Diesel PCM Inputs

Air Conditioning Pressure Switch

The A/C Pressure Switch (ACPSW) is used for additional A/C system pressure control. The ACPSW is also referred to as the Refrigerant Containment Switch.

For refrigerant containment control, the normally closed high pressure contacts open at a predetermined A/C head pressure. This turns off the A/C by opening the A/C demand circuit, preventing the A/C pressure from rising to a level that would open the A/C High Pressure Relief Valve.

The PCM modifies the shift scheduling when the A/C is on and the KOER On Demand and cylinder contribution test (CCT) are aborted. An Excursion may be equipped with the optional electronic automatic temperature control (EATC).

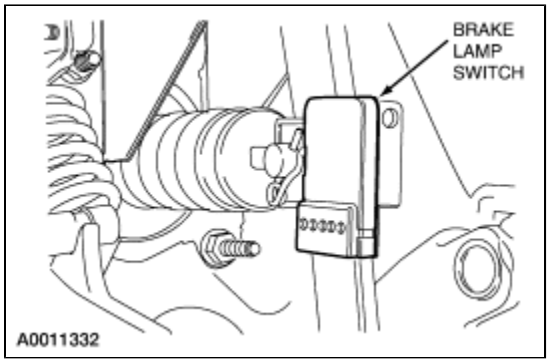
For additional information, refer to the Service Manual Electrical Group, Ventilation/Climate Control Section.

Brake Lamp Switch

The Brake Lamp Switch signals the PCM with a battery positive voltage (B+) signal whenever the vehicle brake pedal is applied.

The signal informs the PCM to disengage the torque converter clutch, speed control and auxiliary idle control (if equipped).

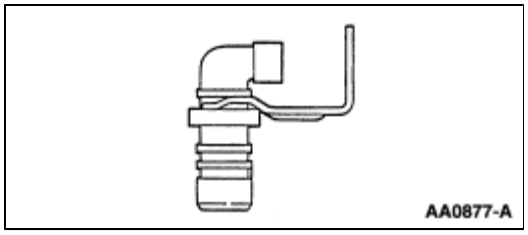
If all the stoplamp bulbs are burned out (open), a high voltage is present at the PCM due to a pull-up resistor in the PCM. This provides fail-safe operation in the event the circuit to the Brake Lamp switch has failed.



Brake Lamp Switch

Camshaft Position Sensor

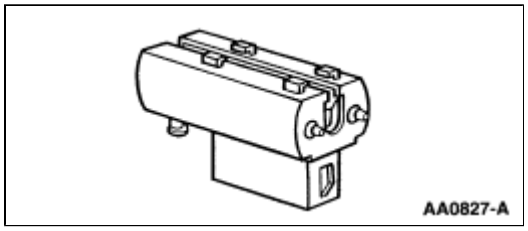
The PCM receives engine rotational position information from the Camshaft Position (CMP) sensor. The CMP is a hall-effect device. It outputs 12 volts to the PCM whenever it detects the iron of a spoked target wheel in front of it, and it outputs 0 volts whenever it detects the space between the spokes. The target wheel spokes and spaces are each 15 crank degrees, except for narrow spoke which indicates cylinder No. 1 and a wide spoke which indicates cylinder No. 4 (fires 5th). The NGS PID RPM is generated by the PCM from the CMP signal.



Camshaft Position (CMP) Sensor

Clutch Pedal Position Switch

The Clutch Pedal Position (CPP) switch is an input to the PCM indicating the clutch pedal position. The CPP sends battery voltage to the PCM when the clutch is engaged (foot off of pedal) and zero voltage when the clutch is disengaged (pedal depressed).



Clutch Pedal Position (CPP) Switch

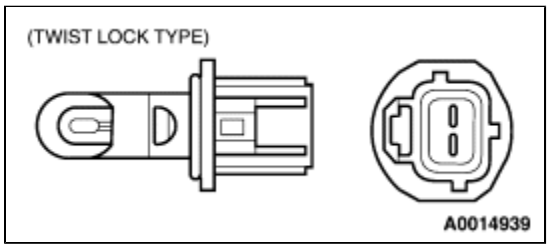
Intake Air Temperature Sensor

The Intake Air Temperature (IAT) Sensors are thermistor devices in which resistance changes with temperature. The electrical resistance of a thermistor decreases as the temperature increases, and increases as the temperature decreases. The varying resistance affects the voltage drop across the sensor terminals and provides electrical signals to the PCM corresponding to temperature.

Thermistor-type sensors are considered passive sensors. A passive sensor is connected to a voltage divider network so that varying the resistance of the passive sensor causes a variation in total current flow.

Voltage that is dropped across a fixed resistor in series with the sensor resistor determines the voltage signal at the PCM. This voltage signal is equal to the reference voltage minus the voltage drop across the fixed resistor.

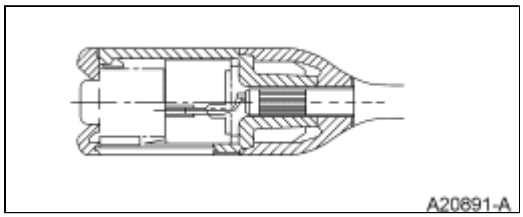
The IAT signal provides air temperature information to the PCM. The PCM uses the air temperature information to operate the Exhaust Back-Pressure (EBP) system and to determine the cold idle setpoint. During long idle periods at cold ambient temperatures, the setpoint will increase engine rpm.



Intake Air Temperature (IAT) Sensor

Transmission Control Switch

The Transmission Control Switch signals the PCM with key power whenever the transmission control switch is pressed. On vehicles with this feature, the Transmission Control Indicator Lamp (TCIL) (not shown) lights when the transmission control switch is cycled to disengage overdrive. The operator of the vehicle controls the position of the transmission control switch.

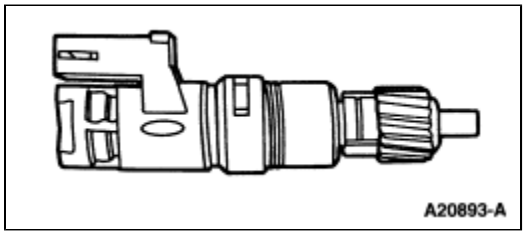


Column-Shift Transmission Control Switch

Vehicle Speed Sensor

For E-Series, the Vehicle Speed Sensor (VSS) is a variable reluctance or Hall-effect type sensor that generates a waveform with a frequency that is proportional to the speed of the vehicle. If the vehicle is moving at a relatively low velocity, the sensor produces a signal with a low frequency. As the vehicle speed increases, the sensor generates a signal with a higher frequency. The PCM uses the frequency signal generated by the VSS (and other inputs) to control such parameters as fuel injection, ignition control, transmission/transaxle shift scheduling and torque converter clutch scheduling.

For F-Series and Excursion, the VSS signal is generated by the Generic Electronic Module (GEM). The GEM generates VSS from a speed sensor on the rear axle.



Vehicle Speed Sensor (VSS)

4x4 Low Switch

The 4x4 Low Switch sends a ground signal to the instrument cluster when in 4x4L. This input is used to adjust the shift schedule.

Using Standard Corporate Protocol (SCP), the cluster provides a 4x4 status signal to the PCM.

Accelerator Pedal Sensor — E-Series

The Accelerator Pedal (AP) sensor provides the PCM with the driver's demand for power. The AP sensor is a three-wire potentiometer that receives VREF from the PCM and returns a signal to the PCM directly proportional to the accelerator pedal position. The AP signal is used in calculating fuel quantity. Also, the AP input is used by the PCM to control the exhaust back-pressure regulator (EBP system is not used on F-Series 650/750).

A PCM detected fault of the AP sensor will illuminate the Malfunction Indicator Lamp in the instrument cluster. An AP signal that is detected out of range, high or low, will cause the PCM to only allow the engine to operate at low idle.

Electronic Throttle Control (ETC) — All, Except E-Series

The Electronic Throttle Control (ETC) combines the accelerator pedal sensor and idle validation switch into a single unit. The AP function provides the PCM with the driver's demand for power. The ETC sensor portion is a three-wire potentiometer that receives VREF from the PCM and returns a signal to the PCM directly proportional to the accelerator pedal position. The ETC signal is used in calculating fuel quantity. Also, the ETC input is used by the PCM to control the exhaust back-pressure regulator (EBP system is not used on F-Series 650/750).

The idle validation function verifies when the accelerator pedal is in the idle position. This switch protects against in-range failure of the ETC sensor.

A PCM detected fault of the ETC sensor will illuminate the Malfunction Indicator Lamp in the instrument cluster. An ETC signal that is detected out of range, high or low, will cause the PCM to only allow the engine to operate at low idle.

Idle Validation Switch

The idle validation switch signals the PCM that the accelerator pedal is in the idle position.

A PCM detected/ETC IVS Switch will illuminate the Malfunction Indicator Lamp. An inoperative ETC/IVS Switch detected by the PCM will only allow the engine to run at idle.

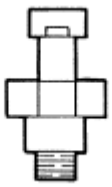
Exhaust Back-Pressure Sensor

Note: The Exhaust Back-Pressure sensor is not present on F-650 and F-750 models.

The Exhaust Back-Pressure sensor is a variable capacitor sensor that is supplied a 5-volt reference signal by the PCM and returns a linear analog voltage signal that indicates pressure. The Exhaust Back-Pressure sensor measures the pressure in the RH exhaust manifold. This sensor is used in conjunction with the exhaust back-pressure regulator to form a closed loop exhaust back-pressure control system.

The exhaust back-pressure is controlled by the PCM to provide more heat to the coolant for cab heating when ambient air temperature is below 7°C (45°F) and engine oil temperature is below 75°C (167°F) during low load, low speed operating conditions.

An open or short in the Exhaust Back-Pressure sensor wiring will result in a low out of range voltage at the PCM, and the PCM will disable Exhaust Back-Pressure control.

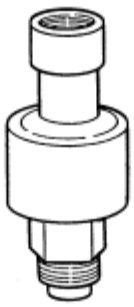


AA0828-A

Injection Control Pressure Sensor

The Injection Control Pressure sensor is a variable capacitor sensor that is supplied a 5-volt reference signal by the PCM and returns a linear analog voltage signal that indicates pressure. The sensor measures the oil pressure in the LH injection rail. PCM uses this information to determine injection control pressure. The Injection Control Pressure sensor along with the Injection Control Pressure Regulator form a closed loop fuel pressure control system.

If the PCM detects an inoperative Injection Control Pressure sensor, the PCM will control injection control pressure from a PCM-estimated injection control pressure.



AA0829-A

Engine Coolant Temperature Sensor (ECT) — With Manual Transmission Only

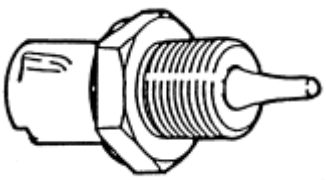
The Engine Coolant Sensor is used as the primary input to the Electronic Control System to enable adaptive cooling. This provides a means of providing adequate cooling in severe engine temperature conditions. When ECT is greater than 107°C (225°F), the fueling rate of the engine is modified to provide cooling protection and prevent engine damage due to overheating.

Engine Oil Temperature Sensor

The Engine Oil Temperature sensor is a thermistor mounted to the oil reservoir whose resistance decreases as engine oil temperature increases. The Engine Oil Temperature signal is used by the PCM to calculate fuel quantity, injection timing, glow plug operation and exhaust back-pressure.

At low ambient air temperatures, and oil temperature below 50°C (122°F), low idle is increased to a maximum of 1300 rpm to increase engine warm-up. Fuel quantity and timing is controlled throughout the total operating range to provide adequate torque and power.

An Engine Oil Temperature signal detected out of range, high or low, by the PCM will cause the PCM to assume an engine oil temperature of 20°C (68°F) for starting purposes and 100°C (212°F) for operating purposes. The Malfunction Indicator Lamp in the instrument cluster will be illuminated as long as the fault condition exists.

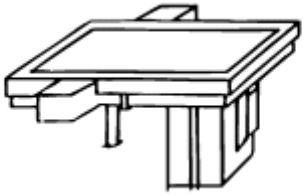


AA0830-A

Analog Manifold Absolute Pressure Sensor

The analog Manifold Absolute Pressure (MAP) sensor is a variable capacitor sensor that is supplied a 5-volt reference signal by the PCM and returns a voltage signal to the PCM relative to intake manifold pressure. The sensor voltage increases as pressure increases. The MAP sensor allows the PCM to determine engine load to calculate fuel quantity. In addition, the MAP signal is used to control smoke by limiting fuel quantity during acceleration until a specified boost pressure is obtained.

A MAP signal fault detected by the PCM will cause the PCM to calculate an estimated manifold pressure based on known engine conditions.



DA1453-A

Barometric Pressure Sensor

The Barometric Pressure (BARO) sensor is a variable capacitor sensor that processes a signal indicating atmospheric pressure. This allows the PCM to compensate for altitude. The PCM uses this information to calculate injection timing and glow plug control. The BARO sensor is not a stand-alone component. It is contained in the PCM.

A BARO sensor fault will result in an out-of-range signal to the PCM. The PCM will assume a default value of 100 kPa (14.5 psi).

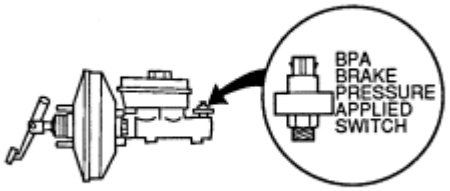
Parking Brake Signal Switch

The Parking Brake Signal switch indicates when the parking brake is applied. On F-250/550, Excursion and E-Series, the Parking Brake Signal switch is located under the instrument panel. On F-650 and F-750, with hydraulic brakes, the parking brake switch is mounted under the hand brake boot. With air brakes, the switch is located on the engine compartment side of the dash panel near the center of the vehicle. The Parking Brake Signal switch will deactivate speed control if the brake is applied during speed control operation.

Brake Pressure Applied Switch

Note: The Brake Pressure Applied switch is present on vehicles equipped with speed control.

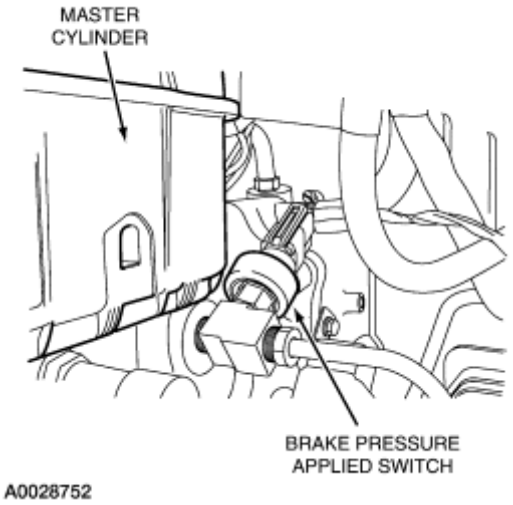
F-250/550 and E-Series



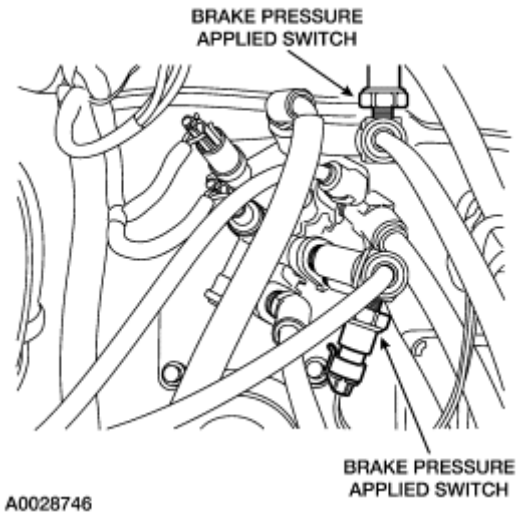
AA0833-A

All vehicles with hydraulic brakes have a single brake pressure (BP) switch. An air brake equipped F-650/750 vehicle has two BP switches. A BP switch provides a backup for the brake pedal position (BPP) switch. Normally, a brakes-applied signal from the BPP switch will disengage the speed control. If the BPP switch signal is lost, the BP switch will then supply the brakes-applied signal to the speed control servo.

F-650/750 with Hydraulic Brakes



F-650/750 with Air Brakes



Speed Control Command Switches

The Speed Control Command Switches are momentary switches which are located on the steering wheel. They consist of one ON-OFF switch and one SET/ACCEL-COAST-RESUME switch. These switches, when pressed, select one of several resistance values which is sent to the PCM to select speed control functions.

Injector Driver Module Feedback

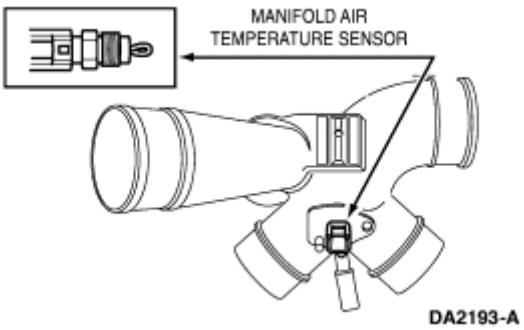
The Injector Driver Module (IDM) provides an EF signal to the PCM which confirms that correct timing/duration of the PCM command was received by the IDM. The EF signal is also used to send diagnostic information about the IDM and fuel injector circuitry.

Manifold Air Temperature (MAT) Sensor

Note: The MAT sensor is not used on E-Series models.

The PCM receives an intake air temperature from the manifold intake air (MAT) sensor. Based on this signal the PCM

adjusts fuel and timing. The sensor is located in the compressor manifold downstream from the intercooler.



Engine Coolant Temperature Sensor — With Manual Transmission Only

The Engine Coolant Temperature (ECT) sensor is a thermistor device in which resistance changes with temperature. The electrical resistance of a thermistor decreases as the temperature increases, and increases as the temperature decreases. The varying resistance affects the voltage drop across the sensor terminals and provides electrical signals to the PCM corresponding to temperature.

If the PCM receives a high engine temperature signal from the ECT, it will adjust fueling rates to protect the engine from damage due to overheating.