# PSI 1.6L PFI
# DIAGNOSTIC TROUBLE CODE SECTION
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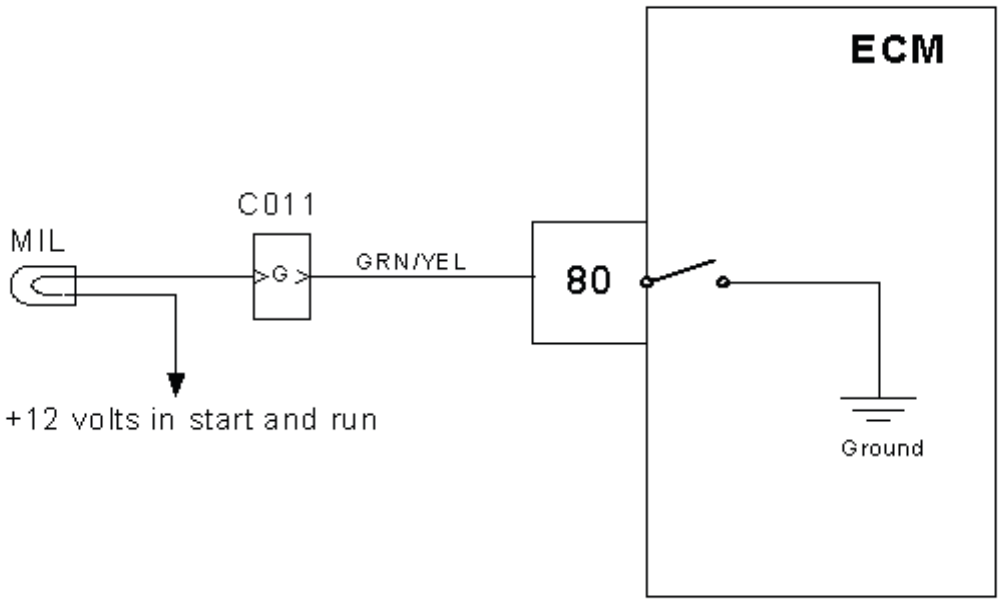
# 1.6L DTC Code to SPN:FMI Code Cross Reference

| DTC Code | Description | SPN Code | FMI Code |
|---|---|---|---|
| 16 | Crank Never Synced at Start | 636 | 8 |
| 91 | Fuel Pump Low Voltage | 94 | 4 |
| 92 | Fuel Pump High Voltage | 94 | 3 |
| 107 | MAP Low Voltage | 106 | 4 |
| 108 | MAP High Pressure | 106 | 16 |
| 111 | IAT Higher Than Expected 1 | 105 | 15 |
| 112 | IAT Low Voltage | 105 | 4 |
| 113 | IAT High Voltage | 105 | 3 |
| 116 | ECT Higher Than Expected 1 | 110 | 15 |
| 117 | ECT Low Voltage | 110 | 4 |
| 118 | ECT High Voltage | 110 | 3 |
| 121 | TPS 1 Lower Than TPS 2 | 51 | 1 |
| 122 | TPS 1 Signal Voltage Low | 51 | 4 |
| 123 | TPS 1 Signal Voltage High | 51 | 3 |
| 127 | IAT Higher Than Expected 2 | 105 | 0 |
| 129 | BP Low Pressure | 108 | 1 |
| 134 | EGO 1 Open/Inactive | 724 | 10 |
| 154 | EGO 2 Open/Inactive | 520208 | 10 |
| 171 | Adaptive Learn High Gasoline | 520200 | 0 |
| 172 | Adaptive Learn Low Gasoline | 520200 | 1 |
| 182 | Fuel Temp Gasoline Low Voltage | 174 | 4 |
| 183 | Fuel Temp Gasoline High Voltage | 174 | 3 |
| 187 | Fuel Temp LPG Low Voltage | 520240 | 4 |
| 188 | Fuel Temp LPG High Voltage | 520240 | 3 |
| 217 | ECT Higher Than Expected 2 | 110 | 0 |
| 219 | Max Govern Speed Override | 515 | 15 |
| 221 | TPS 2 Signal Voltage Low | 51 | 0 |
| 222 | TPS 2 Signal Low Voltage | 520251 | 4 |
| 223 | TPS 2 Signal High Voltage | 520251 | 3 |
| 336 | Crank Sync Noise | 636 | 2 |
| 337 | Crank Loss | 636 | 4 |
| 420 | Gasoline Cat Monitor | 520211 | 10 |
| 524 | Oil Pressure Low | 100 | 1 |
| 562 | System Voltage Low | 168 | 17 |
| 563 | System Voltage High | 168 | 15 |
| 601 | Flash Checksum Invalid | 628 | 13 |

| DTC Code | Description | SPN Code | FMI Code |
|---|---|---|---|
| 604 | RAM Failure | 630 | 12 |
| 606 | COP Failure | 629 | 31 |
| 642 | External 5V Reference Low | 1079 | 4 |
| 643 | External 5V Reference High | 1079 | 3 |
| 685 | Power Relay Open | 1485 | 5 |
| 686 | Power Relay Shorted | 1485 | 4 |
| 687 | Power Relay Short to Power | 1485 | 3 |
| 1111 | Fuel Rev Limit | 515 | 16 |
| 1112 | Sparl Rev Limit | 515 | 0 |
| 1151 | Closed Loop Multiplier High LPG | 520206 | 0 |
| 1152 | Closed Loop Multiplier Low LPG | 520206 | 1 |
| 1155 | Closed Loop Multiplier High Gasoline | 520204 | 0 |
| 1156 | Closed Loop Multiplier Low Gasoline | 520204 | 1 |
| 1161 | Adaptive Learn High LPG | 520202 | 0 |
| 1162 | Adaptive Learn Low LPG | 520202 | 1 |
| 1165 | LPG Cat Monitor | 520213 | 10 |
| 1171 | LPG Pressure Higher Than Expected | 520260 | 0 |
| 1172 | LPG Pressure Lower Than Expected | 520260 | 1 |
| 1173 | EPR Comm Lost | 520260 | 31 |
| 1174 | EPR Voltage Supply High | 520260 | 3 |
| 1175 | EPR Voltage Supply Low | 520260 | 4 |
| 1176 | EPR Internal Actuator Fault | 520260 | 12 |
| 1177 | EPR Internal Circuitry Fault | 520260 | 12 |
| 1178 | EPR Internal Comm Fault | 520260 | 12 |
| 1612 | RTI 1 loss | 629 | 31 |
| 1613 | RTI 2 Loss | 629 | 31 |
| 1614 | RTI 3 Loss | 629 | 31 |
| 1615 | A/D Loss | 629 | 31 |
| 1616 | Invalid Interupt | 629 | 31 |
| 1626 | CAN Tx Failure | 639 | 12 |
| 1627 | CAN Rx Failure | 639 | 12 |
| 1628 | CAN Address Conflict Failure | 639 | 13 |
| 2111 | Unable to Reach Lower TPS | 51 | 7 |
| 2112 | Unable to Reach Higher TPS | 51 | 7 |
| 2229 | BP Pressure High | 108 | 0 |

## OBD System Check/ MIL (Malfunction Indicator Lamp)




### Circuit Description

The Spectrum Fuel system is equipped with OBD (On-Board Diagnostics). The system has a dash mounted MIL (Malfunction Indicator Lamp) for the indication of system problems. Engine control system problems that affect exhaust emissions of the vehicle will set a DTC (Diagnostic Trouble Code). The ECM will then provide a path to ground and illuminate the MIL.

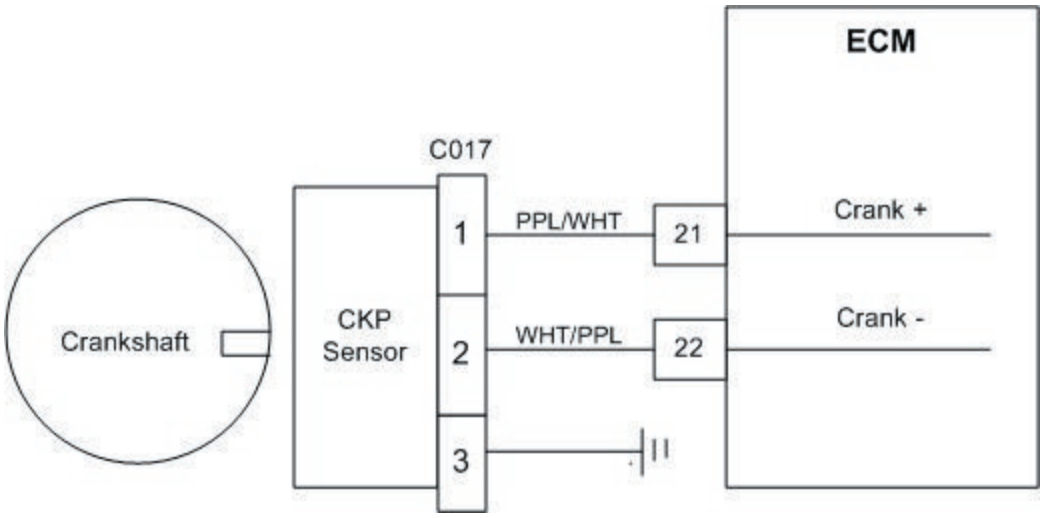
The MIL serves as notification of an emissions related problem. The MIL also has the ability to flash DTC codes in what is referred to the blink code mode. It will display DTC's that have been stored due to a system malfunction. The following DTC charts in this manual will instruct the technician to perform the OBD system check. This simply means to verify the operation of the MIL. The lamp should illuminate when the key is in the ON position, and the engine is not running. This feature verifies that the lamp is in proper working order. If the lamp does not come on with the vehicle key on/engine off, repair it as soon as possible. Once the engine is in start or run mode, the lamp should go off. If the lamp stays on while the engine is in the start or run mode, a current diagnostic trouble code may be set or a problem may exist with the MIL electrical wiring.

# OBD System Check

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | • Key ON Engine OFF<br>Does the MIL illuminate? | | Go to Step (2) | Go to Step (3) |
| 2 | • Start the engine<br>• Does the MIL lamp turn off? | | MIL is working properly. OBD System Check is complete | Go to Step (10) |
| 3 | • Key ON engine OFF<br>• Check for voltage between MIL power source and engine ground<br>Do you have voltage? | | Go to Step (4) | Repair MIL voltage source. Refer to OEM body and chassis wiring diagrams |
| 4 | Replace MIL lamp<br>Did that solve the problem? | | Go to step (1) | Go to Step (5) |
| 5 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Using a DVOM check for continuity between MIL side of connector C011 and ECM pin 80<br>Do you have continuity? | | Go to Step (6) | Go to Step (8) |
| 6 | • Inspect the MIL lamp socket, connector C011 and ECM pin 80 for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (7) |
| 7 | • Replace ECM<br>Is the replacement complete? | | Go to Step (1) | - |
| 8 | • Back probe both MIL and ECM side of terminal G in connector C011<br>• Using a DVOM check for continuity through connector C011<br>Do you have continuity? | | *Go to Step (9)* | Repair open circuit in connector C022 |
| 9 | • Inspect the MIL lamp socket, connector C011 and ECM terminal 80 for damage, corrosion or contamination<br>Did you find a problem? | | Repair the damaged socket or terminal as required. Refer to Wiring Repairs in Engine Electrical. | Repair the wire harness open circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 10 | Active DTC (Diagnostic trouble code) is stored in memory. Proceed with DTC diagnosis. If no active DTC is found in ECM memory return to this page Step (11) | | - | - |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 11 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Using a DVOM check for continuity between ECM terminal 80 and battery voltage<br>• Do you have continuity? | | Repair the shorted to ground circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (7) |

# DTC 16-Never Crank Synced At Start SPN/FMI 636:8




## Conditions for setting the DTC

- Crankshaft Position sensor
- Check Condition- Engine cranking
- Fault Condition- Cranking RPM above 90 and more than 4 cranking revolutions without sync
- MIL Command-ON

## Circuit Description

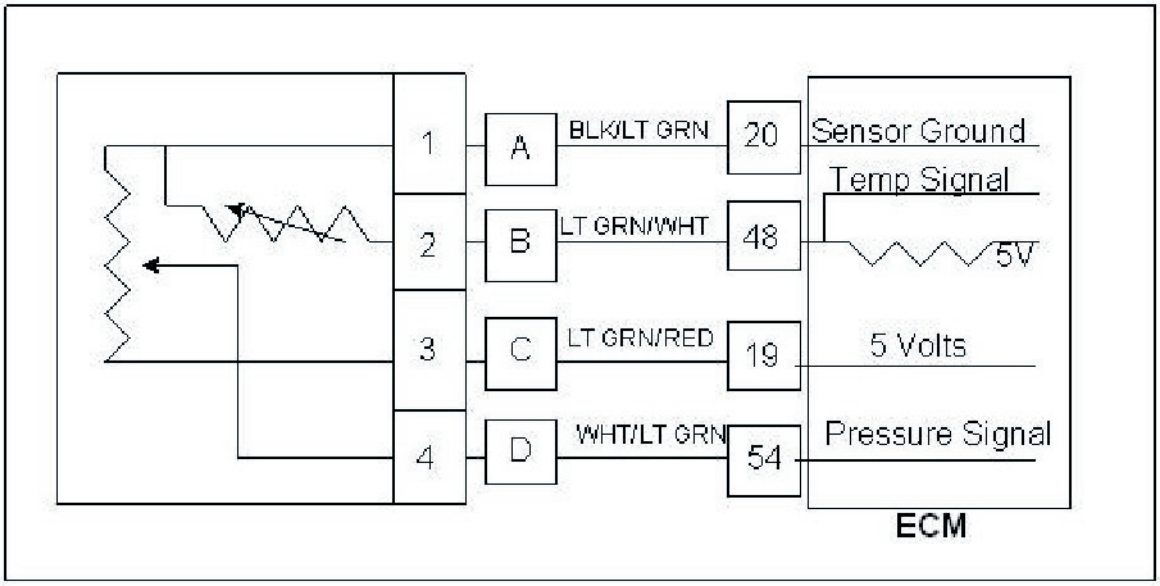
The CKP (crankshaft position sensor) is a magnetic transducer mounted on the engine block adjacent to a pulse wheel located on the crankshaft. It determines crankshaft position by monitoring the pulse wheel. The Crankshaft Position sensor is used to measure engine RPM and its signal is used to synchronize the ignition and fuel systems. This fault will set one or more crank re-sync occur within 800 ms.

# DTC 16- Never Crank Synced At Start SPN/FMI 636:8

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Check to be sure that the ECM ground terminals C014 and C023 are clean and tight.<br>Are terminals C014 and C023 clean and tight? | | Go to Step (3) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 3 | • Key OFF<br>• Disconnect the CKP sensor connector C017<br>• Using a DVOM check for voltage output directly from pins 1 & 2 from the CKP sensor while cranking the engine<br>• Do you have voltage output? | Over .5 volts | Go to Step (4) | Go to Step (11) |
| 4 | • Key OFF<br>• Disconnect ECM connector C001<br>• Using a DVOM check for continuity between CKP connector pin 1 and ECM connector pin 21<br>• Do you have continuity between them? | | Go to Step (5) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 5 | • Using a DVOM check for continuity between CKP connector pin 2 and ECM connector pin 22<br>Do you have continuity between them? | | Go to Step (6) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 6 | • Inspect the CKP connector C017 pins for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (7) |
| 7 | • Inspect the ECM connector C001 pins 21 and 22 for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (8) |
| 8 | • Using a DVOM check for continuity between ECM connector pins 21 and 22 to engine ground<br>Do you have continuity? | | Repair the shorted circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (10) |
| 9 | • Replace CKP sensor<br>Is the replacement complete? | | Go to Step (12) | - |
| 10 | • Replace ECM<br>• Is the replacement complete? | | Go to Step (12) | - |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 11 | • Key OFF<br>• Inspect the pulse wheel and CKP sensor for mechanical damage, corrosion or contamination.<br>Did you find a problem? | | Repair the component as necessary. Refer to Engine Repairs in Engine Section | Go to Step (9) |
| 12 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-16 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 91-Gasoline Fuel Pressure Sensor Low Voltage SPN/FMI 94:4




### Conditions for Setting the DTC

- Gasoline fuel pressure sensor voltage
- Fuel pressure sensor voltage less than .2v for 1s
- MIL-On for active fault and for 2 seconds after active fault
- Adaptive-disabled for the remainder of key cycle

## Circuit Description

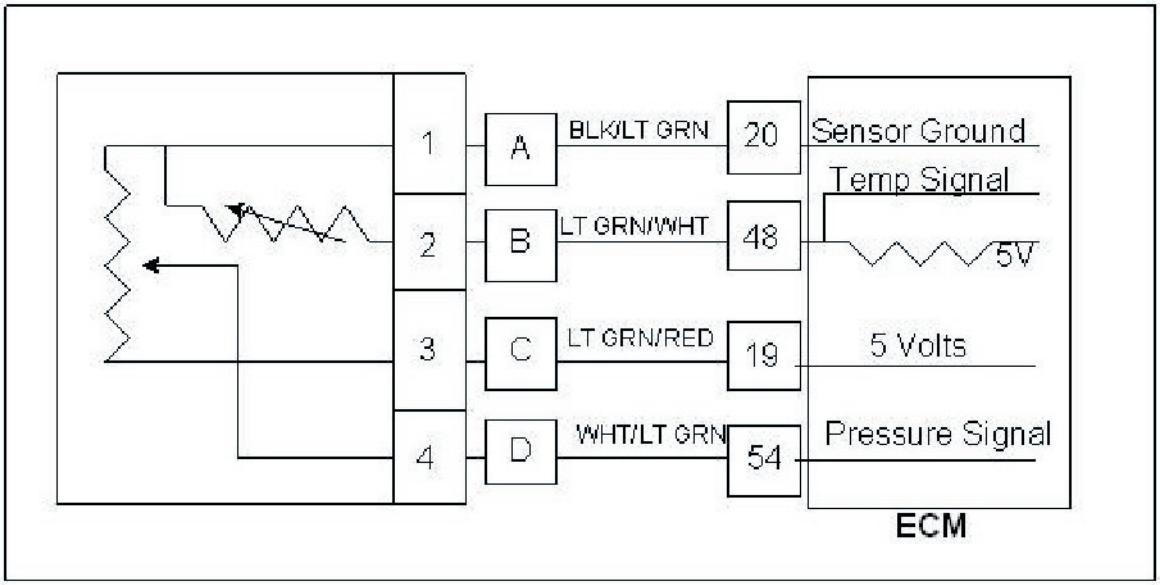
Note: The fuel pressure and temperature sensor is wired via Equipment Manufacturer supplied harness jumper. The terminals A, B, C, D & 19, 20, 48, 54 are engine wiring harness terminals at the fuel sensor interface connector C002 and the ECM header connector C001. You may need to consult additional wiring information supplied by the OEM. The fuel pump pressure sensor voltage is read at less than .2v. This indicates abnormally low fuel pressure or a low voltage fault from the sensor or circuit.

# DTC 91- Gasoline Fuel Pressure Sensor Low Voltage SPN/FMI 94:4

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine running.<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br><br>Using a DVOM, check for voltage at connector C002 terminal D by back probing to ground. Is voltage 0.2v or less with the engine idling? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect the gasoline fuel pressure sensor jumper harness connector C002 from the engine wiring harness<br>• Key On<br>• Using a DVOM, check for voltage between connector C002 terminal C and ground.<br><br>Is voltage 4.5 volts or greater? | | Go to Step (4) | Go to step (8) |
| 4 | • Inspect fuel pressure and temperature sensor connector and pins for corrosion, contamination or mechanical damage. Check for opens or shorts in OEM supplied jumper harness to sensor<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (5) |
| 5 | • Key OFF<br>• Disconnect ECM connector C001<br>• Check for continuity between gasoline pressure sensor connector terminal D and ECM pin 54.<br>Do you have continuity between them? | | Go to Step (6) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 6 | • Check for continuity between fuel pressure sensor connector terminal C and ECM pin 19<br><br>Do you have continuity between them? | | Go to step (7) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 7 | • Check for continuity between fuel pressure sensor connector terminal A and ECM pin 20<br><br>Do you have continuity between them? | | Go to step (11) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 8 | • Key Off<br>• Disconnect ECM header connector C001<br>• Check for continuity between pressure sensor connector C002 terminal C and ECM connector terminal 19.<br><br>Do you have continuity? | | Go to Step (9) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 9 | • Inspect ECM and gasoline pressure sensor connector (C002) terminals for corrosion, contamination or mechanical damage<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (10) |
| 10 | • Replace ECM. Refer to ECM replacement in the Engine Controls Section.<br>Is the replacement complete? | | Go to step (12) | - |
| 11 | • Replace fuel pressure and temperature sensor<br>Is the replacement complete? | | Go to step (12) | - |
| 12 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br><br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-91 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 92-Gasoline Fuel Pressure Sensor High Voltage SPN/FMI 94:3




### Conditions for Setting the DTC

- Gasoline fuel pressure sensor voltage
- Fuel pressure sensor voltage greater than 4.8v for 1s
- MIL-On for active fault and for 2 seconds after active fault
- Adaptive-disabled for the remainder of key cycle

## Circuit Description

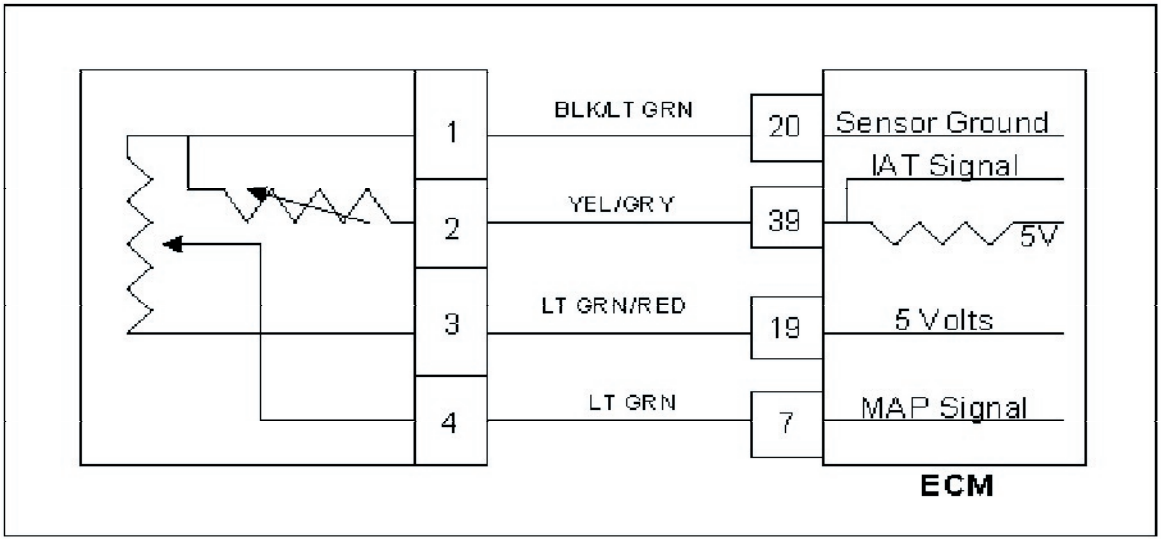
Note: The fuel pressure and temperature sensor is wired via Equipment Manufacturer supplied harness jumper. The terminals A, B, C, D & 19, 20, 48, 54 are engine wiring harness terminals at the fuel sensor interface connector C002 and the ECM header connector C001. You may need to consult additional wiring information supplied by the OEM. The fuel pressure sensor voltage is read at greater than 4.8v. This indicates abnormally high fuel pressure or a high voltage fault from the sensor or circuit.

# DTC 92- Gasoline Fuel Pressure Sensor High Voltage SPN/FMI 94:3

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine running.<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br><br>Using a DVOM, check for voltage at connector C002 terminal D by back probing to ground. Is voltage 4.8v or higher with the engine idling? | | Go to Step (3) | Intermittent problem Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect the gasoline fuel pressure sensor jumper harness connector C002 from the engine wiring harness<br>• Key On<br>• Using a DVOM, check for voltage between connector C002 terminals C and A.<br><br>Is voltage 4.5 volts or greater? | | Go to Step (4) | Go to step (8) |
| 4 | • Inspect fuel pressure and temperature sensor connector and pins for corrosion, contamination or mechanical damage. Check for opens or shorts in OEM supplied jumper harness to sensor<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (5) |
| 5 | • Key OFF<br>• Disconnect ECM connector C001<br>• Check for continuity between gasoline pressure sensor connector terminal D and ECM pin 54.<br>Do you have continuity between them? | | Go to Step (6) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 6 | • Check for continuity between fuel pressure sensor connector terminal C and ECM pin 19<br><br>Do you have continuity between them? | | Go to step (7) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 7 | • Check for continuity between fuel pressure sensor connector terminal A and ECM pin 20<br><br>Do you have continuity between them? | | Go to step (11) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 8 | • Key Off<br>• Disconnect ECM header connector C001<br>• Check for continuity between pressure sensor connector C002 terminal A and ECM connector terminal 20.<br><br>Do you have continuity? | | Go to Step (9) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 9 | • Inspect ECM and gasoline pressure sensor connector (C002) terminals for corrosion, contamination or mechanical damage<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (10) |
| 10 | • Replace ECM. Refer to ECM replacement in the Engine Controls Section.<br>Is the replacement complete? | | Go to step (12) | - |
| 11 | • Replace fuel pressure and temperature sensor<br>Is the replacement complete? | | Go to step (12) | - |
| 12 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br><br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-92 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 107- MAP Low Voltage SPN/FMI 106:4




## Conditions for Setting the DTC

- Manifold Absolute Pressure Sensor
- Check Condition-Engine cranking or running
- Fault Condition-MAP voltage less than 0.05 with throttle position greater than 2% and engine RPM less than 7000.
- MIL-ON
- Adaptive-Disabled for the remainder of key on cycle
- Fueling is based on RPM and TPS Limp-Home Condition during this fault.

## Circuit Description

The Manifold Absolute Pressure sensor is a pressure transducer connected to the intake manifold. It is used to measure the pressure of air in the manifold prior to induction. The pressure reading is used in conjunction with other inputs to estimate the airflow rate to the engine, which determines the fuel flow rate. This fault will set when the MAP reading is lower than the sensor should normally produce. When this fault is set the Adaptive Learn will be disabled for the remainder of the key on cycle and the MIL will be on.

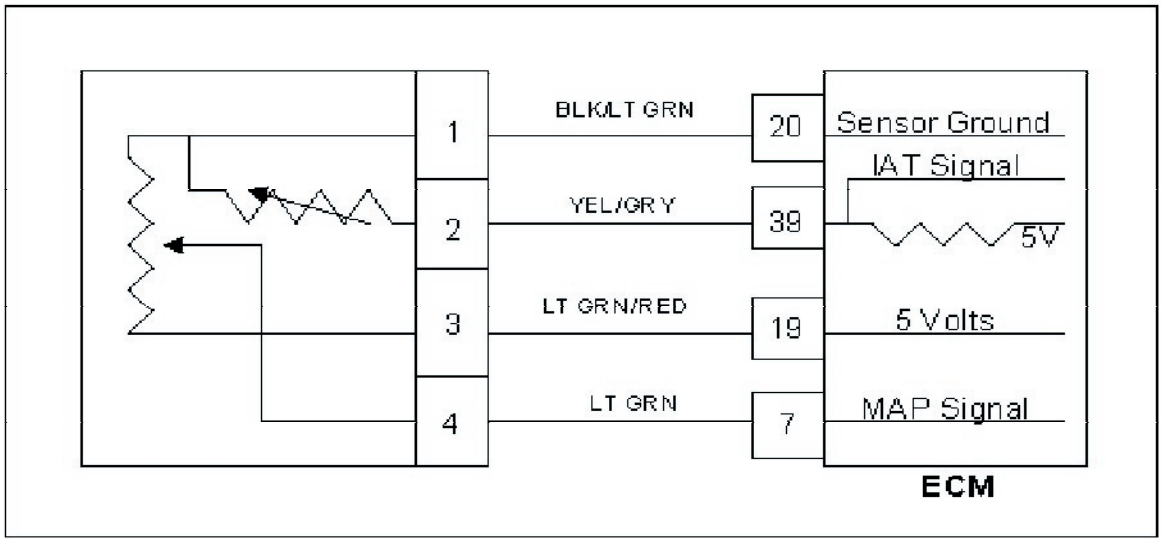
# DTC 107- MAP Low Voltage SPN/FMI 106:4

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine running.<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br><br>Does DST display MAP voltage of 0.05 or less with the engine idling? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect the TMAP sensor connector C007 from the wiring harness<br>• Jump the 5 volt reference pin 3 and MAP signal circuit pin 4 together<br>• Key ON<br><br>Does the DST display MAP voltage of 4.5 volts or greater? | | Go to Step (4) | Go to step (8) |
| 4 | • Inspect TMAP connector and pins for corrosion, contamination or mechanical damage<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (5) |
| 5 | • Key OFF<br>• Disconnect ECM connector C001<br>• Check for continuity between TMAP sensor connector signal pin 4 and ECM MAP signal pin 7.<br>Do you have continuity between them? | | Go to Step (6) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 6 | • Check for continuity between TMAP sensor connector 5 volt supply signal pin 3 and ECM 5 volt supply pin 19<br>Do you have continuity between them? | | Go to step (7) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 7 | • Check for continuity between TMAP sensor connector ground pin 1 and ECM sensor ground pin 20<br>Do you have continuity between them? | | Go to step (17) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 8 | • Probe MAP connector signal circuit pin 4 with a test light connected to battery voltage<br><br>Does the DST display MAP voltage of 4.0 or greater? | | Go to Step (9) | Go to step (13) |
| 9 | • Key OFF<br>• Disconnect ECM connector<br>• Check for continuity between TMAP sensor connector pin 3 and ECM 5 volt reference pin 19.<br>Do you have continuity between them? | | Go to step (10) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 10 | • Check for continuity between TMAP sensor connector 5 volt reference pin 3 and engine ground<br>Do you have continuity? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (11) |
| 11 | • Inspect ECM and TMAP wire harness connector and terminals for corrosion, contamination or mechanical damage<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (16) |
| 12 | • Replace ECM. Refer to ECM replacement in the Engine Controls Section.<br>Is the replacement complete? | | Go to step (17) | - |
| 13 | • Disconnect ECM connector<br>• Check for continuity between TMAP sensor connector signal circuit pin 4 and ECM signal pin 7<br>Do you have continuity between them? | | Go to Step (14) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 14 | • Check for continuity between TMAP sensor connector signal pin 4 and engine ground<br>Do you have continuity? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (15) |
| 15 | • Inspect ECM connector and wire harness connector terminals for corrosion, contamination or mechanical damage<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (16) |
| 16 | • Replace ECM. Refer to ECM replacement in the Engine Controls Section.<br>Is the replacement complete? | | Go to Step (18) | - |
| 17 | • Replace TMAP sensor<br>Is the replacement complete? | | Go to step (18) | - |
| 18 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-107 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 108-MAP High Pressure SPN/FMI 106:16




## Conditions for Setting the DTC

- Barometric pressure check
- Check condition-engine running and greater than 1800 RPM
- Fault Condition-MAP greater than 16 psia withTPS less than 10% and RPM greater than 1800
- MIL-On for active fault and for 4 seconds after active fault
- Adaptive-disabled for the remainder of key cycle

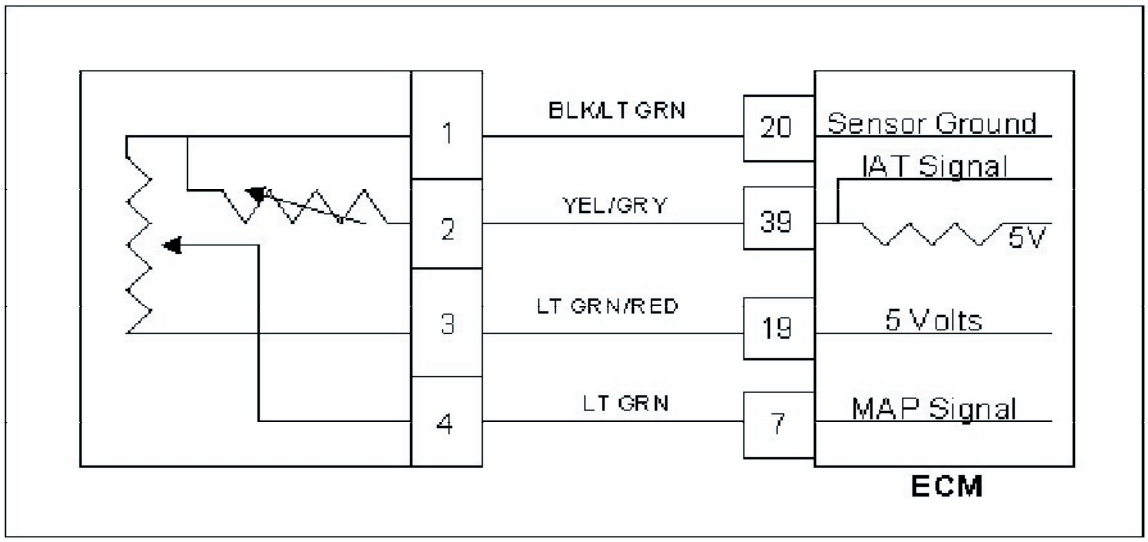
## Circuit Description

The MAP (Manifold Absolute Pressure) is estimated from the TMAP sensor. The MAP pressure value is used for fuel, airflow and spark calculations. This fault will set in the event the MAP value is greater than 16 psia when the TPS is less than 10% with engine speed greater than 1800.

# DTC 108- MAP High Pressure SPN/FMI 106:16

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine running at full operating temperature.<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br><br>Does DST display MAP pressure of 17.0 psia or greater with the engine running above 1800 RPM? | | Go to step (3) | Intermittent problem Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect the TMAP sensor connector C007<br>• Key ON<br>Does the DST display MAP pressure less than 0.05 psia? | | Go to step (4) | Go to step (6) |
| 4 | • Probe TMAP connector ground pin 1 with a test light connected to battery voltage.<br>Does the test light come on? | | Go to step (5) | Go to step (8) |
| 5 | • Check TMAP mechanical vacuum connection for correct mounting or possible damage causing leakage.<br>Is the TMAP sensor mechanical connection Ok? | | Go to step (6) | Go to Step (10) |
| 6 | • Key OFF<br>• Disconnect ECM connector and inspect terminals for damage corrosion or contamination. Is the connection Ok? | | Go to step (7) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 7 | Replace TMAP sensor. Is the repair complete? | — | Go to step (11) | - |
| **8** | • Disconnect ECM connector and check for continuity between TMAP connector sensor ground pin 1 and ECM sensor ground pin 20.<br>Do you have continuity between them? | | Go to step (9) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| **9** | Replace ECM. Refer to ECM replacement in the Engine Controls Section.<br>Is the replacement complete? | | Go to step (11) | - |
| **10** | • Correct TMAP mechanical connection<br><br>Has the TMAP mechanical connection problem been corrected? | | System OK | Go to OBD System Check |

# DTC 111-IAT Higher Than Expected 1 SPN/FMI 105:15




## Conditions for Setting the DTC

- Intake Air Temperature
- Check Condition-Engine Running
- Fault Condition-Intake Air Temperature greater than 200 degrees F. and engine RPM greater than 1000 for more than 60 seconds
- MIL-On
- Adaptive-Disabled during active fault
- Power Derate (Level 1)

## Circuit Description

The TMAP is a combined IAT (Intake Air Temperature) and MAP (Manifold Absolute Pressure) sensor. A temperature sensitive resistor is used in the TMAP located in the intake manifold of the engine. It is used to monitor incoming air temperature, and the output in conjunction with other sensors is used to determine the airflow to the engine. The ECM provides a voltage divider circuit so that when the air is cool, the signal reads higher voltage, and lower when warm. The IAT is a calculated value based mainly on the IAT sensor at high airflow, and influenced more by the ECT (Engine Coolant Temperature) at low airflow. This fault will set if the Intake Air Temperature is greater than 200 degrees F. and engine rpm is greater than 1000 for more than 60 seconds. Power derate level one will be enforced during this fault limiting the maximum throttle position to50%.

## Diagnostic Aid

* This fault will set when inlet air is much hotter than normal. The most common cause of high inlet air temperature is a problem with the inlet air system. Ensure that the air inlet is not obstructed, modified or damaged.
* Inspect the air inlet system for cracks or breaks that may allow unwanted under hood air in to the air inlet system.

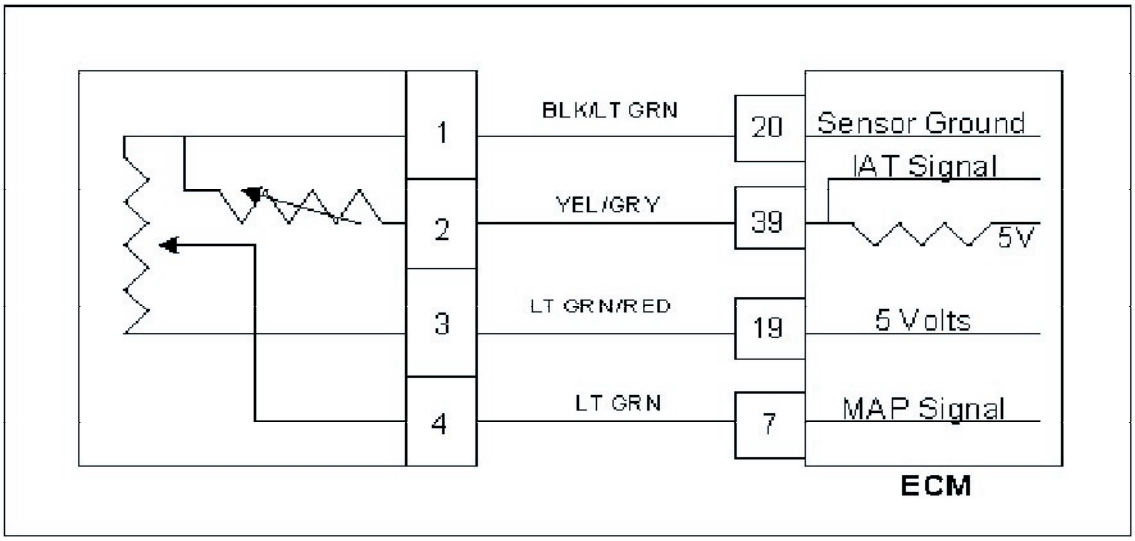
# DTC 111-IAT Higher Than Expected 1 SPN/FMI 105:15

This fault will set when inlet air is much hotter than normal. The most common cause of high inlet air temperature is a problem with the inlet air system. Ensure that the air inlet is not obstructed, modified or damaged.

- Inspect the air inlet system for cracks or breaks that may allow unwanted under hood air in to the air inlet system
- Use the chart below to check resistance accross pins 1 and 2 at TMAP sensor and compare resistance to air temperature.
- If none of the above can be found, Follow the diagnostic steps for DTC 112-IAT Low Voltage

| Temp (° F) | Ohms |
|---|---|
| 248 | 110 |
| 239 | 125 |
| 221 | 162 |
| 203 | 214 |
| 185 | 284 |
| 167 | 383 |
| 149 | 522 |
| 131 | 721 |
| 104 | 1,200 |
| 77 | 2,063 |
| 50 | 3,791 |
| 23 | 7,419 |
| -4 | 15,614 |
| -22 | 26,854 |
| -31 | 35,763 |
| -40 | 48,153 |

# DTC 112-IAT Low Voltage SPN/FMI 105:4




## Conditions for Setting the DTC

- Intake Air Temperature
- Check Condition Engine Cranking or Running
- Fault Condition-IAT Sensor Voltage less than 0.05 for greater than 1 second
- MIL-On during active fault and for 2 seconds after active fault
- Adaptive-Disabled during active fault

## Circuit Description

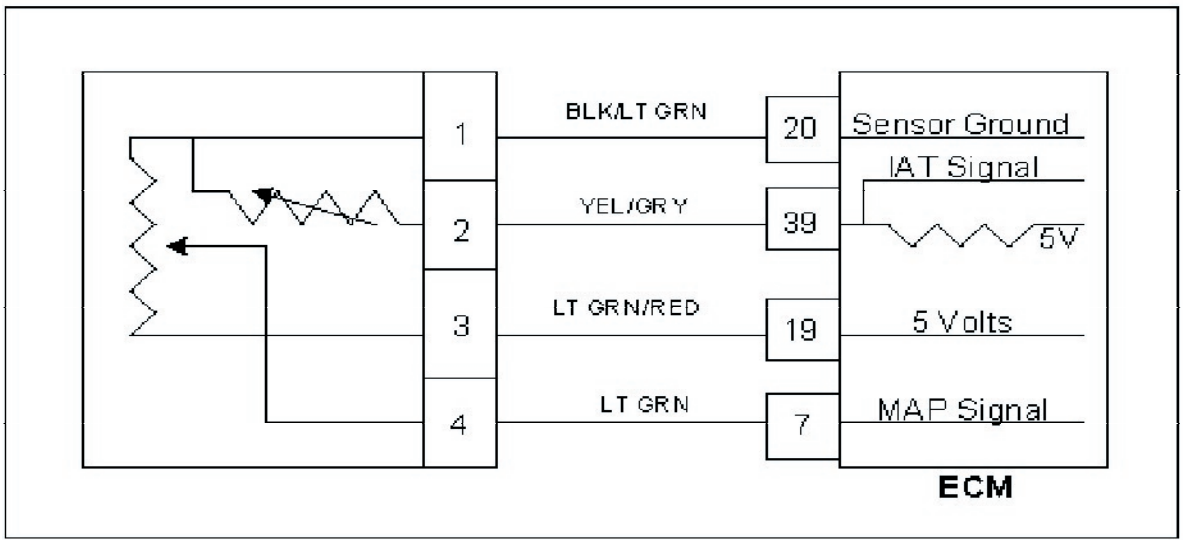
The TMAP is a combined IAT (Intake Air Temperature) and MAP (Manifold Absolute Pressure) sensor. A temperature sensitive resistor is used in the TMAP located in the intake manifold of the engine. It is used to monitor incoming air temperature, and the output in conjunction with other sensors is used to determine the airflow to the engine. The ECM provides a voltage divider circuit so that when the air is cool, the signal reads higher voltage, and lower when warm.
The IAT is a calculated value based mainly on the IAT sensor at high airflow, and influenced more by the ECT (Engine Coolant Temperature) at low airflow. This fault will set if the signal voltage is less than 0.05 volts for 1 second anytime the engine is cranking or running. The ECM will use the default value for the IAT sensor in the event of this fault.

# DTC 112- IAT VOLTAGE LOW SPN/FMI 105:4

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | – | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>Does DST display IAT voltage of 0.05 or less? | | Go to step (3) | Intermittent problem Go to Intermittent section |
| 3 | • Key Off<br>• Disconnect the TMAP sensor connector C007<br>• Key ON<br>Does the DST display IAT voltage of 4.9 volts or greater? | | Go to step (4) | Go to step (5) |
| 4 | • Replace TMAP sensor.<br>Is the replacement complete? | | Go to Step (9) | – |
| 5 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Check for continuity between TMAP sensor connector ground pin 1 and TMAP sensor connector signal pin 2<br>Do you have continuity between them? | — | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (6) |
| 6 | • Check for continuity between TMAP sensor connector signal circuit pin 2 and engine ground.<br>Do you have continuity? | — | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (7) |
| 7 | • Replace ECM. Refer to ECM replacement in the Engine Controls Section.<br>Is the replacement complete? | – | Go to step (8) | – |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 8 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-112 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 113-IAT High Voltage SPN/FMI 105:3




## Conditions for Setting the DTC

- Intake Air Temperature
- Check Condition-Engine Running
- Fault Condition-IAT Sensor Voltage greater than 4.95 for more than 1 second
- MIL-On during active fault and for 2 seconds after active fault
- Adaptive-Disabled during active fault

## Circuit Description

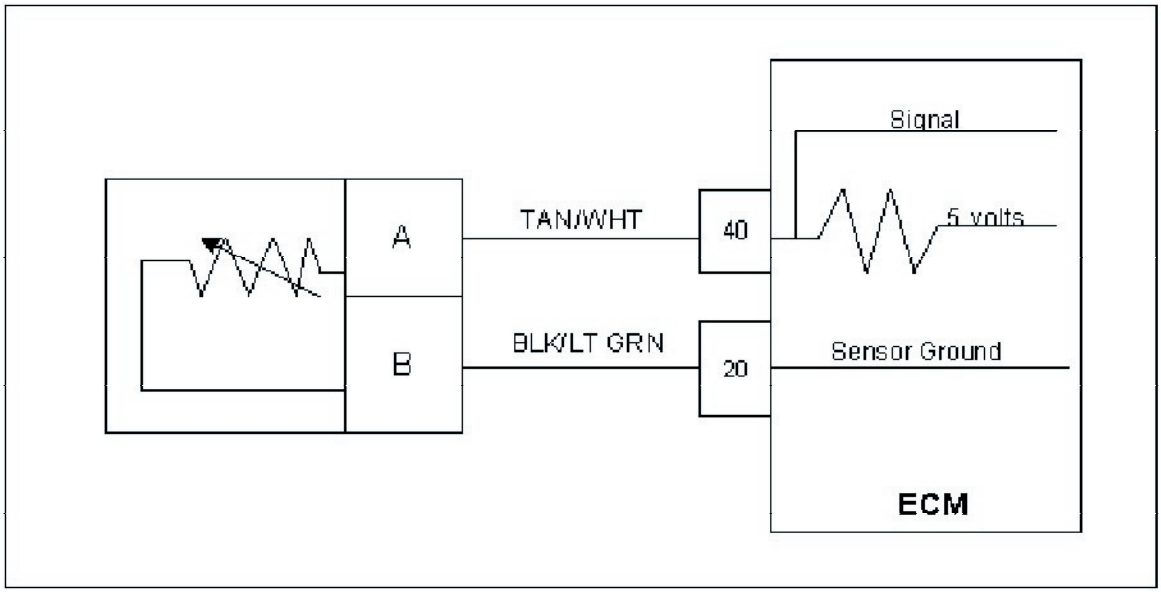
The TMAP is a combined IAT (Intake Air Temperature) and MAP (Manifold Absolute Pressure) sensor. A temperature sensitive resistor is used in the TMAP located in the intake manifold of the engine. It is used to monitor incoming air temperature, and the output in conjunction with other sensors is used to determine the airflow to the engine. The ECM provides a voltage divider circuit so that when the air is cool, the signal reads higher voltage, and lower when warm.
The IAT is a calculated value based mainly on the IAT sensor at high airflow, and influenced more by the ECT (Engine Coolant Temperature) at low airflow. This fault will set if the signal voltage is greater than 4.95 volts for more than 1 second anytime the engine is running. The ECM will use a default value for the IAT sensor in the event of this fault.

# DTC 113- IAT VOLTAGE HIGH SPN/FMI 105:3

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>Does DST display IAT voltage of 4.95 or greater? | | Go to step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key Off<br>• Disconnect the TMAP sensor connector C007 and jump pins 1 and 2 together<br>• Key On<br>Does the DST display IAT voltage of 0.1 volts or less? | | Go to step (9) | Go to step (4) |
| 4 | • Key OFF<br>• Jumper TMAP sensor connector signal pin 2 to engine ground<br>• Key ON<br>• Does DST display IAT voltage of 0.1 volts or less? | | Go to Step (7) | Go to Step (6) |
| 5 | Replace TMAP sensor.<br>Is the replacement complete? | | Go to Step (11) | _ |
| 6 | • Key OFF<br>• Disconnect the ECM wire harness connector C001.<br>• Check for continuity between TMAP sensor connector signal pin 2 and ECM IAT signal pin 39<br>Do you have continuity between them? | __ | Go to step (10) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 7 | • Check for continuity between TMAP sensor connector ground circuit pin 1 and ECM sensor ground circuit pin 20<br>Do you have continuity between them? | __ | Go to step (10) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 8 | • Replace ECM.<br>Refer to ECM replacement in the Engine Controls Section.<br>Is the replacement complete? | _ | Go to step (11) | _ |
| 9 | • Re-check wire harness and TMAP sensor connector for damage corrosion or contamination<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical | Go to Step (5) |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 10 | • Re-check wire harness and TMAP sensor connectors for damage corrosion or contamination<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical | Go to Step (8) |
| 11 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-113 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 116-ECT Higher Than Expected 1 SPN/FMI 110:15




## Conditions for Setting the DTC

- Engine Coolant Temperature
- Check Condition-Engine Running
- Fault Condition-Engine Coolant Temperature reading or estimate greater than 215 degrees F. for greater than 5 seconds
- MIL-On
- Power derate (level 1)
- Adaptive-Disabled during active fault

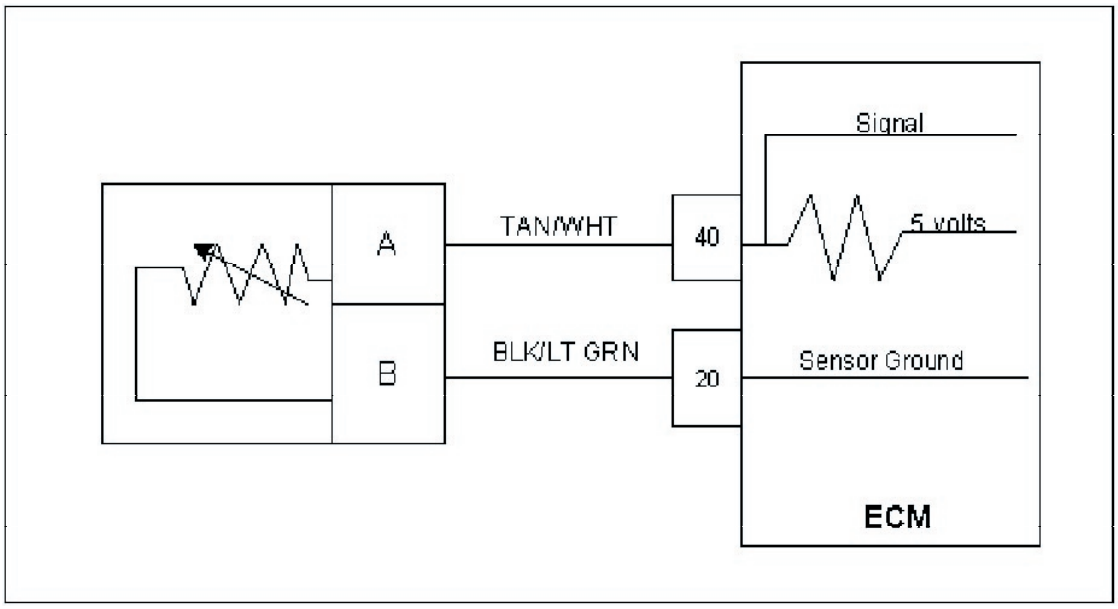
## Circuit Description

The ECT (Engine Coolant Temperature) sensor is a temperature sensitive resistor located in the engine coolant. sensor that is located in the coolant passage. The ECT is used for engine airflow calculation, fuel enrichment, ignition timing control and to enable certain other temperature dependant operations. This code set is designed to help prevent engine damage from overheating. The ECM provides a voltage divider circuit so when the sensor reading is cool the sensor reads higher voltage, and lower when warm. This fault will set when the coolant exceeds 225 degrees F. for more than 5 seconds with the engine speed over 600 rpm. Power derate level one will be enforced during this fault limiting the maximum throttle position to 50%.

# DTC 116- ECT HIGHER THAN EXPECTED 1 SPN/FMI 110:15

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Warm Engine to normal operating temperature, then run the engine above 1200 rpm for at least 60 seconds<br>Does DST display ECT temperature of 225 degrees F. or greater with the engine running over 1200 rpm? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Verify with a temperature gauge that the engine coolant is over 225 degrees F.<br>Does the temperature gauge indicate 225 degrees F. or greater? | | Repair Cooling system. | Go to step (4) |
| 4 | Verify ECT circuit function. Follow diagnostic test procedure for DTC117 ECT Low Voltage | | - | - |

# DTC 117-ECT Low Voltage SPN/FMI 110:4




## Conditions for Setting the DTC

- Engine Coolant Temperature
- Check Condition-Engine Running
- Fault Condition- ECT sensor voltage less than 0.05
- MIL-On during active fault and for 2 seconds after active fault
- Adaptive-Disabled during active fault

## Circuit Description

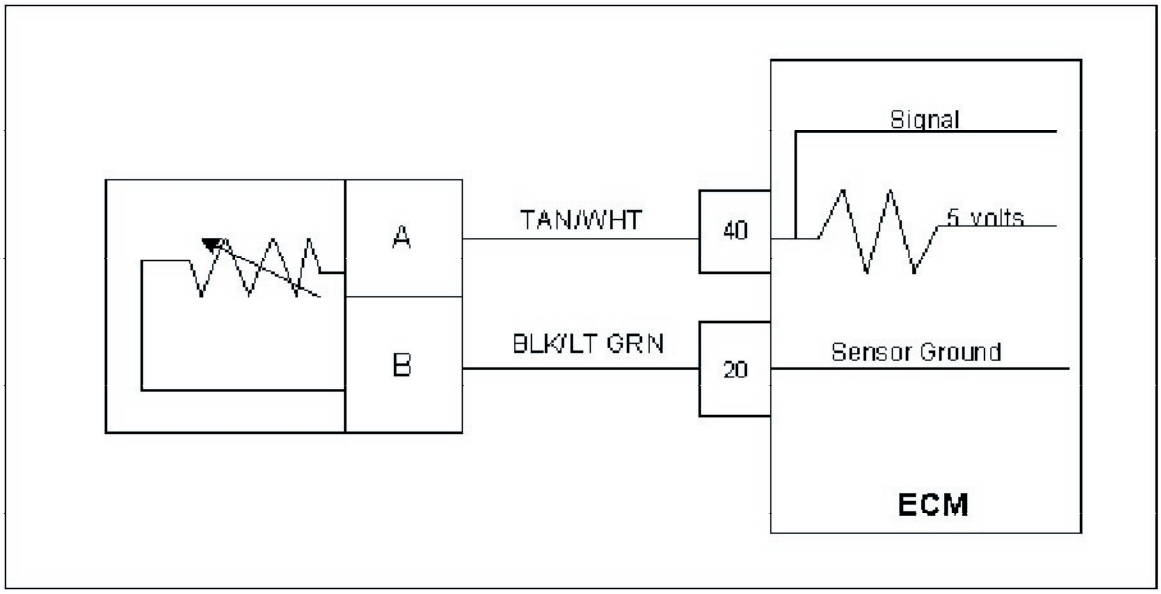
The ECT (Engine Coolant Temperature) sensor is a temperature sensitive resistor located in the engine coolant passage. It is used for the engine airflow calculation, gasoline cold enrichment and to enable other temperature dependant features. The ECM provides a voltage divider circuit so that when the coolant is cool, the signal reads higher voltage, and lower when warm. This fault will set if the signal voltage is less than 0.05 volts anytime the engine is running. The ECM will use a default value for the ECT sensor in the event of this fault.

| Temp (°F) | Ohms |
|---|---|
| 242 | 101 |
| 231.9 | 121 |
| 211.6 | 175 |
| 201.4 | 209 |
| 181.9 | 302 |
| 163.1 | 434 |
| 144.9 | 625 |
| 127.4 | 901 |
| 102.4 | 1,556 |
| 78.9 | 2,689 |
| 49.9 | 5,576 |
| 23.5 | 11,562 |
| -5.7 | 28,770 |
| -21.7 | 49,715 |
| -30.8 | 71,589 |
| -40 | 99,301 |

# DTC 117- ECT VOLTAGE LOW SPN/FMI 110:4

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | _ | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On<br>• DST (Diagnostic Scan Tool) connected in<br>• System Data Mode<br>Does DST display ECT voltage of 0.05 or less? | | Go to step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key Off<br>• Disconnect the ECT wire harness connector<br>• Key ON<br>Does the DST display ECT voltage of 4.9 volts or greater? | | Go to step (4) | Go to step (5) |
| 4 | Replace ECT sensor.<br>Is the replacement complete? | | Go to Step (8) | _ |
| 5 | • Key OFF<br>• Disconnect ECM wire harness connector<br>• Check for continuity between ECT sensor connector signal pin A and ECT sensor ground pin B<br>Do you have continuity between them? | __ | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (6) |
| 6 | • Check for continuity between ECT sensor connector signal circuit pin A and engine ground.<br>Do you have continuity? | __ | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (7) |
| **7** | Replace ECM. Refer to ECM replacement in the Engine Controls Section.<br>Is the replacement complete? | _ | Go to step (8) | _ |
| **8** | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>•<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-117 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 118-ECTHigh Voltage SPN/FMI 110:3




## Conditions for Setting the DTC

- Engine Coolant Temperature
- Check Condition-Engine Running
- Fault Condition-ECT sensor voltage exceeds 4.95 volts for greater than 1 second
- MIL-On during active fault and for 2 seconds after active fault
- Adaptive-Disabled during active fault

## Circuit Description

The ECT (Engine Coolant Temperature) sensor is a temperature sensitive resistor located in the engine coolant passage. It is used for the engine airflow calculation, gasoline cold enrichment and to enable other temperature dependant features. The ECM provides a voltage divider circuit so that when the coolant is cool, the signal reads higher voltage, and lower when warm. This fault will set if the signal voltage is greater than 4.95 volts for one second anytime the engine is running. The ECM will use a default value for the ECT sensor in the event of this fault.

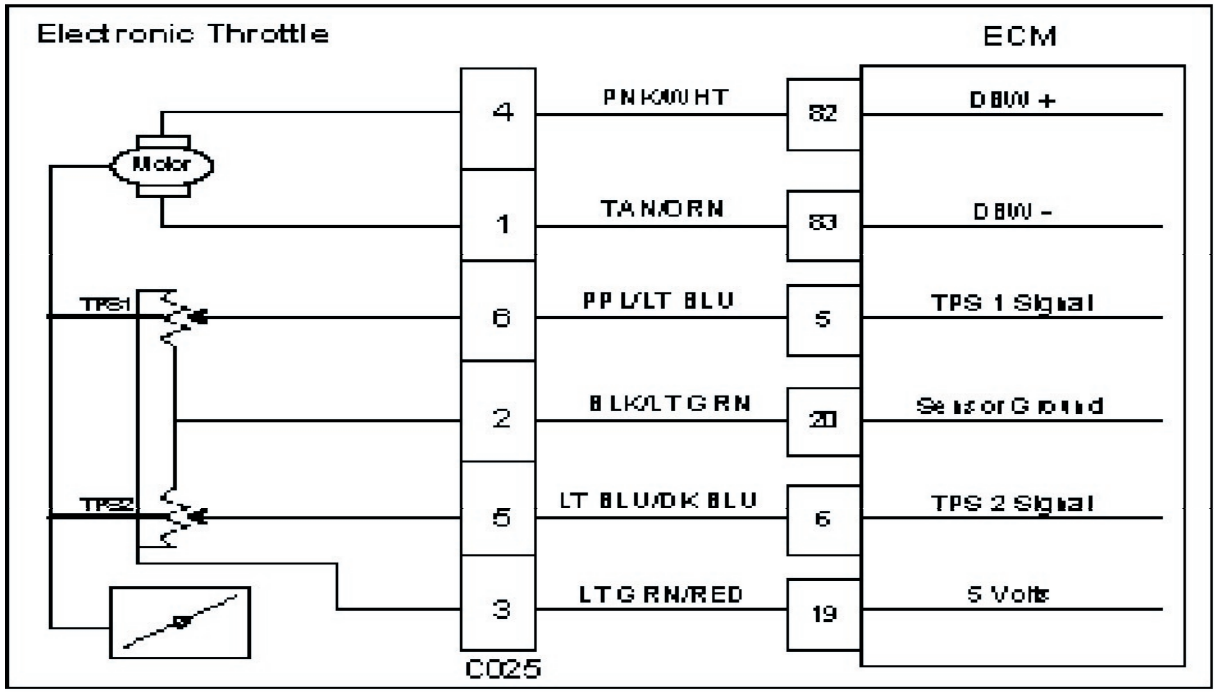
| Temp (° F) | Ohms |
|---|---|
| 242.4 | 101 |
| 231.9 | 131 |
| 211.6 | 175 |
| 201.4 | 209 |
| 181.9 | 302 |
| 163.1 | 434 |
| 144.9 | 625 |
| 127.4 | 901 |
| 102.4 | 1,556 |
| 78.9 | 2,689 |
| 49.9 | 5,576 |
| 23.5 | 11,562 |
| -5.7 | 28,770 |
| -21.2 | 49,715 |
| -30.8 | 71,589 |
| -40.0 | 99,301 |

# DTC 118- ECT VOLTAGE HIGH SPN/FMI 110:3

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to step (2) | Go to OBD System Check Section |
| 2 | • Key On<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>Does DST display ECT voltage of 4.95 or greater? | | Go to step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key Off<br>• Disconnect the ECT sensor connector C008 and Jump terminals A and B together<br>• Key On<br>Does the DST display ECT voltage of 0.05 volts or less? | | Go to step (4) | Go to Step (8) |
| 4 | • Using a DVOM check the resistance between the two terminals of the ECT sensor and compare the resistance reading to the chart<br>Is the resistance value correct? | See resistance chart vs. temperature in the DTC 118 circuit description | Go to step (6) | Go to step (5) |
| 5 | • Replace ECT sensor<br>Is the replacement complete? | | Go to step (14) | - |
| 6 | • Inspect the ECT wire harness connector terminals A and B for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (7) |
| 7 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Inspect ECM connector pins 20 and 40 for damage corrosion or contamination<br>• Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Intermittent problem<br>Go to Intermittent section |
| 8 | • Jumper the ECT signal pin A at the ECT connector to engine ground<br>Does DST display ECT voltage of 0.05 or less? | | Go to step (9) | Go to step (12) |
| 9 | • Key OFF<br>• Disconnect ECM wire harness connector<br>• Using a DVOM check for continuity between ECT sensor ground pin B and ECM connector pin 20<br>Do you have continuity between them? | | Go to step (10) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 10 | • Inspect ECM connector pins 20 and 40 for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (11) |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 11 | • Replace ECM<br>Is the replacement complete? | | Go to step (14) | - |
| 12 | • Key OFF<br>• Disconnect ECM wire harness connector<br>• Using A DVOM check for continuity between ECT connector signal pin A and ECM connector terminal 40<br>Do you have continuity between them? | | Go to step (13) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 13 | • Inspect ECM connector pins 20 and 40 for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (11) |
| 14 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-118 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 121-TPS 1 Lower Than TPS 2 SPN/FMI 51:1




## Conditions for Setting the DTC

- Throttle Position Sensor 1 & 2
- Check Condition-Key On
- Fault Condition-TPS 1 20% lower than TPS 2
- MIL-On for remainder of key on cycle
- Power Derate 1

## Circuit description

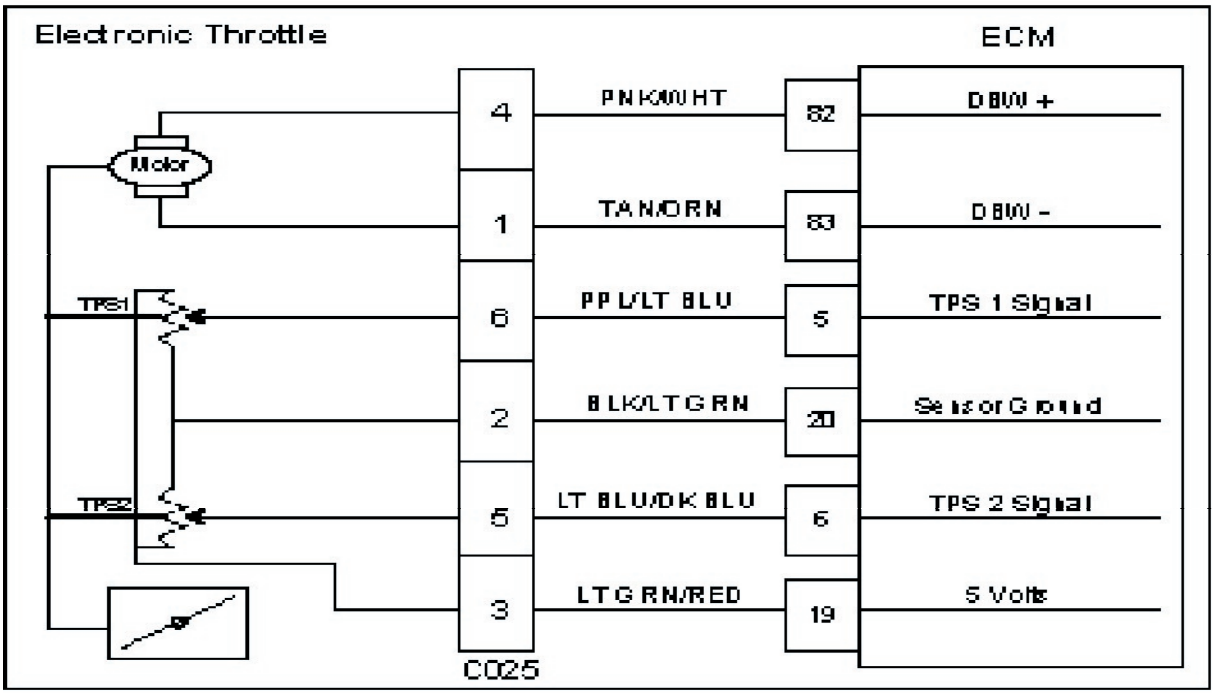
There are two Throttle Position Sensors located within the throttle which use variable resistors to determine signal voltage based on throttle plate position. TPS 1 will read low voltage when closed and TPS 2 will read high voltage when closed. The TPS 1 and TPS 2 percentages are calculated from these voltages. Although the voltages are different, the calculated values for the throttle position percentages should be very close to the same. The TPS values are used by the ECM to determine if the throttle is opening as commanded.
This fault will set if TPS 1 is 20% (or more) lower than TPS 2. At this point the throttle is considered to be out of specification, or there is a problem with the TPS signal circuit. Power derate 1 will be enforced limiting the throttle to 50% maximum. Low rev limit and forced idle will also be enforced during this fault.

# DTC 121 TPS 1 Lower Than TPS 2 SPN/FMI 51:1

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine OFF<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>Does the DST display more than a 20% difference between TPS 1 and TPS 2 voltage? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect electronic throttle connector C025<br>• Key ON<br>• Change DST mode to DBW (drive by wire) test mode<br>Is the voltage for TPS 1 less than 0.1 volts? | | Go to Step (5) | Go to Step (4) |
| 4 | • Key OFF<br>• Disconnect ECM wiring harness connector C001<br>• Key ON<br>• Using a DVOM check for voltage between ECM connector TPS 1 signal pin 5 and engine ground<br>Do you have voltage? | | Repair the TPS 1 circuit shorted to voltage as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (9) |
| 5 | • Jump TPS 1 signal pin 6 to the 5 volt reference pin 3 at connector C025<br>Does DST display TPS 1 voltage over 4.95 volts | | Go to Step (6) | Go to Step (8) |
| 6 | • Inspect wire terminals at throttle connector for damage corrosion or contamination<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (7) |
| 7 | • Replace the electronic Throttle<br>Is the replacement complete? | | Go to Step (12) | - |
| 8 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Using a DVOM check for continuity between throttle connector TPS 1 signal pin 6 and ECM connector TPS 1 signal pin5<br>Do you have continuity between them? | | Go to Step (9) | Repair the open circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 9 | • Using a DVOM check for continuity between throttle connector signal ground pin 2 and ECM connector signal ground pin 20<br>Do you have continuity between them? | | Go to Step (10) | Repair the open circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 10 | • Inspect ECM connector terminals for damage corrosion or contamination.<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical | Go to Step (11) |
| 11 | • Replace ECM<br>Is the replacement complete? | | Go to Step (12) | - |
| 12 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-121 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 122-TPS 1 Signal Voltage Low SPN/FMI 51:4




## Conditions for Setting the DTC

- Throttle Position Sensor 1
- Check Condition-Cranking or Running
- Fault Condition-TPS sensor voltage less than 0.20 for more than .50 seconds
- MIL-On during active fault
- Power Derate 1

## Circuit Description

There are 2 Throttle Position Sensors located within the throttle which use variable resistors to determine signal voltage based on throttle plate position. TPS1 will read lower voltage when closed and TPS2 will read higher voltage when closed. The TPS1 and TPS2 percentages are calculated from these voltages. Although the voltages are different, the calculated values for the throttle position percentages should be very close to the same. The TPS values are used by the ECM to determine if the throttle is opening as commanded. The TPS is not serviceable and in the event of a failure the electronic throttle assembly must be replaced.

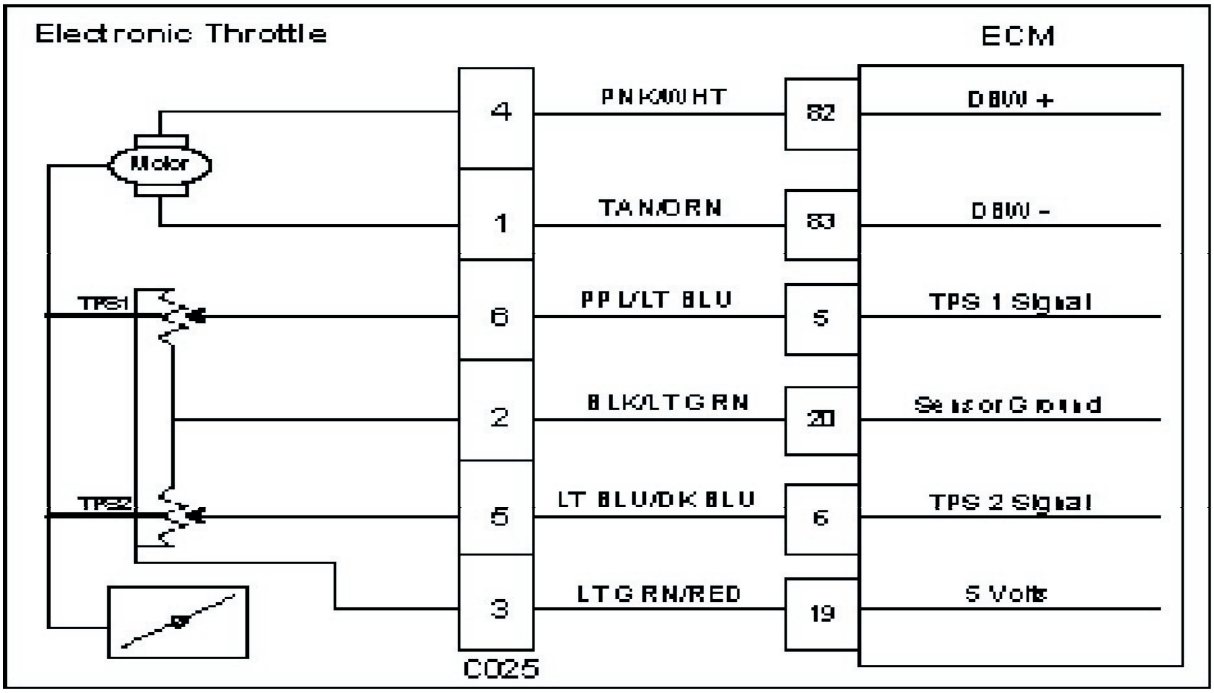
This fault will set if the TPS 1 voltage is less than 0.20 volts for more than .50 seconds. The MIL command in ON and power derate level 1 will be enforced limiting maximum throttle to 50%.

# DTC 122 TPS 1 Signal Voltage Low SPN/FMI 51:4

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine OFF<br>• DST (Diagnostic Scan Tool) connected in DBW (Drive by Wire) throttle test mode<br>Does the DST display TPS 1 voltage of 0.20 volts or less with the throttle closed? | | Go to Step (4) | Go to Step (3) |
| 3 | • Slowly depress Foot Pedal while observing TPS 1 voltage<br>Does TPS 1 voltage ever fall below 0.20 volts? | | Go to Step (4) | Intermittent problem<br>Go to Intermittent section |
| 4 | • Key OFF<br>• Disconnect the electronic throttle connector C025<br>• Jump the 5 volt reference circuit pin 3 and TPS 1 signal circuit pin 6 together at the throttle connector<br>• Key ON<br>Does DST display TPS 1voltage of 4.0 volts or greater? | | Go to Step (7) | Go to Step (5) |
| 5 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>Using a DVOM check continuity between TPS 1 connector C025 signal pin 6 and ECM connector TPS 1 signal pin 5<br>Do have continuity between them? | | Go to Step (6 ) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 6 | • Replace ECM<br>Is the replacement complete? | | Go to Step (9) | - |
| 7 | • Inspect the throttle wire harness connector terminals for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (8) |
| 8 | • Replace the electronic throttle<br>Is the replacement complete? | | Go to Step (9) | - |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 9 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-122 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 123-TPS 1 Signal Voltage High SPN/FMI 51:3




## Conditions for Setting the DTC

- Throttle Position Sensor 1
- Check Condition-Cranking or Running
- Fault Condition-TPS sensor voltage exceeds 4.80 volts for more than .50 seconds
- MIL-On during active fault
- Power derate level 1

## Circuit Description

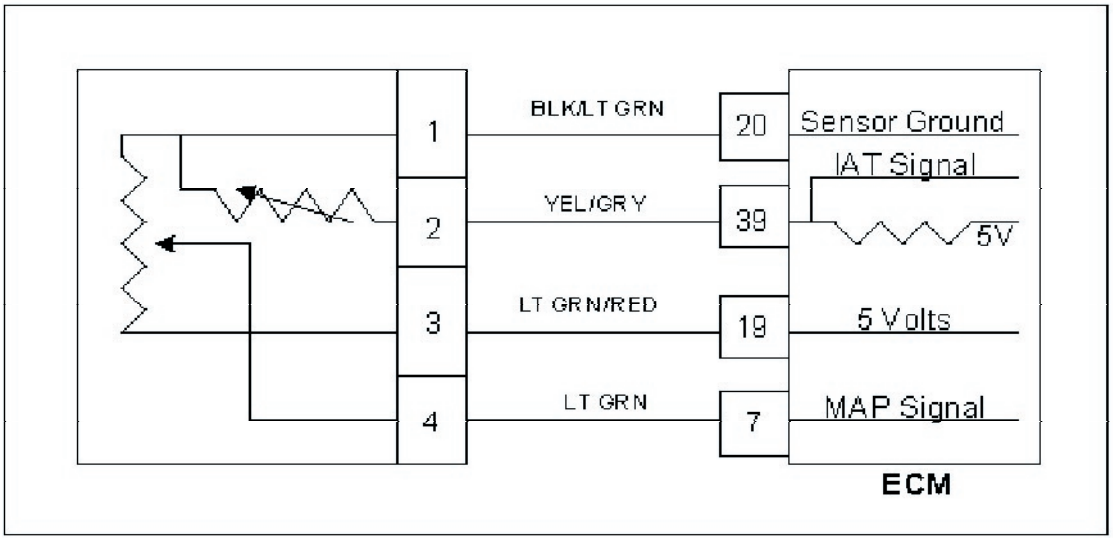
There are 2 Throttle Position Sensors located within the throttle which use variable resistors to determine signal voltage based on throttle plate position. TPS1 will read lower voltage when closed and TPS2 will read higher voltage when closed. The TPS1 and TPS2 percentages are calculated from these voltages. Although the voltages are different, the calculated values for the throttle position percentages should be very close to the same.
The TPS values are used by the ECM to determine if the throttle is opening as commanded. The TPS is not serviceable and in the event of a failure the electronic throttle assembly must be replaced.
This fault will set if the TPS 1 voltage exceeds 4.80 volts for more than .50 seconds. The MIL command in ON and power derate level 1 will be enforced limiting maximum throttle to 50%.

# DTC 123 TPS 1 Signal Voltage High SPN/FMI 51:3

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine OFF<br>DST (Diagnostic Scan Tool) connected<br>Does the DST display TPS 1 voltage of 4.8 volts or greater with the throttle closed? | | Go to Step (4) | Go to Step (3) |
| 3 | • Slowly depress Foot Pedal while observing TPS 1 voltage<br>Does TPS 1 voltage ever exceed 4.8 volts? | | Go to Step (4) | Intermittent problem<br>Go to Intermittent section |
| 4 | • Key OFF<br>• Disconnect electronic throttle connector C025<br>• Key ON<br>Does DST display TPS 1 voltage less than 0.2 volts? | | Go to Step (7) | Go to Step (5) |
| 5 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Key ON<br>• Using a DVOM check for voltage between TPS 1 signal at the ECM connector pin 5 and engine ground<br>Do you have voltage? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (6) |
| 6 | • Replace ECM<br>Is the replacement complete? | | Go to Step (11) | - |
| 7 | • Back probe sensor ground circuit at the ECM side of the wire harness pin 20 with a test light connected to battery voltage<br>Does the test light come on? | | Go to Step (8) | Go to Step (10) |
| 8 | • Inspect the electronic throttle connector terminals for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (9) |
| 9 | • Replace the electronic throttle<br>Is the replacement complete? | | Go to Step (11) | - |
| 10 | • Key OFF<br>• Disconnect ECM connector C001<br>• Using a DVOM check for continuity between the electronic throttle connector C025 sensor ground pin 2 and ECM connector TPS 1 sensor ground pin 20<br>Do have continuity between them? | | Go to Step (6) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 11 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-123 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 127-IAT Higher Than Expected 2 SPN/FMI 105:0




## Conditions for Setting the DTC

- Intake Air Temperature
- Check Condition-Engine Running
- Fault Condition-Intake Air Temperature greater than 210 degrees F. for more than 120 seconds with engine speed greater than 1000 RPM
- MIL-On for active fault and for 15 seconds after active fault
- Engine Shut Down

## Circuit Description

The TMAP is a combined IAT (Intake Air Temperature) and MAP (Manifold Absolute Pressure) sensor. A temperature sensitive resistor is used in the TMAP located in the intake manifold of the engine. It is used to monitor incoming air temperature, and the output in conjunction with other sensors is used to determine the airflow to the engine. The ECM provides a voltage divider circuit so that when the air is cool, the signal reads higher voltage, and lower when warm.

This fault will set if the Intake Air Temperature is greater than 210 degrees F. for more than 120 seconds with engine RPM greater than 1000. The MIL light command is on during this active fault and the engine will shut down.

# DTC 127-IAT Higher Than Expected 2 SPN/FMI 105:0

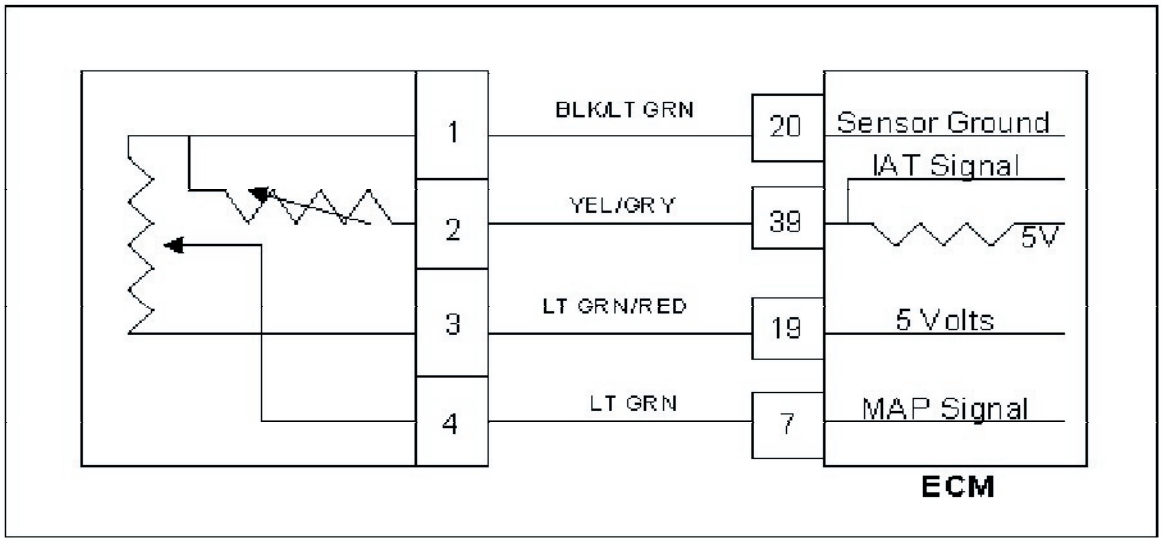
**Diagnostic Aid**

This fault will set when inlet air is much hotter than normal. The most common cause of high inlet air temperature is a problem with the inlet air system. Ensure that the air inlet is not obstructed, modified or damaged.

- Inspect the air inlet system for cracks or breaks that may allow unwanted under hood air in to the air inlet system
- Use the chart below to check resistance accross pins 1 and 2 at TMAP sensor and compare resistance to air temperature.
- If none of the above can be found, follow the diagnostic steps for **DTC 112-IAT Low Voltage.**

| Temp (° F) | Ohms |
|---|---|
| 248 | 110 |
| 239 | 125 |
| 221 | 162 |
| 203 | 214 |
| 185 | 284 |
| 167 | 383 |
| 149 | 522 |
| 131 | 721 |
| 104 | 1,200 |
| 77 | 2,063 |
| 50 | 3,791 |
| 23 | 7,419 |
| -4 | 15,614 |
| -22 | 26,854 |
| -31 | 35,763 |
| -40 | 48,153 |

# DTC 129-BP Low Pressure SPN/FMI 108:1




## Conditions for Setting the DTC

- Barometric pressure check
- Check condition-engine off and key on
- Fault Condition-BP less than 8.3 PSIA
- MIL-On for active fault and for 2 seconds after active fault
- Adaptive-disabled for the remainder of key cycle

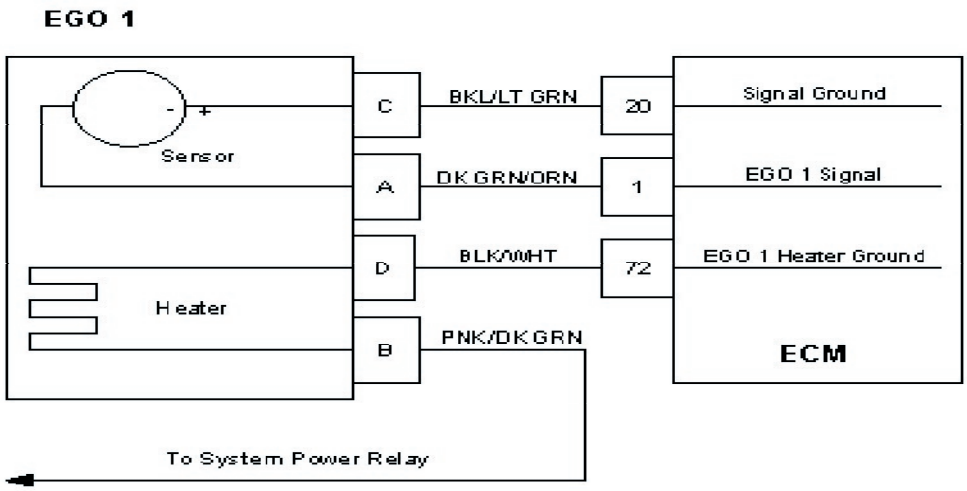
## Circuit Description

The BP (Barometric Pressure) is estimated from the TMAP sensor. The barometric pressure value is used for fuel and airflow calculations. This fault sets in the event the BP value is out of the normal operating range.

# DTC 129- BP Low Pressure SPN/FMI 108:1

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On<br>• DST (Diagnostic Scan Tool) connected in<br>• System Data Mode<br><br>Does DST display MAP pressure of 8.3 PSIA or less? | | Go to step (3) | Intermittent problem Go to Intermittent section |
| 3 | • Replace TMAP sensor.<br>Is the repair complete? | | Go to Step (4) | - |
| 4 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br><br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-129 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System Ok | *Go to OBD System Check* |

# DTC 134-EGO 1 Open/Lazy SPN/FMI 724:10




## Conditions for Setting the DTC

- Heated Oxygen Sensor
- Check condition- Engine running
- Fault condition- EGO 1 cold persistently more than 120 seconds
- MIL- On during active fault and for 1 second after active fault
- Adaptive- Disabled during active fault
- Closed Loop- Disabled during active fault

## Circuit Description

The EGO 1 sensor is used to determine if the fuel flow to the engine is correct by measuring the oxygen content in the exhaust gas. The ECM uses this information to correct the fuel flow with the Closed Loop multiplier and the Adaptive multiplier.

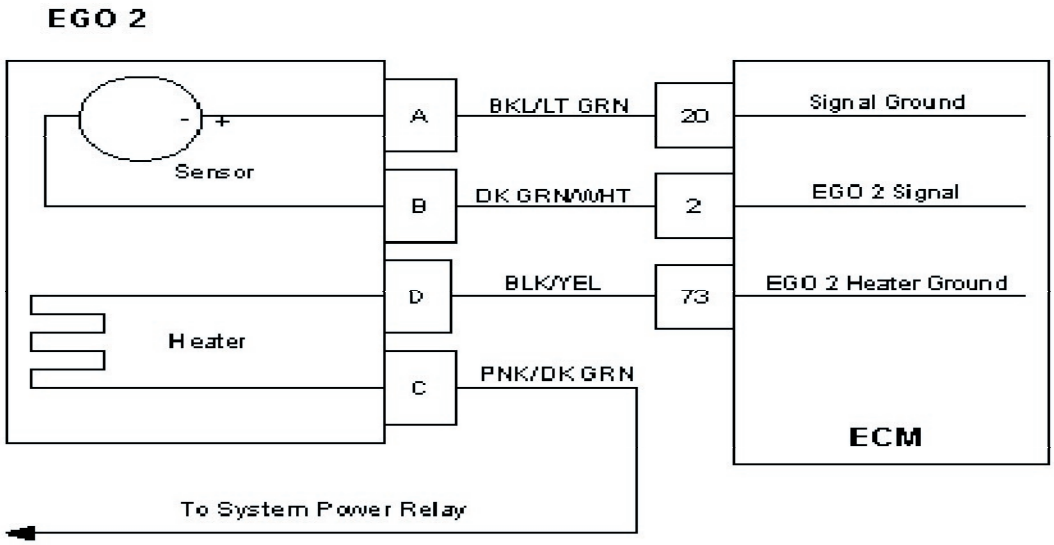
This fault will set if EGO 1 is cold, non-responsive, or inactive for more than 120 seconds.

## DTC 134-EGO 1 Open/Inactive SPN/FMI 724:10

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | *Go to step (2)* | *Go to OBD System Check Section* |
| 2 | • Key ON, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>  • Run engine to full operating temperature and then idle for a minimum of 2 minutes<br><br>Does DST display EGO 1 voltage fixed between 0.4 and 0.5 volts after at least 2 minutes of idle run time? | | Go to Step (3) | Intermittent problem. See Electrical Section Intermittent Electrical Diagnosis |
| 3 | • Key OFF<br>• Disconnect EGO 1 connector C006<br>• Key ON<br>• Using a DVOM check for voltage between EGO 1 connector pins B and D<br><br>**(Check must be made within 30 seconds or before power relay shuts down)**<br><br>Do you have voltage? | | *Go to step (8)* | *Go To Step (4)* |
| 4 | • Key OFF<br>• Using a DVOM check for voltage between EGO 1 connector pin B and engine ground<br>• Key ON<br><br>**(Check must be made within 30 seconds or before power relay shuts down)**<br><br>Do you have voltage? | System Voltage | *Go to step (5)* | *Repair system power relay open circuit* |
| 5 | • Disconnect ECM connector C001<br>• Using a DVOM check for continuity between EGO 1 connector pin D and ECM connector pin 72<br>Do you have continuity? | | *Go to step (6)* | *Repair open heater ground circuit* |
| 6 | • Inspect wire harness connector C006 pins A and D and C001 pins 1 and 72 for damage, corrosion or contamination<br>Did You find a problem? | | Correct the problem as required see Electrical Section wire harness repair | Go to step (7) |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 7 | • Replace ECM<br>Is the replacement complete? | | Go to step (11) | - |
| 8 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Using a DVOM check for continuity between EGO 1 pin A and ECM connector pin 1<br><br>Do you have continuity? | | Go to step (9) | *Repair open EGO 1 circuit* |
| 9 | • Using a DVOM check for continuity between EGO 1 pin C and ECM connector pin 20<br><br>Do you have continuity? | | Go to step (10) | *Repair open EGO 1 signal ground* |
| 10 | • Replace EGO 1 sensor<br><br>Is the replacement complete? | | Go to step (11) | - |
| 11 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br><br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-134 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System Ok | *Go to OBD System Check* |

# DTC 154-EGO 2 Open/Inactive SPN/FMI 520208:10




## Conditions for Setting the DTC

- Heated Oxygen Sensor
- Check condition- Engine running
- Fault condition- EGO 2 cold persistently more than 120 seconds
- MIL- On during active fault and for 2 second after active fault
- Adaptive- Disabled during active fault
- Closed Loop- Disabled during active fault

## Circuit Description

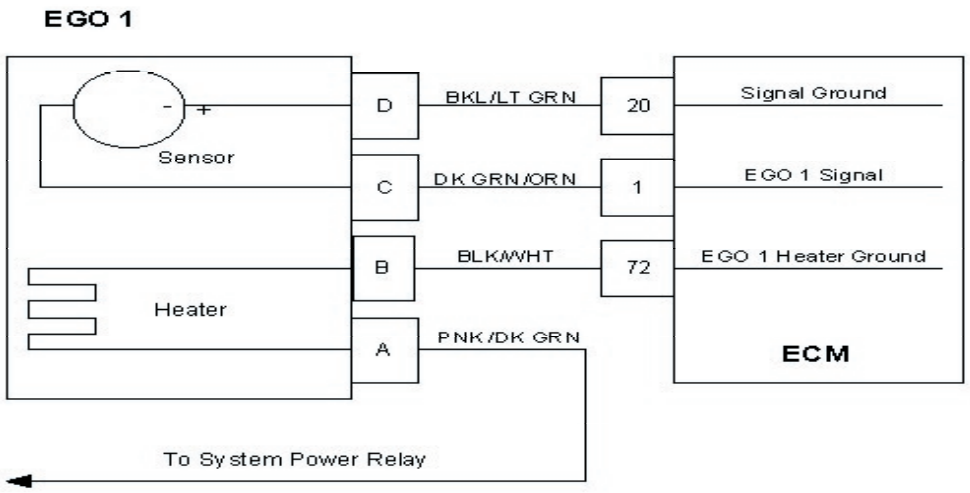
The EGO 2 sensor is used to monitor the efficiency of the catalytic converter. The ECM compares the EGO 1 and EGO 2 voltage signals to determine this. This fault will set if EGO 2 is cold, non-responsive, or inactive for more than 120 seconds.

# DTC 154-EGO 2 Open/Inactive SPN/FMI 520208:10

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>  • Run engine to full operating temperature and then idle for a minimum of 2 minutes<br><br>Does DST display EGO 2 voltage fixed between 0.4 and 0.5 volts after at least 2 minutes of idle run time? | | Go to Step (3) | Intermittent problem. See Electrical Section Intermittent Electrical Diagnosis |
| 3 | • Key OFF<br>• Disconnect EGO 2 connector C005<br>• Key ON<br>• Using a DVOM check for voltage between EGO 2 connector pins C and D<br><br>**(Check must be made within 30 seconds or before power relay shuts down)**<br><br>Do you have voltage? | | Go to step (8) | Go To Step (4) |
| 4 | • Key OFF<br>• Using a DVOM check for voltage between EGO 2 connector pin C and engine ground<br>• Key ON<br><br>**(Check must be made within 30 seconds or before power relay shuts down)**<br><br>Do you have voltage? | System Voltage | Go to step (5) | Repair system power relay open circuit |
| 5 | • Disconnect ECM connector C001<br>• Using a DVOM check for continuity between EGO 2 connector pin D and ECM connector pin 73<br>Do you have continuity? | | Go to step (6) | Repair open heater ground circuit |
| 6 | • Inspect wire harness connector C005 pins C and D and C001 pins 2 and 73 for damage, corrosion or contamination<br>Did You find a problem? | | Correct the problem as required see Electrical Section wire harness repair | Go to step (7) |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 7 | • Replace ECM<br>Is the replacement complete? | | Go to step (11) | - |
| 8 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Using a DVOM check for continuity between EGO 2 connector pin B and ECM connector pin 2<br><br>Do you have continuity? | | Go to step (9) | Repair open EGO 2 circuit |
| 9 | • Using a DVOM check for continuity between EGO 2 pin A and ECM connector pin 20<br><br>Do you have continuity? | | Go to step (10) | Repair open EGO 2 signal ground |
| 10 | • Replace EGO 2 sensor<br><br>Is the replacement complete? | | Go to step (11) | - |
| 11 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br><br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-154 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System Ok | Go to OBD System Check |

# DTC 171-Adaptive Learn High Gasoline SPN/FMI 520200:0




## Conditions for Setting the DTC

- Heated Oxygen Sensor
- Functional Fault-Adaptive multiplier out of range (greater than 30%)
- MIL-On during active adaptive limit condition

## Circuit Description

The EGO 1 sensor is used to determine if the fuel flow to the engine is correct by measuring the oxygen content in the exhaust gas. The ECM uses this information to correct the fuel flow with the Closed Loop multiplier and the Adaptive multiplier. This fault sets if the Adaptive multiplier exceeds the limits of normal operation.

## Diagnostic Aid

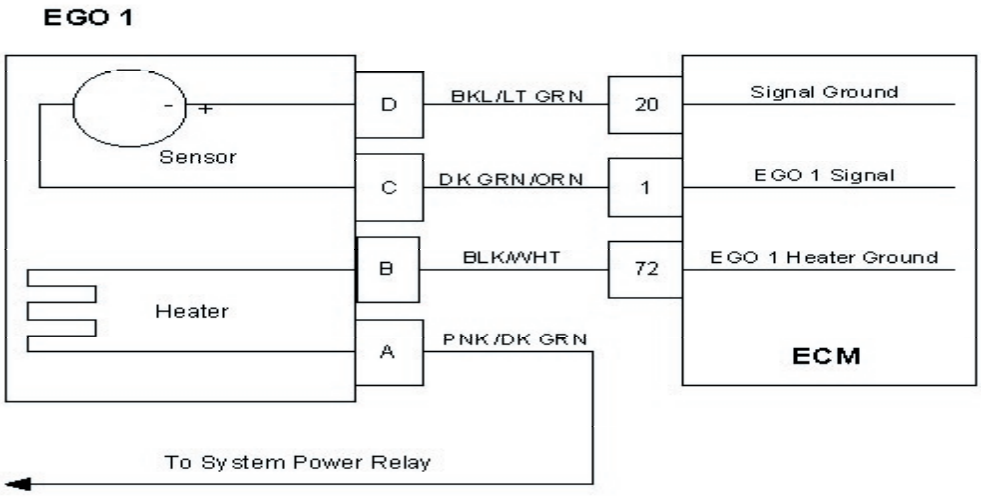
**Check for other DTC codes** that may be set. Correct those starting with the lowest code set number before proceeding with the diagnostic chart.
**Oxygen Sensor Wire** Heated Oxygen sensor wires may be mis-routed and contacting the exhaust manifold.
**Vacuum Leaks** Large vacuum leaks and crankcase leaks can cause a lean exhaust condition at especially at light load.
**Injectors** System will be lean if an injector driver or driver circuit fails open. The system will also be lean if an injector fails in a closed manner or is dirty.
**Fuel Pressure** Low fuel pressure, faulty fuel injector or damaged fuel pump assembly can cause the fuel system to run lean
**Exhaust Leaks** If there is an exhaust leak, outside air can be pulled into the exhaust and past the 02 sensor causing a false lean condition.
**Fuel Quality** Contaminated or spoiled fuel can cause the fuel system to be lean.
**Ground Problem** Check ECM grounds.

# DTC 171 Adaptive Learn High Gasoline SPN/FMI 520200:0

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | • Perform the On-Board (OBD) System Check?<br>Are any other DTCs present? | | Go to Step (3) | Go to Step (2) |
| 2 | Visually and physically check the following items:<br>• The air intake duct for being collapsed or restricted<br>• The air filter for being plugged<br>• The EGO 1 sensor installed securely and the wire leads not contacting the exhaust manifold or ignition wires<br>• ECM grounds must be clean and tight. Refer to Engine Electrical Power and Ground Distribution<br>• Fuel System Diagnostics. Refer to Fuel System Diagnostics<br>Was a repair made? | | Go to Step (8) | Go to Step (4) |
| 3 | • Diagnose any other DTC codes before proceeding with this chart. Always repair existing codes starting with the lowest numerical code set first.<br>Have any other DTC codes been detected, diagnosed and repaired? | | Go to Step (8) | Go to step (4) |
| 4 | • Disconnect EGO1 connector C006<br>• Using a DVOM check for voltage between EGO 1 connector pins A and B<br>• Key ON<br>(**CHECK MUST BE MADE WITHIN 30 SECONDS OR BEFORE POWER RELAY SHUTS DOWN)**<br>Do you have voltage? | System voltage | Go to Step (5) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 5 | • Key OFF<br>• Disconnect EGO 1 sensor wire harness connector C006<br>• Disconnect ECM wire harness connector C001<br>• Key ON<br>• Using a high impedance DVOM check for continuity between EGO 1 connector signal pin C and engine ground<br>Do you have continuity? | | Repair the shorted circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (6) |
| 6 | • Using a high impedance DVOM check for continuity between EGO 1 connector signal ground pin D and EGO 1 signal pin C<br>• Do you have continuity? | | Repair the shorted circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (7) |
| 7 | • Replace EGO 1 sensor<br>Is the replacement complete? | | Go to Step (8) | - |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 8 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-171 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 172-Adaptive Learn Low Gasoline SPN/FMI 520200:1




## Conditions for Setting the DTC

- Heated Oxygen Sensor
- Functional Fault-Adaptive multiplier out of range (at limit of -30%)
- MIL-On during active adaptive limit condition

## Circuit Description

The EGO 1 sensor is used to determine if the fuel flow to the engine is correct by measuring the oxygen content in the exhaust gas. The ECM uses this information to correct the fuel flow with the Closed Loop multiplier and the Adaptive multiplier. This fault sets if the Adaptive multiplier exceeds the limits of normal operation.

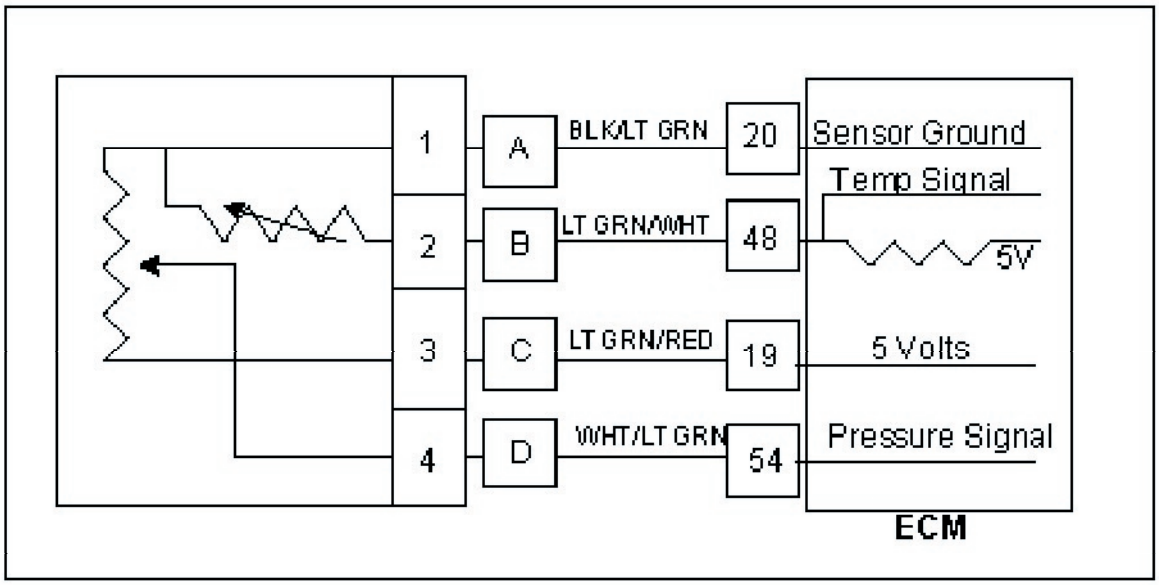
## Diagnostic Aid

**Check for other DTC codes** that may be set. Correct those starting with the lowest code set number before proceeding with the diagnostic chart
**Fuel System** The system will be rich if an injector fails in an open manner. High fuel pressure due to a faulty fuel regulator or obstructed fuel return line will cause the system to run rich.
**Ignition noise** open or poor ground circuit to or in the ignition system or ECM may cause EMI (Electromagnetic interference). This noise could be interpreted by the ECM as ignition pulses, and the sensed RPM becomes higher than the actual speed. The ECM then delivers too much fuel, causing the system to go rich.
**TMAP Sensor** A higher manifold pressure than normal can cause the system to go rich. Temporarily disconnecting the MAP Sensor will allow the ECM to set a default value for MAP.
**IAT Sensor** Check for a shifted sensor that could cause the ECM to sense lower than actual temperature of incoming air. This can cause a rich exhaust condition.
**ECT Sensor** Check for a skewed sensor that could cause the ECM to sense engine temperature cooler than it actually is. This could also cause a rich exhaust condition.

# DTC 172 Adaptive Learn Low Gasoline SPN/FMI 520200:1

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | • Perform the On-Board (OBD) System Check?<br>Are any other DTCs present? | | Go to Step (3) | Go to Step (2) |
| 2 | Visually and physically check the following items:<br>• The air intake duct for being collapsed or restricted<br>• The air filter for being plugged<br>• The EGO 1 sensor installed securely and the wire leads not contacting the exhaust manifold or ignition wires<br>• ECM grounds for being clean and tight. Refer to Engine Electrical Power and Ground Distribution<br>• Fuel System Diagnostics. Refer to Fuel System Diagnostics<br>Was a repair made? | | Go to Step (6) | Go to Step (4) |
| 3 | • Diagnose any other DTC codes before proceeding with this chart.<br>Have any other DTC codes been detected, diagnosed and repaired? | | Go to Step (6) | Go to step (4) |
| 4 | • Key OFF<br>• Disconnect EGO 1 sensor wire harness connector<br>• Disconnect ECM wire harness connector C001<br>• Key ON<br>• Using a DVOM check for voltage at EGO 1 connector C006 signal pin C and engine ground<br>Do you have voltage? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (5) |
| 5 | • Replace EGO 1 sensor<br>Is the replacement complete? | | Go to Step (6) | - |
| 6 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-172 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 182-Gasoline Fuel Temperature Sensor Low Voltage SPN/FMI 174:4




### Conditions for Setting the DTC

- Gasoline fuel temperature sensor voltage
- Fuel temperature sensor voltage greater than 0.05v for 1s
- MIL-On for active fault and for 2 seconds after active fault

## Circuit Description

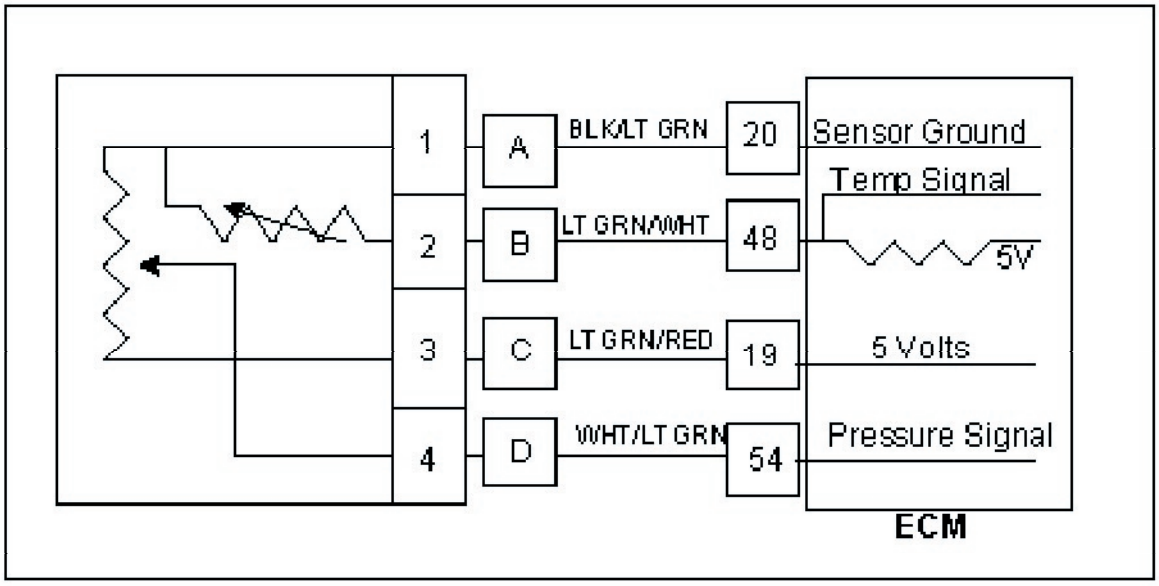
Note: The fuel pressure and temperature sensor is wired via Equipment Manufacturer supplied harness jumper. The terminals A, B, C, D & 19, 20, 48, 54 are engine wiring harness terminals at the fuel sensor interface connector C002 and the ECM header connector C001. You may need to consult additional wiring information supplied by the OEM. The gasoline fuel temperature sensor voltage is read at less than 0.05v. This indicates a low voltage fault from the sensor or circuit.

# DTC 182- Gasoline Fuel Temperature Sensor Low Voltage SPN/FMI 174:4

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine running.<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Check voltage for AUX_PU3 raw on the Raw Volts Page<br><br>Is voltage 0.050 volts or lower? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect the gasoline fuel pressure sensor jumper harness connector C002 from the engine wiring harness<br>• Key On<br>• Using a DVOM, check for voltage between connector C002 terminal B and engine ground.<br><br>Is voltage 4.95 volts or higher? | | Go to Step (4) | Go to step (8) |
| 4 | • Using a DVOM check for voltage between fuel pressure sensor connector C002 terminals A & B.<br>Is voltage of 4.95 volts or higher | | Go to Step (5) | Go to Step (7) |
| 5 | • Jumper fuel pressure sensor connector C002 terminals A & B together.<br><br>Is voltage for AUX_PU3 raw .050 volts or less? | | Go to Step (6) | Go to Step 7 |
| 6 | • Inspect fuel pressure and temperature sensor connector and pins for corrosion, contamination or mechanical damage. Check for opens or shorts in OEM supplied jumper harness to sensor<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (11) |
| 7 | • Key OFF<br>• Disconnect ECM connector C001<br>• Check for continuity between gasoline pressure sensor connector terminal A and ECM pin 20.<br>Do you have continuity between them? | | Go to Step (8) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 8 | • Check for continuity between fuel pressure sensor connector terminal B and ECM pin 48<br><br>Do you have continuity between them? | | Go to step (9) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 9 | • Inspect ECM and gasoline pressure sensor connector (C002) terminals for corrosion, contamination or mechanical damage<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (10) |
| 10 | • Replace ECM. Refer to ECM replacement in the Engine Controls Section.<br>Is the replacement complete? | | Go to step (12) | - |
| 11 | • Replace fuel pressure and temperature sensor<br>Is the replacement complete? | | Go to step (12) | - |
| 12 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br><br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-91 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 183-Gasoline Fuel Temperature Sensor High Voltage SPN/FMI 174:3




### Conditions for Setting the DTC

- Gasoline fuel temperature sensor voltage
- Fuel temperature sensor voltage greater than 4.95v for 1s
- MIL-On for active fault and for 2 seconds after active fault

## Circuit Description

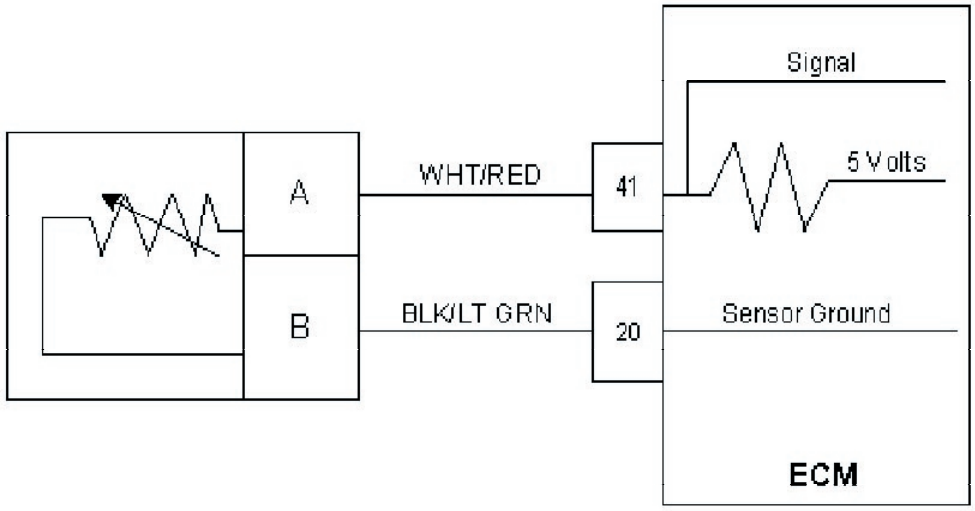
Note: The fuel pressure and temperature sensor is wired via Equipment Manufacturer supplied harness jumper. The terminals A, B, C, D & 19, 20, 48, 54 are engine wiring harness terminals at the fuel sensor interface connector C002 and the ECM header connector C001. You may need to consult additional wiring information supplied by the OEM. The fuel temperature sensor voltage is read at greater than 4.95v. This indicates a high voltage fault from the sensor or circuit.

# DTC 183- Gasoline Fuel Temperature Sensor High Voltage SPN/FMI 174:3

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine running.<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Check voltage for AUX_PU3 raw on the Raw Volts Page<br><br>Is voltage 4.95 volts or higher? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect the gasoline fuel pressure sensor jumper harness connector C002 from the engine wiring harness<br>• Key On<br>• Using a DVOM, check for voltage between connector C002 terminal B and engine ground.<br><br>Is voltage 4.95 volts or higher? | | Go to Step (4) | Go to step (8) |
| 4 | • Using a DVOM check for voltage between fuel pressure sensor connector C002 terminals A & B.<br>Is voltage of 4.95 volts or higher | | Go to Step (5) | Go to Step (7) |
| 5 | • Jumper fuel pressure sensor connector C002 terminals A & B together.<br><br>Is voltage for AUX_PU3 raw .050 volts or less? | | Go to Step (6) | Go to Step (7) |
| 6 | • Inspect fuel pressure and temperature sensor connector and pins for corrosion, contamination or mechanical damage. Check for opens or shorts in OEM supplied jumper harness to sensor<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (11) |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 7 | • Key OFF<br>• Disconnect ECM connector C001<br>• Check for continuity between gasoline pressure sensor connector terminal A and ECM pin 20.<br>Do you have continuity between them? | | Go to Step (8) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 8 | • Check for continuity between fuel pressure sensor connector terminal B and ECM pin 48<br>Do you have continuity between them? | | Go to step (9) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 9 | • Inspect ECM and gasoline pressure sensor connector (C002) terminals for corrosion, contamination or mechanical damage<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (10) |
| 10 | • Replace ECM. Refer to ECM replacement in the Engine Controls Section.<br>Is the replacement complete? | | Go to step (12) | - |
| 11 | • Replace fuel pressure and temperature sensor<br>Is the replacement complete? | | Go to step (12) | - |
| 12 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-91 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 187-LPG Fuel Temperature Sensor Voltage Low SPN/FMI 520240:4




## Conditions for Setting the DTC

- Fuel Temperature
- Check Condition-Engine Running
- Fault Condition-FT sensor voltage less than 0.050 volts
- MIL-On during active fault and for 2 seconds after active fault
- Adaptive-Disabled during active fault and for the remainder of the key cycle

| **Temperature Sensor Temperature Degrees F.** | **Resistance Tolerance ± 10%** Ohms |
|---|---|
| -40 | 99318 |
| -20 | 48300 |
| 0 | 24705 |
| 20 | 13214 |
| 40 | 7357 |
| 60 | 4259 |
| 70 | 3284 |
| 80 | 2554 |
| 100 | 1582 |
| 120 | 1008 |
| 140 | 660.6 |
| 160 | 444.1 |
| 170 | 367.3 |
| 180 | 305.5 |
| 190 | 255.4 |
| 200 | 214.6 |
| 220 | 153.7 |

## Circuit Description

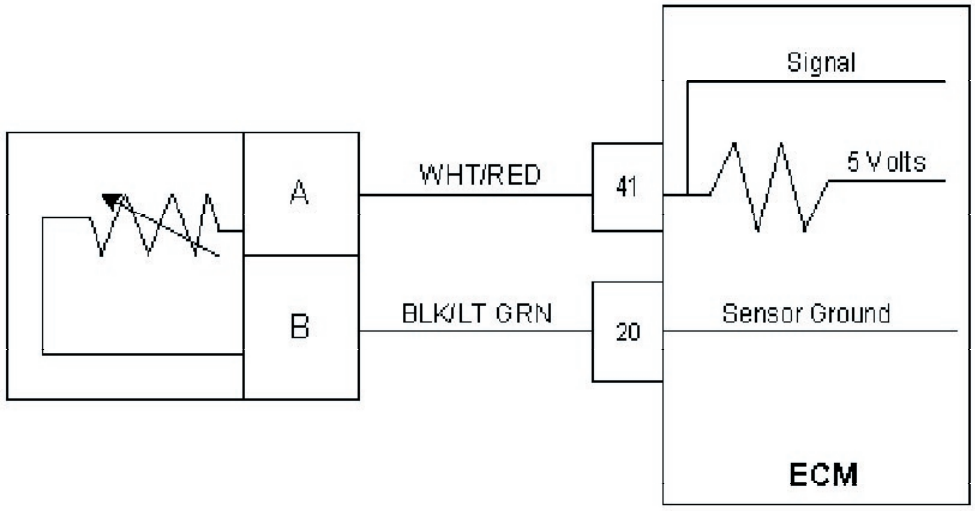
The FT (Fuel Temperature) sensor is a temperature sensitive resistor located near the fuel outlet of the electronic pressure regulator. It is used to help determine fuel charge density for accurate fuel mixture control. The ECM provides a voltage divider circuit so that when the sensor is cool the signal reads a higher voltage, and lower when warm. This fault will set if the signal voltage is less than 0.050 volts anytime the engine is running.

# DTC 187- LPG Fuel Temperature Sensor Voltage Low SPN/FMI 520240:4

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | _ | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On<br>• DST (Diagnostic Scan Tool) connected in<br>• System Data Mode<br>Does DST display FT voltage of 0.050 or less? | | Go to step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key Off<br>• Disconnect the FT wire harness connector C003<br>• Key ON<br>Does the DST display FT voltage of 4.9 volts or greater? | | Go to step (4) | Go to step (5) |
| 4 | Replace FT sensor.<br>Is the replacement complete? | | Go to Step (8) | _ |
| 5 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Check for continuity between FT sensor connector signal pin A and FT sensor ground pin B<br>Do you have continuity between them? | __ | Repair the shorted circuit as Repairs in Engine Electrical. | Go to step (6) |
| 6 | • Check for continuity between FT sensor connector signal circuit pin A and engine ground.<br>Do you have continuity? | __ | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (7) |
| 7 | Replace ECM. Refer to ECM replacement in the Engine Controls Section.<br>Is the replacement complete? | _ | Go to step (8) | _ |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 8 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>•<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-187 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 188-LPG Fuel Temperature Sensor Voltage High SPN/FMI 520240:3




## Conditions for Setting the DTC

- Fuel Temperature
- Check Condition-Engine Running
- Fault Condition-FT sensor voltage exceeds 4.950
- MIL-On during active fault and for 2 seconds after active fault
- Adaptive-Disabled during active fault and for the remainder of the key cycle

| **Temperature Sensor Temperature Degrees F.** | **Resistance Tolerance ± 10%** Ohms |
|---|---|
| -40 | 99318 |
| -20 | 48300 |
| 0 | 24705 |
| 20 | 13214 |
| 40 | 7357 |
| 60 | 4259 |
| 70 | 3284 |
| 80 | 2554 |
| 100 | 1582 |
| 120 | 1008 |
| 140 | 660.6 |
| 160 | 444.1 |
| 170 | 367.3 |
| 180 | 305.5 |
| 190 | 255.4 |
| 200 | 214.6 |
| 220 | 153.7 |

## Circuit Description

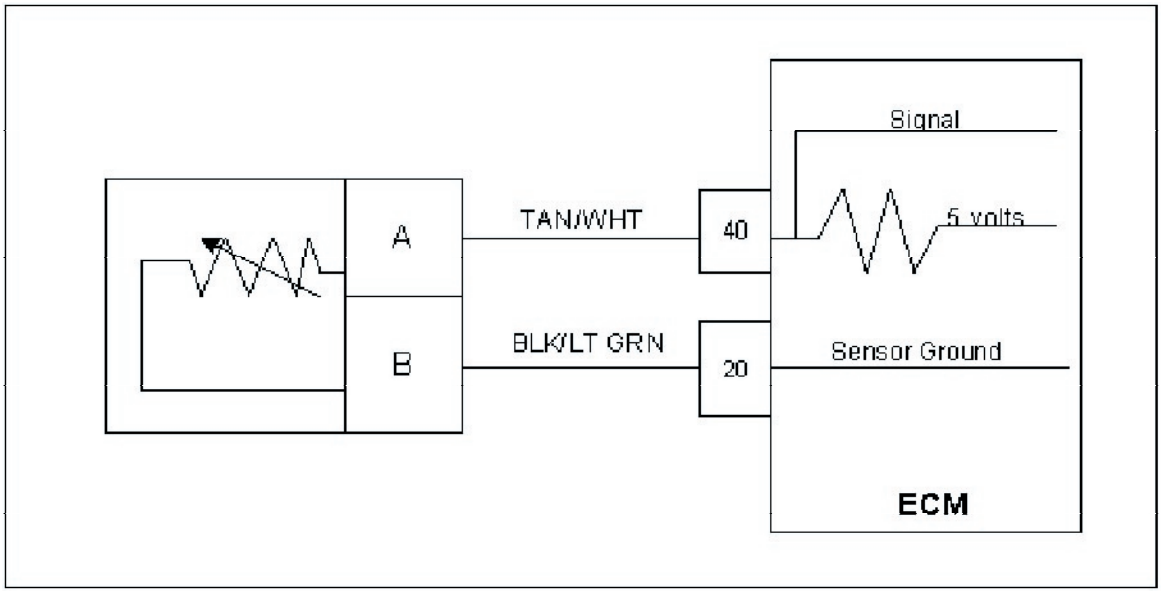
The FT (Fuel Temperature) sensor is a temperature sensitive resistor located near the fuel outlet of the electronic pressure regulator. It is used to help determine fuel charge density for accurate fuel mixture control. The ECM provides a voltage divider circuit so that when the sensor is cool the signal reads a higher voltage, and lower when warm. This fault will set if the signal voltage is greater than 4.950 volts anytime the engine is running.

# DTC 188- FT Voltage High
# SPN/FMI 520240:3

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>Does DST display FT voltage of 4.95 or greater? | | Go to step (3) | Intermittent problem Go to Intermittent section |
| 3 | • Key Off<br>• Disconnect the FT sensor connector C003 and jump connector terminals A and B together<br>• Key On<br>Does the DST display FT voltage of 0.05 volts or less? | | Go to step (4) | Go to Step (8) |
| 4 | • Using a DVOM check the resistance between the two terminals of the FT sensor and compare the resistance reading to the chart<br>Is the resistance value correct? | See temperature vs. resistance chart in the DTC 188 circuit description | Go to Step (6) | Go to step (5) |
| 5 | • Replace FT sensor<br>Is the replacement complete? | | Go to Step (14) | - |
| 6 | • Inspect the FT sensor connector terminals for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (7) |
| 7 | • Key OFF<br>• Disconnect ECM wire harness connector<br>• Inspect ECM connector pins 20 and 41 for damage corrosion or contamination<br>• Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Intermittent problem Go to Intermittent section |
| 8 | • Jump the FT signal pin A at the FT connector C003 to engine ground<br>Does DST display FT voltage of 0.05 or less? | | Go to Step (9) | Go to Step (12) |
| 9 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Using a DVOM check for continuity between FT sensor ground pin B and ECM connector pin 20<br>Do you have continuity between them? | | Go to Step (10) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 10 | • Inspect ECM connector pins 20 and 41 for damage, corrosion or contamination<br><br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (11) |
| 11 | • Replace ECM<br>Is the replacement complete? | | Go to Step (14) | - |
| 12 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Using a DVOM check for continuity between FT connector signal pin A and ECM connector terminal 41<br>Do you have continuity between them? | | Go to Step (13) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 13 | • Inspect ECM connector pins 20 and 41 for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (11) |
| 14 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>•<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-188 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 217-ECT Higher Than Expected 2 SPN/FMI 110:0




## Conditions for Setting the DTC

- Engine Coolant Temperature
- Check Condition-Engine Running
- Fault Condition-Engine Coolant temperature reading or estimate greater than 225 deg. F for more than 15 seconds with the engine speed greater than 600 rpm
- MIL-On
- Engine Shut Down

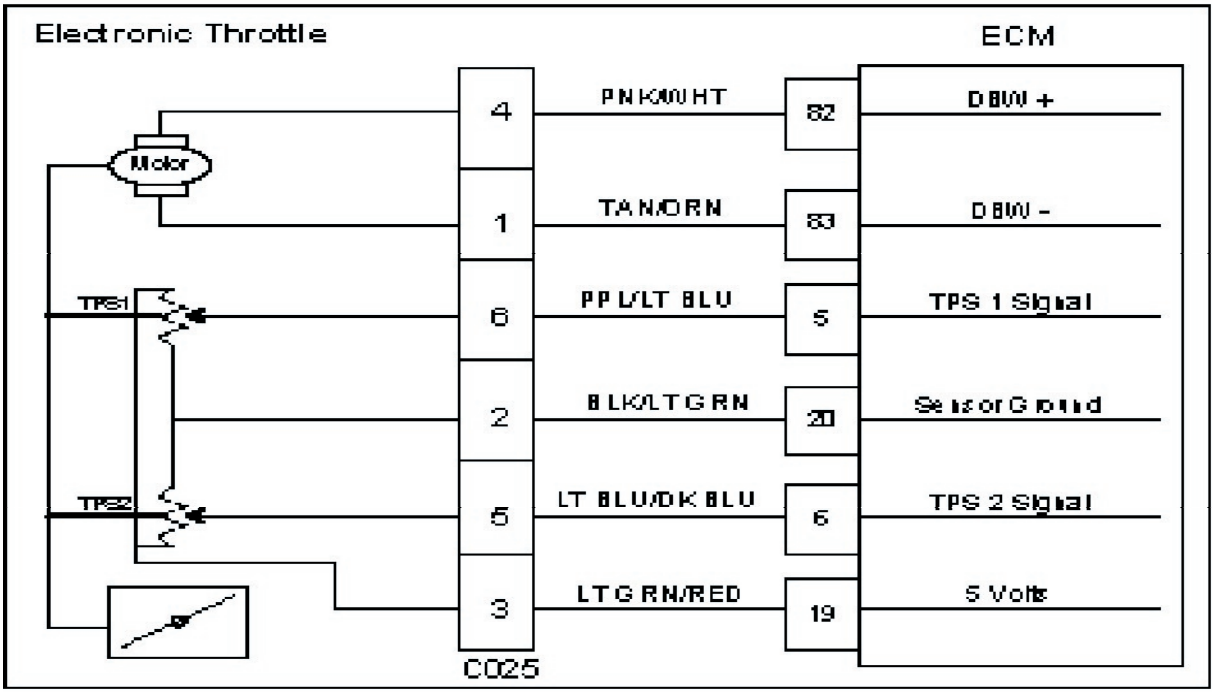
## Circuit Description

The ECT (Engine Coolant Temperature) sensor is a temperature sensitive resistor located in the engine coolant passage. The ECT is used for engine airflow calculation, fuel enrichment, ignition timing control and to enable certain other temperature dependant operations. This code set is designed to help prevent engine damage from overheating. The ECM provides a voltage divider circuit so when the sensor reading is cool the sensor reads higher voltage, and lower when warm. This fault will set when the coolant exceeds 225 degrees F. for more than 15 seconds with the engine speed over 600 rpm. The engine will then shut down.

# DTC 217 ECT Higher than expected 2 SPN/FMI 110:0

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Operate the engine to attempt to recreate the failure running the engine above 1000 rpm for at least 60 seconds<br>• Does DST display ECT temperature of 250 degrees F. or greater with the engine running over 1000 rpm, and then shut down? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Verify with a temperature gauge that the engine coolant is over 250 degrees F.<br>Does the temperature gauge indicate 250 degrees F. or greater? | | Repair Cooling system. | Go to step (4) |
| 4 | Verify ECT circuit function. Follow diagnostic test procedure for DTC-117 ECT Low Voltage | | - | - |

# DTC 219-Max Govern Speed Override SPN/FMI 515:15




## Conditions for Setting the DTC

- Max Govern Speed Override
- Check Condition- Engine Running
- Fault Condition- Engine RPM greater than 3300 for 2 seconds continuously
- MIL- On during active fault

## Circuit description

This fault will set anytime the engine RPM exceeds 3300 for 2 seconds or more continuously. The MIL command is ON during this active fault.

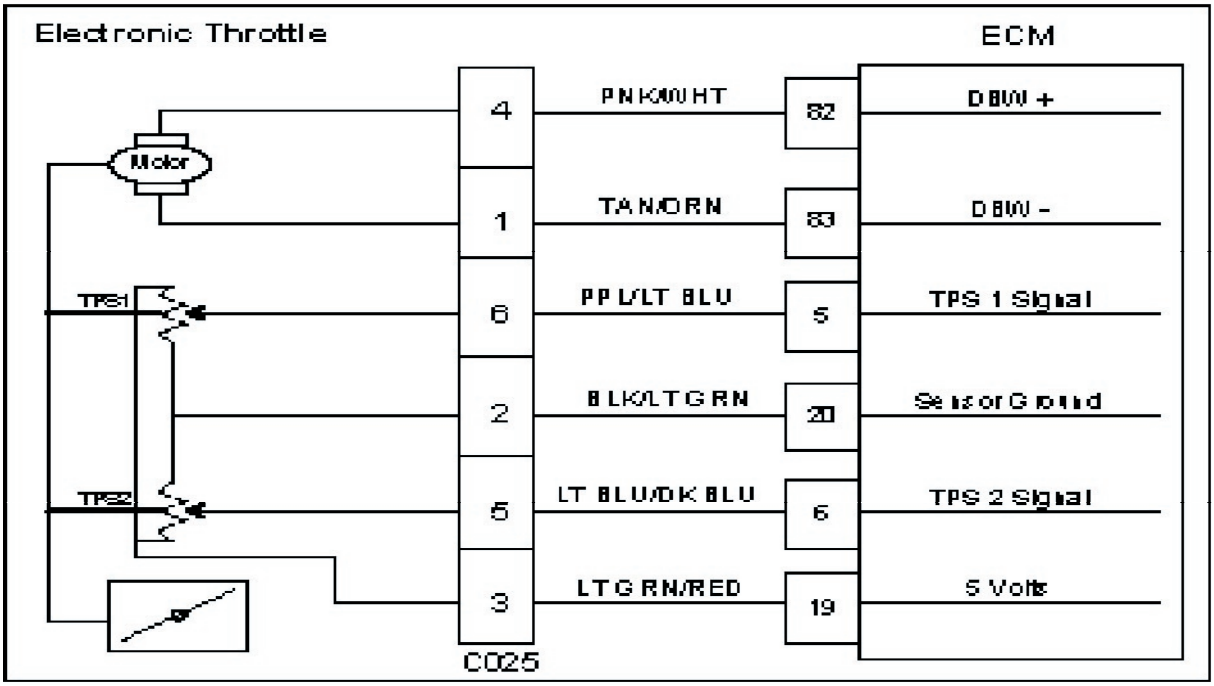
## Diagnostic Aid

Always check for other stored DTC codes before using the following DTC chart for this code set. Repair any existing codes starting with the lowest numerical code first.

# DTC 219- Max Govern Speed Override SPN/FMI 515:15

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine OFF<br>• DST connected<br>Are any other DTC codes present with DTC 219? | | Go to Step (3) | Go to Step (4) |
| 3 | • Diagnose and repair any other DTC codes stored before proceeding with this chart.<br>Have any other DTC codes been diagnosed and repaired? | | Go to step (4) | - |
| 4 | • Check the service part number on the ECM to ensure the correct calibration is in use<br>Is the Service Part Number Correct? | | Go to Step (6) | Go to Step 5 |
| 5 | • Replace ECM with correct service part number<br>Is the replacement complete? | | Go to Step (9) | - |
| 6 | • Check the mechanical operation of the throttle<br>Is the mechanical operation of the throttle OK? | | Go to Step (8) | Go to Step (7) |
| 7 | • Correct mechanical operation of the throttle. Refer to Engine & Component section<br>Has the mechanical operation of the throttle been corrected? | | Go to step (9) | - |
| 8 | • Check engine for large manifold vacuum leaks. Refer to Symptom Diagnostic section<br>Did you find and correct the vacuum leak? | | Go to Step (9) | Go to OBD System Check Section |
| 9 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-219 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 221-TPS 1 Higher Than TPS 2 SPN/FMI 51:0




## Conditions for Setting the DTC

- Throttle Position Sensor 1 & 2
- Check Condition-Key On
- Fault Condition-TPS 1 20% higher than TPS2
- MIL-On for remainder of key on cycle
- Engine Shutdown

## Circuit Description

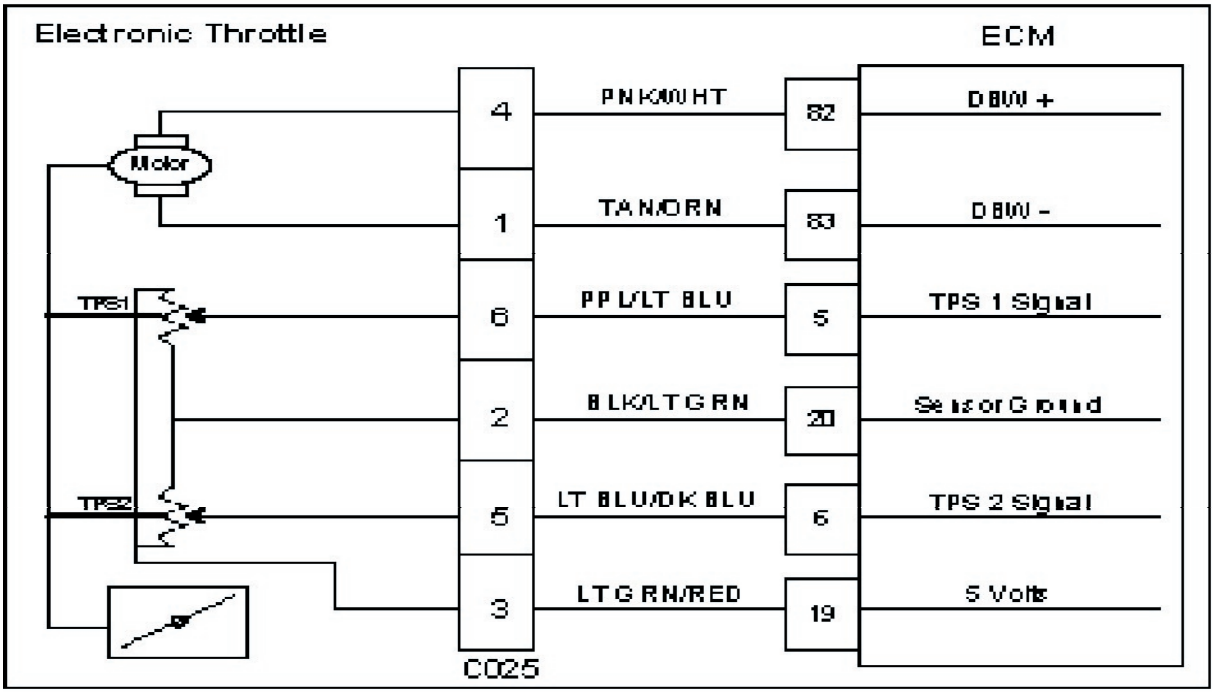
There are two Throttle Position Sensors located within the throttle which use variable resistors to determine signal voltage based on throttle plate position. TPS 1 will read lower voltage when closed and TPS 2 will read higher voltage when closed. The TPS 1 and TPS 2 percentages are calculated from these voltages. Although the voltages are different, the calculated values for the throttle position percentages should be very close to the same. The TPS values are used by the ECM to determine if the throttle is opening as commanded. The TPS is not serviceable and in the event of a failure the electronic throttle assembly must be replaced. This fault will set if TPS 1 is 20% (or more) higher than TPS 2. At this point the throttle is considered to be out of specification, or there is a problem with the TPS signal circuit. The MIL command is ON and Power derate 1 will be enforced limiting the throttle to 50% maximum

# DTC 221 TPS 1 Higher Than TPS 2 SPN/FMI 51:0

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine OFF<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>Does the DST display more than a 20% difference between TPS 1 and TPS 2? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect electronic throttle connector C025<br>• Key ON<br>• Change DST mode to DBW (drive by wire) test mode<br>Is the voltage for TPS 1 less than 0.1 volts? | | Go to Step (5) | Go to Step (4) |
| 4 | • Key OFF<br>• Disconnect ECM wiring harness connector C001<br>• Key ON<br>• Using a DVOM check for voltage between ECM connector TPS 1 signal pin 5 and engine ground<br>Do you have voltage? | | Repair the TPS 1 circuit shorted to voltage as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (9) |
| 5 | • Jump TPS 1 signal pin 6 to the 5 volt reference pin 3 at connector C025<br>Does DST display TPS 1 voltage over 4.95 volts | | Go to Step (6) | Go to Step (8) |
| 6 | • Inspect wire ferminals at throttle connector for damage corrosion or contamination<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (7) |
| 7 | • Replace the electronic Throttle<br>Is the replacement complete? | | Go to Step (12) | - |
| 8 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Using a DVOM check for continuity between throttle connector TPS 1 signal pin 6 and ECM connector TPS 1 signal pin5<br>Do you have continuity between them? | | Go to Step (9) | Repair the open circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 9 | • Using a DVOM check for continuity between throttle connector signal ground pin 2 and ECM connector signal ground pin 20<br>Do you have continuity between them? | | Go to Step (10) | Repair the open circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 10 | • Inspect ECM connector terminals for damage corrosion or contamination.<br>Any problems found? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical | Go to Step (11) |
| 11 | • Replace ECM<br>Is the replacement complete? | | Go to Step (12) | - |
| 12 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-221 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 222-TPS 2 Signal Voltage Low SPN/FMI 520251:4




## Conditions for Setting the DTC

- Throttle Position Sensor 2
- Check Condition-Cranking or Running
- Fault Condition-TPS 2 sensor voltage less than 0.200 volts for more than .500 seconds
- MIL-ON during active fault
- Engine Shutdown

## Circuit Description

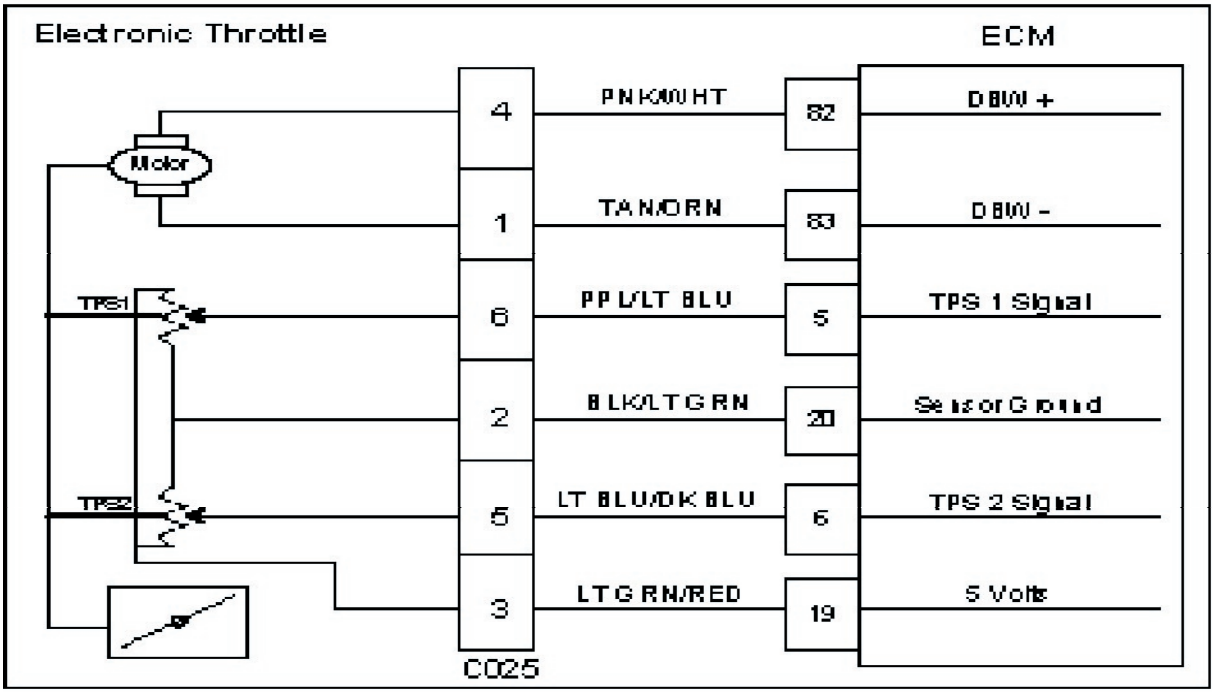
There are 2 Throttle Position Sensors located within the throttle which use variable resistors to determine signal voltage based on throttle plate position. TPS1 will read lower voltage when closed and TPS2 will read higher voltage when closed. The TPS1 and TPS2 percentages are calculated from these voltages. Although the voltages are different, the calculated values for the throttle position percentages should be very close to the same.
The TPS values are used by the ECM to determine if the throttle is opening as commanded. The TPS is not serviceable and in the event of a failure the electronic throttle assembly must be replaced.

This fault will set if the TPS 2 voltage is less than 0.200 volts for more than .500 seconds. The MIL command is ON and the engine will shutdown.

# DTC 222 TPS 2 Signal Voltage Low SPN/FMI 520251:4

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine OFF<br>• DST (Diagnostic Scan Tool) connected in DBW (Drive by Wire) throttle test mode<br>Does the DST display TPS 2 voltage of 0.2 volts or less with the throttle closed | | Go to Step (4) | Go to Step (3) |
| 3 | • Slowly depress Foot Pedal while observing TPS 2 voltage<br>Does TPS 2 voltage ever fall below 0.2 volts? | | Go to Step (4) | Intermittent problem<br>Go to Intermittent section |
| 4 | • Key OFF<br>• Disconnect electronic throttle connector C025<br>• Jumper the 5 volt reference circuit pin 3 and TPS 2 signal circuit pin 5 together at the throttle connector<br>• Key ON<br>Does DST display TPS 2 voltage of 4.0 volts or greater? | | Go to Step (7) | Go to Step (5) |
| 5 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>Using a DVOM check continuity between TPS 2 connector signal pin 5 and ECM connector TPS 2 Signal pin 6<br>Do have continuity between them? | | Go to Step (6 ) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 6 | • Replace ECM<br>Is the replacement complete? | | Go to Step (9) | - |
| 7 | • Inspect the electronic throttle wire harness connector terminals for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (8) |
| 8 | • Replace the electronic throttle<br>Is the replacement complete? | | Go to Step (9) | - |
| 9 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-222 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 223-TPS 2 Signal Voltage High SPN/FMI 520251:3




## Conditions for Setting the DTC

- Throttle Position Sensor 2
- Check Condition-Cranking or Running
- Fault Condition-TPS 2 sensor exceeds 4.80 volts for more than .50 seconds
- MIL-On during active fault
- Engine Shutdown

## Circuit Description

There are 2 Throttle Position Sensors located within the throttle which use variable resistors to determine signal voltage based on throttle plate position. TPS1 will read lower voltage when closed and TPS2 will read higher voltage when closed. The TPS1 and TPS2 percentages are calculated from these voltages. Although the voltages are different, the calculated values for the throttle position percentages should be very close to the same.
The TPS values are used by the ECM to determine if the throttle is opening as commanded. The TPS is not serviceable and in the event of a failure the electronic throttle assembly must be replaced.

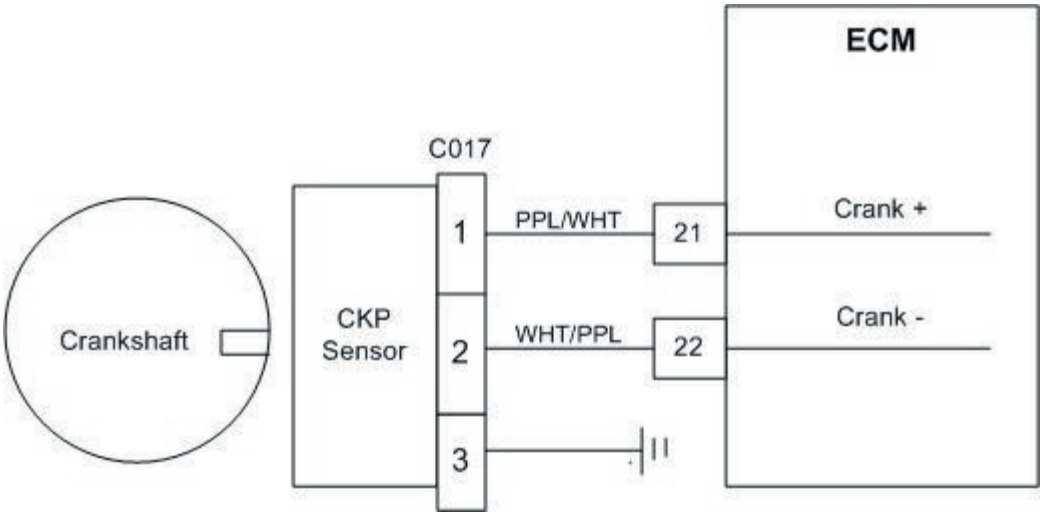
This fault will set if the TPS 2 voltage is greater than 4.80 volts for more than .50 seconds. The MIL command is ON and the engine will shutdown.

# DTC 223 TPS 2 Signal Voltage High SPN/FMI 520251:3

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine OFF<br>• DST (Diagnostic Scan Tool) connected in DBW (Drive by Wire) throttle test mode<br>Does the DST display TPS 2 voltage of 4.8 volts or greater with the throttle closed? | | Go to Step (4) | Go to Step (3) |
| 3 | • Slowly depress Foot Pedal while observing TPS 2 voltage<br>Does TPS 2 voltage ever exceed 4.8 volts? | | Go to Step (4) | Intermittent problem<br>Go to Intermittent section |
| 4 | • Key OFF<br>• Disconnect electronic throttle connector C025<br>• Key ON<br>Does DST display TPS 2 voltage less than 0.2 volts? | | Go to Step (7) | Go to Step (5) |
| 5 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Key ON<br>• Using a DVOM check for voltage between electronic throttle connector TPS 2 signal pin 5 and engine ground<br>Do you have voltage? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (6) |
| 6 | • Replace ECM<br>Is the replacement complete? | | Go to Step (11) | - |
| 7 | • Probe sensor ground circuit at the ECM side of the wire harness pin 20 with a test light connected to battery voltage<br>Does the test light come on? | | Go to Step (8) | Go to Step (10) |
| 8 | • Inspect the electronic throttle wire harness connector and terminals for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (9) |
| 9 | • Replace electronic throttle<br>Is the replacement complete? | | Go to Step (11) | - |
| 10 | • Key OFF<br>• Disconnect ECM connector C001<br>• Using a DVOM check for continuity between throttle connector C025 sensor ground pin 2 and ECM connector sensor ground pin 20<br>Do have continuity between them? | | Go to Step (6) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 11 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-223 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 336-Crank Sync Noise SPN/FMI 636:2




## Conditions for setting the DTC

- Crankshaft Position sensor
- Check Condition- Engine cranking or running
- Fault Condition- one or more invalid crank re-sync within 800 ms
- MIL Command-ON

## Circuit Description

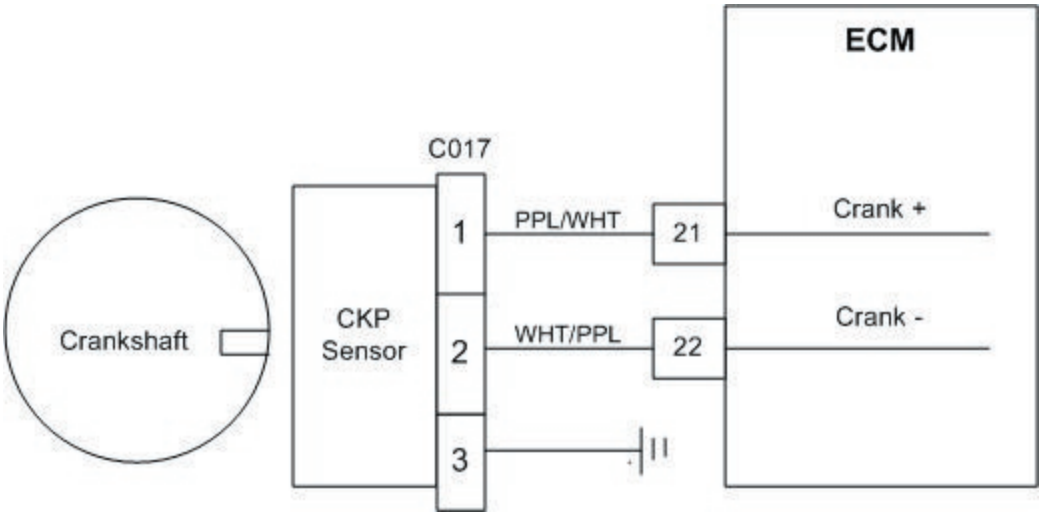
The CKP (crankshaft position sensor) is a magnetic transducer mounted on the engine block adjacent to a pulse wheel located on the crankshaft. It determines crankshaft position by monitoring the pulse wheel. The Crankshaft Position sensor is used to measure engine RPM and its signal is used to synchronize the ignition and fuel systems. This fault will set one or more crank re-sync occur within 800 ms.

# DTC 336- Crank Sync Noise SPN/FMI 636:2

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Check to be sure that the ECM ground terminals C014 and C023 are clean and tight.<br>Are terminals C014 and C023 clean and tight? | | Go to Step (3) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 3 | • Key OFF<br>• Disconnect the CKP sensor connector C017<br>• Using a DVOM check for voltage output directly from the CKP sensor while cranking the engine<br>• Do you have voltage output? | Over .5 volts | Go to Step (4) | Go to Step (11) |
| 4 | • Key OFF<br>• Disconnect ECM connector C001<br>• Using a DVOM check for continuity between CKP connector pin A and ECM connector pin 21<br>• Do you have continuity between them? | | Go to Step (5) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 5 | • Using a DVOM check for continuity between CKP connector pin B and ECM connector pin 22<br>Do you have continuity between them? | | Go to Step (6) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 6 | • Inspect the CKP connector C017 pins for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (7) |
| 7 | • Inspect the ECM connector C001 pins 21 and 22 for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (8) |
| 8 | • Using a DVOM check for continuity between ECM connector pins 21 and 22 to engine ground<br>Do you have continuity? | | Repair the shorted circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (10) |
| 9 | • Replace CKP sensor<br>Is the replacement complete? | | Go to Step (12) | - |
| 10 | • Replace ECM<br>• Is the replacement complete? | | Go to Step (12) | - |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 11 | • Key OFF<br>• Inspect the pulse wheel and CKP sensor for mechanical damage, corrosion or contamination.<br>Did you find a problem? | | Repair the component as necessary. Refer to Engine Repairs in Engine Section | Go to Step (9) |
| 12 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-336 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 337-Crank Loss SPN/FMI 636:4




## Conditions for setting the DTC

- Crankshaft Position sensor
- Check Condition- Engine cranking or running
- Fault Condition- Three or more cam pulses without crank activity
- MIL Command-ON

## Circuit Description

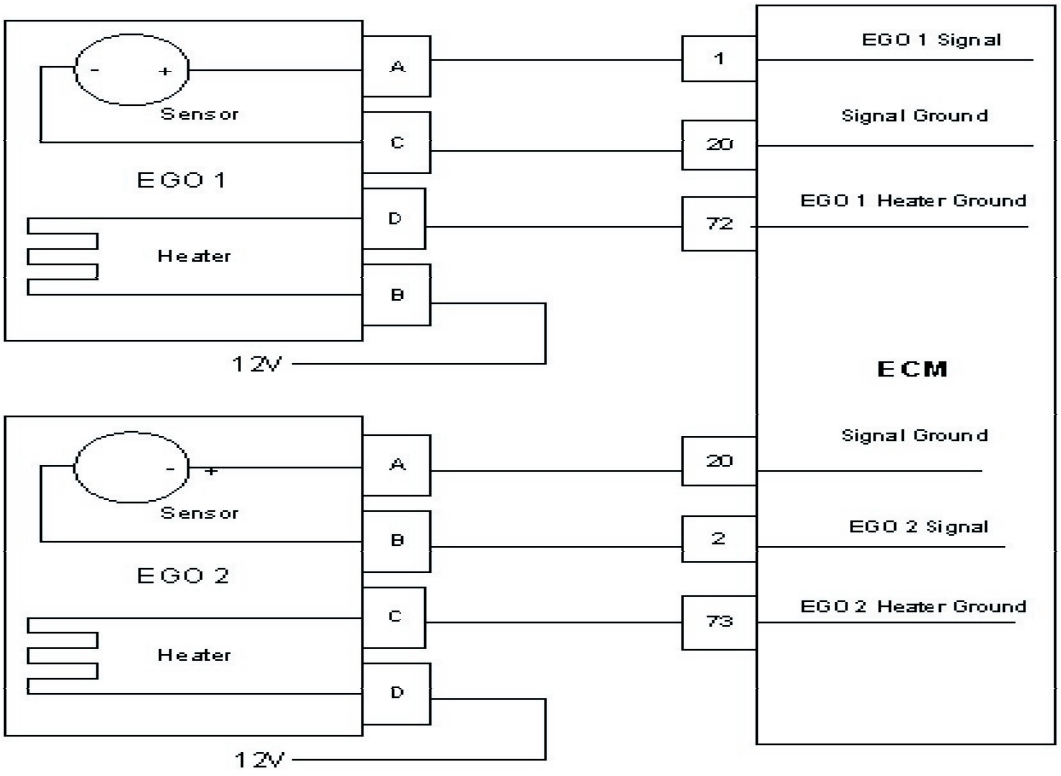
The CKP (crankshaft position sensor) is a magnetic transducer mounted on the engine block adjacent to a pulse wheel located on the crankshaft. It determines crankshaft position by monitoring the pulse wheel. The Crankshaft Position sensor is used to measure engine RPM and its signal is used to synchronize the ignition and fuel systems. This fault will set if three or more cam pulse signals are present without any crankshaft signal.

# DTC 337- Crank Loss SPN/FMI 636:4

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Check to be sure that the ECM ground terminals C014 and C023 are clean and tight.<br>Are terminals C014 and C023 clean and tight? | | Go to Step (3) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 3 | • Key OFF<br>• Disconnect the CKP sensor connector C017<br>• Using a DVOM check for voltage output directly from the CKP sensor while cranking the engine<br>• Do you have voltage output? | Over .5 volts | Go to Step (4) | Go to Step (11) |
| 4 | • Key OFF<br>• Disconnect ECM connector C001<br>• Using a DVOM check for continuity between CKP connector pin A and ECM connector pin 21<br>• Do you have continuity between them? | | Go to Step (5) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 5 | • Using a DVOM check for continuity between CKP connector pin B and ECM connector pin 22<br>Do you have continuity between them? | | Go to Step (6) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 6 | • Inspect the CKP connector C017 pins for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (7) |
| 7 | • Inspect the ECM connector C001 pins 21 and 22 for damage, corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (8) |
| 8 | • Using a DVOM check for continuity between ECM connector pins 21 and 22 to engine ground<br>Do you have continuity? | | Repair the shorted circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (10) |
| 9 | • Replace CKP sensor<br>Is the replacement complete? | | Go to Step (12) | - |
| 10 | • Replace ECM<br>• Is the replacement complete? | | Go to Step (12) | - |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 11 | • Key OFF<br>• Inspect the pulse wheel and CKP sensor for mechanical damage, corrosion or contamination.<br>Did you find a problem? | | Repair the component as necessary. Refer to Engine Repairs in Engine Section | Go to Step (9) |
| 12 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-337 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 420 Gasoline Catalyst Monitor SPN/FMI 520211:10




## Conditions for Setting the DTC

- Catalyst Function
- Check condition- Engine running
- Fault condition- EGO 1 signal = EGO 2 signal for 100 updates
- MIL- On during active fault and for 1 second after active fault
- Adaptive- Disabled during active fault

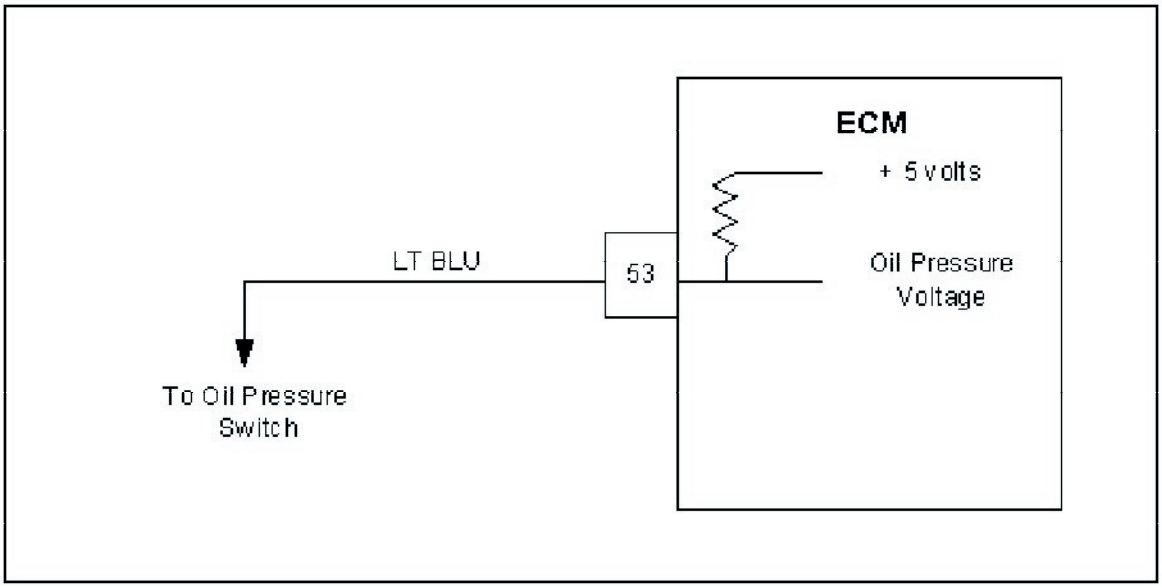
## Circuit Description

The ECM uses EGO 1 and EGO 2 sensor signals to diagnose problems with the catalyst muffler. When the signals for EGO 1 & EGO 2 are similar it may indicate a problem with the catalyst.

## Diagnostic Aids

Always diagnose any other troubles, stored along with DTC 420 first. Check for and eliminate any exhaust leaks prior to replacing catalyst muffler. Look for exhaust leaks at the catalyst muffler inlet and tail pipes. Clear this trouble code after repairing exhaust leaks, and recheck for code.

# DTC 524-Oil Pressure Low SPN/FMI 100:1




## Conditions for Setting the DTC

- Engine Oil Pressure low
- Check Condition-Engine running for 30 seconds with RPM greater than 600
- Fault Condition- closed circuit/voltage low less than 2.5 volts
- MIL-On during active fault and for 3 seconds after active fault
- Engine Shut Down

## Circuit Description

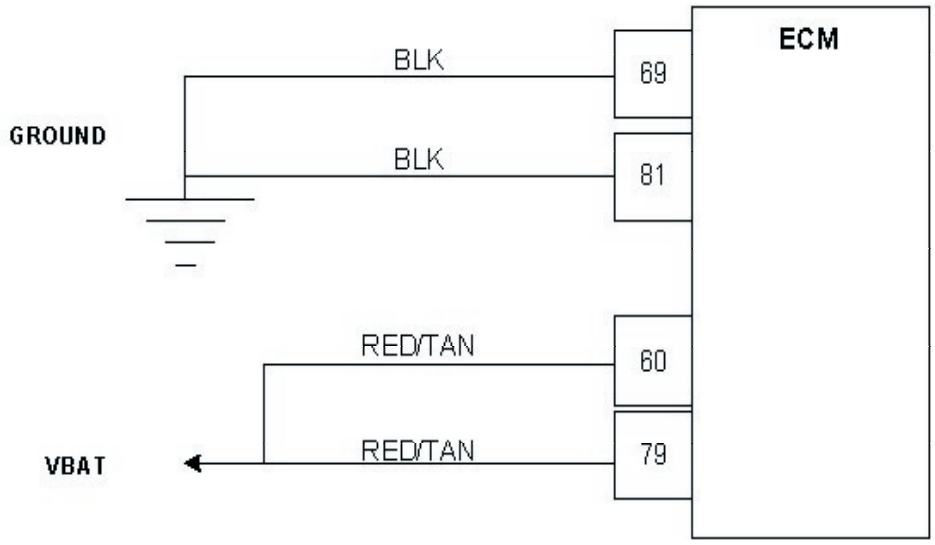
The Oil Pressure Switch is used to communicate a low oil pressure condition to the ECM. Engine damage can occur if the engine is operated with low oil pressure. The ECM uses an analog voltage input with an internal 5 volt reference. If the oil pressure circuit is grounded, the input voltage will be near zero. If it is open, the input will be near 5 volts. The switch is normally closed. This fault will set if the switch remains closed with the engine running. The MIL command is ON and the engine will shut down in the event of this fault to help prevent possible engine damage.

# DTC 524- Oil Pressure Low SPN/FMI 100:1

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Verify that the engine has oil pressure using a mechanical oil pressure gauge before proceeding with this chart. See Engine Specifications Section 1F.<br><br>Does the engine have oil pressure above 2 psi? | | Go to Step (3) | Repair faulty Oiling System |
| 3 | • Key On, Engine Running DST connected in System Data Mode<br>• Clear DTC 524<br>• Warm the engine by idling until the ECT temperature is above 160 degrees F. and has been running for at least one minute<br>• Increase engine speed above 600 RPM<br>Does DTC 524 reset and cause the engine to shut down? | | Go to Step (4) | Intermittent problem<br>Go to Intermittent section |
| 4 | • Key OFF<br>• Disconnect oil pressure switch harness connector C005<br>• Clear DTC 524<br>• Start engine, let idle for at least one minute with ECT over 160 degrees F.<br>• Increase engine speed above 600 RPM<br>Does DTC 524 reset? | | Go to Step (6) | Go to Step (5) |
| 5 | • Replace oil pressure switch<br>Is the replacement complete? | | Go to Step (9) | - |
| 6 | • Key OFF<br>• Disconnect ECM harness connector C001<br>• Using a DVOM check for continuity between oil pressure switch connector LT GRN/BLK wire and engine ground.<br>• Do you have continuity between them? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (7) |
| 7 | • Inspect ECM connector pin 37 for damage corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (8) |
| 8 | • Replace ECM<br>• Is the replacement complete? | | Go to Step (9) | - |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 9 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-524 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 562-System Voltage Low SPN/FMI 168:17




## Conditions for Setting the DTC

- System Voltage to ECM
- Check Condition-Key on with engine speed greater than 1500 RPM
- Fault Condition-Battery voltage at ECM less than 9.0 volts for more than 5 seconds
- MIL-On for active fault and for 10 seconds after active fault
- Adaptive-Disabled and for the for remainder of key ON cycle

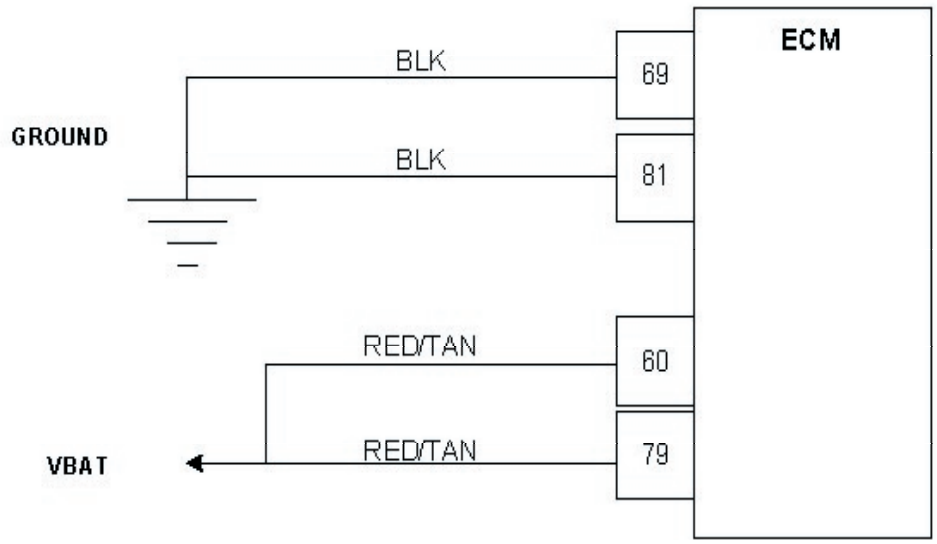
## Circuit Description

The battery voltage powers the ECM and must be measured to correctly operate injector drivers, fuel trim valves and ignition coils. This fault will set if the ECM detects system voltage less than 9.0 for 5 seconds or longer while the alternator should be charging. The adaptive learn is disabled during this fault for the remainder of the key cycle.

# DTC 562- System Voltage Low SPN/FMI 168:17

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>Does DST display system voltage greater than 9.0 volts? | - | Intermittent problem Go to Engine Electrical Intermittent section | Go to Step (3) |
| 3 | • Check battery condition<br>Is it OK? | - | Go to Step (4) | Replace Battery |
| 4 | • Check charging system<br>Is it Ok? | - | Go to Step (5) | Repair charging System |
| 5 | • Check the voltage at ECM connector C001 pins 60 and 79<br>• Measure voltage with DVOM between each pin and engine ground<br>Is the voltage greater than 9.0 volts? | - | Repair ECM Ground circuit. Go to Power and Ground section in engine Electrical | Go to Step (6) |
| 6 | • Check the voltage at ECM connector pins 69 and 81<br>• Measure voltage with DVOM between each pin and battery positive<br>Is the voltage greater than 9.0 volts? | - | Repair ECM power circuit. Go to Power and Ground section in engine Electrical | Go to step (7) |
| 7 | Replace ECM<br>Is the replacement complete? | - | Go to Step (8) | - |
| 8 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-562 check for any stored codes.<br>Does the engine operate normally with no stored codes? | - | System OK | Go to OBD System Check |

# DTC 563-System Voltage High SPN/FMI 168:15




## Conditions for Setting the DTC

- System Voltage to ECM
- Check Condition-Cranking or Running
- Fault Condition-System battery voltage at ECM greater than 18 volts for 3 seconds
- MIL-On for active fault and for 5 seconds after active fault
- Adaptive-Disabled for remainder of key cycle

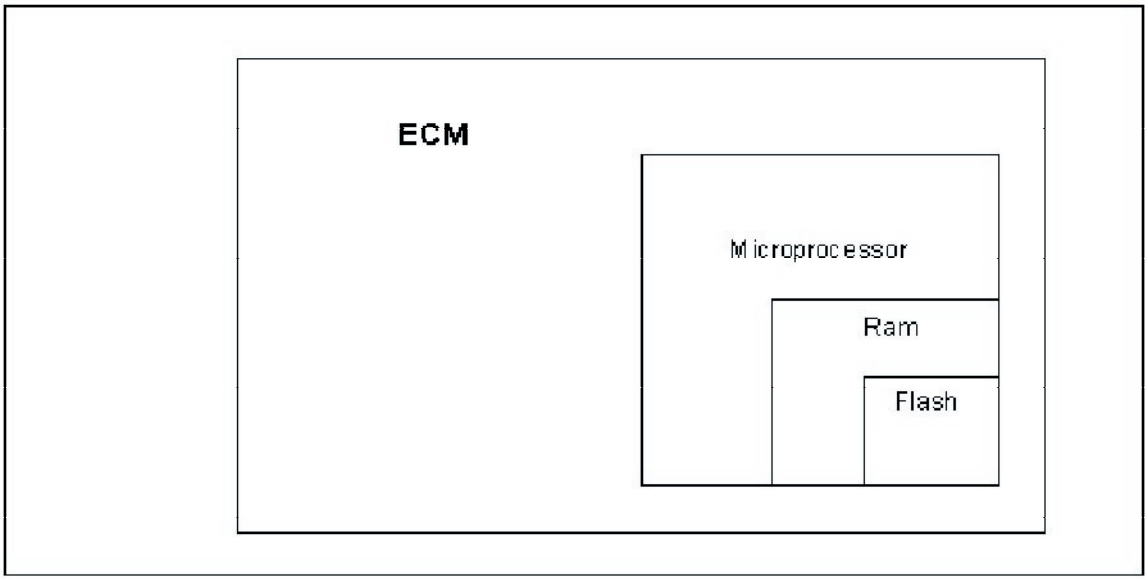
## Circuit Description

The battery voltage powers the ECM and must be measured to correctly operate injector drivers, trim valves and ignition coils. This fault will set if the ECM detects voltage greater than 18 volts for 3 seconds or more anytime the engine is cranking or running. The adaptive learn function is disabled during this fault and for the remainder of the key cycle. The ECM will shut down with internal protection if the system voltage ever exceeds 26 volts.

# DTC 563- System Voltage High SPN/FMI 168:15

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Run engine greater than 1500 rpm.<br><br>Does DST display system voltage greater than 18 volts? | - | Go To Step (3) | Intermittent problem<br>Go to Engine Electrical Intermittent section |
| 3 | • Check voltage at battery terminals with DVOM with engine speed greater than 1500 rpm<br>Is it greater than 18 volts? | - | Go to Step (4) | Go to Step (5) |
| 4 | • Repair the charging system<br>Has the charging system been repaired? | - | Go to Step (6) | - |
| 5 | • Replace ECM<br>Is the replacement complete? | | Go to Step (6) | - |
| 6 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-563 check for any stored codes.<br>Does the engine operate normally with no stored codes? | - | System OK | Go to OBD System Check |

# DTC 601-Flash Checksum Invalid SPN/FMI 628:13




## Conditions for Setting the DTC

- Engine Control Module
- Check Condition- Key on
- Fault Condition- Internal microprocessor error
- MIL- On
- Adaptive- Disabled for the remainder of the key-ON cycle
- Power Derate level 2

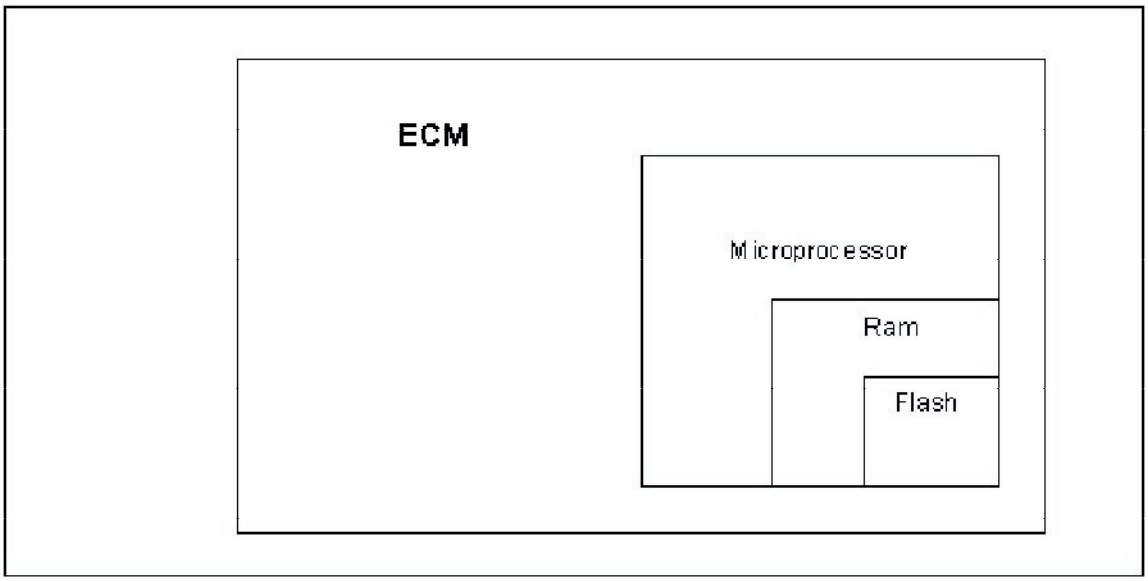
## Circuit Description

The ECM has several internal checks that must be satisfied each time an instruction is executed. Several different things can happen within the microprocessor that will cause this fault. The ECM will attempt to reset itself in the event this fault is set. The MIL command is on and will remain on until the code is cleared using the DST. Power Derate level 2 will be enforced limiting maximum throttle position to 20%.

# DTC 601- Flash Checksum Invalid SPN/FMI 628:13

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Clear system fault code<br>Does DTC 601 reset with the engine idling? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Check ECM power and ground circuits<br>Are the power and ground circuits Ok? | | Go to Step (4) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 4 | • Replace ECM<br>Is the replacement complete? | | Go to Step (5) | - |
| 5 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-601 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 604-RAM Failure SPN/FMI 630:12




## Conditions for Setting the DTC

- Engine Control Module
- Check Condition- Key on
- Fault Condition- Internal microprocessor error
- MIL- On
- Adaptive- Disabled for the remainder of the key-ON cycle
- Power Derate level 2

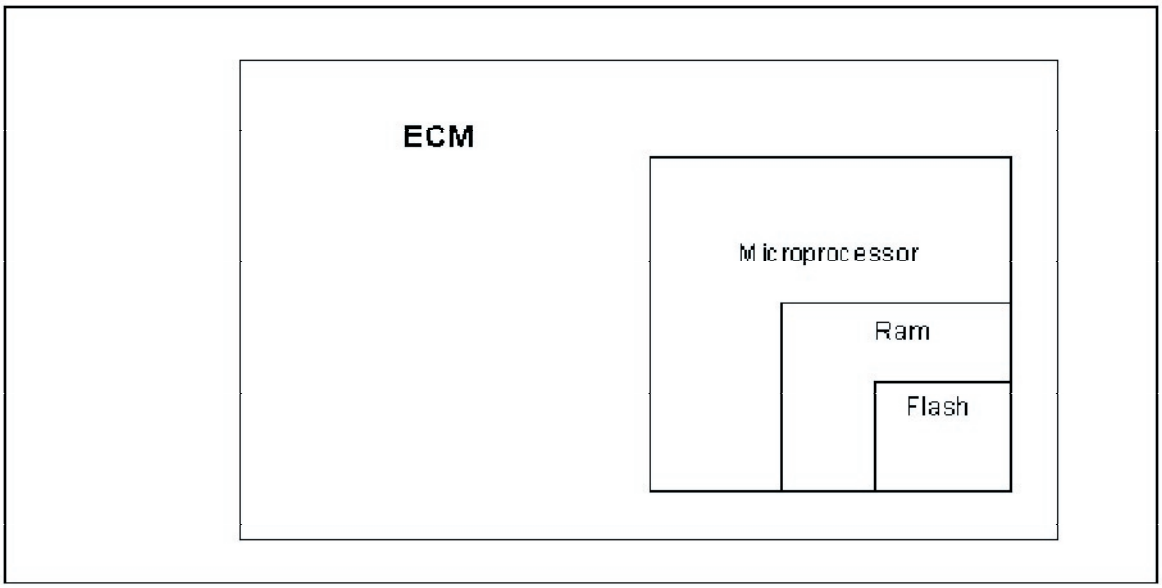
## Circuit Description

The ECM has several internal checks that must be satisfied each time an instruction is executed. Several different things can happen within the microprocessor that will cause this fault. The ECM will attempt to reset itself in the event this fault is set. The MIL command is on and will remain on until the code is cleared using the DST. Power Derate level 2 will be enforced limiting maximum throttle position to 20%.

# DTC 604- RAM Failure SPN/FMI 630:12

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Clear system fault code<br>Does DTC 604 reset with the engine idling? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Check ECM power and ground circuits<br>Are the power and ground circuits Ok? | | Go to Step (4) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 4 | • Replace ECM<br>Is the replacement complete? | | Go to Step (5) | - |
| 5 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-604 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 606-COP Failure SPN/FMI 629:31




## Conditions for Setting the DTC

- Engine Control Module
- Check Condition- Key on
- Fault Condition- Internal microprocessor error
- MIL- On
- Adaptive- Disabled for the remainder of the key-ON cycle
- Power Derate level 2

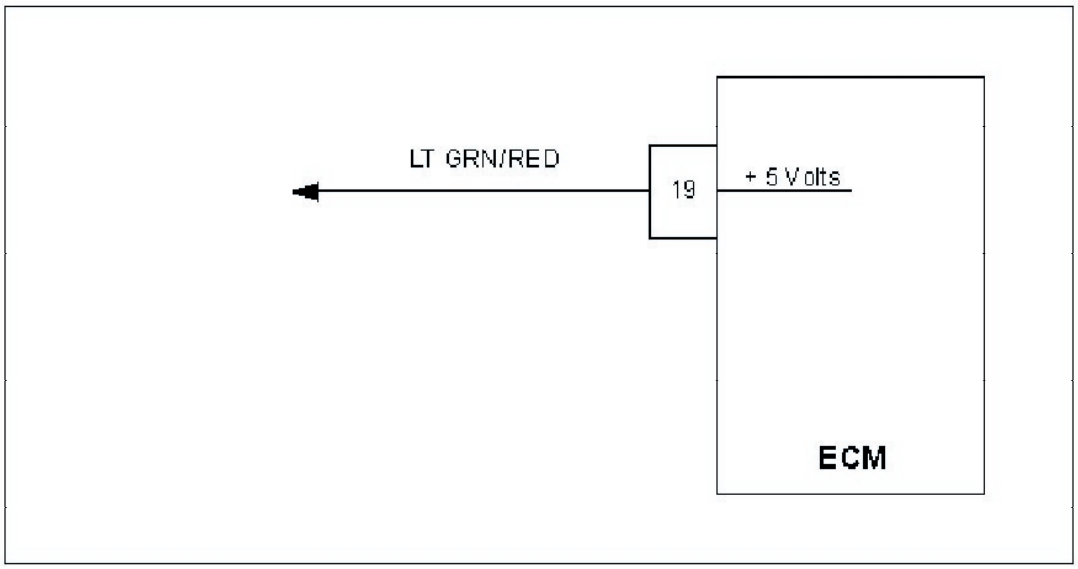
## Circuit Description

The ECM has several internal checks that must be satisfied each time an instruction is executed. Several different things can happen within the microprocessor that will cause this fault. The ECM will attempt to reset itself in the event this fault is set. The MIL command is on and will remain on until the code is cleared using the DST. Power Derate level 2 will be enforced limiting maximum throttle position to 20%.

# DTC 606- COP Failure SPN/FMI 629:31

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Clear system fault code<br>Does DTC 606 reset with the engine idling? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Check ECM power and ground circuits<br>Are the power and ground circuits Ok? | | Go to Step (4) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 4 | • Replace ECM<br>Is the replacement complete? | | Go to Step (5) | - |
| 5 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-606 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 642-External 5 Volt Reference Low SPN/FMI 1079:4




## Conditions for Setting the DTC

- External 5 volt reference
- Check Condition-Cranking with battery voltage greater than 8 volts and engine running
- Fault Condition-5 volt reference voltage lower than 4.6 volts for more than 1 second
- MIL-On during active fault and for 2 seconds after active fault
- Adaptive-Disabled during active fault

## Circuit Description

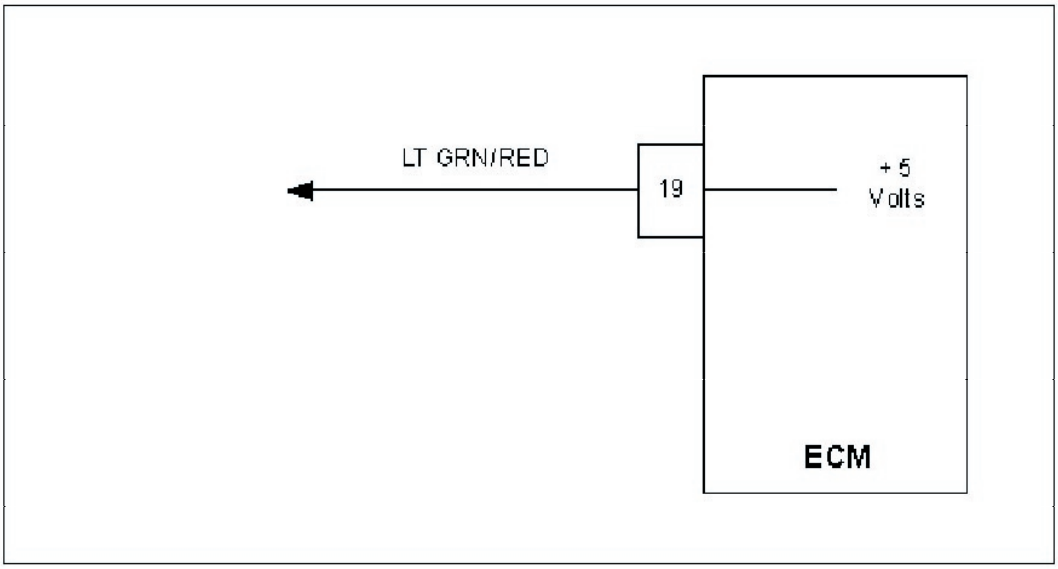
The External 5 volt supply powers many of the sensors and other components of the fuel system. The accuracy of the 5 volt supply is very important to the accuracy of the powered sensors and fuel control by the ECM. The ECM is able to determine if they are overloaded, shorted, or otherwise out of specification by monitoring the 5 volt supply. This fault will set if the 5 volt reference is below 4.6 volts for one second. Adaptive Learn will be disabled during this fault

# DTC 642 External 5V Reference Low SPN/FMI 1079:4

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Fault Mode<br>Does DST display DTC 642? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect ECM connector C001<br>• Using DVOM check for continuity between ECM 5 volt reference pin 19 and engine ground<br>Do you have continuity? | | Go to Step (5) | Go to Step (4) |
| 4 | • Replace ECM<br>Is the replacement complete? | | Go to Step (7) | - |
| 5 | • While monitoring DVOM for continuity between ECM 5 volt reference and engine ground disconnect each sensor (below) one at a time to find the shorted 5 volt reference. When continuity to ground is lost the last sensor disconnected is the area of suspicion. Inspect the 5 volt reference supply wire leads for shorts before replacing the sensor.<br>• IAT<br>• ECT<br>• TMAP<br>• Electronic Throttle<br>• Gasoline Sensor<br>• FPP<br>• TPS 1<br>• TPS 2<br>• Crankshaft Sensor<br>• Camshaft Sensor<br><br>While disconnecting each sensor one at a time did you loose continuity? | | Go to Step (6) | Repair shorted wire harness |
| 6 | • Replace Sensor<br>Is the replacement complete? | | Go to step (7) | - |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 7 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-642 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 643-External 5 Volt Reference High SPN/FMI 1079:3




## Conditions for Setting the DTC

- External 5 volt reference
- Check Condition-Cranking with battery voltage greater than 8 volts or engine running
- Fault Condition-5 volt reference higher than 5.4 volts for more than 1 second
- MIL-On during active fault and for 2 seconds after active fault
- Adaptive-Disabled during active fault

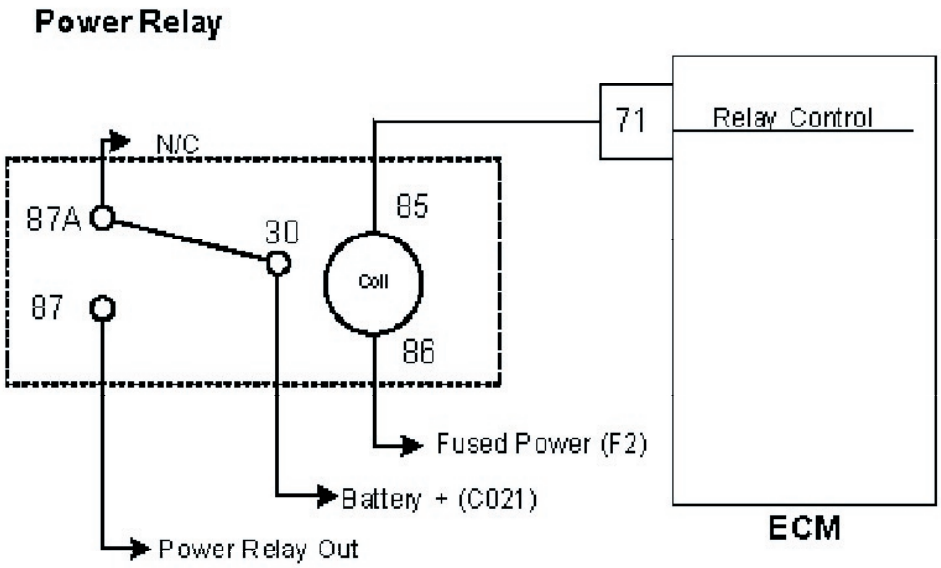
## Circuit Description

The External 5 volt supply powers many of the sensors and other components in the fuel system. The accuracy of the 5 volt supply is very important to the accuracy of the powered sensors and fuel control by the ECM. The ECM is able to determine if they are overloaded, shorted, or otherwise out of specification by monitoring the 5volt supply. This fault will set if the 5 volt reference is above 5.4 volts for more than one second. Adaptive Learn will be disabled during this fault

# DTC 643 External 5 Volt Reference High SPN/FMI 1079:3

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>Does DST display DTC 643? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Check all ECM ground connections<br>Refer to Engine electrical power and ground distribution.<br>Are the ground connections Ok? | | Go to Step (4) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 4 | • Key OFF<br>• Disconnect ECM connector C001<br>• Key ON<br>• Using DVOM check for Voltage between ECM harness wire pin 19 and engine ground<br>Do you have voltage? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (5) |
| 5 | • Replace ECM<br>Is the replacement complete? | | Go to Step (6) | - |
| 6 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-643 check for any stored codes.<br>Does the vehicle engine normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 685-Relay Coil Open SPN/FMI 1485:5




**Conditions for Setting the DTC**

- Power relay check
- Check Condition-Key ON
- Fault Condition- Relay coil open

**Circuit Description**

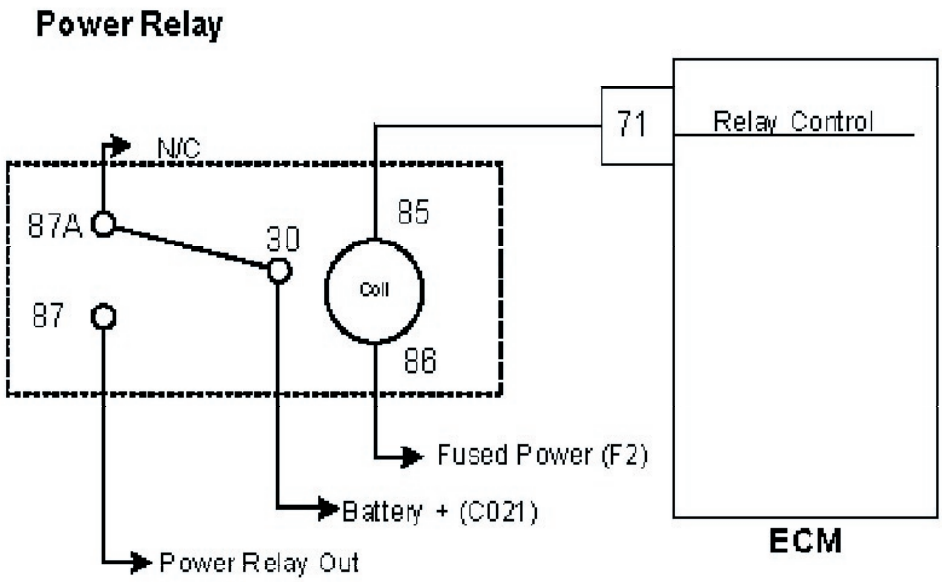
The power relay switches power out to various sensors, actuators and solenoids in the fuel system. This fault will set if the ECM detects an open circuit on the relay control output.

# DTC 685- Relay Coil Open SPN/FMI 1485:5

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • DST connected and in the system data mode<br>• Key OFF<br>• Remove the power relay from the fuse block<br>• Using a DVOM check the resistance of the relay coil between terminals 85 and 86<br>Is the resistance value less than 100 ohms? | | Go to step (4) | Go to step (3) |
| 3 | • Replace the power relay<br>Is the replacement complete? | | Go to step (9) | – |
| 4 | • Check fuse F2<br>Is the fuse open? | | Replace fuse F2 | Go to step (5) |
| 5 | • Disconnect ECM connector C001<br>• Using a DVOM check for continuity between ECM pin 71 and fuse block cavity for relay terminal 85<br>Do you have continuity? | | Go to step (6) | Repair the open circuit as required. See wiring harness repairs |
| 6 | • Remove fuse F2<br>• Using a DVOM check for continuity between fuse block cavity for relay terminal 86 and the power out of the F2 fuse holder<br>Do you have continuity? | | Go to step (7) | Repair the open circuit as required. See wiring harness repairs |
| 7 | • Check all system fuses.<br>• Check all relay placement positions in fuse block.<br>• Run complete pin to pin checks on chassis wiring to fuel system harness.<br>• See complete fuel system schematic for further details<br>Did you find the problem? | | Go to step (9) | Go to step (8) |
| 8 | • Replace the ECM<br>• Is the replacement complete? | | Go to step (9) | – |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 9 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-685 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 686-Relay Control Ground Short SPN/FMI 1485:4




**Conditions for Setting the DTC**

- Power relay ground control
- Check Condition-Key ON
- Fault Condition- Relay control shorted to ground

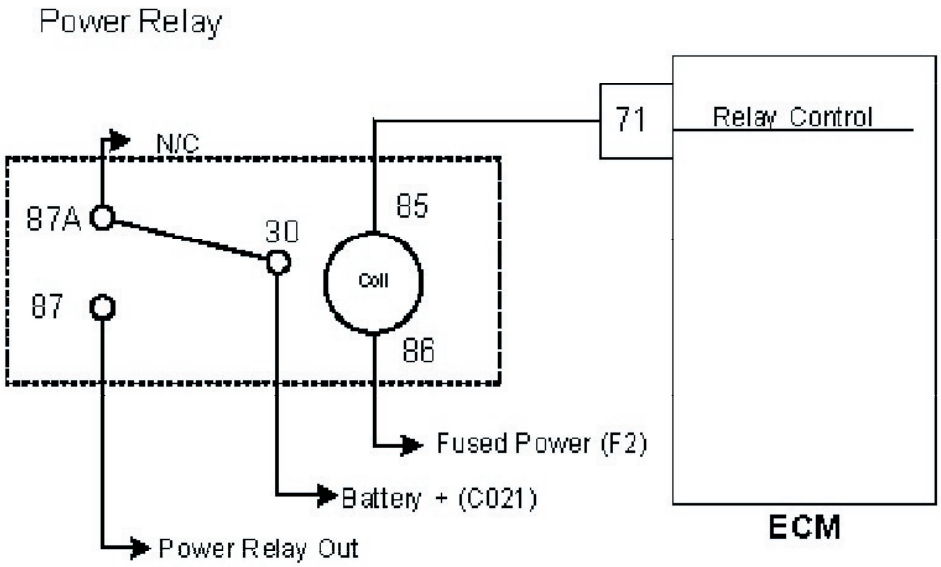
**Circuit Description**

The power relay switches power out to various sensors, actuators and solenoids in the fuel system. This fault will set if the ECM detects a direct short to ground on the relay control output.

# DTC 686- Relay Control Ground Short SPN/FMI 1485:4

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 3 | • Key On, DST connected in the System Data mode<br>• Clear DTC 686<br>• Start the engine<br>Does DTC 686 re-set? | | Go to Step (4) | Intermittent problem<br>Go to Intermittent section |
| 4 | • Disconnect ECM connector C001<br>• Using a DVOM check the resistance value between ECM pin 71 and engine ground<br>Is the resistance less than 60 ohms? | | Go to step (5) | Go to step (7) |
| 5 | • Remove the power relay from the fuse block<br>• Using a DVOM check the resistance value again between ECM pin 71 and engine ground<br>Is the resistance less than 60 ohms? | | Repair the shorted to ground relay control circuit as necessary. See wiring harness repairs | Go to step (6) |
| 6 | • Replace the power relay<br>Is the replacement complete? | | Go to step (8) | – |
| 7 | • Replace ECM<br>• Is the replacement complete? | | Go to step (8) | – |
| 8 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-686 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 687-Relay Coil Short to Power SPN/FMI 1485:3




**Conditions for Setting the DTC**

- Power relay check
- Check Condition-Key ON
- Fault Condition- Relay coil shorted to power

**Circuit Description**

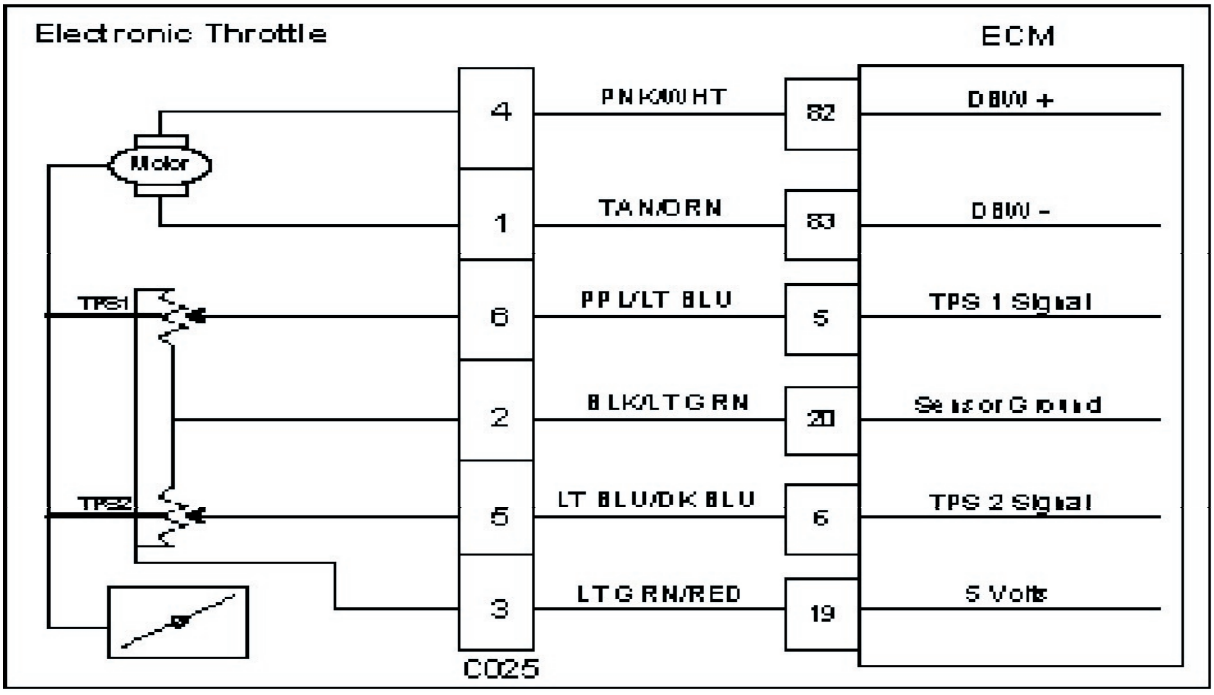
The power relay switches power out to various sensors, actuators and solenoids in the fuel system. This fault will set if the ECM detects a short circuit to power on the relay control output.

# DTC 687- Relay Coil Short to Power SPN/FMI 1485:3

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • DST connected and in the system data mode<br>• Key OFF<br>• Remove the power relay from the fuse block<br>• Using a DVOM check the resistance of the relay coil between terminals 85 and 86<br>Is the resistance value less than 60 ohms? | | Go to step (3) | Go to step (4) |
| 3 | • Replace the power relay<br>Is the replacement complete? | | Go to step (9) | _ |
| 4 | • Using a DVOM check for continuity between relay terminals 85 and 30<br>Do you have continuity between them? | | Go to step (3) | Go to step (5) |
| 5 | • Disconnect ECM wire harness connector C001<br>• Using a DVOM check for power between ECM pin 71 and engine ground with the key ON<br>Do you have power? | System battery voltage | Repair the short to power. See wiring harness repair. | Go to step (6) |
| 6 | • Replace the power relay<br>Is the replacement complete? | | Go to step (7) | _ |
| 7 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-687 check for any stored codes.<br>Does DTC 687 still re-set? | | Go to step (8) | Go to step (9) |
| 8 | • Replace the ECM<br>• Is the replacement complete? | | Go to step (9) | _ |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 9 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-687 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1111-Fuel Rev Limit SPN/FMI 515:16




## Conditions for Setting the DTC

- Fuel Rev Limit
- Check Condition- Engine Running
- Fault Condition- Engine RPM greater than 3500 for 2 seconds continuously
- MIL- On during active fault

## Circuit Description

This fault will set anytime Engine RPM is greater than 3500 for 2 seconds continuously. When these conditions are met the ECM cuts off fueling. This is to help prevent engine or equipment damage. The MIL will be on during this active fault.

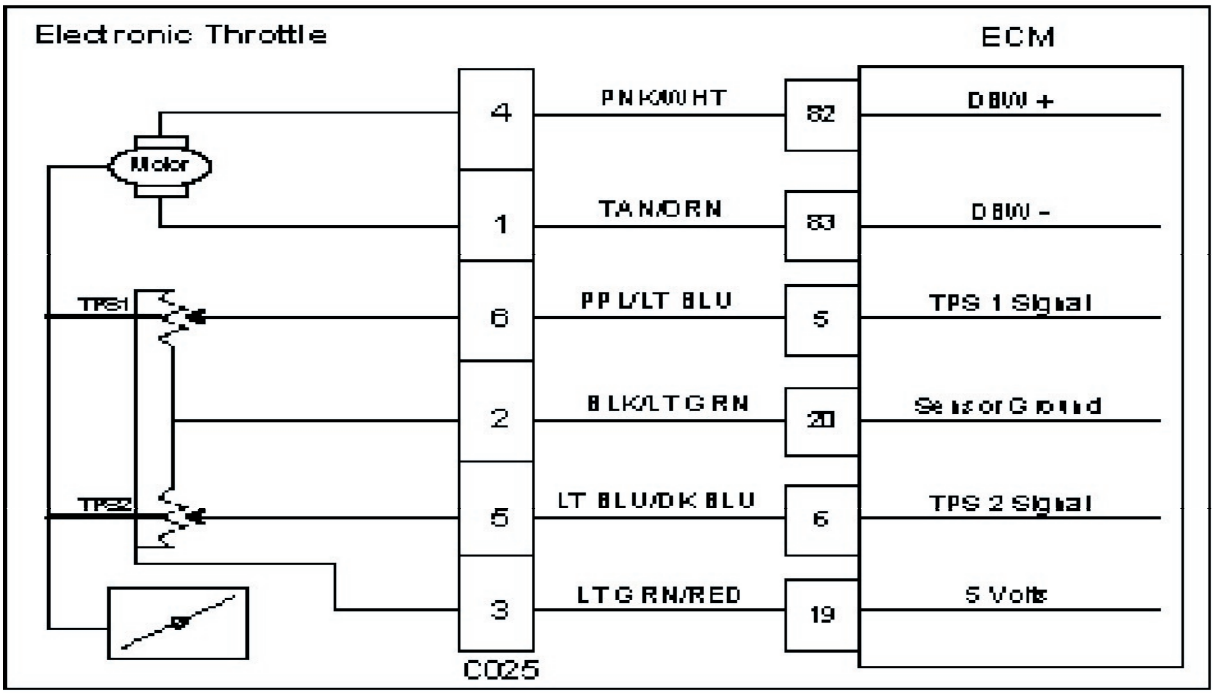
## Diagnostic Aid

Always check for other stored DTC codes before using the following DTC chart for this code set. Repair any existing codes starting with the lowest numerical code first.

# DTC 1111-Fuel Rev Limit SPN/FMI 515:16

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine OFF<br>• DST in Active Fault Mode<br>Are any other DTC codes present with DTC 1111? | | Go to Step (3) | Go to Step (4) |
| 3 | • Diagnose and repair any other DTC codes before proceeding with this chart.<br>Have any other DTC codes been diagnosed and repaired? | | Go to step (4) | - |
| 4 | • Check the service part Number on the ECM to ensure correct calibration is in use<br>Is the service part Number Correct? | | Go to Step (6) | Go to Step 5 |
| 5 | • Replace ECM with the correct service part number<br>Is the replacement complete? | | Go to Step (9) | - |
| 6 | • Check the mechanical operation of the throttle<br>Is the mechanical operation of the throttle OK? | | Go to Step (8) | Go to Step (7) |
| 7 | • Correct mechanical operation of the throttle. Refer to Engine & Component section<br>Has the mechanical operation of the throttle been corrected? | | Go to step (9) | - |
| 8 | • Check engine for large manifold vacuum leaks. Refer to Fuel Systems symptom diagnostics<br>Did you find and correct the vacuum leak? | | Go to Step (9) | Go to OBD System Check Section |
| 9 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1111 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1112-Spark Rev Limit SPN/FMI 515:0




## Conditions for Setting the DTC

- Spark Rev Limit
- Check Condition- Engine running
- Fault Condition- Engine RPM greater than 3700
- MIL- On during active fault
- Engine Shut Down

## Circuit description

This fault will set anytime the engine RPM exceeds 3700. During this condition the ECM will shut off spark to the engine. This is to help prevent engine or equipment damage. The MIL command is ON during this active fault and the engine will shut down.

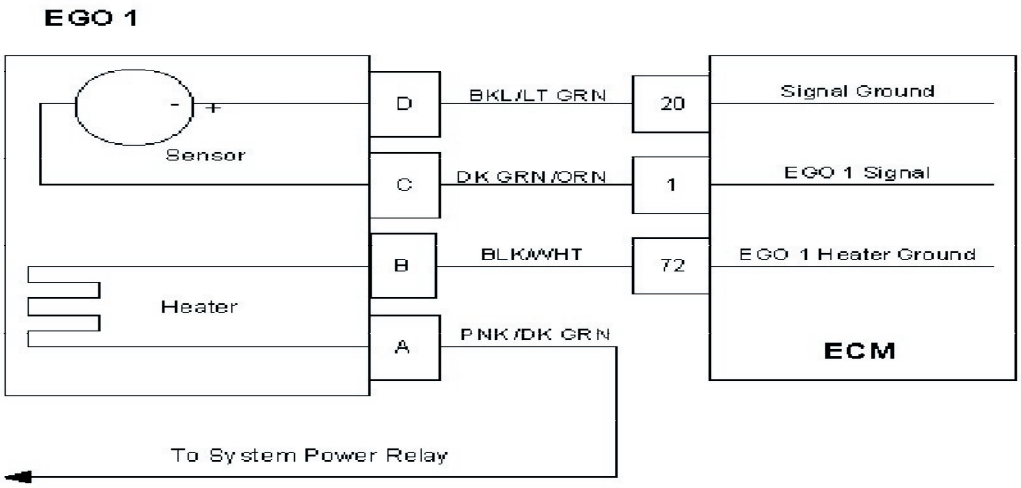
## Diagnostic Aid

Always check for other stored DTC codes before using the following DTC chart for this code set. Repair any existing codes starting with the lowest numerical code first.

# DTC 1112- Spark Rev Limit SPN/FMI 515:0

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine OFF<br>• DST connected<br>Are any other DTC codes present with DTC 1112? | | Go to Step (3) | Go to Step (4) |
| 3 | • Diagnose any other DTC codes before proceeding with this chart.<br>Have any other DTC codes been diagnosed and repaired? | | Go to step (4) | - |
| 4 | • Check the service part number on the ECM to ensure correct calibration is in use<br>Is the service part number Correct? | | Go to Step (6) | Go to Step 5 |
| 5 | • Replace ECM with correct service part Number<br>Is the replacement complete? | | Go to Step (9) | - |
| 6 | • Check the mechanical operation of the throttle<br>Is the mechanical operation of the throttle OK? | | Go to Step (8) | Go to Step (7) |
| 7 | • Correct mechanical operation of the throttle. Refer to Engine & Component section<br>Has the mechanical operation of the throttle been corrected? | | Go to step (9) | - |
| 8 | • Check engine for large manifold vacuum leaks. Refer to Fuel Systems section Symptom Diagnostics<br>Did you find and correct the vacuum leak? | | Go to Step (9) | Go to OBD System Check Section |
| 9 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1112 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1151- Closed Loop Multiplier High LPG SPN/FMI 520206:0




### Conditions for Setting the DTC

- Heated Oxygen Sensor
- Check Condition- Engine running
- Fault Condition- Closed Loop multiplier out of range (greater than 35%)
- MIL- ON

## Circuit description

The HO2S sensor is used to determine if the fuel flow to the engine is correct by measuring the oxygen content in the exhaust gas. The ECM uses this information to correct the fuel flow with the Closed Loop multiplier and the adaptive multiplier. This fault sets if the Closed Loop multiplier exceeds the limits of normal operation and cannot correctly modify the fuel flow within its limits

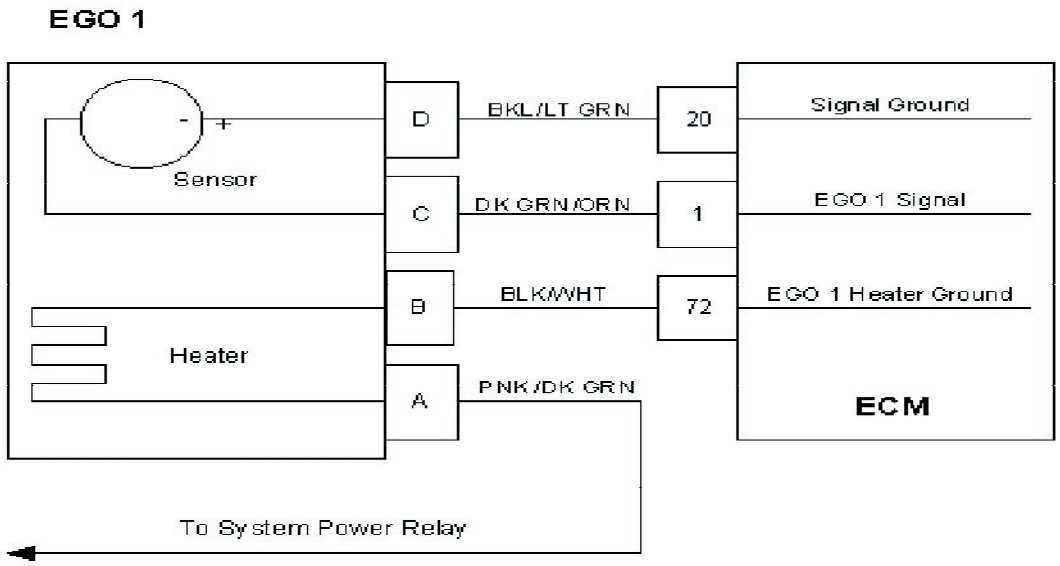
## Diagnostic Aid

**Oxygen Sensor Wire** Heated Oxygen sensor wires may be mis-routed and contacting the exhaust manifold.
**Vacuum Leaks** Large vacuum leaks and crankcase leaks can cause a lean exhaust condition at especially at light load.
**Fuel Mixer** System can be lean due to faulty EPR (Electronic Pressure Regulator) or faulty fuel mixer.
**Fuel Pressure** Low secondary fuel pressure, faulty EPR (Electronic Pressure Regulator) or contaminated fuel filter can cause fuel the system to run lean. Perform LPG Fuel System Diagnosis Diagnosis (Section 5).
**Exhaust Leaks** If there is an exhaust leak, outside air can be pulled into the exhaust and past the 02 sensor causing a false lean condition.
**Fuel Quality** Contaminated or spoiled fuel can cause the fuel system to be lean.
**Ground Problem** ECM grounds must be clean, tight and in the proper location.

# DTC 1151- Closed Loop Multiplier High LPG SPN/FMI 520206:0

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Run engine to full operating temperature and then idle for a minimum of 2 minutes<br>Does DST display EGO 1 voltage fixed below 0.35 volts after 2 minutes of idle run time? | | Go to step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect ECM connector C001<br>• Disconnect EGO 1 wire harness connector C006<br>• Using a high impedance DVOM check for continuity between EGO 1 connector signal pin C and engine ground<br>Do you have continuity? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (4) |
| 4 | • Using a high impedance DVOM check for continuity between EGO 1 connector signal pin C and EGO 1 connector signal ground pin D<br>• Do you have continuity between them? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (5) |
| 5 | • Refer to Diagnostic aids for DTC 1151<br>Did you check the diagnostic Aids for DTC 1151? | | Go to Step (6) | |
| 6 | • Replace EGO 1 sensor<br>Is the replacement complete? | | Go to Step (7) | |
| 7 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1151 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1152- Closed Loop Multiplier Low LPG SPN/FMI 520206:1




## Conditions for Setting the DTC

- Heated Oxygen Sensor
- Functional Fault-Closed Loop multiplier out of range (at limit of -35%)
- MIL Disabled

## Circuit Description

The EGO 1 sensor is used to determine if the fuel flow to the engine is correct by measuring the oxygen content in the exhaust gas. The ECM uses this information to correct the fuel flow with the Closed Loop multiplier and the adaptive multiplier. This fault sets if the Closed Loop multiplier exceeds the limits of normal operation. When the multiplier cannot correctly modify the fuel flow within its limits, it is limited at -35%.

## Diagnostic Aid

**Fuel System** High secondary fuel pressure may cause the system to run rich. A worn fuel mixer, faulty EPR (Electronic Pressure Regulator) may also cause the system to run rich. Perform LPG Fuel System Diagnosis Diagnosis (Section 5).

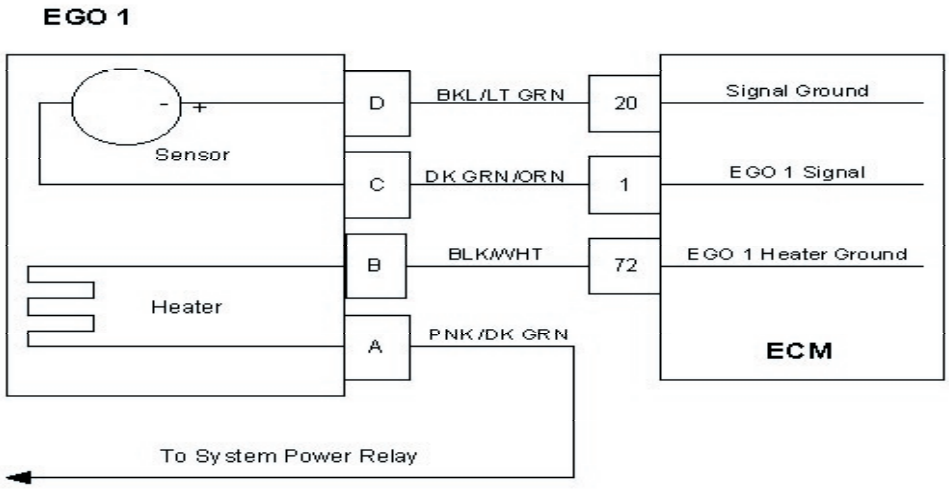
**Fuel Quality** A drastic variation in fuel quality (very high butane content) may cause the fuel system to run rich. Be sure that the specified HD-5 or HD-10 motor fuel grade propane is used

**Air Filter** A plugged, damaged or modified air filter may cause the system to run rich.

# DTC 1152- Closed Loop Multiplier Low LPG SPN/FMI 520206:1

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Run engine to full operating temperature and then idle for a minimum of 2 minutes<br><br>Does DST display HO2S voltage fixed above 0.7 volts after 2 minutes of idle run time? | | Go to step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect HO2S wire harness connector<br>• Disconnect ECM wiring harness connector<br>• Key ON<br>• Using a high impedance DVOM check for voltage between HO2S connector signal pin C and engine ground<br>Do you have voltage? | | Repair wire harness shorted signal to voltage<br>Refer to Wiring Repairs in Engine Electrical. | Refer to Diagnostic Aids for DTC 1152 |

# DTC 1155 -Closed Loop Multiplier High Gasoline SPN/FMI 520204:0




## Conditions for Setting the DTC

- Heated Oxygen Sensor
- Functional Fault-Closed Loop multiplier out of range (at limit of 35%)
- MIL-On during active fault

## Circuit Description

The HO2S sensor is used to determine if the fuel flow to the engine is correct by measuring the oxygen content in the exhaust gas. The ECM uses this information to correct the fuel flow with the Closed Loop multiplier and the Adaptive multiplier. This fault will set if the Closed Loop multiplier exceeds 35%. The MIL command is ON

## Diagnostic Aid

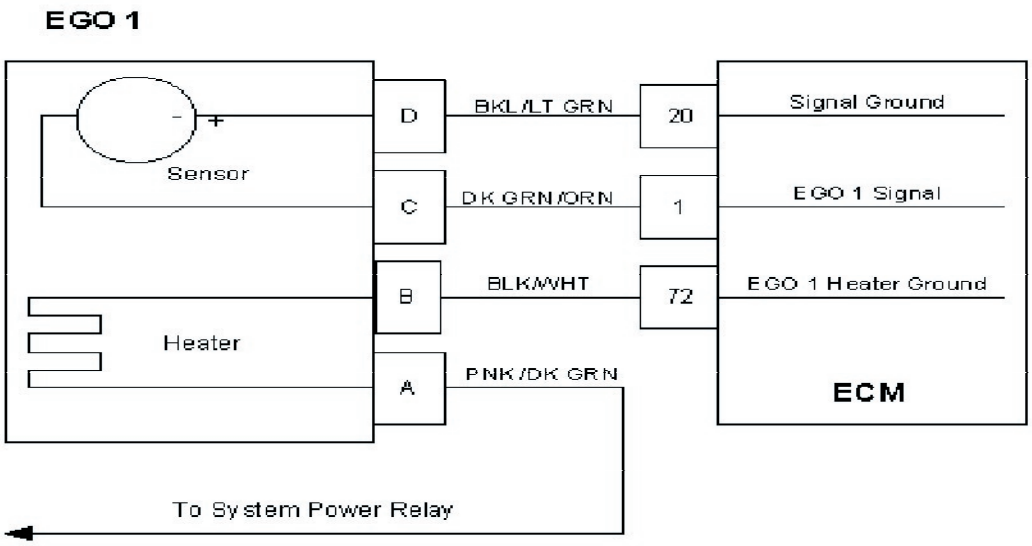
**Oxygen Sensor Wire** Heated Oxygen sensor wires may be mis-routed and contacting the exhaust manifold.
**Vacuum Leaks** Large vacuum leaks and crankcase leaks can cause a lean exhaust condition at especially at light load.
**Fuel Pressure** Low fuel pressure, faulty fuel regulator or contaminated fuel filter can cause fuel the system to run lean
**Exhaust Leaks** If there is an exhaust leak, outside air can be pulled into the exhaust and past the 02 sensor causing a false lean condition.
**Fuel Quality** Contaminated or spoiled fuel can cause the fuel system to be lean.
**Ground Problem** ECM grounds must be clean, tight and in the proper location.

# DTC 1155- Closed Loop Multiplier High Gasoline SPN/FMI 520204:0

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Run engine to full operating temperature and then idle for a minimum of 2 minutes<br><br>Does DST display EGO 1 voltage fixed below 0.35 volts after 2 minutes of idle run time? | | Go to step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect EGO 1 sensor connector C006<br>• Disconnect ECM connector C001<br>• Using a high impedance DVOM Check for continuity between EGO 1 connector signal pin C and engine ground<br>Do you have continuity? | | Repair the circuit as required<br>Refer to Wiring Repairs in Engine Electrical. | Go to Step (4) |
| 4 | • Using a high impedance DVOM Check for continuity between EGO 1 connector signal pin C and EGO 1 sensor ground pin D<br>Do you have continuity? | | Repair the circuit as required<br>Refer to Wiring Repairs in Engine Electrical. | Go to Step (5) |
| 5 | • Refer to Diagnostic aids for DTC 1155<br>Did you check the diagnostic Aids for DTC 1155? | | Go to Step (6) | - |
| 6 | • Replace EGO 1 sensor<br>Is the replacement complete? | | Go to Step (7) | Refer to Diagnostic Aids for DTC 1155 |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 7 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1155 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | | |

# DTC 1156- Closed Loop Multiplier Low Gasoline SPN/FMI 520204:1




## Conditions for Setting the DTC

- Heated Oxygen Sensor
- Functional Fault-Closed Loop multiplier out of range (at limit of -35%)
- MIL-On during active fault and for one update after active fault

## Circuit Description

The HO2S (Heated Oxygen Sensor) sensor is used to determine if the fuel flow to the engine is correct by measuring the oxygen content in the exhaust gas. The ECM uses this information to correct the fuel flow with the Closed Loop multiplier and the adaptive multiplier. This fault will set if the Closed Loop multiplier is less than -35%. The MIL command is ON.

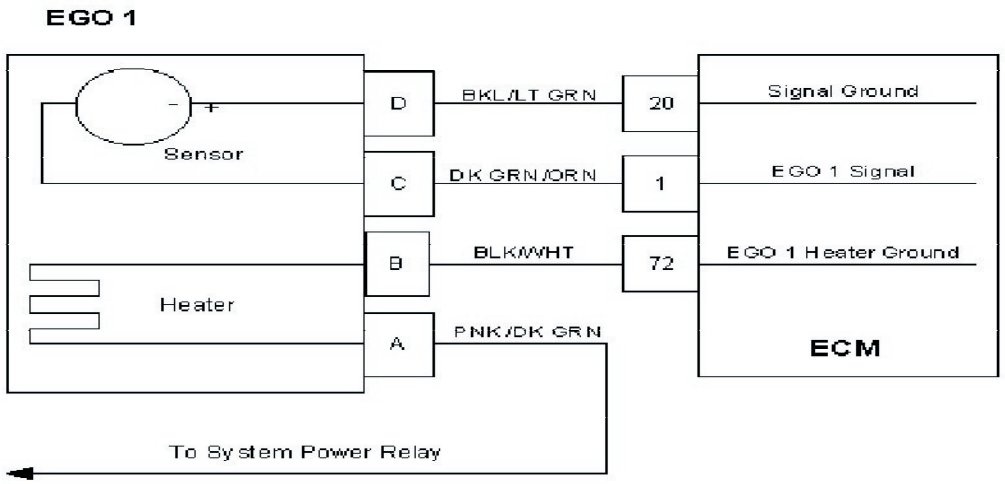
## Diagnostic Aid

**Check for other DTC codes** Correct those starting with the lowest code set number before proceeding with the diagnostic chart.
**Fuel System** The system will be rich if an injector fails in an open manner. High fuel pressure due to a faulty fuel regulator or obstructed fuel return line will cause the system to run rich.
**Ignition noise** open or poor ground circuit to or in the ignition system or ECM may cause EMI (Electromagnetic interference). This noise could be interpreted by the ECM as ignition pulses, and the sensed RPM becomes higher than the actual speed. The ECM then delivers too much fuel, causing the system to run rich.
**TMAP Sensor** A higher manifold pressure than normal can cause the system to go rich. Temporarily disconnecting the MAP Sensor will allow the ECM to set a default value for MAP.
**IAT Sensor** Check for a shifted sensor that could cause the ECM to sense lower than actual temperature of incoming air. This can cause a rich exhaust condition.
**ECT Sensor** Check for a skewed sensor that could cause the ECM to sense engine temperature colder than it actually is. This could also cause a rich exhaust condition.

# DTC 1156- Closed Loop Multiplier Low Gasoline SPN/FMI: 520204:1

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Run engine to full operating temperature and then idle for a minimum of 2 minutes<br>Does DST display EGO 1 voltage fixed above 0.7 volts after 2 minutes of idle run time? | | Go to step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect EGO 1 wire connector C006<br>• Disconnect ECM wiring harness connector C001<br>• Key ON<br>• Using a high impedance DVOM check for voltage between EGO 1 connector signal pin C and engine ground<br>Do you have voltage? | | Repair the circuit as required<br>Refer to Wiring Repairs in Engine Electrical. | Refer to Diagnostic Aid for DTC 1156 |

# DTC 1161-Adaptive Learn High LPG SPN/FMI 520202:0




## Conditions for Setting the DTC

- Heated Oxygen Sensor
- Check Condition- Engine Running
- Fault Condition- Adaptive multiplier out of range (greater than +30%)
- MIL- On

## Circuit Description

The EGO 1 sensor is used to determine if the fuel flow to the engine is correct by measuring the oxygen content in the exhaust gas. The ECM uses this information to correct the fuel flow with the Closed Loop multiplier and Adaptive multiplier. This fault will set if the adaptive multiplier exceeds the limits of normal operation.

## Diagnostic Aid

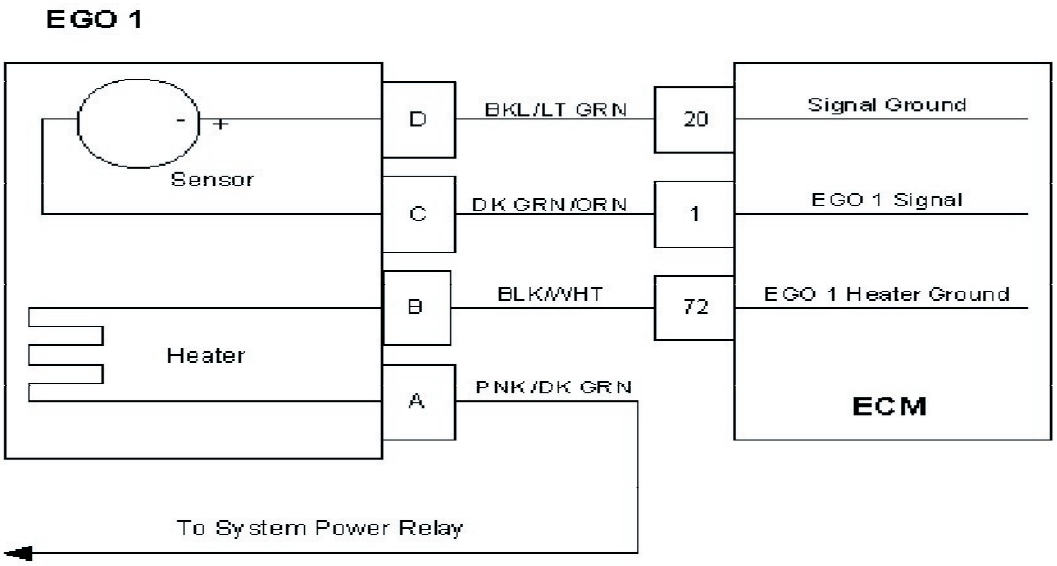
**Oxygen Sensor Wire** Heated Oxygen sensor wires may be mis-routed and contacting the exhaust manifold.
**Vacuum Leaks** Large vacuum leaks and crankcase leaks can cause a lean exhaust condition at especially at light load.
**Fuel Mixer** System can be lean due to faulty EPR (Electronic Pressure Regulator) or faulty fuel mixer.
**Fuel Pressure** Low secondary fuel pressure, faulty low pressure regulator or contaminated fuel filter can cause fuel the system to run lean. Perform LPG Fuel System Diagnosis (Section 5).
**Exhaust Leaks** If there is an exhaust leak, outside air can be pulled into the exhaust and past the 02 sensor causing a false lean condition.
**Fuel Quality** Contaminated or spoiled fuel can cause the fuel system to be lean.
**Ground Problem** ECM grounds must be clean, tight and in the proper location.

# DTC 1161 Adaptive Learn High LPG SPN/FMI 520202:0

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | • Perform the On-Board (OBD) System Check?<br>Are any other DTCs present? | | Go to Step (3) | Go to Step (2) |
| 2 | Visually and physically check the following items:<br>• The air intake duct for being collapsed or restricted<br>• The air filter for being plugged<br>• The EGO 1 sensor installed securely and the wire leads not contacting the exhaust manifold or ignition wires<br>• ECM grounds must be clean and tight. Refer to Engine Electrical Power and Ground Distribution<br>• Fuel System Diagnostics. Refer to Fuel System Diagnostics<br>Was a repair made? | | Go to Step (8) | Go to Step (4) |
| 3 | • Diagnose any other DTC codes before proceeding with this chart. Always repair existing codes starting with the lowest numerical code set first.<br>Have any other DTC codes been detected, diagnosed and repaired? | | Go to Step (8) | Go to step (4) |
| 4 | • Disconnect EGO1 connector C006<br>• Using a DVOM check for voltage between EGO 1 connector pins A and B<br>• Key ON<br>(**CHECK MUST BE MADE WITHIN 30 SECONDS OR BEFORE POWER RELAY SHUTS DOWN)**<br>Do you have voltage? | System voltage | Go to Step (5) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 5 | • Key OFF<br>• Disconnect EGO 1 sensor wire harness connector C006<br>• Disconnect ECM wire harness connector C001<br>• Key ON<br>• Using a high impedance DVOM check for continuity between EGO 1 connector signal pin C and engine ground<br>Do you have continuity? | | Repair the shorted circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (6) |
| 6 | • Using a high impedance DVOM check for continuity between EGO 1 connector signal ground pin D and EGO 1 signal pin C<br>• Do you have continuity? | | Repair the shorted circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (7) |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 7 | • Replace EGO 1 sensor<br>Is the replacement complete? | | Go to Step (8) | Refer to Diagnostic Aids for DTC 1161 |
| 8 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1161 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1162-Adaptive Learn Low (LPG) SPN/FMI 520202:1




## Conditions for Setting the DTC

- Heated Oxygen Sensor
- Check Condition- Engine running
- Fault Condition- Adaptive multiplier out of range (at limit of -30%)
- MIL-On

## Circuit Description

The EGO1 sensor is used to determine if the fuel flow to the engine is correct by measuring the oxygen content in the exhaust gas. The ECM uses this information to correct the fuel flow with the Closed Loop multiplier and Adaptive multiplier. This fault will set if the adaptive multiplier exceeds the limits of normal operation.

## Diagnostic Aid

**Fuel System** High secondary fuel pressure will cause the system to run rich. A worn fuel mixer, faulty EPR (Electronic Pressure Regulator) may also cause the system to run rich. Perform LPG Fuel System Diagnosis (Section 5).

**Fuel Mixer** System can be rich due to faulty EPR (Electronic Pressure Regulator) or a worn fuel mixer.

**Fuel Quality** A drastic variation in fuel quality (very high butane content) may cause the fuel system to run rich. Be sure that the specified HD-5 or HD-10 motor fuel grade propane is used.

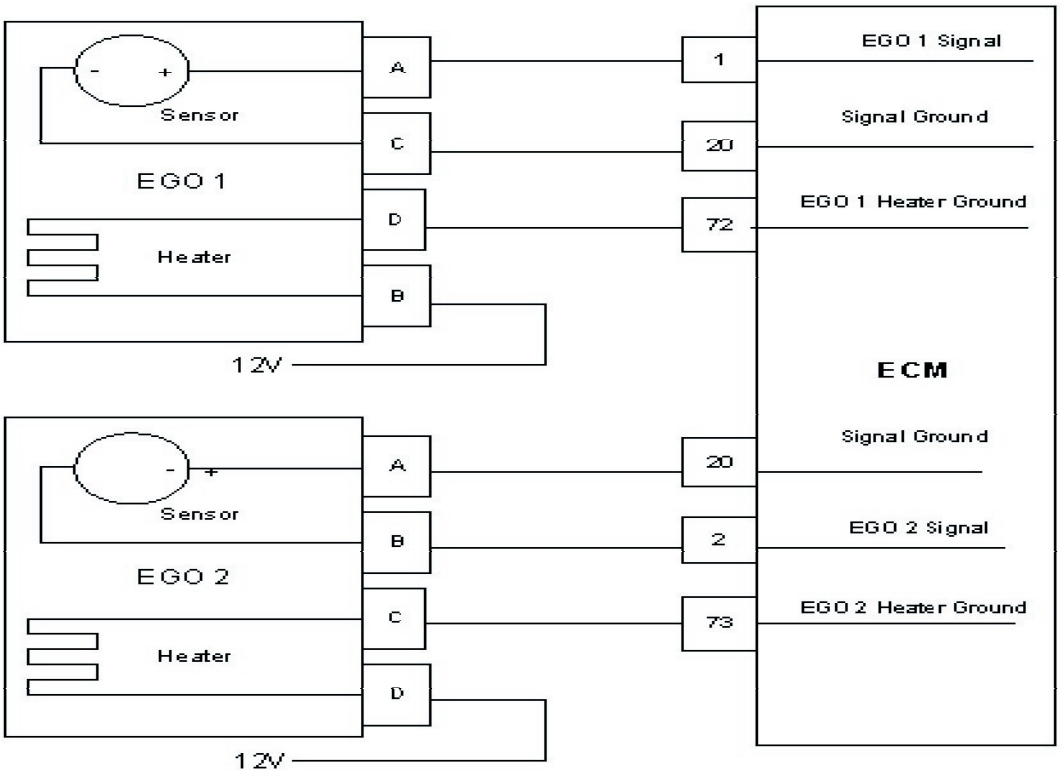
**Air Filter** A plugged, damaged or modified air filter may cause the system to run rich.

# DTC 1162-Adaptive Learn Low LPG SPN/FMI 520202:1

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | • Perform the On-Board (OBD) System Check?<br>Are any other DTCs present? | | Go to Step (3) | Go to Step (2) |
| 2 | Visually and physically check the following items:<br>• The air intake duct for being collapsed or restricted<br>• The air filter for being plugged<br>• The EGO 1 sensor installed securely and the wire leads not contacting the exhaust manifold or ignition wires<br>• ECM grounds must be clean and tight. Refer to Engine Electrical Power and Ground Distribution<br>• Fuel System Diagnostics. Refer to Fuel System Diagnostics<br>Was a repair made? | | Go to Step (8) | Go to Step (4) |
| 3 | • Diagnose any other DTC codes before proceeding with this chart. Always repair existing codes starting with the lowest numerical code set first.<br>Have any other DTC codes been detected, diagnosed and repaired? | | Go to Step (8) | Go to step (4) |
| 4 | • Disconnect EGO1 connector C006<br>• Using a DVOM check for voltage between EGO 1 connector pins A and B<br>• Key ON<br>(**CHECK MUST BE MADE WITHIN 30 SECONDS OR BEFORE POWER RELAY SHUTS DOWN)**<br>Do you have voltage? | System voltage | Go to Step (5) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 5 | • Key OFF<br>• Disconnect EGO 1 sensor wire harness connector C006<br>• Disconnect ECM wire harness connector C001<br>• Key ON<br>• Using a high impedance DVOM check for continuity between EGO 1 connector signal pin C and engine ground<br>Do you have continuity? | | Repair the shorted circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (6) |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 6 | • Using a high impedance DVOM check for continuity between EGO 1 connector signal ground pin D and EGO 1 signal pin C<br>• Do you have continuity? | | Repair the shorted circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (7) |
| 7 | • Replace EGO 1 sensor<br>Is the replacement complete? | | Go to Step (8) | Refer to Diagnostic Aids for DTC 1162 |
| 8 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1162 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1165 LPG Catalyst Monitor SPN/FMI 520213:10




## Conditions for Setting the DTC

- Catalyst Function
- Check condition- Engine running
- Fault condition- EGO 1 signal = EGO 2 signal for 100 updates
- MIL- On during active fault and for 1 second after active fault
- Adaptive- Disabled during active fault

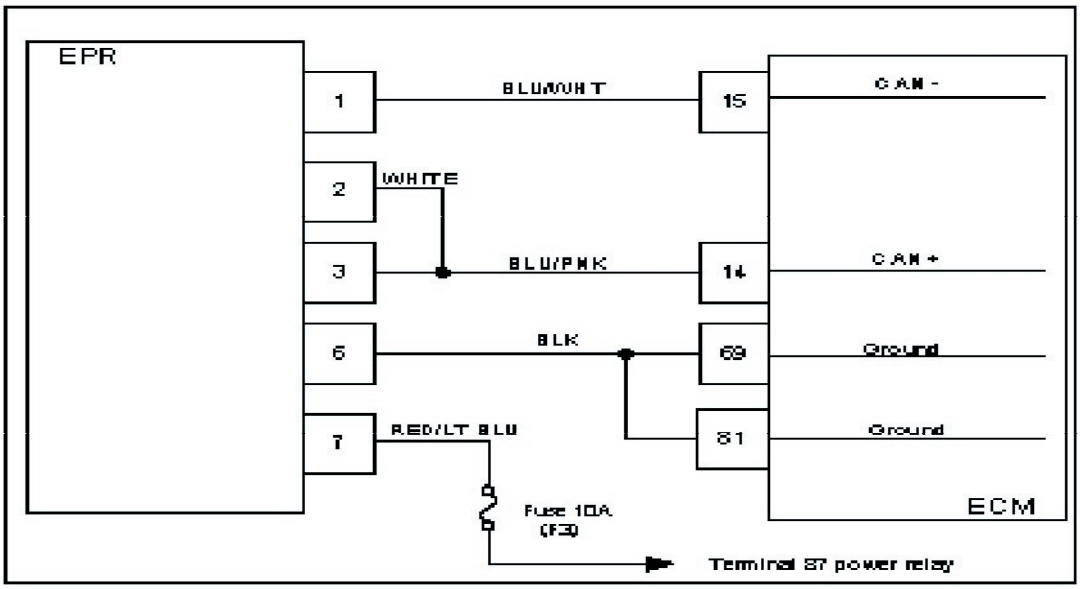
## Circuit Description

The ECM uses EGO 1 and EGO 2 sensor signals to diagnose problems with the catalyst muffler. When the signals for EGO 1 & EGO 2 are similar it may indicate a problem with the catalyst.

## Diagnostic Aids

Always diagnose any other troubles, stored along with DTC 420 first. Check for and eliminate any exhaust leaks prior to replacing catalyst muffler. Look for exhaust leaks at the catalyst muffler inlet and tail pipes. Clear this trouble code after repairing exhaust leaks, and recheck for code.

# DTC1171- EPR Pressure Higher Than Expected SPN/FMI 520260:0




## Conditions for Setting the DTC

- EPR delivery pressure
- Check condition-Engine running or cranking
- MIL-On during active fault
- Fault condition-EPR actual pressure greater than 4.0 inches H2O above commanded pressure
- Adaptive disabled
- Power derate level 1

## Circuit Description

The EPR (Electronic Pressure Regulator) unit measures and controls the amount of fuel that is able to pass to the fuel mixer. Pressure readings are sent over the CAN to the ECM and in return the ECM sends back a control signal to the EPR to increase or decrease pressure for precise mixture control. This code will set in the event the actual pressure is 4.0 inches water pressure higher than the actual commanded pressure. The MIL command is on. Adaptive and closed loop are disabled with power derate level 1 enforced limiting throttle position to 70% maximum.

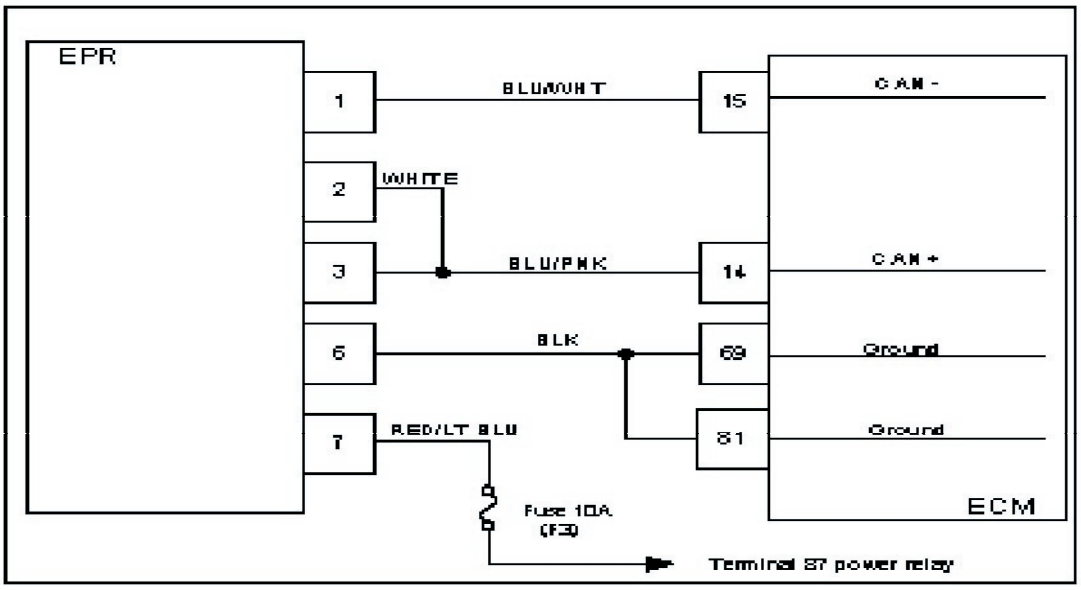
## Diagnostic Aid

Always run the fuel system diagnostic pressure check before proceeding with the following diagnostic chart. High secondary fuel pressure due to a worn or damaged primary or secondary seat may cause this fault to set

# DTC 1171-EPR Pressure Higher Than Expected SPN/FMI 520260:0

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Did you run the fuel pressure diagnostic test in the fuel system diagnostic section with no problems found? | | Go to step (4) | Go to step 3 |
| 3 | • Run the EPR pressure test in the LPG Fuel System Diagnosis procedure (Section 5)<br>Did the EPR pass the fuel pressure test specifications? | | Go to step (4) | Follow the EPR service recommendations from the fuel pressure test chart. |
| 4 | Inspect the EPR electrical connector C026 for damage, corrosion or contamination.<br>Did you find a problem? | | Repair the circuit as necessary. Refer to wire harness repair section. | Go to step (5) |
| 5 | • Replace the EPR<br>Is the replacement complete? | | Go to step (6) | _ |
| 6 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC1171 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC1172- EPR Pressure Lower Than Expected SPN/FMI 520260:1




## Conditions for Setting the DTC

- EPR delivery pressure
- Check condition-Engine running or cranking
- MIL-On during active fault
- Fault condition-EPR actual pressure less than 4.0 inches H2O below commanded pressure
- Adaptive disabled
- Power derate level 1

## Circuit Description

The EPR (Electronic Pressure Regulator) unit measures and controls the amount of fuel that is able to pass to the fuel mixer. Pressure readings are sent over the CAN to the ECM and in return the ECM sends back a control signal to the EPR to increase or decrease pressure for precise mixture control. This code will set in the event the actual pressure is 4.0 inches water pressure lower than the actual commanded pressure. The MIL command is on. Adaptive and closed loop are disabled with power derate level 1 enforced limiting throttle position to 70% maximum.

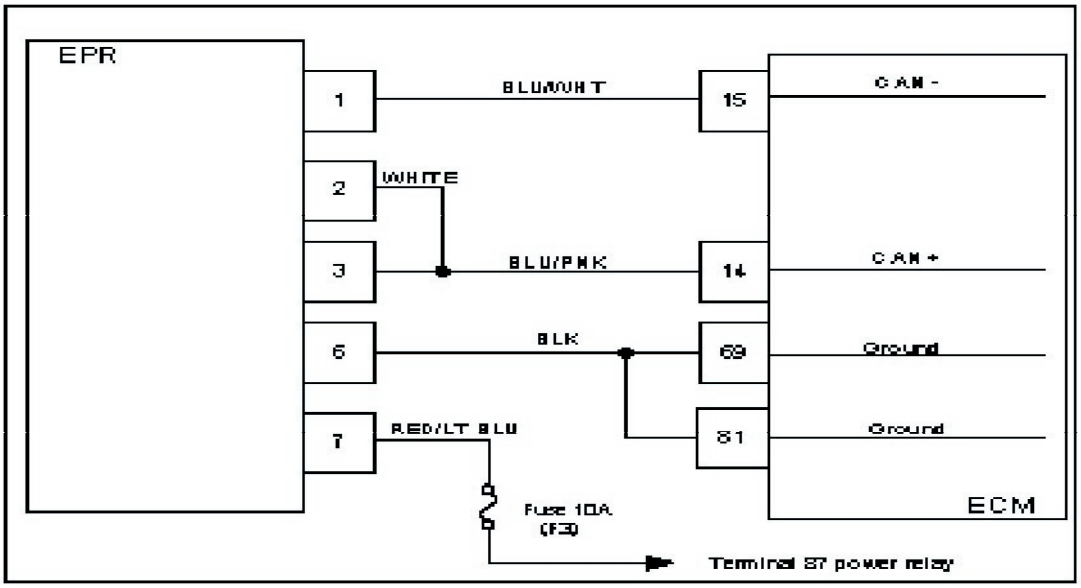
## Diagnostic Aid

Always run the fuel system diagnostic pressure check before proceeding with the following diagnostic chart. Low secondary fuel pressure due to a fuel restriction or faulty regulator may cause this fault.

# DTC 1172-EPR Pressure Lower Than Expected SPN/FMI 520260:1

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Did you run the fuel pressure diagnostic test in the fuel system diagnostic section with no problems found? | | Go to step (4) | Go to step 3 |
| 3 | • Run the EPR pressure test in the LPG Fuel System Diagnosis (Section 5). Did the EPR pass the fuel pressure test specifications? | | Go to step (4) | Follow the EPR service recommendations from the fuel pressure test chart. |
| 4 | Inspect the EPR electrical connector C026 for damage, corrosion or contamination.<br>Did you find a problem? | | Repair the circuit as necessary. Refer to wire harness repair section. | Go to step (5) |
| 5 | • Replace the EPR<br><br>Is the replacement complete? | | Go to step (6) | _ |
| 6 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC1172 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC1173- EPR Communication Lost SPN/FMI 520260:31




## Conditions for Setting the DTC

- EPR CAN communication
- Check condition-Engine running or cranking
- MIL-On during active fault
- Fault condition-No packets received within 500 ms
- Adaptive disabled

## Circuit Description

The EPR (Electronic Pressure Regulator) unit measures and controls the amount of fuel that is able to pass to the fuel mixer. Pressure readings are sent over the CAN to the ECM and in return the ECM sends back a control signal to the EPR to increase or decrease pressure for precise mixture control. This code will set in the event communication with the ECM is lost. The MIL command is on.

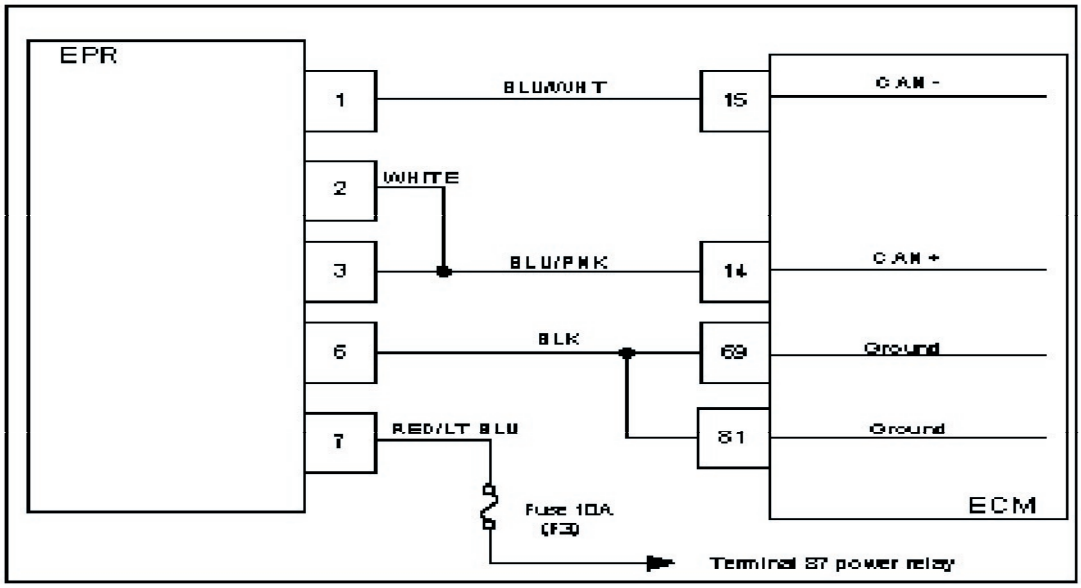
# DTC 1173-EPR Communication Lost SPN/FMI 520260:31

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON<br>• DST (Diagnostic Scan Tool) connected in the system data mode<br>• Clear DTC1173<br>• Key OFF<br>• Key ON, and attempt to start the engine<br>Does DTC1173 re-set | | Go to step (3) | Intermittent problem. Go to Intermittent Problem section in the electrical section of this manual. |
| 3 | • Key OFF<br>• Disconnect EPR electrical connector C026<br>• Key ON<br>• Using a DVOM check for system power between EPR connector pin 7 and engine ground<br>(Be sure to activate relay control ON using the DST function or check before ECM relay control times out)<br>Do you have power? | System battery voltage | Go to step (7) | Go to step (4) |
| 4 | • Check the 10A (EPR) fuse<br>Is the fuse open? | | Go to step (5) | Go to step (6) |
| 5 | • Replace EPR fuse<br>Is the replacement complete? | | Go to step (17) | _ |
| 6 | • Using a DVOM check for system power at power relay terminal 87<br>(Be sure to activate relay control ON using the DST function or check before ECM relay control times out)<br>Do you have power? | System battery voltage | Repair the open circuit between power relay pin 87 and EPR pin 7<br><br>Go to step (17) | Repair the power relay circuit as required<br><br>Go to step (17) |
| 7 | • Using a DVOM check for continuity between EPR connector pin 6 and engine ground<br>Do you have continuity? | | Go to step (8) | Repair the open ground circuit as necessary. Refer to wiring repairs in engine electrical |
| 8 | • Key OFF<br>• Disconnect the EPR connector C026<br>• Disconnect the ECM connector C001<br>• Using a DVOM check for continuity between EPR pin 1 and ECM pin 15<br>Do you have continuity? | | Go to step (9) | Repair the open circuit as necessary. Refer to wiring repairs in engine electrical |
| 9 | • Using a DVOM check for continuity between EPR pin 2 and ECM pin 14<br>Do you have continuity? | | Go to step (10) | Repair the open circuit as necessary. Refer to wiring repairs in engine electrical |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 10 | • Using a DVOM check for continuity between EPR pin 3 and ECM pin 14<br>Do you have continuity? | | Go to step (11) | Repair the open circuit as necessary. Refer to wiring repairs in engine electrical |
| 11 | • Using a DVOM check for continuity between EPR pin 6 and ECM pin 69<br>Do you have continuity? | | Go to step (12) | Repair the open circuit as necessary. Refer to wiring repairs in engine electrical |
| 12 | • Using a DVOM check for continuity between EPR pin 6 and ECM pin 81<br>Do you have continuity? | | Go to step (13) | Repair the open circuit as necessary. Refer to wiring repairs in engine electrical |
| 13 | • Disconnect vehicle interface connector C011<br>• Disconnect DST from the DLC connector C016<br>• Using a DVOM check for continuity between engine ground and EPR pins 1 and 3<br>Do you have continuity? | | Repair the shorted to ground CAN circuit as necessary. Refer to wiring repairs in engine electrical | Go to step (14) |
| 14 | • Replace the EPR<br>Is the replacement complete? | | Go to step (15) | _ |
| 15 | • Remove all test equipment and reconnect the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC1173 check for any stored codes.<br>Does DTC1173 still re-set? | | Go to step (16) | System OK |
| 16 | • Replace the ECM<br>Is the replacement complete? | | Go to step (17) | _ |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 17 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC1173 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC1174- EPR Supply Voltage High SPN/FMI 520260:3




## Conditions for Setting the DTC

- EPR supply voltage
- Check condition-Engine running or cranking
- MIL-On during active fault
- Fault condition- internal EPR supply voltage too high
- Adaptive disabled
- Closed loop disabled

## Circuit Description

The EPR (Electronic Pressure Regulator) unit measures and controls the amount of fuel that is able to pass to the fuel mixer. Pressure readings are sent over the CAN to the ECM and in return the ECM sends back a control signal to the EPR to increase or decrease pressure for precise mixture control. This code will set if the EPR internal supply voltage is too high.

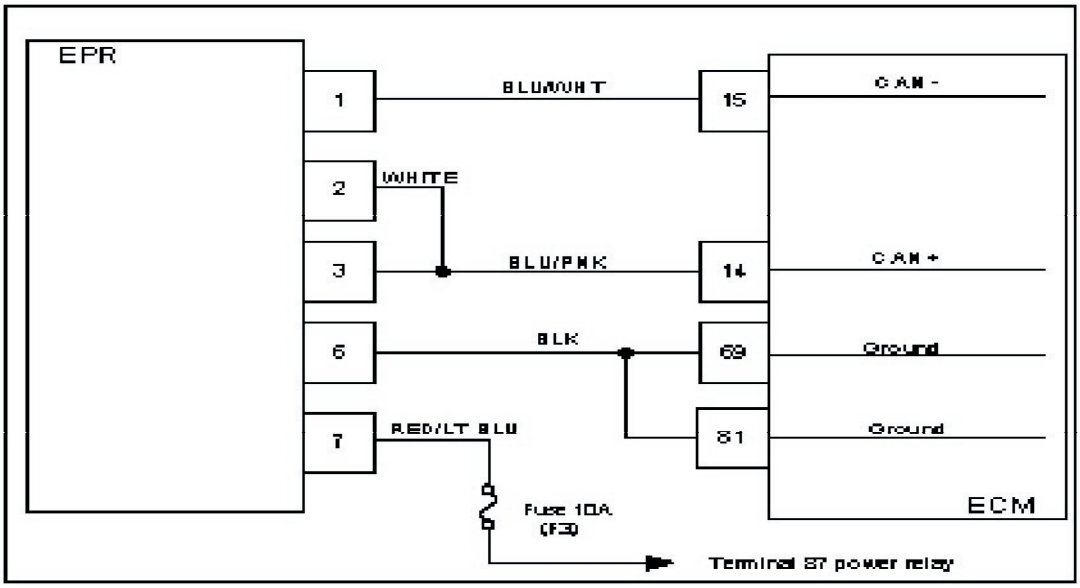
## Diagnostic Aid

This DTC indicates abnormal EPR internal voltages that are not measurable externally. Check the system charging voltage to be sure this DTC and other over voltage DTC's are not present. Repair the charging system if it is found to be out of specification for high charge voltage. In the event of multiple code sets, always start the diagnostic repair with the lowest numerical value DTC first.

# DTC 1174-EPR Voltage Supply High SPN/FMI 520260:3

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • DST connected and in the system data mode<br>• Engine running<br>• Check the system battery voltage.<br>Is the charging voltage within specifications? | | Go to step (3) | Repair the charging system |
| 3 | Using a DVOM compare the system battery voltage to the DST display.<br>Is the voltage reading within 1 volt between the two of them? | 1 volt | Go to step (4) | Go to step (5) |
| 4 | • Replace the EPR<br>Is the replacement complete? | | Go to step (6) | _ |
| 5 | • Replace the ECM<br>Is the replacement complete? | | Go to step (6) | _ |
| 6 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC1174 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC1175- EPR Supply Voltage Low SPN/FMI 520260:4




## Conditions for Setting the DTC

- EPR supply voltage
- Check condition-Engine running or cranking
- MIL-On during active fault
- Fault condition-EPR internal supply voltage low
- Adaptive disabled
- Closed loop disabled

## Circuit Description

The EPR (Electronic Pressure Regulator) unit measures and controls the amount of fuel that is able to pass to the fuel mixer. Pressure readings are sent over the CAN to the ECM and in return the ECM sends back a control signal to the EPR to increase or decrease pressure for precise mixture control. This code will set if the internal EPR supply voltage is low.

## Diagnostic Aid

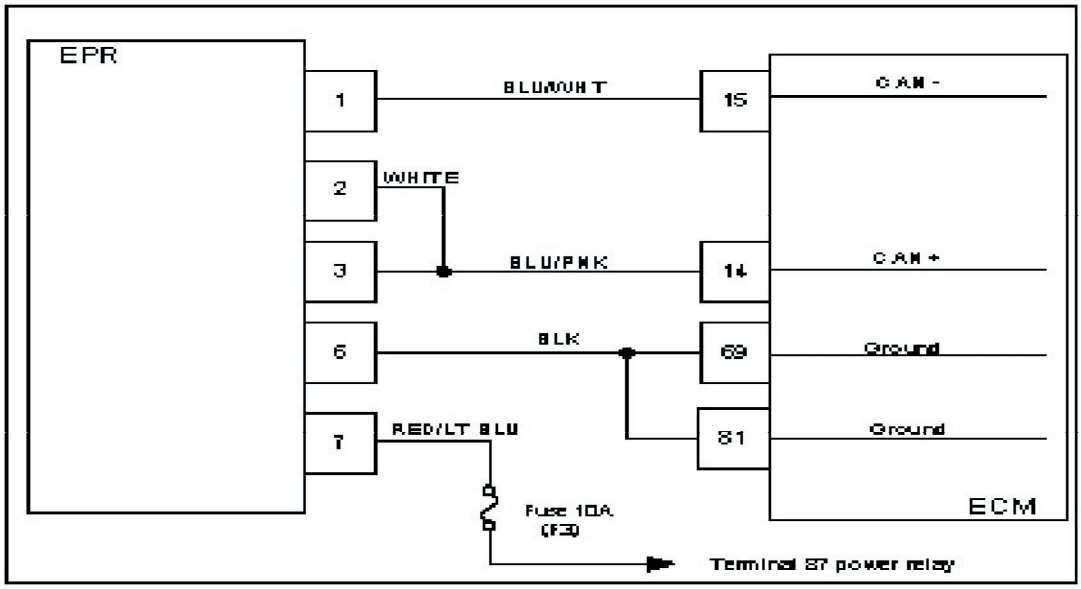
This DTC indicates abnormal EPR internal voltages that are not measurable externally. Check the system charging voltage to be sure this DTC and other low voltage DTC's are not present. Repair the charging system if it is found to be out of specification for low charge voltage. In the event of multiple code sets, always start the diagnostic repair with the lowest numerical value DTC first.

# DTC 1175-EPR Voltage Supply Low SPN/FMI 520260:4

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • DST connected and in the system data mode<br>• Engine running<br>• Check the system battery voltage.<br>Is the charging voltage within specifications? | | Go to step (3) | Repair the charging system |
| 3 | • Key OFF<br>• Disconnect the EPR electrical connector C026<br>• Using a DVOM check for power between the EPR connector pin 7 and engine ground.<br>• Key ON<br>• Record the voltage reading.<br><br>(Be sure to activate relay control ON using the DST function or check before ECM relay control times out)<br><br>• Using a DVOM check the system battery power at the battery terminals and record the voltage reading.<br>Are the recorded voltage readings within 1 volt of each other? | | Go to step (6) | Go to step (4) |
| 4 | • Inspect the EPR connector and F3 fuse holder terminals for damage corrosion or contamination<br>Did you find a problem? | | Correct the problem as necessary. See wiring harness repair in the electrical section of this manual | Go to step (5) |
| 5 | • Check the power relay circuit. Check the power relay connections for damage corrosion or contamination<br>Did you find a problem? | | Correct the problem as necessary. See wiring harness schematic in the electrical section of this manual | – |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 6 | • Key OFF<br>• Disconnect the ECM connector C001<br>• Using a DVOM check the resistance reading between EPR connector pin 6 and ECM connector pin 69 and 81.<br><br>(Do not forget to subtract any resistance value that may be present in you test cables)<br><br>Is the resistance reading less than .5 ohms? | Less than .5 Ohms | Go to step (7) | Repair the poor EPR power ground circuit. See wiring harness repair in the electrical section of this manual |
| 7 | • Replace the EPR<br>Is the replacement complete? | | Go to step (8) | _ |
| 8 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC1175 check for any stored codes.<br>Does DTC 1175 still re-set? | | Go to step (9) | System OK |
| 9 | • Replace the ECM<br>Is the replacement complete? | | Go to step (10) | _ |
| 10 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC1175 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC1176- EPR Internal Actuator Fault SPN/FMI 520260:12




## Conditions for Setting the DTC

- EPR internal actuator test
- Check condition-Engine running or cranking
- MIL-On during active fault
- Fault condition- Failed actuator
- Adaptive disabled
- Closed loop disabled

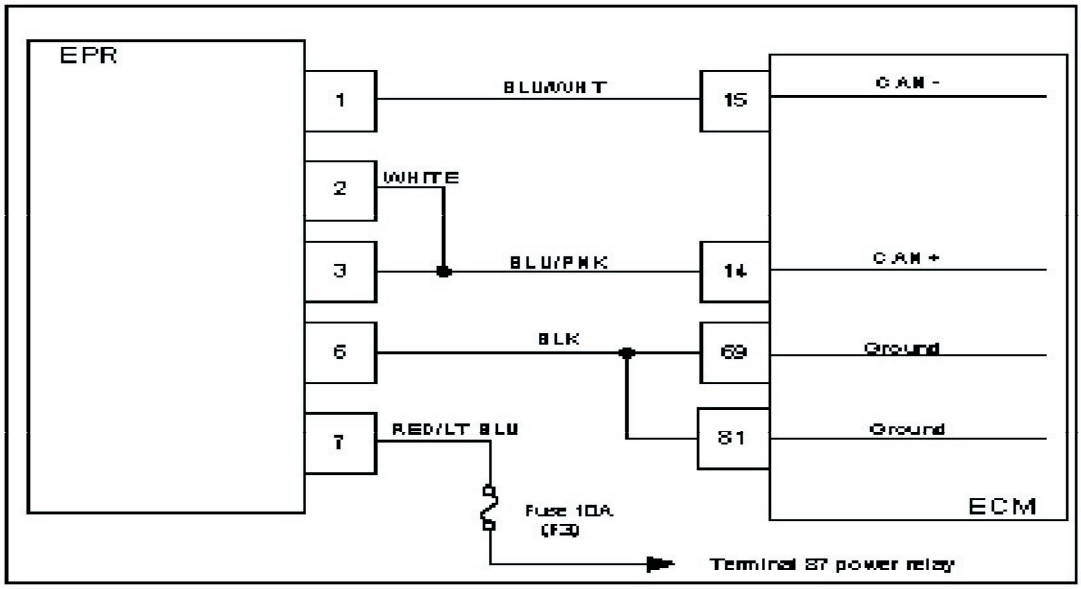
## Circuit Description

The EPR (Electronic Pressure Regulator) unit measures and controls the amount of fuel that is able to pass to the fuel mixer. Pressure readings are sent over the CAN to the ECM and in return the ECM sends back a control signal to the EPR to increase or decrease pressure for precise mixture control. This code will set if the ECM detects an internal actuator fault with the EPR. In the event of multiple code sets, always start the diagnostic repair with the lowest numerical value DTC first. In most instances the EPR will need to be replaced in the event of this code set.

# DTC 1176-EPR Internal Actuator Fault SPN/FMI 520260:12

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • DST connected and in the system data mode<br>• Check for any other current or active DTCs<br>Does the DST show any other codes set? | | Go to step (3) | Go to step (6) |
| 3 | • Repair any other DTC's set starting with the lowest DTC number first<br>Have the other DTC's set been corrected? | | Go to step (4) | Repair Other DTC's |
| 4 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC1176 check for any stored codes.<br>Does DTC 1176 still re-set? | | Go to step (5) | System OK |
| 5 | • Replace the EPR<br>Is the replacement complete? | | Go to step (6) | _ |
| 6 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC1176 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC1177- EPR internal Circuitry Fault SPN/FMI 620260:12




## Conditions for Setting the DTC

- EPR internal circuitry test
- Check condition-Engine running or cranking
- MIL-On during active fault
- Fault condition-
- Adaptive disabled
- Closed loop disabled

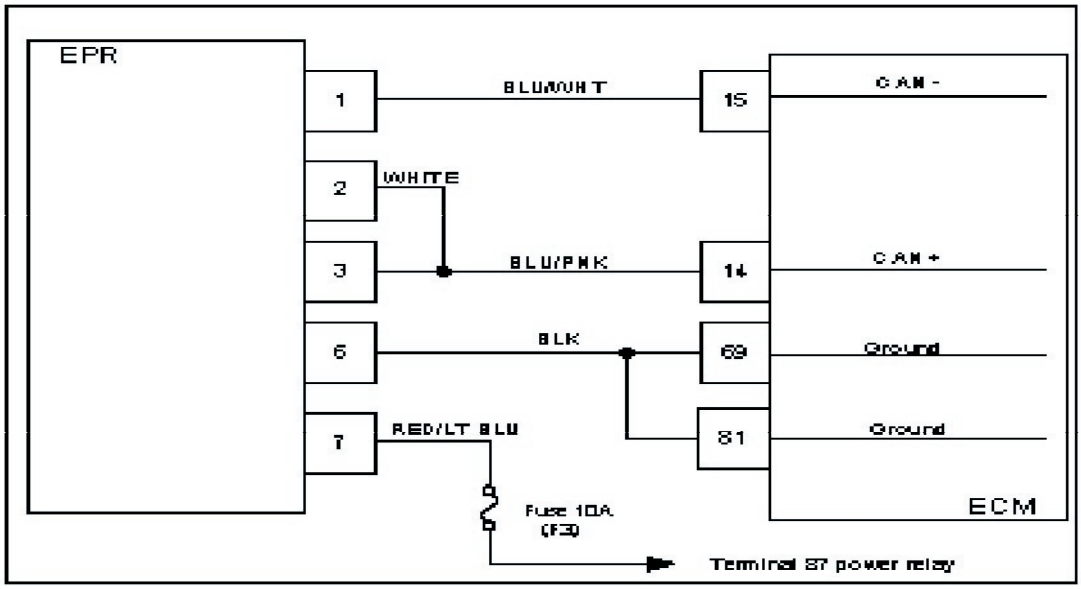
## Circuit Description

The EPR (Electronic Pressure Regulator) unit measures and controls the amount of fuel that is able to pass to the fuel mixer. Pressure readings are sent over the CAN to the ECM and in return the ECM sends back a control signal to the EPR to increase or decrease pressure for precise mixture control. This code will set if the ECM detects an internal circuitry fault in the EPR. In the event of multiple code sets, always start the diagnostic repair with the lowest numerical value DTC first. In most instances the EPR will need to be replaced in the event of this code set.

# DTC 1177-EPR Internal Circuitry Failure SPN/FMI 520260:12

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • DST connected and in the system data mode<br>• Check for any other current or active DTCs<br>Does the DST show any other codes set? | | Go to step (3) | Go to step (6) |
| 3 | • Repair any other DTC's set starting with the lowest DTC number first<br>Have the other DTC's set been corrected? | | Go to step (4) | Repair Other DTC's |
| 4 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC1177 check for any stored codes.<br>Does DTC 1177 still re-set? | | Go to step (5) | System OK |
| 5 | • Replace the EPR<br>Is the replacement complete? | | Go to step (6) | _ |
| 6 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC1177 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC1178- EPR Internal Communication Error SPN/FMI 520260:12




## Conditions for Setting the DTC

- EPR internal communication test
- Check condition-Engine running or cranking
- MIL-On during active fault
- Fault condition-
- Adaptive disabled
- Closed loop disabled

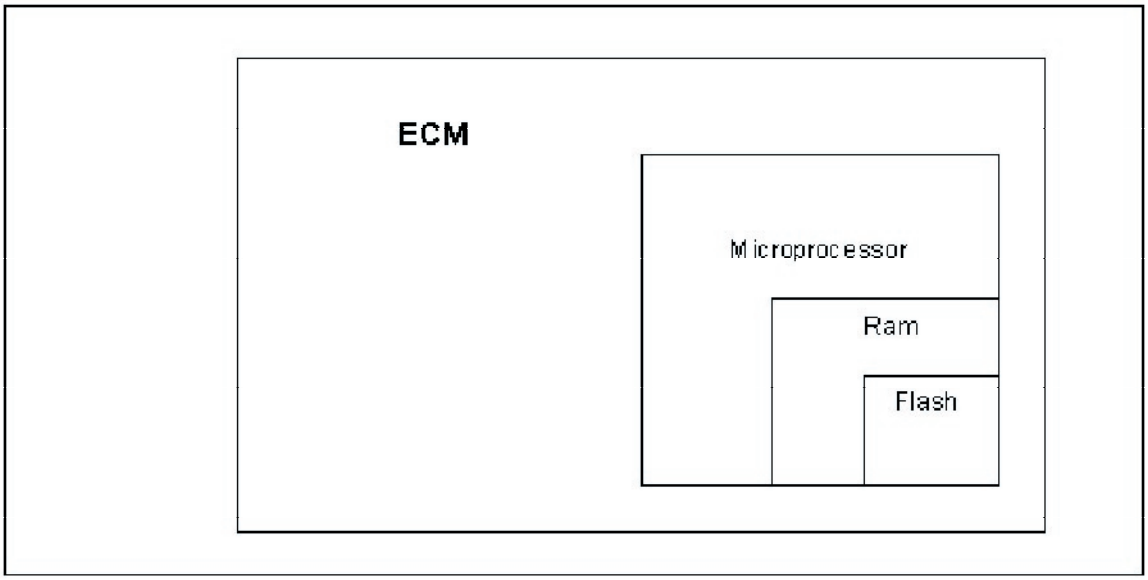
## Circuit Description

The EPR (Electronic Pressure Regulator) unit measures and controls the amount of fuel that is able to pass to the fuel mixer. Pressure readings are sent over the CAN to the ECM and in return the ECM sends back a control signal to the EPR to increase or decrease pressure for precise mixture control. This code will set if the ECM detects an internal communication error in the EPR. In the event of multiple code sets, always start the diagnostic repair with the lowest numerical value DTC first. In most instances the EPR will need to be replaced in the event of this code set.

# DTC 1178-EPR Internal Comm Fault SPN/FMI 520260:12

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • DST connected and in the system data mode<br>• Check for any other current or active DTCs<br>Does the DST show any other codes set? | | Go to step (3) | Go to step (6) |
| 3 | • Repair any other DTC's set starting with the lowest DTC number first<br>Have the other DTC's set been corrected? | | Go to step (4) | Repair Other DTC's |
| 4 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC1178 check for any stored codes.<br>Does DTC 1178 still re-set? | | Go to step (5) | System OK |
| 5 | • Replace the EPR<br>Is the replacement complete? | | Go to step (6) | _ |
| 6 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC1178 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1612-RTI 1 Loss SPN/FMI 629:31




## Conditions for Setting the DTC

- Engine Control Module
- Check Condition- Key on
- Fault Condition- Internal microprocessor error
- MIL- On
- Adaptive- Disabled for the remainder of the key-ON cycle
- Power Derate level 2

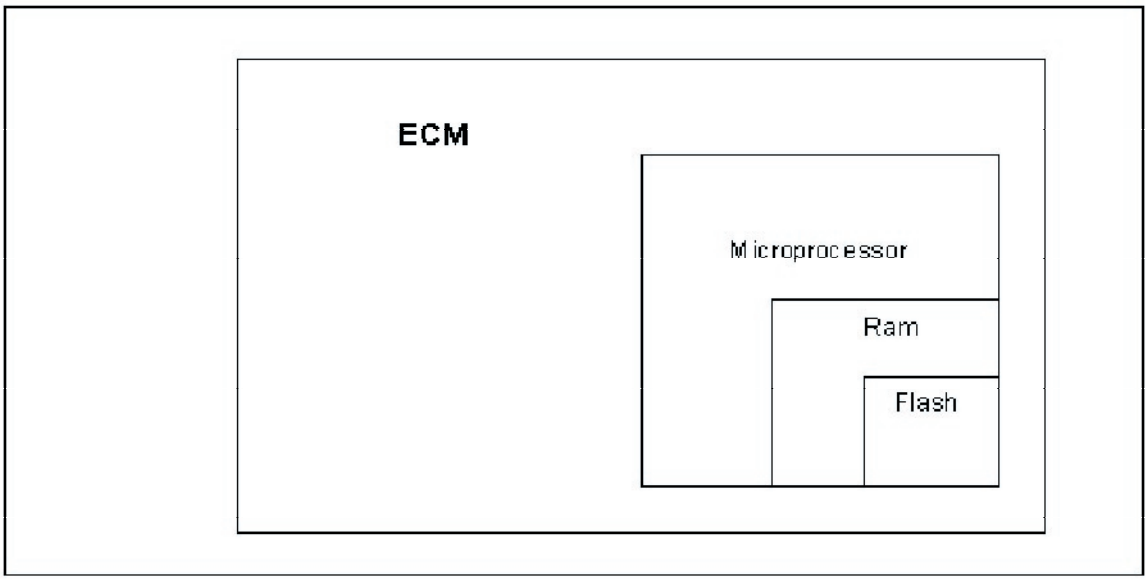
## Circuit Description

The ECM has several internal checks that must be satisfied each time an instruction is executed. Several different things can happen within the microprocessor that will cause this fault. The ECM will attempt to reset itself in the event this fault is set. The MIL command is on and will remain on until the code is cleared using the DST. Power Derate level 2 will be enforced limiting maximum throttle position to 20%.

# DTC 1612- RT 1 Loss SPN/FMI 629:31

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Clear system fault code<br>Does DTC 1612 reset with the engine idling? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Check ECM power and ground circuits<br>Are the power and ground circuits Ok? | | Go to Step (4) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 4 | • Replace ECM<br>Is the replacement complete? | | Go to Step (5) | - |
| 5 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1612 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1613-RTI 2 Loss SPN/FMI 629:31




## Conditions for Setting the DTC

- Engine Control Module
- Check Condition- Key on
- Fault Condition- Internal microprocessor error
- MIL- On
- Adaptive- Disabled for the remainder of the key-ON cycle
- Power Derate level 2

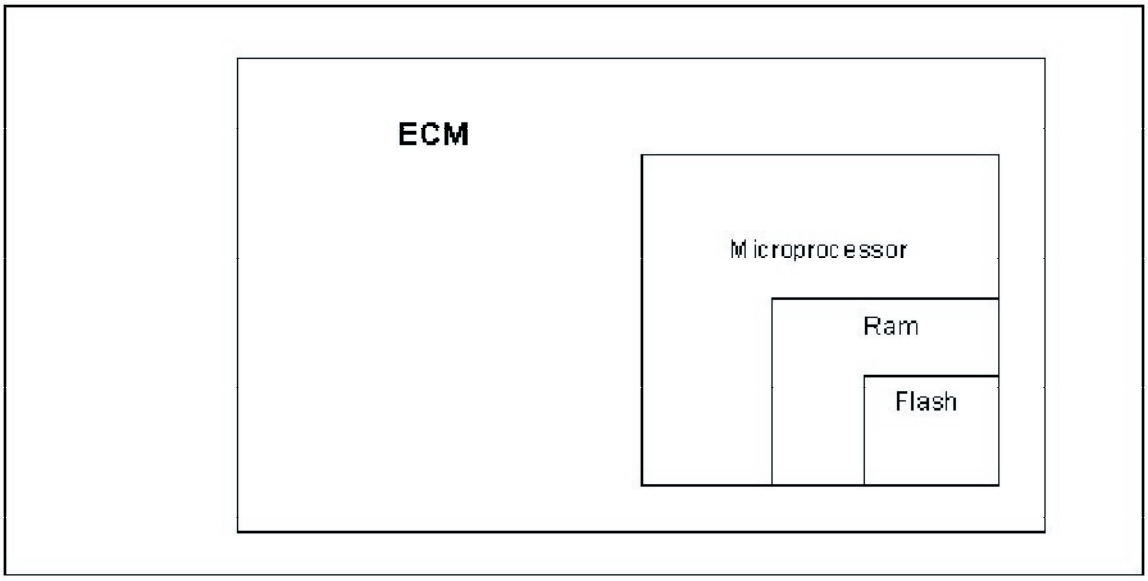
## Circuit Description

The ECM has several internal checks that must be satisfied each time an instruction is executed. Several different things can happen within the microprocessor that will cause this fault. The ECM will attempt to reset itself in the event this fault is set. The MIL command is on and will remain on until the code is cleared using the DST. Power Derate level 2 will be enforced limiting maximum throttle position to 20%.

# DTC 1613- RTI 2 Loss SPN/FMI 629:31

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Clear system fault code<br>Does DTC 1613 reset with the engine idling? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Check ECM power and ground circuits<br>Are the power and ground circuits Ok? | | Go to Step (4) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 4 | • Replace ECM<br>Is the replacement complete? | | Go to Step (5) | - |
| 5 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1613 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1614-RTI 3 Loss SPN/FMI 629:31




## Conditions for Setting the DTC

- Engine Control Module
- Check Condition- Key on
- Fault Condition- Internal microprocessor error
- MIL- On
- Adaptive- Disabled for the remainder of the key-ON cycle
- Power Derate level 2

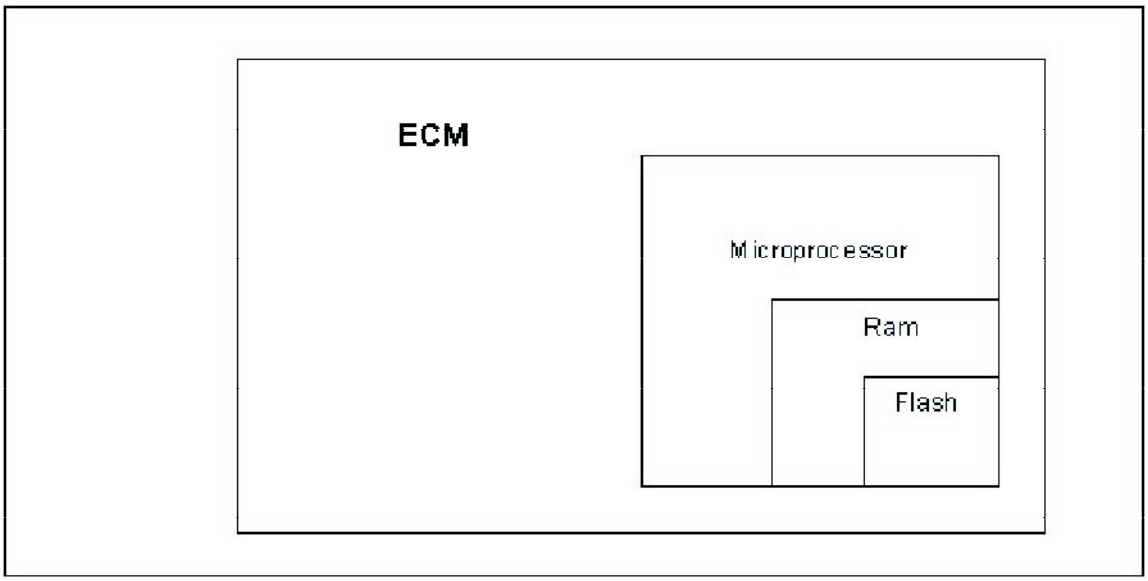
## Circuit Description

The ECM has several internal checks that must be satisfied each time an instruction is executed. Several different things can happen within the microprocessor that will cause this fault. The ECM will attempt to reset itself in the event this fault is set. The MIL command is on and will remain on until the code is cleared using the DST. Power Derate level 2 will be enforced limiting maximum throttle position to 20%.

# DTC 1614- RTI 3 Loss SPN/FMI 629:31

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Clear system fault code<br>Does DTC 1614 reset with the engine idling? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Check ECM power and ground circuits<br>Are the power and ground circuits Ok? | | Go to Step (4) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 4 | • Replace ECM<br>Is the replacement complete? | | Go to Step (5) | - |
| 5 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1614 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1615-A/D Loss SPN/FMI 629:31




## Conditions for Setting the DTC

- Engine Control Module
- Check Condition- Key on
- Fault Condition- Internal microprocessor error
- MIL- On
- Adaptive- Disabled for the remainder of the key-ON cycle
- Power Derate level 2

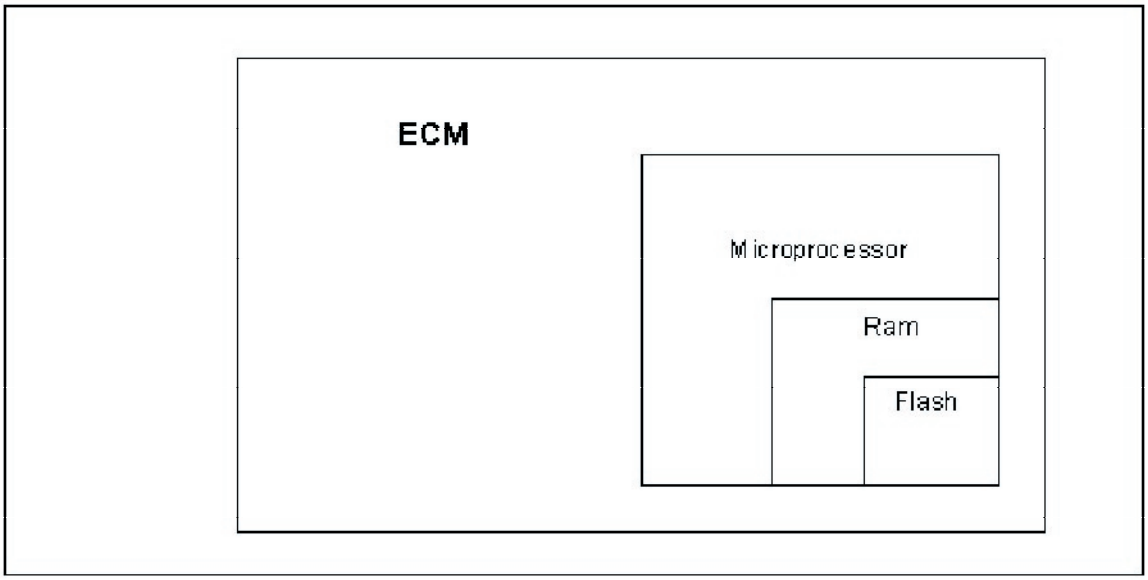
## Circuit Description

The ECM has several internal checks that must be satisfied each time an instruction is executed. Several different things can happen within the microprocessor that will cause this fault. The ECM will attempt to reset itself in the event this fault is set. The MIL command is on and will remain on until the code is cleared using the DST. Power Derate level 2 will be enforced limiting maximum throttle position to 20%.

# DTC 1615- A/D Loss SPN/FMI 629:31

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Clear system fault code<br>Does DTC 1615 reset with the engine idling? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Check ECM power and ground circuits<br>Are the power and ground circuits Ok? | | Go to Step (4) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 4 | • Replace ECM<br>Is the replacement complete? | | Go to Step (5) | - |
| 5 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1615 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1616-Invalid Interrupt SPN/FMI 629:31




## Conditions for Setting the DTC

- Engine Control Module
- Check Condition- Key on
- Fault Condition- Internal microprocessor error
- MIL- On
- Adaptive- Disabled for the remainder of the key-ON cycle
- Power Derate level 2

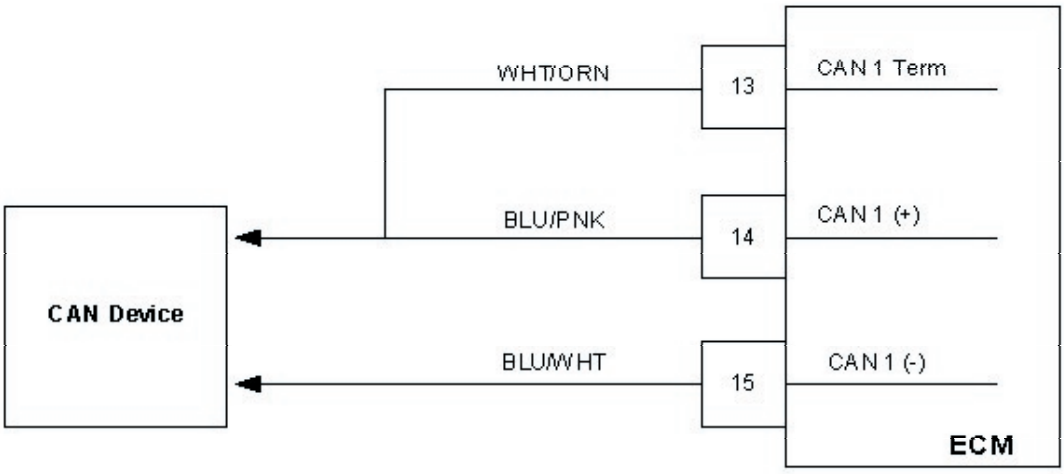
## Circuit Description

The ECM has several internal checks that must be satisfied each time an instruction is executed. Several different things can happen within the microprocessor that will cause this fault. The ECM will attempt to reset itself in the event this fault is set. The MIL command is on and will remain on until the code is cleared using the DST. Power Derate level 2 will be enforced limiting maximum throttle position to 20%.

# DTC 1616- Invalid Interrupt SPN/FMI 629:31

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Clear system fault code<br>Does DTC 1616 reset with the engine idling? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Check ECM power and ground circuits<br>Are the power and ground circuits Ok? | | Go to Step (4) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 4 | • Replace ECM<br>Is the replacement complete? | | Go to Step (5) | - |
| 5 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1616 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1626-CAN Tx Failure SPN/FMI 639:12




### Conditions for Setting the DTC

- CAN Tx
- Check Condition- Engine running
- Fault Condition- CAN Tx error 100 packets lost within 1 second
- MIL- ON

## Circuit description

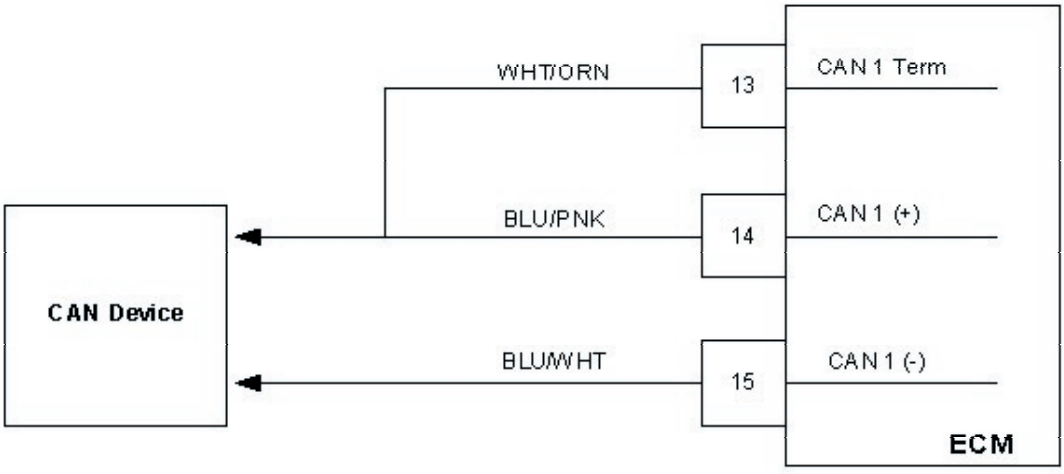
The CAN bus (controller area network) is used by the ECM to communicate with other digital devices used throughout the fuel system. Information is sent over the CAN bus in digital information “packets” that contain information for various control functions. This fault will set if the ECM detects 100 packets lost within a one second time period. The MIL command is ON.

# DTC 1626- CAN Tx Failure SPN/FMI 639:12

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Clear system fault code<br>Does DTC1626 reset with the engine idling? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Check that the ECM power connections C020, C021 and C024 are clean and tight.<br>• Check that the ECM ground connections C014 and C023 are clean and tight.<br><br>Are the power and ground circuits Ok? | | Go to Step (4) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 4 | • Key OFF<br>• Disconnect ECM harness connector C001<br>• Using a DVOM check for continuity between ECM connector pin 13 and 14<br><br>Do you have continuity? | | Go to step (5) | Repair the open circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 5 | • Using a DVOM check for continuity between ECM pins 14 and 15<br><br>Do you have continuity between them? | | Repair the shorted circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (6) |
| 6 | • Using a DVOM check for continuity to engine ground on pins 14 and 16<br><br>Do have continuity to engine ground? | | Repair the shorted to ground circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (7) |
| 7 | • Using a DVOM check for continuity to battery positive on pins 14 and 16<br><br>Do have continuity them? | | Repair the shorted to ground circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (8) |
| 8 | • Replace the ECM<br><br>Is the replacement complete? | | Go to step (9) | _ |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 9 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1626 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1627-CAN Rx Failure SPN/FMI 639:12




## Conditions for Setting the DTC

- CAN Rx
- Check Condition- Engine running
- Fault Condition- CAN Rx error 100 packets lost within 1 second
- MIL- ON

## Circuit description

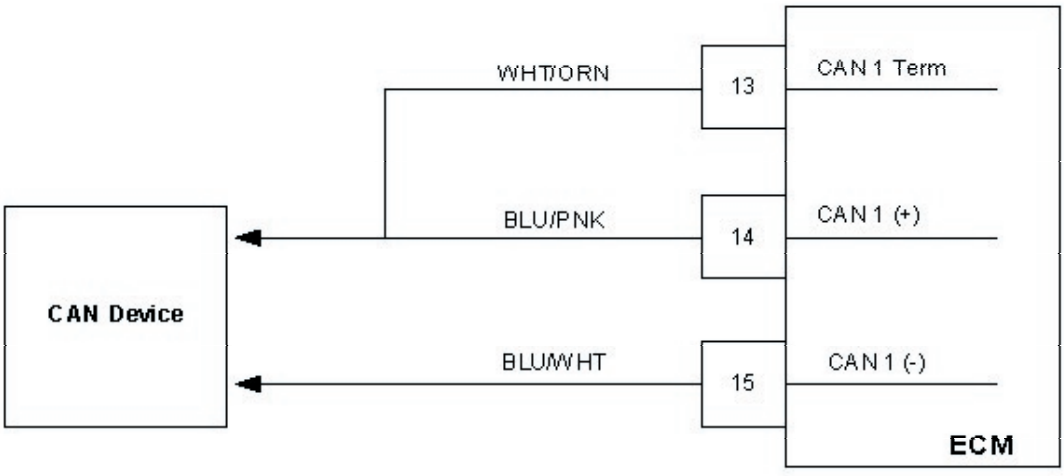
The CAN bus (controller area network) is used by the ECM to communicate with other digital devices used throughout the fuel system. Information is sent over the CAN bus in digital information “packets” that contain information for various control functions. This fault will set if the ECM detects 100 packets lost within a one second time period. The MIL command is ON.

# DTC 1627- CAN Rx Failure SPN/FMI 639:12

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Clear system fault code<br>Does DTC1627 reset with the engine idling? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Check that the ECM power connections C020, C021 and C024 are clean and tight.<br>• Check that the ECM ground connections C014 and C023 are clean and tight.<br><br>Are the power and ground circuits Ok? | | Go to Step (4) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 4 | • Key OFF<br>• Disconnect ECM harness connector C001<br>• Using a DVOM check for continuity between ECM connector pin 13 and 14<br><br>Do you have continuity? | | Go to step (5) | Repair the open circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 5 | • Using a DVOM check for continuity between ECM pins 14 and 15<br><br>Do you have continuity between them? | | Repair the shorted circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (6) |
| 6 | • Using a DVOM check for continuity to engine ground on pins 14 and 16<br><br>Do have continuity to engine ground? | | Repair the shorted to ground circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (7) |
| 7 | • Using a DVOM check for continuity to battery positive on pins 14 and 16<br><br>Do have continuity them? | | Repair the shorted to ground circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to step (8) |
| 8 | • Replace the ECM<br><br>Is the replacement complete? | | Go to step (9) | _ |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 9 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1627 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 1628-CAN Address Conflict SPN/FMI 639:13




## Conditions for Setting the DTC

- CAN Rx
- Check Condition- Engine running
- Fault Condition- 5 or more address conflict errors
- MIL- ON

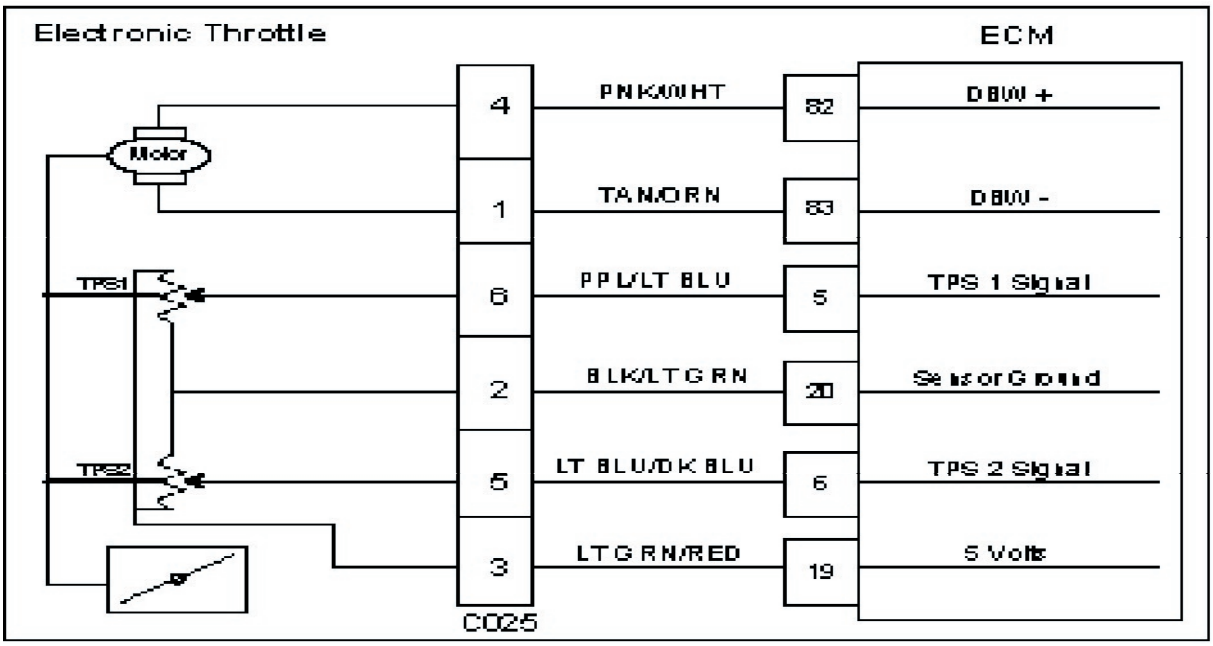
## Circuit description

The CAN bus (controller area network) is used by the ECM to communicate with other digital devices used throughout the fuel system. Information is sent over the CAN bus in digital information “packets” that contain information for various control functions. Individual devices are assigned network addresses. This fault will set if the ECM detects an address conflict, such as two devices with the same address. This is usually not due to an in field failure and may be the results of “add on” CAN devices

# DTC 1628- CAN Address Conflict SPN/FMI 639:13

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On, Engine Running<br>• DST (Diagnostic Scan Tool) connected in System Data Mode<br>• Clear system fault code<br>Does DTC1628 reset with the engine idling? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect one CAN device<br>• Clear DTC 1628<br>• Key ON (start engine if possible if not continue cranking for at least 3 seconds)<br>• Wait 5 seconds<br>• Does DTC 1628 re-set | | Repeat step 3 until all CAN devices have been disconnected one at a time | Contact the CAN device manufacturer for additional CAN address information<br>Go to Step (4) |
| 4 | Has the CAN device been replaced or address conflict resolved | | Go to step (5) | – |
| 5 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-1628 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 2111- Unable To Reach Lower TPS SPN/FMI 51:7




## Conditions for Setting the DTC

- Throttle Position Sensor
- Check Condition-Cranking or Running
- Fault Condition- Actual throttle position is 20% greater than the throttle command
- MIL-On during active fault
- Engine Shut Down

## Circuit Description

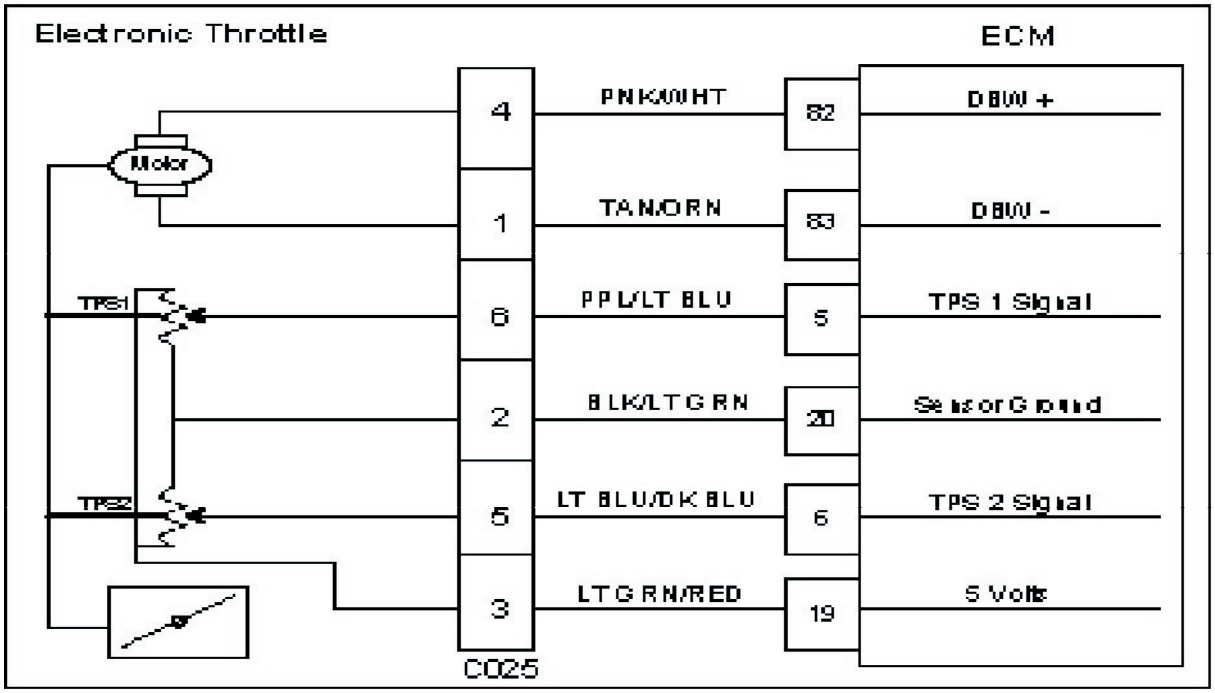
There are two Throttle Position Sensors located within the throttle which use variable resistors to determine signal voltage based on throttle plate position. TPS 1 will read low voltage when closed and TPS 2 will read high voltage when closed. The TPS 1 and TPS 2 percentages are calculated from these voltages. Although the voltages are different, the calculated values for the throttle position percentages should be very close to the same. The TPS values are used by the ECM to determine if the throttle is opening as commanded.
This fault will set if the actual throttle position is 20% greater than the throttle command. During this active fault the MIL command is ON and the engine will shut down.

# DTC 2111 Unable To Reach Lower TPS SPN/FMI 51:7

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine OFF<br>• DST (Diagnostic Scan Tool) connected in DBW (Drive By Wire) test mode<br>• Depress Foot Pedal until theThrottle Command is between 63%-68%<br>Is the TPS 1 voltage greater than 2.0 volts? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect electronic throttle connector C025<br>• Probe TPS 1 signal pin 6 with a test light connected to battery voltage<br>• Key ON<br>Does DST display TPS 1 voltage less than 0.2 volts | | Go to Step (6) | Go to Step (4) |
| 4 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Key ON<br>• Using a DVOM check for voltage between throttle connector TPS 1 signal pin 6 and engine ground<br>Do you have voltage? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (5) |
| 5 | • Replace ECM<br>Is the replacement complete? | | Go to Step (13) | - |
| 6 | • Probe sensor ground circuit at ECM connector C001 with a test light connected to battery voltage<br>Does the test light come on? | | Go to Step (9) | Go to Step (7) |
| 7 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Using a DVOM check for continuity between throttle connector signal ground pin 2 and ECM signal ground circuit pin 20<br>Do you have continuity between them? | | Go to Step (8) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 8 | • Replace ECM<br>• Is the replacement complete? | | Go to Step (13) | - |
| 9 | • Check throttle for foreign object in bore<br>Did you find a foreign object in the bore? | | Go to Step (10) | Go to Step (11) |
| 10 | • Remove foreign object<br>Is the removal complete? | | Go to Step (13) | - |
| 11 | • Inspect the throttle wire harness connector terminals for damage, corrosion or contamination<br>Did you find the problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (12) |
| 12 | • Replace throttle<br>Is the replacement complete? | | Go to Step (13) | - |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 13 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-2111 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 2112-Unable To Reach Higher TPS SPN/FMI 51:7




## Conditions for Setting the DTC

- Throttle Position Sensor
- Check Condition-Cranking or Running
- Fault Condition- Actual throttle position is 20% less than the throttle command
- MIL-On during active fault
- Engine Shut Down

## Circuit Description

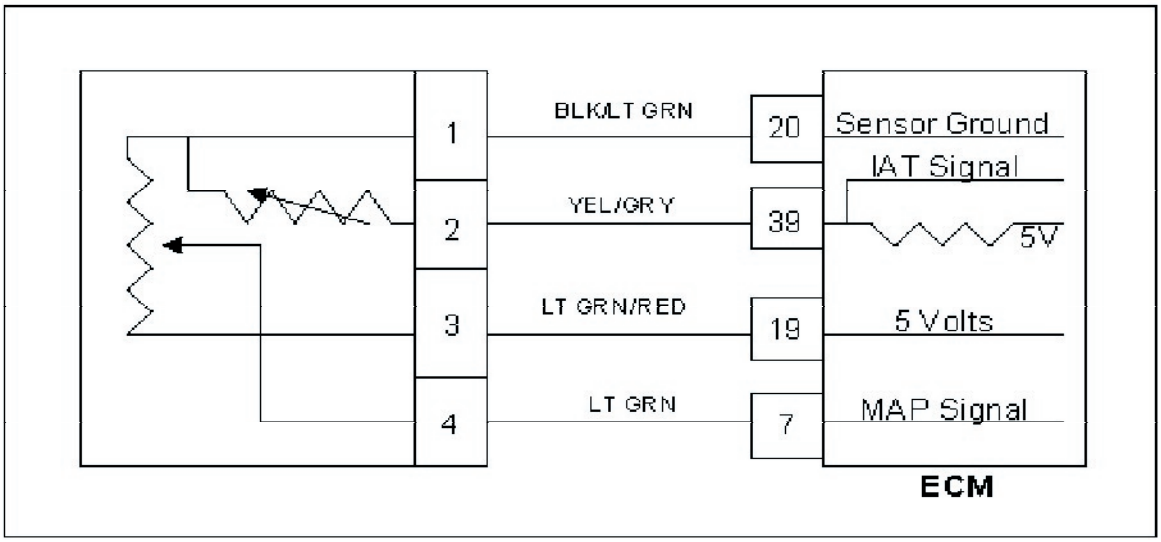
There are two Throttle Position Sensors located within the throttle which use variable resistors to determine signal voltage based on throttle plate position. TPS 1 will read low voltage when closed and TPS 2 will read high voltage when closed. The TPS 1 and TPS 2 percentages are calculated from these voltages. Although the voltages are different, the calculated values for the throttle position percentages should be very close to the same. The TPS values are used by the ECM to determine if the throttle is opening as commanded.
This fault will set if the actual throttle position is 20% less than the throttle command. During this active fault the MIL command is ON and the engine will shut down.

# DTC 2112- Throttle Unable to Open SPN/FMI 51:7

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key ON, Engine OFF<br>• DST (Diagnostic Scan Tool) connected in DBW (Drive By Wire) test mode<br>• Depress Foot Pedal until the Throttle Command is 63%-68%<br>Is the TPS voltage less than 2.0 volts? | | Go to Step (3) | Intermittent problem<br>Go to Intermittent section |
| 3 | • Key OFF<br>• Disconnect electronic throttle connector C025<br>• Probe TPS 1 signal circuit pin 6 with test light connected to battery voltage<br>• Key ON<br>Is TPS voltage 4.0 volts or greater? | | Go to Step (4) | Go to Step (8) |
| 4 | • Check throttle bore for foreign object<br>Did you find a problem? | | Go to Step (5) | Go to step (6) |
| 5 | • Remove the foreign object<br>Has the object been removed? | | Go to Step (11) | - |
| 6 | • Check electronic throttle connector terminals for damage corrosion or contamination<br>Did you find a problem? | | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (7) |
| 7 | • Replace throttle<br>Is the replacement complete? | | Go to Step (11) | - |
| 8 | • Key OFF<br>• Disconnect ECM wire harness connector C001<br>• Using a DVOM check for continuity between throttle connector TPS 1 signal pin 6 and ECM TPS 1 signal pin 5<br>Do you have continuity between them? | | Go to Step (9) | Repair the circuit as necessary. Refer to Wiring Repairs in Engine Electrical. |
| 9 | • Using a DVOM check for continuity between throttle connector TPS 1 signal pin 6 and engine ground<br>Do you have continuity between them? | | Repair the shorted to ground circuit as necessary. Refer to Wiring Repairs in Engine Electrical. | Go to Step (10) |
| 10 | • Replace ECM<br>Is the replacement complete? | | Go to step (11) | - |

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 11 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-2112 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System OK | Go to OBD System Check |

# DTC 2229-BP High Pressure SPN/FMI 108:0




## Conditions for Setting the DTC

- Barometric pressure check
- Check condition-engine off and key on
- Fault Condition-BP greater than 16 PSIA
- MIL-On for active fault and for 2 seconds after active fault
- Adaptive-disabled for the remainder of key cycle

## Circuit Description

The BP (Barometric Pressure) is estimated from the TMAP sensor. The barometric pressure value is used for fuel and airflow calculations. This fault sets in the event the BP value is out of the normal operating range.

# DTC 2229- BP High Pressure SPN/FMI 108:0

| Step | Action | Value(s) | Yes | No |
|---|---|---|---|---|
| 1 | Did you perform the On-Board (OBD) System Check? | - | Go to Step (2) | Go to OBD System Check Section |
| 2 | • Key On<br>• DST (Diagnostic Scan Tool) connected in<br>• System Data Mode<br><br>Does DST display MAP pressure of 16 PSIA or greater? | | Go to step (3) | Intermittent problem Go to Intermittent section |
| 3 | • Replace TMAP sensor.<br>Is the repair complete? | | Go to Step (4) | - |
| 4 | • Remove all test equipment except the DST.<br>• Connect any disconnected components, fuses, etc.<br>• Using the DST clear DTC information from the ECM.<br>• Turn the ignition OFF and wait 30 seconds.<br>• Start the engine and operate the vehicle to full operating temperature<br><br>• Observe the MIL<br>• Observe engine performance and driveability<br>• After operating the engine within the test parameters of DTC-2229 check for any stored codes.<br>Does the engine operate normally with no stored codes? | | System Ok | *Go to OBD System Check* |