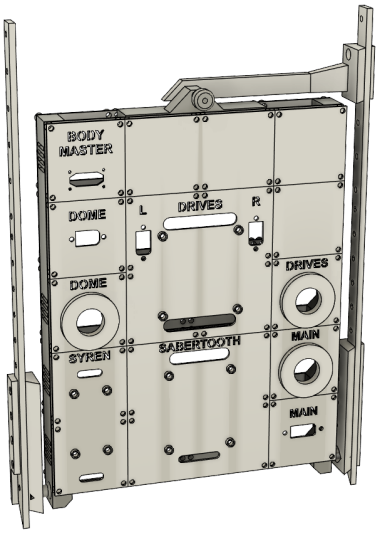
Documentation Modular Control Unit (MCU)



Version 1.1 created by Bastian Oelkuch with Fusion360

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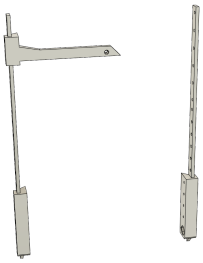
> [!WARNING]
> I am not a trained electrician and cannot take any responsibility for any damage or injury that may occur.

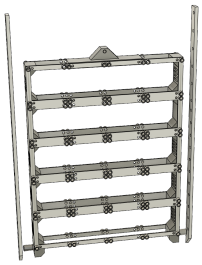
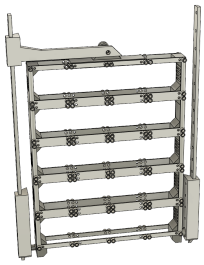
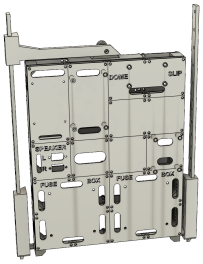
General description and requirements

- All files have numbers at the end `d1x1` means that the panel has a size of 60x60mm.
- The panels only have the size at the end because the quantity depends on your setup. Only in some cases you will find `x2` at the end. E.g. for the Stand.

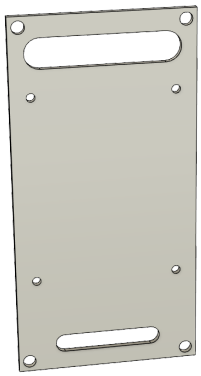
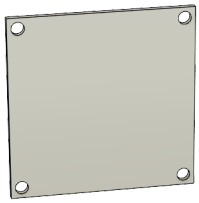
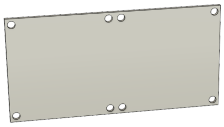
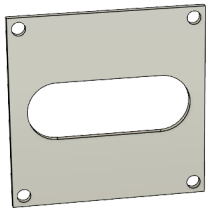
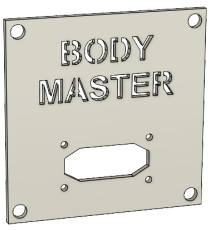
Overview of the design

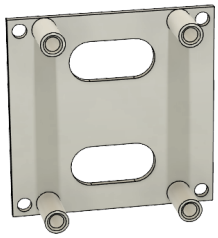
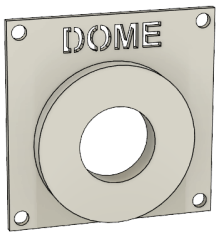
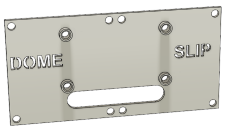
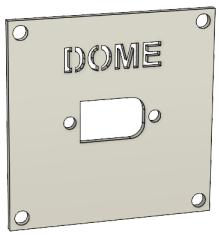
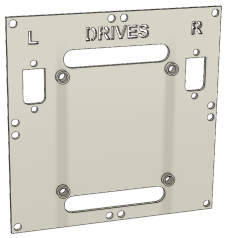
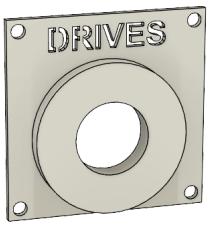
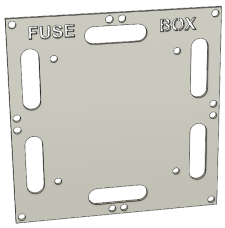
Frame

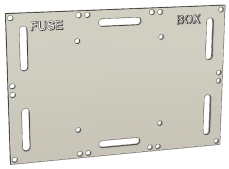
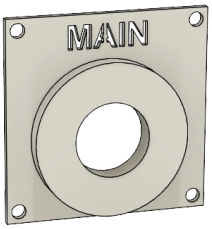
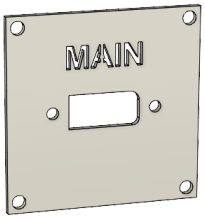
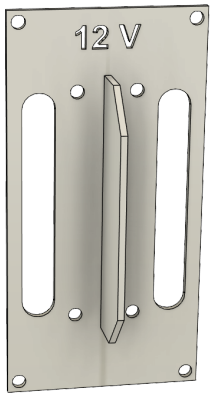
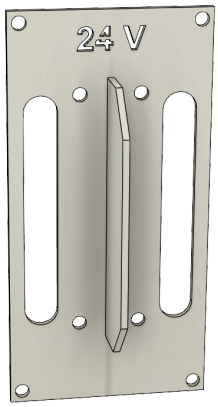
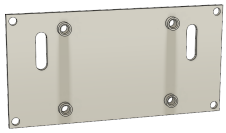


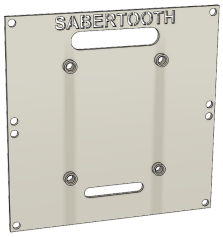
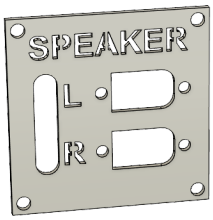
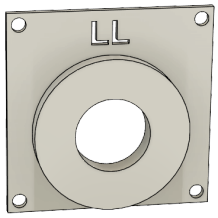
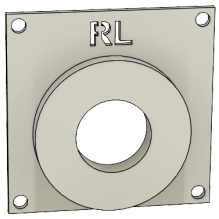
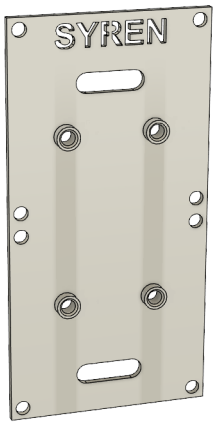
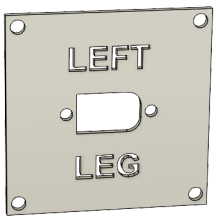




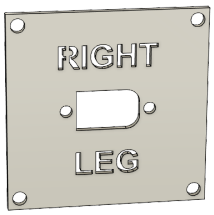
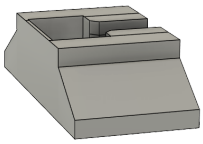

Panels

Name	Screenshot
Panel-AstroCan-Pro-Dual-Shield_d1x2.stl	
Panel-Audio_d1x2.stl	
Panel-Blank_d1x1.stl	
Panel-Blank_d2x1.stl	
Panel-Blank-open_d1x1.stl	
Panel-Body-Master-MPX_d1x1.stl	

Name	Screenshot
Panel-Buck-Converter-12v-20A_d1x1.stl	
Panel-Dome-50A-Switch_d1x1.stl	
Panel-Dome-Slip-Ring-Adapter_d2x1.stl	
Panel-Dome-XT60_d1x1.stl	
Panel-Double-30A-Relay-Board-Drives-XT60-Connectors_d2x2.stl	
Panel-Drives-50A-Switch_d1x1.stl	
Panel-Fusebox_d2x2.stl	

Name	Screenshot
Panel-Fusebox_d3x2.stl	
Panel-Main-50A-Switch_d1x1.stl	
Panel-Main-XT90_d1x1.stl	
Panel-PDB-12V_d1x2.stl	
Panel-PDB-24V_d1x2.stl	
Panel-PDB-Modular_d2x1.stl	

Name	Screenshot
Panel-Sabertooth-32A_d2x2.stl	
Panel-Speaker-XT60_d1x1.stl	
Panel-Switch-Left-Leg_d1x1.stl	
Panel-Switch-Right-Leg_d1x1.stl	
Panel-Syren-10A_d2x1.stl	
Panel-XT60-Left-Leg_d1x1.stl	

Name	Screenshot
Panel-XT60-Right-Leg_d1x1.stl	
Stand_x2.stl	

Parts list

Screws and Nuts

Type	Quantity	Used for	Link
M2x10 mm Cylinder Head Screw	**8**	Attaching amplifier and MPX-like connector to printed panels	
M2x10 mm Cylinder Head Screw	**2**	Attaching Arduino Mega2560 + AstroCan Shield to the printed panel	
M3x6 mm Pan Head Screw	**104**	80 for connecting the front and back frame to the standoffs	
		2 for attaching Arduino Mega2560 + AstroCan Shield to the printed üanel	
		4 for attaching Sabertooth to the printed panel	
		4 for attaching Syren to the printed panel	
		4 for attaching Relay board to the printed panel	
		4 for attaching Slipring-Adapter-PCB to the printed panel	
		4 for attaching 12V 20A buck converter to the printed panel	
M3x10 mm Countersunk Screw	**12**	Attaching the XT60 & XT90 to the adapters	
M3x12 mm Countersunk Screw	**8**	Attaching the fuse boxes to printed panels	
M3 Locknut	**20**	8 for attaching fuse boxes to printed panels	
		12 for attaching XT60 & XT90 to the adapters	
M4x18 mm Countersunk Screw	**4**	Connecting the `Body-Adapter-left.stl` and `Body-Adapter-right.stl` to the body	

Type	Quantity	Used for	Link
M4x25 mm Countersunk Screw	**2**	Screwing the `Frame-Adapter-pin-left.stl` and `Frame-Adapter-pin-right.stl` to `Frame-Connector-left.stl` and `Frame-Connector-right.stl`	
M4x40 mm Countersunk Screw	**1**	Securing the MCU in the body using `Body-Adapter-Top-Knob.stl`	
M4 Square Nut	**1**	Securing the MCU in the body using `Body-Adapter-Top-Knob.stl`	

Threaded inserts, Standoffs & Bearings

Type	Quantity	Used for	Link
M2x3x3.2 mm Threaded Insert	**2**	To attach the AstroCan DualShield to the `Panel-AstroCan-Pro-Dual-Shield_d1x2.stl` panel	
M3x5.7 mm Threaded Insert	**160**	To fill all available recordings on the frame (additional inserts may be required based on panel used)	Amazon
M4x4x6 mm Threaded Insert	**4**	Connecting `Body-Adapter-left.stl` and `Body-Adapter-right.stl` to the body	
M3x25 mm Standoffs	**40**	Connecting the `Frame-Complete_x2.stl` (if you have a big enougth printer) or `Frame-Modular-End_x4.stl` and `Frame-Modular-Middle_x6.stl` to the frame adapters	AliExpress
15x10x4 mm Bearings	**4**	Two each for `Body-Adapter-left.stl` and `Body-Adapter-right.stl`	

Connectors and Switches

Type	Quantity	Used for	Link
XT60 Connector	**5**	Connection to left and right drive, dome, and speakers	AliExpress
XT90 Connector	**1**	Main power connection of the batteries	AliExpress
MPX-like Connector	**2**	To provide a power connection with power and up to 6 data lines to the body	AliExpress
50V 50A Power Switch	**3**	To switch the dome, drives, and main power	AliExpress
7P Powerrails	**0**	Optional for 12/24V power distribution	AliExpress

Boards

Type	Quantity	Used for	Link
5,5-30V 3A LCD Step-down	**0**	Power supply for 5V	AliExpress
5V 15A Buck Converter	**2**	Power supply for 5V	AliExpress
12V 20A Buck Converter	**1**	Power supply for 12V	Amazon
SyRen 10A	**1**	Controller for Dome motor	RobotShop.com
Sabertooth Dual 2x32A	**1**	Controller for Drive motors	RobotShop.com
Double 30 Relay Board	**1**	Cut the power to between motors and Sabertooth	printed-droid.com
12 Wire 8A Slip Ring Interface	**1**	Connect Dome to Body	printed-droid.com
AstroCan Pro Dual Shield	**1**	"The Brain"	printed-droid.com
Hifi Amplifier	**1**	Audiointerface	Amazon
Fusebox	**2**	To get everything secured	AliExpress

Assembly Instructions for the Frame

> [!NOTE]
>
> - The assembly is relatively simple, as the entire "package/unit" is stable once it has been assembled.

Required Parts:

- **15x10x4 mm bearings (4 pieces)**
- **M4x4x6 mm threaded inserts (8 pieces)**
- **M3x18 mm countersunk screws (5 pieces)**
- **M3x6 mm pan head screws (80 pieces)**
- **M4 square nut (1 piece)**
- **M4x40 mm countersunk screw (1 piece)**
- **M3x25 mmStandoffs (40 pieces)**

1. Preparation of the Body Adapters

1. **Body-Adapter-left.stl** and **Body-Adapter-right.stl**:
    1. Press in **two 15x10x4 mm bearings** each.
    2. Melt in **two M4x4x6 mm threaded inserts** each.
    3. Attach to the body using **two M3x18 mm countersunk screws** each, ensuring that the bottom edge of the adapters aligns with the mounting points on the body.
    4. **Optional**: If necessary, two additional screws and threaded inserts can be installed on each side.

2. Preparation of the Frame

> [!NOTE]
>
> - If the build volume is larger than that of a Bambu Lab X1C, `Frame-Complete_x2.stl` can be printed twice.
> - If the build volume is smaller than that of a Bambu Lab X1C, `Frame-Modular-End_x4.stl` must be printed four times and `Frame-Modular-Middle_x6.stl` six times.

1. Melt in **80 M3x5.7 mm threaded inserts** per side (fewer inserts may be used depending on how the modules are arranged).

3. Assembly the Frame

1. Attach the **40 M3x25 mm standoffs** to one side of the frame using **40 M3x6 mm pan head screws**.
2. Screw the `Frame-Connector-pin-left.stl` and `Frame-Connector-pin-right.stl` to the corresponding Frame-Connectors with a **M4x25 mm Countersunk Screw**.
3. Slide the parts `Frame-Connector-left.stl`, `Frame-Connector-right.stl`, and `Frame-Connector-top.stl` over the standoffs.
4. Finally, attach the remaining side to the standoffs using **40 M3x6 mm pan head screws**.

4. Assembly of the Screwable Body Adapter

1. `Body-Frame-Adapter-top.stl` and `Body-Frame-Adapter-top-Knob.stl`:
    1. Melt in **one M4x4x6 mm threaded insert**.
    2. Attach to the body using **one M4x18 mm countersunk screw**, ensuring that the top edge of the adapter aligns with the mounting point on the body.
    3. Assemble the hand-tightened knob using **one M4 square nut** and **one M4x40 mm countersunk screw**.

Assembly on the Body

Required Parts:

- **M4x18 mm countersunk screws (4 pieces)**
- **M4x40 mm countersunk screw (1 piece)**
- **M4 square nut (1 piece)**
- **M4x4x6 mm threaded inserts (4 pieces)**
- **15x10x4 mm bearings (4 pieces)**

Assembly Instructions:

1. **Attach** `Body-Adapter-left.stl`:
    - Screw the left adapter with the 15x10x4 mm bearings and attach it to the body.
2. **Insert the MCU**:
    - Insert the MCU into the left adapter (`Body-Adapter-left.stl`).
3. **Mount** `Body-Adapter-right.stl`:
    - Place the `Body-Adapter-right.stl` onto the MCU.
4. **Secure Adapter to the Body**:
    - Slide the right adapter onto the body, tilt slightly, and then tighten the screws.

Disassembly:

- Follow the steps in reverse order.

Assembly instructions panels

- The panels themselves are each attached to the frame with **1-n M3x6 mm pan head screws**.
- In some cases, **M3x5.7 mm threaded inserts** are also required to attach the parts to the panels themselves.

Community panels

> [!NOTE]
>
> - The following list contains an overview of panels which were created by other users to extend the option what electronics can be used. Thank you so much!

- Stephen Mathis has published his created panels on the Facebook group of Mr. Baddeley. He also posted a video.
- dadmin created a set of panels to hold electronics like a voltmeter, new power terminals, Sparkfun MP3 Trigger, new AMP, XBOX receiver and Mini Maestro 24-Channel USB controller.