

Powertrain Control Hardware

Powertrain Control Module (PCM)

The center of the electronic engine control (EEC) system is a microprocessor called the PCM. The PCM receives input from sensors and other electronic components (switches, relays). Based on the information received and programmed into its memory, the PCM generates output signals to control various relays, solenoids and actuators. There are several different types of PCMs in use for this model year. Refer to the Vehicle PCM Application Table below for PCM types and their applications.

VEHICLE PCM APPLICATION TABLE

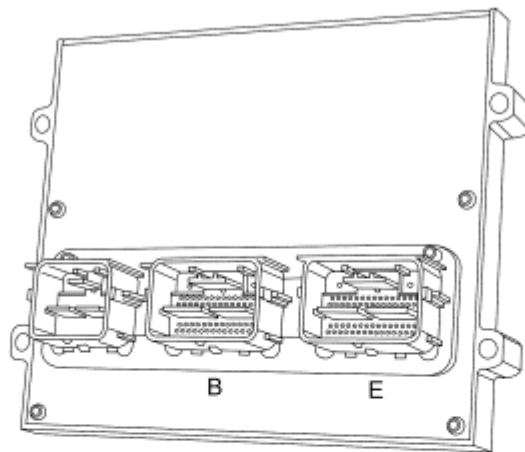
PCM Type	Applications
140-Pin	Fusion, Milan, MKZ
170-Pin	Crown Victoria, E-Series (6.8L), Explorer, Explorer Sport Trac, F-Super Duty, Grand Marquis, Mountaineer, Mustang, Ranger, Town Car
190-Pin	E-Series (4.6L/5.4L), Edge, Escape, Expedition, F-150, Flex, Focus, Mariner, MKS, MKX, Navigator, Sable, Taurus, Taurus X

PCM Locations

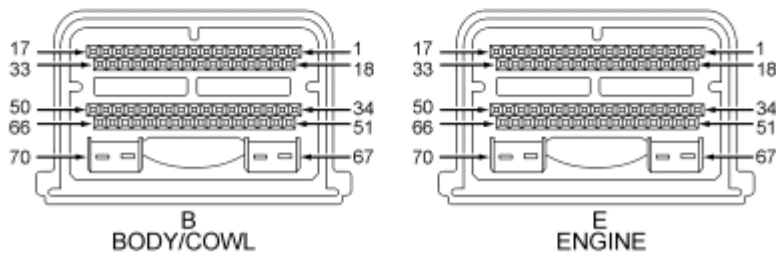
For PCM removal and installation procedures, refer to the Workshop Manual Section 303-14, Electronic Engine Controls.

- Focus - engine compartment, driver side, front of battery.
- Flex, MKS, Taurus, Taurus X, Sable - engine compartment, passenger side, mounted to the cowl.
- Fusion, Milan, MKZ - engine compartment, driver side, under battery, mounted to the cowl.
- Mustang - front of engine compartment, passenger side, near fender, under the battery junction box (BJB).
- Crown Victoria, Grand Marquis, Town Car - engine compartment, driver side, fender mounted.
- Explorer, Explorer Sport Trac, Mountaineer - passenger side, near side cowl, behind the glove compartment.
- Escape, Mariner, Ranger - behind the instrument panel (cowl), center to both driver and passenger sides (access from the engine compartment).
- Edge, Expedition, MKX, Navigator, F-Series, F-Super Duty - passenger side of the engine compartment, mounted to the cowl.
- E-Series - engine compartment, driver side, near the cowl (access from the engine compartment).

140-Pin PCM



140 PIN PCM HARNESS CONNECTOR



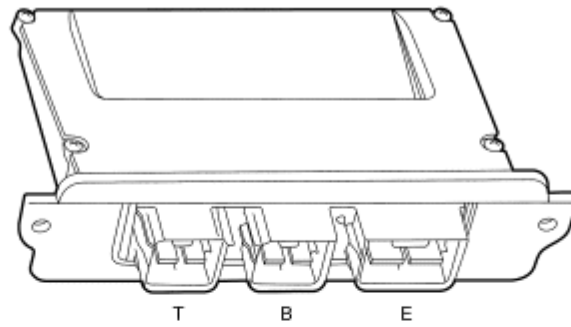
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140-Pin PCM

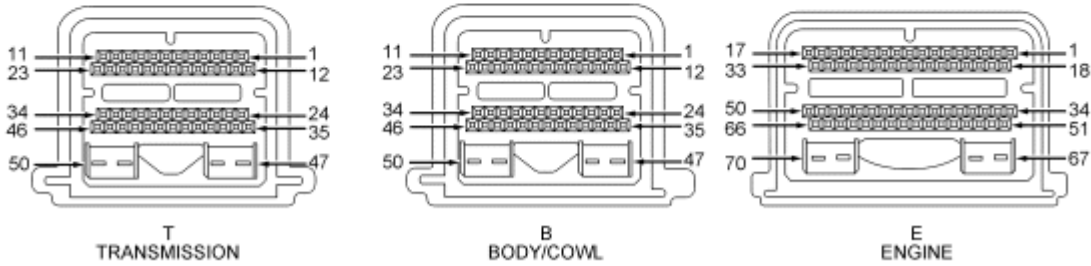
TABLE 1 — 140-PIN PCM POWER AND GROUNDS

Function	Description	Connector/Pin
VPWR	Voltage input to module	B51, B52
PWRGND	Power ground	B67, B68, B69
CSEGND	Case ground	B66
SIGRTN	Signal return	B58, E58
VREF	5.0 volt reference	B33, E57
KAPWR	Keep alive power	B54

170-Pin PCM



170 PIN PCM HARNESS CONNECTOR



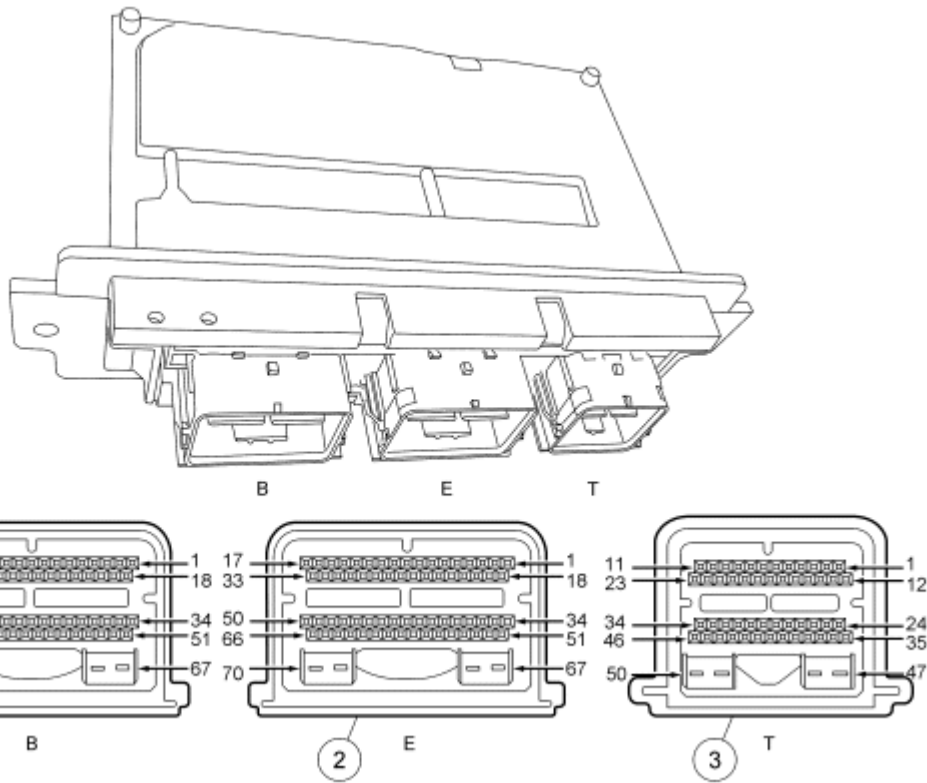
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170-Pin PCM

TABLE 1 — 170-PIN PCM POWER AND GROUNDS

Function	Description	Connector/Pin
VPWR	Voltage input to module	B35, B36
PWRGND	Power ground	B47, B48, B49, B50
CSEGND	Case ground	B10
SIGRTN	Signal return	B41, E58, T41
VREF	5.0 volt reference	B40, E57
KAPWR	Keep alive power	B45

190-Pin PCM



N0073030

Item	Number	Description
1	—	Body
2	—	Engine
3	—	Transmission

TABLE 1 — 190-PIN PCM POWER AND GROUNDS

Function	Description	Connector/Pin (E-Series, Expedition, F-150, Focus, Navigator)	Connector/Pin (Escape, Mariner)	Connector/Pin (All Others)
VPWR	Voltage input to module	B67, B68	B67, B68	B51, B52, B53
PWRGND	Power ground	B69, B70	B69, B70	B67, B68, B69, B70
CSEGND	Case ground	B50	B50	B66
SIGRTN	Signal return	B58, E64, T40	B56, E49, T41	B58, E58
VREF	5.0 volt reference	B52, B66, E63	B52, B66, E35	B29, B64
KAPWR	Keep alive power	B62	B62	B54

Fuel Pump Control Module

The fuel pump control module receives a duty cycle signal from the PCM and controls the fuel pump operation in relation to this duty cycle. The PCM requests low or high speed fuel pump operation depending on engine fuel demand. The fuel pump control module controls the fuel pump by switching the fuel pump power circuit on and off at the required duty cycle. The fuel pump control module sends diagnostic information to the PCM on the fuel pump monitor circuit. For additional information on the fuel pump control and the fuel pump monitor, refer to [Fuel Systems](#) in this section.

Fuel Pump Driver Module (FPDM)

Note: The Mustang 5.4L uses two FPDMs to control fuel for the fuel delivery system. The PCM outputs only one fuel pump duty cycle on the fuel pump control (FPC) circuit. This circuit is used by both FPDMs. The PCM individually monitors the FPDMs through the fuel pump monitor (FPM) and FPM2 circuits. The FPDM located on the driver side of the luggage compartment is referred to as FPDM and the FPDM located on the passenger side of the luggage compartment, is referred to as FPDM2.

The FPDM receives a duty cycle signal from the PCM and controls the fuel pump operation in relation to this duty cycle. This results in variable speed fuel pump operation. The FPDM controls the fuel pump by switching the fuel pump return circuit on and off at the required duty cycle. The FPDM sends diagnostic information to the PCM on the fuel pump monitor circuit. For additional information on the fuel pump control and the fuel pump monitor, refer to [Fuel Systems](#) in this section.

Keep Alive Memory (KAM)

The PCM stores information about vehicle operating conditions in the KAM (a memory integrated circuit chip) and then uses this information to compensate for component variability. The KAM remains powered when the ignition is in the OFF position so that the information is not lost.

Integrated Electronic Ignition System

The integrated electronic ignition system consists of a crankshaft position (CKP) sensor, coil pack(s), connecting wiring, and PCM. The coil on plug (COP) integrated electronic ignition system uses a separate coil for each spark plug and each coil is mounted directly onto the plug. The COP integrated electronic ignition system eliminates the need for spark plug wires but does require input from the camshaft position (CMP) sensor.

Power and Ground Signals

Electronic Throttle Control Reference Voltage (ETCREF)

ETCREF is a consistent positive voltage (5.0 volts plus or minus 0.5 volt) supplied by the PCM. ETCREF is internally bussed within the PCM and is specifically dedicated to the accelerator pedal position (APP) sensor and the electronic throttle body (ETB) throttle position (TP) sensor.

Electronic Throttle Control Return (ETCRTN)

ETCRTN is a return path for ETCREF and is internally bussed within the PCM. ETCRTN is specifically dedicated to the APP sensor and the ETB TP sensor.

Gold Plated Pins

Note: Gold plated terminals should only be replaced with new gold plated terminals.

Some engine control hardware has gold plated pins within the connectors and mating harness connectors to improve electrical stability for low current draw circuits and to enhance corrosion resistance. The electronic engine control (EEC) components equipped with gold terminals vary by vehicle application.

Keep Alive Power (KAPWR)

KAPWR provides a constant voltage input independent of ignition switch state to the PCM. This voltage is used by the PCM to maintain the keep alive memory (KAM).

Mass Air Flow Return (MAF RTN)

The MAF RTN is a dedicated analog signal return from the MAF sensor. It serves as a ground offset for the analog voltage differential input by the MAF sensor to the PCM.

Power Ground (PWR GND)

The PWR GND circuit(s) is directly connected to the battery negative terminal. PWR GND provides a return path for the PCM vehicle power (VPWR) circuits.

Signal Return (SIG RTN)

SIG RTN is a dedicated return path for VREF applied components.

Variable Reluctance Sensor Return (VRSRTN)

The VRSRTN circuit is a dedicated return path for variable reluctance (VR) type sensors.

Vehicle Buffered Power (VBPWR)

VBPWR is a regulated voltage supplied by the PCM to vehicle sensors. These sensors require a constant 12 volts for operation and cannot withstand VPWR voltage variations. VBPWR is regulated to VPWR minus 1.5 volts and is also current limited to protect the sensors.

Vehicle Power (VPWR)

VPWR is the primary source of PCM power. VPWR is switched through the EEC power relay and is controlled by the ignition switch.

Vehicle Reference Voltage (VREF)

VREF is a consistent positive voltage (5.0 volts plus or minus 0.5 volt) provided by the PCM. VREF is typically used by 3-wire sensors and some digital input signals.
