



# **BYD Battery-Box PRO**

## **Service Guideline from EFT-Systems**

Version 1.0

Valid for PRO 2.5-10.0 and PRO 13.8



**Important: The installation and all other kinds of works or measurements in combination with the Battery-Box are only allowed by professional and qualified electricians.**

This manual is a shortened assistance for the installation / service of the Battery-Box PRO and does not replace the original manual, which can be found on [www.eft-systems.de](http://www.eft-systems.de) or [www.byd.com](http://www.byd.com). The installation must be carried out by a trained and qualified electrician. Attention: High Voltage! Improper handling can cause danger and damage.

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# 1. CHECK INSTALLATION

Please proceed first with the installation steps by:

No.	Name	Description
0	Inverter installed correctly?	Please make sure that the connection between the Battery-Box and the inverter and the installation of the inverter have been carried out correctly. If in doubt, follow the instructions of the inverter manufacturer. IMPORTANT: Please install the latest software on the inverter.
1	Configuration	Please double check if your system and application is according to the Compatible Inverter List of BYD (available at <a href="http://www.eft-systems.de">www.eft-systems.de</a> ) Please check the software version of the inverter is at least the minimum version stated in the compatible inverter list of BYD (available at <a href="http://www.eft-systems.de">www.eft-systems.de</a> )
2	DC Power Cable	Make sure that + and - are properly connected.
3	Communication cables	Please check: -In some cases the cable between the battery CAN port and the inverter must be specially made. Please check the specifications in the installation manual. - Recommended CAT5 or higher; - Check the cables and replace them if necessary - Check if all Cables inside the battery (Battery Modules to BMS) are ok, and reinsert them if necessary
4	Grounding	Battery-Box connected directly to the ground-bus of the house. The battery must not be earthed via the inverter! Otherwise, communication problems are possible.
5	Correct Address	Is the ADDR (address) Switch according to the manual? 1 = 10000 2 = 01000 3 = 11000 4 = 00100 ...
6	Correct Restart (!)	Has the system been restarted correctly before commissioning? During the restart process there should not be any LED blinking or on! <b>(Important! The BMU and BMS LEDs must be off completely.)</b>
7	Checking the correct operation	The system runs properly if: - <i>BMU LED is constant green</i> - <i>BMS of battery shows constant green or charging / discharging</i> - No error messages on the inverter - Inverter displays SOC of Battery correctly - System charges / discharges
<b>IMPORTANT: If you can not complete the commissioning, then turn off the battery before you leave the site.</b>		

## 1.1 System Components and general protection mechanisms

The Battery consists of the BMU, Cables, BMS and Battery Cells.

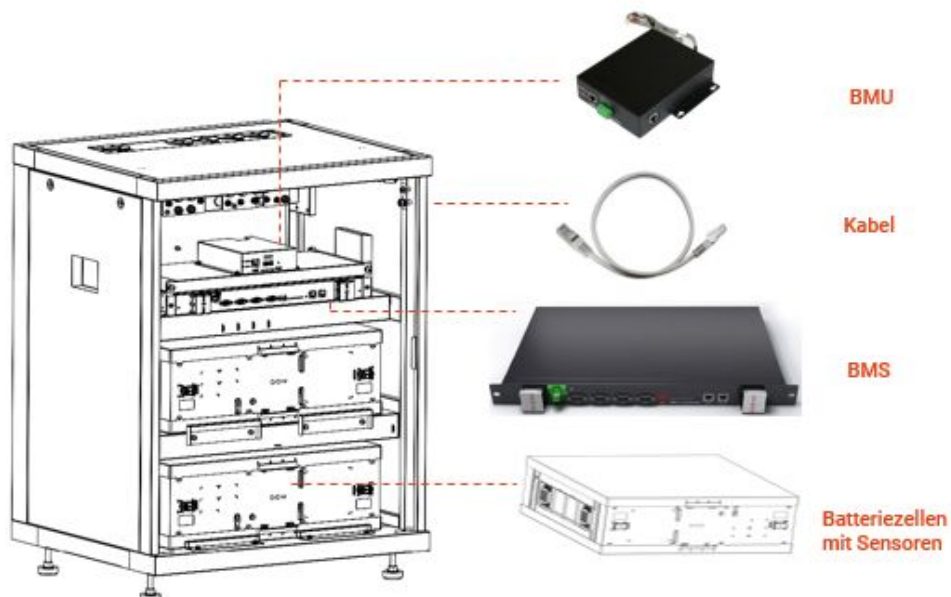
The **BMU** manages the communication between the inverter and all the batteries in the system. The BMU reports the safe working limits, battery status and battery alarms to the inverter. Therefore, if communication is not established correctly or lost the BMU will shutdown all the batteries. Only one BMU is needed and in use for one battery cluster. (See installation manual)

The **BMS** is included in each battery module (B-plus 2.5) or in each cabinet (B-Box 13.8). The BMS balances and protects the battery cells and reports status and alarms to the BMU. In the case that an alarm is present and the BMU fails to protect the system, the BMS may shutdown the battery as a precaution.

### BATTERY-BOX PRO 2.5-10.0 AUFBAU



### BATTERY-BOX PRO 13.8 AUFBAU



## 2. ERROR ANALYSIS

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

If you are having problems with the installation or commissioning please refer to section 2.1

If one or more of the batteries has shutdown or stopped working please refer to section 2.2

If a working system is misbehaving please refer to section 2.3

### 2.1 Installation or commissioning issues

An installation will be successful when the battery detects the inverter (represented by a solid GREEN RUN LED in the BMU-diagram in the right), the inverter detects the battery (In general you will be able to see BYD B-Box in the inverter interface) and the battery is capable of charging and discharging for at least 5min.



Solid green is working normally

If the above is not true please take a look at the number of times the BMU RUN LED is blinking. Please note **in most cases this is not related to the battery software so please review the installation first.**

NO. Blink	Cause	Corrective measures
1	BMU cannot communicate with inverter	<ol style="list-style-type: none"> <li>1. Review in detail the commissioning steps in the inverter manual</li> <li>2. Confirm you are using the CAN cable recommended in the BYD and inverter manual</li> <li>3. Exchange the cable between the BMU and Inverter</li> </ol>
2	BMU cannot communicate with any battery	<ol style="list-style-type: none"> <li>1. Check the addresses of all the modules</li> <li>2. Replace the communication cable between the BMU and the first battery</li> </ol>
3	BMU cannot communicate with one / some batteries	<ol style="list-style-type: none"> <li>1. Check if any battery has a green side to side scrolling light</li> <li>2. Put the address to 00000 and change back to the correct address</li> <li>3. Replace the communication cables between batteries</li> </ol>
4	Battery Damage	<ol style="list-style-type: none"> <li>1. Check how to proceed with RED LED below</li> </ol>

If the communication problems persist please try to commission the system with 1 battery only and if it is successful add the batteries gradually to the system until you identify the one that doesn't communicate. If the problems persist please try a different BMU or a different master inverter if available.

**Always do a correct restart** (all LEDs have to be completely off (also no blinking) - this can take some minutes)

## 2.2 Battery shutdown or inverter reports battery failure

**Yellow ARM light:** Temporary issue → The system or the user can take action to correct it

If the yellow light doesn't disappear after a few minutes please review the electrical installation according to the below legend.

### Alarm:



If the yellow ARM light is on, shortly press Reset (ON/OFF) Button and observe how often the LED blinks

NO. Blink	Cause	Corrective measures
1	Cell or B-plus Undervoltage	Charge
2	Charge overcurrent	Close the input and check it.
3	Charge overcurrent in the low Temperature	Reduce the charging current
4	Charging short circuit	Eliminate short circuit
5	discharging short circuit	Eliminate short circuit
6	Parallel short circuit	Eliminate short circuit
7	Discharge overcurrent protection	Close the load. Check the load power.
8	High temperature protection	Power off the system. Find the cause of the high temperature. Open the exhaust fan or air conditioner to cool down.
9	Low temperature protection	The temperature is too low to turn on the heating up
10	overvoltage protection	discharge.

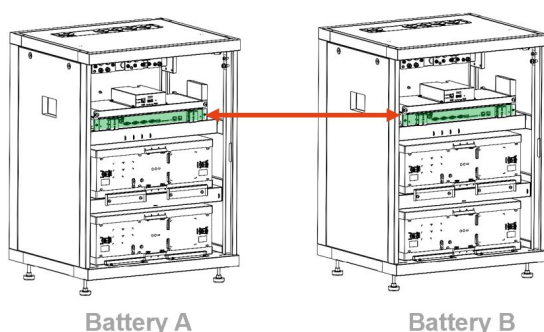
**Red ERR light:** Permanent issue → A component might have been damaged

For 2.5 please see below table and report to your local service partner

For 13.8 we need to confirm if the issue is in the battery, BMS or sampling cable before reporting to the local service partner.

For this purpose we recommend the following test: Change BMS A from Battery A (with error) to Battery B and BMS B to Battery A. Keep the sampling cables in the same battery.

- If the error stays in the same battery, either the cabling or the batteries might be faulty
  - then do the same with the cabling - and exchange this with the other tower.
- If the error moves with the BMS, probably the error is inside the BMS
- If the error disappears it was probably from a loose contact between cables.



**Error:**



If the red ERR light is on, shortly press Reset (ON/OFF) Button and observe how often the LED blinks

No. Blink	Cause	Corrective measures
1	Voltage sensor failure	Read the history alarm information. Check that the sampling line is in good contact.
2	Temperature sensor failure	Read the history alarm information. Check that the sampling line is in good contact.
3	Charging circuit failure	Read the history alarm information.
4	Discharging circuit failure	Read the history alarm information.
5	cell brokened	Read the history alarm information
6	536 Communication failure	Read the history alarm information.

## 2.3 Unusual behavior of a working system

### **Case 1:** Current too low

If available please check the charge/discharge current limit from the inverter data. This value is provided by the battery to the inverter. This value may vary depending on the circumstances, such as SOC close to 0% or 100%, alarms or temperature below 12 degrees (See User manual for details on derating).

If the real current is below the current limit set by the battery please check the remaining components in the system

### **Case 2:** Battery cannot charge/discharge

Please follow the recommendations for case 1 first. When to charge or discharge is decided by the inverter with the data provided by the meter or CT clamp. Please check if those components are communicating properly and no alarms are present. Alternatively check with the inverter provider regarding the correct working modes and parameters for your installation.

### **Case 3:** Abnormal SOC or SOC jumps

There can be two causes for this issue.

Lack of calibration: LFP batteries have a very stable voltage curve and only show meaningful changes of voltage when SOC is close to 0% or 100%. Therefore, it is important to let the batteries charge completely with certain regularity. One time should be enough but if the problem persists please perform several full cycles from close to 0% SOC until 100% SOC.

Small loads for a large period of time: Some devices in an energy storage system are powered by the batteries. Most of these devices have a very low power consumption. There is a limit to the current measurement precision of the batteries, any load below that will not be measured so it will not have an influence in the SOC calculation. Therefore, if the system is idle or under a very small load for a long period of time it is possible that the SOC shown is not the real one. Once that occurs please perform a calibration cycle.



## 3. SERVICE TASKS

In some cases you might be asked to perform additional measurements or tasks to solve a service case

### 3.1 Voltage measurement

#### **ATTENTION: High voltage!**

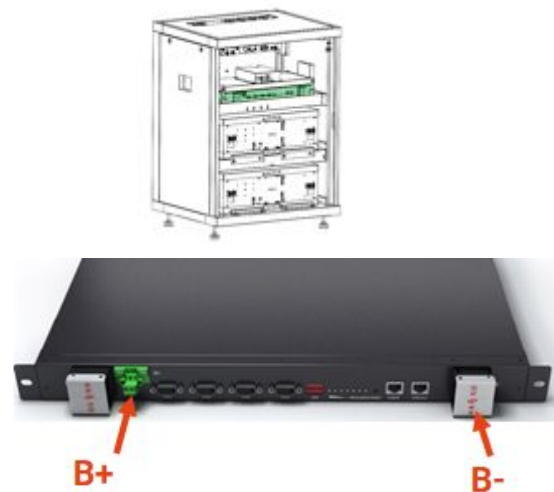
The nominal voltage modules by 50V.

Measure Voltage on BMS (should be about 50V):

PRO 2.5-10.0 (B-PLUS 2.5):



PRO 13.8 (BMS):



For PRO 13.8: If the measured voltage deviates significantly from the nominal value, please measure the voltage directly on the two battery modules DC ports. (Nominal voltage per battery should be around 25 V).

### 3.2 Emergency charge

See emergency charge guide

### 3.3 Battery information Query and Read Alarm history

Manual provided by Service partner

### 3.4 Software update

Manual provided by Service partner

## 4. SERVICE CONTACT

Please note that this document is intended as a quick reference guide to quickly resolve common problems. Further information and detailed installation assistance can be found at [www.eft-systems.de](http://www.eft-systems.de).

To ensure a smooth process, please register yourself and the system under [www.eft-systems.de](http://www.eft-systems.de).

For further help please contact:

**EFT-Systems GmbH**

**Mail: [service@eft-systems.de](mailto:service@eft-systems.de)**

**Phone: +49 9352 8523999**

**IMPORTANT:**

In order to be able to process a service case, it is **absolutely necessary** to get the serial number of the Cabinet / BMS and all error-specific information, see the table below:

No.	Name	Description
A	<b>Serial number Cabinet / BMS / Module</b>	At the cabinet or on the BMS
B	Photos	Photos showing inverter errors / cabling / setup
C	Video	Video that shows the LED behaviour
D	Voltage	Voltage of the Battery according to Section 3.1
E	Serial number of the faulty module (Note: only necessary, if a faulty module was found!)	On the module directly
F	Inverter serial number and model	Important for EFT Systems to analyze and resolve the problem at system level with the inverter partner.
G	If necessary: Delivery address	If replacement parts are required we need: <ul style="list-style-type: none"><li>- Complete delivery address (including country)</li><li>- Contact person</li><li>- Telephone number</li><li>- Email address</li></ul>
H	Additional information	If available, please support us with additional information (eg comments / information displayed on inverter / additional photos of the system / ...).
I	Inverter Error Messages	Please record all inverter error messages - if possible with pictures, or Data sets
J	Inverter Portal Access	In some cases it can be helpful to get access to the inverter portal