

## 1996 1.9L (LL0, L24) Z-Saturn Engine Diagnostic Parameters

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SENSED PARAMETER	FAULT CODE	SENSOR SIGNAL TYPE	ACCEPTABLE OPERATING RANGE AND RATIONALITY	PRIMARY MALF. DETECTION PARAMETERS	SECONDARY MONITORING PARAMETERS AND CONDITIONS	MONITORING TIME LENGTH AND FREQUENCY OF CHECK	MONITORING METHOD	FAULT CODE STORAGE AND MIL ILLUMINATION
Manifold Absolute Pressure Circuit Range/Performance Problem	P0106	Analog	0 volts to .81 volts. During a steady state condition, the MAP value should not change more than 13 KPA. If so a MAP circuit rationality exists	MAP Delta > .81 volt per MAP read	No TP, EGR, IAC DTC's & Engine speed Delta < 100 rpm & TP Delta < 2% & Delta EGR Flow < 9.8% & IAC Delta < 10 counts	20 failures within a 100 test sample after two consecutive trips** Continuous	Pressure Differential Sensor	DTC Type B
Manifold Absolute Pressure Circuit Low Input	P0107	Analog	.20 volts to 4.24 volts This DTC detects a continuous short to low or open in either the signal circuit or the MAP sensor	Raw MAP < .20 volts. RPM > 1600, TP > 15.2 RPM < 1600, TP > 0	No TP DTC's & TP >= 15.2% when engine speed > 1600rpm or TP >= 0% when eng speed <= 1600rpm	200 test failures within a 1000 test sample** Continuous	Pressure Differential Sensor	DTC Type A
Manifold Absolute Pressure Circuit High Input	P0108	Analog	.20 volts to 4.24 volts This DTC detects a continuous short to high in either the signal circuit or the MAP sensor	Raw MAP > 4.24 volts RPM > 1600, TP < 9.8 RPM < 1600, TP < 2	No TP DTC's & TP <= 9.8% when eng speed > 1600rpm or TP <= 2% when eng. speed <= 1600 rpm	200 test failures within a 1000 sample** Continuous	Pressure Differential Sensor	DTC Type A
Intake Air Temperature Circuit Low Input	P0112	Analog	.25 volts To 4.96 volts This DTC detects a continuous short to ground in either the IAT signal circuit or the IAT sensor	IAT < .25 volts	Eng run time > 10 sec	20 test failures within a 60 test sample - 1 sample per sec Continuous	Thermistor	DTC Type A
Intake Air Temperature Circuit High Input	P0113	Analog	.25 volts To 4.96 volts This DTC detects a continuous short to high in the IAT signal circuit or the IAT sensor	IAT > 4.96 volts	No VSS & ECT DTC's & VSS < 15 mph & ECT > 60 deg C & airflow < 16gm/sec & Eng run time > 10 sec	20 test failures within a 60 test sample - 1 sample per sec Continuous	Thermistor	DTC Type A
Engine Coolant Temperature Circuit Low Input	P0117	Analog	.14 volts to 4.7 volts This DTC detects a continuous short to ground in the ECT signal circuit or the ECT sensor	Low Resistance Pullup - Coolant Temp < .14 volts High Resistance Pullup - Coolant Temp. < .14 volts	Engine run time >= 11 sec	3 test failures within 10 samples - 1 sample per sec Continuous	Thermistor	DTC Type A

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Engine Coolant Temperature Circuit High Input	P0118	Analog	.14 volts to 4.7 volts This DTC detects a continuous short to high or open in the ECT signal circuit or the ECT sensor	Low Resistance Pullup - Coolant Temp > 4.7 volts High Resistance Pullup - Coolant Temp > 4.7 volts	Engine run time >= 25 sec	3 test failures within 10 samples - 1 sample per sec Continuous	Thermistor	DTC Type A
Throttle Position Sensor A Circuit Range/Performance Problem	P0121	Analog	This DTC detects a skewed or stuck TP	Predicted TP value in relation to last actual TP value based on engine speed	No TP & MAP DTC's are set & engine is running & MAP < 54.6 KPa & TP Delta < 2%	20 failures within a 100 test sample** Continuous	Potentiometer	DTC Type B
Throttle Position Sensor A Circuit Low Input	P0122	Analog	.2 volts to 4.9 volts. This DTC detects a continuous short to low or open in either the signal circuit or the TP	TP < .20 volts	None	200 failures within a 1000 test samples** Continuous	Potentiometer	DTC Type A
Throttle Position Sensor A Circuit High Input	P0123	Analog	.2 volts to 4.9 volts. This DTC detects a continuous short to high in either the signal circuit or the TP	TP > 4.90 volts	None	30 failures within a 1000 test samples** Continuous	Potentiometer	DTC Type A
Insufficient Coolant Temperature for Closed Loop Fuel Control	P0125	Analog	This DTC detects if a stabilized minimum closed loop is reached and maintained after engine start-up	If timer is exceeded ECT < 0 Deg C	No ECT & IAT DTC's Fast eqn - CLT = 120 sec when 0>ECT>-16 deg C & IAT >0 deg C or -20<ECT<-16 deg C & IAT >20 deg C Slow eqn - CLT = 500 seconds when 0>ECT>-16 deg C & IAT<0 deg C or -20<ECT<-16 & IAT<20 deg C	3 failures /sample after 2 consecutive trips - 1 sec Continuous	Thermistor	DTC Type B

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Front O2 Sensor Circuit Low Voltage	P0131	Analog	0 to 1.1 V This DTC determines if the O2 sensor or circuit is shorted to low by checking for a lean condition during steady throttle and PE	O2 Voltage < .291 V & O2 Voltage <.291 V in PE mode	No MAP, IAT, ECT, TP, Fuel Trim, Misfire, Cam, EGR, CCP DTC's & closed loop & 14.5 <= A/F ratio <= 14.8 & above met for .5 secs. In closed loop. In drive (if auto)	900 failures in a 1000 sample test, and failure remains active for 2 passes of rear O2. 90 failures in a 100 sample test in PE mode .1 sec, continuous	Exhaust Oxygen Sensor	DTC Type B
O2 Sensor Circuit High Voltage	P0132	Analog	0 to 1.1 V This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle and DFCCO	O2 Voltage > .787V & O2 Voltage > .587 V in DFCCO mode	No MAP, IAT, ECT, TP, Fuel Trim, Misfire, Cam, EGR, CCP, DTC's & closed loop & 14.5 <= A/F ratio <= 14.8 & above met for .5 secs. In closed loop. In drive (if auto)	900 failures in a 1000 sample test, and failure remains active for 2 passes of rear O2. 90 failures in a 100 sample test in DFCCO mode -.1 sec, continuous	Exhaust Oxygen Sensor	DTC Type B
Front O2 Sensor Circuit Slow Response	P0133	Analog	0 to 1.1 V This DTC determines if the O2 sensor is functioning properly by checking its response time	O2 Average transition time lean/rich > 125 msec & rich/lean > 156 msec. 1500 < RPM < 3200	No MAP, IAT, ECT, TP, Fuel Trim, Misfire, Cam, EGR, CCP, DTC's & closed loop & O2 Voltage low threshold .300 and high threshold .600 V & flow > 7 g/sec & 1500 < rpm < 3200	100 seconds after closed loop enable once per ignition	Exhaust Oxygen Sensor	DTC Type B
Front O2 Circuit No Activity Detected	P0134	Analog	0v to 1.1v This DTC determines if the O2 sensor or the O2 sensor circuit has developed an open	.391 V <= O2 voltage <= .491V	No MAP, IAT, ECT, TP, Fuel Trim, Misfire, Cam, EGR, CCP, Voltage, DTC's & engine run time > 60 secs. Predictive front O2 temp > 450 Deg C (pred. from RPM and Airflow)	900 failures in a 1000 sample test -.1 sec per sample Continuous	Exhaust Oxygen Sensor	DTC Type B

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Rear O2 Sensor Circuit Low Voltage	P0137	Analog	0 to 1.1 V This DTC determines if the O2 sensor or circuit is shorted to low by checking for a lean condition during steady throttle and PE	O2 voltage < .022 V & O2 voltage < .291 V in PE mode	No MAP, IAT, ECT, TP, Fuel Trim, Misfire, Cam, EGR, CCP, DTC's & closed loop & 14.5 <= A/F ratio <= 14.8 & above met for .5 secs. In drive (if auto). In closed loop.	1000 failures in a 1000 sample test, 3 consecutive tests 90 failures in a 100 sample test in PE mode .1 sec per sample, Continuous	Exhaust Oxygen Sensor	DTC Type B
Rear O2 Sensor Circuit High Voltage	P0138	Analog	0v to 1.1v This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle and DFCO	O2 voltage > 1.065 V & O2 voltage > .587 V in DFCO	No MAP, IAT, ECT, TP, Fuel Trim, Misfire, Cam, EGR, CCP, DTC's & closed loop & 14.5 <= A/F ratio <= 14.8 & above met for .5 secs. In closed loop. In drive (if auto).	1000 failures in a 1000 sample test, continuous 90 failures in a 100 sample test in PE mode - .1 sec per sample, continuous	Exhaust Oxygen Sensor	DTC Type B
Rear O2 Sensor Circuit No Activity Detected	P0140	Analog	0 V to 1.1 V This DTC determines if the O2 sensor or O2 sensor circuit has developed an open	.425 V <= O2 Voltage <=.460 V	No MAP, IAT, ECT, TP, Fuel Trim, Misfire, Cam, EGR, CCP, DTC's & engine run time > 60 secs > Predictive O2 rear temp > 426 Deg C (rpm/airflow)	1450 failures in a 1500 sample test - .1 sec per sample, continuous	Exhaust Oxygen Sensor	DTC Type B
Rear O2 Sensor Heater Circuit Malfunction	P0141	Analog	10.0 V To 16V for not more than 15 seconds This DTC determines if the O2 sensor heater is functioning properly by monitoring the amount of time necessary for the O2 sensor to become active after Ignition key-up	The elapsed time to obtain +.150V or -.146V from mean O2 bias voltage *time based on table: time vs start-up coolant temperature	No MAP, IAT, ECT, TP, Fuel Trim, Misfire, Cam, EGR, CCP, DTC's & engine run time > 5 secs & bias samples > 5 counts & .332 V < bias voltage < .591 V & air flow < 17 g/sec & Delta (ECT - IAT) <= 10deg C & ECT < 50 deg C	* Time determined by table	Exhaust Oxygen Sensor	DTC Type B

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Fuel System too Lean	P0171	software	Determines if the system is in a lean condition	Long Term Fuel > 14.8%	No ECT, MAP, IAT, TP, Evap, Map, TP, O2's, EGR Flow, Misfire DTC's are set & 70 KPa< Baro & 2< Airflow < 80 g/sec & 20 < MAP < 90 KPa & -20 < IAT < 80 Deg C & 500 < RPM < 4000 & . TP < 75% & 60 < ECT < 115 deg C	If lean counter > 3 seconds Continuous	Short term fuel trim, adaptive Index, O2 sensor	DTC Type A
Fuel System Too Rich	P0172	software	Determines if the system is in a rich condition	Long Term Fuel > 21.1%	No ECT, MAP, IAT, TP, VSS, Evap, O2S, P0125 DTC's are set & 70 KPa< Baro & 2< Airflow < 80 g/sec & 20 < MAP < 90 KPa & -20 < IAT < 80 Deg C & 500 < RPM < 4000 & . TP < 75% & 60 < ECT < 115 deg C	If rich counter > 3 seconds Continuous	Short term fuel trim, adaptive Index, O2 sensor	DTC Type A
Random/Multiple Cylinder Misfire Detected	P0300	Digital	These DTC's will determine if a random misfire or a cylinder specific misfire is occurring by monitoring crankshaft velocity	Deceleration/Acceleration Spike vs Engine Speed vs Load vs Camshaft position vs Crankshaft position	No TP, crk, IAT, MAP, ECT DTC's & 469 < Eng. Spd< 6500 rpm(DOHC) 5500-a/5900-m(SOHC)& 8< Ign. V<16 & -6.75<Cool temp<118 deg C & Eng Spd > 0 Fuel control for TC active, TP Delta, DFCO act, Cal. eng torque <-10Nm, EGR diag. In progress, load/speed reg.	5 failed 200 revolution blocks out of 16 (emission level) 1 failed 200 revolution block out of 16 (catalyst damaging) Continuous	Crankshaft Position Sensor, Target Wheel and Camshaft Position Signal	DTC Type B (emission Level) DTC Type A (Catalyst damaging)
Cylinder 1 Misfire Detected	P0301	Digital	same as above	same as above	same as above	same as above	same as above	same as above
Cylinder 2 Misfire Detected	P0302	Digital	same as above	same as above	same as above	same as above	same as above	same as above
Cylinder 3 Misfire Detected	P0303	Digital	same as above	same as above	same as above	same as above	same as above	same as above
Cylinder 4 Misfire Detected	P0304	Digital	same as above	same as above	same as above	same as above	same as above	same as above
Knock Sensor 1 Circuit Low Input	P0327	Digital	This DTC will detect an open or short in the knock sensor circuit	KS noise > 8 A/D counts or < 202 A/D counts	No ECT, TP or P0125 DTC's & TP > 9.8% & ECT > 65 deg C & 3600< RPM < 2200 & eng run time > 10 sec	Conditions are met for 5sec Continuous	Half Effect	DTC Type B

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Crankshaft Position Sensor Circuit Range/Performance	P0336	Digital	This DTC will detect an open or short in the crankshaft position sensor circuit	Low res Period > 6.41 & sync pulse missing	None	10 fails to turn on light** Continuous	Crankshaft Position Sensor	DTC Type A
Camshaft position Sensor Circuit Malfunction	P0340	Digital	This DTC will detect if a cam signal is present	A cam signal needs to be present in 450/7x signal	MAP > 30 kPa	Once per Ignition	Crank sensor software	DTC Type B
Camshaft Position Sensor Circuit Range/Performance	P0341	Digital	This DTC will determine if the Cam is synchronized correctly	If the cam signal falls in the wrong location 3 times	MAP > 30 kPa	Once per Ignition	Crank sensor software	DTC Type B
Exhaust Gas Recirculation Flow Insufficient Detected	P0401	Analog	This diagnostic will determine if there is a reduction in EGR flow.	With EGR valve open, the peak + MAP delta is monitored over a time of 1.0 seconds. This value is compared and subtracted with a threshold from Engine Speed vs Baro. The result is statistically filtered (EWMA) and compared to a decision limit.	No EGR pintle, TP, MAP, VSS, IAT, ECT or IAC DTC's & 1250 rpm < eng. speed < 2600 rpm & Throttle is closed & 35 mph < vehicle speed & ECT > 70 deg C, Baro > 9500 feet	Once per Ignition cycle	Map Delta and software	DTC Type A
Catalyst System Efficiency Below Threshold	P0420	Analog	This DTC will determine the efficiency of the catalyst system based on the FTP	Deviation difference Average = 13 mv from O2 sensor #2	No O2s, ECT, Fuel Trim, VSS, misfire, MAP, IAT, TP DTC's & 5< airflow < 20 g/sec, eng. air load < 80%, Eng speed < 3500 rpm, delta eng load < 10.6% ECT > 70 deg C, 15 < VSS < 255 mph, Converter Temp model > 400 Deg C, 35% < duty cycle < 65%	50 tests per trip See Calmon Description	precat and post cat O2 sensors	DTC Type A
Evaporative Emission Control System Malfunction	P0440	Digital	This diagnostic will monitor the amount of energy contained in the purge solenoid	The number of falling edges of the CCP PWM > 24 in one second	No MAP, ECT & TP DTC's & 25 % < Duty Cycle < 78 % & Eng vacuum > 70 kPa & ECT > 68 deg C & 2% < TP < 99.6% & Eng. Vacuum < 20 kPa, air/fuel = 14.7	Counter > 30 counts - 1 sec / count Continuous	Software and canister purge solenoid	DTC Type A
Vehicle Speed Sensor Malfunction	P0500	Analog	This DTC monitors the output of the VSS sensor	No sensor output during vehicle coast down	1450 < Rpm < 4400 MAP < 23 kPa Closed TP	Continuous 5.2 sec fail threshold	MAP, RPM, TP, Software	DTC Type A

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Idle Control system RPM lower than expected	P0506	Software	This DTC will determine if a low idle is the result of a IAC valve or circuit.	Actual rpm < desired rpm + or - 75 rpm	No TP, ECT, MAP, Misfire, VSS, EGR Pintle DTC's VSS=0, TP 0, Baro > 70 Kpa, 9<Voltage < 18, IAT > -25 Deg C	Continuous 17 seconds	MAP, Crankshaft sensor, TP, VSS, Software	DTC Type B
Idle Control System RPM higher than expected	P0507	Software	This DTC will determine if a high idle is the result of a IAC valve or circuit.	Actual rpm > desired rpm + or - 75 rpm	Same as above	Same as above	Same as above	DTC Type B
Serial Communication Link Malfunction	P0600	Software	This DTC will check to assure that the serial data messages are properly transmitted between the ECM and the TCM	The data stream is verified for proper checksum	None	6.25 msec/failure - 250 failures Continuous	Software	DTC Type A
Internal Control Module Memory Check Sum Error	P0601	Software	This DTC will determine when the ECM RAM is faulty	Cal'd check sum does not equal stored check sum	None	1 failure/ Ign. cycle Continuous	Software	DTC Type A
Control Module Programming Error	P0602	Software	This DTC will check to see if the PCM is programmed properly	Write patterns are not equal	None	1 failure / Ign. cycle on key up	Software	DTC Type A
Internal Control Module Keep Alive memory (KAM) Error	P0603	Software	This DTC checks that the cal'd checksum = stored check sum	Cal'd check sum does not equal stored check sum	None	2 failures/ Ign. cycle Continuous	Software	DTC Type A
Internal Control Module Random Access Memory (RAM) Error	P0604	Software	This DTC checks to see if write patterns match	Write patterns are not equal	None	1 failure / Ign. cycle on key up	Software	DTC Type A
PCM Processor Error	P0606	Software	This DTC checks for illegal interrupts	Any illegal interrupts ?	None	2 failures/ Ign. cycle Continuous	Software	DTC Type A
Transmission Control System Electrical	P0702	Digital	This DTC checks for Power to the Transmission Actuators	The GFD feedbacks don't indicate voltage present at the Transmission Actuators	No 1660 DTC & Engine Speed > 300 rpm & 9.5<Ign, Voltage<17V & A/D converter has not failed & fuel pump relay activated	2 failures/ Ign. cycle Continuous	Software	DTC Type A
Transmission Range Sensor Circuit Malfunction (PRNDL Input)	P0705	Digital	This DTC checks for illegal shift range positions	Any illegal shift positions for 500 msec	No P0708 DTC & Ign. voltage> 9.5V	2 failures/ Ign. cycle Continuous	Range Sensor Switch	DTC Type A
Transmission Range Sensor Circuit Range/Performance	P0706	Digital	This DTC checks that parity = valid parity	Any parity discrepancies for 10 sec	No P0705, P0708 DTC & Ign. Voltage > 9.5V	2 failures/ Ign. cycle Continuous	Range Sensor Switch	DTC Type A

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Transmission Range Sensor Circuit High Input	P0708	Digital	This DTC checks for a disconnected switch	All inputs from switch read high for 500 msec	Ign. voltage > 9.5V	2 failures/ign. cycle Continuous	Range Sensor Switch	DTC Type A
Turbine Speed Sensor Circuit Range/Performance	P0716	Analog	0 rpm to 7200 rpm This DTC detects an unrealistically large change in turbine speed	Delta turbine speed > (The sum of last 8 turbine speed time/pulse)/8 * 1.72 or < (the sum of last 8 turbine speed time/pulse)/8 * .52. for 731 msec	Turbine speed > 1400 RPM	2 failures/ign. cycle Continuous	AC Voltage generating speed sensor	DTC Type A
Turbine Speed Sensor Circuit No Signal	P0717	Analog	This DTC checks for Turbine speed equal to 0	Turbine speed = 0 and eng. speed > 3400 rpm for 2 secs or Output speed > 10 Km/hour for 2 seconds and turbine speed = 0	No P0722 or P0721 DTCs	2 failures/ign. cycle Continuous	AC Voltage generating speed sensor	DTC Type A
Output speed sensor circuit Range/Performance	P0721	Analog	0 rpm to 7200 rpm This DTC detects an unrealistically large change in output speed	Output speed delta > (filtered output speed time/pulse) * 1.44 or < (filtered output speed time/pulse) * .56 for 731 msec NOTE: 8 pulses are received/360 degree revolution of turbine	Output speed > 24 KPH	2 failures/ign. cycle Continuous	AC Voltage generating speed sensors (speed, turbine)	DTC Type A
Output Speed Sensor Circuit No Signal	P0722	Analog	This DTC will detect a loss of output speed	Turbine speed pull down when an upshift is commanded	No P0716, P0717 & turbine speed > 1400 rpm & (turbine speed/ engine speed) < .78 & output speed < 5 kph & TP delta < 11% for > 1.5 secs & a forward drive gear is selected	2 failures/ign. cycle Continuous	AC Voltage generating speed sensors (speed, turbine)	DTC Type A
Engine Speed Input Circuit No Signal	P0727	Analog	0 to 7200 rpm This DTC will detect a loss of an engine speed signal	ECM indicates E.S. > zero via SPI communications while zero E.S. indicated by hardware signal	no 1601 DTC (SPI Fail)	2 failures/ign. cycle Continuous	AC Voltage generating speed sensor. & software	DTC Type A
Incorrect Gear Ratio (no forward gears available)	P0730	Analog	This DTC looks for the occurrence when no gears are available from an initial start	No turbine speed pulldown during commanded upshift	No P0716, P0717, P0727 DTC's	2 failures/ign. cycle Continuous	AC Voltage generating speed sensor.	DTC Type A
Gear 1 Incorrect Ratio	P0731	Analog	This DTC looks for the commanded gear ratio	Commanded gear ratio does not equal actual gear ratio for +/- .0152% for time period based on magnitude of slip (larger the magnitude of slip, the faster the diagnostic will trigger)	Eng. torque > a k value which is a function of gear. Output speed and turbine speed are not substituted & a forward drive gear is selected	2 failures/ign. cycle Continuous	AC Voltage generating speed sensors (turbine & output speed)	DTC Type A
Gear 2 Incorrect Ratio	P0732	same as above	same as above	same as above	same as above	same as above	same as above	DTC Type A

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Gear 3 Incorrect Ratio	P0733	same as above	same as above	same as above	same as above	same as above	same as above	DTC Type A
Gear 4 Incorrect Ratio	P0734	same as above	same as above	same as above	same as above	same as above	same as above	DTC Type A
Torque Converter Clutch System Performance or Stuck Off	P0741	Analog	This DTC detects the inability to lock up the TCC	Engine - turbine does not equal 0 when the TCC is commanded on	No P0716, P0717, P0727 DTC's	2 failures/ign. cycle Continuous	AC Voltage generating speed sensors (engine, turbine)	DTC Type A
Torque Converter Clutch System Stuck On	P0742	Analog	This DTC detects when the TCC is unable to be disengaged	When TCC is commanded off, the engine speed = turbine speed	No P0716, P0717, P0727 DTC's & Eng. speed < 3200 rpm & Eng. Torque > some calibrated value from a lookup table based on turbine speed	2 failures/ign. cycle Continuous	AC Voltage generating speed sensors (output, turbine)	DTC Type A
1-2 Shift Malfunction (2nd gear stuck on)	P0781	Analog	This DTC looks for gears higher than the commanded ratio	1st gear commanded and (turbine/output speed) = 2nd, 3rd or 4th ratio +/- 4% for 3 secs	No P0716, P0717, P0727, P0705, P0706, P0708 DTC's & Engine torque > 100 Nm and output speed and turbine speed are not substituted	2 failures/ign. cycle Continuous	AC Voltage generating speed sensors (output, turbine)	DTC Type A
2-3 Shift Malfunction (3rd gear stuck on)	P0782	Analog	same as above	same as above	same as above	2 failures/ign. cycle Continuous	AC Voltage generating speed sensors (output, turbine)	DTC Type A
3-4 Shift Malfunction (4th gear stuck on)	P0783	Analog	Same as above	Same as above	Same as above	2 failures/ign. cycle Continuous	AC Voltage generating speed sensors (output, turbine)	DTC Type A
Oxygen Sensor System - Too Few O2S R/L and L/R Switches	P1133	Analog	0 V to 1.0 V This DTC determines if the O2 sensor is functioning properly by checking its switches	O2 sensor switches > 10 counts	No MAP, IAT, ECT, TP, Fuel trim, Misfire, Cam, EGR, CCP, Voltage and crank DTC's & closed loop & O2 Voltage low threshold .300 V and high threshold .600 V & flow > 7 g/sec & 1500 < RPM < 3000	100 seconds after closed loop enable, Once per ignition	Exhaust Oxygen sensor	DTC Type B

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O2 Sensor Circuit Transfer Switch Time Ratio Malfunction	P1134	Analog	0V to 1.0V This DTC will determine if the O2 sensor is functioning properly by checking its ratio	Ratio of average response time ratio < .6 or Ratio of average response time ratio > 2.8	No MAP, IAT, FCT, TP, Fuel filter, Misfire, Cam, EGR, CCP, Voltage and crank DTC's & closed loop & O2 Voltage low threshold .300 V and high threshold .600 V & flow > 7 g/sec & 1500 < RPM < 3000	100 seconds after closed loop enable, Once per Ignition	Exhaust Oxygen sensor	DTC Type B
Exhaust Gas Recirculate System Pintle Position Error	P1406	Analog	0V - 5V This DTC will detect an open/short closed valve position too high and position error too high	1. Pintle position < 7 A/D counts for 10 sec & 2. Pintle position > 10 A/D counts from learned closed valve position for 10 sec & 3. deviation between actual position and desired position > -13.7% for 10 secs	Ignition voltage > 11 volts	all three test must run before a failure is reported Continuous	Potentiometer	DTC Type A
Idle Control System Low/Closed	P1508	Stuck IAC Motor	This DTC will determine if a low idle is the result of an engine mechanical problem.	The IAC Motor Intrusive test looks for a delta combustible air grams when closing the IAC Motor. Threshold = 400	4000 < Combustible air grams < 9000, 45 < IAC < 150, Delta TP < .8%, Delta rpm < 50, Enable criteria present for 15 seconds	Continuous when low or high rpm p0506, p0507 are present	Combustible air grams delta	DTC Type B
Idle Control System High/Open	P1509	Stuck IAC Motor	This DTC will determine if a high idle is the result of an engine mechanical problem.	Same as above	Same as above	Same as above	Same as above	DTC Type B
Serial Communication Problem with Device 1 (PCM)	P1601	Software	This DTC will determine if the ECM-TCM SPI communications are functioning correctly	No Communication for 500 mseconds or 5 bad messages received in a row or 10 SPI interrupts received within 10 mseconds.	9.5V < Ignition Voltage < 17V	2 failures per ign cycle Continuous	Software	DTC Type A
PCM System Reset	P1625	Software	This DTC will determine when the TCM microprocessor has an invalid ROM checksum or receives illegal interrupts	Cal'd checksum does not equal stored checksum or illegal interrupts are received	None	2 failures per ign cycle Continuous	Software	DTC Type A
A/D Failure	P1627	Software	This DTC Checks to see if the A/D converter becomes faulty in the	Check A/D read Voltage in range .1 to 4.88 volts	None	5 Falls Continuous	Software	DTC Type A
Engine Coolant Temperature Pull-Up Resistor Failed	P1628	Analog	This DTC detects the ability to switch the value of the resistor	When A/D voltage < 3 volts	No ECT faults	5 failures per ignition, Continuous	Thermistor	DTC Type B
5 Volt Reference Low/High	P1635	Digital	This DTC verifies the 5 volt reference line	3.7 < AD Volt < 5.0 or Volt state invalid	None	Continuous	Software	DTC Type A

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SENSED PARAMETER	FAULT CODE	SENSOR SIGNAL TYPE	ACCEPTABLE OPERATING RANGE AND RATIONALITY	PRIMARY MALF. DETECTION PARAMETERS	SECONDARY MONITORING PARAMETERS AND CONDITIONS	MONITORING TIME LENGTH AND FREQUENCY OF CHECK	MONITORING METHOD	FAULT CODE STORAGE AND MIL ILLUMINATION
A/D Failure (TC Code)	P1639	Software	This DTC verifies the integrity of the analog/digital converter	the A/D converter does not complete in a specified amount of time and 5 counts < A/D conversions < 250 counts	None	2 failures/ign. cycle Continuous	Software	DTC Type A
QDM/QDM C Fault	P1660	Digital	This DTC verifies the integrity of the GFD	Inability to reset the actuator fault	9.5V < Ign. Voltage < 17V	2 failures/ign. cycle Continuous	Software	DTC Type A