LibreSolarBox assembly guide

DISCLAIMER

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we are also not providing any warranty in any aspect.

The construction manual described here has been developed and tested by the team of cos(h) with care and to the best of our knowledge.

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This document contains excerpts from the gos(h)-groups libresolarbox-projectpage at https://github.com/CollectiveOpenSourceHardware/LibreSolarBox .
Some of them were recorded during the Assembly Workshop at the Fablab St.Pauli, 08. July 2018

Environment and Tools

Preparation Steps
- Software tools
  - FreeCAD,
- Prepare tools and place
-> foto of each part
  - table
  - crimping tool
  - screwdriver
  - side cutter
  - allen wrench

- Prepare material and components
  - Frame and Housing (in this case UniProKit)
    - screws, nuts

  - T-slot alu profile
  - 3D printed corner elements / connectors
  - bottom plate
  - housing plates
- Battery pack
  - 3D printed battery case (bottom and cap -> download link to file)
  - battery cells
  - cell connectors
- electrical components
  - Libre Solar components -> MPPT, *BMS*, (optional: CAN2Wifi)
  - (optional: RaspberryPi0)
  - wires - power wires (6 sq mm), balancing wires (2 sq mm)
  - ferrules, cable lugs
  - (optional: communication wire - ethernet cable)
- plugs
  - *dc-output plugs (car plug, 2x)*
  - solar input plugs (Weidmüller PV Stick allows assembly w/o crimping and is compatible to MC4. Clips should be removed that the plug can be unmounted without tools)
  - *usb plugs*
  - *ON/OFF switch, pushbutton, integrated LED*
  - (optional: RJ45 jacks (2x))
  - (optional: epaper display+conncetion wire)

Assembly Steps Overview

1. Frame assembly
- 1.1 nuts into t-slot profile (
- 1.2 place profile in rectangle, place corner elements between profiles, screw together
- 1.3 repeat

- -> result: 2 connected rectangle frame
- 1.4 connect the 2 rectangle frames with profile
- -> result: boxframe

2. screw bottom plate on bottom side of boxframe
- -> result: boxframe with bottom plate

3. cut and crimping wires
- 3.1 ...

4. battery pack assembly -> !!!!!safety note!!!!!
- 4.1 put battery cells in battery case (bottom part)
- 4.2 connect battery cells together
- 4.3 connect balancing wires with cells
- 4.4 connect power wires with battery cells
- 4.5 screw battery pack with bottom plate

5. mouting of electric components

Assembly

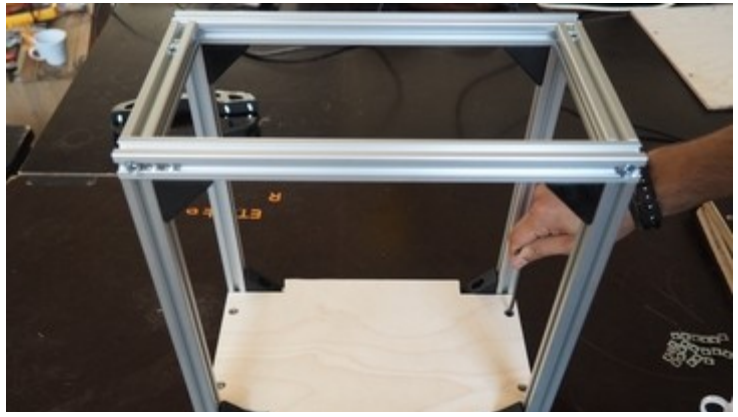
Assembly frame box

!!! For the framebox assembly we urgently recommend to use the detailed step-by-step-guide at https://github.com/case06/libresolarbox-v2_mobile/raw/main/doc/boxassemblyguide1d_osegci.pdf and see the framebox BOM at https://github.com/case06/libresolarbox-v2_mobile/raw/main/doc/bom_boxframe.pdf

Note: square nuts are not symmetric. When inserting them into T-Slot, keep the upper part outside. See picture [...] to determine the upper side of the nuts.
Create large squre frames first.

* Put larger profiles on the table and put plastic corners in the corners. Check orientation of the profiles. The holes on the side of the upper and the lower profile must be up.
* Insert all necessary square nuts in the T-slots.
Hint: Use a bolt to push a square nut into a slot.

* Control the placement of corners, screws and squre nuts.
Start with the bottom part.
* Connect a corner to the bottom.
* Connect a side part to the bottom.
* Connect another corner to the bottom.
* Connect another side to the bottom.
* Connect remaining corners and the upper part.
* Connect small T-profiles to a big square frame. The holes on the side of the large frame must be later outside of the box.
* Insert nuts into short profiles.Two nuts into the short profiles on the top of the future box.Four nuts into every short profile on the bottom of the future box.
* Add the bottom blending.

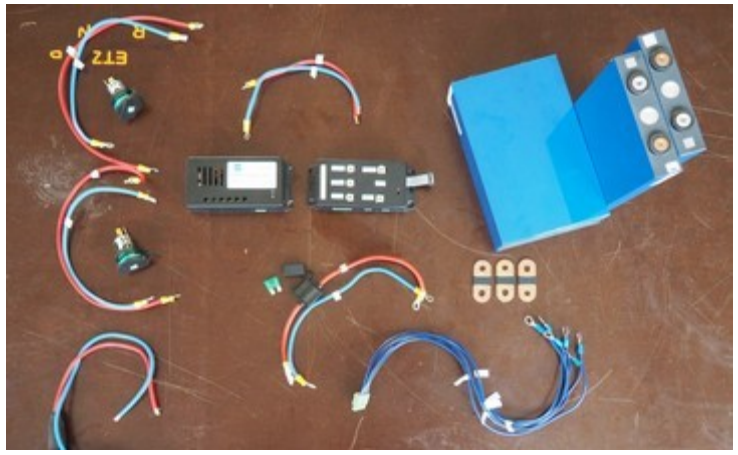


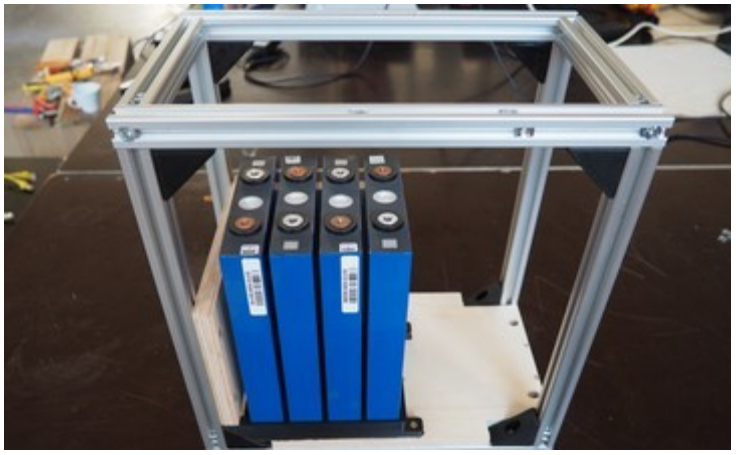
Add batteries

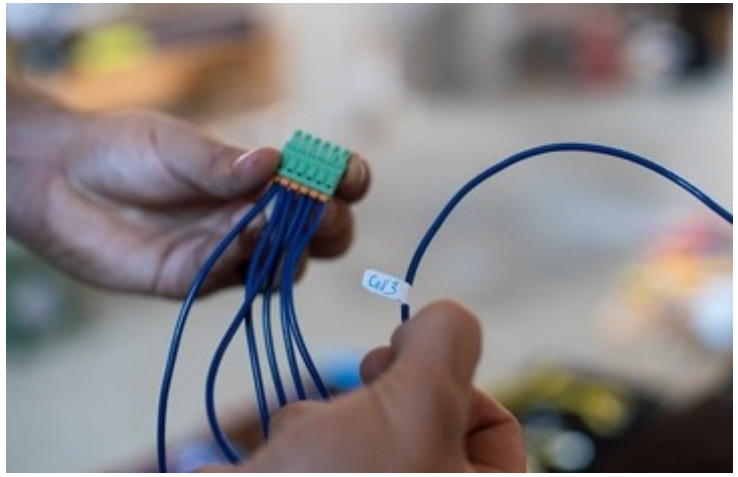
* Mark the batteries with numbers *1*, *2*, *3*, and *4*.
* Put batteries into the battery case.
* Isolate main **+** and main **-** of the batteries.

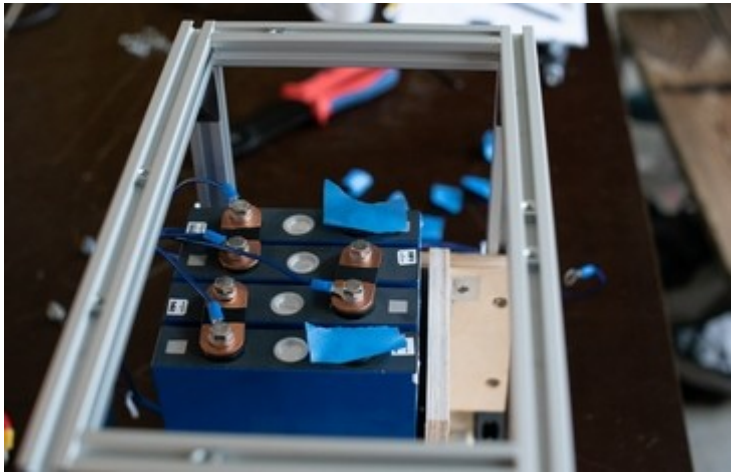
Now carrefully connect batteries one by one, from *4* to *1*.

* Put connector between *4* and *3*.
* Put a washer on the connector on the side *4*.
* Put thin cable with tag *4* on the washer
* Put another washer on the connector of the thin cable.
* Put a screw throw connector, washers and thin cable and tighten it.
* Put a washer on connector on side *3*.
* Put a screw throw the washer and the connector and tighten it.
* Connect in the simmilar way batteries *3* with *2* and *2* with *1*.
* Do **not** remove isolation from main **+** and main **-** yet.









Connect BMS

* Solder cablers to the on/off-switch.
* Mount blue thick cables and USB+ to *PWR-* of BMS.
* Mount red thick cables and USB- to *PWR+* of BMS.
* Connect two blue cables (- or +?) to two DC out sockets.
* Connect two red cables to two DC out sockets.
* Connect two thin cables from on/off-switch to BMS.

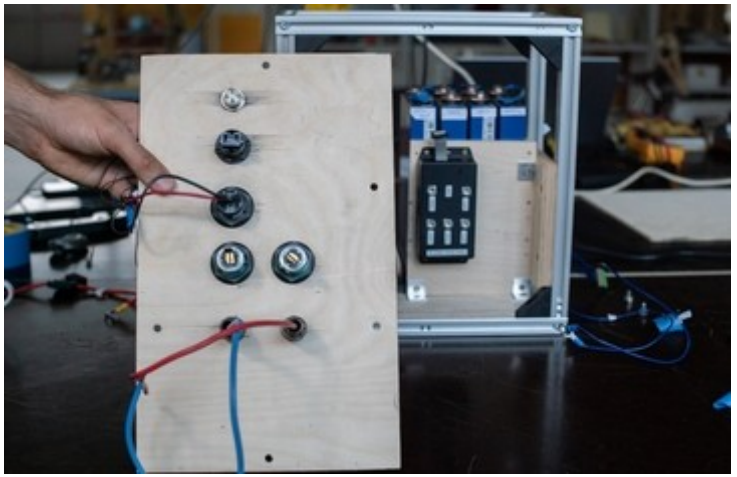
Connect to MPPT

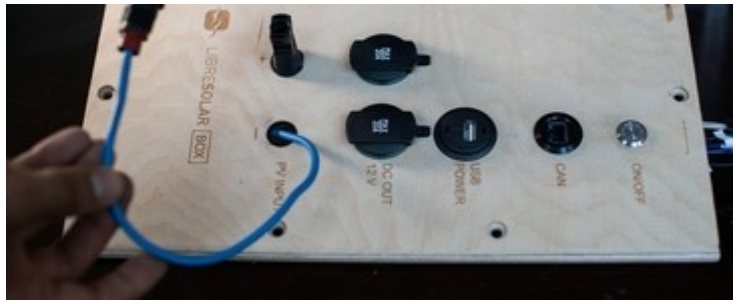
* Connect all cable ends without blade connectors to MPPT.
* Check that these cable are well mounted.

Assembly interface bleding

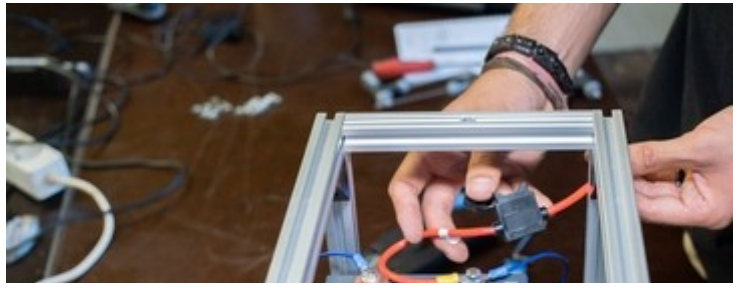
The interface blending is the blending with sockets.

* Put sockets with cables into the blending
* Mount the interface bleding to the frame





Connect battery block
* Remove isolation from **main -**.
* Connect two cables to **main -**.
* Connect thick blue cable to *BAT-* on BMS.
* Connect two cables to **main -**
* Connect balancing to *BAT-* on BMS.
* Add fuse.
* Check the voltage: It must be around 12.8 V.
* Switch off the on/off switch.
* Check the voltages. It must be falling until 0. The voltage does not drop imidiatelly to 0, because there is remaining electric charge in the capacitors.
* Swich on.
* Check Voltage between *POW+* and *POW-*. It must be about 12.8V.



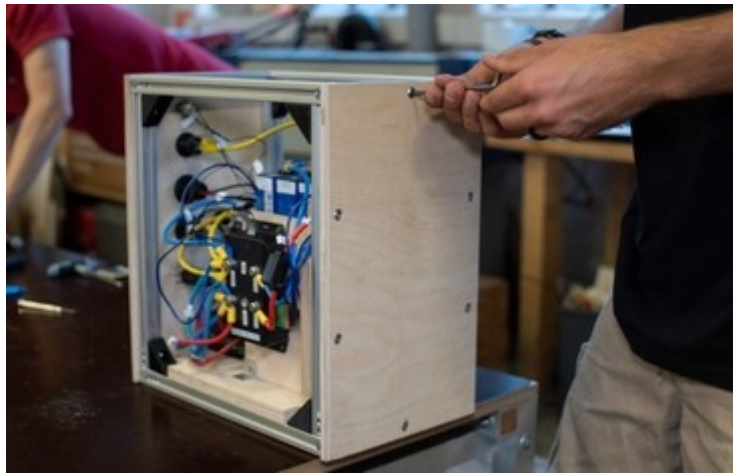
Connect Raspberry

* Connect an internet cable to Raspberry
* Connect the internet cable to BMS.
* Connect an internet cable to CAN socket on the blending.
* Connect the other end of the cable to BMS.
* Mount the Raspbery with two-side tape to the box.

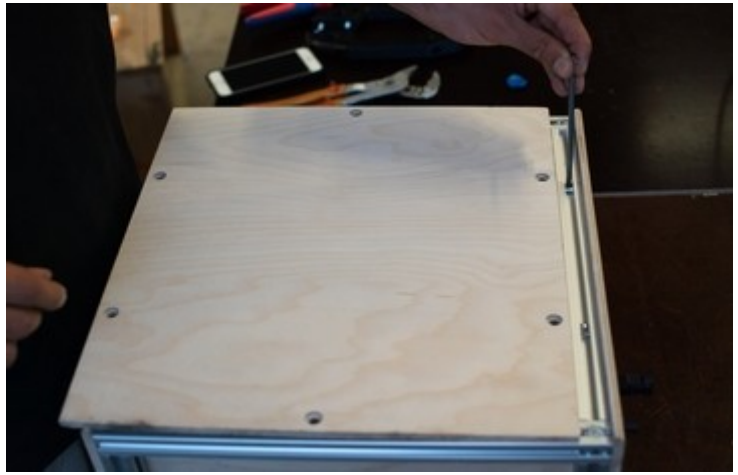
Add back blending

(Better do it before interface blending because the inteface blending is not flat.)

* Put SolarBox on the interface.
* Position square nuts. They must have the same position as the holes of the blending.
* Put blending on the frame.
* Insert bolts through the blending into the square nuts. Tighten the bolts.



Mount side blending
* Put the SolarBox on the side.
* Position the squre nuts.
* Put the blending on the frame.
* Insert bolts through the blending into the square nuts. Tighten the bolts.

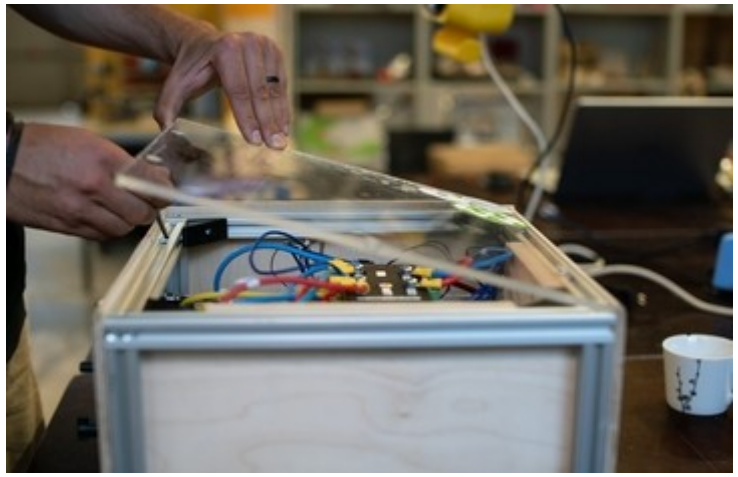


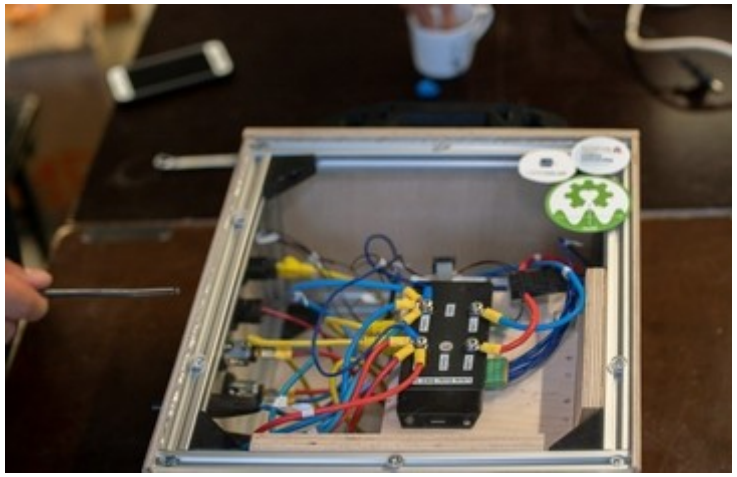
Mount to blending with handles.
* Put the SolarBox on the bottom.
* Position squre nuts for the top blending.

* Put top blending.
* Put handles on the top blending.
* Insert **longer** bolts through the handles, the blending and squre nuts. Use normal bolts for other parts of the blending.
* Tighten the blending.

Mount last side blending
* Check once more if all the connection are good.
* Insert the fuse.
* Put the SolarBox on the side.
* Position the square nuts.
* Add the blending.

* Tighten the bolts.






CAN
USB
POWER
DC OUT
12 V
PV INPUT
LIBRESOLAR BOX