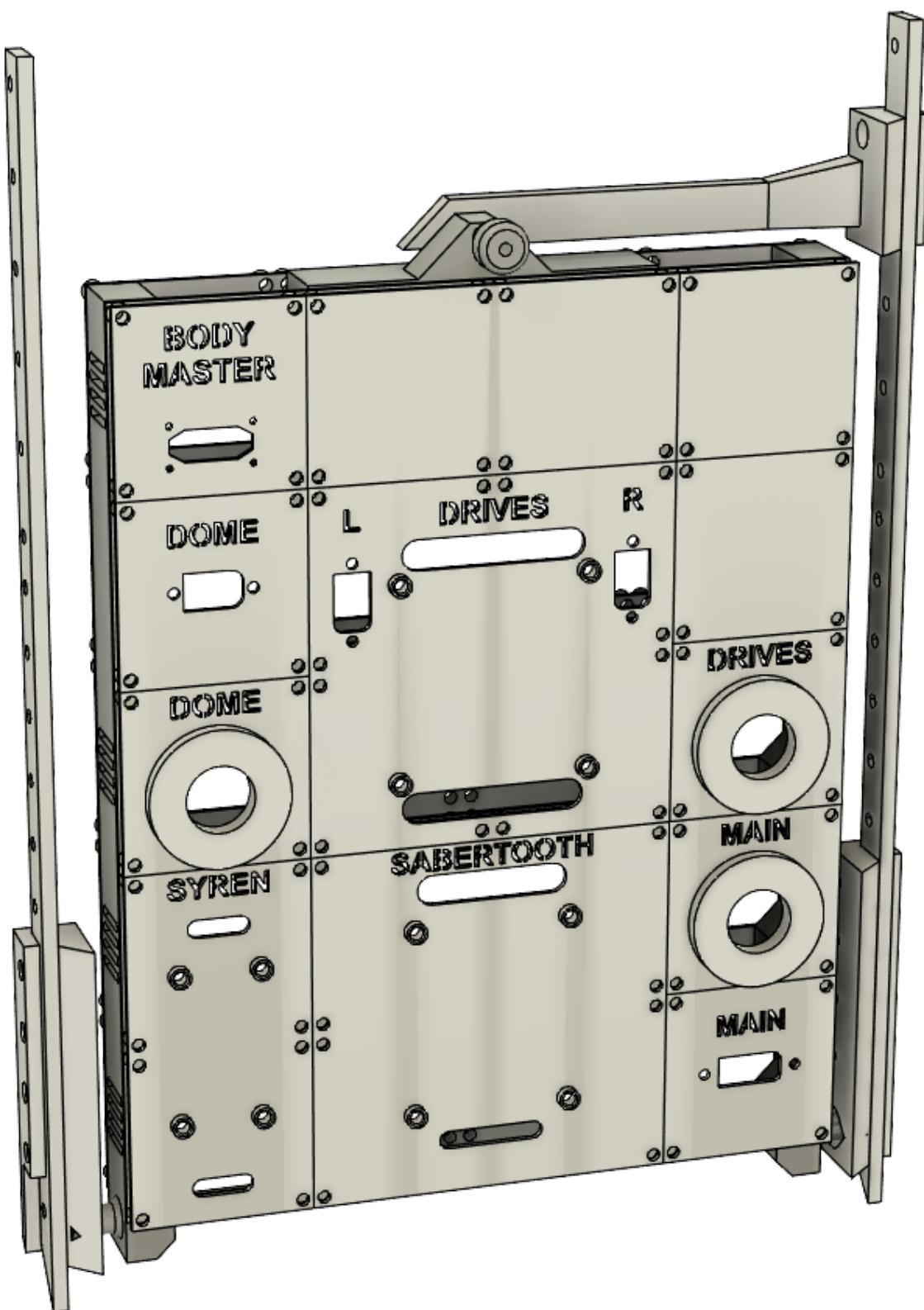


Documentation Modular Control Unit (MCU)



Version 1.2 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.

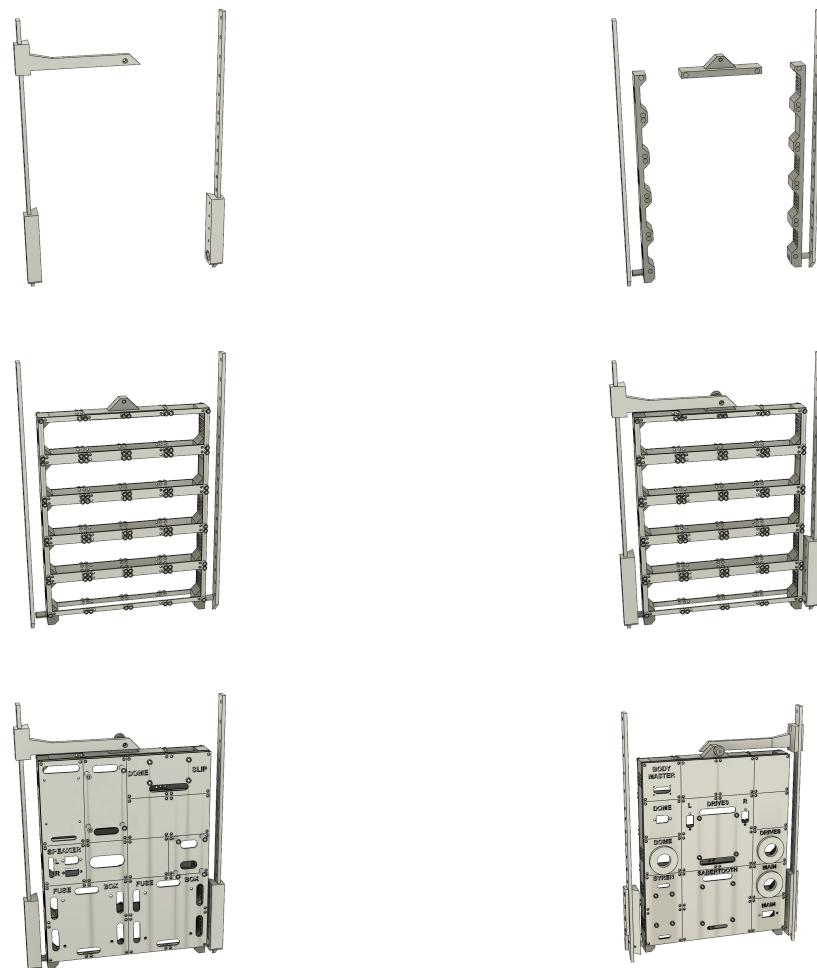
💡 TIP: Have a look at the [R2-D2 Modular Body Backpack](#) if you also want a flexible solution to mount electronics to the Body of your R2 unit.

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.

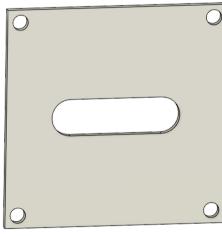
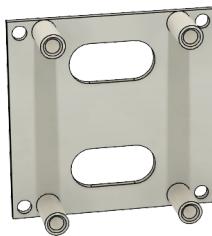
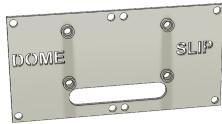
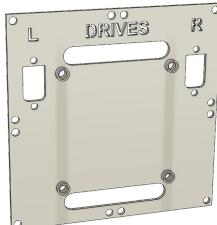
Overview of the design

Frame



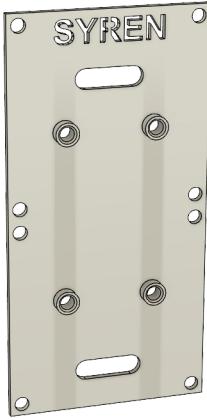
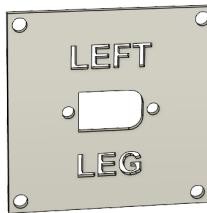
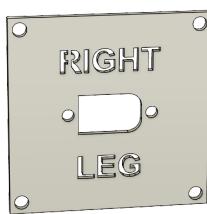
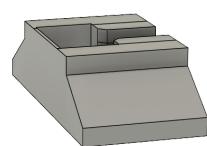
Panels

Name	Screenshot
Panel-AstroCan-Pro-Dual-Shield_d1x2.stl	A vertical metal panel with two horizontal cutouts at the top and bottom, each accompanied by a circular hole. There are four circular holes around the perimeter.
Panel-AstroCan-AutoDome_d1x1.stl	A vertical metal panel with the words "AUTO DOME" printed in the center. It has two vertical bars on either side and four circular holes around the perimeter.
Panel-Audio_d1x2.stl	A vertical metal panel with one horizontal cutout at the top and one at the bottom, each with a circular hole. There are four circular holes around the perimeter.
Panel-Blank_d1x1.stl	A plain rectangular metal panel with four circular holes around the perimeter.
Panel-Blank_d2x1.stl	A horizontal metal panel with four circular holes around the perimeter.
Panel-Blank-open_d1x1.stl	A vertical metal panel with one horizontal cutout at the top, which is open, and four circular holes around the perimeter.

Name	Screenshot
Panel-Blank-open-small_d1x1.stl	
Panel-Body-Master-MPX_d1x1.stl	
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	

Name	Screenshot
Panel-Drives-50A-Switch_d1x1.stl	A 3D model of a metal panel with a large central circular cutout. The word "DRIVES" is printed at the top in a bold, sans-serif font. There are four small circular holes, one at each corner of the panel.
Panel-Fusebox_d2x2.stl	A 3D model of a metal panel with two vertical rectangular cutouts on the left and right sides. The words "FUSE" and "BOX" are printed at the top and bottom respectively in a smaller font.
Panel-Fusebox_d3x2.stl	A 3D model of a metal panel with three vertical rectangular cutouts on the left and right sides. The words "FUSE" and "BOX" are printed at the top and bottom respectively in a smaller font.
Panel-Main-50A-Switch_d1x1.stl	A 3D model of a metal panel with a large central circular cutout. The word "MAIN" is printed at the top in a bold, sans-serif font. There are four small circular holes, one at each corner of the panel.
Panel-Main-XT90_d1x1.stl	A 3D model of a metal panel with a central rectangular cutout. The word "MAIN" is printed above the cutout. Below the cutout is a small rectangular slot or connector area.
Panel-PDB-12V_d1x2.stl	A 3D model of a metal panel with two vertical rectangular cutouts on the left and right sides. The word "12 V" is printed at the top in a bold, sans-serif font. There are four small circular holes, one at each corner of the panel.

Name	Screenshot
Panel-PDB-24V_d1x2.stl	A rectangular metal panel with four circular mounting holes. In the top center, it has the text "24 V". On the left and right sides, there are two vertical rectangular cutouts, each with a small circular hole at the top. A central vertical slot contains a metal strip.
Panel-PDB-Modular_d2x1.stl	A rectangular metal panel with four circular mounting holes. It features two vertical rectangular cutouts, one on each side of a central vertical slot.
Panel-Sabertooth-32A_d2x2.stl	A rectangular metal panel with four circular mounting holes. It has two horizontal rectangular cutouts, one near the top and one near the bottom, with small circular holes at their ends.
Panel-Speaker-XT60_d1x1.stl	A rectangular metal panel with four circular mounting holes. It has two vertical rectangular cutouts, one labeled "L" and one labeled "R", positioned vertically in the center.
Panel-Speaker-XT60-V2_d1x1.stl	A rectangular metal panel with four circular mounting holes. It has two vertical rectangular cutouts, one above the other, positioned centrally.
Panel-Switch-Left-Leg_d1x1.stl	A rectangular metal panel with four circular mounting holes. It features a large central circular cutout with the letters "LL" printed above it.
Panel-Switch-Right-Leg_d1x1.stl	A rectangular metal panel with four circular mounting holes. It features a large central circular cutout with the letters "RL" printed above it.

Name	Screenshot
Panel-Syren-10A_d2x1.stl	
Panel-XT60-Left-Leg_d1x1.stl	
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	
M2x10 mm Cylinder Head Screw	1	Attaching AstroCan AutoDome to the printed panel	
M3x6 mm Pan Head Screw	102	80 for connecting the front and back frame to the standoffs	
		2 for attaching Arduino Mega2560 + AstroCan Shield to the printed panel	
		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 <code>Body-Adapter-left.stl</code> and <code>Body-Adapter-right.stl</code> to the body	

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

Threaded inserts, Standoffs & Bearings

Type	Quantity	Used for	Link
M2x3x3.2 mm Threaded Insert	3	To attach the AstroCan DualShield to the <code>Panel-AstroCan-Pro-Dual-Shield_d1x2.stl</code> panel and AstroCan AutoDome to the <code>Panel-AstroCan-AutoDome_d1x1.stl</code>	
M3x5.7 mm Threaded Insert	160	To fill all available inserts on the frame (additional inserts may be required based on panel used)	Amazon
M4x4x6 mm Threaded Insert	4	Connecting <code>Body-Adapter-left.stl</code> and <code>Body-Adapter-right.stl</code> to the body	
M3x25 mm Standoffs	40	Connecting the <code>Frame-Complete_x2.stl</code> (if you have a big enough printer) or <code>Frame-Modular-End_x4.stl</code> and <code>Frame-Modular-Middle_x6.stl</code> to the frame adapters	AliExpress
15x10x4 mm Bearings	4	Two each for <code>Body-Adapter-left.stl</code> and <code>Body-Adapter-right.stl</code>	

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	1	Power supply for 12V to AstroCan Shield	AliExpress
5,5-30V 3A LCD Step-down	1	Power supply for 5V to AstroCan AutoDome	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
AstroCan AutoDome	1	Control the Dome Motor	printed-droid.com
Hifi Amplifier	1	Audiointerface	Amazon
Alternative Hifi Amplifier without Bluetooth	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**.

5. Assembly and disassembly 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)**

5.1 Assembly

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.

5.2 Disassembly

- Follow the steps in reverse order.

6. Assembly instructions to attach the 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

 **TIP:** The following link contains an overview of panels which were created by other users to extend the option what electronics can be used. Thank you so much!

[R2-D2 MCU-Panel-Collection](#)