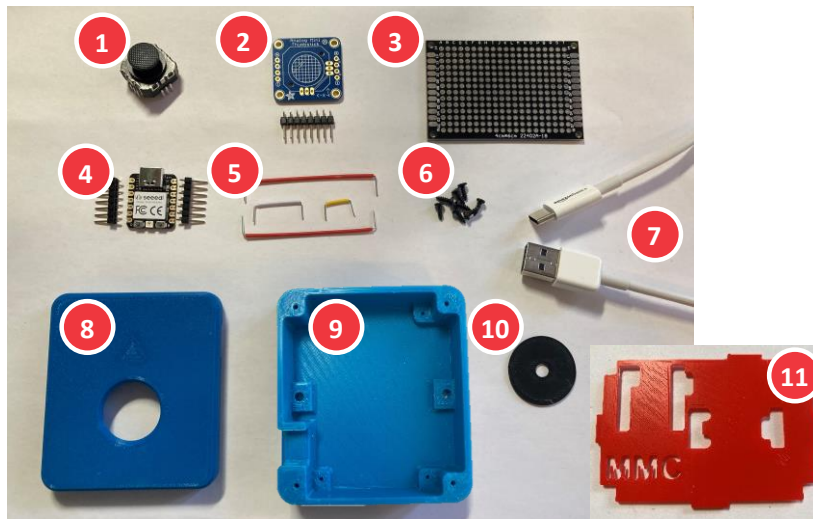


Birch Mini Joystick - U

ASSEMBLY GUIDE

Required Components



BOM

- | | |
|--|-------------------------------------|
| 1. Mini 2-Axis Analog Thumbstick | 6. 8x M2 x 6 mm Self Tapping Screws |
| 2. Analog Mini Thumbstick Breakout Board with Included Male Headers | 7. USB-C Cable – 6 ft |
| 3. Universal Proto-Board PCB 4cm x 6 cm | 8. 3D Printed Enclosure Top |
| 4. SeeedStudio XAIO RP2040 with Included Male Headers (do not use SAMD substitute) | 9. 3D Printed Enclosure Bottom |
| 5. 24 Gauge Wire or Protoboard Jumper Wires | 10. 3D Printed Inner Disk |
| | 11. 3D Printed Overlay |

Optional parts:

- | | |
|--|-----------------------|
| - 3D Printed Joystick Camera Mount Adapter | - 2x M3 x 10mm Screws |
| - ¼-20 Tee Nut | - 2x M3 Nuts |

Required Tools

- Flush Cutters
- Wire Strippers
- Soldering Iron
- Philips Head Screwdriver
- (Optional for mount adapter) ¼-20 Screw or Hex Bolt, at least ½" long

Required Personal Protective Equipment (PPE)

- Safety Goggles

Birch Mini Joystick - U

ASSEMBLY GUIDE

Assembly Instructions

Step 1

Place the 3D printed overlay on the protoboard.

Ensure the text “MMC” is in the same orientation as the text on the protoboard.



3

11

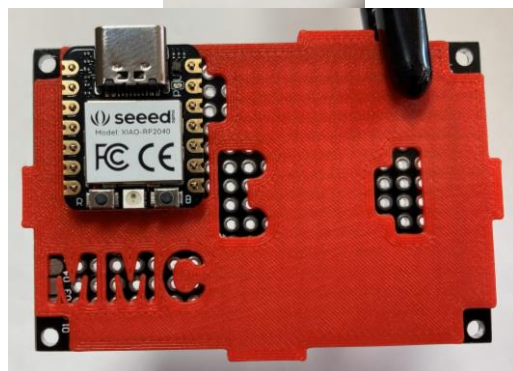
Step 2

Place the two 7 pin male headers on the protoboard through the overlay from the top and place the XIAO microcontroller board on the headers.

Ensure the USB port on the XIAO is oriented towards the nearest edge on the protoboard.



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Birch Mini Joystick - U

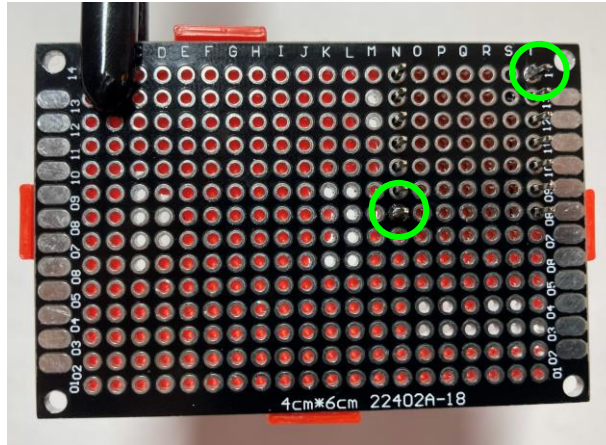
ASSEMBLY GUIDE

Step 3

Solder one pin on each of the headers to the protoboard, ensuring the XIAO microcontroller board remains flat and straight.

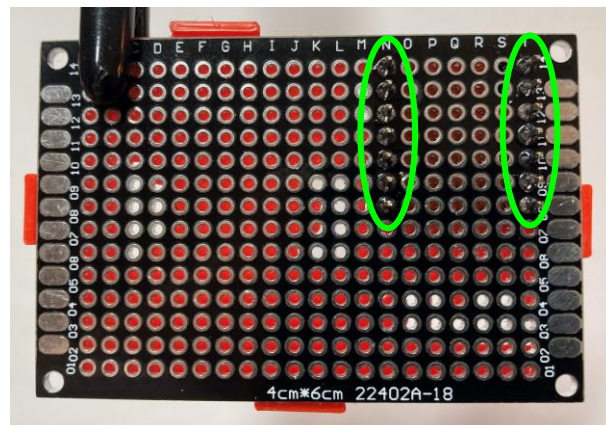
Note: the header pins from the XIAO board should be located at positions N08 – N14 and T08 – T14 (from below).

(This only applies if the numbering on your board matches the photo)



Step 4

Solder the remaining pins from the XIAO board to the protoboard.



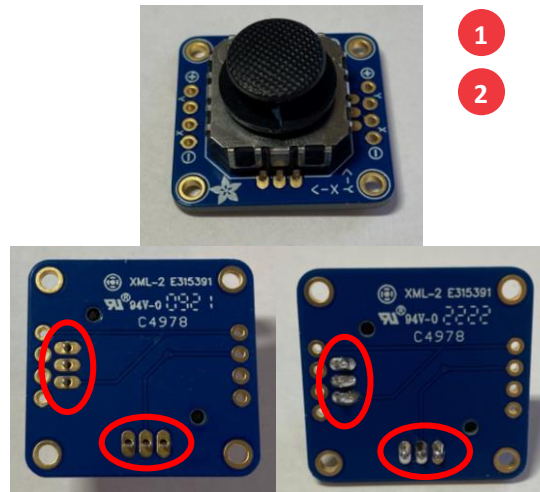
Birch Mini Joystick - U

ASSEMBLY GUIDE

Step 5

Insert the mini 2-axis analog thumbstick into the breakout board.

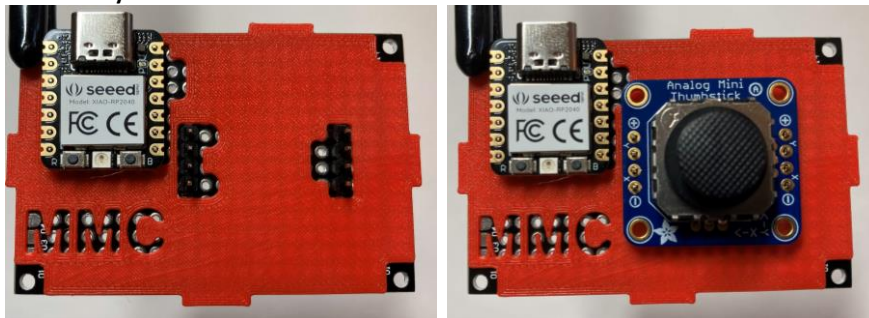
Solder the 6 pins, shown circled in red.



Step 6

Place the two 4 pin male headers on the protoboard through the overlay and place the joystick breakout board on the headers. If you have an 8 pin male header, gently break apart into two 4 pin headers, and then place headers onto the protoboard.

Ensure the breakout board is text side up and the text is in the same orientation as the text on the overlay.



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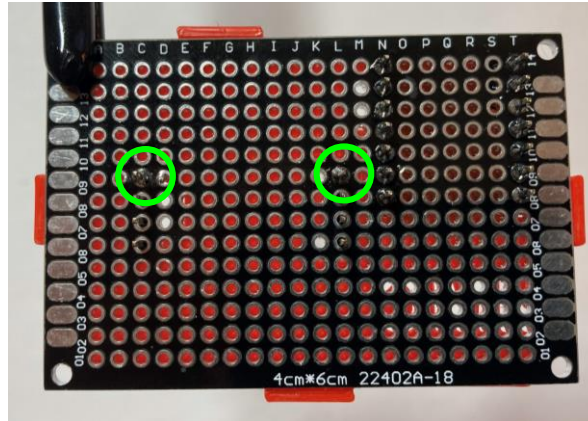
ASSEMBLY GUIDE

Step 7

Solder one pin on each of the headers to the joystick breakout board, ensuring the board remains flat and straight.

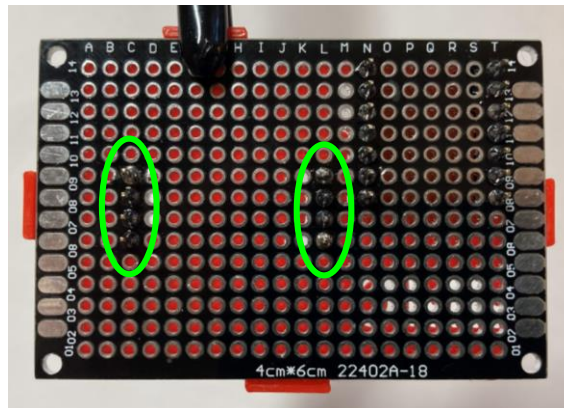
Note: the header pins from the joystick breakout board should be located at positions C06 - C09 and L06 - L09 (from below).

(This only applies if the numbering on your board matches the photo)



Step 8

Solder the remaining pins from the joystick breakout board to the protoboard.

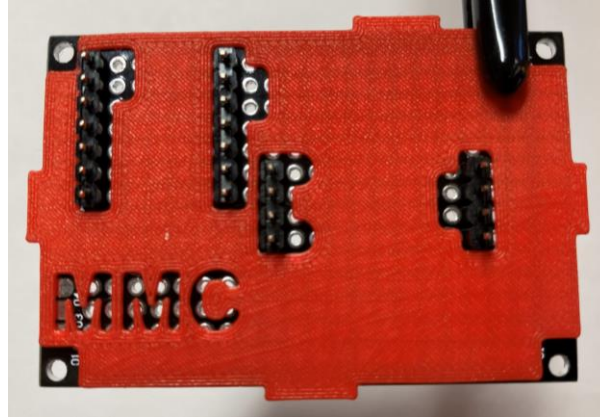


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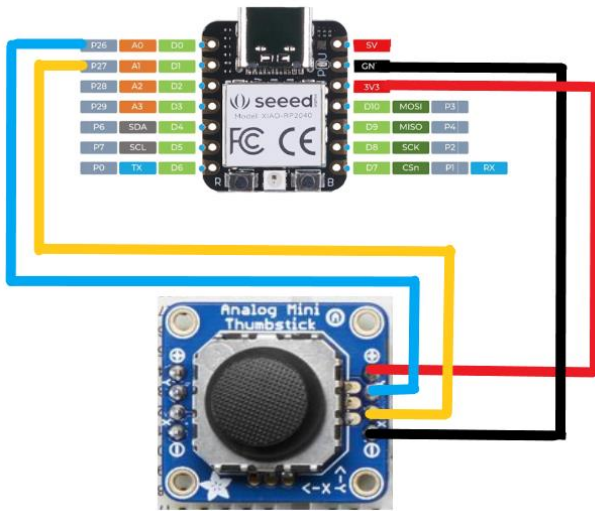
Step 9

Flip the board around and remove the joystick breakout board and the XIAO board from the headers.



Wiring

For the next steps, this is the overall wiring diagram.



Seeed XIAO board	Joystick breakout board
3v3	+
GND	-
D0	Y
D1	X



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Files available at <https://github.com/makersmakingchange/Birch-Mini-Joystick>

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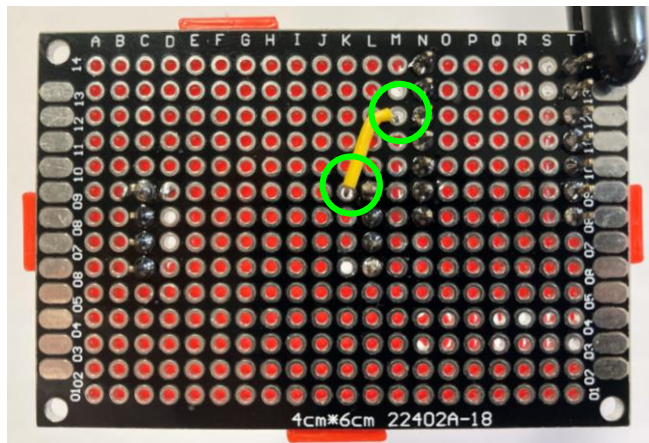
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Step 10

Insert a wire from hole M12 to hole K09.

NOTE: All hole positions are in reference to the bottom of the board.

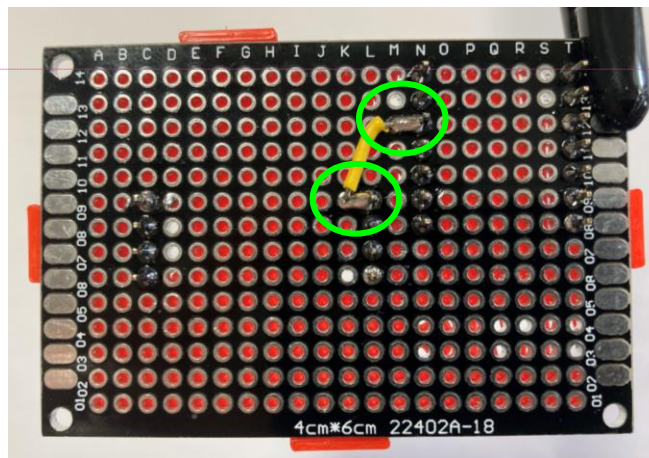
If the numbers and letters on your protoboard don't match this photo go from the holes next to: Joystick board, right header, top pin TO XIAO board, left header, 3rd pin from top.



Step 11

Solder the wire in place and create solder bridges from the wire ends to the adjacent pins. From M12 to N12, from K09 to L09.

If the numbers and letters on your protoboard don't match this photo, go from your new wire to the pin directly to the right.



Commented [JV1]: Bridges are hard, think of another way to do this

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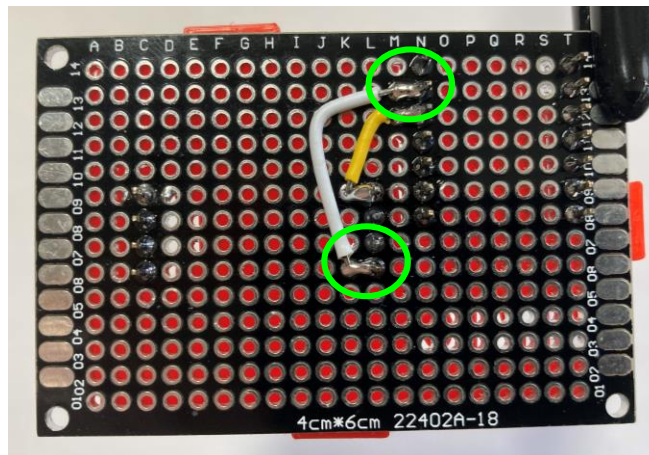
ASSEMBLY GUIDE

Step 12

Insert a wire from M13 to K06.

Solder the wire in place and create solder bridges from the wire ends to the adjacent pins. From M13 to N13 and from K06 to L06.

If the numbers and letters don't match this photo go from the holes to the left of: Joystick board, right header, bottom pin TO XIAO board, left header, 2nd pin from top.

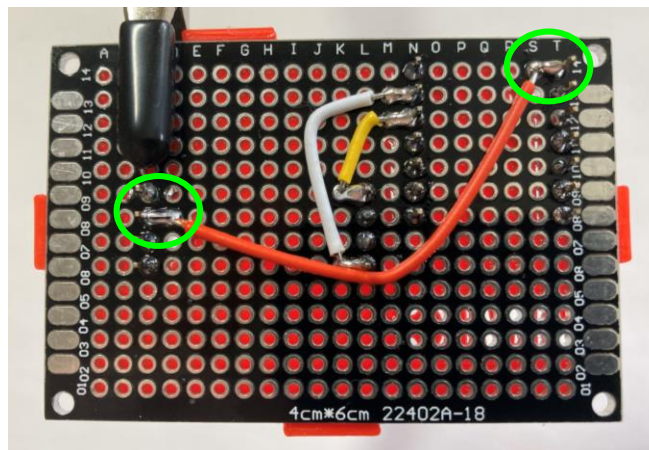


Step 13

Insert a wire from S14 to D08.

Solder the wire in place and create solder bridges from the wire ends to the adjacent pins. From S14 to T14 and from D08 to C08.

If the numbers and letters don't match this photo go from the holes next to: Joystick board, left header, 2nd pin from top TO XIAO board, right header, top pin.



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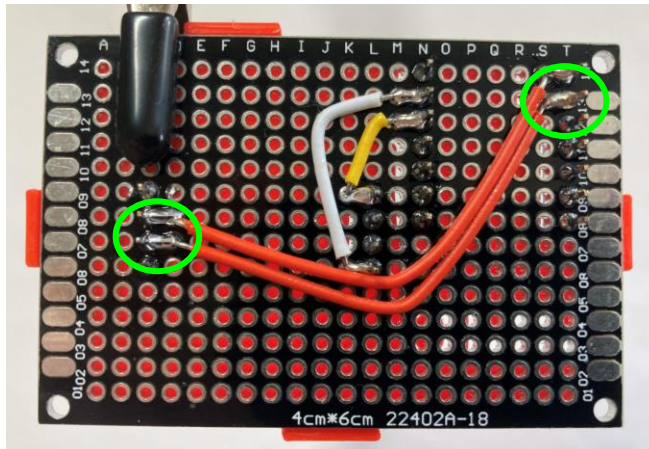
ASSEMBLY GUIDE

Step 14

Insert a wire from S13 to D07.

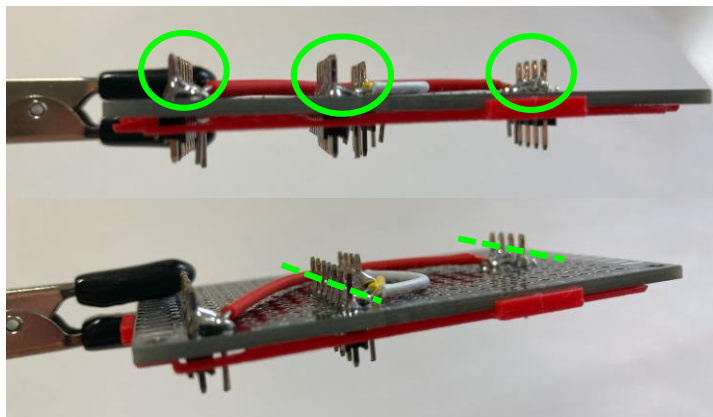
Solder the wire in place and create solder bridges from the wire ends to the adjacent pins. From S13 to T13 and from D07 to C07.

If the numbers and letters don't match this photo go from the holes next to: Joystick board, left header, 3rd pin from top TO XIAO board, right header, 2nd pin from top.



Step 15

On the bottom of the board, trim the header pins for both the joystick board and the XIAO board, as shown circled in green.



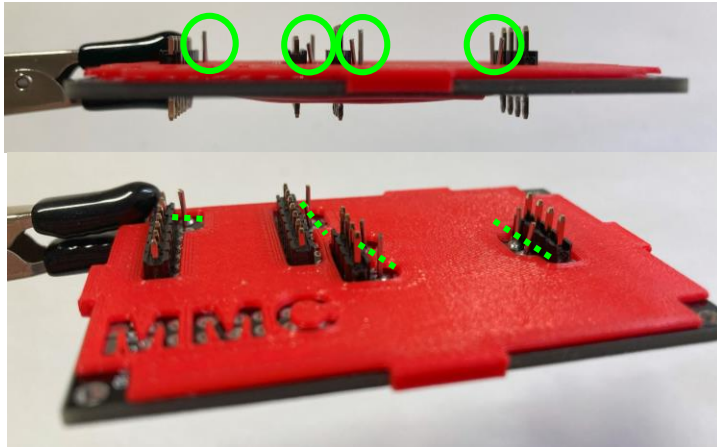
Birch Mini Joystick - U

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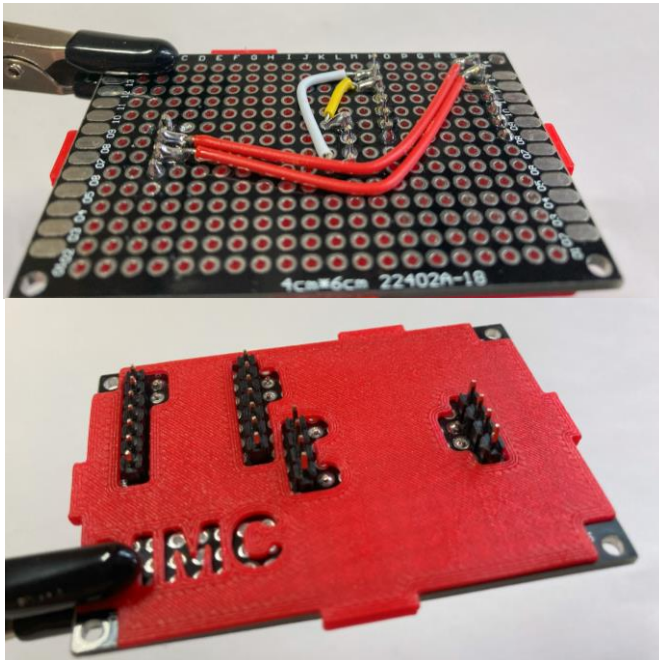
Step 16

On the top of the board, trim the extra length from the jumper wires, as shown circled in green.

Do not trim the male headers on the top of the board.



Below is how the board should look once the wires and bottoms of headers are trimmed.



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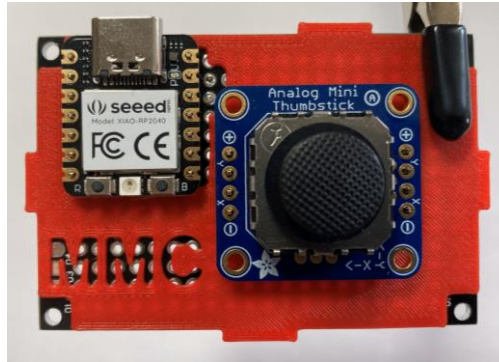
Step 17

If you wish to re-use the 3D printed overlay you may remove it, or it may be left on.

Place the XIAO microcontroller board and the joystick breakout board onto their respective headers.

Ensure the USB port on the XIAO is oriented towards the nearest edge on the protoboard.

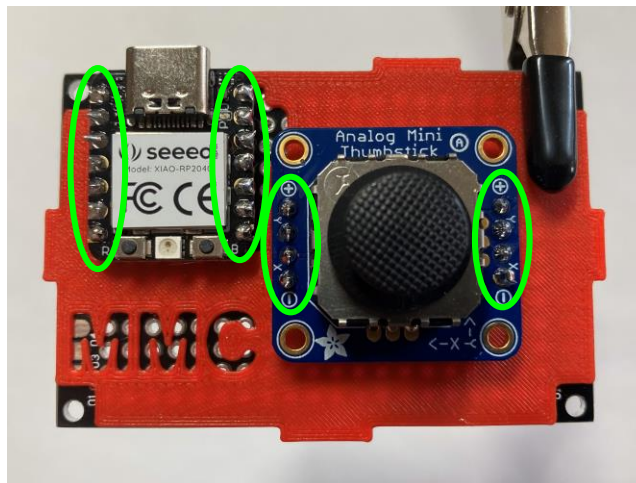
Ensure the text on the joystick board is in the same orientation as the text on the overlay/protoboard.



Step 17

Solder the XIAO microcontroller board and the joystick breakout board to their headers.

Ensure the boards stay flat while soldering.

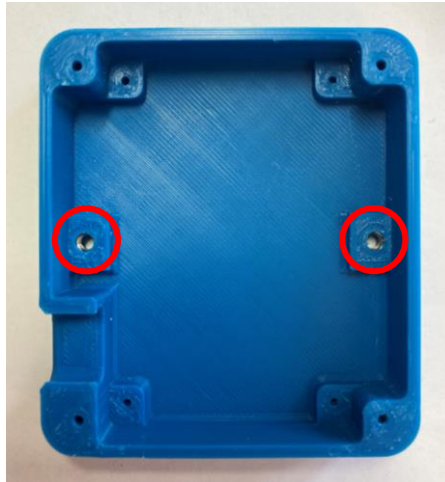


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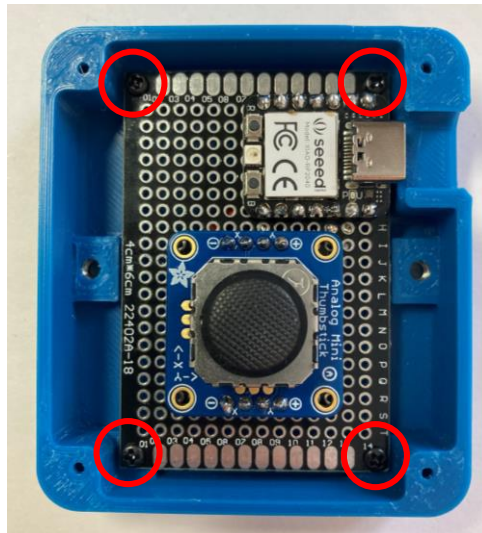
Step 18 – Optional

If mounting the joystick (not using on a tabletop) and using a mount adapter, take the two M3 nuts and slide them into the slots inside the enclosure as shown.



Step 19

Take the protoboard and the bottom of the 3D printed enclosure and insert M2 screws in each of the four corners of the board, as shown circled in red.



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Step 20

Remove the joystick topper.

Place the 3D printed inner disk on the joystick, around the joystick post.

Replace joystick topper.



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Note: if the joystick is difficult to move after this step, sand down the inner cover disk so it is smooth and does not have bumps or zits.

Step 21

Place the 3D printed enclosure lid on top of the enclosure base.



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Step 22

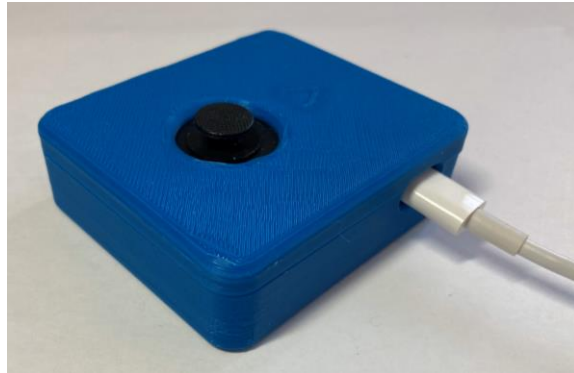
Flip the joystick around and insert an M2 screw into each of the 4 screw holes circled in red and tighten them.



6

Step 23

Plug the USB C cable into the joystick, and proceed to programming the joystick.



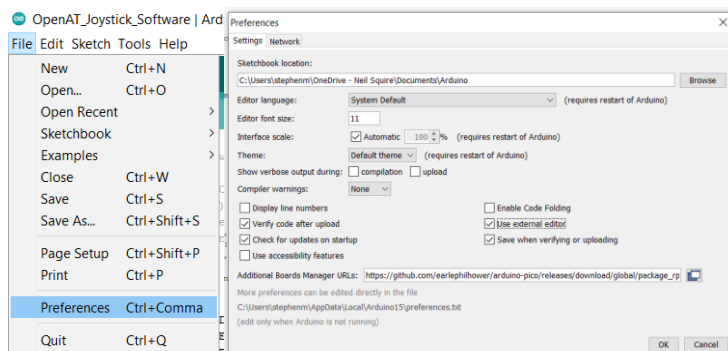
Birch Mini Joystick - U

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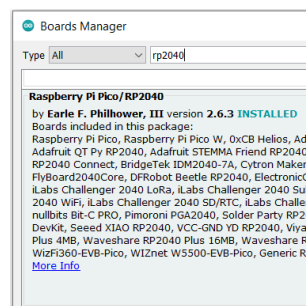


Programming instructions

1. Setup Arduino IDE
 - 1.1. Download Arduino IDE for your operating system at <https://www.arduino.cc/en/software>
 - 1.2. Install Arduino IDE
2. Setup Core
 - 2.1. Open Arduino IDE
 - 2.2. Click on **File -> Preferences**
 - 2.3. Locate the text field that says **Additional Boards Manager URLs** beside it.
 - 2.4. Copy and paste the following link into the field as a new line: https://github.com/earlephilhower/arduino-pico/releases/download/global/package_rp2040_index.json



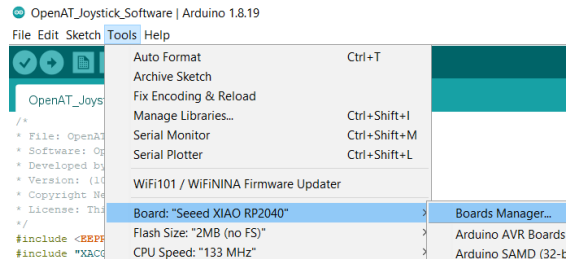
- 2.5. Click on **OK**
- 2.6. Restart the Arduino IDE
- 2.7. Open the **Boards Manager** option from the **Tools-> Board-> Boards Manager...**, search for "Seeed Xiao" and select the package called "Raspberry Pi Pico/RP2040" by Earle F. Philhower, III



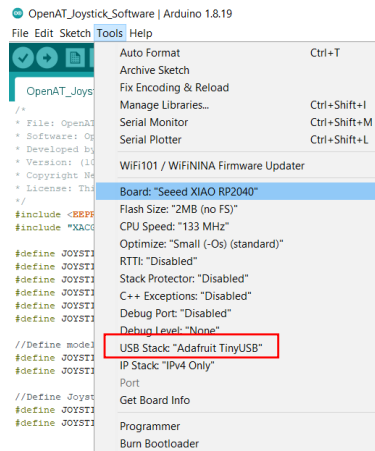
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2.8. Select **Seeed XIAO RP2040** from **Tools -> Board -> Raspberry Pi RP2040 Boards** menu.



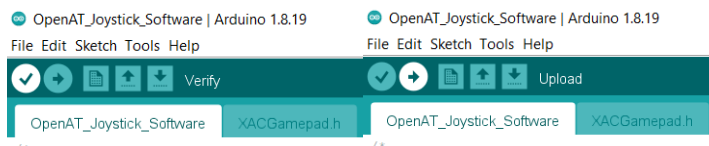
2.9. Click on **Tools -> USB Stack** and select **Adafruit TinyUSB**



More Information: <https://wiki.seeedstudio.com/XIAO-RP2040-with-Arduino/>

3. Upload the Code to the joystick

- 3.1. Open OpenAT_Joystick_Software_Birch.ino with Open Arduino ID.
- 3.2. Select **Seeed XIAO RP2040** from **Tools -> Board -> Raspberry Pi RP2040 Boards** menu.
- 3.3. Connect the joystick using the USB cable to the computer.
- 3.4. Select the correct port from **Tools -> Port** menu.
- 3.5. Verify and upload the code.



Birch Mini Joystick - U

ASSEMBLY GUIDE

Testing

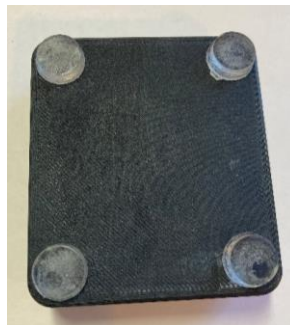
1. Connect the joystick using the USB C cable to the computer.
2. If using Windows, open “Set up USB Game Controllers” from the Control Panel. You can find this by searching your computer in the search bar next to the Windows icon.
3. Ensure that the joystick is registered as a game controller and select your joystick from the list and go to “Properties”.
4. Move your joystick and observe the movement of the cross hatch in the “Axes” window. Ensure it moves in the proper directions when you move the joystick (the arrow points in the up direction). If not, open the joystick and check your connections.

Commented [JV2]: Maybe move testing to before it is screwed together, but would have to move programming too. Maybe do programming before build?

Optional – Mounting

Table Top Mounting – Non-Slip Pads

If using the joystick on a tabletop, and height of the joystick is not a concern, nonslip pads can be added in each of the four corners on the bottom, as shown.

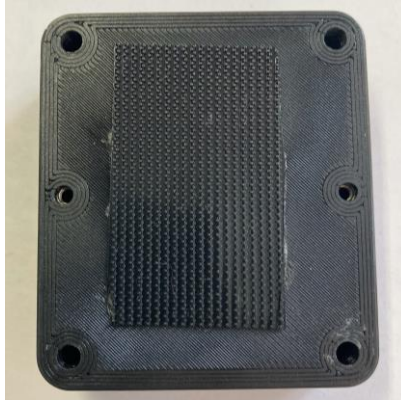


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Table Top Mounting – Hook and Loop Fastener

If using the joystick on a tabletop or other surface with hook and loop fasteners, such as Velcro, stick the hook side (rough side) to the joystick and the loop side (soft side) to the surface to mount to.



Camera Mount

To mount the joystick on a camera mount, the optional Joystick Camera Mount Adapter can be used.

Step 1

Flip the camera mount adapter around to reveal the recess with small slots.

Ensure all supports are removed from the 3D print.



Step 2

Insert the tee nut, lining up the barbs with the small slots in the 3D print.

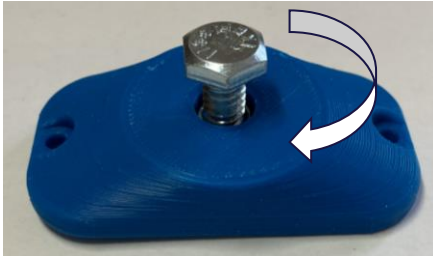


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Step 3

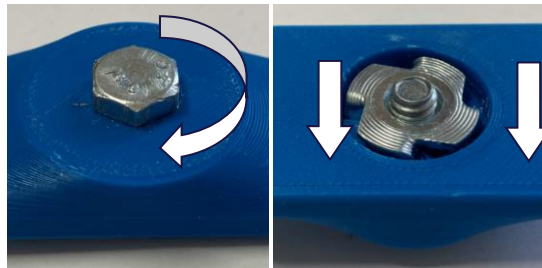
Flip the part around and screw in a ¼-20 hex bolt.



Step 4

Tighten the bolt until the tee nut is seated down as far as possible.

(Alternatively, if you do not have access to a bolt, the tee nut may be press fit as long as it sits flush with the 3D print.)



Step 5

Using 2 M3 screws, screw the camera mount adapter to the bottom of the joystick in the two middle holes.

