EMISSION CONTROL SYSTEM

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ON-BOARD DIAGNOSTICS—2.5L DIESEL ENGINE

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GENERAL INFORMATION

SYSTEM DESCRIPTION—2.5L DIESEL ENGINE

The 2.5L diesel MSA controller and Powertrain Control Module (PCM) monitor and control many different circuits in the fuel injection pump and engine systems. If the MSA senses a problem with a monitored circuit that indicates an actual problem, a Diagnostic Trouble Code (DTC) will be stored in the PCM's memory, and eventually may illuminate the Diesel Glow Plug lamp constantly while the key is on. If the problem is repaired, or is intermittent, the PCM will erase the DTC after 40 warm-up cycles. A warm-up cycle consists of starting the vehicle when the engine is cold, then the engine to warms up to a certain temperature, and finally, the engine temperature falls to a normal operating temperature, then the key is turned off.

Certain criteria must be met for a DTC to be entered into PCM memory. The criteria may be a specific range of engine rpm, engine or fuel temperature and/or input voltage to the PCM. A DTC indicates that the PCM has identified an abnormal signal in a circuit or the system. A DTC may indicate the result of a failure, but never identify the failed component directly.

There are several operating conditions that the MSA does not monitor and set a DTC for. Refer to the following Monitored Circuits and Non–Monitored Circuits in this section.

DESCRIPTION AND OPERATION

MONITORED CIRCUITS

The MSA can detect certain problems in the electrical system.

Open or Shorted Circuit – The MSA can determine if sensor output (which is the input to MSA is within proper range. It also determines if the circuit is open or shorted.

Output Device Current Flow – The MSA senses whether the output devices are electrically connected.

If there is a problem with the circuit, the MSA senses whether the circuit is open, shorted to ground (–), or shorted to (+) voltage.

NON–MONITORED CIRCUITS

The MSA does not monitor the following circuits, systems or conditions that could have malfunctions that result in driveability problems. A DTC will not be displayed for these conditions.

Fuel Pressure: Fuel pressure is controlled by the fuel injection pump. The PCM cannot detect problems in this component.

Cylinder Compression: The MSA cannot detect uneven, low, or high engine cylinder compression.

Exhaust System: The MSA cannot detect a plugged, restricted or leaking exhaust system.

Fuel Injector Malfunctions: The MSA cannot determine if the fuel injector is clogged, or the wrong injector is installed. The fuel injectors on the diesel engine are **not controlled** by the MSA, although a defective fuel injector sensor **is monitored** by the PCM.

GENERAL INFORMATION (Continued)

Vacuum Assist: Leaks or restrictions in the vacuum circuits of vacuum assisted engine control system devices are not monitored by the MSA.

MSA System Ground: The MSA cannot determine a poor system ground. However, a DTC may be generated as a result of this condition.

MSA/PCM Connector Engagement: The MSA cannot determine spread or damaged connector pins. However, a DTC may be generated as a result of this condition.

HIGH AND LOW LIMITS

The MSA compares input signal voltages from each input device. It will establish high and low limits that are programmed into it for that device. If the input voltage is not within specifications and other DTC criteria are met, a DTC will be stored in memory. Other DTC criteria might include engine rpm limits or input voltages from other sensors or switches. The other inputs might have to be sensed by the MSA when it senses a high or low input voltage from the control system device in question.

DESCRIPTION AND OPERATION

DIAGNOSTIC TROUBLE CODES

On the following pages, a list of DTC's is provided for the 2.5L diesel engine. A DTC indicates that the PCM has recognized an abnormal signal in a circuit or the system. A DTC may indicate the result of a failure, but most likely will not identify the failed component directly.

ACCESSING DIAGNOSTIC TROUBLE CODES

A stored DTC can be displayed through the use of the DRB III scan tool. The DRB III connects to the data link connector. The data link connector is located under the instrument panel near bottom of the steering column (Fig. 1).

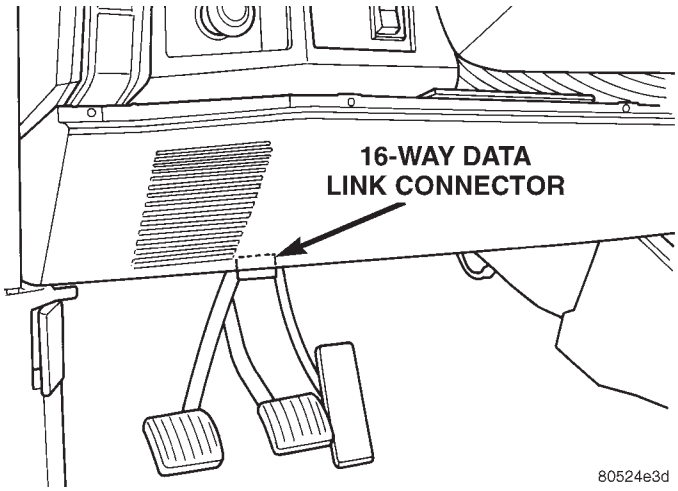

Fig. 1 Data Link Connector Location—Typical

ERASING TROUBLE CODES

After the problem has been repaired, use the DRB III scan tool to erase a DTC.

DESCRIPTION AND OPERATION (Continued)

MSA CONTROLLER DRBIII CODES

Generic Scan Tool Code	DRB III Scan Tool Display
P0100	Mass of Volumes of Air Flow Plausibility Mass of Volumes of Air Flow Signal High Exceeded Mass of Volumes of Air Flow Signal Low Exceeded
P0115	Temperature of Engine Coolant SRC High Exceeded Temperature of Engine Coolant SRC Low Exceeded
P0180	Fuel Temperature Sensor SRC High Exceeded Fuel Temperature Sensor SRC Low Exceeded
P0400	EGR Open Circuit EGR Short Circuit
P0500	Vehicle Speed Sensor PEC Frequency Too High Vehicle Speed Sensor Signal High Exceeded Vehcle Speed Sensor Plausibility
P0725	Engine Speed Sensor Dynamic Plausibility Engine Speed Sensor Over Speed Recognition Engine Speed Sensor Static Plausibilty
P1105	Atmospheric Pressure Sensor SRC High Exceeded Atmospheric Pressure Sensor SRC Low Exceeded
P1201	Needle Movement Sensor High Exceeded Needle Movement Sensor Low Exceeded
P1220	Fuel Quantity Actuator Neg. Gov. Deviation Cold Fuel Quantity Actuator Neg. Gov. Deviation Warm Fuel Quantity Actuator Pos. Gov. Deviation Cold Fuel Quantity Actuator Pos. Gov. Deviation Warm
P1225	Control Sleeve Sensor Signal High Exceeded Control Sleeve Sensor Start End Pos. Not Attained Control Sleeve Sensor Stop End Pos. Not Attained
P1230	Timing Control Negative Governing Governor Deviation Timing Control Positive Governing Governor Deviation
P1515	Accelerator Pedal Postion Sensor Signal High Exceeded Accelerator Pedal Sensor Signal Low Exceeded Accelerator Pedal Sensor Signal PWG Plaus With Low Idle Switch Accelerator Pedal Sensor Signal PWG Plaus With Potentiometer
P1600	Battery Voltage SRC High Exceeded
P1605	Terminal #15 Plausibility After Startup
P1610	Regulator Lower Regulator Limit

DESCRIPTION AND OPERATION (Continued)

Generic Scan Tool Code	DRB III Scan Tool Display
	Regulator Upper Regulator Limit
P1615	Microcontroller Gate-Array Monitoring Microcontroller Gate-Array Watchdog Microcontroller Prepare Fuel Quantity Stop Microcontroller Recovery Was Occurred Microcontrller Redundant Overrun Monitoring
P1630	Solenoid Valve Controller Open Circuit Solenoid Valve Controller Short Circuit
P1635	Glow Relay Controller Open Circuit Glow Relay Controller Short Circuit
P1650	Diagnostic Lamp Open Circuit Diagnostic Lamp Short Circuit
P1660	Redundant Emer. Stop Plausibility In After-Run Redundant Emer Stop Powerstage Defective
P1665	Cruise Status Indicator Lamp Short Circuit
P1680	EEPROM Plausibility Checksum Error for Adj. EEPROM Plausibility Checksum Error in CC212 EEPROM Plausibility Communication With EEPROM EEPROM Plausibility Func. Switch Wrong or Missing EEPROM Plausibility Ver Number Not Corresponding
P1685	Vehicle Theft Alarm Code Line Breakdown
P1703	Brake Signal Plaus With Redundant Contact
P1740	Clutch Signal Plausibilty
P1725	Inductive Aux. Speed Sensor Dynamic Plausibilty Inductive Aux. Speed Sensor Overspeed Recognition Inductive Aux Speed Sensor Plausibilty Inductive Aux. Speed Sensor Static Plausibilty

PCM DRBIII CODES

Generic Scan Tool Code	DRBIII Scan Tool Display
P0117	Engine Coolant Volts Lo
P0118	Engine Coolant Volts Hi
P0500	Vehicle Speed Signal
P0601	Internal Self Test
P1296	5 VDC Output
P1391	Loss of Cam or Crank

EXHAUST EMISSION CONTROLS—2.5L DIESEL ENGINE

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DESCRIPTION AND OPERATION

VACUUM HOSE ROUTING SCHEMATIC

Vacuum for the EGR system is supplied by the internal engine mounted vacuum pump. Refer to EGR System Operation for vacuum pump information. Vacuum harness routing for emission related components is displayed in (Fig. 1).

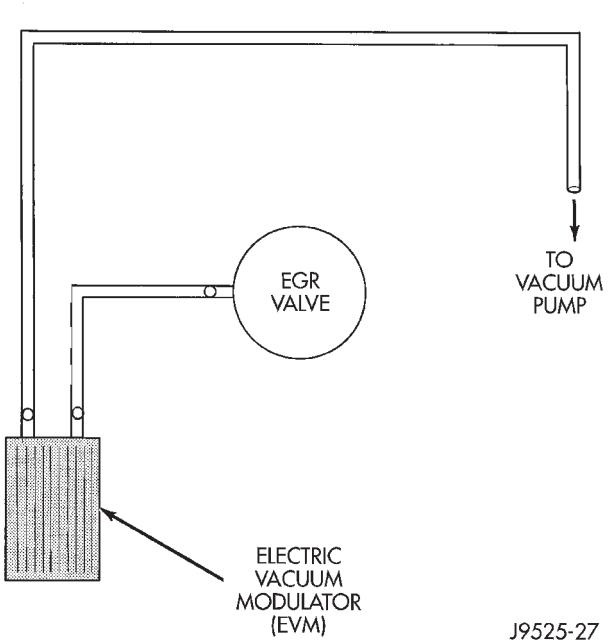

Fig. 1 Typical Hose Routing

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

GENERAL INFORMATION

The EGR system reduces oxides of nitrogen (NOx) in the engine exhaust. This is accomplished by allowing a predetermined amount of hot exhaust gas to recirculate and dilute the incoming fuel/air mixture.

A malfunctioning EGR system can cause engine stumble, sags or hesitation, rough idle, engine stalling and poor driveability.

EGR SYSTEM OPERATION

The system consists of:

- An EGR valve assembly. The valve is located behind the intake manifold (Fig. 2).

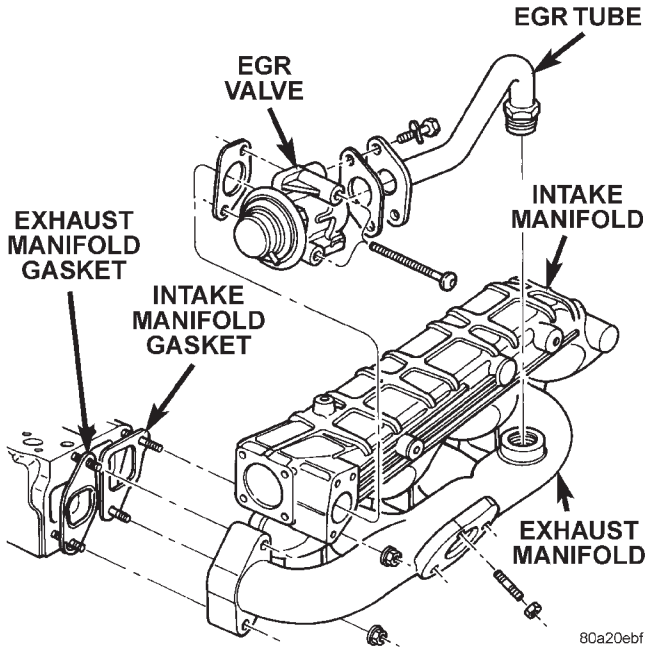

Fig. 2 EGR Valve and Tube Location

- An Electric Vacuum Modulator (EVM). The EVM is sometimes referred to as the EGR control solenoid or EGR duty cycle solenoid. The EVM serves two different functions. One is to control vacuum bleed–off of the EGR valve. The other is to control the “on time” of the EGR valve.
- The MSA operates the EVM. The MSA is located is located inside the vehicle in the center consule.
- An EGR tube (Fig. 2) connecting a passage in the EGR valve to the rear of the exhaust manifold.

DESCRIPTION AND OPERATION (Continued)

• The vacuum pump supplies vacuum for the EVM and the EGR valve. This pump also supplies vacuum for operation of the power brake booster. The pump is located internally in the front of the engine block (Fig. 3) and is driven by the crankshaft gear.

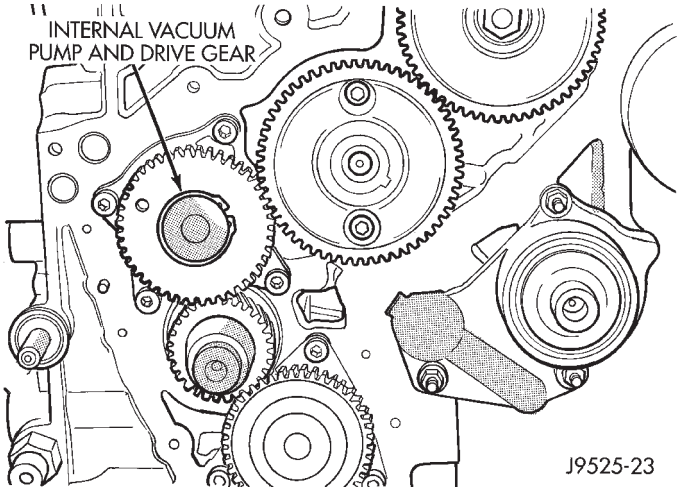

Fig. 3 Internal Vacuum Pump

• Vacuum lines and hoses to connect the various components.

When the MSA supplies a variable ground signal to the EVM, EGR system operation starts to occur. The MSA will monitor and determine when to supply and remove this variable ground signal. This will depend on inputs from the engine coolant temperature, throttle position and engine speed sensors.

When the variable ground signal is supplied to the EVM, vacuum from the vacuum pump will be allowed to pass through the EVM and on to the EGR valve with a connecting hose.

Exhaust gas recirculation will begin in this order when:

• The MSA determines that EGR system operation is necessary.

• The engine is running to operate the vacuum pump.

• A variable ground signal is supplied to the EVM.

• Variable vacuum passes through the EVM to the EGR valve.

• The inlet seat (poppet valve) at the bottom of the EGR valve opens to dilute and recirculate exhaust gas back into the intake manifold.

The EGR system will be shut down by the MSA after 60 seconds of continuous engine idling to improve idle quality.

DIAGNOSIS AND TESTING

EGR GAS FLOW TEST

Refer to the 1998 XJ/ZG Diesel Powertrain Diagnostic Manual for complete test procedure.

EGR SOLENOID TEST

VACUUM TEST

With the engine running, disconnect the vacuum supply line at the fitting on the EVM. Minimum vacuum should be no less than 20 inches. If vacuum is lower, check for leaks in vacuum supply line. If leaks cannot be found, check for low vacuum at vacuum pump. Refer to Group 5, Brake System for procedures.

REMOVAL AND INSTALLATION

EGR VALVE

REMOVAL

(1) Remove the rubber hose from turbocharger to metal tube.

(2) Disconnect vacuum line at EGR valve vacuum supply fitting (Fig. 2).

(3) Loosen the tube fitting at exhaust manifold end of EGR tube (Fig. 2).

(4) Remove the two bolts retaining the EGR tube to the side of EGR valve (Fig. 2).

(5) Remove the two EGR valve mounting bolts (Fig. 2) and remove EGR valve.

(6) Discard both of the old EGR mounting gaskets.

INSTALLATION

(1) Clean the intake manifold of any old gasket material.

(2) Clean the end of EGR tube of any old gasket material.

(3) Position the EGR valve and new gasket to the intake manifold.

(4) Install two EGR valve mounting bolts. Do not tighten bolts at this time.

(5) Position new gasket between EGR valve and EGR tube.

(6) Install two EGR tube bolts. Tighten all four mounting bolts to 23 N·m (204 in. lbs.).

(7) Tighten EGR tube fitting at exhaust manifold.

(8) Connect vacuum line to EGR valve.

(9) Install the rubber hose from turbocharger to metal tube.

EGR TUBE

The EGR tube connects the EGR valve to the rear of the exhaust manifold (Fig. 2).

REMOVAL

(1) Remove rubber hose from turbocharger to metal tube.

(2) Remove two EGR tube mounting bolts at EGR valve end of tube (Fig. 2).

REMOVAL AND INSTALLATION (Continued)

(3) Loosen fitting at exhaust manifold end of tube (Fig. 2).
(4) Remove EGR tube and discard old gasket.
(5) Clean gasket mating surfaces and EGR tube flange gasket surfaces.
(6) Check for signs of leakage or cracked surfaces at both ends of tube, exhaust manifold and EGR valve.

INSTALLATION

(1) Install a new gasket to EGR valve end of EGR tube.
(2) Position EGR tube to engine.
(3) Loosely tighten fitting at exhaust manifold end of tube.
(4) Install 2 mounting bolts at EGR valve end of tube. Tighten bolts to 23 N·m (204 in. lbs.) torque.
(5) Tighten fitting at exhaust manifold end of tube.
(6) Install hose from turbocharger to metal tube.

ELECTRIC VACUUM MODULATOR (EVM)

The EVM (EGR Duty Cycle Purge Solenoid) is mounted to the side of the PDC.

REMOVAL

(1) Disconnect both cables from battery, negative cable first.
(2) Remove 2 screws holding PDC to bracket, swing out of way.
(3) Remove nut and clamp holding battery to battery tray (Fig. 4).
(4) Remove battery from vehicle.
(5) Disconnect two vacuum hoses at EVM.
(6) Remove mounting screws of EVM.
(7) Remove the EVM to gain access to the EVM electrical connector.
(8) Remove electrical connector at EVM.

INSTALLATION

(1) Install electrical connector to EVM.
(2) Install EVM and tighten mounting screws.

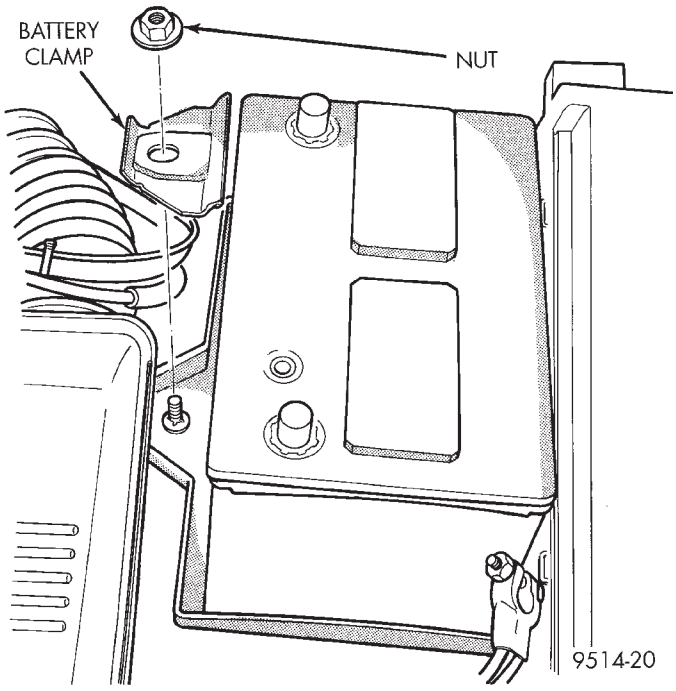

Fig. 4 Battery Clamp

(3) Connect vacuum hoses.
(4) Install PDC to bracket and tighten mounting screws.
(5) Install battery.
(6) Connect battery cables positive first.

SPECIFICATIONS

TORQUE CHART—2.5L DIESEL

Description	Torque
EGR Valve Mounting Bolts	23 N·m (204 in. lbs.)
EGR Tube Mounting Bolts	23 N·m (204 in. lbs.)
EVM (Electric Vacuum Modulator) Mounting Bolt	2 N·m (20 in. lbs.)