

GX-Force FTA (Fault Tree Analysis)

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|------|------------------------------|
| No. | Fault mode TOP |
| 1 | Does not start |
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| 4 | Clock loses time |
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| 16-2 | Abnormal flow rate |

1	Does not start		
	Can not supply battery voltage	Battery voltage error	Unused for a long time
			Battery life
			Leakage
			No batteries inserted
		Battery connection error	Connector terminal disconnected
			Cable disconnected
	Battery circuit error	Battery circuit component error	Solder defect・C/W/M
			Component defect/part mismatch
	Startup circuit error	Startup circuit component error	Solder defect・C/W/M
			Component defect/part mismatch
	SW circuit error	SW circuit component error	Solder defect・C/W/M
			Component defect/part mismatch
		Switch defect	SW contact defect
			SW life span
			Broken boss on switch
	First stage power circuit error	First stage power supply circuit component error	Solder defect・C/W/M
			Component defect/part mismatch
	Main power supply circuit error	Main power supply circuit component error	Solder defect・C/W/M
			Component defect/part mismatch
		Continually outputs reset	Component defect/part mismatch
			Pulse does not come from CPU
		Does not output reset	
		Write connector terminal to terminal S	Solder defect・C/W/M
	Oscillator circuit error	Oscillator circuit part error	Solder defect・C/W/M
			Component defect/part mismatch
		Mismatch defect	
	Microcomputer circuit error	Reset input not done	
		Power on Does not latch	Timer error
		Do not issue WDT pulse	Timer error
		Microcomputer circuit component error	Solder defect・C/W/M
			Component defect/part mismatch

2	Does not operate		
	Switch (SW) circuit error	SW circuit component error	Solder defect - C/W/M
			Component defect/part mismatch
		Switch defect	SW contact failure
			SW life span
			Broken boss on SW
	Oscillator circuit error	Oscillator circuit part error	Solder defect C/W/M
			Component defect/part mismatch
		Mismatch defect	
	Microcomputer circuit error	Infinite loop	Timer error
			RAM error
		CPU maxed out	Excessive noise
		Microcomputer circuit component error	Solder defect C/W/M
			Component defect/part mismatch

3 Continuous use time is short

Battery error	Battery voltage error	Battery life
		Memory effect
Battery circuit error	Increase battery circuit component resistance	Connector terminal loose
		Connector terminal disengaged
		Cable loose
Charger error		
Battery voltage measurement circuit error Battery voltage misread	Reference power supply IC output voltage error	Oscillation
		Shunt current shortage
		Solder defect - C/W/M
		Component defect/part mismatch
	Microcomputer error	A/D error
		AVref error
	Microcomputer circuit component error	Solder defect - C/W/M
		Component defect/part mismatch
Power circuit error	Power supply circuit component error	Solder defect - C/W/M
		Component defect/part mismatch
Flammable power circuit error	Flammable sensor Always ON	Microcomputer circuit error
		Solder defect - C/W/M
		Component defect/part mismatch
	Flammable power circuit component error	Solder defect - C/W/M
		Component defect/part mismatch
		Excessive noise
Oscillator circuit error	Oscillator circuit part error	Solder defect - C/W/M
		Component defect/part mismatch
	Mismatch defect	
Flammable sensor Amplifier circuit error	Flammable power circuit component error	Solder defect - C/W/M
		Component defect/part mismatch
		Excessive noise

4	Clock loses time	
	Backup power circuit error	Backup power supply circuit component error
		Solder defect - C/W/M
		Component defect/part mismatch
		Reverse installation polarity
	RTC circuit error	RTC circuit component error
		Solder defect - C/W/M
		Component defect/part mismatch
		IIC bus unanswered
		RTC defect
		External IO defect
	Microcomputer circuit error	Microcomputer circuit component error
		Solder defect - C/W/M
		Component defect/part mismatch

5	Sudden power loss			
		Main power supply circuit error	Outputs reset	Solder defect・C/W/M
				Component defect/part mismatch
		Oscillator circuit error	Oscillation error	Solder defect・C/W/M
				Component defect/part mismatch
			Mismatch defect	
		Microcomputer circuit error	Microcomputer circuit component error	Solder defect・C/W/M
				Component defect/part mismatch
			Do not issue WDT pulse	WDT SFR error
			Microcomputer out of control	
	Excessive noise			

6	Program write disabled			
	Connector error	Connector short		Solder defect · W/M
	Microcomputer circuit error	Microcomputer circuit component error		Solder defect · C/W/M
				Component defect/part mismatch

7-1	Buzzer does not sound	Piezoelectric element ASSY error		
		Buzzer power circuit error	Buzzer power circuit component error	Solder defect・C/W/M
				Component defect/part mismatch
			No power supplied	Power circuit error
		Buzzer sound circuit error	Buzzer sounding circuit parts error	Solder defect・C/W/M
				Component defect/part mismatch
		Microcomputer circuit error	Microcomputer circuit component error	Solder defect・C/W/M
				Component defect/part mismatch
			Does not output buzzer signal	RAM・FRAM error
7-2	Buzzer sound pressure is low	Piezoelectric element ASSY error		
		Buzzer power circuit error	Buzzer power circuit component error	Solder defect・C/W/M
				Component defect/part mismatch
			No power supply	Power circuit error
		Buzzer sound circuit error	Buzzer sounding circuit parts error	Solder defect・C/W/M
				Component defect/part mismatch
		Microcomputer circuit error	Microcomputer circuit component error	Solder defect・C/W/M
				Component defect/part mismatch
			Does not output buzzer signal	RAM・FRAM error
		Buzzer hole clogged	Water intrusion	
			Foreign body intrusion	
7-3	Buzzer sound is abnormal	Piezoelectric element ASSY error		
		Buzzer power circuit error	Buzzer power circuit component error	Solder defect・C/W/M
				Component defect/part mismatch
			No power supply	Power circuit error
		Buzzer sound circuit error	Buzzer sounding circuit parts error	Solder defect・C/W/M
				Component defect/part mismatch
		Microcomputer circuit error	Buzzer power circuit component error	Solder defect・C/W/M
				Component defect/part mismatch
			Do not output buzzer signal	RAM・FRAM error

8-1	LCD display does not appear		
	Does not turn on		
	LCD error	LCD fault	Vibration shock
			LCD driver error
			Excessive noise
			Cushion defect
	LCD not connected	LCD connector disengaged	
		LCD cable broken wire	
	LCD display circuit error	LCD display circuit component error	Solder defect · C/W/M
			Component defect/part mismatch
	Microcomputer circuit error	Microcomputer circuit component error	Solder defect · C/W/M
			Component defect/part mismatch
		No display data	RAM error
		Display processing not executed	Infinite loop
			Timer error
		Driver control error	RAM error
			Timer error
8-2	LCD error indication		
	LCD error	LCD fault	Vibration shock
			LCD driver error
			Excessive noise
			Cushion defect
	LCD display circuit error	LCD display circuit component error	Solder defect · C/W/M
			Component defect/part mismatch
	Microcomputer circuit error	Microcomputer circuit component error	Solder defect · C/W/M
			Component defect/part mismatch
		Display data error	RAM error
			FRAM error
		Display processing not executed	Infinite loop
			Timer error
		Driver control error	RAM error
			Timer error
		Gas combination error	RAM error
8-3	Backlight does not light up		
	LCD error	LCD fault	Vibration shock
			Backlight component defect
			Cushion defect
	LCD not connected	LCD connector disengaged	
		LCD cable broken wire	
	LCD display circuit error	LCD display circuit component error	Solder defect · C/W/M
			Component defect/part mismatch
	Microcomputer circuit error	Microcomputer circuit component error	Solder defect · C/W/M
			Component defect/part mismatch

9-1	LED does not light up		
	LED error	LED fault	Vibration shock
			Reverse installation polarity
			Parts defect
	LED display circuit error	LED display circuit component error	Solder defect・C/W/M
			Component defect/part mismatch
	Microcomputer circuit error	Microcomputer circuit component error	Solder defect・C/W/M
			Component defect/part mismatch
9-2	LED is dark		
	LED error	LED fault	Vibration shock
			Parts defect
	LED display circuit error	LED display circuit component error	Solder defect・C/W/M
			Component defect/part mismatch
	Microcomputer circuit error	Microcomputer circuit component error	Solder defect・C/W/M
			Component defect/part mismatch

10 Does not detect gas

Concentration not updated	System error	Microcomputer circuit error
	Sensor error	Sensor broken wire
		Sensor circuit error
	Gas setting OFF	Gas setting mistake
		RAM・FRAM error
Maintenance status	Setting error	Does not return to the measurement mode
		Component defect/part mismatch
Underdetection	Internal data error	RAM・FRAM error
	Abnormal value when setting	Calibration with abnormal gas
False alarm generated	Overdetection	Adjustment defect
		Sensor sensitivity error
		Zero tracking error
	Alarm point error	Alarm point setting mistake
		RAM・FRAM error

11	Can not calibrate			
	Does not operate			
	Calibration gas concentration error			
	Sensor error	Sensor broken wire		
		Sensor circuit error		
	Filter error	Perforation		
		Mounting defect		
		Tear		
	Contact disengaged	Vibration shock		
		Solder defect・Crack		
	Sensor disengaged			
	Main power supply circuit	Reference voltage error	Solder defect・C/W/M	
			Component defect/part mismatch	
			First stage power supply error	
	Reference voltage circuit error	Reference voltage circuit component error	Solder defect・C/W/M	
			Component defect/part mismatch	
	Microcomputer circuit error	Microcomputer circuit component error	Solder defect・C/W/M	
			Component defect/part mismatch	
		Microcomputer error	A/D error	
			RAM error	
			FRAM error	

12	Does not measure correctly		
	Calibration defect		
	Sensor error	Sensor broken wire	
		Sensor circuit error	
	High concentration gas contact		
	Interference gas contact		
	Filter error	Perforation	
		Mounting defect	
		Tear	
	Detachment of contact	Vibration shock	
		Solder defect・Crack	
	Excessive noise		
	Main power supply circuit	Reference voltage error	Solder defect・C/W/M
			Component defect/part mismatch
			First stage power supply error
	Reference voltage circuit error	Reference voltage circuit component error	Solder defect・C/W/M
			Component defect/part mismatch
	Microcomputer circuit error	Microcomputer circuit component error	Solder defect・C/W/M
			Component defect/part mismatch
		Microcomputer error	A/D error
			AVref error
			RAM error
			FRAM error
			Timer error

13	Generates false alarm		
	Calibration defect		
	Sensor error	Sensor broken wire	
		Sensor circuit error	
	High concentration gas contact		
	Interference gas contact		
	Filter error	Perforation	
		Mounting defect	
		Tear	
	Contact disengaged	Vibration shock	
		Solder defect · Crack	
	Sensor disengaged		
	Main power supply circuit	Reference voltage error	Solder defect · C/W/M
			Component defect/part mismatch
			First stage power supply error
	Reference voltage circuit error	Reference voltage circuit component error	Solder defect · C/W/M
			Component defect/part mismatch
	Microcomputer circuit error	Microcomputer circuit component error	Solder defect · C/W/M
			Component defect/part mismatch
		Microcomputer error	A/D error
			AVref error
			RAM error
			FRAM error
			Timer error
	Vibration motor circuit error	Vibration motor circuit component error	Solder defect · C/W/M
			Component defect/part mismatch
	Buzzer power circuit error	Buzzer power circuit component error	Solder defect · C/W/M
			Component defect/part mismatch
	Buzzer sound circuit error	Buzzer sounding circuit parts error	Solder defect · C/W/M
			Component defect/part mismatch
	LED display circuit error	LED display circuit component error	Solder defect · C/W/M
			Component defect/part mismatch
	LCD error indication		
	Abnormal temperature value	Rapid temperature change	
		Temperature sensor output error	Parts defect

14	Does not issue alarm		
	Calibration defect		
	Introduced gas concentration error		
	Sensor error	Sensor broken wire	
		Sensor circuit error	
	High concentration gas contact		
	Interference gas contact		
	Contact disengaged	Vibration shock	
		Solder defect - Crack	
	Sensor disengaged		
	Substrate corrosion	Sensor leakage	Sensor error
			Vibration shock
	Main power supply circuit	Reference voltage error	Solder defect - C/W/M
			Component defect/part mismatch
			First stage power supply error
	Reference voltage circuit error	Reference voltage circuit component error	Solder defect - C/W/M
			Component defect/part mismatch
	Microcomputer circuit error	Microcomputer circuit component error	Solder defect - C/W/M
			Component defect/part mismatch
		Microcomputer error	A/D error
			AVref error
			RAM error
			FRAM error
			Timer error
	Vibration motor circuit error	Vibration motor circuit component error	Solder defect - C/W/M
			Component defect/part mismatch
	Buzzer power circuit error	Buzzer power circuit component error	Solder defect - C/W/M
			Component defect/part mismatch
	Buzzer sound circuit error	Buzzer sounding circuit parts error	Solder defect - C/W/M
			Component defect/part mismatch
	LED display circuit error	LED display circuit component error	Solder defect - C/W/M
			Component defect/part mismatch
	LCD error indication		
	Abnormal temperature value	Rapid temperature change	
		Temperature sensor output error	Parts defect

15	Does not self-diagnose			
		Calibration defect		
		Main power supply circuit	Reference voltage error	Solder defect - C/W/M
				Component defect/part mismatch
				First stage power supply error
		Reference voltage circuit error	Reference voltage circuit component error	Solder defect - C/W/M
				Component defect/part mismatch
		Microcomputer circuit error	Microcomputer circuit component error	Solder defect - C/W/M
				Component defect/part mismatch
			Microcomputer error	A/D error
				AVref error
				RAM error
				FRAM error
				Timer error

16-1	Pump does not run		
	Pump error	Pump fault	Vibration shock
			Reverse installation polarity
			Parts defect
	Pump circuit error	Pump circuit component error	Solder defect・C/W/M
			Component defect/part mismatch
	Microcomputer circuit error	Microcomputer circuit component error	Solder defect・C/W/M
			Component defect/part mismatch
16-2	Abnormal flow rate		
	Pressure sensor error	Pressure sensor fault	Vibration shock
			Parts defect
	Pressure sensor circuit error	Pressure sensor circuit component error	Solder defect・C/W/M
			Component defect/part mismatch
	Flow path error	Clogged flow path	Contamination of foreign matter or water in the flow path
	Microcomputer circuit error	Microcomputer circuit component error	Solder defect・C/W/M
			Component defect/part mismatch