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Overview

Our Trellis Feather acrylic enclosures are such dense little packages that we put together this guide to help with assembly.

These are sold as both a case+hardware kit (bring your own Trellis, Feather and STEMMA cable), or a more complete kit with Feather M4 and additional parts.

- 4x4 Enclosure + Hardware Kit () (bring-your-own Feather)
- 4x4 Feather M4 Kit Pack ()
- 8x8 Enclosure + Hardware Kit () (bring-your-own Feather)
- 8x8 Feather M4 Kit Pack ()

Other tools and skills required:

- Cutting and stripping wires
- Soldering ()
- Small Phillips head screwdriver

Two Ways to Build

One way to build this Trellis kit is as a “tethered” device — it operates only when a USB cable is plugged in. This is how the Feather M4 Kit Pack is sold.
Another option is as a wireless, battery-operated device. This requires the addition of a panel-mount switch and a lithium-polymer battery, not included in the standard kit. This also implies using a wireless-capable Feather board...most likely one with Bluetooth support (such as nRF52 or ESP32) to create a wireless keypad for a desktop or laptop computer. But, as an open-source device, there’s nothing discouraging you from creating unique wireless projects, if you want to make some kind of WiFi or LoRa remote trigger.

Tips when using the case-only kit (building your own project):

- This 4-pin STEMMA cable simplifies soldering, and provides just enough extra wire to complete the project. (Included with M4 kit packs.)
- Use a Feather board without headers installed.

Parts

For 4x4 NeoTrellis projects:

Adafruit 4x4 NeoTrellis Feather M4 Kit Pack
We’ve upgraded our popular 4x4 Trellis Keypad kit with a super-specifically-laser-cut enclosure that turns your 4x4 ‘Trellis into a handheld Feather M4...
https://www.adafruit.com/product/4352

Adafruit 4x4 Trellis Feather Acrylic Enclosure + Hardware Kit
A super-specifically-laser-cut enclosure that turns your 4x4 ‘Trellis into a handheld light/music maker! Perfect for your next cool interface, MIDI instrument,...
https://www.adafruit.com/product/4339

For 8x8 NeoTrellis projects:
Adafruit 8x8 NeoTrellis Feather M4 Kit Pack
We've upgraded our popular UNTZtrument with a total make-over, and it's been reborn as the NeoTrellis 8x8 Kit pack. This open-source 8x8 Grid Controller Kit with...
https://www.adafruit.com/product/1929

Adafruit 8x8 Trellis Feather M4 Acrylic Enclosure + Hardware Kit
A super-specifically-laser-cut enclosure that turns your 8x8 'Trellis into a handheld light/music maker! Perfect for your next cool interface, MIDI instrument,...
https://www.adafruit.com/product/4372

For all NeoTrellis projects:

JST PH 2mm 4-Pin to Male Header Cable - I2C STEMMA Cable - 200mm
This cable will let you turn a JST PH 4-pin cable port into 4 individual wires with high-quality 0.1" male header plugs on the end. We're carrying these to match up with any...
https://www.adafruit.com/product/3955

For wireless NeoTrellis projects (use 500mAh battery for 4x4 NeoTrellis, 2500mAh for 8x8 NeoTrellis):
Lithium Ion Polymer Battery - 3.7v 500mAh
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...
https://www.adafruit.com/product/1578

Lithium Ion Polymer Battery - 3.7v 2500mAh
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...
https://www.adafruit.com/product/328

Mini Panel Mount DPDT Toggle Switch
This or that, one or the other, perhaps or perhaps not! So hard to make decisions these days without feeling like you're just going back and forth constantly. Deciding whether or...
https://www.adafruit.com/product/3220

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
Adafruit HUZZAH32 – ESP32 Feather Board

Aww yeah, it's the Feather you have been waiting for! The HUZZAH32 is our ESP32-based Feather, made with the official WROOM32 module. We packed everything you love...

https://www.adafruit.com/product/3405

Prep Work

Peel the backing paper off both sides of all the laser-cut parts (11 in the 4x4 kit, 15 in the 8x8 kit). It’s easiest to start at a corner, catching the edge of the paper with a fingernail.

The laser-cutting process can leave some paper soot at the edges. If you like, wash these parts off with soap and water, just be absolutely certain that all the parts are completely dry before assembling!

Use only soap and water when cleaning these parts. Some chemicals, including rubbing alcohol and alcohol wipes, will damage the plastic!
If using the STEMMA cable (), cut it in half along its length, strip and tin the ends of the wires.

For a tethered device, you only need the half with the plug.

For a wireless device, save the other half. Clip off the header pins, strip and tin both ends of these wires.

You can still build the kit if you don’t have the STEMMA cable but have other wire around...you’ll be soldering directly to the pads on the edges of the Trellis board in that case, it’s not quite as plug-in simple.

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**Soldering**

**Soldering the Components**

Only a few connections are required. Notice however, this project has wires connected from the opposite side than you might normally expect: they approach from under the board and are soldered on top.

**Tethered (USB Only) Connections**

These are the connections for a tethered project (no battery or power switch):

STEMMA Wire Color (or Trellis Edge Pad) - Feather Pin

- Black (GND) - GND
- Red (VIN) - USB
- White (SDA) - SDA
- Green (SCL) - SCL
Here’s how the wiring looks with a STEMMA cable on a Feather M4 board to be used in a “tethered” configuration.

Wires approach from the bottom and are soldered on top. This is important later.

### Standalone Connections

A wireless or standalone configuration requires adding a battery and DPDT panel-mount switch. The latter has six pins, but we’ll only be using four. The pinout is symmetrical, doesn’t matter if you have it turned 180°.

Three extra wires are required. If using the STEMMA cable, the trimmed-off bits are just long enough for this.

A wireless Trellis can still operate over USB if desired, but still must use the power switch regardless.

<table>
<thead>
<tr>
<th>STEMMA Wire (or Trellis Edge Pad)</th>
<th>Feather Pin</th>
<th>Switch Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black (GND)</td>
<td>GND</td>
<td></td>
</tr>
</tbody>
</table>
Notice there are two GND connections that must be made to the Feather board. More on that in a moment...

Here's a back-side view of the switch, showing where wires will connect.
Here's how the wiring looks with a STEMMA cable on a board to be used in a wireless configuration.

Wires approach from the bottom and are soldered on top. This is important later.

Some Feather boards have a single GND pin, others have more than one.

A switched project requires two GND connections. If your Feather only has one GND pin, the STEMMA wires are thin enough that you can twist two together before tinning the ends, and still have it fit through the single GND connection.

**NeoTrellis 8x8 Kit Only**

If building an 8x8 setup, some extra soldering steps are required...
An 8x8 setup is comprised of four 4x4 NeoTrellis...es? NeoTrellis?

Use blobs of solder across the A0–A4 pads to assign each 4x4 NeoTrellis a unique I2C address. Usually this involves leaving one untouched, bridging “A0” on the second, “A1” on the third, and both A0+A1 on the fourth (though you can use whatever combination you want, as long as each is unique...it's configurable in software).

The four sub-Trelloids then need to be soldered together by joining the five pads along their common edges (SDA, SCL, etc.). Although it's possible to do this with just solder alone, you'll likely find it both easier and more durable to solder small pieces of bare wire across these pads.

That's it for the soldering! You can switch off your iron now.

Trim away any excess wire protruding from the top of the board.

For wireless projects, plug in the LiPoly battery and confirm that the Feather board's power LED turns on with the switch in one position, and that the yellow charge LED is on when connected to USB.

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Case Build

The photographs here mostly depict the 4x4 case being assembled. 8x8 is similar enough (just a few extra pieces) that we'll just highlight the differences where necessary.
For a wireless project, the switch must be installed though this piece in a particular back-to-front direction. It’s a bit too much to describe in words, so have a look at the photographs, making sure your parts are oriented the same way.

The locking washer and nut go “on top.” Also, the switch has a small protrusion which fits through a corresponding hole on this piece. This keeps the switch from spinning around when you tighten the nut.

Tethered projects do not require the switch, you may ignore this step.

All Your Base

We’ll start from the bottom and work up...

Note: some versions of this kit don’t accommodate the Feather nRF52840 board (which came later) — a cutout was added to later kits. If you have an incompatible combo, you can try desoldering the debug header from the Feather board...or, if you have access to a laser cutter or 3D printer, you can make a replacement bottom piece from files on the “Downloads” page. DO NOT drill acrylic, it requires a special kind of drill bit!
Collect all the M2.5 hardware...this includes the four smaller screws and nuts, plus four standoffs.

What’s peculiar about this case is that the Feather board sits face down...it’s behind the acrylic here. Turn this bottom piece over and around until you find the orientation that fits the battery socket, reset button and all four mounting holes, like in the picture.

The board installs upside-down like this so the reset button is still accessible with a pen or screwdriver!
Insert four M2.5 screws, turn the base piece over and lay it on your work surface (temporarily tape over the screw heads if you have difficulty with this step).

Add four spacers, lay the Feather board face-down over the screws, then add four nuts.
On some Feather boards, two mounting holes are partially obscured by the wireless module.

In this situation, it’s okay to use only the two mounting holes near the USB port.
Next you'll need these four threaded standoffs, and four of the eight M3 screws.

The screws come up from below the case, with the standoffs on top. It's the same for a tethered or a wireless project.

Sides

These case pieces don't have labels or specific names...but they do have distinct shapes that fit in a certain way.

Pay attention to the slots and tabs on each piece, and refer to the photos to get each item in its correct position.
The case is double-walled in order to hold the Trellis board in place. We’ll do the “inner” walls first...

Look for these two side pieces and slot them into the base. Then the front and back inner walls will slot into these. If it's a wireless project, one of these inner walls will have the switch attached. It fits into a cutout in the base.
The 8x8 case is similar, but has four extra pieces providing some support down the middle.

These smaller horizontal and vertical supports are keyed in such a way to only fit in their corresponding holes. You’ll want to do the vertical supports and sides first, then add the horizontal supports. Then continue just like a 4x4 case.

It will all seem a little wobbly at this stage. That's normal. Once the NeoTrellis and top case are installed, everything becomes much more solid.
For a wireless project, there’s just enough space for a 500 mAh LiPoly battery in the corner away from the Feather and switch. (Up to 2500 mAh on the 8x8 NeoTrellis, positioned at center.)

Double-stick tape — either the foam or cellophane type — can help keep this in place during assembly. Not absolutely vital, just handy if it’s something you have.
The outer walls install in a similar order. But, with the inner walls in place, these outer pieces won’t just drop into place... you’ll need to tilt them up into place, or lift the inner pieces slightly to get all the tabs and slots to lock.
Plug the STEMMA connector into the NeoTrellis socket.

(If you built without the STEMMA cable, the NeoTrellis board will already be attached to the Feather and/or switch directly, using the edge solder pads.)

Before closing it up, this is a good opportunity to connect a USB cable and confirm once more (now with the Trellis connected) that the Feather board powers on and (if building a wireless project) that the switch works and the battery charge LED comes on.

Top Layers

Orient the enclosure so the USB port is at the top, then carefully work the Trellis PCB into position, minding any pinched wires as you go.

The numbers on the Trellis PCB should appear upside-down with respect to the case, i.e. “16” will be at the top-left. You may need to adjust for this in software. This provides clearances for the parts inside with the slimmest possible case.
Compensating for NeoTrellis Orientation

The orientation of the NeoTrellis PCB inside the case requires adopting one of two strategies...EITHER:

- Operate the NeoTrellis case with the USB port at the bottom/front (no big deal for wireless, but might be strange for a USB-tethered project). OR...
- Keep the USB port at the top/back and compensate for the rotation in software. Pixel/button 0 is at the bottom-right now. To remap button #n from old to new orientation, use 15-n instead.

Carefully now...lower the Trellis PCB until it sits flush against the inner walls. You'll probably need to stuff some wires back in using the tip of a screwdriver. If anything is pinching or binding...stop, lift up the Trellis board, find what's tangled and give it another go. Don't force anything.
Install the elastomer button pad over the Trellis PCB. This pad has little “nurnies” that lock into corresponding holes on the PCB, so it has to be turned a certain way before it will sit flush.

Then add the top clear piece. This will probably require a little wiggling to get all the tabs and slots to lock together.

Finally, add the topmost black layer.
The top is held in place with the remaining four M3 screws. It's easier once the first screw is in place...you won't need to keep holding it together like a sandwich.

Add four self-stick rubber “toe beans” to the bottom so it stays in place on your desk.

You’re done!
Downloads

You can laser cut your own enclosure — or make modifications with the following vector files — from acrylic (or other laser-compatible materials) in any colors you wish!

This ZIP file contains .SVG files for both the 4x4 and 8x8 NeoTrellis Feather Cases:

Feather-Trellis-Cases.zip

“Feather Trellis 4x4 Clear.svg” and “Feather Trellis 4x4 Black.svg” are the two files we use when producing a 4x4 NeoTrellis Feather case in 1/8” (3mm) clear and 1/16”
(1.5mm) black acrylic, respectively...of course you can use whatever colors you choose (fluorescent acrylic is pretty rad).

“Feather Trellis 8x8 Clear.svg” and “Feather Trellis 8x8 Black.svg” are the same for an 8x8 NeoTrellis Feather case.

The following Github repositories include files relevant in the production of NeoTrellis PCBs and elastomers:

- [NeoTrellis PCBs (Eagle format)](https://github.com/Adafruit/NeoTrellis/blob/master/PCBs/Eagle Formats/NeoTrellis%20PCBs%20(Eagle%20format).txt)
- [CAD files for Trellis elastomers](https://github.com/Adafruit/NeoTrellis/blob/master/Elastomers/CAD%20files%20for%20Trellis%20elastomers.txt)