

Assemble the intercom base station

Requirements:

Do not assemble the base station before told so in the Setup your intercom base station guide

List of needed parts can be found in the end of this guide

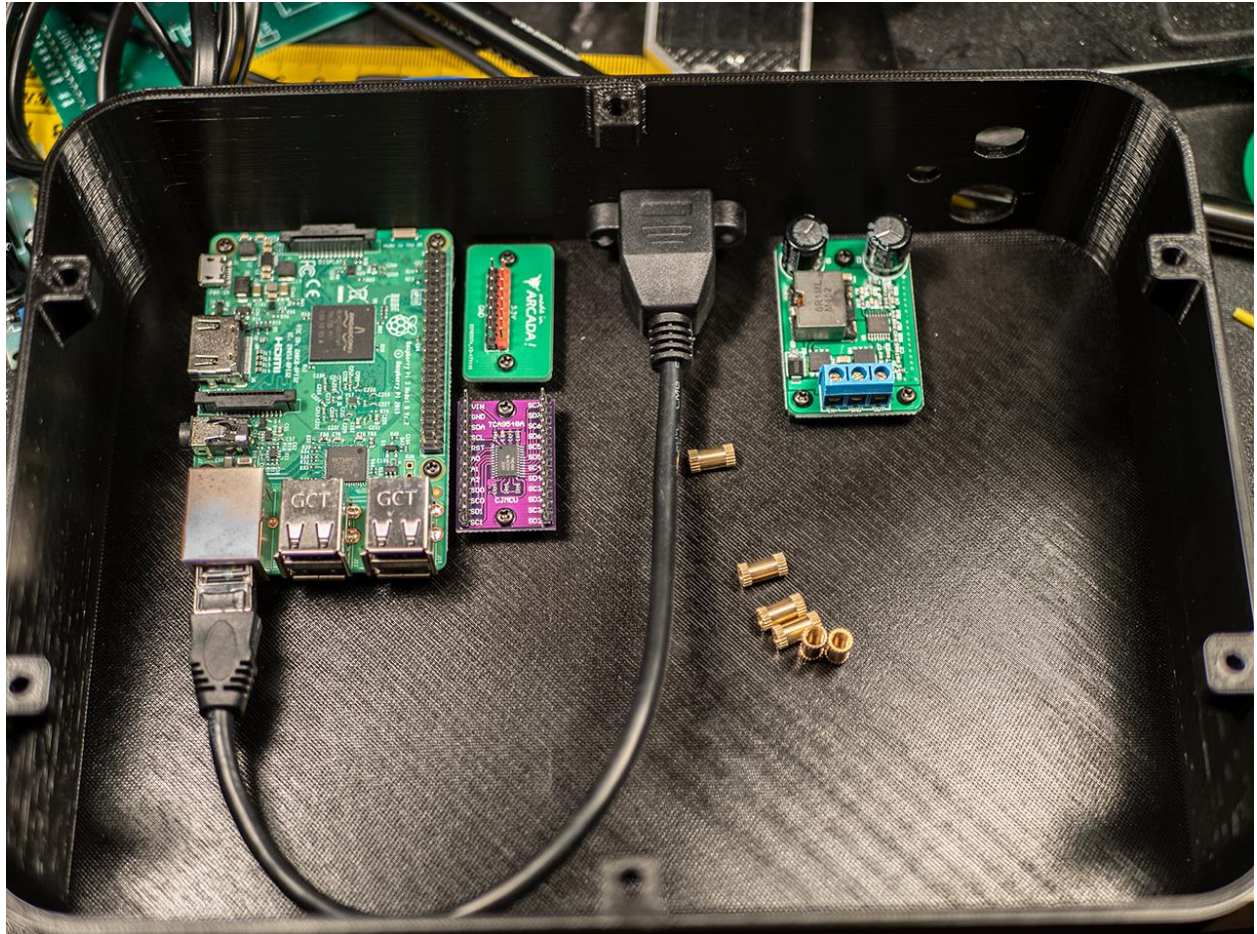
1. Insert brass insert nuts

Start by inserting the brass insert nuts (M4*L 10mm*OD 5mm) into the 6 holes, I've used an old solder iron to carefully heat and press it down until it looks like the picture. Try to get them as straight as possible. Let them cool as they get very hot.

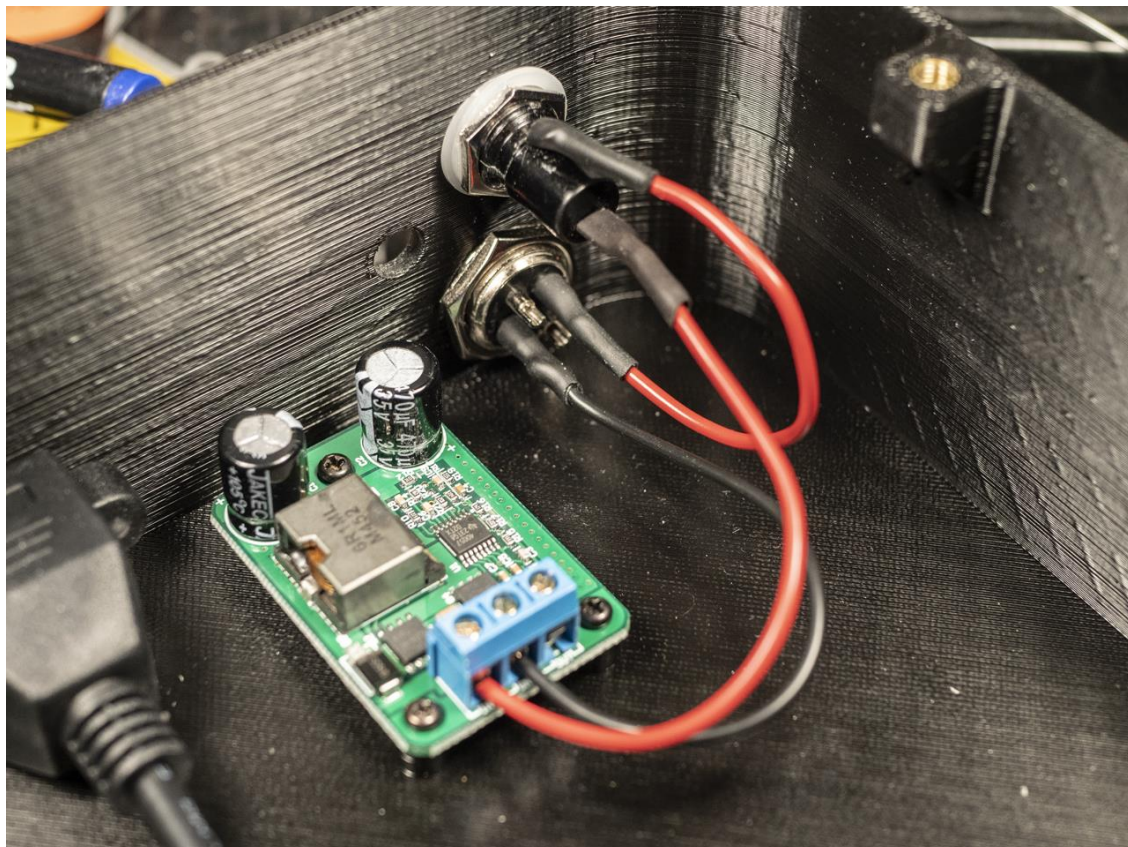


2. Mount the boards and connectors

Install the Raspberry Pi 3, the breakout PCB (8 pins 3.3v and 8 pins GND), the i2c multiplexer and the DC-DC buck step down converter (12V to 5V). If you want to use a 5V power supply you do not need this part but you will need a connector to connect multiple wires to instead). Use M2.5*5mm screws. The Ethernet extension cable is attached with two M3x10mm countersunk hex bolts. The brass inserts in the middle are the ones that were installed in step 1.

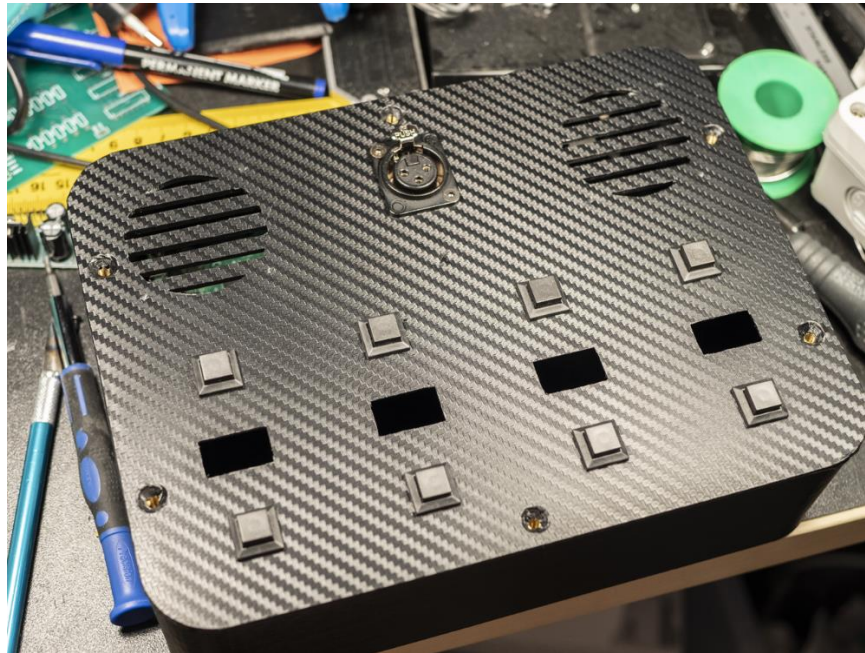


Install the power connector and fuse holder. Solder the wires that can be soldered before mounting. Pin 1 on the power connector is 12V (red), pin 3 is GND (black) and the wire is 0.75mm². Connect the fuse output to the left connector and the GND directly to the middle connector of the step down converter. The red power off button will be installed later. Cover the soldered connectors with heat shrink



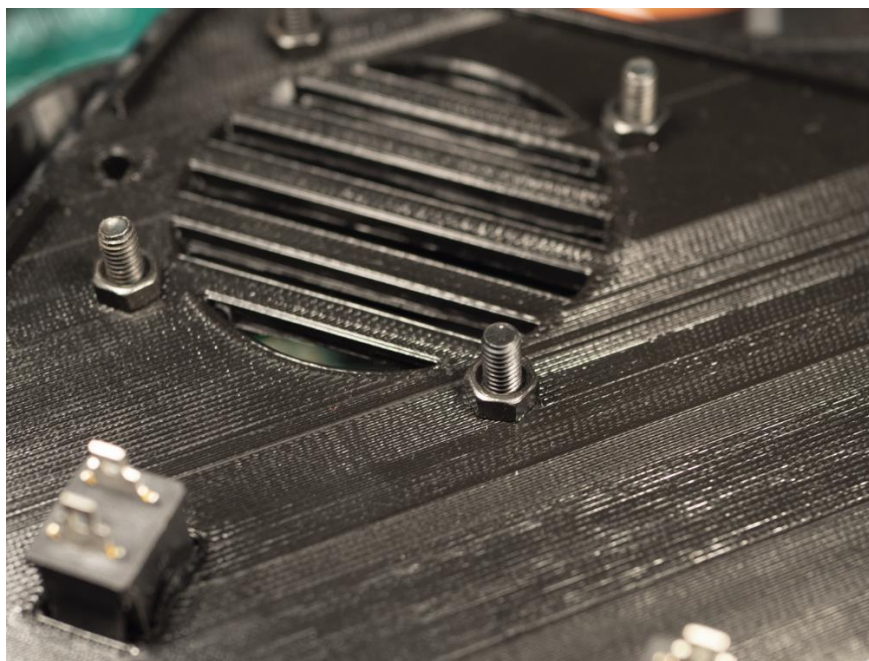
3. Apply vinyl to top cover

This step is optional but makes the base station look so much nicer. Cut out holes for the speakers, buttons, displays and microphone XLR connector.



4. Mount lid components

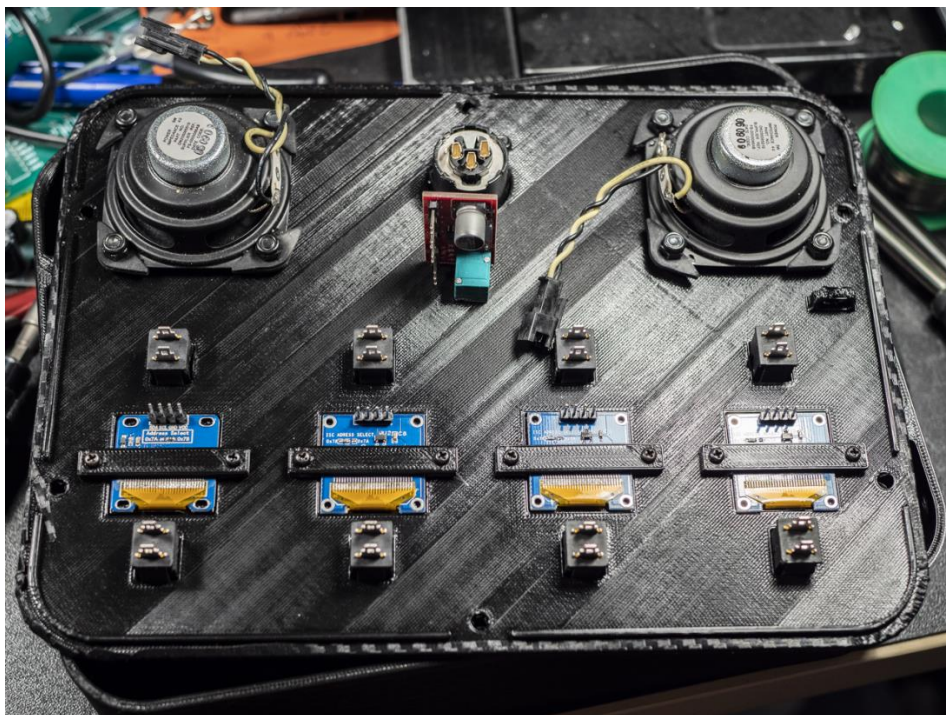
Mount the buttons as shown and fasten four M4x10mm countersunk bolts for the speaker with nuts (to give the speaker some distance from the lid) on the inside.



Install the 2-inch speaker and fasten it with 4 M4 locknuts, repeat for the other speaker.

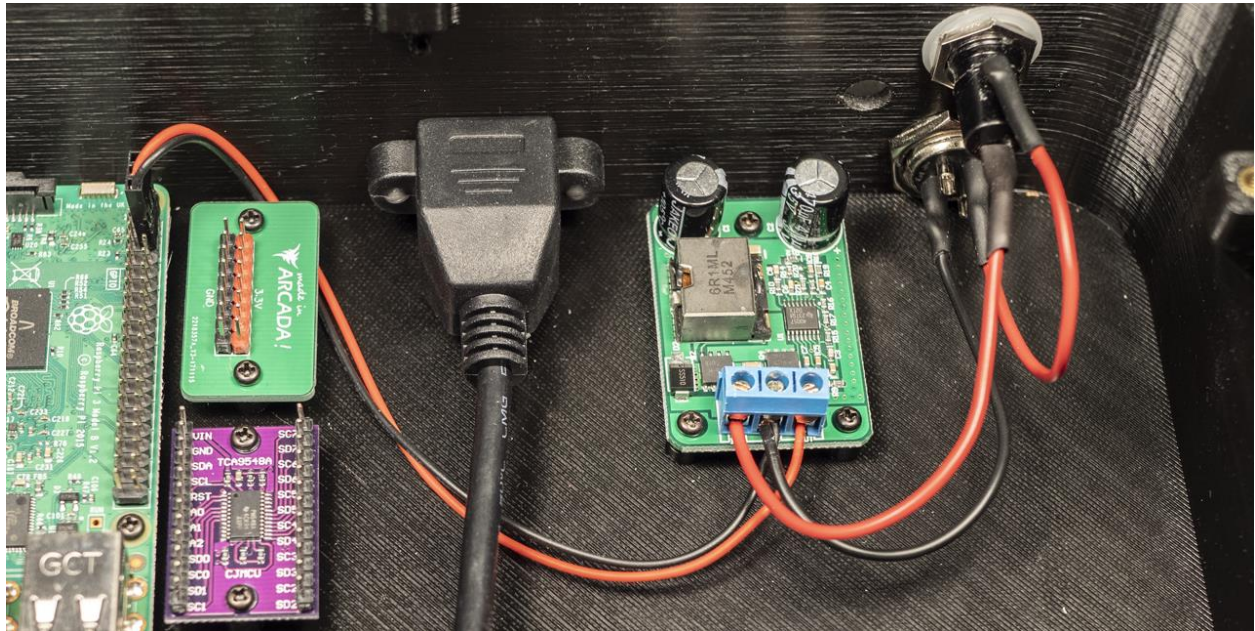


Mount the 4 0.96" oled displays (use printed oled holder and M2.5*5mm screws), the speaker amplifier and the microphone xlr connector (M3 countersunk 10mm hex bolts).

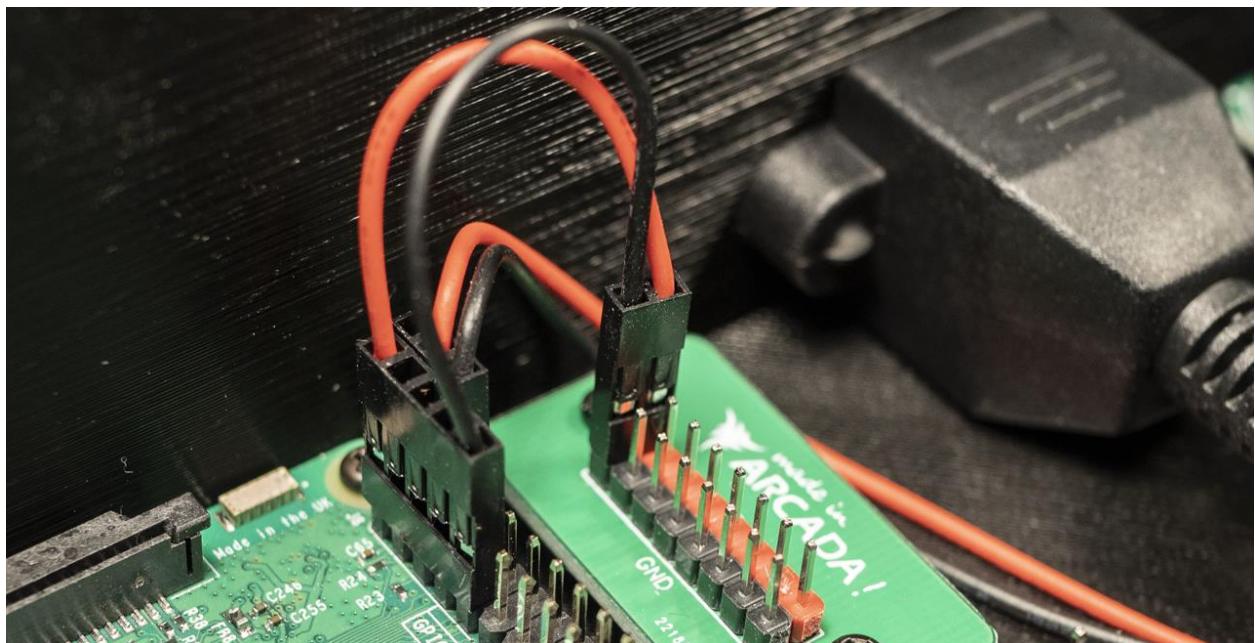


5. Wiring

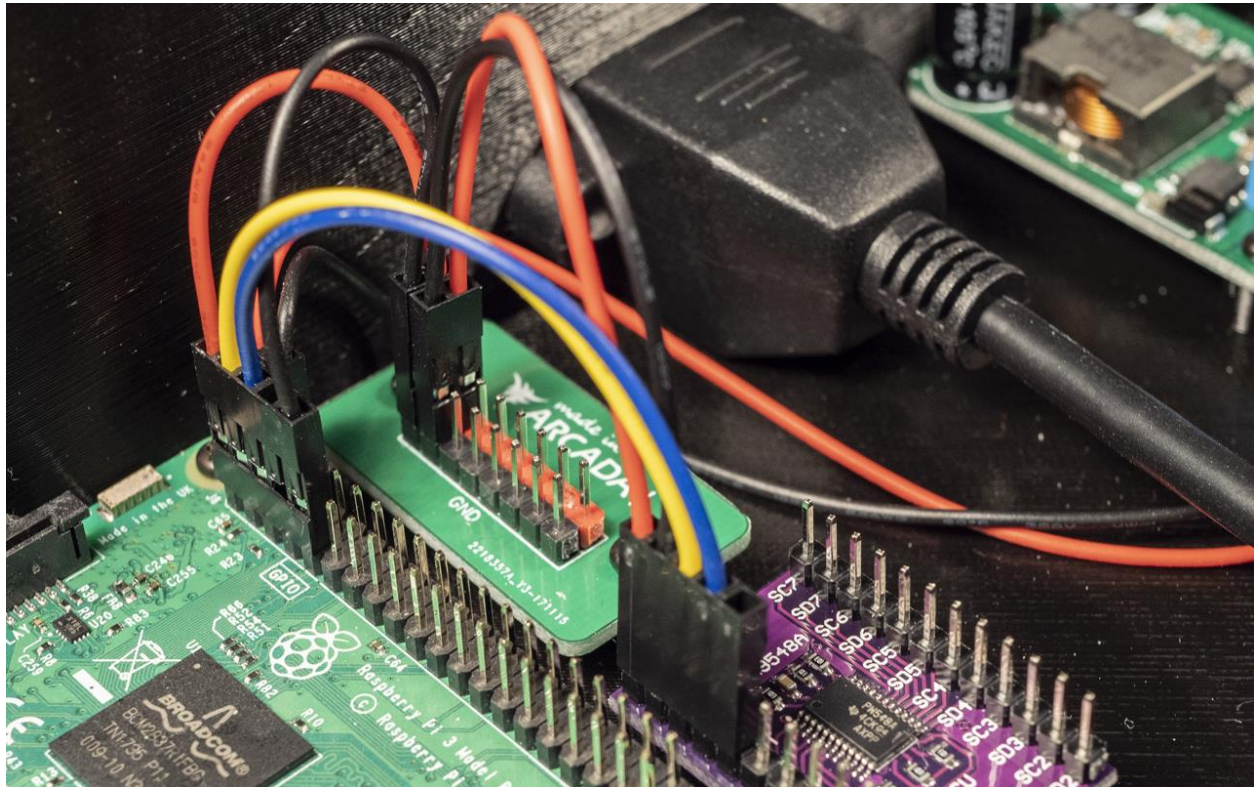
The next steps are critical and you must double check that your connections are made to the right pins, failure to do this will probably break things. Use the Fritzing document to double check. First we connect 5V and GND from the step down converter to pin 4 on the Pi and GND to pin 6 on the Pi. Double check all labels on boards and connectors to make sure that they are the same as the ones used in the guide. All wires used are 24 AWG.



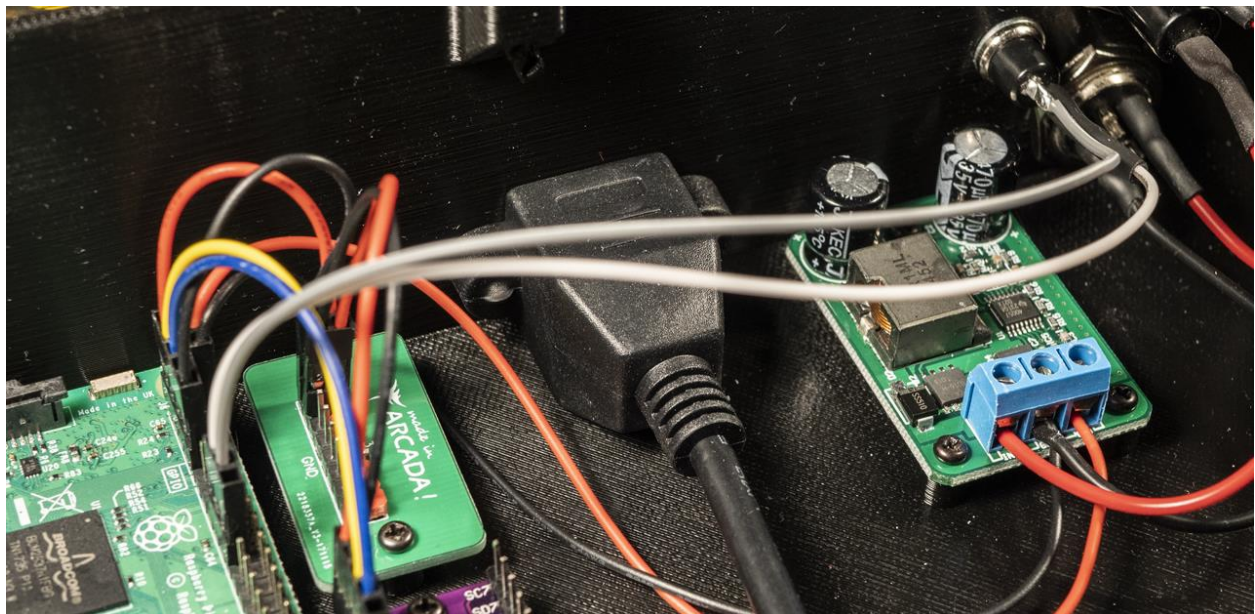
Connect pin 1 (3.3V) on the Pi to the breakout PCB 3.3V and pin 9 to GND, you can use a 5pin Dupont connector as in the picture to get the wires right. We will be adding more wires to the connector in the next step.



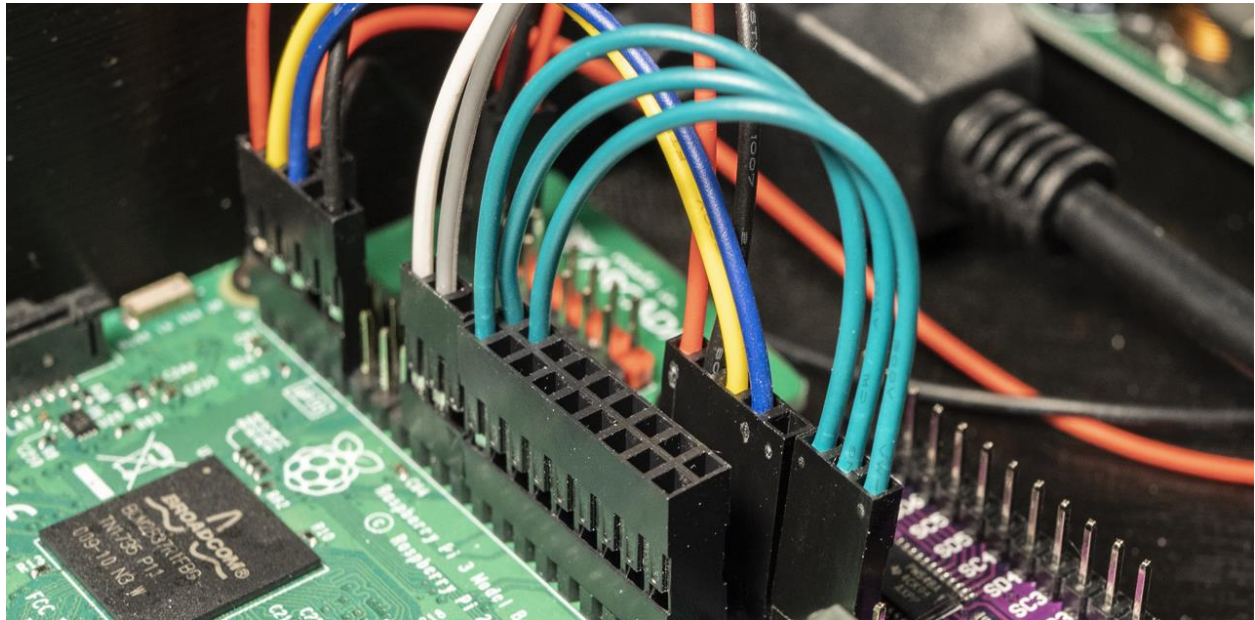
From the PCB breakout board connect 3.3V and GND to the i2c multiplexer pin 1 and 2. Connect a yellow wire from pin 3 (i2c bus SDA) on the Pi to the i2c multiplexer pin 3 and a blue wire from pin 5 (i2c bus SCL) on the Pi to pin 4 on the multiplexer.



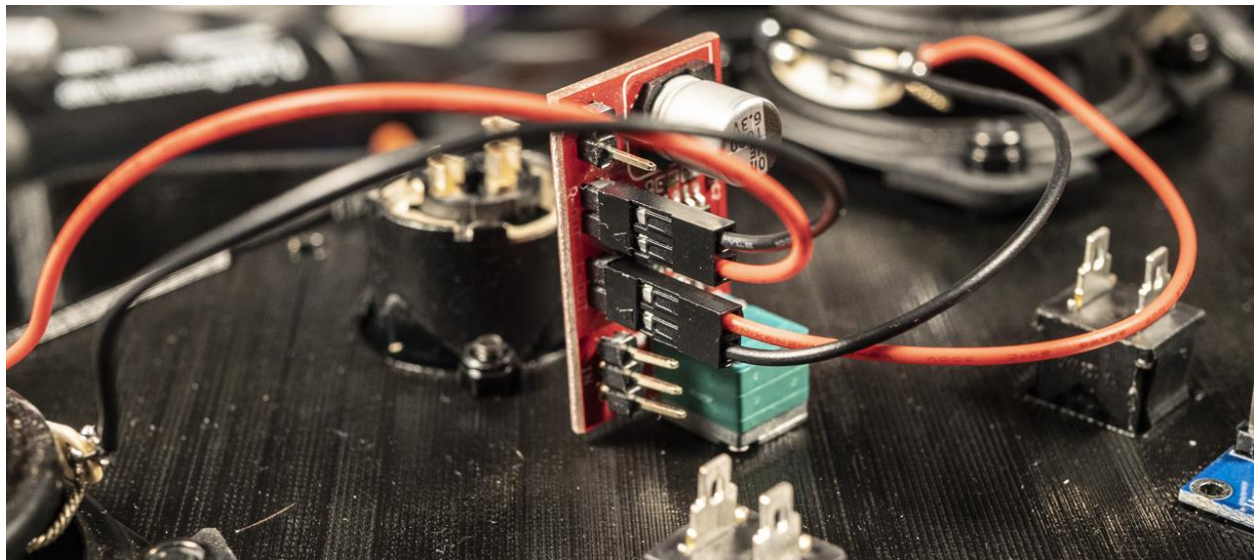
Mount the power off button (observe that there is a 1K resistor between the button and the Pi) to pin 17 and 19.



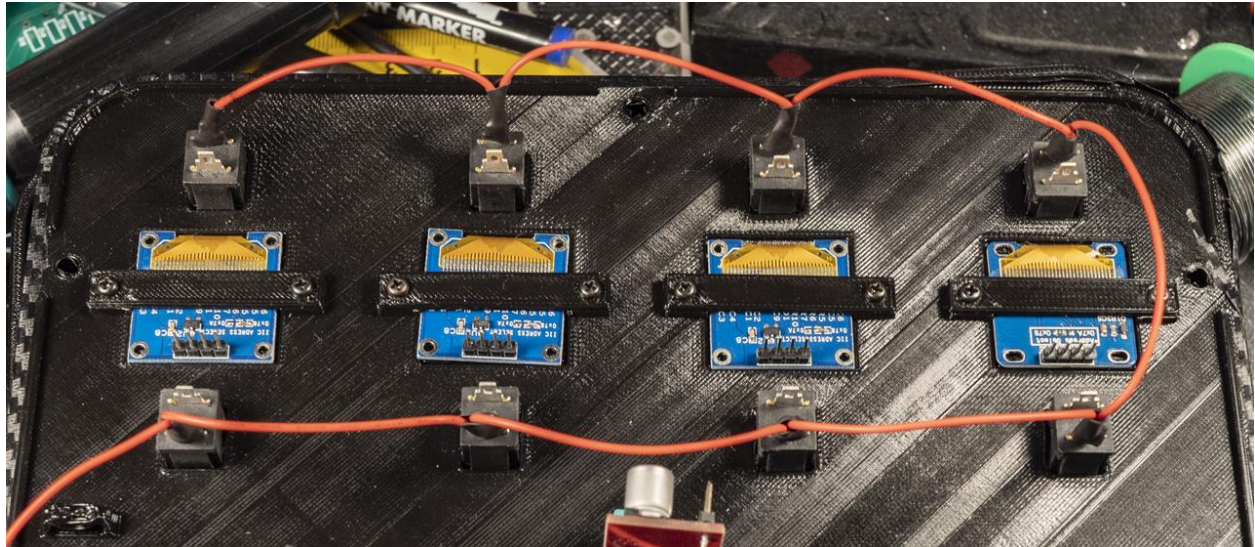
Connect green wires from pin 23,24 and 26 on the Pi to the A0,1,2 pins on the i2c multiplexer. With these wires we can choose which i2c output (display) to use on the multiplexer. The empty holes will be filled later.



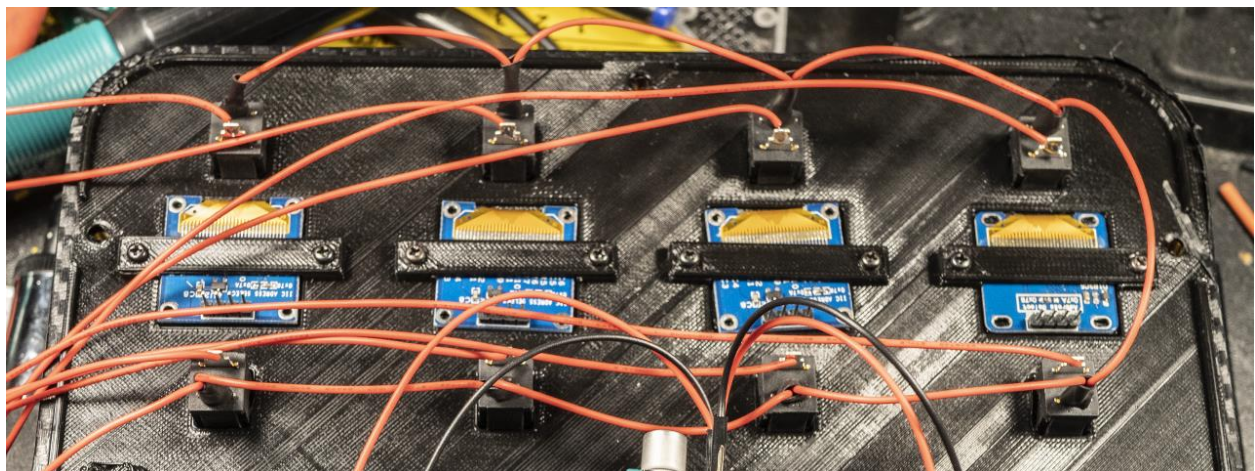
Remove the wires from the speakers and solder red and black wires to the speakers and connect them with Dupont connectors to the amplifier board as shown.



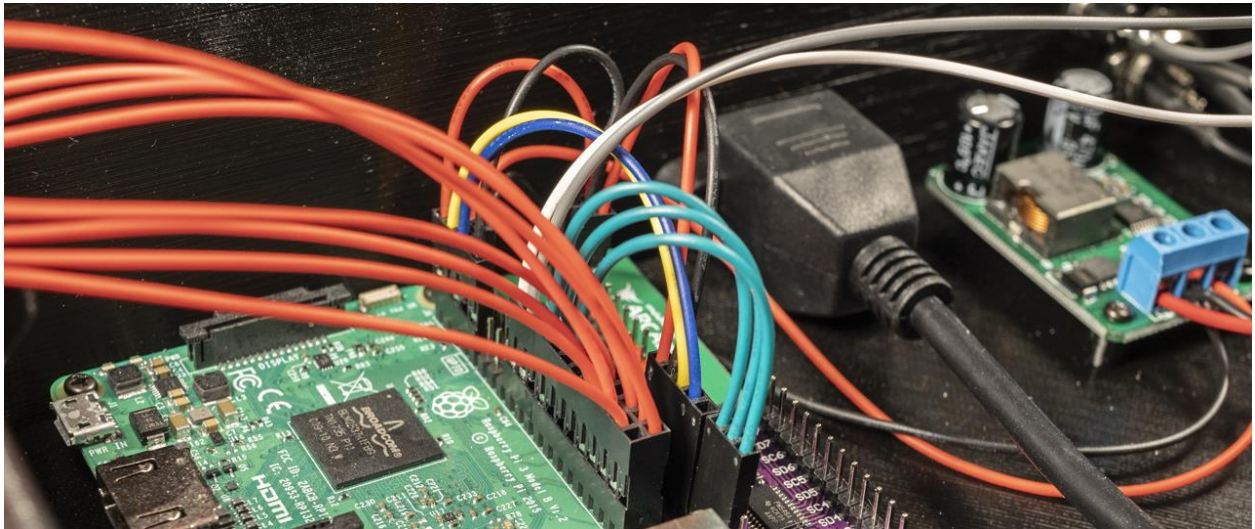
Take a red wire and solder a 1k resistor between the first button and the red wire. The red wire must be long enough to reach one of the PCB breakout boards 3.3V pins (ends with a female Dupont connector), you decide how long is enough for your use. Then loop red wires as in the picture, long red with resistor to the upper left button when seen from above, from there to the next button on the right, after button 4 upper right, down to lower right (button 8) all the way to button 5.



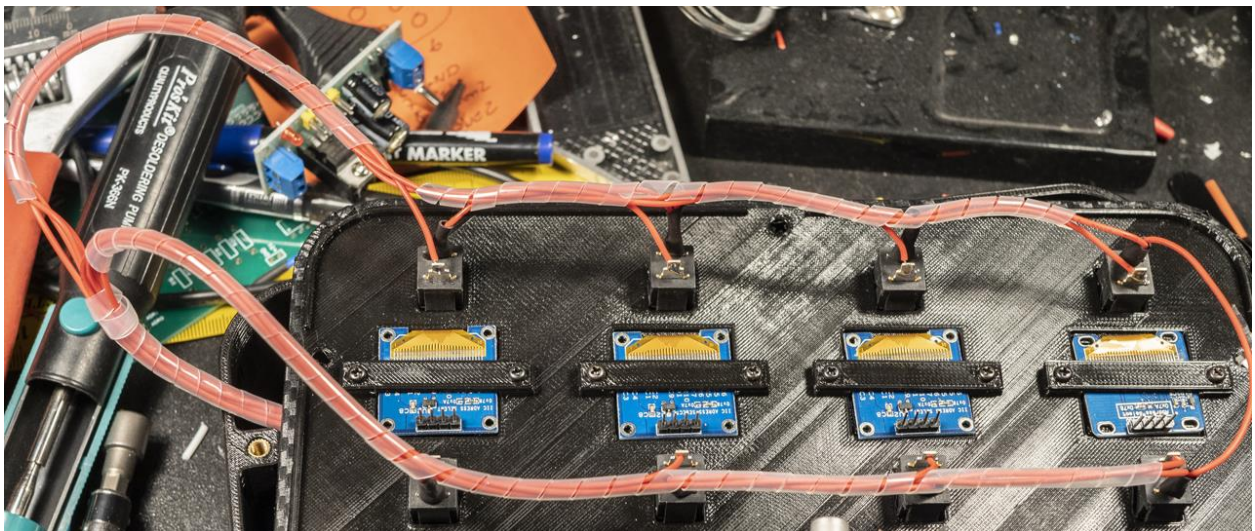
Solder a red wire to the empty side of all buttons, they should be long enough to reach the Pi and end in a female Dupont connector. Button 1 (upper left) connects to the Pi on pin 31, button 2 to pin 32, button 3 to pin 33, button 4 to pin 35 (NOT 34), button 5 to pin pin 36, button 6 to pin 37, button 7 to pin 38, button 8 to pin 40 (NOT 39).



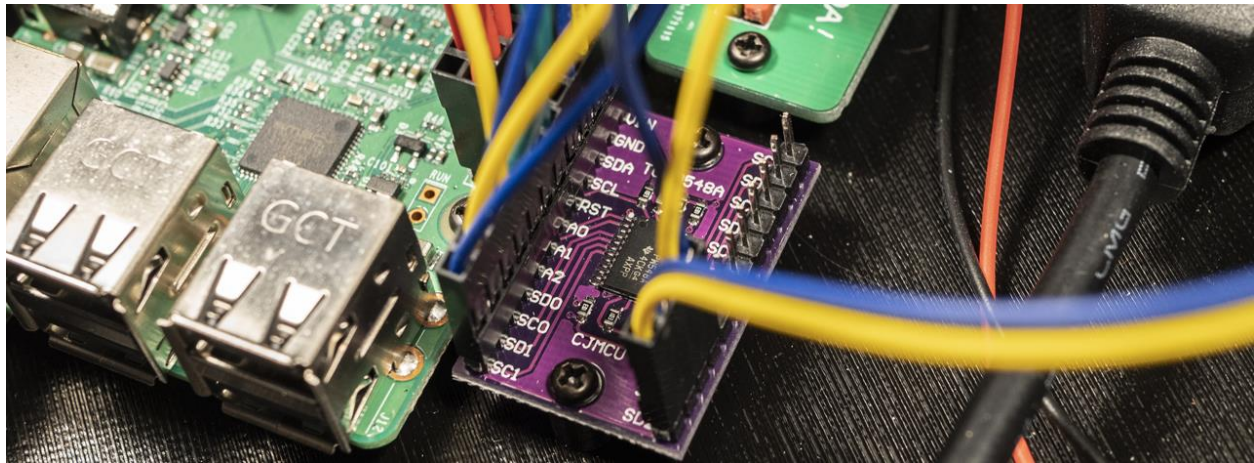
This is how it looks at the Pi end.



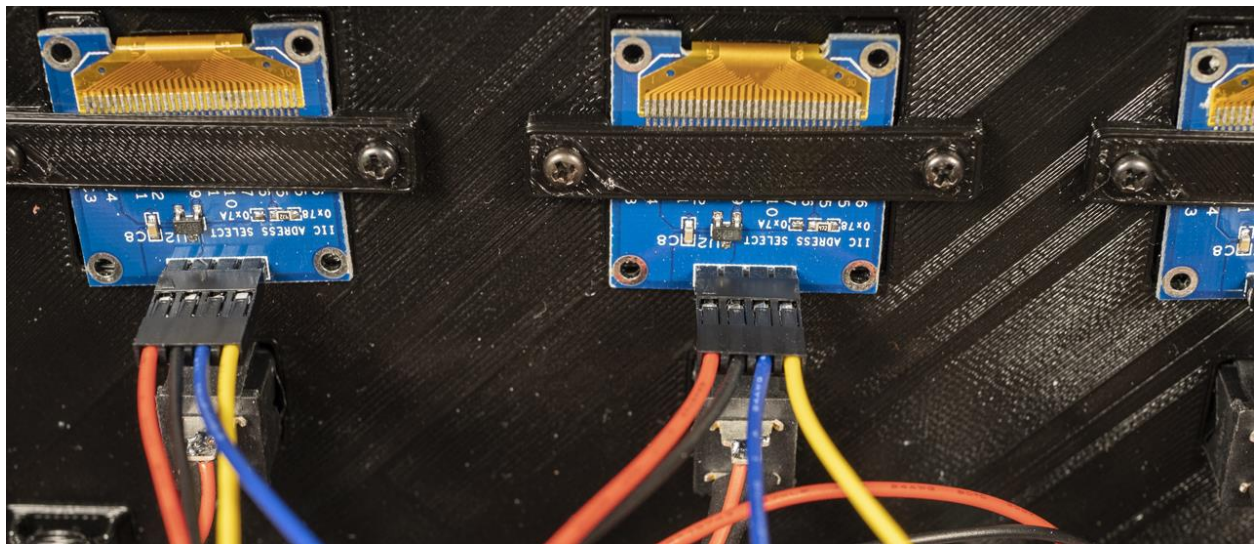
To make the wires a bit nicer you can wrap them into a plastic wire protector.



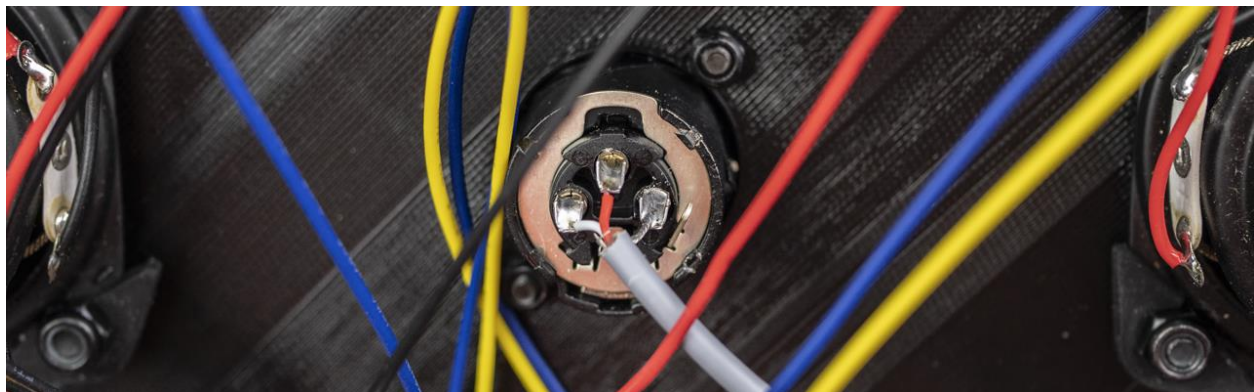
The next step is to wire the oled displays, to do that we need four wires. Red and black (3.3V and GND) from the PCB breakout board and yellow (SDA) and blue (SDC) from the i2c multiplexer. Make wires that are long enough to reach the display, use female Dupont connectors in both ends. From the i2c multiplexer use pins SD0 (yellow) and SC0 (blue) for the first display, SD1 and SC1 for display 2, SD2 and SC2 for display 3 and SD3 and SC3 for display 4.



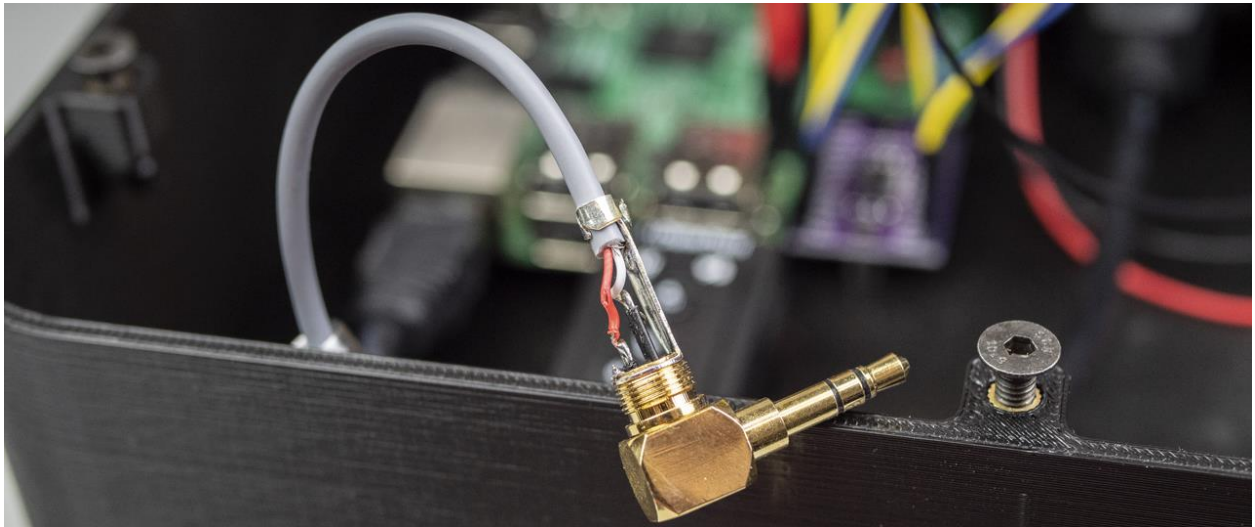
The other end connects to the displays, again check the labels on the displays you are using before connecting the wires as they may be different from the ones used in the guide.



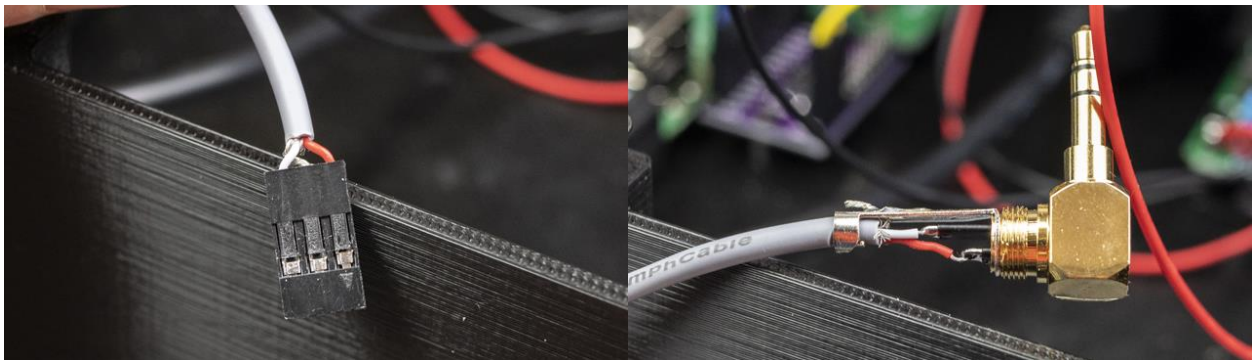
Solder a microphone cable from the microphone connector as shown to a 3.5mm audio connector that plugs in to the soundcard's microphone input.



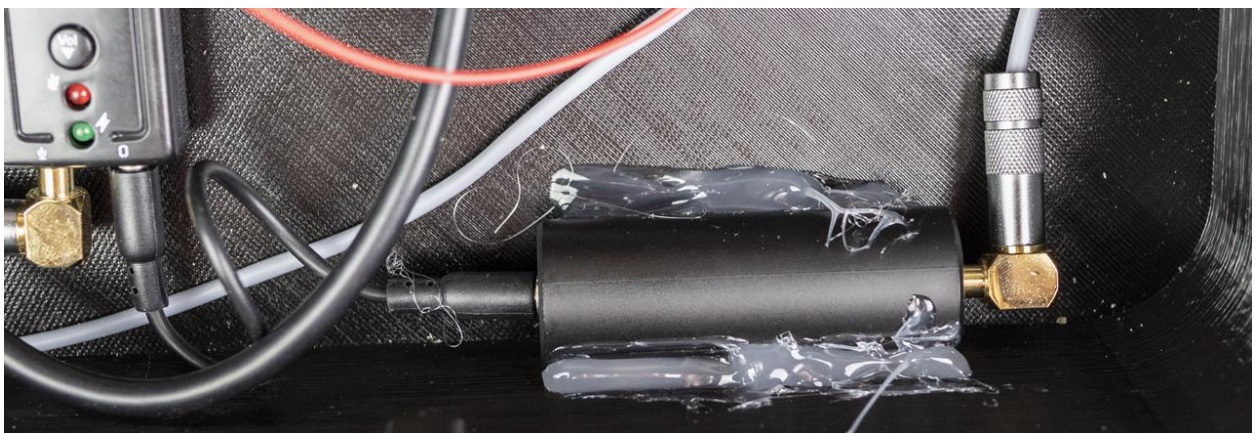
The microphone plug (soundcard) end looks like this.



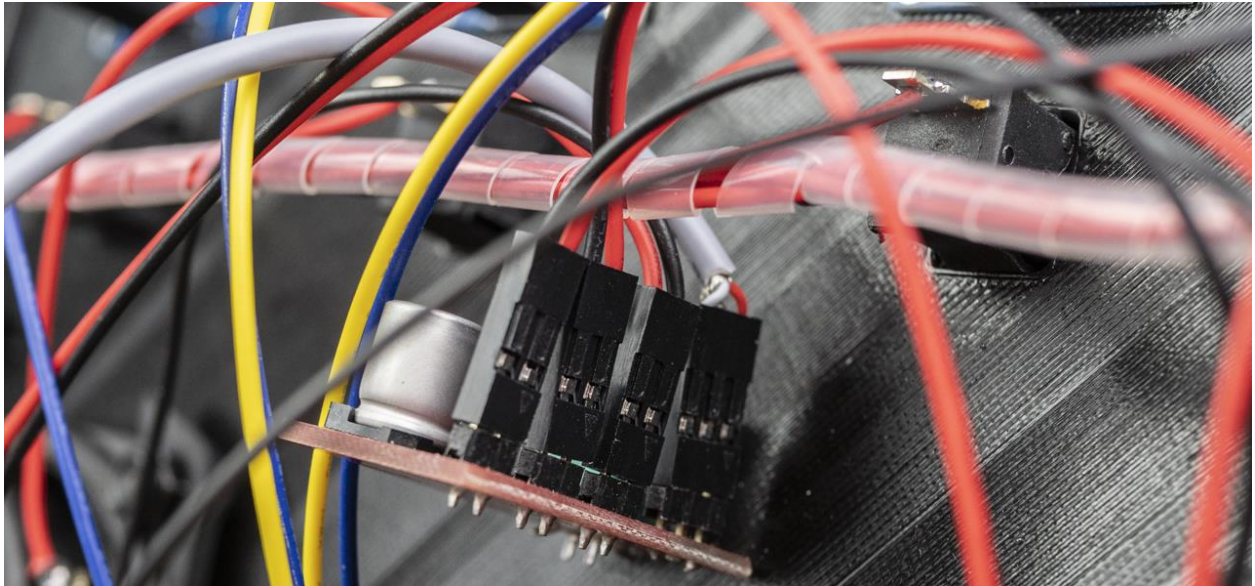
The cable from the soundcard (output) to the amplifier looks like this. The cable should be enough to reach the sound card. Look at the next step before cutting the cable.



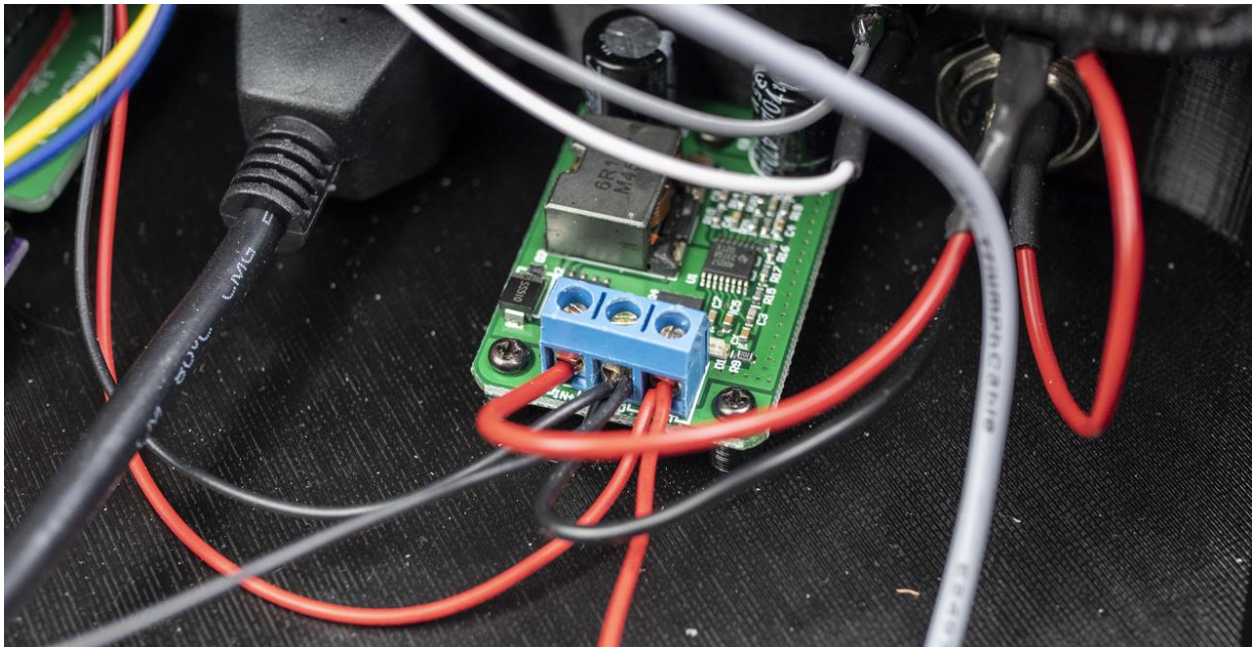
To remove noise from the audio signal we glued a noise isolator between the soundcard and the cable to the amplifier.



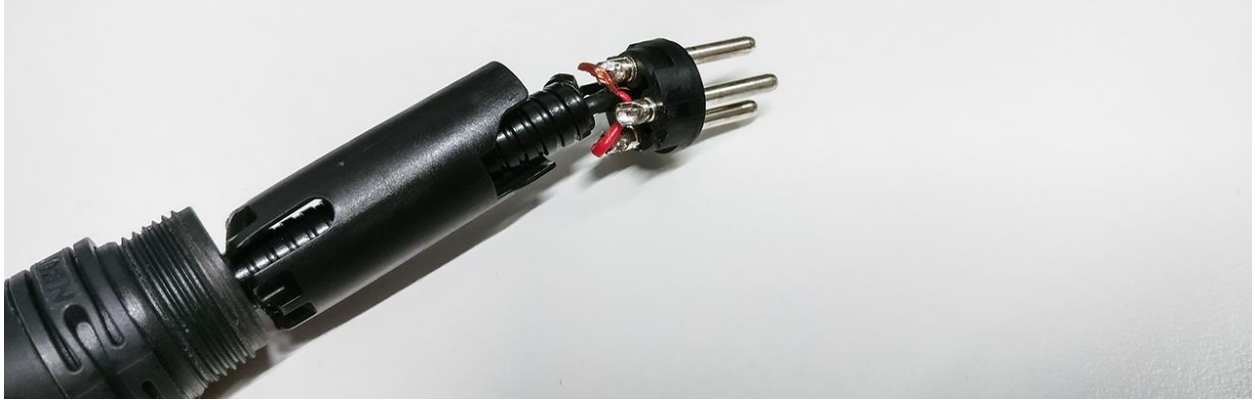
Connect the cable from the noise isolator to the amplifier as shown. Then make the wires for powering the amplifier, Dupont connectors for the amplifier side (the connector closest to the camera).



The other end connects directly to the 5V/GND on the step-down converter (right side).



Everything is now connected, the microphone used needs to be taken apart and fitted with a xlr connector.



Attach the microphone, the volume knob and the base station should look like this.



Parts needed:

6 pcs M4*10mm*5mm Brass insert nuts (case)

<https://www.aliexpress.com/item/200pcs-lot-Brass-Knurl-Nuts-M4-10mm-L-5mm-OD-Metric-Threaded-Nuts-Insert-Round-Shape/32651619949.html>

6 pcs M4x8mm countersunk bolts (case)

11 pcs M2.5*5mm screws (pcbs)

2 pcs M3x12mm countersunk bolts (Ethernet connector)

8 pcs M4x12 countersunk bolts (speakers)

8 pcs M4 nuts (speakers)

8 pcs M4 lock nuts (speakers)

1 pcs Momentary button (power off)

<https://www.aliexpress.com/item/IMC-Hot-10Pcs-Red-Cap-SPST-Momentary-Mini-Pushbutton-Switch-DC-50V-0-3A/32816983756.html>

8 pcs Momentary buttons (push to talk)

<https://www.aliexpress.com/item/5x-Black-Momentary-Square-Push-Button-Switch-SPST-AC-125V-1A/2024643496.html>

1 pcs 4-pin Aviation connector (power)

<https://www.ebay.com/itm/5pcs-Aviation-Plug-4-Pin-16mm-GX16-4-Metal-Male-Female-Panel-Connector-New-ATUS/202350980099>

1 pcs Fuse holder

<https://www.aliexpress.com/item/5pcs-lot-5-20mm-6-30mm-glass-fuse-holders-5x20-6x30-insurance-tube-socket-fuse-holder/32938489250.html>

2 pcs 1k resistor (power off button, talk buttons)

1 pcs Ethernet extension connector

<https://www.ebay.com/itm/1ft-3ft-RJ45-M-F-Shielded-Ethernet-Network-Screw-Panel-Mount-Extension-Cable-TE/123246255485>

4 pcs 0.96" oled display (ssd1306 i2c)

<https://www.aliexpress.com/item/Free-Shipping-White-Blue-Whiteand-Blue-color-0-96-inch-128X64-OLED-Display-Module-For-arduino/32713614136.html>

1 pcs Raspberry Pi 3 with Ethernet connector

1 pcs Usb sound card

<https://www.aliexpress.com/item/External-USB-Audio-Card-Sound-Adapter-Virtual-7-1ch-USB-Microphone-3-5mm-Jack-Converter-for/32658791595.html>

1 pcs 12v – 5v DC-DC Step Down Buck Converter

<https://www.ebay.com/itm/DC-DC-Step-Down-Buck-Converter-Power-Supply-Module-24V-12V-9V-to-5V-5A-25W-MF/172358062967>

1 pcs 12V 5A power supply

<https://www.aliexpress.com/item/5V-24V-12V-Lighting-Transformer-AC-110V-220V-to-12V-Power-Supply-1A-2A-3A-5A/32808214233.html>

1 pcs i2c TCS9548A multiplexer board

<https://www.aliexpress.com/item/CJMCU-9548-TCA9548A-1-to-8-I2C-8-way-multi-channel-expansion-board-IIC-module-development/32648420655.html>

1 pcs 3 pin xlr female chassi Neutrik NC3FD-L-BAG-1 (lid)

1 pcs 3 pin xlr male Neutrik NC3MX-BAG (microphone)

2 pcs 3.5mm audio plugs

<https://www.aliexpress.com/item/10PCS-Gold-Plated-3-5mm-Stereo-3-Pole-Male-Plug-Angled-90-Degree-Audio-Connector-Solder/32512467686.html>

2 pcs 2 inch speakers

<https://www.aliexpress.com/item/2Pcs-Audio-Tweeter-Speakers-Cone-Edge-Neodymium-Magnetic-Full-Range-Speaker-Bluetooth-Portable-Speaker-2Inch-53MM/32770948935.html>

1 pcs microphone

<https://www.aliexpress.com/item/Wired-Conference-Microphone-Meeting-MIC-Condenser-Microphone-with-4M-Cable-ED-21-Free-shipping-wholesale/2042044754.html>

1 pcs noise isolator

<https://www.aliexpress.com/item/1pcs-3-5mm-jack-Audio-Cable-Ground-Loop-Noise-Isolator-for-Car-Audio-System-Home-Stereo/32847115363.html>

1 pcs PAM8406 amplifier board

<https://www.aliexpress.com/item/PAM8406-5Wx2-Digital-Speaker-Amplifier-Board-With-Volume-Potentiometer-DC-3-5-5V/32961145778.html>

Vinyl

<https://www.aliexpress.com/item/200-40cm-3D-4D-Carbon-Fiber-Vinyl-Film-3M-Car-Sticker-Waterproof-DIY-Car-Styling-Wrap/32412230071.html>

Dupont female terminal connectors

<https://www.aliexpress.com/item/Hot-100x-Dupont-Jumper-Cable-Wire-Female-Pin-Connector-2-54mm-copper-DIY-Good-Quality-wholesale/1850210835.html>

Dupont female terminal header connectors (buy a pack or order just the ones needed)

5pcs 2 pin

5pcs 3 pin

6pcs 4 pin

2pcs 5 pin

1pcs 2x9pin

<https://www.aliexpress.com/item/Dupont2-54-Connectors-Cable-Jumper-Wire-Connector-Header-Housing-2-54mm-Pitch-Shell-1-To-10/32957786914.html>

Crimp tool (for making own Dupont connectors)

<https://www.aliexpress.com/item/SN-2549-Pin-Crimping-Tool-2-54mm-3-96mm-4-8mm-28-18awg-0-08-1/32823519191.html>

Wires AWG 24 recommended (white, grey, red, black, yellow, blue, green)

<https://www.aliexpress.com/item/10-Meters-UL-1007-Wire-24AWG-1-4mm-PVC-Wire-Electronic-Cable-UL-Certification-Insulated-LED/32821442881.html>

~0.5m audio cable

<https://www.aliexpress.com/item/2-3-4-core-shielded-wire-UL-2547-28AWG-5-meter-16-4-ft-2-1/32838471899.html>

Heat shrink

<https://www.aliexpress.com/item/1meter-lot-2-4mm-Heat-Shrink-Tube-with-Glue-Adhesive-Lined-3-1-Shrinkage-Dual-Wall/32818131285.html>

1 pcs PCB breakout board or prototype pcb (Gerber file available)

1 pcs 8 pin black Dupont male connector (for PCB breakout board)

1 pcs 8 pin red Dupont male connector (for PCB breakout board)

3D printed enclosure (lid, bottom and 4 oled holders)