PCM CONNECTOR TERMINAL VOLTAGES WITH EXPLANATIONS

PINS A1 - A12

A1 - SYSTEM EARTH

A2 - SYSTEM EARTH

These terminals should have zero volts. They are connected directly to the engine earth.

A3 - PRIMARY SERIAL DATA

This is a dedicated line for the Tech 2 scan tool communication. The circuit connects the PCM, ABS, and BCM. The Tech 2 scan tool can "talk" to each of these modules by sending a message to a controller and asking only it to respond. The communication rate is at 8192 baud. The normal voltage on this circuit is about 5 volts, but when the Tech 2 scan tool is communicating with a controller, the voltage will vary and if read with a DVM may read about 2.5 volts

A4 - IGNITION SWITCH INPUT SIGNAL

This is the "turn on" signal to the PCM from the ignition switch circuit. It is not the "power supply" to the PCM, it only tells the PCM that the ignition switch is "ON." The voltage should equal the battery voltage when the key is in either the `run' or `crank' position.

A5 - NOT USED

A6 - FUEL PUMP (FP) RELAY CONTROL

Turning the ignition "ON" causes the PCM to energise (+12V) the Fuel Pump Relay. If no crankshaft reference input pulses are received, the PCM turns "OFF" the relay. As soon as the PCM receives crankshaft reference input pulses, the PCM will turn the Fuel Pump Relay on again.

A7 - THROTTLE POSITION (TP) SENSOR

REFERENCE VOLTAGE

This voltage should always be 5 volts anytime the ignition is "ON." It is a regulated voltage output from the PCM, and supplies 5 volts to the TP sensor.

A8 - BATTERY VOLTAGE FEED

- HOT AT ALL TIMES -

This supplies the PCM with full-time +12 volts. It stays hot even when the ignition is turned off. It receives its voltage through the "ENGINE" fuse F25. This PCM terminal could be called the power supply and "MEMORY" terminal.

A9 - NOT USED

A10 - NOT USED

A11 - NOT USED

A12 - NOT USED

PINS B1 - B12

B1 - SYSTEM EARTH

B2 - SYSTEM EARTH

These terminals should have zero volts. They are connected directly to the engine earth.

B3 - A/C REFRIGERANT PRESSURE SENSOR INPUT

SIGNAL

The signal that is sent from the pressure transducer to the PCM indicates to the PCM what the A/C pressure is at. Depending on the A/C pressure, this signal will indicate to the PCM if A/C pressure is to low or to high.

B4 - INTAKE AIR TEMPERATURE (IAT) INPUT SIGNAL

The PCM sends a 5 volt signal voltage to the IAT sensor, which is a temperature - variable-resistor called a thermistor. The sensor is also connected to earth, and will alter the signal voltage according to incoming air temperature. As the air temperature increases, the voltage seen on this terminal decreases. At 0 degrees C, the voltage will be above 4 volts. At normal operating temperature (10 degrees C to 80 degrees C) the voltage will be less than 4 volts.

B5 - ENGINE COOLANT TEMPERATURE (ECT)INPUT SIGNAL

The PCM sends a 5 volt signal voltage out to the engine coolant temperature sensor, which is a temperature-variable-resistor called thermistor. The sensor, being also connected to earth, will alter the voltage according to engine coolant temperature. As the engine coolant temperature increases, the voltage seen on terminal B5 decreases. At 0 degrees C engine coolant temperature the voltage will be above 4 volts. At normal operating temperature (85 degrees C to 100 degrees C) the voltage will be less than 2 volts.

B6 - TRANSMISSION FLUID TEMPERATURE (TFT) INPUT SIGNAL

- AUTO TRANS ONLY

The PCM sends a 5 volt signal voltage out to the transmission fluid temperature sensor, which is a temperature-variable-resistor called thermistor. The sensor, being also connected to earth, will alter the voltage according to transmission fluid temperature. As the fluid temperature increases, the voltage seen on terminal B6 will decrease.

B7 - EGR/A/C PRESSURE SENSOR REFERENCE VOLTAGE

This voltage should always be 5 volts anytime the ignition is "ON." It is a regulated voltage output from the PCM, and supplies 5 volts to the A/C Pressure Transducer and EGR valve.

B8 - BATTERY VOLTAGE FEED

- HOT AT ALL TIMES -

This supplies the PCM with full-time +12 volts. It stays hot even when the ignition is turned off. It receives its voltage through the "ENGINE" fuse F25. This PCM terminal could be called the power supply and "MEMORY" terminal.

B9 - NOT USED

B10 - LINEAR EGR VALVE PINTLE POSITION

This voltage is a indication to the PCM the position of the EGR valve pintle position. A low voltage indicates a fully extended pintle (closed valve). A voltage near 5 volts indicates a retracted pintle (open valve).

B11 - THROTTLE POSITION (TP) SENSOR

The TP sensor input voltage, which follows actual throttle changes, is variable from 0 to 5 volts. Typically the voltage is less than 1 volt at idle, and 4 to 5 volts at wide-open throttle.

B12 - INJECTOR CIRCUIT VOLTAGE MONITOR INPUT SIGNAL

The injector voltage monitor line is used so that the PCM will know the exact voltage the fuel injectors are operating at. This voltage signal is used to modify the fuel injector pulse width calculation.

PINS C1 - C16

C1 - TORQUE CONVERTER CLUTCH ENABLE SOLENOID CONTROL

- AUTO TRANS ONLY

The PCM is used to either open or provide a path to earth for the torque converter solenoid. When the PCM provides a path to earth, the TCC solenoid is considered ON and voltage should be near 0 volts. The PCM uses both the TCC enable solenoid and the TCC "PWM" solenoid to control the torque converter clutch. (See TCC PWM solenoid terminal E1)

C2 - 1 - 2 SHIFT SOLENOID CONTROL

- AUTO TRANS ONLY -

The PCM is used to either open or provide a path to earth for the 1-2 shift solenoid. When the PCM provides a path to earth, the 1-2 shift solenoid is considered "ON" and the voltage should read 0 volts.

C3 - 2 - 3 SHIFT SOLENOID CONTROL

- AUTO TRANS ONLY

The PCM is used to either open or provide a path to earth for the 2-3 shift solenoid. When the PCM provides a path to earth, the 2-3 shift solenoid is considered "ON" and the voltage should read 0 volts.

C4 - CANISTER PURGE SOLENOID CONTROL

The PCM operates a normally closed solenoid valve, which controls vacuum to purge the evaporative emissions storage canister of stored gasoline vapours. The PCM turns "ON" the pulse width modulated control of the purge solenoid, to control purging of the stored vapours. If the PCM is not energising the purge solenoid, the voltage measured at this terminal should equal battery voltage. If the PCM is controlling the solenoid, the measured voltage will be between battery voltage and 0.50 volts.

C5 - VEHICLE SPEED OUTPUT TO SPEEDOMETER

The PCM alternately earths this signal, in pulses, when it receives a vehicle speed signal from the vehicle speed sensor in the transmission. This pulsing action takes place about 6250 times per kilometer. The speedometer calculates vehicle speed based on the time between pulses.

C6 - VEHICLE SPEED SENSOR - OUTPUT SHAFT SPEED INPUT SIGNAL HIGH

The transmission has an output shaft speed sensor used by the PCM to calculate vehicle speed, and to help determine various automatic transmission shifting functions. It is a magnetic inductive sensor that generates an AC voltage signal sent to the PCM. If measured with the digital AC voltmeter, no voltage will appear until the output shaft begins turning.

C7 - IDLE AIR CONTROL (IAC)

C8 - IDLE AIR CONTROL (IAC)

C9 - IDLE AIR CONTROL (IAC)

C10 - IDLE AIR CONTROL (IAC)

These terminals connect the Idle Air Control valve, located on the throttle body, to the PCM. It is difficult to predict what the voltage will be, and the measurement is unusable for any service procedures.

C11 - TRACTION CONTROL (TORQUE REQUESTED)

The ABS/ETC module will send a Nm signal to the PCM when torque reduction is requested from the ABS/ETC module for traction control. This Nm signal should match closely with Torque Achieved Nm signal, when traction control is being requested.

C12 - ELECTRONIC SPARK CONTROL (ESC) "KNOCK" INPUT SIGNAL

The Electronic Spark Control "knock" sensor detects when detonation is occurring in the combustion chambers. When detected, the PCM will reduce the amount of spark advance being delivered on the EST output circuit to the ignition module.

C13 - 3 - 2 DOWNSHIFT CONTROL SOLENOID

CONTROL

- AUTO TRANS ONLY -

The 3-2 control solenoid is a normally closed, pulse width modulated solenoid used to control the 3-2 downshift. The PCM operates the 3-2 control solenoid at

a frequency of 50 Hz (cycles per second). The solenoid is constantly fed 12 volts and PCM controls the length of time the path to earth for the electrical circuit is closed.

C14 - 3 - 2 SHIFT SOLENOID FEEDBACK

- AUTO TRANS ONLY -

The 3-2 Shift solenoid is a normally closed solenoid used to control the 3-2 downshift. The solenoid is constantly fed 12 volts and PCM controls the length of time the path to earth for the electrical circuit is closed. The PCM does this to provide a smooth 3-2 downshift. If the PCM senses an incorrect voltage on this circuit when controlling the 3-2 downshift solenoid (i.e. - O volts with the solenoid OFF, or 12 volts with the solenoid ON) a DTC code 66 will set.

C15 - TORQUE CONVERTER CLUTCH - PULSE WIDTH MODULATED APPLY SOLENOID FEEDBACK

- AUTO TRANS ONLY -

The PCM uses the pulse width modulated TCC apply solenoid to smoothly engage the torque converter clutch, after the TCC "ON-OFF" solenoid is energised. By varying the duty cycle pulse width modulation, the PCM can slowly engage the torque converter clutch, allowing very smooth TCC engagement. If the PCM senses an incorrect voltage on this circuit when controlling the TCC PWM solenoid (i.e. - O volts with the solenoid OFF, or 12 volts with the solenoid ON) a DTC code 83 will set.

C16 - TORQUE CONVERTER CLUTCH - PULSE WIDTH MODULATED APPLY SOLENOID CONTROL

- AUTO TRANS ONLY -

The PCM uses the pulse width modulated TCC apply solenoid to smoothly engage the torque converter clutch, after the TCC "ON-OFF" solenoid is energised. By varying the duty cycle pulse width modulation, the PCM can slowly engage the torque converter clutch, allowing very smooth TCC engagement.

PINS D1 - D16

D1 - MASS AIR FLOW (MAF) INPUT SIGNAL

The PCM supplies a 5-volt signal voltage to the mass air flow sensor on this circuit. The mass air flow sensor pulses the 5-volt signal to earth. These earth pulses occur at a very fast rate - from less than 500 per second (500 Hz) with no airflow through the sensor, to upwards of many thousands of pulses per second at high air flow rates such as during acceleration. If measured, the voltage seen will be between 0.5 and 4.5 volts, depending on air flow through the sensor.

D2 - NOT USED

D3 - CAMSHAFT POSITION INPUT SIGNAL

This signal is used by the PCM to "sequence" the energising of the fuel injectors, similar to the firing order of an engine. This allows the PCM to operate the fuel injectors in a "sequential fuel injection" mode. The camshaft position sensor is actually wired to the ignition module. The ignition module sends one pulse per every two crankshaft revolutions to the PCM to determine actual camshaft position, and thus, engine cycle sequence.

D4 - CRANKSHAFT 18X INPUT SIGNAL

The 18X crankshaft reference input signal is used to very accurately control EST spark timing at low engine speeds - below 1200 RPM. Below 1200 RPM, the PCM monitors the 18X signal to control spark timing. At engine speeds above 1200 RPM, the PCM uses the 3X crankshaft reference input signal to control spark timing. (See 3X crankshaft reference terminal D12)

D5 - VEHICLE SPEED SENSOR - OUTPUT SHAFT SPEED INPUT SIGNAL LOW

The transmission has an output shaft speed sensor used by the PCM to calculate vehicle speed, and to help determine various automatic transmission shifting functions. It is a magnetic inductive sensor that generates an AC voltage signal sent to the PCM. If measured with the digital AC voltmeter, no voltage will appear until the output shaft begins turning.

D6 - NOT USED

D7 - NOT USED

D8 - NOT USED

D9 - IGNITION MODULE BYPASS CONTROL

- IGNITION SYSTEM MODE CONTROL -

With ignition "ON" and engine not running this terminal will have very low voltage. As soon as the PCM sees engine RPM of more than 1600 RPM (Electronic Spark Timing "run" threshold) the PCM turns on 5 volts to the Ignition Module Bypass Control circuit, causing the ignition module to allow the PCM to operate the ignition system.

D10 - ELECTRONIC SPARK TIMING (EST) OUTPUT

This terminal will have very low voltage with the ignition "ON" but engine not running. With the engine running at idle, the voltage should be slightly more than 1 volt. As the engine RPM goes up, this voltage will increases.

D11 - CRANKSHAFT REFERENCE INPUT SIGNAL LOW

This terminal should always be zero volts. It is connected through the ignition module to engine earth.

D12 - 3X CRANKSHAFT REFERENCE INPUT SIGNAL HIGH

This terminal could be called the "tach" input. It provides the PCM with RPM and crankshaft position information. With ignition "ON" but engine not running, the voltage will be either high or low, depending on crankshaft position. As the crankshaft turns, the voltage will be an average of the two readings. The PCM uses the 3X signal to control fuel injection, and spark timing with engine speeds above 1200 RPM. (See 18X crankshaft reference terminal D4)

D13 - OXYGEN SENSOR INPUT SIGNAL

- RIGHT BANK -

With ignition "ON" and engine not running, the voltage should be 350 - 450 millivolts (0.350 - 0.450 volts). This is the PCM-supplied 02 circuit "bias" voltage. With the engine running and after the 02 sensor is hot, the voltage should be rapidly changing, somewhere between 10 - 1000 millivolts (0.010 - 1.000 volt).

D14 - OXYGEN SENSOR EARTH

- RIGHT BANK -

This terminal should have zero volts. It is connected directly to the engine earth. This terminal earths the PCM circuitry for the O2 voltage monitor inside the PCM.

D15 - OXYGEN SENSOR INPUT SIGNAL

- LEFT BANK -

With ignition "ON" and engine not running, the voltage should be 350 - 450 millivolts (0.350 - 0.450 volts). This is the PCM-supplied 02 circuit "bias" voltage. With the engine running and after the 02 sensor is hot, the voltage should be rapidly changing, somewhere between 10 - 1000 millivolts (0.010 - 1.000 volt).

D16 - OXYGEN SENSOR EARTH

- LEFT BANK -

This terminal should have zero volts. It is connected directly to the engine earth. This terminal earths the PCM circuitry for the O2 voltage monitor inside the PCM.

PINS E1 - E16

E1 - BOOST CONTROL SOLENOID

The PCM operates a normally closed solenoid valve, which controls vacuum to the By-Pass Valve Actuator. The PCM turns "ON" the solenoid , to allow vacuum to the By-Pass Valve Actuator, to close the By-Pass valve and allow full boost. If the PCM is not energising the boost solenoid, the voltage measured at this terminal should equal battery voltage. If the PCM is controlling the solenoid, the measured voltage will be between battery voltage and 0.50 volts.

E2 - FUEL INJECTOR 3 - CONTROL

E3 - FUEL INJECTOR 2 - CONTROL

E4 - FUEL INJECTOR 5 - CONTROL

The voltage seen at these terminals actually comes through the injectors, which are connected to +12 volts. With the engine not running, the voltage seen would be battery voltage. With the engine running at idle, the charging system increases the voltage slightly, so this voltage will increase. With higher engine RPM or more engine load, the resulting increase in injector pulse frequency or injector pulse width will cause this voltage to appear slightly less.

E5 - FUEL PUMP CONTROL MODULE

A duty cycle earth signal on this circuit varies depending on engine load. Under normal driving conditions, the duty cycle earth signal supplied from the PCM to the Fuel Pump Control Module (terminal 7 of the Fuel Pump Control Module) is at 33% duty cycle. This 33% duty cycle runs the Fuel Pump at a lower fuel flow rate. When the vehicle is in a heavy engine load condition, the PCM will switch from 33% duty cycle to 100% duty cycle. This will cause the Fuel Pump to operate at a high fuel flow rate to compensate for the higher engine load condition. This change in duty cycles does not change the fuel system operating fuel pressure, but changes the fuel flow rate.

E6 - PRNDL A

E7 - PRNDL B

E8 - PRNDL C

These circuits along with PCM circuit F15 indicate to the PCM what transmission gear the driver has selected. The PCM will then send a command via the serial data line to the instrument panel cluster (smart cluster) to indicate to the driver what gear has been selected.

E9 - EGR IGNITION

This is a ignition voltage input that runs between the EGR valve and the PCM. The PCM uses this input to determine actual voltage supplied to the EGR valve.

E10 - EGR CONTROL

The PCM monitors EGR actual position and adjust pintle position accordingly. The PCM uses information from several sensors to control the pintle position.

E11 - NOT USED

E12 - OIL PRESSURE SWITCH

This is a earth input to the PCM from the Oil Pressure Switch indicating proper oil pressure when the engine is running. If oil pressure is lost while the engine is running, the oil switch will open its contacts and the earth signal to the PCM will be removed. When the PCM sees this loss of earth signal, the PCM will command the oil lamp ON.

E13 - NOT USED

E14 - TRANSMISSION PRESSURE CONTROL

SOLENOID (PCS) - LOW

- AUTO TRANS ONLY -

The 4L60-E automatic transmission uses an electrical solenoid to control hydraulic pressure inside the transmission. This electrical solenoid allows the PCM to control "line pressure", similar to other automatic transmissions that use a "throttle valve" cable or vacuum modulator. The duty cycle, and amount of current flow to the PCS, are both controlled by the PCM. By monitoring this line, the PCM can determine if the commanded amperage has gone to the PCS and returned to the PCM.

E15 - TRANSMISSION FLUID PRESSURE CONTROL

SOLENOID (TFP) - HIGH

- AUTO TRANS ONLY -

The duty cycle, and amount of current flow to the TFP, are controlled by the PCM. This circuit is the B+ supply line from the PCM to the TFP. The duty cycle and amperage are controlled by the PCM.

E16 - ENGINE COOLANT TEMPERATURE and THROTTLE POSITION SENSOR EARTH

This terminal should be zero volts. It is connected through the PCM circuitry to engine earth.

PINS F1 - F16

F1 - FUEL INJECTOR 4 - CONTROL

F2 - FUEL INJECTOR 1 - CONTROL

F3 - FUEL INJECTOR 6 - CONTROL

The voltage seen at these terminals actually comes through the injectors, which are connected to +12 volts. With the engine not running, the voltage seen would be battery voltage. With the engine running at idle, the charging system increases the voltage slightly, so this voltage will increase. With higher engine RPM or more engine load, the resulting increase in injector pulse frequency or injector pulse width will cause this voltage to appear slightly less.

F4 -AIR CONDITIONING RELAY CONTROL

When the A/C is requested, the BCM will communicate to the PCM via the serial data line, requesting A/C. The PCM supplies the earth path on this terminal to energise the A/C control relay. The voltage will be less than 1 volt when the PCM energises the relay. When the PCM does energise the A/C control relay, the voltage will be more than 0.1, but less than 1 volt.

F5 - START RELAY CONTROL

When the PCM receives the proper Theft Deterrent signal, the PCM will supply a earth signal to Start Relay. This will allow the vehicle to start. If a improper Theft Deterrent signal is sensed by the PCM, then the PCM will not supply a earth signal to the Start Relay. This will prevent the starter motor from operating.

F6 - ENGINE COOLING FAN - HIGH SPEED RELAY CONTROL

This terminal will have battery voltage until the PCM energises the high speed cooling fan relay by supplying the earth; then it will be close to zero. The input that causes the PCM to energise the high speed fan relay is the engine coolant temperature sensor. The PCM will also energise the high speed fan relay in the Diagnostic Mode - i.e., ignition "ON," engine stopped, and DLC diagnostic "test" enable terminal earthed. Refer engine fan **CHART A-12** in this Section for further explanation.

(The Body Control Module operates the cooling fan low speed relay)

F7 - TRACTION CONTROL (TORQUE ACHIEVED)

The PCM sends a Nm signal to the ABS/ETC module on the delivered torque circuit informing the ABS/ETC module of response made to the desired torque Nm signal. This Nm signal should match closely with the Requested Torque Nm signal. A problem with the delivered torque circuit should cause a ABS/ETC DTC to set, and traction control to be disabled.

F8 - CRANKING SIGNAL INPUT

This cranking signal circuit provides an input for enabling fuel cutoff during a possible backfire situation. During an engine start, when the key switch is released from the crank position before the engine is running, the engine may backfire. The PCM stops all injector pulses when the engine speed is less than 450 RPM, coolant temperature is greater than -4 degrees C, a cranking signal is not received, but was received within the previous 12.5 milliseconds

F9 - RANGE SIGNAL A INPUT SIGNAL

F10 - RANGE SIGNAL B INPUT SIGNAL

F11 - RANGE SIGNAL C INPUT SIGNAL

- AUTO TRANS ONLY -

Range signal "A", "B" and "C". The PCM sends out a buffered 12 volt signal to the pressure switch assembly, located in the automatic transmission valve body. The 12 volt signal must pass through either a normally open or normally closed switch to reach earth. When the switches) are closed, the signal should be near 0 volts. The PCM monitors the status of these signals to determine which gear servo is actually receiving hydraulic apply pressure.

F12 - NORMAL / ECONOMY INPUT SIGNAL

- AUTO TRANS ONLY -

The PCM sends out a signal voltage of about 12 volts, and monitors the status of this circuit. In the ECONOMY position the switch is open, the PCM voltage status signal remains high - about 12 volts, and the PCM does not allow shift point changes. When the transmission switch is pressed to the POWER position the switch is closed and the PCM voltage status signal is pulled low - about 0 volts. The PCM senses the zero voltage signal, and enables power mode shifting only if other criteria are met. These criteria include throttle position and engine speed.

F13 - NOT USED

F14 - DIAGNOSTIC TEST ENABLE INPUT SIGNAL

This terminal is connected to the DLC diagnostic test enable terminal. When the diagnostic test terminal is not earthed, this terminal will have 5 volts on it. When the DLC diagnostic test enable terminal is earthed, the resulting zero voltage at the PCM will cause it to operate in Diagnostic Mode.

F15 - PRNDL P

This circuit along with PCM circuits E6, E7, E8 indicate to the PCM what transmission gear the driver has selected. The PCM will then send a command via the serial data line to the instrument panel cluster (smart cluster) to indicate to the driver what gear has been selected.

F16 - INTAKE AIR TEMPERATURE / TRANSMISSION FLUID TEMPERATURE / EGR VALVE / A/C PRESSURE SENSOR EARTH CIRCUIT

This terminal should be zero volts. It is connected through the PCM circuitry to engine earth.