

**RMA Number: 203710**  
**Model Number: U80314**  
**Date: 12/17/2020**  
**Check By: Thanh Nguyen**

**I. Return Reason**

Batteries are only lasting 10 – 12 months and then unable to recharge.  
Date code: 2019-01

**II. Observation**

A. Appearance: Normal, no physical damaged.



B. Batteries Fuel Gauge Before Fully Charge Test:  
**-Pack #1: Date Code: 2019-01**



bq27X00 Single Cell Battery Gas Gauge

File Options Commands GPIO Help

TEXAS INSTRUMENTS REAL WORLD SIGNAL PROCESSING™

Fuel Level:  %

Rs= 20.00 mOhm

**Registers**

**EEPROM**

**Pro**

**Calibration**

Name	Value	Unit	Log	Scan
Mode Register	44	hex	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
At Rate	0.00	mA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
At Rate Time to Empty	65535	min	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Temperature	21.25	°C	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Voltage	2088	mV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Status Flags	1B	hex	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Relative State of	0	%	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Nominal Available Chg	0.00	mAh	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dsg Comp Cap (CACD)	0.00	mAh	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Temp Comp Cap	0.00	mAh	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Last Meas Discharge	2970.24	mAh	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Average Current	0.00	mA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Name	Value	Unit	Log	Scan
Time to Empty	65535	min	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Time to Full	65535	min	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Standby Current	5.00	mA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Stby Time to Empty	0	min	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Max Load Current	662.59	mA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Max Load TTE	0	min	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Available Energy	0.00	mWh	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Average Power	0.00	mW	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Const Power TTE	65535	min	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cycle Since Learning	0	counts	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cycle Count Total	0	counts	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Comp State of Charge	0	%	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Mode Register  
 GPIEN **GPSTAT** WRTNAC DONE PRST **POR** FRST SHIP

Status Flags  
 CHGS NOACT IMIN **CI** **CALIP** VDQ **EDV1** **EDVF**

Display Engineering Units

Clear Logs Clear Scans

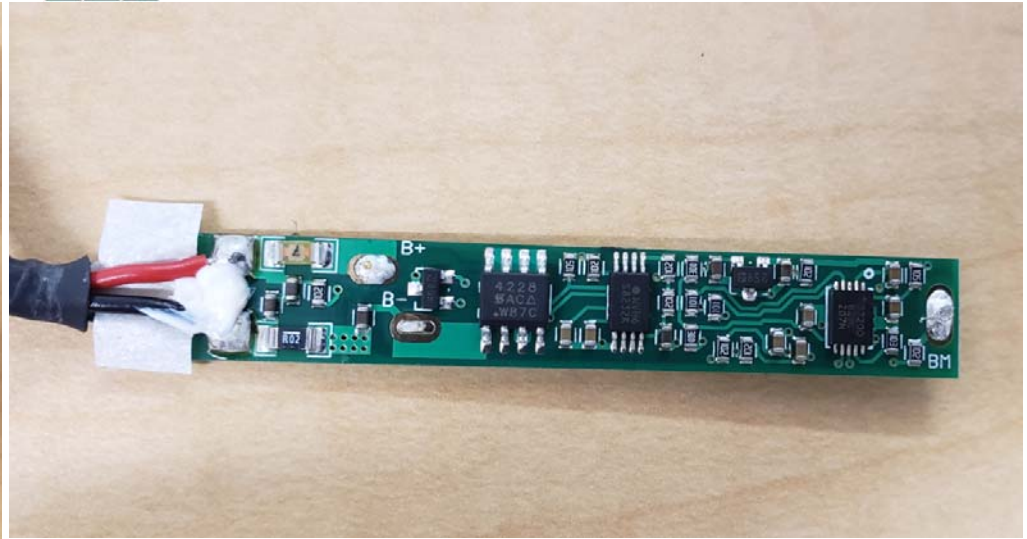
Log All Scan All

Communication Status OK

12/17/2020 10:39 AM

Note: this battery has no output voltage and only communicates when connecting with a power supply. Also it is not taking charge.

Remove protective shrink wrap



Date Code	Cell Voltage		PCBA Leakage		Remark
	Cell 1 (V)	Cell 2 (V)	B+ ( $\mu$ A)	BM ( $\mu$ A)	
2019-01	4.103	3.786	43.4	<0.1	The cell 2 is not holding energy or taking charge.

**-Pack #2: Date code 2019-02**



Software interface for bq27X00 Single Cell Battery Gas Gauge. The window title is "bq27X00 Single Cell Battery Gas Gauge". The menu bar includes File, Options, Commands, GPIO, and Help. The header features the Texas Instruments logo and the slogan "REAL WORLD SIGNAL PROCESSING™".

The main display area shows a circuit diagram of the bq27000 chip connected to a battery and a load. The chip pins are labeled: RBI, VCC, VSS, HDQ, GPIO, SRP, SRN, and BAT. A "Fuel Level:" gauge is shown with a needle pointing to 0%. Below the gauge, the sense resistor value is displayed as "Rs= 20.00 mOhm".

On the left side, there are navigation buttons for "Registers", "EEPROM", "Pro", and "Calibration".

The "Registers" section contains two tables:

Name	Value	Unit	Log	Scan
Mode Register	44	hex	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
At Rate	0.00	mA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
At Rate Time to Empty	65535	min	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Temperature	21.75	°C	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Voltage	2095	mV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Status Flags	1B	hex	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Relative State of	0	%	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Nominal Available Chg	0.00	mAh	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dsg Comp Cap (CACD)	0.00	mAh	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Temp Comp Cap	0.00	mAh	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Last Meas Discharge	2970.24	mAh	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Average Current	0.00	mA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Name	Value	Unit	Log	Scan
Time to Empty	65535	min	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Time to Full	65535	min	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Standby Current	5.00	mA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Stby Time to Empty	0	min	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Max Load Current	662.59	mA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Max Load TTE	0	min	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Available Energy	0.00	mWh	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Average Power	0.00	mW	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Const Power TTE	65535	min	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cycle Since Learning	0	counts	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cycle Count Total	0	counts	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Comp State of Charge	0	%	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

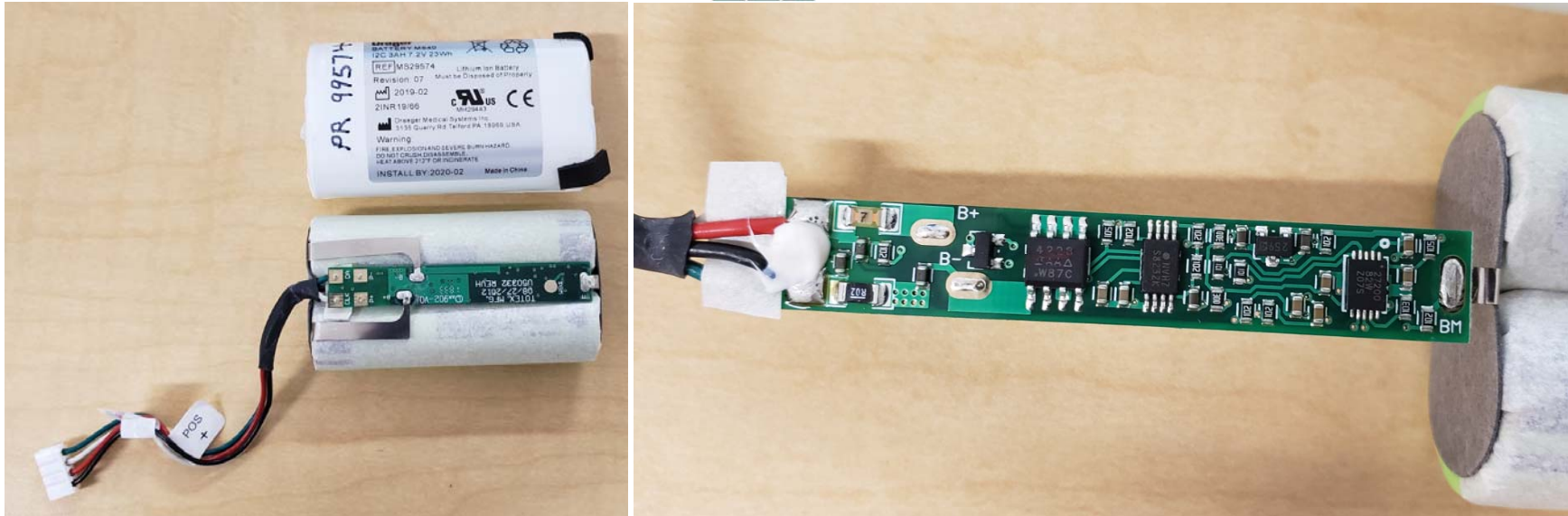
Below the tables, there are buttons for "Clear Logs", "Clear Scans", "Log All", and "Scan All". A checkbox for "Display Engineering Units" is checked.

The "Mode Register" section shows: GPIEN GPSTAT WRTNAC DONE PRST POR FRST SHIP. The "Status Flags" section shows: CHGS NOACT IMIN CI CALIP VDQ EDV1 EDVF.

At the bottom, the status bar shows "Communication Status OK", the date "12/17/2020", and the time "10:42 AM".

Note: this battery has no output voltage and only communicates when connecting with a power supply. Also it is not taking charge.

Remove the protective shrink wrap.



Date Code	Cell Voltage		PCBA Leakage		Remark
	Cell 1 (V)	Cell 2 (V)	B+ ( $\mu$ A)	BM ( $\mu$ A)	
2019-02	0	4.134	43.7	<0.1	The cell 1 has zero voltage, and not takes charge.

### III. Summary

Batteries do not show any sign of mechanical or electrical component damage. Both battery PCBAs have normal communication function and quiescent current. Their cell voltages are imbalanced, which will result in premature charge termination due to one of the cell reach cell reach over voltage threshold and trigger over charge protection.

Since there is no sign of mechanical and electrical damage found other than the cell, such failure might be caused by below reasons in order of probability:

1. One of the two cells in the pack is weaker than the other one. Their performance degradation rates are different. This results in Cell voltage difference increases over cycles or long storage.
2. Battery is operated or stored at elevated ambient temperature.
3. Battery is charged by voltage higher than spec limit or a broken charger.