LED Protest Sign

Created by John Park

https://learn.adafruit.com/led-protest-sign

Last updated on 2024-06-03 03:08:43 PM EDT

Table of Contents

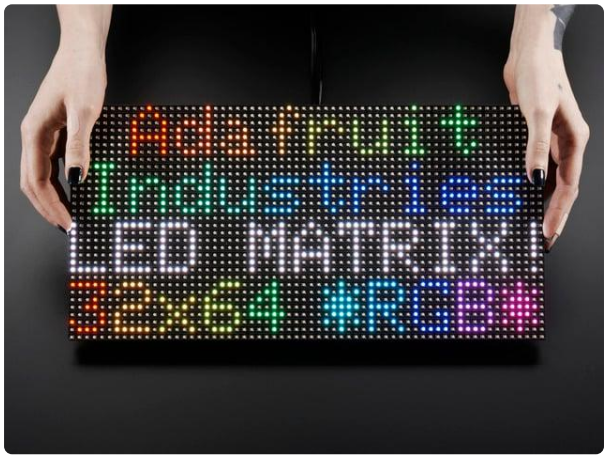
Overview

Build a protest/demonstration sign that can be seen at night. This project makes it simple to use your own graphics on the sign -- it's as easy as dragging and dropping .bmp image files into a folder.

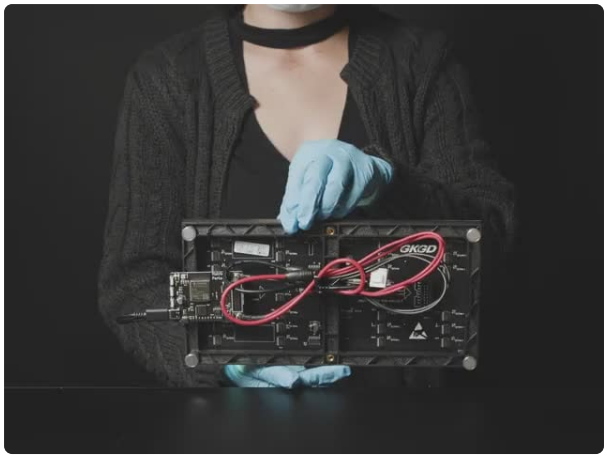
CircuitPython running on the Feather M4 with the RGB Matrix FeatherWing drives any of our RGB LED matrix panels.

You can use the large 6mm pitch version and 3D print the provided brackets to hold LED diffusing plastic. Screw a yardstick or other thin strip of wood to the panel and you can go out and march.

Parts



64x32 RGB LED Matrix - 6mm pitch
Bring a little bit of Times Square into your home with this sweet 64x32 square RGB LED matrix panel. These panels are normally used to make video walls, here in New York we see them on...
https://www.adafruit.com/product/2276



[Adafruit Matrix Portal - CircuitPython Powered Internet Display]
Folks love our wide selection of RGB matrices and accessories, for making custom colorful LED displays... and our RGB Matrix Shields...
https://www.adafruit.com/product/4745

[8 x AA battery holder with 5.5mm/2.1mm Plug and On/Off Switch]
Make a portable power brick with plenty of juice! Use Alkaline AA's for a 12V 3000-4000mAh power supply, or rechargeable NiMH for 2000mAh 9.6V supply. Either one is good for running...
https://www.adafruit.com/product/875

[UBEC DC/DC Step-Down (Buck) Converter - 5V @ 3A output]
Your power supply problems just got SOLVED! This little circuit board may look tiny but inside is a high efficiency DC/DC step-down converter which can output up to 3 Amp at 5V without...
https://www.adafruit.com/product/1385

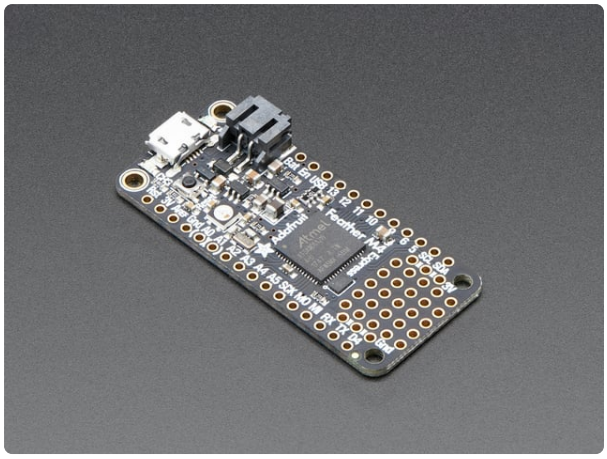
[Panel Mount 2.1mm DC barrel jack]
This power jack is designed to easily attach to a panel up to 8mm thick (0.315" or 5/16") and fit 2.1mm power plugs snugly and securely. Perfect for adding a power connector...
https://www.adafruit.com/product/610

[5.5 / 2.1mm Barrel Connector - DC Power Plug]
DIY? How about D-I-Wire! This barrel jack plug is great for adding a common power connector to the end of your wires.
The jack is compatible with 5.5mm barrel jacks that have a...
https://www.adafruit.com/product/3310

[Heat Shrink Pack]
Heat shrink is the duct tape of electronics, it keeps your stuff all safe and kept together. Especially when wiring and soldering, use heat shrink to add mechanical strength to cables....
https://www.adafruit.com/product/344

[Black Nylon Machine Screw and Stand-off Set – M2.5 Thread]
Totaling 380 pieces, this M2.5 Screw Set is a must-have for your workstation. You'll have enough screws, nuts, and hex standoffs to fuel your maker...
https://www.adafruit.com/product/3299

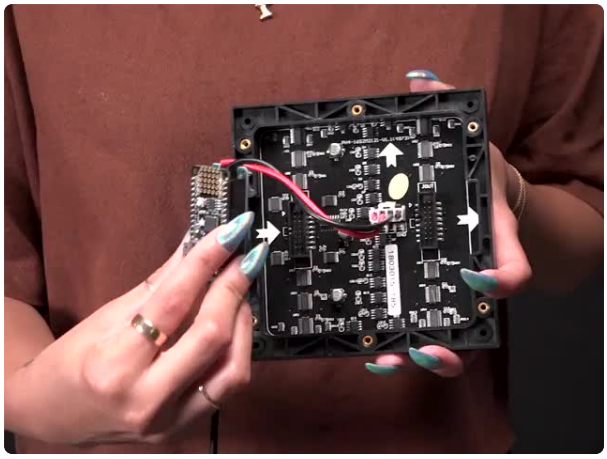
Or, instead of the MatrixPortal, you can use a Feather M4 + Matrix FeatherWing.



Adafruit Feather M4 Express - Featuring ATSAMD51

It's what you've been waiting for, the Feather M4 Express featuring ATSAMD51. This Feather is fast like a swift, smart like an owl, strong like a ox-bird (it's half ox,...

https://www.adafruit.com/product/3857



Adafruit RGB Matrix Featherwing Kit

Ahoy! It's time to create a dazzling light up project with our new RGB Matrix FeatherWing. Now you can quickly and easily create...

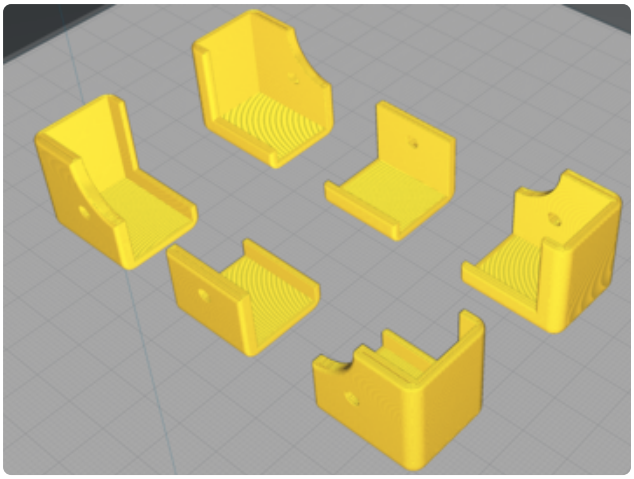
https://www.adafruit.com/product/3036

If using MatrixPortal: a high current-capable USB power bank may be sufficient to power this. If Feather M4: many external laptop battery units can provide 9–16V for the UBEC. Either of these is worth considering if you already have one around...but otherwise, they tend to be expensive and require some experimentation. For most users, we suggest going with the Feather and the AA battery pack above.

Additional Materials

In addition to the parts above, you'll need:

- 8 ea. AA NiMH rechargeable batteries
- A length of 2" x 1/4" wood for a handle, such as a yard stick
- 6 ea. M3 x 8mm screws (https://adafru.it/LHb) for securing the brackets (these can be the typical Phillips head, but I really like hex drive screws)
- 2 ea. M3 x 12mm screws (https://adafru.it/LHc) for attaching the handle
- Sheet of diffusing acrylic 385mm x 190mm x 3mm such as Chemcast Black LED Acrylic (https://adafru.it/IVf)
- Velcro or double stick foam tape to secure the battery holder
- Zip ties



3D Printing

For the brackets and Feather cover, you'll need access to a 3D printer and some PLA or similar filament.

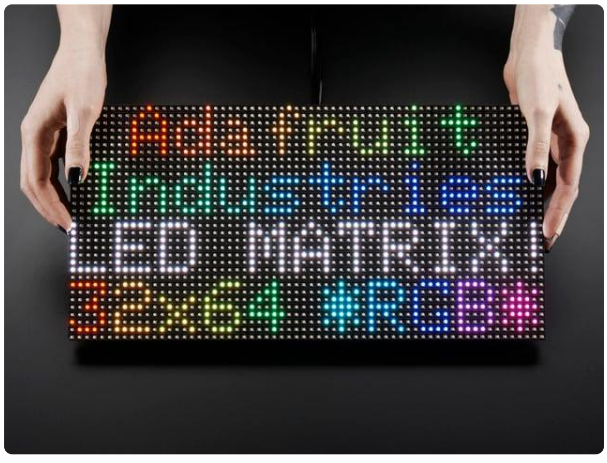
Tools

You'll need:

- screwdriver
- soldering iron and solder
- wire strippers
- hand drill

Using Feather M4 Express

You can build this project using the Feather M4 Express. For a detailed list of all parts needed for this project, check out the Overview.



64x32 RGB LED Matrix - 6mm pitch

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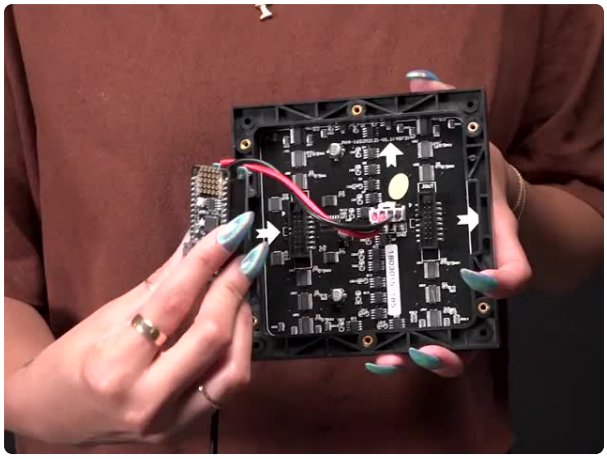

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CircuitPython on Feather M4 Express

CircuitPython (https://adafru.it/tB7) is a derivative of MicroPython (https://adafru.it/BeZ) designed to simplify experimentation and education on low-cost microcontrollers. It makes it easier than ever to get prototyping by requiring no upfront desktop software downloads. Simply copy and edit files on the **CIRCUITPY** drive to iterate.

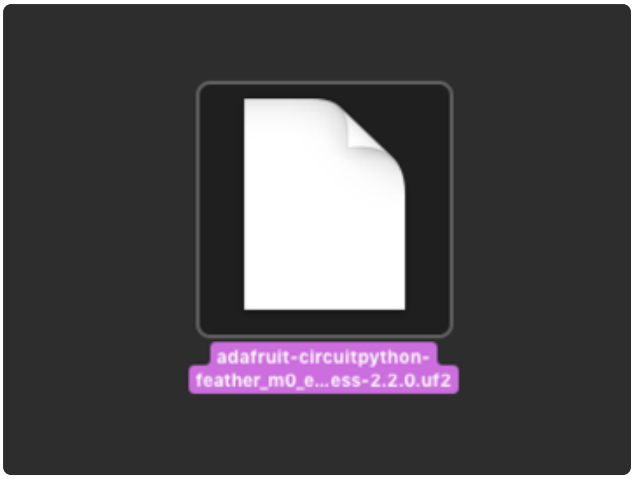
The following instructions will show you how to install CircuitPython. If you've already installed CircuitPython but are looking to update it or reinstall it, the same steps work for that as well!

Set up CircuitPython Quick Start!

Follow this quick step-by-step for super-fast Python power :)

Download the latest version of CircuitPython for this board via CircuitPython.org

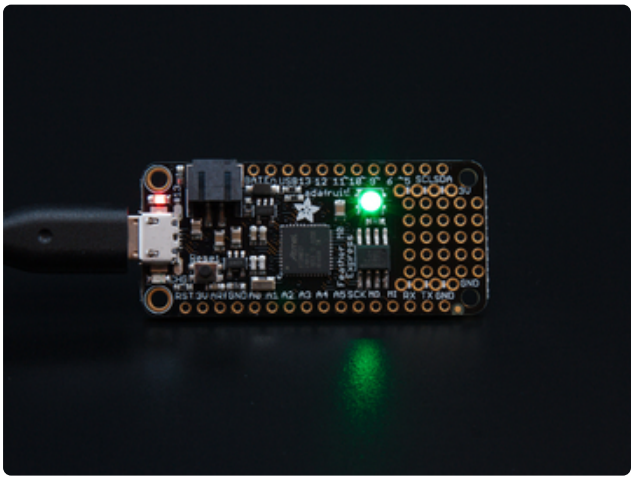
https://adafru.it/Emh



Click the link above and download the latest UF2 file.

Download and save it to your desktop (or wherever is handy).

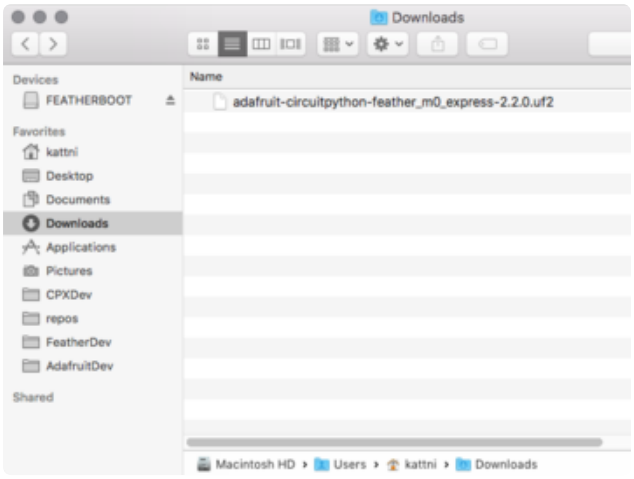
Plug your Feather M4 into your computer using a known-good USB cable.



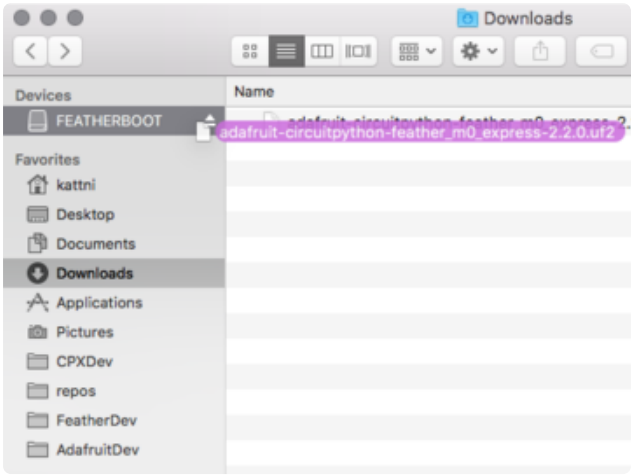
A lot of people end up using charge-only USB cables and it is very frustrating! So make sure you have a USB cable you know is good for data sync.

Double-click the **Reset** button next to the USB connector on your board, and you will see the NeoPixel RGB LED turn green. If it turns red, check the USB cable, try another USB port, etc. **Note:** The little red LED next to the USB connector will pulse red. That's ok!

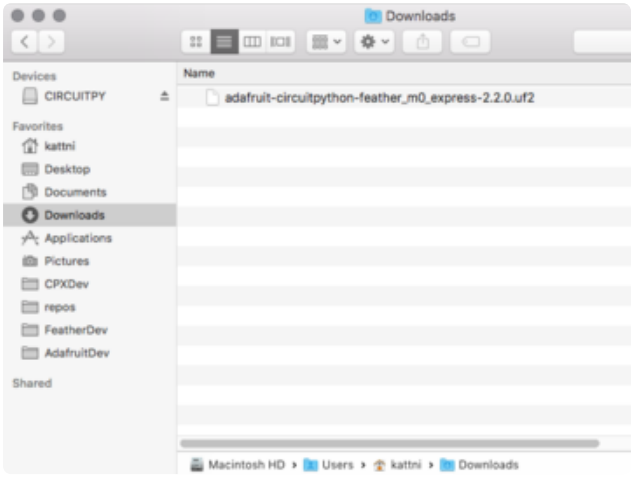
If double-clicking doesn't work the first time, try again. Sometimes it can take a few tries to get the rhythm right!



You will see a new disk drive appear called **FEATHERBOOT**.



Drag the **adafruit_circuitpython_etc.uf2** file to **FEATHERBOOT.**



The LED will flash. Then, the **FEATHERBOOT** drive will disappear and a new disk drive called **CIRCUITPY** will appear.

That's it, you're done! :)

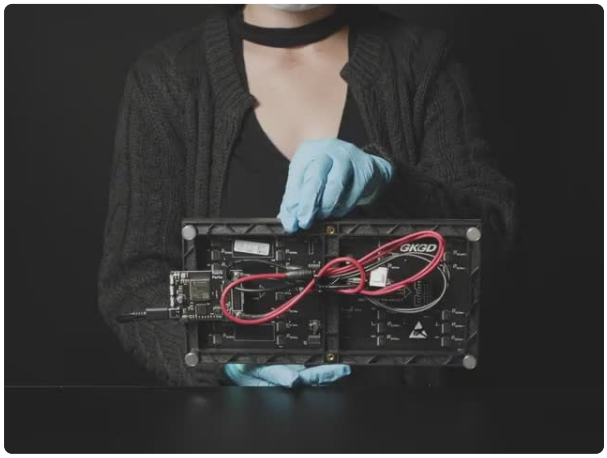
Further Information

For more detailed info on installing CircuitPython, check out Installing CircuitPython (https://adafru.it/Amd).

Using MatrixPortal

You can build this project with an all-in-one Matrix Portal board, its definitely the easiest and least-expensive way to go about it.

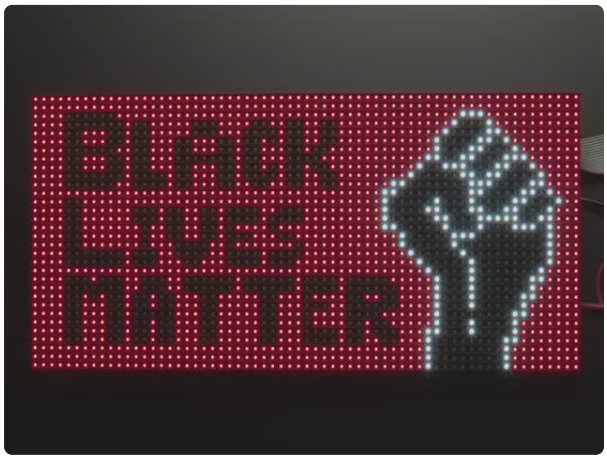
You will need a matrix portal, matrix, and USB C power/data cable



Adafruit Matrix Portal - CircuitPython Powered Internet Display

Folks love our wide selection of RGB matrices and accessories, for making custom colorful LED displays... and our RGB Matrix Shields...

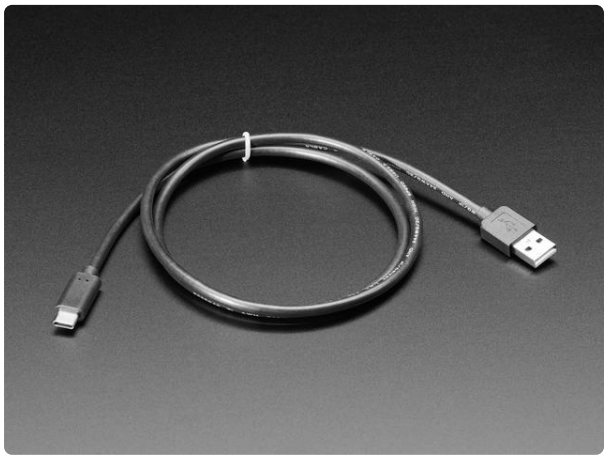
https://www.adafruit.com/product/4745



64x32 RGB LED Matrix - 4mm pitch

Bring a little bit of Times Square into your home with this sweet 64 x 32 square RGB LED matrix panel. These panels are normally used to make video walls, here in New York we see them...

https://www.adafruit.com/product/2278

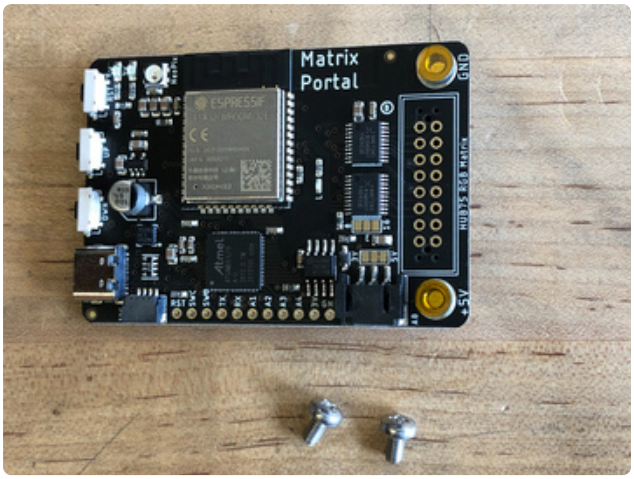


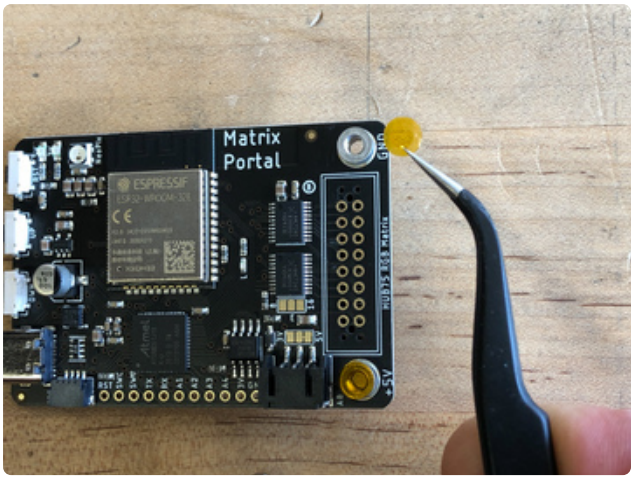
USB Type A to Type C Cable - approx 1 meter / 3 ft long

As technology changes and adapts, so does Adafruit. This USB Type A to Type C cable will help you with the transition to USB C, even if you're still...

https://www.adafruit.com/product/4474

Prep the MatrixPortal

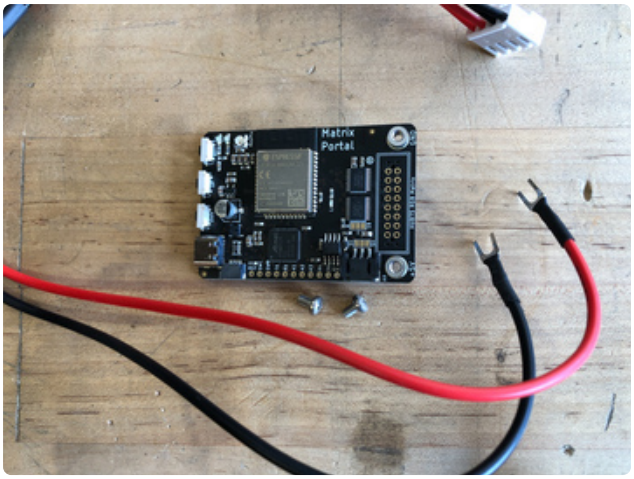


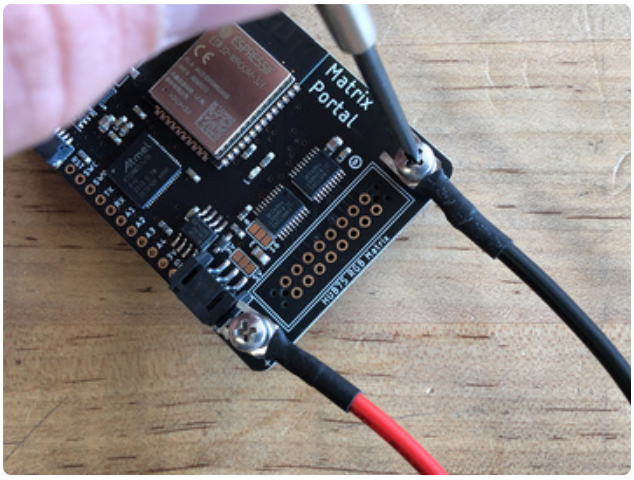


Power Prep

The MatrixPortal supplies power to the matrix display panel via two standoffs. These come with protective tape applied (part of our manufacturing process) which MUST BE REMOVED!

Use some tweezers or a fingernail to remove the two amber circles.

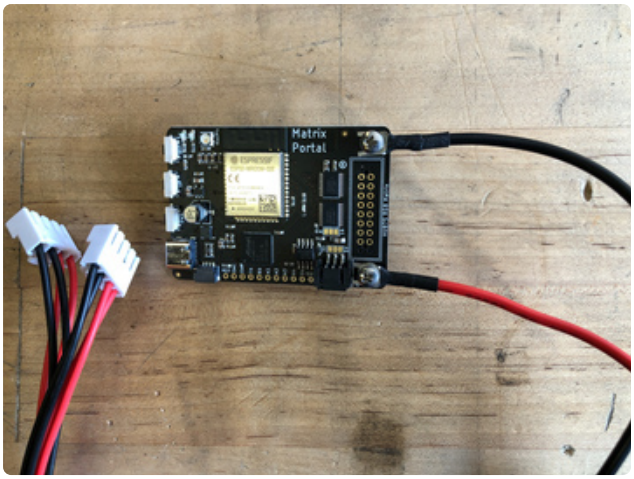


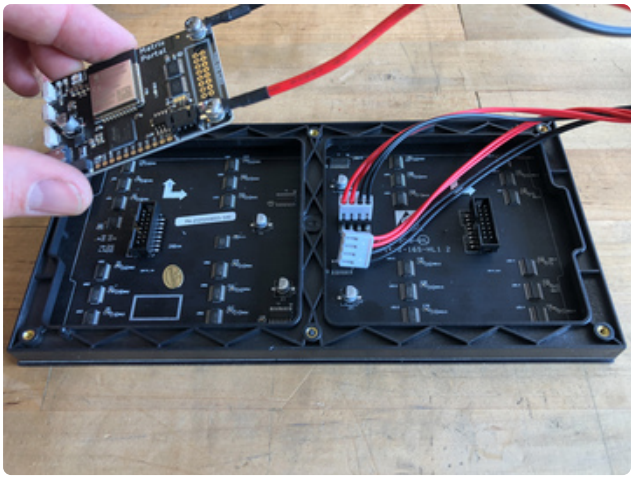


Power Terminals

Next, screw in the spade connectors to the corresponding standoff.

red wire goes to **+5V**
black wire goes to **GND**



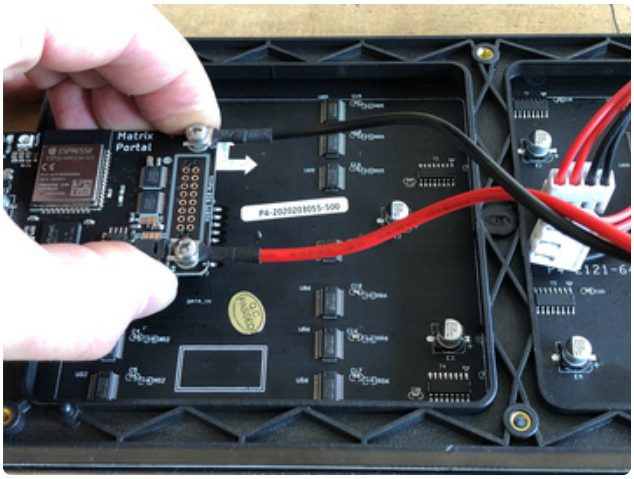


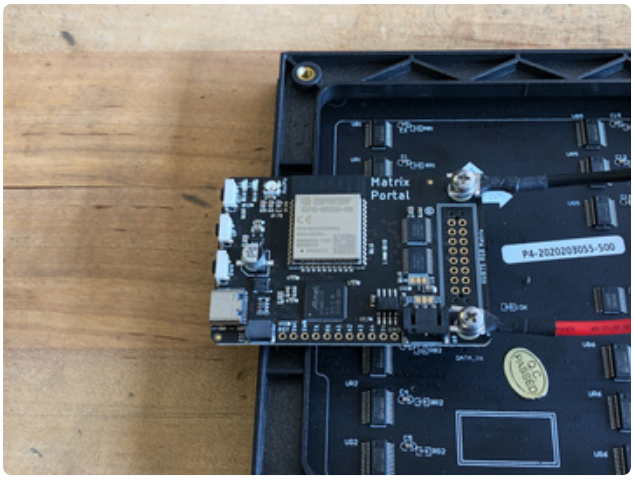
Panel Power

Plug either one of the four-conductor power plugs into the power connector pins on the panel. The plug can only go in one way, and that way is marked on the board's silkscreen.

Dual Matrix Setup

If you're planning to use a 64x64 matrix, follow these instructions on soldering the Address E Line jumper (https://adafru.it/OdJ).

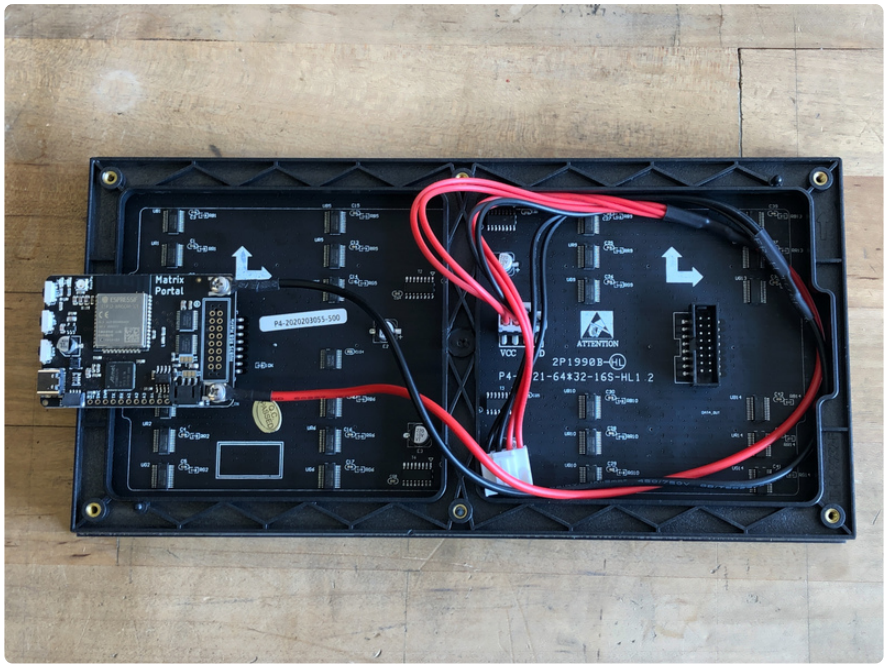




Board Connection

Now, plug the board into the left side shrouded 8x2 connector as shown. The orientation matters, so take a moment to confirm that the **white indicator arrow on the matrix panel is oriented pointing up and right** as seen here and the MatrixPortal overhangs the edge of the panel when connected. This allows you to use the edge buttons from the front side.

Check nothing is impeding the board from plugging in firmly. If there's a plastic nub on the matrix that's keeping the Portal from sitting flat, cut it off with diagonal cutters



For info on adding LED diffusion acrylic, see the page LED Matrix Diffuser.

Install CircuitPython

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Set up CircuitPython Quick Start!

Follow this quick step-by-step for super-fast Python power :)

Download the latest version of CircuitPython for this board via circuitpython.org

https://adafru.it/Nte

Further Information

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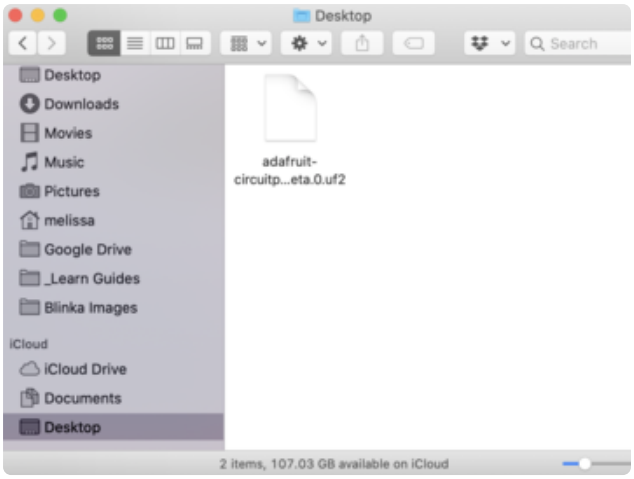

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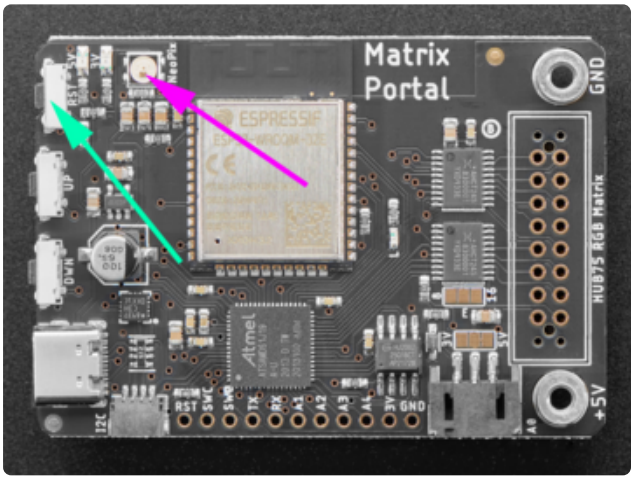
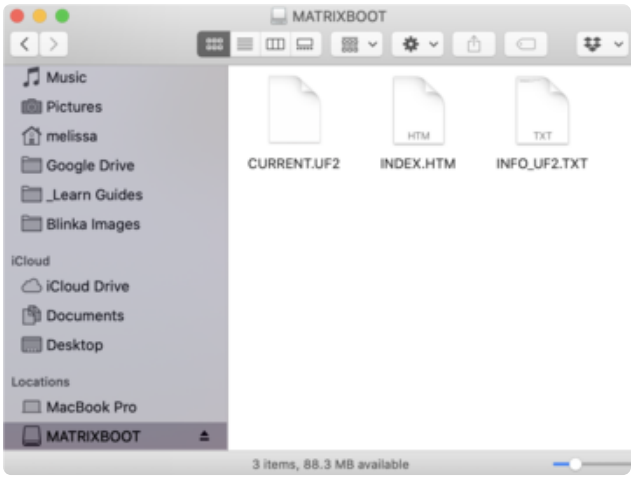


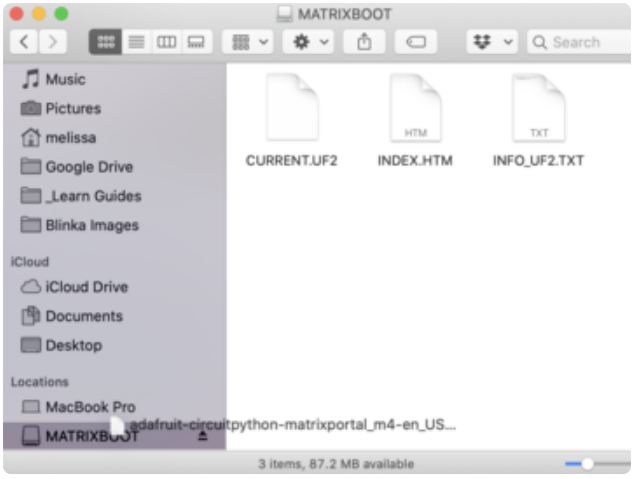
A lot of people end up using charge-only USB cables and it is very frustrating! So make sure you have a USB cable you know is good for data sync.

Double-click the **Reset** button (indicated by the green arrow) on your board, and you will see the NeoPixel RGB LED (indicated by the magenta arrow) turn green. If it turns red, check the USB cable, try another USB port, etc.

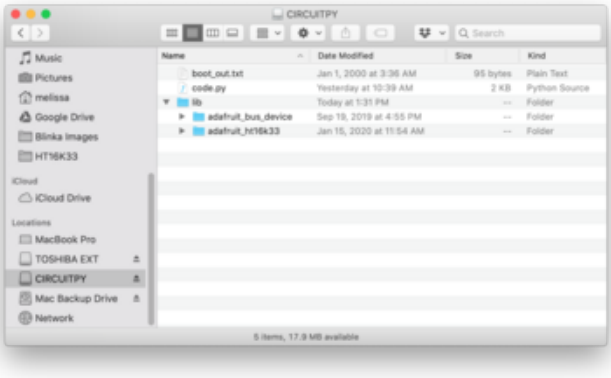
If double-clicking doesn't work the first time, try again. Sometimes it can take a few tries to get the rhythm right!



You will see a new disk drive appear called **MATRIXBOOT**.



Drag the **adafruit_circuitpython_etc.uf2** file to **MATRIXBOOT.**



The LED will flash. Then, the **MATRIXBOOT** drive will disappear and a new disk drive called **CIRCUITPY** will appear.

That's it, you're done! :)

Code the Protest Sign

Text Editor

Adafruit recommends using the Mu editor for using your CircuitPython code with the Feather boards. You can get more info in this guide (https://adafru.it/ANO).

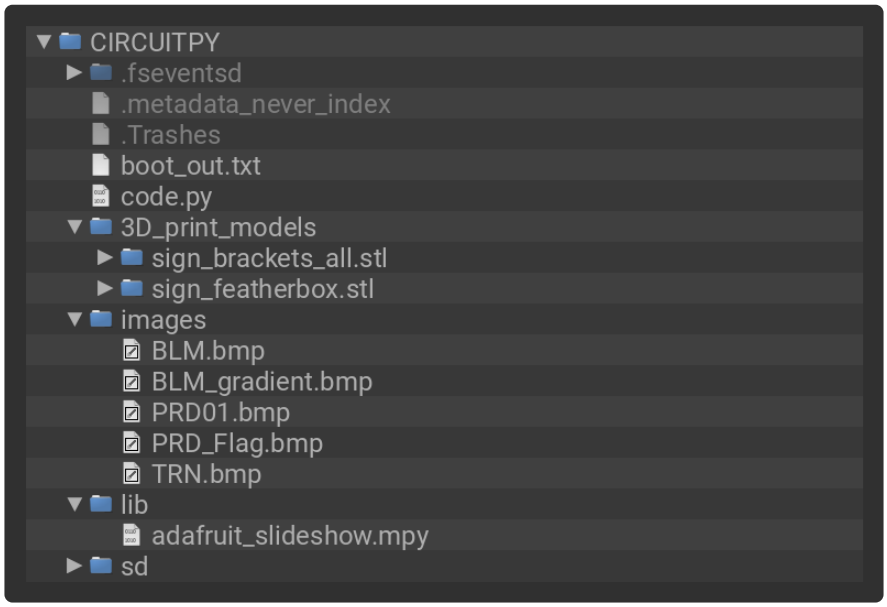
Alternatively, you can use any text editor that saves files.

Installing Project Code

To use with CircuitPython, you need to first install a few libraries, into the lib folder on your **CIRCUITPY** drive. Then you need to update **code.py** with the example script.

Thankfully, we can do this in one go. In the example below, click the **Download Project Bundle** button below to download the necessary libraries and the **code.py** file in a zip file. Extract the contents of the zip file, open the directory **RGB_Matrix_Protest_Sign/** and then click on the directory that matches the version of CircuitPython you're using and copy the contents of that directory to your **CIRCUITPY** drive.

Your **CIRCUITPY** drive should now look similar to the following image:




```
# SPDX-FileCopyrightText: 2020 John Park for Adafruit Industries
#
# SPDX-License-Identifier: MIT

import board
import displayio
import framebufferio
import rgbmatrix
from adafruit_slideshow import SlideShow

displayio.release_displays()
matrix = rgbmatrix.RGBMatrix(
    width=64,
    height=32,
    bit_depth=5,
    rgb_pins=[board.D6, board.D5, board.D9, board.D11, board.D10, board.D12],
    addr_pins=[board.A5, board.A4, board.A3, board.A2],
    clock_pin=board.D13,
```

```
    latch_pin=board.D0,
    output_enable_pin=board.D1,
)

display = framebufferio.FramebufferDisplay(matrix, auto_refresh=True)

slideshow = SlideShow(
    display,
    backlight_pwm=None,
    folder="/images",
    loop=True,
    order=0,
    fade_effect=False,
    dwell=8,
    auto_advance=True,
)


while slideshow.update():
    pass
```

The code is quite short! We are using the **displayio** library along with **framebufferio** and **rgbmatrix** to do the heavy lifting.

The **adafruit_slideshow** library makes it simple to auto-play any images in the specified folder. Here's more detail (https://adafru.it/Fx4) on how to use SlideShow.

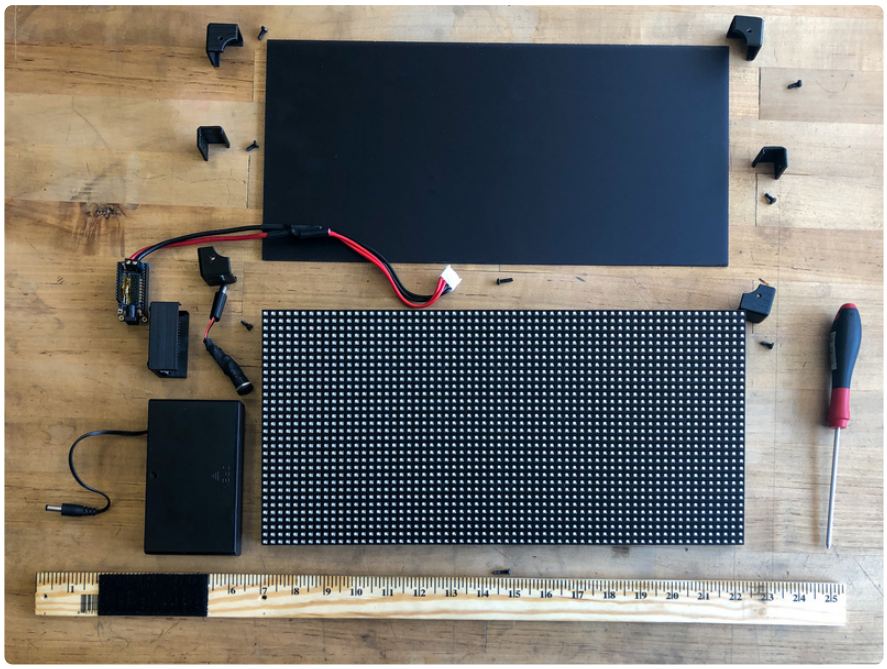
Image Files

You can get started using the included image files, or make your own.

From the project .zip, drag the **images** folder onto the Feather's **CIRCUITPY** drive.

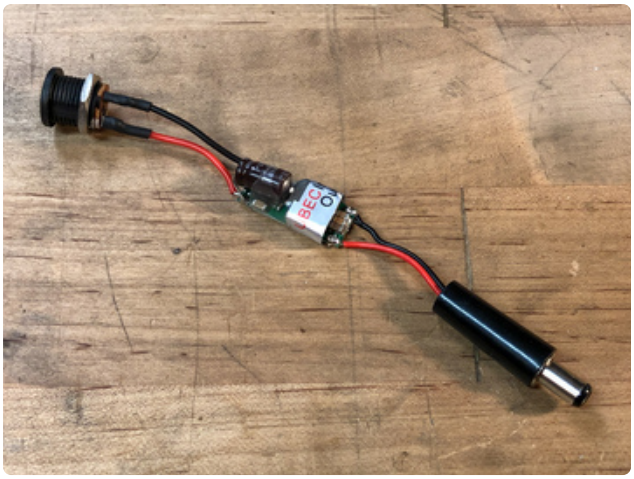
The program will automatically use any .bmp files in the **/images** directory. Make sure they have legal names (no spaces or weird characters!) and are 64x32 pixel .bmp files. 16-bit or 24-bit both work fine.

Build the Sign



Now we'll assemble the sign. These steps include:

- Powering the LED panel and Feather/FeatherWing
- Connecting the Feather and FeatherWing to the panel
- 3D printing brackets to attach the diffusion plastic
- Attaching a handle



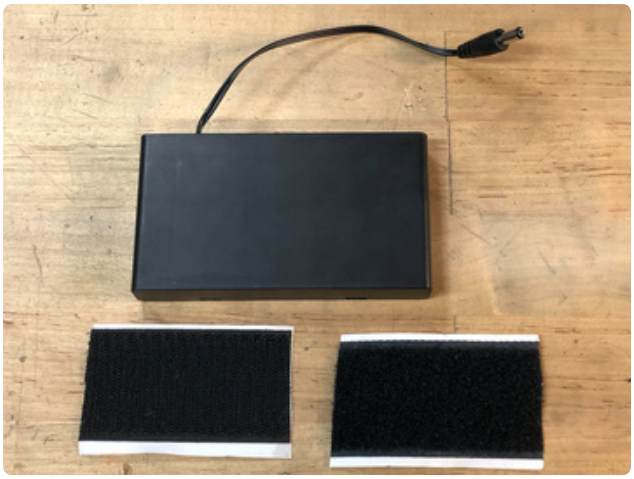
Power

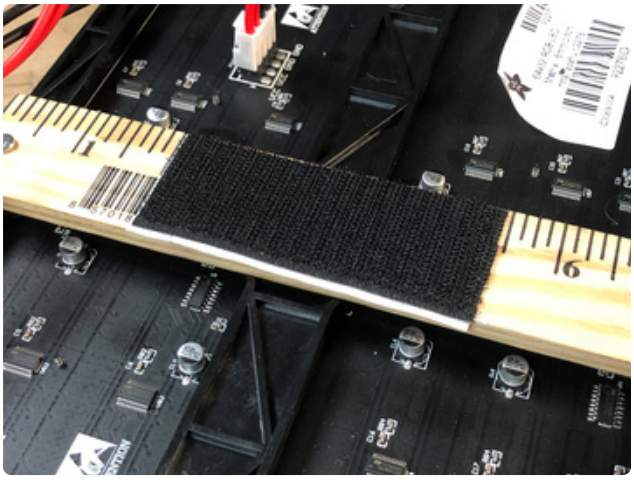
The panel draws about 2A of current at 5V. The UBEC (universal battery elimination circuit) is a buck converter that will take our roughly ~9.6V of power from the 8 x AA NiMH battery pack and step it down to 5V.

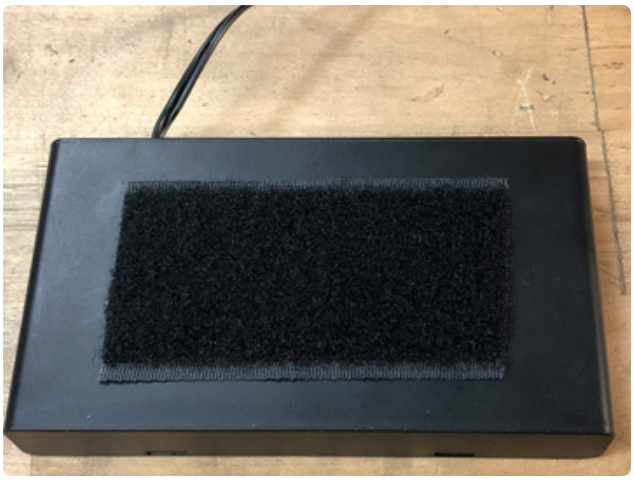
Solder a barrel jack connector so the center leg goes to the positive input wire of the UBEC, and the sleeve leg goes to UBEC ground.

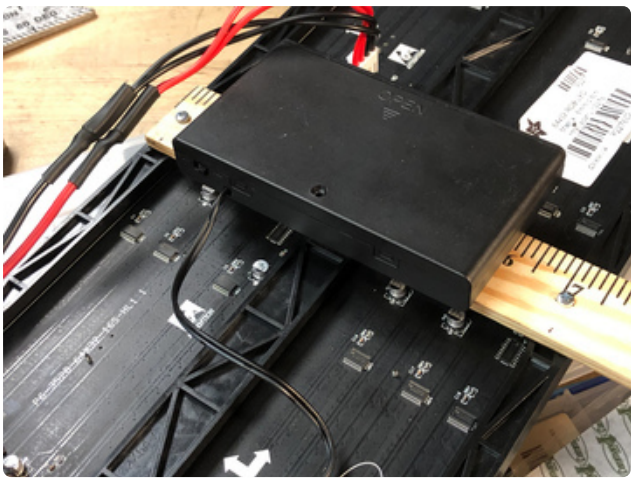
Solder the barrel plug so that the UBEC positive output (red) wire goes to center and the ground to sleeve.

You can then protect the entire circuit with a length of heat shrink tubing as shown here.



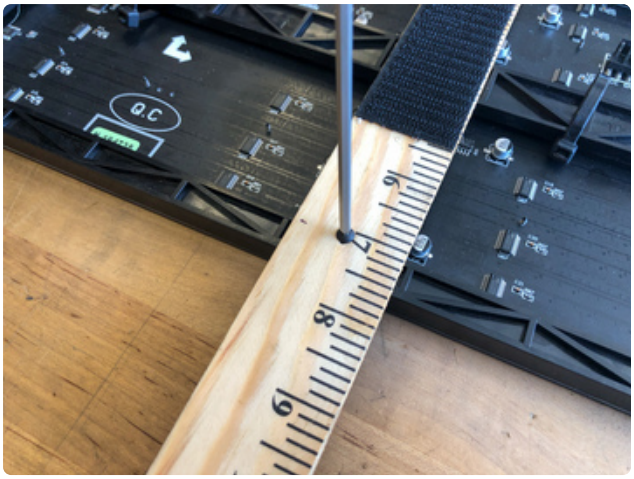


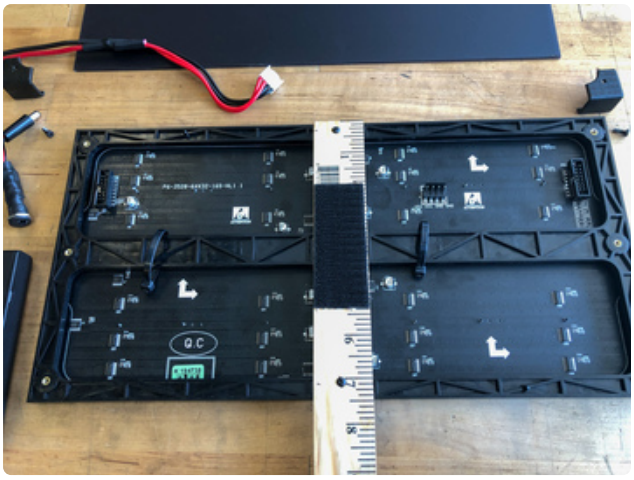




Battery Pack

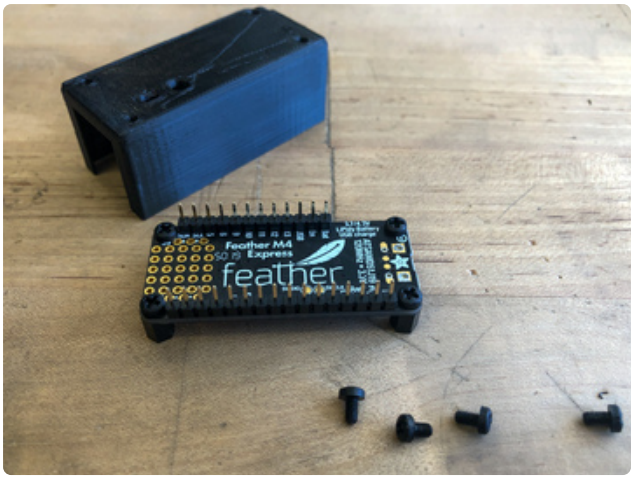
Use Velcro or double-stick foam tape to secure the battery pack, to the sign handle as shown. Make sure to adhere the back side of the battery pack, leaving the lid free to replace batteries as needed.

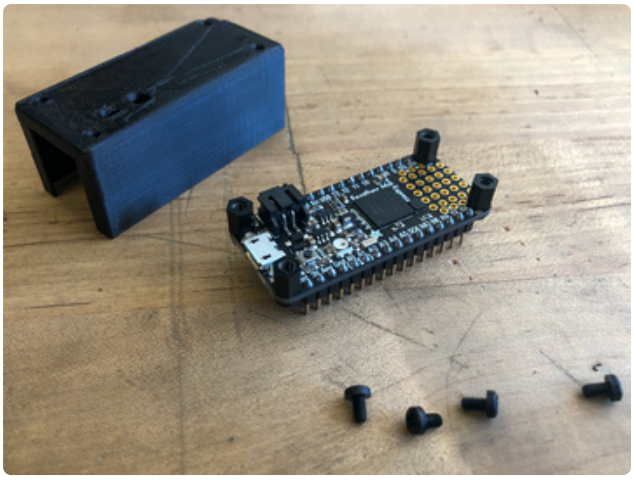


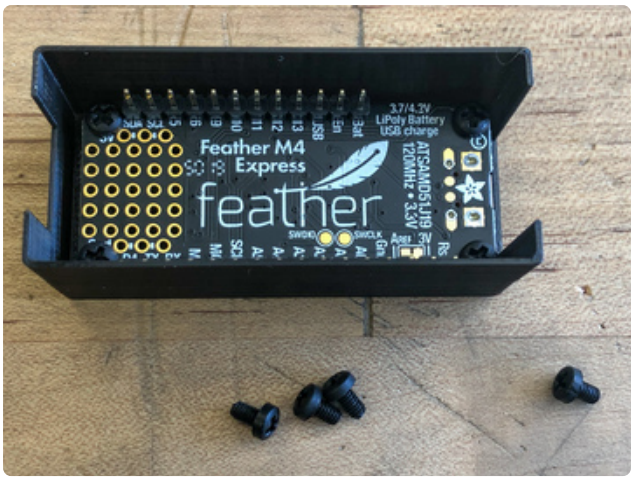


Add Handle

Measure and mark for two ~3mm holes on the top of the handle. Then drill these out and secure the handle using the two M3 x 12mm screws.



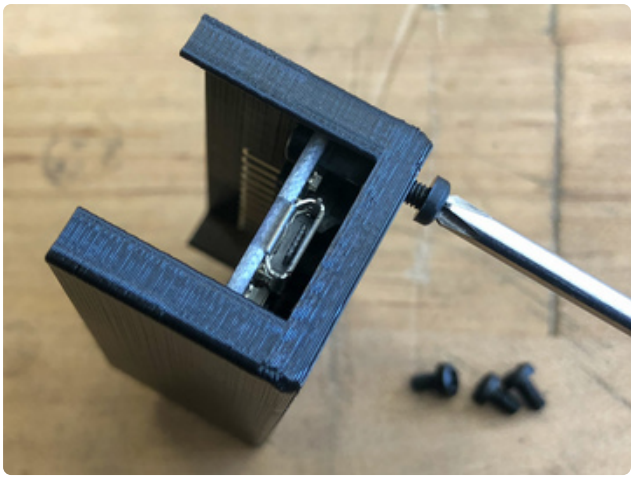


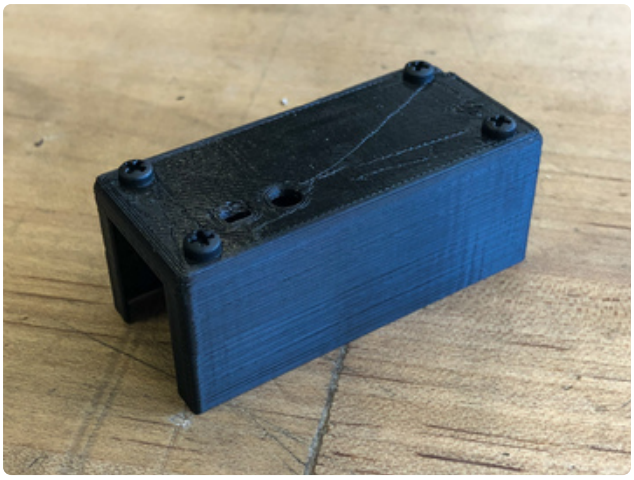


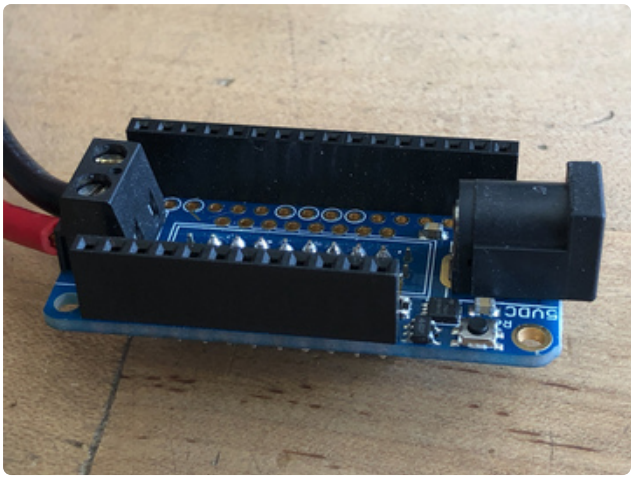
Feather Prep

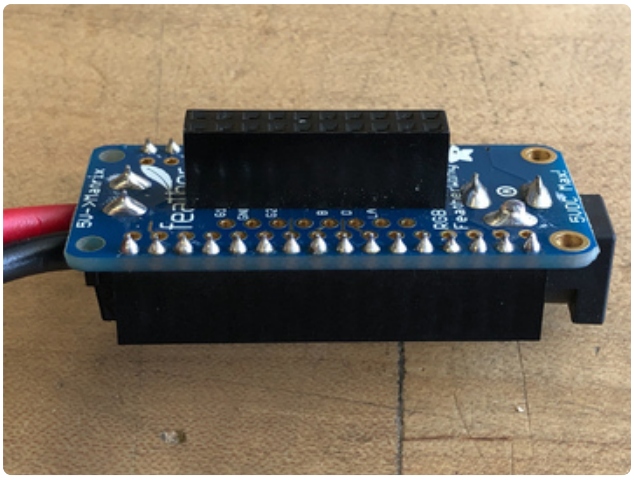
Solder male header pins under the Feather as shown here. The Feather will stack on top of the RGB Matrix FeatherWing

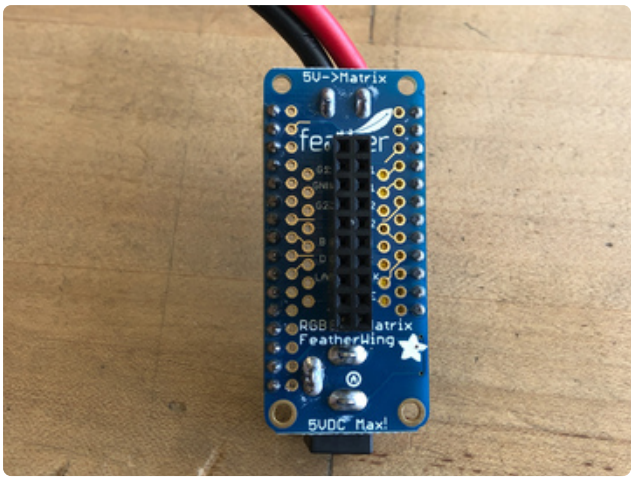
3D print the Feather protector linked below and then use short M2.5 standoffs and screws to secure the Feather to it.

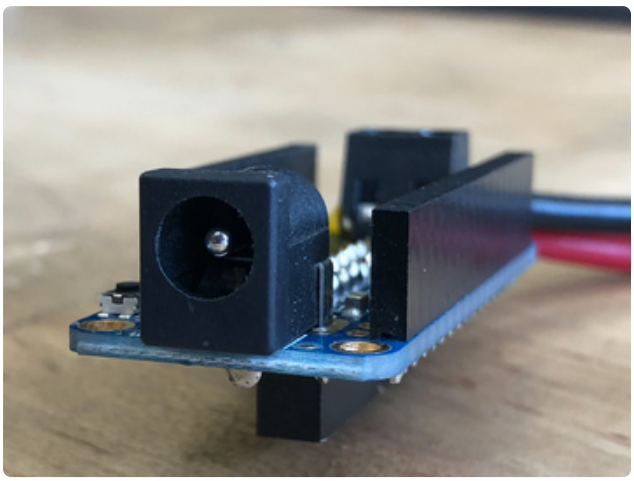












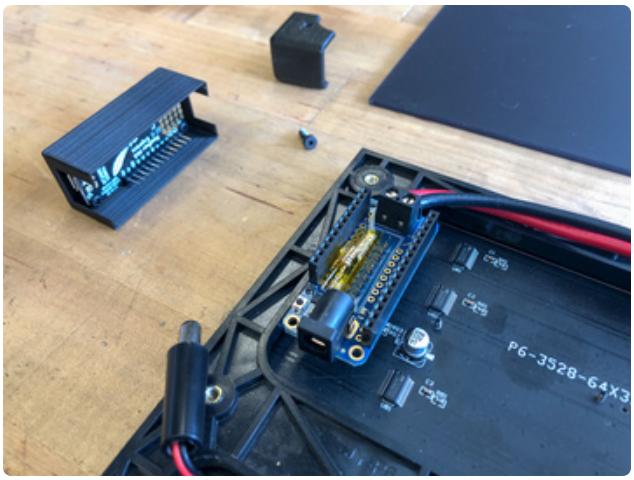
FeatherWing Prep

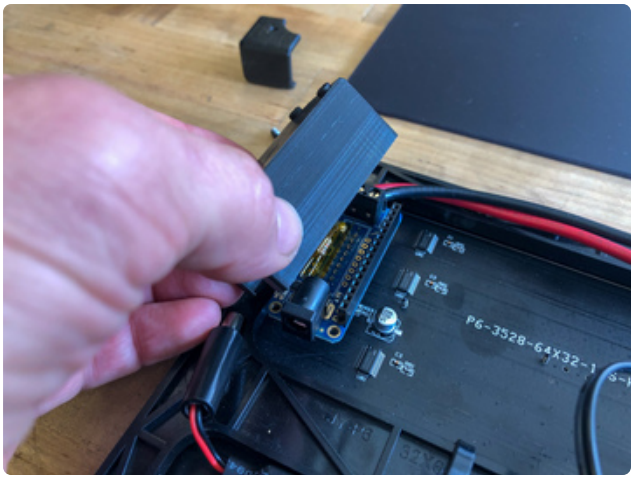
Solder female headers to the top of the FeatherWing as shown, and the box header to the underside. This will allow us to stack the Feather on top of the FeatherWing and plug the show shebang into the panel.

Screw the red and black power wires to the terminal block's positive and ground connections respectively. This cable will plug into the power connector on the matrix panel.

sign_featherbox.stl

https://adafru.it/LHd





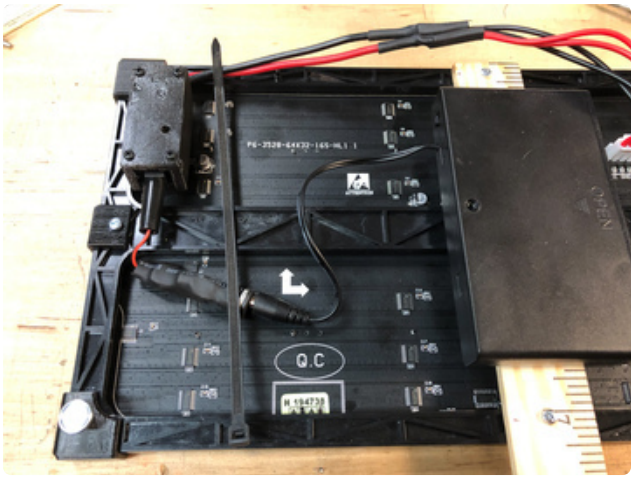
Connect to Sign

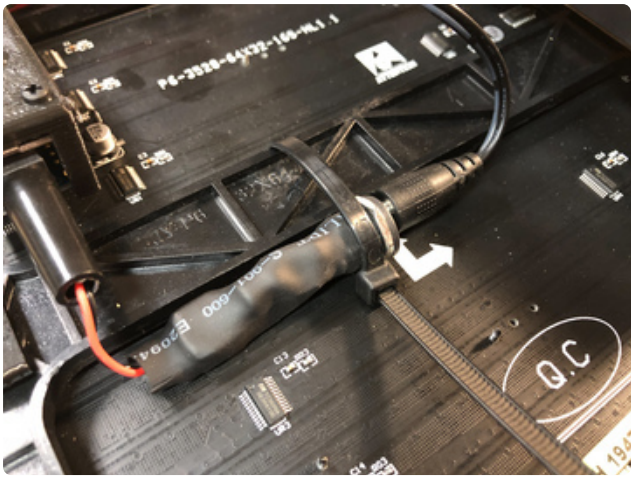
Plug the FeatherWing into the sign's IDC connector -- make sure to orient it as shown in the photo! (The added resistor and Kapton tape are present due to a reset fix for the gen. 1 board (https://adafru.it/LHe)).

Then, stack the Feather on top of the FeatherWing.

Connect the battery pack to the UBEC buck converter and then to the power input of the FeatherWing.

Plug the RGB Matrix FeatherWing power output cable into the panel as shown, and then neaten and secure the UBEC and power wiring with a couple of zip ties.


Q.C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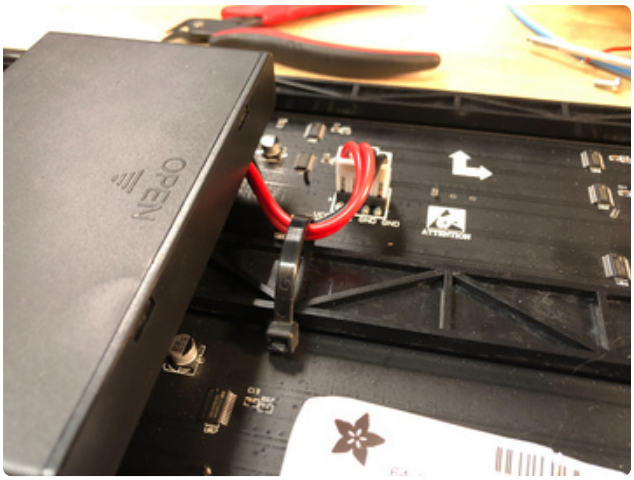
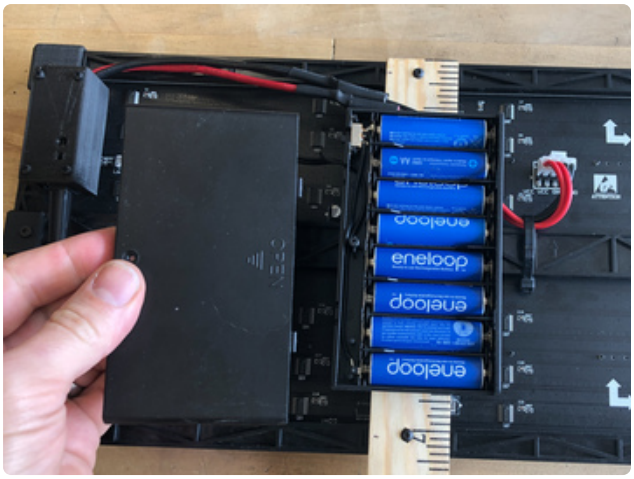




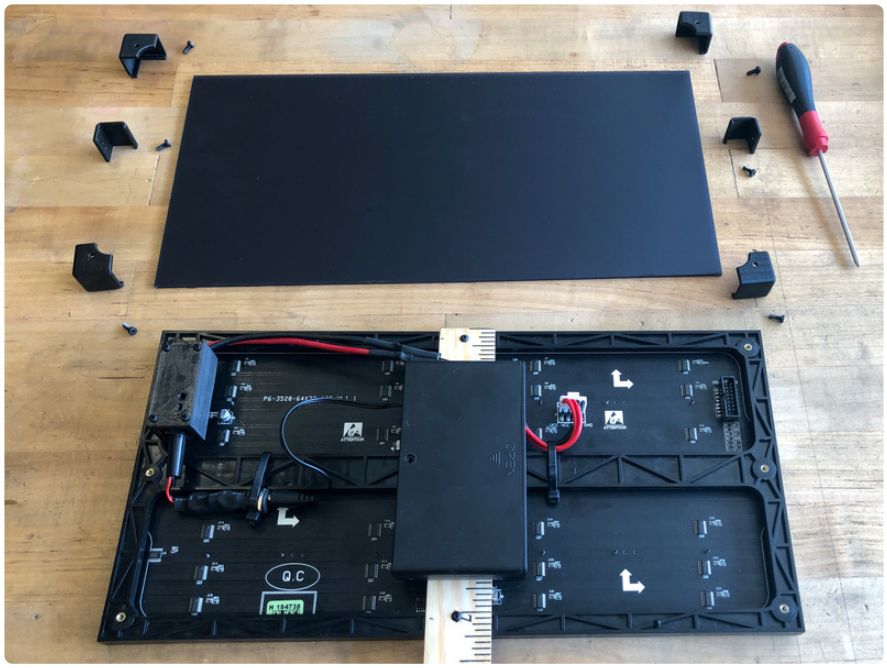
Add Batteries

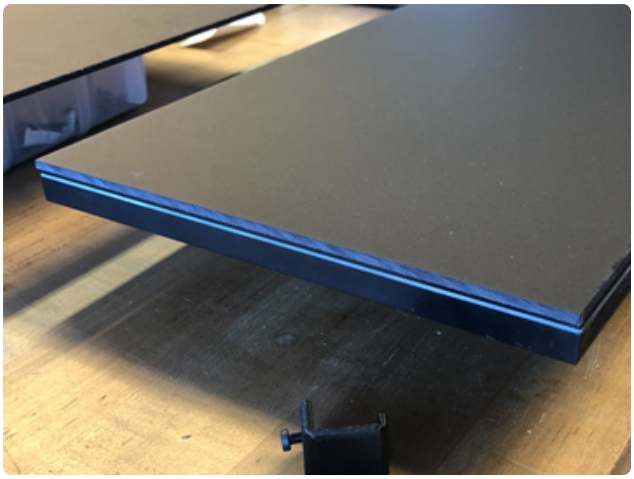
Throw in a freshly recharged set of NiMH batteries -- these should last about 2-3 hours of constant sign use with typical graphics (full white on all LEDs is the worst case scenario and will deplete the batteries in about an hour), so carry an extra set if you need.

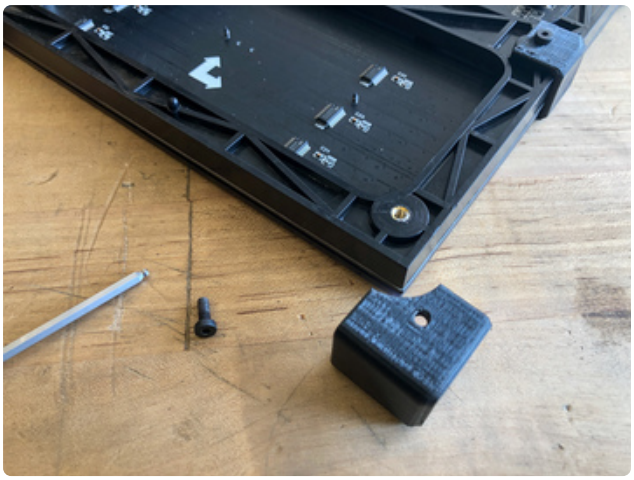
The sign will definitely work in this state, but let's go the extra step and add a sheet of LED diffusion acrylic. This offers the LEDs some protection, and makes the sign much easier to see, especially on video and in pictures. 3D print one set of the brackets linked here to hold the sheet in place.

sign_brackets_all.stl

https://adafru.it/LHf



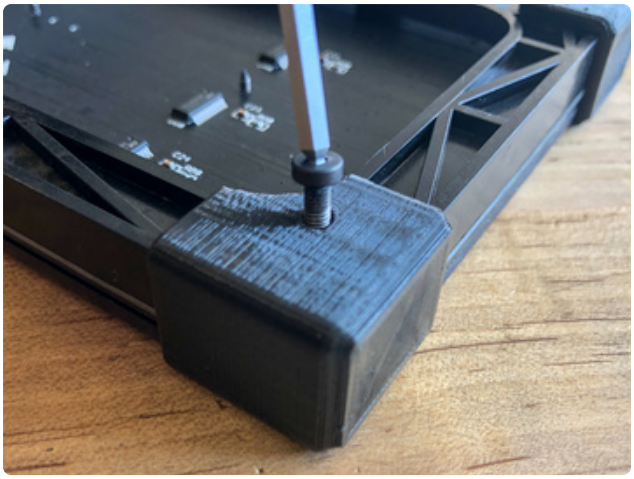


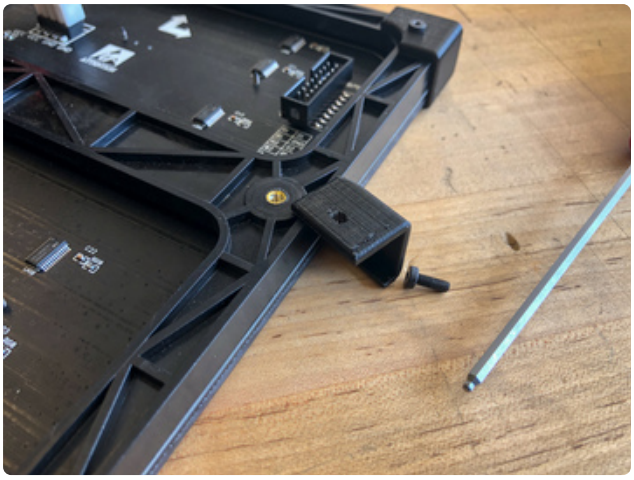


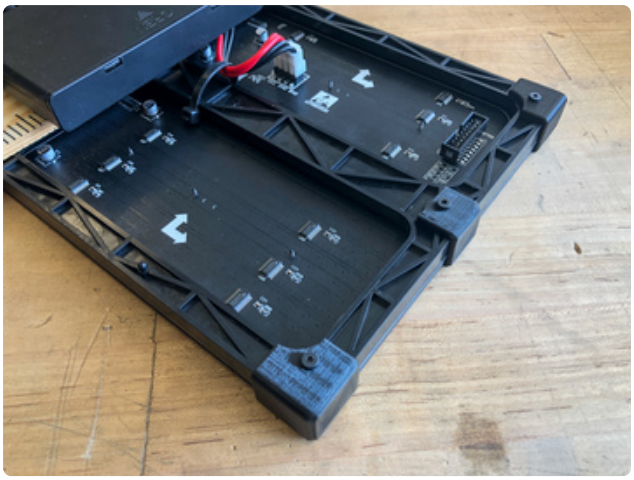
Diffusion Sheet

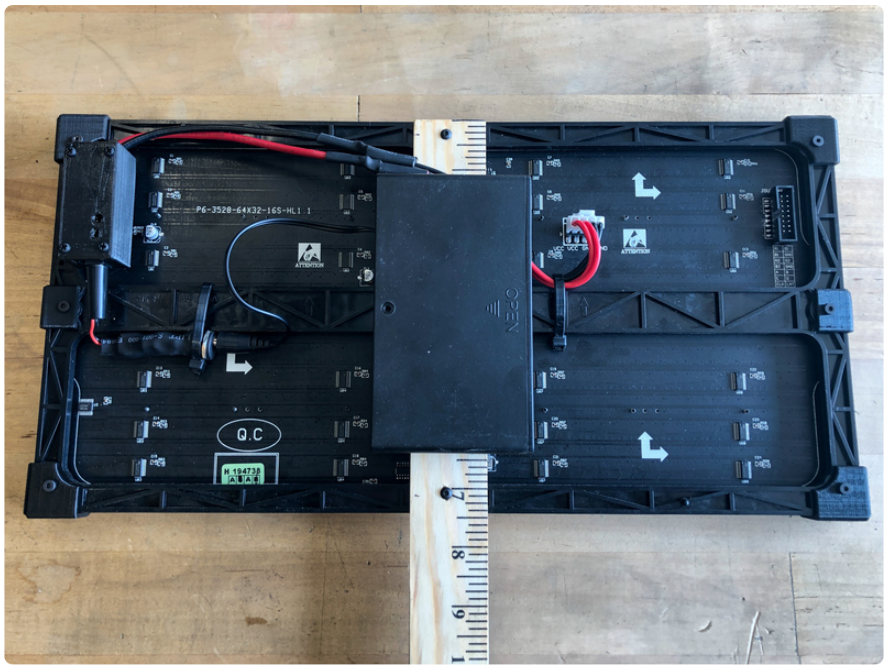
Lay the diffusion plastic sheet on top of the LED panel as shown with the matte side up.

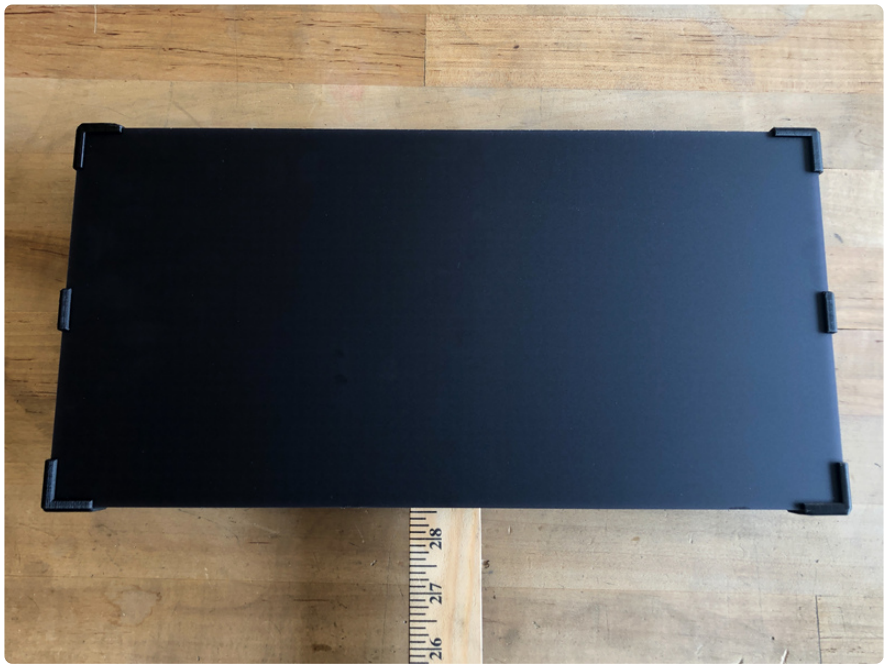
Slide the 3D printed brackets on, then flip the sign over and fasten them in with the M3 x 8mm screws.

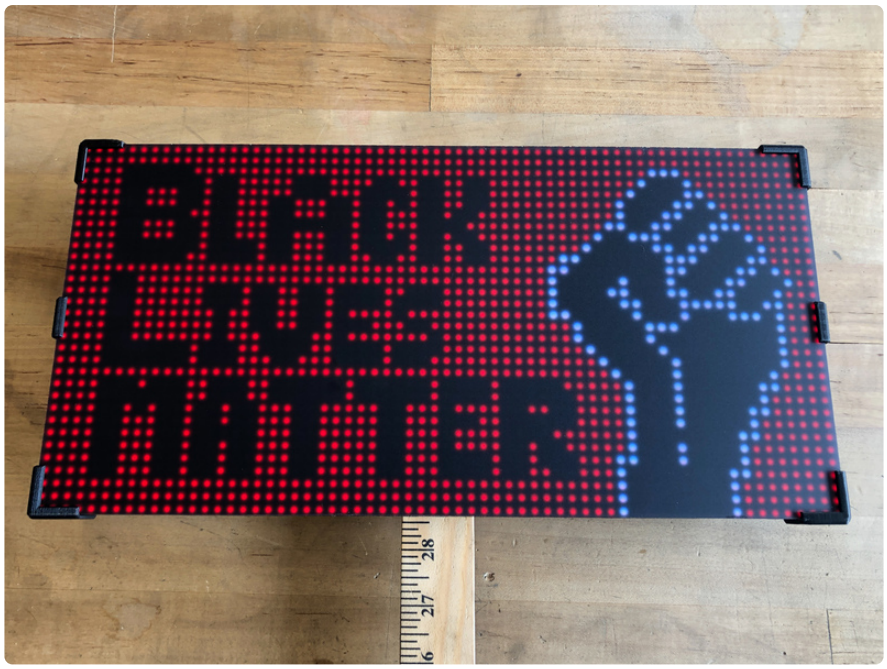


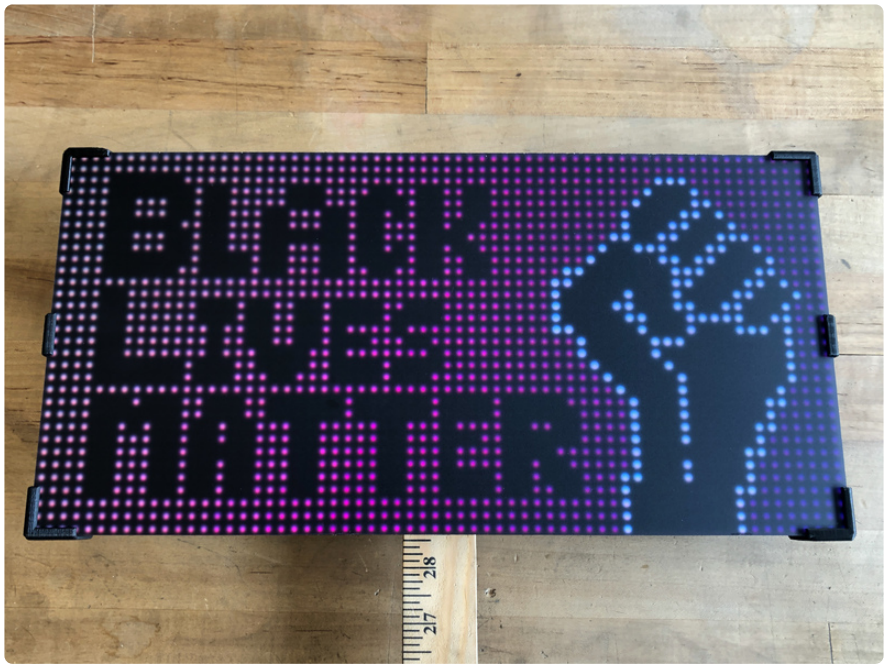


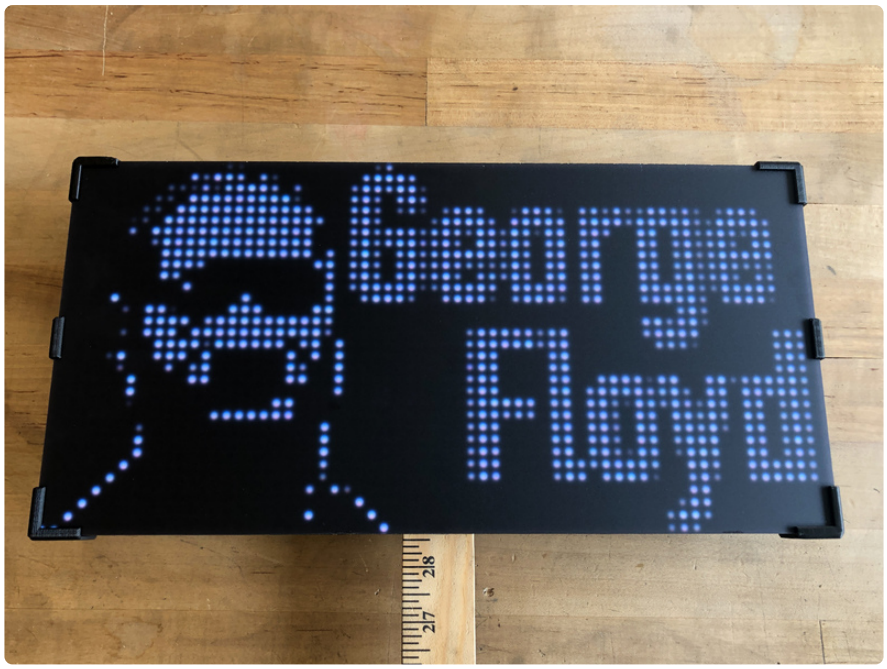


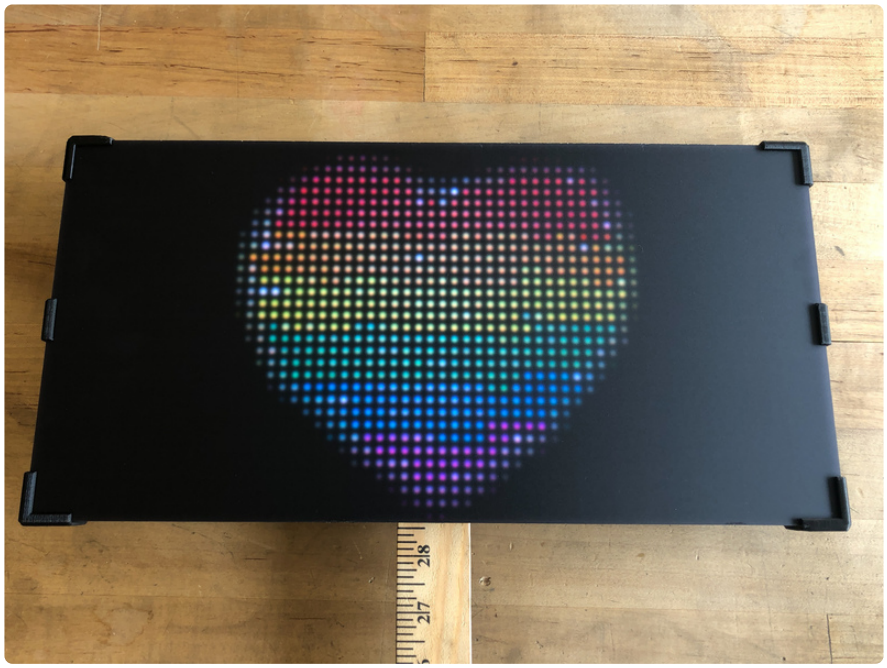

P6-3528-64X32-16S-HL1 1
Q.C

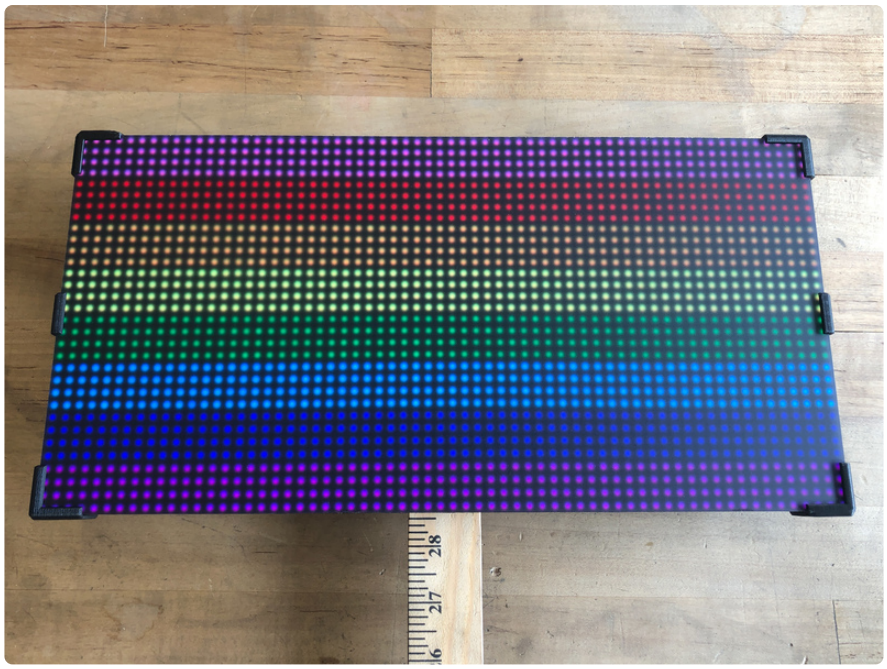



Black
Lives
Matter


Black
Lives
Matter








TRANS
RIGHTS
NOW


BLACK
LIVES
MATTER