

# BMS Interface

Software Documentation

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# 1 Introduction

## 1.1 Purpose

The BMS Interface Software provides a robust communication and control interface for battery management systems, enabling monitoring, diagnostics, and system configuration.

## 1.2 Audience

This document is intended for engineers, developers, and technicians who will install, use, or maintain the BMS Interface Software.

## 1.3 Document Organization

This document covers the communication interface, features, installation and usage instructions, protocol details (including commands and responses), and configuration options.

# 2 System Overview

## 2.1 Communication Interface

Table 1: Communication Parameters

Parameter	Value
Interface	UART2
Baud Rate	115200
Parity	None
Stop Bits	1
Data Bits	8
End of Request	\n (newline)

## 2.2 Key Features

- Real-time data visualization from the connected device
- Retrieve and display device information
- Set threshold values for safety and performance parameters
- Compatible with Windows 10 and Windows 11

# 3 Installation

## 3.1 System Requirements

- Windows 10 or Windows 11 OS
- UART-to-USB converter for BMS connectivity

### 3.2 Installation Steps

1. Download the RAR file from the release section.
2. Extract the RAR file.
3. Run the .exe file to start the application.

No additional installation or setup is required.

## 4 How To Use

1. Connect the BMS to the PC using a UART-to-USB converter (use the **BMS UART2** port).
2. Ensure the baud rate is set to **115200** (in the COM port configuration).
3. Open the application and go to the **Settings** tab.
4. Click **Refresh** to list available COM ports.
5. Select and connect to the correct COM port.
6. The application is now ready to communicate with the BMS.

## 5 User Interface Overview

The BMS Interface Software is organized into four primary tabs, each designed to provide specific functionalities for effective monitoring and configuration:

### 5.1 Live Status Tab

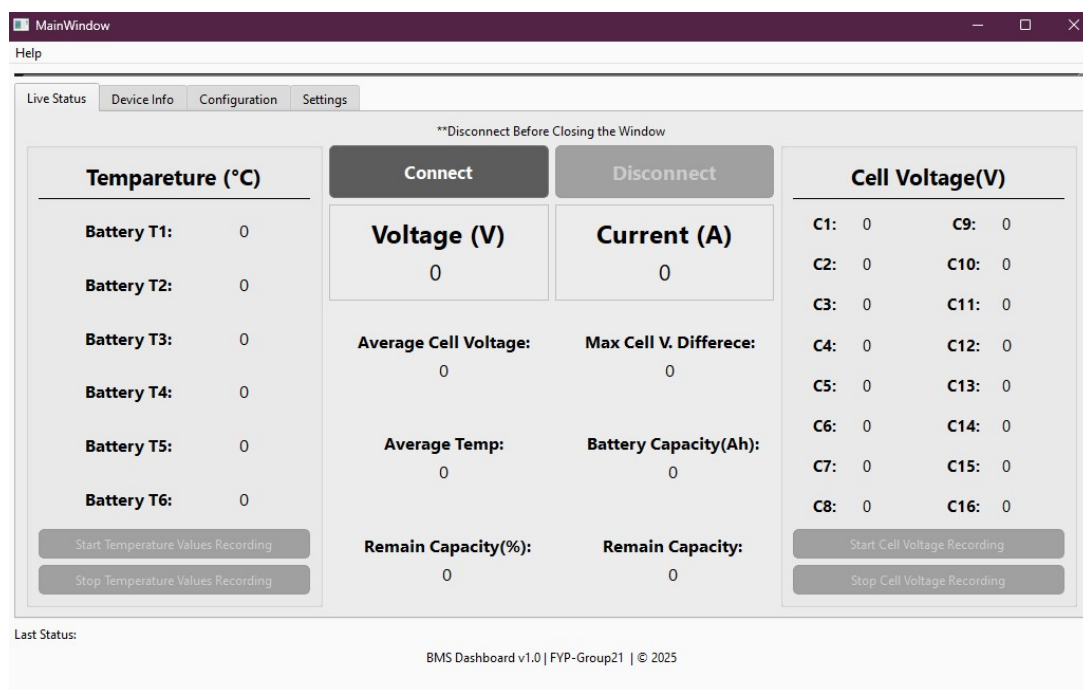


Figure 1: Live Status Tab

This tab provides a real-time visualization of the battery's operational parameters. The following data are displayed and updated live:

- **Cell Voltages:** Displays the voltage of each individual cell.
- **Temperatures:** Shows temperature readings from each connected sensor.
- **Total Voltage:** Shows the total voltage of the battery pack.
- **Total Current:** Displays the current flowing through the battery pack.
- **State of Charge (SoC):** Indicates the current charge level of the battery as a percentage.
- **State of Health (SoH):** Provides an estimation of the battery's overall health and longevity.

The Live Status tab also features two buttons for recording:

- **Record Cell Voltages**
- **Record Temperatures**

When one of these recording buttons is clicked, a new Excel file is created with a filename that includes the type of data and the current date and time (for example, `cell_voltages_2025-05-28_14-00-00.xlsx` or `temperatures_2025-05-28_14-00-00.xlsx`). The file stores the recorded cell voltages or temperatures along with the start date and time. Data entries are saved at intervals specified in the **Settings** tab, allowing for systematic data logging and traceability.

## 5.2 Device Info Tab

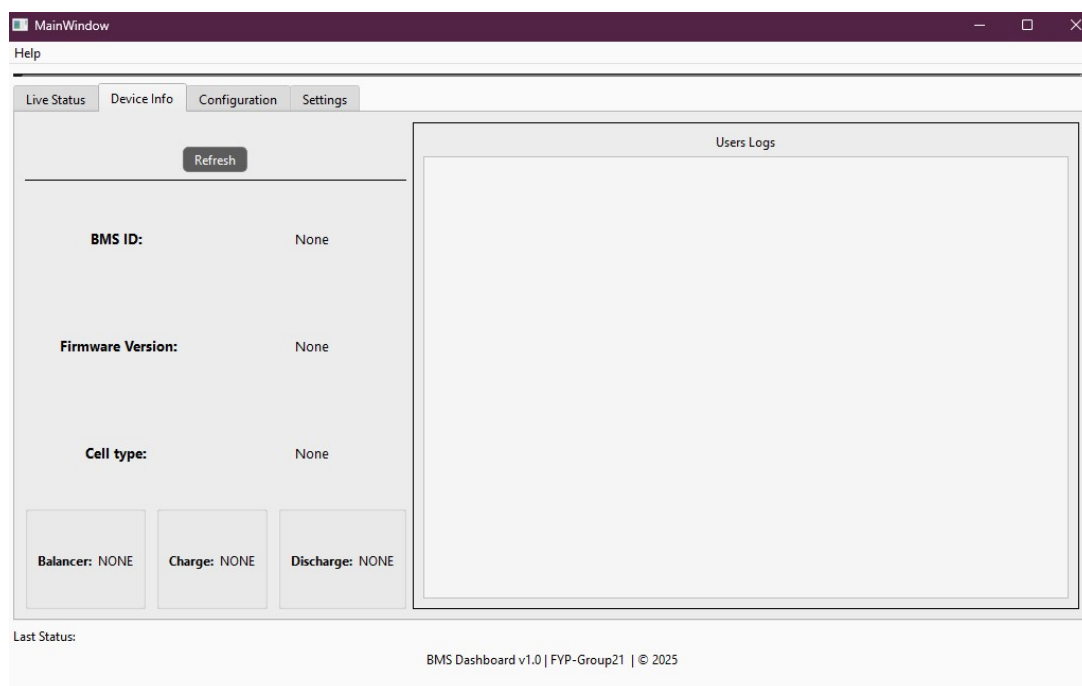


Figure 2: Device info Tab

This tab displays static and diagnostic information retrieved from the connected BMS device:

- **Device ID:** Unique identifier for the battery management system.
- **Firmware Version:** Indicates the current firmware version running on the BMS.
- **Cell Type:** Shows the battery cell chemistry (e.g., LFP, NMC).
- **Latest User Logs:** Presents the most recent log entries or events recorded by the system.

### 5.3 Configuration Tab

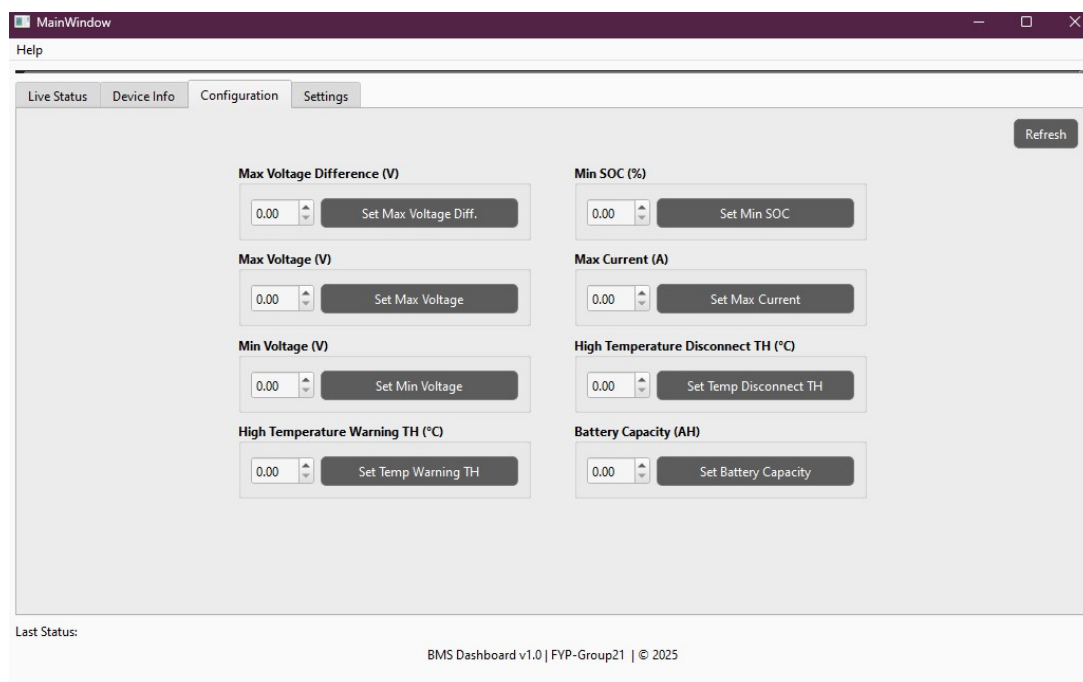


Figure 3: Configuration Tab

In this tab, users can configure and set up safety and performance thresholds for the BMS. Available configuration options include:

- Temperature thresholds (warning, disconnecting)
- Voltage and current thresholds (upper/lower limits)
- State of charge and voltage difference thresholds

Threshold adjustments help ensure safe and efficient operation of the battery system.

## 5.4 Settings Tab

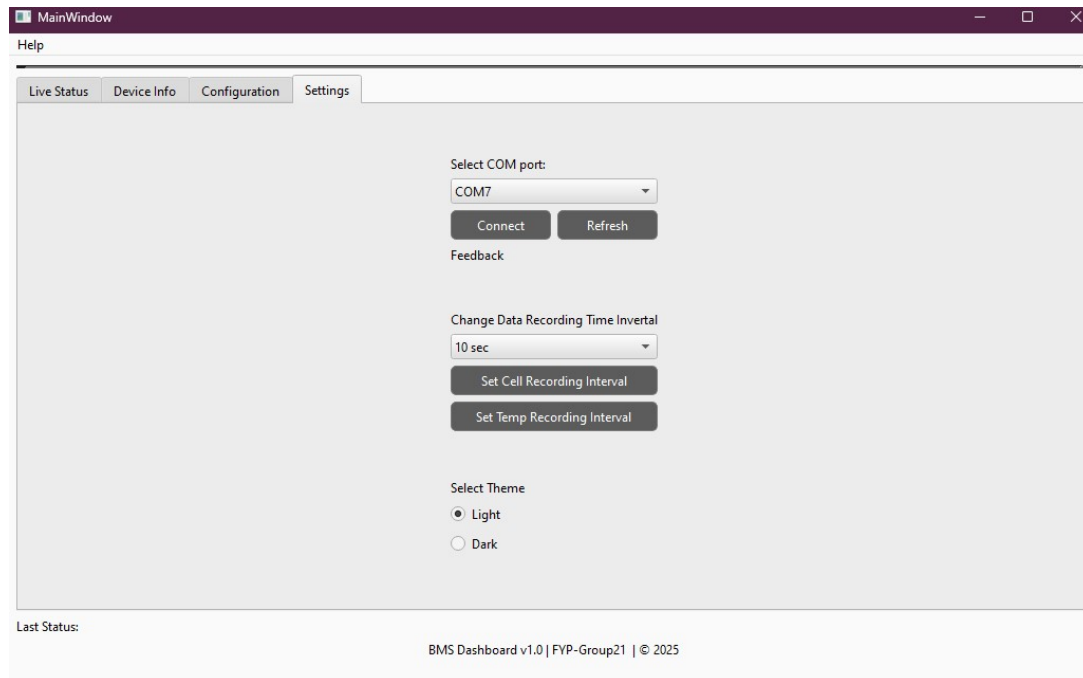


Figure 4: Settings Tab

The Settings tab allows users to customize application and communication preferences:

- **COM Port Setup:** Select and connect to the correct UART/COM port for BMS communication.
- **Data Saving Interval:** Define how often data is saved for logging purposes.
- **Theme Selection:** Choose between dark and light mode for the software interface.

This intuitive organization ensures users can easily access necessary information, perform configurations, and monitor battery status efficiently.

## 6 Protocol Details

### 6.1 UI → BMS: Read Requests

Table 2: UI → BMS Read Requests

Command	Description	Format
DINFO\n	Request Device Information	ASCII string
RDATASTART\n	Start real-time data transmission	ASCII string
RDATASTOP\n	Stop real-time data transmission	ASCII string
GCONFIG\n	Request Configuration Data	ASCII string

## 6.2 BMS → UI: Read Responses

### 6.2.1 Device Information Format

Table 3: Device Information Response Fields

Field	Example	Notes
FMVERSION	FMVERSION:1.0.0	Firmware version
BMSID	BMSID:LFP16-2025/04/21-010	BMS version (see below)
CELLTYPE	CELLTYPE:LFP	Lithium type (e.g., LFP, NMC)
USERLOGS	USERLOGS:U1=Log1;...;U10=Log10	User log entries
BALANCESTATE	BALANCESTATE:ON	Balancing state (ON/OFF)
CHARGESTATE	CHARGESTATE:CHARGING	Charging status
DISCHARGESTATE	DISCHARGESTATE:ENABLED	Discharge status

#### BMS ID structure:

- **First Section:** battery chemistry and number of cells
- **Second Section:** Manufacturer data
- **Third Section:** Unique value, similar to CAN header for BMS

### 6.2.2 Real-Time Data Format

Table 4: Real-Time Data Response Fields

Field	Example	Description
TV	TV:48.76	Total Voltage (V)
TC	TC:-12.34	Total Current (A)
BTS	BTS:T1=100;T2=200;...;T6=200	Battery temperature sensors
CV1	CV1:C1=2.45;C2=4.45;...;C8=1.00	Cell voltages for cells 1–8
CV2	CV2:C9=2.45;C10=4.45;...;C16=1.00	Cell voltages for cells 9–16

**Note:** All responses are newline-terminated (`\n`). Values are in float format unless specified otherwise.

## 6.3 Configuration Data

### 6.3.1 Read Requests

- TWT: temp\_warning\_threshold
- TDT: temp\_disconnecting\_threshold
- VHT: voltage\_higher\_threshold
- VLT: voltage\_lower\_threshold



- CHT: current\_higher\_threshold
- SLT: soc\_lower\_threshold
- VDT: voltage\_different\_threshold

### 6.3.2 Write Requests

- set\_temp\_warning\_threshold – STWT:{value:.2f}
- set\_temp\_disconnecting\_threshold – STDT:{value:.2f}
- set\_voltage\_higher\_threshold – SVHT:{value:.2f}
- set\_voltage\_lower\_threshold – SVLT:{value:.2f}
- set\_current\_higher\_threshold – SCHAT:{value:.2f}
- set\_soc\_lower\_threshold – SSLT:{value:.2f}
- set\_voltage\_different\_threshold – SVDT:{value:.2f}
- set\_soh\_lower\_threshold – SHLT:{value:.2f}

## 7 Troubleshooting

- Ensure the UART-to-USB converter is properly connected.
- Confirm the correct COM port selected.
- Check for required permissions on Windows OS.
- Restart the application if the connection fails.

## 8 Future Work

- Advanced logging and analytics features with graphs.

## 9 Appendix

### 9.1 Glossary

- **BMS:** Battery Management System
- **UART:** Universal Asynchronous Receiver-Transmitter
- **COM Port:** Communication Port
- **SOH:** State of Health
- **SOC:** State of Charge

### 9.2 References

- Manufacturer's BMS communication protocol documentation