BMS: Quick Start Guide

Emus BMS Quick Start kit - cell cable

Emus BMS Quick Start kit - colored wires

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.

Connect 12V power source

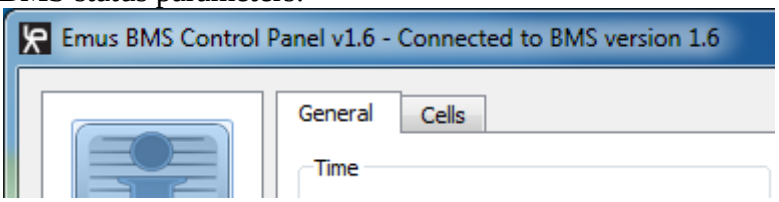
The Emus BMS Control Unit needs 12 volts DC power from vehicle's auxiliary battery or other 8-18 Vdc source. Connect 12V battery's negative (-) tab to ***GROUND*** and battery's positive (+) tab to ***+12V*** wires of the 22-pin connector.

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 also on our webpage

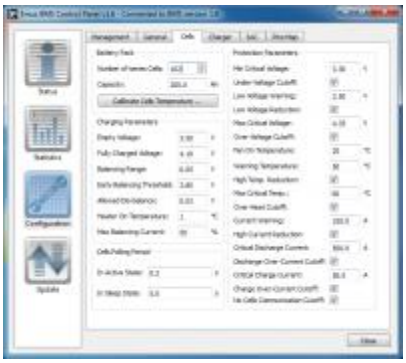
Start the Emus BMS Control Panel

Emus BMS Control Panel software application can be found also on our webpage. 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



Emus BMS Control Panel Cells configuration page

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 Cells* is configured by selecting *Configuration* page and *Cells* tab. We have battery pack with 102 series cells, so we enter *Number of Cells* equal to 102 for demonstration purposes. 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 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.

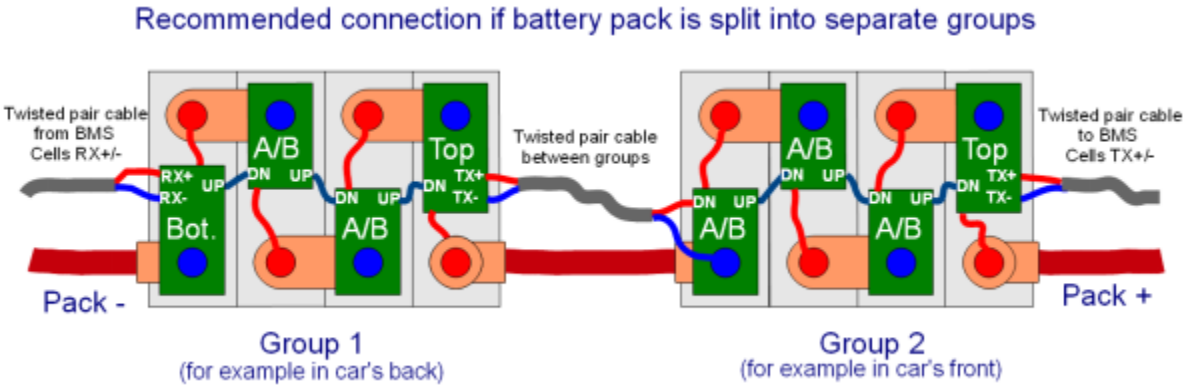
In the *Capacity* field, enter a rated cell's capacity in Amp-hours (Ah), specified in cell manufacturer's datasheet. If multiple cells are used in parallel, specify a total combined capacity here. For example, three parallel cells of 100 Ah is a total of 300 Ah. Change all other parameters as per your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

Install Cell Modules

There are 4 types of Emus BMS Cell Modules to allow nice and tidy installation on the battery pack:

- Bottom
- Type A
- Type B
- Top

The type of Cell Module is printed on the module itself. Bottom ant Top Cell Modules have optical isolation and are connected to Emus BMS Control Unit via shielded twisted-pair cable. Bottom cell module is dedicated to be installed on the cell which has negative (-) terminal of the whole battery pack. Top module is installed on the cell which has positive (+) terminal of the pack. Type A and B modules are intended to be used in close proximity to each other and to Bottom/Top modules and are installed on the cells in between, as illustrated below:



WARNING: If whole battery pack is split into smaller packs, such as in front and back of the vehicle, additional Top module and twisted-pair cable must be used in between. 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.

Installation order

There are no requirements for installation order for Cell Modules, but it is recommended to start from the Bottom Cell Module, going up the pack. Bottom Cell Module's **RX+** and **RX-** signals should be connected via shielded twisted pair cable to Control Unit's **CELL RX+** and **CELL RX-** wires correspondingly. It is recommended to use shielded twisted pair cable

whose shield is connected to **GROUND** of the Emus BMS Control Unit. Similarly, Top Cell Module's **TX+** and **TX-** must be connected to **CELL TX+** and **CELL TX-** accordingly.

Make sure Emus BMS Control Unit is powered up, install Bottom module on be bottom cell of the pack and connect it to Control Unit via twisted pair cable. 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.

Mechanical connection

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

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!