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Alternator Park
Montague Gardens
Cape Town
7441
South Africa



INSTALLATION MANUAL



SS4143-11

Advanced Lithium-Ion battery

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Introduction

This manual is intended to provide assistance to an installer for the installation and commissioning of the range of Solar MD Lithium Ion phosphate (LiFePO₄) energy storage solutions.

Product Description

The SS4143-11 battery solution is available in one standard size and can be paralleled to meet most residential applications. The rated voltage is 51.2V nominal (to suit 48V systems). Larger systems are provided by Solar MD based on specific project requirements.

WARNING: Read the entire document before installing or using the Solar MD battery. Failure to comply with the instructions or warnings in this document could result in electrical shock or serious injury that can result in death or damage to the product that can render the SS4143 Solar MD battery inoperable.

Product Specifications

All SS4143-11 specifications & descriptions contained in this document are verified to be accurate at the time of printing. Solar MD reserves the right to make any product revisions & improvements at any time.

Errors or Inaccuracies

To communicate any inaccuracies, omissions or to provide general feedback regarding this manual, send an email to info@solarmd.co.za

Copyrights

All information in this document is subject to the copyright of Solar MD (Pty) Ltd. Additional information is available upon request.

Safety Information

This manual contains important instructions and warnings that must be followed when using SS4143-11.

Read all instructions before installing and using the SS4143-11.

Warnings

Cautions



- Use SS4143-11 only as instructed.
- For communication and other information please read the BMS manual.
- Do not attempt to disassemble, repair, modify, or tamper with this battery unit.
- Do not insert foreign objects into any part of the battery unit.
- Avoid exposure to any moisture.
- Do not expose to extreme temperatures.
- Do not drill any holes into the box.
- Use only an approved Solar MD installer to install this product.

Failure to comply will void the warranty

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Specification

Solar MD 14.3kWh SS4143-11 specification			
Battery type	Lithium Iron Phosphate	Scalability	Yes
Battery module	SS4143	Communication	CANBUS 500kbps / CAN 2.0B
Rated battery capacity	14336 Wh	Can BUS termination	Single 120 Ohm
Output power	Max 10 kW	Canbus ID range:	256 - 499
Usable battery energy @ 0.3°C	13.00 kWh	Protection method	Cell level: uv / ov / oc Position: x / y / x Acceleration: x / y / z Temperature: ot / ut
Nominal voltage	51.2V	Protection phy	Mechanical relay NO
Rated Current (Ampere)	200A	C Rating	0.71C
Number of battery modules	1 module	Com (CANBUS) isolation	Yes 1.5kV
Weight	118kg	Transportation protection	Yes
Operating voltage	44.8V - 55.6Vdc	Indicator	Led, programmable
Communication	CANBUS	Addition IO	3 GPO
Dimensions of SS4143: h/w/d (mm)	650/600 /210	Cell balancing	Passive balancing
Net Weight of SS4143	118 kg	Counters	Cycle counters and SoH
Battery cycle life [+25 °C]	>6000	Storage duration	6 months@+25°C
Charging efficiency	99%	Safety standards compliance	IEC 62619/UN 38.3/UL1642
Operating temperature	-5°C ~+50°C	Cell Certificate	TUV / CE / RCM / UL1642
Transport	UN3480 & UN38.3		

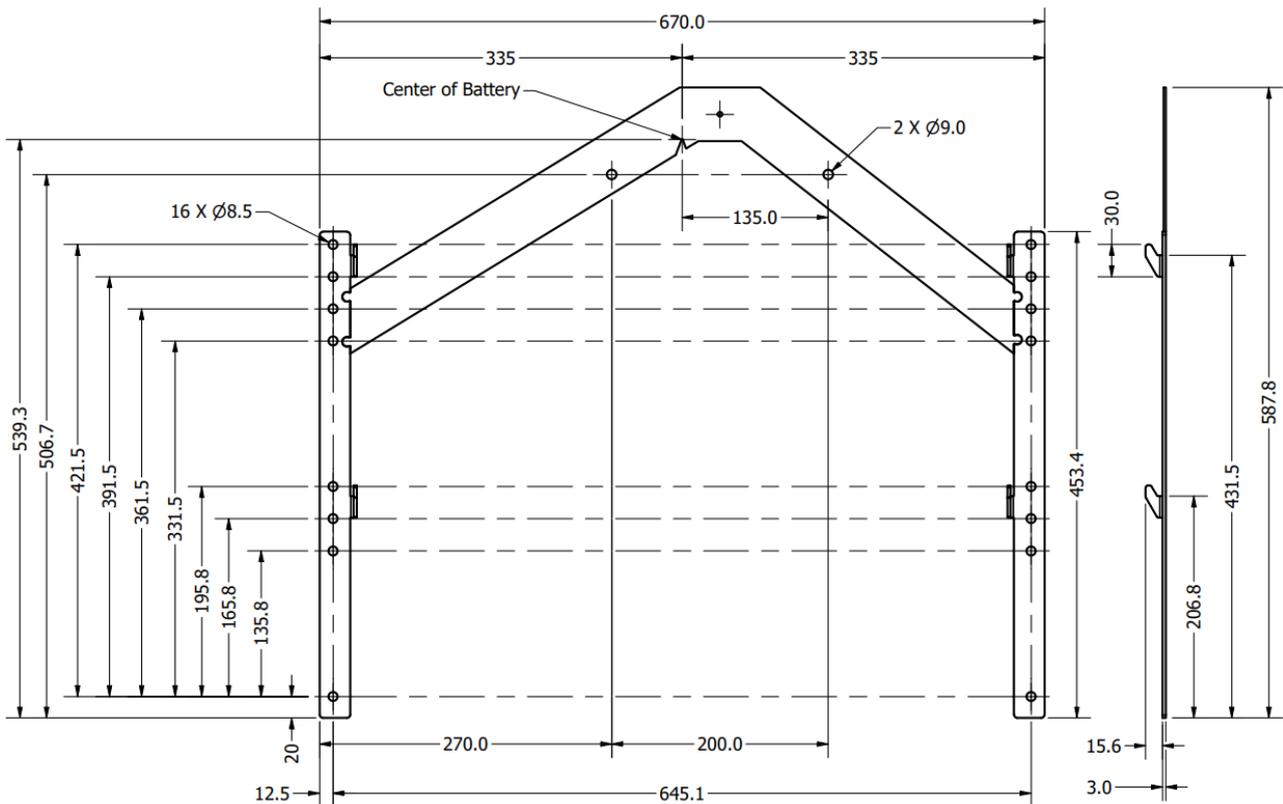
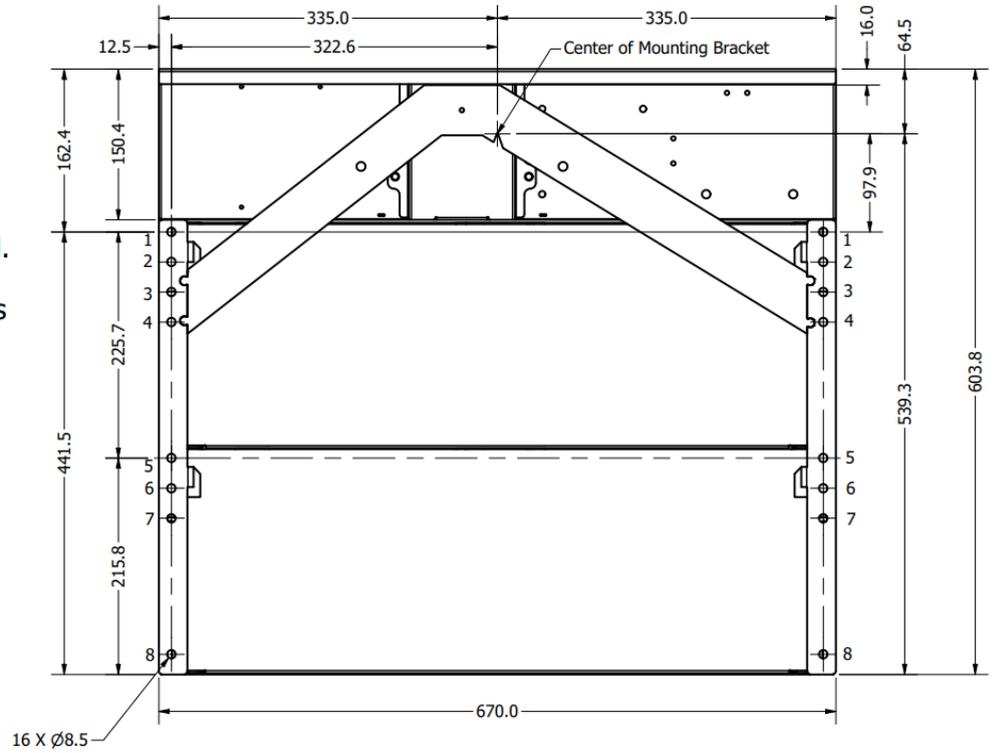
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Mechanical installation

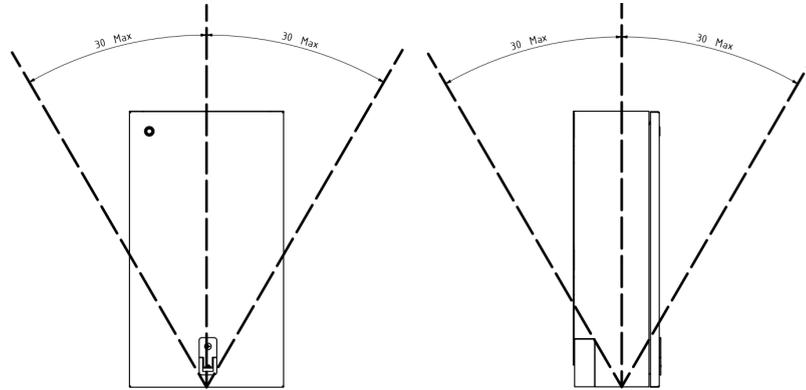
The middle triangle just serves as spacing. No fastening of this piece to the wall is necessary.

Holes 1 & 5 are the most important. Should at least have these 4 secured. Holes 3 & 6 can be the next to be used.

Please use the correct mounting screws for the specific wall surface. Make use of M8 screws/bolts



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Installing top cover plate

Move lid maximum 36mm up,
then move lid towards yourself.
Be mindful of the button that's still connected

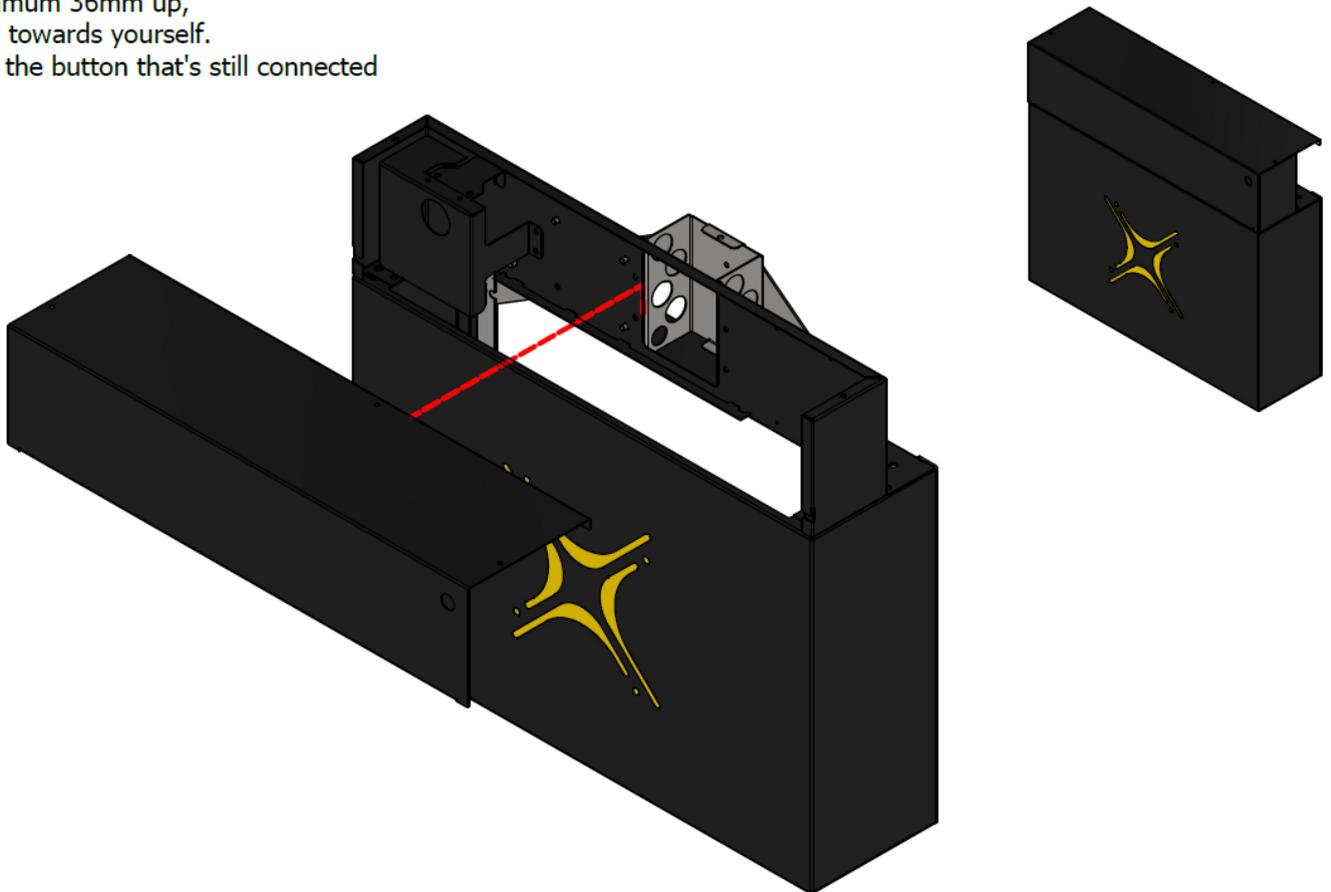


Figure 3a: Top cover installation single or multiple batteries in line

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Installation stacked should be spaced
minimum 50mm vertically
and minimum 15mm horizontally

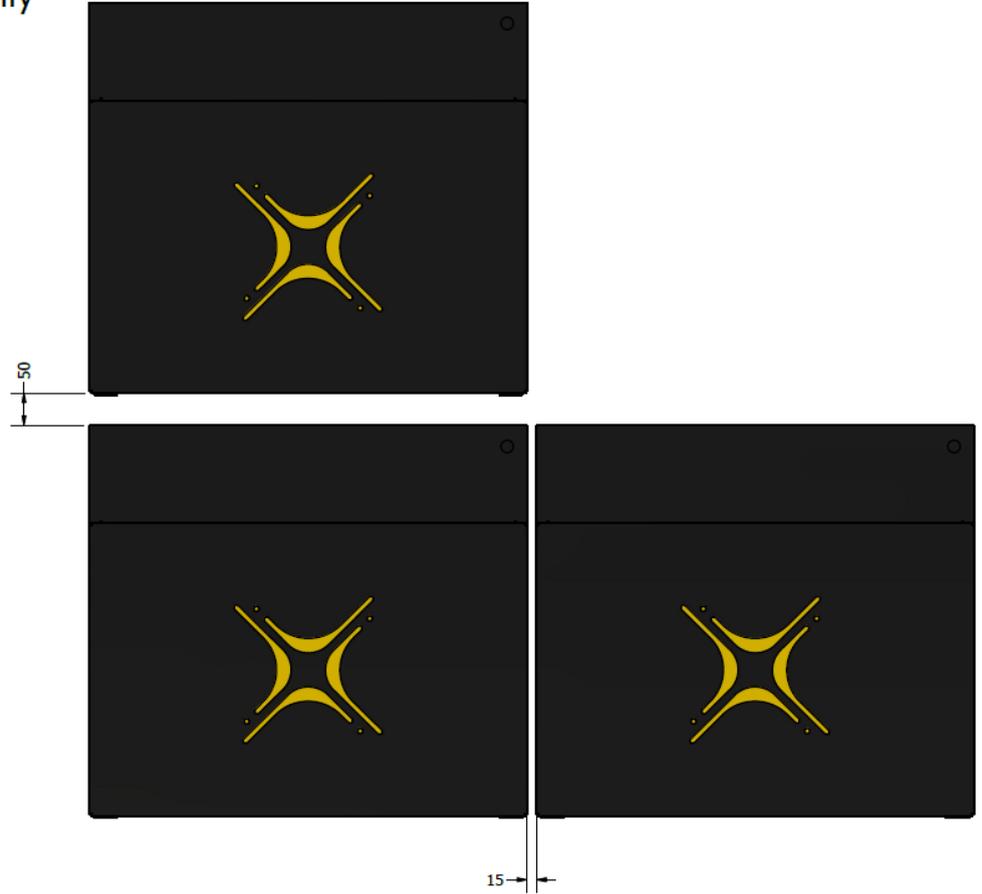


Figure 3b: Battery spacing - installation single or multiple batteries in line

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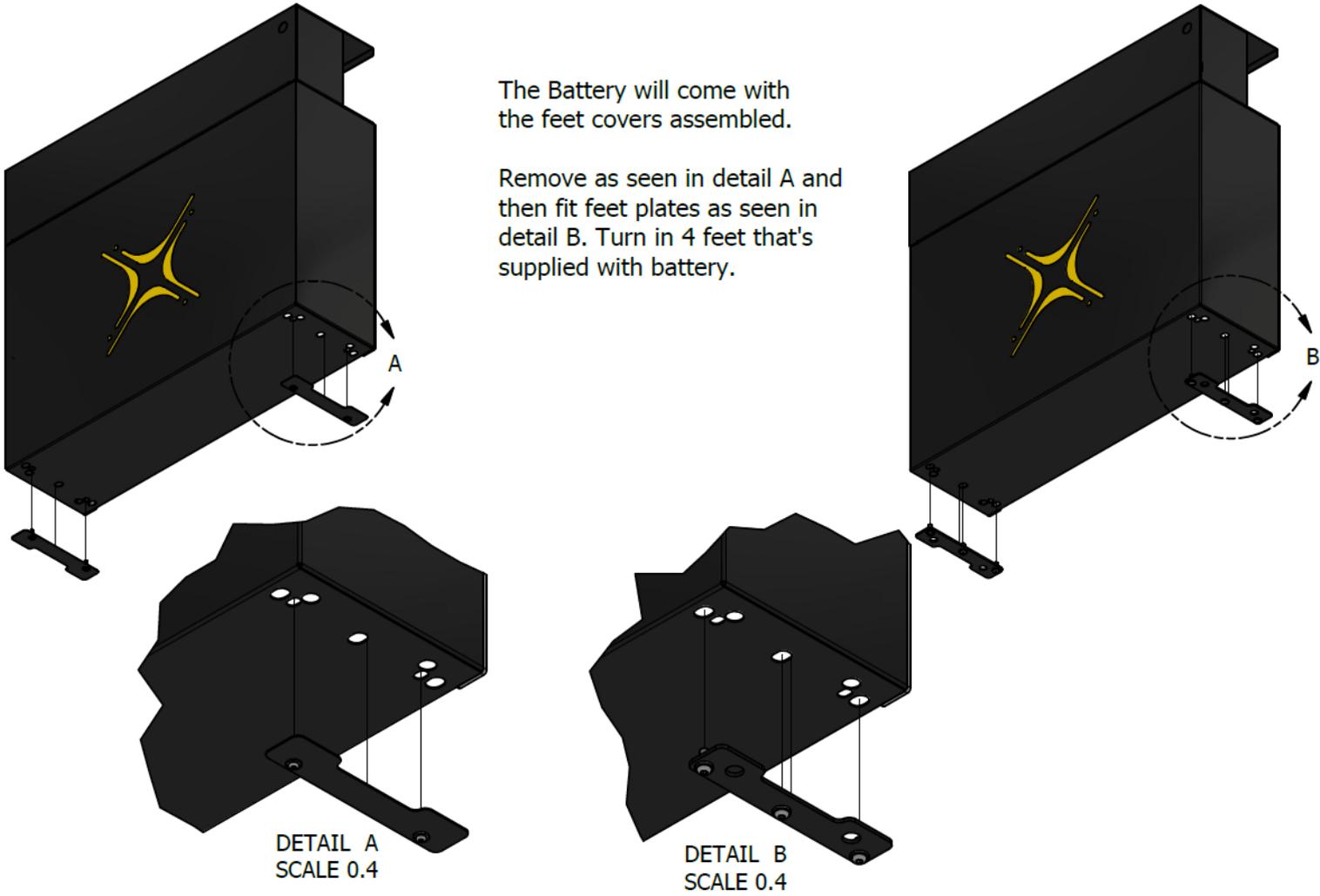


Figure 3c: Battery feet - installation of battery feet

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Electrical installation

Step 1. Before connecting anything be sure that the battery ON/OFF switch is at OFF position. (figure 4)

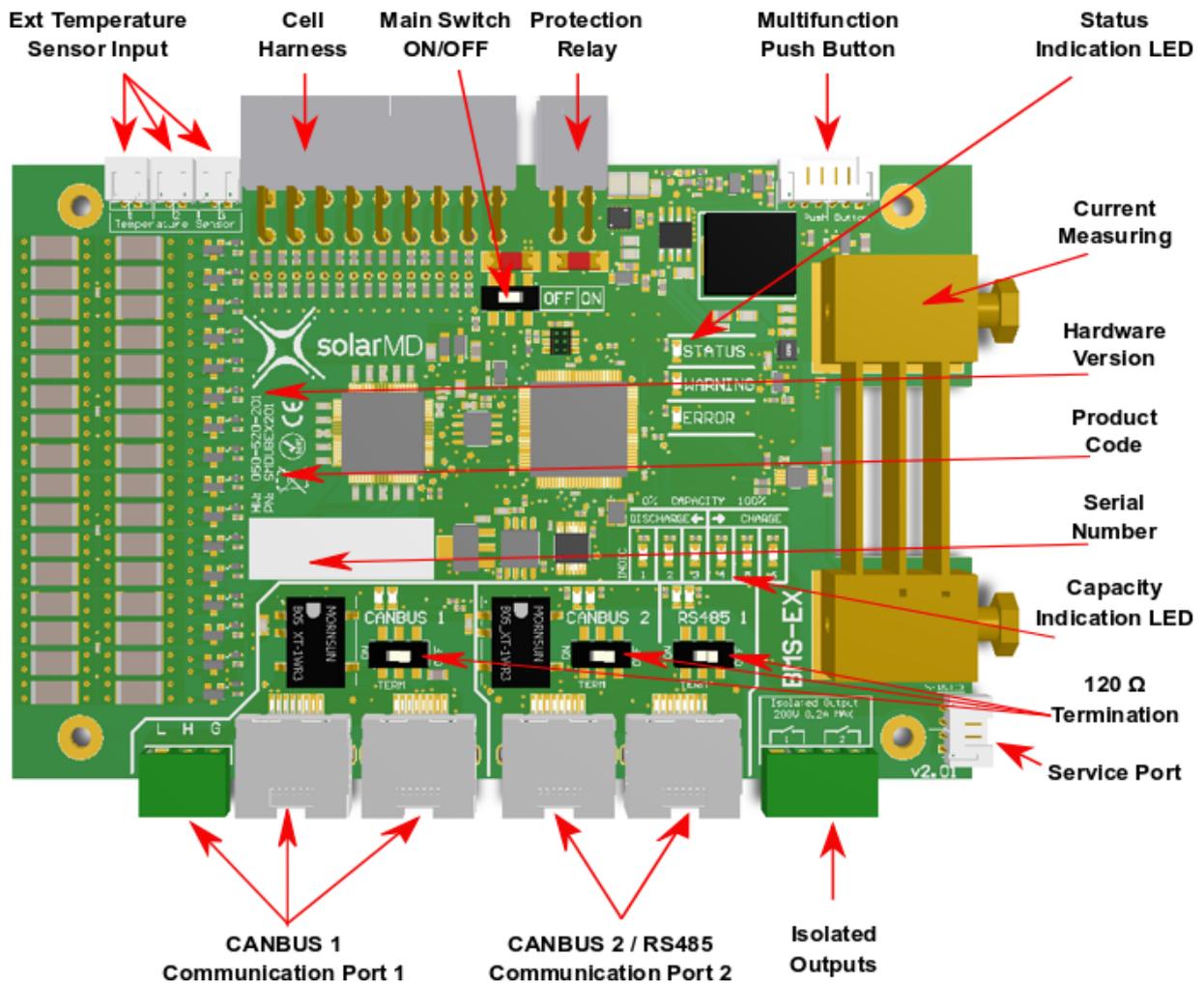


Figure 4: BMS board component locations

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Connecting Inverters/chargers/UPS to the battery unit while it is ON can cause big sparks due to capacitors inside the connected device. This can be harmful to people.



Connecting the main battery terminal must be with the correct size cable based on the rated current of the battery and the charger/inverter in case it's lower.

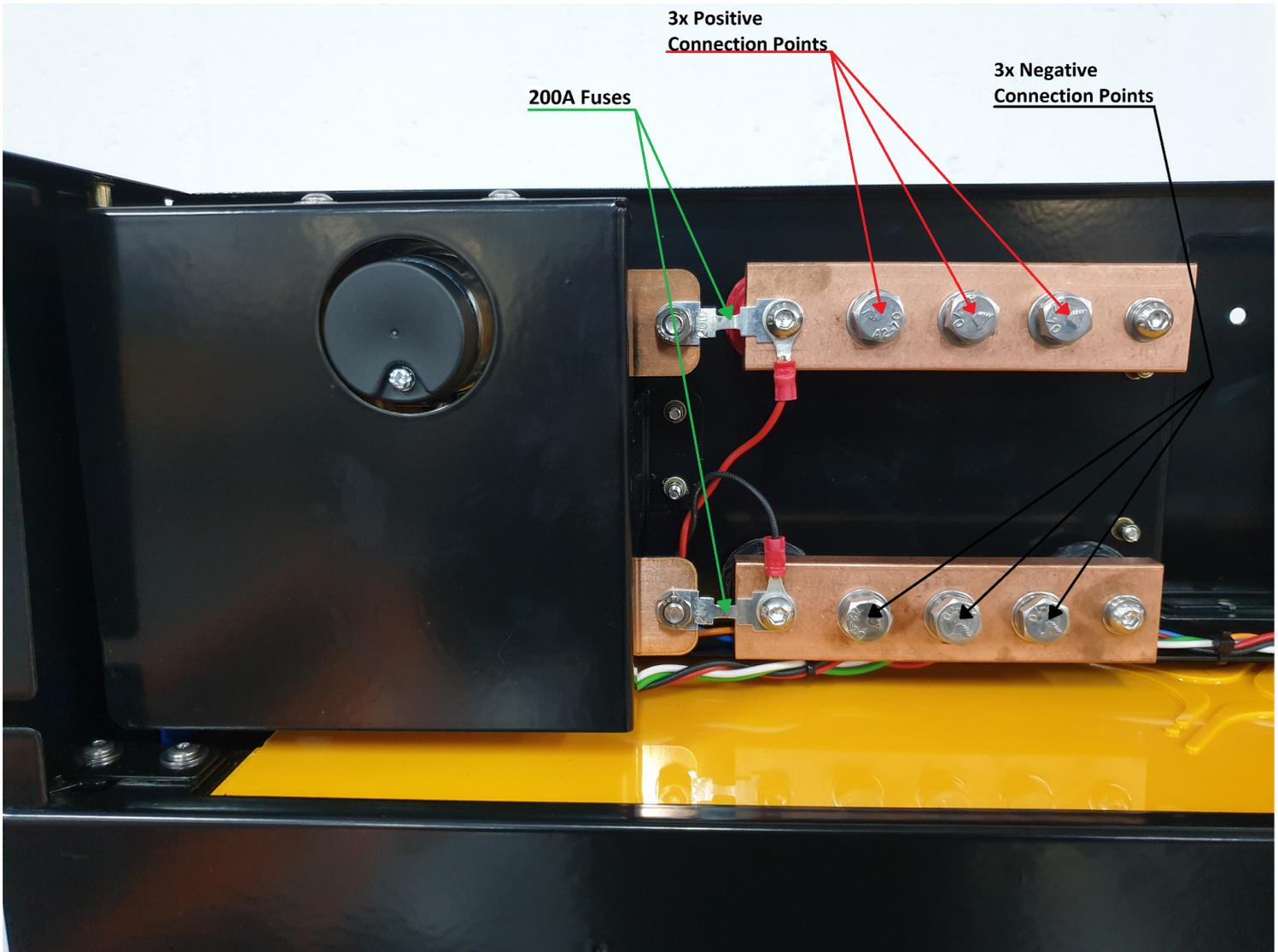


Figure 5: Connection terminals

Step 2. Connect the negative cable to the battery negative busbar and positive cable to the battery positive busbar as shown in figure 5.

Switching the Battery ON

Step 1. Make sure all DC cables are tightened according to specifications.

Step 2. If the battery operates in parallel with other energy sources, make sure that the difference between battery voltage and DC bus is not more than 2.5V. If greater than 2.5V please charge or discharge the other source accordingly until the voltage difference is in a safe range under 2.5V.



Caution! A hot connection with difference in voltage can cause very high equalization current which can burn the fuses of the battery!



Caution! Measure the voltage of the battery before connecting the DC cables.

Step 3. Turn the BMS board ON/OFF switch to the ON position (figure 4).

Step 4. Connect Multipurpose button if not connected to the BMS board connector (figure 4).

Step 5. Hold the multi purpose button until the light comes on.



Warning! If the battery does not switch the main protection contactor ON in 7 sec, please check the BMS board indication LED for faults. See section BMS Error and Warnings.

Multicolor multipurpose button

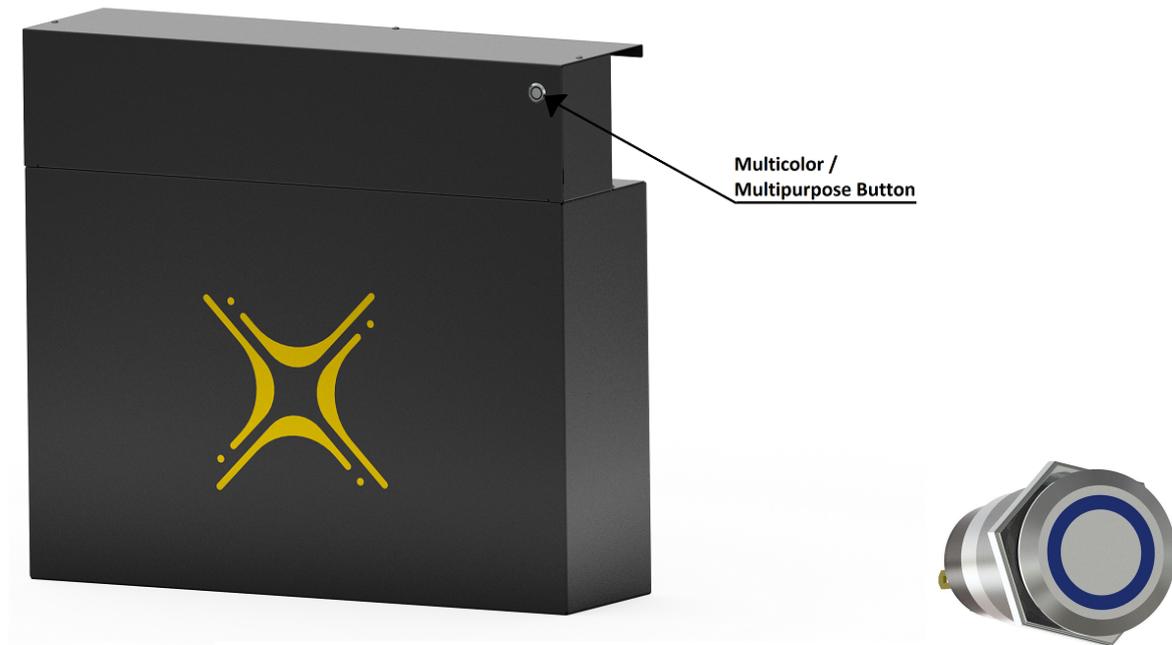


Figure 6 : Multicolor / Multipurpose button.

Button functions

The main functions of **MFB** (Multi Function Button) are:

- Switching Battery On/Off
- Representing various states of the battery with its built-in LED.
- Accessing quick function list
- Parameter Menu

1. Switching battery ON/OFF

- Start by putting the ON/OFF micro switch on the BMS into the ON position.
- To switch the battery ON, simply push and press the button until boards get illuminated.
- To switch the battery OFF, press and hold the MFB for 10 sec until the board switches all lights off.

2. LED States

The MFB is equipped with an LED bezel which can be configured to show different types of battery information. Under normal battery conditions it can be configured to display battery capacity, Current flow direction (charge or discharge) or OFF. This setting will be overridden if the battery is in warning mode or error mode. When in warning mode the LED will flash orange and when in error mode the LED will flash red.

3. Accessing a quick function list.

MFB can execute 4 predefined functions. These functions are accessed by pressing and holding the MFB. While holding, the Indication LEDs (see Figure 10 below) will start to illuminate from left to right. The amount of illuminated LEDs represents the number of the function (1 - 6). To activate a function, release the button when the desired function is selected, then the LEDs will start blinking quickly for around 3 sec. While the LED is blinking, quickly press and release the MFB to confirm the function activation. If no confirmation is triggered the operation will be canceled. The available functions are:

- Function 1: Reserved
- Function 2: By selecting function 2 you can toggle between 3 Indication LEDs functions:
 - Show current flow and direction
 - Show battery capacity
 - LEDs off.
- Function 3: Reserved
- Function 4: Accessing Parameter Menu
- Function 5: Execute override ON for 120 seconds
- Function 6: Execute override OFF for 120 seconds

4. Parameter Menu

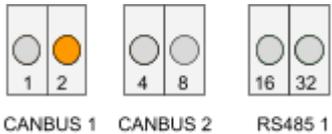
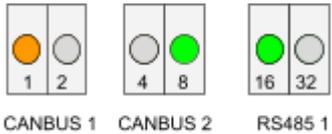
After entering the parameter menu from calling Function 4 you can change BMS parameters. The Parameter Menu uses all 6 indication LEDs to represent a Parameter Number and 6 LEDs from CANBUS1, CANBUS2, RS485 to represent a parameter value. The selected state between

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parameter number and parameter value is represented by LEDs flashing e.g if Indication LEDs are flashing the current menu state is Parameter number.

Changing Parameter number is done by a single quick press of MFB, to switch to value mode press and hold MFB for more than 2 seconds, after that the value LEDs will start blinking quickly.

- Converting LEDs to values.
 Group of LEDs can represent a single digit. These digits can be simply read by a simple method of summing. Each LED in the group represents a number. LED 1 = 1, LED 2 = 2, LED 3 = 4, LED 4 = 8, LED 5 = 16 and LED 6 = 32.
 Summing the values of the illuminated LEDs will give you the calculated number.

Example	Visual Representation	Description
1	 <p>CANBUS 1 CANBUS 2 RS485 1</p>	<p>Sum up all the LEDs that are illuminated to get the represented value.</p> $0 + 2 + 0 + 0 + 0 + 0$ $= 2$
2	 <p>CANBUS 1 CANBUS 2 RS485 1</p>	<p>Sum up all the LEDs that are illuminated to get the represented value.</p> $1 + 0 + 0 + 8 + 16 + 0$ $= 25$

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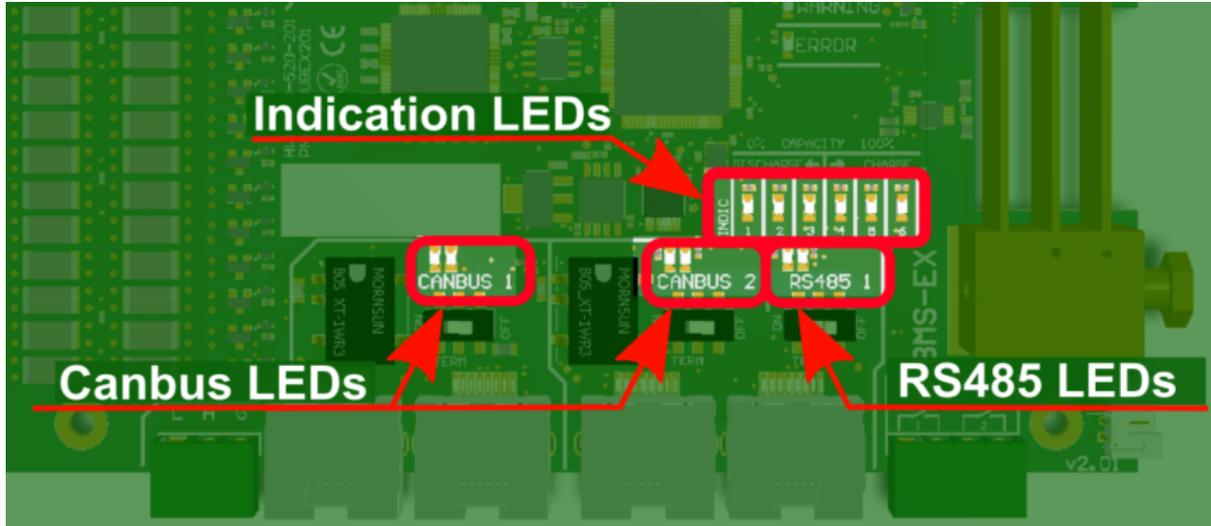


Figure 7: LEDs on the BMS

Main menu navigation

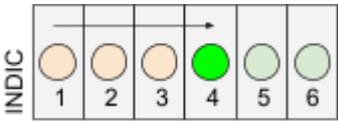
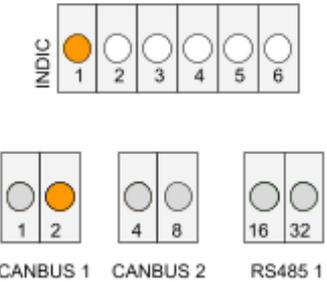
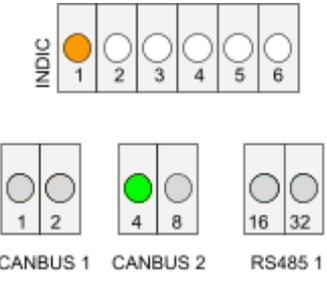
Parameter number	Parameter	Possible value
1	Reserved	
2	Function of Indication LEDs	1. Show current flow and direction 2. Show battery capacity 3. LEDs off
3	Reserved	
4	Enter Sub menu (see below for more detail)	See table below for more info
5	Execute override OFF for 120 seconds	
6	Execute override ON for 120 seconds	

Sub menu navigation

Parameter number	Parameter	Possible value
1	<i>Operation mode</i>	1. <i>Test mode</i> 2. <i>Low voltage mode</i> 3. <i>Production mode</i> 4. <i>High voltage mode</i>
2	<i>Reserved</i>	
3	<i>Inverter type (Low voltage Mode)</i>	1. <i>None (Feature disabled)</i> 2. <i>SMA</i> 3. <i>Victron</i> 4. <i>Sunsynk</i> 5. <i>Goodwe</i> 6. <i>Growatt</i>
4	<i>Reset Cluster Nodes</i>	1. <i>None</i> 2. <i>Reset</i>
5	<i>Reserved</i>	
6	<i>Reserved</i>	

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Example: Navigating the sub menu to change BMS operation from Standalone mode to High Voltage mode.

	Visual Representation	Description
Step 1		<ul style="list-style-type: none"> - Press and hold until the 4th LED starts blinking (the LEDs will blink sequentially from left to right starting at LED 1). - Long press the button to enter into the sub menu.
Step 2		<p>You are now in the Sub menu</p> <ul style="list-style-type: none"> - Quick press to navigate the sub menu until the 1st indication LED is blinking to enter the operation mode (parameter 1 of the sub menu). - Long press to enter into the operation mode setting. - The CANBUS 1, 2 and RS485 LEDs will now start blinking, showing the current settings for the specific parameter. (it's currently showing Standalone mode)
Step 3		<ul style="list-style-type: none"> - Quick press to navigate to production high voltage mode. - Long press to save the setting. - All done! Leave the button for 20 seconds or long for it to go back to its home screen

Button indication

**Access to all features in future development

The Multipurpose button advanced indication functionality, allows the user to choose between 5 different states. Mixed combinations are also allowed when a combination of multiple batteries with BMS-EX are

used. The User can change the preferred stage by logging into their mypower24 Energy Portal and going to the Battery Settings.

Illumination off

**For future development

When this state has been selected, the button serves as an on/off switch without illumination (fixed colour).

Color based on capacity

When this state has been selected, the button shows static illumination in a color based on the state of charge. From RED at 0% SoC (State of Charge) to GREEN at 100% state of charge.

Color based on capacity with current direction based on shading.

**For future development

When this state has been selected, the button shows flashing illumination in a color based on the state of charge and flashing code based on the electrical current direction (charge / discharge). From RED at 0% SoC (State of Charge) to GREEN at 100% state of charge. The flashing code for charge goes through illumination interruption for 1 interval and slow illumination into the color based on the SoC for 5 intervals. The flashing code for discharge represents the opposite from charge - study color for 1 interval and slow loss of color following illumination interruption. Solar MD users refer to both as charging / discharging waves.

Fixed color with current direction based in shading

**For future development

When this state has been selected, the button shows illumination in a color based on the user choice and flashing code based on the electrical current direction (charge / discharge). The flashing code for charge goes through illumination interruption for 1 interval and slow illumination for 5 intervals. The flashing code for discharge represents the opposite from charge - study color for 1 interval and slow loss of color following illumination interruption. Solar MD users refer to both as charging / discharging waves.

Firmware

BMS EX can store multiple firmware versions. Upon startup the bootloader will start the latest version available.

How to Update

Logger V2 can update the firmware of a connected and communicating BMS via CANBUS. The logger stores available BMS-Ex firmwares locally and can send it to the BMS as requested.

Firmware Update Settings

- **Refresh Loaded Firmware info BMS:** Press “Refresh”to see the latest BMS firmware version that has been sent from the logger to the BMS.
- **Check Available Updates:** Press the “Check”button to see the latest BMS firmware version available.
- **Upload Available Firmware to BMS:** If the BMS firmware version is lower than the latest available firmware version then type in the firmware version you would like to upload in the space provided and click “upload”.
- **Write Loaded Firmware:** Once the firmware has been fully uploaded from the logger to the BMS (progress bar should show 100%) click the “write” button. This will start the two step installation process on the BMS.
 - The BMS will first verify the uploaded firmware, during this process the indication LEDs on the BMS will flash slowly from left to right.
 - The second part is installing the firmware, during this process the indication LEDs on the BMS will flash fast from right to left. Once successfully installed the BMS will restart. Verification of a successful update can be seen on the MyPower24 portal.

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Communication

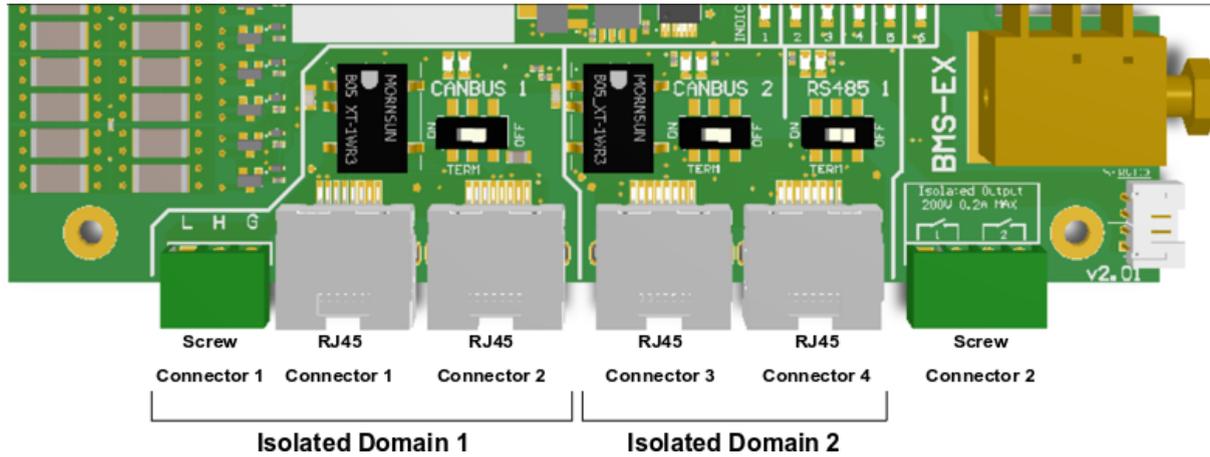


Figure 8: BMS communication ports

The BMS is equipped with three communication interfaces hosted over five connection ports. The Communication ports are split into two domains. Each domain is marked in the board with white contour line and carries an isolation rating of 1500Vdc.

- Isolated Domain 1: Screw connector 1, RJ45 connector 1 and RJ45 connector 2 are for the CANBUS 1 interface.
- Isolated Domain 2: RJ45 connector 3 and RJ45 connector 4 are both denoted to the CANBUS 2 and RS485 interfaces as well as for the remote ON function.

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Pinout

	Isolated Domain 1			Isolated Domain 2		Isolated Domain 3	Ph connector 1
	Screw connector 1	RJ45 Connector 1	RJ45 Connector 2	RJ45 Connector 3	RJ45 Connector 4	Screw connector 2	
Pin 1	CAN 1 Low	-	-	-	-		Gnd
Pin 2	CAN 1 high	GND	GND	GND	GND		RX
Pin 3	GND	-	-	-	-		TX or 5v
Pin 4	-	CAN 1 High	CAN 1 High	CAN 2 High	CAN 2 High		Tx or 5V
Pin 5	-	CAN 1 Low	CAN 1 Low	CAN 2 Low	CAN 2 Low		-
Pin 6	-	-	-	-	-		-
Pin 7	-	REMOTE ON IN (-)	-	RS485 A - / REMOTE ON IN (-)	RS485 A - REMOTE ON OUT (-)		-
Pin 8	-	REMOTE ON IN (+)	-	RS485 B+ REMOTE ON IN (+)	RS485 B+ REMOTE ON OUT (+)		-

Monitoring and Control

BMS-EX uses various communication interfaces and protocols to communicate with the logger and connected inverters.

Charge and Discharge Control

The charge and discharge current and voltage is the maximum and minimum current and voltage range for the battery based on conditions such as cell model, cell voltage and cell temperature. The value is expressed in voltage, current and percentage of rated current and communicated to connected inverters via the logger or CANBUS (2) and RS485 ports.

Settings

Charge Voltage Control: Maximum and minimum cell voltage setpoint at which charging is permitted.

Discharge Voltage Control: Maximum and minimum cell voltage setpoint at which discharging is permitted.

Charge Capacity Control: Maximum and minimum cell capacity at which charging is permitted.

Discharge Capacity Control: Maximum and minimum cell capacity setpoint at which discharging is permitted.

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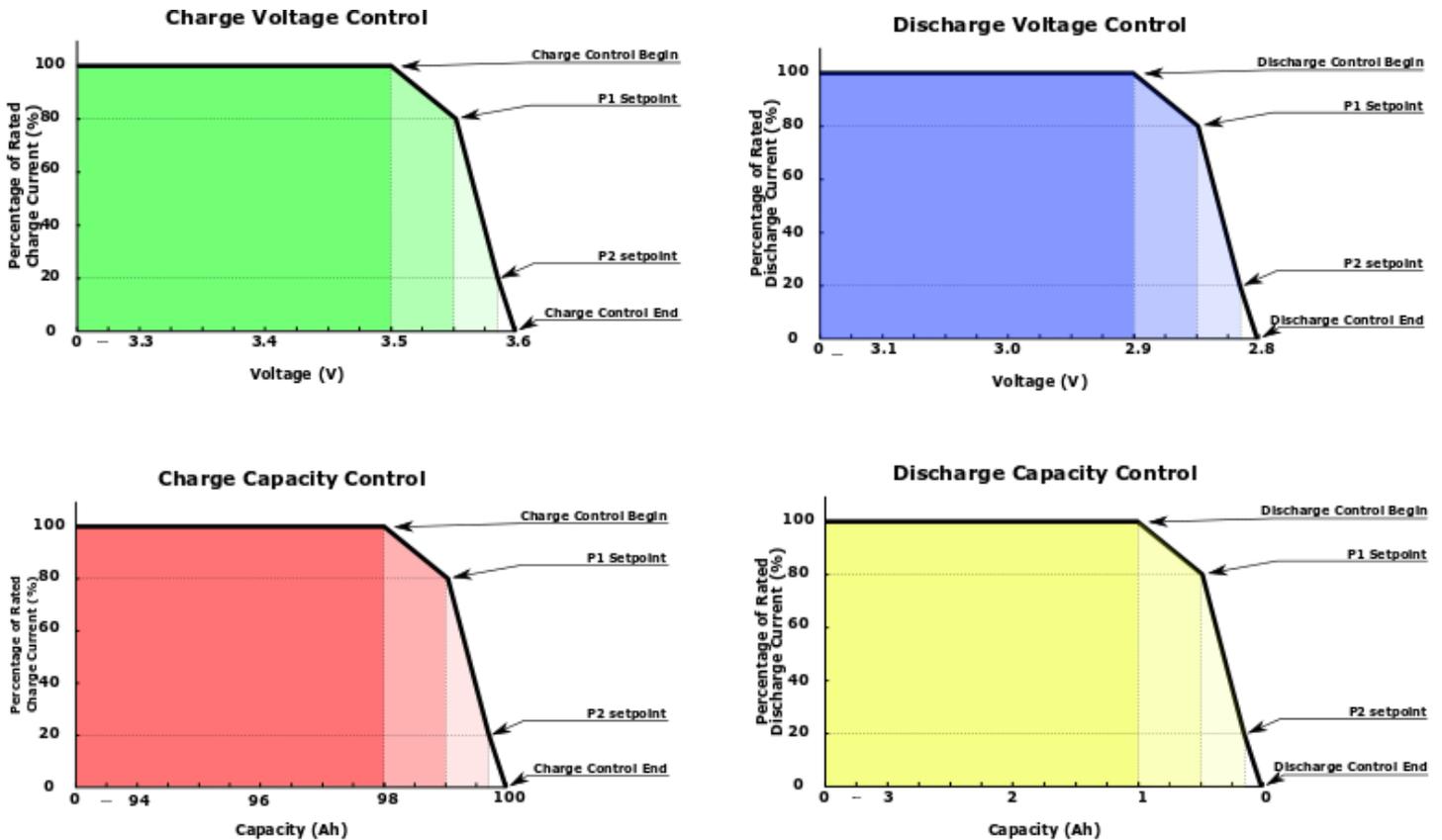


Figure 9: Voltage and capacity based charge and discharge control

CAN BUS 1 and 2

BMS-EX is equipped with two separate CAN BUS interfaces, each with various methods of connection.

- CANBUS 1: Comprising Screw connector 1, RJ45 connector 1 and RJ45 connector 2. This interface is reserved for connecting SolarMD devices (BMS-EX, BMS-EM, BMS-PL, Logger V-series, MPPT3000). The RJ45 connectors allow for easy daily chaining and the screw connector for simple connection with older models. A maximum of 255 devices may be connected to the interface. Each device is assigned a unique CANBUS ID. The range of the CANBUS ID's is from 640 - 895.
- CANBUS 2: For connecting the BMS directly to a compatible inverter / charger for broadcasting charging and discharging current and voltage setpoints.

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Each interface has two indication LEDs which indicate traffic

- Flash Orange 0.5s: Broadcasting, No communication active
- Flash Orange 0.1s: Establishing communication
- Green: Line connected

For stable communication a 120Ω termination selector switch is mounted on the board for each interface.

****Note:** The first and last device in a chain should have terminations ON.

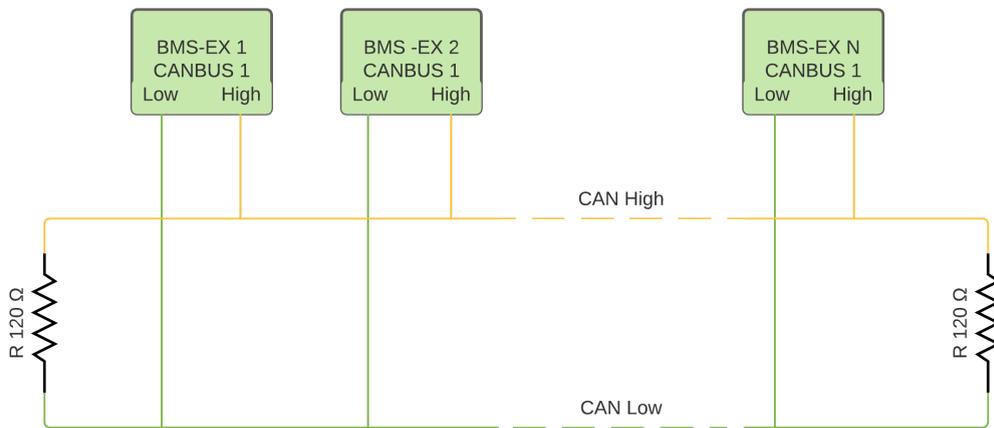
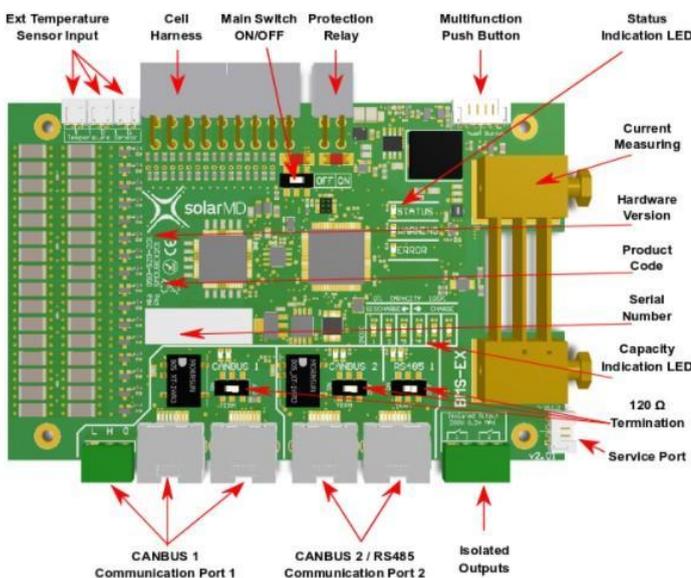
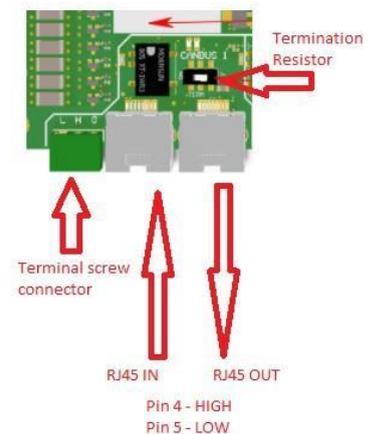


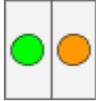
Figure 10: BMS communication ports



Model: BMS-EX



Can bus Warnings and Errors

	CAN BUS Indication LED 	LED Status	Description
1		Green LED - Off	CANBUS interface disabled
		Orange LED - Off	
2		Green LED - Off	Line Open No other devices detected on the Bus
		Orange LED - Flashing with 1 short pulse and 1 long pulse	
3		Green LED - Solid on	Initialising BMS in auto-configuration stage
		Orange LED - Flashing fast	
4		Green LED - Solid on	Duplicated BMS serial number Possible causes non genuine BMS connected
		Orange LED - Flashing with 3 short pulses and 1 long pulse	
5		Green LED - Flashing fast	Communicating
		Orange LED - Off	

BMS Warnings and Errors

Method of displaying general warnings and errors:

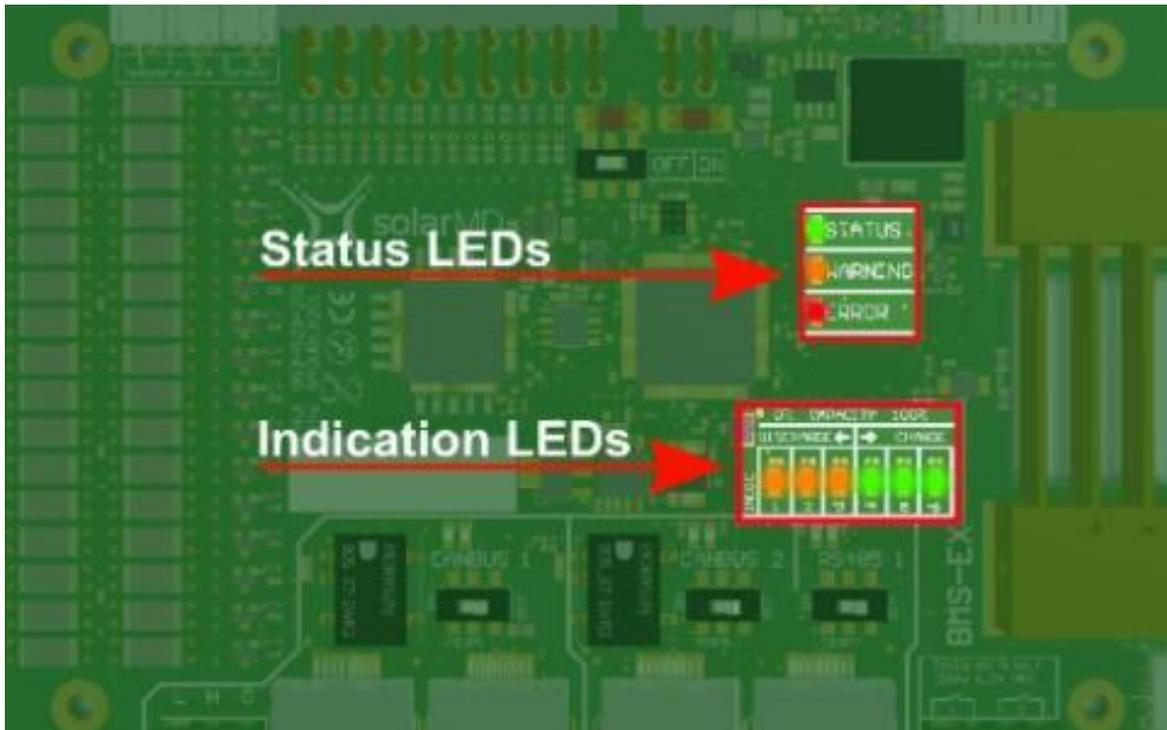


Figure 11 : Display general warnings and errors, main status LEDs and indication LEDs.

The Status LEDs determine what the indication LEDs will show.

1. If the Status LED is Green the indication LEDs will show:
 - a) Battery capacity
 - b) Current flow and direction
 - c) Off

The functionality of the indication LEDs are configurable, see more on this: multifunction push button.

2. If the Warning LED is Orange
 - a) The indication LEDs will show the warning number in binary, which corresponds to that tabulated below in the warning register.
3. If the Error LED is Red
 - a) The indication LEDs will show the error number in binary, which corresponds to that tabulated below in the error register.

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Troubleshooting Warnings / Errors

Code	Cause	Solution
1-2	<ol style="list-style-type: none"> Inverter / rectifier settings may not be correct. Battery cells may be disbalanced 	<ol style="list-style-type: none"> Check the battery settings Contact Solar MD support
3-4	System design is not correct.	Add additional battery, decrease charging / discharging current from your inverter / rectifier / load
5-6	Manual override	Manual override has been activated - please check with your installer
29-30	The BMS is ready to switch on after deep discharge / charge	Connect charger / load to the Battery
5,6,7	The battery is not installed in upright position	Install the battery in the right position
15,16,17	The BMS has been shut down manually or remotely	Switch on the BMS
18,19	The absolute maximum charge/discharge current has been achieved	The BMS will restart automatically, please contact support team or approved installer
21	The BMS is set for different number cells in series as the actually installed	Contact your installer or Solar MD support team
22	Battery cell voltage is way too low.	Fill in the failure report and send to support@solarmd.co.za The unit needs to return to the factory for testing
23	Battery cell voltage way too high	The BMS will restart automatically after pending awake condition
24,25,26, 27,28,30, 31	BMS Internal failure	Fill in the failure report and send to support@solarmd.co.za The BMS will be dispatched to you for replacement
29	Battery factory failure	Fill in the failure report and send to support@solarmd.co.za The unit needs to return to the factory for testing
CANBUS Warnings (page 26)		
1	<ol style="list-style-type: none"> Canbus line open. Single CANBUS resistor not terminated. 	<ol style="list-style-type: none"> Check if the minimum of two nodes are connected on the line with the same transmission speed. Check if single resistor is terminated via the jumper. Located top left of can LEDS(Fig 10).

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Status, Warnings and Errors

The BMS-EX is equipped with an onboard diagnostics system. The system will trigger warnings and errors when one or more battery parameters nears or exceeds the operational limit of the cells, cables or the BMS itself.

Warnings and errors are displayed in two ways:

- Events: The BMS generates and stores events when settings are changed or when warnings or errors are triggered. These events are stored in the BMS and sent to the connected data logger. For each event generated a freeze frame is stored showing the exact battery conditions (such as serial number, date and time, voltages, current, capacity and temperature) at the time of the event.
- Indication LEDs: the BMS uses the indication LEDs on the board as well as the LEDs in the Multifunction push button to display warnings and errors.

Status and Indication LEDs

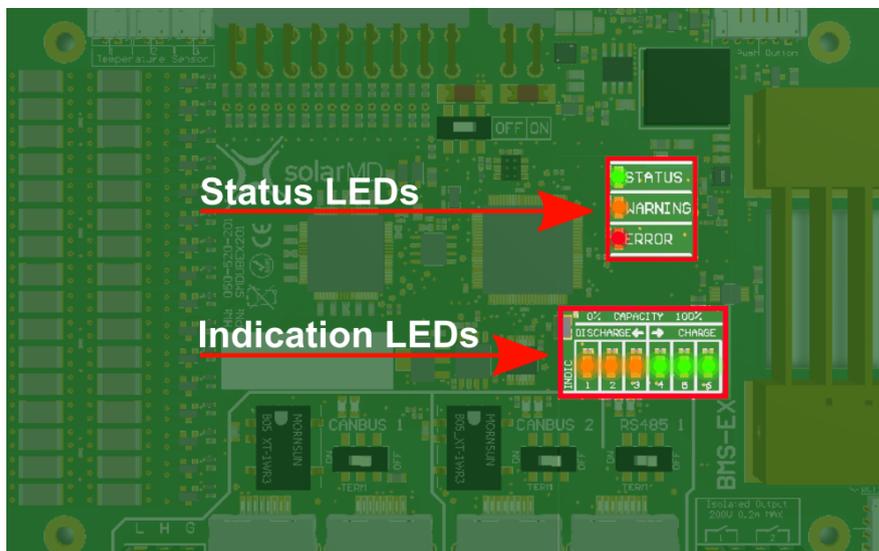


Figure 15: LEDs

The Status LEDs determine what the indication LEDs will show.

1. If the Status LED is Green the indication LEDs can show either:
 - a. Battery capacity
 - b. Current flow and direction
 - c. Off

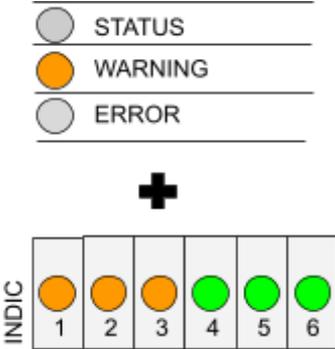
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The functionality of the indication LEDs are configurable, see more on this: [multifunction push button](#).

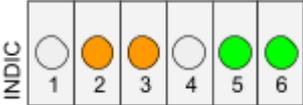
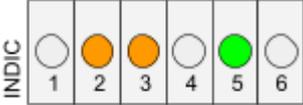
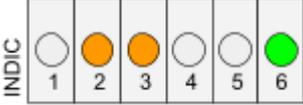
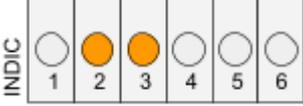
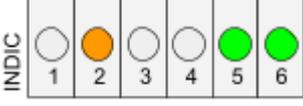
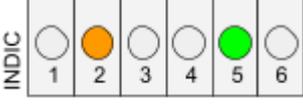
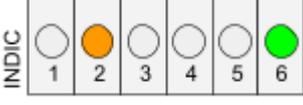
1. If the Warning LED is Orange
 - a. The indication LEDs will show the warning number in binary, which corresponds to that tabulated below in the [warning register](#).

2. If the Error LED is Red
 - a. The indication LEDs will show the error number in binary, which corresponds to that tabulated below in the [error register](#).

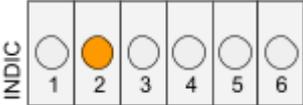
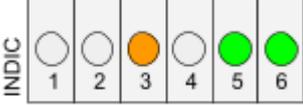
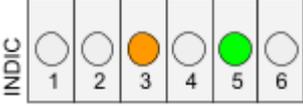
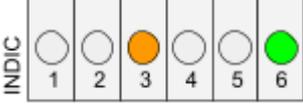
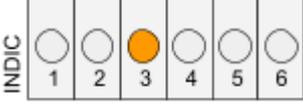
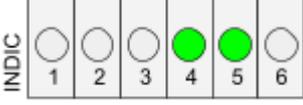
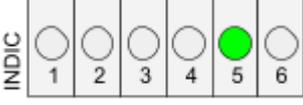
Warning Register

Warning Code	Visual Representation	Description
		<p><i>If the Warning LED blinks ORANGE, refer to the indication LEDs to find the corresponding warning event in the table below</i></p>
31		Pending shutdown
30		Pending Awake High
29		Pending Awake Low
28		Positive fuse blown

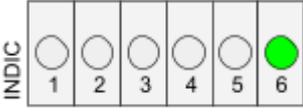
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<p>27</p>		<p>Negative fuse blown</p>
<p>26</p>		<p>Force relay ON (Override ON)</p>
<p>25</p>		<p>Force relay OFF (Override OFF)</p>
<p>24</p>		<p>Master message missing</p>
<p>23</p>		<p>Controlled device coms failed</p>
<p>22</p>		<p>External Temperature sensor 3 missing or faulty</p>
<p>21</p>		<p>External Temperature sensor 2 missing or faulty</p>
<p>20</p>		<p>External Temperature sensor 1 missing or faulty</p>
<p>19</p>		<p>Temperature Control: Discharge Overcurrent</p>
<p>18</p>		<p>Temperature Control: Charge Overcurrent</p>
<p>17</p>		<p>Remote device warning number 3 Specific to connected control device</p>

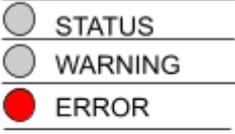
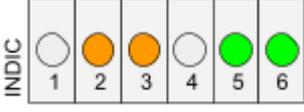
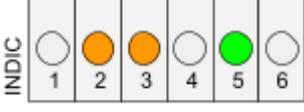
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<p>16</p>		<p>Remote device warning number 2 Specific to connected control device</p>
<p>15</p>		<p>Remote device warning number 1 Specific to connected control device</p>
<p>14</p>		<p>One or more batteries in the cluster are offline</p>
<p>13</p>		<p>Cluster not settings not set</p>
<p>12</p>		<p>Duplicate BMS serial number in cluster</p>
<p>11</p>		<p>Discharge current too high</p>
<p>10</p>		<p>Charge current too high</p>
<p>9</p>		<p>Cell temperature too low</p>
<p>8</p>		<p>Cell temperature too high</p>
<p>6</p>		<p>Different BMS firmware versions detected in the clusters</p>
<p>2</p>		<p>Battery cell voltage too high</p>

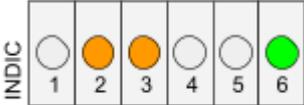
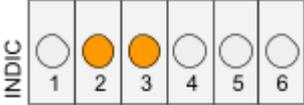
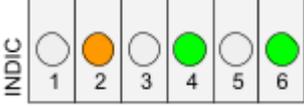
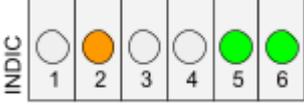
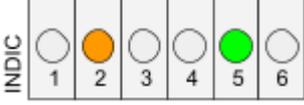
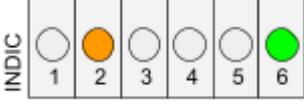
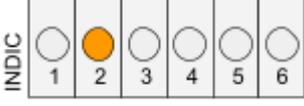
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1		Battery cell voltage too low
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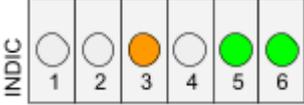
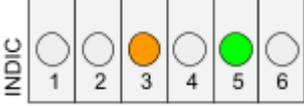
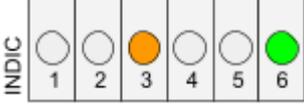
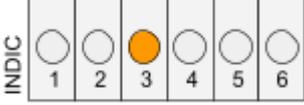
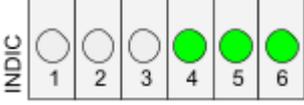
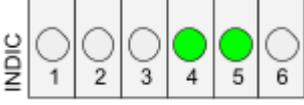
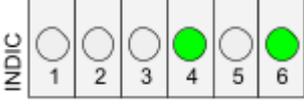
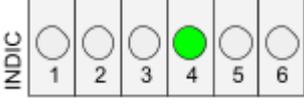
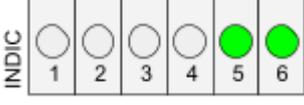
Error Register

Error Code	Visual Representation	Description
	<p>  +  </p>	<p><i>If the Error LED blinks RED, refer to the indication LEDs to find the corresponding Error event in the table below</i></p>
31		Max 14921 not responding (Cell monitoring)
30		BMS Memory Failure
29		Open cell detected
28		Internal EEPROM error
27		External EEPROM error
26		ADC Reference not correct

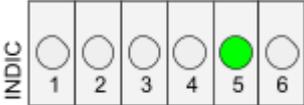
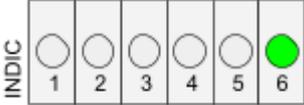
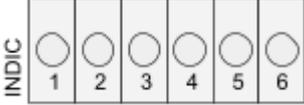
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25		Incorrect Cell Count
24		Override ON out of range
22		Temperature Control: Discharge Overcurrent
21		Temperature Control: Charge Over current
20		Undervoltage Shutdown
19		Shutdown Protection Override Out of Range
18		Over Voltage Sleep Awake
17		Over Voltage Sleep
16		Under Voltage Sleep
15		Charging Over Current
14		Discharging Over Current

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13		Board Over Temperature
12		Board Under Temperature
11		BMS Calibration Required
10		Protection Relay Coil Over Current
9		Protection Relay fuse blown
8		Protection Relay coil open
7		Gyro Z out of range
6		Gyro Y out of range
5		Gyro X out of range
4		External Temperature sensor 3 missing or faulty
3		External Temperature sensor 2 missing or faulty

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<p>2</p>		<p>External Temperature sensor 1 missing or faulty</p>
<p>1</p>		<p>Shunt Temperature Sensor Fault</p>
<p>0</p>		<p>BMS initialising</p> <p>This is not an error state but the BMS will not close the relay until all checks are complete during BMS startup</p>

Maximum charging / discharging voltages for non supported devices.

- Bulk charge (stop charging) 54.6V
- Float charge (if applicable) 53.8V
- Low battery discharge: 48V

Check that the Equalisation function is disabled, then verify if there is a voltage difference on the inverter display and the battery terminals @0.3C discharge / charge current. If so adjust the values above.

Please check if your inverter charger has been approved by Solar MD and it is CAN bus compatible.

For the latest Solar MD installation documents go to:
<https://www.solarmd.com/inverter-compatibility-solarmd>

To secure the full 12-year product warranty for the end user, be sure to register your battery online – login.mypower24.co.za.