









# Battery Module Diagnostic User Guide

Latest version of Lithionics Battery distributed NeverDie BMS allows additional troubleshooting and datalogging at the battery module level, in addition to traditional datalogging at the battery pack level. This is accomplished by adding a status LED and a CANBus data port at each battery module. This guide describes how to collect and interpret the data at the module level.

## Status LED patterns

Status LED installed on each battery module provides heartbeat blink patterns with 1 second intervals. Following table describes the meaning of each blink pattern.

Battery State	LED pattern	LED Blink pattern over time
Recent Alarm, all OK	Long blink	
All OK	Short blink	
Balancing	Slow flash	
LVC	Solid OFF	
HVC, Temp or BMS Fault	Rapid blink	
		

- **Recent Alarm, all OK.** Indicates that currently all cells are within normal operating conditions, but there has been an abnormal event in the last 30 minutes. This helps troubleshoot brief events after their recovery.
- **All OK.** Normal heartbeat pattern when battery module is operating properly.
- **Balancing.** Indicates that BMS has activated the balancing function and that battery module is at the final charging stage.
- **LVC.** Indicates that one or more cells inside the module are deeply discharged and their voltage is below normal range. Battery module must be re-charged ASAP to avoid cell damage. If re-charging fails, the module must be serviced by Lithionics Battery.
- **HVC, Temp or BMS Fault.** Indicates that one or more cells inside the module are outside normal operating conditions, such as overcharge, over or under temperature, or BMS board indicates an internal fault. Further troubleshooting is needed to determine exact root cause, see datalogging instructions below.

## CAN-USB Data Logger

Each battery module has an M12 8-pin connector designed for cell level data logging using CAN-USB Data Logger adapter provided by Lithionics Battery. Please contact Lithionics Battery to purchase this adapter, its part number is 50-242-K and retail price is \$129.

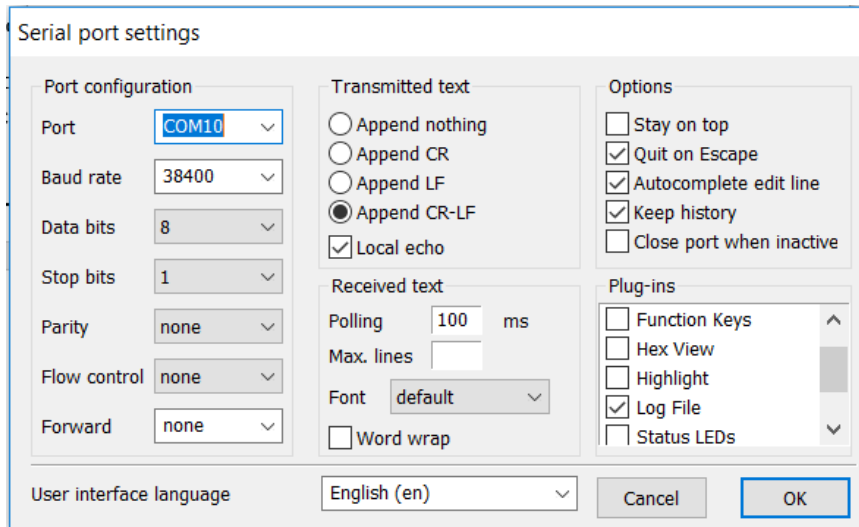


## CANBus Data Logging

The CAN-USB Data Logger adapter connects to a laptop PC and allows data logging using a serial terminal application such as Termite, which can be downloaded here [http://www.compuphase.com/software\\_termite.htm](http://www.compuphase.com/software_termite.htm).

Download “complete setup” version to be able to save data log files for later analysis.

In the Termite configuration screen set the port parameters as shown in the screenshot below, selecting the COM port number which represents the CAN-USB Adapter, baud rate is 38400.



Once connection is made there should be a line of data received approximately every second, which contains a combination of cell voltages and temperature data, described below:

**Example:**

**1,00,16,21,20,326,11,328,6,0000,327,327,327,327,327,328,327,327,327,327,326,327,327,327,327,327**

- 1** – Module address. Will be used in a future multi-module network design.
- 00** – Module status code. Bitmap of 8 status bits described below.
- 16** – Number of series connected cells in the module.
- 21** – Cells temperature inside the module, in Celsius.
- 20** – BMS board temperature, in Celsius.
- 326** – Lowest cell voltage in the module. Actual voltage is 3.26V.
- 11** – Cell number of the lowest cell in the module.
- 328** – Highest cell voltage in the module. Actual voltage is 3.28V.
- 6** – Cell number of the highest cell in the module.
- 0000** – Balancing bitmap, HEX value where each binary bit represents state of balancing for each cell.
- 327** – Cell 1 voltage. The data is repeated for each cell in the module. Actual voltage is 3.27V.

Status code is a HEX value where each binary bit represents the state of the module. Red colored bits indicate abnormal conditions, while green colored bits are only informational.

bit 7	bit6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
unused bit	BMS Fault State	High Temperature	Low Temperature	High Voltage State	Low Voltage State	Cell Balancing	Reserve Voltage State