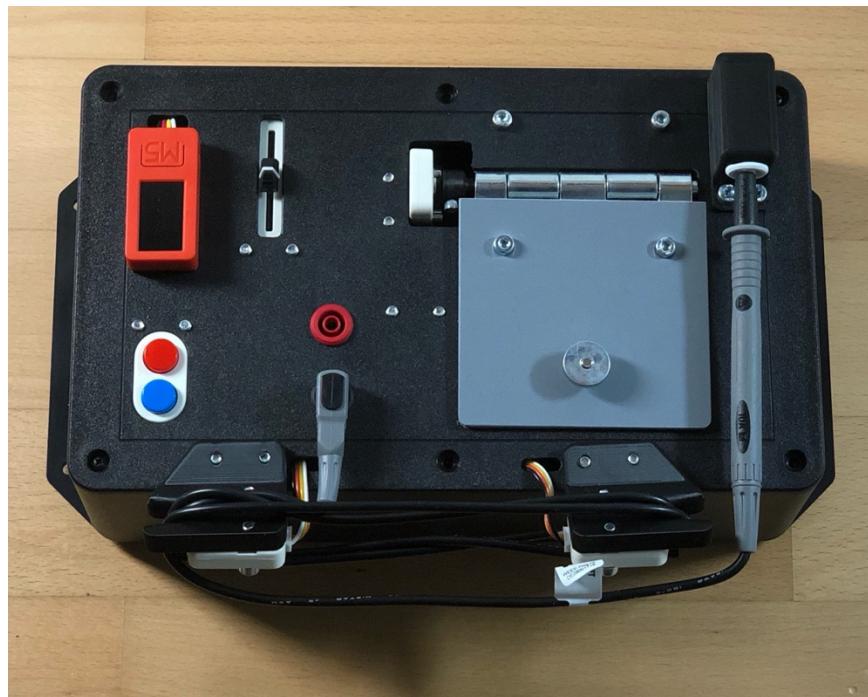


Manipulation Task Board 2023

Assembly Instruction



Complete Task Board Assembly “TBv2023”

Revisions		
Initial Release	04/11/24	Edgar Welte
Minor Updates	01/24/25	Peter So

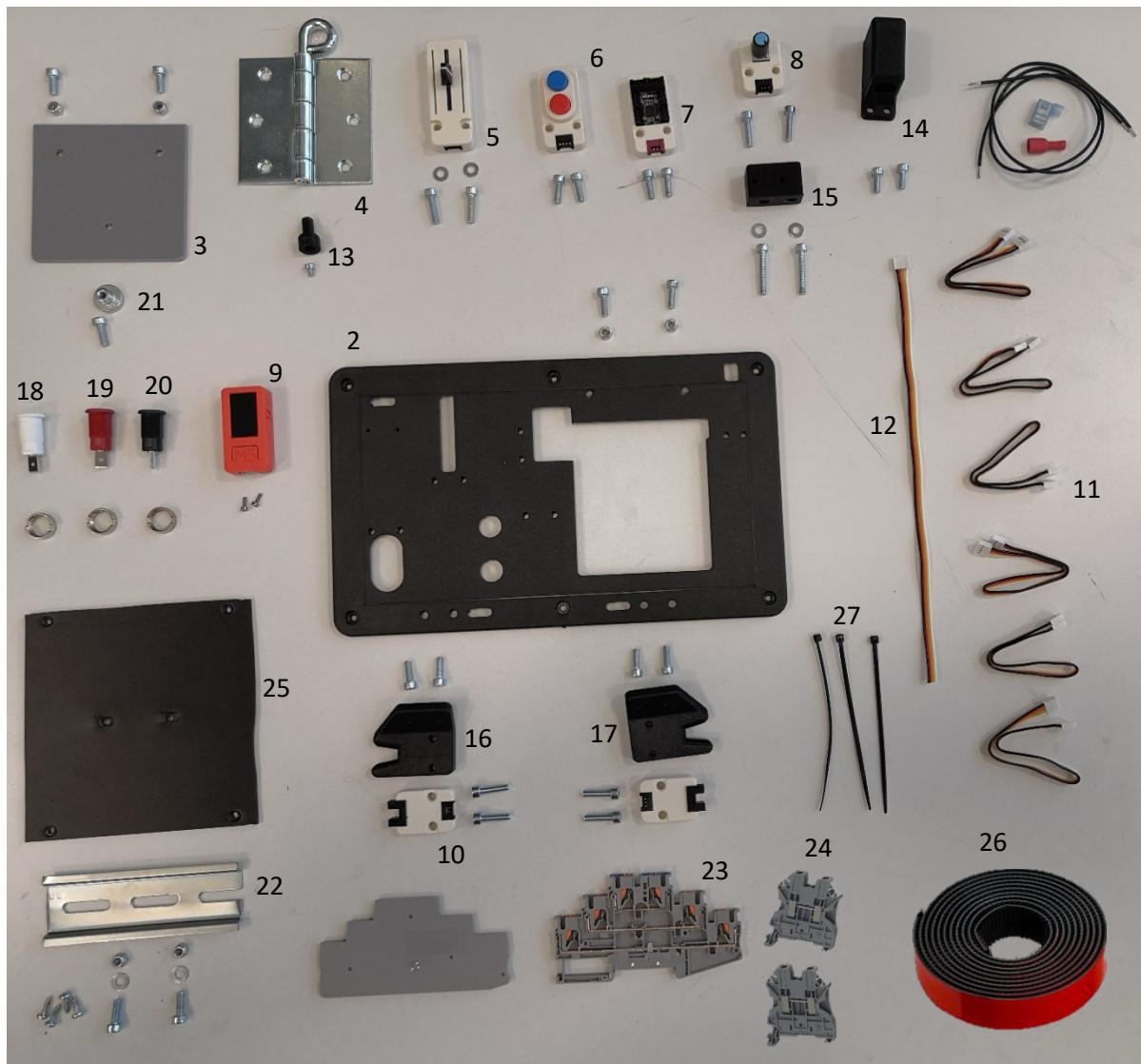
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Parts List

No.	Part	Quantity	Comment
1	Box Base	1	
2	Box Lid	1	CNC milled
3	Door Lid	1	CNC milled
4	Metal Hinge	1	
5	UNIT Potentiometer Fader	1	
6	UNIT DualButton	1	
7	UNIT PbHub	1	
8	UNIT Angle Measurement Sensor	1	
9	UNIT M5StickCPlus Microcontroller	1	
10	UNIT Photo Int Sensor	2	
11	Groove cable short ~20cm	6	included with sensors
12	Groove cable ~30cm	1	only one connector needed
13	Door Hinge Mounting Adapter	1	3D printed
14	Probe Holder	1	3D printed
15	Angle Sensor Mounting Bracket	1	3D printed
16	Cable Wrap Post Left	1	3D printed
17	Cable Warp Post Right	1	3D printed
18	Banana Plug Port white + Nut	1	
19	Banana Plug Port red + Nut	1	
20	Banana Plug Port black + Nut	1	
21	Door Handle	1	
22	Top-Hat Rail 135mm	1	
23	DIN Rail Terminal Block 3-Level + Cap	1	
24	DIN Rail Endstop	2	
25	Backplane	1	
26	3M Dual Lock Velcro 30cm	4	
27	Cable ties 10cm	3	
28	Cable 1mm ² 40cm	2	
29	Crimp contact straight	1	
30	Crimp contact angled	1	
31	Cylinder head screw M2x6	2	
32	Cylinder head screw M3x4	1	
33	Cylinder head screw M4x10	8	
34	Cylinder head screw M4x12	7	
35	Cylinder head screw M4x16	10	
36	Cylinder head screw M4x25	2	
37	M4 washers	4	
38	M4 self-securing nuts	4	
39	Self-tapping screws 2.5x10	4	
40	USB-C cable	1	
41	Probe cable	1	



Picture 1: All parts for Task Board laid out on table prior to assembly.

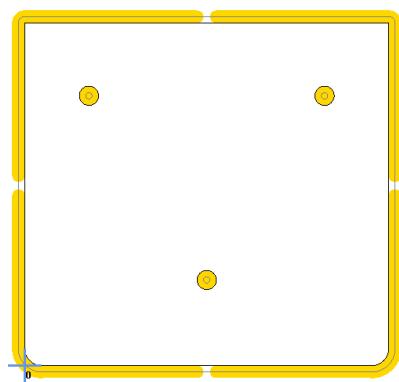
Procedure

1. Cut the holes in the lid of the box

The first step is to cut the holes in the lid of the box with the CNC milling machine. The drawing for the CNC milling machine is included in the **CU-3286-MB - Box Lid V3-updated.dxf** file. The CNC milling machine works with a 3mm wide cutter.

2. Cut the door

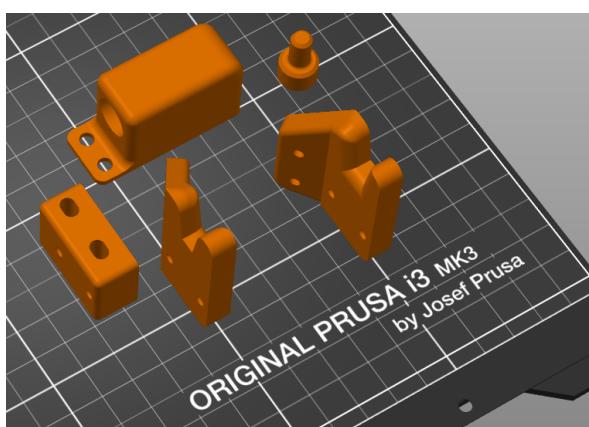
The door is created from 3mm hobby board on the CNC milling machine. The corresponding file is **Door - MillingExport.dxf**. For milling it is important to use holding tabs around the door. These can be cut off with a knife after milling.



3. 3D printing parts

Following parts need to be printed on a 3D printer (20% infill, 0.2mm layer height, no support):

- Door Hinge Mounting Adapter
- Probe Holder
- Angle Sensor Mounting Bracket
- Cable Wrap Post Left
- Cable Warp Post Right

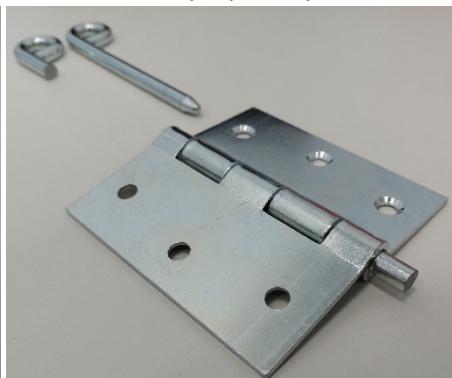
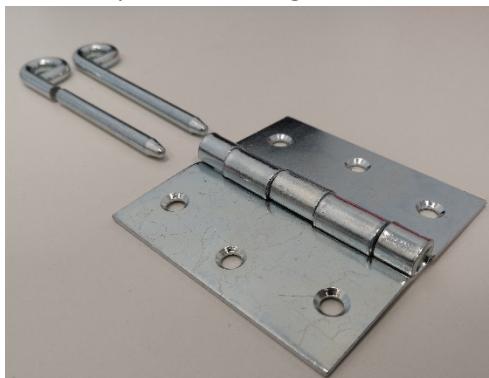


4. Door

- a. Cut the pin of the metal hinge on the marked position with a metal saw.



- b. Turn one part of the hinge 180° and assemble it with the prepared pin.



- c. Cut a M3 thread into the 3D-printed adapter part and insert the M3x4 screw.



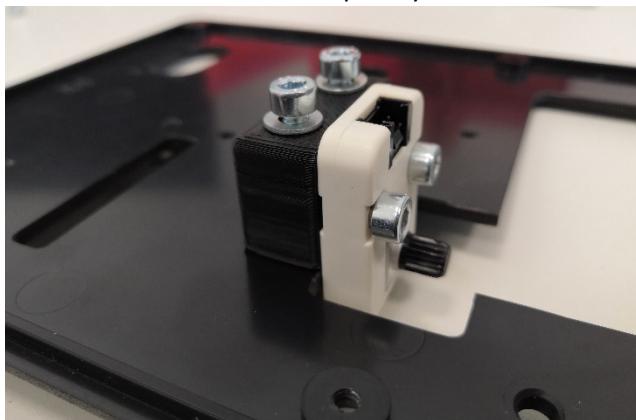
- d. Push the adapter part into the hinge with the vice. Leave a gap of 2mm.



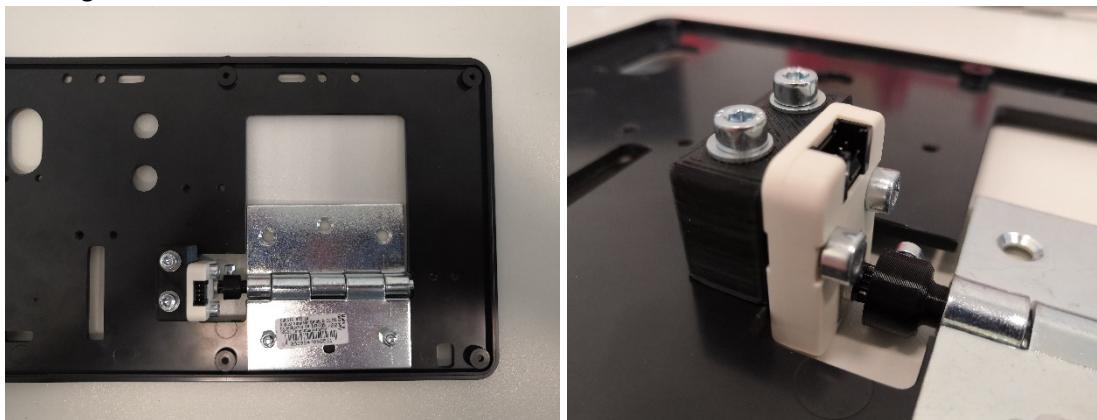
- e. Mount the angle sensor to the Angle Sensor Mounting Bracket with M4x16 screws



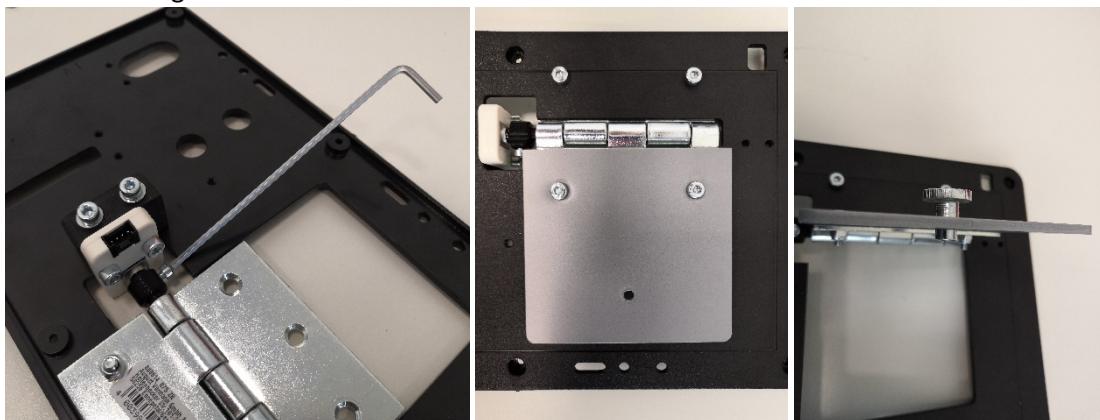
- f. Mount the Angle Sensor Mounting Bracket to the box lid with two M4x25 screws and washers. Don't fasten it completely.



- g. Mount the hinge to the box lid with two M4x12 screws and self-securing nuts. Make sure the moving part of the hinge can freely move. After fastening the screws of the lid the screws of the angle sensor can be fastened too.

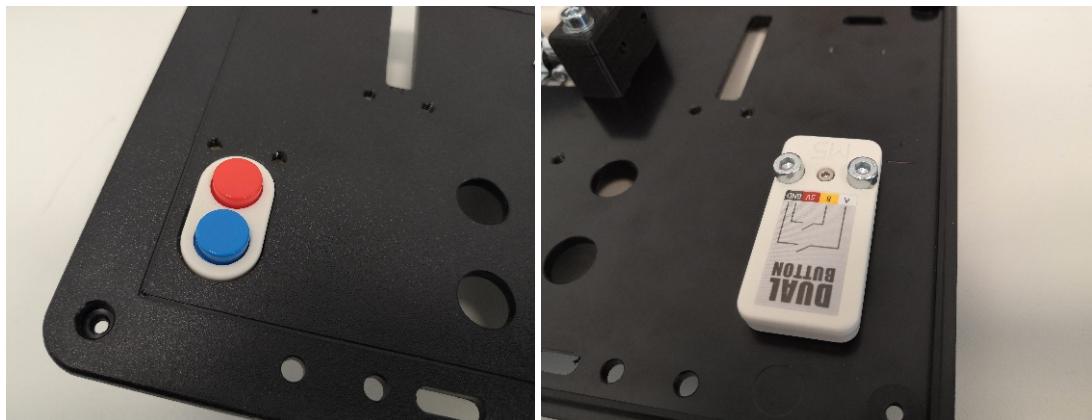


- h. Fasten the M3 screw to lock movement between hinge and angle sensor. The hinge position in the image should indicate the maximum position of the angle sensor.
i. Mount the door to the hinge with two M4x10 screws and nuts. Make sure that the door is aligned parallel to the box lid.
j. Mount dooring with one M4x12 screw.



5. Dual Button Unit

Mount the Dual Button Unit with two M4x12 screws.



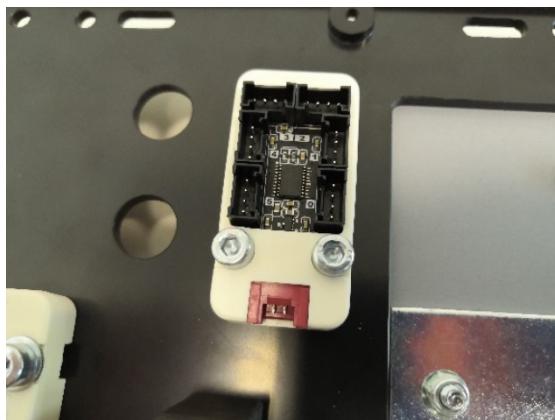
6. Potentiometer Fader Unit

Mount the Potentiometer Fader Unit with two M4x16 screws and washers. Make sure that the Fader aligns with the slot in the box lid.



7. PbHub Unit

Mount the PbHub Unit with two M4x12 to the box lid.



8. Banana Plug Ports

- a. Attach the straight crimp contact to the 40cm cable.
- b. Mount the red and black Banana Plug Port to the box lid. Note the position of black and red port. Mount cable to read port.



9. Probe Holder

- a. Attach a angled crimp contact to one of the 40cm cables.



- b. Mount the white Banana Plug Port into the probe holder. Use a small screwdriver to fasten the nut.

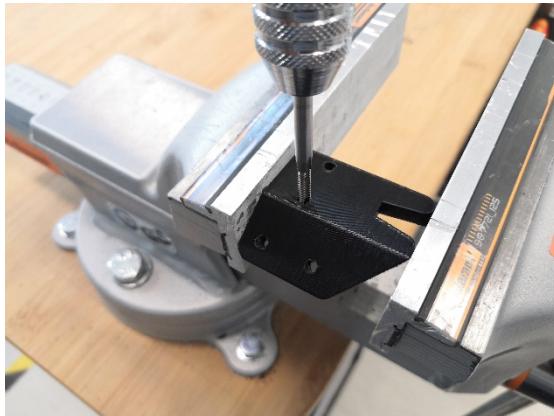


- c. Mount the probe holder with two M4x10 screws onto the box lid.

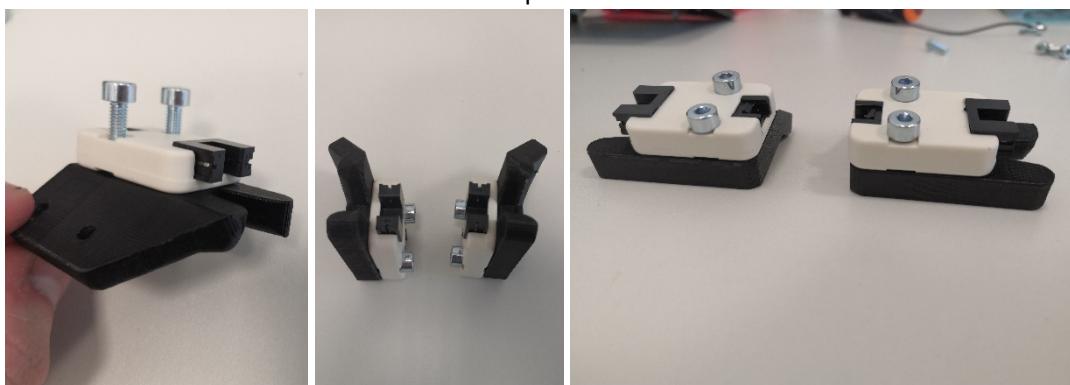


10. Cable Wrap Post

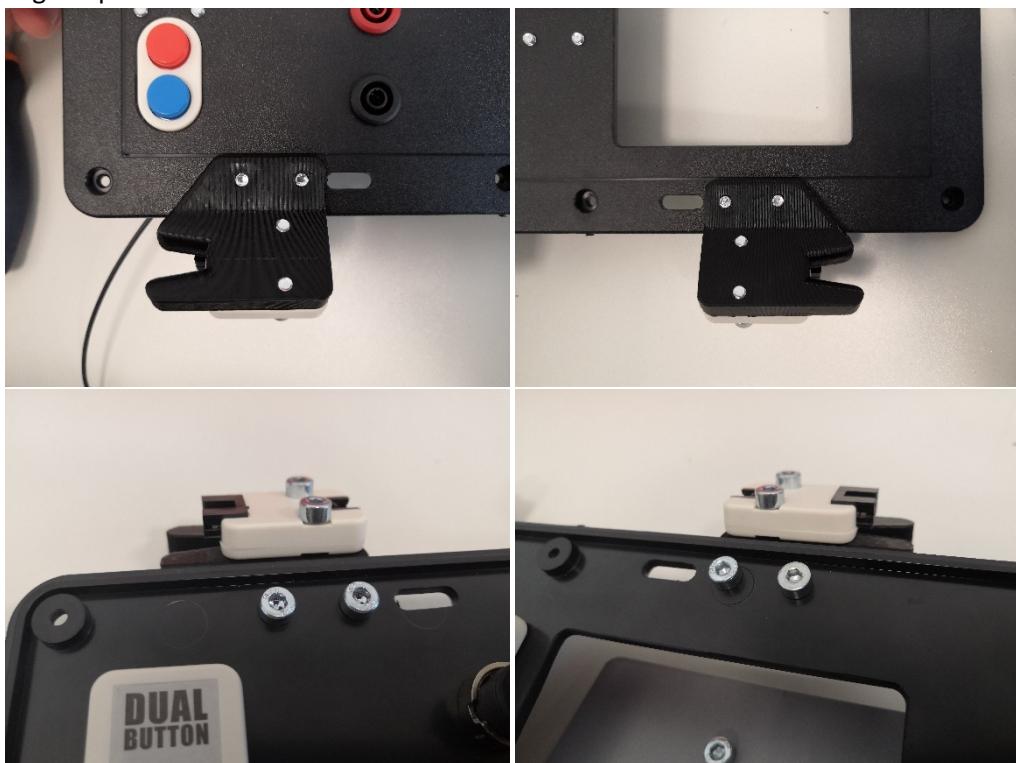
- a. Cut a M4 thread into the four holes of each 3D printed Cable Wrap Posts.



- b. Mount the Photo Int Units to the Cable Wrap Posts with two M4x12 screws each.

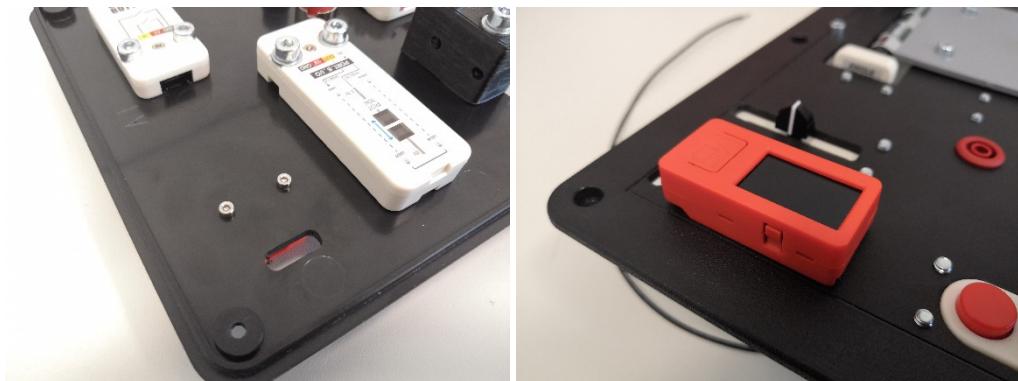


- c. Mount Cable Wrap Posts to box lid with two M4x10 screws each. Make sure the posts are aligned parallel to the box lid border.



11. Controller

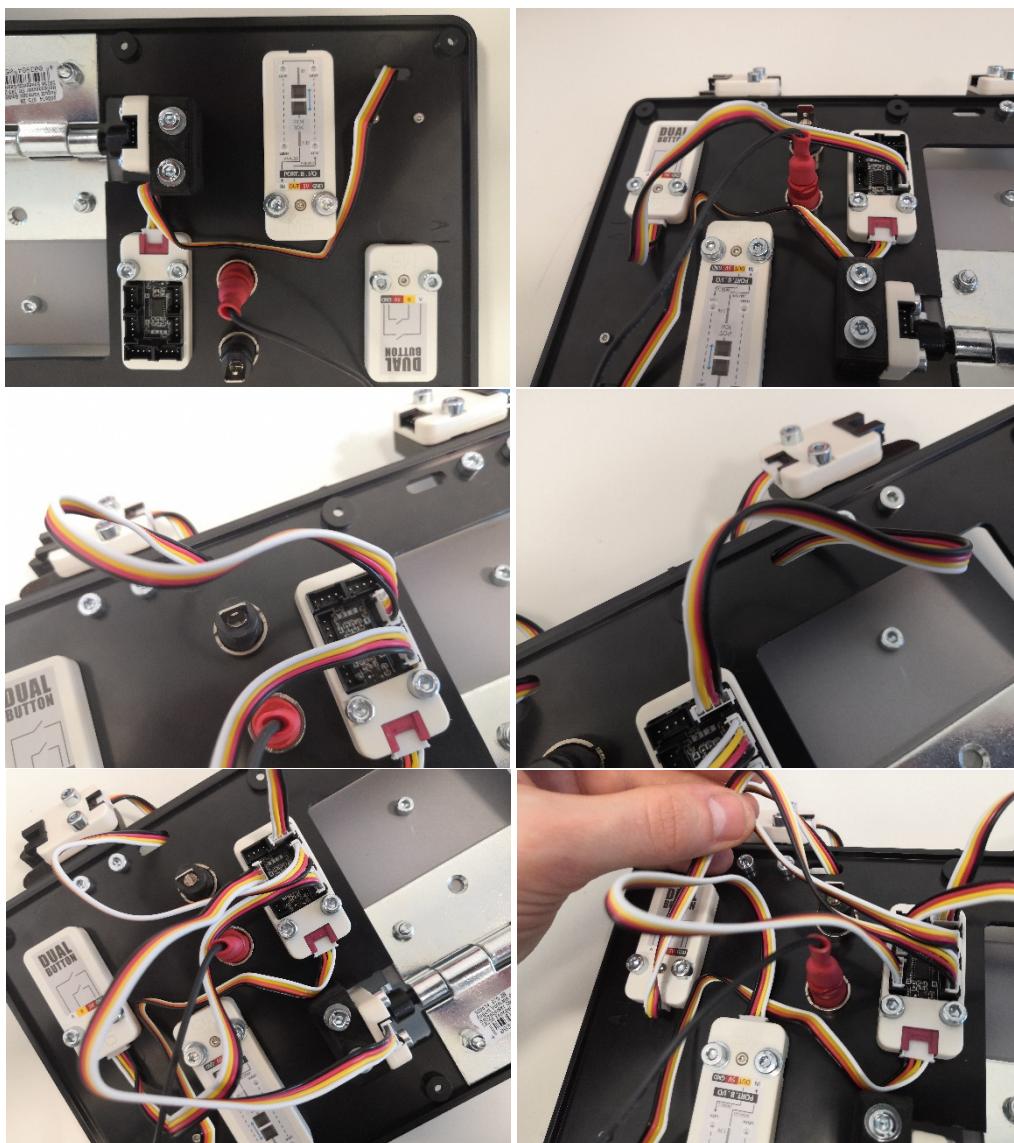
Mount the M5StickCPlus Controller with two M2x6 screws.

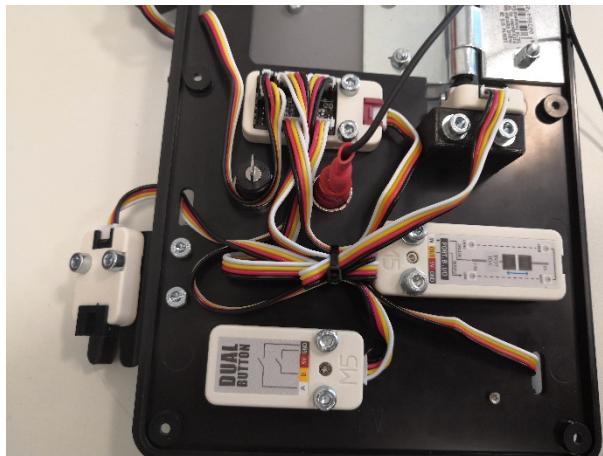


12. Wiring

- a. Connect PbHub Unit to M5StickCPlus Controller with one Groove cable.
- b. Connect the different components to the PbHub Unit according to the following port mapping. Leave port 3 empty for now. This will be connected in the next step. Tie all cables together with a cable tie (see photos).

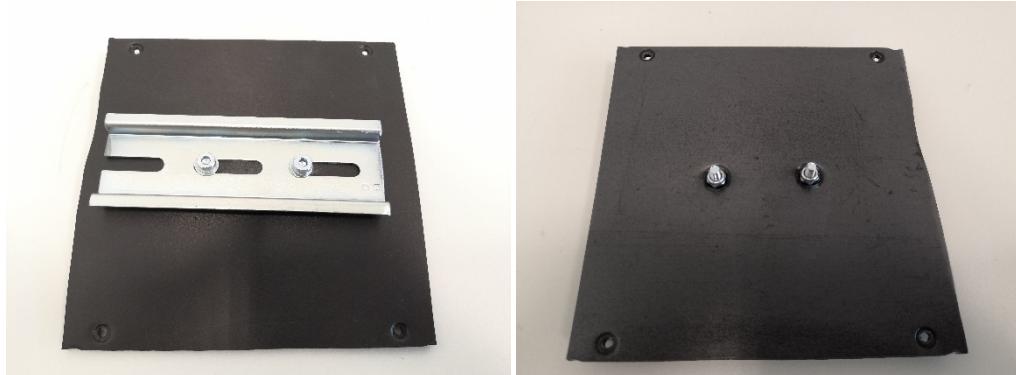
Port of PbHub Unit	Sensor
0	Dual Button
1	Left Photo Int Sensor
2	Right Photo Int Sensor
3	Terminal blocks
4	Angle Sensor
5	Potentiometer Fader





13. Terminal block

- Mount the Top-Hat Rail with two M4x12 screws, nuts and washers to the backplane.



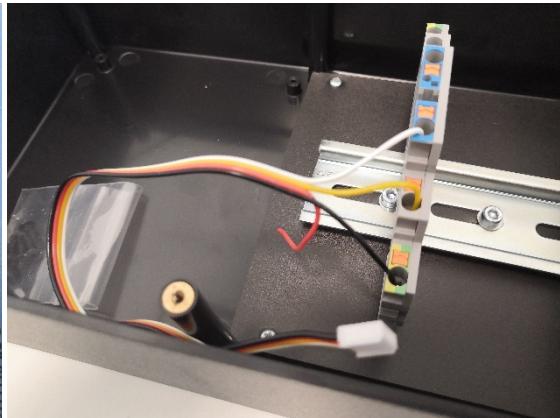
- Install the backplane in the box with four small self-tapping screws.



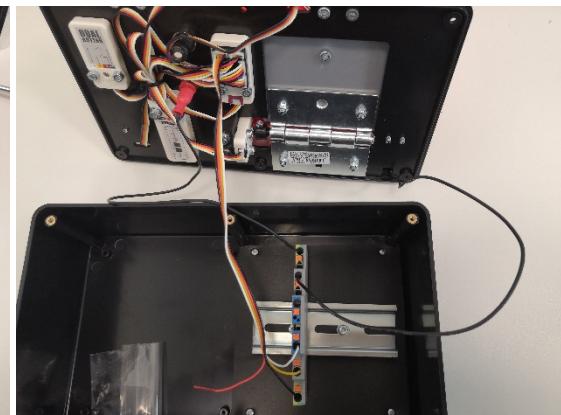
- Place the terminal block and the two end stops on the Top-Hat Rail. Make sure the terminal block is placed in the center of the door opening (end stops are missing in picture).



- d. Strip wires BLACK, YELLOW, WHITE from the Groove cable (30cm, only one connector) and connect it to the terminal block according to this plan.
- BLACK → lowest level
 - YELLOW → middle level
 - WHITE → top level



- e. Connect the cable coming from the red Banana Plug Port to the lowest level of the terminal block.
f. Connect the cable coming from the Probe Holder to the middle level of the terminal block.
g. Connect the Groove connector to port 3 of the PbHub Unit.



- h. Tie the cables with two more cable ties.
i. Close the box lid and mount the box lid onto the box with six screws (shipped with box).

14. Velcro

Cut the Velcro into four 30cm long pieces and tape it on the bottom of the box.

