2003 AF33-5 when used with 2.2L L61 engine in Saturn ION
TRANSMISSION DIAGNOSTIC MATRIX

2003trans1.doc

SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE and RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MALFUNCTION PARAMETERS and CONDITIONS	MONITORING TIME LENGTH and DTC TYPE A (MIL), B (MIL NIC), C (No MIL)
System Voltage Low	P0562		Ignition voltage < 8.68 V Ignition ON for 1000 msec Count = 20 @ 1.0 sec	Input speed > 800 RPM Ignition ON Not in Emergency mode **No faults: P0717**	1.0 sec FATKO Type A
System Voltage High	P0563		Ignition voltage > 18.0 V Ignition ON for 1000 msec Count = 20 @ 1.0 sec	Input speed > 800 RPM Ignition ON Not in Emergency mode **No faults: P0717**	1.0 sec FATKO Type A
Checksum Error	P0601	Calculated checksum differs from actual checksum in ROM	Count = 2		2 counts FATKO Type A
RAM Read/Write Error	P0604	Error in accessing Random Access Memory			2 counts FATKO Type A
Gear Selector Fault	P0705	Failure combination of A, B, C, and PA signals (see below)	Count = 5 @ 1.0 sec		Illegal state ≥ 1.0 sec FATKO Type A

Failure Modes for Selector Position Switch

A	B	C	PA
X	X	X	X
X	X	X	O
O	X	X	X
X	X	O	X
O	O	O	X
X	O	X	X

X = OFF   O = ON

2003trans1.doc

SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE and RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MALFUNCTION PARAMETERS and CONDITIONS	MONITORING TIME LENGTH and DTC TYPE A (MIL), B (MIL NIC), C (No MIL)
Transmission Temperature Stuck	P0711	Detects a Transmission Temperature which remains constant for period of time in which a measurable change is expected	Highest temperature = Oil temperature at initialization time ± 5° C.	Oil temperature at initialization < 0° C. 10 < A/D of Oil temp sensor < 1000 Range = D, I, L, R DS_Active = TRUE RANGE = Q_NORMAL Not in Emergency mode	900 sec Continuous FATKO Type A
Transmission Temperature Sensor Circuit: Low Input	P0712	Detects A/D < 10	Count = 30 @ 10.0 sec	Not in Emergency mode DS_Active = TRUE	10.0 sec. Continuous FATKO Type A
Transmission Temperature Sensor Circuit: High Input	P0713	Detects A/D > 1000	Count = 12 @ 1.0 sec	No Engine Coolant codes DS_Active = TRUE Drive time > 900 sec Engine coolant temperature > 50° C. Not in Emergency mode	1000 msec Continuous FATKO Type A

Input Speed Sensor Circuit: No Signal	P0717	Detects no Input Speed sensor pulses while detecting pulses from Output Speed sensor	**FAIL CASE 1**
			Detect no pulse from Input Speed sensor while detecting 6 pulses from Output Speed sensor
			
			Count = 500
			
			FAIL CASE 2
			Digital signal < 45 or > 545 counts from Input Speed Sensor
			
			Count = 300
				FAIL CASE 1
				Range = D, I, or L
				Output speed * expected gear ratio > 600 RPM
				IF
				  Vehicle speed > 66 km/hr
				OR
				  Trans Oil Temp > 20° C.
				THEN
				  Range from P, R, N to Drive: > 2.5 sec.
				ELSE
				  Range from P, R, N to Drive: > 8.0 sec.
				END IF
				Not shifting
				DS_Active = TRUE
				Not in Emergency mode
				Gear $\geq$ 2nd
				Not in B1 release control
				No faults: P0705, P0711, P0712, P0713, P0722
				
				FAIL CASE 2
				DS_Active = TRUE
				Not in Emergency mode
					FAIL CASE 1
					N/A
					
					FAIL CASE 2
					100 msec continuously
					
					FATKO
					Type A

Output Speed Sensor: Low Voltage	P0722	Detects no vehicle speed when Input Speed signal is present	**FAIL CASE 1**
			Detect no pulse from output speed sensor while detecting 12 pulses from input speed sensor
			
			Count = 500
			
			FAIL CASE 2
			Digital signal < 45 or > 545 counts from Output Speed Sensor
			
			Count = 300 @ 100 msec
				FAIL CASE 1
				Range = D, I, or L
				IF
				  Vehicle speed > 66 km/hr
				OR
				  Trans Oil Temp > 20° C.
				THEN
				  Range from P, R, N to Drive: > 2.5 sec.
				ELSE
				  Range from P, R, N to Drive: > 8.0 sec.
				END IF
				Not in Neutral control, not shifting
				DS_Active = TRUE
				Not in Emergency mode
				
				No faults: P0705, P0711, P0712, P0713, P0722
				
				FAIL CASE 2
				DS_Active = TRUE
				Not in Emergency mode
					FAIL CASE 1
					15 sec. at 2000 RPM input speed
					 5 sec. at 6000 RPM input speed
					
					FAIL CASE 2
					
					100 msec continuously
					
					FATKO
					Type A

2003trans1.doc

SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE and RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MALFUNCTION PARAMETERS and CONDITIONS	MONITORING TIME LENGTH and DTC TYPE A (MIL), B (MIL NIC), C (No MIL)
Engine Speed Circuit Malfunction	P0727	Engine speed information failure on CAN bus	TCM receives Engine Speed Validity = FALSE Count = 1	3.0 sec. after Ignition On **OR** Reset of counter DS_ACTIVE_CAN = TRUE Not in Emergency mode **No faults:** U2105	4.0 sec. continuously FATKO Type A
Gear 1 Manual Low fault (S5 Off, SLU Off)	P0730	Compares Expected Ratio to Actual Ratio	Current Gear = 1st engine braking Absolute value(1-Current Ratio/Expected Ratio) > 20% Count = 12 @ 1.0 sec.	$500 \leq$ Output RPM ≤ 1260 Throttle = 0.0% 8.0 sec. after changing to D, I, L 0.5 sec. after shifting control Oil temperature $\geq 20.0°$ C. Shift position = L Engine speed > 400 RPM Ignition voltage ≥ 10.5 V Not shifting, not in ND control DS_Active = TRUE **No faults:** P0705, P0711, P0712, P0713, P0717, P0722, P0727, P0741, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P0985, P0986, P1781, P1791	1.0 sec. continuously FATKO Type A
Gear 1 ratio fault	P0731	Compares (Input speed/Output speed) to Commanded ratio	Current Gear = 1st Gear ratio =2.22 $\pm$ 4% Count =5 @ 1.0 sec	$500 \leq$ Output RPM ≤ 1260 Throttle ≥ 40.0% Engine acceleration > 0 for 1.0 sec. 8.0 sec. after changing to D, I, L 0.5 sec. after shifting control Oil temperature $\geq 20.0°$ C. Shift position = D, I, L Engine speed ≥ 400 RPM Ignition voltage ≥ 10.5 V Not shifting, not garage shifting Brake off, spinning = FALSE DS_Active = TRUE **No faults:** See P0730 + U2104, U2105	1.0 sec. continuously FATKO Type A
Gear 2 ratio fault	P0732	Compares (Input speed/Output speed) to Commanded ratio	Current gear = 2nd Absolute value(1-Current Gear/Expected Gear) > 20% Count = 12 @ 1.0 sec	Output RPM ≥ 500 Throttle ≥ 10% 0.5 sec. after B1 clutch apply control finished 8.0 sec. after changing to D, I, L 0.5 sec. after shifting control Oil temperature $\geq 20.0°$ C. Shift position = D, I, L Engine speed ≥ 400 RPM Ignition voltage ≥ 10.5 V Not shifting, not garage shifting Brake off, spinning = False DS_Active = TRUE **No faults:** See P0730 + U2104, U2105	1.0 sec. continuously FATKO Type A
Gear 3 ratio fault	P0733	Compares (Input speed/Output speed) to Commanded ratio	Current gear = 3rd Absolute value(1-Current Gear/Expected Gear) > 20% for 1.0 sec. continuously Count = 12 @ 1.0 sec	Output RPM ≥ 500 Throttle ≥ 10% 8.0 sec. after changing to D, I, L 0.5 sec. after shifting control Oil temperature $\geq 20.0°$ C. Shift position = D, I, L Engine speed ≥ 400 RPM Ignition voltage ≥ 10.5 V Not shifting, not garage shifting Brake off, spinning = False DS_Active = TRUE **No faults:** See P0730 + U2104, U2105	1.0 sec. continuously FATKO Type A

2003trans1.doc

SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE and RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MALFUNCTION PARAMETERS and CONDITIONS	MONITORING TIME LENGTH and DTC TYPE A (MIL), B (MIL NIC), C (No MIL)
Gear 4 ratio fault	P0734	Compares (Input speed/Output speed) to Commanded ratio	Current gear = 4th Absolute value(1-Current Gear/Expected Gear) > 20% x4thFail_SLT = ON Current Gear ≠ 3rd gear ratio ± 4% Count = 12 @ 1.0 sec	Output RPM ≥ 500 Throttle ≥ 10% 8.0 sec. after changing to D, I, L 0.5 sec. after shifting control Oil temperature ≥ 20.0° C. Shift position = D, I, L Engine speed ≥ 400 RPM Ignition voltage ≥ 10.5 V Not shifting, not garage shifting Brake off, spinning = False DS_Active = TRUE **No faults:** See P0730 + U2104, U2105	1.0 sec. continuously FATKO Type A
Gear 5 ratio fault	P0735	Compares (Input speed/Output speed) to Commanded ratio	Current gear = 5th Absolute value(1-Current Gear/Expected Gear) > 20% Count = 12 @ 1.0 sec	Output RPM ≥ 500 Throttle ≥ 10% 8.0 sec. after changing to D, I, L 0.5 sec. after shifting control Oil temperature ≥ 20.0° C. Shift position = D, I, L Engine speed ≥ 400 RPM Ignition voltage ≥ 10.5 V Not shifting, not garage shifting Brake off, spinning = False DS_Active = TRUE **No faults:** See P0730 + U2104, U2105	1.0 sec. continuously FATKO Type A
Reverse Gear ratio fault	P0736	Compares (Input speed/Output speed) to Commanded ratio	Current gear = Reverse Absolute value(1-Current Gear/Expected Gear) > 20% Count = 12 @ 0.5 sec	Output RPM ≥ 500 8.0 sec. after changing to R 0.5 sec. after shifting control Oil temperature ≥ 20.0° C. Shift position = R Engine speed ≥ 400 RPM Ignition voltage ≥ 10.5 V Not in NR control Brake off DS_Active = TRUE Not in Emergency mode **No faults:** See P0730 + P0562, P0563, P0601, U2104, U2105	0.5 sec. continuously FATKO Type A
Torque Converter Clutch System Performance: Slipping	P0741	Detects high Torque Converter slip when TCC commanded on (Lock-Up Slipping)	Engine RPM – Input speed > 100 RPM Count = 6 @ 2.0 sec	Throttle ≥ 20% 0.5 sec. after shifting control Engine speed ≤ 4000 RPM Shift position = D, I, L Not shifting Ignition voltage ≥ 10.5 V SLU (TCC PCS) target current ≥ 1000 mA Lock-up ON DS_Active = TRUE Not in Emergency mode **No faults:** See P0730 + U2104, U2105	≥ 2.0 sec. continuously FATKO Type A
Shift Solenoid C Stuck On	P0762	Hydraulic failure	Current gear = 5th Current gear ratio = 1.451 ± 4% Absolute value(1-Current Gear/Expected Gear) > 20% Current gear = 4th for 1.0 sec continuously Increase SLT pressure **IF** Current Ratio = 3rd ratio ± 4% Count = 12 @1.0 sec	Output RPM ≥ 500 Throttle ≥ 10% 8.0 sec. after changing to D, I , or L 0.5 sec. after shifting control Oil temperature ≥ 20.0° C. Shift position = D, I , or L Engine speed ≥ 400 RPM Ignition voltage ≥ 10.5 V Not shifting, not garage shifting Brake off, spinning = FALSE DS_Active = TRUE Not in Emergency mode **No faults:** P0562, P0563, P0601, P0705, P0711, P0712, P0713, P0717, P0722, P0727, P0741, P0744, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0979, P0980, P0982, P0983, P0985, P0986, P1719, P1781, P1791, U2104, U2105 checksum	1.0 sec. continuously FATKO Type A

2003trans1.doc

SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE and RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MALFUNCTION PARAMETERS and CONDITIONS	MONITORING TIME LENGTH and DTC TYPE A (MIL), B (MIL NIC), C (No MIL)
Line Pressure PCS (SLT) Short to Ground, Open	P0962	Detects very low current through solenoid	Detects Input A/D < 68 (92 mA) Count = 25 @ 0.5 sec	Not in Emergency mode DS_Active = TRUE	≥ 500 msec. Continuous FATKO Type A
Line Pressure PCS (SLT) B+ Short	P0963	Detects very high current through solenoid	Detects Input A/D > 1000 (1356 mA) Count = 4 @ 0.5 sec	Not in Emergency mode DS_Active = TRUE	≥ 500 msec. Continuous FATKO Type A
Torque Converter Clutch (TCC) PCS (SLU) Short to Ground, Open	P0966	Detects very low current through solenoid	Detects Input A/D < 68 (92 mA) Count = 25 @ 0.5 sec	Not in Emergency mode DS_Active = TRUE	≥ 500 msec. Continuous FATKO Type A
Torque Converter Clutch (TCC) PCS (SLU) B+ Short	P0967	Detects very high current through solenoid	Detects Input A/D > 1000 (1356 mA) Count = 4 @ 0.5 sec	Not in Emergency mode DS_Active = TRUE	≥ 500 msec. Continuous FATKO Type A
Shift Pressure PCS (SLS) Short to Ground, Open	P0970	Detects very low current through solenoid	Detects Input A/D < 68 (92 mA) Count = 25 @ 0.5 sec	Not in Emergency mode DS_Active = TRUE	≥ 500 msec. Continuous FATKO Type A
Shift Pressure PCS (SLS) B+ Short	P0971	Detects very high current through solenoid	Detects Input A/D > 1000 (1356 mA) Count = 4 @ 0.5 sec.	Not in Emergency mode DS_Active = TRUE	≥ 500 msec. Continuous FATKO Type A
Shift Solenoid A Short to Ground	P0973	Detects Short to Ground	Detects OFF signal of S1 monitor, when S1 driver outputs ON signal Count =1	Not in Emergency mode DS_Active = TRUE 25 msec. after solenoid S1 output changes	≥ 500 msec. Continuous FATKO Type A
Shift Solenoid A B+ Short, Open	P0974	Detects Short to Power or Open	Detects ON signal of S1 monitor, when S1 driver outputs OFF signal Count =1	Not in Emergency mode DS_Active = TRUE 25 msec. after solenoid S1 output changes	≥ 500 msec. Continuous FATKO Type A
Shift Solenoid B Short to Ground	P0976	Detects Short to Ground	Detects OFF signal of S2 monitor, when S2 driver outputs ON signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec. after solenoid S2 output changes	≥ 500 msec. Continuous FATKO Type A
Shift Solenoid B B+ Short, Open	P0977	Detects Short to Power or Open	Detects ON signal of S2 monitor, when S2 driver outputs OFF signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec. after solenoid S2 output changes	≥ 500 msec. Continuous FATKO Type A

2003trans1.doc

SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE and RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MALFUNCTION PARAMETERS and CONDITIONS	MONITORING TIME LENGTH and DTC TYPE A (MIL), B (MIL NIC), C (No MIL)
Shift Solenoid C Short to Ground	P0979	Detects Short to Ground	Detects OFF signal of S3 monitor, when S3 driver outputs ON signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec. after solenoid S3 output changes	≥ 500 msec. Continuous FATKO Type A
Shift Solenoid C B+ Short, Open	P0980	Detects Short to Power or Open	Detects ON signal of S3 monitor, when S3 driver outputs OFF signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec. after solenoid S3 output changes	≥ 500 msec. Continuous FATKO Type A
Shift Solenoid D Short to Ground	P0982	Detects short to ground	Detects OFF signal of S4 monitor, when S4 driver outputs ON signal Count = 1	not in Emergency mode DS_Active = TRUE 25 msec. after solenoid output changes	≥ 500 msec. Continuous FATKO Type A
Shift Solenoid D B+ Short, Open	P0983	Detects Short to Power or Open	Detects ON signal of S4 monitor, when S4 driver outputs OFF signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec. after solenoid S4 output changes	≥ 500 msec. Continuous FATKO Type A
Shift Solenoid E Short to Ground	P0985	Detects Short to Ground	Detects OFF signal of S5 monitor, when S5 driver outputs ON signal	Not in Emergency mode DS_Active = TRUE 25 msec. after solenoid S5 output changes Count = 1	≥ 500 msec. Continuous FATKO Type A
Shift Solenoid E B+ Short, Open	P0986	Detects Short to Power or Open	Detects ON signal of S5 monitor, when S5 driver outputs OFF signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec. after solenoid S5 output changes	≥ 500 msec. Continuous FATKO Type A

Incorrect Shifting	P1719	Detects tie-up, engine flare, long shift time, or rapid shifting	Shift position = D, I, L
			Oil temperature ≥ 60° C.
			No multiplex shifting
			Condition A (tie-up)
			   OR
			Condition B (engine flare)
			   OR
			Condition C (long shift time)
			   OR
			Condition D (rapid shifting)
				No multiplex shifting
				DS_Active = TRUE
				Not in Emergency mode
				
				No faults: P0711, P0712, P0713, P0722, P0727, P1781
					Count = 5
					
					FATKO
					Type A

Driver- Requested Torque CAN Signal Error	P1779	Driver-requested torque signal failure on CAN bus	TCM receives Driver-Requested Torque validity = FALSE Count = 1 @ 4.0 sec	3.0 sec. after Ignition On **OR** Controller reset DS_ACTIVE_CAN = TRUE Not in Emergency mode **No faults:** U2105	4.0 sec. continuously FATKO Type A
CAN Torque Reduction Signal Error	P1780	CAN torque reduction information failure on CAN bus	TCM receives Engine Torque Reduction validity = FALSE Count = 5 @ 4.0 sec	3.0 sec. after Ignition On **OR** Controller reset DS_ACTIVE_CAN = TRUE Not in Emergency mode **No faults:** U2105	4.0 sec. continuously FATKO Type A
Engine Torque Circuit Malfunction	P1781	Engine torque information failure on CAN bus	TCM receives Engine Torque validity = FALSE Count = 1	3.0 sec. after Ignition On **OR** Controller reset DS_ACTIVE_CAN = TRUE Not in Emergency mode **No faults:** U2105	4.0 sec. continuously FATKO Type A

2003trans1.doc

SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE and RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MALFUNCTION PARAMETERS and CONDITIONS	MONITORING TIME LENGTH and DTC TYPE A (MIL), B (MIL NIC), C (No MIL)
Pedal Position Circuit Malfunction	P1791	Pedal Position information failure on CAN bus	TCM receives Pedal Position validity = FALSE Count =1	3.0 sec. after Ignition On **OR** Controller reset DS_ACTIVE_CAN = TRUE Not in Emergency mode **No faults** U2105	4.0 sec. continuously FATKO Type A
Engine Coolant Temperature CAN Signal Error	P1792	Engine coolant temperature signal failure on CAN bus	TCM receives Engine Coolant Temperature validity = FALSE Count = 1	3.0 sec. after Ignition On **OR** Controller reset DS_ACTIVE_CAN = TRUE Not in Emergency mode **No faults:** U2105	4.0 sec. continuously FATKO Type A
CAN Bus Off Counter Overrun Error	U2104	CAN Bus Off Counter Overrun error	TCM receives "BUS OFF" state from CAN controller a number of times Count = 1	3.0 sec after Ignition On **OR** Controller reset DS_Active_CAN = TRUE	Count = 1 FATKO Type A
CAN Error: Lost Communication to ECM	U2105	Lost communication with ECM	TCM cannot detect frame of GENERAL STATUS ECM Count = 1	3.0 sec after Ignition On **OR** Controller reset DS_Active_CAN = TRUE Not in Emergency Mode	4.0 sec. continuously FATKO Type A
CAN Error: Lost Communication to BCM	U2107	Lost communication with BCM	TCM cannot detect frame of GENERAL STATUS BCM Count = 1	3.0 sec after Ignition On **OR** Controller reset DS_Active_CAN = TRUE Not in Emergency Mode	4.0 sec. continuously FATKO Type A
CAN Error: Lost Communication to ABS/TC Control Module	U2108	Lost communication with ABS	TCM cannot detect frame of GENERAL STATUS ABS Count = 1	3.0 sec after Ignition On **OR** Controller reset DS_Active_CAN = TRUE Not in Emergency Mode	4.0 sec. continuously FATKO Type A