

2004 AF23-5 transmission used in Saturn ION with 2.2L L61 engine
TRANSMISSION DIAGNOSTIC PARAMETERS

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SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE and RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MALFUNCTION PARAMETERS and CONDITIONS	MONITORING TIME 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
TCM Random Access Memory	P0604	Random Access Memory read/write failure	Write FF to RAM, then Read RAM Write 00 to RAM, then Read RAM		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
Transmission Temperature Stuck	P0711	Transmission Temperature 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 < 20° 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	Very low digital count	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	Very high digital count	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

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Input Speed Sensor: No Pulse	P0717	No Input Speed sensor pulses when there are pulses from Output Speed sensor	<p>FAIL CASE 1 No pulse from Input Speed sensor while there are 6 pulses from Output Speed sensor Count = 500</p> <p>FAIL CASE 2 Digital signal < 45 or > 545 counts from Input Speed Sensor Count = 300 @ 0.10 sec</p>	<p>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.) AND Range from P, R, N to Drive: > 2.5 sec. ELSE IF 0° C. < Trans Oil Temp < 20° C. AND Range from P, R, N to Drive: > 10.0 sec. ELSE IF Trans Oil Temp < 0° C. AND Range from P, R, N to Drive: > 180.0 sec. END IF Not shifting, not in ND control DS_Active = TRUE Not in Emergency mode Gear ≥ 2nd Not in B1 release control No faults: P0705, P0711, P0712, P0713, P0722</p> <p>FAIL CASE 2 DS_Active = TRUE Not in Emergency mode</p>	<p>FAIL CASE 1 N/A</p> <p>FAIL CASE 2 100 msec continuously</p> <p>FATKO Type A</p>
Output Speed Sensor: No Pulse	P0722	No vehicle speed when Input Speed signal is present	<p>FAIL CASE 1 Detect no pulse from output speed sensor while detecting 12 pulses from input speed sensor Count = 500</p> <p>FAIL CASE 2 Digital signal < 45 or > 545 counts from Output Speed Sensor Count = 300 @ 0.10 sec</p>	<p>FAIL CASE 1 Range = D, I, or L IF (Vehicle speed > 66 km/hr OR Trans Oil Temp > 20° C.) AND Range from P, R, N to Drive: > 2.5 sec. ELSE IF 0° C. < Trans Oil Temp < 20° C. AND Range from P, R, N to Drive: > 10.0 sec. ELSE IF Trans Oil Temp < 0° C. AND Range from P, R, N to Drive: > 180.0 sec. END IF Calculated Output Speed > 300 RPM Not in Neutral control, not shifting Not in ND control DS_Active = TRUE Not in Emergency mode</p> <p>No faults: P0705, P0711, P0712, P0713, P0717</p> <p>FAIL CASE 2 DS_Active = TRUE Not in Emergency mode</p>	<p>FAIL CASE 1 15 sec. at 2000 RPM input speed 5 sec. at 6000 RPM input speed</p> <p>FAIL CASE 2 100 msec continuously</p> <p>FATKO Type A</p>
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

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Gear 1 Manual Low fault (S5 Off, SLU Off)	P0730	Compares Expected Ratio to Actual Ratio	Current Gear = 1 st engine braking Absolute value(1-Current Ratio/Expected Ratio) > 20% Count = 12 @ 1.0 sec.	500 ≤ Output RPM ≤ 1260 Throttle = 0.0%, Brake off 8.0 sec. after changing to L 0.5 sec. after shifting control Oil temperature ≥ 20.0° C. (Shift position = L [defined] OR Speed > 5 kmh for > 75 sec in Range = L [undefined]) 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 and Output Speed	(Input Speed – 4.602 x Output Speed) > 300 RPM AND (Input Speed – 2.220 x Output Speed) < 100 RPM OR Start of 1-2 Shift Count = 10 @ 1.0 sec NOTE: Counter is incremented by FAIL condition, decremented by PASS condition	Current Gear = 1 st Output RPM ≥ Table value Input RPM ≥ Table value Engine Speed ≥ (Input Speed + 150 RPM) for 500 msec continuously Engine Speed ≥ 400 30 ≤ Engine Torque ≤ 200 N-m 8.0 sec. after changing to D, I, L (Shift position = D, I, L [defined] OR Speed > 5 kmh for > 75 sec in Range = D, L [undefined]) 0.5 sec. after shifting control Oil temperature ≥ 20.0° C. Shift position = D, I, L Ignition voltage ≥ 10.5 V Not: Neutral control, garage shifting DS_Active = TRUE No faults: See P0730 + U2104, U2105 – P0741	1.0 sec. continuously FATKO Type A

P0731 Table of Input and Output Speeds

Torque	-50	0	35	90	140	190	230	270	300	330	450
Input RPM	400	400	400	400	400	400	600	800	800	800	800
Output RPM	200	200	200	200	200	200	300	400	400	400	400

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 ≥ 20.0° C. (Shift position = D, I, L [defined] OR Speed > 5 kmh for > 75 sec in Range = D, L [undefined]) Engine speed ≥ 400 RPM Ignition voltage ≥ 10.5 V Not shifting, not garage shifting Brake off, spinning = False DS_Active = TRUE No faults: See P0731	1.0 sec. continuously FATKO Type A
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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	Same as P0732	1.0 sec. continuously FATKO Type A
Gear 4 ratio fault	P0734	Compares (Input speed/Output speed) to Commanded ratio	Current gear = 4th Absolute value(1-Current Gear/Expected Gear) > 20% Current Gear ≠ 3 rd gear ratio ± 4% Count = 12 @ 1.0 sec	Same as P0732	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	Same as P0732	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 [defined] OR Speed > 5 kmh for > 75 sec in Range = R)[undefined]) 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 + P0741	0.5 sec. continuously FATKO Type A
Torque Converter Clutch System Performance: Slipping (SLU Off)	P0741	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 [defined] OR Speed > 5 kmh for > 75 sec in Range = D, L [undefined]) 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 – P0741	≥ 2.0 sec. continuously FATKO Type A

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Torque Converter Clutch System Performance: SLU Stuck On	P0742	Low Torque Converter slip when TCC commanded off	Engine RPM – Input speed < 50 RPM AND Gear = 3L-OFF OR 4L-OFF OR 5L-OFF Count = 12 @ 1.0 sec NOTE: Counter is incremented by FAIL condition, reset to 0 by PASS condition	8.0 sec after shift to position = D, I, L Input Speed < 3000 RPM (Shift position = D, I, L [defined] OR Speed > 5 kmh for > 75 sec in Range = D, L [undefined]) 3.0 min after Ignition On or Controller reset 0.5 sec. after shifting control Transmission Oil Temperature ≥ 20° C. <u>Minimum</u> * ≤ Engine Torque ≤ 240 N-m Engine Speed ≥ 400 RPM Not shifting, not garage shifting Ignition voltage ≥ 10.5 V DS_Active = TRUE Not in Emergency mode No faults: See P0730 + U2104, U2105 *Minimum = 34 N-m @ 1000 RPM Input Spd, 40 @ 1500, 48 @ 2000, 64 @ 2500, 82 N-m @ 3000	≥ 1.0 sec. continuously FATKO Type A
Gear Ratio: C Stuck On	P0762	Shift Solenoid C stuck ON	Current gear = 5 th Current gear ratio = 1.451 ± 4% (Absolute value(1-Current Gear/Expected Gear) > 20% OR Current gear = 4 th) For 1.0 sec continuously Increase SLT pressure IF Current Ratio = 3 rd ratio ± 4% Count = 12 @1.0 sec	Same as P0732	1.0 sec. continuously FATKO Type A
Line Pressure PCS (SLT) Short to Ground, Open	P0962	Very low current through solenoid	Input A/D < 68 (92 mA) Count = 25 @ 0.5 sec	Not in Emergency mode DS_Active = TRUE	0.5 sec Continuous FATKO Type A
Line Pressure PCS (SLT) B+ Short	P0963	Very high current through solenoid	Input A/D > 1000 (1356 mA) Count = 4 @ 0.5 sec	Not in Emergency mode DS_Active = TRUE	0.5 sec Continuous FATKO Type A
Torque Converter Clutch (TCC) PCS (SLU) Short to Ground, Open	P0966	Very low current through solenoid	Input A/D < 68 (92 mA) Count = 25 @ 0.5 sec	Not in Emergency mode DS_Active = TRUE	0.5 sec Continuous FATKO Type A
Torque Converter Clutch (TCC) PCS (SLU) B+ Short	P0967	Very high current through solenoid	Input A/D > 1000 (1356 mA) Count = 4 @ 0.5 sec	Not in Emergency mode DS_Active = TRUE	0.5 sec Continuous FATKO Type A
Shift Pressure PCS (SLS) Short to Ground, Open	P0970	Very low current through solenoid	Input A/D < 68 (92 mA) Count = 25 @ 0.5 sec	Not in Emergency mode DS_Active = TRUE	0.5 sec Continuous FATKO Type A

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Shift Pressure PCS (SLS) B+ Short	P0971	Very high current through solenoid	Input A/D > 1000 (1356 mA) Count = 4 @ 0.5 sec.	Not in Emergency mode DS_Active = TRUE	0.5 sec Continuous FATKO Type A
Shift Solenoid A Short to Ground	P0973	Short to Ground	S1 monitor = OFF when S1 driver outputs ON signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec after solenoid S1 output changes	0.5 sec Continuous FATKO Type A
Shift Solenoid A B+ Short, Open	P0974	Short to Power or Open	S1 monitor = ON when S1 driver outputs OFF signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec after solenoid S1 output changes	0.5 sec Continuous FATKO Type A
Shift Solenoid B Short to Ground	P0976	Short to Ground	S2 monitor = OFF when S2 driver outputs ON signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec after solenoid S2 output changes	0.5 sec Continuous FATKO Type A
Shift Solenoid B B+ Short, Open	P0977	Short to Power or Open	S2 monitor = ON when S2 driver outputs OFF signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec after solenoid S2 output changes	0.5 sec Continuous FATKO Type A
Shift Solenoid C Short to Ground	P0979	Short to Ground	S3 monitor = OFF when S3 driver outputs ON signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec after solenoid S3 output changes	0.5 sec Continuous FATKO Type A
Shift Solenoid C B+ Short, Open	P0980	Short to Power or Open	S3 monitor = ON when S3 driver outputs OFF signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec after solenoid S3 output changes	0.5 sec Continuous FATKO Type A
Shift Solenoid D Short to Ground	P0982	Short to ground	S4 monitor = OFF when S4 driver outputs ON signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec after solenoid output changes	0.5 sec Continuous FATKO Type A
Shift Solenoid D B+ Short, Open	P0983	Short to Power or Open	S4 monitor = ON when S4 driver outputs OFF signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec after solenoid S4 output changes	0.5 sec Continuous FATKO Type A
Shift Solenoid E Short to Ground	P0985	Short to Ground	S5 monitor = OFF when S5 driver outputs ON signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec after solenoid S5 output changes	0.5 sec Continuous FATKO Type A
Shift Solenoid E B+ Short, Open	P0986	Short to Power or Open	S5 monitor = ON when S5 driver outputs OFF signal Count = 1	Not in Emergency mode DS_Active = TRUE 25 msec after solenoid S5 output changes	0.5 sec Continuous FATKO Type A

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Unusual Shifting	P1719	Linear Solenoid mechanical malfunctions	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)	DS_Active = TRUE Not in Emergency mode No faults: P0711, P0712, P0713, P0722, P0727, P1781	Count = 5 FATKO Type A
Actual Engine Torque	P1781	Engine Torque circuit malfunction	TCM receives Engine Torque validity = FALSE Count = 20	3.0 sec. after Ignition On OR Controller reset DS_ACTIVE_CAN = TRUE Not in Emergency mode No faults: U2105	0.2 sec continuously FATKO Type A
Pedal Position	P1791	Pedal Position circuit malfunction	TCM receives Pedal Position validity = FALSE Count =20	3.0 sec. after Ignition On OR Controller reset DS_ACTIVE_CAN = TRUE Not in Emergency mode No faults: U2105	0.2 sec continuously FATKO Type A
CAN Error: CAN Bus Off Counter Overrun	U2104	CAN Bus Off Counter Overrun	TCM receives "BUS OFF" state from CAN controller a number of times Count = 7	3.0 sec after Ignition On OR Controller reset DS_Active_CAN = TRUE	Count = 1 FATKO Type A
CAN Error: ECM	U2105	CAN Engine Control Module error	TCM cannot detect frame of GENERAL STATUS ECM Count = 20	3.0 sec after Ignition On OR Controller reset DS_Active_CAN = TRUE Not in Emergency Mode	0.2 sec continuously FATKO Type A