# Table of Contents

## Overview
- DIY Interruption Sign
- Swappable Faceplates
- Portable & Customizable
- Parts

## Circuit Diagram
- Adafruit Library for Fritzing
- Wired Connections
- Powering

## 3D Printing
- Parts List
- CAD Assembly
- Slicing Parts
- Design Source Files

## CircuitPython for Feather nRF52840
- Set up CircuitPython Quick Start!

## Code
- Coding
- Installing or Upgrading CircuitPython
- Installing Project Code

## Acrylic Cutting
- Acrylic Template
- Scoring Paper Backing on Acrylic
- Scoring Acrylic
- Snap Acrylic Piece
- Vinyl Decals
- Vinyl Transfer Tape
- Apply Transfer Tape
- Remove Transfer Tape
- Apply Vinyl to Faceplate
- Remove Tape from Faceplate

## Wiring
- Wiring Switch
- Soldering Switch
- Wired Switch
- Wiring Strips
- Wiring First Strip (DIN)
- Wiring First Strip (DOUT)
- Wiring Second Strip
- Wired Strips
- Wiring Feather
- Wiring Switch to Feather
- Test Switch
- Wiring Strips to Feather
- Test Circuit
Assembly

- PCB Hardware
- Installed Hardware
- Install Switch
- Install Feather
- Faceplate Holder Hardware
- Install Hardware for Faceplate Holder
- Test Fit PCB
- Holes in Frame
- Installing Strips
- Cut Tape Pieces
- Install Strip A
- Install Strip B
- Test Strips
- Install Faceplate Holder & PCB mount
- Secured Plate Holder
- Connect Battery
- Tack Battery
- Secured Battery
- Install Back Cover
- Back Cover Mounting Brackets
- Install Acrylic Plate
- Install Front Cover
- Final Build
Overview

DIY Interruption Sign
In this project we’re making a NeoPixel LED sign using CircuitPython. This was inspired by BusyBox interruption sign () so we designed and 3D printed our own enclosure.

Swappable Faceplates
We designed it to have swappable faceplates so the front cover can easily come off. Black LED acrylic is used for the faceplates and evenly diffuses the NeoPixels. Use vinyl cut decals to make high-quality faceplate designs.

Portable & Customizable
The slide switch is built into the side of the enclosure so we can easily turn it on and off.

It runs off a lipo battery so it can be mounted to our door without any dangling cables.

Parts

You can use just about any Feather for this project, but if you'd like to later add wireless BLE control, the nRF52840 is the best option!
Adafruit Feather nRF52840 Express
The Adafruit Feather nRF52840 Express is the new Feather family member with Bluetooth Low Energy and native USB support featuring the nRF52840! It's...
https://www.adafruit.com/product/4062

Black LED Diffusion Acrylic Panel 12" x 12" - 0.1" / 2.6mm thick
A nice whoppin' slab of some lovely black acrylic to add some extra diffusion to your LED Matrix project. This material is 2.6mm (0.1") thick and is made of special cast...
https://www.adafruit.com/product/4594

Adafruit NeoPixel Digital RGB LED Strip - White 30 LED
You thought it couldn't get better than our world-famous 32-LED-per-meter Digital LED strip but we will prove you wrong! These...
https://www.adafruit.com/product/1376

Breadboard-friendly SPDT Slide Switch
These nice switches are perfect for use with breadboard and perfboard projects. They have 0.1" spacing and snap in nicely into a solderless breadboard. They're easy to switch...
https://www.adafruit.com/product/805
<table>
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<tr>
<th>Item</th>
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<td>1 x M2.5 Hardware Kit</td>
<td>M2.5 Black Nylon Standoffs and Screws</td>
<td><a href="https://www.adafruit.com/product/3299">https://www.adafruit.com/product/3299</a></td>
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<tr>
<td>1 x Acrylic Cutter</td>
<td>10 Pcs Blade Set, Multi-Use Cutter with Cutting Blade</td>
<td><a href="https://amzn.to/2YS9Zg4">https://amzn.to/2YS9Zg4</a></td>
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<td>1 x Velcro Strips</td>
<td>Command Picture Hanging Strips, Medium, White, 3-Pairs (17201-ES)</td>
<td><a href="https://amzn.to/2YYoMpH">https://amzn.to/2YYoMpH</a></td>
</tr>
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Lithium Ion Polymer Battery - 3.7v 1200mAh
Lithium-ion polymer (also known as 'lipo' or 'lipoly') batteries are thin, light, and powerful. The output ranges from 4.2V when completely charged to 3.7V. This...[link](https://www.adafruit.com/product/258)

Silicone Cover Stranded-Core Ribbon Cable - 10 Wire 1 Meter Long
For those who are fans of our silicone-covered wires, but are always looking to up their wiring game. We now have Silicone Cover Ribbon cables! These may look...[link](https://www.adafruit.com/product/3890)

Fully Reversible Pink/Purple USB A to micro B Cable - 1m long
This cable is not only super-fashionable, with a woven pink and purple Blinka-like pattern, it's also fully reversible! That's right, you will save seconds a day by...[link](https://www.adafruit.com/product/4111)
1 x **Clear Vinyl Transfer Paper Tape**
12 x 50 FT

1 x **Matte Black Vinyl**
12in x 10ft Roll of Oracal 651 Matte Black Craft Vinyl

1 x **Engineering Scissors**
Super Scissors - PH-57

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**Circuit Diagram**

The diagram below provides a visual reference for wiring of the components. This diagram was created using the software package [Fritzing](https://fritzing.org/).

**Adafruit Library for Fritzing**

Use Adafruit's Fritzing parts library to create circuit diagrams for your projects. Download the library or just grab individual parts. Get the library and parts from [GitHub - Adafruit Fritzing Parts](https://github.com/adafruit/Adafruit_Fritzing).

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**Wired Connections**

Two NeoPixel strips are daisy chained together. Each strip has eight NeoPixel LEDs making a total of 16 NeoPixel LEDs.
NeoPixel Strip

- DIN to Pin #6 on Feather
- GND to GND on Feather
- 5V to 3V on Feather
- DOU from strip #1 to DIN on strip #2
- GND from strip #1 to GND on strip 2
- 5V from strip #1 to 5V on strip #2

Switch

- Enable and Ground on Feather

Powering

The Adafruit board can be powered via USB or JST using a 3.7v lipo battery. In this project, a 1200mAh lipo battery is used. The battery is rechargeable with a USB lipo charger. The switch is wired to the EN and GND pins on the Feather.

3D Printing

Parts List

STL files for 3D printing are oriented to print "as-is" on FDM style machines. Parts are designed to 3D print without any support material. Original design source may be downloaded using the links below.

File names

front-cover.stl
frame.stl
back-cover.stl
pcb-mount.stl
plate-holder.stl
hanger-bracket-horiz.stl
hanger-bracket-vert.stl

Fusion 360 Share Link
CAD Assembly
The Feather is mounted to standoffs secured to the PCB mount. The switch is press fitted into the built-in holder on the PCB mount. The faceplate holder is secured to the mounting tabs inside the frame. The PCB mount is secured to the mounting tabs inside the frame behind the faceplate holder. The front and back cover snap fit onto the frame. Additional mounting brackets can be secured to the back cover.

Slicing Parts
No supports are required. Slice with setting for PLA material.

The parts were sliced using CURA using the slice settings below.

PLA filament 220c extruder
0.2 layer height
10% gyroid infill
60mm/s print speed
60c heated bed
Design Source Files
The project assembly was designed in Fusion 360. This can be downloaded in different formats like STEP, STL and more. Electronic components like Adafruit’s board, displays, connectors and more can be downloaded from the Adafruit CAD parts GitHub Repo.

CircuitPython for Feather nRF52840

CircuitPython is a derivative of MicroPython 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

Click the link above to download the latest UF2 file.

Download and save it to your desktop (or wherever is handy).
Plug your Feather nRF52840 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 (identified by the arrow in the image). 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 FTHR840BOOT.

Drag the adafruit_circuitpython_etc.uf2 file to FTHR840BOOT.
The LED will flash. Then, the FTHR840BOOT drive will disappear and a new disk drive called CIRCUITPY will appear.

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

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**Code**

**Coding**

This project uses the neopixel library from the CircuitPython. For more information on NeoPixel animations, check out the [LED animation guide](#) and the [NeoPixel Uber Guide](#).

**Installing or Upgrading CircuitPython**

You should ensure you have CircuitPython 5.0 or greater on your board. Plug your board in with a known good data + power cable (not the cheesy USB cable that comes with USB power packs, they are power only). You should see a new flash drive pop up.

If the drive is CIRCUITPY, then open the boot_out.txt file to ensure the version number is 5.0 or greater.

Adafruit CircuitPython 5.3.0 on 2020-04-29; Adafruit Feather nRF52840 Express with nRF52840

**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 BusyBox_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 Noe Ruiz for Adafruit Industries
#
# SPDX-License-Identifier: MIT

import time
import board
import neopixel
from adafruit_led_animation.animation.comet import Comet
from adafruit_led_animation.animation.pulse import Pulse
from adafruit_led_animation.animation.blink import Blink
from adafruit_led_animation.animation.rainbow import Rainbow
from adafruit_led_animation.animation.colorcycle import ColorCycle
from adafruit_led_animation.sequence import AnimationSequence
from adafruit_led_animation import helper
from adafruit_led_animation.color import PURPLE, AQUA, RED, JADE, ORANGE, YELLOW, BLUE

#Setup NeoPixels
pixel_pin = board.D6
pixel_num = 16
pixels = neopixel.NeoPixel(pixel_pin, pixel_num, brightness=.9, auto_write=False)

#Setup NeoPixel Grid
pixel_wing_vertical = helper.PixelMap.vertical_lines(
    pixels, 8, 2, helper.horizontal_strip_gridmap(8, alternating=True)
)
pixel_wing_horizontal = helper.PixelMap.horizontal_lines(
    pixels, 8, 2, helper.horizontal_strip_gridmap(8, alternating=True)
)

#Setup LED Animations
rainbow = Rainbow(pixels, speed=.001, period=2)
pulse = Pulse(pixels, speed=0.1, color=RED, period=3)
blink = Blink(pixels, speed=0.5, color=RED)
colorcycle = ColorCycle(pixels, speed=0.4, colors=[RED, ORANGE, YELLOW, JADE, BLUE, AQUA, PURPLE])
comet_v = Comet(pixel_wing_vertical, speed=0.05, color=PURPLE, tail_length=6, bounce=True)

#Setup the LED Sequences
animations = AnimationSequence(
    rainbow,
pulse,
    comet_v,
    blink,
    colorcycle,
    advance_interval=5.95,
)
Acrylic Cutting

Acrylic Template
Print out the faceplate template onto paper and cut out the shape using scissors or a hobby knife. This paper template cutout is used to reference the correct size of the faceplates.

Scoring Paper Backing on Acrylic
I started by scoring the paper backing using an xacto knife. I used a metal ruler on a cutting mat and made sure to be extra careful.
Scoring Acrylic
To cut the acrylic I used a scoring tool that's specifically made cutting acrylic. I made sure to score several times before snapping off the pieces.

Snap Acrylic Piece
Once I was about half-way through, I put it near the edge of the table and snapped off the piece. I repeated this process for a so I could make a few different designs.

Vinyl Decals
I used a vinyl cutter with some matte black vinyl to create the signs. I found the matte black vinyl works the best for masking out the LEDs. Use our SVG file for creating similar decals or create your own.

Vinyl Transfer Tape
I cut pieces of transfer tape to size and carefully placed them over the vinyl. Use a standard grip tape meant for vinyl.
Apply Transfer Tape
Using a squeegee, I started from the center and worked my way outwards so I could knock out any air bubbles.

Remove Transfer Tape
Start from the corners and begin to peel the tape off. I tend to peel slowly especially for intricate designs with small pieces.

Apply Vinyl to Faceplate
I made sure to wipe the acrylic clean with a bit of alcohol before sticking it to the faceplate. Place the vinyl onto the faceplate starting with the center and working your way outwards. Using the squeegee once again to knock out those pesky air bubbles.
Remove Tape from Faceplate
Then I proceeded to peel off the transfer tape and lastly removed the protective paper backing.

Wiring

Wiring Switch
Use a 2-wire ribbon cable 86mm in length. Using wire stripper, remove a bit of insulation from the tips of each wire. Tin the wires by adding a bit of solder. This will prevent the strands of wire from fraying.

Soldering Switch
Solder the 2-wire ribbon cable to the middle pin and a pin on either side. Third helping hands can help assist soldering by holding components and wires steady.
Wired Switch
The slide switch is wired to the EN and GND pins on the Feather.

Wiring Strips
Cut two pieces of strips off the reel of NeoPixels. Each strip includes 8x NeoPixels, making a total of 16. Use two 3-wire ribbon cables. The cable for the first strip is 76mm in length. The second strip will require a cable 96mm in length.

Wiring First Strip (DIN)
Solder the 76mm long wire to the first NeoPixel strip. Use the arrow labeled on the flexible PCB to indicate the DIN pin. Solder the cable to the 5V, GND and DIN pads.
Wiring First Strip (DOUT)
Solder the 96mm long cable to the pads on the end the first strip. Solder the cable to 5V, DOUT and GND pads.

Wiring Second Strip
Solder the other end of the 96mm long cable to the pads on the second strip. Solder the cable to 5V, DIN and GND pads.

Wired Strips
Double check the labels on the flexible PCBs to ensure the polarity is correct.
Wiring Feather
The slide switch and NeoPixel strips are now ready to solder to the Feather. The slide switch and NeoPixel strip will share common ground.

Wiring Switch to Feather
Solder the cable from the switch to the EN and GND pins on the Feather. Solder the wires from the bottom of the Feather PCB.

Test Switch
Quickly test out the slide switch by plugging in the battery. Use the switch to power the Feather on and off.
Wiring Strips to Feather
Solder the three wires from the NeoPixel strips to pin #6, GND and 3V on Feather. The ground pin is shared across the switch and NeoPixel strip.

Test Circuit
Plug in the battery again and use the switch to power the Feather on. With CircuitPython installed and code uploaded, the NeoPixel LEDs will power on and cycle through animations.

Assembly

PCB Hardware
Use the following hardware to secure the Feather to the PCB mounting plate.

4x M2.5 x 6mm (female-female) Standoffs
8x M2.5 x 4mm screws
Installed Hardware
Insert the screws through the four mounting holes and install the standoffs. Reference the photo for correct placement.

Install Switch
Place the switch into the built-in holder. Insert the body of the switch at an angle and press down to secure in place.

Install Feather
Place the Feather over the four standoffs and line up the mounting holes. Adjust the wiring so they're neatly fitted under the Feather. Insert and fasten 4x M2.5 x 4mm long screws through the mounting holes to secure the Feather.
Faceplate Holder Hardware
Use the following hardware to secure the faceplate holder to the enclosure framing.

6x M2.5 x 6mm (female-female) standoffs
6x M2.5 x 4mm screws

Install Hardware for Faceplate Holder
Insert the screws through the six mounting tabs and install the standoffs. Reference the photo for correct placement.

Test Fit PCB
I suggest test fitting the PCB mounting plate before securing it to the framing. That helps determine the orientation of the enclosure.
Holes in Frame
The hole cutout on the side of the enclosure framing is used to expose the microUSB port on the Feather and the slide switch.

Installing Strips
The two NeoPixel strips are secured to the inner walls of the framing using nito double-sided tape. Hot glue or other adhesives can also be used as a substitute.

Cut Tape Pieces
I cut out four strips of double-sided nito tape. That was enough to secure the NeoPixel strips.
Install Strip A
The PCB mounting plate is removed in order to have more space for the NeoPixel strip to be attached. Check the wiring and ensure there's enough slack for the strip. Reference the photo for best placement. Attach the strip to the inner wall of the framing.

Install Strip B
Attach the second strip the other side of the framing. Check the wiring and ensure there's enough slack for the strip. Do not cover up the snaps. Try to place the strips in line with the inner wall.

Test Strips
Plug in the battery to the Feather and use the slide switch to power on the circuit. This lets you know if everything is still working and if the placement of the strips are good.
Install Faceplate Holder & PCB mount
Place the faceplate holder down with the standoffs facing up. Place the framing over the faceplate holder and line up the mounting holes. Place the PCB mount over the three mounting tabs onto the inside of the framing. Use the following hardware to secure the parts together. Use the longer screws to secure the PCB mounting plate.

3x M2.5 x 6mm long screws
3x M2.5 x 4mm long screws

Secured Plate Holder
Reference the photo for correct placement of the faceplate holder, PCB mounting plate and framing.

Connect Battery
Plug in the 1200mAh battery into the JST power port on the Feather.
Tack Battery
The battery is secured to the back cover using mounting tack.

Secured Battery
The battery can be fit onto the bar in the middle of the back cover.

Install Back Cover
The back cover snap fits onto the back of the framing.
Back Cover Mounting Brackets
The back cover mounting brackets are used for attaching 3M velcro strips. This allows the sign to be easily taken off the door or wall. Use the holes built-into the back cover to secure onto screws or nails.

Install Acrylic Plate
Insert the acrylic plate into the faceplate holder by sliding into the rails.

Install Front Cover
Place the front cover over the framing with the side tabs properly oriented. Firmly press together to snap fit shut.

Final Build
And there you have it! Your sign is ready to mount onto the wall or door. I plan to use this a whole lot and hope this inspires you to check out CircuitPython!