# SUNBATT

# SUNBATT Battery Service Manual

Sunbatt Peak      4.8/ 7.2/ 9.6/ 12.0

Sunbatt Flex      9.6/ 12.8/ 16/ 19.2/ 22.4/ 25.6

Version 1.0

# Content

# 1. Overview

This manual is subject to technical revisions, and no responsibility is accepted for the accuracy of this manual.

Before contacting the service team, please read this manual to try to solve the problem. If the problem remains, please contact us ASAP.

**Attention: High Voltage! Improper handling can cause danger and damage.**

**Important Note: The installation and all other kinds of works or measurements in correlation with the CORE series battery are only allowed by professional and qualified personnel.**

## 1.1. Claim and Contact

If after completing the inspection with the steps described in this manual or under the guidance of the service team, it is confirmed that there could be a part failure that needs to be resolved by replacement.

If the appearance of the product is damaged, please take photos of the product and the packaging on site and provide them to the service team.

**The contact information for the service team is as follows:**

Telephone: 0034 689 416 541

E-mail: service@sunbatt.eu



Please scan de QR code to download the latest version of this document.

## 1.2. General Steps

If there is any problem of the battery system, please follow the steps for an initial check.

| No. | Inspection items | Inspection steps |
| --- | --- | --- |
| 1 | Settings | Check if the settings on the LCD are correct. Refer to latest "Sunbatt Battery Operating Manual" or "Sunbatt Battery Quick Start Guide", available at: http://sunbatt.eu. Make sure the inverter is configured correctly. |
| 2 | Type of stacks | Do not mix up Sunbatt Peak 1.0 and Sunbatt Flex 1.0. |
| 3 | External connections | 1) Please refer to 1.3.1 to check if the wrong port is plugged in;<br>2) Check whether the cable is loose;<br>3) Check the cable itself for any problems. |
| 4 | Latest Firmware | Check if the firmware is newest, if not, please use CORE Link+ to update it. |
| 5 | Restart | **Note: It is important that the battery system is switched on before the inverter! Otherwise, the BMS might not start and not show any reaction (e.g., no Wi-Fi).**<br>(mind the sequence)<br>1) Switch off the inverter;<br>2) Turn off the battery: Turn off the air switch on the BMS;<br>3) Wait at least 3 minutes;<br>4) Turn on the battery;<br>5) Turn on the inverter. |
| 6 | Checking the correct operation | The system runs properly if :<br>- Inverter displays battery SOC correctly;<br>- System charges/discharges.<br>**Note: If you can not complete the commissioning, turn off the battery before you leave the site and make sure the LCD is off. If it is not possible, remove the BMS and then cover the blind-mate connector of the top stack with an insulating object. After that, contact the service team.** |

## 2. Error Analysis

Please read **2.1** if there are event codes shown on the LCD display, and read **2.2** if they are not available.

## 2.1. Event Code

After the battery system is switched on, if the LED indicator turns yellow and an event code appears in the "Status Area", please refer to **Appendix 1**.

## 2.2. No Event Codes

### 2.2.1. System cannot be turned on

1) BMS shows no reaction.

a.  If you turn on the BMS switch, but Wi-Fi is not detected and the screen is still off, please try to restart the system in the correct sequence (refer to Step 3 in **1.2**).

b.  If the problem remains, please refer to **4.2** to check the voltage. If the voltage is normal, try another BMS if available.

c.  If the voltage is abnormal, please refer to **4.2** to identify the faulty stack.

2) The air switch trips immediately after being turned on.

| No. | Inspection items | Inspection steps |
|---|---|---|
| 1 | Wiring | 1) Switch off the inverter first and then turn off the BMS switch, disconnect all external cables and restart the battery in the correct sequence.<br>2) If it works, check if the inverter is short-circuited; If the problem remains, proceed to the next step. |
| 2 | Voltage | Refer to **4.3** for the voltage check:<br>1) If the voltage is abnormal, identify the faulty stack by referring to **4.2**.<br>2) If the voltage is normal, try another BMS if available. |

### 2.2.2. Automatic tripping after a period of operation

Restart the system in the correct order:

**Note: LCD shows no back-light after the air switch automatically trips: after the air switch trips and the LCD dims out, please wait 2 or 3 minutes before you turn on the air switch.**

1) If successful:

a.  If event codes appear on the LCD, please refer to Appendix 1 for more details.

b.  If not, please use the CORE Link+ to download the logs and send them to Sunbatt service team. Repair under the guidance of the service team.

(Sporadic alarms can be difficult to detect because they only occur occasionally. Therefore, it is very important to download and provide all historical battery log files available to find the root cause.)

2) If failed: Refer to **2.2.1**.

# 3. Frequently Asked Questions

## 3.1. Wi-Fi Issues

Common Wi-Fi failures: no Wi-Fi signal / unstable Wi-Fi / unable to connect to Wi-Fi.

When these failures occur, follow the steps below:

**1) Check the status of the Wi-Fi on the LCD screen**

Wi-Fi usually turns off automatically within 5 hours after the battery turns on. Find the Wi-Fi setting in the "Setting Area" on the LCD (refer to Appendix 3) and check if the status is "ON". If not, please set it as "ON". If yes, please proceed to the next step.

**2) Disconnect LAN cable**

Remove the LAN cable when your laptop device is connecting to the Wi-Fi. After that you can connect it again to the Internet.

**3) Restart**

To restart the Wi-Fi, change the status of Wi-Fi from "ON" to "OFF", and then from "OFF" to "ON".

**4) Try other mobile devices.**

Sometimes the problem comes from the mobile device itself, try to see if other mobile devices can connect to the Wi-Fi.

**5) Replace BMS**

If none of the steps above work, please replace the BMS.

## 3.2. Firmware Update Issue

**1) Fix Wi-Fi**

If it is caused by unstable Wi-Fi, please refer to 3.1.

**2) Restart**

Restart the system in the correct order.

**3) Try again with other laptop devices.**

Sometimes the problem comes from the mobile device itself, try to see if other devices can update.

**4) Replace BMS**

If none of the above steps work, please try another BMS if available.

## 3.3. Changes in SOC

**1) SOC jumps**

The SOC of a battery cannot be measured. It is an estimated value. In general, the state of charge (SOC) of a battery is estimated using the voltage, but other factors such as temperature, current flow and charging behavior also play a role. The calculation of the SOC is generally more precise if the battery regularly sees full cycles. It is normal to have a SOC correction/calibration now and then.

**2) SOC at commissioning**

New stacks have 30% SOC upon delivery. A new BMS might show a different SOC at the beginning (mostly 50%/30%/0%). However, this is only to be understood as a placeholder value, as a new BMS cannot measure the SOC of stacks. As soon as the system starts to run (charge/discharge), the SOC is corrected gradually. The SOC calibration is completed after the latest full cycle.

# 4. Tools and Methods

## 4.1. CORE Link+
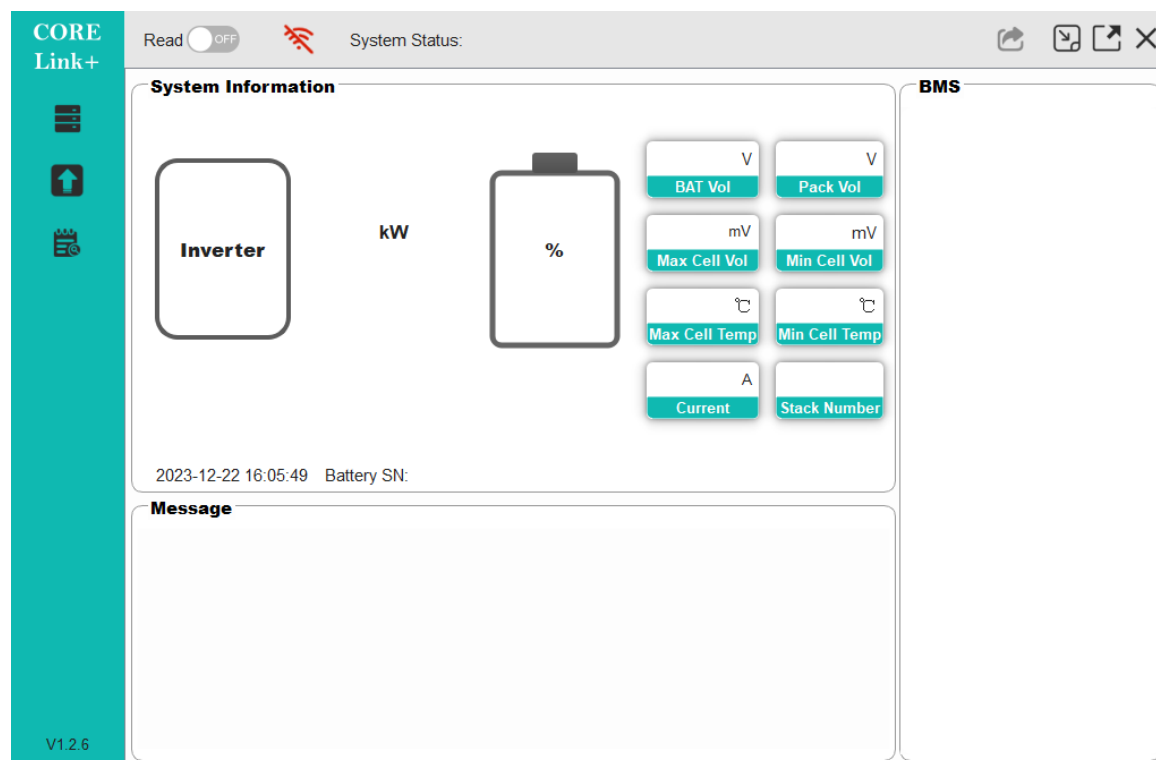


With the CORE Link+ you can:

1)   read the battery information;

2)   update firmware;

3)   export / download battery logs.

The CORE Link+ is constantly being improved and updated. Make sure to use the latest program version.

For the service analysis, please download and provide the data / logs as described in the program instructions.

**Note: You need a Windows computer that can be linked to the battery Wi-Fi.**

## 4.2. Stack Exclusion Method

Make sure the minimum number of the battery stacks in a battery tower is available. (2 for Sunbatt Peak 1.0, and 3 for Sunbatt Flex 1.0)

1) **Check the system. If Okay**, add one stack at a time and check again.
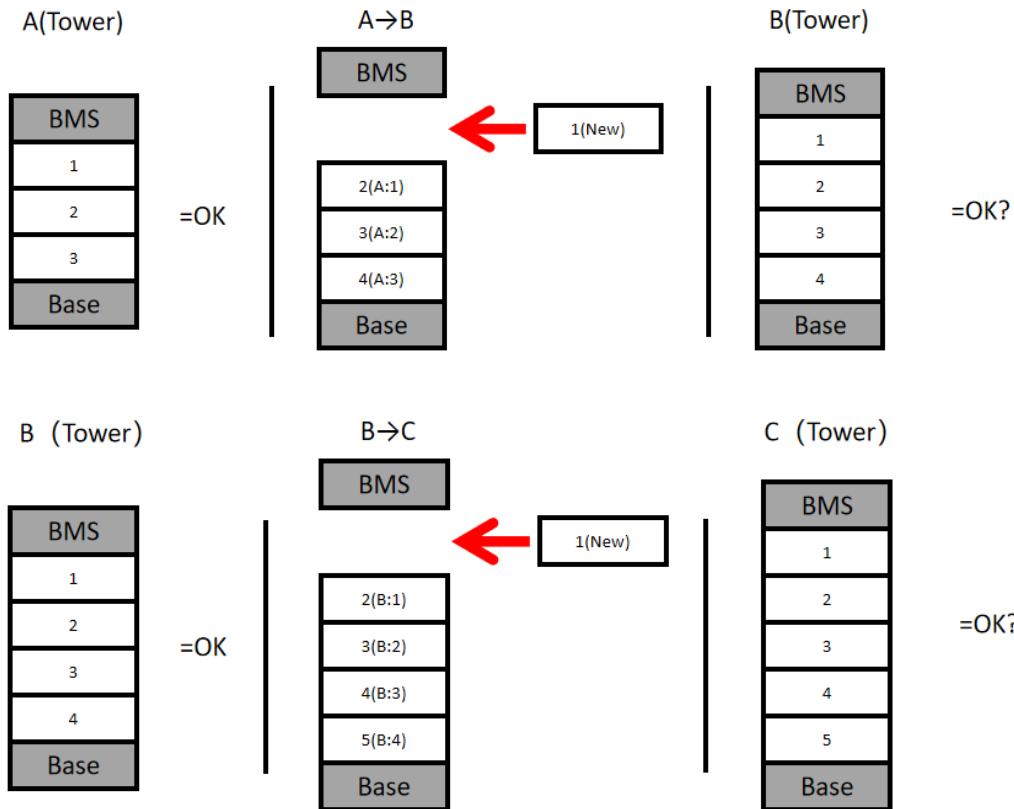


2) **If not okay:** The faulty stack is probably one of the stacks in the tower. Replace each installed stack one by one with a spare stack. Check the battery status after each step. If battery status turns to "OK", the faulty stack is the one that was replaced.
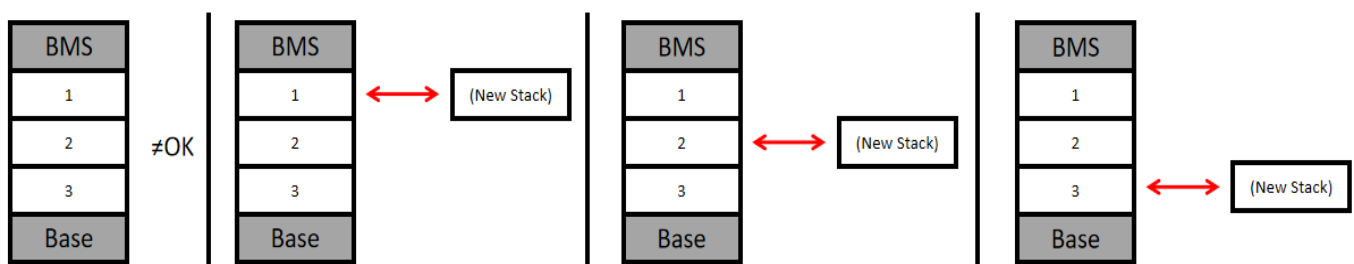
# 4.3. Voltage Measurement/Undervoltage

## 4.3.1. Voltage Measurement

ATTENTION: High voltage!

(If the positive and the negative are measured on the same side of the battery stack by a multimeter, the base should be installed first).

You can see the max./min. cell voltage in the CORE Link+. You can also get the detailed voltage of the stacks and cells in the CORE Link + program or measure it manually according to the below description:

1) Measurement of Tower Voltage

Remove the BMS and measure the tower voltage on the top stack as shown below.

Note: The nominal voltage per stack is 86.4~116.8 V for Sunbatt Peak 1.0, and 54~73 V for Sunbatt Flex 1.0.



If the measured voltage deviates significantly from the nominal value, please check the electrical voltage of the individual stacks, as shown below.

2) Measurement of Individual Stack Voltage:
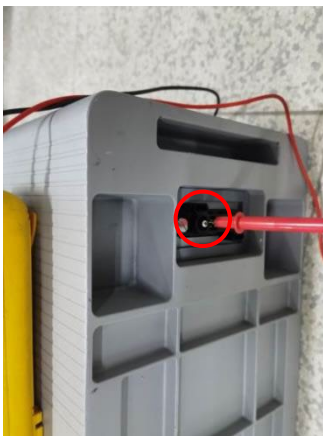


| Positive | Negative | Measure |

11

## 4.3.2. Undervoltage

A stack in which one of the cells has a voltage of <1.5 V is in undervoltage (check with CORE Link+ if possible).

A Sunbatt Peak 1.0 stack with >86.4 V and an Sunbatt Flex 1.0 with >54 V should be fine and you can continue to check other points according to the service manual. Always make sure the version of firmware is the latest! If the stack voltage is <116.8 V (Sunbatt Peak 1.0) / <73 V (Sunbatt Flex 1.0) but the single cell voltage is >1.5 V, the battery needs to be charged as soon as possible.

If only one stack is in undervoltage: remove that one and try to start the system without it (if the number of the remaining stacks still meets the minimum stack number requirement, 2 for Sunbatt Peak 1.0, and 3 for Sunbatt Flex 1.0). Otherwise, make sure to avoid further discharge (e.g., remove BMS)

If more than one, or all stacks are in undervoltage: Contact the service team and make sure to avoid any further discharge of the battery (e.g remove BMS from the system)

When contacting the service team, make sure to fill the service checklist completely and add the following information:

1) Serial Numbers of the BMS and all (affected) stacks;

2) Tower voltage and individual stack voltages of all stacks (related to Serial Number)

3) What was the status of the air switch on the BMS in undervoltage? (tripped or not)

4) Detailed description of how and why the system reached undervoltage if known. Information of when the system was installed and commissioned and in which circumstance and when the undervoltage occurred. If the battery was never running before: Why did it never work before, and what was the status of the battery when the battery was left (on / off / Display).

5) If possible: Logs from the battery using CORE Link+ and screenshots showing the cell voltages and Initial Firmware (FW) Version of the Battery when undervoltage occurs.

# 5. Extension

Note: Within 5 days before expansion, it is recommended to fully charge the original battery system to SOC 100% at least once.

The SOC of the existing battery system and the battery stack to be added should be similar before the battery stack adding on the existing battery system.

Please keep in mind that the quantity of the battery stacks in each tower cannot exceed the limitation.

Procedure:

1. Measure the voltage of the new battery stack with a multimeter, get a value (X).

2. Refer to the following table to find out the SOC (Y) corresponding to the X.

| Flex | | Peak | |
|---|---|---|---|
| Voltage(X) / V | SOC (Y) | Voltage(X) / V | SOC (Y) |
| X<63.6 | 0~5% | X<99.84 | 0~5% |
| 63.6≤X<64.48 | 5~10% | 99.84≤X<103.136 | 5~10% |
| 64.48≤X<65 | 10~15% | 103.136≤X<103.68 | 10~15% |
| 65≤X<65.54 | 15~20% | 103.68≤X<104.512 | 15~20% |
| 65,54≤X<65,96 | 20~25% | 104.512≤X<105.28 | 20~25% |
| 65,96≤X<66,1 | 25~30% | 105.28≤X<105.664 | 25~30% |

3. Charge or discharge the existing battery system until the SOC is almost equal to Y.

4. Switch off the battery system refer to the section 8.2.

5. Loosen the screw between the BMS and battery stack, and then take the BMS off.

6. Add the new battery stack on the top of other battery stacks, and fix it on the wall.

7. Put BMS back on the top of the new battery stack.

8. Switch on the battery system refer to the section 8.1.

9. Check the settings on the LCD.

Original Battery SOC≈Y%

New Battery SOC≈Y%
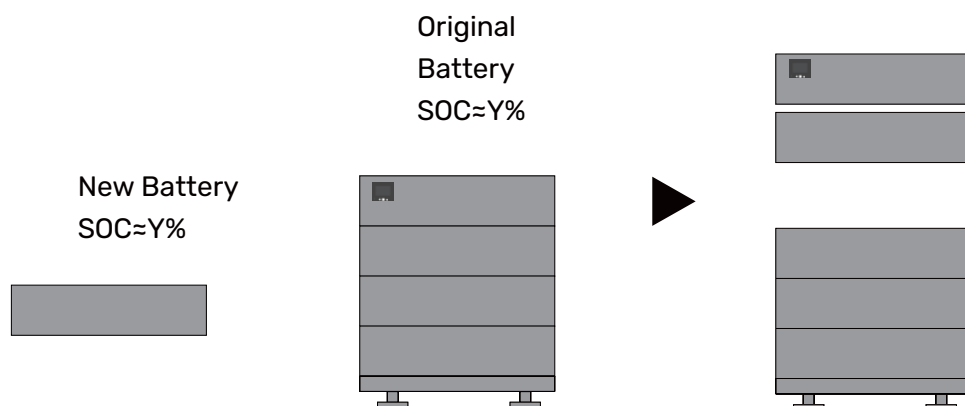
# 6. Replacement Guidance

Please go through the general steps beforehand, see chapter 1.3.

## 6.1. BMS Replacement

1) Switch off the inverter, then switch off the battery.

2) Disconnect all cables from the BMS.

3) Replace the BMS, please do not forget to update the firmware with CORE Link+.

## 6.2. Stack Replacement

1) The 30% SOC rule must be followed.

When replacing with or adding new stacks, make sure that the state of charge (SOC) of all stacks in the system is 30%.

2) In the meantime you can use the battery system with the remaining stacks and a correspondingly reduced capacity (take into account the minimum number of stacks).

3) Please note: It is important that all stacks of a battery tower have a similar state of charge (SOC) with a tolerance of 5%. Therefore, please add a new stack, which has a SOC of 30%, to the system only when the battery system has a SOC between 25% and 35%.

# Appendix 1 Event Code

| Event Code | Description | Operation |
|---|---|---|
| 1001/2001 BTVH | The total voltage is too high. | Normally, this event occurs along with other event codes, and please refer to the instructions for other event codes.<br><br>If there are no other event codes, please check whether the settings of the battery are correct according to the Quick Start Guide or Operating Manual. If not, please set it correctly, if correct, please contact Sunbatt service team. |
| 1002/2002 BTVL | The total voltage is too low. | |
| 1003/2003 CVH | The voltage of cell is too high. | |
| 1004/2004 CVL | The voltage of cell is too low. | |
| 1005/2005 CTH_C | The temperature of cell while charging is too high | |
| 1006/2006 CTL_C | The temperature of cell while charging is too low. | |
| 1007/2007 CTH_D | The temperature of cell while discharging is too high | |
| 1008/2008 CTL_D | The temperature of cell while discharging is too low | |
| 1009/2009 OC_C | Overcurrent occurs in charging | 1) Check whether the settings of the system are correct. (if correct, proceed to the next step, if not, adjust the settings)<br>2) Restart, if the problem remains, try another BMS if available. |

| Event Code | Description | Operation |
|---|---|---|
| 1010/2010 OC_D | Overcurrent occurs in discharging | 1) Check whether the settings of the system are correct. (if correct, proceed to the next step; if not, adjust the settings)<br>2) Check whether there is a high-power load starts when this fault occurs. If yes, check whether the load power is within the power range of the inverter:<br>a) If yes, reduce the loads to ensure that the power is within the range.<br>b) If not, please also contact the inverter service; If not, proceed to the next step.<br>3) Restart, if the problem remains, try another BMS if available. |
| 1011/2011 CUB | The cell is in a serious unbalanced condition. | Normally, this event occurs along with other event codes, and please refer to the instructions for other event codes. |
| 1014/2014 ENV_OT | The environment is overheated. | Please check whether the ambient temperature is too high. If it's normal, restart the battery. If the problem remains, try another BMS if available. |
| 1101/2101 MemF | Memory fault. | Restart, if the problem remains, try another BMS if available. |
| 1102/2102 VSF | Voltage sensor failed. | It is accompanied by other event codes, please refer to other event codes. |
| 1103/2103 TSF | Temperature sensor failed. | |
| 1104/2104 BICcomF_1# | Stack No. 1 signal data not available | Please refer to **4.2 Stack Exclusion Method** to find the faulty modules and replace them.<br>If the problems remains, try another BMS if available. |
| 1105/2105 BVSF | Battery V-sensor failed. | Restart, if the problem remains, try another BMS if available. |
| 1106/2106 CSF | Current sensor failed. | Restart, if the problem remains, try another BMS if available.<br>(If it's possible, observe the current value on the CORE Link+ and on the inverter during charging or discharging the battery, and record the results for feedback to Sunbatt service team). |

| Event Code | Description | Operation |
|---|---|---|
| 1107/2107 R1F | Relay 1 (Anode) failed. | Restart, if the problem remains, try another BMS if available. |
| 1109/2109 PreCCF | Pre-charge circuit failed | |
| 1208/2208 SCAla | Short circuit alarm | 1) Check whether the settings of the system are correct (if correct, proceed to the next step; if not, adjust to the correct setting)<br><br>2) Check whether the power cable connection is correct (if correct, proceed to the next step; if incorrect, then connect the power cable correctly).<br><br>3) Check whether there is a high-power load starts when this fault is reported.<br><br>If yes, check whether the load power is within the power range of the inverter:<br><br>  a) If yes, stop using some loads to ensure that the power is within the range.<br><br>  b) If not, please also contact the inverter service;<br><br>If not, proceed to the next step.<br><br>4) Restart, if the problem remains, try another BMS if available. |
| 1301/2301 PamInc | The parameter is incorrect. | 1) Check if the settings on the LCD are correct. (Especially the "End System": for a single tower, it should be "ON"; for multiple towers, the last slave should be "ON" and the others should be "OFF")<br><br>2) Restart.<br><br>3) Use CORE Link+ to update the firmware and restart again.<br><br>4) If the problem remains, try another BMS if available. |

| Event Code | Description | Operation |
|---|---|---|
| 1302/2302 MTw_1# | Stack No. 1 type is abnormal | 1# means that the fault occurred in stack #1, and here it is just an example. It could also be other numbers.<br><br>1) Check whether the type of Stack #1 is correct or not.<br>  a) If it's incorrect, replace the corresponding stack (refer to 4.2)<br>  b) If it's correct, restart.<br>2) If the problem remains, try another BMS if available. |
| 1303/2303 MNInc | The number of parallel stacks is inconsistent. | Check whether the stack number of each tower is the same:<br>If not, please make them equal.<br>If they are the same, restart. If the problem remains, try another BMS if available. |
| 1304/2304 CANCOMF | Interior CAN communication fault. | 1) Check if the settings of "End system" and "Parallel Res" are right.<br>2) Check whether the communication cable is faulty.<br>3) For a single tower system, try another BMS if available.<br>4) For multiple tower systems, separate them into single towers, and follow the instructions according to the event codes on each display. If there are no event codes on each display, but this event remains after connecting all the towers, check whether the RJ45 ports have mechanical damage. |

| Event Code | Description | Operation |
|---|---|---|
| 1306/2306 InvComTO | Inverter communication timeout. | 1) Check the settings: <br><br>Terminal Res <br><br>The status of Terminal Res on the master tower should be "ON". <br><br>Default Set <br><br>Check whether the status of the default status is "ON". <br><br>2) Check the connection <br><br>Does the inverter properly detect the battery? Check if the inverter detects the battery parameters (e.g., SOC, battery temperature) correctly. If not, check the cabling, especially the pin definition. <br><br>3) Restart in the correct order. <br><br>4) If none of the above work, try another BMS if available. |
| 1307/2307 IDDstF | BMS internal communication failed. | 1) Check if the settings of "End System" and "Parallel Res" are right. <br><br>2) Check whether the communication cable is faulty. <br><br>3) For a single tower system, try another BMS if available. <br><br>4) For multiple tower systems, separate them into single towers, and follow the instructions according to the event codes on each display. If there are no event codes on each display, but this event remains after connecting all the towers, check whether the RJ45 ports have mechanical damage. |
| 1308/2308 BIC_com_F_S_#1 | Single BIC failed | 1# means that the fault occurred in stack #1, and here it is just an example. It could also be other numbers. <br><br>Replace the corresponding stack or the stack above this stack (refer to **4.2**) and restart. If the problem remains, try another BMS if available. |

| Event Code | Description | Operation |
|---|---|---|
| 1309/2309 PreCF | Pre-charge failed. | 1) Restart<br>2) If the problem remains, turn off the battery and disconnect all the power cables from the inverter, black start through the LCD.<br>  a) If the problem remains, replace the BMS;<br>  b) If the problem disappears, check the connection of power cables between the battery and the inverter. |
| 1310/2310 UpdF_Int | The update of built-in systems (BMS/ Parameter) failed. | 1) Restart.<br>2) Use CORE Link+ to update the firmware and restart again.<br>3) If the problem remains, try another BMS if available. |
| 1113/2113 SOHL | Cycle life fault (Low SOH or the failure of battery cell) | Normally, this event code occurs along with other event codes, and please refer to the instructions for other codes. |

# Appendix 2 Ports on the BMS
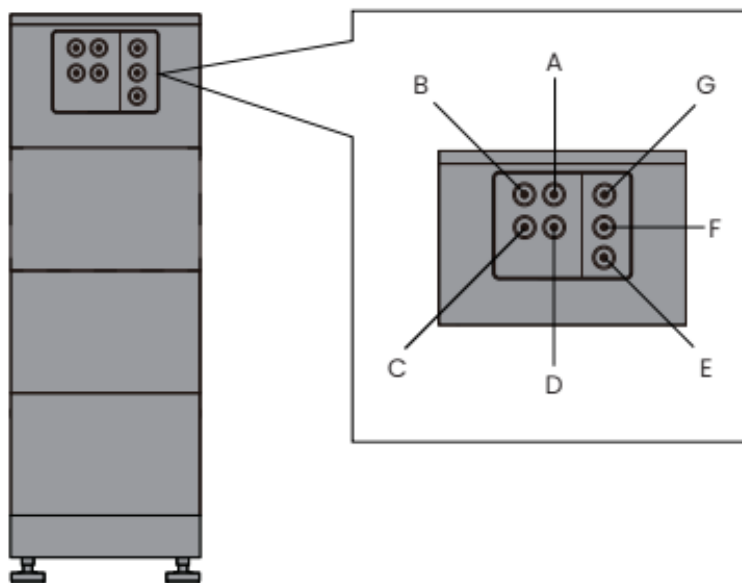


| A | IN | IN port for parallel tower connection |
|---|---|---|
| B | OUT | OUT port for parallel tower connection |
| C | ETH | Network port for connecting a router or network switch |
| D | INV | Port for connecting an inverter data cable |
| E | PE | Grounding cable connecting point |
| F | P– | DC– to inverter |
| G | P+ | DC+ to inverter |

# Appendix 3 Display on BMS
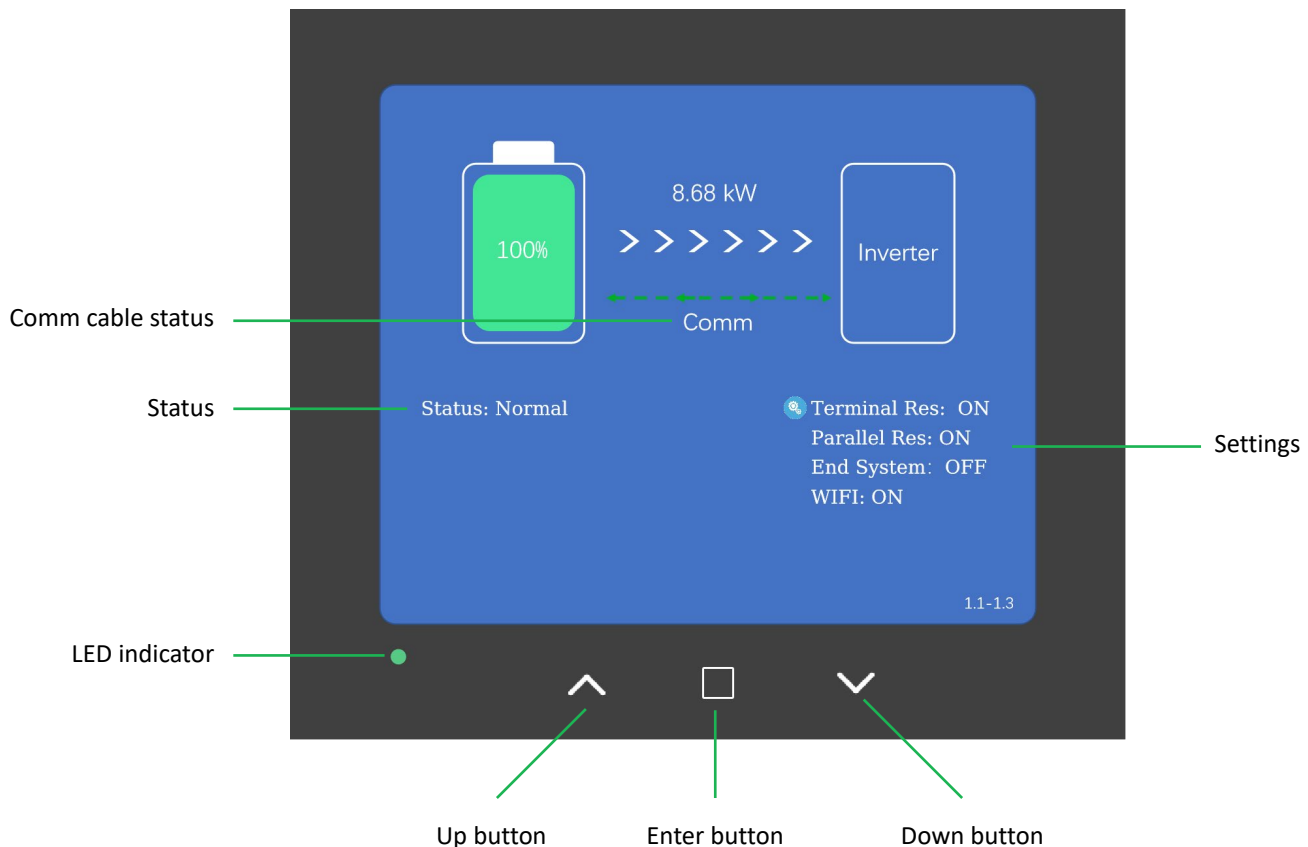


In the "Settings Area", you can check if the settings are correct.

In the bottom right corner of the screen, you can check the firmware version.

When the communication is normal, the comm cable arrow moves from the middle to both sides. When the communication is interrupted, the comm cable turns orange, there is a disconnection mark, and the text shows "Comm fails".

When the system is normal, the LED is green. When a fault occurs, the LED turns yellow and the "Status Area" displays the event codes.

**Sunbatt**

✉ [info@sunbatt.eu](mailto:info@sunbatt.eu)

📞 +34 689 416 541

📍 C/Arboleda 18, 28031, Madrid, Spain

🌐 www.sunbatt.eu

Latest version of
the document.