BYD Battery-Box Premium LVS
Service Guideline and Checklist
Version 1.0

Valid for Premium LVS 4.0 / 8.0 / 12.0 / 16.0 / 20.0 / 24.0

LVS 16.0 (4 Modules + PDU - max. 64 Modules in 16 Towers per System)

BMU (1 x per System)

Make sure to always use the latest version of this service document, available at: www.bydbatterybox.com

Important: The installation and all other kinds of works or measurements in combination with the Battery-Box Premium are only allowed by professional and qualified electricians.
This checklist is a shortened assistance for the Battery-Box and does not replace the original manual, which can be found on www.bydbatterybox.com / www.eft-systems.de / www.alpspower.com.au. Subject to technical modifications; no responsibility is accepted for the accuracy of this information. Attention: Improper handling can cause danger and damage.

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1. GENERAL STEPS

Make sure to always use the latest version of this service document, available at: www.bydbatterybox.com
Please proceed first with the installation steps by:

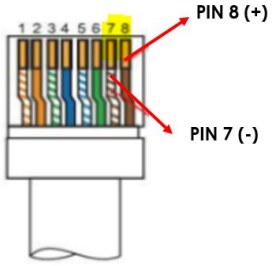
No.	Name	Description
1	Configuration	Check if the configuration is correct. Refer to latest "BYD Battery-Box Premium LVS Minimum Configuration List" (V1.1 or above) available at: www.bydbatterybox.com Make sure the inverter is configured correctly.
2	Correct external cabling	1. Communication to inverter a. Depending on the choice of inverter the cable between the BMU port and the inverter must be specially made. Please check the specifications in the installation manual. b. Recommended CAT5 or higher; c. Check the cables and replace them if necessary 2. Grounding a. Battery-Box connected directly to the ground-bus of the house. b. The battery must not be earthed via the inverter! Otherwise, communication problems are possible. 3. Ethernet-Cable for Internet (**strongly recommended!**) 4. DC-Ports - Make sure that **+** and **-** are properly connected. (Male DC Connector piece required) 5. Correct parallel connection cabling if applicable
3	Latest Firmware	Always install / update the **newest Firmware**! Note: If not stated otherwise, wifi password is BYDB-Box
4	App Configuration	To complete the commissioning, the configuration of the battery via "Be Connect" App is **mandatory**!
5	Restart	After app configuration, please perform a proper restart of the system by switching off the battery correctly (press LED Button on **BMU** for 5 sec). Make sure all LEDs of the battery are completely off. Then follow the correct switch on procedure (see step 6)
6	Switch on procedure	Correct switch on procedure is important for a correct operation! 1. Switch on the fuse between Inverter and Battery (if there is any) 2. Switch on the Battery-Box (LED Button on the top **LVS module**) 3. Activate the inverter
7	Checking the correct operation	The system runs properly if: - Inverter displays battery SOC correctly - System charges / discharges Note: **If you can not complete the commissioning, then turn off the battery before you leave the site and make sure all LEDs are off to avoid a discharge of the battery.**

2. ERROR ANALYSIS

Please refer to the general steps before proceeding, see chapter 1.

2.1 BMU shows no reaction / No LED

LEDs of BMU do not light up, although the battery is ON.

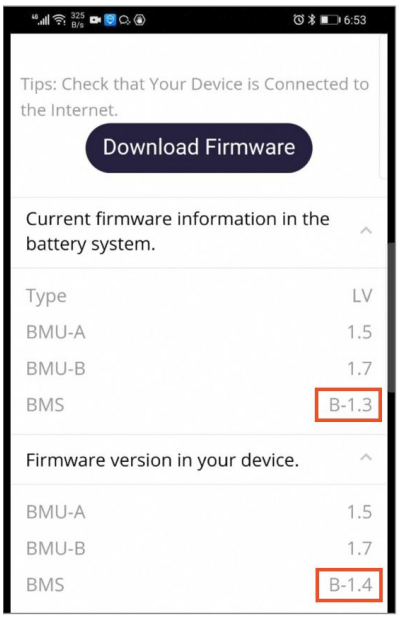
No.	Name	Description
8	Check correct cable port	Make sure that the correct data cable port has been used at the BMU (“BMS” port. Do not mix with “inverter” or “Ethernet” port).
9	Unplug Comm Cable	Sometimes might be necessary to unplug the communication cable and plug it back again when the batteries are switched on.
10	Replace Comm Cable	Try a completely new communication cable between battery and BMU.
11	Voltage measurement on pin 7&8	Measure the voltage of PIN 7 & 8 while the other side of the cable is connected to the IN port of the Battery-Box and while the Battery-Box is powered on. Voltage should be around 50V. If yes: try another BMU (if available). If no: check another cable or try another LVS if multiple batteries are installed in the system.. 
12	Only LED faulty?	In some rare cases, the LED of the BMU is faulty. To check that: check if there is a WIFI access point of the Battery-Box and check if there are internal LEDs inside the BMU. If so, only the external LED is inactive and a commissioning could still work.
13	Voltage measurement	Check voltage of battery. See **Section 2.6**
14	BMU exchange	Only if voltage between pin 7&8 are okay, correct comm port is used, voltage seems correct and the cable between the Battery and the BMU was exchanged: Test another BMU, if available.

2.2 Communication problem with Inverter

No.	Name	Description
15	Configuration	Check if the configuration is correct. Refer to latest “BYD Battery-Box Premium LVS Minimum Configuration List” (V1.1 or above) available at: www.bydbatterybox.com Make sure the inverter is configured and working correctly.
16	Communication cable	- Confirm PIN / Cable Configuration for the specific inverter model (see manual) - Replace the communication cable (min. CAT5!)
17	Check terminal resistor	Make sure that the terminal resistor is connected to the OUT port of the last battery (the battery with the highest address). Terminal resistor properties: 120 Ω resistor between pin 5 and 6
18	**App Configuration and Firmware**	Please check if the App configuration was successful and the Firmware is the most recent one. If there are problems, please refer to **Section 2.3**
19	Restart the entire system	1. Switch off the Inverter 2. Switch off the battery (Press button on BMU for 5 seconds until all batteries switch off) 3. Wait for 2 Minutes 4. Turn on the Battery (button on any battery) and then 5. Turn on inverter second
20	Further checking	If problem remains: - Download all data with BCP **(section 2.5)** - Check the inverter - Try by replacing the BMU, if available

2.3 Problem with the Firmware Update / App Configuration

The Battery Management consists of two components: the BMU and the BMS. The Firmware Update from the App will update the BMU, which will then update the BMS. **The BMS update can take up to 30 Minutes until the firmware is updated on the BMS**.

No.	Name	Description
21	Correct App and Firmware	Make sure to have the latest App Version (>1.5.1) and Battery Firmware (download inside the App) on your mobile device before connecting the app with the battery WiFi. If the App cannot be installed, or other general Problems occur with the App: - Try with a different mobile device (For Android: min Android version requirement is 4.4.) - Try with PC Tool BCP (**section 2.5**)
22	App reports: "Data connection busy" / "Data connection failure."	Battery-Box is busy (e.g the battery could be updating the firmware). Please wait 10 minutes and try again.
23	Close and restart the App	If the App does not react anymore after some minutes loading during the update process, close (close the program completely) and restart the App. Or try with PC Tool BCP (**section 2.5**)
24	BMS Version not updated	The App will only update the BMU. The BMU will update the BMS, which **can take up to 30 minutes**. If the BMS Version is not updated after 30min with stable inverter communication, follow the below Process: 1. Update Firmware through the App again 2. Restart the system a. Switch off the Inverter first, then switch off the battery second (Press LED for 5 seconds) b. Wait for 2 Minutes c. Turn on the Battery first, then turn on the inverter second 3. Wait for 30 Minutes 4. Check BMS Firmware Version again with App. If Version is still wrong, do the update process again (if possible with another mobile device). 

2.4 BMU/BMS LED Event Code (EC)

A constant white LED refers to standby mode. White blinking means charge or discharge.
When the battery is initiating, the LED will flash white and blue with an interval time of 0.5 seconds (normal during startup).
When the LED flashes blue with an interval time of 1 second it indicates an event code. We start to count when the white LED begins to flash, then we count how many times white and blue LED flashes. (also refer to the manual!)
Example: 1xwhite, 6xblue → EC 106 / 1xwhite, 11xblue → EC 111 / 3xwhite, 3xblue → EC 303

Most Errors come from a faulty communication line, incorrect app configuration or missing restart after app-configuration.
Please go in detail through: **Section 2.2 & 2.3**

Note: if the system is not correctly configured with the app, the event code (EC) might be misleading.

EC BMU	EC BMS	Measure
EC 101	all	- Download all data with BCP (especially the historical data) **(section 2.5)** If problem remains: replace BMU, if available
EC 102 EC 105	all	- Make sure app-configuration has been completed correctly (especially module quantity!). - Check terminal resistor - replace communication cable between Battery and BMU - Restart system according to manual. (note: to properly shut down you need to press the button on BMU for 5 seconds. Make sure to start the battery before starting the inverter!) - If the problem remains, check the connection ports of the LVS Module with the LED white and blue blinking and the module above this one. If all modules show this blinking, check the top module first **(see section 2.7)** - Download all data with BCP (especially the historical data) **(section 2.5)** - Check if the system works when removing the suspected module **(see section 2.8)** If problem remains: replace BMU, if available
EC 103	EC 108	- Check DC cabling and make sure that the Minimum Configuration is met. - Check the voltage of the batteries with BCP according to **section 2.5 / 2.6** - Restart system properly (see **Step 19**, **section 2.2**; especially make sure that fuse between battery and inverter is closed, if there is a fuse) - Download all data with BCP (especially the historical and cell data) **(section 2.5)** - Check if the system works when removing the module with the EC **(see section 2.8)** - provide the SN and voltage of the faulty module (see checklist on last page)
EC 104	EC 101	- Check DC cabling (is there any short circuit? Fuse between battery and inverter closed?) - Disconnect the battery system from the inverter and restart the battery system alone (battery isolated), to evaluate if the error is being caused externally (i.e. short circuit in inverter or mppt). If the Event Code remains, the error might be in the battery. If the Event Code has changed, there might be an error in the inverter side. - Download all data with BCP (especially the historical and cell data) **(section 2.5)** - Check if the system works when removing the module with the EC **(see section 2.8)** - provide the SN and voltage of all modules with the EC (see checklist on last page)

EC 104	EC 102 up to EC113 (All other than 101)	- Download all data with BCP (especially the historical and cell data) **(section 2.5)** - Check the voltage of the batteries according to **section 2.6** - Check if the system works when removing the module with the EC **(see section 2.8)** - provide the SN and voltage of the module with the EC (see checklist on last page)
EC 106	all	- Make sure the inverter is on, configured and working correctly. - Check according to **section 2.2**

2.5 Be Connect Plus (BCP)

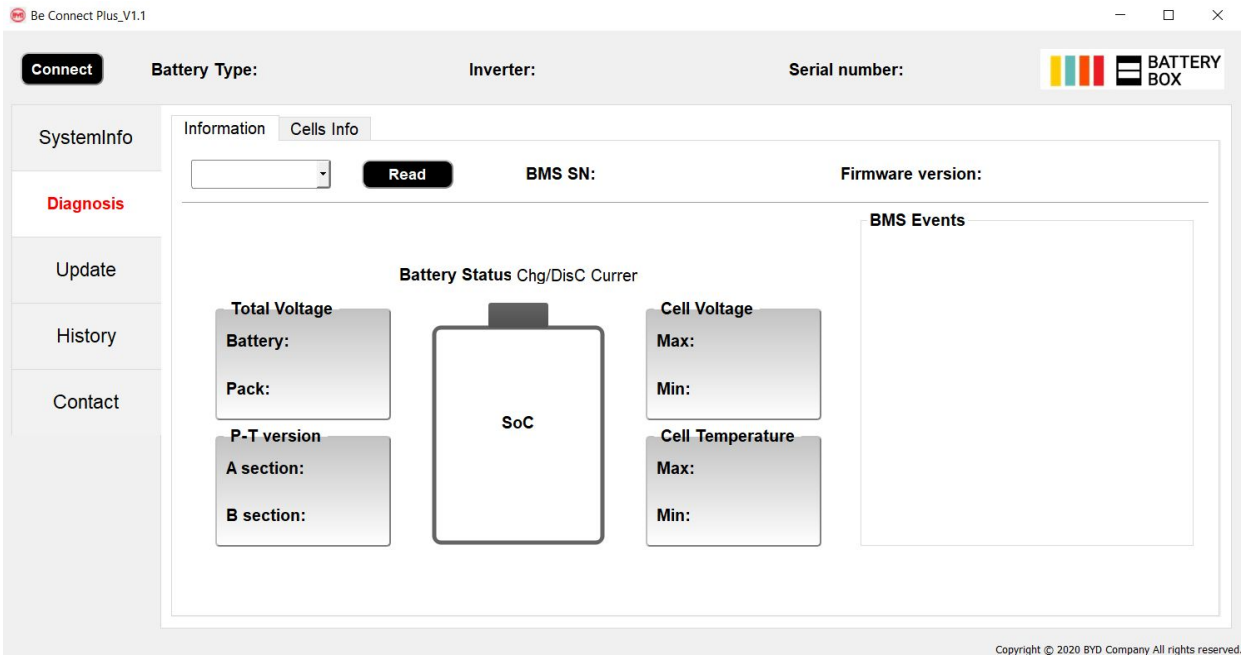
Be Connect Plus is a Windows-PC tool. With Be Connect Plus (BCP) you can:

- read the battery information,
- configure the battery system
- update BMU & BMS firmware
- Export / download battery logs (From BMU and all BMS)

BCP is constantly being improved and updated. **Make sure to use the latest program version. You can download the latest version of the Tool on www.bydbatterybox.com / www.eft-systems.de / www.alpspower.com.au**.

For the service analysis, please download and provide the data / logs as described in the program instructions (see PDF manual inside of program ZIP archive).

Note: You need a windows computer that will be connected to the battery Wifi.



2.6 Voltage measurement and undervoltage

Attention: Make sure not to create a short circuit!

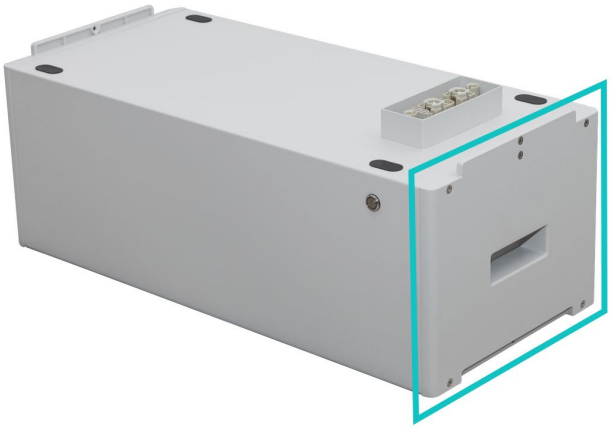
- **You can see the max. and min. cell voltage in the BeConnect App.**
- **You can also get the detailed module and cell voltage in the BCP Program (section 2.5)**
- **or measure it manually according to the below description:**

To check the voltage on the PDU, the Modules have to be ON and the BMU has to be connected with the PDU! (LEDs on Modules and BMU have to be ON)
Please measure at **P+** and **P-** according to the below picture:

The voltage measured on the PDU is the combination / average voltage of all modules in the tower. This should be around 50 V. If it is not around this value, please measure the voltage of each individual LVS Module by one of the following two possibilities (please note, that you cannot measure the correct voltage in any other way).

1. Only put one Module in the tower and measure the voltage according to the above process on the PDU. (Make sure the LVS Module is ON and BMU connected when you measure the voltage on the PDU).

2. If the modules cannot be activated, or you cannot get a correct voltage value, the other option to measure the voltage in one LVS module is by opening the module according to the below process:

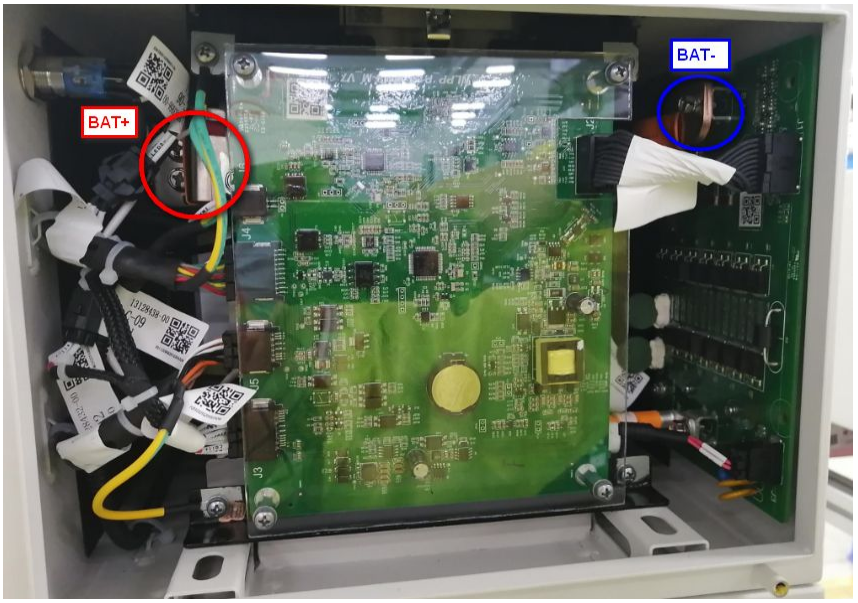


To check the voltage, you need to disassemble the right side of the battery module (the side with the LED). Then follow the procedure described on the next page.

Attention: Make sure not to create a short circuit!

The voltage should be about 50 V.

Measure the voltage at the below marked “BAT+” and “BAT-”.



Measurement shown here:

Undervoltage

A Module in which one of the 16 cells has a voltage of <1.5 V is in undervoltage (check with BCP (section 2.5) / BC if possible).

- LVS Modules with >45 V should be fine and you can continue to check other points according to this service guideline.
- If the module voltage is <40V but the single cell voltage is >1.5V, the battery needs to be charged quickly while avoiding any further discharge. Therefore shutdown the system and search the problem according to the guideline, while the battery is completely off. Also check on the inverter side why the force charge doesn’t work. Do not turn on the battery before making sure the inverter should be able to charge the battery.

- If only one module is in undervoltage: remove that one and try commissioning without it (if the remaining modules still comply with the Compatible Inverter List). Otherwise, make sure to avoid further overdischarge. (Turn off the system completely)

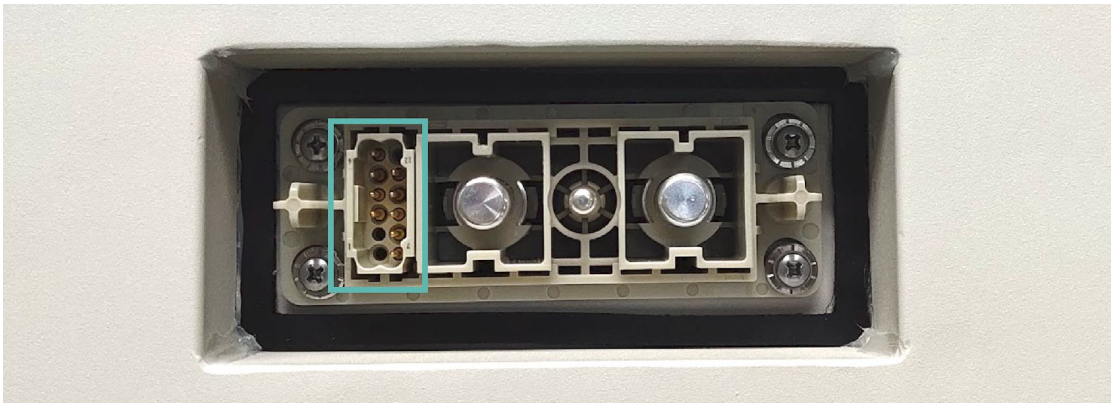
- If one, or all modules are in undervoltage: Contact the service as stated below and make sure to avoid any further discharge of the battery (Turn off the system completely)

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

- Serial Numbers (of the BMU and all (affected) modules)
- Individual module voltages of all modules (related to Serialnumber)
- If possible: Logs from the battery using BCP (section 2.5) and Screenshots showing the cell voltages
- Initial Firmware (FW) Version of the Battery when the UV happened (BMU and BMS)
- Detailed description how and why the system reached Undervoltage if known. Information when the system was installed and commissioned and in which circumstance and when the undervoltage happened. If the battery was never running before: Why did it never work before, and what was the Batteries status when the battery was left (on / off / LED).
- Inverter Model, Serial Number and Inverter Logs
- Access to Inverter portal (add info@eft-systems.de and tell us the name of the system in the portal)

2.7 Visual Check

The PINs should not be bent. A module with twisted pins will still work as long as it is the bottom module in the tower. So if you find twisted pins in a module, make sure to position that module in the bottom of the tower.



2.8 Identifying a faulty module

- **The module quantity must be adjusted in the app whenever the number of modules is changed!**
- **Please perform a visual check of the communication pins according to step 2.7 for each module.**

- Normally a faulty module can be identified with the Be Connect Plus Program or by the LED Code in the Battery Module. In this case, remove the Module with the Event Code from the system, and commission the remaining system (if it still complies with the minimum configuration list) and check if it runs properly. If the problem remains, please also check the module above the one with the Event Code.

- Otherwise, try the LVS Modules one by one, or by adding Modules one by one into the tower and always check if the system can work properly to identify a possibly faulty module.

3. SERVICE TASKS

Please go through the general steps beforehand, see chapter 1.

3.1 BMU Replacement

Have you detected a faulty BMU?:
After replacing the BMU, please do not forget to re-do the configuration and firmware-update in the app.

3.2 PDU Replacement

3.3 LVS Module Replacement

After replacing a Module, please do not forget to re-do the configuration and firmware-update in the app. (Every module has its own BMS)

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1. GENERAL STEPS

Please carefully check **all** 7 „General Steps" from page 3 of the Service Guideline and confirm this in the boxes below

- ☐ 1.1 Configuration
- ☐ 1.2 Correct external cabling
- ☐ 1.3 Latest Firmware
- ☐ 1.4 App Configuration
- ☐ 1.5 Restart
- ☐ 1.6 Switch on procedure
- ☐ 1.7 Correct Operation

2. ERROR RELATED ANALYSIS

Please mark the **error related** Analysis from Chapter 2 (page 4-11) of the Service Guideline that you checked, and collect all the information related to those Sections

- ☐ 2.1 BMU shows no reaction / No LED
- ☐ 2.2 Communication problem with Inverter
- ☐ 2.3 Problem with the Firmware Update / App Configuration
- ☐ 2.4 BMU / BMS LED Event Code (EC)
- ☐ 2.5 Be Connect Plus (BCP)
- ☐ 2.6 Voltage measurement
- ☐ 2.7 Visual Check
- ☐ 2.8 Identifying a faulty module

3. SERVICE INFORMATION

Please fill all available information in below table. Some information like the Serial Number of the BCU is mandatory to receive service.

- **Service Ticket Number or System ID:**

- **Installer / Delivery Address / Contact:**

Company		ZIP / City	
Contact Person		Phone	
Street / Nr.		Email	

- **System Information**

Battery Configuration (LVS...)		BMU Firmware	
BMU Serial Number		BMS Firmware	
BMU Connected to Internet	Yes ☐ No ☐	Inverter Firmware	
Inverter Brand + Model		Inverter Portal Name (State the system name. Provide access)	
Inverter Serial Number			
Commissioning Date			

- **Service Information**

BMU EventCode (EC)		Inverter Error Code	

BMS EventCode(s) and related Module Serial Number(s)

Was the battery charging / discharging before (was the system working normally before?) Yes ☐ No ☐

Get Data of the Battery-Box with the Be Connect Plus (BCP) Programm (see chapter 2.5) ☐

Description of the Problem

Please provide any additional information that is necessary or could help in the analysis of the service case (e.g. serial number of a wrong module, video of a special behaviour; pictures; app screenshots; module voltages...)

By contacting us you confirm, that a qualified person has done the necessary control and collected all available information above.

Service Contact:

Europe: EFT-Systems GmbH
www.eft-systems.de
service@eft-systems.de
+49 9352 8523999

Australia: Alps Power Pty Ltd
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For Europe only: Register Ticket directly in the Online Service Center: https://support.eft-systems.de/

BATTERY BOX