1998 7.4L (L29) C/K-truck, P-truck, G-van ENGINE DIAGNOSTIC PARAMETERS

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Mass Air Flow Sensor Circuit - Range/ Rationality	P0101	0 kHz - 13 kHz Under conditions when the two should match, the Mass Air Flow reading should match calculated Mass Air Flow (based on speed density). If delta Mass Air Flow is too large, a faulty Mass Air Flow condition exists, such as a "skewed" sensor.	MAF $\Delta \geq$ a table value determined by the difference between the MAF sensor reading and the speed density calculation.	Engine Running TP sensor DTC's not active. MAP sensor DTC's not active. Evap. DTC's not active EGR DTC P0401 not active MAF sensor high / low DTC's not active. System voltage > 10V but < 17V Canister Purge DC $\leq$ 99.6% TPS $\Delta \leq$ 3.9% EGR DC $\leq$ 89.8% EGR Pintle Position $\leq$ 89.8% Engine vacuum $\leq$ 90 kPa Throttle Position $\leq$ 89.8% The above must be present for a period of time greater than 2 seconds.	50 test failures within a 100 test sample. Time necessary to complete sample: 10 sec The Mass Air Flow reading and Mass Air Flow calculation are performed during the same cylinder event every 100 ms.	DTC Type A
Mass Air Flow Sensor Circuit - Low Input	P0102	0 kHz - 13 kHz This DTC will determine if the MAF frequency is too low.	***Powerup Test:*** MAF $\leq$ 60 Hz ***LOW FREQUENCY TEST:*** MAF $\leq$ 300 Hz	***Powerup Test:*** Engine "OFF" Ignition "ON" for 2 seconds ***LOW FREQUENCY TEST:*** Engine Speed $\geq$ 300 RPM Engine Run Time $\geq$ 2.0 seconds System Voltage $\geq$ 10 Volts Throttle Position < 89.8% The above must be present for a period of time greater than 0 seconds.	***Powerup Test:*** 20 failures within a 25 test sample. Time necessary to complete sample: 250 ms Test is run every 12.5 ms until "Engine Run" flag is seen. ***LOW FREQUENCY TEST:*** 40 test failures within a 100 test sample. Time necessary to complete sample: 10 sec Test is run at every reading of the Mass Air Flow sensor frequency.	DTC Type A

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Mass Air Flow Sensor Circuit - High Input	P0103	0 kHz - 13 kHz This DTC will determine if the MAF frequency is too high.	***Powerup Test:*** MAF ≥ 12000 Hz ***HIGH FREQUENCY TEST:*** MAF ≥ 11000 Hz	***Powerup Test:*** Engine "OFF" Ignition "ON" for 2 seconds ***HIGH FREQUENCY TEST:*** Engine Speed ≥ 300 RPM Engine Run Time ≥ 2.0 seconds System Voltage ≥ 10 Volts Throttle Position < 89.8% The above must be present for a period of time greater than 0 seconds.	***Powerup Test:*** 20 failures within a 25 test sample. Time necessary to complete sample: 250 ms Test is run every 12.5 ms until "Engine Run" flag is seen. ***HIGH FREQUENCY TEST:*** 40 test failures within a 100 test sample. Time necessary to complete sample: 10 sec Test is run at every reading of the Mass Air Flow sensor frequency.	DTC Type A
MAP Sensor Circuit - Low Input	P0107	.3V to 5.0V This DTC detects a continuous short to low or open in either the signal circuit or the MAP sensor.	Raw MAP < .05 Volts (3 counts)	TP sensor DTC's not active Engine Running Throttle Position ≥ 0% when Engine speed is ≤ 800 RPM **or** Throttle Position is ≥ 12.5% when Engine speed is > 800 RPM	40 test failures within a 100 test sample. Time necessary to complete sample is based on engine speed. At 1600 RPM, the time would be 938 ms Continuous	DTC Type A
MAP Sensor Circuit - High Input	P0108	.3V to 5.0V This DTC detects an open sensor ground or continuous short to high in either the signal circuit or the MAP sensor.	Raw MAP > 4.34 Volts (222 counts)	Cold Start Run Time - Table value in seconds based on Powerup Coolant Temperature. ***Run Test*** TP sensor DTC's not active Throttle Position ≤ .4% when Engine speed is ≤ 1200 RPM **or** Throttle Position is ≤ 19.9% when Engine speed is > 1200 RPM	40 test failures within a 100 test sample. Time necessary to complete sample is based on engine speed. At 1600 RPM, the time would be 938 ms Continuous	DTC Type A

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Intake Air Temp. Sensor Circuit -Low Input	P0112	.24V to 5.0V The DTC detects a continuous short to ground in the IAT signal circuit or the IAT sensor	**Low Resistance pull-up** Raw IAT < 0.82 Volts **High Resistance pull-up** Raw IAT < 0.07 Volts	VS sensor DTC's not active Vehicle speed ≥ 2 mph Engine run time > 100 seconds	40 test failures within a 100 test sample Time necessary to complete sample: 12.5 sec Continuous	DTC Type A
Intake Air Temp. Sensor Circuit - High Input	P0113	.24V to 5.0V The DTC detects a continuous open or short to high in the IAT signal circuit or the IAT sensor	**Low Resistance pull-up** Raw IAT > 5.0 Volts **High Resistance pull-up** Raw IAT > 4.9 Volts	ECT sensor DTC's not active VS sensor DTC's not active MAF sensor DTC's not active Vehicle speed < 2 mph Mass Air flow < 250 g /s Coolant Temperature > 84.7°C Engine run time > 100 seconds	40 test failures within a 100 test sample Time necessary to complete sample: 12.5 sec Continuous	DTC Type A
Engine Coolant Temp. Sensor Circuit-Low Input	P0117	.24V to 5.0V The DTC detects a continuous short to ground in the ECT signal circuit or the ECT sensor	**Low Resistance pull-up** Raw ECT < .78 Volts **High Resistance pull-up** Raw ECT < .078 Volts	Engine run time > 5 seconds	40 test failures within a 100 test sample Time necessary to complete sample: 50 sec Continuous	DTC Type A
Engine Coolant Temp. Sensor Circuit-High Input	P0118	.24V to 5.0V The DTC detects a continuous short to high or open in the ECT signal circuit or the ECT sensor	**Low Resistance pull-up** Raw ECT > 5.0 Volts **High Resistance pull-up** Raw ECT > 4.9 Volts	Engine run time > 5 seconds	40 test failures within a 100 test sample Time necessary to complete sample: 50 sec Continuous	DTC Type A

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Throttle Position Sensor Circuit Range/Rationality	P0121	.5V to 5.0V The DTC detects a "skewed" or stuck TP sensor	***Stuck high test:*** The last throttle position value is > predicted throttle position based on engine RPM. ***Stuck low test:*** The last throttle position value is < predicted throttle position based on engine RPM.	***Test Enable:*** No MAP DTC's active Engine running BARO not defaulted TP Δ < 2.0% ***Stuck high test:*** MAP < 50 kPa ***Stuck low test:*** Stuck high test has passed MAP > 60 kPa	***Stuck high test:*** 50 test failures within a 100 test sample ***Stuck low test:*** 50 test failures within a 100 test sample Time necessary to complete each sample: 50 sec Continuous	DTC Type B
Throttle Position Sensor Circuit-Low Input	P0122	.5V to 5.0V This DTC detects a continuous short to low or open in either the signal circuit or the TP sensor.	TP sensor signal voltage < .15 volts (8 counts)	Engine running	40 consecutive test failures within a 100 test sample Time necessary to complete sample: 1 sec Continuous	DTC Type A
Throttle Position Sensor Circuit-High Input	P0123	.5V to 5.0V This DTC detects a continuous short to high in either the signal circuit or the TP sensor.	TP sensor signal voltage > 4.9 volts (249 counts)	Engine running	40 consecutive test failures within a 100 test sample Time necessary to complete sample: 1 sec Continuous	DTC Type A
Min. Cool. Temp. to Allow C.L. Op. Not Achieved Without Excess. Time	P0125	.24V to 5.0V The DTC detects if a stabilized minimum closed-loop is reached and maintained after engine start-up.	Minimum stabilized ECT < 45°C after 300 seconds. Minimum stabilized ECT < 45°C after 240 seconds.	***Diagnostic Enable*** Engine running IAT> - 7°C ECT > - 9°C Start-up ECT $\leq$ 40°C *Closed Loop Test:* For a vehicle saturated between -7°C (20°F) and 10°C (50°F) Accumulated air flow since start > 5500 grams Accumulated Idle time < 225 seconds For a vehicle saturated at 10°C (50°F) Accumulated air flow since start > 5000 grams **Accumulated Idle time < 180 seconds**	10 consecutive test failures Continuous	DTC Type B

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O2S Circuit-Low Voltage (Bank 1, Sensor 1)	P0131	.1V to 1.0V This DTC determines if the O2 sensor or circuit is shorted to low by checking for a lean condition during steady state throttle and during power enrichment (PE).	***Lean test:*** O2 sensor voltage < 86 mV or ***PE Lean Test:*** O2 sensor voltage < 598 mV	***O2 Diagnostic Enable****: (the following criteria must be met to enable the O2 lean tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Test Enable (Lean test):*** Closed loop low MAP not active Closed loop Air/Fuel ratio ≥ 14.5 but ≤ 14.8 Throttle position > 3.5% but < 99% Above met for 5 seconds ***Test Enable (PE Lean test):*** Closed loop Power Enrichment mode active High speed fuel cutoff not active Time elapsed since test enable ≥ 1 sec.	***Lean Test:*** 400 test failures in a 500 test sample Time necessary to complete sample: 50 sec Continuous or ***PE Lean Test***: 100 test failures in a 200 test sample. Time necessary to complete sample: 20 sec	DTC Type A
O2S Circuit-High Voltage (Bank 1, Sensor 1)	P0132	.1V to 1.0V This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle and Decel fuel cutoff (DFCO)	***RichTest:*** O2 sensor voltage > 950mV or ***DFCO Rich Test:*** O2 sensor voltage > 468 mV	***O2 Diagnostic Enable****: (the following criteria must be met to enable the O2 rich tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Test Enable (Rich Test):*** Closed loop Air/Fuel ratio ≥ 14.5 but ≤ 14.8 Throttle position > 0% but < 50% Above met for 5 seconds ***Test Enable (DFCO Rich Test):*** Decel Fuel Cutoff mode active Closed loop Time elapsed since test enable ≥ 2 sec.	***Rich Test:*** 400 test failures in a 500 test sample Time necessary to complete sample: 50 sec Continuous or ***DFCO Rich Test:*** 100 test failures in a 200 test sample Time necessary to complete sample: 20 sec	DTC Type A

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O2S Circuit-Slow Response (Bank 1, Sensor 1)	P0133	.1V to 1.0V This DTC determines if the O2 sensor functioning properly by checking its response time.	O2 sensor average transition time: L/R > 125 millisec. R/L > 125 millisec. **O2 voltage < 300 mV = lean* **O2 voltage > 600 mV = rich*	***O2 Diagnostic Enable**: (the following criteria must be met to enable the O2 Response tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Response Test Enable:*** Closed loop low MAP not active DTC's P0131, P0132, P0134 and P0135 not active Closed loop ECT > 57°C Engine run time > 75 seconds Air flow ≥ 15 g/s but ≤ 55 g/s Engine speed ≥ 1100 rpm but ≤ 3000 rpm Canister Purge Duty Cycle ≥ 0% Above present for > 2 seconds	100 seconds after closed loop enable Once per ignition cycle	DTC Type B
O2S Circuit- No Activity Detected (Bank 1,Sensor 1)	P0134	.1V to 1.0V This DTC determines if the O2 sensor or the O2 sensor circuit has developed an open.	O2 sensor > 350 mV but < 550 mV	***O2 Diagnostic Enable**: (the following criteria must be met to enable the O2 open test)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts Engine Run Time ≥ 120 seconds ***O2 Sensor Temperature Test:*** Engine Running Not in DFCO ECT ≥ 80°C Air Flow ≥ 15 g/s ***O2 Sensor Open Test Enable:*** O2 Sensor Temperature Test = True DTC P0135 not active	400 test failures with in a 500 test sample Time necessary to complete sample: 50 sec Continuous	DTC Type A

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O2S Heater Circuit Malfunction (Bank 1, Sensor 1)	P0135	11.5V to 14.5V This 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 ± .150V from the mean O2 bias voltage. *Time based on table: Time Vs Average Air Flow	System Voltage > 9V but < 17V *(NOTE: If voltage remains outside this window for 4 consecutive seconds, the test is void for this cold start.)* Air Flow < 45 g/sec Engine run time > 2 seconds ECT < 32°C IAT < 32°C Δ ECT-IAT ≤ 8°C	From cold start to a maximum time of 105 seconds. *Time determined by table.	DTC Type B
O2S Circuit-Low Voltage (Bank 1, Sensor 2)	P0137	.1V to 1.0V This DTC determines if the O2 sensor or circuit is shorted to low by checking for a lean condition during steady state throttle and during power enrichment (PE).	***Lean test:*** O2 sensor voltage < 17 mV or ***PE Lean Test:*** O2 sensor voltage < 399 mV	***O2 Diagnostic Enable***: *(the following criteria must be met to enable the O2 lean tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Test Enable (Lean test):*** Closed loop low MAP not active Closed loop Air/Fuel ratio ≥ 14.5 but ≤ 14.8 Throttle position > 3.5% but < 99% Above met for 5 seconds ***Test Enable (PE Lean test):*** Closed loop Power Enrichment mode active High speed fuel cutoff not active Time elapsed since test enable ≥ 2 sec.	***Lean Test:*** 800 test failures in a 1000 test sample Time necessary to complete sample: 100 sec Continuous or ***PE Lean Test***: 100 test failures in a 200 test sample. Time necessary to complete sample: 20 sec	DTC Type B

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O2S Circuit-High Voltage (Bank 1, Sensor 2)	P0138	.1V to 1.0V This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle and Decel fuel cutoff (DFCO)	***Rich Test:*** O2 sensor voltage > 976 mV or ***DFCO Rich Test:*** O2 sensor voltage > 468 mV	***O2 Diagnostic Enable****: (the following criteria must be met to enable the O2 rich tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Test Enable (Rich Test):*** Closed loop Air/Fuel ratio ≥ 14.5 but ≤ 14.8 Throttle position > 0% but < 50% Above met for 5 seconds ***Test Enable (DFCO Rich Test):*** Decel Fuel Cutoff mode active Closed loop Time elapsed since test enable ≥ 2 sec.	***Rich Test:*** 800 test failures in a 1000 test sample Time necessary to complete sample: 100 sec Continuous or ***DFCO Rich Test:*** 100 test failures in a 200 test sample Time necessary to complete sample: 20 sec	DTC Type B
O2S Circuit- No Activity Detected (Bank 1,Sensor 2)	P0140	.1V to 1.0V This DTC determines if the O2 sensor or the O2 sensor circuit has developed an open.	O2 sensor > 399 mV but < 468 mV	***O2 Diagnostic Enable****: (the following criteria must be met to enable the O2 open test)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts Engine Run Time ≥ 120 seconds ***O2 Sensor Temperature Test:*** Engine Running Not in DFCO ECT ≥ 80°C Air Flow ≥ 15 g/s ***O2 Sensor Open Test Enable:*** O2 Sensor Temperature Test = True DTC P0141 not active Closed Loop	800 test failures with in a 1000 test sample Time necessary to complete sample: 100 sec Continuous	DTC Type B

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O2S Heater Circuit Malfunction (Bank 1, Sensor 2)	P0141	11.5V to 14.5V This 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 ± .150V from the mean O2 bias voltage. *Time based on table: Time Vs Average Air Flow	System Voltage > 9V but < 17V *(NOTE: If voltage remains outside this window for 4 consecutive seconds, the test is void for this cold start.)* Air Flow < 45 g/sec Engine run time > 2 seconds ECT < 32°C IAT < 32°C Δ ECT-IAT ≤ 8°C	From cold start to a maximum time of 150 seconds. *Time determined by table.	DTC Type B
O2S Circuit-Low Voltage (Bank 2, Sensor 1)	P0151	.1V to 1.0V This DTC determines if the O2 sensor or circuit is shorted to low by checking for a lean condition during steady state throttle and during power enrichment (PE).	***Lean test:*** O2 sensor voltage < 86 mV or ***PE Lean Test:*** O2 sensor voltage < 598 mV	***O2 Diagnostic Enable***: *(the following criteria must be met to enable the O2 lean tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Test Enable (Lean test):*** Closed loop low MAP not active Closed loop Air/Fuel ratio ≥ 14.5 but ≤ 14.8 Throttle position > 3.5% but < 99% Above met for 5 seconds ***Test Enable (PE Lean test):*** Closed loop Power Enrichment mode active High speed fuel cutoff not active Time elapsed since test enable ≥ 1 sec.	***Lean Test:*** 400 test failures in a 500 test sample Time necessary to complete sample: 50 sec Continuous or ***PE Lean Test***: 100 test failures in a 200 test sample. Time necessary to complete sample: 20 sec	DTC Type A

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O2S Circuit-High Voltage (Bank 2, Sensor 1)	P0152	.1V to 1.0V This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle and Decel fuel cutoff (DFCO)	***RichTest:*** O2 sensor voltage > 950 mV or ***DFCO Rich Test:*** O2 sensor voltage > 468 mV	***O2 Diagnostic Enable****: (the following criteria must be met to enable the O2 rich tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Test Enable (Rich Test):*** Closed loop Air/Fuel ratio ≥ 14.5 but ≤ 14.8 Throttle position > 0% but < 50% Above met for 5 seconds ***Test Enable (DFCO Rich Test):*** Decel Fuel Cutoff mode active Closed loop Time elapsed since test enable ≥ 2 sec.	***Rich Test:*** 400 test failures in a 500 test sample Time necessary to complete sample: 50 sec Continuous or ***DFCO Rich Test:*** 100 test failures in a 200 test sample Time necessary to complete sample: 20 sec	DTC Type A
O2S Circuit- Slow Response (Bank 2, Sensor 1)	P0153	.1V to 1.0V This DTC determines if the O2 sensor functioning properly by checking its response time.	O2 sensor average transition time: L/R > 125 millisec. R/L > 125 millisec. **O2 voltage < 300 mV = lean* **O2 voltage > 600 mV = rich*	***O2 Diagnostic Enable****: (the following criteria must be met to enable the O2 Response tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Response Test Enable:*** Closed loop low MAP not active DTC's P0131, P0132, P0134 and P0135 not active Closed loop ECT > 57°C Engine run time > 75 seconds Air flow ≥ 15 g/s but ≤ 55 g/s Engine speed ≥ 1100 rpm but ≤ 3000 rpm Canister Purge Duty Cycle ≥ 0% Above present for > 2 seconds	100 seconds after closed loop enable Once per ignition cycle	DTC Type B

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O2S Circuit- No Activity Detected (Bank 2,Sensor 1)	P0154	.1V to 1.0V This DTC determines if the O2 sensor or the O2 sensor circuit has developed an open.	O2 sensor > 350 mV but < 550 mV	***O2 Diagnostic Enable**: (the following criteria must be met to enable the O2 open test)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts Engine Run Time ≥ 120 seconds ***O2 Sensor Temperature Test:*** Engine Running Not in DFCO ECT ≥ 80°C Air Flow ≥ 15 g/s ***O2 Sensor Open Test Enable:*** O2 Sensor Temperature Test = True DTC P0147 not active	400 test failures with in a 500 test sample Time necessary to complete sample: 50 sec Continuous	DTC Type A
O2S Heater Circuit Malfunction (Bank 2, Sensor 1)	P0155	11.5V to 14.5V This 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 ± .150V from the mean O2 bias voltage. *Time based on table: Time Vs Average Air Flow	System Voltage > 9V but < 17V *NOTE: If voltage remains outside this window for 4 consecutive seconds, the test is void for this cold start.)* Air Flow < 45 g/sec Engine run time > 2 seconds ECT < 32°C IAT < 32°C Δ ECT-IAT ≤ 8°C	From cold start to a maximum time of 105 seconds. *Time determined by table.	DTC Type B

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O2S Circuit-Low Voltage (Bank 2, Sensor 2)	P0157	.1V to 1.0V This DTC determines if the O2 sensor or circuit is shorted to low by checking for a lean condition during steady state throttle and during power enrichment (PE).	***Lean test:*** O2 sensor voltage < 17 mV or ***PE Lean Test:*** O2 sensor voltage < 399 mV	***O2 Diagnostic Enable****: (the following criteria must be met to enable the O2 lean tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Test Enable (Lean test):*** Closed loop low MAP not active Closed loop Air/Fuel ratio ≥ 14.5 but ≤ 14.8 Throttle position > 5% but < 99% Above met for 5 seconds ***Test Enable (PE Lean test):*** Closed loop Power Enrichment mode active High speed fuel cutoff not active Time elapsed since test enable ≥ 2sec.	***Lean Test:*** 800 test failures in a 1000 test sample Time necessary to complete sample: 100 sec Continuous or ***PE Lean Test***: 100 test failures in a 200 test sample. Time necessary to complete sample: 20 sec	DTC Type B
O2S Circuit-High Voltage (Bank 2, Sensor 2)	P0158	.1V to 1.0V This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle and Decel fuel cutoff (DFCO)	***Rich Test:*** O2 sensor voltage > 976 mV or ***DFCO Rich Test:*** O2 sensor voltage > 468 mV	***O2 Diagnostic Enable****: (the following criteria must be met to enable the O2 rich tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Test Enable (Rich Test):*** Closed loop Air/Fuel ratio ≥ 14.5 but ≤ 14.8 Throttle position > 5% but < 99% Above met for 5 seconds ***Test Enable (DFCO Rich Test):*** Decel Fuel Cutoff mode active Closed loop Time elapsed since test enable ≥ 2 sec.	***Rich Test:*** 800 test failures in a 1000 test sample Time necessary to complete sample: 100 sec Continuous or ***DFCO Rich Test:*** 100 test failures in a 200 test sample Time necessary to complete sample: 20 sec	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Circuit- No Activity Detected (Bank 2,Sensor 2)	P0160	.1V to 1.0V This DTC determines if the O2 sensor or the O2 sensor circuit has developed an open.	O2 sensor > 399 mV but < 468 mV	***O2 Diagnostic Enable**: (the following criteria must be met to enable the O2 open test)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts Engine Run Time ≥ 120 seconds ***O2 Sensor Temperature Test:*** Engine Running Not in DFCO ECT ≥ 80°C Air Flow ≥ 15 g/s ***O2 Sensor Open Test Enable:*** O2 Sensor Temperature Test = True DTC P0155 not active Closed Loop	800 test failures with in a 1000 test sample Time necessary to complete sample: 100 sec Continuous	DTC Type B
O2S Heater Circuit Malfunction (Bank 2, Sensor 2)	P0161	11.5V to 14.5V This 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 ± .150V from the mean O2 bias voltage. *Time based on table: Time Vs Average Air Flow	System Voltage > 9V but < 17V *(NOTE: If voltage remains outside this window for 4 consecutive seconds, the test is void for this cold start.)* Air Flow < 27 g/sec Engine run time > 2 seconds ECT < 32°C IAT < 32°C Δ ECT-IAT ≤ 8°C	From cold start to a maximum time of 150 seconds. *Time determined by table.	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
System Too Lean (Bank 1)	P0171	Determines if the system is in a lean condition.	The average of short term fuel trim samples ≥ 1.0 and The average of adaptive index multiplier samples ≥ 1.23	***Test Enable:*** IAC / Idle DTC's not active O2 sensor DTC's not active TP sensor DTC's not active MAP DTC's not active EGR DTC's not active Evap. DTC's not active ECT DTC's not active MAF DTC's not active IAT DTC's not active VS sensor DTC's not active Misfire DTC's not active Throttle position < 69.9% Engine speed > 525 rpm but < 4500 rpm Baro > 70 kPa (10,300 ft) ECT > 0°C but < 99.7°C MAP > 20 kPa but < 98.9 kPa IAT > -20 °C but < 80°C Air flow > 3 g/s < 200 g/s Vehicle speed < 85 mph	If lean counter is ≥ 6 counts 1 count ≅ 200 ms Continuous	DTC Type B
System Too Rich (Bank 1)	P0172	Determines if the system is in a rich condition.	The average of short term fuel trim samples ≤ 1.0 and If adaptive lag factor < 0.84, then purge valve is commanded closed. If the integrator exceeds 1.0 within 5 seconds, the diagnostic is turned OFF for 300 seconds to enable the Evap. canister to purge. If the integrator does not exceed 1.0 within 10 seconds, a fault is present.	***Test Enable:*** IAC / Idle DTC's not active O2 sensor DTC's not active TP sensor DTC's not active MAP DTC's not active EGR DTC's not active Evap. DTC's not active ECT DTC's not active MAF DTC's not active IAT DTC's not active VS sensor DTC's not active Misfire DTC's not active Throttle position < 69.9% Engine speed > 525 rpm but < 4500 rpm Baro > 70 kPa (10,300 ft) ECT > 0°C but < 99.7°C MAP > 20 kPa but < 98.9 kPa IAT > -20 °C but < 80°C Air flow > 3 g/s < 200 g/s Vehicle speed < 85 mph	If rich counter is ≥ 6 counts 1 count ≅ 200 ms Continuous	DTC Type B

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System Too Lean (Bank 2)	P0174	Determines if the system is in a lean condition.	The average of short term fuel trim samples ≥ 1.0 and The average of adaptive index multiplier samples ≥ 1.23	***Test Enable:*** IAC / Idle DTC's not active O2 sensor DTC's not active TP sensor DTC's not active MAP DTC's not active EGR DTC's not active Evap. DTC's not active ECT DTC's not active MAF DTC's not active IAT DTC's not active VS sensor DTC's not active Misfire DTC's not active Throttle position < 69.9% Engine speed > 525 rpm but < 4500 rpm Baro > 70 kPa (10,300 ft) ECT > 60°C but < 99.7°C MAP > 20 kPa but < 98.9 kPa IAT > -20 °C but < 80°C Air flow > 3 g/s < 200 g/s Vehicle speed < 85 mph	If lean counter is ≥ 6 counts 1 count ≅ 200 ms Continuous	DTC Type B
System Too Rich (Bank 2)	P0175	Determines if the system is in a rich condition.	The average of short term fuel trim samples ≤ 1.0 and If adaptive lag factor < 0.84, then purge valve is commanded closed. If the integrator exceeds 1.0 within 5 seconds, the diagnostic is turned OFF for 300 seconds to enable the Evap. canister to purge. If the integrator does not exceed 1.0 within 10 seconds, a fault is present	***Test Enable:*** IAC / Idle DTC's not active O2 sensor DTC's not active TP sensor DTC's not active MAP DTC's not active EGR DTC's not active Evap. DTC's not active ECT DTC's not active MAF DTC's not active IAT DTC's not active VS sensor DTC's not active Misfire DTC's not active Throttle position < 69.9% Engine speed > 525 rpm but < 4500 rpm Baro > 70 kPa (10,300 ft) ECT > 60°C but < 99.7°C MAP > 20 kPa but < 98.9 kPa IAT > -20 °C but < 80°C Air flow > 3 g/s < 200g/s Vehicle speed < 85 mph	If rich counter is ≥ 6 counts 1 count ≅ 200 ms Continuous	DTC Type B

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Random Misfire Detected	P0300	This DTC will determine if a misfire is occurring on all cylinders in the engine. If a misfire is occurring on only one cylinder, then a single cylinder misfire is occurring and the corresponding cylinder specific DTC will be activated by the executive.	Deceleration index Vs Engine Speed Vs Load and Camshaft Position FTP Threshold - 1.85% I/M Threshold - 1.85% Catalyst Damage - see speed/load chart	***TEST Enable:*** If start up ECT below -7 C then MFD delayed until ECT is above 21 C. If start upECT ≥is above -7° C then MFT begins after 5 seconds Fuel Level > 10% System voltage ≥ 11 volts but ≤ 16 volts Engine speed ≥ 450 RPM but ≤ 5000 RPM Vehicle speed DTC nt active TP sensor DTC's not active MAF sensor DTC's not active Camshaft position sensor DTC's not active Crank sensor DTC's not active + Throttle position Δ < 1.9%/100ms - Throttle position Δ < 1.9%/100ms	Emission Level 10 failed 200 revolution blocks out of 16 Catalyst Damaging Level 4 failed 200 revolution block out of 16 Continuous	DTC Type B *EMISSION* DTC Type A *CATALYST DAMAGING*
Knock Sensor 1 Circuit Malfunction	P0325	0V - 5V This diagnostic will detect excessive noise on the knock sensor circuit.	***SNEF STUCK LOW TEST:*** Knock is detected for excessive amount of time.	***SNEF STUCK LOW TEST:*** DTC P0327 not active Engine Run Time ≥ 120 seconds System voltage > 10V but ≤ 17.1V	***SNEF STUCK LOW TEST:*** 10 test failures within a 100 test sample. Time necessary to complete sample: 50 sec	DTC Type B
Knock Sensor 1 Circuit - Low Input	P0327	0V - 5V This diagnostic will detect a lack of noise on the knock sensor circuit.	***KNOCK SENSOR UPDATE TEST*** Learned Minimum noise Value updated with the filtered value every 50 msec. ***ACTIVE NOISE CHANNEL TEST:*** Knock sensor noise ≤ 25 A/D counts or > 255 A/D counts. (ESC noise - Minimum Noise Value)	***KNOCK SENSOR UPDATE TEST:*** Timing retard ≤ 0 ° System voltage > 10V but ≤ 17.1V ECT ≥ 60° C Engine Run Time ≥ 120 seconds Engine speed > 525 RPM but ≤ 750 RPM ***ACTIVE NOISE CHANNEL TEST:*** ECT DTC's not active TP sensor DTC's not active Knock sensor update test complete ECT ≥ 60° C Engine speed > 2000 RPM but ≤ 10000 RPM Throttle position ≥ 5.8% Engine run time ≥ 120 seconds System voltage > 10V but ≤ 17.1V Timing retard ≤ 0°	***ACTIVE NOISE CHANNEL TEST:*** Noise counter ≥ 100 counts. 1 count ≅ 100 ms	DTC Type B

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Crankshaft Position Sensor Circuit- Range	P0336	4X Signal This diagnostic will detect a loss of crank sensor signal or long time constant intermittent that would result in a " no start" condition.	Crank Position Sensor Signal missing for a time ≥ .5 seconds.	Engine Cranking 4 or more Cam Shaft Position Signals Present	≥ 3 seconds During engine crank.	DTC Type A
Crankshaft Position Sensor Circuit- Low Input	P0337	4X Signal This diagnostic will detect a low duty cycle from the crankshaft position sensor.	Crank sensor duty cycle < 50% (or the ratio High Ref/Low Ref < .1875)	Engine speed < 4000 RPM Air Flow ≥ 5 g/second	15 Ref pulse failures within a 20 sample limit. Time necessary to complete sample: Varies with engine speed Once every TDC	DTC Type B
Crankshaft Position Sensor Circuit- Intermittent Input	P0339	4X Signal This diagnostic will detect an intermittent crankshaft position signal.	The calculated instantaneous engine speed Δ ≥ 1000 RPM or The calculated instantaneous engine speed = 0 RPM and 4 or more cam cycles have occurred for a period of 1 count (2 to 3 seconds)	Air Flow ≥ 5 g/second	10 test failures within a 500 sample limit. Time necessary to complete sample: 6.25 sec	DTC Type B
Camshaft Position Sensor Circuit Malfunction	P0340	1X Signal This diagnostic will detect if the Cam Sensor signal is present.	Cam Sensor reference pulse is not seen once every 8 cylinders .	Engine Running	If Cam signal is not detected within 1.75 seconds, test has failed. Once every TDC	DTC Type B
Camshaft Position Sensor Circuit Range/Rationality	P0341	1X Signal This diagnostic will determine if the Cam Sensor is synchronized correctly.	Cam Sensor reference pulse is not detected at the correct interval every 8 cylinders.	Engine Running	40 failed tests within a 100 test sample. Time necessary to complete sample: Varies with engine speed Once every TDC	DTC Type B

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Exhaust Gas Recirculation - Insufficient Flow Detected	P0401	This diagnostic will determine if there is a reduction in EGR flow.	With EGR valve open, the peak + MAP Δ is monitored over a time of 2.6 seconds. This value is compared with a threshold from Engine Speed Vs Baro table and the difference computed. 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*** TP sensor DTC's not active MAP DTC's not active VS sensor DTC's not active IAT sensor DTC's not active ECT sensor DTC's not active IAC DTC's not active Linear EGR Pintle Position DTC not active Misfire DTC's not active ECT > 50.2° C Baro > 75 kPa (10,300 ft) Vehicle Speed > 15 mph IAC Δ < 5 counts AC clutch status is unchanged Transmission status is unchanged Engine run time > 120 seconds ***Start Test*** Throttle Position > 4% but < 30% Throttle Position Δ < 2% EGR Position > 15% Engine Speed > 1200 rpm but < 2200 rpm MAP Δ < 1 A/D count (.39 kPa) Compensated MAP > 40 kPa but < 60 kPa No change in DFCO state ***Run Test*** Stabilized MAP (valve closed) recorded and EGR valve "ramped" open over a time interval and peak MAP value recorded and MAP Δ computed. EGR valve closed	2.6 seconds Twice per trip	DTC Type A
EGR Valve Open Pintle Position Error	P0404	Position error too high	***Deviation between actual and desired position > 20% when position is < 70% or deviation is > 30% when desired position is > 70% for 10 seconds***	Ignition voltage >9V	Continuous	DTC Type B
EGR Sensor Signal Low	P0405	Open / Short	***Pintle position <6 A/D counts for 2 seconds***	Ignition voltage > 9V	Continuous	DTC Type B

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Secondary Air Injection System Malfunction ①	P0410	This diagnostic will determine if the secondary air injection system is functioning properly by monitoring O2 sensor voltage and short term fuel trim on both banks 1 and 2 when the air pump is turned on.	***AIR Passive Test 1*** AIR pump ON A/F Ratio ≥ 12:1 Startup ECT ≤ 56.25 °C Hot/Cold Rich time ratio ≥ .39 OR Hot/Cold Lean time < .60 ***AIR Passive Test 2*** AIR Passive test 1 has not run or failed. AIR Pump is ON O2 sensor #1 ≥ 451 mV for a time ≥ 5 seconds ***AIR Active Test*** AIR Passive Test 1 and 2 have failed. AIR Pump ON O2 sensor voltage < 299 Mv OR Integrator Δ < .06 *Above tests are run on both banks 1 and 2.	***AIR Passive Test Enable*** ECT DTC's not active IAC DTC's not active O2 sensor DTC's not active Misfire DTC's not active MAP sensor DTC's not active Fuel Trim DTC's not active Evap DTC's not active TP sensor DTC's not active IAT DTC's not active MAF DTC's not active System Voltage ≥ 1oV for a period > 3 seconds IAT > 0° C Engine run time > 3 seconds ***AIR Active Test Enable*** AIR Passive test failed ECT DTC's not active IAC DTC's not active O2 sensor DTC's not active Misfire DTC's not active MAP sensor DTC's not active Fuel Trim DTC's not active Evap DTC's not active TP sensor DTC's not active IAT DTC's not active MAF DTC's not active Power enrichment not active Decel fuel cutoff not active Air/Fuel Ratio =14.7:1 Engine speed ≥ 550 RPM Closed loop for a period > 15 seconds Engine load < 50% MAF ≤ 100 g/second System voltage ≥ 10V ECT ≥ 75°C but ≤ 105°C IAT > 0°C Integrator > .95 but < 1.0 for 3 seconds	***AIR Passive Test 1*** **Cold test** is run for 30 seconds **Hot test** is run for 10 seconds ***AIR Passive Test 2*** ≥ 15 seconds ***AIR Active Test*** > 3.5 seconds Once per ignition cycle	DTC Type B

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Catalyst System Efficiency Below Threshold - (Bank 1)	P0420	This diagnostic will determine the efficiency of the catalytic converter.	Deviation Difference Average =8 mV from O2 sensor (Bank1,Sensor 1)	***Converter Warm Up Status*** Engine in closed loop Commanded Air/Fuel ratio = 14.7:1 Air flow > 15 g/sec Predicted catalyst warm up temperature >450°C ***Test Enable*** Converter Warm Up Test Passed IAT ≥ -9.75° C ECT > 75° C Air Flow > 15 g/sec but ≤ 50 g/sec Δ engine load ≤ 8.9% Vehicle Speed ≥ 20 mph but ≤ 85 mph(≥ 0 mph with scan tool installed) Engine air load ≤ 99% Engine speed ≤ 4700 rpm Throttle Position ≥ 1.9% VS sensor DTC's not active TP sensor DTC's not active O2 sensor DTC's not active Misfire DTC's not active MAP sensor DTC's not active Fuel Trim DTC's not active IAT sensor DTC's not active MAF DTC's not active	50 tests per trip Time necessary to complete sample: 173 sec Continuous	DTC Type A
Catalyst System Efficiency Below Threshold - (Bank 2)	P0430	This diagnostic will determine the efficiency of the catalytic converter.	Deviation Difference Average =8 mV from O2 sensor (Bank2,Sensor 1)	***Converter Warm Up Status*** Engine in closed loop Commanded Air/Fuel ratio = 14.7:1 Air flow > 15 g/sec Predicted catalyst warm up temperature >450°C ***Test Enable*** Converter Warm Up Test Passed IAT ≥ -9.75° C ECT > 75° C Air Flow > 15 g/sec but ≤ 50 g/sec Δ engine load ≤ 8.9% Vehicle Speed ≥ 20 mph but ≤ 85 mph(≥ 0 mph with scan tool installed) Engine air load ≤ 99% Engine speed ≤ 4700 rpm Throttle Position ≥ 1.9% VS sensor DTC's not active TP sensor DTC's not active O2 sensor DTC's not active Misfire DTC's not active MAP sensor DTC's not active Fuel Trim DTC's not active IAT sensor DTC's not active MAF DTC's not active	50 tests per trip Time necessary to complete sample: 173 sec Continuous	DTC Type A

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Evap. Emission Control System Malfunction	P0440	0.1 V - 4.98V This DTC will detect a weak vacuum condition (large leak or restriction) in the Evap. system.	***WEAK VACUUM TEST- STAGE I (Cold Test):*** Tank Vac. < 13 or 9 in. H_2O ***depending on application*** ***WEAK VACUUM TEST- STAGE II (Warm Test):*** Stage I test failed previous trip and this trip. Tank Vac. < 11 in. H_2O OR If HC vapor is not present and the SMALL LEAK TEST has failed.	***TEST ENABLE :*** MAP DTC's not active TP Sensor DTC's not active VS Sensor DTC's not active O2 Sensor DTC's not active ECT Sensor DTC's not active DTC P0125 not active IAT Sensor DTC's not active Fuel Level >12.5% but < 87.5% Powerup Vacuum Test Fail = False System Voltage > 10V but < 17V ***COLD START TEST:*** ECT > 3.75°C but < 30° C IAT > 3.75°C but < 30° C Cold Temperature Δ (ECT - IAT): < 1.5°C if IAT > ECT < 8.25 °C if ECT > IAT Baro > 72.5 kPa Fuel Level Input = True Fuel Level Present Test = True	***WEAK VACUUM TEST- STAGE I (Cold Test):*** Fault present for a time ≥ 30 , 50 or 80 depending on application sec. (Vac. Weighted) ***WEAK VACUUM TEST- STAGE II (Warm Test):*** Fault present for a time ≥ 1400 sec. Once per cold start	DTC Type A (Behaves as a Type B)

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Evap. Emission Control System Leak Detected (Small Leak)	P0442	0.1 V - 4.98V This DTC will detect a small leak in the Evap. system between the fuel fill cap and up to but not including the purge solenoid.	***SMALL LEAK TEST FAIL:*** Vacuum < 7 , 9 or 11" H_2O for a time < 25,30 or 35 sec. Depending on application Vacuum Decay (determined by fuel level and intake temperature) ≥ a value determined by Start Vacuum minus Tank Vacuum for a period ≥ 15 or 12 seconds. Vacuum > 0.1 in. H_2O for a time ≤ 35 , 50,60,80,85seconds. depending on application	***TEST ENABLE :*** MAP DTC's not active TP Sensor DTC's not active VS Sensor DTC's not active O2 Sensor DTC's not active ECT Sensor DTC's not active DTC P0125 not active IAT Sensor DTC's not active Fuel Level >12.5% but < 87.5% ***COLD START TEST:*** ECT > 3.75°C but < 30° C IAT > 3.75°C but < 30° C Cold Temperature Δ (ECT - IAT): < 1.5°C if IAT > ECT < 8.25 °C if ECT > IAT Baro > 72.5 kPa Fuel Level Input = True Fuel Level Present Test = True ***FUEL SLOSH TEST:*** Tank Vacuum Δ ≤ 0.6 in. H_2O OR Fuel Level Δ ≤ 7.8% ***WEAK VACUUM TEST (Stage I)*** : Throttle position < 75% Vehicle speed < 65 mph Tank Vacuum ≥ 9 ,11,13in. H_2O within 30,50,80 dending on app. seconds.	Vacuum Decay ≥ 12 or 15 seconds Once per cold start	DTC Type A (Behaves as a Type B)

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Evap. Emission Control System Vent Control Malfunction	P0446	This DTC will determine if a restriction is present in the vent solenoid, vent filter, vent hose or canister.	***EXCESS VACUUM TEST - STAGE I :*** Vent solenoid **commanded** OPEN Fuel Tank Vacuum ≥ 7 in. H_2O for 2 s econds(monitored during initial purge ramp) **OR** ***EXCESS VACUUM TEST - STAGE II :*** Vent solenoid **commanded** OPEN during normal purge. Fuel Tank Vacuum ≥ 12.9 in. H_2O for a time ≥ 4 seconds	***TEST ENABLE :*** MAP DTC's not active TP Sensor DTC's not active VS Sensor DTC's not active O2 Sensor DTC's not active ECT Sensor DTC's not active DTC P0125 not active IAT Sensor DTC's not active Fuel Level >12.5% but < 87.5% System Voltage > 10V but < 17V ***COLD START TEST:*** ECT > 3.75°C but < 30° C IAT > 3.75°C but < 30° C Cold Temperature Δ (ECT - IAT): < 1.5°C if IAT > ECT < 8.25 °C if ECT > IAT Baro > 72.5 kPa Fuel Level Input = True Fuel Level Present Test = True ***FUEL SLOSH TEST:*** Tank Vacuum Δ ≥ 0.6 in. H_2O OR Fuel Level Δ ≥ 7.8% ***PURGE HC PRESENT :*** Purge Closed Loop Multiplier ≥ 0.6 for a time ≤ a table value based on coolant temperature ***WEAK VACUUM TEST -Stage I***: Tank Vacuum ≥ 9 11 or 13in. H_2O within 30,50,80 seconds. depending on application	***EXCESS VACUUM TEST - STAGE II :*** 180 seconds Once per cold start at: • Powerup • Excess Vac. Stage I • Excess Vac. Stage II	DTC Type A
EVAP Fuel Tank Pressure Sensor Circuit Low Voltage	P0452	This DTC will detect a vacuum sensor stuck low	tank vacuum raw voltage < 0.1 volt for 5 seconds	***runs countiously after a 1 second delay for sensor warmup***		DTC Type B
EVAP Fuel Tank Pressure Sensor Circuit High Voltage	P0453	This DTC will detect a vacuum sensor stuck hi	tank vacuum raw voltage >4.98 volt for 5 seconds	***runs countiously after a 1 second delay for sensor warmup***		DTC Type B
Vehicle Speed (VS) Sensor Signal Missing	P0500	The DTC detects a missing speed signal between a combination of the rear and front speed sensors.	Vehicle Speed = 0 MPH	MAP sensor DTC's not active MAP < 20 kPa Coolant Temperature > 60° C Engine > 1400 RPM but < 4400 RPM Throttle Position < 3.125 %	Failing > 5 seconds Continuous	DTC Type A

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Idle Control System RPM Lower Than Expected	P0506	This DTC will determine if a low idle is the result of a IAC valve or circuit. A low idle is defined as 100 RPM below the desired idle.	Air flow Δ < 6 g/s	***Test Enable: (non - intrusive)*** TP sensor DTC's not active VS sensor DTC's not active ECT DTC's not active MAP DTC's not active Transmission DTC's not active PRNDL DTC's not active Misfire DTC's not active IAT DTC's not active MAF DTC's not active ECT > 50°C System Voltage > 10V but < 16 V IAT > -25°C Engine run time > 30 seconds Baro > 75 kPa (10000 ft) TP < 1% VS < 2 MPH Above met for a time > 3 seconds to enable diagnostic. If non-intrusive test fails, intrusive test is run. ***Run Test: (intrusive)*** Air Flow > 17.5 g/sec but < 50 g/sec VS > 25 MPH but < 85 MPH TP Δ < 1% Engine Speed Δ < 50 RPM IAC motor commanded 10 %/ 100 msec.	10 seconds Continuous after enable	DTC Type B

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Idle Control System RPM Higher Than Expected	P0507	This DTC will determine if a high idle is the result of a IAC valve or circuit. A high idle is defined as 150 RPM above the desired idle.	Air flow Δ < 6 g/s	***Test Enable: (non - intrusive)*** TP sensor DTC's not active VS sensor DTC's not active ECT DTC's not active MAP DTC's not active Transmission DTC's not active PRNDL DTC's not active Misfire DTC's not active IAT DTC's not active MAF DTC's not active ECT > 50°C System Voltage > 10V but < 16 V IAT > -25°C Engine run time > 30 seconds Baro > 75kPa (10000 ft) TP < 1% VS < 2 MPH Above met for a time > 3 seconds to enable diagnostic. If non-intrusive test fails, intrusive test is run. ***Run Test: (intrusive)*** Air Flow > 17.5 g/sec but < 50 g/sec VS > 25 MPH but < 85 MPH TP Δ < 1% Engine Speed Δ < 50 RPM IAC motor commanded 10 %/ 100 msec.	10 seconds Continuous after enable	DTC Type B
VCM Memory Error - Type 4 (Program Flash)	P0601	This diagnostic checksums the contents of flash EEPROM against the expected value.	The calculated checksum does not match the programmed value.	----------	Once per trip at controller initialization.	DTC Type A
VCM Memory Error - Not Programmed	P0602	This diagnostic checks the state of the Service Calibration Bit to determine if the controller needs to be programmed.	The Calibrated No Start For Service bit is true in the calibration.	----------	Once per trip at controller initialization.	DTC Type A
VCM Memory Error - Type 2 (Keep Alive)	P0603	This diagnostic checks that data stored to the Non-Volatile Keep Alive section of memory is stored correctly.	The data read from the memory location does not match the data that was just stored to that location.	----------	Continuous. On each memory data store as processor available time allows.	DTC Type A
VCM Memory Error - Type 1 (Volatile RAM)	P0604	This diagnostic checks that data stored to the Volatile section of memory is stored correctly.	The data read from the memory location does not match the data that was just stored to that location.	----------	Continuous. On each memory data store as processor available time allows.	DTC Type A

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
VCM Memory Error - Type 3 (Boot Flash)	P0605	This diagnostic checks that data stored to the Boot Flash section of memory is stored correctly.	The data read from the memory location does not match the data that was just stored to that location.	----------	Continuous. On each memory data store as processor available time allows.	DTC Type A
Transmission Clutch Switch Input Malfunction (Manual Trans. Only)	P0704	This DTC will determine if the Transmission Clutch Switch has failed but looking for a clutch transition within a range from 0 MPH to some higher speed.	No clutch transitions detected	VS sensor DTC's not active Vehicle Speed > 50 mph	1 consecutive test failures Time necessary to complete sample: 100 ms	DTC Type B
O2 Sys. Fault - Too Few O2S R/L or L/R Switches, Insufficient Activity (Bank 1, Sensor 1)	P1133	.1V to 1.0V This DTC determines if the O2 sensor functioning properly by monitoring the number of L/R and R/L switches.	Number of switches in 100 seconds: L/R switches < 50 R/L switches < 50	***O2 Diagnostic Enable***: *(the following criteria must be met to enable the O2 Response tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Response Test Enable:*** Closed loop low MAP not active DTC's P0131, P0132, P0134 and P0135 not active Closed loop ECT > 57°C Engine run time > 75 seconds Air flow ≥ 15 g/s but ≤ 55 g/s Engine speed ≥ 1100 rpm but ≤ 3000 rpm Canister Purge Duty Cycle ≥ 0% Above present for > 2 seconds	100 seconds after closed loop enable Once per key cycle	DTC Type B

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O2S Circuit - Transition Time Ratio Malfunction (Bank 1,Sensor 1)	P1134	.1V to 1.0V This DTC determines if the O2 sensor functioning properly by checking the ratio of average response time.	Ratio of average response times: Ratio > 4 or < 0 **O2 voltage < 300 mV = lean* **O2 voltage > 600 mV = rich*	***O2 Diagnostic Enable**: (the following criteria must be met to enable the O2 Response tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Response Test Enable:*** Closed loop low MAP not active DTC's P0131, P0132, P0134 and P0135 not active Closed loop ECT > 57°C Engine run time > 75 seconds Air flow ≥ 15 g/s but ≤ 55 g/s Engine speed ≥ 1100 rpm but ≤ 3000 rpm Canister Purge Duty Cycle ≥ 0% Above present for > 2 seconds	100 seconds after closed loop enable Once per ignition cycle	DTC Type B
O2 Sys. Fault - Too Few O2S R/L or L/R Switches, Insufficient Activity (Bank 2, Sensor 1)	P1153	.1V to 1.0V This DTC determines if the O2 sensor functioning properly by monitoring the number of L/R and R/L switches.	Number of switches in 100 seconds: L/R switches < 50 R/L switches < 50	***O2 Diagnostic Enable**: (the following criteria must be met to enable the O2 Response tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Response Test Enable:*** Closed loop low MAP not active DTC's P0151, P0152, P0154 and P0155 not active Closed loop ECT > 57°C Engine run time > 75 seconds Air flow ≥ 15 g/s but ≤ 55 g/s Engine speed ≥ 1100 rpm but ≤ 3000 rpm Canister Purge Duty Cycle ≥ 0% Above present for > 2 seconds	100 seconds after closed loop enable Once per key cycle	DTC Type B

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O2S Circuit - Transition Time Ratio Malfunction (Bank 2,Sensor 1)	P1154	.1V to 1.0V This DTC determines if the O2 sensor functioning properly by checking the ratio of the average response time.	Ratio of average response times: Ratio > 4 or < 0 **O2 voltage < 300 mV = lean* **O2 voltage > 600 mV = rich*	***O2 Diagnostic Enable**: (the following criteria must be met to enable the O2 Response tests)* TP sensor DTC's not active Evap. DTC's not active IAT sensor DTC's not active MAP DTC's not active ECT sensor DTC's not active MAF sensor DTC's not active Misfire DTC's not active No intrusive tests in progress No device controls active System Voltage ≥ 9 Volts ***Response Test Enable:*** Closed loop low MAP not active DTC's P0151, P0152, P0154 and P0155 not active Closed loop ECT > 57°C Engine run time > 75 seconds Air flow ≥ 15 g/s but ≤ 55 g/s Engine speed ≥ 1100 rpm but ≤ 3000 rpm Canister Purge Duty Cycle ≥ 0% Above present for > 2 seconds	100 seconds after closed loop enable Once per ignition cycle	DTC Type B
Camshaft Sensor Misinstalled	P1345	1X Signal This diagnostic will determine if the Cam sensor and high voltage switch have been installed correctly.	Cam signal falling edge out of phase ± 15°from crank falling edge.	----------	30 test failures within a 50 test sample size. Time necessary to complete sample: Varies with engine speed Every crank fall	DTC Type A
EST Output High	P1351	0 V-1V This diagnostic will determine if a failure has occurred due to an open circuit.	EST voltage >4.9 V	EST Enabled Engine speed < 250 RPM	20 test failure Time necessary to complete sample: Executed during crank, approximately 3 sec Once per ignition cycle	DTC Type A
EST Not Toggling After Enable	P1361	0 V-1V This diagnostic will determine if a failure has occurred due to a grounded circuit.	EST voltage <.04V	EST Enabled Engine speed < 250 RPM	20 test failure Time necessary to complete sample: Executed during crank, approximately 3 sec Once per ignition cycle	DTC Type A

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EGR Valve Circuit Performance - actual position greater than commanded	P1404	Closed valve position too high	***Pintle position > 10 A/D counts from learned closed position for 10 seconds for 5 subroutines***	EGR valve strokes to 100% duty cycle between subroutines. Enable parameters for stroke: 80°C < ETC < 120°C IAT < 100°C Desired EGR > 14%	Continuous	DTC Type B
Secondary Air Injection System Malfunction (Bank 1) ①	P1415	This diagnostic will determine if the secondary air injection system is functioning properly by monitoring O2 sensor voltage and short term fuel trim on bank 1 when the air pump is turned on.	***AIR Passive Test 1*** AIR pump ON A/F Ratio ≥ 12:1 Startup ECT ≤ 56.25 °C Hot/Cold Rich time ratio ≥ .39 OR Hot/Cold Lean time < .60 ***AIR Passive Test 2*** AIR Passive test 1 has not run or failed. AIR Pump is ON O2 sensor #1 ≥ 451 mV for a time ≥ 5 seconds ***AIR Active Test*** AIR Passive Test 1 and 2 have failed. AIR Pump ON O2 sensor voltage < 299 Mv OR Integrator Δ < .06	***AIR Passive Test Enable*** ECT DTC's not active IAC DTC's not active O2 sensor DTC's not active Misfire DTC's not active MAP sensor DTC's not active Fuel Trim DTC's not active Evap DTC's not active TP sensor DTC's not active IAT DTC's not active MAF DTC's not active System Voltage ≥ 1oV for a period > 3 seconds IAT > 0° C Engine run time > 3 seconds ***AIR Active Test Enable*** AIR Passive test failed ECT DTC's not active IAC DTC's not active O2 sensor DTC's not active Misfire DTC's not active MAP sensor DTC's not active Fuel Trim DTC's not active Evap DTC's not active TP sensor DTC's not active IAT DTC's not active MAF DTC's not active Power enrichment not active Decel fuel cutoff not active Air/Fuel Ratio =14.7:1 Engine speed ≥ 550 RPM Closed loop for a period > 15 seconds Engine load < 50% MAF ≤ 100 g/second System voltage ≥ 10V ECT ≥ 75°C but ≤ 105°C IAT > 0° C Integrator > .95 but < 1.0 for 3 seconds	***AIR Passive Test 1*** **Cold test** is run for 30 seconds **Hot test** is run for 10 seconds ***AIR Passive Test 2*** ≥ 15 seconds ***AIR Active Test*** > 3.5 seconds Once per ignition cycle	DTC Type B

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Secondary Air Injection System Malfunction (Bank 2) ① Secondary Air Injection System Malfunction (Bank 2) ①	P1416	This diagnostic will determine if the secondary air injection system is functioning properly by monitoring O2 sensor voltage and short term fuel trim on bank 2 when the air pump is turned on.	***AIR Passive Test 1*** AIR pump ON A/F Ratio ≥ 12:1 Startup ECT ≤ 56.25 °C Hot/Cold Rich time ratio ≥ .39 OR Hot/Cold Lean time < .60 ***AIR Passive Test 2*** AIR Passive test 1 has not run or failed. AIR Pump is ON O2 sensor #1 ≥ 451 mV for a time ≥ 5 seconds ***AIR Active Test*** AIR Passive Test 1 and 2 have failed. AIR Pump ON O2 sensor voltage < 299 Mv OR Integrator Δ < .06	***AIR Passive Test Enable*** ECT DTC's not active IAC DTC's not active O2 sensor DTC's not active Misfire DTC's not active MAP sensor DTC's not active Fuel Trim DTC's not active Evap DTC's not active TP sensor DTC's not active IAT DTC's not active MAF DTC's not active System Voltage ≥ 1oV for a period > 3 seconds IAT > 0° C Engine run time > 3 seconds ***AIR Active Test Enable*** AIR Passive test failed ECT DTC's not active IAC DTC's not active O2 sensor DTC's not active Misfire DTC's not active MAP sensor DTC's not active Fuel Trim DTC's not active Evap DTC's not active TP sensor DTC's not active IAT DTC's not active MAF DTC's not active Power enrichment not active Decel fuel cutoff not active Air/Fuel Ratio =14.7:1 Engine speed ≥ 550 RPM Closed loop for a period > 15 seconds Engine load < 50% MAF ≤ 100 g/second System voltage ≥ 10V ECT ≥ 75°C but ≤ 105°C IAT > 0 °C Integrator > .95 but < 1.0 for 3 seconds	***AIR Passive Test 1*** **Cold test** is run for 30 seconds **Hot test** is run for 10 seconds ***AIR Passive Test 2*** ≥ 15 seconds ***AIR Active Test*** > 3.5 seconds Once per ignition cycle	DTC Type B

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Evap. Emission Control System - Continuous Open Purge Flow	P1441	This DTC will determine if the purge solenoid is leaking.	***PURGE VALVE LEAK TEST:*** Purge Valve closed TP > 0% but < 99.6% Vacuum ≥ 10 KPa Tank Vacuum ≥ 12 in. H_2O for2 sec within ≤ 37.5 seconds after 30 second delay.	***TEST ENABLE :*** MAP DTC's not active TP Sensor DTC's not active VS Sensor DTC's not active O2 Sensor DTC's not active ECT Sensor DTC's not active DTC P0125 not active IAT Sensor DTC's not active Fuel Level >12.5% but < 87.5% System Voltage > 10V but < 17V ***COLD START TEST:*** ECT > 3.75°C but < 30° C IAT > 3.75°C but < 30° C Cold Temperature Δ (ECT - IAT): < 1.5°C if IAT > ECT < 8.25 °C if ECT > IAT Baro >72.5 kPa Fuel Level Input = True Fuel Level Present Test = True ***EXCESS VACUUM TEST -STAGE I :*** Vent solenoid **commanded** OPEN Fuel Tank Vacuum < 7 in. H_2O ***WEAK VACUUM TEST -Stage I*** : Throttle position < 75% Vehicle speed < 65 mph Tank Vacuum ≥ 9, 11 or 13 in. H_2O within 30 ,50 or 80seconds.	***PURGE VALVE LEAK TEST:*** 180seconds Max. Once per cold start	DTC Type B

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Idle Air Control - Low	P1508	This DTC will determine if a low idle is the result of an engine mechanical problem. A low idle is defined as 100RPM below the desired idle.	Air flow Δ > 6 g/s	***Test Enable: (non - intrusive)*** TP sensor DTC's not active VS sensor DTC's not active ECT DTC's not active MAP DTC's not active Transmission DTC's not active PRNDL DTC's not active Misfire DTC's not active IAT DTC's not active MAF DTC's not active ECT > 50°C System Voltage > 10V but < 16 V IAT > -25°C Engine run time > 30 seconds Baro > 75 kPa (10000 ft) TP < 1% VS < 2 MPH Above met for a time > 3 seconds to enable diagnostic. If non-intrusive test fails, intrusive test is run. ***Run Test: (intrusive)*** Air Flow > 17.5 g/sec but < 50 g/sec VS > 25 MPH but < 85 MPH TP Δ < 1% Engine Speed Δ < 50 RPM IAC motor commanded 10 %/ 100 msec.	10 seconds Continuous after enable	DTC Type B

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Idle Air Control - High	P1509	This DTC will determine if a high idle is the result of an engine mechanical problem. A high idle is defined as 150 RPM above the desired idle.	Air flow Δ > 6 g/s	***Test Enable: (non - intrusive)*** TP sensor DTC's not active VS sensor DTC's not active ECT DTC's not active MAP DTC's not active Transmission DTC's not active PRNDL DTC's not active Misfire DTC's not active IAT DTC's not active MAF DTC's not active ECT > 50°C System Voltage > 10V but < 16 V IAT > -25°C Engine run time > 30 seconds Baro > 75 kPa (10000 ft) TP < 1% VS < 2 MPH Above met for a time > 3 seconds to enable diagnostic. If non-intrusive test fails, intrusive test is run. ***Run Test: (intrusive)*** Air Flow > 17.5 g/sec but < 50 g/sec VS > 25 MPH but < 85 MPH TP Δ < 1% Engine Speed Δ < 50 RPM IAC motor commanded 10 %/ 100 msec.	10 seconds Continuous after enable	DTC Type B