| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| MAF Sensor - Range/Rationality | P0101 | Digital | 1135 Hz to 11000 Hz.<br>This DTC compares MAF sensor reading to a speed/density-type air flow calculation. It detects a skewed MAF sensor reading or certain air leaks. | Actual MAF reading - Calculated MAF Reading > Allowable delta | No MAP, TP, or other MAF sensor DTC's set<br>DTC P0401 test not active<br>Ignition voltage ≥ 10V and ≤ 16V<br>Fuel control in closed loop<br>Throttle angle ≤ 50 degrees<br><br>100ms Δ MAP ≤ 5 kPa<br>MAP ≥ 24 kPa<br>If ignition voltage ≤ 11.5V, actual MAF reading ≤ 50 gm/sec<br>Traction control not active<br>EGR test (P0401) not active | 25 test failures within a 50 test sample<br>100 ms loop<br>Continuous | Hot wire air meter | DTC Type A |
| MAF Sensor - Low Input | P0102 | Digital | 1135 Hz to 11000 Hz<br>This DTC detects a low MAF sensor reading. It will catch opens or shorts in MAF sensor wiring and certain MAF sensor failures. | MAF Sensor Frequency < 1135 Hz | Engine running<br>Ignition voltage ≥ 10.5V<br>Time since ign. 1 present ≥ 200 ms(4.6L)<br>Time since ign. 1 present ≥ 0 ms (4.0L) | 3 test failures within a 5 test sample<br>Reference interrupt loop<br>Continuous | Hot wire air meter | DTC Type A |
| MAF Sensor - High Input | P0103 | Digital | 1135 Hz to 11000 Hz<br>This DTC detects a high MAF sensor reading. It will catch certain MAF sensor failures. | MAF Sensor Frequency > 11000 Hz | Ignition voltage ≥ 10.5V<br>Throttle angle ≤ 50 degrees<br>Time since ign. 1 present > 200 ms(4.6L)<br>Time since ign. 1 present > 0 ms (4.0L) | 10 test failures within a 15 test sample<br>Reference interrupt loop<br>Continuous | Hot wire air meter | DTC Type A |

| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| MAP Sensor Range/Rationality | P0106 | Analog | .3V to 5.0V<br>A change in MAP must be preceded by a significant change in throttle angle or engine speed. If not, a faulty MAP condition exists. | Raw MAP Δ > 10 kPa within 12.5 ms. | No TP sensor DTC's set<br>Engine speed ≥ 500 RPM<br>All of the following remain true for 1 second:<br>Engine speed varies < 4 RPM<br>Throttle angle varies < 1 degree<br>EGR fuel compensation varies < 4 %<br>A/C clutch does not transition<br>Engine over-temperature protection not active<br>Traction Control not active | 8 test failures within a 10 test sample<br>50 ms loop<br>Continuous | Pressure Differential Sensor | DTC Type A |
| MAP Sensor Circuit - Low Input | P0107 | Analog | .1V to 5.0V<br>This DTC detects a Continuous short to low or open in either the signal circuit or the MAP sensor. | Raw MAP < .08 Volts | No TP Sensor DTC's set<br>Engine speed ≤ 700 RPM and throttle angle ≤ 18 degrees<br>or<br>engine speed ≤ 1800 and throttle angle ≥ 13 degrees | 3 test failures within a 5 test sample<br>50 ms loop<br>Continuous | Pressure Differential Sensor | DTC Type A |
| MAP Sensor Circuit - High Input | P0108 | Analog | .1V to 5.0V<br>This DTC detects a Continuous short to high in either the signal circuit or the MAP sensor. | Raw MAP > 5.06 Volts | No TP Sensor DTC's set<br>Engine running<br>Throttle angle ≤ 20.5 degrees | 3 test failures within a 5 test sample<br>50 ms loop<br>Continuous | Pressure Differential Sensor | DTC Type A |
| IAT Sensor Circuit - Low Input | P0112 | Analog | .1V to 5.0V<br>This DTC detects a Continuous short to ground in the IAT signal circuit or the IAT sensor. | Raw IAT < .08V | No ECT Sensor DTC's set<br>ECT ≤ 110° C<br>Vehicle speed ≥ 15 MPH | 3 test failures within a 5 test sample<br>250 ms loop<br>Continuous | Thermistor | DTC Type A |

| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| IAT Sensor Circuit - High Input | P0113 | Analog | .1V to 5.0V<br>This DTC detects a Continuous open or short to high in the IAT signal circuit or the IAT sensor. | Raw IAT > 5.02V | No MAF, ECT, or VS Sensor DTC's set<br>Engine speed ≥ 500 RPM for 20 seconds<br>Vehicle speed > 7 MPH for 5 seconds<br><br>Vehicle speed < 50 MPH<br>Air flow < 60 g/sec<br>ECT > 0° C<br>or<br>ECT - IAT ≥ 27° C | 3 test failures within a 5 test sample<br>250 ms loop<br>Continuous | Thermistor | DTC Type A |
| Engine Coolant Temp. Sensor - Low Input | P0117 | Analog | .1V to 5.0V<br>This DTC detects a Continuous short to ground in the ECT signal circuit or the ECT sensor. | Raw ECT < .08V | No IAT sensor DTC's set and IAT ≤ 100° C<br>or<br>No TP sensor DTC's set and Engine running for 210 seconds with throttle angle ≥ 5 degrees and ≤ 35 degrees | 3 test failures within a 5 test sample<br>1 second loop<br>Continuous | Thermistor | DTC Type A |
| Engine Coolant Temp. Sensor - Low Input | P0118 | Analog | .1V to 5.0V<br>This DTC detects a Continuous open or short to high in the ECT signal circuit or the ECT sensor. | Raw ECT > 5.04V | No IAT sensor DTC's set and IAT ≥ -5° C<br>or<br>No TP sensor DTC's set and Engine running for 210 seconds with throttle angle ≥ 7 degrees | 3 test failures within a 5 test sample<br>1 second loop<br>Continuous | Thermistor | DTC Type A |
| Throttle Position Sensor Circuit - Range/Rationality | P0121 | Analog | .5V to 4.9V<br>The DTC detects a skewed or stuck TP sensor. | Throttle position > predicted throttle position based on engine speed. | No TP sensor DTC's set<br>100 ms TP sensor Δ ≤ .6 degrees<br>Engine speed ≥ 400 RPM<br>MAP ≤ 60 kPa<br>Traction control not active<br>All injectors enabled<br>Engine over-temperature protection not active | 7 test failures within a 10 test sample<br>100 ms loop<br>Continuous | Potentiometer | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| Throttle Position Sensor Circuit - Low Input | P0122 | Analog | .5V to 4.9V<br>This DTC detects a Continuous short to low or open in either the signal circuit or the TP sensor. | Raw TP sensor signal < .1V | None | 3 test failures within a 5 test sample<br>100 ms loop<br>Continuous | Potentiometer | DTC Type A |
| Throttle Position Sensor Circuit - High Input | P0123 | Analog | .5V to 4.9V<br>This DTC detects a Continuous short to high in either the signal circuit or the TP sensor. | Raw TP sensor signal > 4.96V | Engine speed ≤ 3000 RPM | 3 test failures within a 5 test sample<br>100 ms loop<br>Continuous | Potentiometer | DTC Type A |
| Minimum coolant temperature to allow closed loop operation not achieved | P0125 | Analog | .1V to 5.0V<br>The DTC detects if a stabilized minimum closed loop is reached and maintained after engine start. | Minimum stabilized ECT < 5° C. | No ECT or IAT sensor DTC's set<br>Engine running<br>Vehicle speed ≥ 10 MPH, cont.<br>IAT > 0° C | 255 seconds<br>1 second loop<br>Continuous | Thermistor | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| O2S Circuit - Low Voltage ( Bank 1, Sensor 1) | P0131 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor or its circuit is shorted to a low voltage by checking for a lean condition during steady throttle conditions. | O2 sensor voltage ≤ .249 volts | No MAP sensor DTC's.<br>No ECT sensor DTC's.<br>No TP sensor DTC's.<br>No MAF sensor DTC's.<br>No Bank 1, Sensor 1 High Voltage or No Activity Detected Failures<br>Bank 2, Sensor 1 low voltage failure not pending.<br><br>Closed loop fuel control O2 ready test passed for Bank 1, Sensor 1.<br>Bank 1 short term fuel trim operating.<br>ECT ≥ 72.5 deg C<br>2.2 deg ≤ Throttle position ≤ 20.2 deg<br>Engine speed ≥ 800 rpm<br>MAP > 32 kPa<br>9 ≤ Ignition voltage ≤ 16 volts<br><br>Above conditions met for 3 seconds. | 400 test failures in a 500 test sample (4.6L)<br><br>450 test failures in a 500 test sample (4.0L)<br><br>100 ms loop Continuous | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| O2S Circuit - High Voltage ( Bank 1, Sensor 1) | P0132 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor or its circuit is shorted to a high voltage by checking for a rich condition during steady throttle conditions. | O2 sensor voltage ≥ .654 volts | No MAP sensor DTC's.<br>No ECT sensor DTC's.<br>No TP sensor DTC's.<br>No MAF sensor DTC's.<br>No Bank 1, Sensor 1 Low Voltage or No Activity Detected Failures<br>Bank 2, Sensor 1 high voltage failure not pending.<br><br>Closed loop fuel control O2 ready test passed for Bank 1, Sensor 1.<br><br>Bank 1 short term fuel trim operating.<br>ECT ≥ 72.5 deg C<br>2.2 deg ≤ Throttle position ≤ 20.2 deg<br>Engine speed ≥ 800 rpm<br>MAP > 32 kPa<br>9 ≤ Ignition voltage ≤ 16 volts<br><br>Above conditions met for 3 seconds. | 450 test failures in a 500 test sample<br><br>100 ms loop<br>Continuous | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| O2S Circuit - Slow Response ( Bank 1, Sensor 1) | P0133 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor is functioning properly by checking its response time. | O2 sensor average transition time:<br>L/R > 119 msec<br>R/L > 119 msec | No MAF DTC's.<br>No TP sensor DTC's.<br>No ECT DTC's.<br>Bank 1*Sensor 1 Voltage DTC's not set or failure pending not set.<br>DTC P0135 (O2 heater) not set.<br>DTC P1133 (Too Few Switches) not set.<br>Closed loop fuel control O2 ready test passed for Bank 1, Sensor 1<br>Bank 1 short term fuel trim operating.<br>Throttle postion ≥ 2.2 deg<br>A/F = 14.7<br>Engine run time > 202 seconds<br>ECT ≥ 75 deg C<br>9 ≤ Ignition volts ≤ 16<br>1000 ≤ Engine speed ≤ 2750 rpm (L37/3.71 and L47/3.71)<br>1000 < Engine speed < 2500 rpm (LD8/3.11 and L47/3.48)<br>15≤ Engine Airflow≤ 35grams/sec<br>Above conditions met for 1.2 seconds | 90 seconds<br>Once per key cycle<br>12.5 ms loop continuous until test completed | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |
| O2S Circuit - No Activity Detected ( Bank 1, Sensor 1) | P0134 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor or its circuit has developed an open circuit. | .303 volt < O2 sensor voltage < .601 volt | No ECT sensor DTC's.<br>No TP sensor DTC's.<br>ECT ≥ 72.5 deg C<br>1 deg ≤ Throttle position ≤ 81.6 deg<br>Engine speed ≥ 800 rpm.<br>Engine run time ≥ 99 seconds<br>9 ≤ Ignition voltage ≤ 16 volts | 500 test failures in a 640 test sample (4.6L)<br>634 test failures in a 640 test sample (4.0L)<br>100 ms loop Continuous | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| O2S Heater Circuit Malfunction ( Bank 1, Sensor 1) | P0135 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor heater is functioning properly by monitoring the amount of time necessary for the O2 sensor to become active after start-up. | The elapsed time to obtain +/- .151 volts from the mean O2 bias voltage.<br><br>*Time based on table:<br>Time vs Average engine airflow during warmup period. Offset to maximum time based on startup coolant temperature. | No ECT DTC's.<br>No MAF sensor DTC's.<br>DTC P0134 (no activity) not set.<br>.351 ≤ Mean O2 bias voltage ≤ .547 volts<br>Average engine airflow during warmup period ≤ 25 grams/sec<br>Average ignition voltage during warmup period ≥ 11 volts<br><br>Cold start determined:<br><br>Based on last engine running ECT - startup ECT ≥ delta temperature (table lookup based on startup coolant temperature | First 255 seconds of engine running.<br><br>Test run only on cold starts. | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |

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|---|---|---|---|---|---|---|---|---|
| O2S Circuit - Low Voltage ( Bank 1, Sensor 2) | P0137 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor or its circuit is shorted to a low voltage by checking for a lean condition during steady throttle conditions. | O2 sensor voltage ≤ .249 volts | No MAP sensor DTC's.<br>No ECT sensor DTC's.<br>No TP sensor DTC's.<br>No MAF sensor DTC's.<br>No Misfire DTC.<br>Bank 1, Sensor 1 or Bank 2 Sensor 1 DTC's not set or failure pending not set.<br><br>Closed loop fuel control O2 ready test passed for Bank 1 Sensor 1, Bank 2 Sensor 1, and Bank 1 Sensor 2.<br><br>Bank 1 and Bank 2 short term fuel trims operating.<br>ECT ≥ 72.5 deg C<br>2.2 deg ≤ Throttle position ≤ 20.2 deg<br>Engine speed ≥ 800 rpm<br>MAP > 32 kPa<br>9 ≤ Ignition voltage ≤ 16 volts<br><br>Above conditions met for 3 seconds. | 400 test failures in a 500 test sample (4.6L)<br><br>450 test failures in a 500 test sample (4.0L)<br><br>100 ms loop Continuous | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |

| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| O2S Circuit - High Voltage ( Bank 1, Sensor 2) | P0138 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor or its circuit is shorted to a high voltage by checking for a rich condition during steady throttle conditions. | O2 sensor voltage ≥ .654 volts | No MAP sensor DTC's.<br>No ECT sensor DTC's.<br>No TP sensor DTC's.<br>No MAF sensor DTC's.<br>No Misfire DTC.<br>Bank 1, Sensor 1 or Bank 2 Sensor 1 DTC's not set or failure pending not set.<br>Closed loop fuel control O2 ready test passed for Bank 1 Sensor 1, Bank 2 Sensor 1, and Bank 1 Sensor 2.<br>Bank 1 and Bank 2 short term fuel trims operating.<br>ECT ≥ 72.5 deg C<br>2.2 deg ≤ Throttle position ≤ 20.2 deg<br>Engine speed ≥ 800 rpm<br>MAP > 32 kPa<br>9 ≤ Ignition voltage ≤ 16 volts<br>Above conditions met for 3 seconds. | 450 test failures in a 500 test sample<br>100 ms loop<br>Continuous | Exhaust Oxygen Sensor PCM Interface Circuit | DTC_Type B |

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|---|---|---|---|---|---|---|---|---|
| O2S Circuit - Slow Response ( Bank 1, Sensor 2) | P0139 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor is functioning properly by checking its response time. | O2 sensor average transition time:<br>L/R > 150 msec<br>R/L > 150 msec | No MAF DTC's.<br>No TP sensor DTC's.<br>No ECT DTC's.<br>Bank 1*Sensor 1 or Bank 2*Sensor 1 DTC's not set or failure pending not set.<br>No Fuel Trim DTC's set.<br>No Misfire DTC set.<br>DTC P0141 (O2 heater) not set.<br>DTC P1139 (Too Few Switches) not set.<br>Closed loop fuel control O2 ready test passed for Bank 1, Sensor 1 and Bank 2, Sensor 1.<br>Bank 1 and 2 short term fuel trim operating.<br>Throttle postion ≥ 2.2 deg<br>A/F = 14.7<br>Engine run time > 202 seconds<br>ECT ≥ 75 deg C<br>9 ≤ Ign. volts ≤ 16<br>1000 ≤ Engine speed ≤ 2750 rpm (L37/3.71, L47/3.71)<br>1000 < Engine speed < 2500 rpm (LD8/3.11, L47/3.48)<br>18 < Engine airflow < 35 gram/sec<br>Above conditions met for 1.5 seconds | 90 seconds<br>Once per key cycle<br>12.5 ms loop continuous until test is completed | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |

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|---|---|---|---|---|---|---|---|---|
| O2S Circuit - No Activity Detected ( Bank 1, Sensor 2) | P0140 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor or its circuit has developed an open circuit. | .303 volt < O2 sensor voltage < .601 volt | No ECT sensor DTC's.<br>No TP sensor DTC's.<br>ECT ≥ 72.5 deg C<br>1 deg ≤ Throttle position ≤ 81.6 deg<br>Engine speed ≥ 800 rpm.<br>Engine run time ≥ 255 seconds<br>9 ≤ Ignition voltage ≤ 16 volts | 420 test failures in a 640 test sample.<br><br>Continuous | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |
| O2S Heater Circuit Malfunction ( Bank 1, Sensor 2) | P0141 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor heater is functioning properly by monitoring the amount of time necessary for the O2 sensor to become active after start-up. | The elapsed time to obtain +/- .151 volts from the mean O2 bias voltage.<br><br>*Time based on table:<br>Time vs Average engine airflow during warmup period. Offset to maximum time based on startup coolant temperature. | No ECT DTC's.<br>No MAF sensor DTC's.<br>DTC P0140 (no activity) not set.<br>.351 ≤ Mean O2 bias voltage ≤ .547 volts<br>Average engine airflow during warmup period ≤ 30 grams/sec<br>Average ignition voltage during warmup period ≥ 11 volts<br><br>Cold start determined:<br><br>Based on last engine running ECT - startup ECT ≥ delta temperature (table lookup based on startup coolant temperature | First 255 seconds of engine running.<br><br>Test run only on cold starts. | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |

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|---|---|---|---|---|---|---|---|---|
| O2S Circuit - Low Voltage ( Bank 1, Sensor 3) | P0143 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor or its circuit is shorted to a low voltage by checking for a lean condition during steady throttle conditions. | O2 sensor voltage ≤ .049 volts | No MAP sensor DTC's.<br>No ECT sensor DTC's.<br>No TP sensor DTC's.<br>No MAF sensor DTC's.<br>No Misfire DTC.<br>No Bank 1, Sensor 1 or Bank 2 Sensor 1 DTC's.<br>Closed loop fuel control O2 ready test passed for Bank 1 Sensor 1, Bank 2 Sensor 1, and Bank 1 Sensor 3.<br><br>Closed loop is enabled.<br>Bank 1 and Bank 2 short term fuel trims operating.<br>ECT ≥ 75.5 deg C<br>2.2 deg ≤ Throttle position ≤ 20.2 deg<br>Engine speed ≥ 800 rpm<br>MAP > 32 kPa<br>9 ≤ ignition voltage ≤ 16 volts<br>Above conditions met for 5 seconds. | 1000 test failures in a 1200 test sample (4.6L)<br><br>1188 test failures in a 1200 test sample (4.0L)<br><br>100 ms loop<br>Continuous | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| O2S Circuit - High Voltage ( Bank 1, Sensor 3) | P0144 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor or its circuit is shorted to a high voltage by checking for a rich condition during steady throttle conditions. | O2 sensor voltage ≥ .952 volts | No MAP sensor DTC's.<br>No ECT sensor DTC's.<br>No TP sensor DTC's.<br>No MAF sensor DTC's.<br>No Misfire DTC.<br>No Bank 1, Sensor 1 or Bank 2 Sensor 1 DTC's.<br>Closed loop fuel control O2 ready test passed for Bank 1 Sensor 1, Bank 2 Sensor 1, and Bank 1 Sensor 3.<br><br>Bank 1 and Bank 2 short term fuel trims operating.<br>ECT ≥ 75.5 deg C<br>2.2 deg ≤ Throttle position ≤ 20.2 deg<br>Engine speed ≥ 800 rpm<br>MAP > 32 kPa<br>9 ≤ Ignition voltage ≤ 16 volts<br>Above conditions met for 5 seconds. | 1000 test failures in a 1200 test sample (4.6L)<br><br>1188 test failures in a 1200 test sample (4.0L)<br><br>100 ms loop<br>Continuous | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| O2S Circuit - No Activity Detected ( Bank 1, Sensor 3) | P0146 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor or its circuit has developed an open circuit. | .360 volt < O2 sensor voltage < .538 volt | No ECT sensor DTC's.<br>No TP sensor DTC's.<br>ECT ≥ 75 deg C<br>2.2 deg ≤ Throttle position ≤ 81.6 deg<br>800 ≤ Engine speed ≤ 3000 rpm.<br>Engine run time ≥ 255 seconds<br>9 ≤ Ignition voltage ≤ 16 volts | 2500 test failures in a 3000 test sample (4.6)<br><br>2800 test failures in a 3000 test sample (4.0L)<br><br>100 ms loop<br>Continuous | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |
| O2S Heater Circuit Malfunction ( Bank 1, Sensor 3) | P0147 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor heater is functioning properly by monitoring the amount of time necessary for the O2 sensor to become active after start-up. | The elapsed time to obtain +/- .151 volts from the mean O2 bias voltage.<br><br>*Time based on table:<br>Time vs Average engine airflow during warmup period. Offset to maximum time based on startup coolant temperature. | No ECT DTC's.<br>No MAF sensor DTC's.<br>DTC P0146 (no activity) not set.<br>.351 ≤ Mean O2 bias voltage ≤.547 volts<br>Average engine airflow during warmup period ≤ 32 grams/sec<br>Average ignition voltage during warmup period ≥ 11 volts<br><br>Cold start determined:<br><br>Based on last engine running ECT - startup ECT ≥ delta temperature (table lookup based on startup coolant temperature | First 255 seconds of engine running.<br><br>Test run only on cold starts.<br><br>25 ms loop continuous until test completed | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |

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|---|---|---|---|---|---|---|---|---|
| O2S Circuit - Low Voltage ( Bank 2, Sensor 1) | P0151 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor or its circuit is shorted to a low voltage by checking for a lean condition during steady throttle conditions. | O2 sensor voltage ≤ .249 volts | No MAP sensor DTC's.<br>No ECT sensor DTC's.<br>No TP sensor DTC's.<br>No MAF sensor DTC's.<br>No Bank 2, Sensor 1 High Voltage or No Activity Detected Failures<br>Bank 1, Sensor 1 low voltage failure not pending.<br><br>Closed loop fuel control O2 ready test passed for Bank 2, Sensor 1.<br>Bank 1 short term fuel trim operating.<br>ECT ≥ 72.5 deg C<br>2.2 deg ≤ Throttle position ≤ 20.2 deg<br>Engine speed ≥ 800 rpm<br>MAP > 32 kPa<br>9 ≤ Ignition voltage ≤ 16 volts<br>Above conditions met for 3 seconds. | 400 test failures in a 500 test sample (4.6L)<br><br>450 test failures in a 500 test sample (4.0L)<br><br>100 ms loop<br>Continuous | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type A |

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| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| O2S Circuit - High Voltage ( Bank 2, Sensor 1) | P0152 | Analog | 0 V to 1.1V<br>The DTC determines if the O2 sensor or its circuit is shorted to a high voltage by checking for a rich condition during steady throttle conditions. | O2 sensor voltage ≥ .654 volts | No MAP sensor DTC's.<br>No ECT sensor DTC's.<br>No TP sensor DTC's.<br>No MAF sensor DTC's.<br>No Bank 2, Sensor 1 Low Voltage or No Activity Detected Failures<br>Bank 1, Sensor 1 high voltage failure not pending.<br>Closed loop fuel control O2 ready test passed for Bank 2, Sensor 1<br>Bank 1 short term fuel trim operating.<br>ECT ≥ 72.5 deg C<br>2.2 deg ≤ Throttle position ≤ 20.2 deg<br>Engine speed ≥ 800 rpm<br>MAP > 32 kPa<br>9 ≤ Ignition voltage ≤ 16 volts<br>Above conditions met for 3 seconds. | 450 test failures in a 500 test sample<br>100 ms loop<br>Continuous | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type A |

| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| O2S Circuit - Slow Response ( Bank 2, Sensor 1) | P0153 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor is functioning properly by checking its response time. | O2 sensor average transition time:<br>L/R > 119 msec<br>R/L > 119 msec | No MAF DTC's.<br>No TP sensor DTC's.<br>No ECT DTC's.<br>Bank 2 Sensor 1 Voltage DTC's not set or failure pending not set.<br>DTC P0155 (O2 heater) not set.<br>DTC P1153 (Too Few Switches) not set.<br>Closed loop fuel control O2 ready test passed for Bank 2, Sensor 1<br>Bank 2 short term fuel trim operating.<br>Throttle postion ≥ 2.2 deg<br>A/F = 14.7<br>Engine run time > 202 seconds<br>ECT ≥ 75 deg C<br>9 ≤ Ign. volts ≤ 16<br>1000 ≤ Engine speed ≤ 2750 rpm (L37/3.71, L47/3.71)<br>1000 < Engine speed < 2500 rpm (LD8/3.11, L47/3.48)<br>15< Engine airflow <35 grams/sec<br>Above conditions met for 1.2 seconds | 90 seconds<br>Once per key cycle<br>12.5 ms loop continuous until test completed | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |
| O2S Circuit - No Activity Detected ( Bank 2, Sensor 1) | P0154 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor or its circuit has developed an open circuit. | .303 volt < O2 sensor voltage < .601 volt | No ECT sensor DTC's.<br>No TP sensor DTC's.<br>ECT ≥ 72.5 deg C<br>1 deg ≤ Throttle position ≤ 81.6 deg<br>Engine speed ≥ 800 rpm.<br>Engine run time ≥ 99 seconds<br>9 ≤ Ignition voltage ≤ 16 volts | 500 test failures in a 640 test sample (4.6L)<br>634 test failures in a 640 test sample (4.0L)<br>100 ms loop Continuous | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type A |

# 1996 4.6L (LD8, L37) E, K-Car Engine Diagnostic Parameters

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| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| O2S Heater Circuit Malfunction ( Bank 2, Sensor 1) | P0155 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor heater is functioning properly by monitoring the amount of time necessary for the O2 sensor to become active after start-up. | The elapsed time to obtain +/- .151 volts from the mean O2 bias voltage.<br><br>*Time based on table:<br>Time vs Average engine airflow during warmup period. Offset to maximum time based on startup coolant temperature. | No ECT DTC's.<br>No MAF sensor DTC's.<br>DTC P0154 (no activity) not set.<br>.351 ≤ Mean O2 bias voltage ≤ .547 volts<br>Average engine airflow during warmup period ≤ 28 grams/sec<br>Average ignition voltage during warmup period ≥ 11 volts<br><br>Cold start determined:<br><br>Based on last engine running ECT - startup ECT ≥ delta temperature (table lookup based on startup coolant temperature | First 255 seconds of engine running.<br><br>Test run only on cold starts. | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |
| System Too Lean - Bank 1 | P0171 | Software | This DTC determines if the engine system is operating in a lean condition | The average of short term fuel trim samples >= 1.04 and the average of long term adaptive learn fuel trim samples >= 1.12. | MAF Rationality DTC not set.<br>No MAP DTC's set.<br>No TP sensor DTC's set.<br>No O2 sensor DTC's set.<br>No injector fault DTC's set.<br>No misfire DTC set.<br>No Knock sensor DTC's set.<br>No EGR flow DTC's set.<br>No Idle or IAC DTC's set.<br>No CAM sensor DTC set.<br><br>BARO > 70.5 Kpa.<br>84 deg. C < ECT < 120 deg. C.<br>3 g/sec < airflow < 200 g/sec.<br>27 kpa < MAP < 103.2<br>0 deg C < IAT < 151 deg C.<br>400 < engine RPM < 3000 RPM.<br>TP sensor < 19.8 deg.<br>Vehicle speed < 70 mph<br>EGR diag. steady state flow test not in stab. period | lean counter >= 11<br><br>frequency:<br>250 msec cont. | Short term fuel trim, long term adaptive learn multiplier, O2 sensor. | DTC Type B |

# 1996 4.6L (LD8, L37) E, K-Car Engine Diagnostic Parameters

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| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| System Too Rich - Bank 1 | P0172 | Software | This DTC determines if the engine system is operating in a rich condition | The average of short term fuel trim samples <= 1.008 and the average of long term adaptive learn fuel trim samples <= 0.85 | MAF Rationality DTC not set.<br>No MAP DTC's set.<br>No TP sensor DTC's set.<br>No O2 sensor DTC's set.<br>No injector fault DTC's set.<br>No misfire DTC set.<br>No Knock sensor DTC's set.<br>No EGR flow DTC's set.<br>No Idle or IAC DTC's set.<br>No CAM sensor DTC set.<br><br>BARO > 70.5 Kpa.<br>84 deg. C < ECT < 120 deg. C.<br>3 g/sec < airflow < 200 g/sec.<br>27 kpa < MAP < 103.2<br>0 deg C < IAT < 151 deg C.<br>400 < engine RPM < 3000 RPM.<br>TP sensor < 19.6 deg..<br>Vehicle speed < 70 mph<br>EGR diag: steady state flow test not in stab. period | rich counter >= 6<br><br>frequency:<br>250 msec cont. | Short term fuel trim, long term adaptive learn multiplier, O2 sensor. | DTC Type B |

| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| System Too Lean - Bank 2 | P0174 | Software | This DTC determines if the engine system is operating in a lean condition | The average of short term fuel trim samples >= 1.04 and the average of long term adaptive learn fuel trim samples >= 1.12 | MAF Rationality DTC not set.<br>No MAP DTC's set.<br>No TP sensor DTC's set.<br>No O2 sensor DTC's set.<br>No injector fault DTC's set.<br>No misfire DTC set.<br>No Knock sensor DTC's set.<br>No EGR flow DTC's set.<br>No Idle or IAC DTC's set.<br>No CAM sensor DTC set.<br><br>BARO > 70.5 Kpa.<br>84 deg. C < ECT < 120 deg. C.<br>3 g/sec < airflow < 200 g/sec.<br>27 kpa < MAP < 103.2<br>0 deg C < IAT < 151 deg C.<br>400 < engine RPM < 3000 RPM.<br>TP sensor < 19.8 deg..<br>Vehicle speed < 70 mph<br>EGR diag. steady state flow test not in stab. period | lean counter >= 11<br><br>frequency:<br>250 msec cont. | Short term fuel trim, long term adaptive learn multiplier, O2 sensor. | DTC Type B |

# 1996 4.6L (LD8, L37) E, K-Car Engine Diagnostic Parameters

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| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| System Too Rich - Bank 2 | P0175 | Software | This DTC determines if the engine system is operating in a rich condition | The average of short term fuel trim samples <= 1.008 and the average of long term adaptive learn fuel trim samples <= 0.85 | MAF Rationality DTC not set.<br>No MAP DTC's set.<br>No TP sensor DTC's set.<br>No O2 sensor DTC's set.<br>No injector fault DTC's set.<br>No misfire DTC set.<br>No Knock sensor DTC's set.<br>No EGR flow DTC's set.<br>No Idle or IAC DTC's set.<br>No CAM sensor DTC set.<br><br>BARO > 70.5 Kpa.<br>84 deg. C < ECT < 120 deg. C.<br>3 g/sec < airflow < 200 g/sec.<br>27 kpa < MAP < 103.2<br>0 deg C < IAT < 151 deg C.<br>400 < engine RPM < 3000 RPM.<br>TP sensor < 19.6 deg.<br>Vehicle speed < 70 mph<br>EGR diag. steady state flow test not in stab. period | rich counter >= 6<br><br>frequency:<br>250 msec cont. | Short term fuel trim, long term adaptive learn multiplier, O2 sensor. | DTC Type B |

| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| Injector Circuit Malfunctions | P0201 - P0208 | Digital | These DTC's detect a short or open on injector A-H drive circuits by monitoring the fault feedback lines from the injector driver. | Injector driver feedback indicating a fault on an injector circuit. | Ignition voltage ≥ 10V and ≤ 16V<br>ALDL mode $AE not active | 5 failures<br>250 ms loop<br>Continuous | Internal feedback | DTC Type A |
| Random Misfire Detected<br>Cylinder 1 Misfire Detected<br>Cylinder 2 Misfire Detected<br>Cylinder 3 Misfire Detected<br>Cylinder 4 Misfire Detected<br>Cylinder 5 Misfire Detected<br>Cylinder 6 Misfire Detected<br>Cylinder 7 Misfire Detected<br>Cylinder 8 Misfire Detected | P0300<br>P0301<br>P0302<br>P0303<br>P0304<br>P0305<br>P0306<br>P0307<br>P0308 | Digital | These DTCs will determine if a random misfire or a cylinder specific misfire is occurring by monitoring crankshaft velocity. | Deceleration Index vs Engine Speed vs Engine load and Camshaft Position | No TP sensor DTC's<br>No MAF sensor DTC's<br>No ECT DTCs<br>ECT > -6.75 C but < 131 C<br>Engine Speed > 400 RPM but < 2400 RPM (see chart)<br>System Voltage > 9 volts but < 16 volts<br>+throtte position delta < 1 deg/12.5 ms or <1.28 deg/100 ms<br><br>"-throttle position delta < 1 deg/12.5 ms or < 1.28 deg/100 ms<br>Rough road table value based on ABS wheel sensor input vs. vehicle speed. | 5 failed 200 revolution blocks out of 16 emission level.<br><br>1 failed 200 revolution block catalyst damaging level.<br><br>frequency:100 ms cont. | Crankshaft position sensor and target wheel and camshaft position sensor | DTC Type B - Emission<br><br>DTC Type A - Catalyst Damaging |
| Knock Sensor Circuit Malfunction | P0325 | Analog | 0V - 5V<br>This diagnostic will detect problems with the range of the knock sensor. | Knock sensor indicating knock activity for > 100 ms | Ignition 1 voltage > 11 volts<br>Power-up timer > 5 seconds | Conditions are met for 3 seconds<br>250 ms loop<br>Continuous | Piezoelectric Knock Sensor | DTC Type B |

| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| Knock Sensor Circuit Range | P0327 | Analog | 0V - 5V<br>This DTC will detect an open or short in the knock sensor circuit. | Knock sensor background noise - learned minimum noise < .5V | Ignition 1 voltage feed present<br>ECT ≥ 40° C<br>Battery voltage ≥ 11V<br>Throttle angle ≥ 5 degrees<br>Engine speed ≥ 3000 RPM | Conditions are met for 1 second<br>250 ms loop<br>Continuous | Piezoelectric Knock Sensor | DTC Type B |
| No CAM Reference Signal | P0340 | Digital | This DTC determines if a CAM reference signal is not being received when 4X reference pulses are being received | No CAM signal | 4X reference pulses being received<br>Engine speed < 1600 RPM | Failure present for 5.25 seconds.<br><br>Frequency:<br>250 ms cont. | Software | DTC Type A |
| Too Many 24X reference pulses | P0371 | Digital | This DTC determines if too many 24X reference pulses are being received every CAM pulse. | 8 4X reference pulses received between CAM pulses and number of 24X reference pulses > 49 | Engine Speed > 496 RPM and < 3500 RPM.<br>CAM pulses being received.<br>Number of CAM edges since key-on >=7 | Test failed 4 times out of 10.<br><br>Frequency:<br>250 ms cont. | Software | DTC Type A |
| Too Few 24X reference pulses | P0372 | Digital | This DTC determines if too few 24X reference pulses are being received every CAM pulse. | 8 4X reference pulses received between CAM pulses and number of 24X reference pulses < 47 | Engine Speed > 496 RPM and < 3500 RPM.<br>CAM pulses being received.<br>Number of CAM edges since key-on >=7 | Test failed 4 times out of 10.<br><br>Frequency:<br>250 ms cont. | Software | DTC Type A |

| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| Exhaust Gas Recirculation - Insufficient Flow Detected | P0401 | Analog | This diagnostic determines if there is a reduction in EGR flow. | Decel test:<br>With EGR valve open, the peak increase in MAP is monitored over a time of 0.8 sec.. This value is compared with a threshold from an engine speed vs BARO table and the difference computed.<br><br>The result is statistically filtered (EWMA) and compared to a decision limit. DTC is set when the filtered result exceeds the decision limit. | Test Enable:<br>No TP sensor DTC's set.<br>No MAP sensor DTC's set.<br>No VS sensor DTC's set.<br>No ECT sensor DTC's set.<br>No IAC DTC's set.<br>No LEGR pintle pos. DTC set.<br>80 deg. C <= ECT <= 110 deg. C.<br>BARO >= 72 kpa.<br><br>20mph<= vehicle speed <=70mph.<br>IAC delta <= 3 counts.<br>trans. state unchanged for 0.3 sec..<br>A/C state unchanged for 0.3 sec..<br>Purge state unchanged for 0.3 sec..<br>11 volts <= sys. volts <= 15 volts.<br><br>Start Test (decel):<br>TPS <= 0.6 deg.<br>EGR pos. <= 8 counts.<br><br>700<= Engine RPM <= 1300.<br>Delta MAP <= 1 kpa.<br>25 <= MAP <= 44 kpa.<br>The above conditions must be present for 0.5 consecutive seconds.<br><br>Run Test (decel):<br>Stabilized MAP (valve closed) recorded and EGR valve ramped open (35 to 70% at a constant rate), the peak increase in MAP is recorded and the change in MAP computed. The EGR valve is ramped closed over 2.0 seconds. | 1 test per trip<br>15 tests if KAM reset<br><br>decel test:<br>3.3 to 4.6 sec.<br><br>freq. = 100 msec. | Delta Manifold Absolute Pressure and Software | DTC Type A |

| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| Catalyst System Efficiency Below Threshold - (Bank 1) | P0420 | Analog | This diagnostic will determine the efficiency of the catalytic converter. | Deviation difference average ≥ 4 mv from Bank 1 Sensor 3 | ***Converter Warm Up Status***<br>Predicted Catalyst Outlet Temp ≥ 344 deg C<br><br>***Test Enable***<br>ECT ≥ 75 deg C<br>12.5 ≤ Engine airflow ≤ 35 grams/sec<br>Engine load ≤ 59.4%<br>Delta engine load ≤ 160%/sec<br>Throttle position ≥ 2.2 deg<br>Engine speed ≤ 3000 rpm<br><br>20 < Vehicle speed < 75 mph<br>IAT > -28 deg C<br>A/F = 14.7<br>Closed loop fuel control is enabled.<br>Closed loop fuel control O2 ready test passed for Bank 1 Sensor 1 and Bank 2 Sensor 1.<br>Bank 1 and Bank 2 short term fuel trims operating.<br><br>No MAF DTC's set.<br>No TPS DTC's set.<br>No ECT DTC's set.<br>No VS sensor DTC's set.<br>No Fuel Trim DTC's set.<br>No Purge System DTC's set.<br>No Misfire DTC's set.<br>No Oxygen Sensor (Bank 1* Sensor 1, Bank 2*Sensor 1, Bank 1*Sensor 2, or Bank 1*Sensor 3) DTC's set. | 50 test samples per trip<br><br>12.5 ms loop continuous until 50 test samples taken | Exhaust Oxygen Sensors: Bank 1 Sensor 2 and Bank 1 Sensor 3 | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| EVAP. Emission Control System - Incorrect Purge Flow | P0441 | Digital | 0V - 5V<br>This diagnostic detects a purge solenoid stuck closed by monitoring the Evap. purge vac. switch state when the Evap. purge solenoid duty cycle is >= 60 %. The vac. switch state should change to high (open) if there is vacuum applied to the system | Evap. Purge Vacuum Switch state = low (closed) vacuum for a period 10 seconds continuous. DTC is set if the above condition occurs 3 times. | Evap. Purge Solenoid Vacuum switch DTC not set.<br>No IAC DTC's set.<br>No MAP DTC's set.<br>No TP sensor DTC's set.<br>No EGR DTC's set.<br>Baro >= 72 kpa.<br>ECT <= 125 deg. C<br>IAT <= 99.5 deg. C<br>Power up IAT >= 5 deg. C<br>30 <= rescaled MAP <= 80 kpa<br><br>Difference between last key off ECT and key on ECT >= 50 deg. C.<br>0 deg. <= TPS <= 81.6 deg.<br>500 <= Engine RPM <= 6375<br>Engine Vacuum >= 25 Kpa<br>Canister purge duty cycle > 65% | 3 test failures<br><br>100 msec continuous | Evap. Purge Vacuum Switch | DTC Type B |
| Vehicle Speed Sensor-Low Input | P0502 | Analog | This DTC detects a low vehicle speed when the vehicle has a large turbine speed in a drive gear range | Vehicle speed <= 5 mph | Gear range is D4, D3, D2, or D1<br>No PSA DTC set<br>No TPS DTC set<br>No MAF DTC set<br>No ISS DTC set<br>Throttle position >= 12.8 degrees<br>Delivered Torque >= 80 ft-lbs<br>Input turbine speed >= 2000 RPM | 2 seconds<br><br>Continuous | AC voltage generating Vehicle Speed Sensor | DTC TYPE A |
| Vehicle Speed Sensor - Intermittent | P0503 | Analog | This DTC detects unrealistically large changes in vehicle speed. | Drop in vehicle speed >= 11 mph and delta turbine speed <= 100 RPM within 0.125 sec | Traction control is not active<br>Time since key on >= 2 sec<br>No TPS DTC set<br>No MAF DTC set<br>No ISS DTC set<br>Throttle position >= 12.8 degrees<br>Delivered Torque >= 80 ft-lbs<br>Engine Speed >= 500 RPM<br>Time since manual lever change is >= 3 sec | 10 times in 10 seconds<br><br>Continuous | AC voltage generating Vehicle Speed Sensor | DTC TYPE A |

| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Idle Control System RPM Lower than Expected | P0506 | Software | This DTC will determine if a low idle is the result of an engine mechanical problem. A low idle is defined as 96 RPM below the desired idle. If a low idle is determined an intrusive test (defined inder P1508 is run) | Idle rpm > 96 rpm below desired rpm | General Test Enable:<br><br>No MAF DTC's set.<br>No MAP DTC's set.<br>No IAT DTC's set.<br>No ECT DTC's set.<br>No TP sensor DTC's set.<br>No injector fault DTC's set.<br>No VS sensor DTC's set.<br>No EGR pintle pos. DTC set.<br>No purge flow DTC's set.<br>No 4x reference DTC's set.<br><br>EGR diag. test not in progress.<br>10.5 <= System volt <=15 volts.<br>IAT >= -40 deg. C<br>BARO >= 65 kpa<br>-40 deg. C <= ECT<= 110 deg. C<br>Engine run time >= 10 seconds<br>Closed loop fueling enabled<br>2 g/sec <= airflow <= 35 g/sec<br>Purge duty cycle <= 0%<br><br>Idle test:<br>General conditions met.<br>vehicle speed <= 0 mph<br>TP sensor <= 0.3 deg.<br>Time since a transition to or from park/neutral > 64 seconds.<br>If idle test fails, intrusive test is run | idle test - 20 sec.<br><br>frequency:<br>250 msec cont. | Software and Stepper Motor | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| Idle Control System RPM Higher than Expected | P0507 | Software | This DTC will determine if a high idle is the result of an engine mechanical problem. A high idle is defined as 184 to 200 RPM (function of coolant temp.) above the desired idle. If a high idle is detected, an intrusive test is run (defined under P1509) | Idle rpm > 184 to 200 rpm above desired rpm ( function of coolant temperature). | General Test Enable:<br><br>No MAF DTC's set.<br>No MAP DTC's set.<br>No IAT DTC's set.<br>No ECT DTC's set.<br>No TP sensor DTC's set.<br>No injector fault DTC's set.<br>No VS sensor DTC's set.<br>No EGR pintle pos. DTC set.<br>No purge flow DTC's set.<br>No 4x reference DTC's set.<br><br>EGR diag. test not in progress.<br>10.5 <= System volt <=15 volts.<br>IAT >= -40 deg. C<br>BARO >= 65 kpa<br>-40 deg. C <= ECT<= 110 deg. C<br>Engine run time >= 10 seconds<br>Closed loop fueling enabled<br>2 g/sec <= airflow <= 35 g/sec<br>Purge duty cycle <= 0%<br><br>Idle test:<br>General conditions met.<br>vehicle speed <= 0 mph.<br>TP sensor <= 0.3 deg.<br>Time since a transition to or from park/neutral > 64 seconds.<br>If idle test fails intrusive test is run. | idle test - 23 sec.<br><br>frequency:<br>250 msec cont. | Software and Stepper Motor | DTC Type A |

| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| Input Speed Sensor Circuit-Range/Perf | P0716 | Analog | This DTC detects unrealistically large changes in input speed. | Input speed drop is >= 1000 RPM in 0.075 sec | No SSA and SSB sol. DTC set<br>No VSS DTC set<br>No TPS DTC set<br>No MAF DTC set<br>No ISS DTC set<br>Throttle position >= 12.8 degrees<br>Vehicle speed >= 7 mph<br>Engine running for >= 5 sec<br>Not in fuel cut-off. | 10 times in 10 seconds<br><br>Continuous | AC voltage generating Vehicle Speed Sensor | DTC TYPE A |
| Input Speed Sensor Circuit-No signal | P0717 | Analog | This DTC detects a low input speed when the vehicle has large Vehicle and Engine Speeds | Input Speed <= 50 RPM | No PSA DTC set<br>No VSS DTC set<br>No TPS DTC set<br>PSA indicating not in P/N<br>Vehicle speed >= 10 mph<br>Engine running for >= 5 sec<br>Not in fuel cut-off. | 2 seconds<br><br>Continuous | AC voltage generating Vehicle Speed Sensor | DTC TYPE A |
| TCC System Stuck-OFF | P0741 | Software | This DTC detects high torque converter slip when the TCC is commanded on | Slip >= TCTSTSLP<br>TCTSTSLP / Torque<br>48 / 0<br>72 / 32<br>88 / 64<br>200 / 96<br>248 / 128<br>256 / 160<br>272 / 192<br>280 / 224<br>280 / 256 | No PSA DTC set<br>No VSS DTC set<br>No TPS DTC set<br>No MAF sensor DTC set<br>No ISS DTC set<br>No TCC control sol. DTC set<br>No TCC Stuck on DTC set<br>TCC is commanded ON<br>Trans is in D4 according to PSA<br>2nd, 3rd, or 4th gear ratio seen<br>Throttle position >= 8 degrees<br>20 <= Trans. fluid Temp <= 120 C<br>32 <= Delivered Torque <= 150 ft-lbs<br>Engine running for >= 5 sec<br>Not in fuel cut-off. | 5 seconds<br><br>Continuous | Software calculates TCC slip using engine speed and turbine speed. | DTC TYPE A |

| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| TCC System Stuck-ON | P0742 | Software | This DTC detects low torque converter slip when the TCC is commanded off | Slip speed >= 67 rpm or<br>slip speed <= -5 rpm | No PSA DTC set<br>No VSS DTC set<br>No TPS DTC set<br>No MAF sensor DTC set<br>No ISS DTC set<br>No TCC control sol. DTC set<br>No TCC stuck off DTC set<br>TCC is commanded OFF<br>Trans is in D4 according to PSA<br>2nd, 3rd, or 4th gear ratio seen<br>Throttle position >= 11.8 degrees<br>100 <= Delivered Torque <= 200 ft-lbs<br>Engine running for >= 5 sec<br>Not in fuel cut-off. | 6.4 seconds<br><br><br>Continuous | Software calculates TCC slip using engine speed and turbine speed. | DTC TYPE A |
| Shift Solenoid A Performance | P0751 | Software | This DTC detects incorrect gear ratio when a gear is commanded. | 1. Commanded Gear = 1<br>Ratio = 2nd<br>Del. Torque >= 60 ft-lb.<br>2. Commanded Gear = 2<br>Ratio = 1st<br>Del. Torque >= 70 ft-lbs<br>3. Commanded Gear = 3<br>Ratio = 4th<br>Del. Torque >= 60 ft-lbs<br>4. Commanded Gear = 4<br>Ratio = 3rd<br>Del. Torque >= 70 ft-lbs<br><br>(1&4) or (2&3) fails | No PSA DTC set<br>No VSS DTC set<br>No TPS DTC set<br>No MAF sensor DTC set<br>No ISS DTC set<br>No Shift Sol. Electrical Codes<br>Vehicle Speed >= 4 mph<br>Trans is in D4, D3, D2, OR D1<br>Trans Temp >= 30 degree C<br>Throttle position >= 11.0 degrees<br>Engine running for >= 5 sec<br>Not in fuel cut-off.<br>A shift is not in progress | 1. 1.0 seconds<br>2. 3.0 seconds<br>3. 3.0 seconds<br>4. 5.0 seconds<br><br><br>Continuous | Software calculates Ratio using Turbine Speed and Vehicle speed | DTC TYPE A |
| Shift Solenoid A Electrical | P0753 | Analog | This DTC detects a continuous open or short to ground in the SS A circuit or solenoid | Fail Counter >= 17 | No ODM B DTC set<br>Engine Running >= 5 sec<br>Increment fail counter if output state is invalid 17 out of 20 possible times in 250 msec | 5 seconds<br><br><br>Continuous | Analog output to Shift solenoid | DTC TYPE A |

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|---|---|---|---|---|---|---|---|---|
| Shift Solenoid B Performance | P0756 | Software | This DTC detects incorrect gear ratio when a gear is commanded. | 1. Commanded Gear = 1<br>Ratio = 4th<br>Del. Torque >= 60 ft-lbs<br>2. Commanded Gear = 2<br>Ratio = 3rd<br>Del. Torque >= 60 ft-lbs<br>3. Commanded Gear = 3<br>Ratio = 2nd<br>Del. Torque >= 60 ft-lbs<br>4. Commanded Gear = 4<br>Ratio = 1st<br>Del. Torque >= 16 ft-lbs<br><br>(1&2) or (3&4) fails | No PSA DTC set<br>No VSS DTC set<br>No TPS DTC set<br>No MAF sensor DTC set<br>No ISS DTC set<br>No Shift Sol. Electrical Codes<br>Vehicle Speed >= 4 mph<br>Trans is in D4, D3, D2, OR D1<br>Trans Temp >= 30 degree C<br>Throttle position >= 11.0 degrees<br>Engine running for >= 5 sec<br>Not in fuel cut-off.<br>A shift is not in progress | 1. 1.0 seconds<br>2. 0.5 seconds<br>3. 4.0 seconds<br>4. 1.0 seconds<br><br>Continuous | Software calculates Ratio using Turbine Speed and Vehicle speed | DTC TYPE A |
| Shift Solenoid B Electrical | P0758 | Analog | This DTC detects a continuous open or short to ground in the SS B circuit or solenoid | Fail Counter >= 17 | No ODM B DTC set<br>Engine Running >= 5 sec<br>Increment fail counter if output state is invalid 17 out of 20 possible times in 250 msec | 5 seconds<br><br>Continuous | Analog output to Shift solenoid | DTC TYPE A |
| MAP to Baro Correlation | P1108 | Analog | 3V to 5.0V<br>At low throttle angles, MAP should be well below barometric pressure. If MAP is close to Baro. for too long, a faulty MAP condition exists. | MAP-Baro ≤ 11 kPa | No TP sensor or other MAP sensor DTC's set<br>Throttle switch closed<br>Baro ≥ 75 kPa<br>Engine speed ≥ 400 RPM<br>Throttle angle ≤ 18 degrees | Failure must exist for 15 seconds<br>250 ms loop<br>Continuous | Pressure Differential Sensor | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| O2S System - Too Few O2S R/L and L/R Switches ( Bank 1, Sensor 1) | P1133 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor is functioning properly by monitoring the number of L/R and R/L switches. | Number of switches in 90 seconds:<br><br>L/R switches < 12<br>R/L switches < 12 | No MAF DTC's.<br>No TP sensor DTC's.<br>No ECT DTC's.<br>Bank 1*Sensor 1 Voltage DTC's not set or failure pending not set.<br>DTC P0135 (O2 heater) not set.<br>Closed loop fuel control O2 ready test passed for Bank 1, Sensor 1<br><br>Bank 1 short term fuel trim operating.<br>Throttle postion ≥ 2.2 deg<br>A/F = 14.7<br>Engine run time > 202 seconds<br>ECT ≥ 75 deg C<br>9 ≤ Ign. volts ≤ 16<br>1000 ≤ Engine speed ≤ 2750 rpm (L37/3.71, L47/3.71)<br>1000 < Engine speed < 2500 rpm (LD8/3.11, L47/3.48)<br><br>15< Engine airflow <35 grams/sec<br><br>Above conditions met for 1.2 seconds | 90 seconds<br><br>Once per key cycle<br><br>12.5 ms loop continuous until test completed | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |

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|---|---|---|---|---|---|---|---|---|
| O2S Circuit - Transition Switch Time Ratio Malfunction ( Bank 1, Sensor 1) | P1134 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor is functioning properly by checking the ratio of the average transition times. | Ratio of average response times (Rich-Lean/Lean-Rich):<br><br>Ratio > 3 or < .33 | No MAF DTC's.<br>No TP sensor DTC's.<br>No ECT DTC's.<br>Bank 1*Sensor 1 Voltage DTC's not set or failure pending not set.<br>DTC P0135 (O2 heater) not set.<br>Closed loop fuel control O2 ready test passed for Bank 1, Sensor 1<br>Bank 1 short term fuel trim operating.<br>Throttle postion ≥ 2.2 deg<br>A/F = 14.7<br>Engine run time > 202 seconds<br>ECT ≥ 75 deg C<br>9 ≤ Ign. volts ≤ 16<br>1000 ≤ Engine speed ≤ 2750 rpm (L37/3.71, L47/3.71)<br>1000 < Engine speed < 2500 rpm (LD8/3.11, L47/3.48)<br>15< Engine airflow <35 grams/sec<br><br>Above conditions met for 1.2 seconds | 90 seconds<br><br>Once per key cycle<br><br>12.5 ms loop continuous until test completed | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |

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|---|---|---|---|---|---|---|---|---|
| O2S System - Too Few O2S R/L and L/R Switches ( Bank 1, Sensor 2) | P1139 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor is functioning properly by monitoring the number of L/R and R/L switches. | Number of switches in 90 seconds:<br><br>L/R switches < 10<br>R/L switches < 10 | No MAF DTC's.<br>No TP sensor DTC's.<br>No ECT DTC's.<br>Bank 1*Sensor 1 or Bank 2*Sensor 1 DTC's not set or failure pending not set.<br>No Fuel Trim DTC's set.<br>No Misfire DTC set.<br><br>DTC P0141 (O2 heater) not set.<br>Closed loop fuel control O2 ready test passed for Bank 1, Sensor 1 and Bank 2, Sensor 1.<br>Bank 1 and 2 short term fuel trim operating.<br>Throttle postion ≥ 2.2 deg<br>A/F = 14.7<br>Engine run time > 202 seconds<br>ECT ≥ 75 deg C<br>9 ≤ Ign. volts ≤ 16<br>1000 ≤ Engine speed ≤ 2750 rpm (L37/3.71, L47/3.71)<br>1000 < Engine speed < 2500 rpm (LD8/3.11, L47/3.48)<br>18 < Engine airflow < 35 gram/sec<br><br>Above conditions met for 1.5 seconds | 90 seconds<br><br>Once per key cycle<br><br>12.5 ms loop continuous until test completed | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |

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|---|---|---|---|---|---|---|---|---|
| O2S Circuit - Transition Switch Time Ratio Malfunction ( Bank 1, Sensor 2) | P1140 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor is functioning properly by checking the ratio of the average transition times. | Ratio of average response times (Rich-Lean/Lean-Rich):<br><br>Ratio > 3 or < .33 | No MAF DTC's.<br>No TP sensor DTC's.<br>No ECT DTC's.<br>Bank 1*Sensor 1 or Bank 2*Sensor 1 DTC's not set or failure pending not set.<br>No Fuel Trim DTC's set.<br>No Misfire DTC set.<br><br>DTC P0141 (O2 heater) not set.<br>Closed loop fuel control O2 ready test passed for Bank 1, Sensor 1 and Bank 2, Sensor 1.<br>Bank 1 and 2 short term fuel trim operating.<br>Throttle postion ≥ 2.2 deg<br>A/F = 14.7<br>Engine run time > 202 seconds<br>ECT ≥ 75 deg C<br>9 ≤ Ign. volts ≤ 16<br>1000 ≤ Engine speed ≤ 2750 rpm (L37/3.71, L47/3.71)<br>1000 < Engine speed < 2500 rpm (LD8/3.11, L47/3.48)<br>18 < Engine airflow < 35 gram/sec<br><br>Above conditions met for 1.5 seconds | 90 seconds<br><br>Once per key cycle<br><br>12.5 ms loop continuous until test completed | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |

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|---|---|---|---|---|---|---|---|---|
| O2S System - Too Few O2S R/L and L/R Switches ( Bank 2, Sensor 1) | P1153 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor is functioning properly by monitoring the number of L/R and R/L switches. | Number of switches in 90 seconds:<br><br>L/R switches < 12<br>R/L switches < 12 | No MAF DTC's.<br>No TP sensor DTC's.<br>No ECT DTC's.<br>Bank 2*Sensor 1 Voltage DTC's not set or failure pending not set.<br>DTC P0155 (O2 heater) not set.<br>Closed loop fuel control O2 ready test passed for Bank 2, Sensor 1<br>Bank 2 short term fuel trim operating.<br>Throttle postion ≥ 2.2 deg<br>A/F = 14.7<br>Engine run time > 202 seconds<br>ECT ≥ 75 deg C<br>9 ≤ Ignition voltage ≤ 16<br>1000 < Engine speed < 2750 rpm (L37/3.71, L47/3.71)<br>1000 < Engine speed < 2500 rpm (LD8/3.11, L47/3.48)<br>15< Engine airflow <35 grams/sec<br><br>Above conditions met for 1.2 seconds | 90 seconds<br><br>Once per key cycle<br><br>12.5 ms loop continuous until test completed | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |

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|---|---|---|---|---|---|---|---|---|
| O2S Circuit - Transition Switch Time Ratio Malfunction ( Bank 2, Sensor 1) | P1154 | Analog | 0 V to1.1V<br>The DTC determines if the O2 sensor is functioning properly by checking the ratio of the average transition times. | Ratio of average response times (Rich-Lean/Lean-Rich):<br><br>Ratio > 3 or < .33 | No MAF DTC's.<br>No TP sensor DTC's.<br>No ECT DTC's.<br>Bank 2*Sensor 1 Voltage DTC's not set or failure pending not set.<br>DTC P0155 (O2 heater) not set.<br>Closed loop fuel control O2 ready test passed for Bank 2, Sensor 1<br>Bank 2 short term fuel trim operating.<br>Throttle postion ≥ 2.2 deg<br>A/F = 14.7<br>Engine run time > 202 seconds<br>ECT ≥ 75 deg C<br>9 ≤ Ign. volts ≤ 16<br>1000 < Engine speed < 2750 rpm (L37/3.71, L47/3.71)<br>1000 < Engine speed < 2500 rpm (LD8/3.11, L47/3.48)<br><br>15< Engine airflow <35 grams/sec<br><br>Above conditions met for 1.2 seconds | 90 seconds<br><br>Once per key cycle<br><br>12.5 ms loop continuous until test completed | Exhaust Oxygen Sensor PCM Interface Circuit | DTC Type B |
| Engine Over-temperature Protection Active | P1258 | Digital | .1V to 5.0V<br>The DTC detects if the engine over-temperature protection mode is active. | Engine over-temperature protection mode is active. | None | 2 seconds<br>500 ms loop<br>Continuous | Thermistor | DTC Type A |
| Direct Ignition System 4X Reference Signal Interrupt | P1320 | Digital | This DTC determines if there has been a sudden loss of 4X reference pulses | No 4X reference signal | Engine Speed > 568 RPM | Failure must exist for 0.4 seconds.<br><br>Frequency:<br>100 ms cont. | Software | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| No 24X Reference Signal | P1323 | Digital | This DTC determines if there are no 24X reference pulses received with 4X reference pulses being received. | No 24X reference signal | Engine Speed > 496 RPM<br>Number of CAM edges since key-on > 7<br>CAM pulses being received. | Fail if failed 1 out of 10 times.<br><br>Frequency:<br>4 sec.<br>cont./monitored every CAM pulse | Software | DTC Type A |
| EST/Bypass Problem | P1350 | Digital | This DTC determines if the Electronic Spark Timing (EST)/bypass cicuitry is operating correctly | EST pulses detected in bypass mode or no EST pulses detected in EST mode | More than 1 or 2 (depending on operating conditions) reference pulses detected since last loop. | Failure must exist for > 0.8 seconds<br><br>Frequency:<br>100 ms cont. | Software | DTC Type A |
| Too Many 4X Reference Pulses | P1370 | Digital | The DTC determines if there are too many 4X reference pulses being received every CAM cycle. | 48 24X reference pulses have occurred between CAM pulses and<br>4X pulses between CAM pulses > 8. | Engine Speed >496 RPM<br>CAM pulses being received<br>Number of CAM edges since key-on > 7 | 4 test failures out of 10 test samples.<br><br>Frequency:<br>250 ms cont. | Software | DTC Type A |
| Too Few 4X reference Pulses | P1371 | Digital | The DTC determines if there are too few 4X reference pulses being received every CAM cycle. | 48 24X reference pulses have occurred between CAM pulses and<br>4X pulses between CAM pulses < 8. | Engine Speed >496 RPM<br>CAM pulses being received<br>Number of CAM edges since key-on > 7 | 4 test failures out of 10 test samples.<br><br>Frequency:<br>250 ms cont. | Software | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| No Crank Sensor A or B Signal to D.I.S. or 24X Shorted High | P1375 | Digital | The DTC determines if the 24X reference signal is shorted high. This could be due to a short or the D.I.S. detects a missing crank sensor input. | 24X reference signal high and number of 4X reference pulses since line went high > 8. | Engine Speed > 496 RPM<br>More than 7 cam edges detected since key on | 1 test failure out of 10 test samples.<br><br>Frequency:<br>250 ms cont. | Software/ Crank sensor | DTC Type A |
| CAM to Reference Correlation Problem | P1377 | Digital | This DTC determines if the cam and reference signals are synchronized correctly | 4X reference pulses received per cam cycle not equal to 16 for 2 cam cycles | Engine Speed > 496 RPM<br>More than 7 CAM edges detected since key on | 4 test failures out of 10 samples.<br><br>Frequency:<br>250 ms cont. | Software | DTC Type A |
| Exhaust Gas Recirculation - Pintle Position Error | P1406 | Analog | 0v - 5v<br>This diagnostic will detect three conditions:<br>1 - An open or short<br>2 - Closed valve position too high<br>3 - Position error too high | 1. Filtered Closed Valve Pintle Position <= 9, or >= 103 counts<br>2. Pintle pos.error > 25 for 300 times if ign. volt > 12 volts. -or- Pintle pos.error > 75 for 1000 times if ign. volt < 12 volts.<br>3. Pintle pos. > 20 counts from learned closed position. | All cases: Ignition Voltage >= 11 volts<br><br>Case 2: If ignition voltage < 12 volts then the following must be true:<br><br>Engine vacuum < 50 kpa<br>Transmission temperature < 90 deg. C (if trans. temp. sensor is failed then this criteria is bypassed). | 1. Immediate<br>2. 300 occurrences if ignition voltage > 12 volts. 1000 occurrences if ignition voltage < 12 volts.<br>3. 2 fails ( with pintle movement above 47% between each fail) timed at 10 sec. each fail.<br><br>250 msec / position error every 12.5 msec. | Potentiometer | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| Evap. Emission Control System - Continuous Open Purge Flow | P1441 | Digital | 0V - 5V<br>This diag. detects a purge solenoid stuck open by monitoring the Evap. purge vac. switch state when the Evap. purge solenoid duty cycle is <= 5 %. The vac. switch state should change to low (closed) if there is no vacuum applied to the system | Evap. Purge Vacuum Switch state = high (open) vacuum for a period 10 seconds continuous. DTC is set if the above condition occurs 3 times. | Evap. Purge Solenoid Vacuum switch DTC not set.<br>No IAC DTC's set.<br>No MAP DTC's set.<br>No TP sensor DTC's set.<br>No EGR DTC's set.<br>Baro >= 72 kpa.<br>ECT <= 125 deg. C<br>IAT <= 99.5 deg. C<br>Power up IAT >= 5 deg. C<br>30 <= rescalad MAP <= 70 kpa<br>Difference between last key off ECT and key on ECT >= 50 deg. C.<br>0 deg. <= TPS <= 81.6 deg.<br>500 <= Engine RPM <= 6375<br>Canister purge duty cycle < 5%. | 3 test failures<br><br>100 msec continuous | Evap. Purge Vacuum Switch | DTC Type B |

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|---|---|---|---|---|---|---|---|---|
| Purge Solenoid Diagnostic Vacuum Switch Malfunction | P1442 | Digital | 0v - 5v<br>This diagnostic will detect a diagnostic vacuum switch stuck in the open (high vacuum) position. | Engine Running Test:<br>Vacuum Switch open (high vacuum) for 255 consecutive seconds.<br><br>Power Up Test:<br>Vacuum switch open (high vacuum) for 2 tests out of 3. | Engine Running Test:<br>No IAC DTC's set.<br>No MAP DTC's set.<br>No TP sensor DTC's set.<br>No EGR flow DTC set.<br>No MAF DTC's set.<br>No Purge Driver failure DTC set<br>Baro >= 72 kpa.<br>ECT <= 125 deg. C<br>IAT <= 99.5 deg. C<br>Power up IAT >= -25 deg. C<br><br>20.2 <= rescaled MAP <= 100 kpa<br>Power Up Test not failed.<br>Engine Vacuum <= 1 kpa.<br><br>Power Up Test:<br>No IAT DTC's set.<br>Reference pulses not being received.<br>Difference between last key off ECT and key on ECT >= 50 deg. C.<br>Engine not run this ignition cycle | Engine running - 255 seconds<br><br>Power up test - 2 test failures out of 3 tests<br><br>Frequency: one second/ switch state at power up - 12.5 msec.<br><br>Power up test - once per ignition cycle | Purge vacuum switch | DTC Type B |

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|---|---|---|---|---|---|---|---|---|
| Idle Air Control - Low | P1508 | Software | This DTC will determine if a low idle is the result of an IAC valve or circuit. A low idle is defined as 96 RPM below the desired idle. | Change in Airflow during commanded IAC movement >= 1.5 grams/sec. | General Test Enable:<br><br>No MAF DTC's set.<br>No MAP DTC's set.<br>No IAT DTC's set.<br>No ECT DTC's set.<br>No TP sensor DTC's set.<br>No injector fault DTC's set.<br>No VS sensor DTC's set.<br>No EGR pintle pos. DTC set.<br>No purge flow DTC's set.<br>No 4x reference DTC's set.<br><br>EGR diag. test not in progress.<br>10.5 <= System volt <=15 volts.<br>IAT >= -40 deg. C<br>BARO >= 65 kpa<br>-40 deg. C <= ECT<= 110 deg. C<br>Engine run time >= 10 seconds<br>Closed loop fueling enabled<br>2 g/sec <= airflow <= 35 g/sec<br>Purge duty cycle <= 0%<br><br>Idle test:<br>General conditions met.<br>vehicle speed <= 0 mph.<br>TP sensor <= 0.6 deg.<br>if idle test fails intrusive test is run.<br><br>Intrusive test:<br>30mph <=vehicle speed<= 45mph<br>10 <= comm. IAC <= 300 counts<br>2 g/sec <= airflow <= 30 g/sec<br><br>change in TPS from start of test <= 1 deg. to continue test.<br>change in engine speed from start of test <= 75 rpm to continue test. | Idle test - 15 sec.<br>Intrusive test - 2 sec.<br><br>frequency:<br>250 msec cont. | Software and Stepper Motor | DTC Type A |

| SENSED PARAMETER | FAULT CODE | SENSOR SIGNAL TYPE | ACCEPTABLE OPERATING RANGE & RATIONALITY | PRIMARY MALFUNCTION DETECTION PARAMETERS | SECONDARY MONITORING PARAMETERS & CONDITIONS | MONITORING TIME LENGTH & FREQUENCY OF CHECK | MONITORING METHOD | FAULT CODE STORAGE & MIL ILLUMINATION |
|---|---|---|---|---|---|---|---|---|
| Idle Air Control - High | P1509 | Software | This DTC will determine if a high idle is the result of an IAC valve or circuit. A high idle is defined as 128 RPM above the desired idle. | Change in Airflow during commanded IAC movement >= 1.5 grams/sec. | <u>General Test Enable:</u><br><br>No MAF DTC's set.<br>No MAP DTC's set.<br>No IAT DTC's set.<br>No ECT DTC's set.<br>No TP sensor DTC's set.<br>No injector fault DTC's set.<br>No VS sensor DTC's set.<br>No EGR pintle pos. DTC set.<br>No purge flow DTC's set.<br>No 4x reference DTC's set.<br><br>EGR diag. test not in progress.<br>10.5 <= System volt <=15 volts.<br>IAT >= -40 deg. C<br>BARO >= 65 kpa<br>-40 deg. C <= ECT<= 110 deg. C<br>Engine run time >= 10 seconds<br>Closed loop fueling enabled<br>2 g/sec <= airflow <= 35 g/sec<br>Purge duty cycle <= 0%<br><br><u>Idle test:</u><br>General conditions met.<br>vehicle speed <= 0 mph.<br>TP sensor <= 0.6 deg.<br>if idle test fails intrusive test is run.<br><br><u>Intrusive test:</u><br>30mph <=vehicle speed<= 45mph<br>10 <= comm. IAC <= 300 counts<br>2 g/sec <= airflow <= 30 g/sec<br><br>change in TPS from start of test <= 1 deg. to continue test.<br>change in engine speed from start of test <= 75 rpm to continue test. | idle test - 15 sec.<br>intrusive test - 2 sec.<br><br>frequency:<br>250 msec cont. | Software and Stepper Motor | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| Ignition 1 Supplement Fault | P1633 | Analog | This DTC detects a loss of ignition 1 supplement feed to the PCM by comparing it to the state of the ignition 1 feed. | Ignition 1 supplement voltage not present. | Engine running Ignition 1 ≥ 5.5 volts | Failure must exist for 1 second.<br><br>100 ms Continuous | Internal feedback | DTC Type A |
| Ignition 1 Input Fault | P1634 | Analog | This DTC detects a loss of ignition 1 feed to the PCM by comparing it to the state of the ignition 0 feed while the engine is running. | The difference between ignition 1 voltage and ignition 0 voltage is ≥ 6 volts | Engine running | Failure must exist for 20 seconds.<br><br>100 ms Continuous | Internal feedback | DTC Type A |
| Output Driver Module A Failure | P1640 | Digital | This DTC detects an over-temperature or over-current condition on output driver module A by monitoring the fault feedback line from the driver. | Output driver module feedback indicating a fault. | Engine run time ≥ 10 seconds<br>Ignition voltage > 9 volts | 8 test failures within a 10 test sample<br>250 ms loop<br>Continuous | Internal feedback | DTC Type A |
| Canister Purge Output Failure | P1645 | Digital | This DTC detects a short or open on the canister purge solenoid drive circuit by monitoring the fault feedback line from the output driver module. | Output driver module feedback indicating a fault on the canister purge solenoid circuit. | Output driver module A failure not set<br>Engine run time ≥ 10 seconds<br>Ignition Voltage > 9 volts | 8 test failures within a 10 test sample<br>250 ms loop<br>Continuous | Internal feedback | DTC Type A |
| Output Driver Module B Failure | P1650 | Digital | This DTC detects an over-temperature or over-current condition on output driver module A by monitoring the fault feedback line from the driver. | Output driver module feedback indicating a fault. | Engine run time ≥ 10 seconds<br>Ignition voltage > 9 volts | 8 test failures within a 10 test sample<br>250 ms loop<br>Continuous | Internal feedback | DTC Type A |

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|---|---|---|---|---|---|---|---|---|
| Quad Driver Module 1 Output Failure | P1660 | Digital | This DTC detects a short or open on the cooling fan drive circuits by monitoring the fault feedback line from the quad driver module. | Quad driver module feedback indicating a fault on either cooling fan drive circuit. | Engine run time ≥ 10 seconds<br>Ignition voltage ≥ 10V and ≤ 16V<br>Closed loop fuel control enabled | 10 test failures<br>250 ms loop<br>Continuous | Internal feedback | DTC Type A |
| PSA Circuit Malfunction (Fail Case 1) | P1810 | Digital | This DTC detects an invalid state of PSA sensor or the PSA circuit by deciphering the PSA inputs. | Illegal Range is true | No MAF DTC set<br>No TPS DTC set<br>No VSS DTC set<br>No ISS DTC set<br>Engine running for >= 5 sec<br>10 <= Ign. volts <= 17.<br>Not in fuel cut-off. | 5 seconds<br><br><br>Continuous | Digital input from PSA | DTC TYPE B |
| PSA Circuit Malfunction (Fail Case 2) | P1810 | Digital | This DTC detects an invalid state of PSA sensor or the PSA circuit by deciphering the PSA inputs. | PSA indicates P/N when Ratio indicate Drive or Reverse Gear | No MAF DTC set<br>No TPS DTC set<br>No VSS DTC set<br>No ISS DTC set<br>Vehicle Speed >= 7 mph<br>Throttle position >= 11.0 degrees<br>80 <= Del. Torque <= 200 ft-lbs<br>10 <= Ign. Voltage <= 17 Volts<br>Engine running for >= 5 sec<br>Not in fuel cut-off. | 4 seconds<br><br><br>Continuous | Digital input from PSA | DTC TYPE B |
| PSA Circuit Malfunction (Fail Case 3) | P1810 | Digital | This DTC detects an invalid state of PSA sensor or the PSA circuit by deciphering the PSA inputs. | PSA indicates Reverse when Ratio indicate Drive Gear | No MAF DTC set<br>No TPS DTC set<br>No VSS DTC set<br>No ISS DTC set<br>Vehicle Speed >= 7 mph<br>Throttle position >= 11.0 degrees<br>80 <= Del. Torque <= 200 ft-lbs<br>10 <= Ign. Voltage <= 17 Volts<br>Engine running for >= 5 sec<br>Not in fuel cut-off. | 4 seconds<br><br><br>Continuous | Digital input from PSA | DTC TYPE B |

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|---|---|---|---|---|---|---|---|---|
| PSA Circuit Malfunction (Fail Case 4) | P1810 | Digital | This DTC detects an invalid state of PSA sensor or the PSA circuit by deciphering the PSA inputs. | PSA indicates D4, D3, D2, or D1 when Ratio Indicates Reverse Gear | No MAF DTC set<br>No TPS DTC set<br>No VSS DTC set<br>No ISS DTC set<br>Vehicle Speed >= 7 mph<br>Throttle position >= 12.0 degrees<br>10 <= Ign. Voltage <= 17 Volts<br>Engine running for >= 5 sec<br>Not in fuel cut-off. | 5 seconds<br><br><br>Continuous | Digital input from PSA | DTC TYPE B |
| PSA Circuit Malfunction (Fail Case 5) | P1810 | Digital | This DTC detects an invalid state of PSA sensor or the PSA circuit by deciphering the PSA inputs. | PSA indicates D2 before engine run flag is set and PSA does not indicate P/N >= 4.95 sec | No MAF DTC set<br>No TPS DTC set<br>No VSS DTC set<br>No ISS DTC set<br>Vehicle speed <= 5 mph<br>Running Reset has not occurred<br>10 <= Ign. Voltage <= 17 Volts<br>Engine Run flag set for <= 5 sec | 4.95 seconds<br><br><br>Continuous | Digital input from PSA | DTC TYPE B |
| TCC control Solenoid Electrical | P1860 | Analog | This DTC detects a continuous open or short to ground in the TCC control solenoid or circuit | Fail Counter >= 17 | PWM duty cycle >=85 or <= 10<br>No ODM B DTC set<br>Engine Running >= 5 sec<br>Increment fail counter if output state is invalid 17 out of 20 possible times in 250 msec | 5 seconds<br><br><br>Continuous | Analog output to TCC control solenoid | DTC TYPE A |