

2005 Audi A4 Quattro

ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

ST GENERIC SCAN TOOL

ON BOARD DIAGNOSTIC (OBD)

Generic Scan Tool (GST) Manual Contents

Included in the contents of this Generic Scan Tool (GST) manual is a summary table of the vehicle specific OBD II Emission Related Engine and Transmission DTCs. This table contains all necessary Malfunction Criteria, Threshold Values, Secondary Parameters, Enabling Conditions, Monitoring Time Length, Frequency of Checks, and Mil. Illumination to accurately monitor and diagnose the Engine Emissions and Transmission and perform all functions required to run Modes 01 through 09 with a hand held scan tool.

This Generic Scan Tool (GST) manual also contains the step by step pin point test procedures to accurately diagnose and repair the suspected component or system once a DTC has been set. All references to repair procedures and wiring diagrams will be found within the diagnostic test procedure and easily identified as. e.g. -> **24 - MULTIPOINT FUEL INJECTION (MFI)** or 2005 A4 2.0L TSFI Engine Wiring Diagrams.

On Board Diagnostic (OBD) Systems

OBD II

OBD is an abbreviation for the On Board Diagnostic System.

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 (MDPVs) 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.

Serial Data Link (MIL) Illumination

MIL is an abbreviation for the Malfunction Indicator Lamp (MIL).

If the Engine Control Module (ECM) recognizes a malfunction that leads to increased emissions values, it indicates them by lighting the Malfunction Indicator Lamp (MIL) which is located in the instrument cluster.

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The Engine Control Module (ECM) switches on the Malfunction Indicator Lamp (MIL) after the ignition is switched on. Shortly after the engine is started, The Malfunction Indicator Lamp (MIL) goes out if the Engine Control Module (ECM) does not detect a malfunction that increases the emissions values.

If the Engine Control Module (ECM) recognizes a malfunction that leads to increased emissions during the operation of the engine, the Engine Control Module (ECM) switches on the Malfunction Indicator Lamp (MIL) and an entry is stored in the DTC memory of the Engine Control Module (ECM).

Controller Area Network (CAN) Data Link

CAN is an abbreviation for Controller Area Network.

The Engine Control Module (ECM) communicates with all databus capable control modules via a CAN Data Link.

The databus capable control modules (i.e. Engine Coolant temperature Sensor) are connected via two data bus wires which are twisted together (CAN_High and CAN_Low), and exchange information (messages) to the Engine Control Module (ECM). Missing information on the databus is then recognized and stored as a malfunction.

The Engine Control Module (ECM) illuminates the Malfunction Indicator Lamp (MIL) through the CAN data link and tells the Malfunction Indicator Lamp (MIL) to turn on, turn off, or blink.

Electronic Power Control (EPC) Warning Lamp

EPC is an abbreviation that stands for the Electronic Power Control (E-gas).

The Engine Control Module (ECM) monitors all EPC components after the ignition is switched on.

If a malfunction is recognized in the EPC system during the operation of the engine, the Engine Control Module (ECM) switches on the Electronic Power Control (EPC) Warning Lamp which is located in the instrument cluster and an entry is stored in the DTC memory of the Engine Control Module (ECM).

DIAGNOSTIC MODES

Diagnostic Modes Description

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.

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

NOTE:

- Depending on diagnostic tester and protocol used, the information in diagnostic mode 01 may be referred to by different names such as Test-ID

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

Selectable diagnostic modes

Mode 1: Obtain data --> **Diagnostic Mode 01: Obtain data.**

Mode 2: Obtain operating conditions --> **Diagnostic Mode 02: Obtain operating conditions.**

Mode 3: Interrogating fault memory --> **Mode 03: Interrogating fault memory.**

Mode 4: Reset/delete diagnostic data --> **Diagnostic Mode 04: Reset/delete diagnostic data.**

Mode 5: Obtain lambda test results --> **Diagnostic Mode 05: Check lambda test results.**

Mode 6: Checking test results of components that are not continuously monitored --> **Diagnostic Mode 06: Checking test results of components that are not continuously monitored.**

Mode 7: Checking test results of components that are continuously monitored --> **Diagnostic Mode 07: Check test results of components that are continuously monitored.**

Mode 8: Tank leak test --> **Diagnostic Mode 08: Tank leak test.**

Mode 9: Vehicle information --> **Diagnostic Mode 09: Vehicle information.**

Diagnostic Mode 01: Obtain data

Diagnostic Mode 01 is used to display and monitor all emissions related measured values.

Test requirement

- Coolant temperature at least 80°C.

Procedure

- Connect the diagnostic tester.
- 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".

NOTE:

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

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

PID	Component or System
01:	Monitoring status since erasing DTC memory
03:	Condition of fuel system
04:	Calculated load condition value
05:	Coolant temperature

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06:	Short term gasoline-air ratio bank 1
07:	Gasoline-air ratio bank 1
12:	Engine rotations per minute (RPM)
13:	Vehicle speed
14:	Ignition timing adjustment at 1. cyl. in direction
15:	Intake air temperature (IAT)
16:	Air flow quantity at Mass Air Flow (MAF) sensor
17:	Throttle valve position (absolute)
19:	Existing oxygen B1 to B2-S2 to (exist./nonexist.)
21:	Bank 1 - sensor 2
28:	OBD request is designed for diagnostic of this vehicle
31:	Time after engine on
33:	Driven distance after MIL on
35:	Fuel Rail Pressure
46:	Commanded Evaporative Purge
48:	Number of warm ups since diagnostic trouble codes
49:	Distance since diagnostic trouble codes cleared
51:	Barometric Pressure
52:	Bank 1 - sensor 1
56:	Bank 2- sensor 1
60:	Catalyst Temperature Bank 1, Sensor 1
65:	Monitor status this driving cycle
66:	Control module voltage
67:	Absolute Load Value
68:	Commanded Equivalence Ratio
69:	Relative Throttle Position
70:	Ambient air temperature
71:	Absolute Throttle Position B
73:	Accelerator Pedal Position D
74:	Accelerator Pedal Position E
76:	Commanded Throttle Actuator Control

- Switch the ignition off.
- **End of diagnosis.**

Diagnostic Mode 02: Obtain operating conditions

Diagnostic Mode 02 is used to monitor the operating conditions under which the Engine Control Module (ECM) has detected and stored an emissions related DTC.

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- Depending on diagnostic tester 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 diagnostic tester.
- Start the engine and run at idle.

NOTE:

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

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

NOTE:

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

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

PID	Component or System
02:	DTC which triggered the current reception of all control module information
03:	Condition of fuel system
04:	Calculated load condition value
05:	Coolant temperature
06:	Short term gasoline-air ratio bank 1
07:	Gasoline-air ratio bank 1
12:	Engine rotations per minute (RPM)
13:	Vehicle speed
14:	Ignition timing adjustment at 1. cyl. in direction
15:	Intake air temperature (IAT)
16:	Air stream amount at Mass Air Flow (MAF) sensor
17:	Throttle valve position (absolute)
31:	Time after engine on
35:	Fuel Rail Pressure
46:	Commanded Evaporative Purge
51:	Barometric Pressure
66:	Control module voltage

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67:	Absolute Load Value
68:	Commanded Equivalence Ratio
69:	Relative Throttle Position
70:	Ambient air temperature
71:	Absolute Throttle Position B
73:	Accelerator Pedal Position D
74:	Accelerator Pedal Position E
76:	Commanded Throttle Actuator Control

- Switch the ignition off.
- **End of diagnosis.**

Mode 03: Interrogating fault memory

Description

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

Diagnostic Mode 03 is used to retrieve and view any DTC which may be stored in the Engine Control Module (ECM).

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

NOTE:

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

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

P-Codes

Component group					
P	x	x	x	x	DTC for the drivetrain
Norm-Code					
P	0	x	x	x	Trouble codes defined by SAE with specified malfunction texts
P	1	x	x	x	Additional emission relevant DTCs

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					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
P	x	3	x	x	Ignition system
P	x	4	x	x	Additional exhaust system
P	x	5	x	x	Speed and idle control
P	x	6	x	x	Control module and output signals
P	x	7	x	x	Transmission
P	x	8	x	x	Transmission
P	x	9	x	x	Control modules, input and output signals

U-Codes

Component group					
U	x	x	x	x	DTC for network (CAN

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					(bus)
Norm-Code					
U	0	x	x	x	Trouble codes defined by SAE with specified malfunction texts

Interrogating the Fault Memory

Procedure

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

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

Indication example	Explanation
P0444	SAE Diagnostic Trouble Code (DTC)
Evaporative Emission (EVAP) Canister Purge Regulator Valve	Malfunctioning wiring path or malfunctioning component
Circuit Open	Malfunction type as next

- Refer to the following DTC tables for the diagnostic repair procedure:
 - SAE P0xxxDTCs. --> **SAE P0xxx-DTCs.**
 - SAE P1xxx-DTCs --> **SAE P1xxx-DTCs.**
 - SAE P2xxxDTCs. --> **SAE P2xxx-DTCs.**
 - SAE P3xxxDTCs. --> **SAE P3xxx-DTCs.**
 - SAE U0xxxDTCs, --> **SAE U0xxx-DTCs.**

Fuel, air mixture, and additional emissions regulations

- Switch the ignition off.
- **End of diagnosis.**

Diagnostic Mode 04: Reset/delete diagnostic data

Diagnostic Mode 04 is used to reset or delete the following stored information:

- All emission related malfunctions in the DTC memory.

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- The operating conditions at which a malfunction was stored will be reset.
- All adaptation values.
- The test results of all diagnostic functions.

NOTE:

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

Procedure

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

The diagnostic tester will display: "Diagnostic data are being erased".

- Switch the ignition off.
- **End of diagnosis.**

Diagnostic Mode 05: Check lambda test results

NOTE:

- The diagnostic information for "Diagnostic Mode 5: check lambda test results" is not supported in this section of the 2005 Audi A4 2.0L TFSI Generic Scan Tool (GST) service manual and has been moved to "Diagnostic Mode 6: Checking test results of components that are not continuously monitored" section.
- Refer to "Diagnostic Mode 6: Checking test results of components that are not continuously monitored" for the static values of all oxygen sensors and all emission related components --> Diagnostic Mode 06: Checking test results of components that are not continuously monitored.

NOTE:

- Depending on diagnostic tester and protocol used, diagnostic mode 05 and the information provided may be referred to by a different name.

Diagnostic Mode 06: Checking test results of components that are not continuously monitored

Diagnostic Mode 06 displays the test results of emission related components and systems which are not continuously monitored.

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

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- Depending on diagnostic tester and protocol used, the information 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

- 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 diagnostic tester.
- Start the engine and run at idle.

NOTE:

- If the engine does not start, crank the engine using starter for at least 5 seconds, do not switch the ignition off afterward under any circumstances.
- Select "Mode 6: Check test the results of components that are not continuously monitored".
- Select the desired "Test-ID" of the component or system that is to be monitored, e.g. "Test-ID 01: Oxygen Sensor Monitor Bank 1 - Sensor 1".
- Select the desired "Test-ID".

The current minimum and maximum values will be displayed on the diagnostic tester 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>Test-ID 01 (\$01): Oxygen Sensor Monitor Bank 1 - Sensor 1</u>	Oxygen Sensor Monitor Bank 1 - Sensor 1
02 (\$02): <u>Test-ID 02 (\$02): Oxygen Sensor Monitor Bank 1- Sensor 2</u>	Oxygen Sensor Monitor Bank 1 - Sensor 2
33 (\$21): <u>Test-ID 33 (\$21): Catalytic Converter Monitoring</u>	Catalytic Converter Monitoring
59 (\$3B): <u>Test-ID 59 (\$3B): Fuel Tank EVAP System Integrity/LeakTest (0.40/1.0mm)</u>	Fuel Tank EVAP System Integrity/Leak Test (0.40/1.0mm)
60 (\$3C): <u>Test-ID 60 (\$3C): Fuel Tank EVAP System Integrity/LeakTest (0.20/0.5mm)</u>	Fuel Tank EVAP System Integrity/LeakTest (0.20/0.5mm)
61 (\$3D): <u>Test-ID 61 (\$3D): EVAP Valve Function Check</u>	EVAP Valve Function Check
65 (\$41): <u>Test-ID 65 (\$41): Oxygen Sensor Heater</u>	Oxygen Sensor Heater Monitor Bank 1 - Sensor 1

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Monitor Bank 1 - Sensor 1	
66 (\$42): Test-ID 66 (\$42): Oxygen Sensor Heater	Oxygen Sensor Heater Monitor Bank 1 - Sensor 2
Monitor Bank 1 - Sensor 2	
162 (\$A2): Test-ID 162 (\$A2): Mis-Fire Cylinder 1 Data	Mis-Fire Cylinder 1 Data
163 (\$A3): Test-ID 163 (\$A3): Mis-Fire Cylinder 2 Data	Mis-Fire Cylinder 2 Data
164 (\$A4): Test-ID 164 (\$A4): Mis-Fire Cylinder 3 Data	Mis-Fire Cylinder 3 Data
165 (\$A5): Test-ID 165 (\$A5): Mis-Fire Cylinder 4 Data	Mis-Fire Cylinder 4 Data

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

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

Select "Test-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. .	3.500	----	Refer to DTC P0133 in --> Fuel and air ratios .

- If any of 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 -> **Mode 03: Interrogating fault memory**.
- Switch the ignition off.
- **End of diagnosis.**

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

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

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

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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.	Additional Information
01 (\$01)	P0139	Oscillation Check. .	0.6241 V	0.650 V	Refer to DTC P0139 in <u>Fuel and air ratios</u> .
02 (\$02)	P0139	Oscillation Check.	0.6241 V	0.650 V	Refer to DTC P0139 in <u>Fuel and air ratios</u> .
07 (\$07)	P0137	Output Voltage (signal activity) Check.	0 V	0.450 V	Refer to DTC P0137 in <u>Fuel and air ratios</u> .
08 (\$08)	P0138	Output Voltage (signal activity) Check.	0.450 V	1.2998 V	Refer to DTC P0138 in <u>Fuel and air ratios</u> .
129 (\$81)	P0139	Signal activity Check.	0 V	0.650 V	Refer to DTC P0139 in <u>Fuel and air ratios</u> .
130 (\$82)	P0140	Signal activity Check.	0.6241 V	1.2998 V	Refer to DTC P0140 in <u>Fuel and air ratios P0140</u> .
131 (\$83)	P0139	Fuel cut off Check.	0 V	1.599 V	Refer to DTC P0139 in <u>Fuel and air ratios</u> .

- 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 -> **Mode 03: Interrogating fault memory.**
- Switch the ignition off.
- **End of diagnosis.**

Test-ID 33 (\$21): Catalytic Converter Monitoring

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

Select "Test-ID 33 (\$21)".

- 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
132 (\$84)	P0420	Conversion Capability (storage) Check.	1.0	----	Refer to DTC P0420 in <u>Additional exhaust regulation</u> .

- 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 -> **Mode 03: Interrogating fault memory.**
- Switch the ignition off.
- **End of diagnosis.**

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

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

Select "Test-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)	P0455	Fuel Tank Leak Test.	1.95-2.15 S	----	Refer to DTC P0455 in <u>Additional exhaust regulation.</u>

- 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 -> **Mode 03: Interrogating fault memory.**
- Switch the ignition off.
- **End of diagnosis.**

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

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

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Select "Test-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
130 (\$82)	P0455	Fuel Tank Leak Test.	4.5-6.5 S	----	Refer to DTC P0455 in <u>Additional exhaust regulation.</u>

- 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 -> **Mode 03: Interrogating fault memory.**
- Switch the ignition off.
- **End of diagnosis.**

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

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

Select "Test-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
130 (\$82)	P0441	Function check.	29.99%	0.01%	Refer to DTC P0441 in <u>Additional exhaust regulation.</u>

- 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 -> **Mode 03: Interrogating fault memory.**
- Switch the ignition off.
- **End of diagnosis.**

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

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

Select "Test-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	Readiness check.	+ 40°C	1200°C	Refer to DTC P0135 in <u>Fuel and air ratios.</u>

- 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 -> **Mode 03: Interrogating fault memory.**
- Switch the ignition off.
- **End of diagnosis.**

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

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

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

- 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)	P0141	Readiness check.	0 Ohm	1.0 Ohm	Refer to DTC P0141 in <u>Fuel and air ratios.</u>

- 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 -> **Mode 03: Interrogating fault memory.**
- Switch the ignition off.

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○ End of diagnosis.

Test-ID 162 (\$A2): Mis-Fire Cylinder 1 Data

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

Select "Test-ID 162 (\$A2)".

- 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
129 (\$81)	P0301	Crankshaft speed fluctuation, single or multiple misfire check.	0 - 65535 (counts)	Refer to DTC P0301 in <u>Ignition system</u> .
129 (\$81)	P0301	Crankshaft speed fluctuation, single or multiple misfire check.	0 - 65535 (counts)	Refer to DTC P0301 in <u>Ignition system</u> .

- 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 -
-> **Mode 03: Interrogating fault memory.**
- Switch the ignition off.
- End of diagnosis.

Test-ID 163 (\$A3): Mis-Fire Cylinder 2 Data

- Connect the diagnostic tester.
- Start the engine and run at idle.
- Select "Mode 6 Check test the results of components that are not continuously monitored".

Select "Test-ID 163 (\$A3):".

- 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. Values	Additional Information
129 (\$81)	P0302	Crankshaft speed fluctuation, single or multiple misfire check.	0 - 65535 (counts)	Refer to DTC P0302 in <u>Ignition system.</u>
129 (\$81)	P0302	Crankshaft speed fluctuation, single or multiple misfire check.	0 - 65535 (counts)	Refer to DTC P0302 in <u>Ignition system.</u>

- 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 -> **Mode 03: Interrogating fault memory.**
- Switch the ignition off.
- **End of diagnosis.**

Test-ID 164 (\$A4): Mis-Fire Cylinder 3 Data

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

Select "Test-ID 164 (\$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
129 (\$81)	P0303	Crankshaft speed fluctuation, single or multiple misfire check.	0 - 65535 (counts)	Refer to DTC P0303 in <u>Ignition system.</u>
129 (\$81)	P0303	Crankshaft speed fluctuation, single or multiple misfire	0 - 65535 (counts)	Refer to DTC P0303 in <u>Ignition system.</u>

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check.

- 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 -> **Mode 03: Interrogating fault memory.**
- Switch the ignition off.
- **End of diagnosis.**

Test-ID 165 (\$A5): Mis-Fire Cylinder 4 Data

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

Select "Test-ID 165 (\$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
129 (\$81)	P0304	Crankshaft speed fluctuation, single or multiple misfire check.	0 - 65535 (counts)	Refer to DTC P0304 in <u>Ignition system.</u>
129 (\$81)	P0304	Crankshaft speed fluctuation, single or multiple misfire check.	0 - 65535 (counts)	Refer to DTC P0304 in <u>Ignition system.</u>

- 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 -> **Mode 03: Interrogating fault memory.**
- Switch the ignition off.
- **End of diagnosis.**

Diagnostic Mode 07: Check test results of components that are continuously monitored

Diagnostic Mode 07 displays all stored DTCs of emission related components and systems which are continuously monitored.

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NOTE:

- Depending on diagnostic tester and protocol used, diagnostic mode 07 and the information provided may be referred to by a different name.

Test requirements

- No DTCs stored in the DTC memory.
- Coolant temperature at least 80°C.

Procedure

- Connect the diagnostic tester.
- Start the engine and run at idle.

NOTE:

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

- Select "Mode 7: Check test results of components that are continuously monitored".

The number of stored DTCs or "0 malfunctions detected" will be displayed diagnostic tester screen.

- Switch the ignition off.
- Refer to the following DTC tables for the diagnostic repair procedure:

- SAE P0xxxDTCs. --> SAE P0xxx-DTCs.
- SAE P1xxx-DTCs --> SAE P1xxx-DTCs.
- SAE P2xxxDTCs. --> SAE P2xxx-DTCs.
- SAE P3xxxDTCs. --> SAE P3xxx-DTCs.
- SAE U0xxxDTCs, --> SAE U0xxx-DTCs.

- Switch the ignition off.
- **End of diagnosis.**

Diagnostic Mode 08: Tank leak test

Diagnostic Mode 08 is used to test the fuel system for leaks.

NOTE:

- Depending on diagnostic tester and protocol used, diagnostic mode 08 and the information provided may be referred to by a different name.

NOTE:

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

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Test requirements

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

Procedure

- Connect the diagnostic tester.
- 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 diagnostic tester screen:

Tank leak test	Specified value
• Test function active • Test function is being initiated, please wait • Test off • Test aborted	Test OK

- Switch the ignition off.

If the specified value is obtained:

- Refer to "Diagnostic mode 03: Interrogating fault memory " to check for any DTCs that may be stored.
- To repeat the tank test, switch the ignition off and start the engine again and let run for 15 minutes at idle.
- Switch the ignition off.
- **End of diagnosis.**

Diagnostic Mode 09: Vehicle information

NOTE: • **For all calibration and immobilizer information.**

Diagnostic Mode 09 is used to display vehicle specific information, e.g. the different Engine Control Module (ECM) versions.

NOTE: • **Depending on diagnostic tester and protocol used, diagnostic mode 09**

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

and the information provided may be referred to by a different name.

Test requirement

- No DTCs stored in the DTC memory.

Procedure

- Connect the diagnostic tester.
- Switch the ignition on.
- Select "Mode 09: Vehicle information".
- Select the desired "Test-ID".
- The information requested will be displayed on the diagnostic tester screen.

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

Test-ID	Diagnostic text
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.
- **End of diagnosis.**

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 manufacturers instruction manual for correct tool operation.

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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 (IAT) 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.

CAUTION: When performing the drive cycle operation, pay strict attention to driving conditions and please observe and obey all posted speed limits. Failure to follow these instructions may result in personal injury or possible death.

Drive Cycle Procedure

- Connect the diagnostic tester.
- Switch the ignition on and start the vehicle.
- Idle the vehicle for 2-3 minutes. This executes the O2S Heater, Misfire, Secondary AIR, Fuel Trim, and Purge system monitors.
- Drive the vehicle at 45-55 mph for a continuous 7-minute period, avoid stopping. This executes the EVAP, O2S, Fuel Trim, and Misfire monitors.
- Accelerate the vehicle to an engine speed of 5000 RPM (with automatic transmission use the tip-tronic mode); 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; O2S, Misfire, Fuel Trim, and Purge System monitors.
- Decelerate and idle the vehicle again for 3 minutes. This executes the Misfire, Secondary AIR, Fuel Trim, and Purge system monitors.

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- Check the status of the readiness code.

NOTE:

- Depending on the diagnostic tester 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 EVAP monitor or thermostat-monitor, allow the engine to cool until the coolant temperature and the ambient air temperature are between 10°C and 35°C with a difference between them no greater than 4°C is observed 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 diagnostic tester and switch the ignition off.
- End of operation.

DIAGNOSTIC TROUBLE CODE (DTC) TABLES

SAE P0xxx-DTCs

Fuel, air mixture, and additional emissions regulations

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P000A	Intake (A) Camshaft Position Slow Response Bank 1	○ Check Camshaft Adjustment Valve 1 N205 --> <u>Camshaft Adjustment Valve 1 N205, checking.</u>	Response Check.	Signal change 2 - 3°C/°s	● Engine speed 1000 rpm ● ECT -10.5°C ● Time after engine start >10 Sec.	60 Sec.	● Continuous ● 2 DCY

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
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					• Number of checks 3 - • Time length 4 Sec.		
P0010	Intake (A) Camshaft Position Actuator Circuit/Open (Bank 1)	○ Check Camshaft Adjustment Valve 1 N205 --> <u>Camshaft Adjustment Valve 1 N205, checking.</u>	Open circuit.	Signal voltage, 2.15-3.25 V	• Camshaft valve, commanded off • Engine speed, >80 RPM	0.5 Seconds	• Continuo • 2 DCY
P0011	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 1)	○ Check Camshaft Adjustment Valve 1 N205 --> <u>Camshaft Adjustment Valve 1 N205, checking.</u>	Stuck Check.	Signal change 2 - 3°CA/s	• Engine speed 1000 rpm • ECT -10.5° C • Time after engine start >10 Sec. • Number of checks 3 - • Time length 4 Sec.	60 Sec.	• Continuo • 2 DCY
P025A	Fuel Pump	○ Check fuel pump --> <u>Fuel pump delivery quantity, checking.</u>	Open Circuit.	Signal voltage > 4.4-5.6 V	• Engine speed > 80 rpm • Time length 0.5 Sec.	0.5 Seconds	• Continuo • 2 DCY
P025C	Fuel Pump	○ Check fuel pump --> <u>Fuel pump delivery quantity, checking.</u>	Short to Ground.	Signal voltage 2.15-3.25 V	• Engine speed > 80 rpm • Time length 0.5 Sec.	0.5 Seconds	• Continuo • 2 DCY
P025D	Fuel Pump	○ Check fuel pump --> <u>Fuel pump</u>	Short to Battery (+).	Signal current > 1.1 A	• Engine speed > 80 rpm	0.5 Seconds	• Continuo • 2 DCY

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		<u>delivery quantity, checking.</u>			• Time length 0.5 Sec.		
P0030	HO2S Heater Control Circuit (Bank 1, Sensor 1)	○ Check Oxygen Sensor (O2S) Heater Z19 --> <u>Oxygen Sensor (O2S) Heater Z19 for Heated Oxygen Sensor (HO2S) G39 before catalytic converter, checking.</u>	Open Circuit.	Heater voltage 4.4-5.6V	Heater, Active	0.5 Seconds	• Continuou • 2 DCY
P0031	HO2S Heater Control Circuit Low (Bank 1, Sensor 1)	○ Check Oxygen Sensor (O2S) Heater Z19 --> <u>Oxygen Sensor (O2S) Heater Z19 for Heated Oxygen Sensor (HO2S) G39 before catalytic converter, checking.</u>	Short to Ground.	Heater voltage 2.2-3.2 V	Engine speed >80 rpm	0.5 Seconds	• Continuou • 2 DCY
P0032	HO2S Heater Control Circuit High (Bank 1, Sensor 1)	○ Check Oxygen Sensor (O2S) Heater Z19 --> <u>Oxygen Sensor (O2S) Heater Z19</u>	Short to Battery (+).	Heater current > 2,2 A	Engine speed >80 rpm	0.5 Seconds	• Continuou • 2 DCY

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
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		<u>for Heated Oxygen Sensor (HO2S) G39 before catalytic converter, checking.</u>					
P0036	HO2S Heater Control Circuit (Bank 1, Sensor 2)	Check Oxygen Sensor (O2S) Heater Z29 --> <u>Oxygen Sensor (O2S) 1 (behind Three Way Catalytic Converter (TWC)) Heater Z29, checking.</u>	Open Circuit.	Heater voltage, 4.4-5.6 V	Heater, Active	0.5 Seconds	- Continuou 2 DCY
P0037	HO2S Heater Control Circuit Low (Bank 1, Sensor 2)	Check Oxygen Sensor (O2S) Heater Z29 --> <u>Oxygen Sensor (O2S) 1 (behind Three Way Catalytic Converter (TWC)) Heater Z29, checking.</u>	Short to Ground.	Heater voltage, 2.2-3.2 V	Engine speed, >80 rpm	0.5 Seconds	- Continuou 2 DCY
P0038	HO2S Heater Control Circuit High (Bank 1, Sensor 2)	Check Oxygen Sensor (O2S) Heater Z29 --> <u>Oxygen</u>	Short to Battery (+).	Heater current, > 3 A	Engine speed, >80 rpm	0.5 Seconds	- Continuou 2 DCY

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Sensor
(O2S) 1
(behind
Three Way
Catalytic
Converter
(TWC))
Heater
Z29,
checking.

SAE P0xxx-DTCs

Fuel and air ratios

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Condition
P0100	Mass or Volume Air Flow A Circuit	Check Mass Air Flow (MAF) Sensor G70 -- > <u>Mass Air Flow (MAF) Sensor G70 , checking.</u>	Signal Check.	Signal duty cycle, 0	Time after engine start, 150 Rev.
P0101	Mass or Volume Air Flow A Circuit Range/Performance	Check Mass Air Flow (MAF) Sensor G70 -- > <u>Mass Air Flow (MAF) Sensor G70 , checking.</u>	Rationality Check.	- Mass air flow vs. lower threshold map, 3-197 kg/h - Mass air flow vs. upper threshold map, 60-890 kg/h	Time after engine start, 150 Rev.
P0102	Mass or Volume Air Flow A Circuit Low Input	Check Mass Air Flow (MAF) Sensor G70 -- > <u>Mass Air Flow (MAF) Sensor G70 , checking.</u>	Signal Range Check.	Signal duty cycle, 0.066 ms	Time after engine start, 150 Rev.
P0103	Mass or Volume Air Flow A Circuit High Input	Check Mass Air Flow (MAF) Sensor G70 -- > <u>Mass Air Flow (MAF) Sensor G70 , checking.</u>	Signal Range Check.	Signal duty cycle, >4.500 ms	Time after engine start, 150 Rev.

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P0106	Manifold Absolute Pressure/BARO Sensor Range/Performance	Check Charge Air Pressure Sensor G31 --> <u>Charge Air Pressure Sensor G31 , checking.</u>	Rationality Check.	- Altitude sensor, -21 kPa - Boost pressure signal, >23 kPa	- Throttle position, 7% - Engine speed, 1000 RPM
P0112	Intake Air Temperature Sensor 1 Circuit Low Input	Check Intake Air Temperature (IAT) Sensor G42 --> <u>Intake Air Temperature (IAT) Sensor G42 , checking.</u>	Short to Ground.	IAT, > 141.0°C	
P0113	Intake Air Temperature Sensor 1 Circuit High Input	Check Intake Air Temperature (IAT) Sensor G42 --> <u>Intake Air Temperature (IAT) Sensor G42 , checking.</u>	Short to Battery (+), Open Circuit.	IAT, 45.75°C	
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	- Check Engine Coolant Temperature (ECT) Sensor G62 --> <u>Engine Coolant Temperature (ECT) Sensor G62 , checking.</u> - Check coolant regulator --> <u>19 - ENGINE - COOLING SYSTEM .</u>	Stuck Check.	- Delta ECT, 77°C - ECT at engine start, > 106°C	- Driving condition 1, x >10s - Vehicle speed, 0-31 MPH - Mass air flow, >4-80 kgh and - Driving condition 2, x >40s - Vehicle speed, 25-100 MPH - Mass air flow, >12-160 kgh

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					Engine temperature, >-9.8 C
P0117	Engine Coolant Temperature Sensor 1 Circuit Low Input	- Check Engine Coolant Temperature (ECT) Sensor G62 --> <u>Engine Coolant Temperature (ECT) Sensor G62 , checking.</u> - Check coolant regulator --> <u>19 - ENGINE - COOLING SYSTEM .</u>	Short to Ground.	ECT, >141°C	
P0118	Engine Coolant Temperature Sensor 1 Circuit High Input	- Check Engine Coolant Temperature (ECT) Sensor G62 --> <u>Engine Coolant Temperature (ECT) Sensor G62 , checking.</u> - Check coolant regulator --> <u>19 - ENGINE - COOLING SYSTEM .</u>	Short to Battery (+), Open Circuit.	ECT, 43.5°C	
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance	Check Throttle Valve Control Module J338 --> <u>Throttle Valve Control Module J338 , checking.</u>	Rationality Check.	- TPS 1-TPS 2, >6.3% - Actual TPS 1-calc. value, Actual TPS 2-calc. value or - TPS 1 calc. value, >9%	Engine speed, >1200 RPM
P0122	Throttle/Pedal Position Sensor A Circuit Low Input	Check Throttle Valve Control Module J338 --> <u>Throttle Valve Control Module J338 , checking.</u>	Out of Range, Low.	Signal voltage, 0.25 V	
P0123	Throttle/Pedal Position Sensor A Circuit High	Check Throttle Valve	Out of Range,	Signal voltage, > 4.75 V	

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	Input	Control Module J338 --> <u>Throttle Valve Control Module J338 , checking.</u>	High.		
P0131	O2 Circuit Low Voltage (Bank 1, Sensor 1)	○ Check oxygen sensor before catalytic converter --> <u>Heated Oxygen Sensor (HO2S) G39 and oxygen sensor regulation before catalytic converter, checking.</u>	Short to Ground.	• Virtual mass VM Voltage >2 V • Nernst voltage UN Voltage >1.75 V • Adjustment current IA Voltage >0.3 V	
P0132	O2 Circuit High Voltage (Bank 1, Sensor 1)	○ Check oxygen sensor before catalytic converter --> <u>Heated Oxygen Sensor (HO2S) G39 and oxygen sensor regulation before catalytic converter, checking.</u>	Short to Battery (+).	• Virtual mass VM Voltage >3 V • Nernst voltage UN Voltage >4V • Adjustment current IA Voltage >1.5 V	
P0133	O2 Circuit Slow Response (Bank 1, Sensor 1)	○ Check oxygen sensor before catalytic converter --> <u>Oxygen Sensor (O2S) Heater Z19 for Heated Oxygen Sensor (HO2S) G39 before catalytic converter, checking.</u>	Signal Dynamic Check.	• O2S signal front vs. modeled O2s signal, signal ratio =0.35- • Cycles completed, >=40-	• Lambda control, closed loop • Engine load 20-70% • Engine speed, 1400 3520 RPM • Delta engine load, 3% se • Purge fuel rate vs. injection rat

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					0.18- Actual lambda, 0.8 1.15-
P0135	O2 Heater Circuit (Bank 1, Sensor 1)	Check Oxygen Sensor (O2S) Heater Z19 --> <u>Oxygen Sensor (O2S) Heater Z19 for Heated Oxygen Sensor (HO2S) G39 before catalytic converter, checking.</u>	Out of Range, High.	O2S ceramic temperature, 715°C	- Heater control, active - Heater power, 100% - Fuel cut off, not active - Modeled exhaust gas temp., > 300°C
P0136	O2 Circuit (Bank 1, Sensor 2)	Check oxygen sensor behind Three Way Catalytic Converter (TWC) --> <u>Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking.</u>	Heater Coupling Check.	- Signal voltage, delta one step. 2 V - Cycles completed, >=6-	- O2S rear dewpoint, exceeded - O2S rear, fully heated up - Modeled exhaust gas temp. 200-800°C
P0137	O2 Circuit Low Voltage (Bank 1, Sensor 2)	Check oxygen sensor behind Three Way Catalytic Converter (TWC) --> <u>Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking.</u>	Signal Check.	Signal voltage, 60 mV	- O2S rear dewpoint, exceeded - O2S rear, fully heated up - Modeled exhaust gas temp. 200-800°C - Lambda control post cat., closed loop
P0138	O2 Circuit High Voltage	Check oxygen sensor	Short to	Signal voltage	O2S rear,

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	(Bank 1, Sensor 2)	behind Three Way Catalytic Converter (TWC) --> <u>Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking.</u>	Battery (+).	1.3 V	fully heated up Modeled exhaust gas temp. 200-800°C
P0139	O2 Circuit Slow Response (Bank 1, Sensor 2)	Check oxygen sensor behind Three Way Catalytic Converter (TWC) --> <u>Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking.</u>	Oscillation Check.	O2S signal rear during fuel cut off, 160 mV	- Fuel cut off, > 5 S - O2S rear readiness, > 60 S - Modeled exhaust gas temp. > 350 C
P0140	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	Check oxygen sensor behind Three Way Catalytic Converter (TWC) --> <u>Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking.</u>	Signal Activity Check.	Signal voltage, 401-400mV	- O2S rear, ready - Modeled exhaust gas temp. 200-800°C
P0141	O2 Heater Circuit (Bank 1, Sensor 2)	Check Oxygen Sensor (O2S) Heater Z29 --> <u>Oxygen Sensor (O2S) 1 (behind Three Way Catalytic Converter (TWC)) Heater Z29 , checking.</u>	Out of Range.	Heater resistance, 1-26 kOhm	- Modeled exhaust gas temp., 300-650°C - Heater, commanded on
P0171	System Too Lean (Bank 1)	Check fuel pump delivery and quantity --> <u>Fuel pump</u>	System too Lean.	Adaptive value >5 %	Lambda control, closed loop

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delivery quantity, checking.

- Check Fuel pressure regulator and residual pressure --> Fuel pressure and residual pressure before high pressure pump , checking.
- Check Fuel Pressure Sensor G247 --> Fuel Pressure Sensor G247 , checking.
- Check fuel injectors N30, N31, N32, N33, N83 --> Fuel Injectors N30, N31, N32, N33 , checking.
- Check oxygen sensor before catalytic converter --> Oxygen Sensor (O2S) Heater Z19 for Heated Oxygen Sensor (HO2S) G39 before catalytic converter, checking.
- Check oxygen sensor behind Three Way Catalytic Converter (TWC) --> Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking.
- Check Evaporative Emission (EVAP) Canister Purge Regulator Valve N80

- EVAP purg valve, close
- ECT, > 60°C
- Substitute ECT, 80°C
- Engine speed 1200 RPM
- Mass air flow 26 kg/h
- Duration of multiplication check >50.8 S
- Engine load 9-45%
- Delta fuel adaptation 0.234

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		--> <u>Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking.</u> ○ Check intake system for leaks (false air). ○ Check exhaust system for proper seal. ○ Check vacuum lines for leaks			
P0172	System Too Rich (Bank 1)	○ Check Fuel pressure regulator and residual pressure --> <u>Fuel pressure and residual pressure before high pressure pump , checking.</u> ○ Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u> ○ Check Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 --> <u>Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking.</u> ○ Check oxygen sensor before catalytic converter --> <u>Oxygen Sensor (O2S) Heater Z19 for Heated Oxygen Sensor (HO2S) G39 before catalytic converter, checking.</u> ○ Check oxygen sensor behind Three Way	System too Rich.	Adaptive value -6 %	• Lambda control, closed loop • EVAP purge valve, close • ECT, > 60°C • Substitute ECT, 80°C • Engine speed 1200 RPM • Mass air flow 26 kg/h • Duration of multiplication check >50.8 S • Engine load 9-45% • Delta fuel adaptation 0.234

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		Catalytic Converter (TWC) --> <u>Oxygen Sensor (O2S)</u> <u>Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking.</u>			
P0190	Fuel Rail Pressure Sensor A Circuit	○ Check Fuel Pressure Sensor G247 --> <u>Fuel Pressure Sensor G247 , checking.</u>	Signal Range Check.	Signal voltage > 4.8 V	
P0192	Fuel Rail Pressure Sensor A Circuit Low Input	○ Check Fuel Pressure Sensor G247 --> <u>Fuel Pressure Sensor G247 , checking.</u>	Signal Range Check.	Signal voltage 2.0 V	
P0201	Injector Circuit/Open - Cylinder 1	○ Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Open Circuit.	Signal current, 2.1 A	• Engine speed,> 80 RPM • High side signal current, > 2. A
P0202	Injector Circuit/Open - Cylinder 2	○ Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Open Circuit.	Signal current, 2.1 A	• Engine speed,> 80 RPM • High side signal current, > 2. A
P0203	Injector Circuit/Open - Cylinder 3	○ Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Open Circuit.	Signal current, 2.1 A	• Engine speed,> 80 RPM • High side signal current, > 2. A
P0204	Injector Circuit/Open - Cylinder 4	○ Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Open Circuit.	Signal current, 2.1 A	• Engine speed,> 80 RPM • High side signal

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					current, > 2. A
P0219	Engine Overspeed Condition	- Repair mechanical damage if necessary. - Erase DTC memory - --> <u>Diagnostic Mode 04: Reset/delete diagnostic data.</u>			
P0221	Throttle/Pedal Position Sensor/Switch B Circuit Range/Performance	Check Throttle Valve Control Module J338 --> <u>Throttle Valve Control Module J338 , checking.</u>	Rationality Check.	- TPS 1-TPS 2, >6.3% - Actual TPS 1-calc. value, Actual TPS 2-calc. value or - TPS 2 calc. value, >9%	Engine speed, >1200 RPM
P0222	Throttle/Pedal Position Sensor/Switch B Circuit Low Input	Check Throttle Valve Control Module J338 --> <u>Throttle Valve Control Module J338 , checking.</u>	Out of Range, Low.	Signal voltage, 0.20 V	
P0223	Throttle/Pedal Position Sensor/Switch B Circuit High Input	Check Throttle Valve Control Module J338 --> <u>Throttle Valve Control Module J338 , checking.</u>	Out of Range, High.	Signal voltage, > 4.75 V	
P0234	Turbocharger/Supercharger Overboost Condition	- Check Charge Air Pressure Sensor G31 - --> <u>Charge Air Pressure Sensor G31 , checking.</u> - Check charge air system for proper seal. --> <u>21 - TURBOCHARGER, G-CHARGER</u>	Boost Pressure Check.	Modeled pressure/actual pressure, 40 kPa	Engine speed, > 2400-3000 RPM
P0237	Turbocharger/Supercharger Boost Sensor A Circuit Low	Check Charge Air Pressure Sensor G31 - --> <u>Charge Air Pressure Sensor G31 , checking.</u>	Short to Ground.	Signal voltage, 0.2 V	

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		○ Check charge air system for proper seal. --> <u>21 - TURBOCHARGER, G-CHARGER</u>			
P0238	Turbocharger/Supercharger Boost Sensor A Circuit High	○ Check Charge Air Pressure Sensor G31 -> <u>Charge Air Pressure Sensor G31 , checking.</u> ○ Check charge air system for proper seal. --> <u>21 - TURBOCHARGER, G-CHARGER</u>	Short to Battery (+), Open Circuit.	Signal voltage, > 4.88 V	
P0243	Turbocharger/Supercharger Wastegate Solenoid A	○ Check Wastegate Bypass Regulator Valve N75 --> <u>Wastegate Bypass Regulator Valve N75 , checking.</u>	Open Circuit.	Signal voltage, > 5.6-4.4 V	• Charge pressure control valv commanded off • Engine speed, > 80 RPM
P0245	Turbocharger/Supercharger Wastegate Solenoid A Low	○ Check Wastegate Bypass Regulator Valve N75 --> <u>Wastegate Bypass Regulator Valve N75 , checking.</u>	Short to Ground.	Signal voltage, 3.25-2.15 V	• Charge pressure control valv commanded off • Engine speed, > 80 RPM
P0246	Turbocharger/Supercharger Wastegate Solenoid A High	○ Check Wastegate Bypass Regulator Valve N75 --> <u>Wastegate Bypass Regulator Valve N75 , checking.</u>	Short to Battery (+).	Signal current, >2.2 A	• Charge pressure control valv commanded off • Engine speed, > 80 RPM
P0261	Cylinder 1 Injector Circuit Low	○ Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Short to Ground.	Signal current 2.1 A	• Engine speed, > 80 RPM • High side

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					signal current, > 2. A
P0262	Cylinder 1 Injector Circuit High	Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Short to Battery (+).	Signal current 2.1 A	- Engine speed, > 80 RPM - High side signal current, > 4. A
P0264	Cylinder 2 Injector Circuit Low	Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Short to Ground.	Signal current 2.1 A	- Engine speed, > 80 RPM - High side signal current, > 2. A
P0265	Cylinder 2 Injector Circuit High	Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Short to Battery (+).	Signal current 2.1 A	- Engine speed, > 80 RPM - High side signal current, > 4. A
P0267	Cylinder 3 Injector Circuit Low	Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Short to Ground.	Signal current 2.1 A	- Engine speed, > 80 RPM - High side signal current, > 2. A
P0268	Cylinder 3 Injector Circuit High	Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Short to Battery (+).	Signal current 2.1 A	- Engine speed, > 80 RPM - High side signal current, > 4. A
P0270	Cylinder 4 Injector Circuit Low	Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Short to Ground.	Signal current 2.1 A	- Engine speed, > 80 RPM - High side signal

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					current, > 2. A
P0271	Cylinder 4 Injector Circuit High	Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Short to Battery (+).	Signal current 2.1 A	- Engine speed, > 80 RPM - High side signal current, > 4. A
P0299	Turbocharger/Supercharger Underboost	Check charge air system for proper seal. --> <u>21 - TURBOCHARGER, G-CHARGER</u>	Boost Pressure Check.	Modeled pressure/actual pressure, > 10 kPa	- Engine speed, 2400 3000 RPM - Target charge, P amb + 45 kl

Ignition system

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Freeze Frame
P0300	Random Misfire Detected	- Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u> - Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292 , checking.</u> - Check Spark	Crankshaft Speed Fluctuation, Single or Multiple Misfire.	- Emission threshold 1st interval %(MR), >1.7% - Emission threshold misfire rate (MR), > 1.7% - Catalyst damage misfire rate (MR), > 16-20%	- Time after engine start, idle- 150 RPM - Camshaft revolutions, 1 - Engine speed range, idle- 6760 RPM - Engine torque, > 0 torque (Nm) - Fuel cut off, not active - ECT at start, > -7°	1000 Rev. 200 Rev.	

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		plugs --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292, checking.</u> ○ Check the intake system for leaks --> <u>Checking intake system for leaks (false air).</u> ○ Check fuel pressure --> <u>Fuel pressure and residual pressure before high pressure pump, checking.</u>			• If ECT at start, wait until actual ECT, > 20°C		
P0301	Cylinder 1 Misfire Detected	○ Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33, checking.</u> ○ Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70, N127, N291,</u>	Crankshaft Speed Fluctuation, Single or Multiple Misfire.	• Emission threshold 1st interval %(MR), >1.7% • Emission threshold misfire rate (MR), > 1.7% • Catalyst damage misfire rate (MR), > 16-20%	• Time after engine start, idle-150 RPM • Camshaft revolutions, 1 • Engine speed range, idle-6760 RPM • Engine torque, > 0 torque (Nm) • Fuel cut off, not	• 1000 Rev. • 200 Rev.	

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		<u>N292 , checking.</u> ○ Check Spark plugs --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292 , checking.</u> ○ Check the intake system for leaks --> <u>Checking intake system for leaks (false air).</u> ○ Check fuel pressure --> <u>Fuel pressure and residual pressure before high pressure pump , checking.</u>			active • ECT at start, > -7° C • If ECT at start, wait until actual ECT, > 20° C		
P0302	Cylinder 2 Misfire Detected	○ Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u> ○ Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with</u>	Crankshaft Speed Fluctuation, Single or Multiple Misfire.	• Emission threshold 1st interval %(MR), >1.7% • Emission threshold misfire rate (MR), > 1.7% • Catalyst damage	• Time after engine start, idle- 150 RPM • Camshaft revolutions, 1 • Engine speed range, idle- 6760 RPM • Engine torque, > 0 torque	• 1000 Rev. • 200 Rev.	• , • , • ,
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		<u>Power Output</u> <u>Stage N70, N127, N291, N292, checking.</u> ○ Check Spark plugs --> <u>Ignition Coil with Power Output</u> <u>Stage N70, N127, N291, N292, checking.</u> ○ Check the intake system for leaks --> <u>Checking intake system for leaks (false air).</u> ○ Check fuel pressure --> <u>Fuel pressure and residual pressure before high pressure pump, checking.</u>		misfire rate (MR), > 16-20%	(Nm) • Fuel cut off, not active • ECT at start, > -7° C • If ECT at start, wait until actual ECT, > 20° C		
P0303	Cylinder 3 Misfire Detected	○ Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33, checking.</u> ○ Check Ignition Coil	Crankshaft Speed Fluctuation, Single or Multiple Misfire.	• Emission threshold 1st interval %(MR), >1.7% • Emission threshold misfire rate (MR), >	• Time after engine start, idle-150 RPM • Camshaft revolutions, 1 • Engine speed range, idle-	• 1000 Rev. • 200 Rev.	, , ,
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		with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292, checking.</u> ○ Check Spark plugs --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292, checking.</u> ○ Check the intake system for leaks --> <u>Checking intake system for leaks (false air).</u> ○ Check fuel pressure --> <u>Fuel pressure and residual pressure before high pressure pump, checking.</u>		1.7% • Catalyst damage misfire rate (MR), > 16-20%	6760 RPM • Engine torque, > 0 torque (Nm) • Fuel cut off, not active • ECT at start, > -7° C • If ECT at start, wait until actual ECT, > 20° C		
P0304	Cylinder 4 Misfire Detected	○ Check fuel injectors N30, N31, N32, N33, N83 --> <u>Fuel Injectors N30, N31, N32, N33,</u>	Crankshaft Speed Fluctuation, Single or Multiple Misfire.	• Emission threshold 1st interval %(MR), >1.7% • Emission	• Time after engine start, idle-150 RPM • Camshaft revolutions, 1	• 1000 Rev. • 200 Rev.	•
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		<u>checking.</u> ○ Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292, checking.</u> ○ Check Spark plugs --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292, checking.</u> ○ Check the intake system for leaks --> <u>Checking intake system for leaks (false air).</u> ○ Check fuel pressure --> <u>Fuel pressure and residual pressure before high pressure pump, checking.</u>		threshold misfire rate (MR), > 1.7% • Catalyst damage misfire rate (MR), > 16-20%	• Engine speed range, idle-6760 RPM • Engine torque, > 0 torque (Nm) • Fuel cut off, not active • ECT at start, > -7° C • If ECT at start, wait until actual ECT, > 20° C	
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance	○ Check Engine Speed (RPM) Sensor G28 --> <u>Engine</u>	Rationality Check.	Counted versus referenced teeth, > 1	• Engine speed, 600-1600 RPM • Vehicle	0.5 Seconds

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		<u>Coolant Temperature (ECT) Sensor G62, checking.</u>			speed, 1 or > 15 MPH		
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	Check Engine Speed (RPM) Sensor G28 -- > <u>Engine Coolant Temperature (ECT) Sensor G62, checking.</u>	Signal Activity Check.	Comparison with phase sensor, no signal	- Engine speed, 600-1600 RPM - Vehicle speed, 1 or > 15 MPH	0.5 Seconds	,
P0324	Knock Control System Error	Check Knock Sensors --> <u>Knock Sensor, checking.</u>	Internal Hardware Check.	Zero test procedure, failed	ECT, > 40.5°C	150 Seconds	,
P0327	Knock Sensor 1 Circuit Low Input (Bank 1)	Check Knock Sensors --> <u>Knock Sensor, checking.</u>	Signal Range Check.	Lower threshold, 0.07-0.53 V	- Engine speed, > 2000 RPM - ECT, > 40.5°C - Engine load, > 25%	0.5 Seconds	,
P0328	Knock Sensor 1 Circuit High Input (Bank 1)	Check Knock Sensors --> <u>Knock Sensor, checking.</u>	Signal Range Check.	Upper threshold, 5.1-38.6 V	- Engine speed, > 2000 RPM - ECT, > 40.5°C - Engine load, > 25%	0.5 Seconds	,
P0332	Knock Sensor 2 Circuit Low Input (Bank 2)	Check Knock Sensors --> <u>Knock Sensor, checking.</u>	Signal Range Check.	Lower threshold, 0.07-0.57 V	- Engine speed, > 2000 RPM - ECT, > 40.5°C - Engine	0.5 Seconds	,

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					load, > 25%		
P0333	Knock Sensor 2 Circuit High Input (Bank 2)	Check Knock Sensors --> <u>Knock Sensor , checking.</u>	Signal Range Check.	Upper threshold, 5.1-38.6 V	- Engine speed, > 2000 RPM - ECT, > 40.5°C - Engine load, > 25%	0.5 Seconds	,
P0340	Camshaft Position Sensor A Circuit (Bank 1 or single sensor)	Check Camshaft Position (CMP) Sensor G40 --> <u>Camshaft Position (CMP) Sensors , checking.</u>	Rationality Check.	Adaptive vs. target value, > 20°CA	- Engine speed, 600-1600 RPM - ECT, > 50.25°C	2 Seconds	,
P0341	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or single sensor)	Check Camshaft Position (CMP) Sensor G40 --> <u>Camshaft Position (CMP) Sensors , checking.</u>	Rationality Check.	Signal voltage, no altering at reference gap		0.5 Seconds	,
P0342	Camshaft Position Sensor A Circuit Low Input (Bank 1 or single sensor)	Check Camshaft Position (CMP) Sensor G40 --> <u>Camshaft Position (CMP) Sensors , checking.</u>	Rationality Check.	Signal low voltage, 12 Rev.		0.5 Seconds	,
P0343	Camshaft Position Sensor A Circuit High Input (Bank 1 or single sensor)	Check Camshaft Position (CMP)	Rationality Check.	Signal voltage high, 12 rev.		0.5 Seconds	,

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		Sensor G40 -- > <u>Camshaft Position (CMP) Sensors , checking.</u>					
P0351	Ignition Coil A Primary/Secondary Circuit	Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292 , checking.</u>	Open Circuit, Internal Hardware Check.	- Signal current, 4.95-8.82 mA - Internal fault, changing error	Engine speed, 5000 RPM	0.5 Seconds	,
P0352	Ignition Coil B Primary/Secondary Circuit	Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292 , checking.</u>	Open Circuit, Internal Hardware Check.	- Signal current, 4.95-8.82 mA - Internal fault, changing error	Engine speed, 5000 RPM	0.5 Seconds	,
P0353	Ignition Coil C Primary/Secondary Circuit	Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292 , checking.</u>	Open Circuit, Internal Hardware Check.	- Signal current, 4.95-8.82 mA - Internal fault, changing error	Engine speed, 5000 RPM	0.5 Seconds	,
P0354	Ignition Coil D Primary/Secondary Circuit	Check Ignition Coil with Power Output Stage	Open Circuit, Internal Hardware	Signal current, 4.95-8.82 mA	Engine speed, 5000 RPM	0.5 Seconds	,

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		--> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292 , checking.</u>	Check.	Internal fault, changing error			
--	--	---	--------	--	--	--	--

Additional exhaust regulation

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequent checks, Illum
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	- Check oxygen sensor before catalytic converter --> <u>Oxygen Sensor (O2S) Heater Z19 for Heated Oxygen Sensor (HO2S) G39 before catalytic converter, checking.</u> - Check oxygen sensor behind Three Way Catalytic Converter (TWC) --> <u>Oxygen Sensor (O2S) Behind Three Way</u>	NMOG/NMHC Conversion Capability.	Amplitude ratio O2S 1-	- Time after engine start >255 Sec. - Engine start temp. > -10 C° - Delta mass airflow 20 kg/h/s - EVAP purge flow 25% - Mass air flow at catalyst temp. 23-75 kg/h 420-620 C° - Mass air flow at catalyst temp 75-120 kg/h 600-720 C°	70 Seconds	- O - D 2

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		<u>Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking.</u> ○ Check Three Way Catalytic Converter (TWC) --> <u>Three Way Catalytic Converter (TWC), checking.</u>					
P0441	Evaporative Emission System Incorrect Purge Flow	○ Check Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 - -> <u>Evaporative Emission (EVAP) Canister Purge Regulator Valve N80, checking.</u> ○ Check Leak Detection Pump (LDP) V144. --> <u>Leak Detection Pump (LDP) V144,</u>	Functional Check.	• Deviation lambda control 7% • Deviation idle control 30%	• Engine speed Idle RPM • Engine speed deviation 80 RPM • Time after engine start >425 S • ECT >65°C Or substitute ECT >80°C • IAT >3.8°C • IAT at engine start >3.8°C • Altitude 2500 M	25 Seconds	• O D • 2

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		<u>checking</u> ○ Check Evaporative Emission (EVAP) Canister System for proper seal - -> <u>Evaporative Emission (EVAP) canister system, checking for proper seal.</u>					
P0442	Evaporative Emission System Leak Detected (Small Leak)	○ Check Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 - -> <u>Evaporative Emission (EVAP) Canister Purge Regulator Valve N80, checking.</u> ○ Check Leak Detection Pump (LDP) V144. --> <u>Leak Detection Pump (LDP) V144, checking</u> ○ Check	Pressure Check.	Time for pressure drop 1.85-2.15 S Depending on Altitude and IAT	• EVAP purge valve closed • LDP Activated • Altitude 2500 M • Number of diagnostic attempts = 5 • IAT > 4°C • Delta ambient pressure 300 Pa • IAT drop after engine start 7 K • Time after engine start > 175 S • ECT 4-115° C	150 Seconds	• 0 • D • 2

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		Evaporative Emission (EVAP) Canister System for proper seal - -> <u>Evaporative Emission (EVAP) canister system, checking for proper seal.</u>			- ECT at start 4-35°C - Vehicle speed > 25 MPH - Selected gear, Any drive		
P0444	Evaporative Emission System Purge Control Valve Circuit Open	- Check Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 - -> <u>Evaporative Emission (EVAP) Canister Purge Regulator Valve N80, checking.</u> - Check Leak Detection Pump (LDP) V144. --> <u>Leak Detection Pump (LDP) V144, checking</u> - Check Evaporative Emission (EVAP) Canister	Open Circuit.	Signal voltage > 5.6- 4.4 V	- EVAP purge valve Commanded off - Engine speed > 80 RPM	0.5 Seconds	- C 2

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		System for proper seal - -> <u>Evaporative Emission (EVAP) canister system, checking for proper seal.</u>					
P0455	Evaporative Emission System Leak Detected (gross leak/no flow)	○ Check Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 - -> <u>Evaporative Emission (EVAP) Canister Purge Regulator Valve N80, checking.</u> ○ Check Leak Detection Pump (LDP) V144. <u>--> Leak Detection Pump (LDP) V144, checking</u> ○ Check Evaporative Emission (EVAP) Canister System for proper seal - -> <u>Evaporative</u>	Pressure Check.	Time for pressure drop 0.95-1.00 S	• EVAP purge valve closed • LDP Activated • Altitude 2500 M • Number of diagnostic attempts = 5 • IAT > 4°C • Delta ambient pressure 300 Pa • IAT drop after engine start 7 K • Time after engine start > 175 S • ECT 4-115° C • ECT at start 4-35°C • Vehicle speed > 25 MPH • Selected	150 Seconds	• O D • 2

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		<u>Emission (EVAP) canister system, checking for proper seal.</u>			gear, Any drive		
P0456	Evaporative Emission System Leak Detected (very small leak)	○ Check Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 - -> <u>Evaporative Emission (EVAP) Canister Purge Regulator Valve N80, checking.</u> ○ Check Leak Detection Pump (LDP) V144. --> <u>Leak Detection Pump (LDP) V144, checking</u> ○ Check Evaporative Emission (EVAP) Canister System for proper seal - -> <u>Evaporative Emission (EVAP) canister system,</u>	Pressure Check.	Time for pressure drop, 1.85-2.00, x 4.5-6.5 S (depending on altitude and IAT)	• EVAP purge valve closed • LDP Activated • Altitude 2500 M • Number of diagnostic attempts = 5 • IAT > 4°C • Delta ambient pressure 300 Pa • IAT drop after engine start 7 K • Time after engine start > 175 S • ECT 4-115° C • ECT at start 4-35°C • Vehicle speed > 25 MPH • Selected gear, Any drive	140 Seconds	• O D • 2

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

		<u>checking for proper seal.</u>					
P0458	Evaporative Emission System Purge Control Valve Circuit Low	○ Check Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 - -> <u>Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking.</u> ○ Check Leak Detection Pump (LDP) V144. --> <u>Leak Detection Pump (LDP) V144 , checking</u> ○ Check Evaporative Emission (EVAP) Canister System for proper seal - -> <u>Evaporative Emission (EVAP) canister system, checking for proper seal.</u>	Short to Ground.	Signal voltage, 3.25.. 2.15 V	EVAP purge valve, Commanded off	0.5 Seconds	• C • 2

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Generic Scan Tool.

P0459	Evaporative Emission System Purge Control Valve Circuit High	○ Check Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 - -> <u>Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking.</u> ○ Check Leak Detection Pump (LDP) V144. --> <u>Leak Detection Pump (LDP) V144 , checking</u> ○ Check Evaporative Emission (EVAP) Canister System for proper seal - -> <u>Evaporative Emission (EVAP) canister system, checking for proper seal.</u>	Short to Battery (+).	Signal current, > 2.2 A	● EVAP purge valve, Commanded on ● Engine speed, > 80 RPM	0.5 Seconds	● C ● 2
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Speed and idle control

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DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency checks, MI Illum
P0501	Vehicle Speed Sensor A Range/Performance	Check vehicle speed signal --> <u>Speed signal, checking.</u>	Rationality Check.	VSS signal, 2 MPH	- Fuel cut off, active - Vehicle speed, 1520-4520 RPM	4 Seconds	- Multi 2 DC
P0506	Idle Air Control System RPM Lower Than Expected	Check Throttle Valve Control Module J338 --> <u>Throttle Valve Control Module J338, checking.</u>	Out of Range, Low.	Engine speed deviation, - 80 RPM	- Engine speed, idle - Accelerator PP, 0% - Fuel cut off, not active - Vehicle speed, 0 MPH - Purge fuel rate vs. injection rate, 0.18 - Altitude, 2500 m - IAT, >60° C - ECT, >60° C - Engine load, 34.5%	4 Seconds	- Multi 2 DC
P0507	Idle Air Control System RPM Higher Than Expected	Check Throttle Valve Control Module J338 -->	Out of Range, High.	Engine speed deviation >80 RPM	- Engine speed, idle - Accelerator PP, 0%	4 Seconds	- Multi 2 DC

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		<u>Throttle Valve Control Module J338, checking.</u>			- Fuel cut off, not active - Vehicle speed, 0 MPH - Purge fuel rate vs. injection rate, 0.18 - Altitude, 2500 m - IAT, >60° C - ECT, >60° C		
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Control module and output signals

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monit Time Length
P0600	Serial Communication Link	Eliminate malfunction in Can-bus components according to the wiring diagram	Signal check.	No message received from DME or Invalid data, timeout	- CAN Bus, no error and ready to transmit - Delay after engine on, 0.5 S - Battery voltage, > 9 V	0.5 Sec
P0601	Internal Control Module Memory Check Sum Error	- Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623, replacing.</u> - Replace	Internal Check Sum Verification.	Internal check sum, incorrect		0.5 Sec

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		Transmission Control Module (TCM) J217 --> <u>Transmission Control Module (TCM) J217, replacing.</u>				
P0604	Internal Control Module Random Access Memory (RAM) Error	○ Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623, replacing.</u> ○ Replace Transmission Control Module (TCM) J217 --> <u>Transmission Control Module (TCM) J217, replacing.</u>	RAM Check.	Write ability check, failed		0.5 Sec
P0605	Internal Control Module Read Only Memory (ROM) Error	○ Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623, replacing.</u> ○ Replace Transmission Control Module (TCM) J217 --> <u>Transmission Control Module (TCM) J217, replacing.</u>	EPROM Check.	Check, failed		0 Seco
P0606	ECM/PCM Processor	○ Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623, replacing.</u> ○ Replace	• EEPROM Check • Drive by Wire Module Check	• Engine operation condition, Out of range		0.5 Sec

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		Transmission Control Module (TCM) J217 --> <u>Transmission Control Module (TCM) J217 , replacing.</u>				
P0607	Control Module Performance	○ Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623 , replacing.</u> ○ Replace Transmission Control Module (TCM) J217 --> <u>Transmission Control Module (TCM) J217 , replacing.</u>	• EEPROM Check • Drive by Wire Module Check	SW verify of EEPROM emulation, negative		0 Seco
P0614	ECM/TCM Incompatible	○ Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623 , replacing.</u> ○ Replace Transmission Control Module (TCM) J217 --> <u>Transmission Control Module (TCM) J217 , replacing.</u>	Signal check.	CAN level engine does not fit CAN level transmission	• CAN Bus, no error and ready to transmit • Delay after engine on, 0.5 S • Ignition, status on	0 Seco
P0638	Throttle Actuator Control Range/Performance - Bank 1	○ Check Throttle Valve Control Module J338 --> <u>Throttle Valve Control Module J338 , checking.</u> ○ Check Throttle Position (TP)	• Rationality Check, Close Movement • Signal range check At mechanical	• Time to open over reference point + 12%, > 0.14 s • Time to close	• Ignition, on • Engine speed, 0 RPM • IAT, >5°C • Vehicle speed, 0	0.5 Sec

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		Sensor G79/Accelerator Pedal Position Sensor 2 G185 --> <u>Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185, checking.</u>	stop, low or	below reference point, + 3%, > 0.56s • Time to open over reference point + 12%, > 0.14 s • Time to close below reference point, + 3%, > 0.56s • TPS 1 signal voltage, not (0.42-0.77) V • TPS 2 signal voltage, not (4.26-4.58) V	MPH • ECT, >5°C	
P0641	Sensor Reference Voltage A Circuit/Open	○ Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623, replacing.</u> ○ Replace Transmission Control Module (TCM) J217 --> <u>Transmission Control Module (TCM) J217,</u>	Open Circuit.	Internal communication, failure A		0.5 Sec

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		<u>replacing.</u>				
P0642	Sensor Reference Voltage A Circuit Low	○ Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623 , replacing.</u> ○ Replace Transmission Control Module (TCM) J217 --> <u>Transmission Control Module (TCM) J217 , replacing.</u>	Out of Range, Low.	Signal voltage, 4.5-5 V		0.5 Sec
P0643	Sensor Reference Voltage A Circuit High	○ Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623 , replacing.</u> ○ Replace Transmission Control Module (TCM) J217 --> <u>Transmission Control Module (TCM) J217 , replacing.</u>	Out of Range, High.	Signal voltage, >5-5.4 V		0.5 Sec
P0651	Sensor Reference Voltage B Circuit/Open	○ Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623 , replacing.</u> ○ Replace Transmission Control Module (TCM) J217 --> <u>Transmission Control Module (TCM) J217 ,</u>	Open Circuit.	Internal communication, failure A		0.5 Sec

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		<u>replacing.</u>				
P0652	Sensor Reference Voltage B Circuit Low	○ Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623 , replacing.</u> ○ Replace Transmission Control Module (TCM) J217 --> <u>Transmission Control Module (TCM) J217 , replacing.</u>	Out of Range, Low.	Signal voltage, 4.5-5 V		0.5 Sec
P0653	Sensor Reference Voltage B Circuit High	○ Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623 , replacing.</u> ○ Replace Transmission Control Module (TCM) J217 --> <u>Transmission Control Module (TCM) J217 , replacing.</u>	Out of Range, High.	Signal voltage, >5-5.4 V		0.5 Sec
P0657	Actuator Supply Voltage A Circuit/Open	○ Check Engine Component Power Supply Relay J757	Open Circuit.	Signal voltage, > 4.4-5.6 V	• Relay, commanded off • Engine speed, > 80 RPM	0.5 Sec
P0658	Actuator Supply Voltage A Circuit Low	○ Check Engine Component Power Supply Relay J757	Short to Ground.	Signal voltage, 2.15-3.25 V	• Relay, commanded off • Engine speed, 80 RPM	0.5 Sec
P0685	ECM/PCM Power	○ Check voltage	Open Circuit.	• Control	Ignition, off	0.5 Sec

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

	Relay Control Circuit/Open	supply for Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623 voltage supply, checking.</u> ○ Check activation of Motronic Engine Control Module (ECM) Power Supply Relay J271 --> <u>Motronic Engine Control Module (ECM) Power Supply Relay J271, checking.</u>		voltage, 2.6-3.7 V • Sense circuit voltage, 6 V		
P0686	ECM/PCM Power Relay Control Circuit Low	○ Check voltage supply for Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623 voltage supply, checking.</u> ○ Check activation of Motronic Engine Control Module (ECM) Power Supply Relay J271 --> <u>Motronic Engine Control Module (ECM) Power Supply Relay J271, checking.</u>	Short to Ground.	• Control voltage, 2.6-3.7 V • Sense circuit voltage, >6 V	Ignition, off	0.5 Sec
P0687	ECM/PCM Power Relay Control Circuit High	○ Check voltage supply for Engine Control Module (ECM) J623 --> <u>Engine</u>	Short to Battery (+).	• Signal current, >1.4-0.7 A • Sense	Ignition, off	0.5 Sec

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		<u>Control Module (ECM) J623 voltage supply, checking.</u> ○ Check activation of Motronic Engine Control Module (ECM) Power Supply Relay J271 --> <u>Motronic Engine Control Module (ECM) Power Supply Relay J271, checking.</u>		circuit voltage, >6 V		
P0688	ECM/PCM Power Relay Sense Circuit	○ Check voltage supply for Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623 voltage supply, checking.</u> ○ Check activation of Motronic Engine Control Module (ECM) Power Supply Relay J271 --> <u>Motronic Engine Control Module (ECM) Power Supply Relay J271, checking.</u>	Signal Range Check.	• Sense voltage, 3.0 V • Sense voltage, >3.0 V	• Main relay, commanded on • Main relay, commanded off	0.5 Sec
P0697	Sensor Reference Voltage C Circuit/Open	○ Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623, replacing.</u>	Open Circuit.	Internal communication, failure A		0.5 Sec
P0698	Sensor Reference Voltage C Circuit	○ Replace the	Out of Range, Low.	Signal voltage, 4.5-5 V		0.5 Sec

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

	Low	Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623, replacing.</u>				
P0699	Sensor Reference Voltage C Circuit High	Replace the Engine Control Module (ECM) J623 --> <u>Engine Control Module (ECM) J623, replacing.</u>	Out of Range, High.	Signal voltage, >5-5.4 V		0.5 Sec

Transmission

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Moni Time
P0700	Transmission Control System (MIL Request)	Replace Transmission Control Module (TCM) J217 - -> <u>Transmission Control Module (TCM) J217, replacing.</u>	Watchdog check, MC components check.	Check, failed		0 Sec
P0706	Transmission Range Sensor A Circuit Range/Performance	Check Multi-Function Transmission Range (TR) Switch F125 - -> <u>Multi-Function Transmission Range (TR) Switch, checking.</u>	Position switch check.	4 bit position code, incorrect	- Sensor supply, 5.5-8 V - Status, OK	0.1 Se
P0710	Transmission Fluid Temperature Sensor A Circuit	Check ATF level: --> <u>37 CONTROLS.</u>	Signal range check.	Sensor short circuit: U_sensor (+), 2.3 u+ 2.7 v		1.5 Se

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
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		<u>HOUSING</u> ○ Check Transmission Fluid Temperature Sensor G93 --> <u>Transmission Fluid Temperature Sensor, checking.</u>		• U_sensor (-), 2.3 u- 2.7 v		
P0711	Transmission Fluid Temperature Sensor A Circuit Range/Performance	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check Transmission Fluid Temperature Sensor G93 --> <u>Transmission Fluid Temperature Sensor, checking.</u>	Rationality check.	Discontinual temperature: • ATF temperature delta T between 2 measurements, >20°C Sensor stuck: • Comparison ATF vs. chip temperature, ATF temp. must follow chip temp. in certain ranges, 20-40°C	• Temperature fault, no other fault detected • Chip temperature, status OK • Engine speed or input speed, > 400 RPM • Signal status, OK	1.5 Sec
P0712	Transmission Fluid Temperature Sensor A Circuit Low	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check Transmission Fluid Temperature Sensor G93 --> <u>Transmission Fluid Temperature Sensor, checking.</u>	Signal range check.	Circuit low: • U_sensor (+), 4.5 V • U_sensor (-), 0.5 V		1.5 Sec

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P0713	Transmission Fluid Temperature Sensor A Circuit High	<u>checking.</u> ○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check Transmission Fluid Temperature Sensor G93 --> <u>Transmission Fluid Temperature Sensor, checking.</u>	Signal range check.	Circuit high: • U_sensor (+), > 4.5 V • U_sensor (-), > 0.5 V		1.5 Sec
P0714	Transmission Fluid Temperature Sensor A Circuit Intermittent	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check Transmission Fluid Temperature Sensor G93 --> <u>Transmission Fluid Temperature Sensor, checking.</u>	Signal range check.	Circuit high: • U_sensor (+), > 4.5 V • U_sensor (-), 0.5 V		1.5 Sec
P0716	Input/Turbine Speed Sensor A Circuit Range/Performance	○ Check Transmission Input Speed (RPM) Sensor G182 --> <u>Sensor for transmission RPM, checking.</u>	Rationality check.	Signal higher or lower than threshold • Higher, > + 8000 RPM • Lower, 20 RPM	Higher: • Sensor supply, OK • Sensor, no electrical error Lower: • Sensor supply, OK • Engine speed, >600	0.6 Sec

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

					RPM • Status engine speed, OK • Output speed, >500 RPM • Status output speed, OK or substitute value • Range position, OK or substitute value • Sensor, no electrical error • Transmission condition, friction-locked • Error flag fnabvra_err, not set	
P0717	Input/Turbine Speed Sensor A Circuit No Signal	○ Check Transmission Input Speed (RPM) Sensor G182 --> <u>Sensor for transmission RPM, checking.</u>	• Short to Ground (GND) • Short to Battery (+) • Open circuit	Hardware detection	Sensor supply, OK	0.6 Sec
P0721	Output Speed Sensor Circuit Range/Performance	○ Check Transmission Output Speed (RPM) Sensor G195 --> <u>Sensor for transmission output RPM,</u>	Rationality check.	• Signal > threshold, > 1000 RPM • Difference between last and actual value > threshold, -	• Sensor supply, OK • Sensor, no electrical error • Transmission condition,	

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

		<u>checking.</u>		1000 RPM • Difference to wheel speeds, > 500 RPM and input speed, > 200 RPM	friction-locked • Input speed sensor, OK • Difference between output speed and input speed, > 200 RPM • Transmission condition, friction-locked backwards or forwards • Shift flag, = 0 (no shift) • Input speed, OK • Sensor supply, OK • Wheel speeds, OK	
P0722	Output Speed Sensor Circuit No Signal	◦ Check Transmission Output Speed (RPM) Sensor G195 --> <u>Sensor for transmission output RPM, checking.</u>	• Short to Ground (GND) • Short to Battery (+) • Open circuit	Hardware detection	Sensor supply, OK	0.6 Sec
P0727	Engine Speed Input Circuit No Signal	◦ Check wiring connection Between Engine Control Module (ECM) J623 and the Transmission	Rationality check.	CAN message signal error flag, =1	• Ignition, on • CAN Bus, OK • DME CAN connection, OK	1 Sec

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
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		Control Module (TCM) J217 according to wiring diagrams ○ Check Engine Speed (RPM) Sensor G28 --> <u>Engine Speed (RPM) Sensor G28, checking.</u>				
P0729	Gear 6 Incorrect Ratio	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> ○ Check Solenoid Valve 1 N88 - --> <u>Solenoid valve 1, checking.</u> ○ Mechanical malfunction in transmission	Rationality check.	Speed difference between • Output speed, > characteristic speed difference = f (output speed), output speed 100; 1400; 8150 RPM • Input speed, speed difference 200; 200 RPM	• Transmission oil temp, > -20°C • Forward gear (1 to 6), activated • Output speed, > 0 RPM • Engine speed, >550 RPM • Input speed, > 300 RPM • Input speed, OK • Stand by control, inactive • Time after gear switch, 0.2 s	3 Syn
P0731	Gear 1 Incorrect Ratio	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check pressure regulator	Rationality check.	Speed difference between • Output speed, > characteristic speed	• Transmission oil temp, > -20°C • Forward gear (1 to 6), activated	3 Syn

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		valves --> <u>Pressure regulator valves, checking.</u> ○ Check Solenoid Valve 1 N88 - -> <u>Solenoid valve 1, checking.</u> ○ Mechanical malfunction in transmission		difference = f (output speed), output speed 0; 250; 2000 RPM • Input speed, speed difference 500; 200; 200 RPM	• Output speed, > 0 RPM • Engine speed, >550 RPM • Input speed, > 300 RPM • Input speed, OK • Stand by control, inactive • Time after gear switch, 0.2 s	
P0732	Gear 2 Incorrect Ratio	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> ○ Check Solenoid Valve 1 N88 - -> <u>Solenoid valve 1, checking.</u> ○ Mechanical malfunction in transmission	Rationality check.	Speed difference between • Output speed, > characteristic speed difference = f (output speed), output speed 0; 400; 3500 RPM • Input speed, speed difference 300; 200; 200 RPM	• Transmission oil temp, > - 20°C • Forward gear (1 to 6), activated • Output speed, > 0 RPM • Engine speed, >550 RPM • Input speed, > 300 RPM • Input speed, OK • Stand by control, inactive • Time after gear switch, 0.2 s	3 Syn
P0733	Gear 3 Incorrect	○ Check ATF	Rationality	Speed difference	• Transmission	3 Syn

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
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	Ratio	level: --> <u>37</u> <u>CONTROLS,</u> <u>HOUSING</u> ○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> ○ Check Solenoid Valve 1 N88 - --> <u>Solenoid valve 1, checking.</u> ○ Mechanical malfunction in transmission	check.	between • Output speed, > characteristic speed difference = f (output speed), output speed 100; 650; 5500 RPM • Input speed, speed difference 200; 200; 200 RPM	oil temp, > - 20°C • Forward gear (1 to 6), activated • Output speed, > 0 RPM • Engine speed, >550 RPM • Input speed, > 300 RPM • Input speed, OK • Stand by control, inactive • Time after gear switch, 0.2 s	
P0734	Gear 4 Incorrect Ratio	○ Check ATF level: --> <u>37</u> <u>CONTROLS,</u> <u>HOUSING</u> ○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> ○ Check Solenoid Valve 1 N88 - --> <u>Solenoid valve 1, checking.</u> ○ Mechanical malfunction in	Rationality check.	Speed difference between • Output speed, > characteristic speed difference = f (output speed), output speed 100; 850; 7500 RPM • Input speed, speed difference 200; 200; 200 RPM	• Transmission oil temp, > - 20°C • Forward gear (1 to 6), activated • Output speed, > 0 RPM • Engine speed, >550 RPM • Input speed, > 300 RPM • Input speed, OK • Stand by control,	3 Syn

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		transmission			inactive	
					Time after gear switch, 0.2 s	
P0735	Gear 5 Incorrect Ratio	- Check ATF level: --> <u>37 CONTROLS, HOUSING</u> - Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> - Check Solenoid Valve 1 N88 - --> <u>Solenoid valve 1, checking.</u> - Mechanical malfunction in transmission	Rationality check.	Speed difference between - Output speed, > characteristic speed difference = f (output speed), output speed 100; 1100; 8150 RPM - Input speed, speed difference 200; 200; 200 RPM	- Transmission oil temp, > - 20°C - Forward gear (1 to 6), activated - Output speed, > 0 RPM - Engine speed, >550 RPM - Input speed, > 300 RPM - Input speed, OK - Stand by control, inactive - Time after gear switch, 0.2 s	3 Syn
P0736	Reverse Incorrect ratio	- Check ATF level: --> <u>37 CONTROLS, HOUSING</u> - Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> - Check Solenoid Valve 1 N88 -	Rationality check.	Speed difference between - Output speed, > characteristic speed difference = f (output speed), output speed 100; 250; 2000 RPM - Input speed, speed difference	- Transmission oil temp, > - 20°C - Reverse gear, activated - Output speed, > 0 RPM - Engine speed, >550 RPM - Input speed,	3 Syn

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
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		-> <u>Solenoid valve 1, checking.</u> ○ Mechanical malfunction in transmission		500; 500; 300 RPM	> 300 RPM • Input speed, OK • Stand by control, inactive • Time after gear switch, 0.2 s	
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	○ Check Engine Speed (RPM) Sensor G28 --> <u>Engine Speed (RPM) Sensor G28, checking.</u> ○ Check Transmission Input Speed (RPM) Sensor G182 --> <u>Sensor for transmission RPM, checking</u> ○ Check Automatic Transmission Pressure Regulating Valve 6 N371 --> <u>Pressure regulator valves, checking.</u>	Rationality check.	Rate of (setting of nominal value) - actual value, > 50 RPM	Status of clutch, closed or closed loop control	15 Se
P0746	Pressure Control Solenoid 'A' Performance or Stuck Off	○ Check Automatic Transmission Pressure Regulating Valve 1 N215 --> <u>Pressure regulator valves,</u>	Short to Ground (GND)/open circuit.	PWM hardware detection, 0 or 100%	• Low side and high side FET, activated • Power supply, > 9 V	0.05 s

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
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		<u>checking.</u>			• Voltage drop at FET, = 1 V • Solenoid supply, > 9 V	
P0747	Pressure Control Solenoid 'A Stuck On	○ Check Automatic Transmission Pressure Regulating Valve 1 N215 --> <u>Pressure regulator valves, checking.</u>	Short to Battery (+).	PWM hardware detection, 0 or 100%	• Low side and high side FET, activated • Power supply, > 9 V • Voltage drop at FET, = 1 V • Solenoid supply, > 9 V	0.05 s
P0748	Pressure Control Solenoid 'A Electrical	○ Check Automatic Transmission Pressure Regulating Valve 1 N215 --> <u>Pressure regulator valves, checking.</u>	Rationality check.	Current higher or lower than threshold, > (50 + 170) mA	• Low side and high side FET, activated • Power supply, > 9 V • Voltage drop at FET, = 1 V • Solenoid supply, > 9 V	0.05 s
P0751	Shift Solenoid A Performance or Stuck Off	○ Check Solenoid Valve 1 N88 - -> <u>Solenoid valve 1, checking.</u>	• Short to Ground (GND) • Open circuit	• If PWM = 0%, diagnosis by ASIC • If 0% = PWM, 7.6% voltage return lead (low), 0.15 V • If 7.6% =	• High side FET voltage drop, = 1 V • High side FET, enabled • Low side FET, enabled	0.05 s

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

				PWM , 92.4% voltage return lead (high), 0.15 V • If 7.6% = PWM , 92.4% voltage return lead (low), 0.15 V		
P0752	Shift Solenoid Stuck On	○ Check Solenoid Valve 1 N88 - -> <u>Solenoid valve 1, checking.</u>	Short to Battery (+).	• If PWM = 100%, diagnosis by ASIC • If 7.6% = PWM = 100% voltage return lead (high), >0.3 V	• High side FET voltage drop, = 1 V • High side FET, enabled • Low side FET, enabled	0.05 s
P0776	Pressure Control Solenoid B Performance or Stuck Off	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u>	Short to Ground (GND).	PWM hardware detection, 0 or 100%	• Low side and high side FET, activated • Power supply, > 9 V • Voltage drop at FET, = 1 V • Solenoid supply, > 9 V	0.05 s
P0777	Pressure Control Solenoid B Stuck On	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u>	Short to Battery (+)/open circuit.	PWM hardware detection, 0 or 100%	• Low side and high side FET, activated • Power supply, > 9 V • Voltage drop at FET, = 1 V • Solenoid	0.05 s

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

					supply, > 9 V	
P0778	Pressure Control Solenoid B Electrical	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u>	Rationality check.	Current higher or lower than threshold, (850 - 120) mA	• Low side and high side FET, activated • Power supply, > 9 V • Voltage drop at FET, = 1 V • Solenoid supply, > 9 V	0.05 s
P0781	1-2 Shift	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> ○ Mechanical malfunction in transmission	• Fault detection during gear changes 1-2A • Fault detection during gear changes 1-2B	• Input speed - output speed > threshold, > 500 RPM • Input speed - output speed x ratio (0)- • Input speed - output speed x ratio (0) threshold , -30 calculated value 30 RPM	• Transmission oil temperature, > = - 10°C • Engine speed, > = 600 RPM • Range position, no P,R,N • Output speed, > = 300 RPM Depending on monitoring function procedure: monitoring function A: at x detected symptoms. Refer to DTC Monitoring function B: at y detected symptom . Refer to DTC	>=5
P0781	Load control	○ Check ATF level: --> <u>37 CONTROLS,</u>	• Fault detection during	• Input speed - output speed > threshold	• Transmission oil temperature,	>=5

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		<u>HOUSING</u> ○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> ○ Mechanical malfunction in transmission	gear changes 2-1B	• Input speed - output speed x ratio (t)- • Input speed - output speed x ratio (0) threshold , -30 calculated value 30 RPM	>= -10°C • Engine speed, >=600RPM • Range position, no P,R,N • Output speed, >=250 RPM	
P0782	2-3 Shift	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> ○ Mechanical malfunction in transmission	• Fault detection during gear changes 2-3A • Fault detection during gear changes 2-3B	• Input speed - output speed > threshold, > 500 RPM • Input speed - output speed x ratio (t)- • Input speed - output speed x ratio (0) threshold , -30 calculated value 30 RPM	• Transmission oil temperature, >= -10°C • Engine speed, >=600RPM • Range position, no P,R,N • Output speed, >=300 RPM Depending on monitoring function procedure: monitoring function A: at x detected symptoms. Refer to DTC Monitoring function B: at y detected symptom . Refer to DTC	>=5
P0782	Load control	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check pressure	• Fault detection during gear changes 3-2B	• Input speed - output speed > threshold • Input speed - output speed x ratio (t)-	• Transmission oil temperature, >= -10°C • Engine speed,	>=5

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		- regulator valves --> <u>Pressure regulator valves, checking.</u> - o Mechanical malfunction in transmission		- Input speed - output speed x ratio (0) threshold , -30 calculated value 30 RPM	>=600RPM - Range position, no P,R,N - Output speed, >=500 RPM	
P0783	3-4 Shift	- o Check ATF level: --> <u>37 CONTROLS, HOUSING</u> - o Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> - o Mechanical malfunction in transmission	- Fault detection during gear changes 3-4A - Fault detection during gear changes 3-4B	- Input speed - output speed > threshold, > 500 RPM - Input speed - output speed x ratio (t)- - Input speed - output speed x ratio (0) threshold , -30 calculated value 30 RPM	- Transmission oil temperature, > =- 10°C - Engine speed, >=600RPM - Range position, no P,R,N - Output speed, >=300 RPM Depending on monitoring function procedure: monitoring function A: at x detected symptoms. Refer to DTC Monitoring function B: at y detected symptom . Refer to DTC	>=5
P0783	Load control	- o Check ATF level: --> <u>37 CONTROLS, HOUSING</u> - o Check pressure regulator valves --> <u>Pressure</u>	Fault detection during gear changes 4-3B	- Input speed - output speed > threshold - Input speed - output speed x ratio (t)- - Input speed - output speed x	- Transmission oil temperature, > =- 10°C - Engine speed, >=600RPM - Range	>=5

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		<u>regulator valves, checking.</u>		ratio (0) threshold , -30 calculated value 30 RPM	position, no P,R,N • Output speed, >=700 RPM	
P0784	4-5 Shift	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> ○ Mechanical malfunction in transmission	• Fault detection during gear changes 4-5A • Fault detection during gear changes 4-5B	• Input speed - output speed > threshold, > 500 RPM • Input speed - output speed x ratio (t)- • Input speed - output speed x ratio (0) threshold , -30 calculated value 30 RPM	• Transmission oil temperature, > =- 10°C • Engine speed, >=600RPM • Range position, no P,R,N • Output speed, >=300 RPM Depending on monitoring function procedure: monitoring function A: at x detected symptoms. Refer to DTC Monitoring function B: at y detected symptom . Refer to DTC	>=5
P0784	Load control	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u>	• Fault detection during gear changes 5-4B	• Input speed - output speed > threshold • Input speed - output speed x ratio (t)- • Input speed - output speed x ratio (0) threshold	• Transmission oil temperature, > =- 10°C • Engine speed, >=600RPM • Range position, no P,R,N • Output	>=5

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		○ Mechanical malfunction in transmission		, -30 calculated value 30 RPM	speed, ≥ 1200 RPM	
P0796	Pressure Control Solenoid C Performance or Stuck Off	○ Check Automatic Transmission Pressure Regulating Valve 3 N217 --> <u>Pressure regulator valves, checking.</u>	Short to Ground (GND)/open circuit.	PWM hardware detection, 0 or 100%	• Low side and high side FET, activated • Power supply, > 9 V • Voltage drop at FET, $= 1$ V • Solenoid supply, > 9 V	0.05 s
P0797	Pressure Control Solenoid C Stuck On	○ Check Automatic Transmission Pressure Regulating Valve 3 N217 --> <u>Pressure regulator valves, checking.</u>	Short to Battery (+).	PWM hardware detection, 0 or 100%	• Low side and high side FET, activated • Power supply, > 9 V • Voltage drop at FET, $= 1$ V • Solenoid supply, > 9 V	0.05 s
P0798	Pressure Control Solenoid C Electrical	○ Check Automatic Transmission Pressure Regulating Valve 3 N217 --> <u>Pressure regulator valves, checking.</u>	Rationality check.	Current higher or lower than threshold, $> (50 + 170)$ mA	• Low side and high side FET, activated • Power supply, > 9 V • Voltage drop at FET, $= 1$ V • Solenoid supply, > 9	0.05 s

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

					V	
P0829	Load control	○ Check ATF level: --> <u>37 CONTROLS, HOUSING</u> ○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> ○ Mechanical malfunction in transmission	• Fault detection during gear changes 6-5B	• Input speed - output speed > threshold • Input speed - output speed x ratio (t)- • Input speed - output speed x ratio (0) threshold	• Transmission oil temperature, > = 10°C • Engine speed, > = 600RPM • Range position, no P,R,N • Output speed, > = 1800 RPM	>=5
P0889	TCM Power Relay Sense Circuit Range/Performance	○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> ○ Check Solenoid Valve 1 N88 - -> <u>Solenoid valve 1, checking.</u>	Rationality check.	FET drive, not possible	• Filtered battery voltage, > 7 V • High side and low side FET, enabled • Status counter initialization, 0 or 1	0.03 s
P0890	TCM Power Relay Sense Circuit Low	○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> ○ Check Solenoid Valve 1 N88 - -> <u>Solenoid valve 1, checking.</u>	Short to Ground (GND).	• Solenoid power supply voltage, 5.5 V • Drop voltage over high side FET, > 0.1 V	• Filtered battery voltage, > 7 V • High side and low side FET, enabled • Status counter initialization, 0 or 1	0.03 s

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

P0891	TCM Power Relay Sense Circuit High	○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> ○ Check Solenoid Valve 1 N88 - -> <u>Solenoid valve 1, checking.</u>	Short to Battery (+).	Hardware detection	• Filtered battery voltage, > 7 V • High side and low side FET, enabled • Status counter initialization, 0 or 1	0.03 s
P0892	TCM Power Relay Sense Circuit Intermittent	○ Check pressure regulator valves --> <u>Pressure regulator valves, checking.</u> ○ Check Solenoid Valve 1 N88 - -> <u>Solenoid valve 1, checking.</u>	Open circuit.	Hardware detection	• Filtered battery voltage, > 7 V • High side and low side FET, enabled • Status counter initialization, 0 or 1	0.03 s

SAE P1xxx-DTCs

Transmission

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P1702	Malfunction cannot activate control module replacement function, since	○ Replace Transmission Control Module (TCM) J217 - -> <u>Transmission</u>	Rationality Check.	SW functions: actuating solenoid valves colliding with 2 substitute		0.02 Seconds	• Continuous • 2 DCY

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

another malfunction with equal priority is present	<u>Control Module (TCM) J217, replacing.</u>	functions with same priority as driven solenoid valves that have short circuit to supply or interruption			
--	---	--	--	--	--

SAE P2xxx-DTCs

Fuel and air mixture, additional emissions regulations

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Fail II
P2004	Intake Manifold Runner Control Stuck Open Bank 1	Check Intake Flap Motor V157/Intake Manifold Runner Position Sensor G336 --> <u>Intake Flap Motor V157/Intake Manifold Runner Position Sensor G336, checking.</u>	Signal range check at upper mechanical stop or Signal range check at lower mechanical stop.	- Normal closed position, unable to reach - Signal voltage, 2.75 or >3.66 V	- Ignition, off - Runner flaps, commanded closed - Position sensor, no DTC - Actuator, no DTC	25 Seconds	
P2008	Intake Manifold Runner Control Circuit/Open Bank 1	Check Intake Flap Motor V157/Intake Manifold	Signal range check.	Signal duty cycle and ECM power stage	>80% - Failure	5 Seconds 1 Seconds	

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

		Runner Position Sensor G336 --> <u>Intake Flap Motor V157/Intake Manifold Runner Position Sensor G336, checking.</u>		or • Deviation vs. Calculated value • ECM power stage	• >5% • Failure	
P2014	Intake Manifold Runner Position Sensor/Switch Circuit Bank 1	○ Check Intake Flap Motor V157/Intake Manifold Runner Position Sensor G336 --> <u>Intake Flap Motor V157/Intake Manifold Runner Position Sensor G336, checking.</u>	Signal range check.	Signal voltage, >4.71 V		0.2 Seconds
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance Bank 1	○ Check Intake Flap Motor V157/Intake Manifold Runner Position Sensor G336 --> <u>Intake Flap Motor V157/Intake Manifold Runner Position Sensor G336, checking.</u>	Signal range check, rationality check.	• Signal duty cycle, >80% • Deviation vs. Calculated value, Failure	• ECM power stage, no failure • Position sensor, no DTC	• 5 Seconds • 1 Second

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 1)	Check Intake Flap Motor V157/Intake Manifold Runner Position Sensor G336 --> <u>Intake Flap Motor V157/Intake Manifold Runner Position Sensor G336, checking.</u>	Signal range check, rationality check.	Signal voltage, 0.35 V		0.2 Seconds
P2088	A Camshaft Position Actuator Control Circuit Low Bank 1	Check Camshaft Adjustment Valve 1 N205 --> <u>Camshaft Adjustment Valve 1 N205, checking.</u>	Short to Ground (GND).	Signal voltage, 2.15-3.25 V	- Camshaft valve, commanded off - Engine speed, >80 RPM	0.5 Seconds
P2089	A Camshaft Position Actuator Control Circuit High Bank 1	Check Camshaft Adjustment Valve 1 N205 --> <u>Camshaft Adjustment Valve 1 N205, checking.</u>	Short to Battery (+).	Signal current, >2.2 A	- Camshaft valve, commanded on - Engine speed, >80 RPM	0.5 Seconds
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Check oxygen sensor before catalytic converter --> <u>Heated Oxygen Sensor</u>	Adaptive value limit low.	Deviation lambda control > -3%	- Lambda control, closed loop - Fuel trim control post cat., active - Engine	100 Seconds

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

		<u>(HO2S) G39 and oxygen sensor regulation before catalytic converter, checking.</u> ○ Check oxygen sensor behind Three Way Catalytic Converter (TWC) --> <u>Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking.</u>			speed, 1200-4000 RPM • Engine load, 18-70.5% • O2S rear, On DTC	
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	○ Check oxygen sensor before catalytic converter --> <u>Heated Oxygen Sensor (HO2S) G39 and oxygen sensor regulation</u>	Adaptive value limit high.	Deviation lambda control > 3%	• Lambda control, closed loop • Fuel trim control post cat., active • Engine speed, 1200-4000 RPM • Engine load, 18-	100 Seconds
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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		<u>before catalytic converter, checking.</u> ○ Check oxygen sensor behind Three Way Catalytic Converter (TWC) --> <u>Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and oxygen sensor regulation behind catalytic converter, checking.</u>			70.5% • O2S rear, On DTC	
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Fuel and air ratio

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length
P2101	Throttle Actuator Control Motor Circuit Range/Performance	○ Check Throttle Valve Control Module J338 --> <u>Throttle Valve Control Module J338 , checking.</u>	Signal range check, rationality check.	• Duty cycle and ECM power stage • Deviation throttle valve angles vs. Calculated value	• >80% • No failure	• 0.6 Seco • 0.5 Seco
P2106	Throttle Actuator	○ Check Throttle	Signal	Duty cycle and	• >80%	5 Seconds

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

	Control System - Forced Limited Power	Valve Control Module J338 --> <u>Throttle Valve Control Module J338 , checking.</u>	range check.	ECM power stage	No failure	
P2122	Throttle/Pedal Position Sensor/Switch D Circuit Low Input	Check Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 -- > <u>Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking.</u>	Out of range, low.	Signal voltage 0.63 V	Signal voltage sensor 2 >1.11 V	5 Seconds.
P2123	Throttle/Pedal Position Sensor/Switch D Circuit High Input	Check Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 -- > <u>Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking.</u>	Out of range, High.	Signal voltage >4.82 V	Signal voltage sensor 2 >1.11 V	5 Seconds.
P2127	Throttle/Pedal Position Sensor/Switch E Circuit Low Input	Check Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 -- > <u>Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking.</u>	Out of range, low.	Signal voltage 0.43 V	Signal voltage sensor 1 >1.11 V	5 Seconds.
P2128	Throttle/Pedal Position	Check Throttle Position (TP)	Out of range,	Signal voltage >4.94 V	Signal voltage sensor 1 >1.11 V	5 Seconds.

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

	Sensor/Switch E Circuit High Input	Sensor G79/Accelerator Pedal Position Sensor 2 G185 -- > <u>Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking.</u>	High.			
P2138	Throttle/Pedal Position Sensor/Switch D/E Voltage Correlation	Check Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 -- > <u>Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking.</u>	Rationality check.	Signal voltage, sensor 1 vs. sensor 2 >0.22-V	Signal voltage - sensor 1, >0.84 V - sensor 2, >08.4 V	5 Seconds.
P2146	Fuel Injector Group A Supply Voltage Circuit/Open	Check Fuel injectors --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Short to Battery (+).	Signal current, 2.6 A	- Injection valve, commanded on - Engine speed >80 RPM - Low side signal current >2.7 A	0.5 seconds
P2149	Fuel Injector Group B Supply Voltage Circuit/Open	Check Fuel injectors --> <u>Fuel Injectors N30, N31, N32, N33 , checking.</u>	Short to Ground (GND).	Signal current >14.9 A	- Injection valve, commanded off - Engine speed >80 RPM	0.5 seconds
P2181	Cooling System Performance	Check Engine Coolant	Rationality check.	- ECT 77°C - Mass air	ECT at start, 4.5-60°C	500 Second

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		Temperature (ECT) Sensor G62 --> <u>Engine Coolant Temperature (ECT) Sensor G62 , checking.</u> ○ Check Coolant Pump V50 --> <u>19 - ENGINE - COOLING SYSTEM</u> ○ Check Coolant Thermostat. --> <u>19 - ENGINE - COOLING SYSTEM .</u>		integral 4-13.7 Kg	- ECT, >40°C - Accum. fuel shut off, 100 S - Delta ambient pressure, 1.2 kPa Average value: - Vehicle speed, 21-75 MPH - Mass air flow, >24-62 kg/h - Mass air flow, 65-200 kg/h	
P2195	O2 Sensor Signal Biased/Stuck Lean - Bank 1, Sensor 1	○ Check oxygen sensor before catalytic converter --> <u>Heated Oxygen Sensor (HO2S) G39 and oxygen sensor regulation before catalytic converter, checking.</u>	Stuck high check.	- Lambda value - O2S rear signal	>1.08 (-) 0.777 V	200 second
P2196	O2 Sensor Signal Biased/Stuck Rich - Bank 1, Sensor 1	○ Check oxygen sensor before catalytic converter --> <u>Heated Oxygen Sensor (HO2S) G39 and oxygen sensor regulation before catalytic converter,</u>	Stuck low check.	- Lambda value - O2S rear signal	- Lambda control, closed loop - O2S rear, ready - Lambda control, minimum value - Exhaust	200 second

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		<u>checking.</u>			mass air integral, >0.3-0.8 kg	
P2237	O2 Sensor Positive Current Control Circuit/Open - Bank 1, Sensor 1	○ Check oxygen sensor before catalytic converter --> <u>Heated Oxygen Sensor (HO2S) G39 and oxygen sensor regulation before catalytic converter, checking.</u>	Open circuit, pump circuit (IP).	• Lambda value setting 0.97 [-] or • O2S signal front 1.49-1.51V • Lambda value setting > 1.03 - • Fuel cut off > 3 S • O2S signal front 1.7 V • Enrichment or lean out Active • O2S signal front 1.49-1.51 V • Delta lambda value setting > 0.1-	• Lambda control Closed loop • O2S ceramic temperature 780 +/- 65° C • Mass air integral > 0.8 kg • Lambda control Closed loop	30 Seconds
P2243	O2 Sensor Reference Voltage Circuit/Open - Bank 1, Sensor 1	○ Check oxygen sensor before catalytic converter --> <u>Heated Oxygen Sensor (HO2S) G39 and oxygen sensor regulation before catalytic</u>	Open circuit, nernst voltage (UN).	• O2S signal front > 4.7 V and Internal resistance > 1000 Ohm • or O2S signal front 0.3 V And	Heater control Active	18 Seconds

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		<u>converter, checking.</u>		Internal resistance > 1000 Ohm		
P2294	Fuel Pressure Regulator 2 Control Circuit	○ Check Fuel Pressure Sensor G247 --> <u>Fuel Pressure Sensor G247 , checking.</u>	Open circuit.	Signal voltage 2.3 - 2.7 V	• EVAP purge valve Commanded off • Fuel pump Commanded on	1 Second
P2295	Fuel Pressure Regulator 2 Control Circuit Low	○ Check Fuel Pressure Sensor G247 --> <u>Fuel Pressure Sensor G247 , checking.</u>	Short to Ground (GND).	Signal voltage 1.8- 2.2 V	• EVAP purge valve Commanded off • Fuel pump Commanded on	1 Second
P2296	Fuel Pressure Regulator 2 Control Circuit High	○ Check Fuel Pressure Sensor G247 --> <u>Fuel Pressure Sensor G247 , checking.</u>	Short to Battery (+).	Signal voltage >3.9 V	• EVAP purge valve Commanded on	1 Second

Ignition System

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	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 Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70, N127, N291,</u>	Short to Ground (GND).	Signal voltage 0.5-1.0 V	Engine speed 5000 RPM	0.5 Sec.	• Continuous • 2 DCY

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		<u>N292 , checking.</u>					
P2301	Ignition Coil A Primary Control Circuit High	Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292 , checking.</u>	Short to Battery (+).	Signal voltage >5.2-6.0 V	Engine speed 5000 RPM	0.5 Sec.	- Continuous 2 DCY
P2303	Ignition Coil B Primary Control Circuit Low	Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292 , checking.</u>	Short to Ground (GND).	Signal voltage 0.5-1.0 V	Engine speed 5000 RPM	0.5 Sec.	- Continuous 2 DCY
P2304	Ignition Coil B Primary Control Circuit High	Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70,</u>	Short to Battery (+).	Signal voltage >5.2-6.0 V	Engine speed 5000 RPM	0.5 Sec.	- Continuous 2 DCY

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		<u>N127, N291, N292 , checking.</u>					
P2306	Ignition Coil C Primary Control Circuit Low	○ Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292 , checking.</u>	Short to Ground (GND).	Signal voltage 0.5-1.0 V	Engine speed 5000 RPM	0.5 Sec.	• Continuous • 2 DCY
P2307	Ignition Coil C Primary Control Circuit High	○ Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292 , checking.</u>	Short to Battery (+).	Signal voltage >5.2-6.0 V	Engine speed 5000 RPM	0.5 Sec.	• Continuous • 2 DCY
P2309	Ignition Coil D Primary Control Circuit Low	○ Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output</u>	Short to Ground (GND).	Signal voltage 0.5-1.0 V	Engine speed 5000 RPM	0.5 Sec.	• Continuous • 2 DCY

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

		<u>Stage N70, N127, N291, N292, checking.</u>					
P2310	Ignition Coil D Primary Control Circuit High	Check Ignition Coil with Power Output Stage --> <u>Ignition Coil with Power Output Stage N70, N127, N291, N292, checking.</u>	Short to Battery (+).	Signal voltage >5.2-6.0 V	Engine speed 5000 RPM	0.5 Sec.	- Continuous 2 DCY

Additional emission regulations

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	F
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	- Check Leak Detection Pump (LDP) V144. --> <u>Leak Detection Pump (LDP) V144, checking</u> - Check Evaporative Emission (EVAP) Canister System for proper seal -	Open circuit.	Signal voltage > 4.4- 5.6 V	- LDPCommanded off - Engine speed > 80 RPM	0.5 Seconds	cl II

2005 Audi A4 Quattro

ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		-> <u>Evaporative Emission (EVAP) canister system, checking for proper seal.</u>				
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	○ Check Leak Detection Pump (LDP) V144. --> <u>Leak Detection Pump (LDP) V144, checking</u> ○ Check Evaporative Emission (EVAP) Canister System for proper seal - -> <u>Evaporative Emission (EVAP) canister system, checking for proper seal.</u>	Short to Ground (GND).	Signal voltage 2.15-3.25 V	• LDP Commanded off • Engine speed > 80 RPM	
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	○ Check Leak Detection Pump (LDP) V144. --> <u>Leak Detection Pump (LDP) V144, checking</u> ○ Check	Short to Battery +.	Signal current > 1.1 A	• LDP Commanded on • Engine speed > 80 RPM	

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

		Evaporative Emission (EVAP) Canister System for proper seal -> <u>Evaporative Emission (EVAP) canister system, checking for proper seal.</u>				
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	○ Check Leak Detection Pump (LDP) V144. --> <u>Leak Detection Pump (LDP) V144, checking</u> ○ Check Evaporative Emission (EVAP) Canister System for proper seal -> <u>Evaporative Emission (EVAP) canister system, checking for proper seal.</u>	Rationality check, unable to close.	Low signal voltage > 1 S	• LDP Commanded off • EVAP purge valve closed • LDP Activated • Altitude 2500 M • Number of diagnostic attempts = 5 • IAT > 4°C • Delta ambient pressure 300 Pa • IAT drop after engine start 7 K • Time after engine start > 175 S • ECT 4-115°C • ECT at start 4-35°C • Vehicle speed > 25 MPH • Selected gear, Any drive	10 Seconds

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

P2404	Evaporative Emission System Leak Detection Pump Sense Range/Performance	○ Check Leak Detection Pump (LDP) V144. --> <u>Leak Detection Pump (LDP) V144, checking</u> ○ Check Evaporative Emission (EVAP) Canister System for proper seal -> <u>Evaporative Emission (EVAP) canister system, checking for proper seal.</u>	Rationality check, unable to open.	High signal voltage > 0.36 V	• LDP Commanded on • EVAP purge valve closed • LDP Activated • Altitude 2500 M • Number of diagnostic attempts = 5 • IAT > 4°C • Delta ambient pressure 300 Pa • IAT drop after engine start 7 K • Time after engine start > 175 S • ECT 4-115°C • ECT at start 4-35°C • Vehicle speed > 25 MPH • Selected gear, Any drive	
P2414	O2 Sensor Exhaust Sample Error Bank 1, Sensor 1	○ Check oxygen sensors before catalytic converter --> <u>Heated Oxygen Sensor (HO2S) G39 and oxygen sensor regulation before</u>	Signal range check.	• Signal voltage 3.7-4.81V • at Lambda 0.65-1.3 or • Signal Voltage 2,5-3,2	• O2S ceramic temperature 780 +/- 65°C • Low fuel signal On Than wait >600 S	10 Seconds

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		<u>catalytic converter, checking.</u>		V • at Lambda 0.65-1.3		
P2539	Low Pressure Fuel System Sensor Circuit	Check Fuel Pressure Sensor G247 --> <u>Fuel Pressure Sensor G247, checking.</u>	Signal range check.	Signal voltage > 4.9 V		1 Second
P2541	Low Pressure Fuel System Sensor Circuit Low	Check Fuel Pressure Sensor G247 --> <u>Fuel Pressure Sensor G247, checking.</u>	Signal range check.	Signal voltage 2.0 V		
P2626	O2 Sensor Pumping Current Trim Circuit/Open Bank 1 Sensor 1	Check oxygen sensors before catalytic converter --> <u>Heated Oxygen Sensor (HO2S) G39 and oxygen sensor regulation before catalytic converter, checking.</u>	Open circuit adjustment check (IA).	O2S signal front > 3,2 V	- O2S ceramic temperature 780 +/- 65°C - Modeled exhaust gas temp. 700°C - Fuel cut off Active - Low fuel signal On Than wait >600 S	1.5 Seconds

Transmission

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria and	Secondary Parameters with Enable	Monitoring Time Length	Frequency of checks, MIL Illum
12:09:48 AM				Page 100			

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

				Threshold Value	Conditions		
P2637	Torque management Feedback Signal A	Check DME Can-bus connection.	Signal check.	CAN message signal error flag, = 1	- Ignition, on - CAN Bus, OK - DME CAN connection, OK	0.5 Seconds	- Continu 2 DCY
P2714	Pressure Control Solenoid D Performance or Stuck off	Check Automatic Transmission Pressure Regulating Valve 4 N218 --> <u>Pressure regulator valves, checking.</u>	Short to Ground (GND)/open circuit.	PWM hardware detection, 0 or 100%	- Low side and high side FET, Activated - Power supply, > 9 V - Volage drop at FET, = 1 V - Solenoid supply, > 9 V	0.03 Seconds	- Continu 2 DCY
P2715	Pressure Control Solenoid D Stuck On	Check Automatic Transmission Pressure Regulating Valve 4 N218 --> <u>Pressure regulator valves, checking.</u>	Short to Battery (+)	PWM hardware detection, 0 or 100%	- Low side and high side FET, Activated - Power supply, > 9 V - Volage drop at FET, = 1 V - Solenoid supply, > 9 V	0.03 Seconds	- Continu 2 DCY
P2716	Pressure Control Solenoid D Electrical	Check Automatic Transmission Pressure Regulating Valve 4	Rationality check.	Current higher or lower than threshold, (850-120) mA	- Low side and high side FET, Activated - Power supply, > 9	0.03 Seconds	- Continu 2 DCY

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

		N218 --> <u>Pressure regulator valves, checking.</u>			V		• Volage drop at FET, = 1 V • Solenoid supply, > 9 V
P2723	Pressure Control Solenoid E Performance or Stuck off	○ Check Automatic Transmission Pressure Regulating Valve 5 N233 --> <u>Pressure regulator valves, checking.</u>	Short to Ground (GND)/open circuit.	PWM hardware detection, 0 or 100%	• Low side and high side FET, Activated • Power supply, > 9 V • Volage drop at FET, = 1 V • Solenoid supply, > 9 V	0.05 Seconds	• Continu • 2 DCY
P2724	Pressure Control Solenoid E Stuck On	○ Check Automatic Transmission Pressure Regulating Valve 5 N233 --> <u>Pressure regulator valves, checking.</u>	Short to Battery (+)	PWM hardware detection, 0 or 100%	• Low side and high side FET, Activated • Power supply, > 9 V • Volage drop at FET, = 1 V • Solenoid supply, > 9 V	0.05 Seconds	• Continu • 2 DCY
P2732	Pressure Control Solenoid F Performance or Stuck off	○ Check Automatic Transmission Pressure Regulating Valve 6 N371 --> <u>Pressure</u>	Short to Ground (GND)/open circuit.	PWM hardware detection, 0 or 100%	• Low side and high side FET, Activated • Power supply, > 9 V	0.05 Seconds	• Continu • 2 DCY

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

		<u>regulator valves, checking.</u>			• Volage drop at FET, = 1 V • Solenoid supply, > 9 V		
P2733	Pressure Control Solenoid F Stuck On	○ Check Automatic Transmission Pressure Regulating Valve 6 N371 --> <u>Pressure regulator valves, checking.</u>	Short to Battery (+)	PWM hardware detection, 0 or 100%	• Low side and high side FET, Activated • Power supply, > 9 V • Volage drop at FET, = 1 V • Solenoid supply, > 9 V	0.05 Seconds	• Continu • 2 DCY

SAE P3xxx-DTCs

Fuel and air mixture, additional emissions regulations

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P3081	Engine Temperature Too Low	○ Allow engine to warm up. • Coolant temperature must be at least 50°C.	Temperature too low.	• Modeled ECT, Minus ECT • >8.25 K	ECT 60°C	2 Sec.	• Once DCY • 2 DCY

SAE U0xxx-DTCs

Control module and output signals

DTC	Error Message	Diagnostic Procedure	Monitor Strategy	Malfunction Criteria	Secondary Parameters	Monitoring Time	Frequency checks, MI

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System,
Generic Scan Tool.

				and Threshold Value	with Enable Conditions	Length	Illum
U0001	High Speed CAN Communication Bus	Check terminal resistance of CAN-Bus --> <u>Terminal resistance for Can-Bus, checking.</u>	Reading back sent message.	CAN message, No feedback		1 sec.	- Cont 2 DC
U0101	Lost Communication with TCM	Check terminal resistance of CAN-Bus --> <u>Terminal resistance for Can-Bus, checking.</u>	Communication with Transmission Control Module (TCM) J217.	CAN message, No message		5 sec.	- Cont 2 DC
U0302	Software Incompatibility with Transmission Control Module	Replace Transmission Control Module (TCM) J217 -> <u>Transmission Control Module (TCM) J217, replacing.</u>	Software incompatibility with Transmission Control Module (TCM) J217	AT vehicle ECM coded as MT vehicle		5 sec.	- Cont 2 DC
U0402	Invalid Data Received from Transmission Control Module	Check wiring connection between Engine Control Module (ECM) J623 and the Transmission Control Module (TCM) J217 according to wiring diagrams	Communication with Transmission Control Module (TCM) J217.	AT vehicle ECM coded as MT vehicle		5 Sec.	- Cont 2 DC

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20 FUEL SUPPLY

FUEL SUPPLY SYSTEM

Fuel Supply System

For all Fuel Supply system component locations. Refer to --> **20 - FUEL SUPPLY SYSTEM**

For all Fuel supply system removal/installation procedures and torque specifications. Refer to --> **20 - FUEL SUPPLY SYSTEM**

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

Safety precautions

CAUTION:

- The fuel system is under pressure! Before opening the system, place rags around the connection area. Then release the 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 the engine or the fuel injection system, the pressure must be relieved to residual pressure before opening the high pressure components --> **24 - MULTIPOINT FUEL INJECTION (MPI)** .
- Place sources of flame, e.g. cigarette lighters, as well as those sources of others in the area, out of reach. These can ignite fuel vapors.

Perform the following steps before beginning work on the fuel supply system:

- Disconnect the battery Ground (GND) cable with the ignition switched off -->
 - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL**
 - **27 BATTERY, STARTER, GENERATOR, CRUISE CONTROL** for ELECTRICAL EQUIPMENT, CABRIOLET
- Open the fuel filler flap briefly and then close again.

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.

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

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

Observe the following when removing and installing the fuel tank:

- Empty the fuel tank for weight reasons.

Rules for cleanliness

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 parts that have been removed on a clean surface and cover them. Do not use fluffy cloths!
- Carefully cover over opened components or seal, if repairs are not performed immediately.
- Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored unpacked (e.g. in tool boxes etc.).
- When the system is open: Do not work with compressed air. Do not move vehicle unless absolutely necessary.

Fuel pump delivery quantity, checking

Special tools, testers and auxiliary items required

- Pressure gauge V.A.G 1318
- Adapter V.A.G 1318/11
- Adapter V.A.G 1318/12
- Remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-3
- Fuel-resistant measuring container

Test conditions

- Battery voltage at least 12.5 V.
- Fuel filter OK
- Fuse on fuse panel S228 (position 28) OK.

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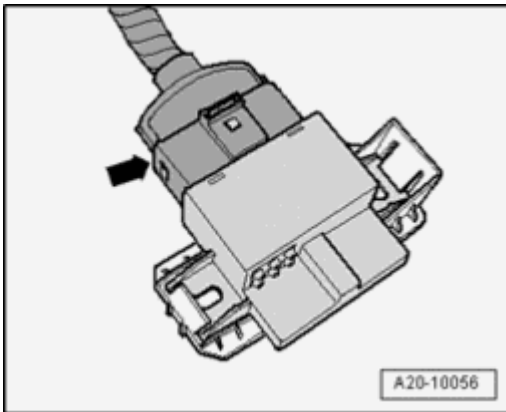


Fig. 1: Identifying Fuel Pump (FP) Control Module J538
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fuel Pump (FP) Control Module J538 OK.
- Fuel tank at least $\frac{1}{4}$ filled.
- Ignition switched off.

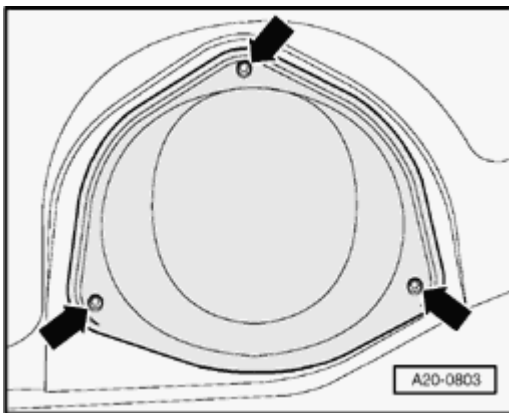


Fig. 2: Removing Cover Bolts For Locking Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Test sequence

- Remove rear seat bench -->
 - **72 - SEAT - FRAMES**
 - **72 - SEAT - FRAMES** for BODY INTERIOR - CABRIOLET
- Unbolt cover for left locking flange - **arrows** -.

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

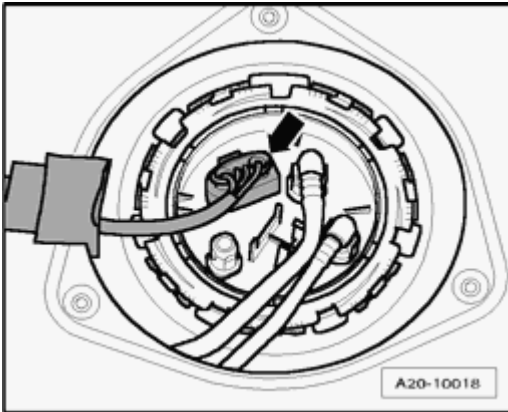


Fig. 3: Disconnecting Electrical Harness Connector At Right Locking Flange
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - at right locking flange.

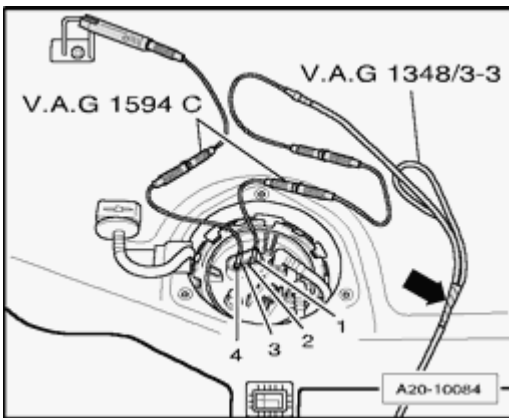


Fig. 4: Connecting Other End Of Hand Held Remote Starter (Jumper) To Vehicle Battery (+)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect remote control V.A.G 1348/3 A with connection V.A.G 1348/3-3 to contact - **1** - using an adapter cable from connector test set V.A.G 1594 C.
- Using insulating tape, tape over the second contact of connection V.A.G 1348/3-3 to prevent a short circuit - **arrow** -.
- Connect contact - **4** - to vehicle Ground (GND) using a jumper cable from connector test set V.A.G 1594 C.
- Connect alligator clip to vehicle battery (+).

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

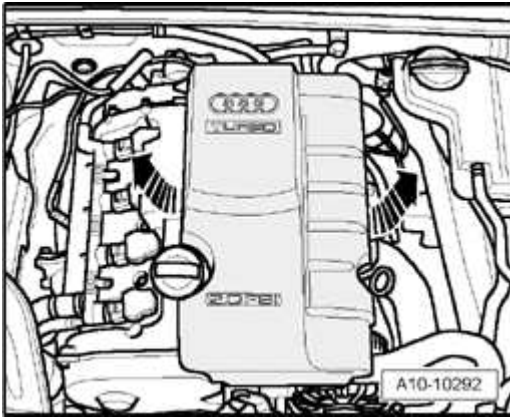


Fig. 5: Removing Engine Cover

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove fuel filler cap from fuel filler tube.
- Remove engine cover - **arrows** -.

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

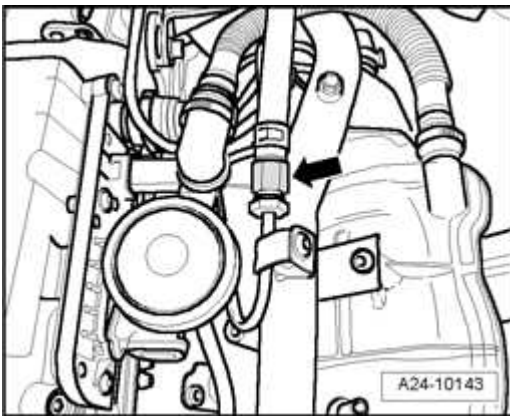


Fig. 6: Disconnecting Fuel Line From Line Connection On Engine

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect fuel line - **arrow** - from line connection on engine.

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

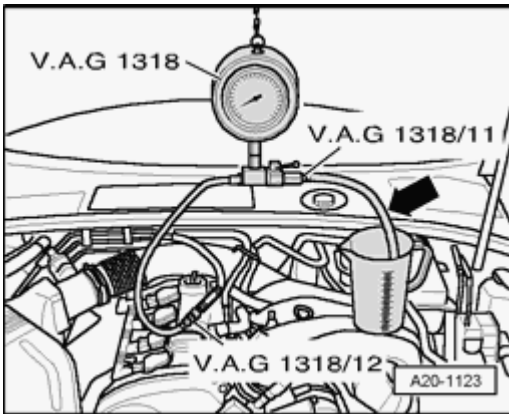


Fig. 7: Connecting Pressure Gauge V.A.G 1318 To Fuel Supply Line Using Adapters V.A.G 1318/11 And V.A.G 1318/12

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect pressure gauge V.A.G 1318 to fuel supply line using adapters V.A.G 1318/11 and V.A.G 1318/12.
- Connect extension hose - **arrow** - to pressure gauge and hold it in a measuring container.
- Open shut-off valve of pressure gauge. The lever points in direction of flow.
- Generate pressure in fuel system by pressing switch of remote control and slowly closing shut-off valve of pressure gauge.
- Specification: 4 bar positive pressure.
- From this point on do not move position of shut-off valve.
- Empty measuring container.
- Press switch on remote control for 15 seconds.

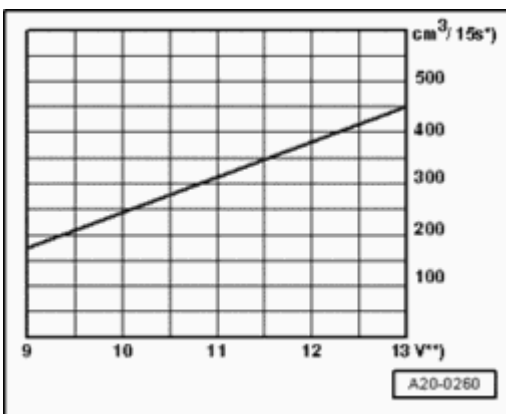


Fig. 8: Delivery Rate Diagram

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Compare quantity of fuel delivered with minimum delivery rate in diagram ($\text{cm}^3/15\text{s}$).

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

NOTE:

- Voltage at fuel pump with engine stopped and pump running is approx. 2 volts less than battery voltage.

Installation is in reverse order of removal. Note the following:

- Install the fuel line.

Torque specifications

Component	Nm
Fuel line to fuel rail	22

Fuel pump electrical, checking

Special tools, testers and auxiliary items required

- Remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-3.
- Multimeter V.A.G 1526 B or equivalent.
- Connector test set V.A.G 1594 C.

Test conditions

- Battery voltage at least 12.5 V.
- Fuse S228 OK.
- The Fuel Pump (FP) Control Module J538 OK .
- The fuel filter OK
- The ignition switched off.

Test sequence

- Remove the rear seat bench -->
 - **72 - SEAT - FRAMES**
 - **72 - SEAT - FRAMES** for BODY INTERIOR - CABRIOLET

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

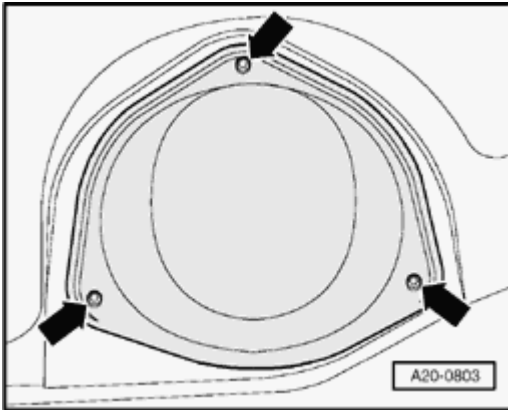


Fig. 9: Removing Cover Bolts For Locking Flange

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the right locking flange cover and bolts - **arrows** -.

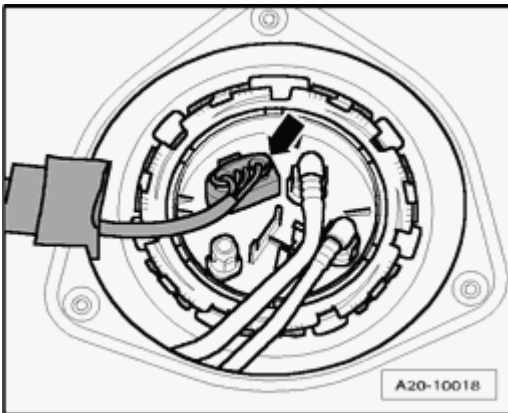


Fig. 10: Disconnecting Electrical Harness Connector At Right Locking Flange

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect the electrical harness connector - **arrow** - at the right locking flange.
- Connect remote control V.A.G 1348/3 A with connection V.A.G 1348/3-3 to contact - **1** - using an adapter cable from the connector test set V.A.G 1594 C.
- Using insulating tape, tape over the second contact of connection V.A.G 1348/3-3 to prevent a short circuit - **arrow** -.
- Connect contact - **4** - to vehicle Ground (GND) using a jumper cable from the connector test set V.A.G 1594 C.

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

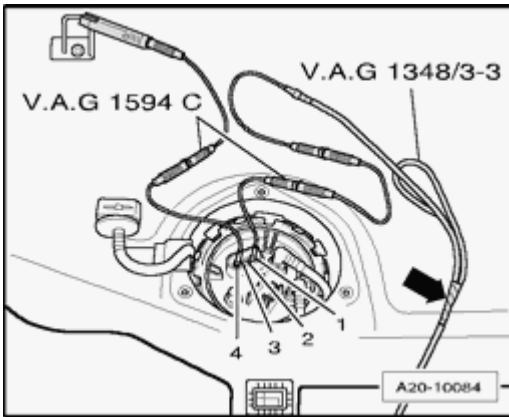


Fig. 11: Connecting Other End Of Hand Held Remote Starter (Jumper) To Vehicle Battery (+)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect the alligator clip to the vehicle battery (+).
- Press the switch on the remote control.

NOTE:

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

The fuel pump must run and an audible noise of the fuel pump running should be heard.

If no operating noise can be heard:

- Remove the fuel delivery unit. --> **20 - FUEL SUPPLY SYSTEM** .

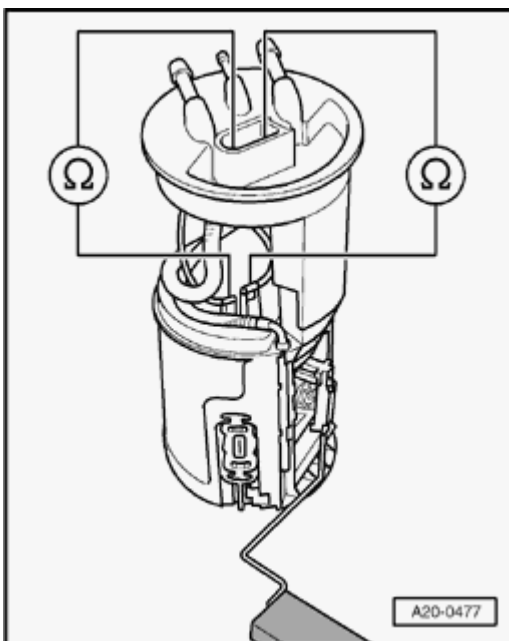


Fig. 12: Checking Electrical Circuit Between Terminals Of Fuel Delivery Unit And Fuel Pump For

Continuity**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Using multimeter V.A.G 1526 B or equivalent, check the electrical connections between the flange and the fuel pump.

Specified value: Wire resistance max 0 ohms.

If the specification is not obtained:

- Check the wiring for an open circuit.
- If necessary, repair the wiring connection.

If no malfunction is detected in the wiring, replace the fuel pump. --> **20 - FUEL SUPPLY SYSTEM** .

- Install the fuel delivery unit --> **20 - FUEL SUPPLY SYSTEM** .

Final procedures

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

1. Check the DTC memory.
 2. If necessary, erase the DTC memory.
 3. If the DTC memory was erased, generate readiness code.
- End diagnosis and switch the ignition off.

EVAPORATIVE EMISSIONS (EVAP) SYSTEM**EVAP system, leak detection****Function**

The leak detection system recognizes leaks in the complete fuel system, including the fuel tank, EVAP canister and the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80.

On the mechanical side, the leak detection system consists mainly of a vacuum-driven diaphragm pump equipped with a reed contact on the actuation rod of the pump diaphragm. The pump is supplied with vacuum via the engine intake stroke.

- When leak detection is activated, the diaphragm pump pumps the fuel system up to 20 30 mbar. The pump diaphragm is then moved out so that the reed contact at the operating rod remains in the "open" position.
- During the leak diagnosis, the reed contact is monitored to check if it remains open within 10 seconds. This indicates the system is sealed.
- If the pressure falls (indicating a leak), the diaphragm moves back and the reed contact closes.

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

- If the reed contact closes within 10 seconds of leak detection time, a further test is performed: In this case the diaphragm pump pumps four times again. The Engine Control Module (ECM) J623 measures the time for each of the four pumps until the reed contact is closed again. From that, the control module can recognize a "small leak" (greater than 1 mm in diameter) or a "large leak".

Leak diagnosis is activated automatically shortly following every engine start. If a malfunction is determined, an entry is made to the Diagnostic Trouble Code (DTC) memory. The Malfunction Indicator Lamp (MIL) K83 in the instrument cluster lights up if the malfunction is recognized for two subsequent starts.

Evaporative Emission (EVAP) canister system, checking for proper seal

NOTE:

- **Secure all hose connections using hose clamps appropriate for the model type .**
- **Replace seals and gaskets when performing repair work.**

Test sequence

- Connect the diagnostic tester.
- Start the engine and let run at idle for at least 15 minutes.
- Select "Diagnostic mode 8: Tank leak test".
- Select the "Test-ID 01: Tank leak test" and check the specified value at idle.

Specified value: test OK

NOTE:

- **If the accelerator pedal is depressed during the test, the test will be aborted.**
- **To repeat the tank leak-tightness test, switch the ignition off, start the engine again, and let it run at idle.**

If the specified value is obtained:

- End diagnosis and switch the ignition off.

If the specified value is not obtained:

Checking fuel supply and tank ventilation systems for leaks

- Check whether the fuel filler cap of the fuel tank was completely sealed for test.
- Check whether the seal of the fuel filler cap was damaged or crimped. Replace if necessary.
- Remove the rear seat bench -->
 - **72 - SEAT - FRAMES**
 - **72 - SEAT - FRAMES** for BODY INTERIOR - CABRIOLET

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

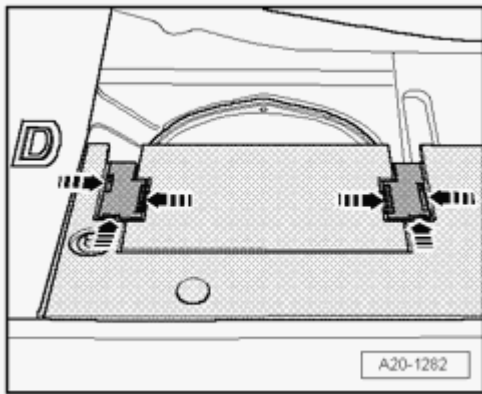


Fig. 13: Releasing Retaining Tabs

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release the retaining tabs - **arrows** -.
- Fold the retaining tabs open - **1** - and - **3** - toward the rear.

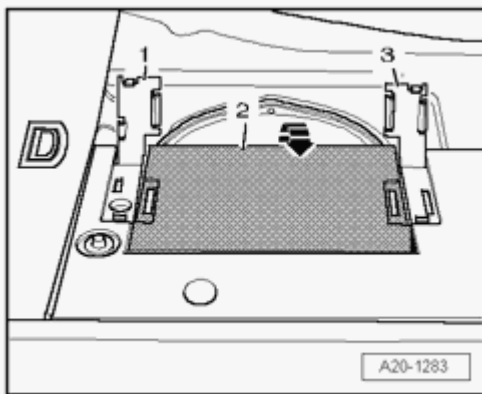


Fig. 14: Folding Cover Toward Front

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fold the cover - **2** - toward the front - **arrow** -.

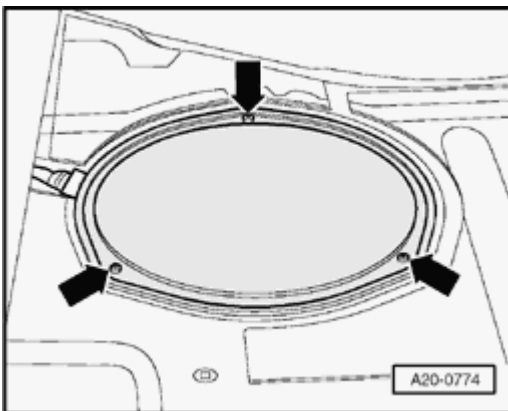


Fig. 15: Unbolting Cover

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unbolt the cover - **arrows** -.

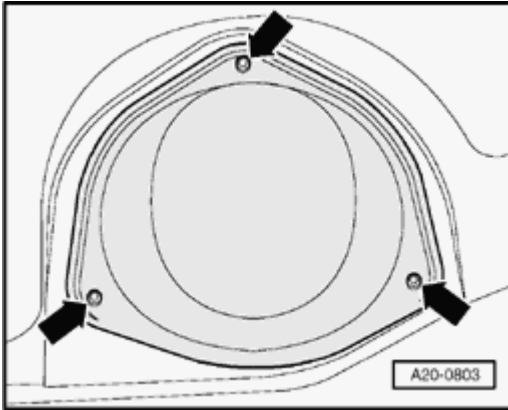


Fig. 16: Removing Cover Bolts For Locking Flange

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove the bolts - **arrows** - and remove the cover for the locking flange, left and right.
- Check whether the seals under the locking flanges are OK and the union nuts are properly tightened on the fuel tank. Also check the fuel line connections.
- Visually check all hose connections of the fuel supply system and replace any leaking lines, e.g:
 - Line from the EVAP canister to the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80.
 - Lines from the EVAP canister to the Leak Detection Pump (LDP) V144.
 - Line from the fuel tank to the EVAP canister (below cover for EVAP canister).
 - Lines for the tank ventilation (beneath right rear wheel housing liner).
- Fuel lines to the engine.

NOTE:

- **Leaks at the lines and components of the fuel tank ventilation system can sometimes be located using a non-flammable, environmentally compliant leak detection spray. Initiate the leak diagnosis several times in sequence to build up pressure in the system. At leaking areas, bubbles will form.**

- Repeat the function test.

If a malfunction persists:

- Perform a visual inspection on the fuel system components and tank ventilation system.
 - Fuel tank
 - EVAP canister

2005 Audi A4 Quattro

ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

- Leak Detection Pump (LDP) V144
- Evaporative Emission (EVAP) Canister Purge Regulator Valve N80

NOTE:

- Due to the form or function of the components, leaking areas may not always be localized by spraying on the leak detection spray. It may be necessary to clamp off the relevant component using Hose Clamps Up To 25mm Dia. 3094 and initiate the tank leak detection diagnostic. If the leak is no longer indicated, the component that was clamped off is faulty. If clamped off directly at the leak detection pump and a leak is still indicated, the leak detection pump itself is leaking.

Final procedures

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

1. Check the DTC memory.
2. If necessary, erase the DTC memory.
3. If the DTC memory was erased, generate readiness code..
 - End diagnosis and switch the ignition off.

Evaporative Emission (EVAP) Canister Purge Regulator Valve N80 , checking

Special tools, testers and auxiliary items required

- Multimeter V.A.G 1526 or equivalent.
- Test Box 105 Pin VAG1598/42.
- Adapter Lead Vag1598/39 VAG1598/39.
- Adapter cable V.A.G 1598/39-1.

Test requirements

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

Procedure

- Disconnect the electrical harness connector - 3 - from the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80.

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

Checking internal resistance

- Using the Multimeter V.A.G. 1526 A or equivalent, check the resistance between the terminals of the Evaporative Emission (EVAP) Canister Purge Regulator Valve N80.

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.

Checking voltage supply

If the specification is obtained:

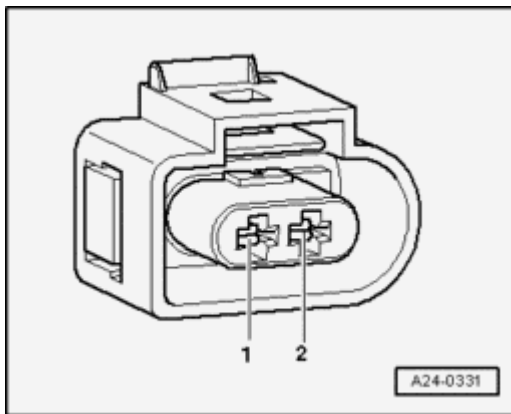


Fig. 17: Identifying 2-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using the Multimeter V.A.G. 1526 A or equivalent, check the electrical harness connector terminal 1 to 2 for voltage.
- Operate the starter briefly.

Specified value: aprox. battery voltage

If there is no voltage:

- Using the Multimeter V.A.G. 1526 A or equivalent, check the electrical harness connector terminal for voltage.

Harness connector Terminal	Measure to
1	Engine Ground (GND)

- Operate the starter briefly.

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

Specified value: aprox. battery voltage

If there is no voltage again:

- Check the wiring connection from the electrical harness connector terminal 1 to the Leak Detection Pump (LDP) -V144- terminal 3 for an open circuit according to wiring diagram.

Specified value: Wire resistance max 1.5 ohms.

- If necessary, repair the wiring connection.

If the voltage supply is OK:

Check Ground (GND) activation

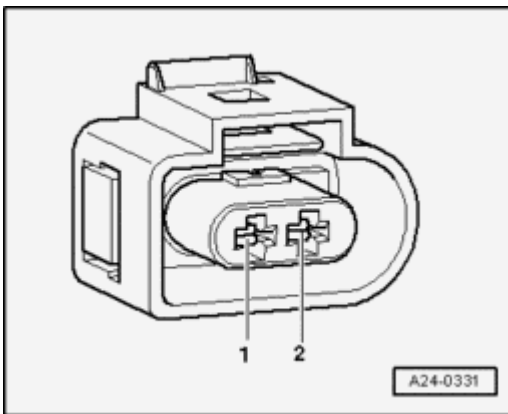


Fig. 18: Identifying 2-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using the Multimeter V.A.G. 1526 A or equivalent, check the electrical harness connector for voltage.

Harness connector Terminal	Measure to
2	Battery positive (+)

- Operate the starter briefly.

Specified value: aprox. battery voltage.

- Switch the ignition off.

If the specified value is not obtained:

- Connect the test box 1598/42 to the wiring harness of the Engine Control Module (ECM) J623. --> **24 - MULTIPORT FUEL INJECTION (MFI)** . The ECM is not connected.

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

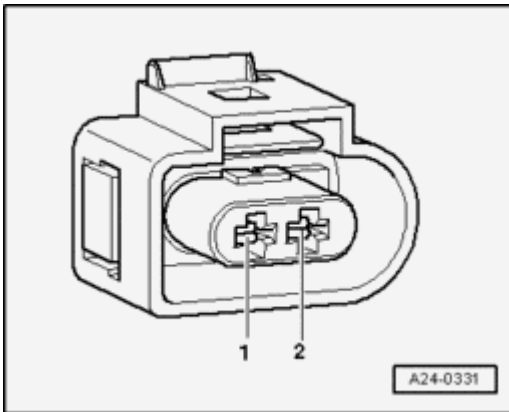


Fig. 19: Identifying 2-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using the Multimeter V.A.G. 1526 A or equivalent, the following wire connection for open circuit.

Harness connector Terminal	Test box Socket
2	49

Specified value: Wire resistance max 1.5 ohms.

Specification: 0 ohms.

If the specification is not obtained:

- Check the wiring for a short circuit to Battery positive (+) or an open circuit.
- If necessary, repair the wiring connection.

If the specification is obtained:

- Replace the Engine Control Module (ECM) J623 --> **Engine Control Module (ECM) J623 , replacing.**

Final procedures

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

1. Check the DTC memory.
 2. If necessary, erase the DTC memory.
 3. If the DTC memory was erased, generate readiness code.
- End diagnosis and switch the ignition off.

Leak Detection Pump (LDP) V144 , checking

Special tools, testers and auxiliary items required

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

- Multimeter V.A.G 1526 or equivalent.
- Test Box 105 Pin VAG1598/42.
- Adapter Lead Vag1598/39 VAG1598/39.
- Adapter cable V.A.G 1598/39-1.

Test requirements

- The Leak Detection Pump (LDP) V144 fuse OK.
- The ignition switched off.

Procedure

- Remove the left rear wheel housing liner. -->
 - **66 EXTERIOR EQUIPMENT**
 - **66 - EXTERIOR EQUIPMENT** for BODY EXTERIOR - CABRIOLET

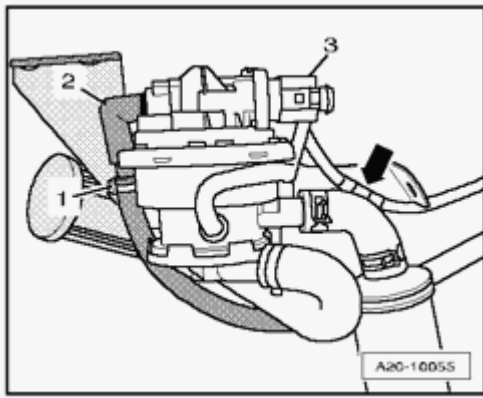


Fig. 20: Checking Electrical Harness Connector For Damage, Corrosion, Lose Or Broken Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect the electrical harness connector - 3 -.

Checking internal resistance

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

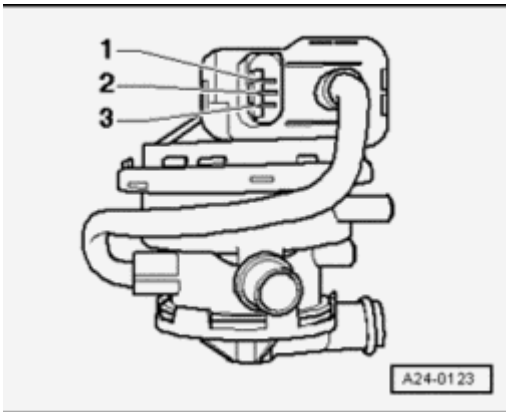


Fig. 21: Locating 3-Pin Connector At Fuel System Leak Detection Pump V144
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using the Multimeter V.A.G. 1526 A or equivalent, check the Leak Detection Pump (LDP) V144 for resistance as follows:

Leak Detection Pump (LDP) -V144- terminal	Specified value
- 1 - + - 3 -	640 to 720 ohms
- 2 - + - 3 -	15 to 17 ohms

If the specifications are not obtained:

- Replace the Leak Detection Pump (LDP) -V144-. --> **20 - FUEL SUPPLY SYSTEM** .

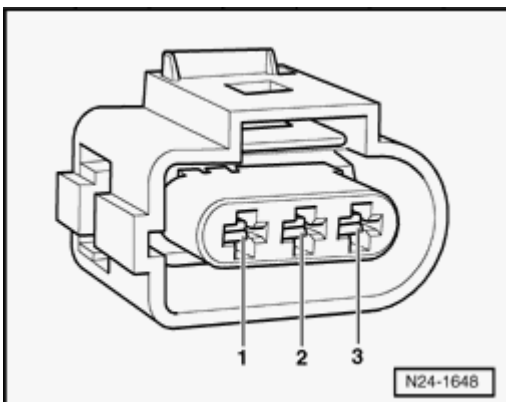
If the specified values are obtained:

- Check the voltage supply of the Leak Detection Pump (LDP) -V144-.

Checking voltage supply

NOTE:

- The voltage for the Leak Detection Pump (LDP) -V144- is supplied via the Engine Control Module (ECM) J623.



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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

Fig. 22: Identifying 3-Pin Electrical Connector & Terminals

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using the Multimeter V.A.G. 1526 A or equivalent, check the electrical harness connector for voltage.

Harness connector terminal	Measure to
- 3 -	Engine Ground (GND)

- Operate the starter briefly.

Specified value: approx. battery voltage.

- Switch the ignition off.

If the specified value was not obtained:

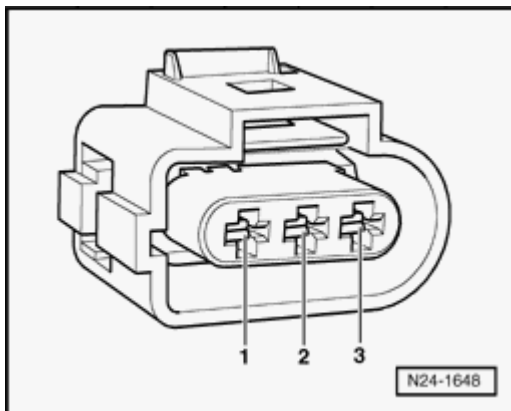


Fig. 23: Identifying 3-Pin Electrical Connector & Terminals

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using the Multimeter V.A.G. 1526 A or equivalent, check electrical harness connector terminal - 3 - via Fuel Metering Valve N290 to Engine Control Module (ECM) J623 for open circuit.

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.
- If necessary, repair the faulty wiring connection.

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

Checking output wiring

- Connect the test box 1598/42 to the wiring harness of the Engine Control Module (ECM) J623. --> **24 -**

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

MULTIPOINT FUEL INJECTION (MFI) The ECM is not connected.

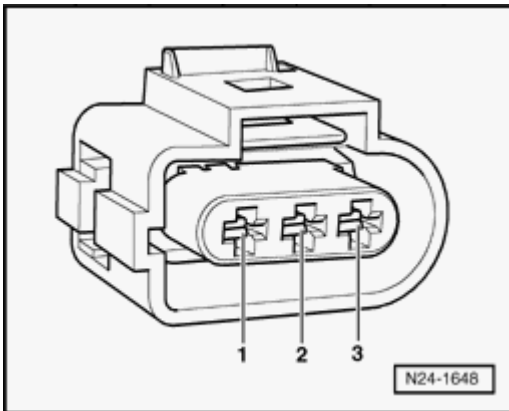


Fig. 24: Identifying 3-Pin Electrical Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using the Multimeter V.A.G. 1526 A or equivalent, check the following wire connections for an open circuit.

Harness connector terminal	Test box Socket
- 1 -	40
- 2 -	8

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.
- If necessary, repair the wiring connection.

If no malfunction is found in wiring:

- Replace the Engine Control Module (ECM) J623 --> **Engine Control Module (ECM) J623 , replacing.**

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

- Install the left rear wheel housing liner -->
 - **66 EXTERIOR EQUIPMENT**
 - **66 - EXTERIOR EQUIPMENT** for BODY EXTERIOR - CABRIOLET

Final procedures

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

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

1. Check the DTC memory.
2. If necessary, erase the DTC memory.
3. If the DTC memory was erased, generate readiness code.
 - End diagnosis and switch ignition off.

ELECTRONIC POWER CONTROL (EPC)

Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 , checking

Special tools, testers and auxiliary items required

- Multimeter V.A.G 1526 or equivalent.
- Test Box 105 Pin VAG1598/42.
- Adapter Lead Vag1598/39 VAG1598/39.
- Adapter cable V.A.G 1598/39-1.

NOTE:

- **The Throttle Position (TP) Sensor G79/Accelerator Pedal Position Sensor 2 G185 is located in the accelerator pedal module and communicate the drivers intensions to the SIMOS Control Module J361 completely independently of each other. Both sensors are located in the accelerator pedal module and replaced as an entire assembly.**

Test requirements

- The fuses for the engine electronics OK.
- The battery voltage must be at least 12.5 Volts.
- All the electrical consumers such as, for example, lights and rear window defroster must be switched off.
- The parking brake must be applied, otherwise the daytime running lights are switched on.
- On vehicles with an automatic transmission, the selector lever must be in position "P" or "N".
- If the vehicle is equipped with an A/C system, it must be switched off.
- The ground (GND) connections between the engine and body must be OK.

Procedure

- Remove the left knee bolster -->
 - **68 - INTERIOR EQUIPMENT**
 - **68 - INTERIOR EQUIPMENT** for BODY INTERIOR - CABRIOLET

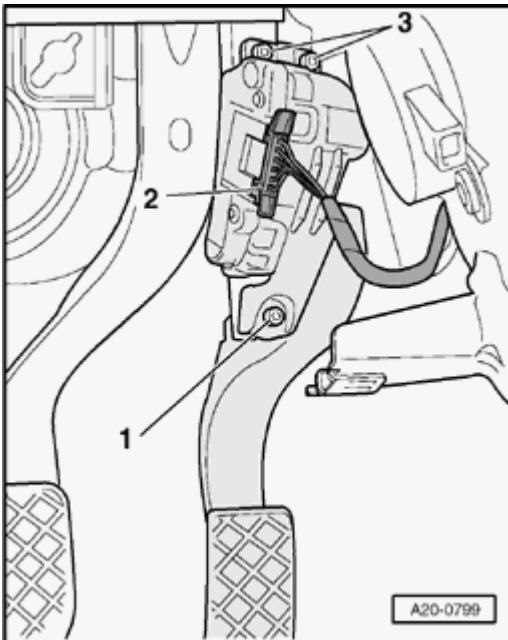


Fig. 25: Checking Electrical Harness Connector For Damage, Corrosion, Lose Or Broken Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect the electrical harness connector - 2 -.

Checking voltage supply

- Switch the ignition on.

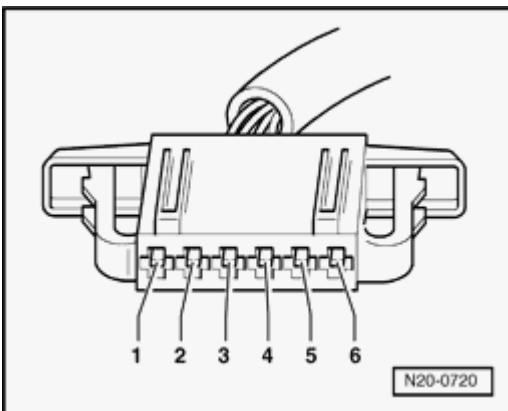


Fig. 26: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using the Multimeter V.A.G. 1526 A or equivalent, check the following wiring connections for voltage.

Harness connector Terminal	Specified value
1 to Ground (GND)	about 5 V
1 to 5	about 5 V

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

2 to Ground (GND)	about 5 V
2 to 3	about 5 V

- Switch the ignition off.

If the specified values are not obtained:

Checking wiring connections

- Connect the Test Box 105 Pin VAG1598/42 to the wiring harness of the Engine Control Module (ECM) J623. --> **24 - MULTIPOINT FUEL INJECTION (MPI)** . The ECM is not connected.

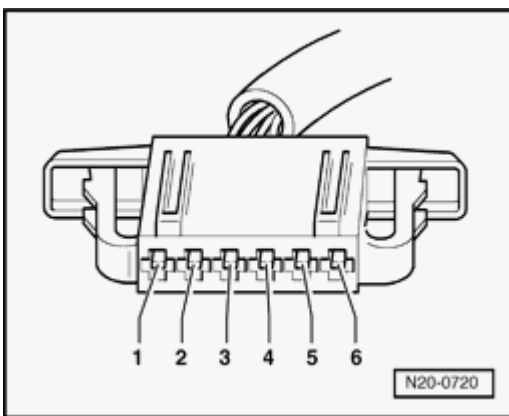


Fig. 27: Identifying 6-Pin Electrical Harness Connector & Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using the Multimeter V.A.G. 1526 A or equivalent, check the following wiring connections for open circuit.

Harness connector Terminal	Test box Socket
1	58
2	80
3	78
4	79
5	56
6	57

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.
- If necessary, repair the faulty wiring connection.

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ENGINE PERFORMANCE 2.0L 4-Cyl. 4V Turbo Engine Code BPG Motronic Fuel Injection System, Ignition System, Generic Scan Tool.

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. --> **20 - FUEL SUPPLY SYSTEM**.

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

- Replace the Engine Control Module (ECM) J623 --> **Engine Control Module (ECM) J623 , replacing.**

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

- Install the left knee bolster -->
 - **68 - INTERIOR EQUIPMENT**
 - **68 - INTERIOR EQUIPMENT** for BODY INTERIOR - CABRIOLET

Final procedures

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

1. Check the DTC memory.
 2. If necessary, erase the DTC memory.
 3. If the DTC memory was erased, generate readiness code.
- End diagnosis and switch the ignition off.

24 - MULTIPOINT FUEL INJECTION (MFI)

SAFETY MEASURES AND CLEANLINESS RULES

General information, On Board Diagnostic (OBD)

- The engine control module is equipped with On Board Diagnostics (OBD). Before repairs such as fault finding, check the DTC memory first. Also the vacuum hoses and connections must be checked (unmetered air).
- Fuel hoses in engine compartment must only be secured with spring-type clips. The use of clamp or screw type clips is not permissible.
- For the electric components to work properly, a voltage of at least 11.5 Volts is required.
- Do not use sealants containing silicone. Particles of silicone drawn into the engine, will not be burnt in the engine and damage the oxygen sensor.
- The vehicles have a crash fuel shut-off. It reduces the danger of a fire in a crash as the fuel pump is switched off via the fuel pump relay.
- At the same time, with this set-up, an improvement in driveability is also attained. When the driver-side door is opened, the Fuel Pump (FP) is activated for 2 seconds so that pressure builds in the fuel system, observe safety measures --> Safety precautions.

Safety precautions

CAUTION: Fuel system is under pressure! Fuel pressure must be reduced to a residual pressure before opening high pressure area of injection system, see --> Procedure that must be performed before opening the high-pressure fuel injection system - Pay close attention!

After reducing high pressure, connection should be opened immediately. To do this, place a cloth around the connection to reduce residual pressure (approx. 7 bar).

Observe the following if test and measuring instruments are required during a test drive:

- CAUTION:**
- Test and measuring equipment must always be secured to the rear seat and be operated from there by a second person.
 - If test and measuring instruments are operated from the front passengers seat and the vehicle is involved in an accident, there is a possibility that the person sitting in this seat may receive serious injuries when the airbag is triggered.

To reduce the risk of personal injury and/or damage to the fuel injection and ignition system, always observe the following:

- The battery must be disconnected before opening the fuel system, for safety reasons. The fuel pump may

be activated by the drivers door contact switch.

- Individuals with a pacemaker must not stay in the danger area of high voltage systems, e.g. ignition systems, xenon light.
- Fuel lines must not be opened when engine is running.
- Only disconnect and reconnect wires for injection and ignition system, including test leads, when ignition is switched off.
- If engine is to be cranked at starting RPM without starting (e.g. for compression testing), disconnect connectors from ignition coils and remove fuse for electric fuel pump.
- It is possible that the control module will recognize a malfunction and store a DTC during some tests. Therefore after completing all checks and repairs the DTC memory must be checked and if necessary erased.
- If the DTC memory was erased, the readiness code must be newly generated.
- Cleaning the engine should only be performed with ignition switched off.
- The battery must only be disconnected and connected with the ignition switched off, since the Engine Control Module (ECM) can otherwise be damaged.

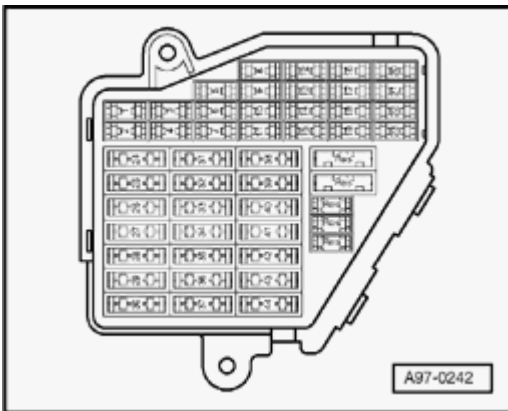


Fig. 1: Identifying Main Fuse Panel

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If engine is to be cranked at starting RPM without starting (e.g. for compression testing), disconnect the four connectors for ignition coils, using the ignition coil puller T40039 --> **Ignition coils with power output stage, removing and installing**. Also remove fuse from Fuel Pump (FP) Control Module J538.

NOTE:

- The fuse is located in the fuse carrier in the instrument panel.
- By removing fuse - 28 - , the voltage supply to terminal 30 for the Fuel Pump (FP) Control Module J538 is interrupted.

Cleanliness rules and instructions for working on fuel system

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

- Before loosening, connections and surrounding areas must be cleaned thoroughly with engine or brake

cleaner, and then cleaned area must be dried completely.

- Plug open lines and connections immediately with appropriate protective caps.
- Place parts that have been removed on a clean surface and cover them. Use lint free cloths.
- Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored unpackaged (e.g. in tool boxes etc.).
- When the system is open: Do not work with compressed air. Do not move vehicle unless absolutely necessary.

PROCEDURE THAT MUST BE PERFORMED BEFORE OPENING THE HIGH-PRESSURE FUEL INJECTION SYSTEM - PAY CLOSE ATTENTION!

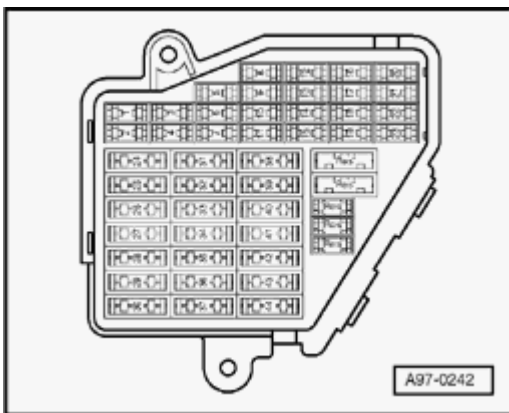


Fig. 2: Identifying Main Fuse Panel

Courtesy of VOLKSWAGEN UNITED STATES, INC.

For safety reasons, if the battery is not disconnected, fuse - 28 - from the Fuel Pump (FP) Control Module J538 must be removed before opening fuel system. Otherwise, the fuel pump will be activated by the drivers door contact switch.

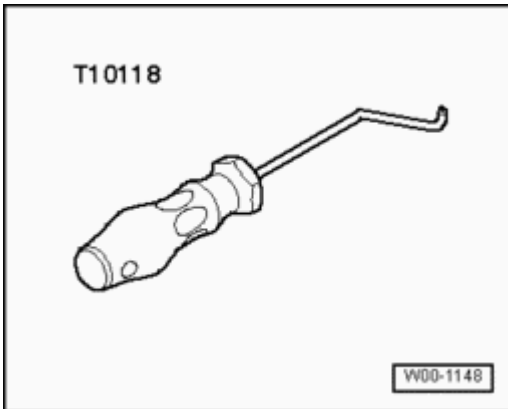
NOTE:

- The fuse is located in the fuse carrier in the instrument panel.
- By removing fuse - 28 - , the voltage supply to terminal 30 for the Fuel Pump (FP) Control Module J538 is interrupted.

CAUTION: The fuel injection system is divided into a high pressure section (maximum approx. 110 bar) and a low pressure system (approx. 6 bar).

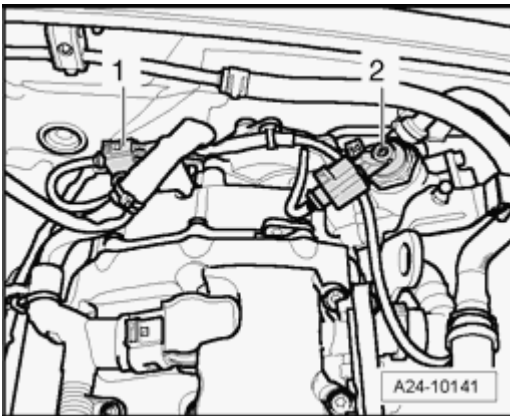
Before opening high pressure parts, e.g. removing high pressure pump, fuel rail, fuel injectors, fuel pipes or Fuel Pressure Sensor G247 G247 , fuel pressure in high pressure area must be reduced to a residual pressure of approx. 6 bar. The procedure for this is as follows.

High fuel pressure, reducing

Special tools, testers and auxiliary items required**Fig. 3: Identifying Assembly Tool T10118**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assembly tool T10118

**Fig. 4: Removing Electrical Connector From Fuel Pressure Regulator Valve N276 Using Assembly Tool T10118**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove electrical connector - 2 - from Fuel Pressure Regulator Valve N276 using the Assembly Tool T10118.
- Allow engine to idle approx. 10 seconds.

NOTE:

- By removing the electrical connector from the Fuel Pressure Regulator Valve N276 in idle, the fuel pressure is reduced from approx. 50 bar to approx. 6 bar.
- The decreasing fuel pressure can be decreased if a Vehicle Diagnosis and Service Syst. VAS 5052 VAS 5052 is connected and engine control module is selected. And select display group 140 under "Read measured value block" function.

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ENGINE PERFORMANCE 2.0 Liter 4-Cyl. 4V Turbo Fuel Injection Ignition, Engine Code(s): BPG, BWT

- Fuel pressure (actual value) is shown in display field 3.

- Switch off ignition.

CAUTION: The fuel lines will continue to be filled with fuel, but will no longer be under high pressure. To open fuel system, wear protective eyewear and clothing to prevent injuries and contact with skin.

Before opening the high pressure system, place a cloth around the connection.

- After reducing high pressure, high pressure system can be opened. To do this, place a clean cloth around connection to reduce residual pressure in system to approx. 7 bar. Escaping fuel must be absorbed.

NOTE:

- If the high pressure line is not opened immediately, the fuel pressure can increase slightly.

- Connector Vehicle Diagnosis and Service Syst. VAS 5052 and generate the readiness code in the engine control module in "Guided Fault Finding" operating mode.

TECHNICAL DATA

Engine data		2.0L/125 kW/147 kW/162 kW Turbo FSI engine
Idle speed cannot be adjusted, it is regulated by idle stabilization		640 to 800 RPM
Engine speed limitation via fuel injector shut-off		6500 RPM
Fuel pressure	Fuel supply-pressure up to high-pressure pump, (is produced by an electric fuel pump in the fuel tank)	Approx. 6.0 bar pressure with ignition on
	Fuel high pressure (produced by a mechanical single-piston pump) at approx. 85 degree coolant temperature	Approx. 50 bar positive pressure at idle Approx. 110 bar positive pressure at certain operating points.

OVERVIEW OF COMPONENT LOCATIONS

Components A through R are not depicted in the exploded view illustration.

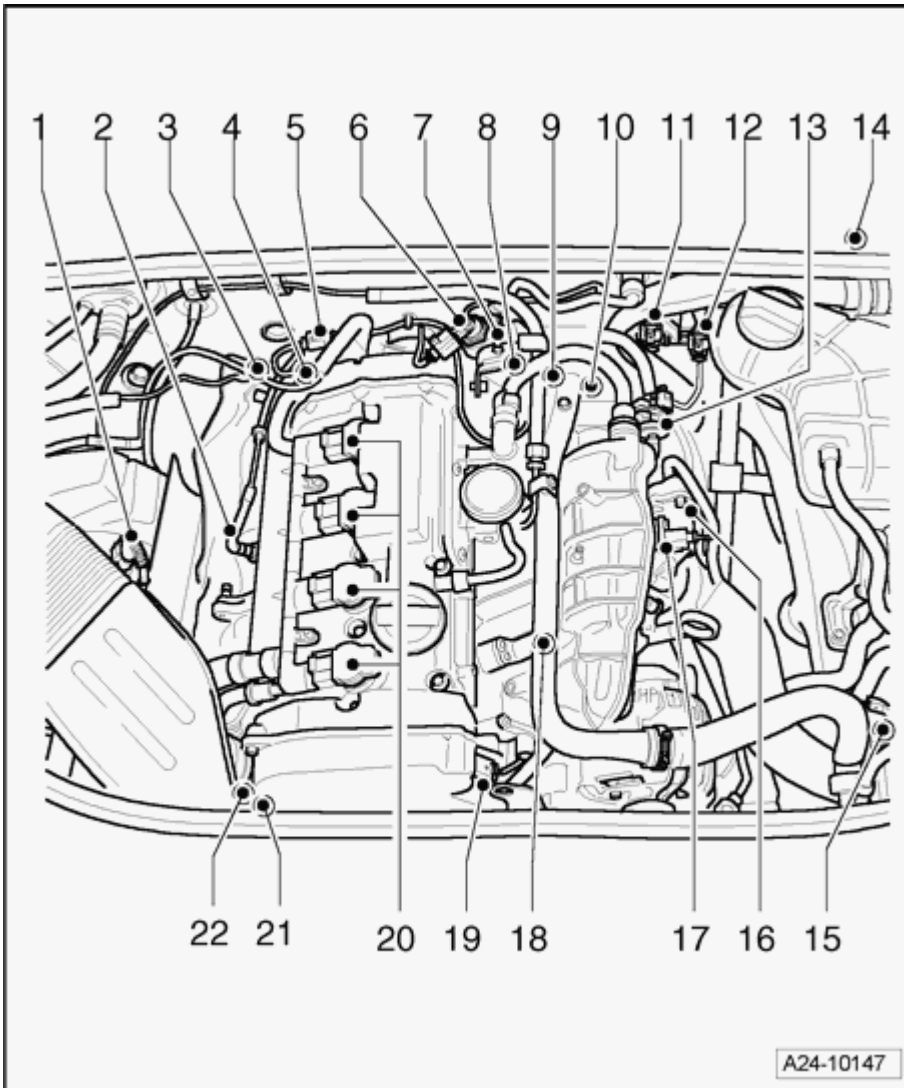


Fig. 5: Overview Of Component Locations

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Mass air flow (MAF) sensor G70

- **Mass Air Flow (MAF) Sensor G70 - 1 -**

2 - Heated Oxygen Sensor (HO2S) G39 and Oxygen Sensor (O2S) Heater Z19

- Removing and installing --> **Heated Oxygen Sensor (HO2S) G39 and Oxygen Sensor (O2S) Heater Z19 before catalytic converter, removing and installing**

3 - Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and Oxygen Sensor (O2S) Heater 1 (behind Three Way Catalytic Converter (TWC)) Z29

- **Oxygen sensors**

2005 Audi A4 Quattro

ENGINE PERFORMANCE 2.0 Liter 4-Cyl. 4V Turbo Fuel Injection Ignition, Engine Code(s): BPG, BWT

- Removing and installing --> **Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and Oxygen Sensor (O2S) Heater 1 (behind Three Way Catalytic Converter (TWC)) Z29, removing and installing**

4 - Engine Coolant Temperature (ECT) Sensor G62

- **Engine Coolant Temperature (ECT) Sensor G62 - 1 -**

5 - Camshaft Adjustment Valve 1 N205

- and under **Camshaft Adjustment Valve 1 N205 - 1 - and Fuel Pressure Regulator Valve N276 - 2 -**
- Removing and installing --> **15 - ENGINE - CYLINDER HEAD, VALVETRAIN**

6 - Fuel Pressure Regulator Valve N276

- and under **Camshaft Adjustment Valve 1 N205 - 1 - and Fuel Pressure Regulator Valve N276 - 2 -**

7 - Single piston high pressure pump

- Removing and installing --> **High pressure pump, removing and installing**

8 - Low Fuel Pressure Sensor G410

- 15 Nm

9 - Intake Flap Motor V157 with Intake Manifold Runner Position Sensor G336

- After replacing the fuel rail, the Intake Manifold Runner Position Sensor G336 must be adapted to the Engine Control Module (ECM) J623 again, "Guided Functions"

10 - Engine speed (RPM) sensor G28

- **Electrical harness connectors**

11 - 6-pin harness connector

- For Heated Oxygen Sensor (HO2S) G39 and Oxygen Sensor (O2S) Heater Z19 (black) **Electrical harness connectors**

12 - 6-pin harness connector

- Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and Oxygen Sensor (O2S) 1 (behind Three Way Catalytic Converter (TWC) Heater Z29 (brown connector) **Electrical harness connectors**

13 - Evaporative Emission (EVAP) Canister Purge Regulator Valve N80

14 - Engine Control Module J623

- Removing and installing --> **Engine Control Module (ECM) J623 , replacing**

15 - Charge Air Pressure Sensor G31

- **Charge Air Pressure Sensor G31 - 1 -**
- Removing and installing --> **21 - TURBOCHARGER, G-CHARGER**

16 - Throttle Valve Control Module J338 , Throttle Drive (for Electronic Power Control (EPC)) G186

- Throttle Drive Angle Sensor 1 (for Electronic Power Control (EPC)) G187 and Throttle Drive Angle Sensor 2 (for Electronic Power Control (EPC)) G188
- After replacing the Throttle Valve Control Module J338 , it must be adapted to the Engine Control Module (ECM) J623 again (basic setting, display group 60) see "Guided Functions"
- **Intake Air Temperature (IAT) Sensor G42 - 1 - Throttle Valve Control Module J338 - 2 -**

17 - Intake Air Temperature (IAT) Sensor G42

- **Intake Air Temperature (IAT) Sensor G42 - 1 - Throttle Valve Control Module J338 - 2 -**

18 - Fuel Pressure Sensor G247

- 22 Nm
- (Torque Specification 22 Nm) under **Fuel Pressure Sensor G247 - 1 - (Torque Specification 22 Nm)**

19 - Camshaft Position (CMP) Sensor G40

- **Camshaft Position (CMP) Sensor G40 - 1 -**

20 - Ignition coils with power output stages

- Ignition Coil 1 with Power Output Stage N70
- Ignition Coil 2 with Power Output Stage N127
- Ignition Coil 3 with Power Output Stage N291
- Ignition Coil 4 with Power Output Stage N292
- The ignition coils must be pulled out of cylinder head using ignition coil puller T40039
- Removing and installing --> **Ignition coils with power output stage, removing and installing**

21 - Turbocharger Recirculating Valve N249

- Installed directly on turbocharger **Components on turbocharger**
- Removing and installing --> **21 - TURBOCHARGER, G-CHARGER**

22 - Wastegate Bypass Regulator Valve N75

- Installed directly on turbocharger **Components on turbocharger**
- Removing and installing --> **21 - TURBOCHARGER, G-CHARGER**

A - Data Link Connector (DLC)

- In knee bolster on drivers side

B - Fuel Pump (FP) Control Module J538

- **Fuel Pump (FP) Control Module J538 - 1 -**
- If Fuel Pump (FP) Control Module J538 or fuel pump is replaced, an adaptation must be performed "Initiate basic setting" display group 103
- Check Fuel Pump (FP) Control Module J538 --> **20 FUEL SUPPLY** .

C - "EPC" Warning lamp

- In instrument cluster

D - Emission Malfunction Indicator Lamp "MIL"

- In instrument cluster

E - 8-pin harness connector for fuel injectors

- **Component locations beneath intake manifold**

F - Connector

- For Camshaft Position (CMP) Sensor G40 and Fuel Pressure Sensor G247
- **Component locations beneath intake manifold**

G - Brake Light Switch F and Brake Pedal Switch F63

- **Installed location Brake Light Switch F/Brake Pedal Switch F47 , Clutch Pedal Switch F36**

H - Throttle Position (TP) Sensor G79 and Accelerator Pedal Position Sensor 2 G185

- On accelerator pedal (both sensors are stored in one housing)

I - Clutch pedal switch F36

- **Installed location Brake Light Switch F/Brake Pedal Switch F47 , Clutch Pedal Switch F36**

J - Relay and fuse carrier in E-box

- **Installed location in 4-socket relay carrier, plenum chamber E-box**

K - Coolant Fan Control (FC) control module J293

- Installed in left coolant fan, when facing driving direction

L - Fuel injector

- In fuel rail line
- Cylinder 1 Fuel Injector N30
- Cylinder 2 Fuel Injector N31
- Cylinder 3 Fuel Injector N32
- Cylinder 4 Fuel Injector N33
- Removing and installing --> **Fuel injectors, removing and installing**

Fuel injectors referred to here are high pressure fuel injectors. They inject fuel directly into the cylinder under high pressure (max. approx. 120 bar).

M - Knock Sensor (KS) I G61

- For cylinder 1 and 2
- Torque specification: 20 Nm
- **Component locations beneath intake manifold**

N - Knock sensor 2 G66

- For cylinder 3 and 4
- Torque specification: 20 Nm
- **Component locations beneath intake manifold**

O - Oil pressure switch F1

- **Electrical harness connectors**
- Checking, removing and installing --> **17 - ENGINE - LUBRICATION**

P - Oil Level Thermal Sensor G266

- **Oil Level Thermal Sensor G266**

Q - Leak detection pump (LDP) V144

- Only installed on engine code BPG

R - Left Electro-Hydraulic Engine Mount Solenoid Valve N144

- Only installed on vehicles with automatic transmission

Fuel Pressure Sensor G247 - 1 - (Torque Specification 22 Nm)

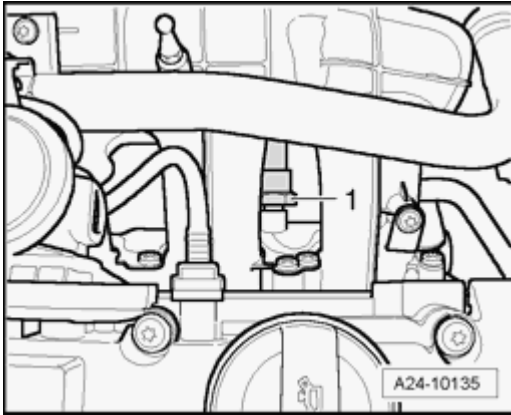


Fig. 6: Fuel Pressure Sensor G247

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The torque specification of the connection is "30 Nm" , and must be checked before installing the Fuel Pressure Sensor G247.

Camshaft Position (CMP) Sensor G40 - 1 -

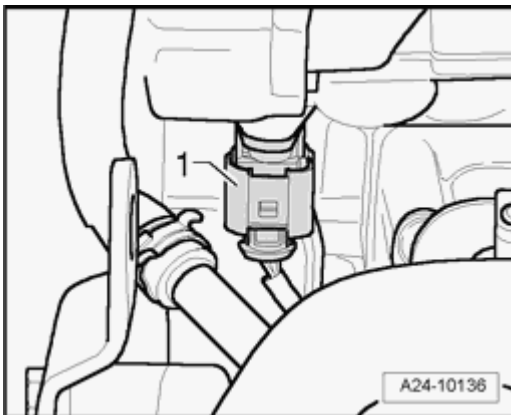


Fig. 7: Camshaft Position (CMP) Sensor G40

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Mass Air Flow (MAF) Sensor G70 - 1 -

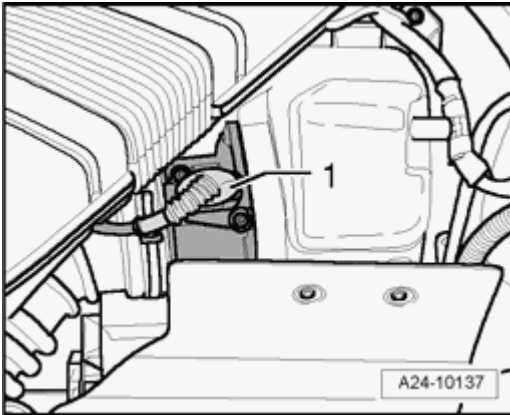


Fig. 8: Mass Air Flow (MAF) Sensor G70

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Camshaft Adjustment Valve 1 N205 - 1 - and Fuel Pressure Regulator Valve N276 - 2 -

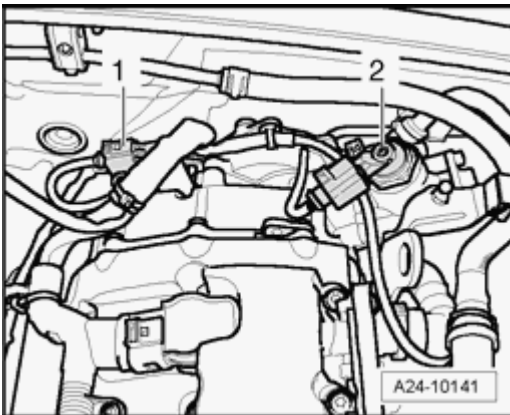


Fig. 9: Camshaft Adjustment Valve 1 N205 And Fuel Pressure Regulator Valve N276

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Intake Air Temperature (IAT) Sensor G42 - 1 - Throttle Valve Control Module J338 - 2 -

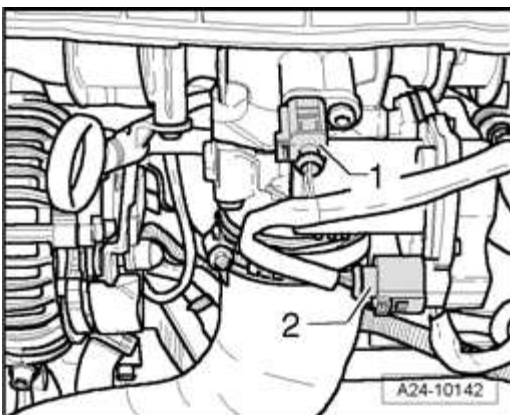


Fig. 10: Intake Air Temperature (IAT) Sensor G42 Throttle Valve Control Module J338

Courtesy of VOLKSWAGEN UNITED STATES, INC.

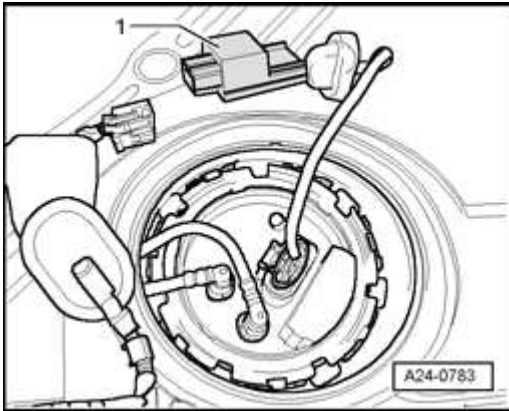
Fuel Pump (FP) Control Module J538 - 1 -

Fig. 11: Fuel Pump (FP) Control Module J538
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If the Fuel Pump (FP) Control Module J538 or fuel pump is replaced, an adaptation must be performed "Initiate basic setting" display group 103
- Check Fuel Pump (FP) Control Module J538 --> **20 FUEL SUPPLY** .

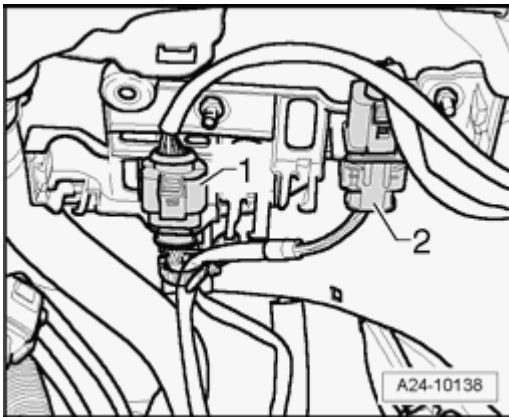
Electrical harness connectors

Fig. 12: Disconnecting 4-Pin Electrical Harness Connector From Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Heated Oxygen Sensor (HO2S) G39 and Oxygen Sensor (O2S) Heater Z19 (black connector)

2 - Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and Oxygen Sensor (O2S) Heater 1 (behind Three Way Catalytic Converter (TWC)) Z29 (brown connector)

Oxygen sensors

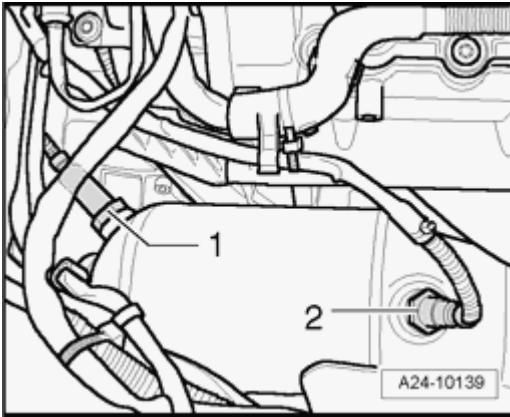


Fig. 13: Identifying Oxygen Sensors

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 and Oxygen Sensor (O2S) Heater 1 (behind Three Way Catalytic Converter (TWC)) Z29

2 - Heated Oxygen Sensor (HO2S) G39 and Oxygen Sensor (O2S) Heater Z19

Installed location of Engine Control Module (ECM) J623

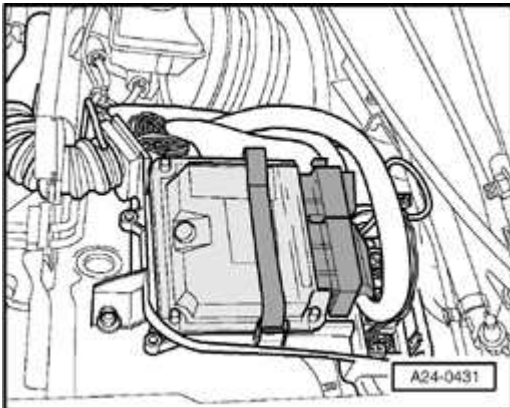


Fig. 14: Installed Location Of Engine Control Module (ECM) J623

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine Coolant Temperature (ECT) Sensor G62 - 1 -

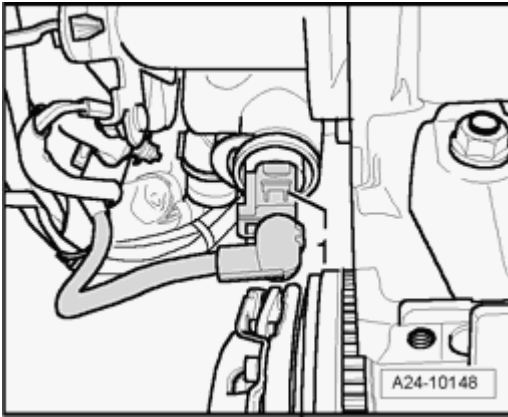


Fig. 15: Engine Coolant Temperature (ECT) Sensor G62
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Installed location Brake Light Switch F/Brake Pedal Switch F47 , Clutch Pedal Switch F36

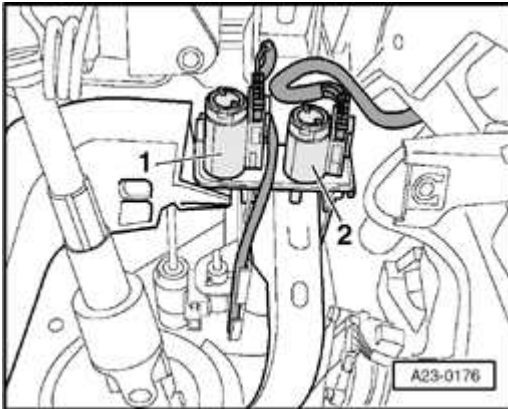


Fig. 16: Installed Location Brake Light Switch F/Brake Pedal Switch F47 , Clutch Pedal Switch F36
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1. Brake light switch F , Brake pedal switch F47
2. Clutch pedal switch F36

NOTE:

- To ensure that they are absolutely securely seated, the switches may only be installed once.

Installed location in 4-socket relay carrier, plenum chamber E-box

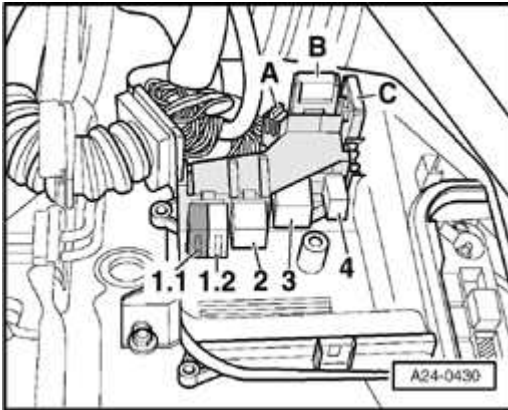


Fig. 17: Installed Location In 4-Socket Relay Carrier, Plenum Chamber E-Box
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1.1 - Not used

1.2 - Starting Interlock Relay J207

2 - Motronic Engine Control Module (ECM) Power Supply Relay J271

3 - Engine Component Power Supply Relay J757

Installed location on 9-socket relay carrier in driver footwell

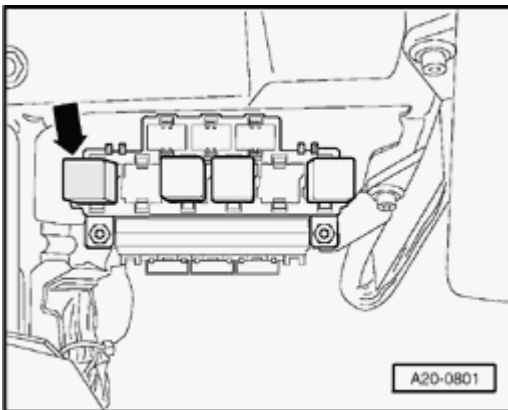
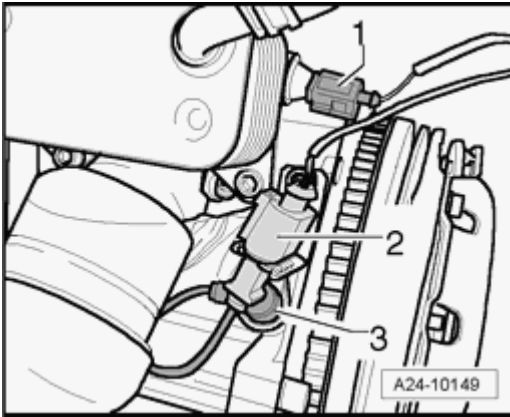


Fig. 18: Installed Location On 9-Socket Relay Carrier In Driver Footwell
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Arrow - Fuel Pump (FP) Relay J17

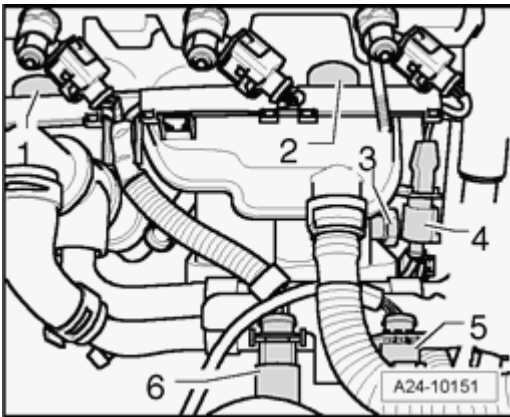
Electrical harness connectors

**Fig. 19: Electrical Harness Connectors**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Oil Pressure Switch F1
- 2 - 3-pin connector (gray) for Engine Speed (RPM) Sensor G28
- 3 - Engine Speed (RPM) Sensor G28

Component locations beneath intake manifold

**Fig. 20: Component Locations Beneath Intake Manifold**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Knock Sensor (KS) 1 G61
- 2 - Knock Sensor (KS) 2 G66
- 3 - Oil Pressure Switch F1 in oil filter bracket
- 4 - 3-pin connector (gray) for Engine Speed (RPM) Sensor G28
- 5 - Electrical connector for Camshaft Position (CMP) Sensor G40 and Fuel Pressure Sensor G247

6 - 8-pin harness connector for fuel injectors

Charge Air Pressure Sensor G31 - 1 -

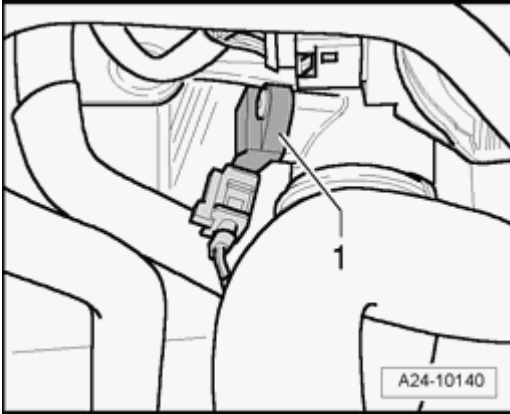


Fig. 21: Charge Air Pressure Sensor G31
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- O-ring, replace
- Tighten to 5 Nm
- Removing and installing --> **21 - TURBOCHARGER, G-CHARGER**

Oil Level Thermal Sensor G266

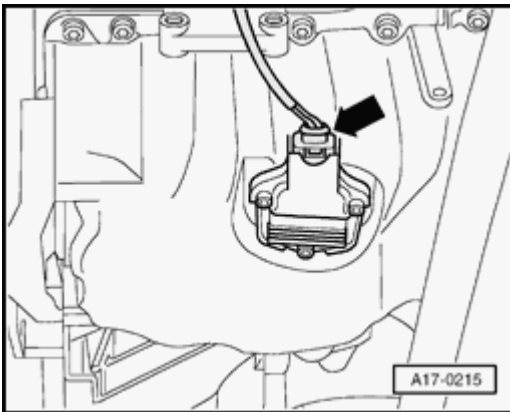


Fig. 22: Oil Level Thermal Sensor G266
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Components on turbocharger

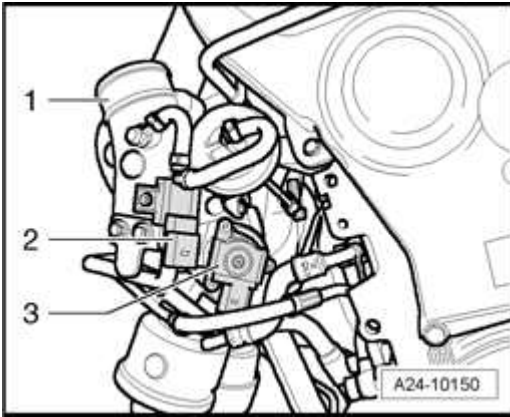


Fig. 23: Components On Turbocharger

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Turbocharger
- 2 - Tighten Wastegate Bypass Regulator Valve N75 to 3 Nm.
- 3 - Tighten Turbocharger Recirculating Valve N249 to 7 Nm (observe installed location, next illustration)

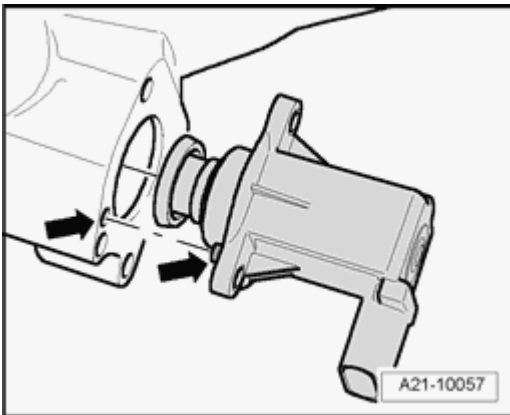


Fig. 24: Installation Position Of Turbocharger Recirculating Valve N249

Courtesy of VOLKSWAGEN UNITED STATES, INC.

Observe installed location of Turbocharger Recirculating Valve N249

AIR FILTER, ASSEMBLY OVERVIEW



Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 1 - Not installed
- 2 - Air guide hose
 - To turbocharger
 - Check the air duct hose for dirt and leaves
- 3 - Hose clamp
- 4 - Mass air flow (MAF) sensor G70
 - Removing and installing --> **Mass Air Flow (MAF) Sensor G70 , removing and installing**

5 - Bolt

- 1.5 Nm

6 - Air duct

- To lock carrier

7 - Bolt

- 1.5 Nm
- On lock carrier

8 - Air duct

- To air filter housing
- Clean the air channel of debris and leaves

9 - Spreader clip

10 - Bolt

- 1.5 Nm

11 - Upper part of air filter housing

- Clean air filter housing-upper part of salt residue, dirt and leaves

12 - Heat shield

13 - Bolt

- 1.5 Nm

14 - Air filter element

- Always use a genuine air filter element
- Removing and installing --> **Air filter insert, removing and installing**
- Observe change intervals -->
 - **01 - MAINTENANCE**
 - **01 - MAINTENANCE** for MAINTENANCE PROCEDURES - CABRIOLET

15 - Lower part of air filter housing

- Clean the air filter housing-lower part of salt residue, dirt and leaves

- Using pressurized air, blow out the water drain (small hole) in the lower part of the air filter housing.

16 - O-ring

- Replace if damaged

17 - Not installed

ENGINE COVER, REMOVING AND INSTALLING

Removing

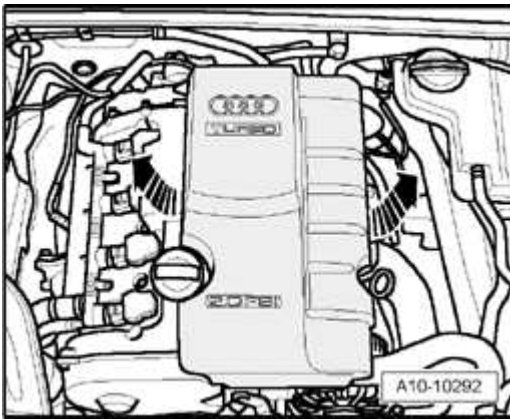


Fig. 26: Removing Engine Cover

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully remove engine cover from retaining pins. Do not remove engine cover one-sidedly or in a jerking manner.

Installing

- To prevent damage, do not hit engine cover with fist or tools.
- Position the engine cover (observe oil filler tube and oil dipstick) on the engine.
- Using both hands, press the engine cover into the rubber sleeves.

AIR FILTER INSERT, REMOVING AND INSTALLING

Air filter installing, removing

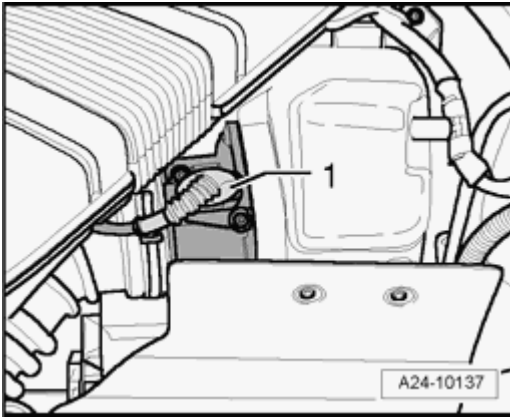


Fig. 27: Disconnecting Electrical Harness Connector From Mass Air Flow (MAF) Sensor G70
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect the electrical connector - **1** - from Mass Air Flow (MAF) Sensor G70.

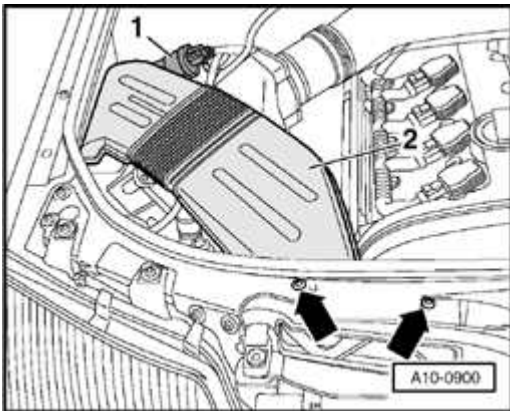


Fig. 28: Evaporative Emission Canister Purge Regulator Valve N80 And Air Duct
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both bolts - **arrows** - from the air duct, at the lock carrier.
- Disconnect air duct - **2** - from air filter housing.
- Open the hose clamp on air duct hose to turbocharger and pull it off at Mass Air Flow (MAF) Sensor G70.

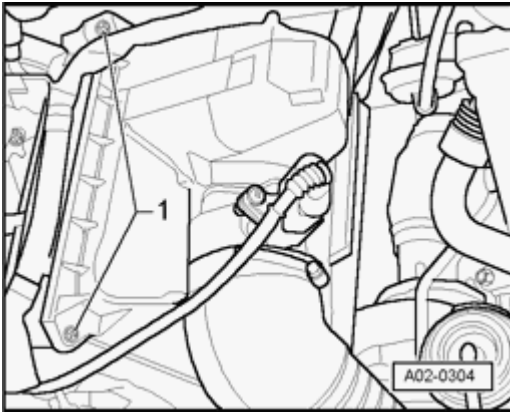


Fig. 29: Identifying Upper Part Of Air Filter Bolts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both bolts - 1 - at upper part of air filter and lift the upper part of air filter upward and out.
- Remove the old filter element.

Air filter installing

For problem-free operation of the mass air flow (MAF) sensor G70 it is very important to observe the following notes and procedures.

NOTE:

- If the air filter element is very dirty or soaked, dirt particles or moisture may have contaminated the Mass Air Flow (MAF) Sensor G70 and may be causing false mass air flow values. This results in a reduction of power, since a lower injection quantity is calculated.
 - Always use an original equipment air filter element.
 - Hose connections and charge air system hoses must be free of oil and grease before installing. When installing, do not use any lubricants containing silicone.
 - The air filter housings must be absolutely clean.
 - Secure all hose connections using hose clamps appropriate for the model type
 - Note the following when blowing out the air filter housing with pressurized air: To prevent malfunctions, cover the critical air flow components, such as Mass Air Flow (MAF) Sensor, air intake tubes, etc., with a clean rag.
 - Observe disposal regulations!
-
- Using pressurized air, blow out the water drain (small hole) in the lower part of the air filter housing.
 - Clean air filter housing (upper and lower sections) of salt residue, dirt or leaves (use vacuum cleaner if necessary).
 - Check the Mass Air Flow (MAF) Sensor and air duct hose (intake air side) for salt residue, dirt, and leaves.

- Check the air duct from lock carrier to air filter housing for dirt and leaves.
- Make sure that air filter element is properly centered when placed into the mounting of the lower part of air filter housing.
- Set upper part of air filter housing onto lower part of air filter housing, without using much force. When doing this, make sure that the upper part of air filter housing is not placed crooked onto the air filter element (observe sealing lip of air filter element).
- Make sure air duct hose is securely seated on Mass Air Flow (MAF) Sensor G70.

Further installation is performed in reverse order.

MASS AIR FLOW (MAF) SENSOR G70 , REMOVING AND INSTALLING

Removing

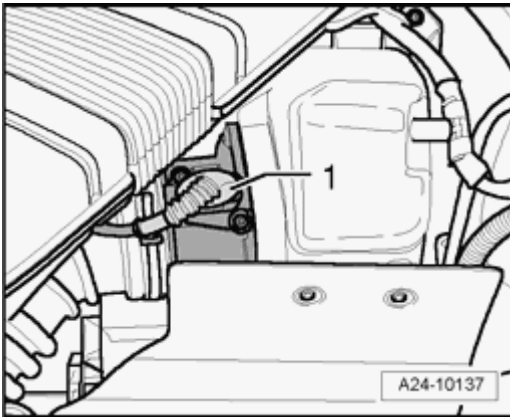


Fig. 30: Disconnecting Electrical Harness Connector From Mass Air Flow (MAF) Sensor G70
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 1 - from mass air flow (MAF) sensor G70.

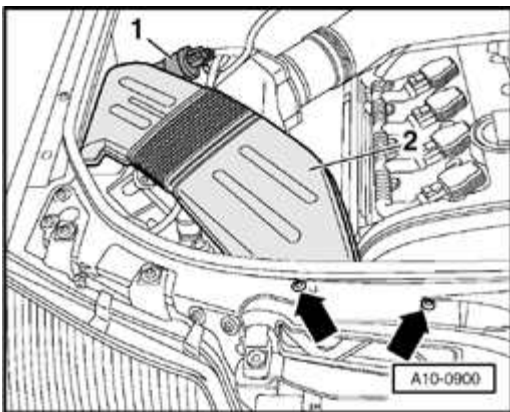


Fig. 31: Evaporative Emission Canister Purge Regulator Valve N80 And Air Duct
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both bolts - **arrows** - of the air duct at the lock carrier.
- Disconnect air duct - **2** - from air filter housing.
- Open hose clamp on air duct hose to turbocharger and pull it off at Mass Air Flow (MAF) Sensor G70.
- Remove both bolts from Mass Air Flow (MAF) Sensor G70.

- Carefully pull the Mass Air Flow (MAF) Sensor G70 out of the guide from air filter housing.

Installing

For problem-free operation of the Mass Air flow (MAF) Sensor G70 it is very important to observe the following notes and procedures.

NOTE:

- **If the air filter element is very dirty or soaked, dirt particles or moisture may have contaminated the Mass Air Flow (MAF) Sensor G70 and may be causing false mass air flow values. This results in a reduction of power, since a lower injection quantity is calculated.**
 - **Always use an original equipment air filter element.**
 - **Use a lubricant (silicone-free) for installing the air duct hose.**
 - **Secure all hose connections using hose clamps appropriate for the model type**
-
- Check Mass Air Flow (MAF) Sensor and air duct hose (intake air side) for salt residue, dirt, and leaves.
 - Check intake ducting up to the air filter element for dirt. If any contaminants are discovered, clean the air filter housing (upper and lower parts) of salt residue, dirt and leaves (if necessary, clean by washing or vacuuming). Air filter, removing and installing --> **Air filter insert, removing and installing**

Installation is in reverse order of removal.

INTAKE MANIFOLD, ASSEMBLY OVERVIEW

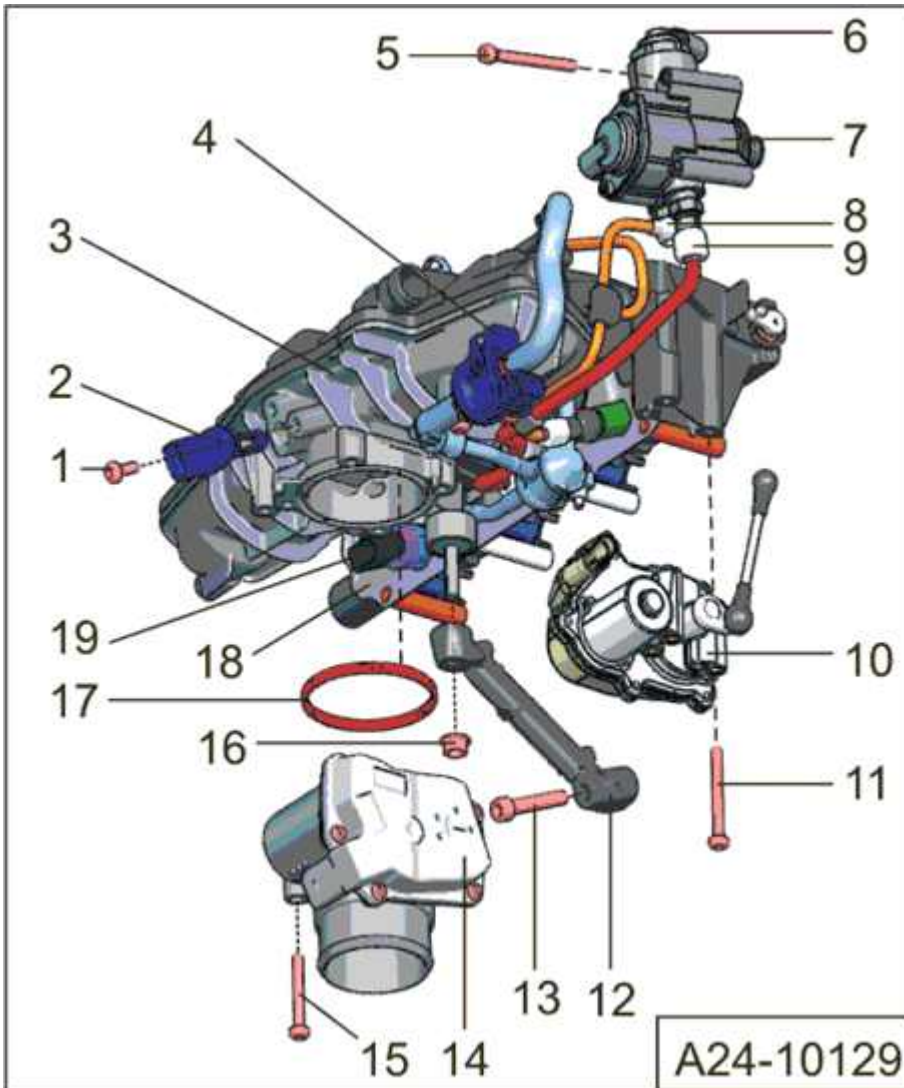


Fig. 32: Intake Manifold, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Intake Air Temperature (IAT) Sensor 2 G299 bolt

- 5 Nm

2 - Intake Air Temperature (IAT) Sensor 2 G299

3 - Intake manifold

- Removing and installing --> **Intake manifold with fuel rail, removing and installing**

4 - Evaporative Emission (EVAP) Canister Purge Solenoid Valve 1 N80

5 - Bolt for single-piston high-pressure pump

- 3 pieces
- 10 Nm

6 - Fuel Pressure Regulator Valve N276**7 - Mechanical single-piston high-pressure pump**

- With Fuel Pressure Regulator Valve N276 and Low Fuel Pressure Sensor G410
- An electrical fuel pump, located in the fuel tank, supplies fuel to the mechanical high-pressure pump at a pressure of approx. 6 bar.
- When installing the high-pressure pump, make sure that no dirt enters the fuel system.
- The fuel system must be pressureless, releasing fuel pressure --> **Procedure that must be performed before opening the high-pressure fuel injection system - Pay close attention!**
- Do not install fuel lines with tension
- Removing and installing --> **High pressure pump, removing and installing**

8 - Connection for fuel return line to fuel tank

- Replace bolt
- Tighten connection to 40 Nm (before each installation of the fuel line, check the torque of the connection)
- Do not install fuel line with tension (be aware of cleanliness) Torque specification: 25 Nm

9 - Fuel supply line to fuel rail

- Tighten connection to 30 Nm (before each installation of the fuel line, check the torque of the connection)
- Do not install fuel line with tension (be aware of cleanliness) Torque specification: 30 Nm

10 - Intake Flap Motor V157 with Intake Manifold Runner Position Sensor G336

- After replacement of the fuel rail, the Intake Manifold Runner Position Sensor G336 must be adapted to the Engine Control Module (ECM) J623 again, "Guided Functions"

11 - Bolt for the Intake Flap Motor V157 with Intake Manifold Runner Position Sensor G336

- 3 pieces
- 7 Nm

12 - Intake manifold support**13 - Bolt for the intake manifold support**

- 23 Nm

14 - Throttle Valve Control Module J338 , Throttle Drive (for Electronic Power Control (EPC)) G186

- With Throttle Drive Angle Sensor 1 (for Electronic Power Control (EPC)) G187 and Throttle Drive Angle Sensor 2 (for Electronic Power Control (EPC)) G188
- After replacing the Throttle Valve Control Module J338 , it must be adapted to the Engine Control Module (ECM) J623 again (basic setting, display group 60) see "Guided Fault Finding"

15 - Bolt for Throttle Valve Control Module J338

- 4 pieces
- 7 Nm

16 - Nut for intake manifold support

- 10 Nm

17 - Seal

- Replace

18 - Fuel rail

- Removing and installing --> **Fuel rail, removing and installing**

19 - Fuel Pressure Sensor G247

- 20 Nm

FUEL RAIL, ASSEMBLY OVERVIEW

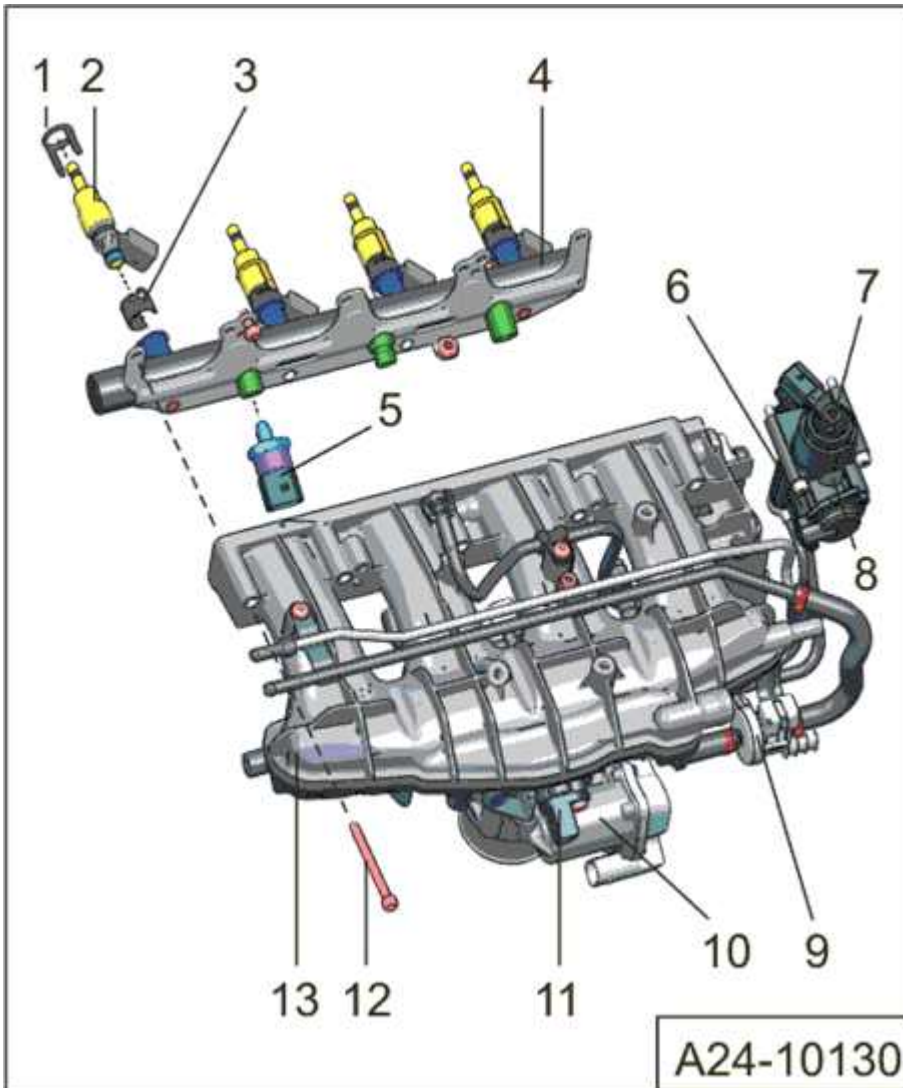


Fig. 33: Fuel Rail, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Radial adjustment

- Replace if damaged

2 - Fuel injector

- With combustion chamber seal (Teflon seal), always replace
- Replace O-Rings
- Note correct installation position
- Removing and installing --> **Fuel injectors, removing and installing**

3 - Support ring

4 - Fuel rail

- Removing and installing --> **Fuel rail, removing and installing**

5 - Fuel Pressure Sensor G247

- 22 Nm
- Tighten connections to 30 Nm

6 - Low Fuel Pressure Sensor G410

- 15 Nm

7 - Fuel Pressure Regulator Valve N276**8 - Mechanical single-piston high-pressure pump**

- With Fuel Pressure Regulator Valve N276 and Low Fuel Pressure Sensor G410
- An electrical fuel pump, located in the fuel tank, supplies fuel to the mechanical high-pressure pump at a pressure of approx. 6 bar.
- When installing the high-pressure pump, make sure that no dirt enters the fuel system.
- The fuel system must be pressureless to install the high-pressure pump, releasing fuel pressure --> **Procedure that must be performed before opening the high-pressure fuel injection system - Pay close attention!**
- Do not install fuel lines with tension
- Removing and installing --> **High pressure pump, removing and installing**

9 - Evaporative Emission (EVAP) Canister Purge Regulator Valve N80**10 - Throttle Valve Control Module J338 , Throttle Drive (for Electronic Power Control (EPC)) G186**

- With Throttle Drive Angle Sensor 1 (for Electronic Power Control (EPC)) G187 and Throttle Drive Angle Sensor 2 (for Electronic Power Control (EPC)) G188
- After replacing the Throttle Valve Control Module J338 , it must be adapted to the Engine Control Module (ECM) J623 again (basic setting, display group 60) see "Guided Fault Finding"

11 - Intake Air Temperature (IAT) Sensor 2 G299

- Tighten to 5 Nm

12 - Bolts for intake manifold

- 9 Nm

13 - Intake manifold

- Removing and installing --> **Intake manifold with fuel rail, removing and installing**

INTAKE MANIFOLD WITH FUEL RAIL, REMOVING AND INSTALLING

CAUTION: Before opening a component of the high-pressure section, the fuel pressure must be released. Pay absolute attention to --> **Procedure that must be performed before opening the high-pressure fuel injection system - Pay close attention!**

NOTE:

- To access the fuel injectors, the intake manifold and the fuel rail with intake manifold runner control valve must be removed. (Depending on version, more or fewer work steps may be required).
- The combustion chamber seal (Teflon) and the O-ring must always be replaced.
- Intake manifold, overview --> **Intake Manifold, assembly overview**

Removing

- Remove engine cover --> **Engine cover, removing and installing.**
- Disconnect all electrical harness connectors from the intake manifold and fuel rail.
- Disconnect vacuum hose between intake manifold and vacuum pump from intake manifold.

NOTE:

- This vacuum hose and the vacuum pump (attached to rear of cylinder head) are only installed on vehicles with automatic transmission.

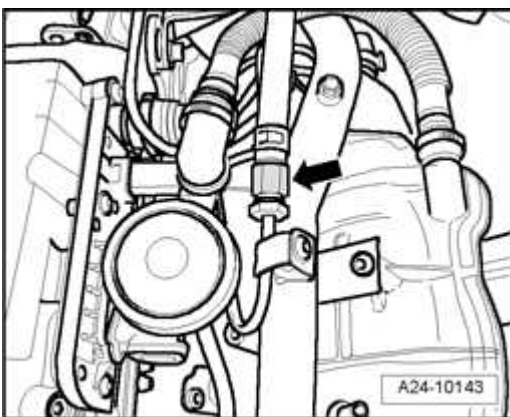


Fig. 34: Disconnecting Fuel Line

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect fuel line - **arrow** - (catch escaping fuel and plug the open connections immediately).

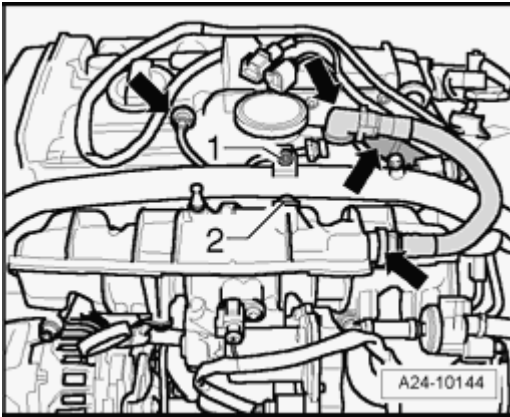


Fig. 35: Removing Both Bolts From Valve Cover/Coolant Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect hose connections - **arrows** - from valve cover.

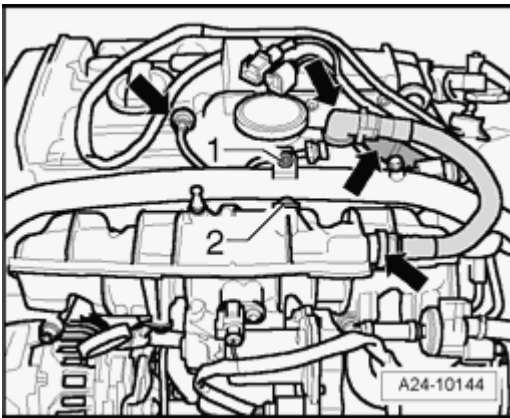


Fig. 36: Removing Both Bolts From Valve Cover/Coolant Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both bolts - **1 and 2** - from coolant pipe.

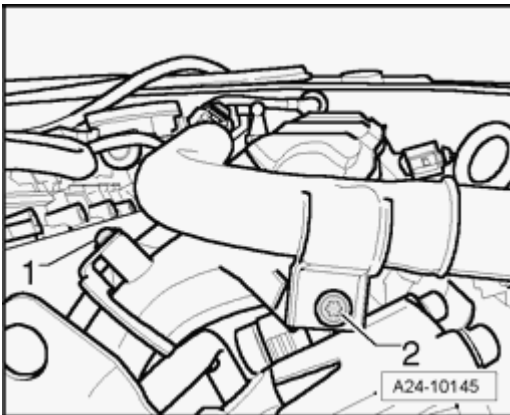


Fig. 37: Removing Bolt From Oil Line And From Coolant Pipe
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt from oil line - 1 - and from coolant pipe - 2 -.

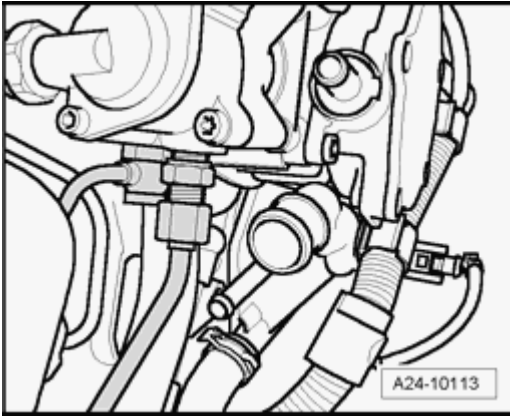


Fig. 38: Identifying High Pressure Pump Fuel Lines
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both fuel lines at high-pressure pump.
- Open hose clamps and pull intake hose off from Throttle Valve Control Module J338 and intake manifold.

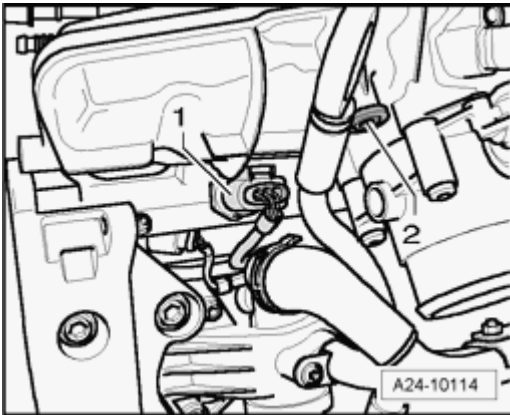


Fig. 39: Identifying 3-Pin Connector From Fuel Pressure Sensor -G247-
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 1 - from Fuel Pressure Sensor G247.

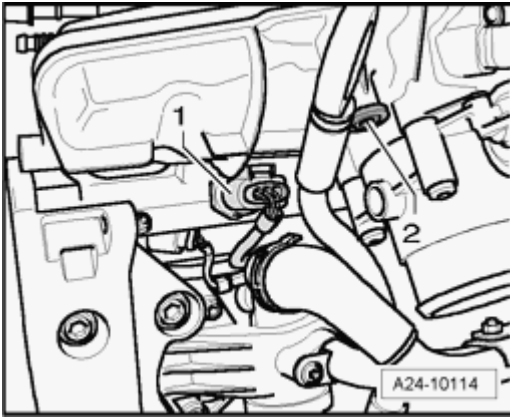


Fig. 40: Identifying 3-Pin Connector From Fuel Pressure Sensor -G247-
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull oil dipstick out and remove bolt - 2 - for oil dipstick guide tube.

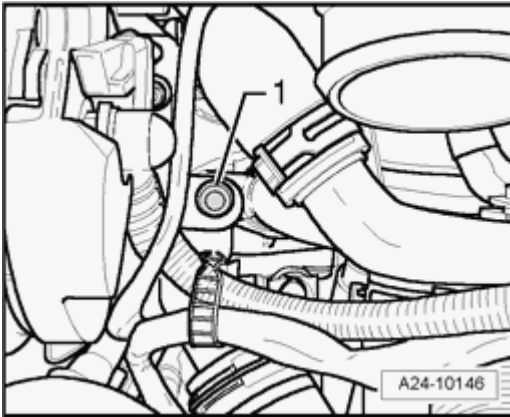


Fig. 41: Removing Bolt For Oil Line
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove bolt - 1 - for oil line.

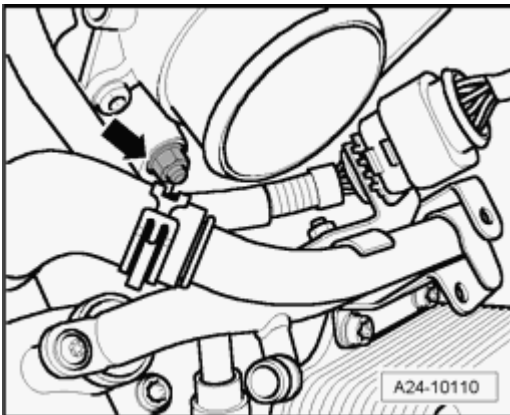


Fig. 42: Removing Nut From Intake Manifold Support
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove nut - **arrow** - from intake manifold support (if necessary, remove Throttle Valve Control Module J338 to access the support nut).

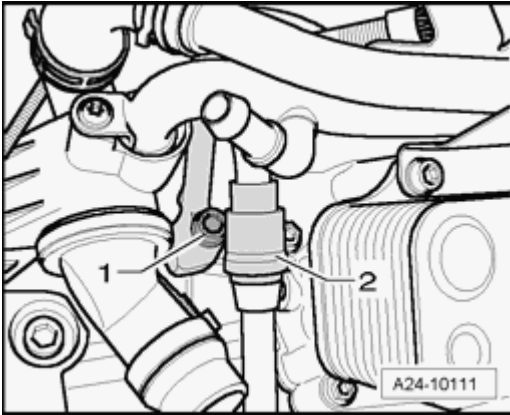


Fig. 43: Separating Oil Dipstick Guide Tube At Separation Point And Removing Bolt For Intake Manifold Bracket

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Separate oil dipstick guide tube - 2 - at separation point and remove bolt - 1 - for intake manifold bracket.
- Remove all bolts from intake manifold.
- Carefully remove intake manifold with fuel rail from cylinder head.

NOTE:

- **The fuel injectors could remain stuck in the fuel rail.**

- Fuel rail, removing and installing --> **Fuel rail, removing and installing**

Installing

- Installation is in reverse order of removal.

Torque specifications	Nm
Mounting bolts for intake manifold	9
Bolt for intake manifold support	23
Nut for intake manifold support	10
Fuel supply line to high pressure pump	30
Fuel return line to high pressure pump (replace)	25
Bolts for Intake Flap Motor V157	7

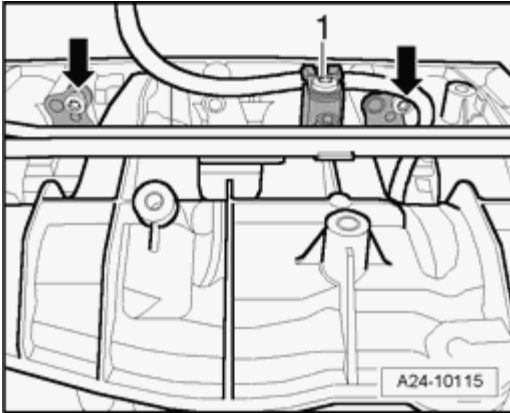
FUEL RAIL, REMOVING AND INSTALLING

If fuel rail is to be replaced, the Intake Manifold Runner Position Sensor G336 must be adapted to the Engine Control Module (ECM) J623 again, "Guided Functions"

NOTE:

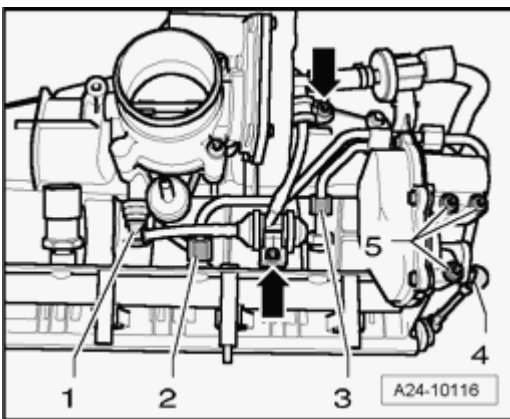
- Intake manifold must be removed, removing --> Intake manifold with fuel rail, removing and installing.

- Remove hoses from EVAP canister.
- To do so, open hose clamp - 1 -.

**Fig. 44: Identifying Hose Clamp & Bolts**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both bolts - **arrows** - from fuel rail.
- Remove hose connection 1 from intake manifold and remove both bolts - **arrows** -.

**Fig. 45: Removing/Installing Coupling Rod From Intake Flap Motor V157**

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both fuel lines - **2 and 3** -.
- Carefully pry off linkage from Intake Flap Motor V157 - **4** -.

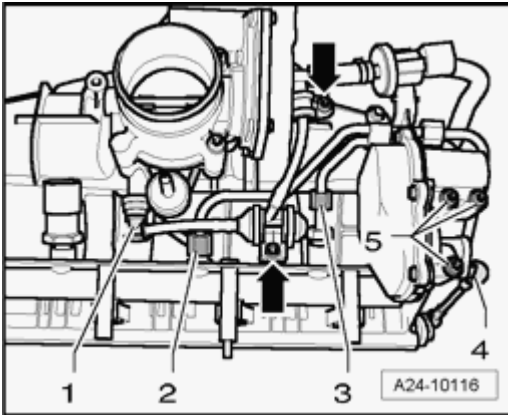


Fig. 46: Removing/Installing Coupling Rod From Intake Flap Motor V157
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Intake Flap Motor V157 - 5 -.

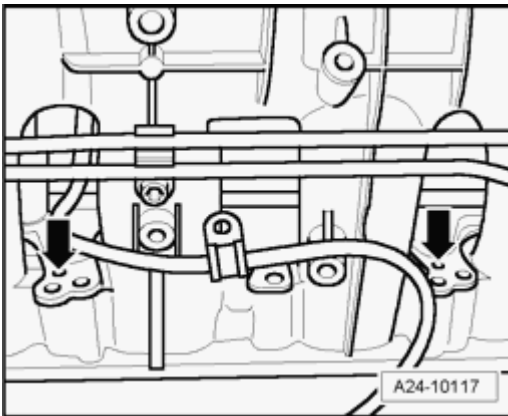


Fig. 47: Removing Fuel Rail From Intake Manifold
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pry fuel rail off from the intake manifold via the retaining tabs - **arrows** -.
- Remove fuel rail from intake manifold.

Installing

- Installation is in reverse order of removal.
- Install intake manifold --> **Intake manifold with fuel rail, removing and installing.**

FUEL INJECTORS, REMOVING AND INSTALLING

Removing

Remove intake manifold and fuel rail --> **Intake manifold with fuel rail, removing and installing.**

Removing fuel injectors, in the event that they are stuck in the fuel rail

Carefully pull fuel injectors out of the fuel rail.

Removing fuel injectors, in the event that they are stuck in the cylinder head

Special tools, testers and auxiliary items required



Fig. 48: Identifying Tool Set T10133

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Tool set with puller T10133 Tool Set T10133

Remove intake manifold and fuel rail --> **Intake manifold with fuel rail, removing and installing.**

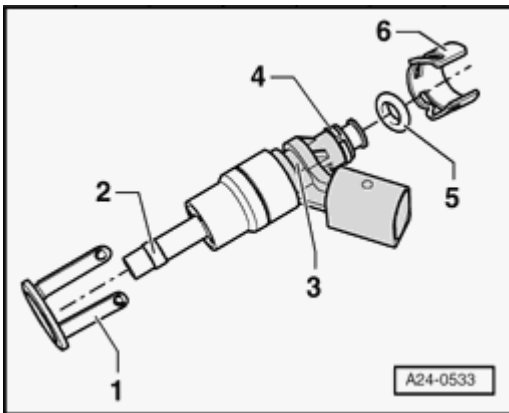


Fig. 49: Identifying Fuel Injector, Individual Parts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

The illustration shows the fuel injector.

1 - Radial compensation, replace if damaged

2 - Combustion chamber sealing ring (Teflon sealing ring). Replace the sealing ring once removed. The sealing ring must not be greased or handled with any other lubricants when installing.

3 - Groove on fuel injector

4 - Spacer ring, replace if damaged

5 - O-ring (replace, coat lightly with clean engine oil when installing)

6 - Support ring (via this support ring, the fuel rail utilizes the force to hold the fuel injector in place in the cylinder head).

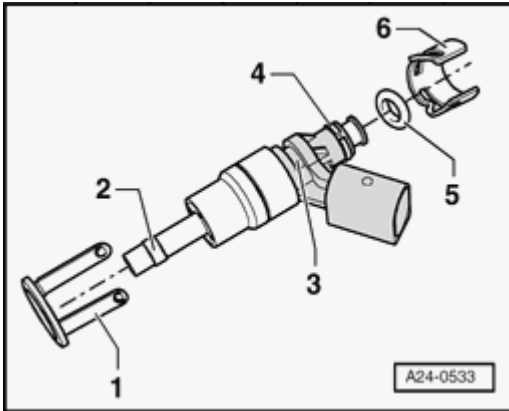


Fig. 50: Identifying Fuel Injector, Individual Parts

Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- With fuel injector installed, the radial adjustment - 1 - is clipped into the support ring - 6 -. To remove the fuel injector, the support ring must be separated from the fuel injector in order to install the puller T10133/2 into the indentation on the fuel injector - 3 -.

- Cover open intake channels with a clean rag.
- Disconnect electrical harness connector at fuel injector that is to be removed.

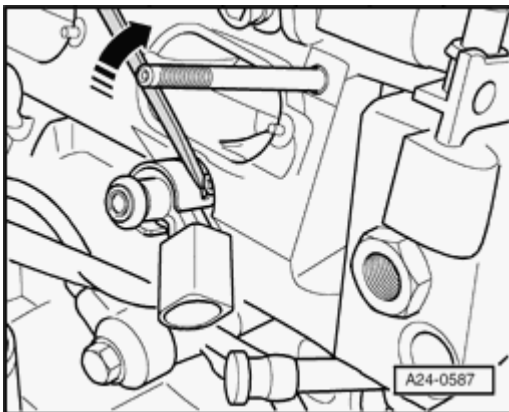


Fig. 51: Bending Retaining Tabs Of Radial Compensation To Side

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Bend retaining tabs of radial compensation to the side using a screwdriver and pull off support ring from fuel injector.

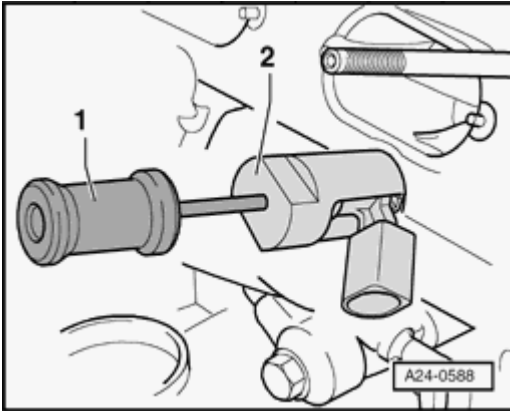


Fig. 52: Installing Hammer T10133/3 To Puller T10133/2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble the slide hammer T10133/3 - 1 - and the injector puller T10133/2 - 2 -. Then, guide the puller T10133/2 into the groove on the fuel injector and carefully drive the fuel injector out. It is possible that this will destroy the radial compensation (retaining tabs break). This must be replaced when re-installing fuel injector.

NOTE:

- The combustion chamber seal must always be replaced before re-installing the fuel injector --> Combustion chamber sealing ring (Teflon sealing ring), replacing.

COMBUSTION CHAMBER SEALING RING (TEFLON SEALING RING), REPLACING

NOTE:

- The combustion chamber seal must always be replaced before re-installing the fuel injector.

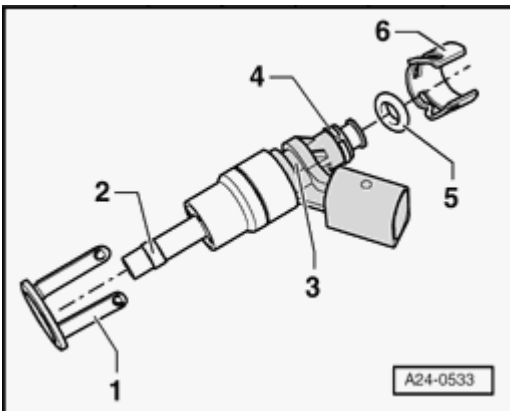


Fig. 53: Identifying Fuel Injector, Individual Parts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The illustration shows the fuel injector.

1 - Radial compensation, replace if damaged

2 - Combustion chamber sealing ring (Teflon sealing ring), replace, the ring must not be greased or handled with any other lubricants when installing.

3 - Groove on fuel injector

4 - Spacer ring, replace if damaged

5 - O-ring (replace, coat lightly with clean engine oil when installing)

6 - Support ring (via this support ring, the fuel rail utilizes the force to hold the fuel injector in place in the cylinder head).

- Carefully remove the old Teflon seal with the appropriate tool (e.g. with cut the seal open with a razor and spread seal open with a small screwdriver and pull it forward and off.) When doing this, make sure not to damage the groove and circumferential rib in the groove base.

NOTE:

- **If the groove is damage, the fuel injector must be replaced.**

- Before installing the new Teflon seal, the seal groove and the shaft of the fuel injector must be cleaned of combustion residue using a clean rag.

NOTE:

- **A fuel injector with "angled connector" is shown in the illustration. Do not pay attention to this for the remainder of the procedure, because it is unrelated to replacement of the combustion chamber seal.**

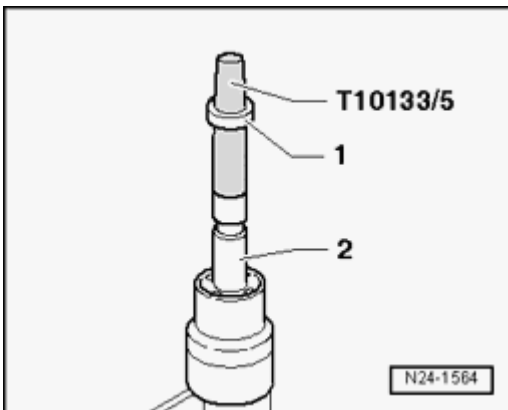


Fig. 54: Placing Assembly Cone T10133/5 With New Teflon Seal Onto Fuel Injector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Place the assembly cone T10133/5 with the new Teflon seal - **1** - onto the fuel injector - **2** -.

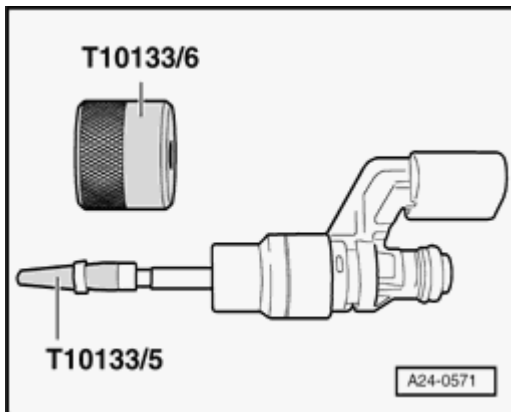


Fig. 55: Pushing Teflon Seal Further Onto Assembly Cone T10133/5
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using the assembly sleeve T10133/6, push the Teflon seal further onto the assembly cone T10133/5 until the Teflon seal is engaged in the seal groove. When doing this, do not use any lubricants.

NOTE:

- By pushing the Teflon seal onto the fuel injector, the Teflon seal is expanded. For this reason, the Teflon seal must be contracted again, once it has been pushed on. This is done in two steps. The procedure for this is as follows.

The 1st step of calibrating (adapting) the Teflon seal is performed using the calibration sleeve T10133/7.

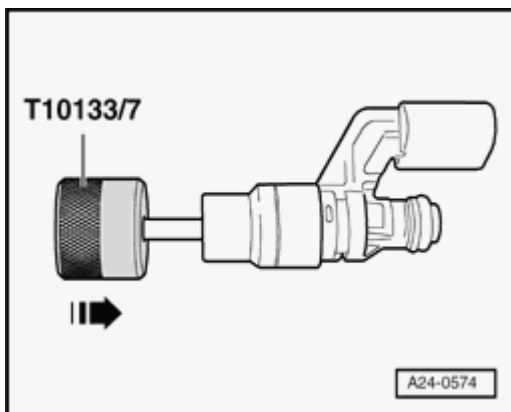


Fig. 56: Pushing Calibration Sleeve T10133/7 Over Fuel Injector Up To Stop
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a rotating motion (approx. 180) and light pressure, push the calibration sleeve T10133/7 over the fuel injector up to the stop. Pull the calibration sleeve T10133/7 off again, rotating it in the opposite direction.

The 2nd step of calibrating (adapting) the Teflon seal is performed using the calibration sleeve T10133/8.

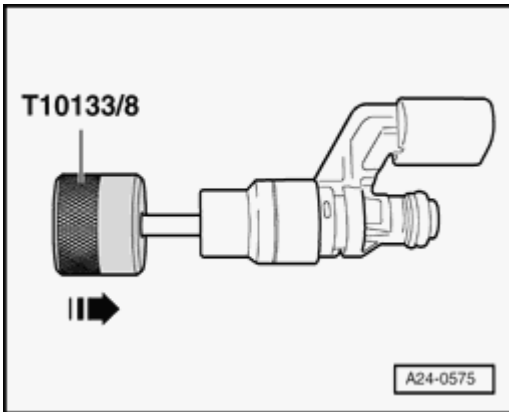


Fig. 57: Pushing Calibration Sleeve T10133/8 Over Fuel Injector Up To Stop
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using a rotating motion (approx. 180) and light pressure, push the calibration sleeve T10133/8 over the fuel injector up to the stop. Pull the calibration sleeve T10133/8 off again, rotating it in the opposite direction.
- Replace O-ring on fuel injector. Moisten the O-ring with clean engine oil before installing.
- The Teflon seal must not be oiled.

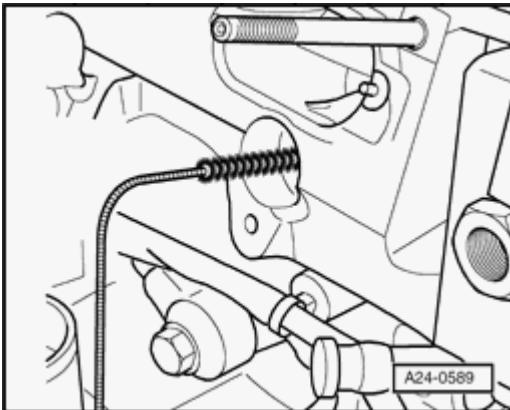


Fig. 58: Cleaning Bores For High Pressure Fuel Injectors In Cylinder Head Using Nylon Brush T10133/4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using the included nylon brush T10133/4 , thoroughly clean the fuel injector bores in the cylinder head before installing the fuel injectors.

NOTE:

- An opened intake valve hinders the cleaning of the bore. In this case, the engine must be turned further by hand using a wrench on the crankshaft.

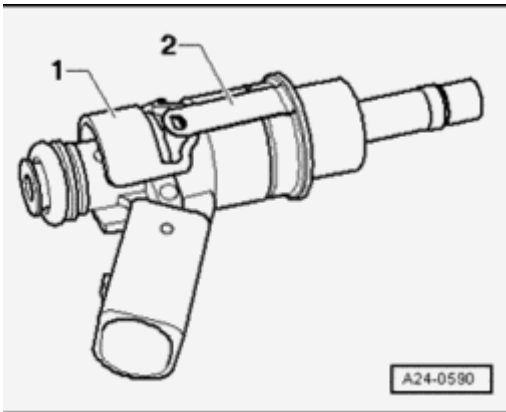


Fig. 59: Installing Fuel Injector Again With Support Ring And Clipping In Radial Compensation On Support Ring

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Install fuel injector again with support ring - 1 - and clip in radial compensation - 2 - on support ring.

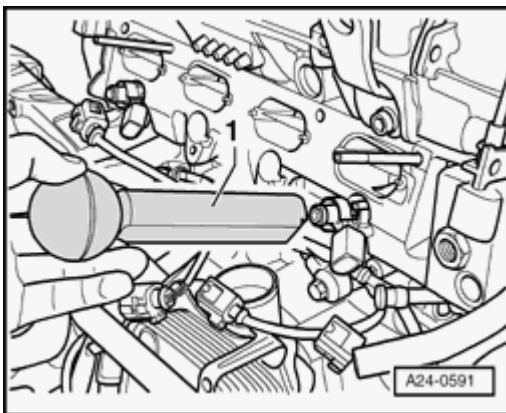


Fig. 60: Using Assembly Drift T10133/9 To Press Fuel Injector Into Hole In Cylinder Head Until It Stops

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Using assembly drift T10133/9 , press the fuel injector into the fuel injector bore in the cylinder head until it stops. Make sure the fuel injectors are positioned correctly in cylinder head.
- Further installation is in reverse order of removal.
- Install intake manifold with fuel rail --> **Fuel rail, removing and installing**

FUEL PRESSURE AND RESIDUAL PRESSURE BEFORE HIGH PRESSURE PUMP, CHECKING

Special tools, testers and auxiliary items required

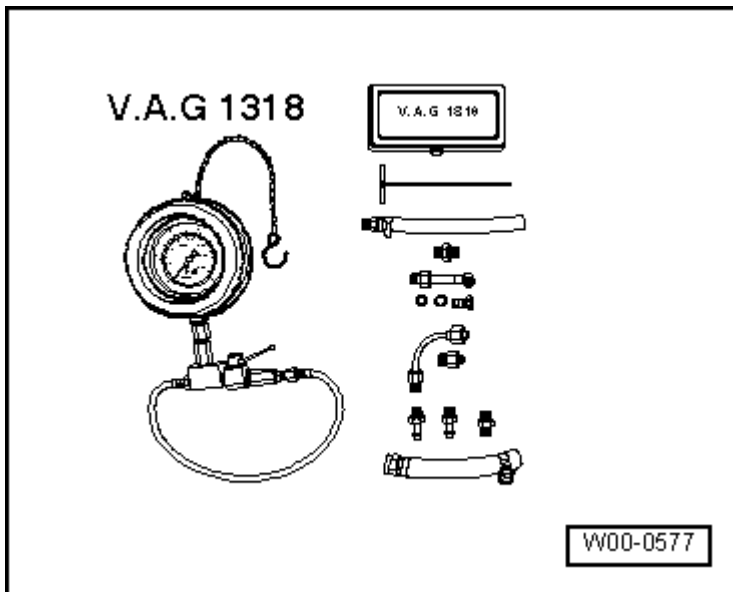


Fig. 61: Identifying Pressure Gauge V.A.G 1318
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Fuel inj. Pressure Gauge VAG1318
- Adapter V.A.G 1318/11
- Adapter V.A.G 1318/12

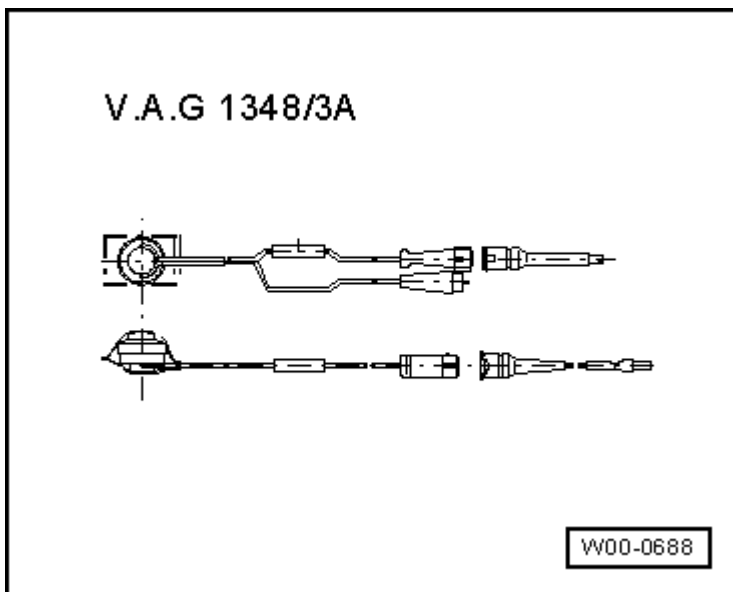


Fig. 62: Identifying Remote Control Connection V.A.G 1348/3A
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remote Control V.A.G 1348/3A with adapter cable V.A.G 1348/3-3
- Measuring container, fuel-resistant

- Fold forward the right backrest of rear seat, if necessary.

Wagon:

- Remove left 1/3 backrest -->
 - **72 - SEAT - FRAMES**
 - **72 - SEAT - FRAMES** for BODY INTERIOR - CABRIOLET
- Remove left side trim in luggage compartment and dirt tray -->
 - **70 - INTERIOR TRIM**
 - **70 - INTERIOR TRIM** for BODY INTERIOR - CABRIOLET

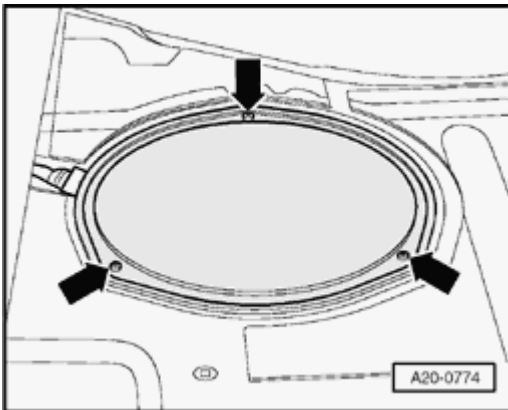
All:

Fig. 65: Unbolting Cover For Locking Flange In Luggage Compartment
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove locking flange cover - **arrows** -.

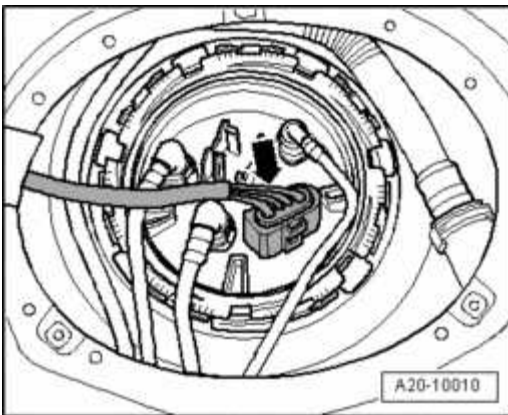


Fig. 66: Disconnecting Electrical Harness Connector At Locking Flange

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - **arrow** - at locking flange.

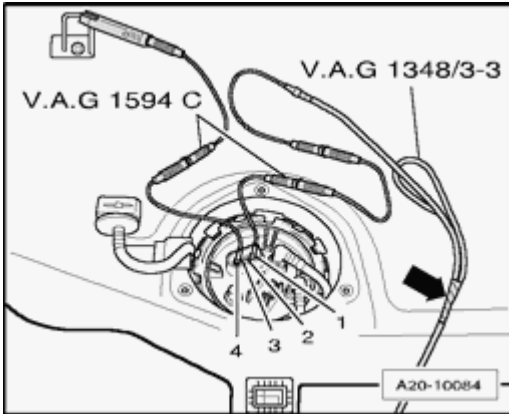


Fig. 67: Connecting Other End Of Hand Held Remote Starter (Jumper) To Vehicle Battery (+)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect remote control V.A.G 1348/3 A with connection V.A.G 1348/3-3 to contact - **1** - using an adapter cable from the connector test set V.A.G 1594 C.
- Using insulating tape, tape over the second contact of adapter cable V.A.G 1348/3-3 to prevent a short circuit - **arrow** -.
- Connect contact - **4** - to vehicle Ground (GND) using a jumper cable from connector test set V.A.G 1594 C.
- Connect alligator clip to vehicle battery (positive).
- Remove fuel filler cap from fuel filler tube.

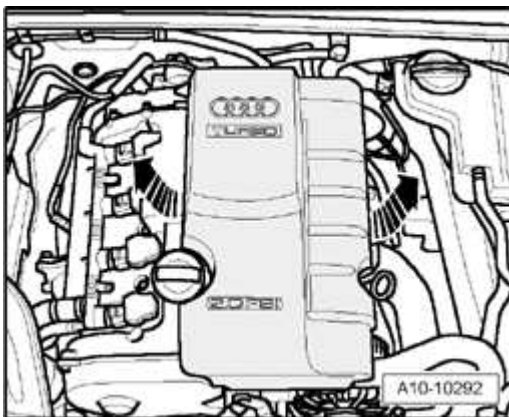


Fig. 68: Removing Engine Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove engine cover - **arrows** -.

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

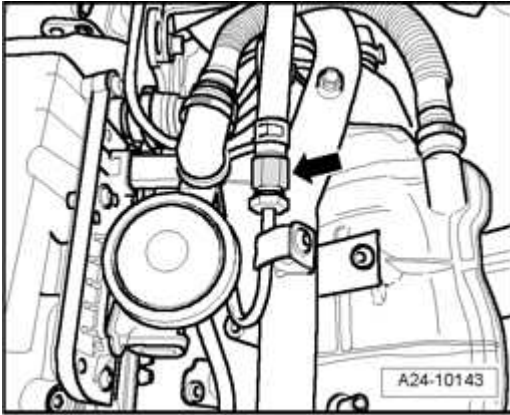


Fig. 69: Disconnecting Fuel Line

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect fuel supply line - **arrow** -.

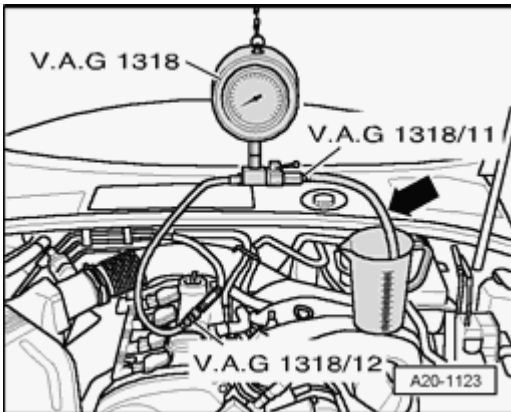


Fig. 70: Connecting Pressure Gauge V.A.G 1318 To Fuel Supply Line Using Adapters V.A.G 1318/11 And V.A.G 1318/12

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Connect pressure gauge V.A.G 1318 to fuel supply line using adapter V.A.G 1318/11 and V.A.G 1318/12.
- Connect bleed hose - **arrow** - to the Pressure Gauge V.A.G 1318 and hold it in a measuring container.
- Open shut-off valve of pressure gauge V.A.G 1318. The shut off valve lever points in the direction of flow.
- Bleed fuel system by pressing remote control briefly.

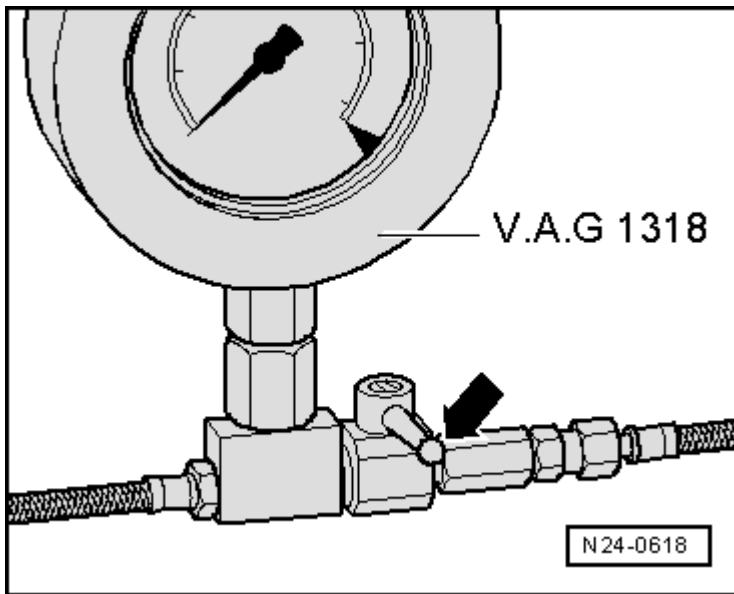


Fig. 71: Locating V.A.G 1318 Shut-Off Tap
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Close shut-off valve on Pressure Gauge V.A.G 1318. The shut off valve lever points in the direction of flow. - **arrow** -.
- Hold switch of the remote control until no more pressure increase is observed on the Pressure Gauge V.A.G 1318.
- Specified value: approx. 6 bar (5 to 7 bar) positive pressure.

If specification is not obtained:

- Check delivery rate of fuel pump --> **20 FUEL SUPPLY** .

Checking residual pressure

- Check for leaks and residual pressure by observing pressure drop on Pressure Gauge V.A.G 1318.
- After 10 minutes there must be a residual pressure of at least 3.75 bar.

The holding pressure drops below 3.75 bar:

- Check connection between fuel Pressure Gauge V.A.G 1318 and fuel line for leaks.
- Check Pressure Gauge V.A.G 1318 for leaks.
- Check fuel lines and their connections for leaks.
- Replace fuel filter with integrated fuel pressure regulator --> **20 FUEL SUPPLY** . Then repeat test.
- If the fuel filter is OK, replace fuel pump --> **20 FUEL SUPPLY** .

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

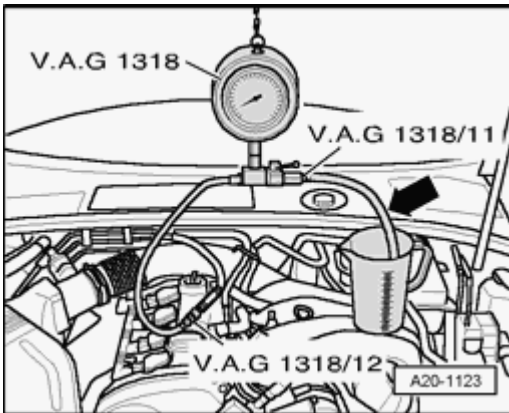


Fig. 72: Connecting Pressure Gauge V.A.G 1318 To Fuel Supply Line Using Adapters V.A.G 1318/11 And V.A.G 1318/12

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Switch off ignition.

NOTE:

- Before disconnecting pressure gauge, release pressure by opening shut-off valve. Hold collecting container in front of hose.

- Tighten fuel supply line (ensure cleanliness).

Torque specifications

Component	Nm
Fuel line to fuel rail	22

HIGH PRESSURE PUMP, ASSEMBLY OVERVIEW

CAUTION: Fuel system is under high pressure! Before opening the system, perform the procedure for releasing fuel pressure. Procedure, see --> Procedure that must be performed before opening the high-pressure fuel injection system - Pay close attention!

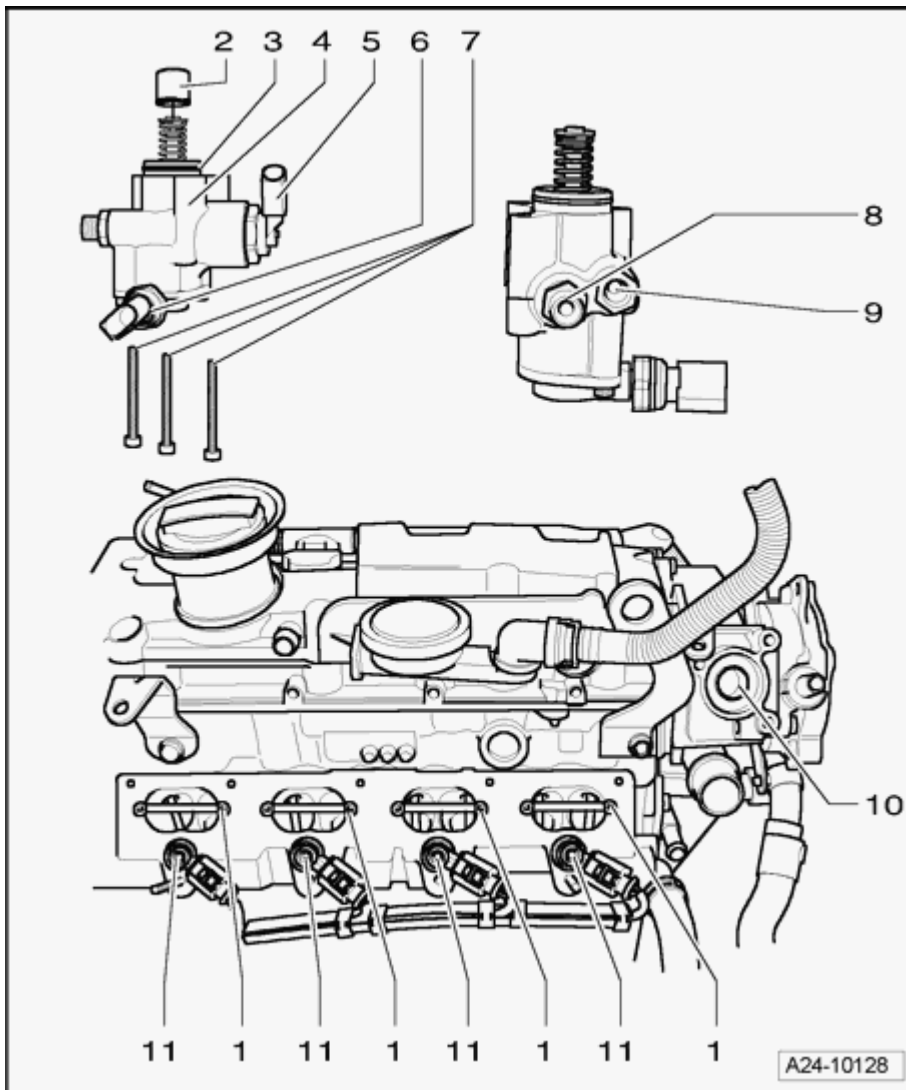


Fig. 73: High Pressure Pump, Assembly Overview
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Air deflector plates

- Removable
- Check for damages and correct positioning

2 - Sleeve

- Remains inserted in cylinder head after removing the high-pressure pump, removable

3 - O-ring

- Always replace

4 - Mechanical single-piston high-pressure pump

- An electrical fuel pump, located in the fuel tank, supplies fuel to the mechanical high-pressure pump at a pressure of approximately. 6 bar.
- When installing the high-pressure pump, make sure that no dirt enters the fuel system.
- The fuel system must be pressureless. Releasing fuel pressure --> **Procedure that must be performed before opening the high-pressure fuel injection system - Pay close attention!**
- Do not install fuel lines with tension
- Removing and installing --> **High pressure pump, removing and installing**

5 - Fuel Pressure Regulator Valve N276**6 - Low Fuel Pressure Sensor G410**

- 15 Nm

7 - Bolts for high-pressure pump

- Torx bolts (Qty. 3)
- 9 Nm

8 - Connection for fuel return line to fuel tank

- Replace bolt
- Tighten connection to 40 Nm (before each installation of the fuel line, check the torque of the connection)
- Do not install fuel line with tension (be aware of cleanliness) Torque specification: 25 Nm

9 - Fuel supply line to fuel rail

- Tighten connection to 30 Nm (before each installation of the fuel line, check the torque of the connection)
- Do not install fuel line with tension (be aware of cleanliness) Torque specification: 30 Nm

10 - Hole in cylinder head for high-pressure pump**11 - Fuel injector**

- Replace O-Rings
- Note correct installation position
- Removing and installing --> **Fuel injectors, removing and installing**

HIGH PRESSURE PUMP, REMOVING AND INSTALLING

CAUTION: Fuel system is under high pressure! Before opening the system, perform

the procedure for releasing fuel pressure. Procedure, see --> Procedure that must be performed before opening the high-pressure fuel injection system - Pay close attention!

NOTE:

- The removal and installation of the high-pressure fuel pump can only be performed on a cold engine.
- When installing the high-pressure fuel pump, make sure that no dirt enters the fuel system.
- Catch escaping fuel with a rag.
- The O-ring must always be replaced.
- High-pressure fuel lines must always be fastened free of tension.

Removing

- Disconnect electrical connectors from Low Fuel Pressure Sensor G410 and from Fuel Pressure Regulator Valve N276 - **1 and 2** -.
- Remove both fuel lines.

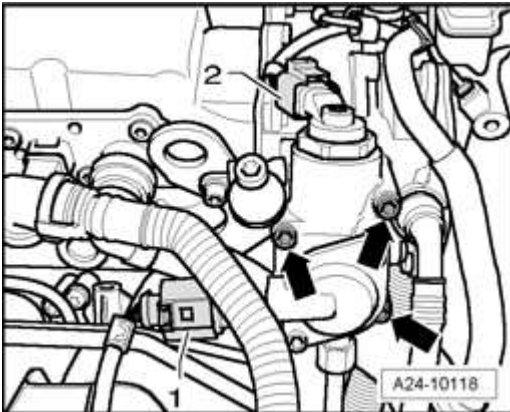


Fig. 74: Identifying Bolts, 3-Pin Connector, Low Fuel Pressure Sensor -G410-, 2-Pin Connector And Fuel Pressure Regulator Valve -N276-

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove 3 bolts - **arrows** -.
- Carefully pull out high-pressure fuel pump. The sleeve may remain inserted in the cylinder head.

Installing

- Replace O-ring for the high-pressure pump.
- Carefully place high-pressure pump with the sleeve into the opening in the cylinder head.
- Tighten bolts in diagonal sequence to 10 Nm.
- Before installing the fuel lines, check the torque of the connections on the high-pressure pump.

Torque specification for the connection of fuel return line: 40 Nm

Torque specification for the connection of fuel supply line: 30 Nm

NOTE:

- **Replace the bolt for the fuel return line**

- Install bolt for the fuel return line hand-tight. Align so it is free of stress.
- Hand-tighten the union nut for the fuel supply line. Align so it is free of stress.

Torque specification for the fuel return line: 25 Nm

Torque specification for the fuel supply line: 30 Nm

- Connect electrical connectors on Low Fuel Pressure Sensor G410 and for Fuel Pressure Regulator Valve N276.

NOTE:

- **Check fuel system for leaks.**

WIRING AND COMPONENTS, CHECKING WITH TEST BOX V.A.G 1598/42**NOTE:**

- The test box is designed with 105 pins. The connection cable can be separated from the test box. This means that as new engine control module (ECM) connectors are introduced in the future, only a new cable must be designed and no longer the entire test box.

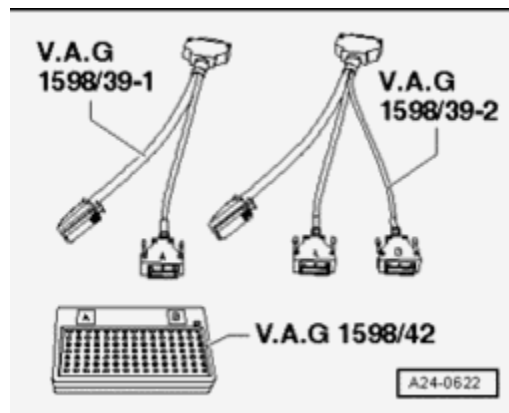


Fig. 75: Connecting Test Box V.A.G 1598/42 To Wiring Harness With Adapter Cable V.A.G 1598/39-1 Or Adapter Cable V.A.G 1598/39-2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The smaller of the two connectors on the engine control module (ECM) is assigned with terminals 1 to 60. The larger of the two connectors is assigned with terminals 1 to 94.
- If a wiring connection to the engine control module (ECM) is to be tested,

use the wiring diagrams to determine through which connector the wire leads to the engine control module (ECM). If it is a wire that leads to the 60-pin connector, e.g. the wire for activating the variable intake manifold valve, (T60/27) then connect the smaller of the two connectors adapter cable V.A.G 1598/391 to the input "A" of the test box V.A.G 1598/42 and measure to Pin 27.

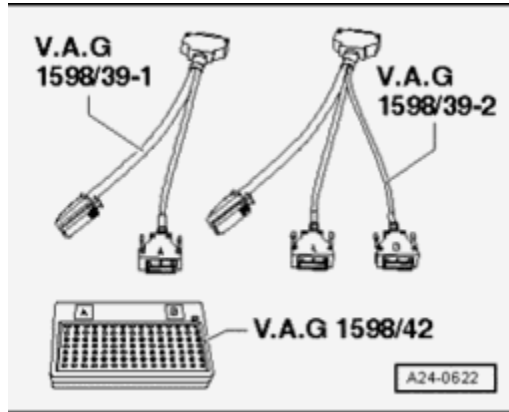


Fig. 76: Connecting Test Box V.A.G 1598/42 To Wiring Harness With Adapter Cable V.A.G 1598/39-1 Or Adapter Cable V.A.G 1598/39-2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If a wiring connection leads to the 94-pin connector according to wiring diagram, connect the larger of the two connectors adapter cable V.A.G 1598/392 as follows. The connector designated with an "A" must be connected to input "A" of the test box V.A.G 1598/42 and the connector "B" must be connected to input "B" of the test box V.A.G 1598/42.
- The test box V.A.G 1598/42 is designed so that it can be connected simultaneously to the engine control module harness and the engine control module itself.
- This is advantageous because electronic engine control remains fully functional (e.g. measurement of signals with engine running) when the test box is attached.
- The procedures will indicate whether the engine control module is to remain connected to the test box or not.

CAUTION: To avoid damaging electronic components, switch to the corresponding measuring range and observe all test conditions before connecting the test leads.

- Remove Engine Control Module (ECM) --> **Engine Control Module (ECM) J623 , replacing.**
- Connect test box V.A.G 1598/42 to wiring harness connector. Ground (GND) clip at test box must be clipped to battery minus. The procedures will indicate whether the engine control module is to be connected to the test box.

- Perform test as described in relevant repair sequences.

Installing engine control module (ECM)

Installation is performed in reverse order.

- Thereafter, the engine control module must be equipped with the metal retainer.
- Clean threaded holes for shear bolts of locking compound residue. Cleaning can be performed with a thread cutter (tap).
- Always use new shear bolts.
- Check DTC memory and, if necessary, erase it. After DTC memory is erased, a readiness code must be generated for the engine control module using "Guided Functions" operating mode.

NOTE:

- When ending Guided Fault Finding, the tester attempts to erase the DTC memory of all control modules. If this is not successful, the remaining DTCs stored in memory must be corrected until all DTCs can be erased.

ENGINE CONTROL MODULE (ECM) J623 , REPLACING

NOTE:

- When connector is disconnected from the Engine Control Module (ECM), adaptation values are erased and content of DTC memory remains intact.

Removing

- Connect Vehicle Diagnostic, Testing and Information System VAS 5051B and select vehicle system "01 - Engine electronics". Thereby, the ignition must be switched on.



Fig. 77: VAS 5051 Tester Displaying Control Module Identification And Coding
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- On the screen of the vehicle diagnostic, testing, and information system VAS 5051B , the control module identification and coding are displayed.
- Allow the control module identification to be displayed and then print it out.

- Switch off ignition.
- Remove the rubber seal of plenum chamber cover in direction of arrow.

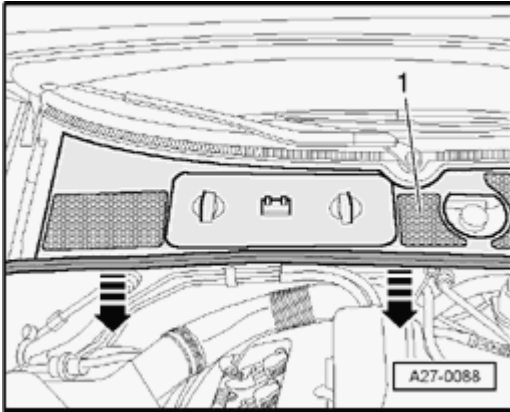


Fig. 78: Identifying Plenum Chamber Cover & Removing Rubber Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove plenum chamber cover - 1 - toward front.
- Pry off both covers - 3 - using a screwdriver.

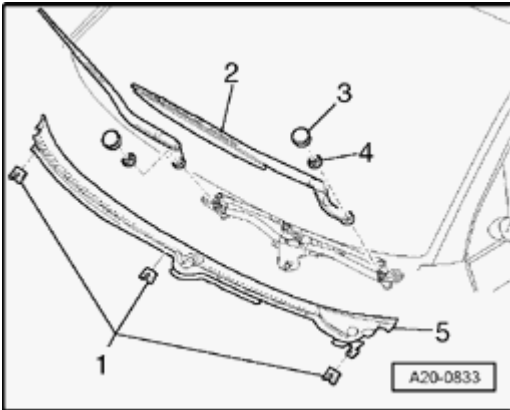


Fig. 79: Removing Securing Clips And Cowl
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Loosen hex-nuts - 4 - by several turns.
- Loosen wiper arms - 2 - from the wiper axle by tilting slightly.
- Remove nuts completely and remove wiper arms.

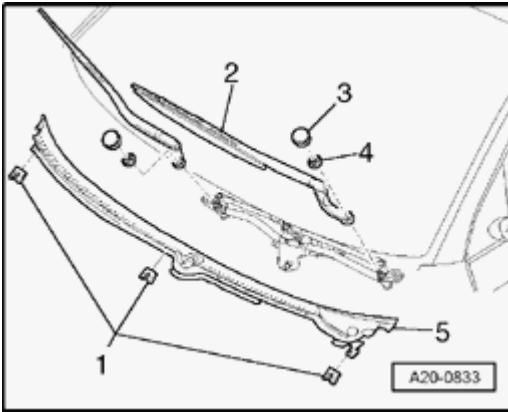


Fig. 80: Removing Securing Clips And Cowl
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove securing clips - 1 - and remove cowl - 5 -.

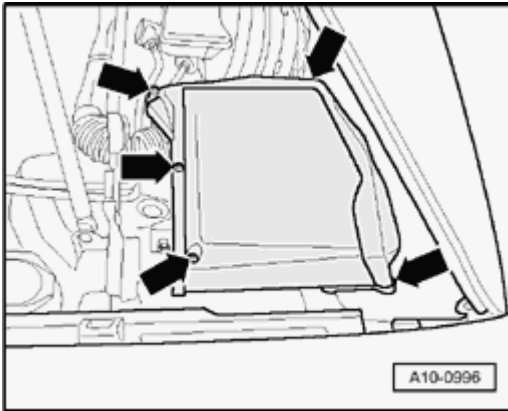


Fig. 81: Removing Screws And Cover From E-Box In Plenum Chamber
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove cover for E-Box in plenum chamber, by removing the bolts - **arrows** -.

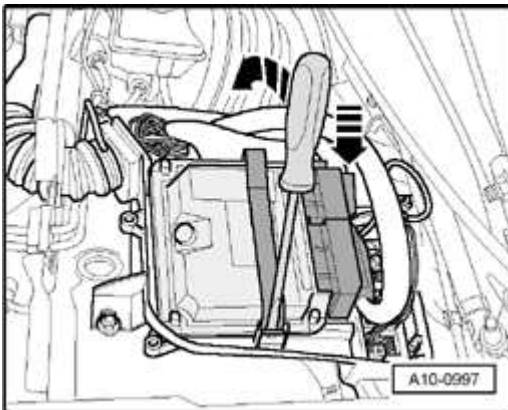


Fig. 82: Using Screwdriver To Remove Retainer Bar And Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Carefully pry off retainer bar with a screwdriver - **arrow** -.

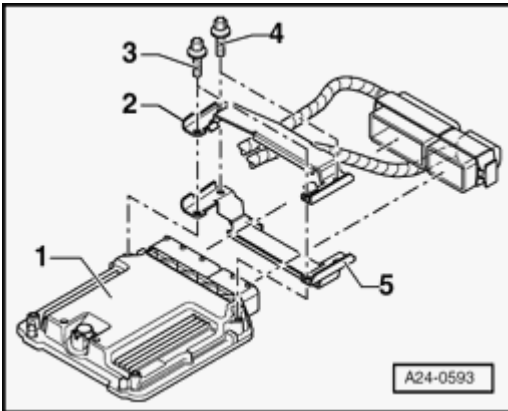


Fig. 83: Removing Protective Housing From Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- To increase difficulty with which the ECM connectors can be accessed, the ECM - **1** - is secured in a metal housing - **5** - with retaining tabs - **2** - and shear bolts - **3 and 4** -.

Special tools, testers and auxiliary items required

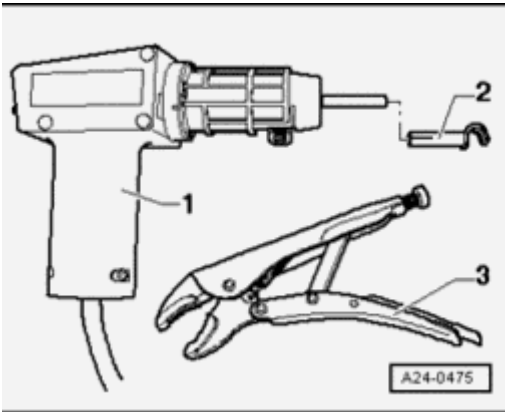


Fig. 84: Heat Gun, Adapter Nozzle And Pliers
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Hot air gun - **1** - from the Wiring Harness Repair Kit VAS 1978A.
- Nozzle attachment - **2** - also from the Wiring Harness Repair Kit VAS 1978A
- Commercially available locking pliers (vise grips)

CAUTION: To prevent damages (burning) of wire and harness connections, insulation and control modules, perform the following work procedures exactly!
Observe operating instructions for heat gun.

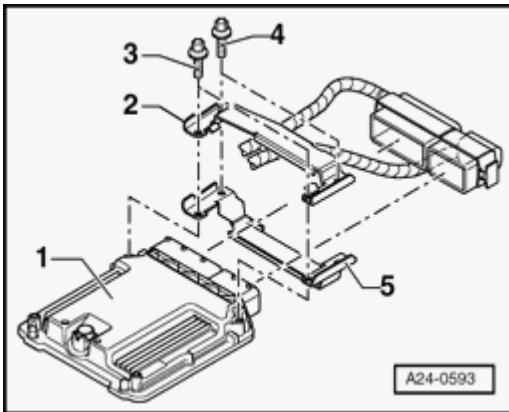


Fig. 85: Removing Protective Housing From Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The threads of the shear bolts - 4 - (that are not installed into the ECM) are coated with a locking compound. For this reason, the threads must be heated with the heat gun to remove both bolts.

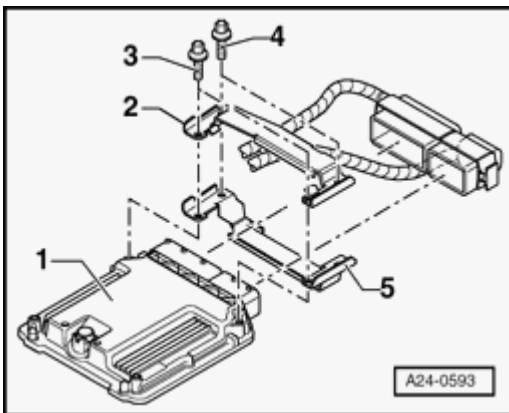


Fig. 86: Removing Protective Housing From Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- The threads of both shear bolts - 3 - (that are installed into the ECM) are not coated with a locking compound. The threads in the ECM housing must not be heated and do not require to be heated (unintentional heating of the ECM).

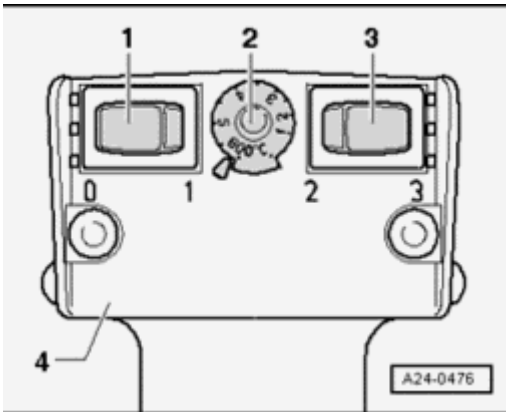


Fig. 87: Performing Adjustments On Hot Air Gun

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Set adjustment on the heat gun as shown in the illustration, with the temperature potentiometer - 2 - set to maximum heat and the two-stage air flow switch - 3 - set to level 3.

NOTE:

- Then, the shear bolts are heated with the heat gun. During this step, the holding effect that the locking compound has on the shear bolt threads is reduced, thereby allowing the shear bolts to be unscrewed easier.
- Cover all painted components to prevent damage that may be caused by the heat gun or the locking pliers.

CAUTION: By heating the shear bolts, parts of the protective housing are heated intensely. Do not burn yourself on this! Make sure that only the shear bolts are heated as much as possible, and not any of the surrounding parts. Possibly cover these parts.

- Direct heat gun nozzle at shear bolt on the retaining tab.

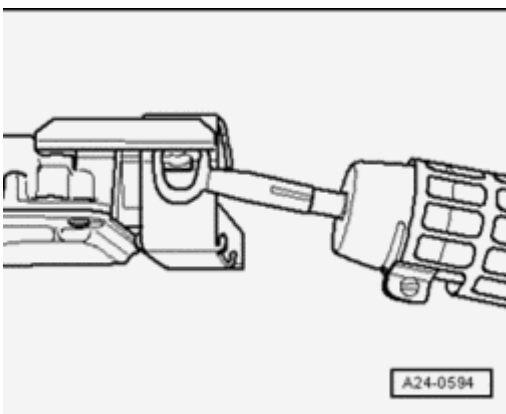


Fig. 88: Using Heat Gun To Direct Heat Gun Nozzle At Shear Bolt Of Retaining Tab

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Switch on heat gun and heat bolt for approximately 20 to 25 seconds.

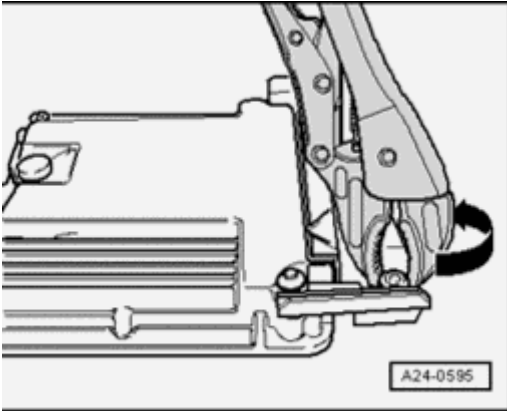


Fig. 89: Using Locking Pliers To Remove Shear Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Then grab bolt head with the locking pliers and unscrew the shear bolt.

The procedure for the second shear bolt is exactly the same.

- Both bolts that are installed into the ECM do not require heating. They can be removed without heat.

Then, the engine control module (ECM) can be separated from the protective housing.

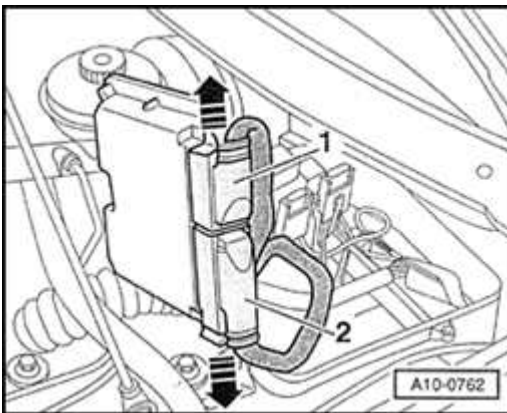


Fig. 90: Disengaging Electrical Connector Retainers And Disconnecting Electrical Connectors From Engine Control Module (ECM) J623
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disengage connector retainers - **arrows** - and disconnect connectors - **1 and 2** - from Engine Control Module (ECM).
- Remove old ECM and install the new ECM.

Installing

Installation is in reverse order of removal, note the following:

- The Engine Control Module (ECM) J623 must be equipped with the metal retainer.
- Clean threaded holes for shear bolts of locking compound residue. Cleaning can be performed with a thread cutter (tap).
- Always use new shear bolts.

After installing a new Engine Control Module (ECM), the following work steps must be performed:

- Activate engine control module (ECM) in "Guided Functions" operating mode under "Replace ECM".

HEATED OXYGEN SENSOR (HO2S) G39 AND OXYGEN SENSOR (O2S) HEATER Z19 BEFORE CATALYTIC CONVERTER, REMOVING AND INSTALLING

Removing

Special tools, testers and auxiliary items required

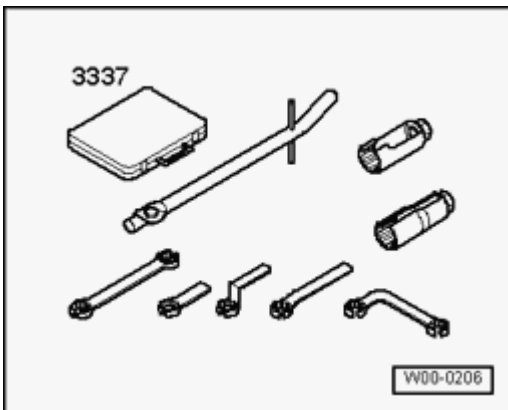


Fig. 91: Identifying Ring Spanner 7-Piece Set 3337
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Ring Spanner 7-piece Set 3337

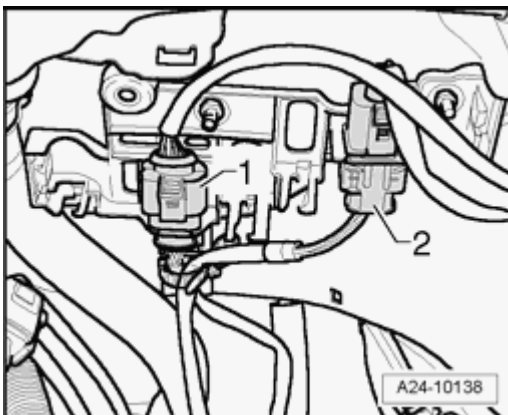


Fig. 92: Disconnecting 4-Pin Electrical Harness Connector From Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical harness connector - 1 - of the Heated Oxygen Sensor (HO2S) G39 and Oxygen Sensor (O2S) Heater Z19.

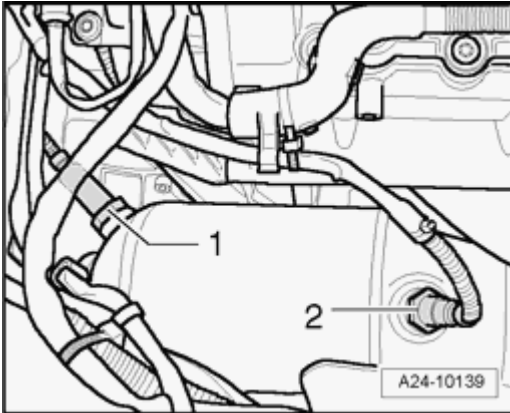


Fig. 93: Identifying Oxygen Sensors
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove Heated Oxygen Sensor (HO2S) G39 - 2 - using a tool from the Ring Spanner 7-piece Set 3337.

Installing

When installing, note the following:

NOTE:

- New oxygen sensors are coated with assembly paste; the paste must not get into slots of oxygen sensor body.
- For a used oxygen sensor, only coat threads with hot bolt paste. This paste must not come into contact with sensor slots. Hot bolt paste
- Wiring connection of oxygen sensor must always be secured in the same position when installing so that contact with the exhaust pipe is avoided.
- Torque specification 55 Nm.

OXYGEN SENSOR (O2S) BEHIND THREE WAY CATALYTIC CONVERTER (TWC) G130 AND OXYGEN SENSOR (O2S) HEATER 1 (BEHIND THREE WAY CATALYTIC CONVERTER (TWC)) Z29 , REMOVING AND INSTALLING

Removing

Special tools, testers and auxiliary items required

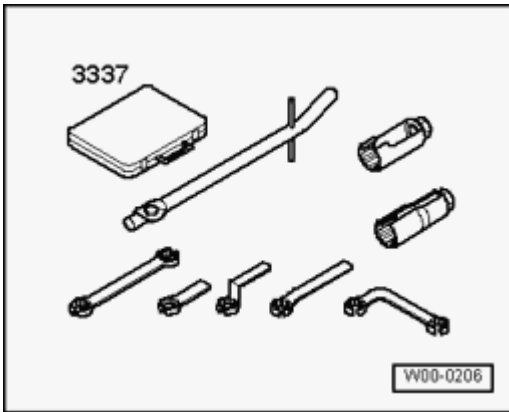


Fig. 94: Identifying Ring Spanner 7-Piece Set 3337
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Ring Spanner 7-piece Set 3337

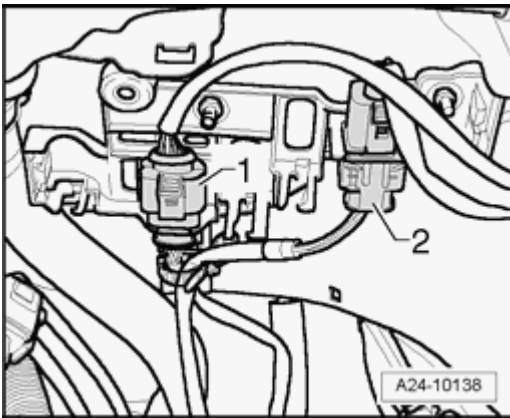


Fig. 95: Disconnecting 4-Pin Electrical Harness Connector From Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect electrical connector - 2 - (brown connector) on Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130.

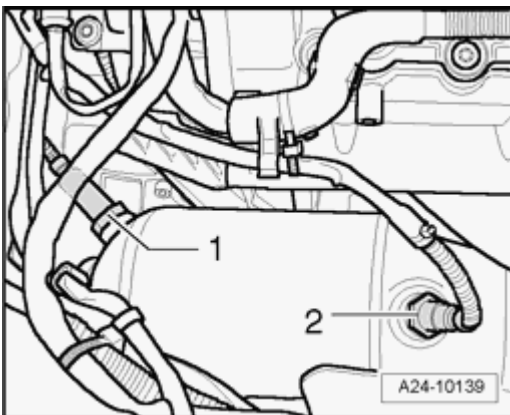


Fig. 96: Identifying Oxygen Sensors**Courtesy of VOLKSWAGEN UNITED STATES, INC.**

- Remove Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) G130 - **1** - using the tool from the Ring Spanner 7-piece Set 3337.

Installing

When installing, note the following:

NOTE:

- New oxygen sensors are coated with assembly paste; the paste must not get into slots of oxygen sensor body.
- For a used oxygen sensor, only coat threads with hot bolt paste. This paste must not come into contact with sensor slots. Hot bolt
- Wiring connection of oxygen sensor must always be secured in the same position when installing so that contact with the exhaust pipe is avoided.
- Torque specification 55 Nm.

28 - IGNITION/GLOW PLUG SYSTEM

IGNITION SYSTEM, CHECKING

Ignition system, general information

- The engine control module is equipped with On Board Diagnostics (OBD).
- For the electric components to work properly, a voltage of at least 11.5 Volts is required.
- It is possible that the control module will recognize a malfunction and store a DTC during some tests. Therefore after completing all checks and repairs the DTC memory must be checked and if necessary erased.
- If the engine only starts briefly and then turns off again after troubleshooting, repair or checking of the components, it may be that the immobilizer is blocking the Engine Control Module (ECM). DTC memory must then be checked and if necessary, control module must be adapted.

Safety precautions

CAUTION:

- Test and measuring equipment must always be secured to the rear seat and be operated from there by a second person.
- If test and measuring instruments are operated from the front passengers seat and the vehicle is involved in an accident, there is a possibility that the person sitting in this seat may receive serious injuries when the airbag is triggered.

To reduce the risk of personal injury and/or damage to the fuel injection and ignition system, always observe the following:

- Do not touch or remove ignition wires when engine is running or turning at starter speed.
- Always switch ignition off before disconnecting or reconnecting wires for the ignition system, including high voltage wiring and test leads.
- If engine is to be cranked at starting RPM without starting (e.g. for compression testing), disconnect connectors from ignition coils and from fuel injectors. After performing work, check and erase DTC memory.
- Cleaning the engine should only be performed with ignition switched off.
- The battery must only be disconnected and connected with the ignition switched off, since the Engine Control Module (ECM) can otherwise be damaged.

Technical data, Ignition

Engine data	2.0L/125 kW/147 kW/162 kW Turbo FSI engine
Idle speed Idle speed cannot be adjusted, it is regulated by idle stabilization	640 to 800 RPM

2005 Audi A4 Quattro

ENGINE PERFORMANCE 2.0 Liter 4-Cyl. 4V Turbo Fuel Injection Ignition, Engine Code(s): BPG, BWT

RPM limited by switching off fuel injectors and closing throttle valve	approx. 6500 RPM
Ignition timing is regulated by control module. It is not possible to adjust the ignition timing.	
Ignition system	Single coil ignition system with 4 ignition coils (output stages integrated), that are connected directly to spark plugs via the ignition cables; The ignition coils can be pulled out of the cylinder head using Ignition Coil Puller T40039
Ignition sequence	1-3-4-2

Ignition system, assembly overview

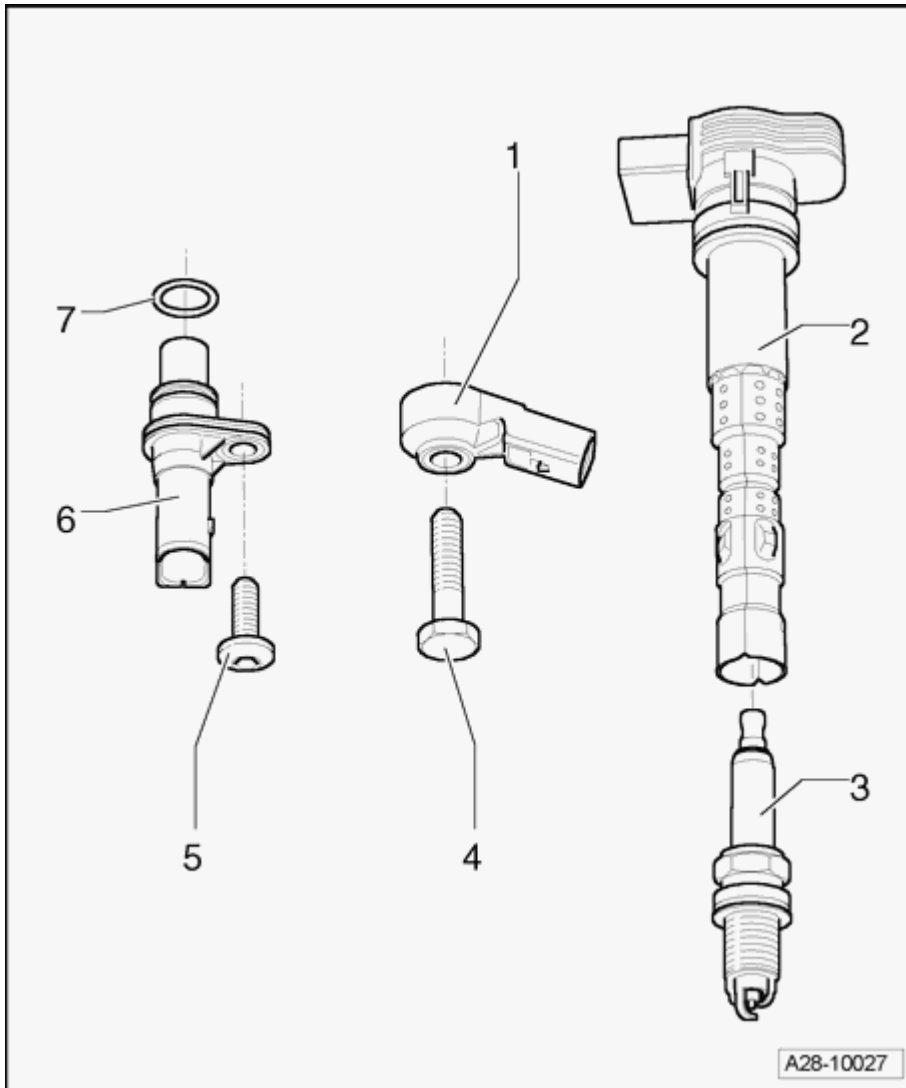


Fig. 97: Ignition System, Assembly Overview

Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Knock Sensor (KS) 1 G61 and Knock Sensor (KS) 2 G66

- Contacts gold plated

2 - Ignition coil with power output stage (N70, N127, N291, N292)

- Removing and installing --> **Ignition coils with power output stage, removing and installing**
- To remove, use the ignition coil puller T40039

3 - Spark plug

- 30 Nm
- Removing and installing -->

- **01 - MAINTENANCE**
- **01 - MAINTENANCE** for MAINTENANCE PROCEDURES - CABRIOLET

4 - Bolt

- 20 Nm
- Tightening torque affects function of Knock Sensors (KS)

5 - Bolt

- 10 Nm

6 - Camshaft Position (CMP) sensor G40

- Contacts gold plated

7 - O-ring

- If damaged, replace O-ring

Ignition coils with power output stage, removing and installing

Special tools, testers and auxiliary items required

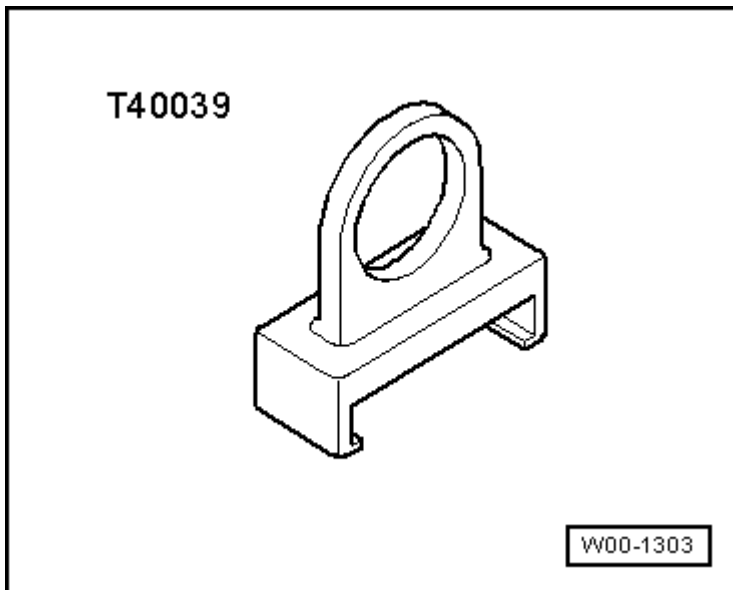


Fig. 98: Identifying Ignition Coil Puller T40039
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Ignition Coil Puller T40039

Removing:

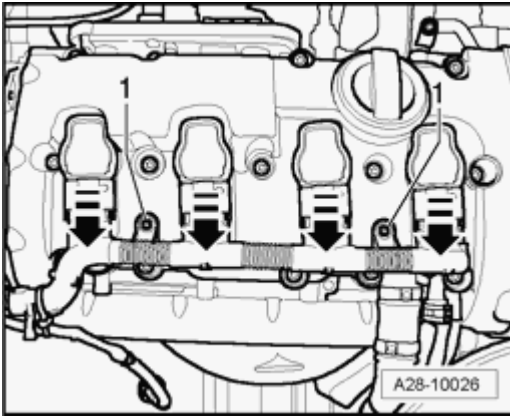


Fig. 99: Removing Ignition Coils With Power Output Stage N70, N127, N291, N292 Electrical Harness Screws

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Remove both bolts - **1** - from the connector strip.

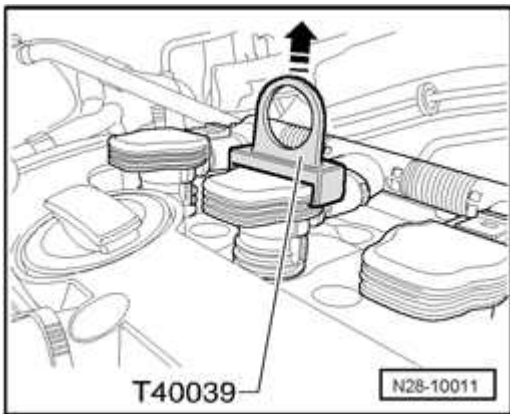


Fig. 100: Pulling All Ignition Coils Using Ignition Coil Puller T40039

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Pull all ignition coils approximately 30 mm out of spark plug shaft using Ignition Coil Puller T40039.

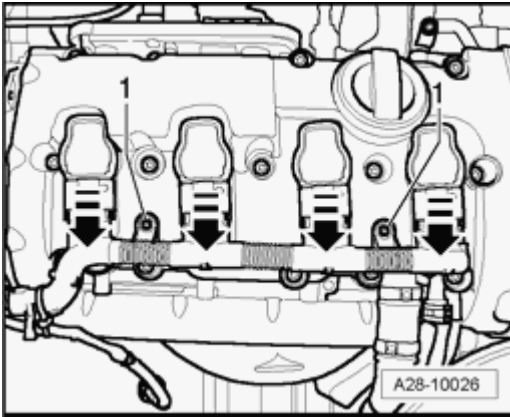


Fig. 101: Removing Ignition Coils With Power Output Stage N70, N127, N291, N292 Electrical Harness Screws

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Release connectors and pull all connectors simultaneously off from the ignition coils.

Installing:

- Insert all ignition coils loosely into spark plug shaft.

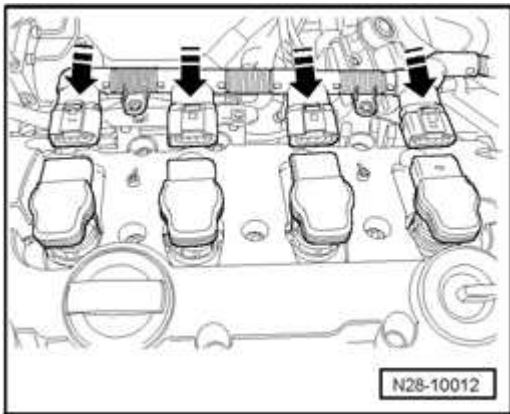


Fig. 102: Connecting Connectors To Ignition Coils

Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Align ignition coils to the connectors and then connect all of the connectors onto the ignition coils.
- Press ignition coils uniformly onto the spark plugs by hand (do not use an impact tool).