

# BMS: Quick Start Guide v2.x

From Documentation

Emus BMS, when ordered for the first time, is shipped with Quick Start kit. The kit includes 4 meter long cell communication cable with 22 pin header and USB port, as well as 20 cm long pre-crimped colored wires for peripheral connection. Quantity orders can be customized as per customer's request.

Quick Start kit is all that is needed to get Emus BMS running and connected to PC for configuration.



Emus BMS Quick Start kit - cell cable

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Emus BMS Quick Start kit - colored wires

## Connect 12V power source

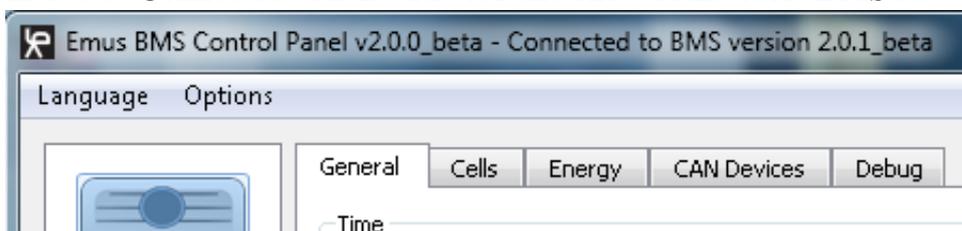
The Emus BMS Control Unit needs 12 volts DC power from vehicle's auxiliary battery or other 8-18 Vdc source. Connect 12V battery's negative (-) tab to **GROUND** and battery's positive (+) tab to **+12V** wires of the 22-pin connector.

## Connect the USB

To verify basic operation, connect the Emus BMS Control Unit's USB socket to a Windows PC via mini-USB cable. Drivers and installation manual can be found on Downloads page.

## Start the Emus BMS Control Panel

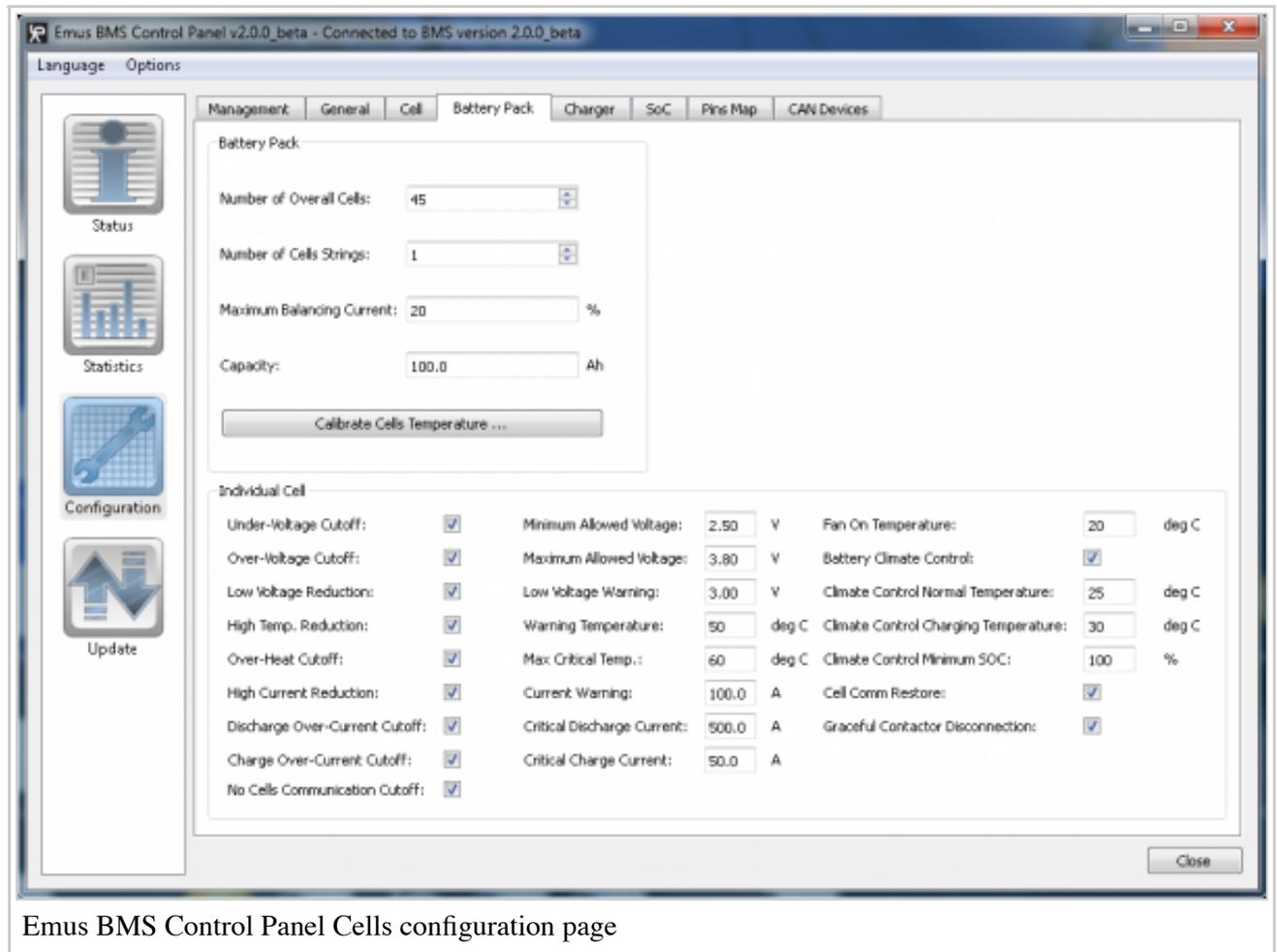
Emus BMS Control Panel software application can be found on Downloads page. When started, application will initiate a connection to the Emus BMS. When connected, Emus BMS Control Panel application will indicate "Connected" on the title bar and show some basic BMS status parameters:



Cells tab will indicate the Number of Cells is “0” as you don't have any cells and Cell Modules connected to your Control Unit yet.

## Configure cell count and type

The



connection of the cells will be covered in the next chapter, but before that we will configure the number of cells for Emus BMS that it would expect to see on the battery after installation. The *Number of Overall Cells* is configured by selecting *Configuration* page and *Battery pack* tab. Using serial cells communication, cells can be connected in series and parallel configuration, for example 102 series and 3 parallel, 306 cells in total. Only a number of series cells should be specified here. Note how the *Number of Overall Cells* field background color changes to yellow which indicates that the parameter is updated, but has not been written into Emus BMS Control Unit yet. When you press Tab key or select other parameter field, the color changes back to white, which means that parameter has been written to BMS.

Cells can also be arranged in several strings connected in parallel, using CAN Cell Group Modules. In such case *Number of Overall Cells* will be updated automatically after CAN Cell Group Module configuration has been completed. Please refer to the Configuration page ([http://elektromotus.lt/wiki/index.php?title=BMS:\\_Configuration\\_Manual\\_v2.x#CAN\\_Devices\\_configuration](http://elektromotus.lt/wiki/index.php?title=BMS:_Configuration_Manual_v2.x#CAN_Devices_configuration)) for further information on how to configure CAN Cell Group Modules.

In the *Capacity* field, enter a rated cell's capacity in Amp-hours (Ah), specified in cell manufacturer's datasheet. If multiple cells are used in parallel, or several parallel string are used, specify a total combined capacity here. For example, three parallel cells of 100 Ah is a total of 300 Ah. Also, if three parallel strings are used, each of them consisting of 100 Ah cells, then the total capacity is 300Ah. Change all other parameters as per your requirements.

## Cell Module installation order

There are no requirements for installation order for Cell Modules, but it is recommended to start from bottom, going up the pack. Bottom optical isolator must be connected to Emus Control Unit's **RX+** and **RX-** signals. Similarly, Cell Module at the top of pack via Top optical isolator connects to **TX+** and **TX-** of the Emus Control Unit.

Make sure Emus BMS Control Unit is powered up, install Cell Module on be bottom cell of the pack and connect it to Control Unit. All Cell Modules have green LEDs, that blink each time correct digital data packet is received (interval is configurable via Emus BMS Control Panel software) - this, going up the pack module by module, helps determining faults during installation.

Connections of signal wires can be easily done without tools, by pushing back spring-loaded lever and pushing a bare end of the wire in to a hole of connector, all the way. The connectors have markings next to them showing “Dn” and “Up”. “Up” means upward direction i.e. going to next module in the stack towards positive (+) terminal of the battery pack, starting from the bottom (-). “Dn” means opposite downward direction, towards negative (-) terminal of the battery pack. Connect the “Up” signal of lower adjacent cell to “Dn” signal of upper adjacent cell.

**HINT:** Modules of type A and B are identical, except the opposite direction of communication signal: **Up** and **Dn** signals are on different sides to allow neat installation without loops. Modules can be swapped from Bot-A-B-A-B-A-B-Top to Bot-B-A-B-A-B-A-Top, if required.

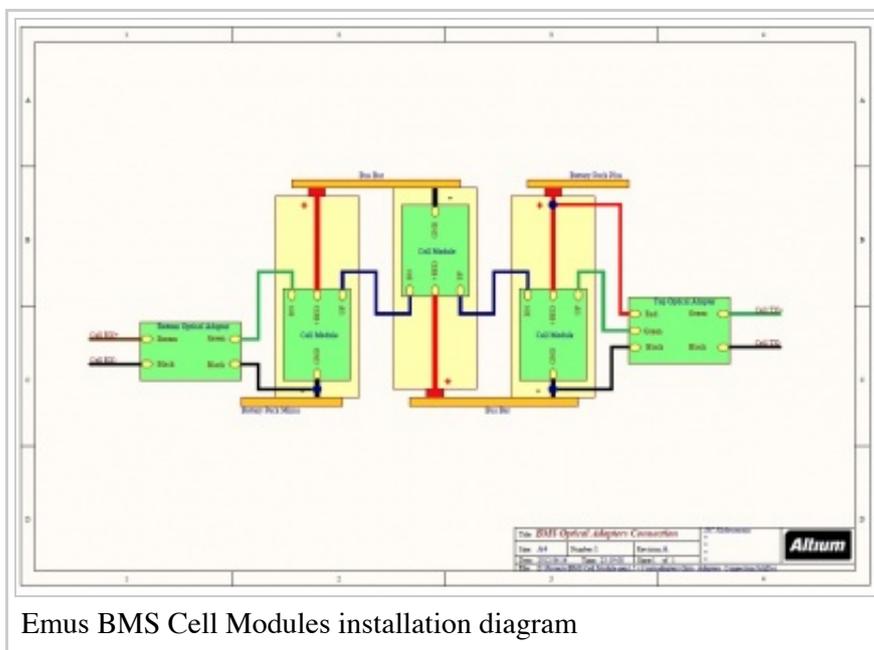
**WARNING:** Please pay special attention to the cell and module's polarity! Cell Module must be bolted onto cell's negative (-) terminal and module's wire must be bolted onto positive (+) terminal of the cell. Connection in reverse order even for a short period of time will result in Cell Module damage! This type of Cell Module failure is not covered by warranty.

**WARNING:** Cell module one-wire communication line is not designed to withstand high voltage swings. This means that data line must be disconnected during maintenance (disconnection) of power line between those modules. This also applies to any other circuitry between cells, that can induce high voltage swings (above few volts) between adjacent cells: long power line wires, fuses, circuit breakers, contactors, etc. If such case is required or a whole battery pack is split into smaller packs, such as in front and back of the vehicle, additional Group Modules are needed. Consult JSC Elektromotus customer support for further information.

## Mechanical connection

Bolt a Cell Module on the cell in the following scheme (top to bottom of the assembly):

1. Bolt



2. Spring washer
3. Washer
4. Emus BMS Cell Module
5. Washer
6. Cells inter-connection bus-bar.

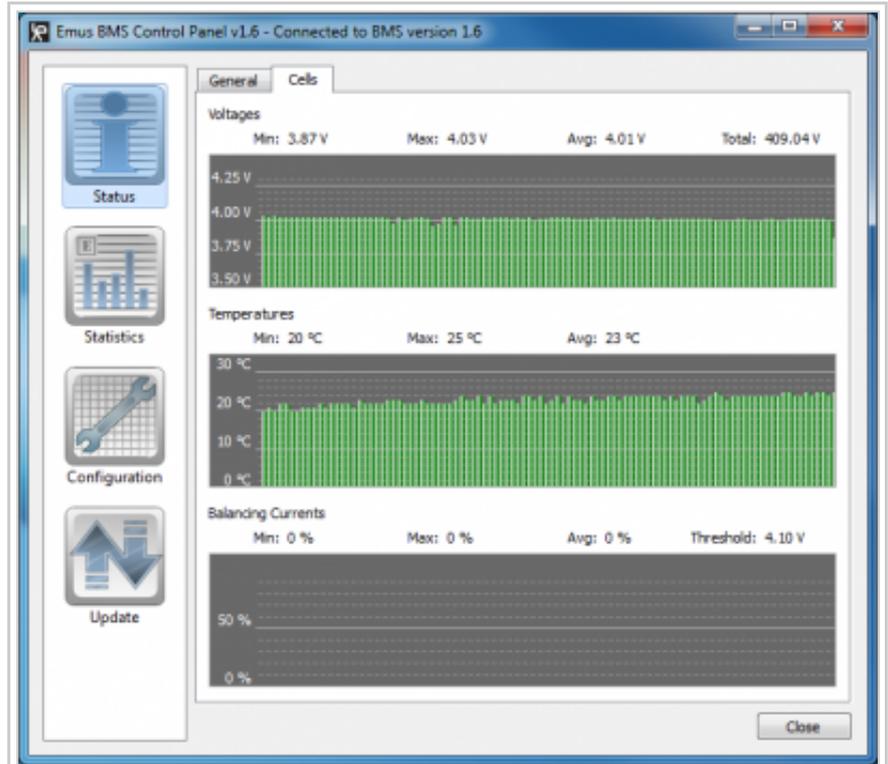
This applies for both Emus BMS Cell Module itself (negative (-) contact) and it's red wire (positive (+) contact).

Once all Cell Modules are installed and connected, the Emus BMS Control Unit should be able to read voltages of all cells. The Emus BMS Control Panel's Cells status tab should show a bar graph of cell voltages of all pack. In our example, 102 cells are connected.

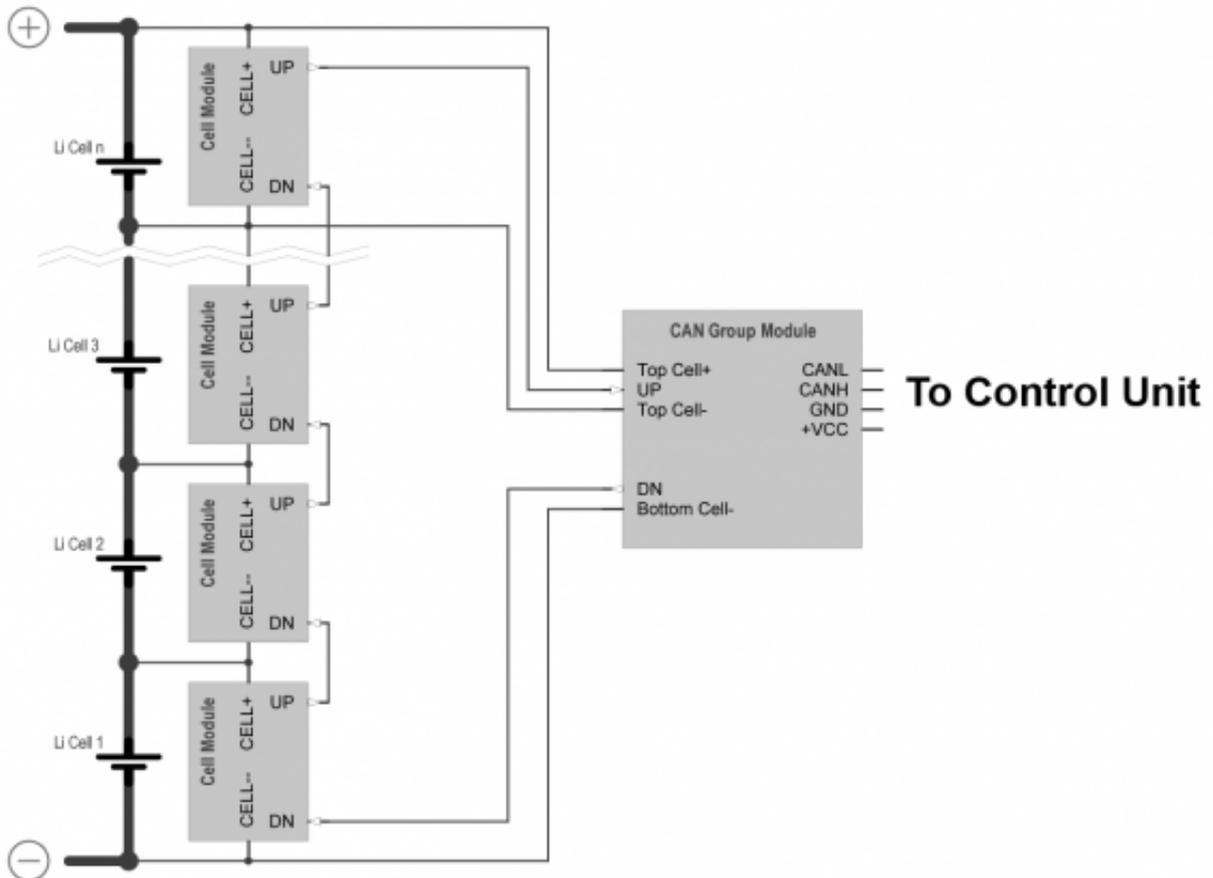
If you see something similar then you've completed your Cell Modules installation!

### CAN Cell Group Module installation order

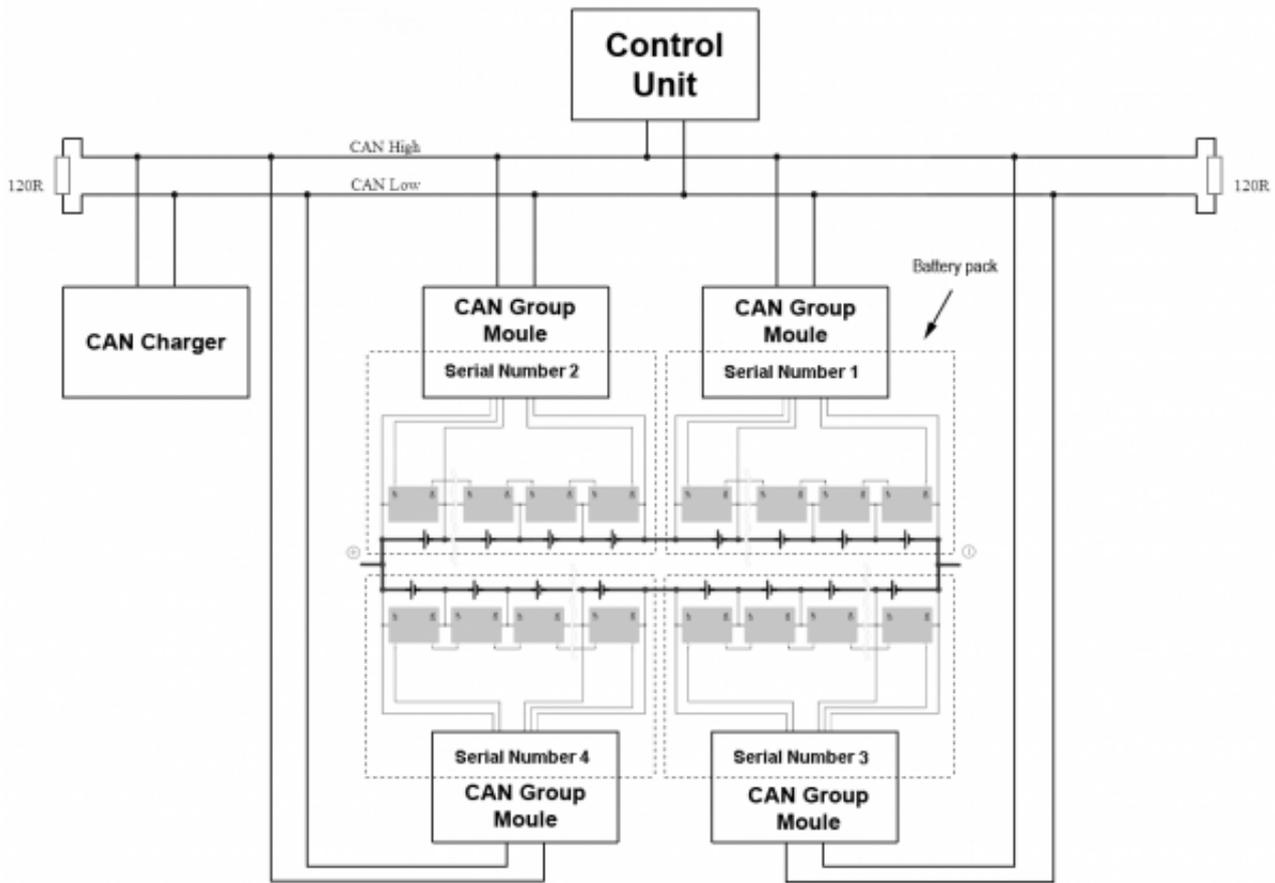
If CAN Cell Group Modules are use for cell communication, each group module has to be connected to the group of cells in the same way as a series of cells is connected to Control Unit, as show in the connection diagram below.



Emus BMS Control Panel's bar-graph of all cell voltages in the battery pack



**NOTE!:** the recommended connection method for CAN Cell Group Modules is to connect the group module with the smallest serial number to the cell group with the most negative potential (the one closest to the negative terminal of the cell string), and to connect the rest of the group modules by their serial numbers in ascending order. The last group module with the biggest serial number in such case would be connected to the most positive cell group (the one closest to the positive terminal of the pack) . If several parallel strings are used, the ascending order should continue from one string to another. See the example connection diagram below. For further information on how to configure CAN Cell Group Modules, refer to Configuration manual ([http://elektromotus.lt/wiki/index.php?title=BMS:\\_Configuration\\_Manual\\_v2.x#CAN\\_Devices\\_configuration](http://elektromotus.lt/wiki/index.php?title=BMS:_Configuration_Manual_v2.x#CAN_Devices_configuration))



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