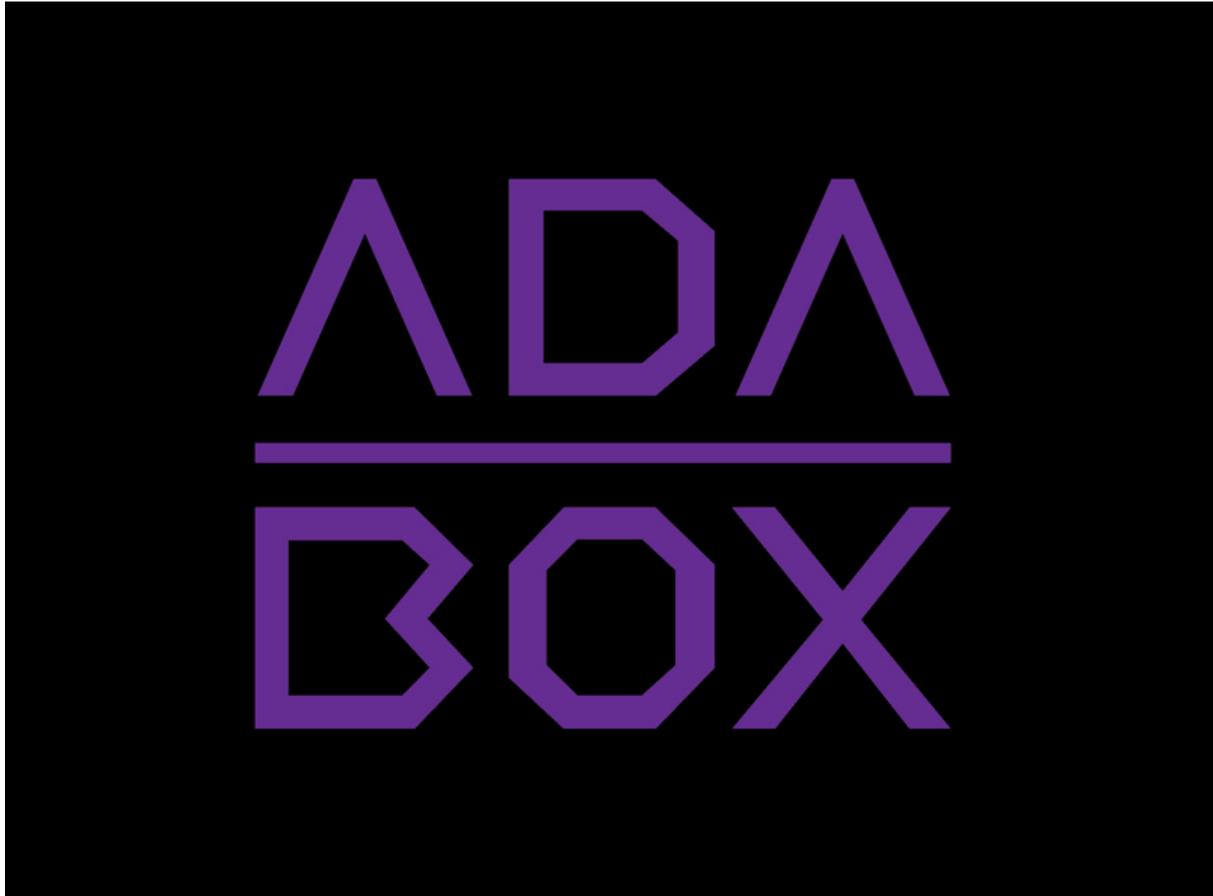




# AdaBox 019

Created by John Park



<https://learn.adafruit.com/adabox019>

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# Introduction

## Hi there!

[If you're looking to subscribe to AdaBox, click here! \(https://adafru.it/tNC\)](https://adafru.it/tNC)

If you're here, it's because you were given the gift of electronics with an AdaBox! Perhaps you are a beginner who is getting started with your AdaBox. Or maybe you just want to relive what it's like being a beginner at electronics again. But most of all, you want to learn how to build and make creative, awesome stuff with mechanical keyswitches, displays, a rotary encoder, LEDs, and coding! ([If, rather than learn all that, you'd like to look at pictures of cats instead, please check https://www.adafruit.com/galleries/cats-of-engineering \(https://adafru.it/oAd\)](https://www.adafruit.com/galleries/cats-of-engineering))

And, you're in luck: there's never been a better time. Seriously. We're not just saying that. It's wild how great a time this is for you to build your own custom mini keyboard, and code it to your exact specifications to become your favorite little input assistant!

Gone are the days where you need thousands of dollars of equipment and a physics/math background. Nowadays, if you want to learn to work with electronics and code microcontrollers, you can jump right in for \$100 or less and any sort of computer. And we're talking about learning a lot of electronics, graphics, coding, USB HID - from the basics of setting up a microcontroller, to customizing your graphics on an OLED display! Soon you'll be building your own keyboard shortcuts, making an Ableton Live launcher, crafting a custom calculator, tailoring your perfect soundboard, making a mechanical keyswitch MIDI keeb, or a gaming turbo pad, and much more!

## Who is this for?

Anyone who is interested in learning how to program and build interactive projects, and with access to a modern web browser. That's pretty much the minimum. Remember, this guide is specifically for people who have purchased or received an AdaBox subscription!

**You don't need to know a lot of physics or math**, and just like an Art Degree isn't required for making art and being creative, **you don't need to have a computer science or mechanical engineering degree**. It helps if you're comfortable using computers but that's a skill most people pick up through life.

If you know how to program already - great! If not, don't worry, we'll teach you enough to be dangerous.

## Who isn't this for?

While you can follow along without an AdaBox, it will not make as much sense unless you have all of the components and more which either came as a gift or purchased yourself - remember, the goal is helping beginners!

This guide is also not for snails. Snails are interesting creatures, but [they're probably chilling out in their shells instead of coding](https://adafru.it/Pdn) (<https://adafru.it/Pdn>).

If you're an expert, please visit our thousands of other tutorials and jump right in at [learn.adafruit.com](https://adafruit.com) (<https://adafru.it/dlu>)

## Who are you?

Great question. This is me:

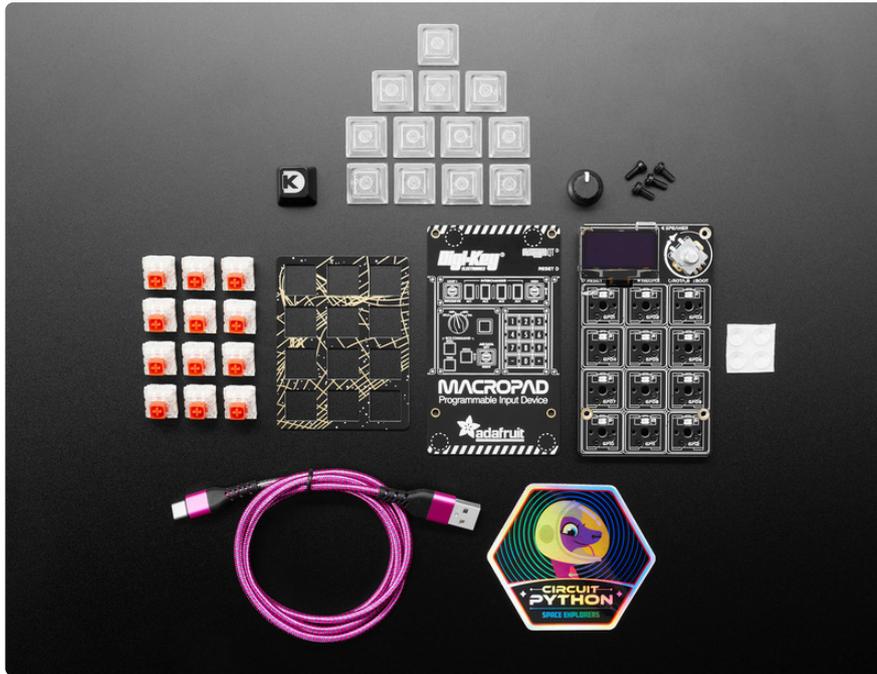
I'm Ladyada, and I love to teach people how to build stuff and how they can be creative with technology.

So, are you ready?

Let's do this thing!

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# Unboxing Adabox 019



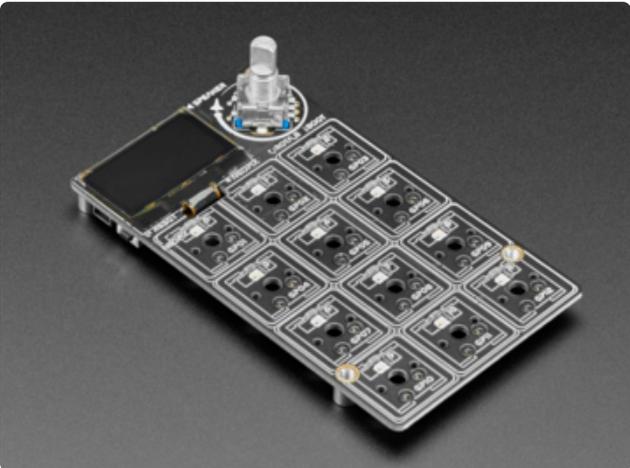
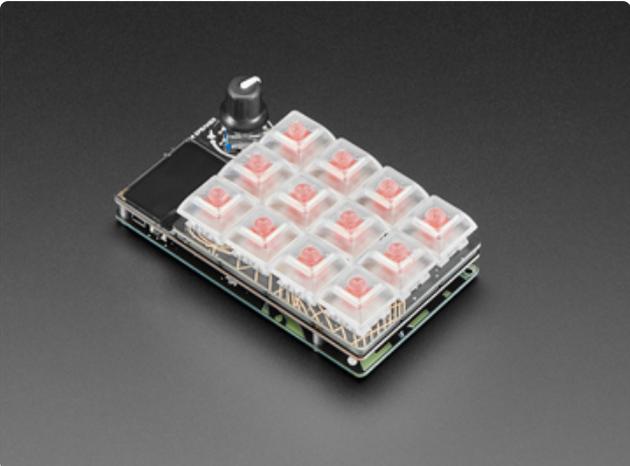
Strap yourself in, we're launching in T-minus 10 seconds...Destination? A new Class M planet called ADABOX 019! "M" here stands for "Microcontroller" because this ADABOX is the first one to feature the newest technology from the Raspberry Pi sector: say hello to the RP2040.

It's a speedy little microcontroller with lots of GPIO pins and 64 times more RAM than the Apollo Guidance Computer. Get ready to upgrade your desk's mission control station with a CircuitPython powered Macropad - complete with 12 buttons, OLED display, speaker and rotary encoder.

Customize it for your spacecraft to help guide you through the great reaches of the unknown. (Or just have it type out your favorite emojis.)

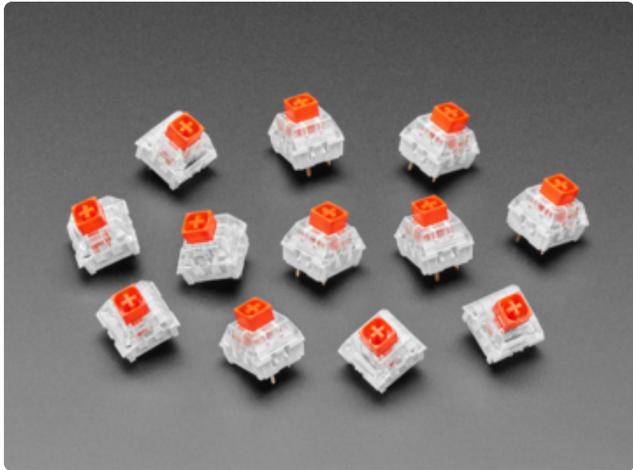
On this interstellar journey, you won't be traveling alone. **Our long-term ADABOX partner Digi-Key is the co-pilot and booster rocket!** Just like a friendly astro mechadroid, they're always there to help us keep the ship running tip-top with plenty of repair parts and tools. Celebrate their contribution to ADABOX with a custom etched keycap that can be used on your Macropad or on any MX-compatible mechanical keyboard!

# In the Box



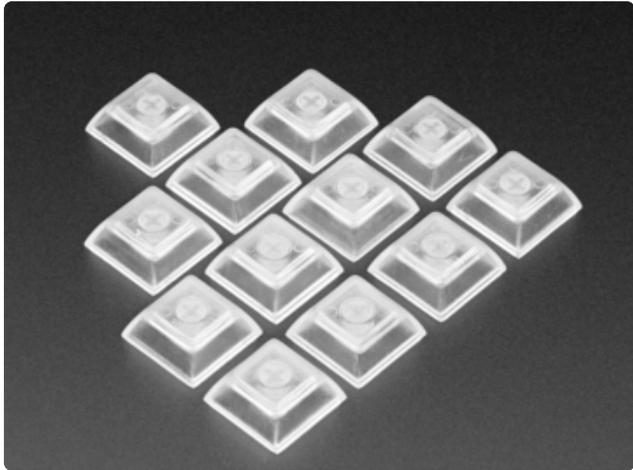
## Adafruit Macropad

A 3x4 customizable keypad that is programmable in CircuitPython. Starring the Raspberry Pi RP2040, this powerful chip can act like a keyboard or MIDI device.



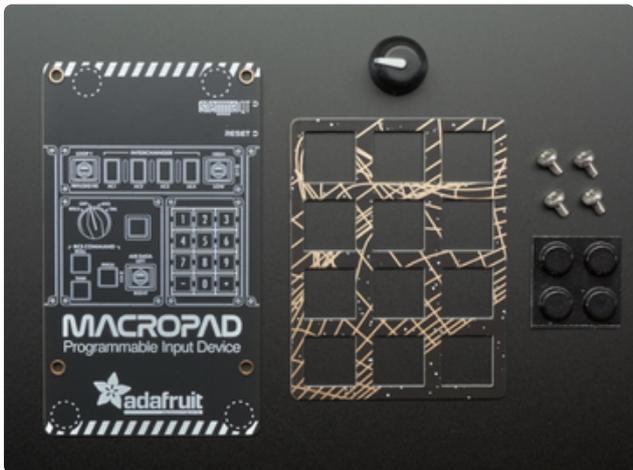
## Kailh Box Red Keyswitches

These are the most common keyswitch style in the known galaxy - with a smooth linear feel. Of course you can replace them with any MX-compatible switches you may have on hand.



## Translucent DSA Keycaps

Snap on top of your keyswitches - since they're translucent, you can light up the Macropad's NeoPixels to get glowy.



## Macropad Top and Bottom Plates

These custom PCBs help keep your Macropad stable, while looking awesome, thanks to a gorgeous space-themed silkscreen.

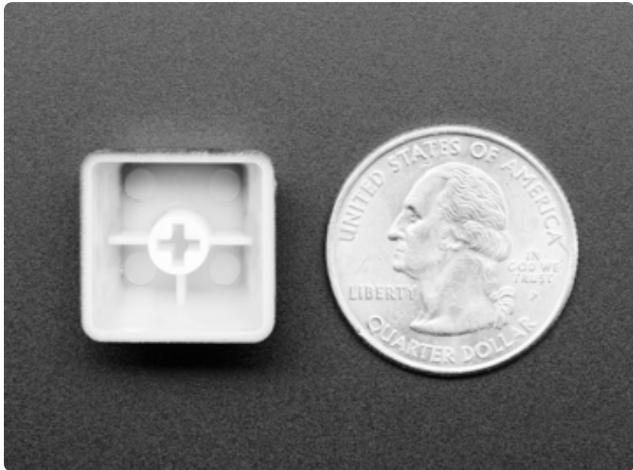
Also included:

- 1 x D-Shaft Skirted Rubber Knob
- 4 x M3 5mm machine screw
- 4 x Rubber feet



## Pink & Purple Woven USB C Cable

This fancy cable will let you connect your Macropad to a computer or laptop



## Custom Digi-Key Keycap

This custom-etched keycap goes onto any MX-compatible mechanical keyboard. If you have an illuminated keyboard you'll see the color glow through the top!

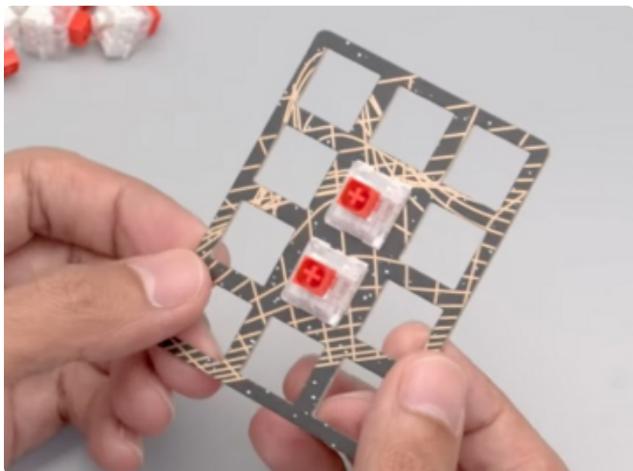
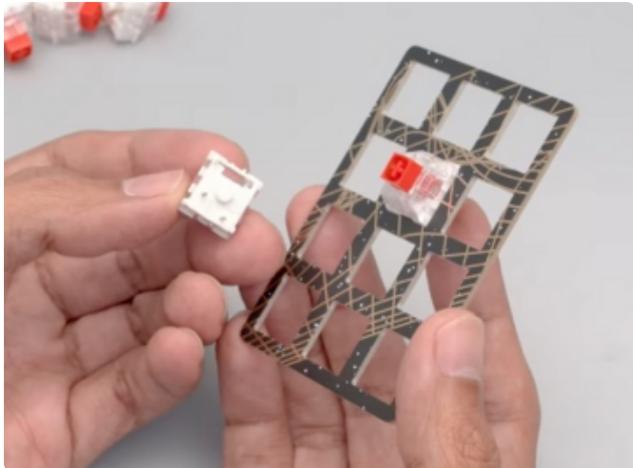


## CircuitPython Space Explorers Sticker

So shiny and space-y! It's Blinka In Space! Slap this on the side of your rocket to let all the other intergalactic travelers you represent! (May not survive re-entry into Earth's atmosphere.)

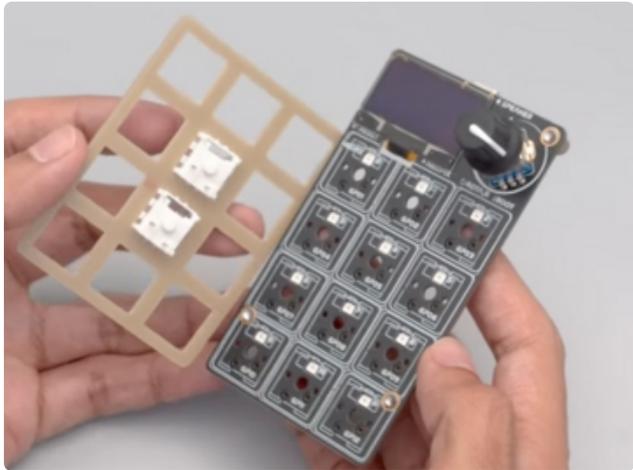
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## Macropad Assembly



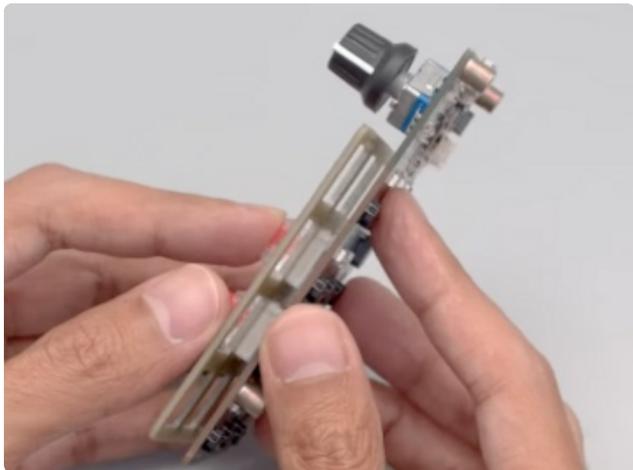
### Switches into Plate

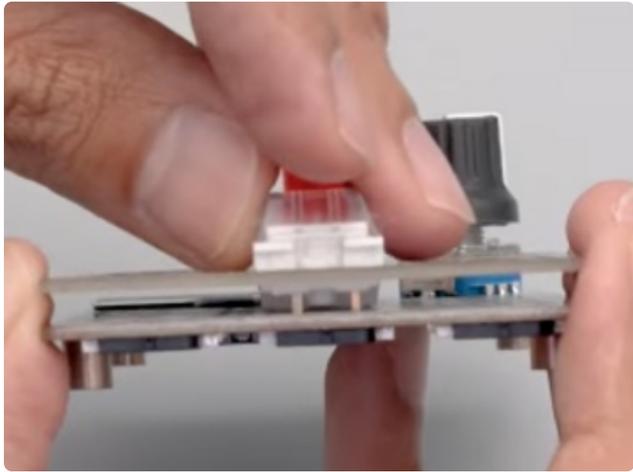
First, insert a couple of keyswitches through the keyswitch plate. The plate mechanically connects the switches to each other, which lends some nice lateral stability to the keys.



## Connect to Board

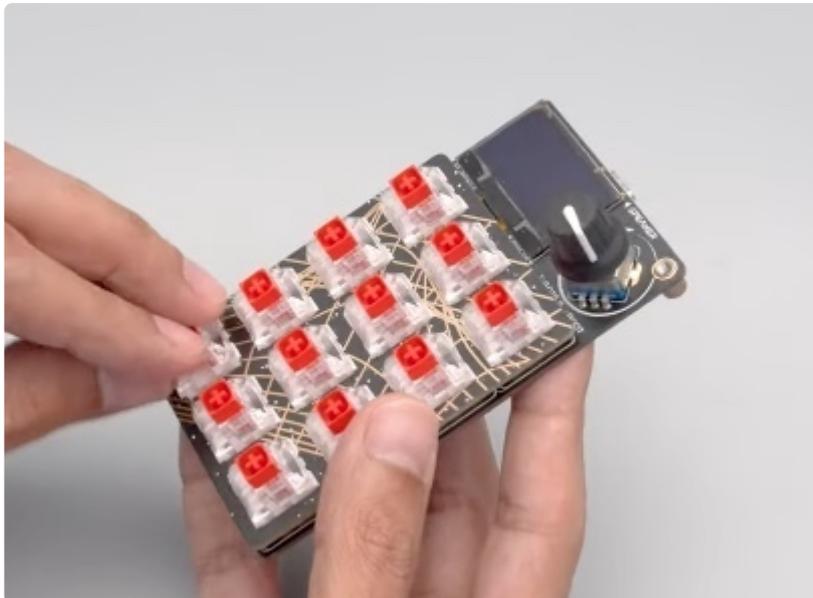
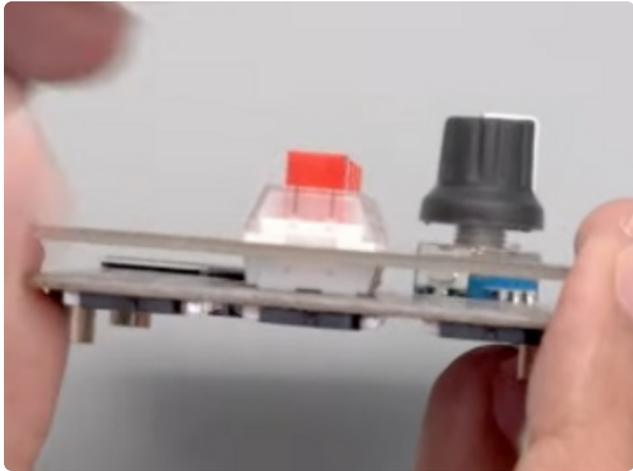
Carefully press the two switches into the switch sockets, being very careful to align the legs so none bend!





## Add Switches

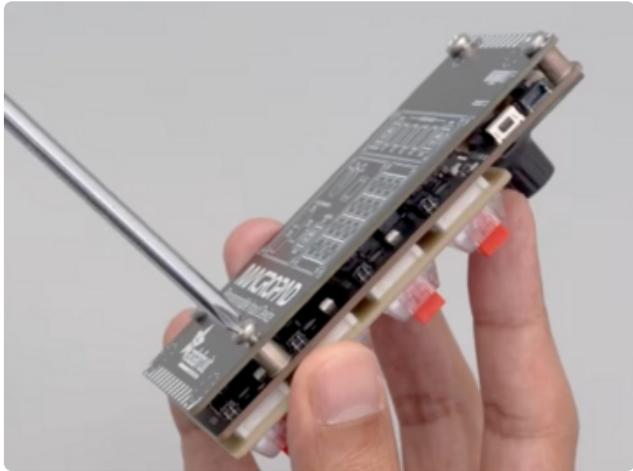
Continue adding switches, being mindful of their orientation.

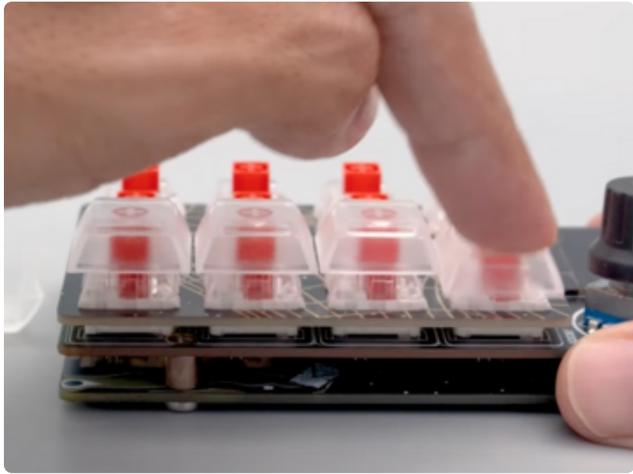




## Backplate

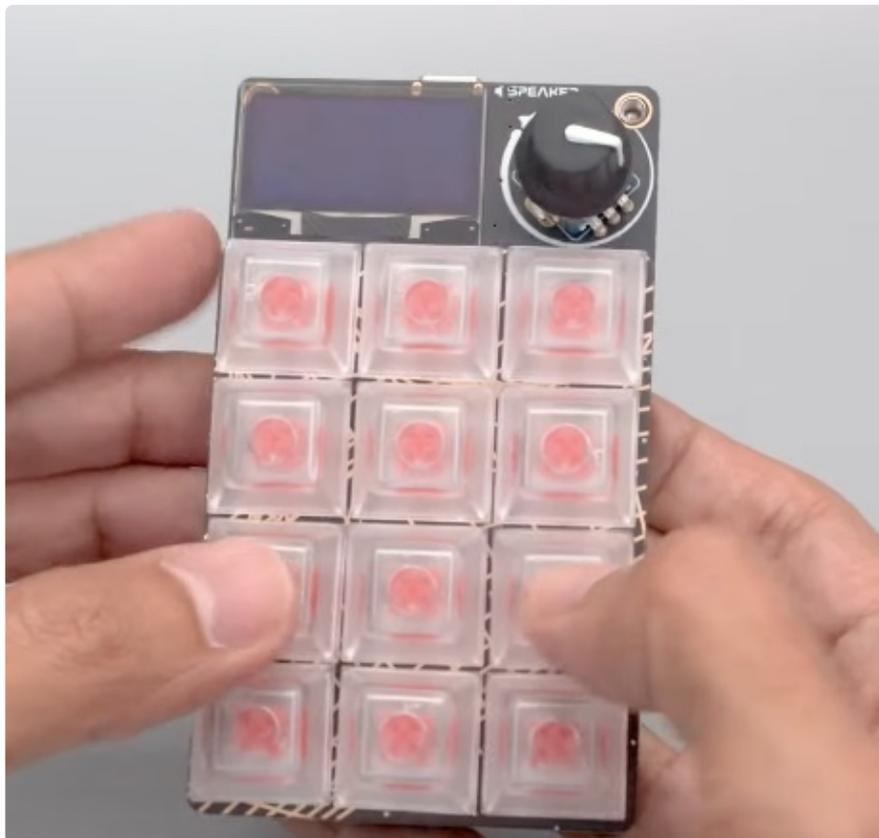
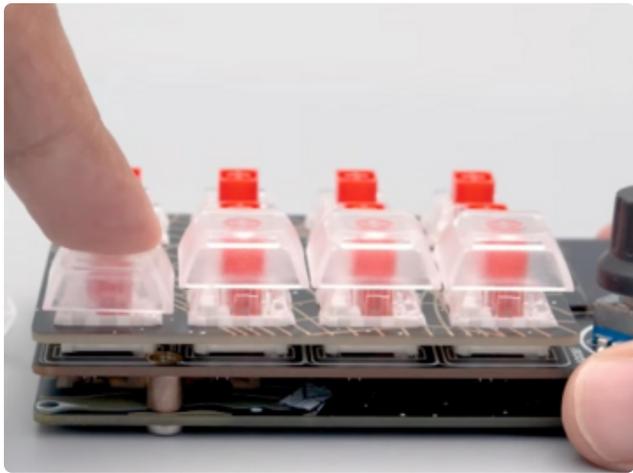
You can add the optional backplate using four M3 x 6mm screws.





## Keycaps

Now, you can add your keycaps! simply press them onto the keyswitch stems until they are fully seated.



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## Adafruit Macropad RP2040

[Adafruit Macropad RP2040 \(https://adafru.it/TJD\)](https://adafru.it/TJD)

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## Macropad Hotkeys

[Macropad Hotkeys \(https://adafru.it/TJE\)](https://adafru.it/TJE)

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## Macropad Olympics

[Macropad Olympics \(https://adafru.it/U8E\)](https://adafru.it/U8E)

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## Ableton Live Macropad Launcher

[Ableton Live Macropad Launcher \(https://adafru.it/TWc\)](https://adafru.it/TWc)

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## 2FA Authentication Friend

[2FA Authentication Friend \(https://adafru.it/TWe\)](https://adafru.it/TWe)

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## Braille Macropad

[Braille Macropad \(https://adafru.it/U9a\)](https://adafru.it/U9a)

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## 3D Printed Stand for Macropad

[3D Printed Stand for Macropad \(https://adafru.it/TKa\)](https://adafru.it/TKa)

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## Keypad and Matrix Scanning in CircuitPython

[Keypad and Matrix Scanning in CircuitPython \(https://adafru.it/TJF\)](https://adafru.it/TJF)

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## Original Firmware

If you're looking for the firmware that shipped on the Adafruit MacroPad in your Adabox 019, you're in luck! Download it below.

Note that this is the code that ships with your Adabox 019, but it also includes the self-test used by Adafruit to set up the MacroPad in the first place, so it's a bit weird. Ignore that part and enjoy the code!

### MacroPad Adabox 019 Firmware

<https://adafru.it/U9B>