

- The ignition timing
- The on-board diagnostics for powertrain functions

The PCM constantly monitors the information from various sensors and controls the systems that affect vehicle performance and emissions. The PCM also performs the diagnostic functions for those systems. The PCM can recognize operational problems and alert the driver through the malfunction indicator lamp (MIL) when a malfunction has occurred. When a malfunction is detected, the PCM stores a diagnostic trouble code (DTC) which helps to identify problem areas. This is done to aid the technician in making repairs.

The PCM supplies either 5.0 or 12.0 volts to power various sensors and switches. This is done through resistances in the PCM. The resistance is so high in value that a test lamp does not illuminate when connected to the circuit. In some cases, even an ordinary shop voltmeter does not give an accurate reading because the voltmeters resistance is too low. Therefore, a DMM with a minimum of 10 megaohms input impedance is required to ensure accurate voltage readings.

The PCM controls output circuits such as the fuel injectors, the idle air control (IAC), the cooling fan relays, etc. by controlling the ground or the power feed circuit through transistors or a device called an output driver module.

Torque Management

Torque management is a function of the PCM that reduces engine power under certain conditions. Torque management is performed for the following reasons:

1. To prevent over-stressing the powertrain and driveline components
2. To prevent damage to the vehicle during certain abusive maneuvers
3. To reduce engine speed when the IAC is out of the normal operating range

The PCM monitors the following sensors and engine parameters in order to calculate engine output torque:

- The air/fuel ratio
- The mass air flow (MAF) sensor
- The manifold absolute pressure (MAP) sensor
- The intake air temperature (IAT) sensor
- The spark advance
- The engine speed
- The engine coolant temperature (ECT) sensor
- The A/C clutch status

The PCM monitors the torque converter status, the transmission gear ratio, and the engine speed in order to determine if torque reduction is required. The PCM retards the spark as appropriate to reduce engine torque output if torque reduction is required. The PCM also shuts OFF the fuel to certain injectors in order to reduce the engine power in the case of an abusive maneuver.

The following are instances when engine power reduction is likely to be experienced:

- During transmission upshifts and downshifts

- During heavy acceleration from a standing start
- When the clutch pedal is released too quick under a heavy load, 6.0L only
- When one set of drive axles loses traction while the other set of drive axles are not moving, 4 Wheel Drive only and in 4WD low
- If the IAC is out of the normal operating range, except 6.0L
- When the driver is performing harsh or abusive maneuvers such as shifting into gear at high throttle angles or shifting the transmission from reverse to drive to create a rocking motion

The driver is unlikely to notice the torque management actions in the first 2 instances. The engine power output is moderate at full throttle in the other cases.

The PCM calculates the amount of spark retard necessary to reduce the engine power by the desired amount. The PCM disables the fuel injectors for cylinders 1, 4, 6, and 7 in the case of an abusive maneuver.

PCM Function

The PCM supplies a buffered voltage to various sensors and switches. The PCM controls most components with electronic switches which complete a ground circuit when turned ON.

Use of Circuit Testing Tools

Do not use a test lamp in order to diagnose the powertrain electrical systems unless specifically instructed by the diagnostic procedures. Use the [J 35616-A](#) Connector Test Adapter Kit whenever diagnostic procedures call for probing any connectors.

Basic Knowledge Required

Without a basic knowledge of electricity, you will have difficulty using the diagnostic procedures contained in this section. You should understand the basic theory of electricity and know the meaning of voltage--volts, current--amps, and resistance--ohms. You should understand what happens in a circuit with an open or a shorted wire. You should be able to read and understand a wiring diagram.

PCM Service Precautions

The PCM is designed to withstand normal current draws associated with vehicle operations. Avoid overloading any circuit. When testing for opens or shorts, do not ground any of the PCM circuits unless instructed. When testing for opens or shorts, do not apply voltage to any of the PCM circuits unless instructed. Only test these circuits with a DMM while the PCM connectors remain connected.

Aftermarket (Add-On) Electrical And Vacuum Equipment

Aftermarket, add-on electrical and vacuum equipment is defined as any equipment installed on a vehicle after leaving the factory that connects to the vehicles electrical or vacuum systems. No allowances have been made in the vehicle design for this type of equipment.

Notice: Do not attach add-on vacuum operated equipment to this vehicle. The use of add-on vacuum equipment may result in damage to vehicle components or systems.