

TestReport002 – eTransit with SBS

Fenton Secondary Battery System – Charging Level 1 Test Results

Report Date: 2023-Oct-28

Vehicle: Prototype1



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Original Release: 2023-Oct-28

Revised: NA

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1. Test Purpose

To establish real-world charging performance baseline when charging both Ford eTransit and Fenton Secondary Battery System (SBS) using Level1 Charging.

2. Test Setup

- Use Ford Mobile Charger, which is supplied with each Ford eTransit vehicle. (Model: LJ98-10F868-AJ)
- Level1 charging is used. Level1 charging is defined as using standard household power of 120vac to achieve a charging power of ~1.3-2.4kW.
- Vehicle under test is a Ford eTransit 2023.
- Secondary Battery System under test is Fenton SBS Revision1.



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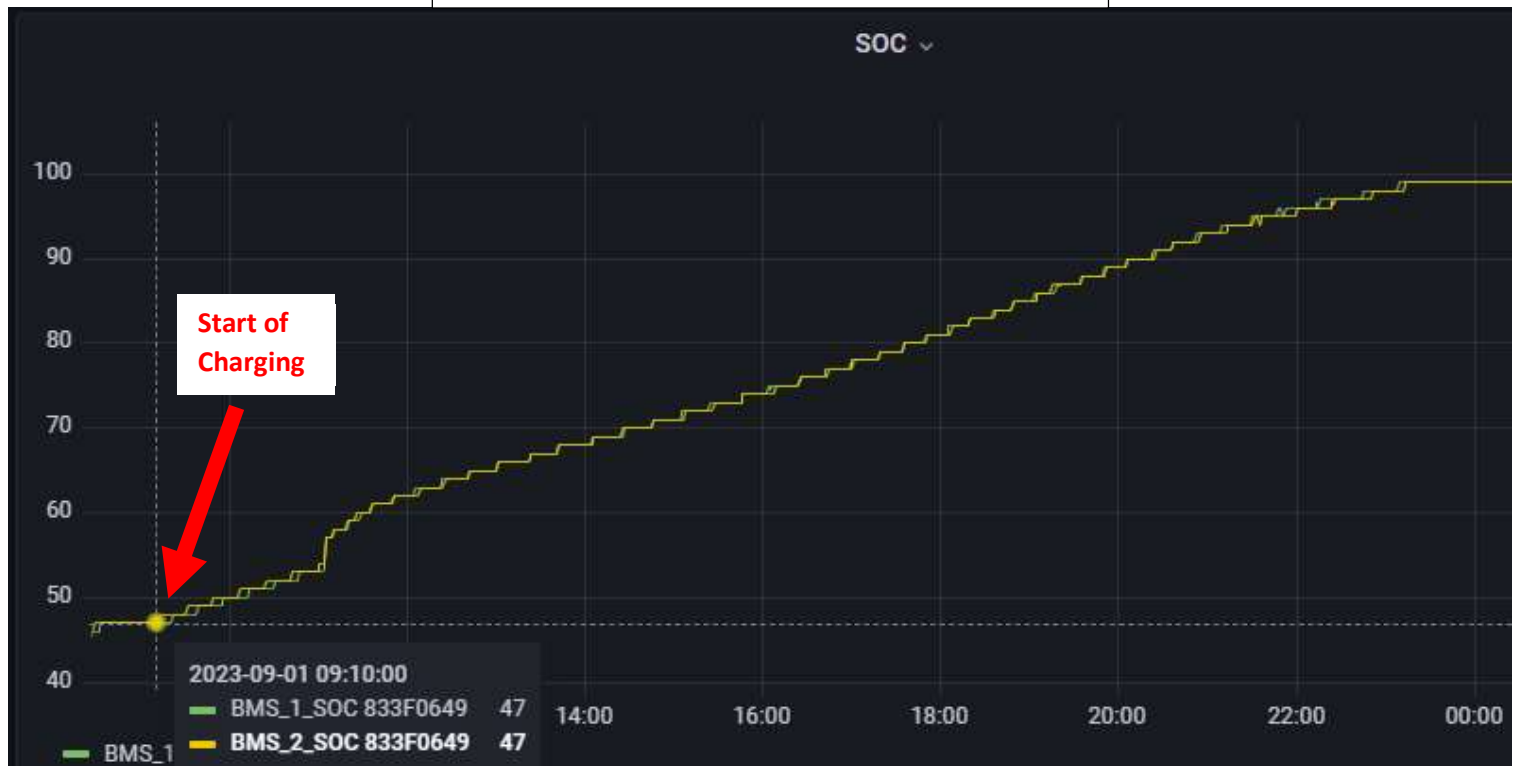
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3. Test Data

- Figure1 shows the start of charging for the **Fenton Secondary Battery System (SBS)**:
 - SOC = State of Charge %
 - BMS = Battery Management System
 - Starting Time = 9:10am
 - Starting SOC for BMS1 = 47%
 - Starting SOC for BMS2 = 47%
 - Starting SOC for both batteries = 47%

Figure1 – Start of Charging



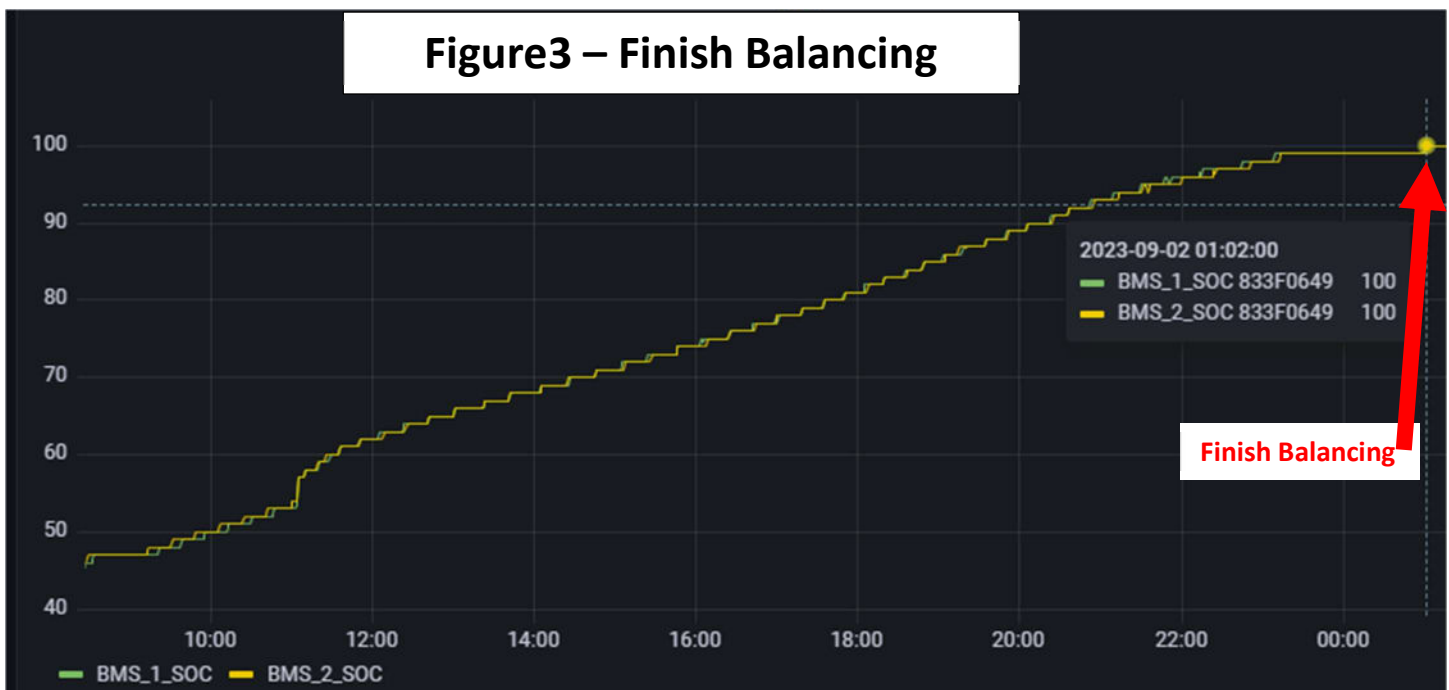
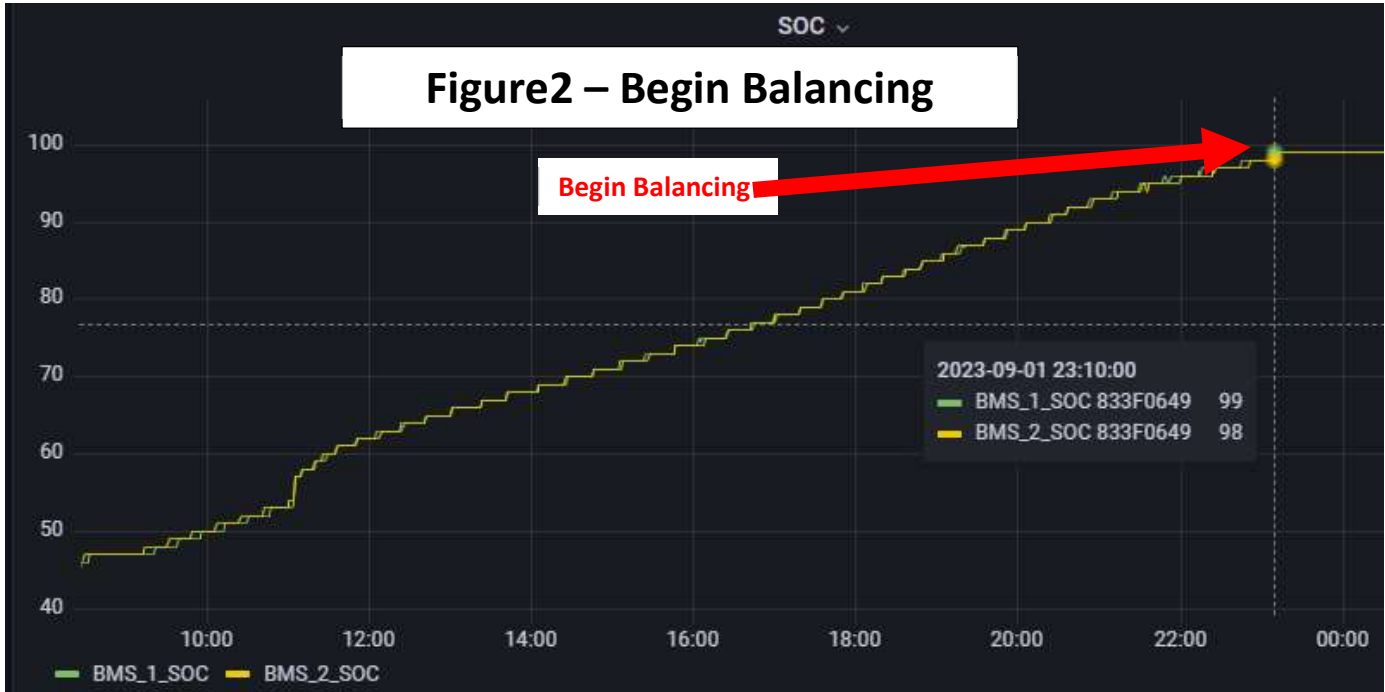
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3. Test Data (SBS System Continued)

- Figure2 & Figure3 show the end of charging for the Fenton Secondary Battery System (SBS):
 - Begin Balancing @ SOC = 99% Time = 11:10pm
 - Finish Balancing @ SOC = 100% Time = 1:02am



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3) Test Data (SBS System Continued)

- Figure3 shows the actual charging voltage and current at a residential facility.
 - Actual Charging Power: $\sim 114\text{vac} * \sim 10.8\text{A} = \sim 1.2\text{kW}$

Figure3 – Actual Charging Voltage & Current



- Data and calculations for the Fenton SBS are presented here. The summary is presented in **4. Test Summary**.

Partial Charge + Balancing Session		
14.0	Hours	<-- Time til Balance Start
1.9	Hours	<-- Balance Duration
~113	VAC	<-- Average Charging Voltage
~1.21	kW	<-- Average Charging Power
47.0	%	<-- SOC% Start
100.0	%	<-- SOC% End
53.0	%	<-- SOC% Delta (Added)
3.8	%/h	<-- SOC% Charge Rate (Balance Start)
15.5	kWh	<-- Energy Delta (Added)
1.1	kW	<-- Ave Charging Power
Voltage Note: Voltage Range = 111-115vac		

3) Test Data (Continued)

Regarding the charging of the **Ford eTransit battery**, Figure 5 shows test data for two typical partial charging sessions. The summary is presented in **4. Test Summary**.

Figure5 – Charging Ford @ Level1 Summary

Session1: Standard Partial Charging Session		
16.8	Hours	<-- Time on Charger
56	%	<-- SOC% Start
82	%	<-- SOC% End
26	%	<-- SOC% Delta (Added)
1.5	%/h	<-- SOC% Charge Rate
17.7	kWh	<-- Energy Delta (Added)
1.1	kW	<-- Ave Charging Power

Session2: Standard Partial Charging Session		
21.0	Hours	<-- Time on Charger
61	%	<-- SOC% Start
94	%	<-- SOC% End
33	%	<-- SOC% Delta (Added)
1.6	%/h	<-- SOC% Charge Rate
22.4	kWh	<-- Energy Delta (Added)
1.1	kW	<-- Ave Charging Power

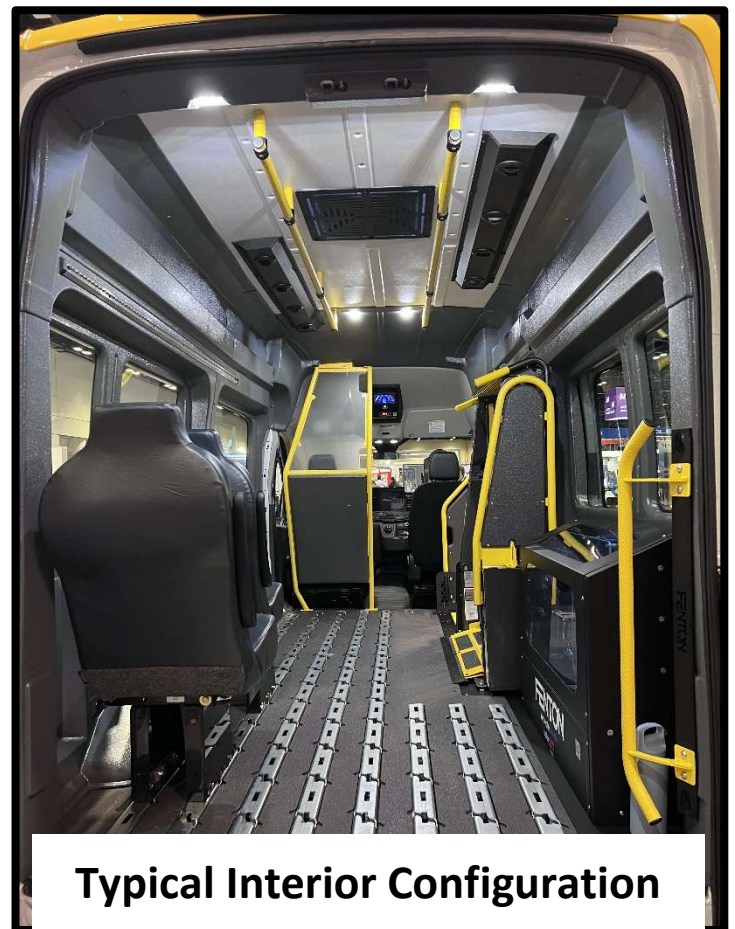
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4. Test Summary

- Charging the **Fenton Secondary Battery System (SBS)**:
 - We saw the battery SOC% increase ~47% in ~14hrs.
 - Level1 charging power and therefore charging rate is ~5x Slower than Level2 charging.
 - Level1 Average Charging Power = ~1.1kW
 - Level2 Average Charging Power = ~5.5kW
- Charging the **Ford eTransit** system:
 - We saw the battery SOC% increase ~33% in ~21hrs.
 - The Level1 charging power and therefore charging rate is ~6.4x Slower than Level2 charging.
 - Level1 Average Charging Power = ~1.1kW when doing a partial charge.
 - Level2 Average Charging Power = ~7.0kW when doing a partial charge.



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5. Other Fenton Documents

- For real-world testing data of charging both the Ford eTransit 2023 and the Fenton Secondary Battery Systems, please see these other documents:
 - Charging @ Level2: See ***TestReport003-eTransit-w-SBS-ChargingLevel2***
 - DC Fast Charging: See ***TestReport004-eTransit-w-SBS-DC-Fast-Charging***
 - For best practices and recommendations for optimizing performance and getting the most out of your system, please see the ***Best Practices*** document on the website @ fentonmobility.com.