

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Camshaft Sensor Misinstalled	P0016	This diagnostic will determine if the Cam sensor and cam timing have been installed correctly compared to the crank timing.	Cam signal falling edge out of phase -10 or + 11 degrees from corresponding crank falling edge.	Engine is running – run flag is true No crank position sensor circuit or performance DTC's No Fault Pending CAM Circuit DTC's	1 Test failure is counted when all 4 cam pulses (4x cam sensor) are more than the allowed crank degrees. 25 test failures within a 35 test sample size. Time necessary to complete sample: Varies with engine speed 1 Sample = 1 engine cycle.	DTC Type B
O2S Heater Control Circuit Bank 1 Sensor 1	P0030	This DTC checks the Heater Output Driver circuit for electrical integrity	Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).	<ul style="list-style-type: none"> Ignition switch is in crank or run 11 volts < Ignition Voltage < 18 volts RPM > 425 	20 failures out of 25 samples Frequency: 250ms loop Continuous	DTC Type B
O2S Heater Control Circuit Bank 1 Sensor 2	P0036	This DTC checks the Heater Output Driver circuit for electrical integrity	Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).	<ul style="list-style-type: none"> Ignition switch is in crank or run 11 volts < Ignition Voltage < 18 volts RPM > 425 	20 failures out of 25 samples Frequency: 250ms loop Continuous	DTC Type B
O2S Heater Control Circuit Bank 2 Sensor 1	P0050	This DTC checks the Heater Output Driver circuit for electrical integrity	Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).	<ul style="list-style-type: none"> Ignition switch is in crank or run 11 volts < Ignition Voltage < 18 volts RPM > 425 	20 failures out of 25 samples Frequency: 250ms loop Continuous	DTC Type B
HO2S Heater Resistance Bank 1 Sensor 1	P0053	Detects an oxygen sensor heater having an incorrect or out of range resistance value.	3.0293 < Calculated Heater resistance < 9.209	<ul style="list-style-type: none"> Coolant – IAT < 8°C Engine Soak Time > 28800 Seconds -30 °C < Coolant Temp < 45°C Coolant Fault = Not Active Ignition Off Timer Fault = Not Active Intake Air Temp Fault = Not Active Ignition Voltage < 18 	Once per valid cold start.	DTC Type B
HO2S Heater Resistance Bank 1 Sensor 2	P0054	Detects an oxygen sensor heater having an incorrect or out of range resistance value.	3.3301 < Calculated Heater resistance < 9.510	<ul style="list-style-type: none"> Coolant – IAT < 8°C Engine Soak Time > 28800 Seconds -30 °C < Coolant Temp < 45°C Coolant Fault = Not Active Ignition Off Timer Fault = Not Active Intake Air Temp Fault = Not Active Ignition Voltage < 18 	Once per valid cold start.	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
B2S2 Oxygen Sensor Heater Circuit (ODM)	*P0056	This DTC checks the Heater Output Driver circuit for electrical integrity	Output state shorted or open	Output driver commanded on Ignition switch is in crank or run 10 volts < Ignition Voltage < 18 volts RPM > 425	20 failures out of 25 samples Frequency: 250ms loop Continuous	DTC Type B 4 Sensor Systems
HO2S Heater Resistance Bank 2 Sensor 1	P0059	Detects an oxygen sensor heater having an incorrect or out of range resistance value.	3.2305 < Calculated Heater resistance < 9.4102	<ul style="list-style-type: none"> • Coolant – IAT < 8°C • Engine Soak Time > 28800 Seconds • -30 °C < Coolant Temp < 45°C • Coolant Fault = Not Active • Ignition Off Timer Fault = Not Active • Intake Air Temp Fault = Not Active • Ignition Voltage < 18 	Once per valid cold start.	DTC Type B
B2S2 Oxygen Sensor Heater Resistance	*P0060	Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or out of range (OOR) resistance value.	O2 Heater Resistance < 8.7 ohms OR O2 Heater Resistance > 20.8 ohms (O2 Heater Resistance is corrected to 20 degrees C)	Engine Soak Time > 10 Hours Coolant – IAT < 8°C -30°C < Coolant Temp < 45°C ECM/PCM Internal Engine Off Timer Performance Fault Not Active No ECT faults Active No IAT faults Active	Frequency: Once per valid cold start 12.5mSec Loop 1.0 Sec Loop for reporting	DTC Type B 4 Sensor Systems
MAP/MAF/Throttle Position Correlation	P0068	Detect when manifold absolute pressure and measured airflow do not match estimated engine airflow as established by the TPS	Difference between measured MAP and estimated MAP < X kPa Difference between measured MAF and estimated MAF < Y grams/sec X, Y depend on throttle position, and maximum of X, and Y are 33kPa, 38gram/sec.	Engine running No PCM processor, throttle actuation DTCs Both TPS circuits DTCs are set	187.5 msec Continuous in the main processor	DTC Type A
MASS AIR FLOW SYSTEM PERFORMANCE (RATIONALITY)	P0101	This DTC determines if the MAF sensor is stuck within the normal operating range	(Measured Flow – Modeled air Flow) Filtered > 30 AND (Measured Manifold Air Pressure – Manifold Model 2 pressure)Filtered > 25	Engine rpm =>550 and <= 5000 MAP sensor high/low DTC's not active EGR DTC's P0401.,P0405, and P1404 not active MAF sensor high/low DTC's not active Crank sensor DTC's not active Engine Coolant DTC's not active Intake Air Temp. DTC's not active Engine Coolant > 70 deg C and < 121 deg C Intake Air Temp > -7 deg C and < 60 deg C	Continuous The Mass Air Flow reading and Mass Air Flow calculation are performed during the same 12.5 ms loop	DTC Type B
MASS AIR FLOW SENSOR CIRCUIT LOW FREQUENCY	P0102	Detects a continuous short to low or a open in either the signal circuit or the MAF sensor	MAF ≤ 10 Hz	Engine Running ≥ 1 second Engine Speed ≥ 300 RPM RunCrank Voltage ≥ 8 volts Above must be true ≥ 1 second	50 failures in a 63 sample test 1 sample every LoRes event	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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 HIGH FREQUENCY	P0103	Detects a continuous short to high in either the signal circuit or the MAF sensor	MAF \geq 14500 Hz	Engine Running \geq 1 second Engine Speed \geq 300 RPM RunCrank Voltage \geq 8 volts Above must be true \geq 1 second	50 failures in a 63 sample test 1 sample every LoRes event	DTC Type B
MAP SENSOR RANGE/ PERFORMANCE (RATIONALITY)	P0106	This DTC determines if the MAP sensor is stuck within the normal operation range	(Measured MAP - Manifold Model 1 pressure) filtered > 25 AND (Measured MAP - Manifold Model 2 pressure) filtered > 25	Engine rpm \Rightarrow 550 and \leq 5000 MAP sensor high/low DTC's not active EGR DTC's P0401, P0405, and P1404 not active MAF sensor high/low DTC's not active Crank sensor DTC's not active Engine Coolant DTC's not active Intake Air Temp, DTC's not active Engine Coolant > 70 deg C and < 121 deg C Intake Air Temp > -7 deg C and < 60 deg C	Continuous The MAP reading and the Manifold Model calculations are performed in the same LoRes loop	DTC Type B
MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW	P0107	This DTC detects a continuous short to low or open in either the signal circuit or the MAP sensor.	MAP voltage < 2% of Vref (0.1 volts)	Key-On test: Engine speed \leq 400 RPM Run Test: No TPS failures present TPS \geq 0%, and Engine Speed \leq 800 RPM, or TPS \geq 12.5%, Engine Speed > 800 RPM)	320 failures in a 400 sample test 12.5 msec / sample	DTC Type B
MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH	P0108	This DTC detects an open sensor ground or continuous short to high in either the signal circuit or the MAP sensor	MAP voltage > 98% of Vref (4.9 volts)	No TPS failures present Engine running Engine run time > Min based on power-up coolant temp (-30°C = 242 seconds, -15°C = 188 seconds, 0°C = 144 seconds, 15°C = 80 seconds, 30°C = 0 seconds) TPS < 1%, and Engine Speed \leq 1200 RPM, or TPS < 20%, and Engine Speed > 1200 RPM	320 failures in a 400 sample test 12.5 msec / sample	DTC Type B
INTAKE AIR TEMP SENSOR CIRCUIT LOW (HIGH TEMP)	P0112	This DTC detects a continuous short to ground in the IAT signal circuit or the IAT sensor	Raw IAT < 25 ohms	No ECT failures present No Vehicle Speed failures present Coolant Temp < 150°C Vehicle speed \geq 0 kph Engine run time > 10 seconds	50 failures in a 63 sample test 100 msec / sample	DTC Type B
INTAKE AIR TEMP SENSOR CIRCUIT HIGH (LOW TEMP)	P0113	This DTC detects a continuous open or short to high in the IAT signal circuit or the IAT sensor	Raw IAT > 1,800,000 ohms	No ECT failures present No MAF failures present No Vehicle Speed failures present Coolant Temp \geq -40°C Mass Airflow < 512 g/s Vehicle speed < 512 kph Engine run time > 10 seconds	50 failures in a 63 sample test 100 msec / sample	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
ENGINE COOLANT TEMP SENSOR RATIONALITY (HIGH-SIDED)	P0116	Detects coolant temp sensor stuck in mid range	A failure will be reported if any of the following occur: ECT at powerup > IAT at powerup by an IAT based table lookup value after a minimum 8 hour soak (fast fail). ECT at powerup > IAT at powerup by 10C after a minimum 8 hour soak and a block heater has not been detected. ECT at powerup > IAT at powerup by 10C after a minimum 8 hour soak and the time spent cranking the engine without starting is greater than 5 seconds with the fuel level being above a minimum level of 5%.	No VSS DTC's No IAT DTC's No ECT sensor shorted DTC's ECM/PCM Internal Engine Off Timer Performance DTC not active Non-volatile memory failure has not been detected on power-up. Engine off time > 8 hours Test run this trip = false Test aborted this trip = false Block heater detection: ECT at powerup > IAT at powerup by 20C Powerup IAT > -7C Vehicle driven a minimum of 400 seconds above 15 kph and IAT drops more than 4C from powerup IAT.	1 failure 500 ms loop	DTC Type B
ENGINE COOLANT TEMP SENSOR CIRCUIT LOW (HIGH TEMP)	P0117	This DTC detects a continuous short to ground in the ECT signal circuit or the ECT sensor.	Raw ECT < 25 ohms	Engine run time > 10 seconds, or IAT ≤ 50°C	5 test failures in a 6 sample test. 1 sec / sample	DTC Type B
ENGINE COOLANT TEMP SENSOR CIRCUIT HIGH (LOW TEMP)	P0118	This DTC detects a continuous short to high or open in the ECT signal circuit or the ECT sensor.	Raw ECT > 1,800,000 ohms	Engine run time > 10 seconds, or IAT ≥ 0°C	5 failures in a 6 sample test 1 sec / sample	DTC Type B
Throttle Position (TP) Sensor 1 Circuit	P0120	Detects a continuous or intermittent short or open in TP sensor #1 circuit	0.35 V > TPS > 4.58 V	Ignition in unlock/accessory, run or crank System voltage > 5.23 V No PCM processor, 5 V reference DTCs	79/159 counts; 55 counts continuous; 3.125 msec /count in the ECM main processor 19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
TP SENSOR CIRCUIT PERFORMANCE (RATIONALITY)	P0121	The DTC determines if a TPS sensor is stuck within the normal operating range	(The calculated throttle residual from the MAF model and the Manifold Model) filtered > 400	Engine rpm =>550 and <= 5000 MAP sensor high/low DTC's not active EGR DTC's P0401, P0405, and P1404 not active MAF sensor high/low DTC's not active Crank sensor DTC's not active Engine Coolant DTC's not active Intake Air Temp. DTC's not active Engine Coolant > 70 deg C and < 121 deg C Intake Air Temp > -7 deg C and < 60 deg C	Continuous Calculations are performed every 12.5 ms	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Throttle Position (TP) Sensor 1 Circuit Lo	P0122	Detects a continuous or intermittent OOR lo TPS	TPS < 0.35V	Ignition in unlock/accessory, run or crank System voltage>5.23 V No PCM processor, 5 V reference DTCs	79/159 counts; 55 counts continuous; 3.125 msec /count in the ECM main processor 19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Throttle Position (TP) Sensor 1 Circuit Hi	P0123	Detects a continuous or intermittent OOR lo TPS	TPS > 4.58 V	Ignition in unlock/accessory, run or crank System voltage>5.23 V No PCM processor, 5 V reference DTCs	79/159 counts; 55counts continuous; 3.125 msec /count in the ECM main processor 19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
COOLANT TEMPERATURE BELOW STAT REGULATING TEMPERATURE	P0128	Under driving conditions, target coolant temperature should be achieved based on amount of cumulative airflow ingested, and based on startup coolant temperature	A table defines maximum cumulative airflow based on startup coolant temperature and IAT at which target coolant temperature must have been reached For -7C < IAT < 10C, Target = 75C For IAT > 10C, Target = 75C	10 gps < Airflow < 35 gps Engine runtime <1370seconds before test completes Engine runtime > 60 seconds Minimum IAT > -7C Vehicle speed > 8 kph for 0.5 kilometers For -7C < IAT < 10C, Startup ECT< 70 For IAT > 10C, Startup ECT<70 No ECT, Throttle, IAT, VSS, MAF or MAP faults	Once per trip Time based on flow	DTC Type B
O2S Circuit Low Voltage Bank 1 Sensor 1	P0131	This DTC determines if the O2 sensor circuit is shorted to low.	O2 sensor voltage < 25 millivolts (B*S1) O2 sensor voltage < 10 millivolts (B1S2)	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's Catalyst monitor diagnostic Intrusive Test = Not Active Post Oxygen Sensor Diagnostic Intrusive Test = Not Active Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active 10 volts < system voltage < 18 volts EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> 0.99 ≤ Equivalence ratio ≤ 1.01 0 % ≤ throttle position ≤ 50 % Fuel state = closed loop with no fault pending All fuel injectors = ON Traction Control = not active All of the above met for at least 3 seconds	160 test failures in a 200 sample test for 2 consecutive tests <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

2006file1.doc

Page 5 of 49

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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 High Voltage Bank 1 Sensor 1	P0132	This DTC determines if the O2 sensor or circuit is shorted to high.	O2 sensor voltage > 950 millivolts to go fault pending O2 sensor voltage > 900 millivolts to set DTC	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> • $0.99 \leq \text{Equivalence Ratio} \leq 1.01$ • $0\% \leq \text{throttle position} \leq 60\%$ • Fuel State = Closed loop All of the above met for at least 3 seconds	80 test failures in a 100 sample test for 4 consecutive tests <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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 Slow Response Bank 1 Sensor 1	P0133	This DTC determines if the O2 sensor response time is degraded	Refer to "O2S Slow Response Bank 1 Sensor 1 (P0133), O2S Slow Response Bank 2 Sensor 1 (P0153) Pass/Fail Thresholds." In Lookup Tables section.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • O2 Heater on for ≥ 0 seconds • B1S1 DTCs = Not Active • Learned heater resistance is valid • Misfire DTC = Not Active • ECT > 70 °C • IAT > -40 °C • Engine run time > 202 seconds • EVAP Canister purge duty cycle ≥ 0 % • 20 gps ≤ MAF ≤ 40 gps • 1100 ≤ RPM ≤ 2500 • Ethanol percentage < 85 % • Baro > 70 kPa • Throttle position ≥ 3 % • Fuel Level > 10 % • Fuel state = closed loop • No fuel level data faults • Transmission (automatic) not in Park, Reverse or Neutral • Transmission gear selection is not defaulted • Baro is not defaulted <p>All of the above met for at least 1 second.</p>	60 seconds <u>Frequency:</u> Once per trip	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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 Insufficient Activity Bank 1 Sensor 1	P0134	This DTC determines if the O2 sensor circuit is open.	500 millivolts < O2 sensor < 400 millivolts	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's Catalyst monitor diagnostic Intrusive Test = Not Active Post Oxygen Sensor Diagnostic Intrusive Test = Not Active Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active 10 volts < system voltage < 18 volts EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> Engine run time > 101 seconds Ethanol percentage < 85 % No B1S1 heater related DTCs 	480 test failures in a 600 test samples Minimum of 0 occurrences of a delta TP sensor \geq 5 % during diagnostic test <u>Frequency:</u> Continuous for pre catalyst sensors 100 ms loop rate	DTC Type B
O2S Heater Performance Bank 1 Sensor 1	P0135	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	O2 sensor heater current is < 0.25 amps or > 3.125 amps	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's Catalyst monitor diagnostic Intrusive Test = Not Active Post Oxygen Sensor Diagnostic Intrusive Test = Not Active Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active 10 volts < system voltage < 18 volts EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> Engine Run Time \geq 180 seconds ECT \geq 60° C 500 \leq Engine Rpm \leq 3000 5 gps \leq Mass Airflow \leq 45 gps O2 heater not in Device control B1S1 O2 heater resistance DTC not active <p>All of the above met for at least 2 seconds</p>	8 test failures in 10 test samples <u>Frequency:</u> 2 tests per trip 120 seconds delay between tests 1 second execution rate	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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 Low Voltage Bank 1 Sensor 2	P0137	This DTC determines if the O2 sensor circuit is shorted to low by checking for a lean condition during steady throttle.	O2 sensor voltage < 75 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's Catalyst monitor diagnostic Intrusive Test = Not Active Post Oxygen Sensor Diagnostic Intrusive Test = Not Active Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active 10 volts < system voltage < 18 volts EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> 0.99 ≤ Equivalence ratio ≤ 1.01 0 % ≤ throttle position ≤ 50 % Fuel state = closed loop All fuel injectors = ON Traction Control = not active <p>All of the above met for at least 3 seconds</p>	320 test failures in a 400 sample test for 1 consecutive test	DTC Type B
O2S Circuit High Voltage Bank 1 Sensor 2	P0138	This DTC determines if the O2 sensor or circuit is shorted to high	O2 sensor voltage > 1000 millivolts to go fault pending O2 sensor voltage > 950 millivolts to set DTC	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's Catalyst monitor diagnostic Intrusive Test = Not Active Post Oxygen Sensor Diagnostic Intrusive Test = Not Active Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active 10 volts < system voltage < 18 volts EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> 0.99 ≤ Equivalence Ratio ≤ 1.01 0 % ≤ throttle position ≤ 50 % Fuel State = Closed loop <p>All of the above met for at least 3 seconds</p>	320 test failures in a 400 sample test for 1 consecutive test	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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 Insufficient Activity Bank 1 Sensor 2	P0140	This DTC determines if the O2 sensor circuit is open.	400 millivolts < O2 sensor < 500 millivolts for regular open test 300 millivolts < O2 sensor < 600 millivolts to fail the fast pass open test (must fail the regular open test in order to fail the DTC; regular open test is run if fast pass is not run or if fast pass fails)	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> • Ethanol percentage > 85 % • No B1S2 heater related DTCs • PCM State = run <u>Fast Pass:</u> <ul style="list-style-type: none"> • Engine run time ≤ 100 seconds (Fast pass cannot report a fail; if Fastpass fails, the regular open test is run)	1200 test failures in a 1500 test samples Minimum of 5 occurrences of a delta TP sensor ≥ 5 % during diagnostic test (sample counts – failure counts) < 400 within 100 seconds of engine run time to fail the fast pass test (regular open test is run when fast pass fails; to fail DTC the regular open test must fail) <u>Frequency:</u> Once/trip for post catalyst sensors 100 ms loop	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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 Heater Performance Bank 1 Sensor 2	P0141	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	O2 sensor heater current is < 0.25 amps or > 3.125 amps	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's Catalyst monitor diagnostic Intrusive Test = Not Active Post Oxygen Sensor Diagnostic Intrusive Test = Not Active Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active 10 volts < system voltage < 18 volts EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> Engine Run Time ≥ 180 seconds ECT ≥ 60° C 500 ≤ Engine Rpm ≤ 3000 5 gps ≤ Mass Airflow ≤ 45 gps O2 heater not in Device control B1S2 O2 heater resistance DTC not active <p>All of the above met for at least 2 seconds</p>	8 test failures in 10 test samples Frequency: 2 tests per trip 120 seconds delay between tests 1 second execution rate	DTC Type B
O2S Circuit Low Voltage Bank 2 Sensor 1	P0151	This DTC determines if the O2 sensor circuit is shorted to low	O2 sensor voltage < 100 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's Catalyst monitor diagnostic Intrusive Test = Not Active Post Oxygen Sensor Diagnostic Intrusive Test = Not Active Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active 10 volts < system voltage < 18 volts EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> 0.99 ≤ Equivalence ratio ≤ 1.01 0 % ≤ throttle position ≤ 50 % Fuel state = closed loop with no fault pending All fuel injectors = ON Traction Control = not active <p>All of the above met for at least 3 seconds</p>	160 test failures in a 200 sample test for 2 consecutive tests <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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 High Voltage Bank 2 Sensor 1	P0152	This DTC determines if the O2 sensor or circuit is shorted to high.	O2 sensor voltage > 950 millivolts to go fault pending O2 sensor voltage > 900 millivolts to set DTC	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's Catalyst monitor diagnostic Intrusive Test = Not Active Post Oxygen Sensor Diagnostic Intrusive Test = Not Active Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active 10 volts < system voltage < 18 volts EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> $0.99 \leq \text{Equivalence Ratio} \leq 1.01$ $0\% \leq \text{throttle position} \leq 60\%$ Fuel State = Closed loop All of the above met for at least 3 seconds	80 test failures in a 100 sample test for 4 consecutive tests <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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 Slow Response Bank 2 Sensor 1	P0153	This DTC determines if the O2 sensor response time is degraded	Refer to "O2S Slow Response Bank 1 Sensor 1 (P0133), O2S Slow Response Bank 2 Sensor 1 (P0153) Pass/Fail Thresholds." In Lookup Tables section.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • O2 Heater on for ≥ 0 seconds • B2S1 DTCs = Not Active • Learned heater resistance is valid • Misfire DTC = Not Active • ECT > 70 °C • IAT > -40 °C • Engine run time > 202 seconds • EVAP Canister purge duty cycle ≥ 0 % • 20 gps ≤ MAF ≤ 40 gps • 1100 ≤ RPM ≤ 2500 • Ethanol percentage < 85 % • Baro > 70 kPa • Throttle position ≥ 3 % • Fuel Level > 10 % • Fuel state = closed loop • No fuel level data faults • Transmission (automatic) not in Park, Reverse or Neutral • Transmission gear selection is not defaulted • Baro is not defaulted <p>All of the above met for at least 1 second.</p>	60 seconds <u>Frequency:</u> Once per trip	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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 Insufficient Activity Bank 2 Sensor 1	P0154	This DTC determines if the O2 sensor circuit is open.	400 millivolts < O2 sensor < 500 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's Catalyst monitor diagnostic Intrusive Test = Not Active Post Oxygen Sensor Diagnostic Intrusive Test = Not Active Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active 10 volts < system voltage < 18 volts EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> Engine run time > 101 seconds Ethanol percentage < 85 % No B1S1 heater related DTCs 	<p>480 test failures in a 600 test samples</p> <p>Minimum of 0 occurrences of a delta TP sensor \geq 5 % during diagnostic test</p> <p><u>Frequency:</u> Continuous for pre catalyst sensors 100 ms loop rate</p>	DTC Type B
O2S Heater Performance Bank 2 Sensor 1	P0155	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	O2 sensor heater current is < 0.25 amps or > 3.125 amps	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's Catalyst monitor diagnostic Intrusive Test = Not Active Post Oxygen Sensor Diagnostic Intrusive Test = Not Active Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active 10 volts < system voltage < 18 volts EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> Engine Run Time \geq 180 seconds ECT \geq 60° C 500 \leq Engine Rpm \leq 3000 5 gps \leq Mass Airflow \leq 45 gps O2 heater not in Device control B2S1 O2 heater resistance DTC not active <p>All of the above met for at least 2 seconds</p>	<p>8 test failures in 10 test samples</p> <p><u>Frequency:</u> 2 tests per trip 120 seconds delay between tests 1 second execution rate</p>	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
(B2S2) HEATED OXYGEN SENSOR CIRCUIT LOW	*P0157	Circuit Continuity Detects a HO2S voltage stationary lean (low signal voltage) condition.	Oxygen sensor voltage < 80 mV	Closed Loop Fuel Control. TPS: 3-70% Fuel > 10% 10 V < System Voltage < 18 V .992 < Equivalence Ratio < 1.0136 All valves of active cylinders enabled Above conditions met for 2 sec No Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. Traction Control not active	380 failures out of 400 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken. 100 ms/sample Continuous	DTC Type B 4 Sensor Systems
(B2S2) HEATED OXYGEN SENSOR CIRCUIT HIGH	*P0158	Circuit Continuity Detects a HO2S voltage stationary rich (high signal voltage) condition.	Oxygen sensor voltage > 950 mV	Closed Loop Fuel Control. TPS: 3-70% Fuel > 10% .992 < Equivalence Ratio < 1.0136 All valves of active cylinders enabled 10 V < System Voltage < 18 V Above conditions met for 2 sec No Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. Traction Control not active	380 failures out of 400 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken. 100 ms/sample Continuous	DTC Type B 4 Sensor Systems
(B2S2) HEATED OXYGEN SENSOR CIRCUIT NO ACTIVITY	*P0160	Circuit Continuity Detects a HO2S circuit open.	410 mV < B2S2 voltage < 490 mV Or Post O2 sensor fast pass B2S2 > 550 mV B2S2 < 350 mV	Engine runtime > 300 sec Closed Loop Fuel Control. 10 V < System Voltage < 18 V 5% Δ TPS within 1 sec, 6 times DTC P0161 not set No Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. Traction Control not active 10 V < System Voltage < 18 V Engine runtime < 200 sec DTC P0161 not set No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. Traction Control not active	1450 failures out of 1500 samples. 100 ms/sample Once per trip 550 more passing samples than failing samples. 100 ms/sample Once per trip	DTC Type B 4 Sensor Systems

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
(B2S2) HEATED OXYGEN SENSOR HEATER CIRCUIT	*P0161	Current Monitor: Detects a malfunctioning HO2S heater circuit by monitoring the current through the circuit AND Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or (OOR) resistance value	Current Monitor: 0.25 A < Heater Current < 1.375 A OOR: -7.50 < Limit Part Error < 4.57 NOTE: If the P0161 DTC sets for an OOR fault, then the Current Monitor test for this sensor will be disabled, until another pass or fail decision is made. (This eliminates the scenario in which a OOR fail and then a Current Monitor pass would prevent illumination of the MIL.)	Current Monitor: 0 V < System Voltage < 18 V Coolant > 50 °C 3 g/s < Airflow < 40 g/s Device control not active Engine runtime > 300 sec 500 < RPM < 3000 No Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. Traction Control not active OOR: Coolant – IAT < 8°C Engine Soak Time > 10 Hours -30°C < Coolant Temp < 45°C	Current Monitor: 8 failures out of 10 samples Frequency: 2 times per key cycle OOR: Once per valid cold start.	DTC Type B 4 Sensor Systems
Fuel System Too Lean Bank 1	P0171	Determines if the fuel control system is in a lean condition, based on the EWMA of long-term fuel trim (LTM). (Note: EWMA stands for “Exponentially Weighted Moving Average”)	The EWMA of long term fuel trim (LTM) samples ≥ 1.24	<ul style="list-style-type: none"> No Misfire, pre-cat O2 Sensor, or EVAP DTC’s No Fuel Injector or Composition (Ethanol) DTC’s No IAC, MAF, MAP, ECT, EGR, or A.I.R. DTC’s No TP Sensor or TAC System DTC’s Engine speed > 400 rpm but < 6000 rpm BARO > 70 kpa ECT > -38 °C but < 150 °C MAP > 5 kpa but < 255 kpa IAT > -38 °C but < 150 °C Mass Airflow > 0.5 g/s but < 510 g/s Vehicle speed < 134 kph Closed Loop and Long Term Fuel Trim Learning enabled Not in Device Control EGR Flow Diagnostic Intrusive Test = Not Active Catalyst Monitor Diagnostic Intrusive Test = Not Active Post O2 Diagnostic Intrusive Test = Not Active Evap diagnostic is at any stage except the “tank pull down” portion of the test. <p>General Notes: At least 55 seconds of LTM data must accumulate on each trip, with at least 45 seconds of data in the current fuel trim cell before a pass or fail decision can be made</p>	The EWMA of long term fuel trim (LTM) samples ≥ 1.24 for ≥ 100 ms Frequency: Continuous 100 ms loop	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Fuel System Too Rich Bank 1	P0172	<p>Determines if the fuel control system is in a rich condition, based on the EWMA of long-term fuel trim (LTM).</p> <p>(Note: EWMA stands for "Exponentially Weighted Moving Average")</p>	<p>There exists both a Passive and, if needed, Intrusive rich test.</p> <p>Passive: The EWMA of long term purge-off fuel trim (LTM) samples ≤ 0.79</p> <p>Intrusive: If a passive decision cannot be made, and the EWMA of long term purge-on fuel trim (LTM) samples ≤ 0.78, purge is ramped off to determine if excess purge is the cause. Therefore, the following must also occur to report a failure:</p> <p>The EWMA of LTM samples with purge off ≤ 0.79 for at least 10 seconds during each of 3 intrusive segments.</p> <p>Intrusive Notes:</p> <ol style="list-style-type: none"> Segments can last up to 60 seconds, and are separated by the smaller of a 10 second purge-on time or enough time to purge 5 grams of vapor. A maximum of 5 completed segments or 20 intrusive attempts are allowed for each intrusive test. After an intrusive test report is completed, another intrusive test cannot occur for 300 seconds to allow sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the EWMA of LTM samples $> .79$ and at least 60 seconds of extended purging has occurred indicating that the canister has been purged. <p>Performing intrusive tests too frequently may also affect EVAP and FTP emissions, and the execution frequency of other diagnostics.</p>	<ul style="list-style-type: none"> No Misfire, pre-cat O2 Sensor, or EVAP DTC's No Fuel Injector or Composition (Ethanol) DTC's No IAC, MAF, MAP, ECT, EGR, or A.I.R. DTC's No TP Sensor or TAC System DTC's Engine speed > 400 rpm but < 6000 rpm BARO > 70 kpa ECT > -38 °C but < 150 °C MAP > 5 kpa but < 255 kpa IAT > -38 C but < 150 °C Mass Airflow > 2.89 g/s but < 510 g/s Vehicle speed < 134 kph Closed Loop and Long Term Fuel Trim Learning enabled Not in Device Control EGR Flow Diagnostic Intrusive Test = Not Active Catalyst Monitor Diagnostic Intrusive Test = Not Active Post O2 Diagnostic Intrusive Test = Not Active Evap diagnostic is at any stage except the "tank pull down" portion of the test. <p>General Notes: At least 105 seconds of LTM data must accumulate on each trip, with at least 45 seconds of data in the current fuel trim cell before a pass or fail decision can be made.</p> <p>Intrusive Enable Criteria</p> <ul style="list-style-type: none"> Insufficient purge-off data prior to purge-on. The EWMA of long term purge-on fuel trim (LTM) samples $\leq .79$ RPM > 400 Mass Airflow > 2.89 g/s but < 510 g/s MAP > 5 kpa but < 255 kpa 	<p>Passive: The EWMA of long term purge-off fuel trim (LTM) samples $\leq .79$ for ≥ 100ms</p> <p>Intrusive: If rich fail counter is ≥ 3 before pass counter ≥ 3, diagnostic fails.</p> <p><u>Frequency:</u> Continuous 100 ms loop</p>	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Fuel System Too Lean Bank 2	P0174	Determines if the fuel control system is in a lean condition, based on the EWMA of long-term fuel trim (LTM). (Note: EWMA stands for "Exponentially Weighted Moving Average")	The EWMA of long term fuel trim (LTM) samples ≥ 1.24	<ul style="list-style-type: none"> • No Misfire, pre-cat O2 Sensor, or EVAP DTC's • No Fuel Injector or Composition (Ethanol) DTC's • No IAC, MAF, MAP, ECT, EGR, or A.I.R. DTC's • No TP Sensor or TAC System DTC's • Engine speed > 400 rpm but < 6000 rpm • BARO > 70 kpa • ECT > -38 °C but < 150 °C • MAP > 5 kpa but < 255 kpa • IAT > -38 °C but < 150 °C • Mass Airflow > 0.5 g/s but < 510 g/s • Vehicle speed < 134 kph • Closed Loop and Long Term Fuel Trim Learning enabled • Not in Device Control • EGR Flow Diagnostic Intrusive Test = Not Active • Catalyst Monitor Diagnostic Intrusive Test = Not Active • Post O2 Diagnostic Intrusive Test = Not Active • Evap diagnostic is at any stage except the "tank pull down" portion of the test. <p>General Notes:</p> <ul style="list-style-type: none"> • At least 55 seconds of LTM data must accumulate on each trip, with at least 45 seconds of data in the current fuel trim cell before a pass or fail decision can be made 	The EWMA of long term fuel trim (LTM) samples ≥ 1.24 for ≥ 100 ms <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Fuel System Too Rich Bank 2	P0175	Determines if the fuel control system is in a rich condition, based on the EWMA of long-term fuel trim (LTM). (Note: EWMA stands for "Exponentially Weighted Moving Average")	There exists both a Passive and, if needed, Intrusive rich test. Passive: The EWMA of long term purge-off fuel trim (LTM) samples ≤ 0.79 Intrusive: If a passive decision cannot be made, and the EWMA of long term purge-on fuel trim (LTM) samples ≤ 0.79 , purge is ramped off to determine if excess purge is the cause. Therefore, the following must also occur to report a failure: The EWMA of LTM samples with purge off ≤ 0.79 for at least 10 seconds during each of 3 intrusive segments. Intrusive Notes: 1. Segments can last up to 60 seconds, and are separated by the smaller of a 10 second purge-on time or enough time to purge 5 grams of vapor. 2. A maximum of 5 completed segments or 20 intrusive attempts are allowed for each intrusive test. 3. After an intrusive test report is completed, another intrusive test cannot occur for 300 seconds to allow sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the EWMA of LTM samples $> .79$ and at least 60 seconds of extended purging has occurred indicating that the canister has been purged. Performing intrusive tests too frequently may also affect EVAP and FTP emissions, and the execution frequency of other diagnostics.	<ul style="list-style-type: none"> No Misfire, pre-cat O2 Sensor, or EVAP DTC's No Fuel Injector or Composition (Ethanol) DTC's No IAC, MAF, MAP, ECT, EGR, or A.I.R. DTC's No TP Sensor or TAC System DTC's Engine speed > 400 rpm but < 6000 rpm BARO > 70 kpa ECT > -38 °C but < 150 °C MAP > 5 kpa but < 255 kpa IAT > -38 °C but < 150 °C Mass Airflow > 2.89 g/s but < 510 g/s Vehicle speed < 134 kph Closed Loop and Long Term Fuel Trim Learning enabled Not in Device Control EGR Flow Diagnostic Intrusive Test = Not Active Catalyst Monitor Diagnostic Intrusive Test = Not Active Post O2 Diagnostic Intrusive Test = Not Active Evap diagnostic is at any stage except the "tank pull down" portion of the test. <p>General Notes:</p> <p>General Notes: At least 105 seconds of LTM data must accumulate on each trip, with at least 45 seconds of data in the current fuel trim cell before a pass or fail decision can be made.</p> <p>Intrusive Enable Criteria</p> <ul style="list-style-type: none"> Insufficient purge-off data prior to purge-on operation. The EWMA of long term purge-on fuel trim (LTM) samples $\leq .79$ RPM > 400 Mass Airflow > 2.89 g/s but < 510 g/s MAP > 5 kpa but < 255 kpa 	Passive: The EWMA of long term purge-off fuel trim (LTM) samples $\leq .79$ for ≥ 100 ms Intrusive: If rich fail counter is ≥ 3 before pass counter ≥ 3 , diagnostic fails. <u>Frequency:</u> Continuous 100 ms loop	DTC Type B
Injector Control Circuit (Cylinders 1-8) (ODM)	P0201 – P0208	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine running PT_RelayInRange (9 volts $<$ Ignition $<$ 18 volts) Ignition voltage in range > 1 seconds	20 failures in a 25 sample test 250 msec / sample	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Throttle Position (TP) Sensor 2 Circuit	P0220	Detects a continuous or intermittent short or open in TP sensor #2 circuit	0.35 V > TPS > 4.59 V	Ignition in Unlock/accessory, run, crank System voltage > 5.23 V No PCM processor, 5 V reference DTCs	79/159 counts ; 55 counts continuous; 3.125 msec /count in the motor processor 19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Throttle Position (TP) Sensor 2 Lo	P0222	Detects a continuous or intermittent short or open in TP sensor #2 circuit	TPS < 0.35 V	Ignition in Unlock/accessory, run, crank System voltage > 5.23 V No PCM processor, 5 V reference DTCs	79/159 counts ; 55 counts continuous; 3.125 msec /count in the ECM main processor 19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Throttle Position (TP) Sensor 2 Circuit Hi	P0223	Detects a continuous or intermittent short or open in TP sensor #2 circuit	TPS > 4.59 V	Ignition in Unlock/accessory, run, crank System voltage > 5.23 V No PCM processor, 5 V reference DTCs	79/159 counts ; 55 counts continuous; 3.125 msec /count in the ECM main processor 19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
FUEL PUMP CONTROL CIRCUIT (ODM)	P0230	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (9 volts < Ignition < 18 volts) Engine speed > 0 RPM	20 failures in a 25 sample test 250 msec / sample	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Random Misfire Detected	P0300	These DTC's will determine if a random misfire or a cylinder specific misfire is occurring by monitoring crankshaft velocity.	Deceleration index Vs Engine Speed Vs Load and Camshaft Position	<ul style="list-style-type: none"> • Engine run time > 2 crankshaft revolutions • DTCs not active for VSS, CKP, TP, MAP, ECT, MAF, and IAT sensors. • No engine protection faults. • P0315 (Crankshaft Position System Variation Not Learned) not active or engine speed < 1000 RPM • Deceleration Fuel and Clutch cutoff not active. • Power management is not active. • Not an automatic transmission shift with a throttle position >95%. • Brake torque management not active. • Fuel level > 10% (disablement ends 500 engine cycles, after a low fuel level condition ceases, and fuel disable does not occur with a fuel sensor DTC). • -7°C < ECT < 129 ° C. • If ECT at startup < -7 °C, then disable until ECT > 21 °C. • 150 RPM below minimum hot idle < Engine speed < 400 RPM below Engine Over Speed Protection... • 9 volts < System voltage 18 volts. • + Throttle position delta < 50 % per 100 ms. • - Throttle position delta <50% per 100 ms. • Abnormal engine speed is not present. • ABS rough road not detected. • ABS / TCS / VSES is not active. • Not an abusive engine speed condition, 500 RPM above maximum engine over speed protection. Abusive engine speed delay = 1250 cycles (Manual Transmission Only) • Positive and zero torque (except the CARB approved 3000 rpm to redline triangle). Positive and zero torque is detected when both is true: 1) engine load > zero torque cal (cal a function of engine speed and temperature), and 2) Throttle open or VSS < 48 KPH. • EGR Intrusive test not active. • Misfire Diag is not requesting to disable TCC when transmission is in hot mode. • Crankshaft Ring Filter inactive (after a low level misfire, another misfire may not be detectable until crankshaft ringing ceases) 	Emission Exceedence = (5) failed 200 revolution blocks of 16. Failure reported with (1) Exceedence in 1st (16) 200 revolution block, or (4) Exceedences thereafter. 1st Catalyst Exceedence = Number of 200 revolution blocks as data supports for catalyst damage. 2nd and subsequent Catalyst Exceedences = (1) 200 revolution block with catalyst damage. Failure reported with (3) Exceedences in FTP, or (1) Exceedence outside FTP. <u>Frequency:</u> Continuous	DTC Type B (MIL Flashes with Catalyst Damaging Misfire)
Cylinder 1 Misfire Detected	P0301					
Cylinder 2 Misfire Detected	P0302					
Cylinder 3 Misfire Detected	P0303					
Cylinder 4 Misfire Detected	P0304					
Cylinder 5 Misfire Detected	P0305					
Cylinder 6 Misfire Detected	P0306					
Cylinder 7 Misfire Detected	P0307					
Cylinder 8 Misfire Detected	P0308	Emission Failure Threshold =1.625% (Kt_MISF_Emission_Misfire), depending on engine speed and engine load Catalyst Damage Threshold = 5 – 11.25% (Kt_MISF_Catalyst_Misfire), depending on engine speed and engine load				
Crankshaft Position System Variation Not Learned	P0315	The DTC will determine if the Crankshaft Position System Variation has not been learned	Sum of compensation factors not within range	<ul style="list-style-type: none"> • PCM State =Run • Manufacturers enable counter must be Zero. 	100 ms loop continuous	DTC Type A

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
KNOCK SENSOR CIRCUIT	P0325	This diagnostic will detect a failed internal ECM component associated with knock control	Engine speed > 2000 RPM and any gain average > 3.5 OR Engine speed > 1500 RPM and all gain averages < 0.19971	Air Per Cylinder > 100	50 fails out of 100 samples 100ms sample rate Continuous .	DTC Type B
KNOCK SENSOR PERFORMANCE	P0326	This diagnostic checks for an overactive knock sensor caused by noisy engine components (e.g. lifters)	Fast Retard $\geq 15^\circ$	Engine RPM ≥ 800 MAP ≥ 42 kPa No Throttle Faults	50 fails out of 100 samples 100ms sample rate Continuous	DTC Type B
KNOCK SENSOR 1 CIRCUIT LOW	P0327	Checks knock sensor and wiring based on delta noise levels	<u>Gated Low Pass Filter > 4V – Input & Return open</u> <u>Gated Low Pass Filter < 1.24V – Input & Return Shorted</u> OR KNS_FL < 2.02V or RTN_KSFL > 3.76V – Input Shorted High OR KNS_FL > 2.86V or RTN_KSFL < 1.48V – Input Shorted Lo Where: KNS_FL = knock sensor flat response input RTN_KSFL = return	Air Per Cylinder > 100	50 fails out of 100 samples 100ms sample rate Continuous .	DTC Type B
KNOCK SENSOR 2 CIRCUIT LOW	P0332	Checks knock sensor and wiring based on delta noise levels	<u>Gated Low Pass Filter > 4V – Input & Return open</u> <u>Gated Low Pass Filter < 1.24V – Input & Return Shorted</u> OR KNS_FL < 2.02V or RTN_KSFL > 3.76V – Input Shorted High OR KNS_FL > 2.86V or RTN_KSFL < 1.48V – Input Shorted Lo Where: KNS_FL = knock sensor flat response input RTN_KSFL = return	Air Per Cylinder > 100	50 fails out of 100 samples 100ms sample rate Continuous	DTC Type B
Crankshaft Position (CKP) Sensor A Circuit	P0335	This diagnostic determines whether a fault exists with crank position sensor signal	1. No crankshaft position sensor pulses received for 4 seconds 2. No crankshaft position sync 3. No crankshaft position sensor pulses received	1. Engine cranking and either CMP pulses being received or MAF > 3 grams per second 2. Engine is spinning and no 5V reference DTCs set 3. Engine is spinning and no 5V reference or cam position sensor DTCs set	1. Continuous - 12.5 ms 2. Continuous - 12.5 ms 3. Continuous - 12.5 ms 2 test failures out of 10 samples	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Crankshaft Position (CKP) Sensor A Performance	P0336	This diagnostic determines whether a performance fault exists with crank position sensor signal	<ol style="list-style-type: none"> Twenty crank resyncs occur within 25 seconds 55 > number of crank pulses received in one engine revolution >61 	<ol style="list-style-type: none"> Engine speed > 450 RPM Engine is spinning and no 5V reference or cam position sensor DTCs set 	<ol style="list-style-type: none"> Continuous – 2 test failures Continuous – 8 test failures out of 10 samples 	DTC Type B
Camshaft Position (CMP) Sensor Circuit Bank 1 Sensor A	P0340	This diagnostic will detect if a fault exists on the camshaft position sensor signal.	<ol style="list-style-type: none"> No Cam pulses received during first 24 MEDRES events No Cam pulses received for 100 engine cycles No Cam pulses received No Cam pulses received 	<ol style="list-style-type: none"> Crank is synchronized and no 5V ref DTCs set Crank is synchronized and no 5V ref DTCs set Engine is cranking and either crank pulses are received or MAF > 3 grams per second Engine is spinning and no 5V ref DTCs set 	<ol style="list-style-type: none"> Continuous Continuous – 8 test failures out of 10 samples Continuous – 4 seconds Continuous – 1.5 seconds 	DTC Type B
Camshaft Position (CMP) Sensor Performance Bank 1 Sensor A	P0341	Detects cam sensor performance malfunctions by monitoring for the incorrect number of cam sensor pulses in a given number of crank sensor pulses	<ol style="list-style-type: none"> 4 > number of cam pulses received in 24 MEDRES events > 6 397 > number of cam pulses received in 100 engine cycles > 403 	<ol style="list-style-type: none"> Crank is synchronized and no 5V ref DTCs set Crank is synchronized and no 5V ref DTCs set 	<ol style="list-style-type: none"> Continuous Continuous – 8 test failures out of 10 samples 	DTC Type B
IGNITION CONTROL (Cylinders 1-8)	P0351 – P0358	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine cranking or Engine Running RunCrank Active (Ignition > 6 volts)	50 failures in a 63 sample test 100 msec / sample	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Exhaust Gas Recirculation (EGR) Flow Insufficient	P0401	During a closed throttle decel condition, the EGR valve is normally closed. This diagnostic opens the valve to a pre-determined position, and the change in MAP is computed. This change in MAP correlates to the flow rate of the EGR system.	With EGR valve open, the peak + MAP Δ is monitored over a period of time. 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 of 0.897 kpa	<p><u>Test Enables</u></p> <ul style="list-style-type: none"> No fuel injector DTCs set No CKP DTCs set No TP sensor DTC's set No MAP DTC's set No VSS DTC's set No ETC DTC's set No 5 volt reference DTC's set No IAT sensor DTC's set No ECT sensor DTC's set No IAC DTC's set No EGR Pintle Position DTC set No Misfire DTC's set No MAF DTC's set No CPP (Clutch) DTC's set No PCM DTC's set No Engine Metal Overtemperature Protection Not in Power Take Off (PTO) Mode Not in device control Traction control not active EGR valve icing not occurring EGR valve over temperature not occurring EGR Engine run time expired Not in Power Enrichment Not in Catalyst protection mode ECT > 5°C ECT < 150°C BARO > 74Kpa BARO data is valid IAT < 100°C IAT > NA Ignition Voltage < 18V Ignition Voltage > 11V Transmission is in 3 or 4gear In decel fuel cut off decel fuel cut off status is unchanged Vehicle speed < 130 kph Vehicle Speed > 32 kph Throttle Position is virtually closed Transmission status is unchanged <p><u>Stability Mode Enables</u></p> <ul style="list-style-type: none"> EGR Position < 1% 1000_RPM < Engine Speed < 1800 MAP Δ < 1.1 kpa 5 kPa < Compensated MAP 45 kpa Throttle Area Delta < 1.1% Difference between desired & actual airflow < 2 g/s <p><u>Intrusive Mode Enables</u></p> <ul style="list-style-type: none"> Vehicle Speed Δ > 24 of 49 + RPM Δ < 100 rpm - RPM Δ < 200 rpm 	<p><u>Test Time</u></p> <p>0.5 sec. + 0.3 sec = 0.8 sec</p> <p><u>Frequency</u></p> <p>6.26 ms loop</p> <p>Once per trip (typically)</p> <p>Rapid Step Response feature will initiate multiple tests:</p> <p>IF the difference between the current EWMA and the current map diff > 3.19 kPa AND current map diff > -0.039 kPa THEN 3 tests will be run per trip until 10 tests have been completed</p> <p>Fast Initial Response feature will initiate multiple tests upon code clear or a non-volatile memory failure: Several tests per trip will run until 10 tests have been completed.</p>	DTC Type A

2006file1.doc

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Exhaust Gas Recirculation (EGR) Solenoid Control Circuit	P0403	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (9 volts < Ignition < 18 volts)	20 failures in a 25 sample test 250 msec / sample	DTC Type B
Exhaust Gas Recirculation (EGR) Open Position Performance	P0404	This diagnostic detects if the pintle position error is too large	Pintle position error [absolute value of (desired position - actual position)] > 15 %	5 Volt reference DTC's not active P1258 not active Engine is running Off-board device not active Power Take Off (PTO) not active P0401 not intrusive Ignition voltage ≥ 11V EGR is enabled Desired EGR position > 0% Δ Desired EGR position < 14.5 % for 2 sec.	336 counts out of 420 counts 100ms loop Continuous	DTC Type B
Exhaust Gas Recirculation (EGR) Position Sensor A Circuit Low Voltage	P0405	This diagnostic detects if the pintle position feedback circuit is open or shorted to ground	EGR feedback sensor signal < 4 % of A/D reference voltage	5 Volt reference DTC's not active Engine is running Off-board device not active Power Take Off (PTO) not active P0401 not intrusive Ignition voltage ≥ 11 volts	50 counts out of 55 counts 100ms loop Continuous	DTC Type B
Exhaust Gas Recirculation (EGR) Position Sensor A Circuit High Voltage	P0406	This diagnostic detects if the pintle position feedback circuit is shorted to high voltage or the 5V return is open.	EGR feedback sensor signal > 94.7 % of A/D reference voltage	5 Volt reference DTC's not active Engine is running Off-board device not active Power Take Off (PTO) not active P0401 not intrusive Ignition voltage ≥ 11 volts Enable conditions met for	180 counts out of 200 counts 100ms loop Continuous	DTC Type B
AIR System Incorrect Flow	P0411	Detects an AIR system insufficient flow condition. This test is run during the phase 1 (pump on, control valve open) portion of the Secondary Air Injection Diagnostic (SAI D).	AIR normalized pressure error > 5 kPa (higher than predicted pressure) during SAID phase 1 test OR AIR normalized pressure error < -5kPa (lower than predicted pressure) during SAID phase 1 test	No active AIR pressure sensor circuit DTCs set. No active AIR pressure sensor performance DTCs set. No active MAP sensor DTCs set. No active AIR pump relay circuit DTC set. No active AIR control valve relay circuit DTC set. No active MAF sensor DTCs set. No active 5 volt reference DTCs set. No active IAT sensor DTCs set. No active ECT sensor DTCs set. No active Misfire DTCs set. No active catalyst monitor DTCs set. No active fuel injector DTCs set. No active EST DTCs set. No active DTC P0606 set. AIR pressure sensor circuit fault pending = False. AIR operation is allowed this start... IAT > 5° C 18 volts > System voltage > 9 volts.	SAID phase 1 conditional test weight > 7 seconds Conditional test weight is based on Baro, Mass air flow & System voltage. Once per trip where AIR pump operation is requested at startup.	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Secondary Air Injection (AIR) Solenoid Control Circuit Bank 1	P0412	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (9 volts < Ignition < 18 volts)	20 failures in a 25 sample test 250 msec / sample	DTC Type B
Secondary Air Injection (AIR) Pump Control Circuit Bank 1	P0418	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (9 volts < Ignition < 18 volts)	20 failures in a 25 sample test 250 msec / sample	DTC Type B
Catalyst System Low Efficiency Bank 1	P0420	Oxygen Storage	<p>OSC time difference ≥ 0.13477 (EWMA filtered)</p> <p>OSC time difference = OSC worst pass threshold - OSC compensation factor * (post cat O2 resp time - pre cat O2 resp time)</p> <p>OSC worst pass thresh = 4.5 seconds</p>	<p><u>General Enable</u></p> <ul style="list-style-type: none"> No EVAP, PTO not active, TAC system, MAF, CAM, ECT, CKP, EGR, BARO, AIR, EST, Fuel Injector, Fuel Trim, Idle Air, MAP, IAT, Misfire, O2 Sensor, TP Sensor, VSS or Engine Overtemp Protection Mode DTC's IAT > -20° C Green Converter Delay = not active <p><u>Valid Idle Period Criteria</u></p> <ul style="list-style-type: none"> Engine speed ≥ 1000 RPM for a minimum of 20 seconds since end of last idle period. Engine Speed < 1000 RPM Engine run time ≥ 350 seconds. Vehicle Speed ≤ 3.2 kph FASD and/ or POS Diagnostic Intrusive Test and/or AIR Diagnostic Intrusive Test not Active Tests attempted this trip ≤ 18.00 <p><u>Idle conditions Met Criteria</u></p> <p>General Enable met; Valid Idle Period met</p> <ul style="list-style-type: none"> 0.9 \leq short term fuel trim ≤ 1.1 A short term fuel trim since valid idle conditions met ≤ 2 predicted catalyst temp $\geq 385^\circ\text{C}$ for at least 75 seconds with a closed throttle time ≤ 180 seconds consecutively (closed throttle \Rightarrow TPS < 1.9989%) Closed loop fueling Long term fuel trim learning enabled Barometric pressure > 70 kPa 70°C \leq ECT $\leq 125^\circ\text{C}$ System voltage > 10.7 volts 0 < Idle period ≤ 60 seconds \Rightarrow Idle time is incremented if: Vehicle Speed ≤ 3.2 kph and Throttle Position $\leq 1.9989\%$ IAT < 250°C PRNDL is in Drive Range <p><u>Test Enable Conditions; must hold true from after idle conditions are met to end of test</u></p> <ul style="list-style-type: none"> 3 gps \leq MAF ≤ 18 gps CCP DC Multiplier ≤ 1 Tests attempted this idle period < 1 Predicted catalyst temperature $\leq 640\text{degC}$ <p><u>Engine Fueling Criteria at Beginning of Idle Period</u></p> <ul style="list-style-type: none"> Must be met from between 3 and 7 seconds after idle conditions have been met for at least 3 seconds Number of pre-O2 switches ≥ 1 0.96% average short term fuel trim ≤ 1.04 	<p>1 test attempted per valid idle period</p> <p>Minimum of 1 test per trip</p> <p>Maximum of 6 tests per trip</p> <p><u>Frequency:</u></p> <ul style="list-style-type: none"> 12.5 ms Continuous <p>Rapid Step Response feature will initiate multiple tests: If the difference between current EWMA value and the current OSC time difference ≥ 1.26 seconds and OSC time difference ≥ 0.00 seconds</p> <p>Maximum of 6 tests per trip. Maximum of 18 tests to detect failure when rapid step response is enabled.</p> <p><u>Green Converter Delay Criteria</u></p> <ul style="list-style-type: none"> The diagnostic will not be enabled until the next ignition cycle after the following has been met: Predicted catalyst temperature $\geq 500^\circ\text{C}$ for 3600 seconds non-continuously. (Note that all other enable criteria must be met on the next ignition cycle for the test to run on that ignition cycle) Note: this feature is only enabled when the vehicle is new and cannot be enabled in service 	DTC Type A

Comment [G1]:

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
CATALYTIC CONVERTER LOW OXYGEN STORAGE	*P0430	Oxygen Storage.	<p><u>OSC Time Difference</u> ≥ 0.14257</p> <p>OSC Time Difference = OSC Worst Pass Thresh - OSC Compensation Factor * (Post Cat O2 Resp Time - Pre Cat O2 Resp Time)</p> <p><u>OSC Worst Pass Thresh</u> = 1.69375 sec</p>	<p><u>Trip Enable Criteria</u> No VSS, EGR Control, Throttle, Purge control, Purge Circuit, Oxygen sensor, Misfire, IAT, MAP, Camel Mode, Injector, EST Control, EGR Sensor, Coolant, Crank sensor, Cam sensor, Air flow, AIR, IAC, or Fuel trim DTC's failing</p> <p><u>Valid Idle Period Criteria</u> Engine Speed ≥ 900 rpm for minimum of 25 sec since end of last idle period Vehicle Speed < 2 mph RPM < 900</p> <p><u>Test Enable Conditions</u> 538 < Predicted Catalyst Temperature < 750 Predicted catalyst temperature > 538 for 120 sec, and throttle not < 2% for 180 sec 0.90 < Short term fuel trim < 1.1 at start of idle 0.96 < Average Short term fuel trim < 1.04 during summing time to enable intrusive fuel control Min engine runtime ≥ 350 sec Barometric Pressure ≥ 70 kPa -20 ≤ IAT ≤ 85°C 70°C ≤ ECT ≤ 125.5°C 0 < Idle Period ≤ 60 sec Tests Attempted this trip ≤ 6 Tests Attempted this idle period < 1</p> <p><u>Rapid Step Response Enable Criteria</u> OSC Time Difference Step ≥ 0.46777 OSC Time Difference ≥ 0.000 sec</p> <p>All 2006 applications for small block – use material burnoff delay algorithm. Diagnostic will not enable until the following has been met: predicted catalyst temperature ≥ 650°C for 1 hour (non-continuously) from first production start.</p>	<p>1 test attempted per valid idle period</p> <p>Minimum of 1 test per trip.</p> <p>Maximum of 6 tests per trip.</p> <p>Maximum of 6 trips to detect failure when Rapid Step Response is enabled</p> <p>frequency: 12.5 ms continuous</p>	<p>DTC Type A</p> <p>Dual Bank Systems</p>

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Evaporative Emission (EVAP) System Small Leak Detected	P0442	This DTC will detect a small leak ($\geq 0.020''$) in the EVAP system between the fuel fill cap and the purge solenoid. The engine off natural vacuum method (EONV) is used.	<p><u>SMALL LEAK TEST FAIL:</u> Engine Off Natural Vacuum (EONV) while the engine is off. The total pressure change achieved during the test is normalized against a target value that is based upon fuel level and ambient temperature. (value of 1.60" to 2.50" water). The normalized value is entered into EWMA (with 0= perfect pass and 1=perfect fail). Once EWMA exceeds the fail threshold, the DTC light is illuminated. The DTC light can be turned off if the EWMA falls below the re-pass threshold for 3 consecutive trips.</p> <p>Fail threshold = 0.70 Re-Pass threshold = 0.40</p>	<p><u>TEST ENABLE :</u> No MAP DTC's No Thermostat Rationality DTC's VS Sensor DTC's not active No Fuel Tank Pressure Sensor circuit DTC's No EVAP Canister Purge Solenoid circuit DTC's No EVAP Canister Vent Solenoid circuit DTC's No Fuel Level DTC's Coolant Sensor DTC's not active IAT Sensor DTC's not active EVAP CCP stuck open DTC not active. EVAP large leak DTC not active. Ignition off timer DTC not active. Canister Vent restriction DTC is not active Fuel Level $>15.0\%$ but $< 85.0\%$ Drive time ≥ 600 seconds. Drive length ≥ 8 kilometers. Coolant $\geq 70^{\circ}\text{C}$. No fuel filling (fuel level increment $\geq 10\%$) During EONV test. BARO $> 74.0\text{kPa}$ Estimated ambient temperature at end of drive $>2^{\circ}\text{C}$ but $< 32^{\circ}\text{C}$.</p> <p>Estimate of Ambient Air Temperature Valid Conditions to be valid 1. Cold Start Startup $\Delta^{\circ}\text{C}(\text{ECT-IAT}) < 8^{\circ}\text{C}$ if $\text{ECT} > \text{IAT}$ OR 2. Hot Restart Sufficient drive length to get accurate estimate of ambient air temperature (at least a minimum of 3 minutes and 5 kilometers)</p>	Once per trip, during hot soak (up to 2500 sec.). Time since last complete test ≥ 17 hours if EWMA is passing, or ≥ 10 hours if EWMA is failing. No more than 2 attempts per day.	DTC Type A EWMA Average run length is 9. under normal conditions Run length is 2 to 6 trips after code clear or non-volatile reset
EVAP CANISTER PURGE SOLENOID VALVE CIRCUIT (ODM)	P0443	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (9 volts < Ignition < 18 volts)	20 failures in a 25 sample test 250 msec / sample	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Evaporative Emission (EVAP) Vent System Performance	P0446	This DTC will determine if a restriction is present in the vent solenoid, vent filler, vent hose or EVAP canister	Tank Vacuum > 12.00 "H2O for 5 seconds BEFORE Purge Volume > 6 liters OR Vented Vacuum < -2.5 in. H2O or Vented Vacuum > 5 in. H2O for 15 seconds 2 liters of fuel must be consumed after setting the DTC active the first time to set the DTC active the second time.	General Test Enable No MAP DTC's No TP Sensor DTC's No VSS DTC's No IAT DTC's No ECT DTC's No Fuel Tank Pressure Sensor circuit DTC's No Evap Canister Purge solenoid circuit DTC's No EVAP Canister Vent Solenoid circuit DTC's No Thermostat Rationality DTC's 15 % < Fuel Level < 85. % 10.00 V < System Voltage < 18.00 V 4 °C < IAT < 30°C ECT < 30 °C BARO > 74.00 kPa (8000 ft)	Once per Cold Start Time is dependent on driving conditions Max. before test abort is 1000 seconds	DTC Type B
EVAP VENT SOLENOID CONTROL CIRCUIT (ODM)	P0449	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (9 volts < Ignition < 18 volts)	20 failures in a 25 sample test 250 msec / sample	DTC Type B
Fuel Tank Pressure (FTP) Sensor Circuit Performance	P0451	The DTC will be set if the fuel tank vacuum sensor is out of range when it tries to re-zero prior to the phase-1 or phase-2 portions of the engine-off natural vacuum small leak test.	The tank vacuum sensor voltage is compared to a window about the nominal sensor voltage offset (~1.5 volts) upper voltage threshold (voltage addition above the nominal voltage): 0.2 volts lower voltage threshold (voltage subtraction below the nominal voltage): 0.2 volts The difference between tank vacuum sensor voltage and the nominal offset voltage is then normalized against the appropriate threshold listed above to produce a ratio between 0.0 and 1.0. This normalized re-zero ratio is then filtered with a EWMA (with 0= perfect pass and 1=perfect fail). Once EWMA exceeds the fail threshold, the DTC light is illuminated. The DTC light can be turned off if the EWMA falls below the re-pass threshold for 3 consecutive trips. Fail threshold = 0.73 Re-Pass threshold = 0.40	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	This test is executed during an engine-off natural vacuum small leak test. The number of times that it executes can range from zero to two per engine-off period. The length of the test is determined by the refueling rationality test which can take up to 600 seconds to complete.	DTC Type A EWMA average run length: 6 Used on EONV Applications

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Fuel Tank Pressure (FTP) Sensor Circuit Low Voltage	P0452	This DTC will detect a fuel tank pressure sensor signal that is too low out of range.	Fuel tank pressure sensor signal < 0.1 volts produces a failing sample. Otherwise, the sample is considered passing. If 80 samples fail out of 100 samples total, then a fail will be reported to the DTC.	<ul style="list-style-type: none"> 0.10 second delay after sensor power up for sensor warm-up ECM State <> crank 	<u>Frequency:</u> Continuous 100ms loop	DTC Type B
Fuel Tank Pressure (FTP) Sensor Circuit High Voltage	P0453	This DTC will detect a fuel tank pressure sensor signal that is too high out of range.	Fuel tank pressure sensor signal > 4.9 volts produces a failing sample. Otherwise, the sample is considered passing. If 80 samples fail out of 100 samples total, then a fail will be reported to the DTC.	<ul style="list-style-type: none"> 0.10 second delay after sensor power up for sensor warm-up ECM state <> crank 	<u>Frequency:</u> Continuous 100ms loop	DTC Type B
Fuel Tank Pressure (FTP) Sensor Circuit Intermittent	P0454	This DTC will detect intermittent tank vacuum sensor signals that would have caused the engine-off natural vacuum small leak test to abort due to an apparent re-fueling event.	If an abrupt change in tank vacuum is detected the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that a refueling event occurred. If a refueling is confirmed, then the test sample is considered passing. Otherwise, the sample is considered failing indicating an intermittent signal problem. The abrupt change is defined as a change > 0.45 and < 1.0 "H2O vacuum in the span of 1.0 seconds. A refueling event is confirmed if the fuel level has a persistent change of 10.0 % for 30 seconds. The test will report a failure if 2 out of 3 samples are failures.	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period. The length of the test is determined by the refueling rationality test which can take up to 600 seconds to complete.	DTC Type A Used on EONV Applications

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Evaporative Emission (EVAP) System Large Leak Detected	P0455	This DTC will detect a weak vacuum condition (large leak or purge blockage) in the Evap system.	Purge volume > 25.00 liters BEFORE Tank vacuum < 10 "H ₂ O 2 liters of fuel must be consumed after setting the DTC active the first time to set the DTC active the second time. <u>Weak Vacuum Follow-up Test</u> (fuel cap replacement test) Weak Vacuum Test failed previous trip and this trip. Passes if tank vacuum > 10" H ₂ O. Note: Weak Vacuum Follow-up Test can only report a pass.	<u>General Test Enable</u> <ul style="list-style-type: none"> • No MAP DTC's • No TP Sensor DTC's • No VSS DTC's • No IAT DTC's • No ECT DTC's • No Fuel Tank Pressure circuit Sensor DTC's • No Evap Canister Purge solenoid circuit DTC's • No EVAP Canister Vent Solenoid circuit DTC's • No Thermostat Rationality DTC's • 15 % < Fuel Level < 85. % • 10.00 V < System Voltage < 18.00 V • 4 °C < IAT < 30°C • ECT < 30 °C • BARO > 74.00 kPa (8000 ft) Cold Start Test <ul style="list-style-type: none"> • IAT < 30°C • Cold temperature Δ(ECT-IAT): < 8 °C if ECT > IAT • Cold Test Timer < 1000 seconds 	Once per cold start Time is dependent on driving conditions Max. before test abort is 1000 seconds <u>Weak Vacuum Follow-up Test</u> On 2 nd trip with large leak detected, the follow-up test is limited to 600 seconds. Once the MIL is on, the follow-up test runs indefinitely.	DTC Type B
Fuel Level No Change, Stuck in Range Primary Tank	P0461	This DTC will detect a fuel sender stuck in range.	IF Delta Fuel Volume change less than 3 liters over a accumulated 200 Kilometers.	No VSS DTC's set Engine Running	Continuous	DTC Type B
Fuel Level Stuck Low Primary Tank	P0462	This DTC will detect a fuel sender stuck out of range low	Fuel level Sender % of 5V range less than 10 %	runs continuously	60 failures out of 100 samples 1 sample = 100 ms Continuous	DTC Type B
Fuel Level Stuck High Primary Tank	P0463	This DTC will detect a fuel sender stuck out of range high	Fuel level Sender % of 5V range > than 70%	runs continuously	60 failures out of 100 samples 1 sample = 100 ms Continuous	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Fuel Level Sensor 1 Circuit Intermittent	P0464	This DTC will detect intermittent fuel level sensor signals that would have caused the engine-off natural vacuum small leak test to abort due to an apparent re-fueling event.	<p>If a change in fuel level is detected the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that a refueling event occurred. If a refueling is confirmed, then the test sample is considered passing. Otherwise, the sample is considered failing indicating an intermittent signal problem.</p> <p>The refuel event is defined as a change of 10.0 % fuel level during the engine-off test.</p> <p>A refueling event is confirmed if the fuel level has a persistent change of 10.0 % for 30 seconds.</p> <p>The test will report a failure if 2 out of 3 samples are failures.</p>	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	<p>This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period.</p> <p>The length of the test is determined by the refueling rationality test which can take up to 600 seconds to complete.</p>	<p>DTC Type A</p> <p>Used on EONV Applications</p>
PRIMARY COOLING FAN RELAY CONTROL CIRCUIT MALF (ODM)	P0480	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match	RunCrankIgnInRange (9 volts < Ignition < 18 volts) Engine speed greater than 400 rpm	20 failures in a 25 sample test 250 msec / sample	DTC Type B
SECONDARY COOLING FAN RELAY CONTROL CIRCUIT MALF (ODM)	P0481	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match	RunCrankIgnInRange (9 volts < Ignition < 18 volts) Engine speed greater than 400 rpm	20 failures in a 25 sample test 250 msec / sample	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Evaporative Emission (EVAP) System Flow During Non-Purge	P0496	This DTC will determine if the purge solenoid is leaking to engine manifold vacuum.	Tank Vacuum > 10 "H2O for 5.00 sec BEFORE Test time > 60 seconds (cold start)	<u>General Test Enable</u> <ul style="list-style-type: none"> • No MAP DTC's • No TP Sensor DTC's • No VSS DTC's • No IAT DTC's • No ECT DTC's • No Fuel Tank Pressure Sensor circuit DTC's • No EVAP canister purge solenoid circuit DTC's • No EVAP Canister Vent Solenoid circuit DTC's • No Thermostat Rationality DTC's • 15 % < Fuel Level < 85. % • 10.00 V < System Voltage < 18.00 V • 4 °C < IAT < 30°C • ECT < 30 °C • BARO > 74.00 kPa (8000 ft) <p style="text-align: center;">Cold Start Test</p> <ul style="list-style-type: none"> • IAT < 30°C • Cold temperature Δ(ECT-IAT): < 8 °C if ECT > IAT • Cold Test Timer < 1000 seconds 	Once per cold start. Cold start: max time is 1000 seconds	DTC Type B
Vehicle Speed Sensor (VSS) Circuit Low Voltage	*P0502	This DTC detects a missing from the output speed sensor in a manual transmission vehicle.	Output speed sensor signal not detected	Manual VSS diagnostic enabled No MAP DTC's set No TPS DTC's set No idle system DTC's set 1000 < Engine speed < 5000 5 % < throttle position < 100 % 68 < engine torque(Nm) < 8192	No activity for 10sec while meeting enable criteria	DTC Type B Manual Transmission Vehicles only
Vehicle Speed Sensor (VSS) Circuit Intermittent	*P0503	This DTC detects a intermittent signal from the output speed sensor in manual transmission vehicle	Output speed sensor signal erratic performance	Manual VSS diagnostic enabled No MAP DTC's set No TPS DTC's set No idle system DTC's set Positive rate change less than 150 counts per sample for at least 0.5 sec Output speed > 300 counts for 6 sec	Rate of speed change (negative) exceeds fail criteria for 6 sec	DTC Type B Manual Transmission Vehicles only

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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																				
IDLE SYSTEM - LOW ENGINE SPEED	P0506	This DTC will determine if a low idle exists.	RPM < Desired RPM by an amount determined in a look up table based on engine coolant <table border="1"> <thead> <tr> <th>ECT</th> <th>value</th> </tr> </thead> <tbody> <tr><td>56</td><td>-100</td></tr> <tr><td>68</td><td>-100</td></tr> <tr><td>80</td><td>-100</td></tr> <tr><td>92</td><td>-100</td></tr> <tr><td>104</td><td>-100</td></tr> <tr><td>116</td><td>-100</td></tr> <tr><td>128</td><td>-100</td></tr> <tr><td>140</td><td>-100</td></tr> <tr><td>152</td><td>-100</td></tr> </tbody> </table>	ECT	value	56	-100	68	-100	80	-100	92	-100	104	-100	116	-100	128	-100	140	-100	152	-100	No MAF, MAP, IAT, ECT, TP, Injector, Fuel System, Misfire, VSS or Purge DTC Engine Run > 60 sec. ECT ≥ -16 °C BARO > 65 kPa IGN. voltage > 10.5 volts but < 18 volts IAT > -18 °C Time since a gear state change > 3 seconds Time since a TCC mode change is > 3 seconds Idle control logic indicates that the engine is in an idle condition Idle conditions present for > 2 seconds to enable diagnostic test	Time for each test: Within pass criteria continuously for 3 seconds Outside of fail criteria continuously for 5 seconds 3 tests to fail; must leave enable criteria between each test <u>Frequency:</u> Continuous after enable 100ms loop	DTC Type B
ECT	value																									
56	-100																									
68	-100																									
80	-100																									
92	-100																									
104	-100																									
116	-100																									
128	-100																									
140	-100																									
152	-100																									
IDLE SYSTEM - HIGH ENGINE SPEED	P0507	This DTC will determine if a high idle exists	RPM > Desired RPM by an amount determined in a look up table based on engine coolant <table border="1"> <thead> <tr> <th>ECT</th> <th>value</th> </tr> </thead> <tbody> <tr><td>56</td><td>100</td></tr> <tr><td>68</td><td>100</td></tr> <tr><td>80</td><td>100</td></tr> <tr><td>92</td><td>100</td></tr> <tr><td>104</td><td>100</td></tr> <tr><td>116</td><td>100</td></tr> <tr><td>128</td><td>100</td></tr> <tr><td>140</td><td>100</td></tr> <tr><td>152</td><td>100</td></tr> </tbody> </table>	ECT	value	56	100	68	100	80	100	92	100	104	100	116	100	128	100	140	100	152	100	No MAF, MAP, IAT, ECT, TP, Injector, Fuel System, Misfire, VSS or Purge DTC Engine Run > 60 sec. ECT ≥ -16 °C BARO > 65 kPa IGN. voltage > 10.5 volts but < 18 volts IAT > -18 °C Time since a gear state change > 3 seconds Time since a TCC mode change is > 3 seconds Idle control logic indicates that the engine is in an idle condition Idle conditions present for > 2 seconds to enable diagnostic test	Time for each test: Within pass criteria continuously for 3 seconds Outside of fail criteria continuously for 5 seconds 3 tests to fail; must leave enable criteria between each test <u>Frequency:</u> Continuous after enable 100ms loop	DTC Type B
ECT	value																									
56	100																									
68	100																									
80	100																									
92	100																									
104	100																									
116	100																									
128	100																									
140	100																									
152	100																									
ENGINE OIL PRESSURE (EOP) SWITCH CIRCUIT	P0520	This DTC checks the circuit for electrical integrity during operation.	The ECM detects if the input state remains active (high pressure), after sufficient engine-off time.	No ECT failures present RunCrank Active (Ignition > 6 volts) Engine is not moving Coolant Temp at previous shutdown > 80°C Engine has been shutdown > 3600 seconds, or Coolant Temp drop > 10°C	250 msec / sample Continuous failures ≥ 2 seconds	DTC Type B																				
Control Module Read Only Memory (ROM)	P0601	This DTC will be stored if the calibration check sum is incorrect	Output state invalid	<ul style="list-style-type: none"> PCM state = crank or run Ignition voltage ≥ 5 volts 	1 failure if it occurs on the first pass, 5 failures after the first pass has completed successfully <u>Frequency:</u> Runs continuously in the background	DTC Type A																				

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Control Module Not Programmed	P0602	This DTC will be stored if the PCM is a service PCM that has not been programmed.	Output state invalid	<ul style="list-style-type: none"> PCM state = crank or run PCM is identified through calibration as a Service PCM 	Test is run at Powerup Test also runs: <u>Frequency:</u> 100ms loop Continuous	DTC Type A
Control Module Long Term Memory Reset	P0603	Non-volatile memory checksum error at controller power-up	Checksum at power-up does not match checksum at power-down		1 failure Once at power-up	DTC Type A
Control Module Random Access Memory (RAM)	P0604	Indicates that PCM is unable to correctly write and read data to and from RAM	Data read does not match data written	Ignition in Run or Crank	1 failure if it occurs on the first pass, 5 failures after the first pass has completed successfully <u>Frequency:</u> Runs continuously in the background. The first test runs quickly (~ 1 second). Subsequent tests run at a slower rate.	DTC Type A

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
PCM Processor Processor Performance Check - Throttle limiting Fault (motor processor) Processor Performance Check - ETC software is not executed in proper order Processor Performance Check Processor Performance Check - SPI failed Processor Performance Check - motor processor state of health (Main) Processor Performance Check - Learn Corruption Fault (Main motor processor) Processor Performance Check - Learn Corruption Fault MAIN & motor processor Processor Performance Check - motor processor state of health (Main) Processor Performance Check - MAIN state of health (motor processor)	P0606	Indicates that the ECM has detected an ETC internal processor integrity fault	MHC processor detects throttle limiting fault Software tasks loops > schedule tasks loop Loss of SPI communication from the motor processor 1.5 msec < Average motor processor state of health toggle > 2.5 msec TPS or APPS minimum learned values fail compliment check TPS or APPS minimum learned values fail range check Motor processor integrity check error occurs Motor processor integrity check error of main processor occurs	Ignition in unlock/accessory, run or crank System voltage>5.23 V	187.5 ms in the MHCprocessor Error > 5 times of loop time; loop time are 12.5, 25,50,100 and 250 ms in the main processor 159/400 counts or 15 counts continuous; 39 counts continuous @ initialization. 4 counts/ 10 counts at initialization, 50 msec/count in the main processor, 487.5ms in MHC processor. 187.5ms continuous/100 ms intermittent in the main processor 187.5ms continuous/100 msec intermittent in the main processor	DTC Type A
Control Module Accelerator Pedal Position (APP) System Performance	P060D	Verify that the indicated accelerator pedal position calculation is correct	APPS #2 signal voltage > 2.05V Difference between Main processor indicated accelerator pedal position and MHC processor indicated accelerator pedal position > 2.5%	Ignitions in unlock/ accessory and run, System voltage > 5.23 V No PCM processor DTC Ignition in unlock, accessory, run or crank System voltage > 5.23 V No PCM processor DTC No Comm Fault w/ Main	39 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Control Module EEPROM Error	P062F	Indicates that the NVM Error flag has not been cleared	Last EEPROM write did not complete	Ignition on.	1 test failure Once on controller power-up	DTC Type A

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
5 Volt Reference 1 Circuit	P0641	Detects a continuous or intermittent short on the #1 5 V sensor reference circuit	Vref1 < 4.875 or > 5.125 v	Ignition in unlock/accessory, run or crank System voltage > 5.23 V No ECM processor DTCs	19/39 counts or 200 msec continuous; 12.5 msec/count in main /MHC processor	DTC Type A
Malfunction Indicator Lamp Control Circuit MALF (ODM)	P0650	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (9 volts < Ignition < 18 volts) Remove Vehicle Start is not active	20 failures in a 25 sample test 250 msec / sample	DTC Type B, No MIL
5 Volt Reference 2 Circuit	P0651	Detects a continuous or intermittent short on the #2 5 V sensor reference circuit	V Vref2 < 4.4875 or > 5.125 v	Ignition in unlock/accessory, run or crank System voltage > 5.23 V No ECM processor DTCs	19/39counts or 200 msec continuous; 12.5 msec/count in main/MHC processor	DTC Type A
Powertrain Relay Control (ODM)	P0685	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (9 volts < Ignition < 18 volts)	20 failures in a 25 sample test 250 msec / sample	DTC Type B
Powertrain Relay Feedback Circuit Low	P0689	This DTC is a check to determine if the Powertrain relay is functioning properly	PT Relay feedback voltage is ≤ 5 volts	Powertrain relay commanded "ON" No Powertrain Relay Control output driver fault	5 failures in a 6 sample test 1 second / sample	DTC Type B
Powertrain Relay Feedback Circuit High	P0690	This DTC is a check to determine if the Powertrain relay is functioning properly	PT Relay feedback voltage is ≥ 18 volts Stuck Test: PT Relay feedback voltage is > 2 volts when commanded 'OFF'	Powertrain relay commanded "ON" No Powertrain Relay Control output driver fault	5 failures in a 6 sample test 1 second / sample Stuck Test: 100 msec / sample Continuous failures ≥ 2 seconds	DTC Type B
Transmission Control Module (TCM) Requested MIL Illumination	P0700	Monitors the TCM MIL request line to determine when the TCM has detected a MIL illuminating fault.	Transmission Emissions-Related DTC set	Time since power-up > 3 seconds	Continuous	DTC Type A No MIL
Reverse Inhibit Solenoid Control Circuit	*P0801	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine is running	5 seconds. Continuous.	DTC Type C Manual Transmission Vehicles Only
Skip Shift Solenoid Circuit - ODM	*P0803	Control circuit voltage is monitored during operation. It should be low during operation and near B+ when "off".	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine is running	5 seconds. Continuous.	DTC Type B Manual Transmission Vehicles Only
Clutch Pedal A Circuit Low Voltage	*P0831	Clutch switch state is monitored during vehicle operation.	The PCM detects that a clutch switch state transition has not occurred when the vehicle speed has gone from 0 KPH above a threshold value and back to 0 KPH.	No VSS codes present VSS > 39kph TRQ > 75Nm RPM > 400 TPS > 10% 9 < volt < 18	400 test failures in a 500 test sample size 100ms Continuous	DTC Type C Manual Transmission Vehicles Only

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
CLUTCH SWITCH CIRCUIT	*P0833	Clutch switch state is monitored during vehicle operation.	The PCM detects that a clutch switch state transition has not occurred when the vehicle speed has gone from 0 KPH above a threshold value and back to 0 KPH.	No VSS codes present VSS > 39kph	9 test failures in a 10 test sample size 100ms Continuous	DTC Type B Manual Transmission Vehicles Only
Inlet Airflow System Performance	P1101	This DTC detects flaws with all Inlet Airflow sensors suggesting a major inlet flow problem.	(Measured Flow – Modeled air Flow) Filtered > 30 or (Measured MAP - Manifold Model 1 pressure) filtered > 25 and (Measured MAP – Manifold Model 2 pressure) filtered > 25 and (The calculated throttle residual from the MAF model and the Manifold Model) filtered > 400	Engine rpm =>500 and <= 5000 MAP sensor high/low DTC's not active EGR DTC's P0401, P0405, and P1404 not active MAF sensor high/low DTC's not active Crank sensor DTC's not active Engine Coolant DTC's not active Intake Air Temp. DTC's not active Engine Coolant > 70 deg C and < 121 deg C Intake Air Temp > -7 deg C and < 60 deg C	Continuous Evaluated every 12.5 ms	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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 Insufficient Switching Bank 1 Sensor 1	P1133	This DTC determines if the O2 sensor is no longer sufficiently switching.	Half cycle L/R switches < 43 OR Half cycle R/L switches < 43 OR Slope Time L/R switches < 1 OR Slope Time R/L switches < 1	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's Catalyst monitor diagnostic Intrusive Test = Not Active Post Oxygen Sensor Diagnostic Intrusive Test = Not Active Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active 10 volts < system voltage < 18 volts EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> O2 Heater on for ≥ 0 seconds B1S1 DTCs = Not Active Learned heater resistance is valid Misfire DTC = Not Active ECT > 70 °C IAT > -40 °C Engine run time > 202 seconds EVAP Canister purge duty cycle ≥ 0 % 20 gps \leq MAF \leq 40 gps 1100 \leq RPM \leq 2500 Ethanol percentage < 85 % Baro > 70 kPa Throttle position ≥ 3 % Fuel Level > 10 % Fuel state = closed loop No fuel level data faults Transmission (automatic) not in Park, Reverse or Neutral Transmission gear selection is not defaulted Baro is not defaulted <p>All of the above met for at least 1 second.</p>	60 seconds <u>Frequency:</u> Once per trip	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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 Insufficient Switching Bank 2 Sensor 1	P1153	This DTC determines if the O2 sensor is no longer sufficiently switching.	Half cycle L/R switches < 43 OR Half cycle R/L switches < 43 OR Slope Time L/R switches < 1 OR Slope Time R/L switches < 1	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's Catalyst monitor diagnostic Intrusive Test = Not Active Post Oxygen Sensor Diagnostic Intrusive Test = Not Active Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active 10 volts < system voltage < 18 volts EGR, Idle, Fuel Inj, and AIR Device controls = Not Active <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> O2 Heater on for ≥ 0 seconds B2S1 DTCs = Not Active Learned heater resistance is valid Misfire DTC = Not Active ECT > 70 °C IAT > -40 °C Engine run time > 202 seconds EVAP Canister purge duty cycle ≥ 0 % 20 gps \leq MAF \leq 40 gps 1100 \leq RPM \leq 2500 Ethanol percentage < 85 % Baro > 70 Throttle position ≥ 3 % Fuel Level > 10 Fuel state = closed loop No fuel level data faults Transmission (automatic) not in Park, Reverse or Neutral Transmission gear selection is not defaulted Baro is not defaulted <p>All of the above met for at least 1 second.</p>	60 seconds <u>Frequency:</u> Once per trip	DTC Type B
ENGINE PROTECTION MODE ACTIVE	P1258	Monitor for engine protection mode active.	Coolant temperature $\geq 137^{\circ}\text{C}$ Condition exists ≥ 7 seconds.	No coolant sensor failures	Set immediately upon engine protection mode active.	DTC Type A
ABS Rough Road Malfunction	P1380	This diagnostic detects if the ABS Controller is indicating a fault. When this occurs, misfire will continue to run.	ABS Controller sends a message to the ECM indicating that a failure has occurred in the ABS Module.	<ul style="list-style-type: none"> VS ≥ 0 kph 	40 failures out of 80 samples 100 msec loop continuous	DTC Type C (DTC can only set when a P0300 Light Request is True)

2006file1.doc

Page 40 of 49

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
ABS System Rough Road Detection Communication Fault	P1381	This diagnostic detects if the rough road information is no longer being received from the ABS Module. When this occurs, misfire will continue to run.	Serial data messages are lost.	• None	40 failures out of 80 samples 100 msec loop continuous	DTC Type C (DTC can only set when a P0300 Light Request is True)
Cold Start Emissions Reduction System Fault	P1400	Model based test computes power from exhaust flow and thermal energy resulting from the elevated idle speed and retarded spark advance. Detects if the cold start emission reduction system has failed resulting in the delivered power being out of range.	If RPM in Park/Neutral < 1004 - 1145 {f(ECT and engine run time)} or If RPM in Gear < 650 - 750 {f(ECT and engine run time)}, then the model tends to make a fail decision. If Spark Advance in Park/Neutral > 5 {f(RPM and air per cylinder)} or If Spark Advance in Gear > 5 {f(RPM and air per cylinder)}, then the model tends to make a fail decision. The DTC will set when: (Average desired accumulated power - Average estimated accumulated power) > .25 Or (Average desired accumulated power - Average estimated accumulated power) < -11	Cold start emission reduction strategy is active. VS < 2 kph Airflow per cylinder > 40 mg/cyl TP(area w/o idle) < .05 % Engine run time > 0 Sec. for No DTC's set for the following systems: MAP, MAF, IAT, ECT, Misfire, Electronic Spark Timing, Crank sensor, Idle, Fuel Injection, TP sensor, VS sensor, 5 volt reference, ECM/PCM Memory, Intake Flow Rationality	100ms loop Runs once per trip when the cold start emission reduction strategy is active. Test completes after 10 seconds of accumulated qualified data	DTC Type A
Exhaust Gas Recirculation (EGR) Closed Position Performance	P1404	This diagnostic detects if the valve is stuck open when commanded closed.	Actual pintle position >= 5.5 % of reference voltage from learned closed position	5 Volt reference DTC's not active Engine is running Off-board device not active Power Take Off (PTO) not active P0401 not intrusive Ignition voltage ≥ 11 volts EGR is enabled EGR stroke is enabled Desired EGR position = 0, for 1 sec.	4 detections of: 240 counts out of 300 counts with pintle movement between failure detections of 30 % for at least 5 seconds open time 100ms loop Continuous	DTC Type B
Cooling Fan Speed Output Circuit	*P1482	Control circuit voltage is monitored during operation. It should be low during operation and near B+ when "off"	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match	Engine speed greater than 400 rpm Ignition voltage > 10 volts, but < 18 volts	5 seconds Continuous	DTC Type B For use on vehicles with PWM Fan

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Throttle Actuator Control (TAC) Module - Throttle Actuator Position Performance	P1516	Detect a throttle positioning error. Determine if the actuator has been miswired.	$ \text{throttle error} \geq 2\%$ after > 4 sec stability with no change in error sign, $ \text{throttle error} > 9.1\%$	1-3. Ignition in run or crank [RPM>0 or (RPM=0 and not in battery saver mode and System voltage >11.0 V)]. No airflow actuation, throttle actuation DTCs Engine running = true or System voltage > 5.5 V 4. Minimum TPS learn active state = false	187.5ms in the MHC processor	DTC Type A
Ignition Correlation	P1682	Detect a continuous or intermittent OOC in the Run/Crank Ignition Voltage & ETC Run/Crank Ignition Voltage	$ \text{Run/Crank} - \text{ETC Run/Crank} > 3 \text{ V}$	Ignition in unlock/accessory, run or crank System voltage >5.23 V & Powertrain Relay Commanded on.	15/15 counts , 12.5msec loop time, in main processor	DTC Type B
Fuel Level No Change, Stuck in Range Secondary Tank	*P2066	This DTC will detect a fuel sender stuck in range	IF Delta Fuel Volume change less than 3 liters over a accumulated 200 kilometers OR If Primary is FULL and Secondary is EMPTY for > 200 kilometers Or If primary is less than 32 liters and secondary tank is greater than 7 liters for more than 2400 seconds.	Fuel level greater than 32 liters No VSS DTC's set Engine Running	Continuous	DTC Type B For use on vehicles with dual fuel tank
Fuel Level Stuck Low Secondary Tank	*P2067	This DTC will detect a fuel sender stuck out of range low	Fuel level Sender % of 5V range less than 10 %	Fuel Level greater than 32 liters runs continuously	60 failures out of 100 samples 1 sample = 100 ms Continuous	DTC Type B For use on vehicles with dual fuel tank
Fuel Level Stuck High Secondary Tank	*P2068	This DTC will detect a fuel sender stuck out of range high	Fuel level Sender % of 5V range > than 70%	Fuel Level greater than 32 liters runs continuously	60 failures out of 100 samples 1 sample = 100 ms Continuous	DTC Type B For use on vehicles with dual fuel tank
Control Module Throttle Actuator Position Performance	P2101	Detect a throttle positioning error	Difference between measured throttle position and modeled throttle position > 9.1%	Ignition in run or crank [RPM>0 or (RPM=0 and not in battery saver mode, and system voltage > 11.0)] No airflow actuation, throttle actuation DTC.s Engine running and System voltage > 5.5 V	Check runs every 12.5 msec in the main processor 15/15 counts continuous	DTC Type A
Accelerator Pedal Position (APP) Sensor 1	P2120	Detect a continuous or intermittent short or open in the APP sensor #1	$0.325 \text{ V} < \text{Raw APP 1} < 4.59 \text{ V}$	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, 5 V reference DTCs	19/39counts or 13counts continuous; 12.5 msec/count in the main processor 19/39counts or 13counts continuous; 12.5 msec/count in the motor processor	DTC Type A

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Accelerator Pedal Position (APP) Sensor 1 Lo	P2122	Detect a continuous or intermittent short or open in the APP sensor #1	Raw APP 1 < 0.325V	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, 5 V reference DTCs	19/39counts or 13 counts continuous; 12.5 msec/count in the main processor 19/39counts or 13counts continuous; 12.5 msec/count in the motor processor	DTC Type A
Accelerator Pedal Position (APP) Sensor 1 Hi	P2123	Detect a continuous or intermittent short or open in the APP sensor #1	Raw APP 1 > 4.59V	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, 5 V reference DTCs	19/39counts or 13 counts continuous; 12.5 msec/count in the main processor 19/39 counts or 13counts continuous; 12.5 msec/count in the motor processor	DTC Type A
Accelerator Pedal Position (APP) Sensor 2	P2125	Detect a continuous or intermittent short or open in the APP sensor #2	0.325 V < Raw APP 1 < 4.59v	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, 5 V reference DTCs	19/39counts or 13counts continuous; 12.5 msec/count in the main processor 19/39 counts or 13counts continuous; 12.5 msec/count in the motor processor	DTC Type A
Accelerator Pedal Position (APP) Sensor 2 Lo	P2127	Detect a continuous or intermittent short or open in the APP sensor #2	Raw APP 2 < 0.325V	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, 5 V reference DTCs	19/39 counts or 13 counts continuous; 12.5 msec/count in the main processor 19/39 counts or 13 counts continuous; 12.5 msec/count in the motor processor	DTC Type A
Accelerator Pedal Position (APP) Sensor 2 Hi	P2128	Detect a continuous or intermittent short or open in the APP sensor #2	Raw APP 2 > 4.59V	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, 5 V reference DTCs	19/39 counts or 13 counts continuous; 12.5 msec/count in the main processor 19/39counts or 13 counts continuous; 12.5 msec/count in the motor processor	DTC Type A
Throttle Position (TP) Sensor 1-2 Correlation	P2135	Detects a continuous or intermittent correlation fault between TP sensors #1 and #2	Difference between (raw min. learned TPS#1 voltage-raw min. TPS#1 voltage) and (raw TPS#2 voltage - raw min. learned TPS#2 voltage) < 7% offset at min. throttle position with an increasing to 10% at max. throttle position	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, TPS circuit DTCs	79/159 counts or 63 counts continuous; 3.125 msec/count in the main processor 19/39 counts or 15 counts continuous; 12.5 msec/count in the MHCprocessor	DTC Type A

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Accelerator Pedal Position (APP) Sensor 1-2 Correlation	P2138	Detect an invalid minimum mechanical position correlation between APP sensor #1 and #2 Detect a short between APP sensors #1 and #2 circuits.	Difference between (raw min. learned PPS#1 voltage-raw min. PPS#1 voltage) and (raw PPS#2 voltage - raw min. learned PPS#2 voltage) > 5.0% offset at min. throttle position with an increasing to 10% (0.5v) at max. throttle position	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, APP sensor, 5 V reference DTCs Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor DTCs	19/39 counts intermittent or 15 counts continuous, 12.5 msec/count in the main processor 19/39 counts intermittent or 15 counts continuous, 12.5 msec/count in the motor processor	DTC Type A
Minimum Throttle Position Not Learned	P2176	TP minimum learning not completed	TPS > 0.935V	Minimum TPS learn active state Stable throttle position reading for 40 msec Ignition in run or crank No TPS circuit DTCs	1.8secs	DTC Type A
AIR System Pressure Sensor A Circuit	P2430	Detects a stuck-in-range AIR pressure sensor signal.	Stuck in Range Average Error < 0.5 AND Stuck in Range Variance < 1.0	No active DTC P0412 set. No active DTC P0418 set. No active DTC P0606 set. No active DTC P2432 set. No active DTC P2433 set. No active 5 volt reference DTCs set. AIR pressure sensor circuit fault pending = False. AIR pump is commanded ON	Stuck in Range Cumulative Info > 5 sec. Once per trip where AIR pump operation is requested at startup.	DTC Type B
AIR System Pressure Sensor A Performance	P2431	Detects significant errors in the comparison of the AIR pressure sensor signal and estimated BARO as well as evaluates the quality of the comparison.	Cumulative Error < -500 or > 500 Test quality is based on BARO and the distance traveled since the last unthrottled BARO update.	No active DTC P0412 set. No active DTC P0418 set. No active DTC P0606 set. No active DTC P2432 set. No active DTC P2433 set. No active 5 volt reference DTCs set. AIR pressure sensor circuit fault pending = False. AIR pump is commanded OFF	Performance Cumulative Info > 30 sec. Continuous, 100ms loop	DTC Type B
AIR System Pressure Sensor A Circuit Low	P2432	Detects a low out-of-range AIR pressure sensor signal	AIR Pressure Sensor signal < 5% of 5V ref.	No active DTC P0606 set. No active 5 volt reference DTCs set.	50 fail counts out of 63sample counts. Continuous, 12.5 ms loop.	DTC Type B
AIR System Pressure Sensor A Circuit High	P2433	Detects a high out-of-range AIR pressure sensor signal	AIR Pressure Sensor signal > 94% of 5V ref.	No active DTC P0606 set. No active 5 volt reference DTCs set.	50 fail counts out of 63 sample counts. Continuous, 12.5 ms loop.	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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																				
AIR System Switch / Valve Stuck Open	P2440	Detects an AIR system control valve stuck open condition. This test is run during the phase 2 (pump on, control valve shut) portion of the SAI diagnostic.	AIR normalized pressure error < a table value (lower than predicted pressure) during SAID phase 2 test <table border="1"> <thead> <tr> <th>Cumul. Wght. time</th> <th>Pres. Err.</th> </tr> </thead> <tbody> <tr><td>0</td><td>-6</td></tr> <tr><td>1</td><td>-6</td></tr> <tr><td>2</td><td>-5</td></tr> <tr><td>3</td><td>-4</td></tr> <tr><td>4</td><td>-3</td></tr> <tr><td>5</td><td>-3</td></tr> <tr><td>6</td><td>-3</td></tr> <tr><td>7</td><td>-3</td></tr> <tr><td>8</td><td>-3</td></tr> </tbody> </table>	Cumul. Wght. time	Pres. Err.	0	-6	1	-6	2	-5	3	-4	4	-3	5	-3	6	-3	7	-3	8	-3	No active AIR pressure sensor circuit DTCs set. No active AIR pressure sensor performance DTCs set. No active MAP sensor DTCs set. No active AIR pump relay circuit DTC set. No active AIR control valve relay circuit DTC set. No active MAF sensor DTCs set. No active 5 volt reference DTCs set. No active IAT sensor DTCs set. No active ECT sensor DTCs set. No active Misfire DTCs set. No active catalyst monitor DTCs set. No active fuel injector DTCs set. No active EST DTCs set. No active DTC P0411 set. No active DTC P0606 set. AIR pressure sensor circuit fault pending = False. AIR operation is allowed this start. 18 volts > System voltage > 9 volts.	SAID phase 2 conditional test weight > 1.5 seconds Conditional test weight is based on Baro, Mass air flow & System voltage. Once per trip where AIR pump operation is requested at startup.	DTC Type B
Cumul. Wght. time	Pres. Err.																									
0	-6																									
1	-6																									
2	-5																									
3	-4																									
4	-3																									
5	-3																									
6	-3																									
7	-3																									
8	-3																									
AIR System Pump Stuck On	P2444	Detects an AIR pump stuck ON condition. This test is run during the phase 3 (pump off) portion of the SAI diagnostic.	AIR normalized pressure error > 4.2 kPa (higher than predicted pressure) during SAID phase 3 test	No active AIR pressure sensor circuit DTCs set. No active AIR pressure sensor performance DTCs set. No active MAP sensor DTCs set. No active AIR pump relay circuit DTC set. No active AIR control valve relay circuit DTC set. No active MAF sensor DTCs set. No active 5 volt reference DTCs set. No active IAT sensor DTCs set. No active ECT sensor DTCs set. No active Misfire DTCs set. No active catalyst monitor DTCs set. No active fuel injector DTCs set. No active EST DTCs set. No active DTC P0411 set. No active DTC P0606 set.bb No active DTC P2440 set. AIR pressure sensor circuit fault pending = False. AIR operation is allowed this start. SAID post control time < 14 seconds	Within 10 seconds of the AIR pump being commanded OFF. Once per trip where AIR pump operation is requested at startup.	DTC Type A																				
ECM/PCM Internal Engine Off Timer Performance	P2610	This DTC determines if the engine off timer does not initialize or count properly. Clock rate test: Checks the accuracy of the 1 second timer by comparing it with the 12.5 msec timer	Initial value test: 1 second ≤ Initial Value ≤ 10 seconds Clock rate test: .8 sec ≤ 1 second accuracy < 1.2 sec	ECM is powered down DTC sets on next key cycle if failure detected -40°C ≤ IAT ≤ 125°C	Initial value test: 3 failures 1.375 sec / sample Clock rate test: 8 failures in a 10 sample test 1 second / sample test runs once each key-off	DTC Type B																				

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Fuel Pump 2 Flow Insufficient	*P2636	DTC monitors that enough fuel is transferred from the secondary fuel tank to the primary fuel tank	If Primary Tank < 32 liters and secondary tank > 7 liters for more than 2400 seconds	Engine Running	Continuous	DTC Type C No Light For use on vehicles with dual fuel tank
O2 Sensor Circuit Range/Performance Bank 1 Sensor 1	P2A00	This DTC determines if the O2 sensor voltage is not meeting the voltage criteria to enable closed loop fueling.	Closed loop fuel control O2 sensor Ready flag set to "Not Ready." O2 sensor voltage must be > 650 millivolts or < 250 millivolts to set closed loop fuel O2 Ready flag. Once set to "Ready," the O2 sensor voltage cannot be > 250 millivolts and < 650 millivolts for > 10 seconds or the O2 Ready flag will be reset to "Not Ready."	<ul style="list-style-type: none"> No TP Sensor, MAF, MAP, IAT, ECT, EVAP, Secondary Air, Injector DTC's No B1S1 or B2S1 O2 DTC's Engine Run Time ≥ 100 seconds ECT ≥ 70° C Engine Metal Overtemp = Not Active Traction Control = Not Active No default throttle action Not in Catalyst Protection Mode 10 volts ≤ Ignition Voltage ≤ 18 volts 500 ≤ Engine Speed ≤ 5000 3 gps ≤ Mass Airflow ≤ 30 gps Not in Decel Fuel Cutoff Mode Not in Power Enrichment Predicted O2 temp ≥ 0°C <p>All of the above met for 5 seconds.</p>	250 test failures in a 300 test sample <u>Frequency:</u> Continuous 100ms loop	DTC Type B
O2 Sensor Circuit Range/Performance Bank 1 Sensor 2	P2A01	This DTC determines if the post catalyst O2 sensor is stuck in a normal voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic includes a passive (stage 1) test and an intrusive (stage 2) test. The stage 2 increases or reduces delivered fuel to achieve the required rich or lean threshold.	Post catalyst O2 sensor cannot achieve voltage ≥ 751 millivolts and voltage ≤ 299 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> No O2 circuit, heater, response or heater driver DTC's active No TP Sensor, ETC, MAF, ECT, MAP, IAT, EVAP, Secondary Air, Fuel Injector DTC's Engine Runtime ≥ 260 seconds <p><u>Stage 2 Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> Stage 1 portion of test not passed No Fuel Trim or Misfire DTC's active Engine Runtime > 261 seconds 500 rpm ≤ Engine Speed ≤ 5000 rpm 15 gps ≤ Airflow ≤ 50 gps 24 kph ≤ Vehicle Speed ≤ 145 kph <p>All of the above met for at least 2 seconds, and then:</p> <ul style="list-style-type: none"> 1.05 ≤ Short term fuel trim ≤ 0.95 Fuel state = closed loop EVAP diagnostic not in control of purge 	<p><u>Stage 1:</u> Runs until pass or fail reporting.</p> <p><u>Stage 2:</u> Up to 8 seconds for each threshold</p> <p><u>Frequency:</u> Once per trip</p>	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
O2 Sensor Circuit Range/Performance Bank 2 Sensor 1	P2A03	This DTC determines if the O2 sensor voltage is not meeting the voltage criteria to enable closed loop fueling.	Closed loop fuel control O2 sensor Ready flag set to "Not Ready." O2 sensor voltage must be > 650 millivolts or < 250 millivolts to set closed loop fuel O2 Ready flag. Once set to "Ready," the O2 sensor voltage cannot be > 250 millivolts and < 650 millivolts for > 10 seconds or the O2 Ready flag will be reset to "Not Ready."	<ul style="list-style-type: none"> No TP Sensor, MAF, MAP, IAT, ECT, EVAP, Secondary Air, Injector DTC's No B1S1 or B2S1 O2 DTC's Engine Run Time \geq 100 seconds ECT \geq 70° C Engine Metal Overtemp = Not Active Traction Control = Not Active No default throttle action Not in Catalyst Protection Mode 10 volts \leq Ignition Voltage \leq 18 volts 500 \leq Engine Speed \leq 5000 3 gps \leq Mass Airflow \leq 30 gps Not in Decel Fuel Cutoff Mode Not in Power Enrichment Predicted O2 temp \geq 0°C <p>All of the above met for 5 seconds.</p>	250 test failures in a 300 test sample <u>Frequency:</u> Continuous 100ms loop	DTC Type B
O2 Sensor Circuit Range/Performance Bank 2 Sensor 2	*P2A04	This DTC determines if the post catalyst O2 sensor is stuck in a normal voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic includes a passive (stage 1) test and an intrusive (stage 2) test. The stage 2 increases or reduces delivered fuel to achieve the required rich or lean threshold.	Post catalyst O2 sensor cannot achieve voltage \geq 751 millivolts and voltage \leq 299 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> No O2 circuit, heater, response or heater driver DTC's active No TP Sensor, ETC, MAF, ECT, MAP, IAT, EVAP, Secondary Air, Fuel Injector DTC's Engine Runtime \geq 260 seconds <p><u>Stage 2 Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> Stage 1 portion of test not passed No Fuel Trim or Misfire DTC's active Engine Runtime > 261 seconds 500 rpm \leq Engine Speed \leq 5000 rpm 15 gps \leq Airflow \leq 50 gps 24 kph \leq Vehicle Speed \leq 145 kph <p>All of the above met for at least 2 seconds, and then:</p> <ul style="list-style-type: none"> 1.05 \leq Short term fuel trim \leq 0.95 Fuel state = closed loop EVAP diagnostic not in control of purge 	<p><u>Stage 1:</u> Runs until pass or fail reporting.</p> <p><u>Stage 2:</u> Up to 8 seconds for each threshold</p> <p><u>Frequency:</u> Once per trip</p>	DTC Type B 4 Sensor Systems
Control Module Communication Bus Off (Automatic transmission)	U0073	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state.	CAN device driver has reported that it has entered a bus-off state.		5 seconds <u>Frequency:</u> Continuous 1 second loop	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

2006file1.doc

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
Lost Communication with TCM (Automatic transmission)	U0101	Detects that CAN serial data communication has been lost with the TCM.	Lost communication with the TCM while the ignition switch is in the RUN power mode.		12 seconds <u>Frequency:</u> Continuous 1 second loop	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

**TABLE - O2S Slow Response Bank 1 Sensor 1 (P0133), O2S Slow Response Bank 2 Sensor 1 (P0153)
Lean-Rich Ave**

Seconds	0.000	0.045	0.060	0.075	0.090	0.105	0.125	0.140	0.155	0.170	0.185	0.200	0.215	0.240	0.255	0.285	0.290
0.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
0.045	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
0.060	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
0.075	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
0.090	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
0.105	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL
0.120	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL
0.130	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL
0.150	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL
0.170	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL
0.180	FAIL	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL
0.210	FAIL	FAIL	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL
0.230	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL
0.240	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL
0.255	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
0.285	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
0.290	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL

Rich-Lean Ave