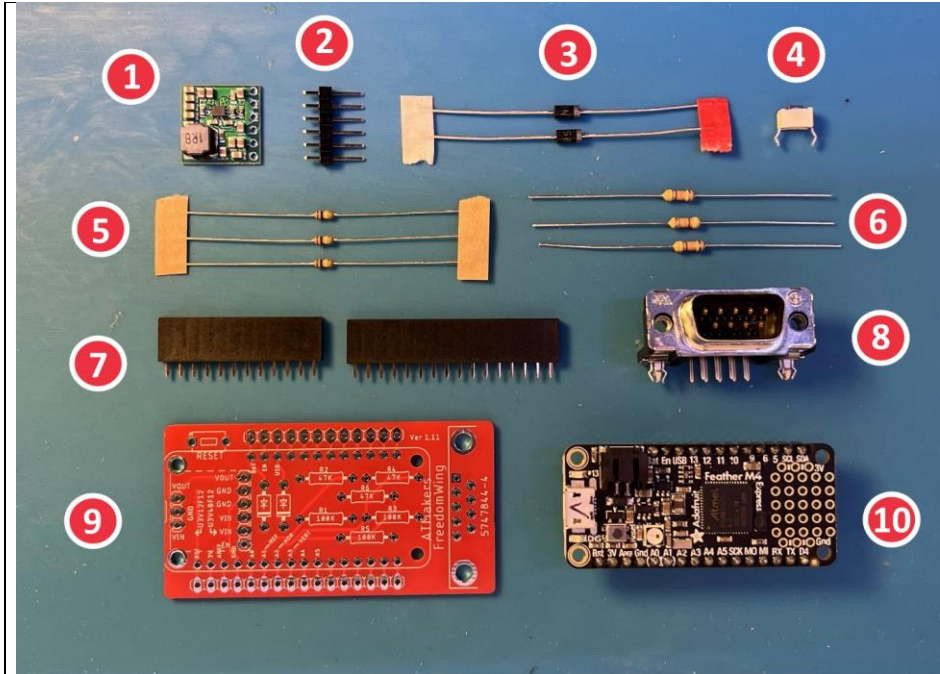# FreedomWing Joystick Adapter
ASSEMBLY GUIDE

Required Components

BOM

1. 12V Step-Up Voltage Regulator U3V40F12
2. 6 Pin Header
3. 40V 1A Schottky Diode - DO-41
4. Tactile Switch SPST-No
5. 100K Through-Hole Resistor
6. 47K Through-Hole Resistor
7. Header Kit for Feather
8. 9 Position D-Sub Connector
9. FreedomWing 1.1 Printed Circuit Board
10. Adafruit Feather M4 Express

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Required Tools

- Temperature regulated soldering Iron.
- Fine rosin core 60/40 or electrical solder suitable for electronics work.
- Needle nose Pliers
- Side cutters
- Screwdriver
- Solderless breadboard to help with soldering (Optional; Recommended)

Required Personal Protective Equipment (PPE)

- Safety glasses
- Disposable examination gloves (Optional- rosin residue may irritate sensitive skin)

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## Assembly Instructions

Step 1

Place the 12V Step-Up Voltage Regulator onto the header for soldering. The board should be at a right angle with the male header pins. Here, we place a female header strip under the back end of the regulator to help keep it aligned during soldering.
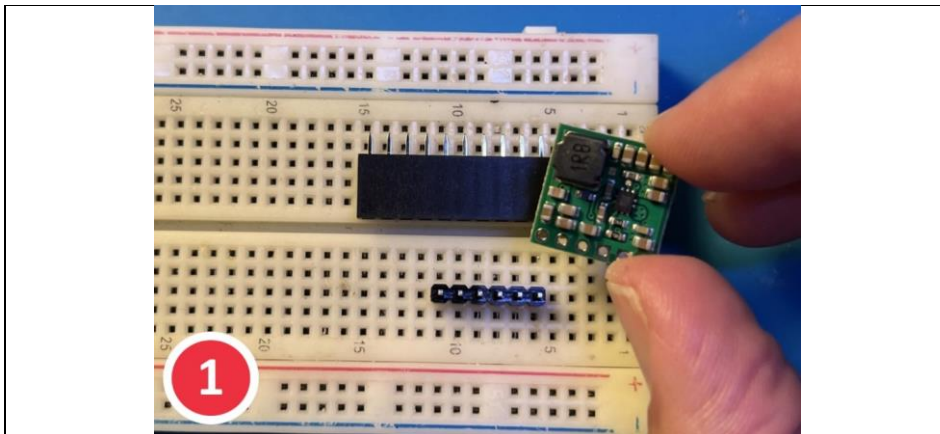

Step 2

Ensure the short side of the male header pins are in the board for soldering, and then solder 1 pin. Check the alignment. If the alignment is square, solder the remaining 5 holes.
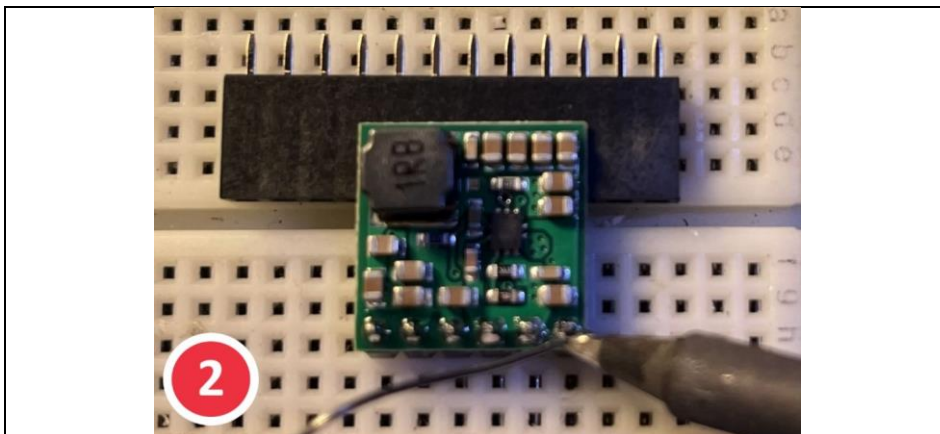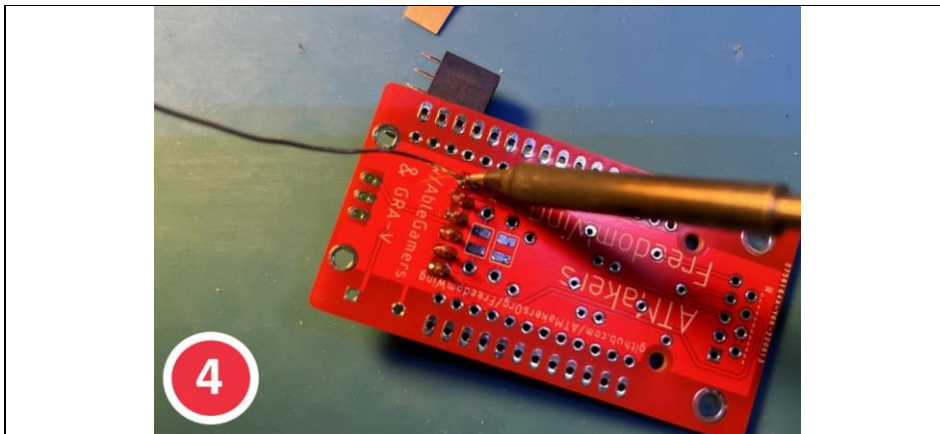
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Step 3

Insert the pins of the soldered Step Up Regulator into the FreedomWing PCB as shown. Ensure the regulator board is on the component side (white part outlines, as shown). Again, we can use a female header as a support to help with alignment, as regulator should be flat with the board, and sit as low as possible.
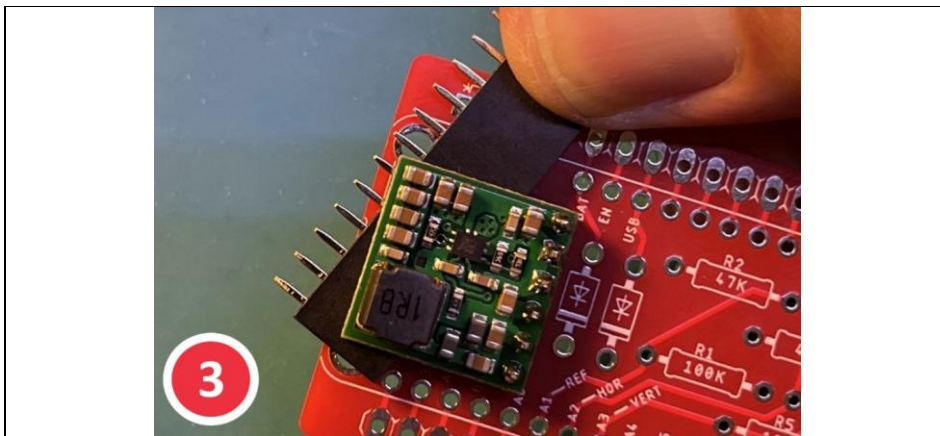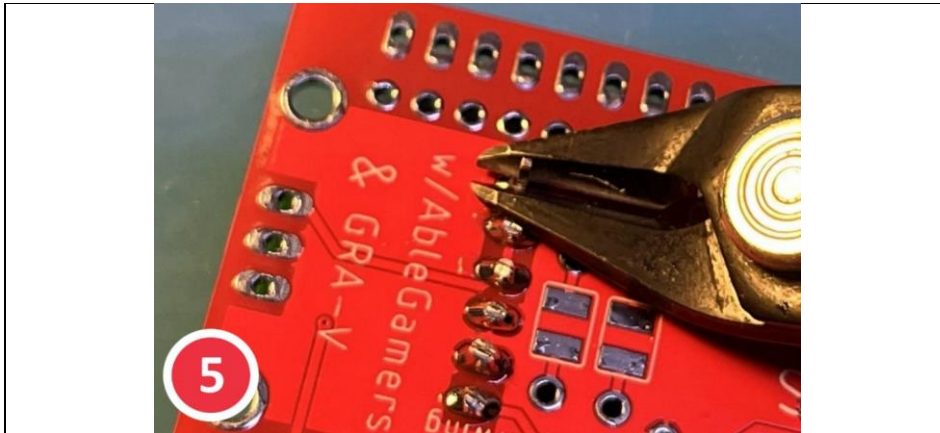

Step 4

Solder the first header pin, and if the alignment looks good, solder the remaining 5 header pins onto the main PCB.

FreedomWing Joystick Adapter
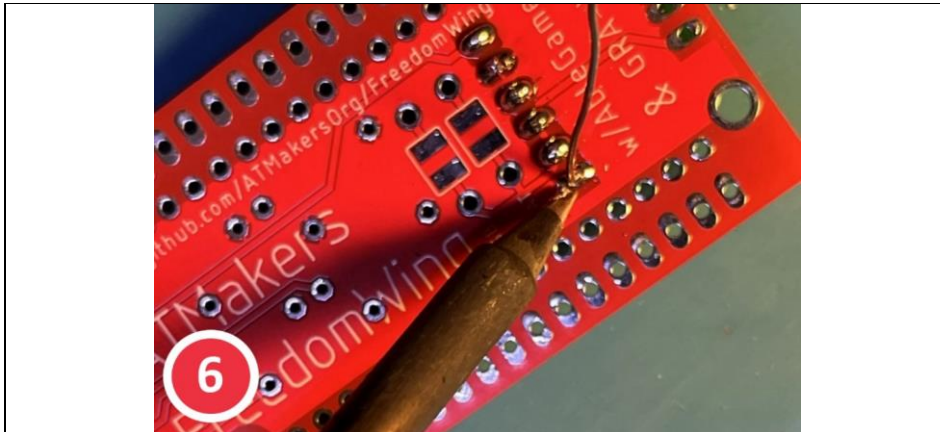## ASSEMBLY GUIDE

Step 5

Ensure your safety glasses are on, as trimming headers can send bits of metal. Use side cutters, trim the protruding header pins just above the solder joints.


Step 6

Resolder the cut pins, by applying small blobs of solder. This will minimize the chance of getting nicked by sharp metal edges left by cutting headers.

FreedomWing Joystick Adapter
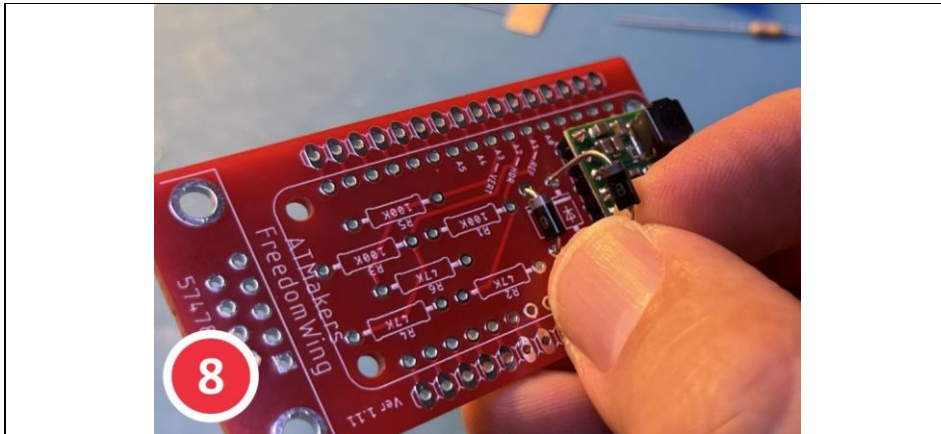## ASSEMBLY GUIDE

Step 7

In preparation Bend the leads of each Schottky diode at right angles, as shown. Note the grey stripe on the diode case tube. This marks the cathode wire of the diode.
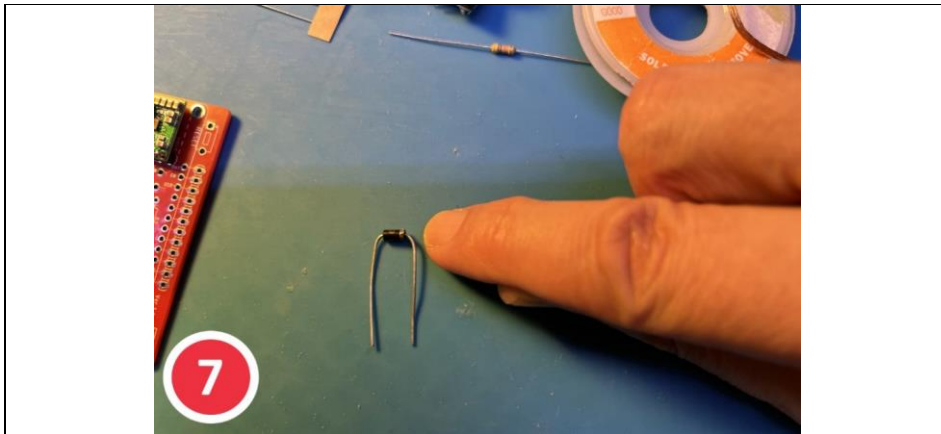

Step 8

Insert the Schottky diode into the FreedomWing PCB, being extra careful to place the grey stripe cathode ends into the diode location marked with a white stripe on the PCB board (as shown).

FreedomWing Joystick Adapter
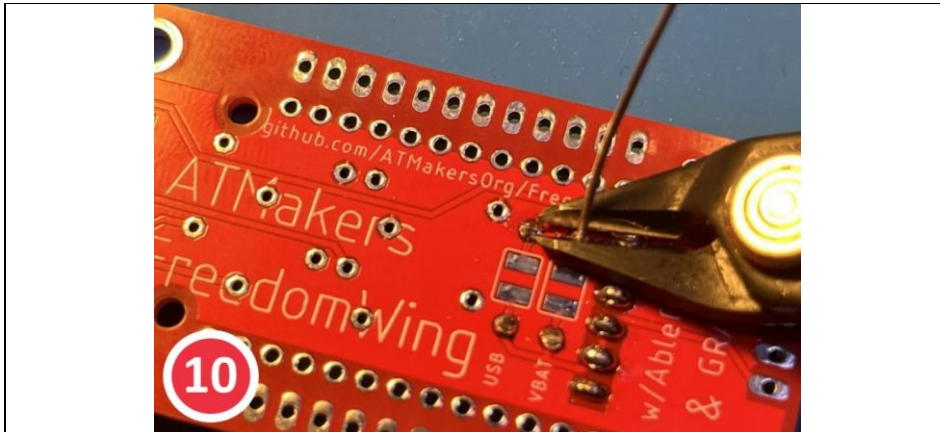## ASSEMBLY GUIDE

Step 9

After confirming Schottky diode orientation, solder all four diode wires to the PCB on the solder side of the board, as shown.
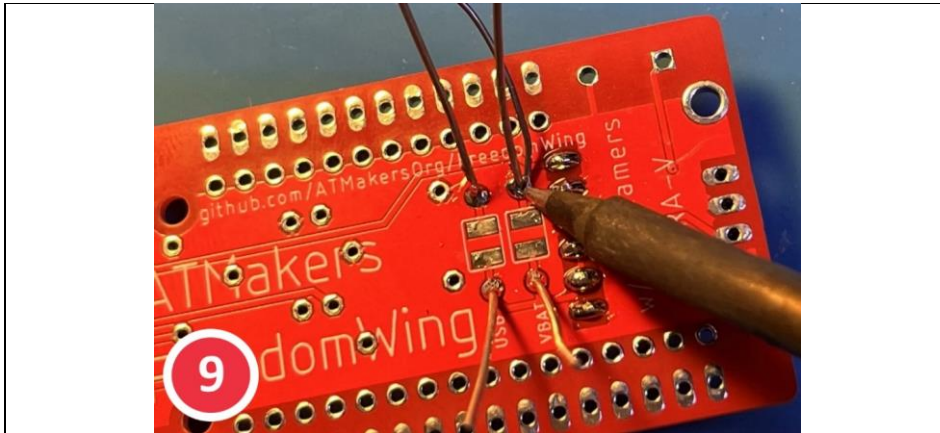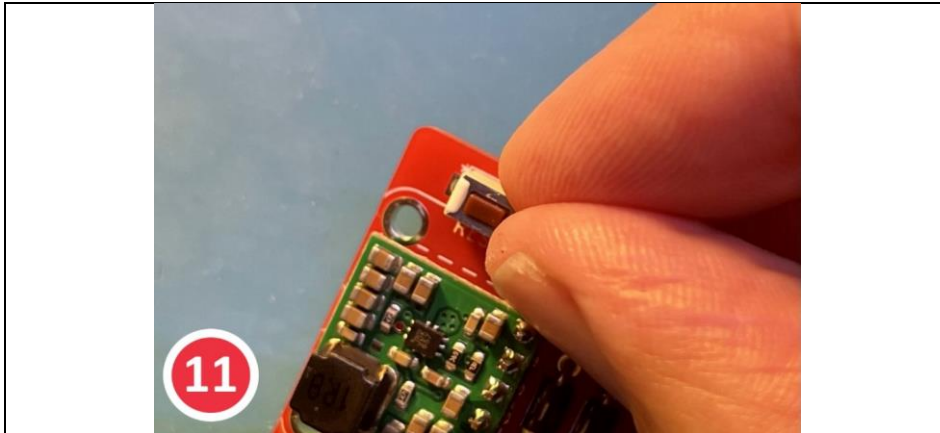

Step 10

Trim the diode wires with side cutters, again wearing eye safety glasses, and trim just above the solder joints.

FreedomWing Joystick Adapter
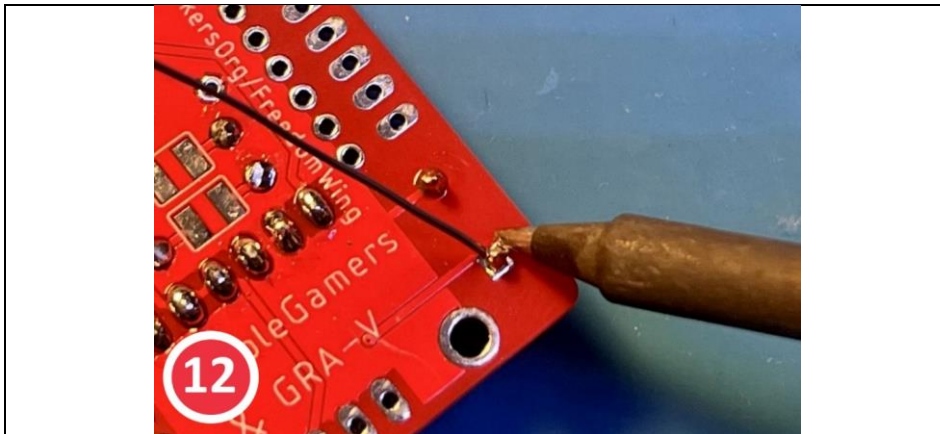## ASSEMBLY GUIDE

Step 11

Insert the push button switch into the switch holes of the PCB (component side).
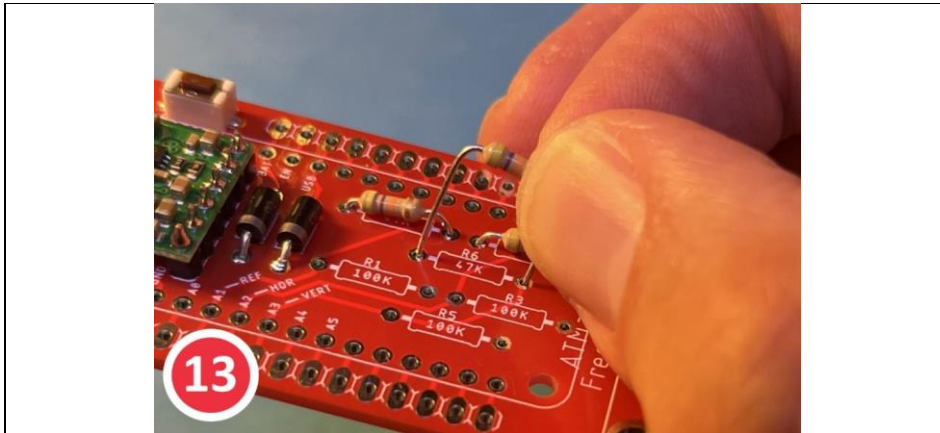

Step 12

Solder the switch solder terminals on the solder side of the PCB. Depending on the type of switch being used,

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Step 13

Bend the leads of the three 47K resistors, as you did previously with the diodes. Insert the resistors into the holes for the resistor locations marked "47K" as shown in photo (below).

Step 14

Solder the 47K resistor leads, and trim away the leads with side cutters, (as you did with the diodes in step 10).

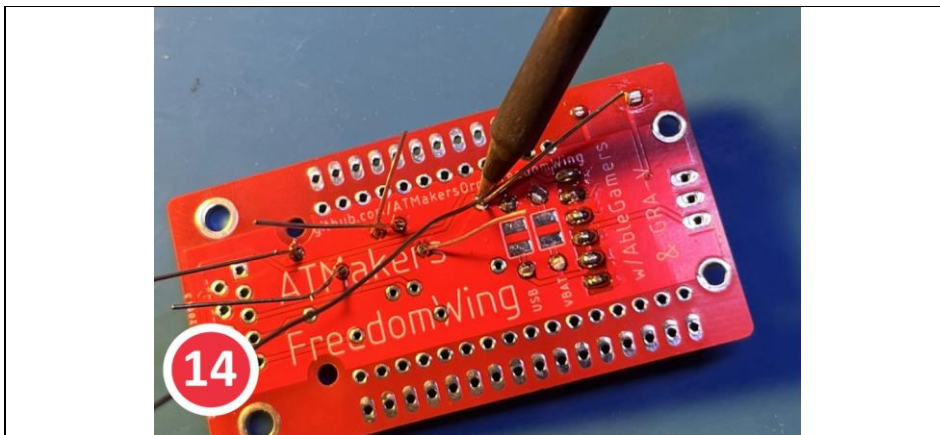# FreedomWing Joystick Adapter
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Step 15

Bend the leads of the three 100K resistors, as you did previously with the diodes. Insert the resistors into the holes for the resistor locations marked "100K" as shown in photo (below).
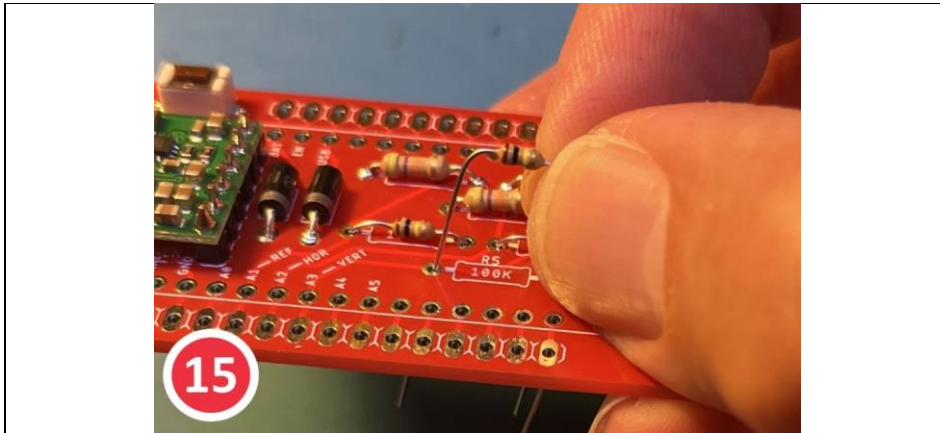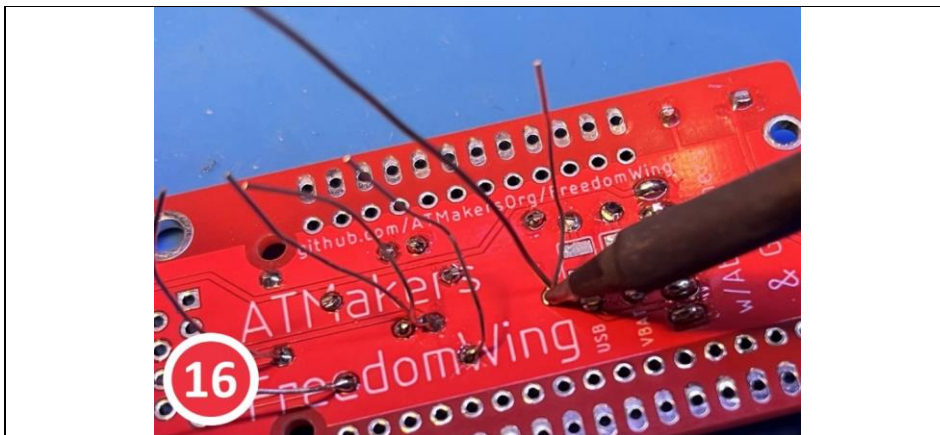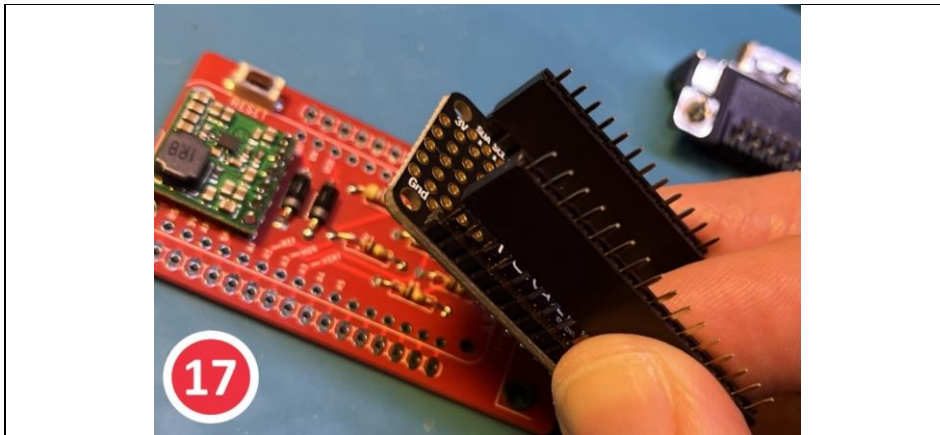

Step 16

Solder the 100K resistor leads, and trim away the leads with side cutters, (as you did with the diodes in step 10).

FreedomWing Joystick Adapter
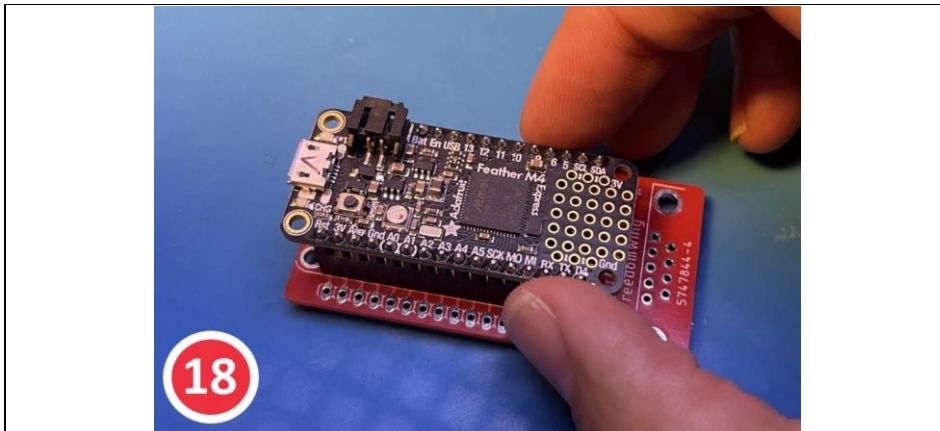## ASSEMBLY GUIDE

Step 17

Insert female headers onto the Feather micro-controller pins. Ensure the header lengths correspond with the lengths of the male headers on the micro. Also, make sure all pins of the micro, are inside female header strips.
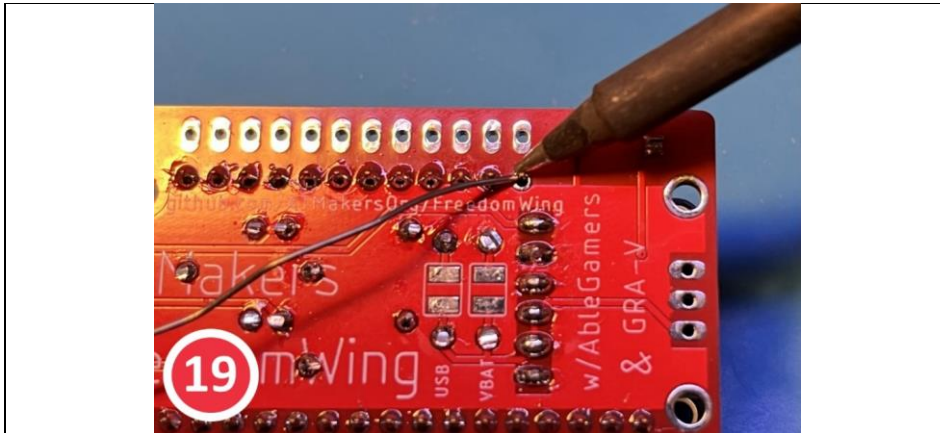

Step 18

Insert the Feather micro with added headers into its designated holes on the Freedomwing PCB on the component side of the PCB.

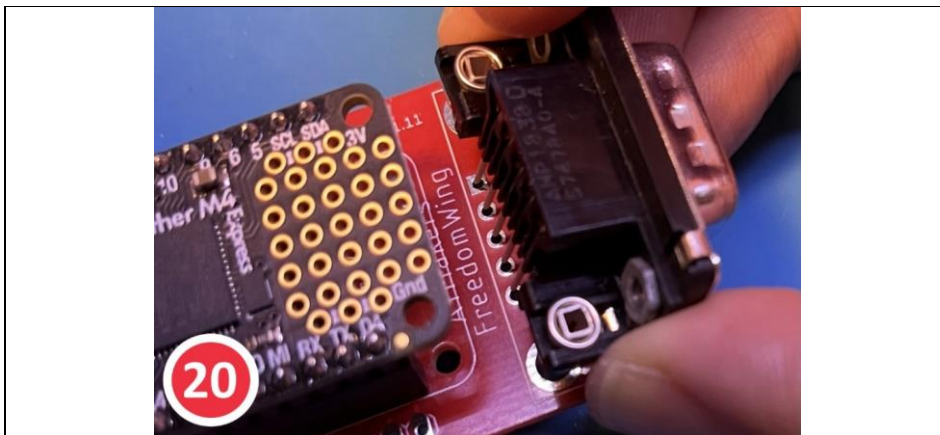# FreedomWing Joystick Adapter
ASSEMBLY GUIDE

Step 19

On the solder side of the PCB, apply solder to all the header pins that were inserted in step 18. Make sure the headers remain flush with the PCB as you do so.

Step 20

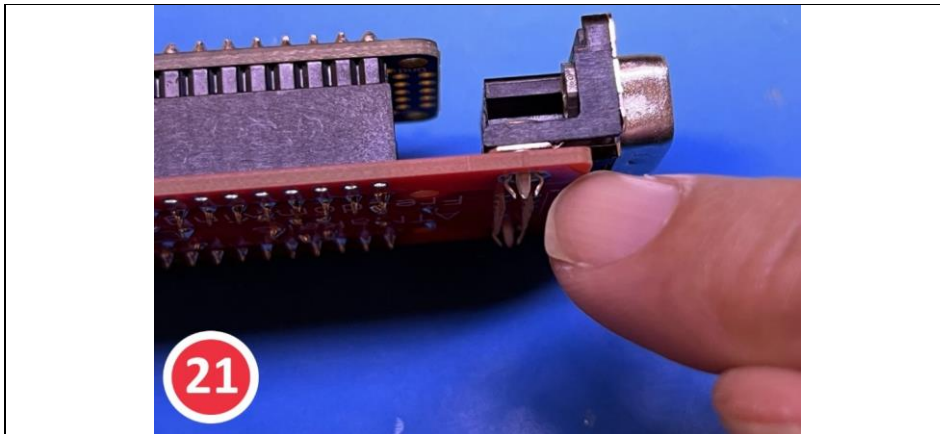Insert the 9 Position D-Sub Connector into its marked position on the PCB. Ensure all pins protrude on the solder side of the PCB.

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Step 21

Ensure the connector is flush with the PCB, and that the mounting clips are through the mounting holes as shown:

Step 22

Apply solder to all 9 pins of the D-Sub Connector, and the protruding ends of the mounting clips.
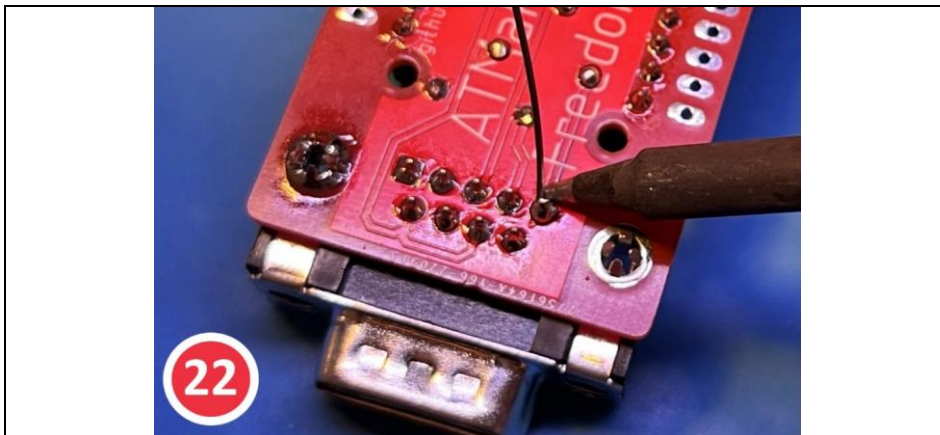
FreedomWing Joystick Adapter
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Step 23
Compare the PCB to the photos below to ensure no steps have been missed.
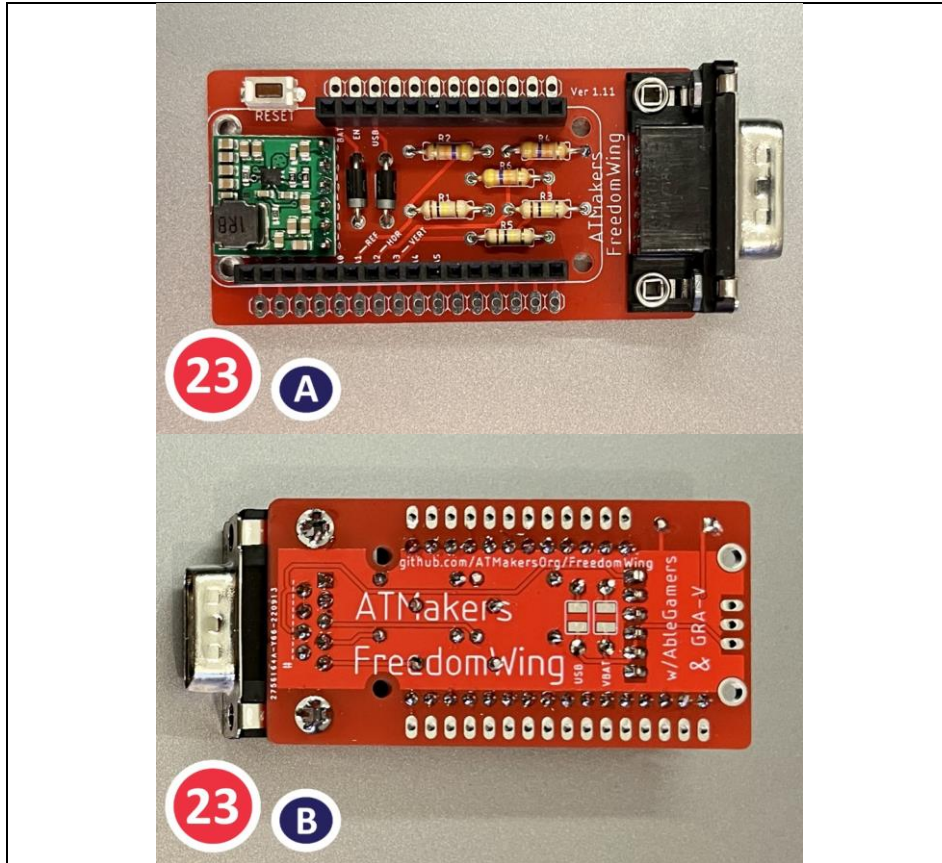
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Step 24

Insert 2 M2.5 hex nuts into Nut Holder A
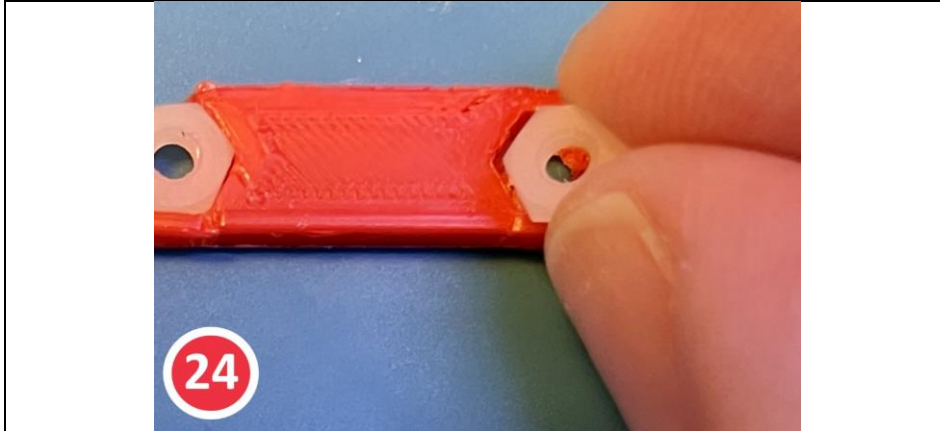
Step 25

Insert 2 M2.5 hex nuts into Nut Holder B
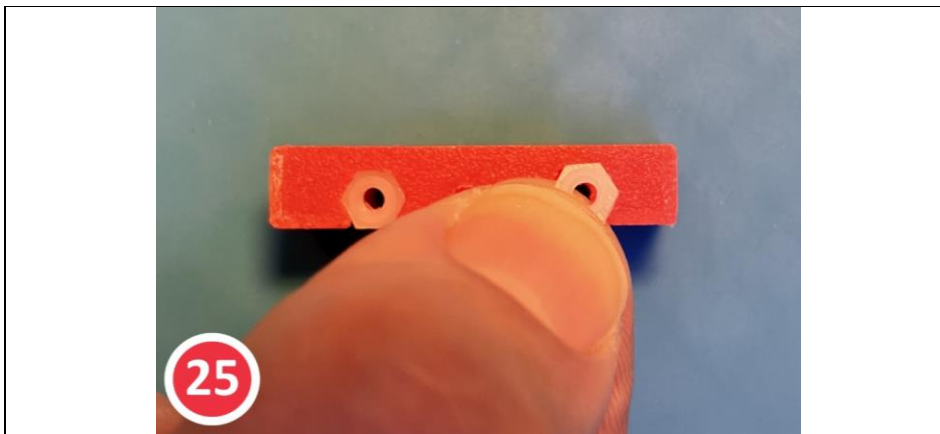
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Step 26

Remove the microcontroller. Slide Nut Holder A in position underneath the Buck Booster.
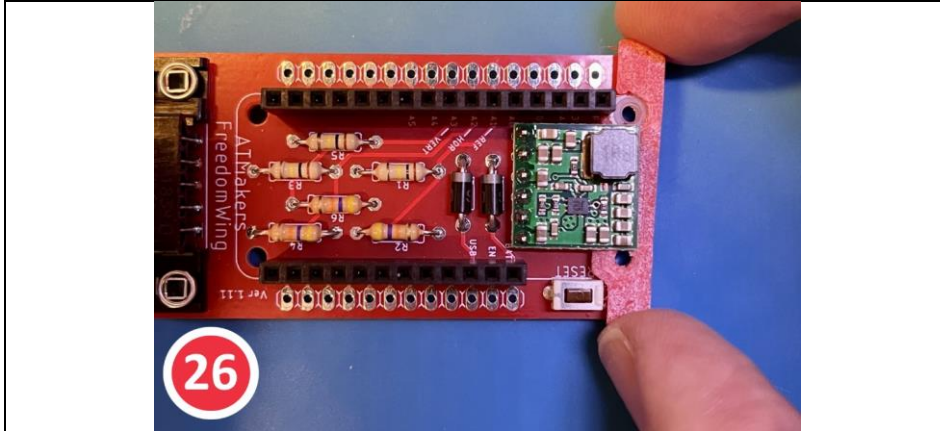
Step 27

Slide Nut Holder B in position near the DB9 connector.
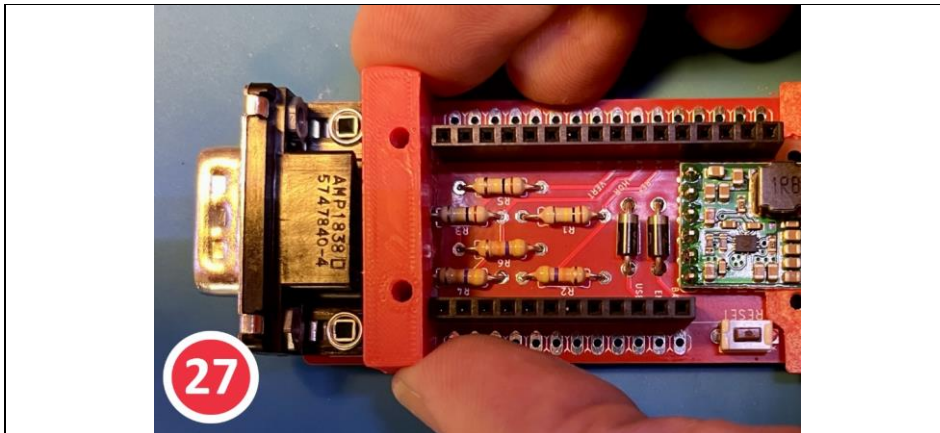
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Step 28

Re-insert the microcontroller into the PCB.
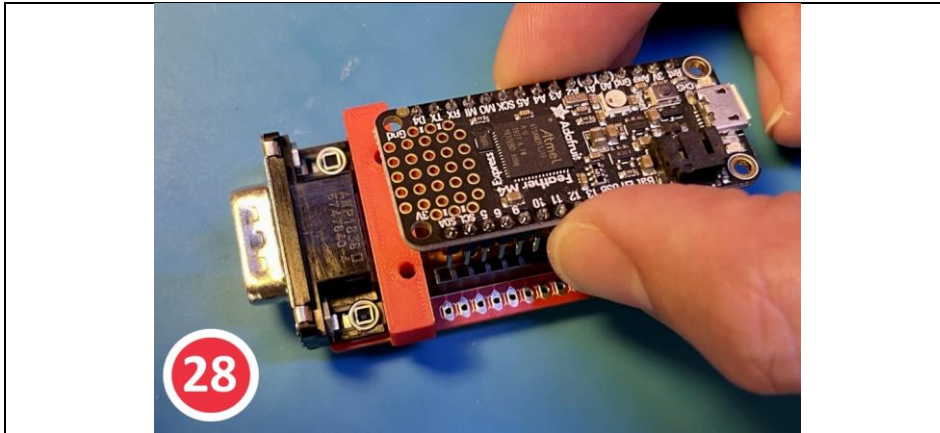
Step 29

Carefully insert the PCB into the case.

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Step 30

Insert the 4 M2.5 machine screws from the bottom of the case, using the screwdriver to tighten them into the hex nuts within the Nut Holders. Do not overtighten.

Step 31

Orient and attach the lid via the snap fits.

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Software Setup

Determine CircuitPython Version

1. Connect the Feather board to a computer through a USB Cable.
2. A new disk drive called **CIRCUITPY** will appear.
3. Navigate to the **CIRCUITPY** drive.
4. Open a file named **boot_out.txt** from the main directory of **CIRCUITPY** drive using a text editor software.
5. Identify the CircuitPython version number.

Example:

Adafruit CircuitPython 7.3.3 on 2022-08-29; Adafruit Feather RP2040 with rp2040

Board ID:adafruit_feather_rp2040

boot.py output:

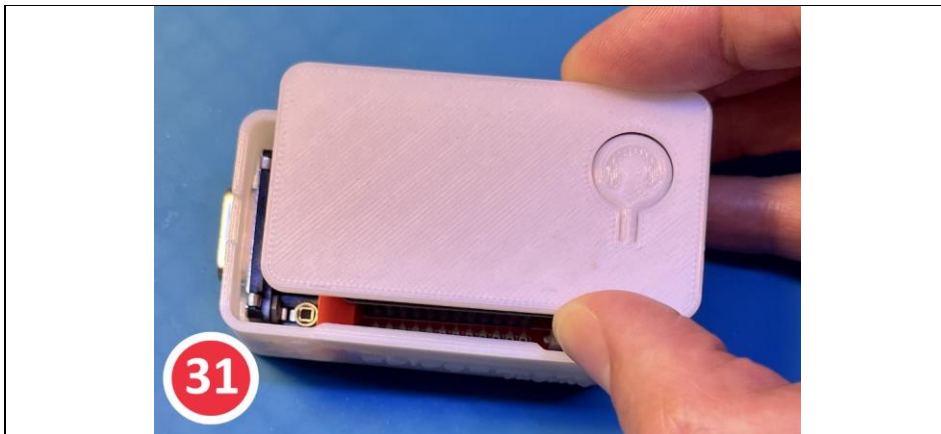
CircuitPython Version 7 or Above

1. Make sure you are running **CircuitPython 7** or above in the Feather board. Please follow the instructions below if you are running older version of **CircuitPython**.
   a. Download **CircuitPython 7** or above from CircuitPython official website. The downloaded file will come with **.UF2** extension.
   b. Enter the bootloader by following one of the options below based on the model of your Feather board.
      i. **Feather M4 Express**: Double-clicking the **Reset** button next to the USB connector. The RGB LED turns green.
      ii. **Feather RP2040**: Hold down the **BOOT** button, and while continuing to hold it, press and release the **Reset** button.
   c. You will see a new disk drive appear called **FEATHERBOOT** or **RPI-RP2.**
   d. Drag and drop the downloaded **.UF2** file to the drive.
   e. Once the transfer is complete, **FEATHERBOOT or RPI-RP2** drive will disappear, and a new disk drive called **CIRCUITPY** will appear.
2. Download FreedomWing 1.1 software bundle.
3. Navigate to **CIRCUITPY** drive in your computer
4. Copy the **__init__.py** file under **\lib\adafruit_hid** directory of **CIRCUITPY** drive.
5. Copy the **boot.py** file inside main directory of **CIRCUITPY** drive.
6. Copy the **code.py** file inside main directory of **CIRCUITPY** drive.
7. Copy the **hid_xac_gamepad.py** file inside main directory of **CIRCUITPY** drive.

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8. Hard reset the Feather board by pressing the *Reset* button.

Circuit Python Version 6.xx or below

1. Download the appropriate custom CircuitPython with added XBox Adaptive Controller's USB HID gamepad profile from cp4xac repository on GitHub. The downloaded file will come with *.UF2* extension.
2. Enter the bootloader by following one of the options below based on the model of your Feather board.
   a. *Feather M4 Express*: Double-clicking the *Reset* button next to the USB connector. The RGB LED turns green.
   b. *Feather RP2040*: Hold down the *BOOT* button, and while continuing to hold it, press and release the *Reset* button.
3. You will see a new disk drive appear called *FEATHERBOOT* or *RPI-RP2.*
4. Drag and drop the downloaded *.UF2* file to the drive.
5. Once the transfer is complete, *FEATHERBOOT or RPI-RP2* drive will disappear, and a new disk drive called *CIRCUITPY* will appear.
6. Download FreedomWing 1.p software bundle.
7. Navigate to *CIRCUITPY* drive in your computer
8. Copy the *code.py* file inside main directory of *CIRCUITPY* drive.