECONDARY AIR INJECTION PUMP MOTOR, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, refer to the applicable wiring diagram.

Special tools and workshop equipment required

- Multimeter.
- Wiring diagram.

Test requirements

- The Secondary Air Injection (AIR) Pump Relay --J299-- fuses OK.
- The Secondary Air Injection (AIR) Pump Fuse -S130- fuse OK.
- Battery voltage at least 12.5 V.
- All electrical consumers switched off (radiator fan must NOT run during test).
- A/C switched off.
- The ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start diagnosis

-- Disconnect the secondary air injection hose. Under right headlamp.

-- Disconnect the Secondary Air Injection (AIR) Pump Motor --V101-- electrical harness connector -2-.

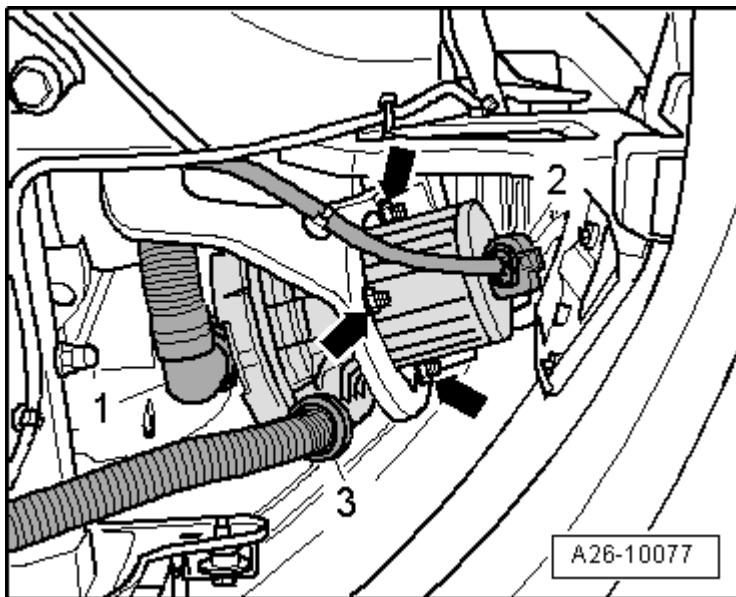


Fig. 156: Identifying Air Guide Hoses, Electrical Connector, Nuts & Secondary Air Injection (AIR) Pump

Courtesy of AUDI OF AMERICA, LLC

Checking voltage

-- Switch the ignition on.

-- Using a multimeter, check the Secondary Air Injection (AIR) Pump Motor --V101-- electrical harness connector terminals 1 to 2 for voltage.

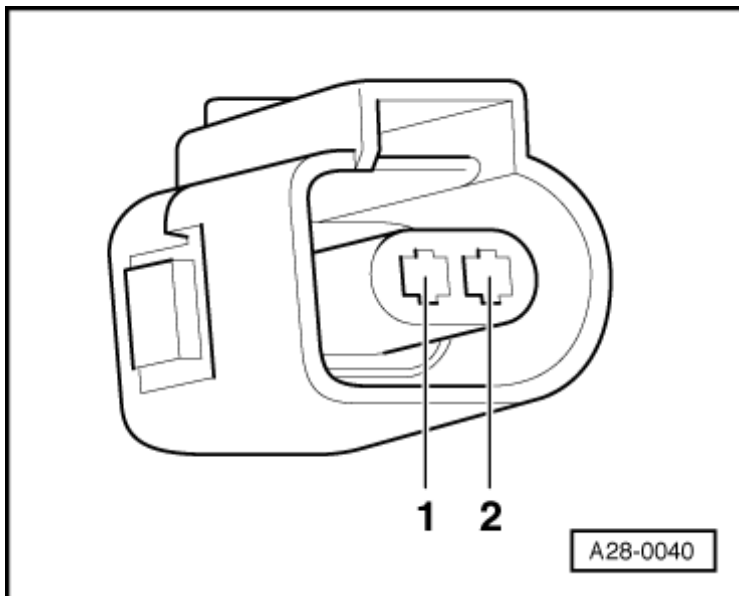


Fig. 157: 2-Pin Electrical Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: battery voltage.

-- Switch the ignition off.

If the specified value was not obtained:

-- Switch the ignition on

-- Using a multimeter, check the Secondary Air Injection (AIR) Pump Motor --V101-- electrical harness connector terminal 2 to Ground (GND).

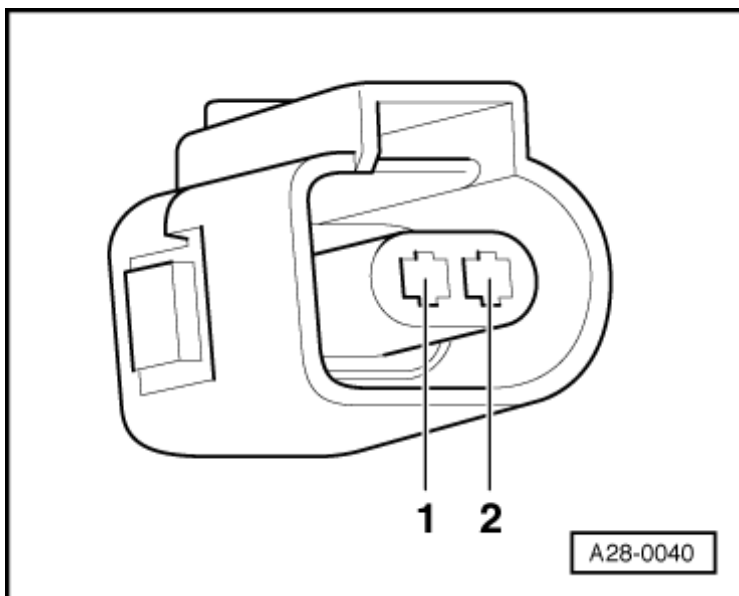


Fig. 158: 2-Pin Electrical Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: battery voltage.

If the specified value was not obtained:

-- Check the wiring connection from the Secondary Air Injection (AIR) Pump Relay --J299-- socket 2 to the Secondary Air Injection (AIR) Pump Motor --V101-- electrical harness connector terminal 2 for an open circuit or a short circuit.

-- Check the wiring connections for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If the specified value was obtained:

Checking Ground (GND)

-- Using a multimeter, check the Secondary Air Injection (AIR) Pump Motor --V101-- electrical harness connector terminal 1 to Ground (GND) for resistance.

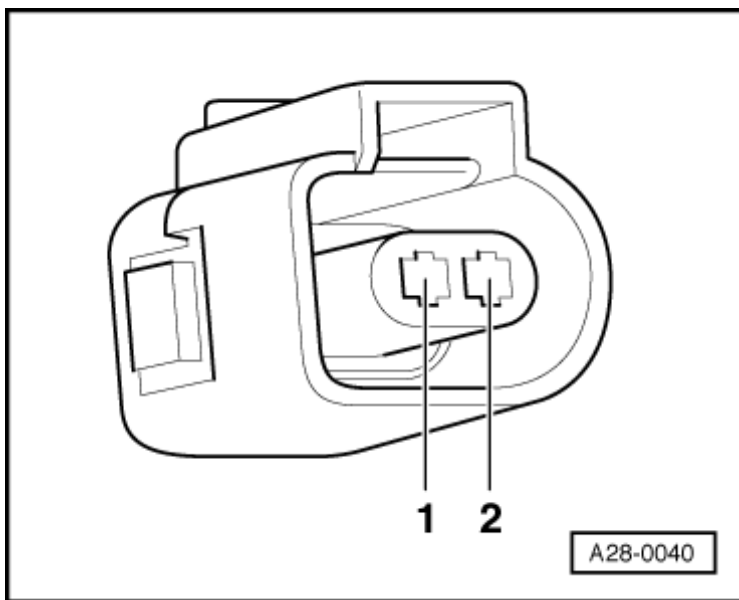


Fig. 159: 2-Pin Electrical Connector & Terminals
Courtesy of AUDI OF AMERICA, LLC

Specified value: 1.5 ohms Max.

If the specification was not obtained:

-- Check the wiring for a short circuit to Battery (+), or an open circuit.

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-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring and voltage supply was OK:

-- Replace Secondary Air Injection (AIR) Pump Motor --V101--. Refer to the appropriate service information.

-- Erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.

-- Perform a road test to verify repair.

If the DTC does not return:

Generate readiness code. Refer to **READINESS CODE**.

If the DTC does return and no malfunction is detected in the wiring and the voltage supply was OK:

-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

TCM TO ECM CAN BUS TERMINAL RESISTANCE, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

Prior to repair work, perform a preliminary check to verify the condition. Refer to **PRELIMINARY CHECK**.

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- Multimeter
- Wiring diagram

Test requirement

- A CAN malfunction was recognized
- Battery voltage at least 12.5 volts
- Engine control module fuses OK
- Ignition switched off

Test procedure

-- Remove the transmission control module. Refer to the appropriate service information for removal and installation procedures.

-- Disconnect the transmission control module electrical harness connector.

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- Repair as necessary.

NOTE: **The ECM must remain connected for the following step. The central terminal resistor is located in the ECM.**

-- Using a multimeter, check the Transmission Control Module (TCM) -J217- electrical harness connector terminals 9 to 11 for resistance.

Specified value: 60 to 72 ohms (at approx. 20° C)

If the specified value was not obtained:

Checking wiring

-- Remove the engine control module. Refer to the appropriate service information for removal and installation procedures.

-- Using a multimeter, check each of the CAN bus circuits between the transmission control module and the engine control module. Refer to the applicable wiring diagram.

-- Check each CAN circuit for a short to ground, short to voltage, open circuit or high resistance.

-- Repair as necessary.

If the specified resistance value was not obtained and no malfunction is found in the wiring:

-- Replace the engine control module. Refer to the appropriate service information for removal and installation procedures.

If the specified resistance value was obtained:

-- Remove the engine control module. Refer to the appropriate service information for removal and installation procedures.

-- Check each CAN circuit for a short to ground, short to voltage, open circuit or high resistance.

-- Repair as necessary.

If no malfunction is found in the wiring:

-- Replace the transmission control module. Refer to the appropriate service information for removal and installation procedures.

Final procedures

After repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

THROTTLE POSITION SENSOR/ACCELERATOR PEDAL POSITION SENSOR 2, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- multimeter.
- **Wiring diagram**

Test requirement

- The Motronic Engine Control Module (ECM) - J623- fuses OK.

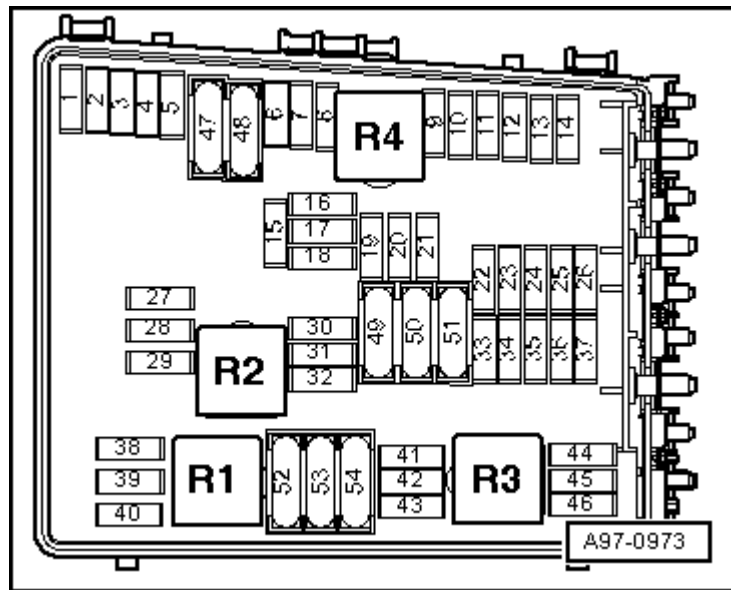


Fig. 160: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.

NOTE: Use only gold-plated terminals when servicing the electrical harness connector terminals in Throttle Position (TP) Sensor -G79- /Accelerator Pedal Position Sensor 2 -G185-.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

- Remove the drivers side storage compartment. Refer to the appropriate service information.
- Disconnect the Throttle Position (TP) Sensor -G79- /Accelerator Pedal Position Sensor 2 -G185- 6-pin electrical harness connector -2-.

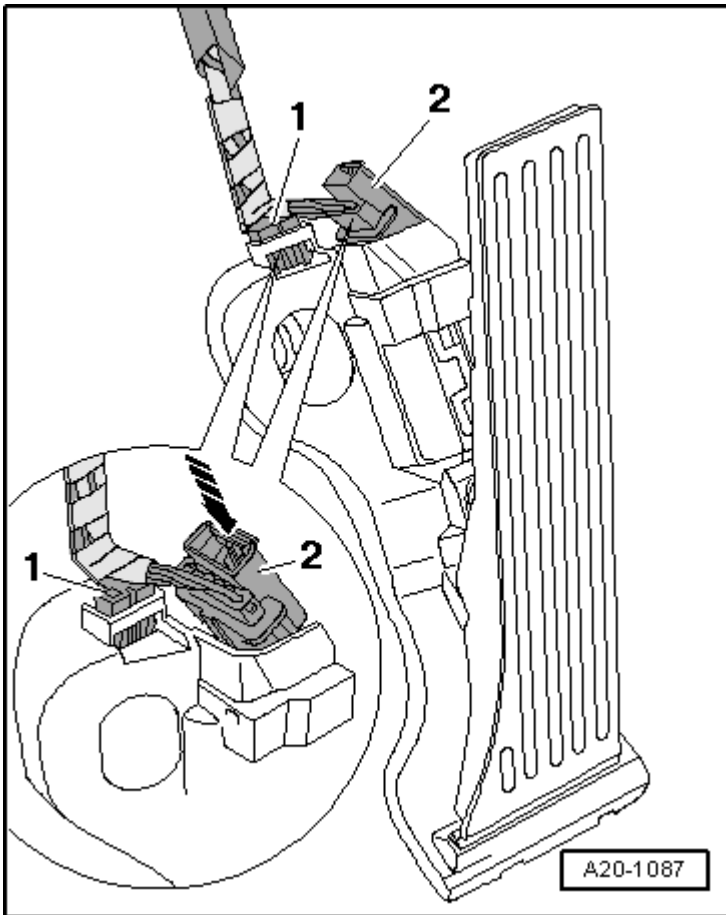


Fig. 161: Component Location Of Throttle Position (TP) Sensor G79 With Accelerator Pedal Position Sensor 2 G185

Courtesy of AUDI OF AMERICA, LLC

Checking voltage supply and wiring

- Switch the ignition on.
- Using a multimeter, check the following wiring connections for voltage.

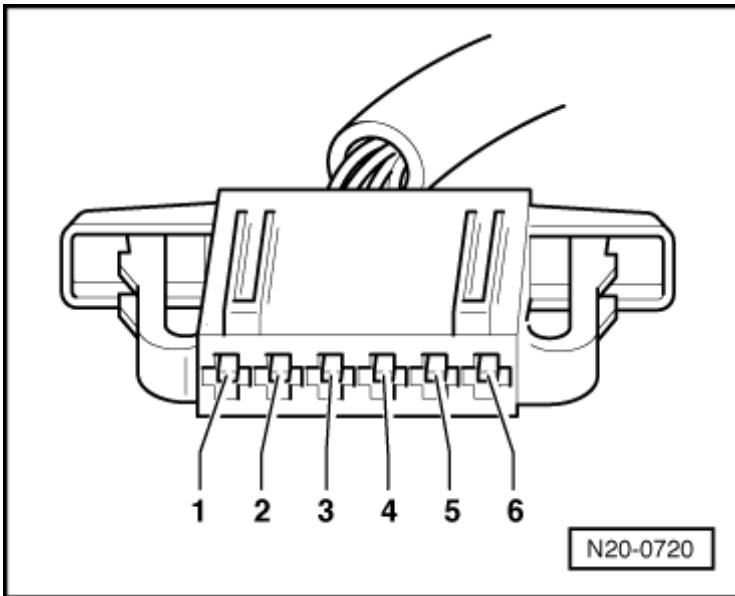


Fig. 162: 6-Pin Electrical Harness Connector & Terminals
 Courtesy of AUDI OF AMERICA, LLC

Throttle Position (TP) Sensor -G79- /Accelerator Pedal Position Sensor 2 - G185- electrical harness connector terminals	Specified value
1 to Ground (GND)	about 5 V
1 to 5	about 5 V
2 to Ground (GND)	about 5 V
2 to 3	about 5 V

-- Switch the ignition off.

If the specification was not obtained:

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.
- Using a multimeter, check the Throttle Position (TP) Sensor -G79- /Accelerator Pedal Position Sensor 2 - G185- electrical harness connector terminals to the Motronic Engine Control Module (ECM) -J623- electrical connector T94 for an open circuit.

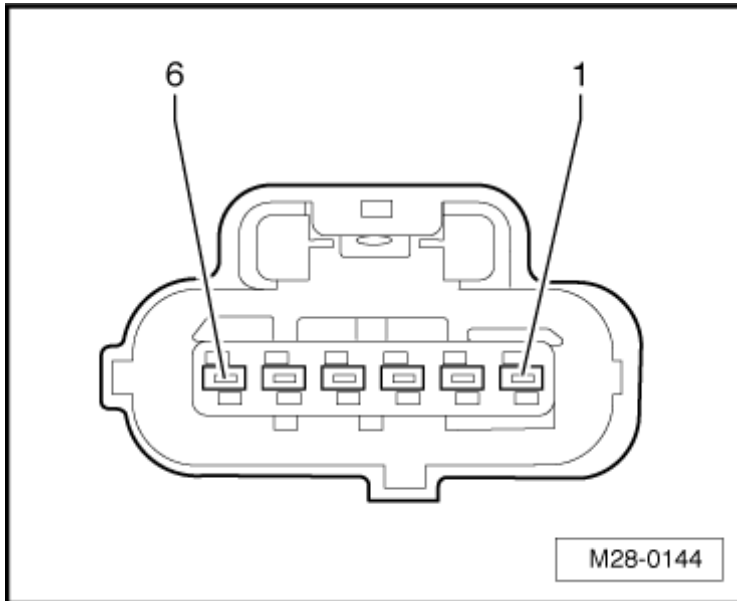


Fig. 163: 6-Pin Electrical Connector & Terminals

Courtesy of AUDI OF AMERICA, LLC

Throttle Position (TP) Sensor -G79- /Accelerator Pedal Position Sensor 2 - G185- electrical harness connector terminals	Motronic Engine Control Module (ECM) -J623- electrical connector T94 terminals or test box sockets
1	58
2	80
3	56
4	57
5	78
6	79

Specified value: 1.5 ohms max.

If the specification is not obtained:

- Check the wiring for a short circuit to each other, Battery (+), and Ground (GND).
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.
- If necessary, repair the faulty wiring connection.

If no malfunction is detected in the wiring and if the voltage supply was OK:

- Replace the Throttle Position (TP) Sensor -G79- /Accelerator Pedal Position Sensor 2 -G185-. Refer to the appropriate service information.

If no malfunction is detected in the wiring and if the voltage supply was not OK:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to the appropriate service information.
- Install the drivers side storage compartment. Refer to the appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

THROTTLE VALVE CONTROL MODULE, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

- multimeter.
- Wiring diagram.

Test requirements

- The Motronic Engine Control Module (ECM) - J623- fuses OK.

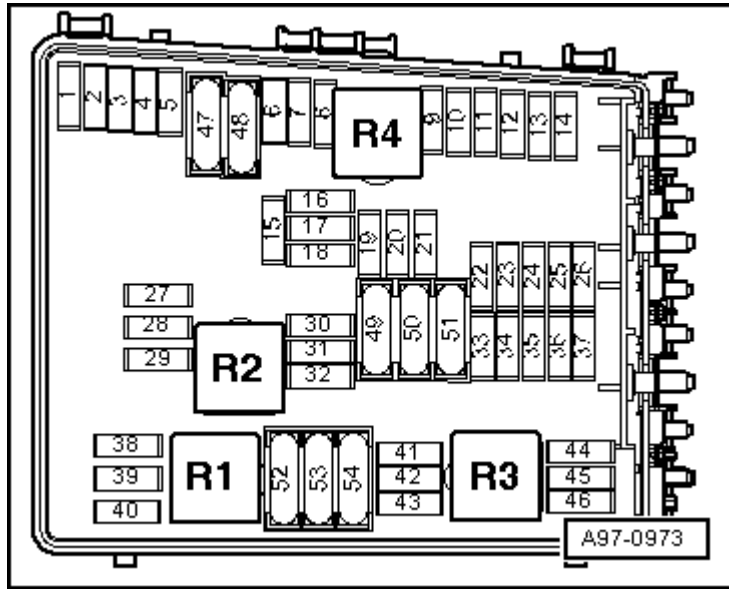


Fig. 164: Fuses On E-Box In Engine Compartment, Left Side
Courtesy of AUDI OF AMERICA, LLC

- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, shift selector lever into position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Throttle valve must not be damaged or dirty.
- Coolant Temperature at least 80° C.

Function

Throttle valve operation occurs by an electric motor (Throttle Drive (for Electronic Power Control (EPC)) - G186-) in the Throttle Valve Control Module - J338-. It is operated by the Motronic Engine Control Module (ECM) -J623- and the Throttle Position (TP) Sensor -G79- /Accelerator Pedal Position Sensor 2 -G185-.

The Throttle Valve Control Module -J338- is made up of the following components:

- Throttle Drive (for Electronic Power Control (EPC)) -G186-
- Throttle Drive Angle Sensor 1 (for Electronic Power Control (EPC)) -G187-
- Throttle Drive Angle Sensor 2 (for Electronic Power Control (EPC)) -G188-

The Throttle Valve Control Module -J338- cannot be serviced separately and must be serviced as a unit.

Test procedure

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-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Connect the scan tool.

-- Switch ignition on.

-- Using the scan tool, check the throttle valve position (absolute) at idle stop:

Diagnostic text	Specified value
Throttle valve position (absolute)	
Idle stop	3.0 to 25.0%

-- Slowly depress the accelerator pedal to Wide Open Throttle (WOT) stop while observing the percentage display. The percentage display must increase uniformly.

-- Using the scan tool, check the throttle valve position (absolute) at Wide Open Throttle (WOT) stop:

Diagnostic text	Specified value
Throttle valve position (absolute)	
Wide Open Throttle (WOT) stop	84.0 to 97.0%

-- End diagnosis and switch ignition off.

If the specified values are not obtained:

-- Remove the Throttle Valve Control Module -J338 - far enough so that the electrical connector terminals are reached.

-- Disconnect the Throttle Valve Control Module -J338- electrical harness connector -arrow-.

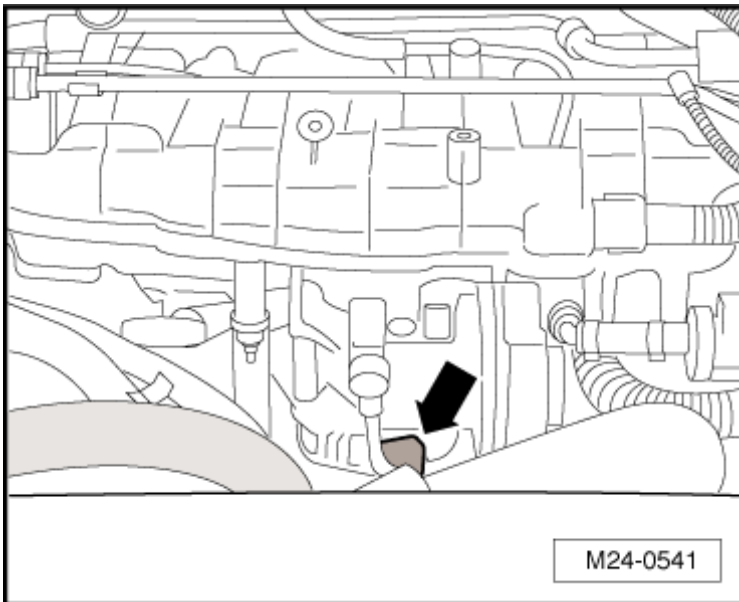


Fig. 165: Identifying Throttle Valve Control Module J338 Electrical Harness Connector
Courtesy of AUDI OF AMERICA, LLC

Checking resistance

-- Using a multimeter, check the Throttle Drive (for Electronic Power Control (EPC)) -G186- at the Throttle Valve Control Module -J338- terminals 1 to 3 for resistance.

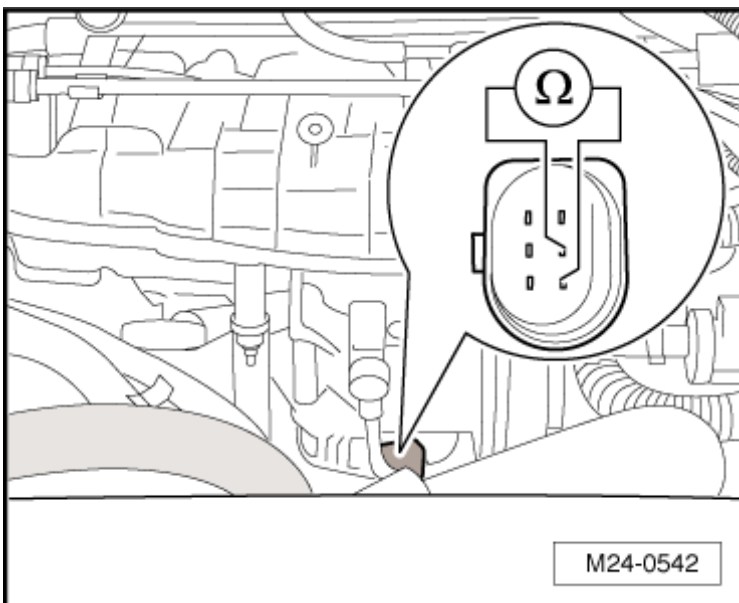


Fig. 166: Checking Throttle Drive (For Electronic Power Control (EPC)) G186 At Throttle Valve Control Module J338 Terminals 3 To 5 For Resistance
Courtesy of AUDI OF AMERICA, LLC

Specified value: 1.0 to 5.0 ohms (at 20° C)

If the specification was not obtained:

-- Replace the Throttle Valve Control Module - J338-. Refer to appropriate service information.

If the specification was obtained:

-- Check the voltage supply of the Throttle Valve Control Module -J338- to the Motronic Engine Control Module (ECM) -J623-.

Checking voltage supply and wiring

-- Switch the ignition on.

-- Using a multimeter, check the Throttle Drive Angle Sensor 1 (for Electronic Power Control (EPC)) -G187- at the Throttle Valve Control Module -J338- electrical harness connector terminals 1 to 6 for voltage.

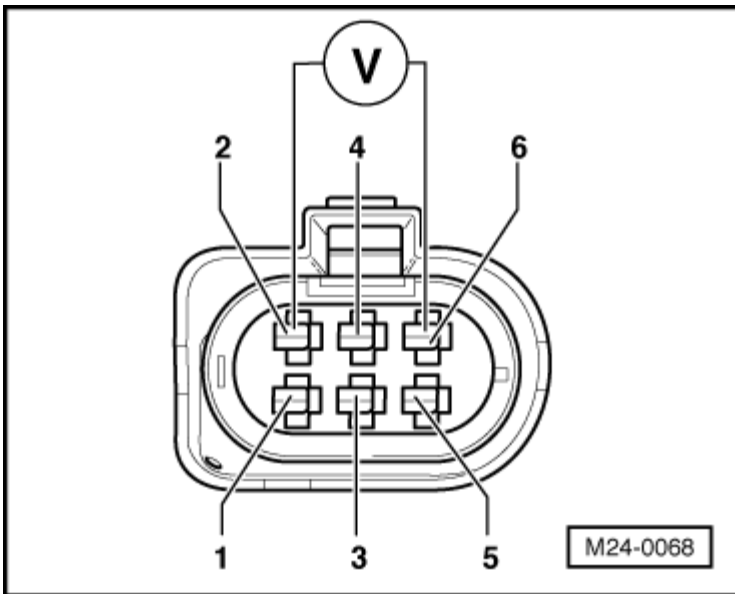


Fig. 167: Checking Connector Terminals 2 To 6 For Voltage
Courtesy of AUDI OF AMERICA, LLC

Specified value: at least 4.5 V

-- Switch the ignition off.

If the specification was not obtained:

Checking wiring

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Throttle Valve Control Module -J338- at electrical harness connector terminals to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T60 terminals for an open circuit according to the wiring diagram.

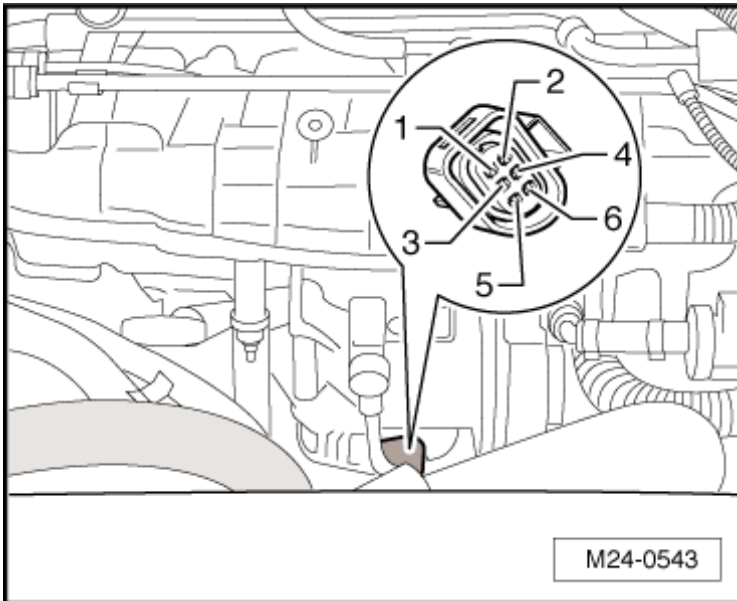


Fig. 168: Identifying Throttle Valve Control Module J338 Electrical Harness Connector Terminals
Courtesy of AUDI OF AMERICA, LLC

Throttle Valve Control Module -J338- electrical harness connector terminals	Motronic Engine Control Module (ECM) - J623- electrical connector T60 terminals or test box socket
1	28
2	14
3	15
4	13
5	30
6	29

Specified value: 1.5 ohms max.

If the specification is not obtained:

- Check the wiring for a short circuit to Battery (+), or an open circuit.
- If necessary, repair the faulty wiring connection.
- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

If no malfunction is detected in the wiring and if the voltage supply was not OK:

- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

Final procedures

After the repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

ENGINE COMPONENT POWER SUPPLY RELAY, CHECKING

Special tools and workshop equipment required

- multimeter.
- wiring diagrams.

Test requirements

- Fuse -SA2- OK.
- The Engine Control Module Power Supply Relay -J271- OK.
- The Ground (GND) connections at the engine and transmission OK.
- The battery voltage at least 12.5 V.
- The generator OK.

Test procedure

- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**.

Start diagnosis

- Using a multimeter, check the following wiring connection for voltage.

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Engine Component Power Supply Relay - J757- socket	Measure to
2	Engine Ground (GND)

Specified value: 12.5 V

If the specified value was not obtained:

-- Check the Engine Component Power Supply Relay -J757- socket 2 to the Battery -A- positive terminal for an open circuit or short to Ground (GND).

-- Check the electrical harness connectors for damage, corrosion, loose or broken terminals.

-- If necessary, repair the wiring connection.

If no malfunctions are found in the wiring:

-- Switch the engine on.

-- Using a multimeter, check the following wiring connection for voltage.

Engine Component Power Supply Relay -J757- socket	Measure to
8	Engine Ground (GND)

Specified value: 12.5 V

-- Switch the engine off.

If the specified value was not obtained:

-- Check the Engine Component Power Supply Relay -J757- socket 8 to fuse SA2 for an open circuit or short to Ground (GND).

-- Check the electrical harness connectors for damage, corrosion, loose or broken terminals.

-- If necessary, repair the wiring connection.

If no malfunctions are found in the wiring:

Checking Ground (GND)

If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Using a multimeter, check the following wiring connection for resistance.

Engine Component Power Supply Relay -J757- socket	Engine Control Module - J623- electrical harness connector T94 or test box socket
6	72

Specified value: 1.5 ohms.

If the specified value was not obtained:

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the wiring connection.

If no malfunctions are found in the wiring and the voltage supply was OK:

-- Replace the Engine Component Power Supply Relay -J757-.

-- Perform a road test to verify repair.

If the fault does not return:

Generate readiness code. Refer to **READINESS CODE**.

If the fault does return and no malfunction is detected in the wiring and the voltage supply was OK:

-- Replace the Engine Control Module (ECM) -J623-. Refer to the appropriate service information.

-- Assembly is performed in the reverse of the removal.

Final procedures

After repair work, the following work steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

VOLTAGE SUPPLY, CHECKING

Observe all safety precautions: **SAFETY PRECAUTIONS**

View clean working conditions: **CLEAN WORKING CONDITIONS**

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

For wiring diagrams, component locations, and connector views, Refer to the applicable wiring diagram.

Special tools and workshop equipment required

-
- multimeter.
- Wiring diagram.

Test requirements

- The Motronic Engine Control Module (ECM) - J623- fuses OK.

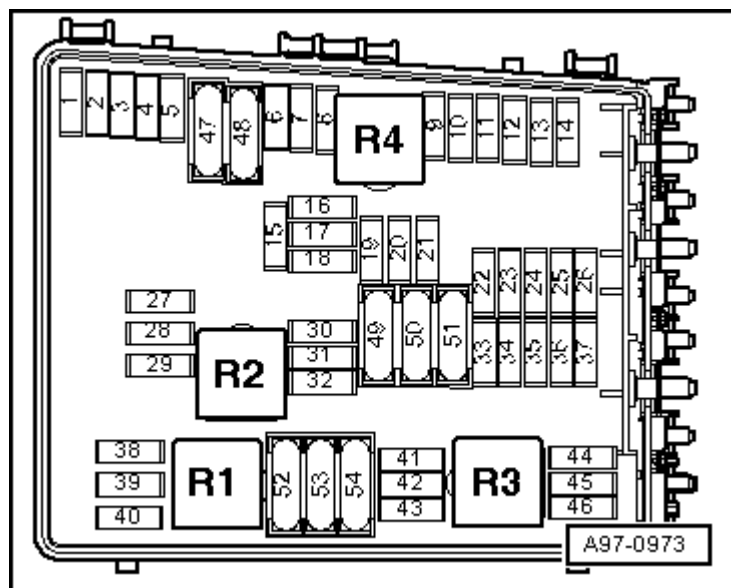


Fig. 169: Fuses On E-Box In Engine Compartment, Left Side

Courtesy of AUDI OF AMERICA, LLC

- Battery voltage at least 12.5 volts.
- All electrical consumers such as, lights and rear window defroster, switched off.
- Vehicles with automatic transmission, selector lever in position "P" or "N".
- A/C switched off.
- Ground (GND) connections between engine/transmission/chassis OK.
- Ignition switched off.

Test procedure

-- Perform a preliminary check to verify the customers complaint. Refer to **PRELIMINARY CHECK**

Start diagnosis

-- Remove the Motronic Engine Control Module (ECM) Power Supply Relay -J271-. Refer to appropriate service information.

Checking voltage

-- Using a multimeter, check the Motronic Engine Control Module (ECM) Power Supply Relay -J271- socket 2 to Ground (GND).

Specified value: battery voltage.

If the specified value was not obtained:

-- Check the wiring connections from the Battery to the Motronic Engine Control Module (ECM) Power Supply Relay -J271- socket 2 for an open circuit or a short circuit.

-- Check the wiring connections for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If the specified value was obtained:

-- Switch the ignition on.

-- Using a multimeter, check the Motronic Engine Control Module (ECM) Power Supply Relay -J271- socket 8 to Ground (GND).

Specified value: battery voltage.

If the specified value was obtained:

Checking wiring

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If the manufacturers test box is being used, perform the following step.

-- Install the test box.

If the manufacturers test box is not being used, perform the following step.

-- Remove the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

-- Using a multimeter, check the Motronic Engine Control Module (ECM) Power Supply Relay -J271- socket 6/85 to the Motronic Engine Control Module (ECM) -J623- electrical harness connector T94 terminal 19 for resistance.

Motronic Engine Control Module (ECM) Power Supply Relay -J271- socket terminal	Motronic Engine Control Module (ECM) - J623- electrical connector T94 terminal or test box socket
6	19

Specified value: 2.0 ohms Max.

If the specification was not obtained:

-- Check the wiring for a short circuit to Battery (+), or an open circuit.

-- Check the electrical harness connector for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring:

Checking activation

-- Switch the ignition on.

-- Using a multimeter, check the Motronic Engine Control Module (ECM) Power Supply Relay -J271- socket 4 for voltage.

Motronic

Motronic Engine Control Module (ECM) Power Supply Relay -J271- socket terminal	Engine Control Module (ECM) - J623- electrical connector T94 terminal or test box socket
4/86	19

-- Switch the ignition off.

Specified value: 0.5 V Max.

If the specified value was obtained:

-- Replace the Motronic Engine Control Module (ECM) Power Supply Relay -J271-. Refer to appropriate service information.

If the specified value was not obtained:

-- Check the wiring for a short circuit to Battery (+), or an open circuit.

-- Check the wiring connection for damage, corrosion, loose or broken terminals.

-- If necessary, repair the faulty wiring connection.

If no malfunction is found in the wiring and voltage supply was not OK:

-- Replace the Motronic Engine Control Module (ECM) -J623-. Refer to appropriate service information.

Final procedures

After the repair work, the following steps must be performed in the following sequence:

1. Check the DTC memory. Refer to **DIAGNOSTIC MODE 03 - READ DTC MEMORY**.
2. If necessary, erase the DTC memory. Refer to **DIAGNOSTIC MODE 04 - ERASE DTC MEMORY**.
3. If the DTC memory was erased, generate readiness code. Refer to **READINESS CODE**.

ELECTRICAL COMPONENTS FOR REGULATING TRANSMISSION 0B5

SAFETY PRECAUTIONS

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For all Automatic Transmission - Gears, hydraulic controls, Technical Data. Refer to the appropriate service information.

For all Automatic Transmission - Gears, hydraulic controls component locations. Refer to the appropriate service information.

For all Automatic Transmission - Gears, Hydraulic controls removal/installation procedures and torque specifications. Refer to the appropriate service information.

NOTE: All manufacturers special tools as well as common tools may contain a manufacturer specific part number.

Manufacturers special tools as well as common tools that contain a manufacturer specific part number may be referenced in the test procedure illustrations showing the tool use or installation. If the manufacturer specific tool is not being used, an equivalent aftermarket tool may be installed in the same manner as the manufacturers special tool.

The manufacturers test box Test Box 105 Pin VAG1598/42 is available for purchase or rental.

Certainly you have received an electrical shock once before when touching something made out of metal. The reason for this is the electrostatic charge of the human body. This charge can lead to functional problems by touching the electrical components of the transmission and selector lever mechanism. Touch a grounded object, e.g. a water pipe or a hoist, before working on the electrical components!

Do not make direct contact on electrical harness connector terminals!

Always switch ignition off before disconnecting or connecting Battery -A-, failure to do so may damage the Transmission Control Module (TCM) -J217-.

If special testing equipment is required during road test, note the following:

WARNING:

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

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aftermarket test lead kit for back-probing all electrical harness connectors.