



[SHAD-2] During execution of PTL-903900 for Osprey Battery Life testing, unable to download the database from one of the units

Created: 17/Dec/24 1:45:49 PM - Updated: 25/Feb/25 11:20:17 AM

Status:	Risk Assessment
Project:	System and Hardware Anomaly/Defect
Component/s:	None
Affects Version/s:	None
Fix Version/s:	None

Type:	Defect	Priority:	Unprioritized
Reporter:	Kris Winks	Assignee:	Stefan Robert
Resolution:	Unresolved	Votes:	0
Labels:	None		
Original Estimate:	Not Specified		
Remaining Estimate:	Not Specified		
Time Spent:	Not Specified		

Intake

Problem Statement: During the execution of PTL-903900, it was observed that one of the 120 Maxell units was unable to complete the "Database Download" command with Quasar (SW10886). The unit was able to connect to Quasar and provide some information, but was unable to maintain a connection during the database download. The NFC tool was used to communicate with the device. The command, "0xAC" was sent to the transmitter and the response, "0xac 0x80 0x23 0x3c 0x1e 0x00 0x17 0x00 0x00 0x00 0x00 0x00 0x00 0x94", indicates that an unrecoverable error occurred on day 22 of the session and the unrecoverable error was caused by a hard reset. The unit's part number is MT-26023-72 with SW14531 v 57.192.109.37. The Serial Number is 511917828029. The transmitter was built in ER24-522.

QA Reviewer: Kris Winks

PN: MT-26023-72

Affected Product(s): G7

Impacted Components in System: Wearable

Source: DVT

Specify Requirement Impacted: *TBD*

PTL: PTL-903900

TP: None Listed

Time Point: AA T=36m

Pre-Condition: AA T=36m (TAA = 60C, TRT = 22C)

Complaint Code: N/A

Clinical: N/A

Human Factors: N/A

Device Manufacture: N/A

Device Name: N/A

Device Model: N/A

Device Serial Number: 511917828029

OS Version: N/A

App SW #: N/A
App SW Description: N/A
App SW# version: N/A
Transmitter FW Number: SW14531
Transmitter FW Description: G7 15-Day IIT Transmitter Firmware Image (Nordic SoC)
Transmitter FW Revision: v 57.192.109.37
Grey Listed Devices:
Hardware Compatibility Report: N/A
MDM on Device: N/A
Country: N/A
COMPAT #: N/A
Number of Defects / Anomalies: 1
Part Traceability Information (TX ID): 511917828029
More Information:
Rate %: 0.83% (1/120)
Risk Assessment
Risk Assessment Attendees:
Does the issue exist in commercial product?:
Severity:
Severity Justification:
Occurrence (P1):
Occurrence (P1) Justification:
Occurrence (P2):
Occurrence (P2) Justification:
Risk Index:
System Effect:
Does Risk Exist within Documentation?:
Document #:
Revision #:
Line Items:
CO #:
Does Risk Index Align with Risk Documentation?:
Benefit Risk Analysis (BRA) Conclusion:

HHA #:

**Defer to the future
release?:**

**Final Risk
Justification:**

Disposition

**Containment
Required:**

Reference Number:

**Containment
Rationale:**

Investigation

Investigation Details:

Anomaly Root Cause:

**Investigation
Summary:**

Actions Taken:

CAPA Escalation:

CAPA #:

**CAPA Escalation
Rationale:**

Description

RISK ASSESSMENT:

This is not a field-facing issue.

RPN: 30 (RA-00573 3.13.3)

In the DFMEA, the failure mode observed is not battery leakage but potential battery damage due to the conditioning.

HHA Escalation: Not required as this is part of testing on a product that is not released yet.

Attachments

511917828029.Transmitter (60 kB)

511917828029_12_17_2024_14_21_43_445.xlsx (497 kB)

Maxell Battery Communication.pdf (362 kB)

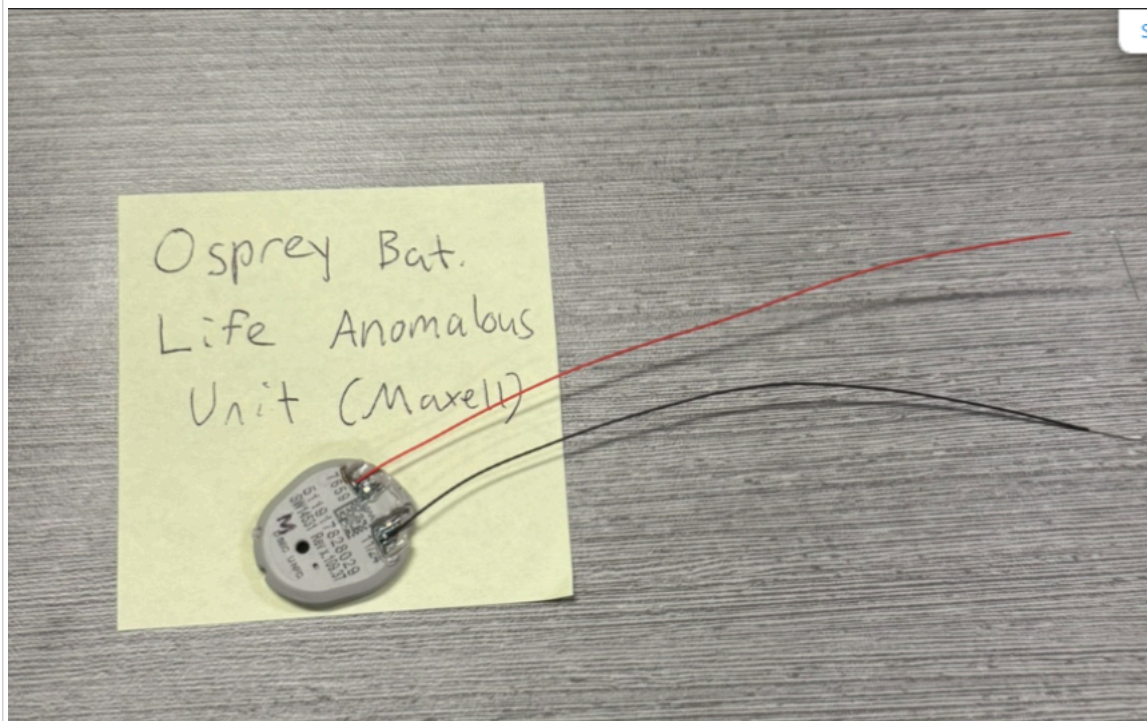


image-2025-01-21-07-32-36-089.png (628 kB)

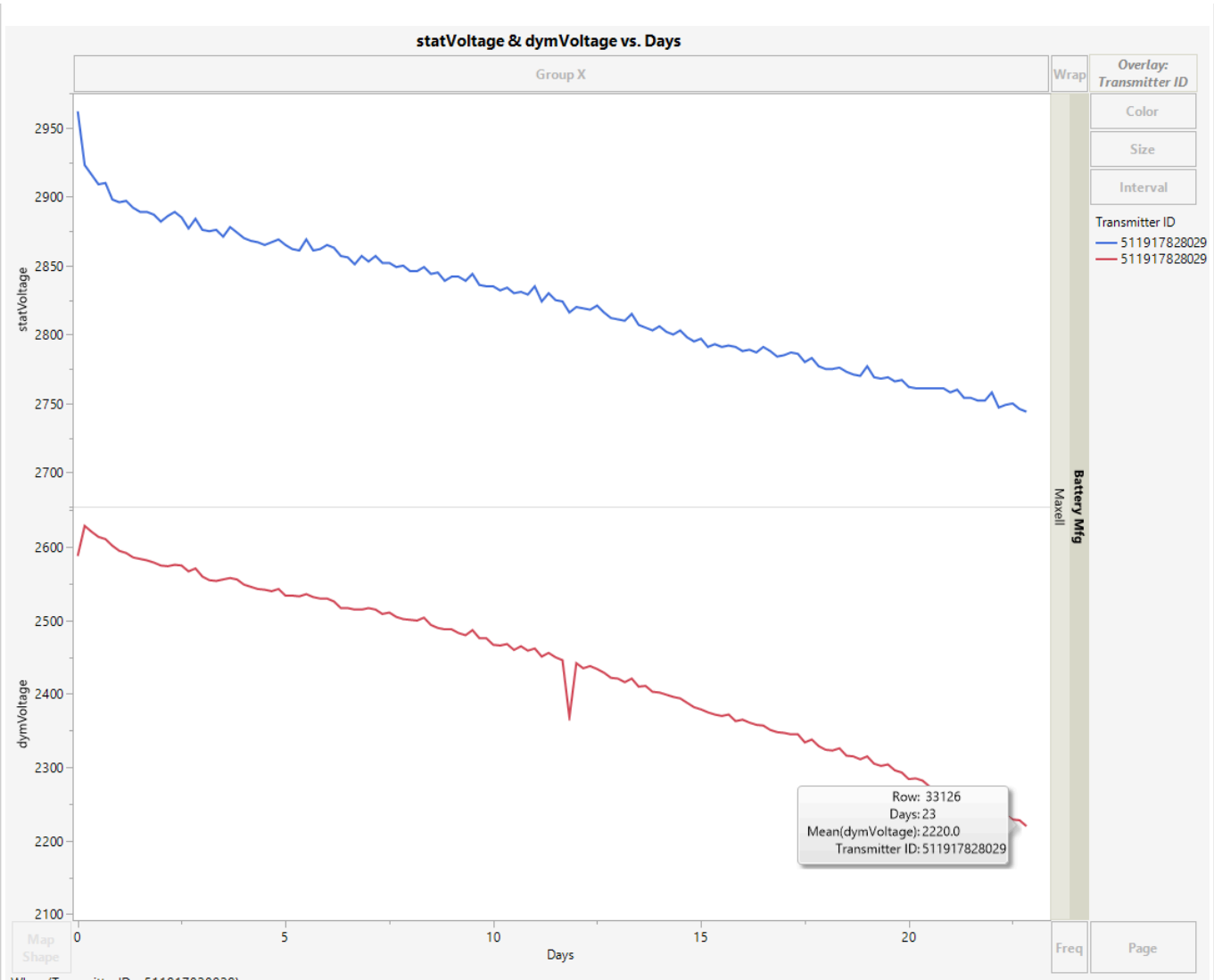


image-2025-01-21-07-44-55-764.png (56 kB)

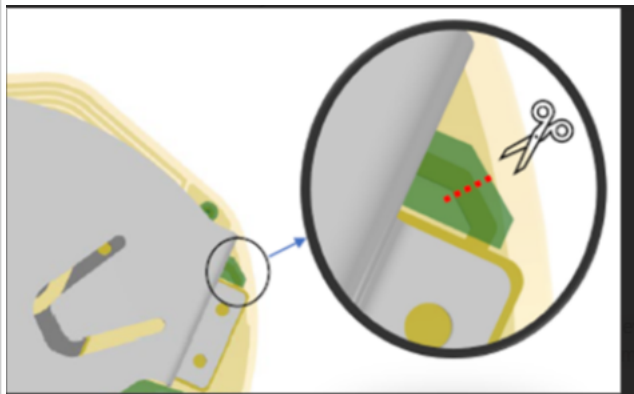


image-2025-02-18-15-41-41-761.png (86 kB)

Test Step	Value	Unit	Comment
Measure VBAT to GND before battery disconnect	0.3	V	Battery in unit as received is dead
Measure VBAT to GND after battery disconnect	0	V	Confirms successful battery disconnect rework
Bench Supply for External Power	2.99	V	Confirm supply voltage prior to connecting to DUT
Measure sleep current as is (post-session)	3.7 - 4.1	uA	Sleep current is in normal/expected range after battery disconnect
Return to FTM, erase DB, soft reset	N/A	N/A	NFC commands: 0x4d -> 0x42 -> 0x31
Measure storage current in FTM	175 - 225	nA	Storage current is in normal/expected range
Measure sleep current in FTM	3.7 - 4.1	uA	Sleep current is in normal/expected range
FTM complete	N/A	N/A	NFC commands: 0x7c 5 to FTM complete
Measure storage current	175 - 225	nA	Storage current is in normal/expected range
Wake unit via NFC	N/A	N/A	NFC commands: 0x54 used to wake device up
Measure sleep current in session	3.7 - 4.1	uA	Sleep current is in normal/expected range

image-2025-02-18-15-42-17-256.png (175 kB)

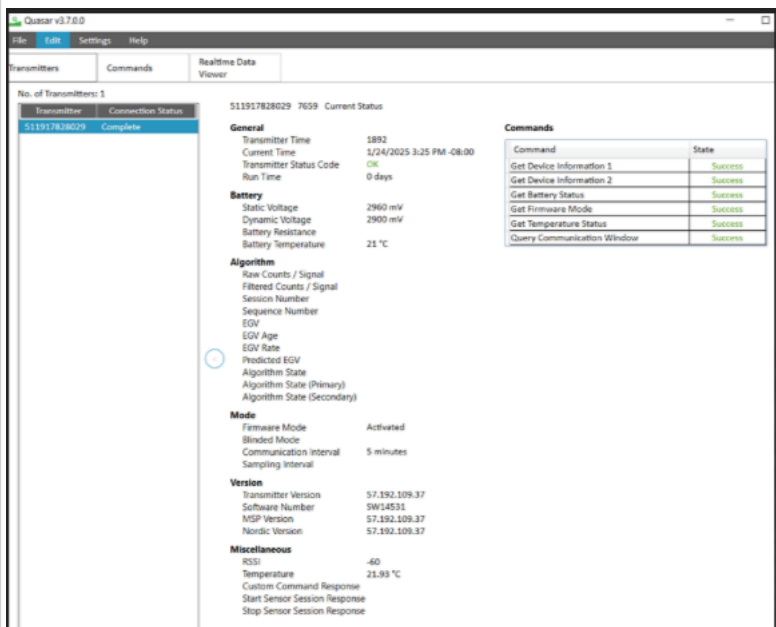


image-2025-02-18-15-42-39-518.png (88 kB)

Comments

Stefan Robert added a comment - 17/Jan/25 5:50:32 AM

Update on investigation:
Database was retrieve by connecting a power supply to the unit. Database indicate that unit:

From Jeff Stanton: "this has the hallmark of a brown out reset (hard reset). The spread between static/dynamic battV was ~ 500mV which shows the battery had some higher IR. The POF event happened just before the brown out but before it could run an ADC batt measurement."

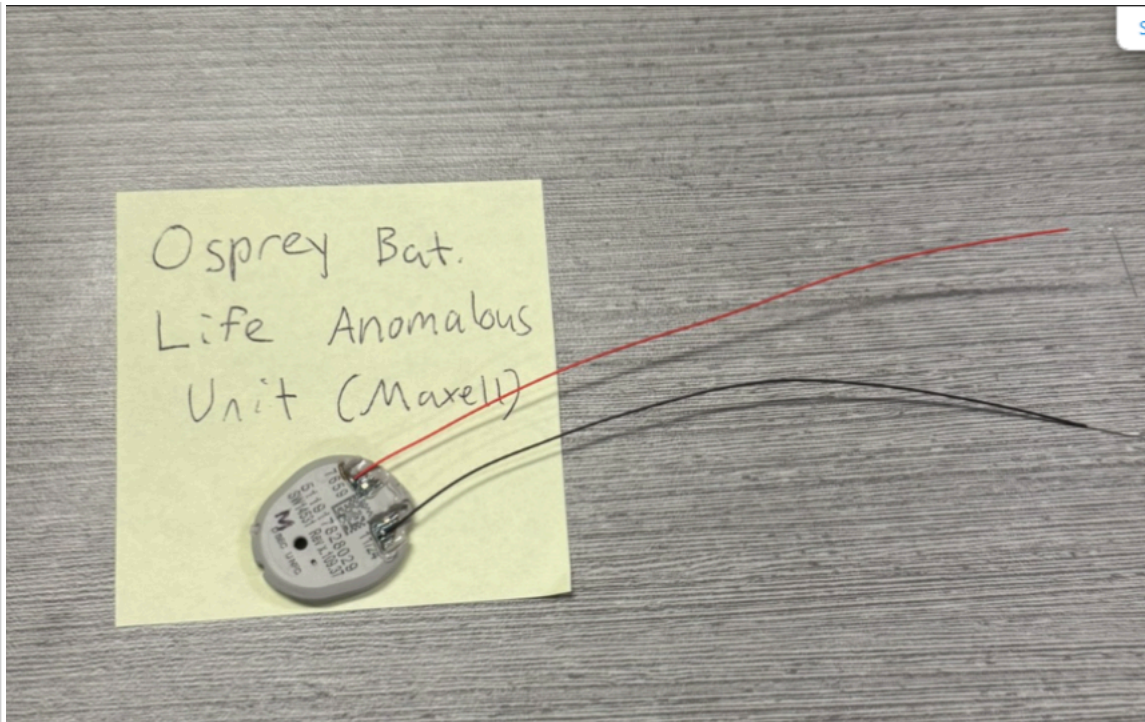
"The POF event will schedule a static/dyn measurement at the next 5-min boundary, but in this case, it doesn't look like it make it that long before it reset. The PDD suggests the brown out event / POF occurred as they connected quasar"

Stefan Robert added a comment - 21/Jan/25 7:31:26 AM

Attached the Tx database to the ticket.

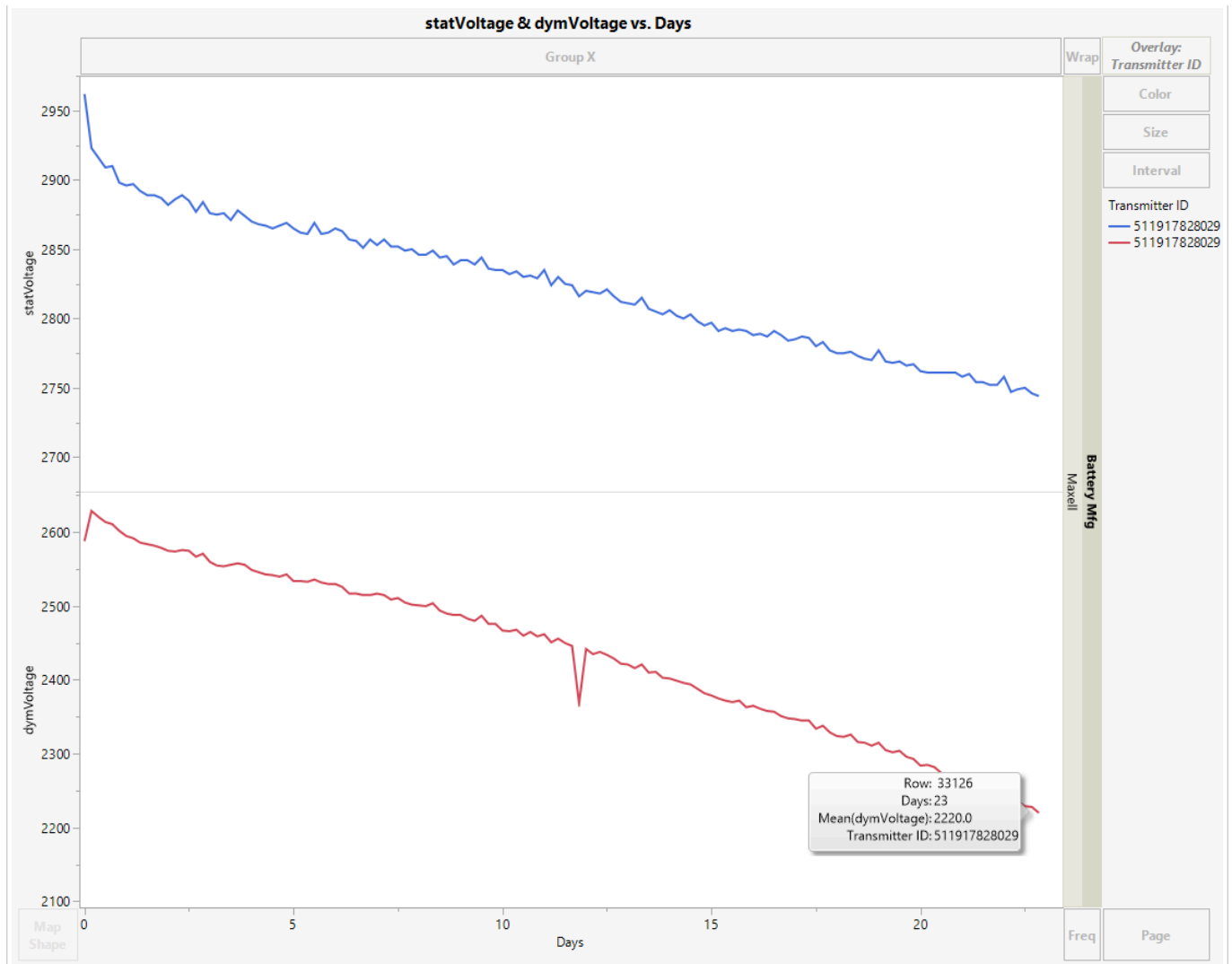
Stefan Robert added a comment - 21/Jan/25 7:32:47 AM

Database was downloaded after connecting power supply to transmitter.



Stefan Robert added a comment - 21/Jan/25 7:45:04 AM

Static Voltage compared to DynVoltage over time



Stefan Robert added a comment - 22/Jan/25 6:26:48 AM

Next steps for investigation:

- Rework unit to disconnect battery (remove minimal LPM just to expose battery trace, sever trace)
- Measure PCBA current to confirm if normal or elevated (battery now out of circuit) - review results before next step
- Remove LPM and extract battery (turn over battery to Zach)
- Reconfirm current measurement on PCBA - review results before next step
- Restore battery trace connection, re-run test with new battery

Stefan Robert added a comment - 18/Feb/25 3:39:47 PM

Manufacturing data was reviewed for unit 511917828029. Sleep current is within expected range.

ID	364924
STATION_ID	EQ-1000326-002
UUT_SERIAL_NUMBER	PG27124002000551
USER_LOGIN_NAME	administrator

START_DATE_TIME	50:05.0
EXECUTION_TIME	111.1471172
UUT_STATUS	Passed
UUT_FAIL_MESSAGE	
UUT_ERROR_MESSAGE	
PART_NUMBER	MT-25668-72 Rev 002
TXSN	511917828029
LOTID	19785844
DISABLE_SECURITY	FALSE
UNRESTRICT_NFC	FALSE
RAW_SENSOR_COUNT	991.41
GAIN	0.9205
OFFSET	-3.1875
VBIAS	0.592
SLEEP_CURRENT	4.84E-06
STORAGE_CURRENT	2.23E-07
BAT_CURRENT	0.0003196
BAT_VOLTAGE	3.15
VDDNRF	3.147
VUNREG	2.604
VDDD	1.038
MEASURED_RSSI	-29.96
REPORTED_RSSI	-29
TEMPERATURE	27
TEMP_SENSOR_STATUS	17

Stefan Robert added a comment - 18/Feb/25 3:41:07 PM

From [Steve Reichert](#) on 01/24/2024:

1. Rework to sever the battery trace was successful. For reference the trace that is cut is shown below:

!9k=!

2. Measured the current with a 3V bench supply - Top level summary is that everything looks normal so far, no sign of high current for sleep or storage current. The table below provides the measurements, which match reasonably well with the BTS data:

!9k=!

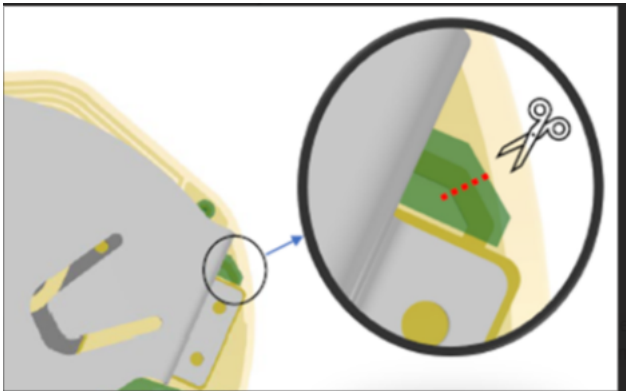
3. Restarted unit into a session - Connected to Quasar and got first battery measurement (see image below). This is still with the external bench supply which is why there is not much difference between static and dynamic voltages. I'm going to let the unit run over the weekend and download on Monday to see if there is any indication of trouble. At that point I think we should reconvene and discuss/reconfirm the next step. E.g. whether we should move forward with the characterization per PTL-903900 prior to battery extraction and whether that should be done with a bench supply or by attaching a battery externally.

!2Q==!

Stefan Robert added a comment - 18/Feb/25 3:42:45 PM

From [Steve Reichert](#) on 01/24/2024:

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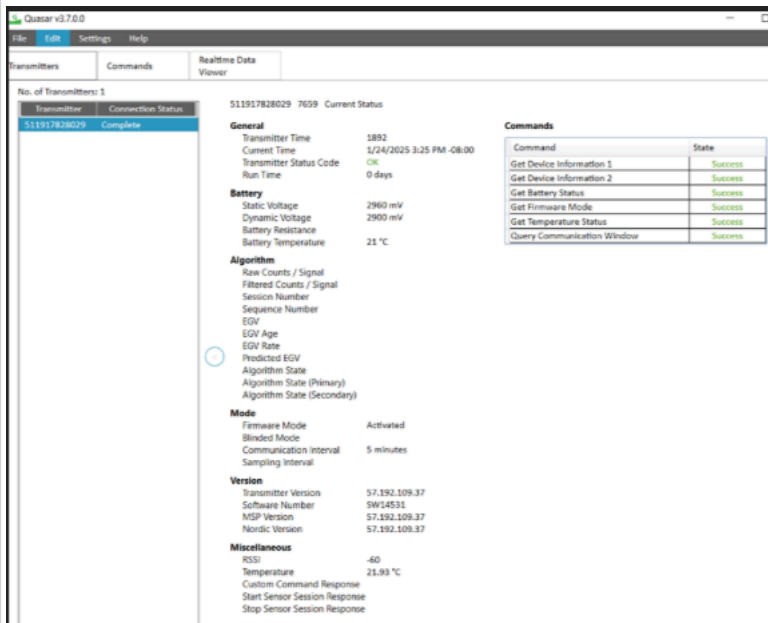


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per PTL-903900 prior to battery extraction and whether that should be done with a bench supply or by attaching a battery externally.



Stefan Robert added a comment - 18/Feb/25 3:46:32 PM

Actions from 02/05/2024 Meeting:

- **Battery Testing:** Retrieve a battery from the same vintage and conditioning, hook it up to the device, and rerun the original tests for 7-10 days. (Steve, Zach)
- **Battery Data Analysis:** Download and analyze the data after the 7-10 day test period to check for any abnormal trends. (Zach, Steve)

Update on 02/12/2024:

New battery hooked up to defective unit. Waiting on completing 7-10 days for abnormal trends.

Stefan Robert added a comment - 25/Feb/25 11:12:31 AM

Review of the protocol showed the following:

- Communication with the transmitter was done with Quasar using the Download Database command
- Download Database command is more power hungry than a private data download, which is the command used by display devices.
- The intent of the protocol is to simulate communication with a display device.
- ACTION: protocol should be clarified to request a private data download request and not a database download

Stefan Robert added a comment - 25/Feb/25 11:20:17 AM

A review of the protocol execution shows the following:

- The protocol does not specify the RH to use as part of the testing
- The protocol used 20% RH controlled
- Previous execution used uncontrolled RH
- Communication with Maxell, testing for aging should be conducted as uncontrolled RH ([Maxell Battery Communication.pdf](#))
- ACTION: Protocol should clarify how relative humidity is controlled and follow battery manufacturer recommendation (uncontrolled RH)