PSM Trouble shooting guide
(To be included in the installation manual)

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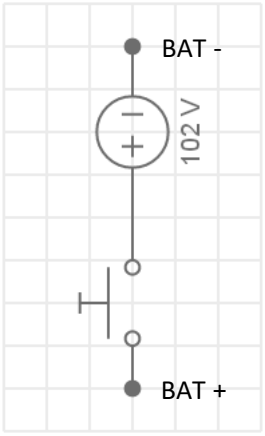
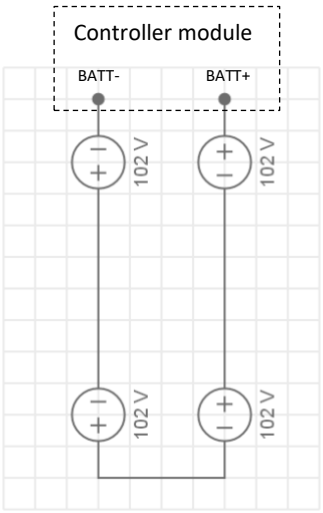
Battery system schematic diagram

1. One battery module.

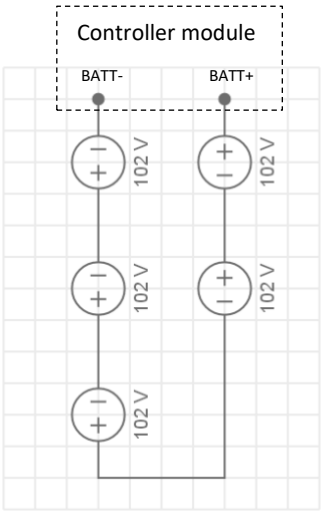


Note: the **jumper brick** is illustrated here as a “switch”; when inserted, the single battery module is **switched ON.** Refers to **6.1 JUMPER BRICKS** for detailed description. The open circuit voltage measured between BAT+ and BAT- is 102 ~ 106V.

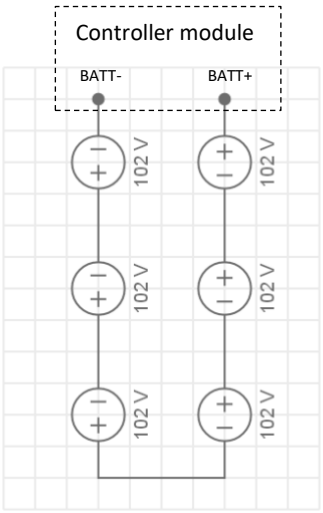
2. **Schematic diagram** showing **power cables**



PSM 10 (4 Batt.)

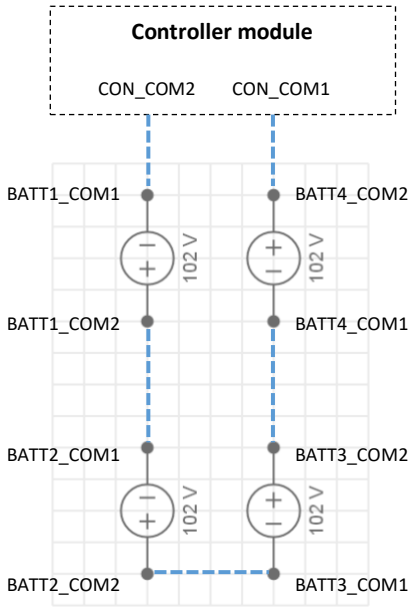


PSM 12,5 (5 Batt.)



PSM 15 (6 Batt.)

3. **Schematic diagram** showing **comm. cables**



Note: the **cable connector is labeled** with the exact port to be connected.

Taking **PSM10** (4 batteries) for example, 5 comm. cable are installed between:

CON_COM2	BATT_COM1
BATT1_COM2	BATT2_COM1
BATT2_COM2	BATT3_COM1
BATT3_COM2	BATT4_COM1
BATT4_COM2	**CON_COM1**

Properly installed comm. cables should resemble a "**close loop**"

Trouble shooting guide

1. Measure the voltage (BAT+ and BAT-) for **each battery** module

   - The measured module voltage $V_{BAT+,BAT-}$ shall be 102 ~ 106V

2. Check the power cable polarity according to the system **schematic diagram**

   - Use a **CAT III** (690V or better) multimeter for measuring the total voltage of a battery string. Normally, the **Negative (COM)** probe is **black,** and the **Positive (DC V)** probe is **red.**

   - Step by step measuring the battery voltage in series, the measurement should be according to the following:

Negative (COM)	Positive (DC V)	Battery pcs.	Approx. Voltage (V)
BAT1-	BAT1+	1	102
BAT1-	BAT2+	2	204
BAT1-	BAT3+	3	306
BAT1-	BAT4+	4	408
BAT1-	BAT5+	5	510
BAT1-	BAT6+	6	612

if the measured voltage does not correspond to above, check the power **cable** as well as the safety **jumper brick**; repeat the measurement.

- If properly connected, the total measured voltage at the **controller module** (BATT +, BATT -) should be:

Negative (COM)	Positive (DC V)	PSM model	Approx. $V_{BATT+,\ BATT-}$
BATT-	BATT+	PSM 10	408 v
BATT-	BATT+	PSM 12,5	510 v
BATT-	BATT+	PSM 15	612 v

3. Check the protection earth (**PE**)

- Note: the PE is shared by the **controller module, ESO** (casing)**,** the **cabinet** and **PE in the main junction box.** The electric potential should be equal when measured using a multimeter.

- It **prohibited** to connect PE with single phase neutral line (N) which will cause **isolation** fault thus result in system bootup failure.

- At normal operation condition (bootup completed), the PE is "floating" meaning:

$$V_{BATT+,\ PE} = V_{PE,BATT-}$$

Taking PSM 10 with 4 batteries for example, when measuring at the controller module output with a multimeter:
$V_{BATT+,\ BATT-}$ *$\sim= 408$ V ,* $V_{BATT+,\ PE} = V_{PE,BATT-} \sim= 204$ V*

4. Check the CAN communication cable (**COM1, COM2, CAN**)

- **Proprietary cables** are used for CAN communication between adjacent modules and are always physically connecting from port **COM2** (on the first module) to **COM1** (next adjacent one). Follow **3.3 CABLE INSTALLATION** for detailed instruction. Refer also to the **Schematic diagram** showing **comm. cable** in previous section.

- Standard RJ45 cable is used for CAN communication between controller module to the ESO.

  When connecting a CAN analyzer to the **CAN** port (RJ45) on the controller module for debugging, one will need to manually set **RES** dip1 to **ON** (CAN terminating resistor) because some CAN analyzer does NOT have internal terminating resistor thus results in CAN communication failure. It is OK to leave **RES** dip1 to **ON** even for normal operation condition.

5. Power on the PSM system

- **CHECK the DC junction box first**: the DC junction box normally accommodates one DC breaker (MCB, 4-p 1000V) for DC-link and multiple fuse holders (1-p 1000V) for SSO (10A, solar panel) and ESO (20A, battery).

  It is important to **connect only ESO** to the DC-Link for trouble shooting. Make sure DC power (Energy hub) is turned off before proceeding.

- First, power up the DC-link

  - Connect ONLY the ESO to the DC-link, it can be done by closing its fuse holders while leaving the SSO fuse holder (s) open; close the MCB breaker for DC-link, then

  - Switch on the Energy hub, it will automatically detect modules connected to DC link and power them up;

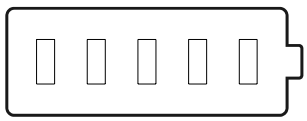
  - The LED on the ESO panel will light up indicating it is powered through the DC link

  - The fault LED on the ESO panel will light up **red** indicating no communication to the battery controller module. This fault will be cleared as long as the battery is properly connected.

- Second, switch on the battery controller module

  - Make sure the main **breaker (QS)** is on and the **jumper** (green) on the front of the controller module is inserted. The controller model (H100030H-P02) will bootup immediately after powered through AC 230V.

  - The LED on the front panel will light up **one at a time from left to right** indicating self-diagnosis, during which time the user can hear multiple "**click**" indicating relay action inside the controller module.



  - The PSM boot up sequence will take about 45 seconds; when finished, the ESO will automatically recognized the connected battery, and the LED on the ESO panel will light up **green**.

  - On the PSM cabinet front panel, the left-most LED will **stay on** indicating SOC ~ 20%.

- **Note:** the controller module will automatically perform multiple diagnoses before trying to **pre-charge** then **close its main relays** (powered on):

output shortage	short circuit between controller module output to the ESO (LOAD/CHG +, -)
isolation	Step-wise impedance check: • Batt.+ to PE • Batt.- to PE • LOAD/CHG + to PE (briefly close pre-charge relay) • LOAD/CHG - to PE (open pre-charge relay, briefly close negative relay)
batt. voltage	the voltage from the controller battery string (batt.) agrees with the number of battery modules installed in the system
communication	the CAN communication between controller module and each battery module is established
Cell level BMU	the cell level management unit (BMU, inside the battery module) functioning normal; the cell voltage is normal
temperature	the temperature sensors are functioning normal; the ambient temperature should be above zero

In case any error is detected during the bootup, the controller module will abort the sequence and all LED on the cabinet front panel starts **flashing**.

Please contact customer support for further help if the guide does not resolve the issue.

Trouble shooting checklist

Mark **"x"** if the part is checked OK

What to check	Where to check	Mark
Power cables	Batt. module	
Jumper bricks	Batt. module	
Comm. Cable	Batt. module / Ctrl. module	
Protective earth (PE)	ESO / Junction box / Ctrl. module/ Cabinet	
DC-Link cable (DC+, DC-)	ESO / Junction box	
Power output (LOAD/CHG)	Ctrl. module (LOAD +, -) / ESO (BAT+, -)	
AC 230 cable	Ctrl. module	
QS switch	Ctrl. module	
Safety jumper (green)	Ctrl. module	
RJ45 (CAN)	Ctrl. module / ESO	