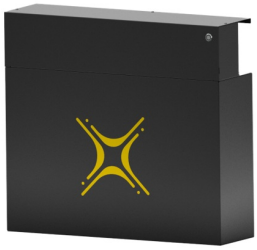
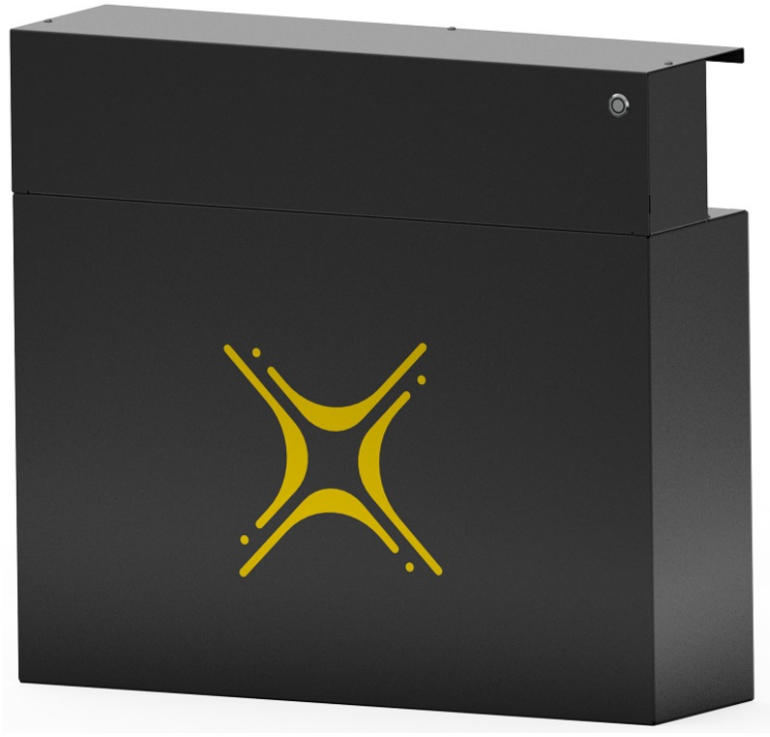


solarMD SS4143-01 Advanced Lithium-Ion Battery Instruction Manual

Advanced Lithium-Ion Battery Instruction Manual



SS4143-01
Advanced Lithium-Ion battery

Contents

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 SS4143-01 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 attery. 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 SS4143-01 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

Safety Information

This manual contains important instructions and warnings that must be followed when using SS4143-01. Read all instructions before installing and using the SS4143-01.

Warnings

Cautions

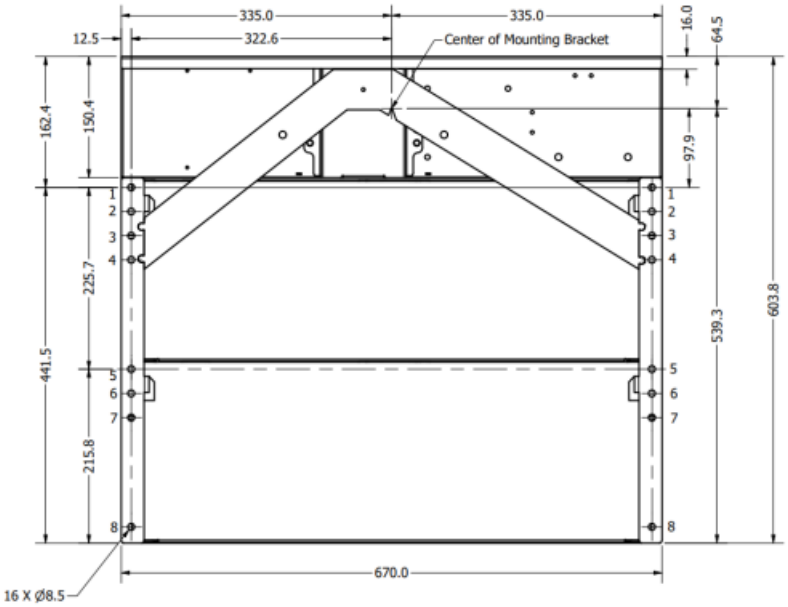
- Use SS4143-01 only as instructed.
- For communication and other information please read the BMS manual.
- Do not attempt to disassemble, repair, modify, or tamper with this battery unit.
- Do not insert foreign objects into any part of the battery unit.
- Avoid exposure to any moisture.
- Do not expose 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

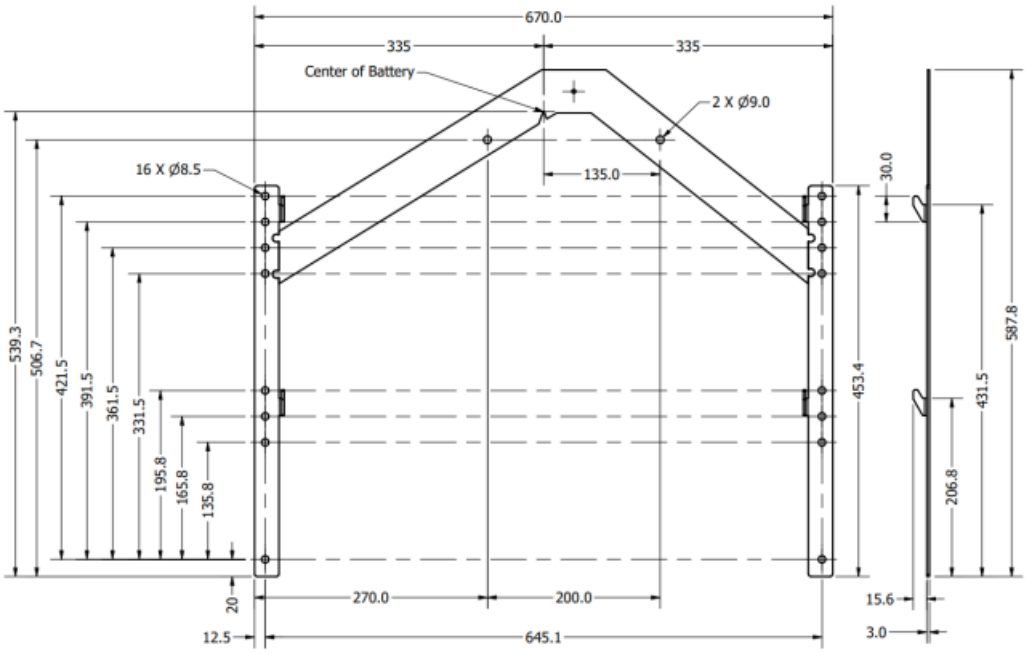
Specification

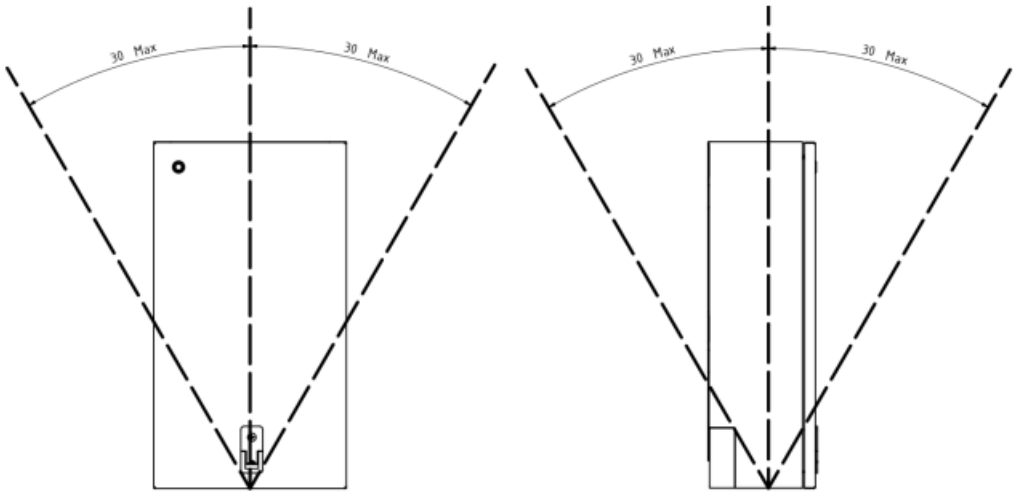
Solar MD 14.3kWh SS4143-01 specification			
Battery type	Lithium Iron Phos phate	**Scalability**	Yes
Battery module	SS4143	**Communication**	CANBUS 500kbps / CAN 2. 0B
Rated battery capacity	14336 Wh	**Can BUS termination**	Single 120 Ohm
Output power	Max 10 kW	**Canbus ID range:**	256 – 499
Usable battery energy @ 0.3 ℃	13.00 kWh	**Protection method**	Cell level: uv / ov / oc Positio n: x / y / xAcceleration: 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 ℃]	> 4000	**AUX power output**	5V 1A max
Charging efficiency	99%	**Storage duration**	6 months@+25℃
Operating temperature	-5℃ ~+50℃	**Safety standards complia nce**	IEC 62619/UN 38.3/UL1642
Transport	UN3480 & UN38. 3	**Cell Certificate**	TUV / CE / RCM / UL1642

Mechanical installation

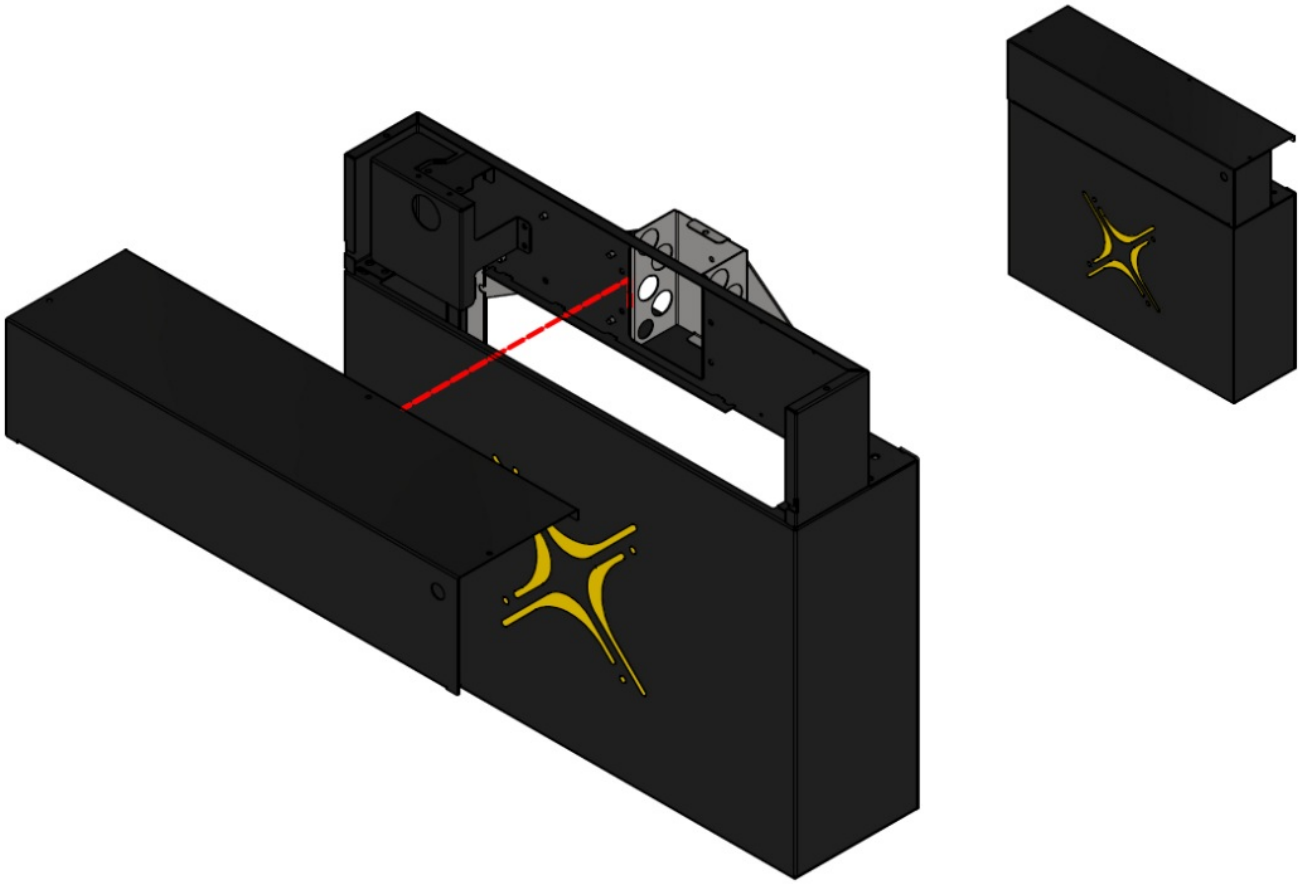
The middle triangle just serves as spacing. No fastening of this piece to the wall is necessary.
Holes 1 & 5 are the most important. Should at least have these 4 secured. Holes 3 & 6 can be the next to be used.
Please use the correct mounting screws for the specific wall surface. Make use of M8 screws/bolts.







Installing the top cover plate



Move lid maximum 36mm up, then move lid towards yourself. Be mindful of the button that's still connected.
Figure 3. Top cover installation single or multiple batteries in line
Installation stacked should be spaced a minimum 50mm vertically and a minimum of 15mm horizontally.

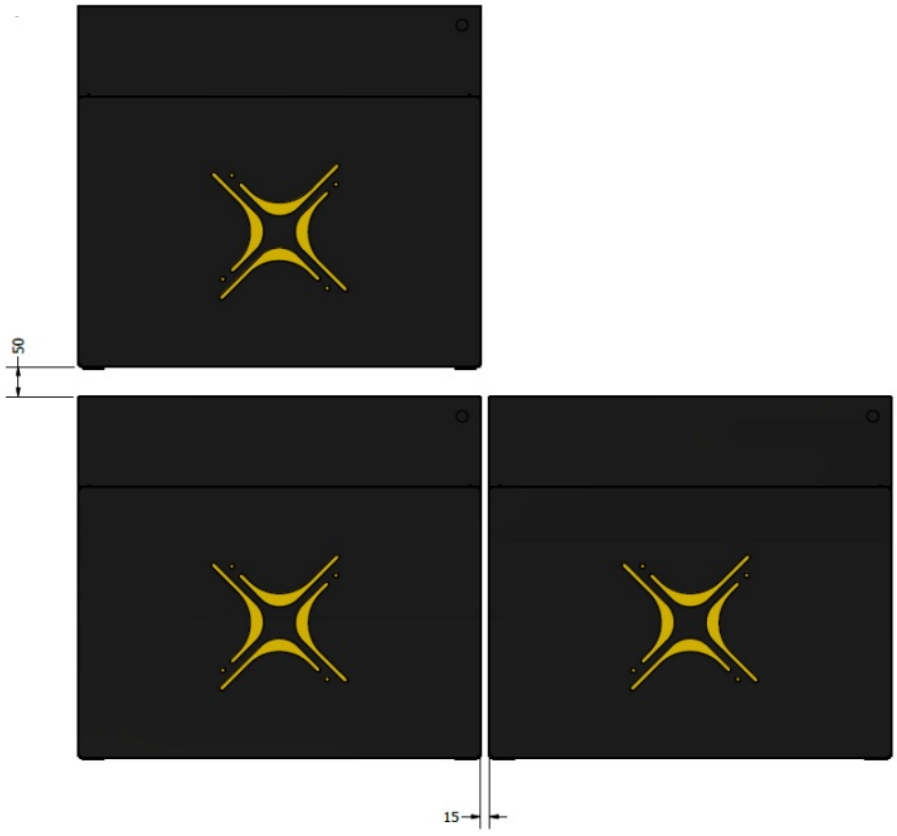


Figure 3b Battery spacing – installation single or multiple batteries in line

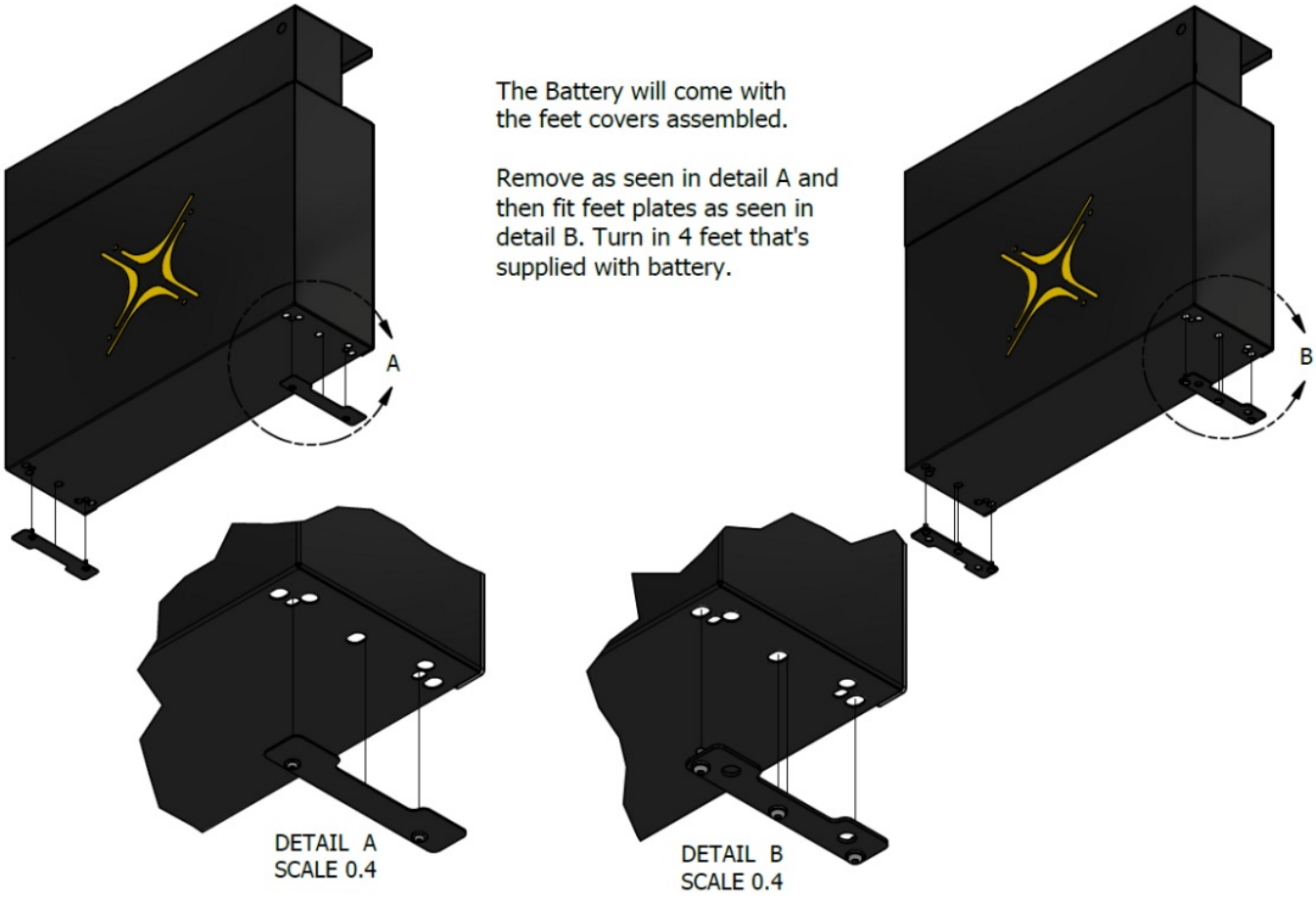


Figure 3c Battery feet – installation of battery feet

Electrical installation

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

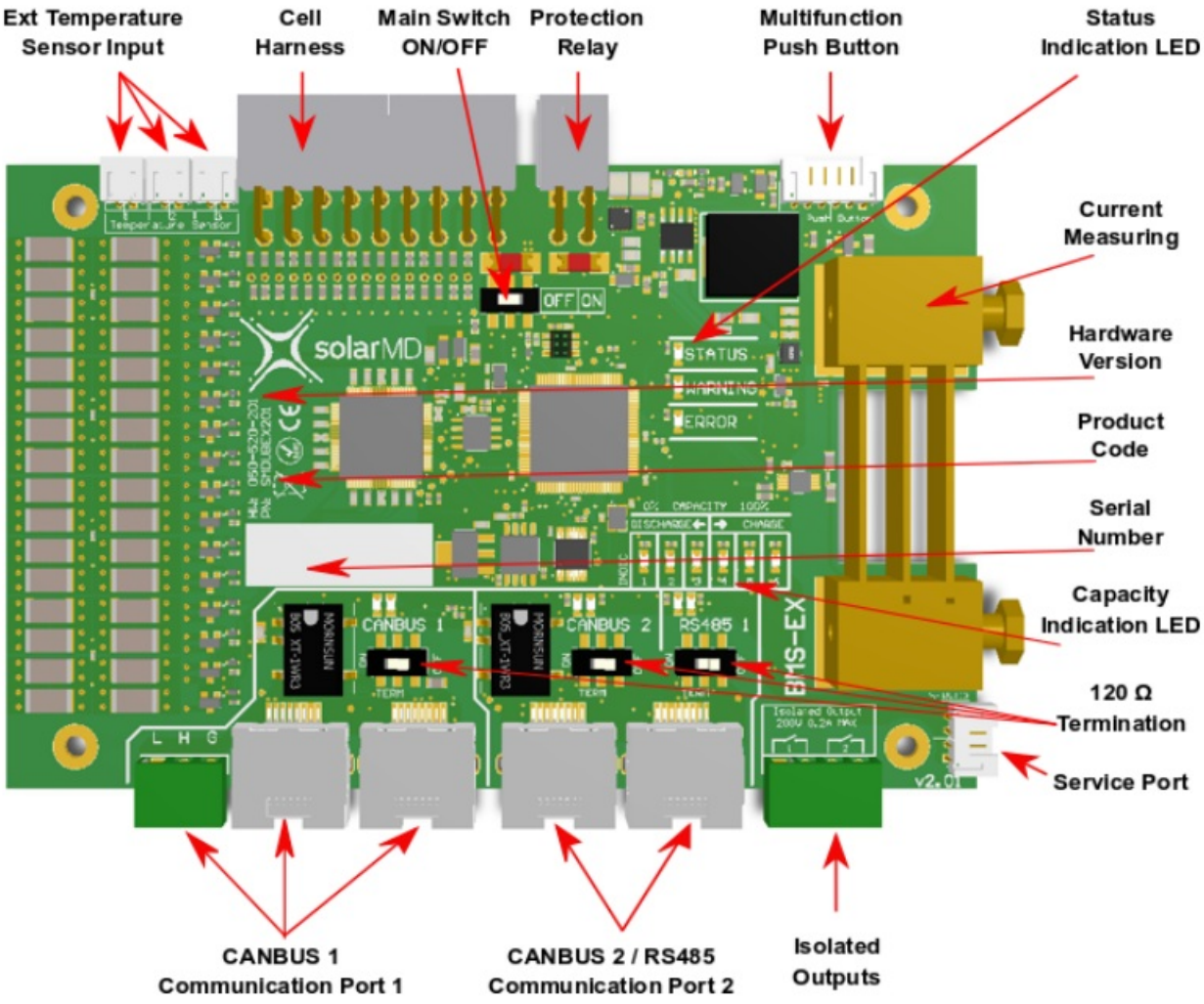
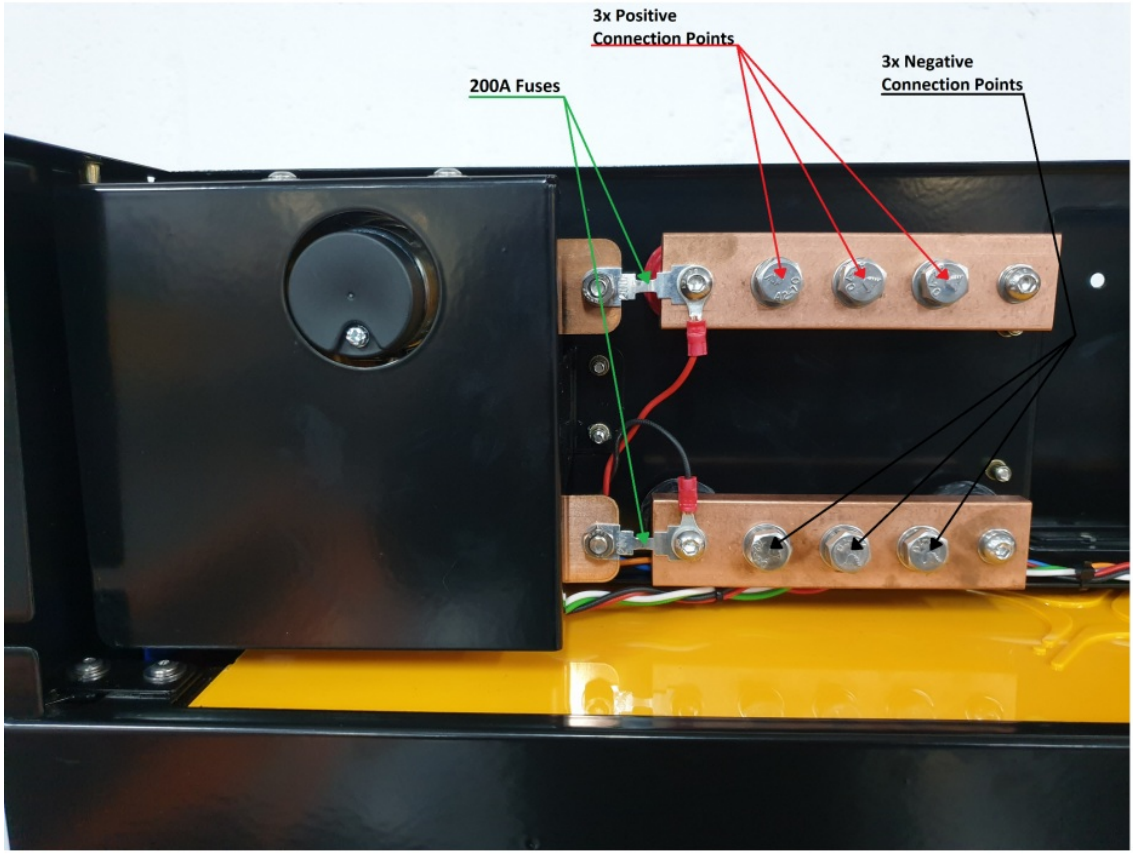


Figure 4 BMS board component locations

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.



Step 2. Connect the negative cable to the battery negative busbar and the 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 the difference in voltage can cause a 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 the 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

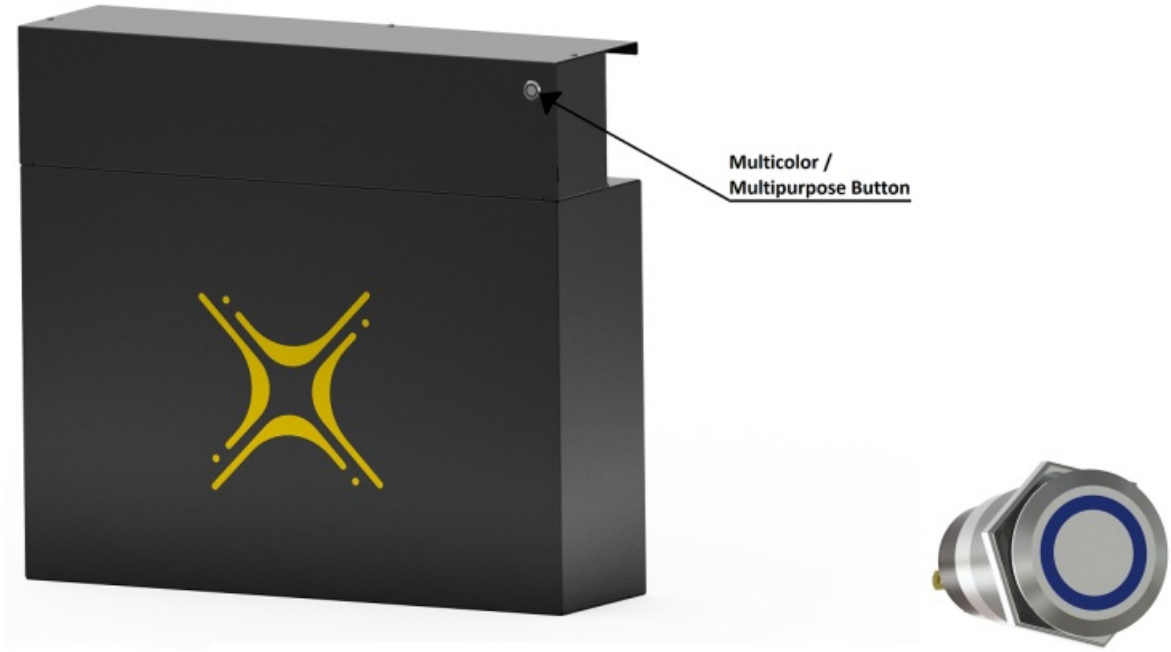


Figure 6: Multicolor / Multipurpose button.

Button functions

The new Solar MD Multipurpose button has an extended functionality in combination with the BMS-EX. The Multipurpose Button can be used to directly execute 6 predefined functions and a shutdown instruction. In combination with the 6 Indication LEDs on BMS-EX, the user can choose between each function by holding the button until the LED count matches the number of the function. By releasing the button while moving through the functions, the LEDs will start blinking and wait for the user to press the button again within 3 seconds.
The predefined functions are:

1. Reserved
2. Change indication LED function between Show Capacity, Show Current, and Off
3. Reserved
4. Wake up if Sleep mode is active
5. Activate Override Off state for 60sec
6. Activate Override On state for 60sec

If the button is held continuously after function 6, shutdown mode is activated and the battery will send a signal to switch off in 4sec. Further holding the button causes the BMS to delay complete shutdown for a maximum of 3 minutes. This operation is used when the technician wants to continue to read or write parameters after shutdown.

Button indication

**Access to all features in future development
The Multipurpose button's 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 is used. The User can change the preferred stage by logging into their mypower24 Energy Portal and go 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 color).
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 of charge – study color for 1 interval and low loss of color following illumination interruption. Solar MD users refer for 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 of charge – study color for 1 interval and slow loss of color following illumination interruption. Solar MD users refer for both as charging/discharging waves.

BMS Warnings and Errors

Method of displaying general warnings and errors:

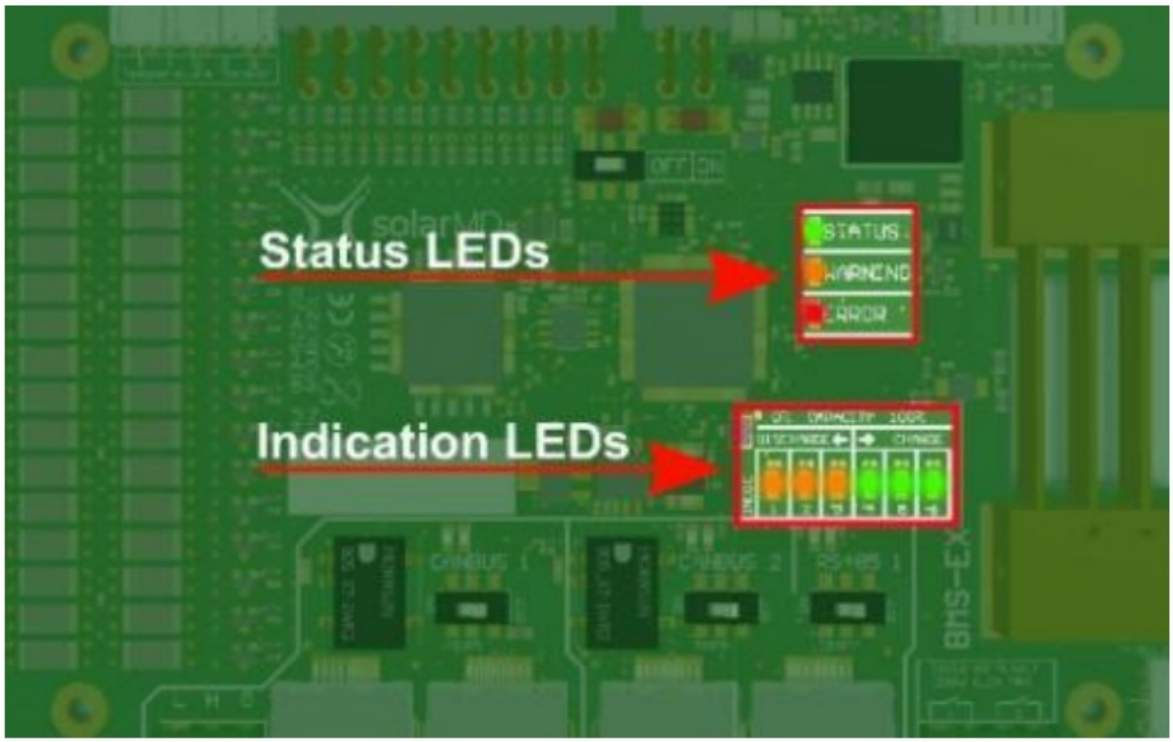
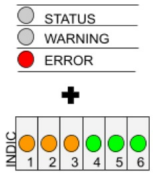
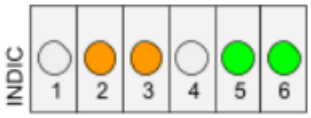
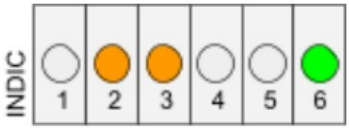
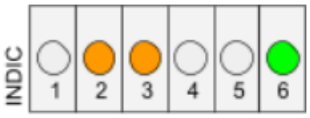
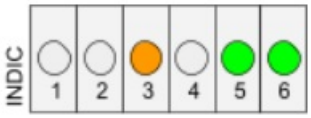
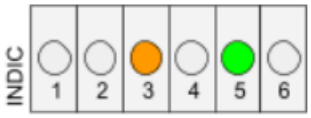
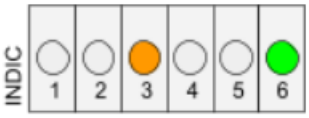
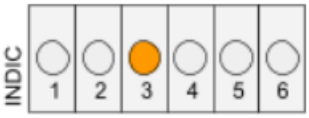
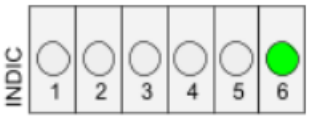


Figure7: Display general warnings and errors, main status LEDs, and indication LEDs. The Status LEDs determine what the indicator LEDs will show.

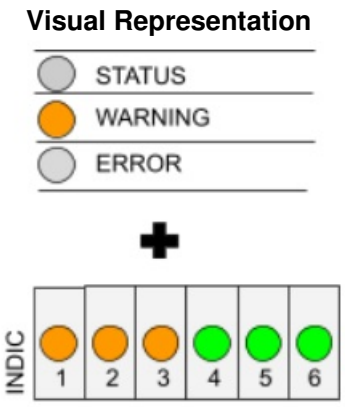
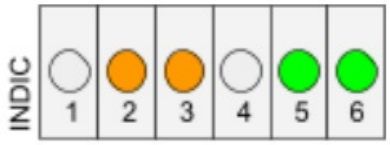
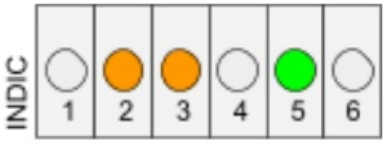
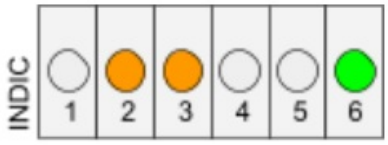
1. If the Status LED is Green the indication LEDs will show:
   a) Battery capacity
   b) Current flow and direction
   c) Off The functionality of the indicator LEDs are configurable, see more on this: multifunction push button.
2. If the Warning LED is Orange
   a) The indication LEDs will show the 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.

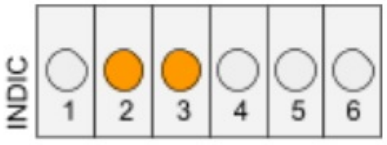
Warning Register

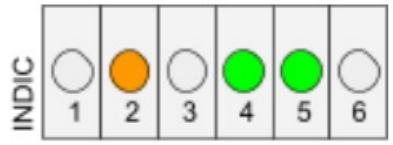
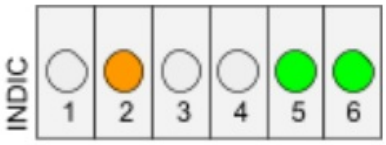
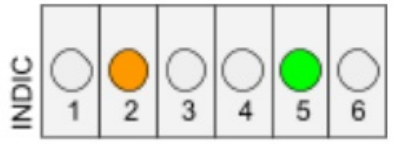
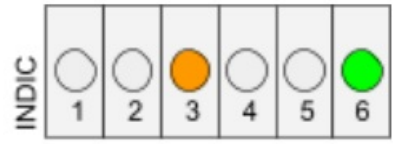
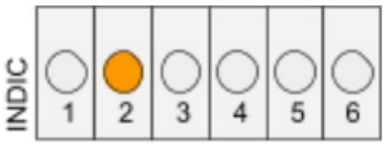
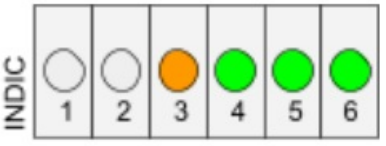
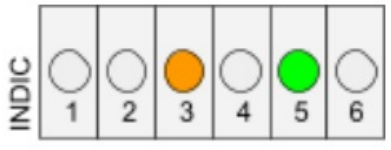
Warning Code	Visual Representation	Description
		**Description** If the Warning LED blinks ORANGE , refer to the indication LEDs to find the correspon ding warning event in the table below
30		Pending Awake High
29		Pending Awake Low
28		Positive fuse blown
27		Negative fuse blown
26		Override ONactive
25		Override OFF active
11		Discharge current too high

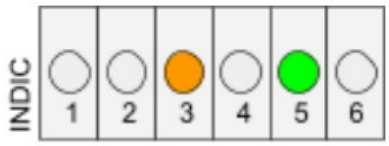
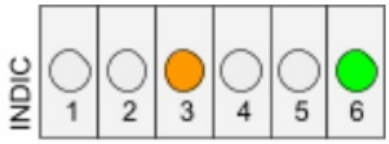
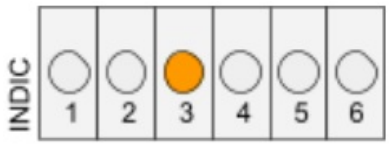
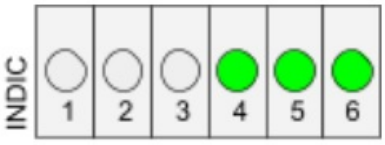
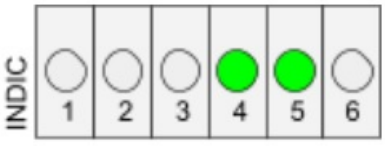
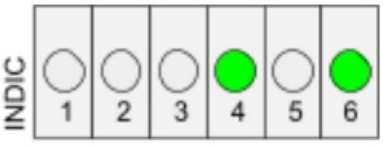
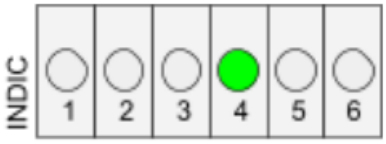
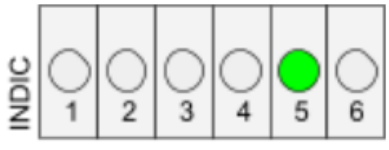
10		Charge current too high
9		Cell temperature too low
8		Cell temperature too high
2		Battery cell voltage too high
1		Battery cell voltage too low

Error Register

Error Code	Visual Representation	Description If the Error LED blinks RED, refer to the indicator LEDs to find the corresponding Error event in the table below
		
31		Max 14921 not responding (Cell monitoring)
30		Max 14921 thermal shutdown
29		Open cell detected
28		Internal EEPROM error
27		External EEPROM error
26		Balancing error internal FET circuit
25		ADC reference not correct

24		Override On out of range

23		Internal fault
22		Cell overvoltage
21		Charge Over current
20		Pack overvoltage
19		Pack Undervoltage
18		Pack Undervoltage
17		Over-current charge
16		Over-current discharge
15		User shutdown init
14		Remote shutdown init

10		Relay coil over current
9		Relay fuse blown
8		Relay coil open
7		Gyro Z out of range
6		Gyro Y out of range
5		Gyro X out of range
4		Ext NTC 3 fault
3		Ext NTC 2 fault
2		Ext NTC 1 fault
1		Cell temperature too high

CANBUS connection.
Bms EX used CAN 2.0B @ 500000 kb. Connecting other devices operating at different speed rates is not allowed.

For connection please use twisted pair wires in a shielded cable o minimize RF emissions. RJ45 connections can be used for daisy chaining BMS EX together using a straight Ethernet cable. The output of the Bms EX CAN transceiver is galvanically isolated.

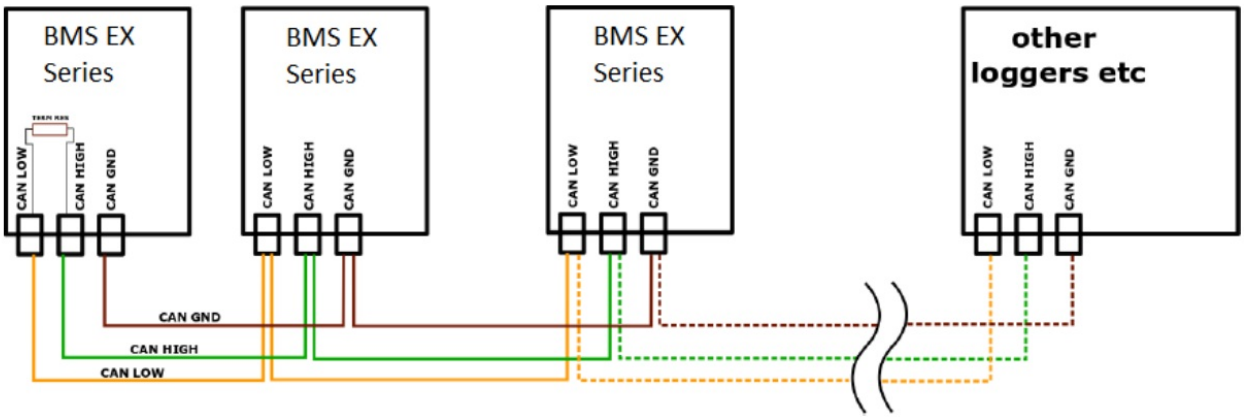
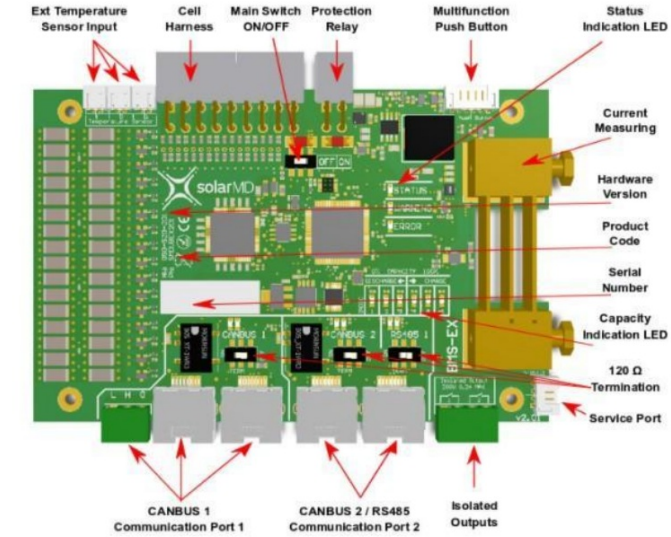
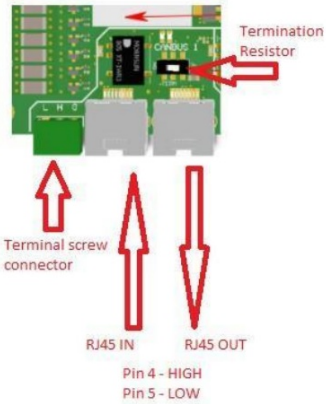


Figure 8: BMS-E connection to the CANBUS.



Model: BMS-EX



CANBUS warnings

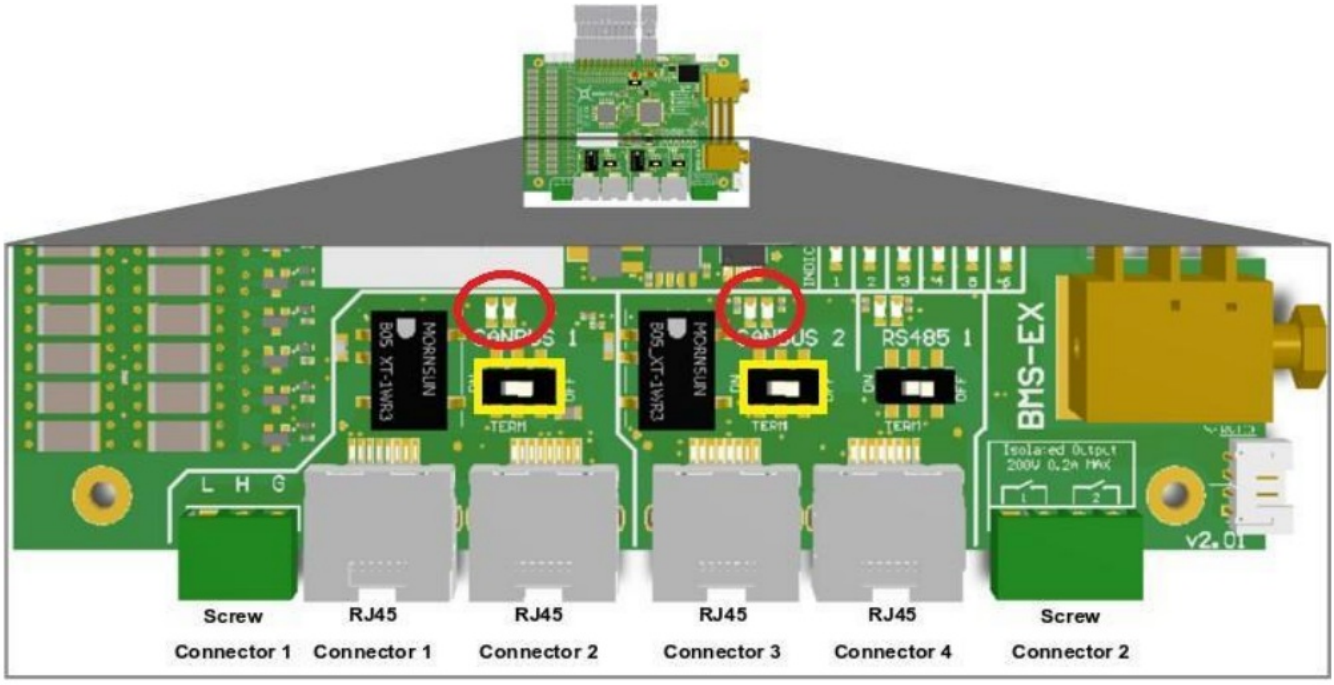


Figure 9 CANBUS Termination resistor and Warning LED location.

pules ON

pules OFF

The Orange LED (WARN) is used to display a warning for canbus only. Reading this warning is possible with pulse counting.
– CANBUS line open or no termination resistor set. [1]

-CAN BUS line in the initialization stage. Canbus init occurs when the line is opened and then established. The minimum period for initialization is 30sec. In this period all nodes are scanned in the network and scanned for ID and serial number collisions. [2]

– Duplicate CAN ID detected with no “auto-ID” set. [3]

– Duplicate Serial number detected. [4]

CANBUS Internal fault. [5]

Troubleshooting Warnings/Errors

Code	Cause	Solution
Warnings (Figure 6)		
1-2	1. inverter/rectifier settings may not be correct. 2. Battery cells may be imbalanced	1. Check the battery settings 2. Contact Solar MD support
3-4	The system design is not correct.	Add additional battery, decrease chargin g / discharging current from your inverter / rectifier / load
5-6	Manual override	Manual override has been activated – pl ease check with your installer
29-30	The BMS is ready to switch on after deep discharge/char ge	Connect charger / load to the Battery
Errors (Figure 7 & 8)		
5,6,7	The battery is not installed in the 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 be en achieved	The BMS will restart automatically, pleas e contact support team or approved insta ller
21	The BMS is set for different number cells in series as the actually installed	Contact your installer or Solar MD suppo rt team
22	The battery cell voltage is way too low.	Fill in the failure report and send to **info @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 p ending awake condition
24,25,26 , 27,28,3 0, 31	BMS Internal failure	Fill in the failure report and send to **info @solarmd.co.za** The BMS will be dispatched to you for re placement
29	Battery factory failure	Fill in the failure report and send to **info @solarmd.co.za** The unit needs to return to the factory for testing

CANBUS Warning (Figure 10)		
1	1. Canbus line open. 2. Single CANBUS resistor not terminated.	1. Check if a minimum of two nodes are connected on the line with the same tran smission speed. 2. Check if the single resistor is terminat ed via the jumper. Located top left of can LEDS(Fig 10).

Maximum charging / discharging voltages for nonsupported devices.
– Bulk charge (stop charging) 54.6V
– Float charge (if applicable) 53.8V
– Low battery discharge: 48V
Check that the Equalisation function are disabled, then verify if there is a voltage difference on the inverter display and the battery terminals@0.3 Cdischarge/charge current. adjust the values above.
Please check if your inverter charger has been approved by Solar MD and it is CAN compatible.
For the latest Solar, MD installation documents go to: **www.solarmd.com**
To secure the full 12-year product warranty for the end user, be sure to register your battery online – **login.mypower24.co.za**.

SS4143.01 INSTALLATION MAN UAL v1.0

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Documents / Resources

	**solarMD SS4143-01 Advanced Lithium-Ion Battery** [pdf] Instruction Manual SS4143-01, Advanced Lithium-Ion Battery, SS4143-01 Advanced Lithium-Ion Battery, Lithium-I on Battery, Battery

References

- SolarMD login
- Leaders In Lithium-Ion Storage | Solar MD | Cape Town
- Leaders In Lithium-Ion Storage | Solar MD | Cape Town

- W Twisted pair - Wikipedia