



Energy Management System EMS Extension

Installation and User Manual

This manual is an addition to the TAO EMS installation and user manual
Revision A.01



TAO Performance

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1. OVERVIEW

EMS Extensions are designed to expand the TAO EMS functionalities to batteries up to 48 volts.

TAO EMS manages four cells in series (12 volts). One EMS Extension is required for each additional four cells in series


Battery voltage	Cells in series	# EMS Extension
12	4	0
24	8	1
36	12	2
48	16	3

- Each EMS extension is connected to a group of four cells in series
- All the EMS Extensions are connected in a daisy chain to the TAO EMS

2. INSTALLATION AND CONFIGURATION

2.1 Connection to the battery

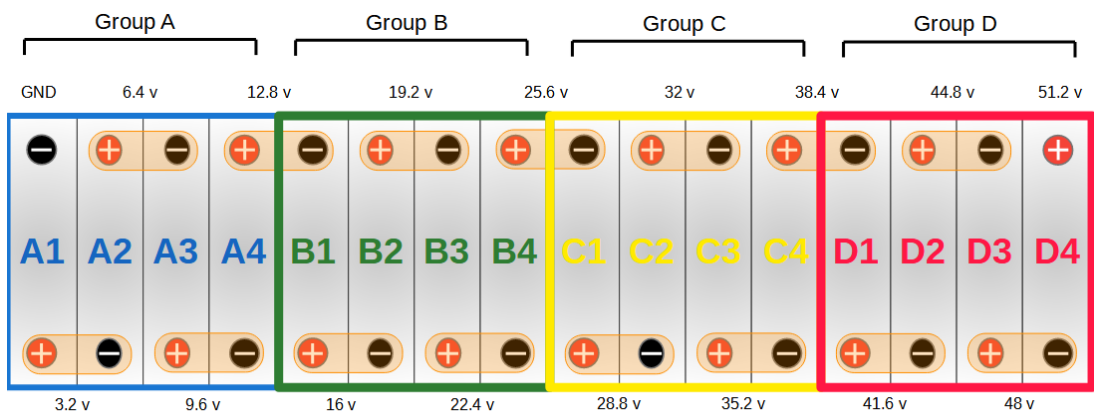
Each EMS Extension is equipped with the same wire harness and the same fuse box as the TAO EMS.



**Remove all the fuses from the fuse boxes
before connecting the wire harness to the battery cells.**

Identify each group of four cells by a letter (A, B, C, D)

- group A is the first one with it's negative stud connected to the installation ground
- following 4 cells are group B.....
- in each group cells are numbered sequentially from 1 to 4



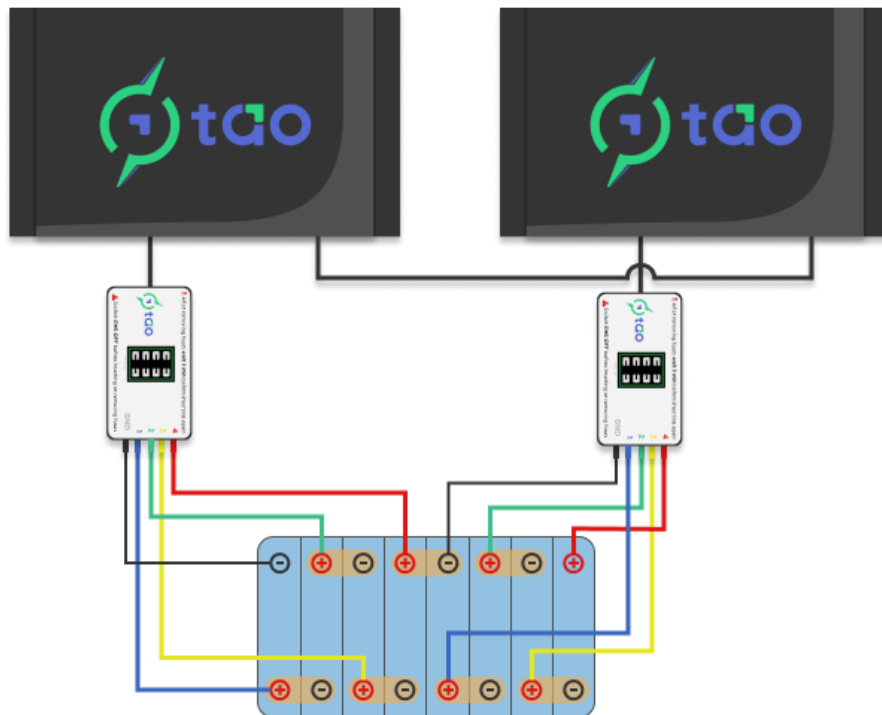
16 lithium cells in series (8S) = 48 volt

EMS Extension - installation and user manual V A01. Operating Procedures
Connect each wire harness to the group of four cells it will manage:

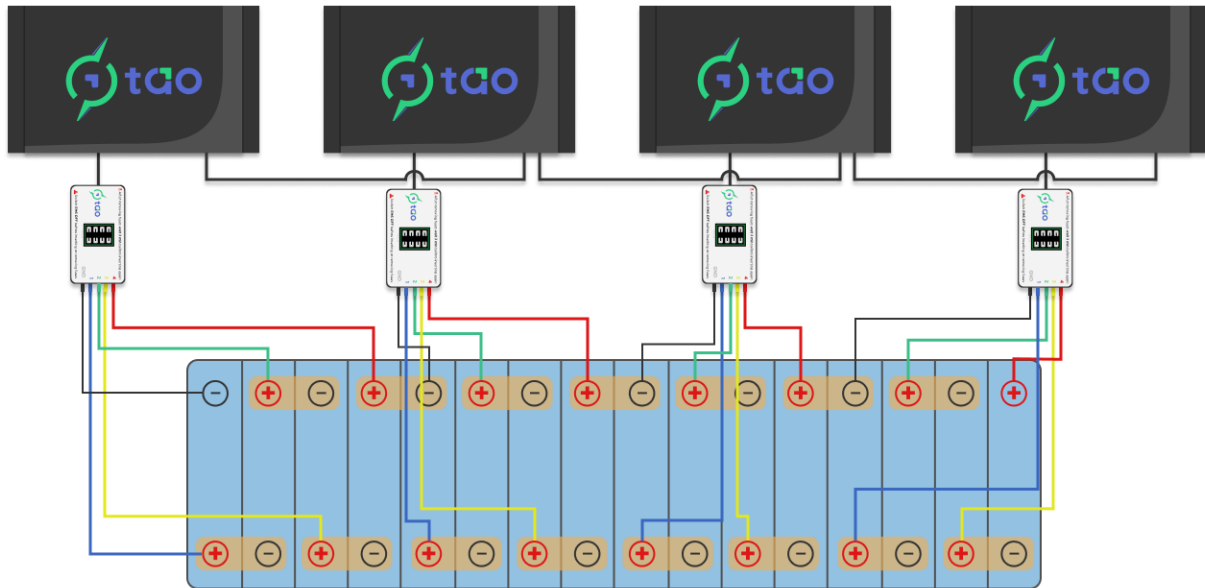
- the EMS is connected to "group A"
- Extension 1 is connected to "group B"...

Wire / connector colour	Cell #	Cell post
black	1	Negative
blue	1	Positive
green	2	Positive
yellow	3	Positive
red	4	Positive

24 volt installation



8 lithium cells in series (8S) = 24 volt



16 lithium cells in series (8S) = 48 volt

2.2 Interconnection between EMS and Extensions

EMS and Extensions are interconnected using cables with RJ45 connectors. If the EMS and the Extensions have been purchased as a kit from TAO Performance these interconnections are already done.

1. Identify the connectors lined-up with the label on the covers:
 - "Extension" on the EMS
 - "EMS / Lower ext" and "Higher ext" on the EMS Extension
2. Connect the first cable:
 - from the EMS (connector: Extension)
 - to the first Extension (connector: EMS / Lower ext)
3. connect the second cable:
 - from the first Extension (connector: Higher ext)
 - to the next Extension (connector: EMS / Lower ext)
4. keep connecting the additional EMS Extensions in a daisy chain...
 - from connector "Higher ext"
 - to connector "EMS / Lower ext"

2.3 Hardware configuration

If the EMS and the Extensions have been purchased as a kit from TAO Performance the hardware configuration is already done.

Looking at the EMS at the same angle as the above pictures:

Last EMS Extension in the daisy chain (Top of stack):

- slide the TOS switch on the bottom to the right (marked "I")

EMS and other intermediate Extensions:

- slide the TOS switch on the bottom to the left (marked "O")

2.4 Firmware configuration

Use the EMSconfig application to configure the EMS parameters for the right installation voltage:

Firmware version 1.23 Upload to EMS

General

BMS address

Battery voltage 12 volts 24 volts 36 volts 48 volts

Measure frequency seconds

Relays activated by default 1 2 3 4 5 6

Shutdown relays 1 2 3 4 5 6

Relay sequencing delay seconds

Output 1 pre-charge delay seconds

Thermistors Beta coefficient

You will also need to adjust the parameter "Mini battery voltage for 100% SOC":

SOC

Nominal battery capacity Ah

Battery efficiency %

Mini battery voltage for 100% SOC V

Max current for 100% SOC A

Mini time for 100% SOC seconds

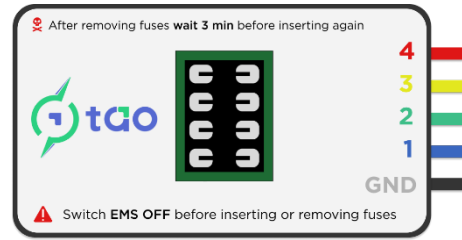
Cell voltage when empty V

3. OPERATING PROCEDURES

3.1 Fuse insertion and removal

The procedure is the same for the EMS and each Extension.

Each fuse corresponds to one cell wire numbered from 1 to 4:



Insert the fuses only AFTER the wire harness for the EMS and each Extension is connected to the battery

Remove the fuses BEFORE the wire harness for the EMS and each Extension is disconnected from the battery

3.2 Switch ON and OFF

- The Extensions must be switched ON before the EMS:
 - no doing so will make the EMS self-diagnostics fail
- The EMS must be switched OFF before the Extensions
 - not doing so will activate a number of warning and alarms