DESCRIPTION AND OPERATION

Electronic Engine Controls

The electronic engine controls consist of the following:

- Powertrain control module (PCM)
- Throttle position (TP) sensor
- Camshaft position (CMP) sensor
- Crankshaft position (CKP) sensor
- Mass air flow (MAF) sensor
- Heated oxygen sensors (HO2S)
- Catalyst monitor sensors (CMS)
- Knock sensor (KS)
- Fuel rail pressure and temperature sensor
- Engine coolant temperature (ECT) sensor — 4.0L SOHC only
- Cylinder head temperature (CHT) sensor — 4.6L (3V) only
- Charge motion control valve (CMCV) — 4.6L (3V) only
- Engine oil temperature sensor — 4.6L (3V) only
- Variable camshaft timing (VCT) oil control solenoid — 4.6L (3V) only

The PCM carries out the following:

- accepts input from various engine sensors to compute the fuel flow rate necessary to maintain a prescribed air/fuel ratio throughout the entire engine operational range.
- outputs a command to the fuel injectors to meter the appropriate quantity of fuel.

The TP sensor:

- sends the PCM a signal indicating the throttle plate angle.
- is the main input to the PCM from the driver.

The CMP sensor:

- sends the PCM a signal indicating camshaft position used for fuel synchronization.

The CKP sensor:

- sends the PCM a signal indicating crankshaft position.
- is essential for calculating spark timing.

The MAF sensor:

- uses a hot wire sensing element to measure the amount of air entering the engine. Air passing over the hot wire causes it to cool.

The HO2S:

- creates a voltage signal dependent on exhaust oxygen content.
- provides feedback information to the PCM used to calculate fuel delivery.

The CMS:

- monitors oxygen content after it flows through the catalytic converter.
- provides a voltage to the PCM used to calculate catalytic converter integrity.

The KS:

- is used to detect engine detonation.
- sends a voltage signal to the PCM.
- is able to provide a signal which retards the ignition timing, as necessary.

The fuel rail pressure and temperature sensor:

- measures the pressure and temperature of the fuel rail and sends these signals to the PCM.
- uses intake manifold vacuum as a pressure reference.

The ECT sensor:

- sends the PCM a signal indicating engine coolant temperature.
- voltage decreases as coolant temperature increases.

The CHT sensor:

- is mounted into the wall of the cylinder head and is not connected to any coolant passages.
- sends the PCM a signal indicating cylinder head temperature.
- if the temperature exceeds approximately 121°C (250°F), the PCM disables half of the fuel injectors at a time. The PCM will alternate which fuel injectors are disabled every 32 engine cycles. The cylinders that are not being fuel injected act as air pumps to aid in engine cooling.

DESCRIPTION AND OPERATION (Continued)

- If the temperature exceeds approximately 166°C (330°F), the PCM disables all of the fuel injectors until the engine temperature drops below approximately 154°C (310°F).
- The coolant temperature gauge pointer will read fully hot.
- The check gauge warning indicator will illuminate and DTCs are set.

The 4.6L air induction system improves engine performance by using the CMCV assemblies as follows:

- The intake manifold has 2 runners per cylinder, feeding each of the intake ports in the cylinder heads.
- The CMCV assemblies are located between the intake manifold and cylinder heads, providing 2 air passages for each cylinder.
- One air passage is always open and the other passage switches from closed to open by means of a valve plate.
- The valve plates are opened and closed by the CMCV electric actuator, which is controlled by the PCM.

The engine oil temperature sensor:

- monitors engine oil temperature.

The variable camshaft timing (VCT) oil control solenoid:

- The VCT oil control solenoid is an electrically controlled hydraulic valve that directs engine oil to the variable camshaft. Once the PCM transmits a signal, the solenoid moves a valve spool, directing oil into the camshaft phaser cavity. This action changes valve timing by either inducing an advance or retard condition. The camshaft is, thereby repositioned in relation to crankshaft timing and allows for optimum engine performance and lower emissions.