2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Control Circuit Bank 1 Sensor 1	P0030	This DTC checks the Heater Output Driver circuit for electrical integrity	Output state shorted or open	• Ignition switch is in crank or run • 11 volts < Ignition Voltage < 18 volts	15 failures out of 20 samples Frequency: 100ms 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	Output state shorted or open	• Ignition switch is in crank or run • 11 volts < Ignition Voltage < 18 volts	15 failures out of 20 samples Frequency: 100ms 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	Output state shorted or open	• Ignition switch is in crank or run • 11 volts < Ignition Voltage < 18 volts	15 failures out of 20 samples Frequency: 100ms loop Continuous	DTC Type B
O2S Heater Control Circuit Bank 2 Sensor 2	P0056	This DTC checks the Heater Output Driver circuit for electrical integrity	Output state shorted or open	• Ignition switch is in crank or run • 11 volts < Ignition Voltage < 18 volts	15 failures out of 20 samples Frequency: 100ms loop Continuous	DTC Type B
MAP/MAF - Throttle Position Correlation	P0068	Indicates that measured engine airflow does not match estimated engine airflow as established by the TP Sensor.	MAP based airflow – TP Sensor estimated airflow > 165 mg/cyl AND MAF based airflow – TP Sensor estimated airflow > 165 mg/cyl	• Engine running = true. • Ignition on > 2 seconds • RPM > 600 • No Throttle Actuation DTC's. • No PCM-TACM Serial Data DTC. • Both TPS Circuit DTC's are not set. • No PCM Processor DTC's • No TACM Processor DTC	Both fail counters are incremented by 2 for every error and decrement by 1 for every pass; both thresholds are 32; both fail counters must exceed threshold to set DTC. Frequency: 18.75 ms loop Continuous	DTC Type A
Manifold Absolute Pressure – Barometric Pressure Correlation	P0069	This DTC compares the Predicted Barometric Pressure to the Barometric Pressure Sensor value.	When Predicted BARO is MAP, Difference between Predicted BARO and Barometer Pressure Sensor > 5.195313 kPa When Predicted BARO is calculated, Difference Between Predicted BARO and Barometer Pressure Sensor > 60 kPa	• No Map Sensor DTC's active • No TP Sensor DTC's active • No ECT Sensor DTC's active • No MAF Sensor DTC's active • No IAT Sensor DTC's active • No VSS DTC's active • No BARO Sensor Shorted/Open DTC's active • Predicted BARO must have been updated within the last 1 mile of this trip; Predicted BARO is set equal to powerup MAP at start of trip	10 failures out of 100 samples Frequency: 100ms loop Continuous	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Airflow (MAF) Sensor Performance	P0101	This DTC determines if the MAF sensor is stuck within the normal operating range.	(Calculated Flow - Measured Flow) > cal table lookup as a function of calculated flow	• No MAF circuit DTC's failing • No MAP DTC's failing • No TP Sensor DTC's failing • No EVAP DTC's failing • No EGR DTC's failing • No TAC System DTC faults • No ECT DTC's failing • No IAT DTC's failing • PCM State = RUN • Traction Control = Not Active • EGR Flow Diag. – Not Active • EGR ≤ 100% • EGR DC ≤ 100% • EVAP Canister Purge Valve Duty Cycle ≤ 100% • Delta MAP ≤ 5.195313 kPa • Delta TP Sensor ≤ 15 % • Engine Vacuum ≤ 80 kPa • TP Sensor ≤ 50% • 11 volts ≤ Ignition Voltage ≤ 18 volts • If ignition voltage ≤ 11.5 volts then undefaulted MAF must be ≤ 40 gps • Enable Criteria Stable Time ≥ 2 seconds	320 test failures in a 400 test sample Frequency: 100 ms loop Continuous	DTC Type B
Mass Air Flow (MAF) Sensor Circuit Low	P0102	This DTC detects a continuous short to low or open in either the signal circuit or the MAF sensor.	MAF sensor signal ≤ 1200 Hz	• Engine Run Time ≥ 0 seconds • RPM ≥ 50 • System Voltage ≥ 8 volts • Ignition is in crank or run • Indicated Throttle Position ≥3.496094 percent rotation (Vehicles with Electronic Throttle Control) (OR IAC steps ≥ 5 for vehicles without Electronic Throttle Control) • Enable Criteria Stable Time ≥ 0.5 seconds	395 test failures in a 400 test sample 1 sample on every reference pulse	DTC Type B
Mass Air Flow (MAF) Sensor Circuit High	P0103	This DTC detects a continuous short to high in either the signal circuit or the MAF sensor.	MAF sensor signal ≥ 11500 Hz	• Engine Run Time ≥ 0 seconds • RPM ≥ 50 • System Voltage ≥ 8 volts • Ignition is in crank or run • Indicated Throttle Position ≥3.496094 percent rotation (Vehicles with Electronic Throttle Control) (OR IAC steps ≥ 5 for vehicles without Electronic Throttle Control) • Enable Criteria Stable Time ≥ 0.5 seconds	395 test failures in a 400 test sample 1 sample on every reference pulse	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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
Manifold Absolute Pressure (MAP) Sensor Circuit Low	P0107	This DTC detects a continuous short to low or open in either the signal circuit or the MAP sensor.	MAP sensor signal < 0.098 volts	• No TP Sensor DTC's failing • No TAC system DTC's failing • [(TP Sensor ≥ 0 & Engine Speed ≤1000) or (TP Sensor ≥ 10% & Engine Speed > 1000)]	175 test failures in a 200 test sample Continuous: 12.5 ms loop if engine is not running every reference pulse below 3200 rpm when engine is running every other reference pulse above 3200 rpm when engine is running	DTC Type B
Manifold Absolute Pressure (MAP) Sensor Circuit High	P0108	This DTC detects a continuous short to high in either the signal circuit or the MAP sensor.	MAP sensor signal > 4.31 volts	• No TP Sensor DTC's failing • No TAC system DTC's failing • Controller State = RUN • Engine Run Time based on power up coolant temperature: > 1 sec at ≥ 30°C >30 sec at 15°C > 45 sec at 45°C >90 sec at -15°C > 120 sec at -30° C; time is interpolated between temperature points • [(TP Sensor < 2% & Engine Speed ≤ 1500) or (TP Sensor < 10% & Engine Speed > 1500)]	175 test failures in a 200 test sample Continuous: 12.5 ms loop if engine is not running every reference pulse below 3200 rpm when engine is running every other reference pulse above 3200 rpm when engine is running	DTC Type B
Intake Air Temperature (IAT) Sensor Circuit Low	P0112	This DTC determines if the IAT sensor is shorted low by checking for an IAT sensor output voltage below a threshold	IAT sensor signal < .035 volts	• No VSS DTC's failing • No ECT DTC's failing • Vehicle speed ≥ 25.00 mph • Engine run time > 10.00 seconds • ECT < 126.0156°C • Engine Run Time > 10 seconds	175 test failures within 1200 test sample s <u>Frequency:</u> 100 ms loop Continuous	DTC Type B
Intake Air Temperature (IAT) Sensor Circuit High	P0113	This DTC determines if the IAT sensor is shorted high or open by checking for an IAT sensor output voltage above a threshold	IAT sensor signal > 4.95 volts	• No ECT DTC's failing • No VSS DTC's failing • No MAF DTC's failing • Vehicle speed < 15.00 mph • Airflow < 10.00 g /s • ECT ≥ 60.00 °C • Engine run time> 180.00 seconds	1100 test failures within a 1200.00 test sample <u>Frequency:</u> 100 ms loop Continuous	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Temperature (ECT) Sensor Performance	P0116	This DTC detects if the engine coolant sensor is biased high while in range.	A failure will be reported if any of the following occur: ECT at powerup > IAT at powerup by 100°C after a minimum 8 hour soak (fast fail). ECT at powerup > IAT at powerup by 15°C after a minimum 8 hour soak and a block heater has not been detected. ECT at powerup > IAT at powerup by 15°C 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 10%.	• 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 > 480 minutes (8 hours) • Test run this trip = false • Test aborted this trip = false Block heater detection: - ECT at powerup > IAT at powerup by 15°C - Powerup IAT > 15°C - Vehicle driven a minumu of 300 seconds above 25 mph and IAT drops more than 5° C from powerup IAT.	<u>Frequency:</u> 100 ms loop Continuous	DTC Type B
Engine Coolant Temperature (ECT) Sensor Circuit Low	P0117	Thermistor Analog Voltage This DTC detects if the engine coolant sensor's analog voltage falls below a minimum expected value	ECT sensor signal < .025 volts	• Engine run time > 3.00 seconds OR min IAT ≤ 90°C Note: the min IAT used above is clamped to a maximum value of 54.5°C	240 test failures within a 250.00 test sample <u>Frequency:</u> 100 ms loop Continuous	DTC Type B
Engine Coolant Temperature (ECT) Sensor Circuit High	P0118	Thermistor Analog Voltage This DTC detects if the engine coolant sensor's analog voltage exceeds a maximum expected value	ECT sensor signal > 4.975 volts	• Engine run time > 15.00 seconds OR min IAT ≥ 0°C Note: the min IAT used above is clamped to a maximum value of 54.5°C	240 test failures within a 250.00 test sample <u>Frequency:</u> 100 ms loop Continuous	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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	P0120	1) TACM indicates a continuous or intermittent short or open in either the signal circuit or the TP sensor #1. OR 2) TACM indicates an invalid minimum mechanical position for the TP sensor #1. OR 3) TACM indicates reference voltage out of range.	1) Raw TP sensor signal < 0.376 V or > 4.506 V. OR 2)TP sensor minimum mechanical stop voltage < 0.376 V or > 0.714 V. OR 3) Reference Voltage < 4.54 V or > 5.21 V.	• Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data. • No TACM processor DTC.	1) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 133. Check runs every 3 ms. 2) One occurrence. Check runs at power-up. 3a). Continuous. Counter increments by 1 for every error, decrements by 1 for every pass. Threshold is 10ms. For reference voltage direct short to ground. 3b) Second continuous counter increments by 1 for every error and decrements by 1 for every pass, threshold is 1000 msec. Verify A/D input on reference voltage to be 5volts +/- tolerance.	DTC Type A
Throttle Position (TP) Sensor 1 Performance	P0121	This DTC determines if the TP Sensor is stuck within the normal operating range.	Stuck High MAP < 50 KPa & TP Sensor > predicted TP Sensor (lookup table as a function of RPM) or Stuck Low MAP > 70 KPa & TP Sensor < predicted TP Sensor (lookup table as a function of RPM)	• No TP Sensor circuit DTC's • No IAC DTC's • No MAP DTC's failing • Engine runtime ≥120 seconds • ECT ≥ 75°C • MAP delta ≤ 5 kPa for MAP Stable Time ≥ 5 seconds • 0 ≤ IAC position ≤ 130	95 test failures in a 100 test sample Frequency: 100 ms loop Continuous	DTC Type B
Throttle Position (TP) Sensor 1 Circuit Low	P0122	This DTC detects a continuous short to low or open in either the signal circuit or the TP sensor.	TP sensor signal < 0.0975 volts	• PCM State = Crank or Run	95.00 consecutive test failures within a 100 test sample Frequency: 12.5 ms Continuous	DTC Type B
Throttle Position (TP) Sensor 1 Circuit High	P0123	This DTC detects a continuous short to high in either the signal circuit or the TP sensor.	TP sensor signal > 4.9 volts	• PCM State = Crank or Run	95.00 consecutive test failures within a 100 test sample Frequency: 12.5 ms Continuous	DTC Type B

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ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Temperature (ECT) Insufficient for Closed Loop Fuel Control	P0125 (this logic used on L26, L32, L67, and L36)	This DTC detects if the engine coolant temperature rises too slowly due to an ECT sensor or cooling system fault	If actual accumulated airflow is > predicted accumulated airflow before engine coolant reaches 6 °C	• No MAF DTC's • No IAT sensor DTC's • NO ECT sensor shorts DTC's • No VSS DTC's • ECT Sensor shorts tests not failing • Start up ECT < 6 °C • Minimum Average Airflow > 1.0 gps • Vehicle speed > 5 MPH for 0.50 miles • 30.00 sec < Engine Run Time < 1800.00 sec • IAT ≥ -6.99 °C • ECT > -40 °C • Maximum airflow added to actual accumulated airflow limited to 35 gps	30 failures to set DTC Frequency: Once per ignition cycle 1 second loop	DTC Type B
Engine Coolant Temperature (ECT) Insufficient for Closed Loop Fuel Control	P0125 (this logic used on LG8 and LA1)	Under driving conditions, closed loop temperature should be achieved based on amount of cumulative airflow ingested and based on startup coolant temperature	If closed-loop timer is exceeded: 120 sec @ 44 °F 300.00 sec @ 24 °F to 44°F 439.0 sec @ region 3 and ECT < 15 ° C (59°F) Coolant temperature < 32.5°C when actual cumulative airflow ≥ predicted cumulative airflow (based on start-up coolant temperature, minimum IAT, engine run time) for 30 seconds Cumulative airflow is accumulated when 15 GPS < airflow < 75 GPS	• ECT sensor shorts test not failing • IAT sensor DTCs not active • Engine runtime > 0 • Start up ECT ≤ 10.00 °C • IAT ≥ -6.99 °C • ECT ≥ -40.00 °C • Max Idle Time ≤ : 95.00 sec @ 44 °F 210.00 sec @ 24°F to 44 °F 329.00 sec @ Reg 3 • Min Total Engine Air ≥ : 1252.00 grams @ 44 °F 1908.00 grams @ 24 °F to 44°F 4669.0 grams @ Reg 3	Frequency: Once per ignition cycle 100 ms loop Time to fail based on flow	DTC Type B
Engine Coolant Temperature (ECT) Below Thermostat Regulating Temperature	P0128	This DTC detects if the engine coolant temperature rises too slowly due to an ECT or cooling system fault	If actual accumulated airflow is > predicted accumulated airflow before engine coolant reaches 80.00 °C	• No MAF DTC's • No IAT sensor DTC's • NO ECT sensor shorts DTC's • No VSS DTC's • ECT Sensor shorts tests not failing • Start up ECT < 75 °C • Minimum Average Airflow > 1 gps • Vehicle speed > 5 MPH for 0.50 miles • 30.00 sec < Engine Run Time < 1800.00 sec • IAT ≥ -6.99 °C • ECT > -40 °C • Maximum airflow added to actual accumulated airflow limited to 35 gps (true for L26 and L32 only)	30 failures to set DTC Frequency: Once per ignition cycle 1 second loop	DTC Type B

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ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Bank 1 Sensor 1	P0130	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 > 600 millivolts or < 300 millivolts to set closed loop fuel O2 Ready flag. Once set to "Ready," the O2 sensor voltage cannot be > 300 millivolts and < 600 millivolts for > 10 seconds or the O2 Ready flag will be reset to "Not Ready."	• No TP Sensor DTC's • No MAF DTC's • No MAP DTC's • No ECT DTC's • No Bank 1 Sensor 1 or Bank 2 Sensor 1 O2 DTC's • Engine Run Time ≥ 180 seconds • ECT ≥ 65° C • Traction Control = Not Active • Not in Catalyst Protection Mode • 9 volts ≤ Ignition Voltage ≤ 18 volts • 602 ≤ Engine Speed ≤ 3000 • 5gps ≤ Mass Airflow ≤ 38gps • 3% ≤ TP Sensor ≤ 35% • Not in Decel Fuel Cutoff Mode • Not in Power Enrichment • Predicted O2 temp ≥ 720°C All of the above met for 3 seconds	300 test failures in a 360 test sample <u>Frequency:</u> Continuous 100ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.doc

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O2S Circuit Low Voltage Bank 1 Sensor 1	P0131	This DTC determines if the O2 sensor circuit is shorted to low by checking for a lean condition during steady throttle and PE.	O2 sensor voltage < 78.125 millivolts or O2 sensor voltage < 600.00 millivolts in PE mode	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic intrusive test = Not Active • Catalyst monitor diagnostic intrusive test = Not Active • Post Oxygen Sensor Diagnostic intrusive test= Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • 0.88 ≤ Equivalence ratio ≤ 1.088 • 4 % ≤ throttle position ≤ 40.00 % • Fuel state = closed loop • All fuel injectors = ON • Traction Control = not active • ECT < 131°C All of the above met for at least 3 seconds For PE Test • All injectors = on • Indication that closed loop fueling is ready • Equivalence Ratio ≥ 1.088 • Engine Run Time ≥ 300 seconds All of the above met for at least 2 seconds	155 test failures in a 170.00 test sample for 3.00 sets of samples 60.00 failures in a 75.00 test sample for PE mode Frequency: Continuous 100 ms loop	DTC Type B

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ENGINE DIAGNOSTIC PARAMETERS

2004file4.doc

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O2S Circuit High Voltage Bank 1 Sensor 1	P0132	This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle.	O2 sensor voltage > 889.76 millivolts	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic intrusive test = Not Active • Catalyst monitor diagnostic intrusive test= Not Active • Post Oxygen Sensor Diagnostic intrusive test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • 0.88 ≤ Equivalence Ratio ≤ 1.088 • 3.00 % ≤ throttle position ≤ 40.00 % • Fuel_State = Closed loop All of the above met for at least 3 seconds	100.00 test failures in a 125 test sample for 6.00 sets of samples Frequency: Continuous 100 ms loop	DTC Type B

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2004file4.doc

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O2S Slow Response Bank 1 Sensor 1	P0133	This DTC determines if the O2 sensor response time is degraded	O2 Sensor Average Transition Time: LRA > 160.00 ms or RLA > 170.00 ms	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic intrusive test = Not Active • Catalyst monitor diagnostic intrusive test = Not Active • Post Oxygen Sensor Diagnostic intrusive test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • O2 Heater on for ≥ 0 seconds • Bank 1 Sensor1 circuit and heater and heater driver DTCs = Not Active • Bank 2 Sensor 1 circuit and heater and heater driver DTCs = Not Active • In one of the following four fueling cells: Purge off, normal; purge off, high flow; purge on, normal; purge off, high flow • Misfire DTC = Not Active • ECT > 65.00 °C • Engine run time > 60.00 seconds • EVAP Canister purge duty cycle ≥ 0.00 % • 15.00 gps ≤ MAF ≤ 31.00 gps • 1300.00 ≤ RPM ≤ 3150.00 • Throttle position ≥ 2.00 % • Fuel state = closed loop • Transmission (automatic) not in Park, Reverse or Neutral All of the above met for at least 2 seconds	90000.00 ms Frequency: Once per trip	DTC Type B

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ENGINE DIAGNOSTIC PARAMETERS

2004file4.doc

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O2S Circuit Insufficient Activity Bank 1 Sensor 1	P0134	This DTC determines if the O2 sensor is open.	381.94 millivolts < O2 sensor < 525.17 millivolts	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic intrusive test = Not Active • Catalyst monitor diagnostic intrusive test = Not Active • Post Oxygen Sensor Diagnostic intrusive test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific_Enable_Criteria • Engine run time > 120.00 seconds • Predicted O2 temperature > 700°C	250 test failures in a 300 test sample Frequency: 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.	The heater full on current is < 0.234375 amps or > 0.9375 amps	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic intrusive test = Not Active • Catalyst monitor diagnostic intrusive test = Not Active • Post Oxygen Sensor Diagnostic intrusive test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable_Criteria • Engine Run Time ≥ 100 seconds • ECT ≥ 65° C • 600 ≤ Engine Rpm ≤ 3000 • 4 gps ≤ Mass Airflow ≤ 30 gps • O2 heater not in Device control • O2 heater driver DTC not active All of the above met for at least 2 seconds	17 test failures in 20 test samples Frequency: 5 tests per trip 30 second delay between tests 1 second execution rate	DTC Type B

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ENGINE DIAGNOSTIC PARAMETERS

2004file4.doc

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O2S Circuit Bank 1 Sensor 2	P0136	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 ≥ 685.76 millivolts and voltage ≤ 290.8 millivolts	Common Enable Criteria • No O2 circuit, heater, response or heater driver DTC's active • No TP Sensor DTC's • No MAF DTC's • No ECT DTC's • No MAP DTC's • No IAT DTC's • No EVAP DTC's • No Fuel Injector DTC's • 9 volts ≤ system voltage ≤ 18 volts • Engine Runtime ≥ 6 seconds Stage 2 Specific Enable Criteria: • Stage 1 portion of test not passed • Must be in one of the following fuel cells: No Purge, normal; No Purge, high flow; Purge, normal; Purge, high flow • 1000 rpm ≤ Engine Speed ≤ 3000 rpm • 14 gps ≤ Airflow ≤ 50 gps • 20 mph ≤ Vehicle Speed ≤ 80 mph • EGR Flow diagnostic intrusive test not active All of the above met for at least 4.5 seconds, and then: • 97.5 ≤ Short term fuel trim ≤ 102.5 • Fuel state = closed loop • EVAP diagnostic not in control of purge	Stage 1: Up to 380 seconds Stage 2: Up to 11.4 seconds for each threshold Frequency: One test per trip	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.doc

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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 < 78.125 millivolts	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic intrusive test = Not Active • Catalyst monitor diagnostic intrusive test = Not Active • Post Oxygen Sensor Diagnostic intrusive test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • 0.88 ≤ Equivalence ratio ≤ 1.088 • 4 % ≤ throttle position ≤ 40.00 % • Fuel state = closed loop • All fuel injectors = ON • Traction Control = not active • ECT < 131°C All of the above met for at least 3 seconds	360 test failures in a 400 test sample for 3.00 sets of samples Frequency: Continuous 100 ms loop	DTC Type B

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ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 2	P0138	This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle.	O2 sensor voltage > 924.48 millivolts	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic = Not Active • Catalyst monitor diagnostic = Not Active • Post Oxygen Sensor Diagnostic = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • 0.88 ≤ Equivalence Ratio ≤ 1.088 • 3.00 % ≤ throttle position ≤ 40.00 % • Fuel_State = Closed loop All of the above met for at least 3 seconds	540 test failures in a 600 test sample for 2 sets of samples Frequency: Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 is open.	390.63 millivolts < O2 sensor < 520.83 millivolts for regular open test 381.94 millivolts < O2 sensor < 525.17 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)	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic = Not Active • Catalyst monitor diagnostic = Not Active • Post Oxygen Sensor Diagnostic = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific_Enable_Criteria • O2S Heater Performance Bank 1 Sensor 2 not active • O2S Heater Control Circuit Bank 1 Sensor 2 not active • PCM State = run Fast Pass: • (Engine run time ≤ 90 seconds) OR (current start <> cold start) Cold start determination: Powerup ECT < 35° C Powerup IAT < 35° C Powerup ECT – Powerup IAT < 6° C (Fast pass cannot report a fail; if Fastpass fails, the regular open test is run) Regular Open Test • Engine run time > 120 seconds • Predicted O2 temperature > 630° C • Fuel state = closed loop • Minimum of 3 occurrences of a delta TP sensor ≥ 8.0 % during diagnostic test	1080 test failures in a 1200 test sample for regular open test (sample counts – failure counts) < 180 within 90 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) Frequency: Once/trip for post catalyst sensors 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 logic applies to L26, L32 and LX9	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	The heater full on current is < 0.2148438 amps or > 0.957031 amps	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test = Not Active • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable_Criteria • Engine Run Time ≥ 100 seconds • ECT ≥ 65° C • 600 ≤ Engine Rpm ≤ 3000 • 4 gps ≤ Mass Airflow ≤ 30 gps • O2 heater not in Device control • O2 heater driver DTC not active All of the above met for at least 2 seconds	17 test failures in 20 test samples Frequency: 5 tests per trip 30 second delay between tests 1 second execution rate	DTC Type B
O2S Heater Performance Bank 1 Sensor 2	P0141 This logic applies to L36, L67, LA1 and LG8	This DTC determines if the O2 sensor heater is degraded.	The elapsed time to obtain ± 150 millivolts from the mean O2 bias voltage. *Time based on table: Time vs Start Up ECT	• No O2 sensor DTC's for Bank 1 Sensor 2 set (P0137, P0138, P0140) • Device control = Not Active • Current start = cold start • 399.31 mV< start-up bias voltage < 499.13 mV • 9 volts < system voltage < 18.00 volts Cold start determination: Powerup ECT < 35° C Powerup IAT < 35° C Powerup ECT – Powerup IAT < 6° C Note: Cannont report a pass if average airflow ≥ 26 grams per second	One test/trip	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Bank 2 Sensor 1	P0150 This logic applies to LX9	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 > 600 millivolts or < 300 millivolts to set closed loop fuel O2 Ready flag. Once set to "Ready," the O2 sensor voltage cannot be > 300 millivolts and < 600 millivolts for > 10 seconds or the O2 Ready flag will be reset to "Not Ready."	• No TP Sensor DTC's • No MAF DTC's • No MAP DTC's • No ECT DTC's • No Bank 1 Sensor 1 or Bank 2 Sensor 1 DTC's • Engine Run Time ≥ 180 seconds • ECT ≥ 65° C • Traction Control = Not Active • Not in Catalyst Protection Mode • 9 volts ≤ Ignition Voltage ≤ 18 volts • 602 ≤ Engine Speed ≤ 3000 • 5gps ≤ Mass Airflow ≤ 38gps • 3% ≤ TP Sensor ≤ 35% • Not in Decel Fuel Cutoff Mode • Not in Power Enrichment • Predicted O2 temp ≥ 720°C All of the above met for 3 seconds	300 test failures in a 360 test sample <u>Frequency:</u> Continuous 100ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 2 Sensor 1	P0151 This logic applies to LX9	This DTC determines if the O2 sensor circuit is shorted to low by checking for a lean condition during steady throttle and PE.	O2 sensor voltage < 78.125 millivolts or O2 sensor voltage < 600.00 millivolts in PE mode	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test = Not Active • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • 0.88 ≤ Equivalence ratio ≤ 1.088 • 4 % ≤ throttle position ≤ 40.00 % • Fuel state = closed loop • All fuel injectors = ON • Traction Control = not active • ECT < 131°C All of the above met for at least 3 seconds For PE Test • All injectors = on • Indication that closed loop fueling is ready • Equivalence Ratio ≥ 1.088 • Engine Run Time ≥ 300 seconds All of the above met for at least 2 seconds	155 test failures in a 170.00 test sample for 3.00 sets of samples 60.00 failures in a 75.00 test sample for PE mode Frequency: Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 logic applies to LX9	This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle.	O2 sensor voltage > 889.76 millivolts	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test = Not Active • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • 0.88 ≤ Equivalence Ratio ≤ 1.088 • 3.00 % ≤ throttle position ≤ 40.00 % • Fuel_State = Closed loop All of the above met for at least 3 seconds	100.00 test failures in a 125 test sample for 6.00 sets of samples Frequency: Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 logic applies to LX9	This DTC determines if the O2 sensor response time is degraded	O2 Sensor Average Transition Time: LRA > 160.00 ms or RLA > 170.00 ms	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test = Not Active • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • O2 Heater on for ≥ 0 seconds • Bank 1 Sensor1 circuit and heater and heater drive DTCs = Not Active • Bank 2 Sensor1 circuit and heater and heater driver DTCs = Not Active • In one of the following four fueling cells: Purge off, normal; purge off, high flow; purge on, normal; purge off, high flow • Misfire DTC = Not Active • ECT > 65.00 °C • Engine run time > 60.00 seconds • EVAP Canister purge duty cycle ≥ 0.00 % • 15.00 gps ≤ MAF ≤ 31.00 gps • 1300.00 ≤ RPM ≤ 3150.00 • Throttle position ≥ 2.00 % • Fuel state = closed loop • Transmission (automatic) not in Park, Reverse or Neutral All of the above met for at least 2 seconds	90000.00 ms Frequency: Once per trip	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 logic applies to LX9	This DTC determines if the O2 sensor is open.	381.94 millivolts < O2 sensor < 525.17 millivolts	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test = Not Active • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific_Enable_Criteria • Engine run time > 120.00 seconds • Predicted O2 temperature > 700°C	250 test failures in a 300 test sample Frequency: Continuous for pre catalyst sensors 100 ms loop rate	DTC Type B
O2S Heater Performance Bank 2 Sensor 1	P0155 This logic applies to LX9	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	The heater full on current is < 0.234375 amps or > 0.9375 amps	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test = Not Active • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable_Criteria • Engine Run Time ≥ 100 seconds • ECT ≥ 65° C • 600 ≤ Engine Rpm ≤ 3000 • 4 gps ≤ Mass Airflow ≤ 30 gps • O2 heater not in Device control • O2 heater driver DTC not active All of the above met for at least 2 seconds	17 test failures in 20 test samples Frequency: 5 tests per trip 30 second delay between tests 1 second execution rate	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Bank 2 Sensor 2	P0156 This logic applies to LX9	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 ≥ 685.76 millivolts and voltage ≤ 290.8 millivolts	Common Enable Criteria • No O2 circuit, heater, response or heater driver DTC's active • No TP Sensor DTC's • No MAF DTC's • No ECT DTC's • No MAP DTC's • No IAT DTC's • No EVAP DTC's • No Fuel Injector DTC's • 9 volts ≤ system voltage ≤ 18 volts • Engine Run time ≥ 6 seconds Stage 2 Specific Enable Criteria: • Stage 1 portion of test not passed • Must be in one of the following fuel cells: No Purge, normal; No Purge, high flow; Purge, normal; Purge, high flow • 1000 rpm ≤ Engine Speed ≤ 3000 rpm • 14 gps ≤ Airflow ≤ 50 gps • 20 mph ≤ Vehicle Speed ≤ 80 mph • EGR Flow diagnostic Intrusive Test not active All of the above met for at least 4.5 seconds, and then: • 97.5 ≤ Short term fuel trim ≤ 102.5 • Fuel state = closed loop • EVAP diagnostic not in control of purge	Stage 1: Up to 380 seconds Stage 2: Up to 11.4 seconds for each threshold Frequency: One test per trip	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 2 Sensor 2	P0157 This logic applies to LX9	This DTC determines if the O2 sensor circuit is shorted to low by checking for a lean condition during steady throttle.	O2 sensor voltage < 78.125 millivolts	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test = Not Active • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test= Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • 0.88 ≤ Equivalence ratio ≤ 1.088 • 4 % ≤ throttle position ≤ 40.00 % • Fuel state = closed loop • All fuel injectors = ON • Traction Control = not active • ECT < 131°C All of the above met for at least 3 seconds	360 test failures in a 400 test sample for 3.00 sets of samples Frequency: Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 2	P0158 This logic applies to LX9	This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle.	O2 sensor voltage > 924.48 millivolts	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test = Not Active • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • 0.88 ≤ Equivalence Ratio ≤ 1.088 • 3.00 % ≤ throttle position ≤ 40.00 % • Fuel_State = Closed loop All of the above met for at least 3 seconds	540 test failures in a 600 test sample for 2 sets of samples Frequency: Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 2	P0160 This logic applies to LX9	This DTC determines if the O2 sensor is open.	390.63 millivolts < O2 sensor < 520.83 millivolts for regular open test 381.94 millivolts < O2 sensor < 525.17 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)	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test = Not Active • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific_Enable_Criteria • O2S Heater Performance Bank 1 Sensor 2 not active • O2S Heater Control Circuit Bank 1 Sensor 2 not active • PCM State = run Fast Pass: • (Engine run time ≤ 90 seconds) OR (current start <> cold start) Cold start determination: Powerup ECT < 35° C Powerup IAT < 35° C Powerup ECT – Powerup IAT < 6° C (Fast pass cannot report a fail; if Fastpass fails, the regular open test is run) Regular Open Test • Engine run time > 120 seconds • Predicted O2 temperature > 630° C • Fuel state = closed loop • Minimum of 3 occurrences of a delta TP sensor ≥ 8.0 % during diagnostic test	1080 test failures in a 1200 test sample for regular open test (sample counts – failure counts) < 180 within 90 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) Frequency: Once/trip for post catalyst sensors 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 2 Sensor 2	P0161 This logic applies to LX9	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	The heater full on current is < 0.2148438 amps or > 0.957031 amps	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test = Not Active • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable_Criteria • Engine Run Time ≥ 100 seconds • ECT ≥ 65° C • 600 ≤ Engine Rpm ≤ 3000 • 4 gps ≤ Mass Airflow ≤ 30 gps • O2 heater not in Device control • O2 heater driver DTC not active All of the above met for at least 2 seconds	17 test failures in 20 test samples Frequency: 5 tests per trip 30 second delay between tests 1 second execution rate	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Trim System Lean Bank 1	P0171 This logic applies to the followin g engine rpo's: L26, L32, LX9	Determines if the system is in a lean condition.	The average of long term fuel trim samples (LTM average) ≥ 1.1641 Note: The LTM average is weighted 50% idle cell purge on, and 50% normal cell purge on.	• No TP Sensor DTC's • No TAC System DTC's • No Misfire DTC's • No IAC DTC's • No Fuel Injector DTC's • No MAF DTC's • No O2 sensor DTC's • No MAP DTC's • No EGR DTC's • No EVAP DTC's • Engine speed > 0.0 rpm but < 6000.00rpm • BARO > 74.00 kpa • ECT > -40°C but < 126.01°C • MAP > 25.0 kpa but < 199.00 kpa • IAT > -18.01 °C but < 140.00°C • Airflow > 3.0 g/s but < 150.00 g/s • Vehicle speed < 82.00 mph • Closed Loop Fueling • 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. • At least 60 seconds have been spent in both the purge on normal driving cell and the purge on idle driving cell • Fuel Level > 10 % (must be < 10% for 10 seconds to disable; default is to enable if fuel sender is broken)	50.00 test failures <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Trim System Lean Bank 1	P0171 This logic applies to the followin g engine rpo's: L36, L67, LA1, LG8	Determines if the system is in a lean condition.	The average of long term fuel trim samples ≥ 1.1641	• No TP Sensor , Misfire, IAC, Fuel Injector, MAF, O2 Sensor, MAP, EGR, or EVAP DTC's • Engine speed > 500 .00 rpm but < 6000.00 rpm • BARO > 74.00 kPa (8500 ft) • ECT > 10.00 ºC but < 123.9844 °C • MAP > 15.0 kPa but < 105.00 kPa • IAT > -18.01 °C but < 140.00 °C • Airflow > 5.0 gps but < 150.00 gps • Vehicle speed < 82.00 mph • Closed Loop Fueling • Long Term Fuel Trim Learning enabled • Not in Device Control • EGR Flow Diagnostic Intrusive Test = Not Active • Catalyst Monitor Diagnostic Intrusive Test = Not Active • Evap Diagnostic = Done • Post O2 Diagnostic Intrusive Test – Not Active • Fuel Level > 10 % (must be < 10% for 10 seconds to disable; default is to enable if fuel sender is broken)	5.00 test failures <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Trim System Rich Bank 1	P0172 This logic applies to the following engine rpo's: L26, L32, LX9	Determines if the system is in a rich condition.	The average of long term fuel trim (LTM) samples ≤ 0.76563 Once the above occurs, the purge is ramped off to determine if excess purge is present or if the system is truly failing. Therefore, in addition to the above, one of the following must also occur: The snapshot value of the long term fuel trim of the idle purge off cell < 0.76 Or The snapshot value of the long term fuel trim of the normal purge off cell < 0.76 Or The snapshot value of the long term fuel trim of the high flow purge off cell < 0.76 Snapshots of the long term modifier values of the learned cells in the idle, normal, or high flow cells (all purge off), are separated by a 10-second purge off time interval; a minimum of 80 seconds total accumulated time must be spent in any one cell before a snapshot can occur in that cell. Note: 1. If the intrusive portion of the test does not fail, the intrusive portion of the diagnostic will be delayed for 4304 seconds. Repetitive intrusive tests would affect the Running Loss Test. During this delay, fuel trim will pass if the EVAP canister vapors are cleaned out and the long term modifier average increases above 0.76563 2. The LTM average is weighted 50% idle cell purge on, and 50% normal cell purge on.	• No TP Sensor , TAC System, Misfire, IAC, Fuel Injector, MAF, O2 Sensor, MAP, EGR, or EVAP DTC's • Engine speed > 0.00 rpm but < 6000.00 rpm • BARO > 74.00 kpa • ECT > -40ºC but < 126.01°C • MAP > 25.0kpa but < 199.00 kpa • IAT > -18.01 °C but < 140°C • Airflow > 3.00 g/s but < 150.00 g/s • Vehicle speed < 82.00 mph • Closed Loop Fueling • 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 but the "tank pull down" portion of the test. Intrusive Enable Criteria • Time spent in the purge on idle cell and the purge on normal cell is at least 60 seconds each • Average of long term fuel trim samples ≤ 0.76563 for 10 seconds • RPM > 0 • 3 gps < Mass Airflow < 150 gps • Must be in the idle purge on cell, normal purge on cell, or the high flow purge on cell, for at least 2 consecutive seconds. • VSS > 12 mph Temporary Intrusive Test Disable criteria • If during intrusive test, leave Excess Purge Test cell (idle, normal, or high flow purge off) for 5 consecutive seconds. • If have been intrusive for longer than 40 consecutive seconds. (in this case, purge valve is opened for the smaller of 60 seconds or enough time to purge 24 grams vapor)	If rich fail counter is ≥3.00 Before rich non-fail counter ≥ 1, diagnostic fails. <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Trim System Rich Bank 1	P0172 This logic applies to the followin g engine rpo's: L36, L67, LG8, LA1	Determines if the system is in a rich condition.	The average of long term fuel trim samples ≤ 0.82813 The change in (ltm + stm + plm) < 0.1015625 in 4 seconds (purge is ramped from a higher to a lower value and the change in fueling is evaluated to decide if excess purge is present or if the system is failing rich (normal purge is present)) Note: 1. If the intrusive portion of the test indicates the presence of excess purge, the diagnostic will be delayed for 10 seconds to allow the EVAP canister time to clean itself. 2. After either 9 indications of normal purge present or 5 indications of excess purge present (both indication limits are application dependent), the intrusive portion of the test will be delayed for 4304 seconds. Repetitive intrusive tests would affect the Running Loss Test. During this delay, fuel trim will pass if the EVAP canister vapors are cleaned out and the long term modifier average increases above 0.82813. 3. The LTM average is weighted 30% non-purge idle cell, 30% non-purge normal cell, 15% purge normal cell, 10% purge high flow cell and 15% purge idle cell (weight and cell choice depends on application).	• No TP Sensor DTC's • No Misfire DTC's • No IAC DTC's • No Fuel Injector DTC's • No MAF DTC's • No O2 sensor DTC's • No MAP DTC's • No EGR DTC's • No EVAP DTC's • Engine speed > 500 .00 rpm but < 6000.00 rpm • BARO > 74.00 kPa (8500 ft) • ECT > 10.00 °C but < 123.9844 °C • MAP > 15.0 kPa but < 105.00 kPa • IAT > -18.01 °C but < 140.00 °C • Airflow > 3.0 gps but < 150.00 gps • Vehicle speed < 82.00 mph • Closed Loop Fueling • Long Term Fuel Trim Learning enabled • Not in Device Control • EGR Flow Diagnostic Intrusive Test = Not Active • Catalyst Monitor Diagnostic Intrusive Test = Not Active • Evap Diagnostic = Done • Post O2 Diagnostic Intrusive Test = Not Active Intrusive Enable Criteria • Average of long term fuel trim samples ≤ 0.82813 • RPM > 1000 • 5 gps < Mass Airflow < 80 gps • EVAP Canister Purge Valve Duty Cycle must be > 30 % for 8 seconds • Must be in the normal, purge on cell or the high flow, purge on cell; must have spent a minimum of 50 seconds in the high flow cell with learning enabled during the life of the vehicle to enable in that cell, and 41 seconds in the high flow cell to enable in that cell.	3.00 test failures <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Trim System Lean Bank 2	P0174 This logic applies to the followin g engine rpo's: LX9	Determines if the system is in a lean condition.	The average of long term fuel trim samples (LTM average) ≥ 1.1641 And The average of short term fuel trim samples ≥ 0.00 Note: The LTM average is weighted 50% idle cell purge on, and 50% normal cell purge on.	• No TP Sensor , TAC system, Misfire, IAC, Fuel Injector, MAF, O2 Sensor, MAP, EGR, or EVAP DTC's • Engine speed > 0.0 rpm but < 6000.00rpm • BARO > 74.00 kpa • ECT > -40ºC but < 126.01°C • MAP > 25.0 kpa but < 199.00 kpa • IAT > -18.01 °C but < 140.00°C • Airflow > 3.0 g/s but < 150.00 g/s • Vehicle speed < 82.00 mph • Closed Loop Fueling • 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. • At least 60 seconds have been spent in both the purge on normal driving cell and the purge on idle driving cell • Fuel Level > 10 % (must be < 10% for 10 seconds to disable; default is to enable if fuel sender is broken)	50.00 test failures <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Trim System Rich Bank 2	P0175 This logic applies to the following engine rpo's: LX9	Determines if the system is in a rich condition.	The average of long term fuel trim (LTM) samples ≤ 0.76563 And The average of short term fuel trim samples ≤ 1.9922 Once the above occurs, the purge is ramped off to determine if excess purge is present or if the system is truly failing. Therefore, in addition to the above, one of the following must also occur: The snapshot value of the long term fuel trim of the idle purge off cell < 0.76 Or The snapshot value of the long term fuel trim of the normal purge off cell < 0.76 Or The snapshot value of the long term fuel trim of the high flow purge off cell < 0.76 Snapshots of the long term modifier values of the learned cells in the idle, normal, or high flow cells (all purge off), are separated by a 10-second purge off time interval; a minimum of 80 seconds total accumulated time must be spent in any one cell before a snapshot can occur in that cell. Note: 1. If the intrusive portion of the test does not fail, the intrusive portion of the diagnostic will be delayed for 4304 seconds. Repetitive intrusive tests would affect the Running Loss Test. During this delay, fuel trim will pass if the EVAP canister vapors are cleaned out and the long term modifier average increases above 0.76563 2. The LTM average is weighted 50% idle cell purge on, and 50% normal cell purge on.	• No TP Sensor , TAC system, Misfire, IAC, Fuel Injector, MAF, O2 Sensor, MAP, EGR, or EVAP DTC's • Engine speed > 0.00 rpm but < 6000.00 rpm • BARO > 74.00 kpa • ECT > -40ºC but < 126.01°C • MAP > 25.0kpa but < 199.00 kpa • IAT > -18.01 °C but < 140°C • Airflow > 3.00 g/s but < 150.00 g/s • Vehicle speed < 82.00 mph • Closed Loop Fueling • 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 but the "tank pull down" portion of the test. Intrusive Enable Criteria • Time spent in the purge on idle cell and the purge on normal cell is at least 60 seconds each • Average of long term fuel trim samples ≤ 0.76563 for 10 seconds • Average of short term fuel trim samples ≤ 1.9922 • RPM > 0 • 3 gps < Mass Airflow < 150 gps • Must be in the idle purge on cell, normal purge on cell, or the high flow purge on cell, for at least 2 consecutive seconds. • VSS > 12 mph Temporary Intrusive Test Disable criteria • If during intrusive test, leave Excess Purge Test cell (idle, normal, or high flow purge off) for 5 consecutive seconds. • If have been intrusive for longer than 40 consecutive seconds. (in this case, purge valve is opened for the smaller of 60 seconds or enough time to purge 24 grams vapor)	If rich fail counter is ≥3.00 Before rich non-fail counter ≥ 1, diagnostic fails. <u>Frequency:</u> Continuous 100 ms loop	DTC Type B
Injector 1 Control Circuit	P0201	This DTC checks the Fuel Injectors for electrical integrity	Output state is shorted or open	• Ignition switch is in crank or run • 11< Ignition Voltage < 18	15 failures out of 20 samples <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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
Injector 2 Control Circuit	P0202	This DTC checks the Fuel Injectors for electrical integrity	Output state is shorted or open	• Ignition switch is in crank or run • 11< Ignition Voltage < 18	15 failures out of 20 samples Frequency: Continuous 100 ms loop	DTC Type B
Injector 3 Control Circuit	P0203	This DTC checks the Fuel Injectors for electrical integrity	Output state is shorted or open	• Ignition switch is in crank or run • 11< Ignition Voltage < 18	15 failures out of 20 samples Frequency: Continuous 100 ms loop	DTC Type B
Injector 4 Control Circuit	P0204	This DTC checks the Fuel Injectors for electrical integrity	Output state is shorted or open	• Ignition switch is in crank or run • 11< Ignition Voltage < 18	15 failures out of 20 samples Frequency: Continuous 100 ms loop	DTC Type B
Injector 5 Control Circuit	P0205	This DTC checks the Fuel Injectors for electrical integrity	Output state is shorted or open	• Ignition switch is in crank or run • 11< Ignition Voltage < 18	15 failures out of 20 samples Frequency: Continuous 100 ms loop	DTC Type B
Injector 6 Control Circuit	P0206	This DTC checks the Fuel Injectors for electrical integrity	Output state is shorted or open	• Ignition switch is in crank or run • 11< Ignition Voltage < 18	15 failures out of 20 samples Frequency: Continuous 100 ms loop	DTC Type B
Throttle Position (TP) Sensor 2 Circuit	P0220 Applies to the following engine rpo's: L26, L32, LX9	1) TACM indicates a continuous or intermittent short or open in either the signal circuit or the TP sensor #2. OR 2) TACM indicates an invalid minimum mechanical position for the TP sensor #2. OR 3) TACM indicates reference voltage out of range.	1) Raw TP sensor signal < 0.282 V or > 4.60 V. OR 2) TP sensor minimum mechanical stop voltage < 0.282 V or > 0.813V OR 3) Reference voltage > 0.5 V	• Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data. • No TACM processor DTC.	1) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 133. Check runs every 3 ms. 2) One occurrence. Check runs at power-up. 3) Continuous. Counter increments by 1 for every error, decrements by 1 for every pass. Threshold is 10ms. For Reference voltage direct short to ground.	DTC Type A

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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
Turbocharger Wastegate / Supercharger Boost Solenoid A Control Circuit	P0243 Applies to the following engine rpo: L32	This DTC checks the Supercharcger Solenoid Control Circuit for electrical integrity	Output state invalid	• Ignition switch is in crank or run • 11< Ignition Voltage < 18	15 failure out of 20 samples OR chip protection logic indicates a short failure 1 time <u>Frequency:</u> Continuous 100 ms loop <u>Chip protection logic:</u> 5 failures out of 10 samples indicate a short Frequency of this logic is 12.5 ms loop Continuous Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip.	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Misfire Detected Cylinder 1 Misfire Detected Cylinder 2 Misfire Detected Cylinder 3 Misfire Detected Cylinder 4 Misfire Detected Cylinder 5 MisfireDetected Cylinder 6 Misfire Detected	P0300 P0301 P0302 P0303 P0304 P0305 P0306	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 Emission Failure Threshold = 1.0% Catalyst Damage Threshold = 5 % to 16 % Misfire depending on engine speed and engine load	• DTCs not active for VSS, CKP, CMP, TP, MAP, ECT, MAF, TAC system sensors. • P0315 (Crankshaft Position System Variation Not Learned) not active or engine speed < 1200. • Any Fuel cutoff not active. • Power management is not active. • 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). • -6.99 °C < ECT < 126.0156 ° C. • If ECT at startup < -6.99 °C, then disable until ECT > 21.09 °C. • 475.00 RPM < Engine speed < 5850.00 RPM. • 9.00 volts < System voltage < 18 volts. • + Throttle position delta < 100 % per 50 ms. • - Throttle position delta < 100 % per 50 ms. • Abnormal engine speed is not present. • ABS rough road not detected. • Excessive drive wheel slip is not detected (enablement occurs if {Non Drive Wheel Speed > 255 MPH} or {Drive Wheel Speed - Non Drive Wheel Speed > 255 MPH} and {wheel speed data is valid}) • ABS is not active, TCS is not active. • 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 2) TP Sensor > 1.4% or VSS < 20 MPH. • Detectable engine speed and engine load region. • EGR Intrusive test not active. • CMP sensor is in sync with CKP sensor. • Automatic transmission is not shifting • PRNDL indication did not change • Misfire Diag is not requesting to disable TCC when transmission is in hot mode. • Abusive Engine Speed is not present (Abusive engine speed is > 12000 RPM, delay occurs 0 engine cycles, after abusive engine speed ceases). • 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 (this number is 1 in this application). 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)

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 System Variation Not Learned (CASE)	P0315	Determines if the Crankshaft Position System Variation has not been learned.	Sum of Compensation Factors are ≤ 2.997 or ≥ 3.0043	• Manufacturers Enable Counter must be zero.	0.50 seconds Frequency: Continuous 100 ms loop	DTC Type A
Knock Sensor (KS) Circuit Bank 1	P0325	This diagnostic will detect a failed internal PCM component associated with knock control	Output voltage is high and stays relatively constant	Enable Conditions • No VSS DTC's • No TP Sensor DTC's • No TAC System DTC's • No ECT DTC's • NO Crank Sensor DTC's • No CMP Sensor DTC's • No MAF DTC's • Engine running longer than 30 seconds • Ignition voltage ≥ 11 volts • Throttle position ≥ 10.00 % • ECT ≥ 60.00 °C • Engine speed between 1000 & 2500 RPM • Cylinder air mass ≥ 40.00 % • Ignition Control Spark retard ≤ 15.01 degrees Determine Fault Region • (Instantaneous voltage – average voltage is too small; delta from average ≤ .03125 OR Average voltage – instantaneous voltage is too small; delta from average ≤ 0.03125) AND the average voltage ≥ 4.8 volts	Frequency: Every combustion event Continuous 260 test failures out of 300 samples	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 (KS) Circuit Low Frequency Bank 1	P0327	This diagnostic will detect a wiring fault with knock sensor 1	Output voltage amplitude is low and stays relatively constant	Enable Conditions • No VSS DTC's • No TP Sensor DTC's • No TAC System DTC's • No ECT DTC's • NO Crank Sensor DTC's • No CMP Sensor DTC's • No MAF DTC's • Engine running longer than 30 seconds • Ignition voltage ≥ 11 volts • Throttle position ≥ 10.00 % • ECT ≥ 60.00 °C • Engine speed between 1000 & 2500 RPM • Cylinder air mass ≥ 40.00 % • Ignition Control Spark retard ≤ 15.01 degrees Determine Fault Region • (Instantaneous voltage – average voltage is too small; delta from average ≤ .03125 OR Average voltage – instantaneous voltage is too small; delta from average ≤ 0.03125) AND the average voltage < 4.8 volts	Every combustion event Continuous 260 test failures out of 300 samples	DTC Type B
Knock Sensor (KS) Circuit Low Frequency Bank 2	P0332 (does not apply to the following engine rpo's: LA1, LG8	This diagnostic will detect a wiring fault with knock sensor 2	Output voltage amplitude is low an stays relatively constant	Enable Conditions • No VSS DTC's • No TP Sensor DTC's • No TAC System DTC's • No ECT DTC's • NO Crank Sensor DTC's • No CMP Sensor DTC's • No MAF DTC's • Engine running longer than 30 seconds • Ignition voltage ≥ 11 volts • Throttle position ≥ 10.00 % • ECT ≥ 60.00 °C • Engine speed between 1000 & 2500 RPM • Cylinder air mass ≥ 40.00 % • Ignition Control Spark retard ≤ 15.01 degrees Determine Fault Region • (Instantaneous voltage – average voltage is too small; delta from average ≤ .03125 OR Average voltage – instantaneous voltage is too small; delta from average ≤ 0.03125) AND the average voltage < 4.8 volts	Every combustion event Continuous 260 test failures out of 300 samples	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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	18X Signal This diagnostic will detect an incorrect signal from the crankshaft sensor.	If in one engine cycle 36 medium resolution. pulses are not seen, but 6 low resolution pulses and 1 CMP Sensor pulse are seen.	• Engine run time > 3.00 sec	290.00 failures within 300.00 sample limit. <u>Frequency:</u> Continuous 100msec loop	DTC Type B
Intake Camshaft Position (CMP) Sensor Circuit Bank 1	P0340 Applies to LX9 only	1X Signal This diagnostic will detect if a fault exists on the camshaft position sensor signal.	A. Engine is cranking and the engine speed from CMP Sensor < 1 for more than 2 seconds OR B. Reference pulse logic saw more than 7 reference pulses and the medium resolution logic did not see 1 CMP Sensor pulse OR C. Medium resolution logic saw at least one CMP Sensor Pulse but did not see 6 low resolution pulses OR D. CMP Sensor sequence in falling region ≤ 3 or ≥ 6	A. Ignition Switch is in crank PRNDL is in park or neutral (vehicle won't start with out this being true) Starter relay is commanded on B. Ignition switch is in run or crank C. Ignition switch is in run or crank Match has already occurred D: Ignition switch is in run or crank Match has already occurred Low Resolution. pulse in falling CMP sensor signal region = 6 RPM < 3000 RPM	A. 2 seconds without CMP Sensor signal detected. 12.5 ms continuous B. Rref pulse logic saw more than 7 reference pulses and the medium resolution logic did not see one CMP Sensor pulse Continuous every reference pulse C. 5 failures in a 100 sample limit Continuous every Medium reference pulse D. 5 failures in a 100 sample limit Continuous every medium reference pulse	DTC Type B
Intake Camshaft Position (CMP) Sensor Performance Bank 1	P0341	1X Signal This diagnostic will detect if the CMP Sensor signal is present.	If in one engine cycle, one CMP Sensor reference pulse is not seen but 36 med resolution pulses are seen and 6 low resolution pulses are seen.	• Engine runtime > 3.00 sec	If CMP sensor signal is not detected 290.00 out of 300.00 test samples. <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 (Classic Flow test)	P0401 (Runs on the follwing engine rpo's: LA1, LG8, L67)	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 1.992188 kPa.	Test Enables • No VSS, TP Sensor, Misfire, IAT, MAP, IAC DTC's • No Fuel Injector DTC's • No EGR Sensor DTC's • No ECT DTC's • No Crank Sensor DTC's • No MAF DTC's • Engine Run Time > cal table based on startup coolant temperature • ECT > 75.00 ° C • BARO > 74.00 kPa (8500 ft) • 0°C ≤IAT ≤ 100°C • 11 ≤ Ignition voltage ≤ 18 • IAC Δ < 5.00 counts • Throttle Position < 1% • AC clutch status is unchanged • Transmission status is unchanged • Transmission is not in Park or Neutral • Not in Power Enrichment • Not in Catalyst Protection Mode • Traction contol is not active • Vehicle Speed ≥ 30 mph • RPM ≥ 775 • ECT < 131° C • EGR Icing is not possible • EGR is not in device control • AC Clutch status is not changed • Clutch is not depressed (manual trans only) • Not in Decel Fuel Cut off (LA1, LG8 only) • DFCO status is unchanged Stability Mode Enables • EGR Position < 1% • Engine Speed > 1000.00 rpm but < 1400.00 rpm • MAP Δ < 2.998 kPa • MAP > 15.00 kPa but < 70.00 kPa All of the above met for 0.5 seconds Intrusive Mode Enables • Vehicle Speed Δ < 5 MPH • + RPM Δ < 250 RPM • - RPM Δ < 350 RPM • Max EGR position > 90%	Test Time: 3.9 seconds Frequency: 100 ms loop Once per trip (typically) **Rapid Step Response feature will initiate multiple tests:** IF the difference between the current EWMA and the current map diff is > 7.001953 kpa AND current map diff is > 2.001953 kpa THEN 4 tests may be run per trip until 24 tests have been completed Fast Initial Response feature will initiate multiple tests upon code clear: Several tests per trip will run until 12 tests have been completed.	DTC Type A

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 (Quick Test)	P0401 (Runs on the following engine rpo's: L36, L26, L32 and LX9)	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 0.732 kPa.	Test Enables No Fuel Injector, Idle, TP sensor, MAP, VSS, TAC system, 5 volt reference, IAT, ECT, EGR Pintle Position, Misfire, PCM, or MAF DTCs set Not in device control EGR valve icing not occuring EGR Engine run time expired Not in Power Enrichment ECT > 75° C ECT < 126.0156° C BARO > 74 kPa (8500 Ft) IAT < 100° C IAT > -7° C System Voltage < 18 volts System Voltage > 11 volts Transmission is in 3rd or 4th gear Decel Fuel Cutoff is either inactive (mode 0) or at a commanded spark value of 0 (mode 2) for at least 6.25 ms. Vehicle speed < 70 MPH Vehicle Speed > 28 MPH Throttle Position is < 0.9% A/C clutch status is unchanged for 1 second. Transmission status is unchanged for 1.5 seconds. Throttle Area Delta < 100 % Stability Mode Enables EGR Position < 1% 1000 RPM < Engine Speed < 1500 RPM MAP Δ < 1.108 kpa 17 kpa < Compensated MAP < 43 kpa Difference between desired & actual airflow < 1.2 Grams/sec. Intrusive Mode Enables Vehicle Speed Δ < 3 MPH + RPM Δ < 100 RPM - RPM Δ < 200 RPM Max EGR Position > 75 % Max EGR Position < 95 % EGR Duty Cycle On Time < 25	*Test Time* 800 ms ***Frequency*** 6.26 ms loop Once per trip (typically) **Rapid Step Response feature will initiate multiple tests:** IF the difference between the current EWMA and the current map diff is > 2.305 kpa AND current map diff is > 0.796 kpa THEN 6 tests may be run per trip until 32 tests have been completed Fast Initial Response feature will initiate multiple tests upon code clear: Several tests per trip will run until 16 tests have been completed.	DTC Type A

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Linear EGR circuit for electrical integrity	Output state invalid	• Ignition switch is in crank or run • 11 volts < Ignition Voltage < 18 volts	20.00 seconds OR chip protection logic indicates a short failure 1 time Frequency: Continuous 100 ms loop Chip protection logic: 5 failures out of 10 samples indicate a short Frequency of this logic is 12.5 ms loop Continuous Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip.	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)] > 15.00 %	• System voltage ≥ 11 volts • EGR valve icing or over temperature not occurring • Sensor supply is valid (P0641 not failing) • Desired EGR position > 0% • EGR Intrusive test not active. • Δ Desired EGR position < 30.00 %	200.00 loops Frequency: 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 < 3.1% of 5 volt reference voltage	• EGR valve icing or over temperature not occurring • System voltage ≥ 11.00 volts • Sensor supply is valid (P0641 not failing) • EGR Intrusive test not active.	20.00 seconds Frequency: 100ms loop Continuous	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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
Catalyst Low Efficiency Bank 1	P0420	Oxygen Storage	OSC time difference ≥ 0.25 OSC time difference = OSC worst pass threshold - OSC compensation factor * (post cat O2 resp time - pre cat O2 resp time) OSC worst pass thresh = 1.875 seconds	*General Enable* • No EVAP, TAC system, MAF, CAM, ECT, CKP, EGR, 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 ***Valid Idle Period Criteria*** • Engine speed ≥ 1100 RPM for a minimum of 30 seconds since end of last idle period. • Engine Speeed < 1100 RPM • Engine run time ≥ 600 seconds. • Vehicle Speed ≤ 2 mph • Fuel Trim Intrusive Test and/ or POS Diagnostic Intrusive Test not Active • Tests attempted this trip ≤ 6.00 *Idle conditions Met Criteria* General Enable met; Valid Idle Period met • 0 ≤ short term fuel trim ≤ 2 • Δ short term fuel trim since valid idle conditions met ≤ 2 • 490°C ≤ predicted catalyst temperature ≤ 765°C for at least 30 seconds with a closed throttle time ≤ 80 seconds consecutively (closed throtte ⇒ TPS < 1.503906%) • AC clutch and fan clutches are stable • Closed loop fueling • Long term fuel trim learning enabled • Barometric pressure > 74 kPa • 75°C ≤ ECT ≤ 126.0156°C • System voltage > 10.7 volts • 0 < Idle period ≤ 69 seconds ⇒ Idle time is incrementd if: Vehicle Speed ≤ 2 mph and Throttle Position ≤ 1.503906% • IAT < 100°C • PRNDL is in Drive Range ***Test Enable Conditions; must hold true from 5 seconds after idle conditions are met to end of test*** • Delta IAC ≤ 5 steps Delta RPM ≤ 300 • 3 gps ≤ MAF ≤ 10 gps CCP DC Multiplier ≤ 1 • RPM – Desired RPM ≤ 200 Desired RPM – RPM ≤ 300 • Tests attempted this idle period < 1 *Engine Fueling Criteria at Beginning of Idle Period* • Must be met from between 4 and 7 seconds after idle conditions have been met for at least 5 seconds • Number of pre-O2 switches ≥ 4 • Average BPW is within a window based on a table defined by airflow • 0.94≤ average short term fuel trim ≤ 1.06	1 test attempted per valid idle period Minimum of 1 test per trip Maximum of 6 tests per trip Frequency: • 12.5 ms Continuous **Rapid Step Response feature will initiate multiple tests:** If the difference between current EWMA value and the current OSC time difference ≥ 0.4697266 seconds and OSC time difference ≥ 0.00 seconds Maximum of 6 tests per trip. Maximum of 18 tests to detect failure when rapid step response is enabled. *Green Converter Delay Criteria* • The diagnostic will not be enabled until the next ignition cycle after the following has been met:Predicted catalyst temperature ≥ 490° 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

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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
Catalyst Low Efficiency Bank 2	P0430	Oxygen Storage	OSC time difference ≥ 0.25 OSC time difference = OSC worst pass threshold - OSC compensation factor * (post cat O2 resp time - pre cat O2 resp time) OSC worst pass thresh = 1.875 seconds	*General Enable* • No EVAP, TAC system, MAF, CAM, ECT, CKP, EGR, 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 ***Valid Idle Period Criteria*** • Engine speed ≥ 1100 RPM for a minimum of 30 seconds since end of last idle period. • Engine Speeed < 1100 RPM • Engine run time ≥ 600 seconds. • Vehicle Speed ≤ 2 mph • Fuel Trim Intrusive Test and/ or POS Diagnostic Intrusive Test not Active • Tests attempted this trip ≤ 6.00 *Idle conditions Met Criteria* General Enable met; Valid Idle Period met • 0 ≤ short term fuel trim ≤ 2 • Δ short term fuel trim since valid idle conditions met ≤ 2 • 490°C ≤ predicted catalyst temperature ≤ 765°C for at least 30 seconds with a closed throttle time ≤ 80 seconds consecutively (closed throtte ⇒ TPS < 1.503906%) • AC clutch and fan clutches are stable • Closed loop fueling • Long term fuel trim learning enabled • Barometric pressure > 74 kPa • 75°C ≤ ECT ≤ 126.0156°C • System voltage > 10.7 volts • 0 < Idle period ≤ 69 seconds ⇒ Idle time is incrementd if: Vehicle Speed ≤ 2 mph and Throttle Position ≤ 1.503906% • IAT < 100°C • PRNDL is in Drive Range ***Test Enable Conditions; must hold true from 5 seconds after idle conditions are met to end of test*** • Delta IAC ≤ 5 steps Delta RPM ≤ 300 • 3 gps ≤ MAF ≤ 10 gps CCP DC Multiplier ≤ 1 • RPM – Desired RPM ≤ 200 Desired RPM – RPM ≤ 200 • Tests attempted this idle period < 1 *Engine Fueling Criteria at Beginning of Idle Period* • Must be met from between 4 and 7 seconds after idle conditions have been met for at least 5 seconds • Number of pre-O2 switches ≥ 4 • Average BPW is within a window based on a table defined by airflow • 0.94≤ average short term fuel trim ≤ 1.06	1 test attempted per valid idle period Minimum of 1 test per trip Maximum of 6 tests per trip Frequency: • 12.5 ms Continuous **Rapid Step Response feature will initiate multiple tests:** If the difference between current EWMA value and the current OSC time difference ≥ 0.4697266 seconds and OSC time difference ≥ 0.00 seconds Maximum of 6 tests per trip. Maximum of 18 tests to detect failure when rapid step response is enabled. *Green Converter Delay Criteria* • The diagnostic will not be enabled until the next ignition cycle after the following has been met:Predicted catalyst temperature ≥ 490° 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

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 in the evap system between the fuel fill cap and up to the purge solenoid	0.04" EWMA Value > 0.0289917 in. dia. OR 0.02" EWMA Value > 0.01123291 in. dia.	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 DTC's • No Evap Canister Purge solenoid DTC's • No EVAP Canister Vent Solenoid 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) • VSS < 80.00 mph (0.02" leak only) • 39 % < Fuel level < 85 % (0.02" leak only) • Δ Vacuum Slosh < 0.44 – 0.95 "H2O based on fuel level OR Δ Fuel Slosh < 3.1 – 7.1 % based on fuel level (if occurs, test will try to run, again) • Δ Vacuum Slosh < 0.22 – 0.47 "H2O based on fuel level OR Δ Fuel Slosh < 2.2 – 4.9 % based on fuel level (If these occur, the 0.020" EWMA will not be updated) Cold Start Test • IAT < 30°C • Cold temperature Δ(ECT-IAT): < 150 °C if IAT>ECT < 8 °C if ECT > IAT • Cold Test Timer < 675 seconds	Once per cold start Time is dependent on driving conditions Max. before test abort is 675 seconds	DTC Type A

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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) Purge Solenoid Control Circuit	P0443	This DTC checks the Purge Solenoid Control Circuit for electrical integrity	Output state is invalid	• Ignition switch is in crank or run • 11< Ignition Voltage < 18	15 failure out of 20 samples OR Chip protection logic indicates a short failure 1 time Frequency: Continuous 100 ms loop Chip protection logic: 5 failures out of 10 samples indicate a short Frequency of this logic is 12.5 ms loop Continuous Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip.	DTC Type B
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 > 10.00 "H2O for 5 seconds BEFORE Purge Volume > 4 liters OR Vented Vacuum < -2.5 in. H20 or Vented Vacuum > 5 in. H20 for 15 seconds	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 DTC's • No Evap Canister Purge solenoid DTC's • No EVAP Canister Vent Solenoid 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 trip Time is dependent on driving conditions Max. before test abort is 675 seconds	DTC Type B
Evaporative Emission (EVAP) Vent Solenoid Control Circuit	P0449	This DTC checks the output driver for electrical integrity	Output state is invalid	• Ignition switch is in crank or run • 11< Ignition Voltage < 18	15 failures out of 20 samples Frequency: Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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	• 0.10 second delay after sensor power up for sensor warm-up • PCM State <> crank	5 seconds Frequency: 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 < 4.90 volts	• 0.10 second delay after sensor power up for sensor warm-up • PCM state <> crank	5 seconds Frequency: Continuous 100ms loop	DTC Type B
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 > 3.00 liters BEFORE Tank vacuum < 8 "H_2O	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 DTC's • No Evap Canister Purge solenoid DTC's • No EVAP Canister Vent Solenoid 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 • IAT < 30°C • Cold temperature Δ(ECT-IAT): < 150 °C if IAT>ECT < 8 °C if ECT > IAT • Cold Test Timer < 675 seconds	Once per cold start Time is dependent on driving conditions Max. before test abort is 675 seconds	DTC Type B
Fuel Level Sensor 1 Circuit Low Voltage	P0462	This diagnostic will detect a fuel sender failed to a low voltage level.	Discrete (applies to this application): Fuel level input ≤ 32 counts Class 2 (applies to C car only): Fuel sender module sends information that the sender is out of range Note: If communication with fuel sender is lost, default action for diagnostic occurs	PCM is powered up. • Default to gauge: 0.00 % • Default to evap : 40 vapor volume = 50 liters 20 vapor volume = 46 liters • Default to misfire and fuel trim: Run diagnostic ignoring fuel level	Frequency: 12.5 ms Continuous Discrete (applies to this application): Failed for 10.00 consecutive seconds Class 2 (applies to C car only): Fuel sender sends failed message after seeing failure for 10 consecutive seconds	DTC Type C

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 High Voltage	P0463	This diagnostic will detect a fuel sender failed to a high voltage level.	Discrete: Fuel level input ≥ 150 counts Class 2 (applies to C car only): Fuel sender module sends information that the sender is out of range Note: If communication with fuel sender is lost, default action for diagnostic occurs	PCM is powered up. • Default to gauge: 0.00 % • Default to evap : 40 vapor volume = 50 liters 20 vapor volume = 46 liters • Default to misfire and fuel trim: Run diagnostic ignoring fuel level	Frequency: 12.5 ms Continuous Discrete (applies to this application): Failed for 25.00 consecutive seconds Class 2 (applies to C car only): Fuel sender sends failed message after seeing failure for 60 consecutive seconds	DTC Type C
Cooling Fan 1 Control Circuit	P0480	This DTC checks the output driver for electrical integrity	Output state is invalid	• Ignition switch is in crank or run • 11< Ignition Voltage < 18	15 failure out of 20 samples OR chip protection logic indicates a short failure 1 time Frequency: Continuous 100 ms loop Chip protection logic: 5 failures out of 10 samples indicate a short Frequency of this logic is 12.5 ms loop Continuous Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip.	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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
Cooling Fan 2 Control Circuit	P0481	This DTC checks the output driver for electrical integrity	Output state is invalid	• Ignition switch is in crank or run • 11< Ignition Voltage < 18	15 failure out of 20 samples OR chip protection logic indicates a short failure 1 time Frequency: Continuous 100 ms loop Chip protection logic: 5 failures out of 10 samples indicate a short Frequency of this logic is 12.5 ms loop Continuous Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip.	DTC Type B
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)	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 DTC’s • No EVAP canister purge valve solenoid DTC’s • No EVAP Canister Vent Solenoid 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 • IAT < 30°C • Cold temperature Δ(ECT-IAT): < 150 °C if IAT>ECT < 8 °C if ECT > IAT • Cold Test Timer < 675 seconds	Once per cold start. Cold start: max time is 65 seconds	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.doc

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Idle Air Control (IAC) System - RPM Too Low	P0506	This DTC will determine if a low idle exists.	RPM < (Desired RPM – a value from a look up table based on ECT) ECT / value -40 / 300 -28 / 300 -16 / 300 -4 / 300 8 / 300 20 / 300 32 / 100 44 / 100 56 / 100 68 / 100 80 / 100 92 / 100 104 / 100 116 / 100 128 / 100 140 / 100 152 / 100	***Test Enable:*** • No EVAP Canister Purge Valve Stuck Open DTC • No EVAP Canister Purge Solenoid Control Circuit DTC • No ECT DTC's • No Fuel Injector DTC's • No EGR Flow or Sensor DTC's • No TAC system DTC's • No IAT DTC's • No Fuel Trim DTC's • No MAF DTC's • No TP Sensor DTC's • No Misfire DTC's • No VSS DTC's • No MAP DTC's • ECT ≥ -40.00 °C • System Voltage ≥ 11.00 V but ≤ 18.00 V • IAT ≥ -40.00 °C • Engine run time ≥ 1.00 seconds • BARO ≥ 60.00 kPa • TP Sensor ≤ 0.25% • VSS ≤ 3.00 MPH • Catalyst Diagnostic Intrusive Test = not active • EGR Flow Diagnostic Intrusive Test = not active • Post O2 Diagnostic Intrusive Test = not active • Transmission state hasn't changed in last 0.1 seconds • Above met for a time ≥ 5 seconds to enable diagnostic.	8.00 seconds per test 4 tests to fail; must leave enable criteria between each test Frequency: Continuous after enable 100ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Air Control (IAC) System - RPM Too High	P0507	This DTC will determine if a high idle exists. Results in Limited Authority Mode if vehicle has Electronic Throttle Control	RPM > (Desired RPM + value from look up table based on ECT) ECT / value -40 / 300 -28 / 300 -16 / 300 -4 / 300 8 / 300 20 / 300 32 / 200 44 / 200 56 / 200 68 / 175 80 / 175 92 / 175 104 / 175 116 / 175 128 / 175 140 / 175 152 / 175	***Test Enable:*** • No EVAP Purge Valve Stuck Open DTC • No EVAP Canister Purge Solenoid Control Circuit DTC • No ECT DTC's • No Fuel Injector DTC's • No EGR Flow or Sensor DTC's • No TAC system DTC's • No IAT DTC's • No Fuel Trim DTC's • No MAF DTC's • No TP Sensor DTC's • No Misfire DTC's • No VSS DTC's • No MAP DTC's • ECT ≥ -40.00 °C • System Voltage ≥ 11.00 V but ≤ 18.00 V • IAT ≥ -40.00 °C • Engine run time ≥ 1.00 seconds • BARO ≥ 60.00 kPa • TP Sensor ≤ 0.25% • VSS ≤ 3.00 MPH • Catalyst Diagnostic Intrusive Test = not active • EGR Flow Diagnostic Intrusive Test = not active • Post O2 Diagnostic Intrusive Test = not active • Transmission state hasn't changed in last 0.1 seconds • Above met for a time ≥ 5 seconds to enable diagnostic.	8.00 seconds per test 4 tests to fail; must leave enable criteria between each test Frequency: Continuous after enable 100ms loop	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	• PCM state = crank or run • Ignition voltage ≥ 5 volts • Engine speed < 5000	1 failure Frequency: 50 ms loop Continuous	DTC Type A
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	• PCM state = crank or run • PCM is identified through calibration as a Service PCM	Test is run at Powerup Test also runs: Frequency: 100ms loop Continuous	DTC Type A

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 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) One failure at key-up initialization. This check is on all GMPX RAM. OR 2) Fault counter increments by 10 for every error, decrements by 1 for every pass; fail threshold = 20. This check is on the Desired Throttle Position RAM location and runs 12.5 ms continuous OR 3) Fault counter increments by 10 for every error, decrements by 1 for every pass; fail threshold = 20. This check is on all GMPX RAM and runs 100 ms continuous	DTC Type A
ECM/PCM Processor	P0606	Indicates that the PCM has detected a TACM internal processor integrity fault	TACM has process sequencing error, dual path consistency error, clock error, or computer is not operating properly	Ignition in Run/Crank or during key-off	Fault sets within 200 msec Runs every 18.75 msec	DTC Type A
5 Volt Reference 1 Circuit	P0641	This DTC detects if the 5 Volt supply is too high or too low	Voltage state invalid (Voltage > 4.7 volts or voltage < 4.39 volts)	• PCM state = run	Failed for 10.00 sec <u>Frequency:</u> 100ms loop Continuous	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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
Malfunction Indicator Lamp (MIL) Control Circuit	P0650	This DTC checks the output driver for electrical integrity	Output state is shorted, open or over temperature	• Ignition switch is in crank or run • 9< Ignition Voltage < 18	15 failure out of 20 samples for open or over temperature chip protection logic indicates a short failure 1 time <u>Frequency:</u> Continuous 100 ms loop <u>Chip protection logic:</u> 5 failures out of 10 samples indicate a short Frequency of this logic is 12.5 ms loop Continuous Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip.	DTC Type B No MIL
5 Volt Reference 2 Circuit	P0651	This DTC detects if the 5 Volt supply is too high or too low	Voltage state invalid (Voltage > 4.7 volts or voltage < 4.4 volts)	• PCM state = run	Failed for 10.00 sec <u>Frequency:</u> 100ms loop Continuous	DTC Type B
Accelerator Pedal Position (APP) System	P1125	PCM determines a limp home mode of operation due to multiple accelerator pedal sensor faults.	This DTC is set when: 1) 1 or more APP sensors are out of range, OR 2) Both APP sensors disagree	• Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data. • No TACM processor DTC.	One occurrence. Check runs every 18.75 ms.	DTC Type A

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 < 45.00 OR Half cycle R/L switches <45.00 OR Slope Time L/R switches < 4.00 OR Slope Time R/L switches < 4.00	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test= Not Active • Catalyst monitor diagnostic Intrusive Test= Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • O2 Heater on for ≥ 0 seconds • Bank 1 Sensor1 circuit and heater and heater drive DTCs = Not Active • Bank 2 Sensor1 circuit and heater and heater driver DTCs = Not Active • In one of the following four fueling cells: Purge off, normal; purge off, high flow; purge on, normal; purge off, high flow • Misfire DTC = Not Active • ECT > 65.00 °C • Engine run time > 60.00 seconds • EVAP canister purge duty cycle ≥ 0.00 % • 15.00 gps ≤ MAF ≤ 31.00 gps • 1300.00 ≤ RPM ≤ 3150.00 • Throttle position ≥ 2.00 % • Fuel state = closed loop • Transmission (automatic) not in Park, Reverse or Neutral All of the above met for at least 2 seconds	90000.00 ms Frequency: Once per trip	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Transition Time Ratio Bank 1 Sensor 1	P1134	This DTC determines if the O2 sensor transition time between rich to lean and lean to rich is degraded	Transition time difference < -28 OR Transition time difference > 80	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test = Not Active • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • O2 Heater on for ≥ 0 seconds • Bank 1 Sensor1 circuit and heater and heater drive DTCs = Not Active • Bank 2 Sensor1 circuit and heater and heater driver DTCs = Not Active • In one of the following four fueling cells: Purge off, normal; purge off, high flow; purge on, normal; purge off, high flow • Misfire DTC = Not Active • ECT > 65.00 °C • Engine run time > 60.00 seconds • EVAP canister purge duty cycle ≥ 0.00 % • 15.00 gps ≤ MAF ≤ 31.00 gps • 1300.00 ≤ RPM ≤ 3150.00 • Throttle position ≥ 2.00 % • Fuel state = closed loop • Transmission (automatic) not in Park, Reverse or Neutral All of the above met for at least 2 seconds	90000.00 ms Frequency: Once per trip	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 < 45.00 OR Half cycle R/L switches <45.00 OR Slope Time L/R switches < 4.00 OR Slope Time R/L switches < 4.00	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test = Not Active • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • O2 Heater on for ≥ 0 seconds • Bank 1 Sensor1 circuit and heater and heater drive DTCs = Not Active • Bank 2 Sensor1 circuit and heater and heater driver DTCs = Not Active • In one of the following four fueling cells: Purge off, normal; purge off, high flow; purge on, normal; purge off, high flow • Misfire DTC = Not Active • ECT > 65.00 °C • Engine run time > 60.00 seconds • EVAP canister purge duty cycle ≥ 0.00 % • 15.00 gps ≤ MAF ≤ 31.00 gps • 1300.00 ≤ RPM ≤ 3150.00 • Throttle position ≥ 2.00 % • Fuel state = closed loop • Transmission (automatic) not in Park, Reverse or Neutral All of the above met for at least 2 seconds	90000.00 ms Frequency: Once per trip	

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Transition Time Ratio Bank 2 Sensor 1	P1154	This DTC determines if the O2 sensor transition time between rich to lean and lean to rich is degraded	Transition time difference < -28 OR Transition time difference > 80	Common Enable Criteria • No TP Sensor DTC's • No MAP DTC's • No ECT DTC's • No MAF DTC's • No IAT DTC's • No Evap DTC's • No Fuel Injector DTC's • EGR flow diagnostic Intrusive Test = Not Active • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • 9 volts < system voltage < 18.00 volts • Device control = Not Active Specific Enable Criteria • O2 Heater on for ≥ 0 seconds • Bank 1 Sensor1 circuit and heater and heater drive DTCs = Not Active • Bank 2 Sensor1 circuit and heater and heater driver DTCs = Not Active • In one of the following four fueling cells: Purge off, normal; purge off, high flow; purge on, normal; purge off, high flow • Misfire DTC = Not Active • ECT > 65.00 °C • Engine run time > 60.00 seconds • EVAP canister purge duty cycle ≥ 0.00 % • 15.00 gps ≤ MAF ≤ 31.00 gps • 1300.00 ≤ RPM ≤ 3150.00 • Throttle position ≥ 2.00 % • Fuel state = closed loop • Transmission (automatic) not in Park, Reverse or Neutral All of the above met for at least 2 seconds	90000.00 ms Frequency: Once per trip	DTC Type B
Engine Coolant Overtemperature - Protection Mode Active	P1258	This DTC indicates that the engine is or has been in camel mode, where the coolant has gotten so hot that the engine is being run first on one bank of injectors, and then on the other bank, in an effort to save the engine.	Injectors are turned off due to ECT > 131°C	• ECT shorts tests not failing • Engine is running • Engine run time > 5 seconds	Frequency: 1 second Continuous	DTC Tyoe A

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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
Ignition Coil 1 Control Circuit High Voltage	P1351	This DTC checks the IC circuit for electrical integrity	Voltage state invalid	• PCM state = crank or run	90 failures within 100 samples Frequency: Every engine cycle Continuous	DTC Type B
Ignition Coil 2 Control Circuit High Voltage	P1352	This DTC checks the IC circuit for electrical integrity	Voltage state invalid	• PCM state = crank or run	90 failures within 100 samples Frequency: Every engine cycle Continuous	DTC Type B
Ignition Coil 3 Control Circuit High Voltage	P1353 (LX9 only)	This DTC checks the IC C circuit for electrical integrity	Voltage state invalid	• PCM state = crank or run	90 failures within 100 samples Frequency: Every engine cycle Continuous	DTC Type B
Ignition Coil 1 Control Circuit Low Voltage	P1361	This DTC checks the Bypass circuit for electrical integrity	Voltage state invalid	• PCM state = crank or run	90 failures within 100 samples Frequency: Every engine cycle Continuous	DTC Type B
Ignition Coil 2 Control Circuit Low Voltage	P1362	This DTC checks the Bypass circuit for electrical integrity	Voltage state invalid	• PCM state = crank or run	90 failures within 100 samples Frequency: Every engine cycle Continuous	DTC Type B
Ignition Coil 3 Control Circuit Low Voltage	P1363 (LX9 only)	This DTC checks the IC C circuit for electrical integrity	Voltage state invalid	• PCM state = crank or run	90 failures within 100 samples Frequency: Every engine cycle Continuous	DTC Type B
Crankshaft Position (CKP) High to Low Resolution Frequency Correlation	P1374	3X signal This diagnostic will detect if the 3X signal is missing.	In one engine cycle 6 low resolution pulses are not seen, but 1 cmp sensor pulse and 36 medium resolution pulses are seen.	• Engine runtime > 3 sec	290.00 out of 300.00 test samples Frequency: Continuous 100 ms loop	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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
Misfire Detected - Rough Road Data Not Available	P1380	This diagnostic detects if the ABS controller is indicating a fault. When this occurs, misfire will STILL run.	ABS controller sends a message to PCM indicating that a failure has occurred in the ABS module	• VSS ≥ 10 mph • Engine Speed ≤ 5000 rpm • Engine Load ≤ 87.5 %	50.00 failures out of 60.00 samples Frequency: 500ms loop Continuous	DTC Type C (DTC sets when a P0300 has a light request – misfire diagnostic ignores rough road information if ABS signal fails)
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 STILL run.	Serial data messages are lost for 5.00 seconds	• VSS ≥ 10 mph • Engine Speed ≤ 5000 rpm • Engine Load ≤ 87.5 %	60.00 failures out of 70.00 samples Frequency: 500ms loop Continuous	DTC Type C (DTC sets when a P0300 has a light request – misfire diagnostic ignores rough road information if ABS signal fails)
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 5 volt reference voltage from closed position	• System voltage ≥ 11 volts • EGR valve icing or over temperature not occurring • Sensor supply is valid (P0641 not failing) • EGR Intrusive test not active. • Desired EGR = 0 %	4.00 separate failures for 20 seconds (with pintle movement > 40.00 % for 0.50 seconds opening time between tests) Frequency: 100ms loop Continuous	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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	1) Indicates that the TAC Module has detected a throttle positioning error OR 2) Either Processor cannot determine throttle positioning OR 3) Both TP Sensors are invalid	1) Absolute value of the throttle error: a) ≥2 degrees for >200 ms with no change in error sign. OR b) ≥2 degrees for >500 ms for throttle command changes ≥ 2 degrees. OR c) ≥ 5 degrees for >200 ms for throttle command changes ≥ 5 degrees. OR d) ≥ 5 degrees for > 300 ms with no change in error sign. [Throttle error = Measured throttle position - commanded throttle position] OR 2a) PCM processor DTC's. OR 2b) TACM processor DTC. OR 3a) both TP Sensor Circuit DTC's are set. OR 3b) PCM-TACM Serial Data DTC with any APP Sensor DTC or TP Sensor DTC. [Throttle error = Measured throttle position - commanded throttle position]	• Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data. • Not in battery saver mode.	One occurrence. Check runs every 3 ms.	DTC Type A

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Serial Data Circuit	P1518	Indicates that the serial data line between the PCM and TACM has intermittently or continuously failed.	PCM: No message for 18.75 ms. Corrupted data in the message. Invalid message protocol. PCM processor DTC's. TACM processor DTC. TAC Module: No message for 25 ms. Corrupted data in the message. Invalid message protocol. PCM processor DTC's. TACM processor DTC. Throttle Authority Limit Exceeded.	• (Ignition in Run or Crank) AND engine not in crank state. • Time since power-up > 0. • Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data.	PCM and TACM continuous No valid message received for 500 ms. PCM Intermittent: Invalid or missing message increments counter by 10; valid message received decrements counter by 1; threshold is 254. TACM Intermittent: Invalid or missing message increments counter by 6; valid message received decrements counter by 1; threshold is 200. Check for invalid messages runs every 18.75 ms. Check for missing messages runs every 25 ms. Throttle Authority Limit Exceeded > 300 ms	DTC Type A
Control Module Throttle Actuator Position Performance	P2101	Indicates that the PCM has detected a throttle positioning error	Absolute value of the throttle error > 5%. [Throttle error = Measured throttle position - modeled throttle position]	• Ignition in Run or Crank • TACM determines PCM Desired Throttle Position is valid. • Not in battery saver mode. • No Airflow Actuation DTC. • (Engine Running = true) OR (Ignition Voltage > 8.5 volts). • No Throttle Actuation DTC. • No PCM-TACM Serial Data DTC. • Both TP Sensor Circuit DTC's are not set. • No PCM Processor DTC's. • No TACM Processor DTC.	High counter increments by 2 for every throttle error > 5%; decrements by 1 if 0% < throttle error <5%; decrements by 5 if -5% < throttle error <0%; clears if throttle error < -5%. Check runs every 18.75 ms with TACM - PCM valid message received. Low counter increments by 2 for every throttle error < -5%; decrements by 1 if -5%<throttle error <0%; decrements by 5 if 0%<throttle error <5%; clears if throttle error > 5%. Check runs every 18.75 ms with TACM - PCM valid message received.	DTC Type A

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 Performance	P2108	Indicates that TAC Module is unable to correctly read data from the flash memory. Indicates that TAC Module is unable to correctly write and read data to and from RAM. Indicates that the TAC Module has detected an internal processor integrity fault.	1) Power-up test fails to read/write data OR 2) Maximum allowed Running Resets exceeded OR 3) ROM checksum does not match expected checksum OR 4) RAM data read does not match data written OR 5) Failure of Interrupt process flag to match expected value. OR 6) Program is not executed in the proper order OR 7) Primary and Redundant RAM variables disagree OR 8) Primary and Redundant Indicated Pedal Position calculation difference > 0.0%. OR 9) Math/Logic test fails to equate to a predetermined value. OR 10) Internal Register data read does not match data written. OR 11) Internal Timer fails to increment OR 12) Watchdog Timer fails to increment OR 13) Failure of Processor Stack pointer to zero at Main Loop.	• Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data.	1) One occurrence Check runs at Reset initialization 2) 10 occurrences during ignition cycle Check runs at Reset initialization 3) One occurrence. Check runs at power up and every 60 seconds thereafter. 4) One occurrence. Check runs at power up and every 800 milliseconds thereafter 5) - 13) One occurrence. Check runs every 3 milliseconds. Second Watchdog timer runs in 10 millisecond loop.	DTC Type A
Accelerator Pedal Position (APP) Sensor 1 Circuit	P2120	1) TACM indicates a continuous or intermittent short or open in either the signal circuit or the APP sensor #1. OR 2) TACM indicates an invalid minimum mechanical position for the APP sensor #1. OR 3) TACM indicates reference voltage out of range.	1) Raw APP sensor signal < 0.235 V or > 4.487 V. OR 2) APP sensor minimum mechanical stop voltage < 0.235 V. OR 3) Reference Voltage < 4.54 V or > 5.21 V.	• Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data. • No TACM processor DTC.	1) & 2) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 133. Check runs every 3 ms.	DTC Type A

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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 2 Circuit	P2125	1) TACM indicates a continuous or intermittent short or open in either the signal circuit or the APP sensor #2. OR 2) TACM indicates an invalid minimum mechanical position for the APP sensor #2. OR 3) TACM indicates reference voltage out of range.	1) Raw APP sensor signal < 0.235 V or > 4.487 V. OR 2) APP sensor minimum mechanical stop voltage > 0.235 V. OR 3) Reference voltage < 4.54 V or > 5.21 V.	• Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data. • No TACM processor DTC.	1) & 2) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 180. Check runs every 3 ms.	DTC Type A
Throttle Position (TP) Sensor 1-2 Correlation	P2135	1) TACM indicates a continuous or intermittent correlation fault between TP sensors #1 and #2. OR 2) TACM indicates an invalid minimum mechanical position correlation between TP sensor #1 and #2. OR 3) TP Sensor 1 signal short to TP Sensor 2 signal, Any reference, or ground.	1) Absolute value of (TP Sensor 1 raw – TP Sensor 2 raw) < 6.0%. OR 2) TP Sensor 1 signal to TP Sensor 2 signal > 0.05V when TP Sensor 2 reference = 0.0 V.	• Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data. • No TACM processor DTC.	1) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 180. Check runs every 3 ms. 2) One occurrence. Check runs at power-up 3) Counter increments by 4 for every error, decrements by 1 for every pass: threshold is 133 Check runs every 3ms..	DTC Type A
Accelerator Pedal Position (APP) Sensor 1-2 Correlation	P2138	1) TACM indicates a continuous or intermittent correlation fault between APP sensors #1 and #2 OR 2) TACM indicates an invalid minimum mechanical position correlation between APP sensor #1 and #2. OR 3) APP sensor 1 signal short to APP sensor 2 signal, any reference, or ground.	1)Absolute value of (raw APP sensor #2 voltage - raw APP sensor #1 voltage) > 0.269 V. OR 2) APP sensor 1 to APP sensor 2 > 0.05V when APP sensor 2 reference is 0.0 V.	• Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data. • No TACM processor DTC.	1) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 180 Check runs every 3 ms. 2) Counter increments by 4 for every error, decrements by 1 for every pass: threshold is 1333 Check runs every 3ms..	DTC Type A

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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
Barometric Pressure (BARO) Sensor Performance	P2227	This DTC detects a BARO Sensor reading that is rapidly changing (unstable).	BARO Sensor has changed more than 10 kPa since the last time read.	• No Map Sensor DTC's active • No TP Sensor DTC's active • No ECT Sensor DTC's active • No MAF Sensor DTC's active • No IAT Sensor DTC's active • No VSS DTC's active • No BARO Sensor Shorted/Open DTC's active • Engine run time > 10 seconds • Vehicle Speed < 255.9844	80 failures out of 100 samples Frequency: 100 ms loop continuous	DTC Type B
Barometric Pressure (BARO) Sensor Circuit Low Voltage	P2228	This DTC detects a continuous short to low or open in either the signal circuit or the BARO sensor.	BARO Sensor Voltage < 0.25 volts		80 failures out of 100 samples Frequency: 100 ms loop Continuous	DTC Type B
Barometric Pressure (BARO) Sensor Circuit High Voltage	P2229	This DTC detects a continuous short to high in either the signal circuit or the BARO sensor.	BARO Sensor Voltage > 4.33 volts		80 failures out of 100 samples Frequency: 100 ms loop Continuous	DTC Type B
ECM/PCM Internal Engine Off Timer Performance	P2610	This DTC determines if the ignition off timer has failed.	A failure will be reported if any of the following occur: Ignition Off Time < 0 seconds Ignition Off Time > 8 seconds Sample Counter > 25 Ignition Off Time < Old Ignition Off Time <u>On positive timer transition</u> Sample Counter < 7 or Sample Counter > 13 or (Ignition Off Time - Old Ignition Off Time) ≠ 1 second note: Sample Counter is incremented if Ignition Off Time = Old Ignition Off Time	Test Run This Trip = FALSE Ignition Off Timer Enabled = TRUE (PCM State = Poweroff; Time in poweroff ≥ 1.6 seconds)	<u>Frequency:</u> 100 ms loop Continuous	DTC Type B

2004 3.1L (LG8), 3.4L (LA1), 3.5L (LX9), 3.8L (L26, L32, L36, L67)
ENGINE DIAGNOSTIC PARAMETERS

2004file4.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

LOOKUP TABLES

P0101: (Calculated Flow – Measured Flow) Lookup Table: 3.8L (L26) Grand Prix

Calculated Airflow	Airflow Delta
Grams_Air_0	15
Grams_Air_40	20
Grams_Air_80	25
Grams_Air_120	35
Grams_Air_160	35
Grams_Air_200	35
Grams_Air_240	35
Grams_Air_280	400
Grams_Air_320	400
Grams_Air_360	400
Grams_Air_400	400

LOOKUP TABLES

P0141: Lookup Tables for Fail Times: 3.8L (L36) C Car (Grand Prix uses current monitor on both sensors)
P0141 – Bank 1, Sensor 2

Additional Fail Time (Add this amount at this Startup Coolant Temperature)	
	Bank 1, Sensor 2
-40 Degrees_C	30
-28 Degrees_C	19
-16 Degrees_C	12
-4 Degrees_C	6
8 Degrees_C	4
20 Degrees_C	2
32 Degrees_C	0
44 Degrees_C	0
56 Degrees_C	0
68 Degrees_C	0
80 Degrees_C	0
92 Degrees_C	0
104 Degrees_C	0
116 Degrees_C	0
128 Degrees_C	0
140 Degrees_C	0
152 Degrees_C	0
Unadjusted Fail Time	
	Bank 1, Sensor 2
0 Grams_Per_Second	280
5 Grams_Per_Second	200

LOOKUP TABLES

10 Grams_Per_Second	140
15 Grams_Per_Second	95
20 Grams_Per_Second	95
25 Grams_Per_Second	95
30 Grams_Per_Second	200
35 Grams_Per_Second	200
40 Grams_Per_Second	200
45 Grams_Per_Second	200
50 Grams_Per_Second	200
55 Grams_Per_Second	200
60 Grams_Per_Second	200
65 Grams_Per_Second	200
70 Grams_Per_Second	200
75 Grams_Per_Second	200
80 Grams_Per_Second	200
85 Grams_Per_Second	200
90 Grams_Per_Second	200
95 Grams_Per_Second	200
100 Grams_Per_Second	200

LOOKUP TABLES

P0121: Stuck High TP Sensor Lookup Table: 3.8L (L36) C Car (Grand Prix does not support this Pcode as it has Electronic Throttle Control, not analog TP sensor)

Engine RPM	Max TP Sensor Value
400 RPM	15
800 RPM	20
1200 RPM	25
1600 RPM	29.60938
2000 RPM	32.79297
2400 RPM	35.99609
2800 RPM	39.19922
3200 RPM	42.40234
3600 RPM	45.60547
4000 RPM	48.80859
4400 RPM	51.99219
4800 RPM	60
5200 RPM	100
5600 RPM	100
6000 RPM	100
6400 RPM	100

LOOKUP TABLES

P0121: Stuck Low TP Sensor Lookup Table: 3.8L (L36) C Car (Grand Prix does not support this Pcode as it has Electronic Throttle Control, not analog TP sensor)

Engine RPM	Min TP Sensor Value
400 RPM	0
800 RPM	0
1200 RPM	0
1600 RPM	3.496094
2000 RPM	5.996094
2400 RPM	6.992188
2800 RPM	9.492188
3200 RPM	13.49609
3600 RPM	15.99609
4000 RPM	19.00391
4400 RPM	21.50391
4800 RPM	23.00781
5200 RPM	24.00391
5600 RPM	25
6000 RPM	25
6400 RPM	25

LOOKUP TABLES

P0401: Engine Run Time as a Function of Coolant Temperature Table: 3.8L (L26) Grand Prix7

Coolant Temperature at Startrun	Engine Run Time (seconds)
Deg_C_m40	64
Deg_C_m30	64
Deg_C_m20	64
Deg_C_m10	55
Deg_C___0	40
Deg_C__10	39
Deg_C__20	38
Deg_C__30	37
Deg_C__40	36
Deg_C__50	35
Deg_C__60	34
Deg_C__70	28
Deg_C__80	20
Deg_C__90	20
Deg_C_100	20
Deg_C_110	31
Deg_C_120	49.33
Deg_C_130	64
Deg_C_140	64

LOOKUP TABLES

P0300: Catalyst Damaging Misfire Percentages as a Function of Engine Speed and Load Table: 3.8L (L26) Grand Prix

Eng. Load ↓ / Eng. RPM →	0 RPM	1000 RPM	2000 RPM	3000 RPM	4000 RPM	5000 RPM	6000 RPM	7000 RPM
0 Load_In_Percent	15.83%	15.83%	15.83%	15.83%	15.83%	15.83%	15.83%	15.83%
10 Load_In_Percent	15.83%	15.83%	15.83%	15.83%	15.83%	15.83%	15.83%	15.83%
20 Load_In_Percent	15.83%	15.83%	15.83%	15.83%	15.83%	15.83%	5.00%	5.00%
30 Load_In_Percent	15.83%	15.83%	15.83%	15.83%	11.67%	11.67%	5.00%	5.00%
40 Load_In_Percent	15.83%	15.83%	15.83%	15.83%	11.67%	10.25%	5.00%	5.00%
50 Load_In_Percent	15.83%	15.83%	15.83%	13.42%	10.25%	10.25%	5.00%	5.00%
60 Load_In_Percent	15.83%	15.83%	11.00%	13.42%	10.25%	10.25%	5.00%	5.00%
70 Load_In_Percent	15.83%	15.83%	7.75%	11.67%	10.25%	9.17%	5.00%	5.00%
80 Load_In_Percent	15.83%	15.83%	5.00%	8.00%	11.67%	8.25%	5.00%	5.00%
90 Load_In_Percent	15.83%	15.83%	5.00%	7.00%	8.00%	5.00%	5.00%	5.00%
100 Load_In_Percent	15.83%	15.83%	5.00%	6.00%	6.00%	5.00%	5.00%	5.00%

LOOKUP TABLES

P0420: Average Base Pulse Width Maximum Allowed Value as a Function of Airflow Table: 3.8L (L26) Grand Prix

Airflow in gps	Average BPW in milliseconds
0	100.0029
1	100.0029
2	100.0029
3	4.503273
4	4.898909
5	5.504
6	5.794909
7	6.295273
8	6.702545
9	7.202909
10	7.598545
11	100.0029
12	100.0029
13	100.0029
14	100.0029
15	100.0029
16	100.0029

LOOKUP TABLES

P0420: Average Base Pulse Width Minimum Allowed Value as a Function of Airflow Table: 3.8L (L26) Grand Prix

Airflow in gps	Average BPW in milliseconds
0	0
1	0
2	0
3	0
4	0.500364
5	1.198545
6	1.896727
7	2.699636
8	3.304727
9	4.096
10	4.794182
11	0
12	0
13	0
14	0
15	0
16	0