

# PicoBoy Build Guide



Created by HalloSpaceBoy

# Before You Build:

Make sure that you have every part included in the kit. They are listed below:

- 1x ST7789 Display
- 1x Raspberry Pi Pico
- 1x PicoBoy PCB
- 4x Diode
- 9x Button
- 1x Speaker
- 2x Slide Switch
- 1x 3xAAA Battery Holder
- 8 M3x6mm Hex Screws

Also make sure that you have these tools/materials for building the PicoBoy:

- A Soldering Iron (Pencil/Chisel Tip)
- Solder
- 1x Spool of 22 AWG Solid Core Wire
- 3D Printed Casing
- Flush Cutters
- Screwdriver (M3 Hex Bit)

If you want/need to, use these in the process of building the PicoBoy:

- Desoldering Wick (Optional)
- Kapton Tape (Optional)
- Flux (Optional)
- Tweezers (Optional)
- Multimeter (Optional)

Make sure that you have downloaded the PicoBoy Software Package from the [Github](#).

TLDR: Make sure you have the parts that you need, make sure you have the tools you need, make sure you have the software you need.

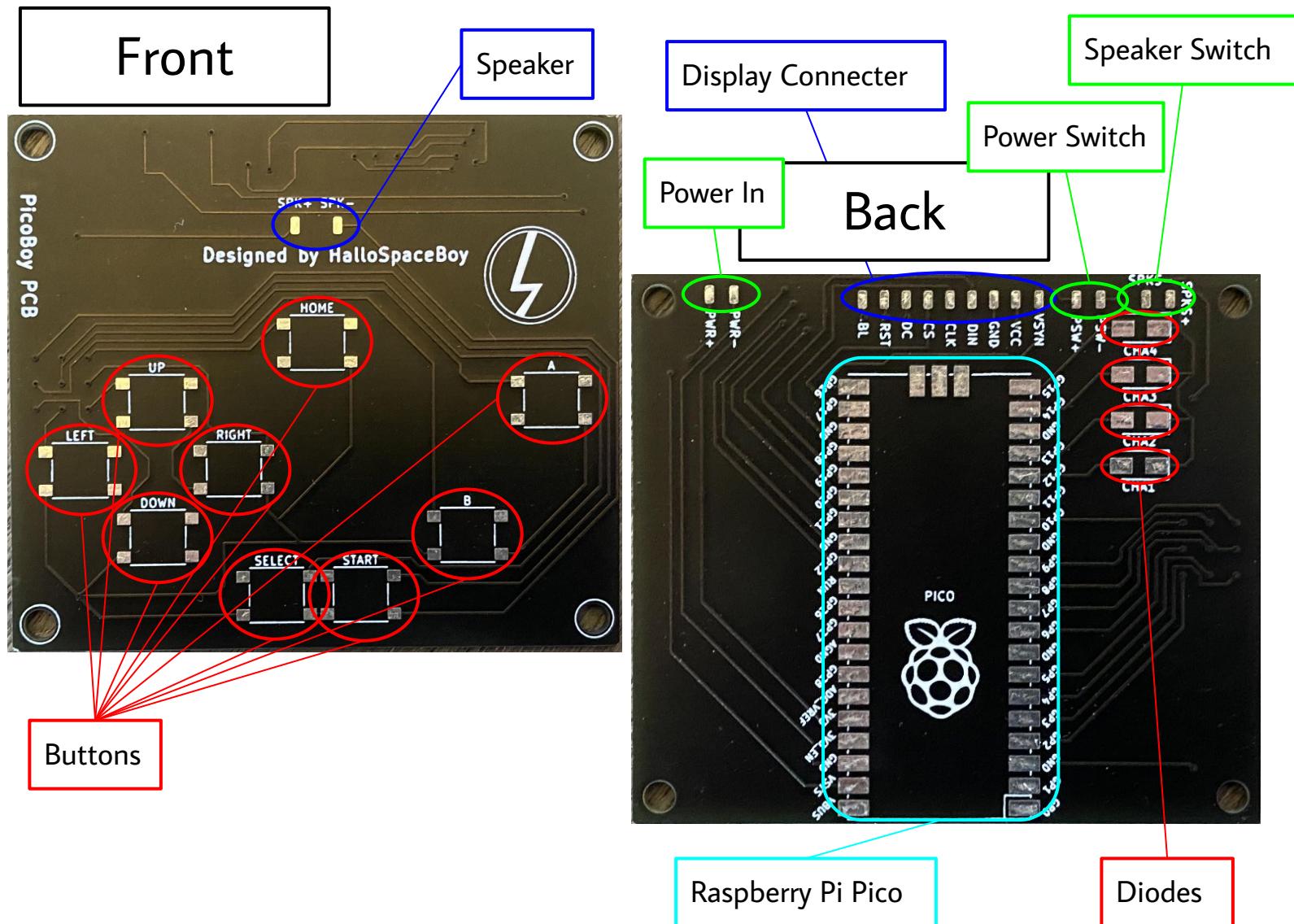
Do not worry about your skill! This is a relatively easy kit to assemble and program. I recommend a snack while you build it (It takes a little while). If you are having trouble, check back on the instruction you are on. If you are really having trouble, reach out on the [discord server!](#)

**Good Luck!**

# Recommended Tools and Parts:

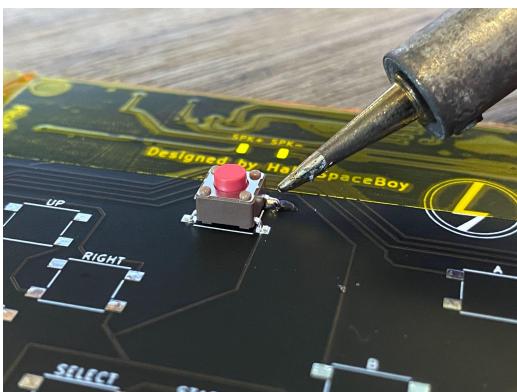
Soldering Iron: <https://www.amazon.com/Weller-Digital-Soldering-Station-WLC100/dp/B000AS28UC/>  
Soldering Flux: <https://www.amazon.com/AMTECH-NC-559-V2-TF-clean-free-tacky-hand-soldering/dp/B09NXCPNN3/>  
Desoldering Wick: <https://www.amazon.com/Lesnow-No-Clean-Desoldering-Removal-Dispenser/dp/B094GZ6CPZ/>  
Solder: <https://www.amazon.com/MAIYUM-63-37-Solder-Electrical-Soldering/dp/B075WB98FJ>  
Kapton Tape: <https://www.amazon.com/Polyimide-Tape-Temperature-Electrical-Application/dp/B07HB81Q4L>  
Wire: <https://www.amazon.com/TUOFENG-Hookup-Wires-6-Different-Colored/dp/B07TX6BX47>

## Where the Parts Go:

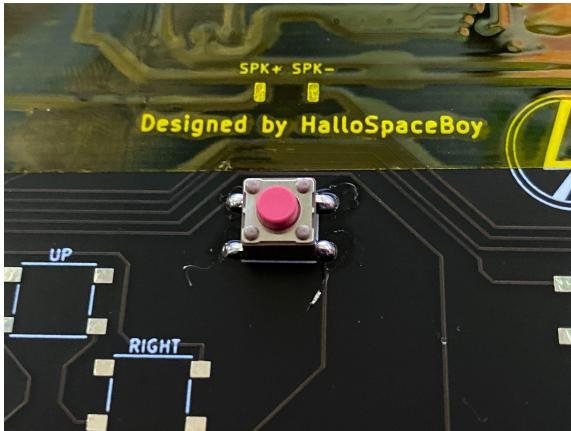


# Step 1: Solder the Buttons

1: Secure the button in place by soldering one leg to a pad on the PicoBoy PCB:



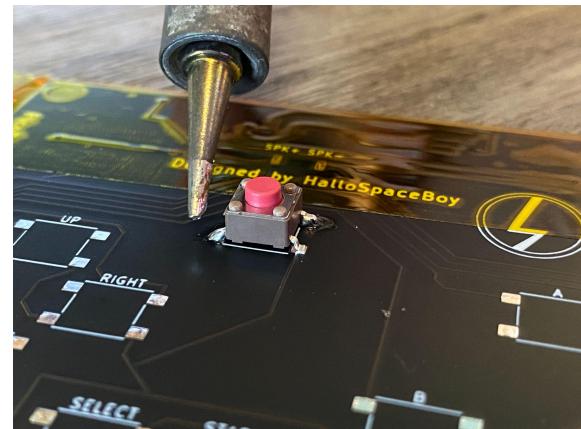
3: Now solder the rest of the legs to their pads:



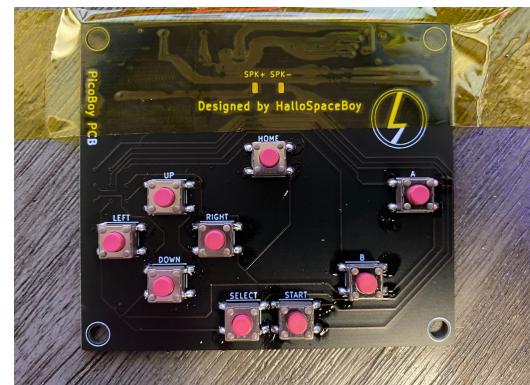
Tip: When soldering the start and select buttons, make sure there are no bridged pads. If you are having trouble, use desoldering wick to remove some solder.

Tip: For better looking joints, use flux. It will make the joints look perfect!

2: After that, solder the leg opposite the soldered one to its pad:



4: If your board looks like this, great job! You can now move on to the next step!



(Do these steps 9 times!)

# Step 2: Solder the Speaker

1: Start by applying a bead of solder to each speaker pad:



3: After that, solder the black wire to the pad labeled "SPK-":



Tip: To make the speaker's connection more secure, you can stick the wires down with kapton tape.

Note: The color of the wire and the specific pad matters a lot. With incorrect wiring, the speaker will not work properly.

2: Then, solder the red wire of the speaker to the pad labeled "SPK+":

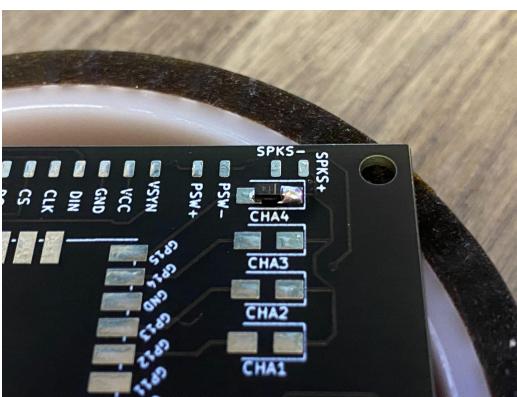


4: If your board looks like this, great job! You can now move on to the next step!

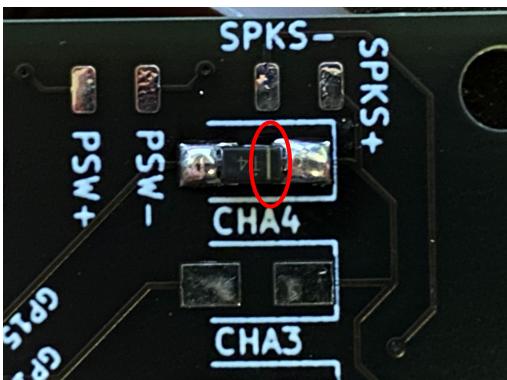


# Step 3: Solder the Diodes

1: Start by tinning one of the pads, then secure one leg of the diode with the solder on the pad:



**IMPORTANT! MAKE SURE THE DIODES ARE ORIENTED WITH THE LINE ON THE RIGHT!**



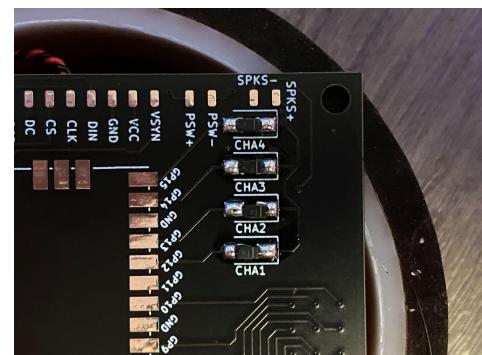
Tip: Use tweezers to position the diodes, they are very small so be careful. If you burn or lose one, there should be 1 backup diode in the kit.

Tip: You can test your soldering with a multimeter. Switch the multimeter into continuity mode. Touch the red wire to the left of the diode and the black wire to the right. If the multimeter beeps, you have installed it correctly.

2: After that, solder the second leg to its pad:



3: If your board looks like this, great job! You can now move on to the next step!



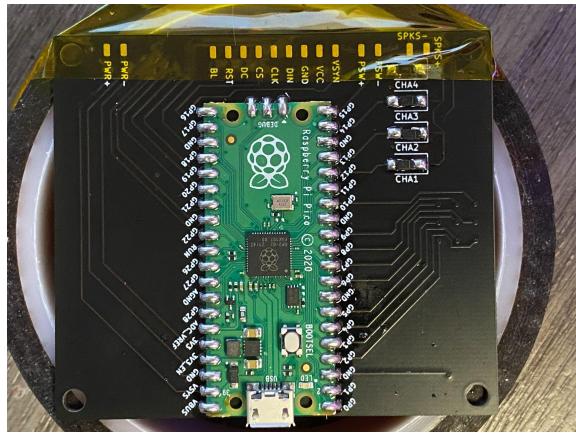
(Do these steps 4 times!)

# Step 4: Solder the Pico

1: To solder the Pico, you need to first align it. Align the Pico with the pads on the PCB so that each contact touches a pad. Make sure that the USB port is facing down Secure with kapton tape. It should look like this:

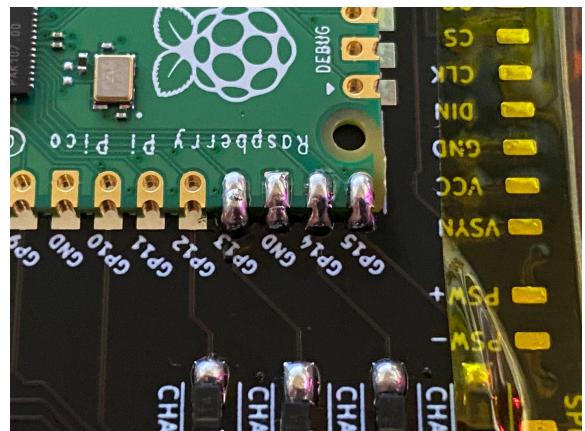


3: If your board looks like this, great job! You can now move on to the next step!



Note: This step is very difficult to undo, even with the magic of desoldering wick. Be very careful while aligning and soldering in this step.

2: Once aligned and taped, solder every pad and contact together. Make sure there are no bridges. The joints should look like this:



Tip: Drag the soldering iron from the top of the contact to the bottom of the pad while applying solder to get good joints.

# **Step 5: Prepare the Casing**

Preparing the case is simple. All you need to do is sand down the button holes until each button can fall into place with gravity. After preparing the buttons, you have the option of sanding the casing to make it smoother. This is not necessary, but it adds a little bit of niceness to the console. In preparation for the next step, place all of the buttons in their holes. Once finished, the inside of your case should look like this:

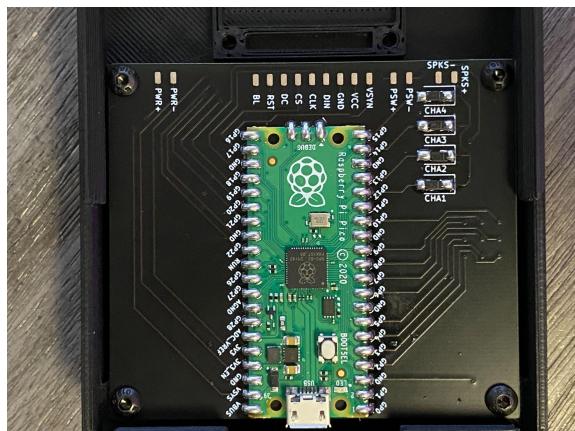


# Step 6: Seat the PCB

1: Place the PCB so that the PCBs holes are aligned with the four holes in the bottom of the case. Make sure the Pico's USB port is facing down:



3: If your board looks like this, great job! You can now move on to the next step!



Note: Make sure the speaker is taped inside of the hole with grills. If you don't do this, the speaker will sound weak and tinny.

2: Take four of the screws and secure the PCB with them. Make sure you don't screw them in too tight. If you do the case may crack or the buttons might not click right:



Note: Screwing the screws in is slightly more difficult because the case is 3D printed. If you can't seem to get the screws in, try using more force.

# Step 7: Seat the Screen

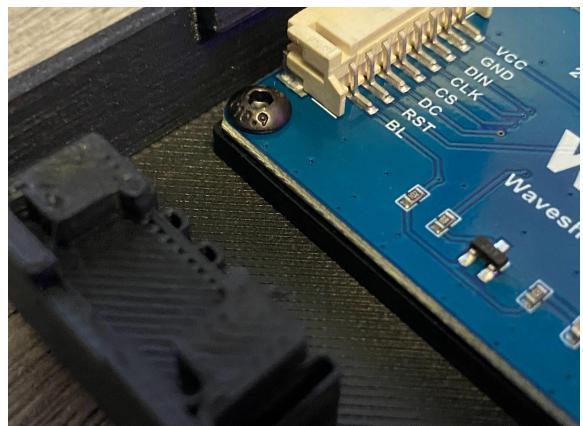
1: Place the screen in the upper-seat in the casing. Make sure that all of the screw holes are aligned:



Note: Make sure to remove the protective film over the screen.

2: Take another four screws and begin securing them into all four screw holes of the screen. Take care not to screw the screws in too tight or the screws will begin to poke through the casing:

3: If your board looks like this, great job! You can now move on to the next step!



Note: Screwing the screws in is slightly more difficult because the case is 3D printed. If you can't seem to get the screws in, try using more force.

# Step 8 (Part 1): Solder the Screen

## Preface:

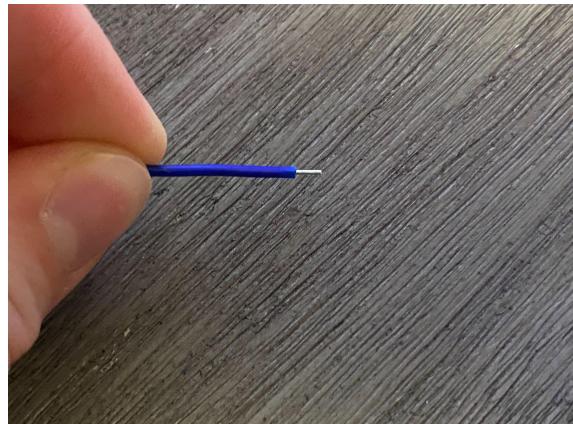
The process of connecting the screen to the PCB is complicated, make sure you follow each step carefully. When connecting the screen, please ignore the "VSYN" pad. It is useless. DO NOT CONNECT IT TO THE SCREEN! Each well on the screen should have the same label as a pad on the board. To connect the screen, you will need to execute these steps 7 times for each hole on the display:

1: fill the solder well in the display with solder:



Note: Do not insert too much wire or the wire will melt into the casing and become stuck

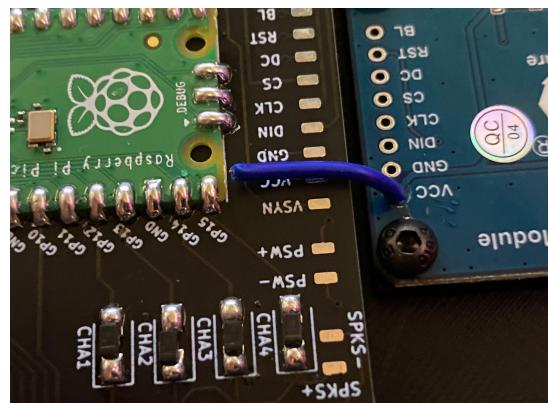
2: Expose 1-2 mm of wire with the flush cutters:



3: While keeping the entire well melted, insert the exposed part of the wire into the hole:



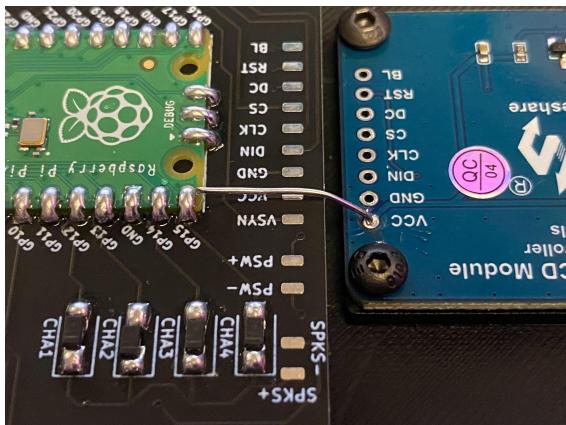
4: Bend the wire over the pad that it is supposed to connect to and trim:



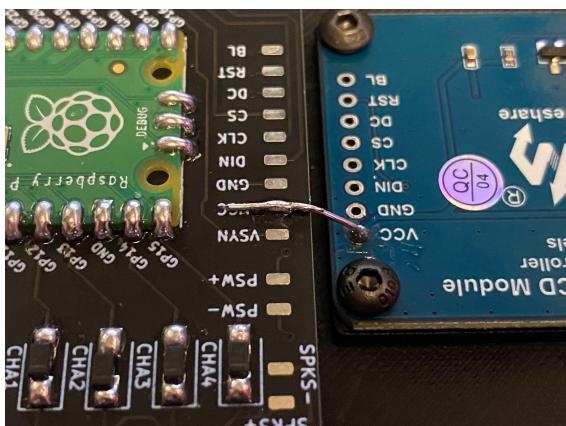
# Step 8 (Part 2): Solder the Screen

Optional: Remove the whole assembly from the casing and trim off any excess wire protruding from the bottom of the screen.

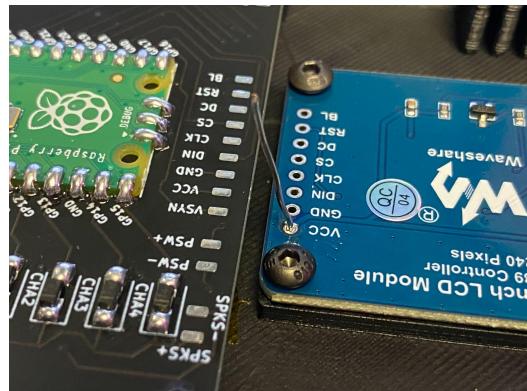
6: Bend the exposed wire onto the pad it is supposed to connect to:



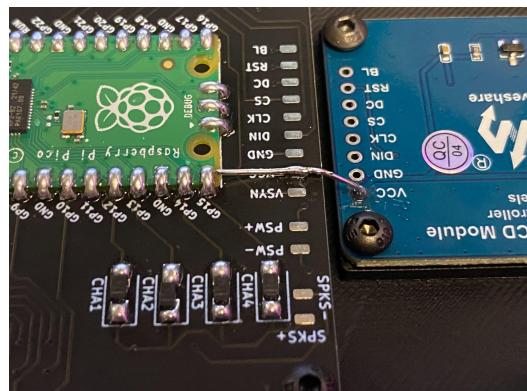
8: Trim off the excess wire:



5: Straighten the wire and pull off the casing:



7: Solder the wire to the pad that it is bent over:



If your board looks like this, great job! You can now move on to the next step!



# Step 9: Solder the Switches

1: Place the switch into it's well in the case and tape it down:

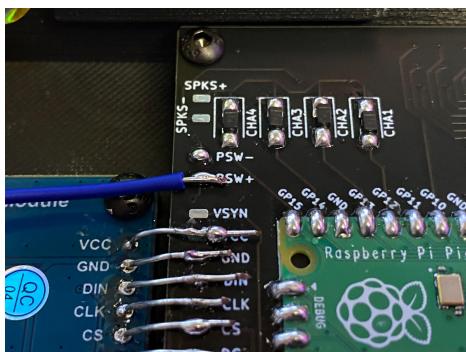


Tip: Don't trim a new wire segment until you have routed the wire to its pad. This makes for better wire routing.

2: Solder the end of a wire to the top pin of the switch:



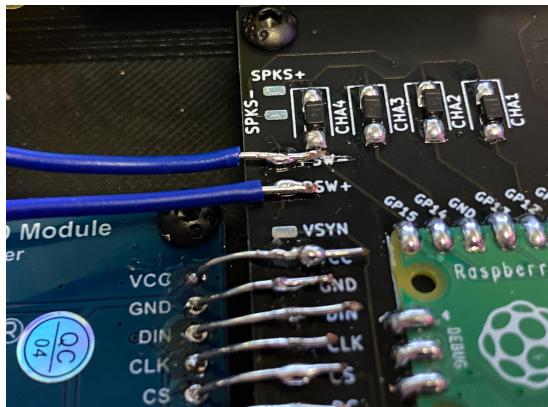
3: Route the wire to the corresponding pad on the PCB and solder (Top pin goes to +, Middle Pin goes to -):



4: Solder the end of a wire to the middle pin of the switch:



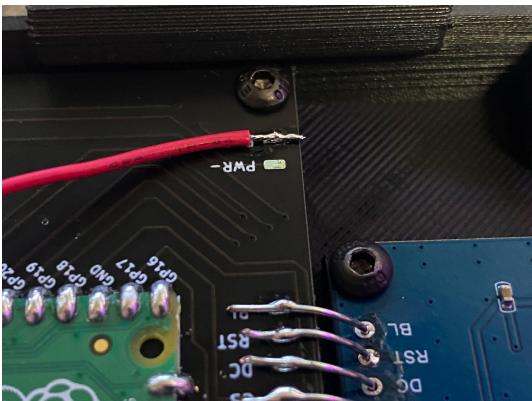
5: Route the wire to the pad that corresponds to the other on the PCB:



(Do these steps 2 times for each switch!)

# Step 10: Solder the Battery

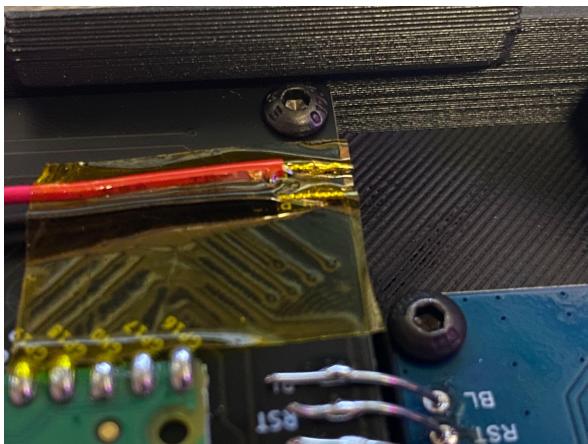
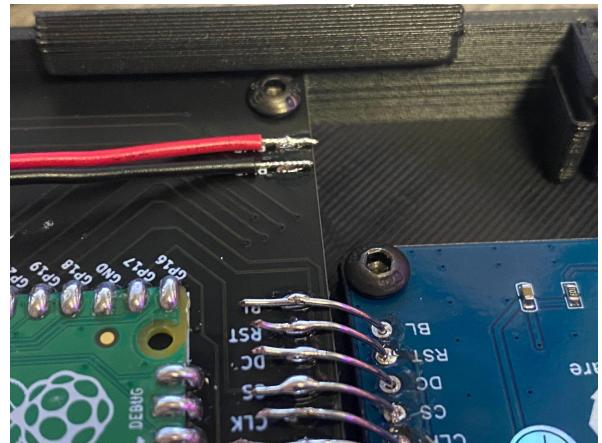
1: Solder the RED wire on the battery holder to the "PWR+" pin:



**IMPORTANT! MAKE SURE THE WIRES ARE IN THE CORRECT ORDER!  
ANYTHING ELSE CAN DAMAGE THE CONSOLE!**

Tip: Solder the power wires against the PCB and tape them down to make sure they don't loosen.

2: Solder the BLACK wire on the battery holder to the "PWR-" pin:



Tip: Don't keep the batteries in the holder while soldering the holder to the PCB

3: Slot the battery holder into the back of the casing with the wires in the wire spacer:



# LEVEL CLEAR!

Now that you are done with building, you can close your PicoBoy by snapping the two halves of the shell together. You can then add batteries and insert the battery cover.

You have now successfully assembled the PicoBoy! Sadly, your games are in another castle. It is time to begin testing and flashing your console!

Thank you maker!

But our games are in another castle!

# Flash the OS

1: Download the latest release of micropython from this [link](#):

## Firmware

### Releases

v1.19.1 (2022-06-18).uf2 [Release notes] (latest)  
v1.18 (2022-01-17).uf2 [Release notes]  
v1.17 (2021-09-02).uf2 [Release notes]  
v1.16 (2021-06-18).uf2 [Release notes]  
v1.15 (2021-04-18).uf2 [Release notes]  
v1.14 (2021-02-02).uf2 [Release notes]

### Nightly builds

v1.19.1-996-g783ddfc26 (2023-04-04).uf2  
v1.19.1-1002-gf34af3e42 (2023-04-04).uf2  
v1.19.1-1001-g11b5ee0d7 (2023-04-04).uf2  
v1.19.1-995-g0a3600a9a (2023-03-31).uf2

3: While holding down the button labeled "BOOTSEL", plug the other end of the cable into the Pico:

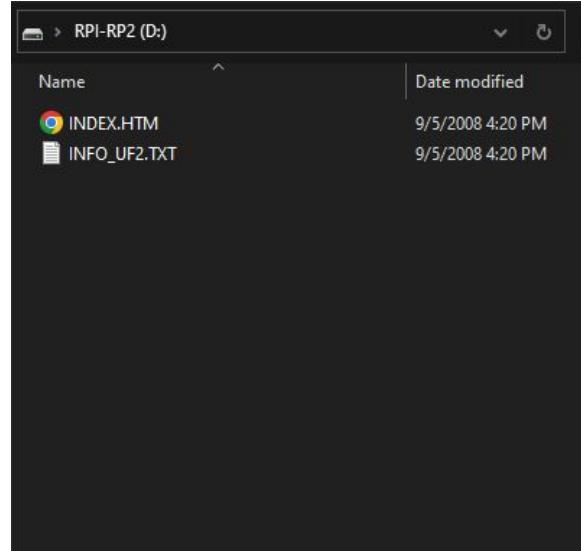


Note: Make sure you are holding the button down WHILE you plug the Pico in.

2: Plug the USB end of the USB cable into your PC:

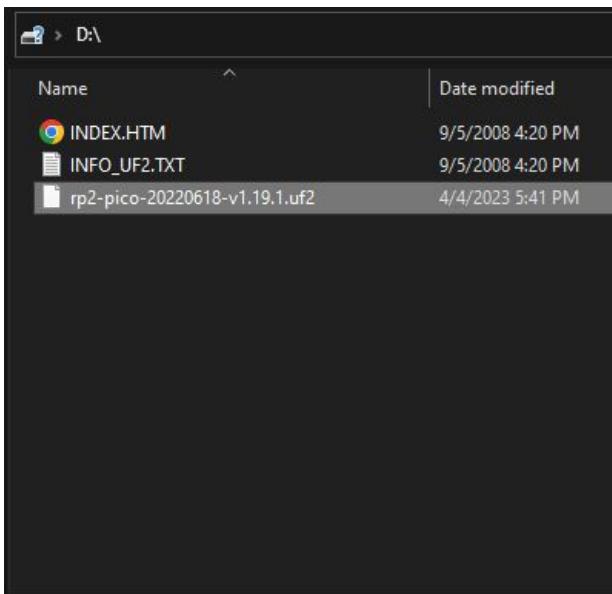


4: If a drive called "RPI-RP2" mounts, you have completed these steps correctly:



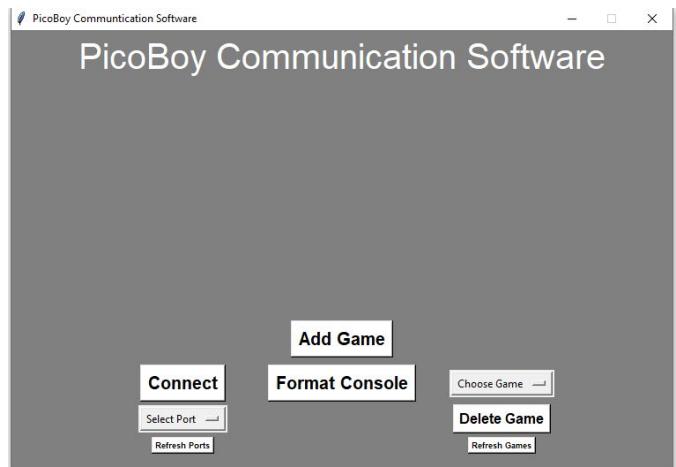
# Flash the OS

5: Copy the previously downloaded file onto the drive. It should immediately eject itself:

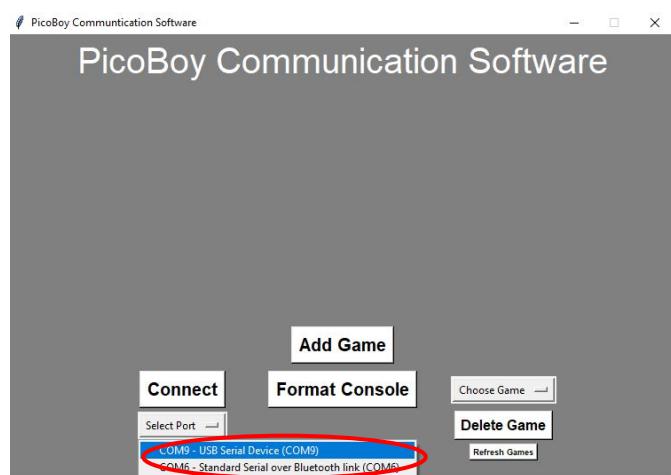


Note: Windows will flag the program as "suspicious". I promise it is not.

6: Open the software package and run "PicoBoy Communication Software.exe" (I promise it isn't a virus, I wrote it myself):

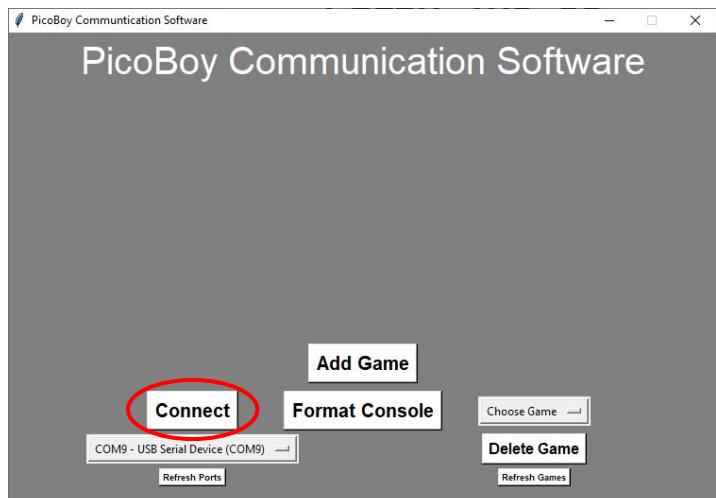


7: Click "Select Port", a list should appear. Click the option that says "USB Serial Device":



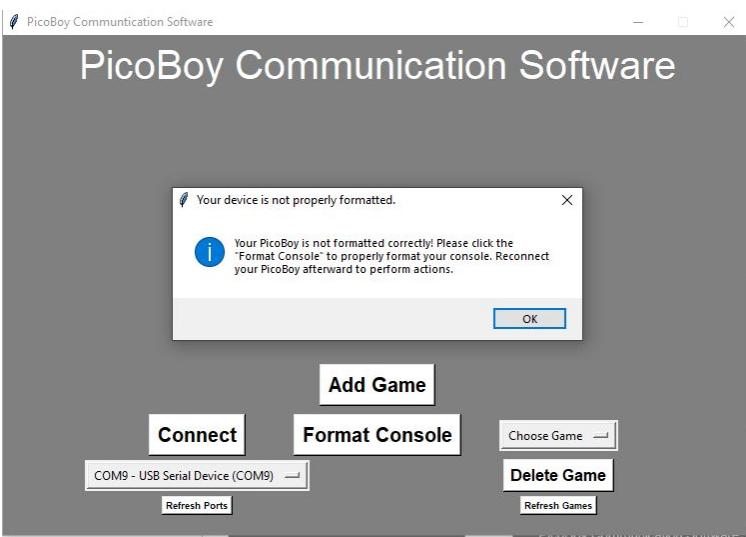
Note: Keep the Pico plugged into your PC the whole time.

8: Click "Connect". If you receive an error, consult the user guide:

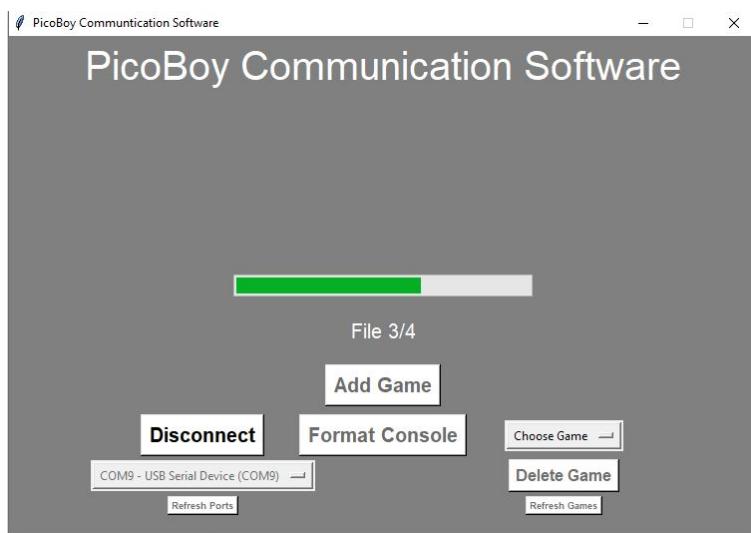


# Flash the OS

9: Upon connecting, you will get this notification. Don't worry, we will fix this, click "OK":

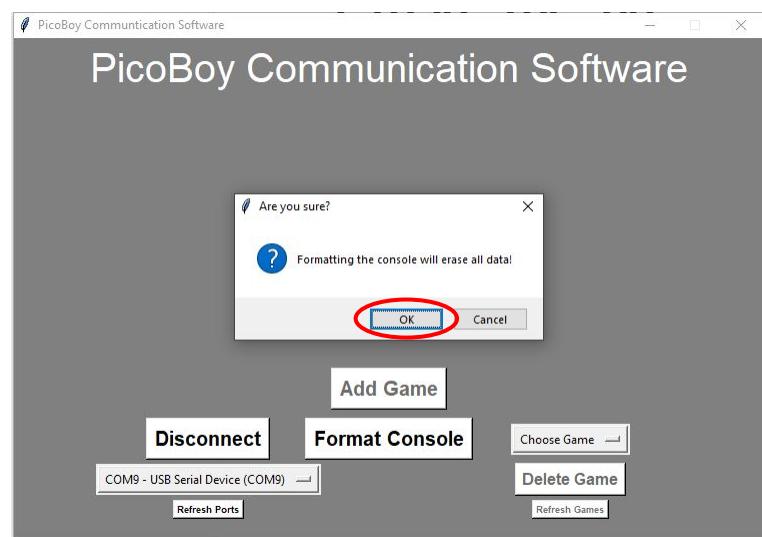


11: The program will pause for a bit, then a loading bar should appear. Wait for all of them to complete:

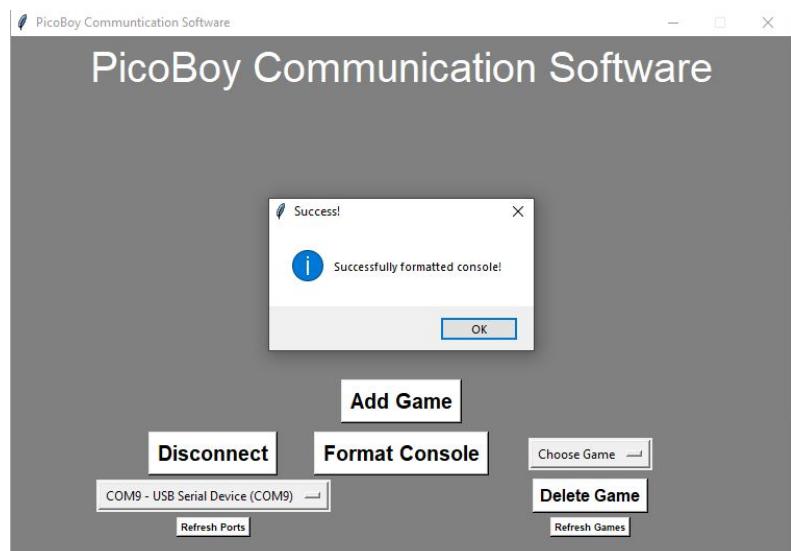


Note: If you receive an error message while flashing, consult the user guide. If all else fails, ask in the [discord](#).

10: Click "Format Console". You will get a warning that looks like this, click "OK":



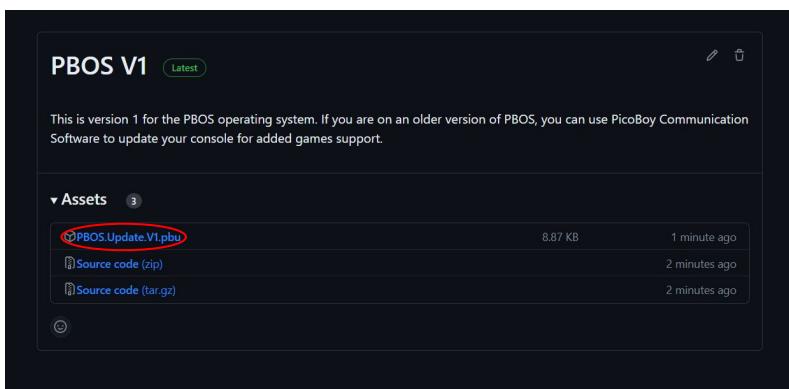
12: Once you receive this message, you did it! Your PicoBoy is successfully flashed!



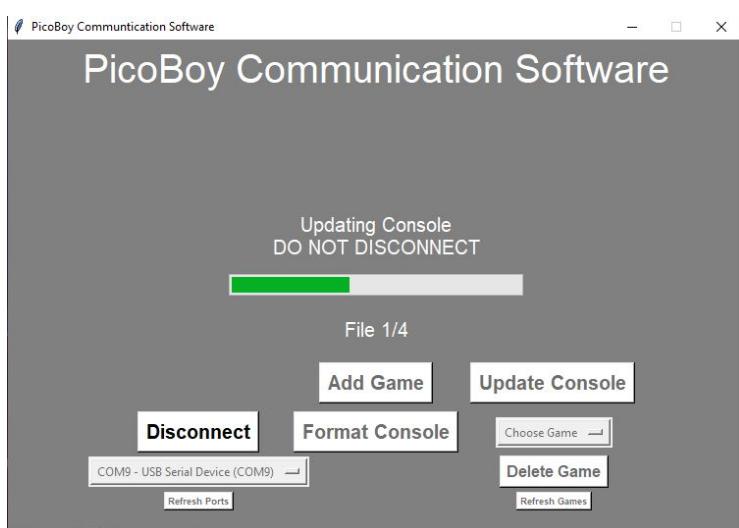
# Update the OS

You may or may not need to do this, it depends on your version of the PicoBoy OS

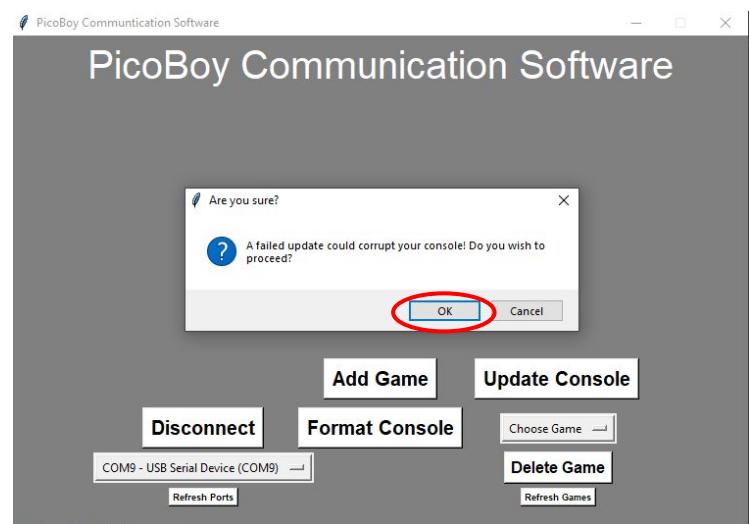
1: Download the latest update from the GitHub [here](#). It will have the file extension ".pbu"



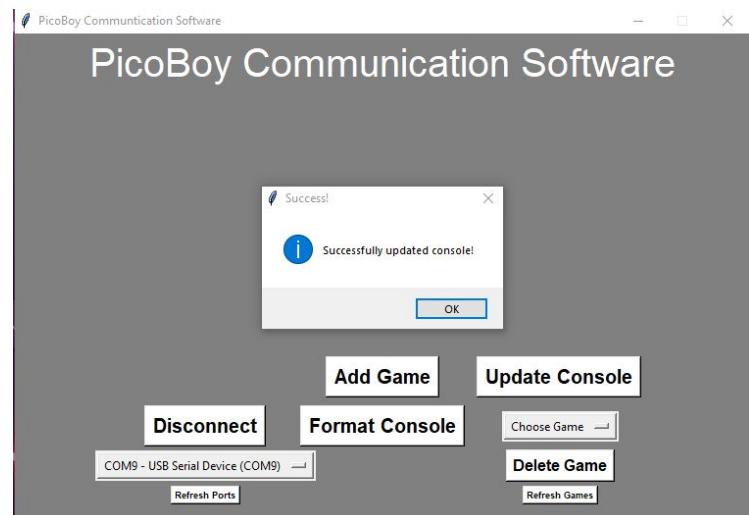
3: The program will pause for a bit, then a loading bar should appear. Wait for all of them to complete:



2: Click the "Update Console" button. When prompted, click "OK". Afterwards, select the ".pbu" file and click "OK":



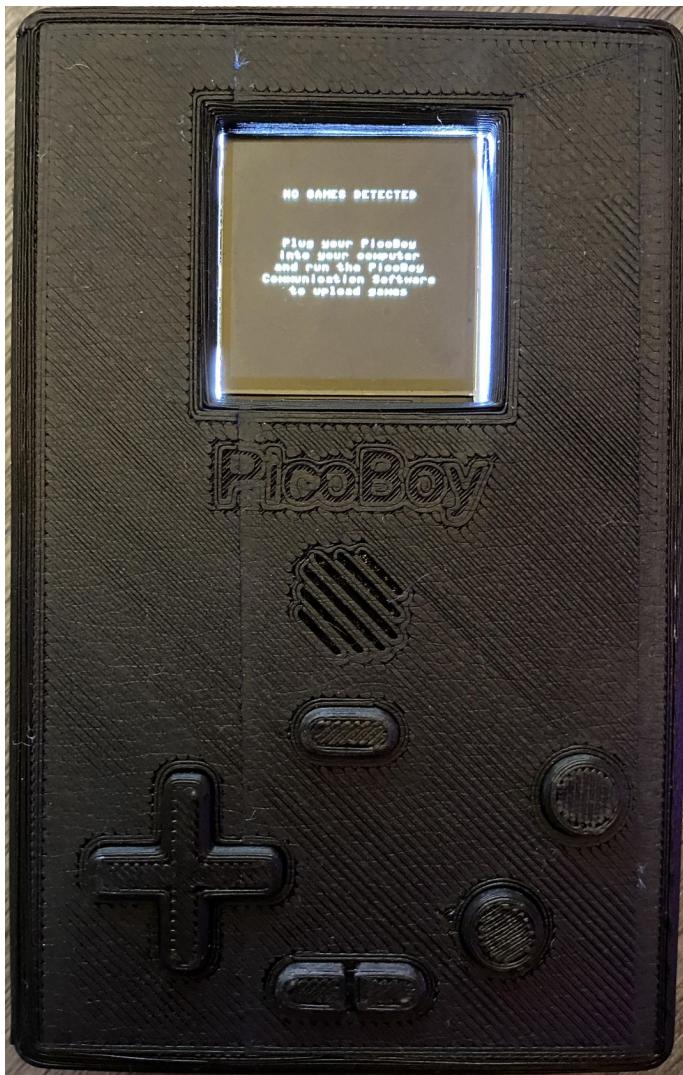
4: Once you receive this message, you did it! Your PicoBoy is successfully updated!



# You Did It!

Your PicoBoy is now complete!  
You can leave it as is, but  
that's a little boring. Let's  
add some games!

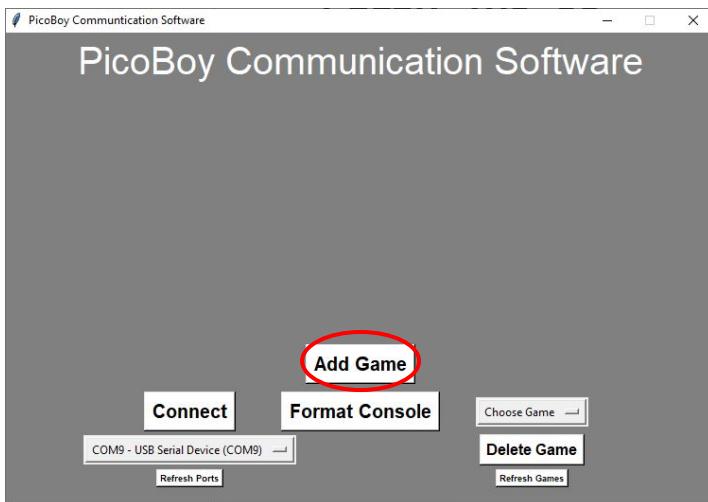
I need  
some  
games!



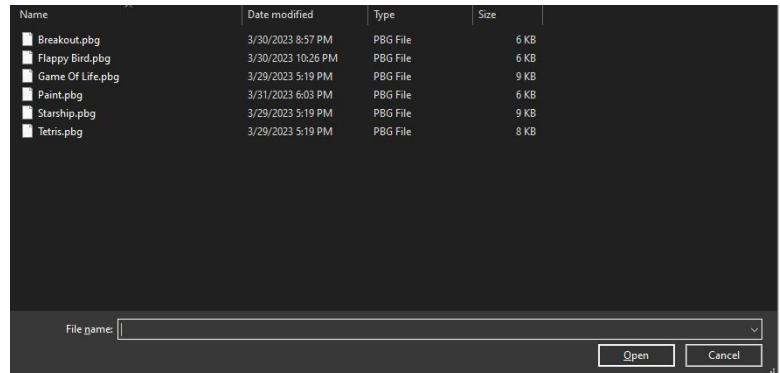
# Adding Games

PicoBoy games are represented as a ".pbg" file. Due to limitations on the Raspberry Pi Pico, the PicoBoy can only hold 4 games at a time. Your PicoBoy will say that there are no games detected upon flashing, this will fix that.

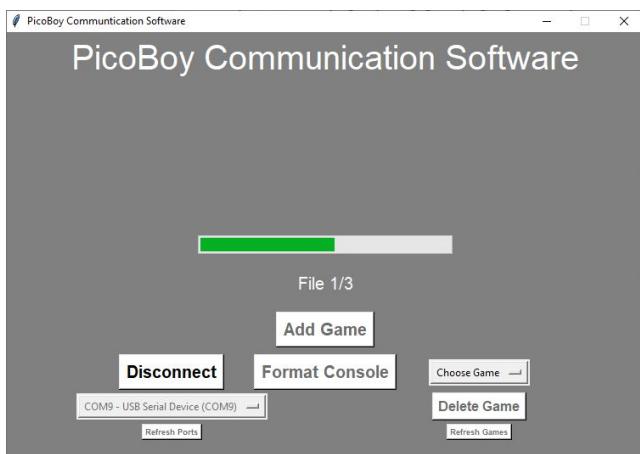
1: In the PicoBoy Communication Software, click "Add Game"



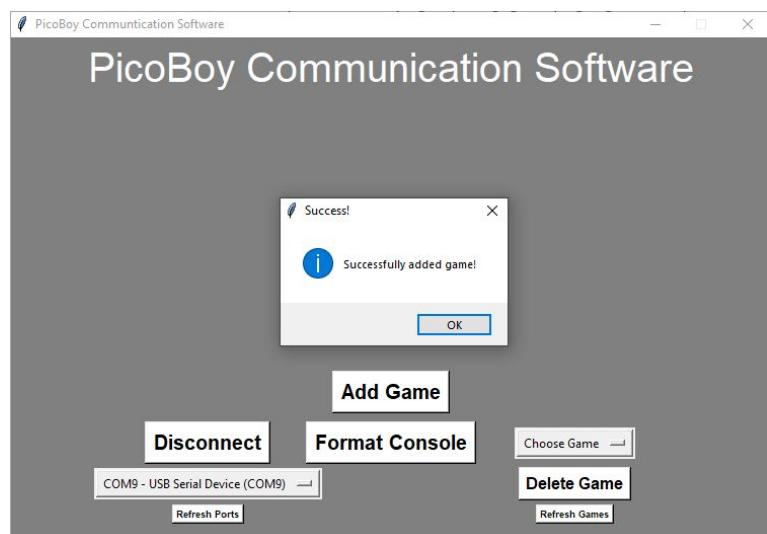
2: A file window should pop up, choose the game you want to install (It needs to be a ".pbg" file):



3: After clicking "OK", a loading bar should appear. Wait for it to complete for all files:

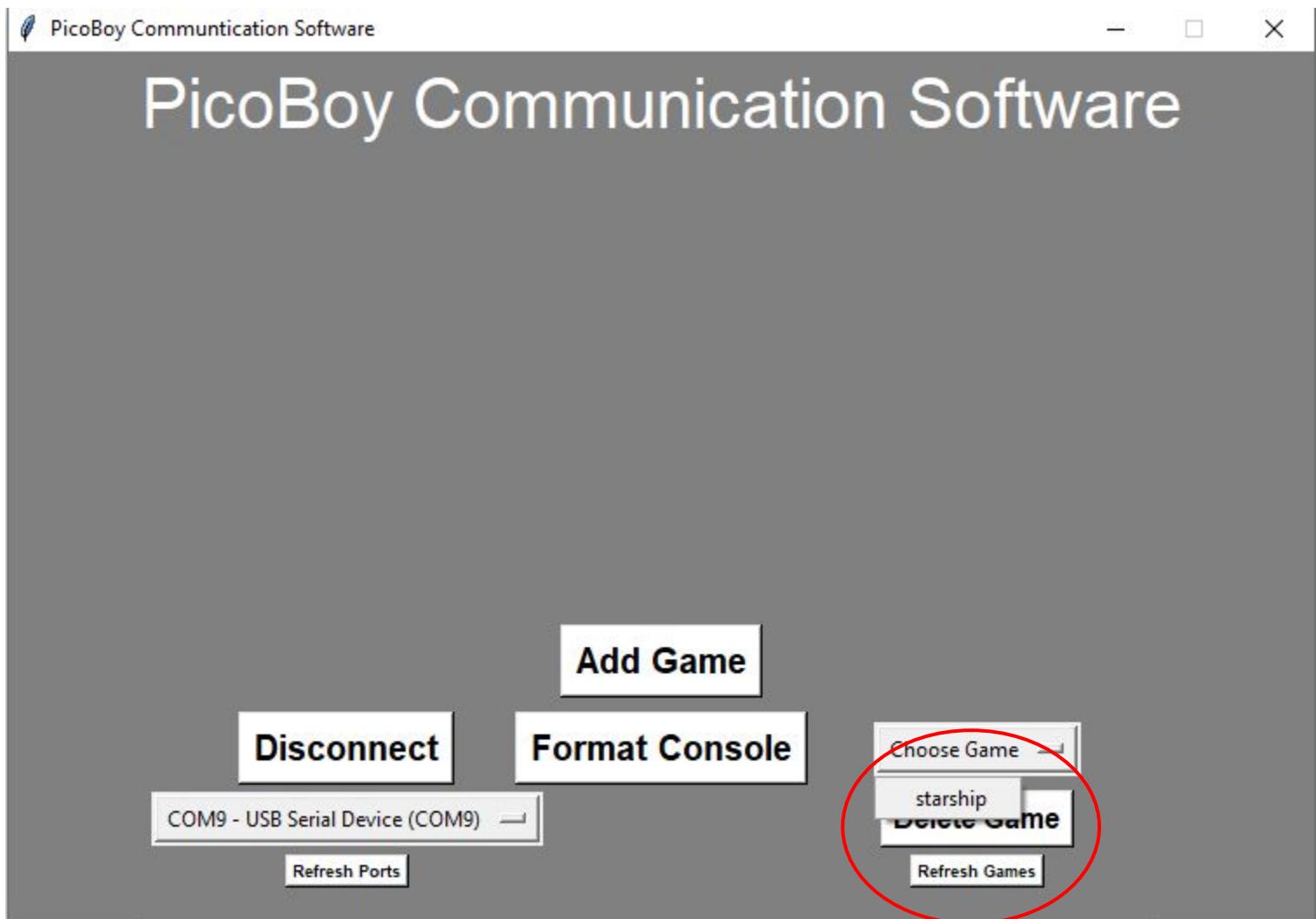


4: After about 45 to 60 seconds, a success message will appear:



# Adding Games

If you have received any errors while adding games, check the user guide. If you are still having trouble, ask in the [discord](#). Otherwise, You should now have a game on your PicoBoy! You can verify this by clicking the dropdown menu labeled "Choose Game". If the game you added is in there, it means that it is on your PicoBoy.



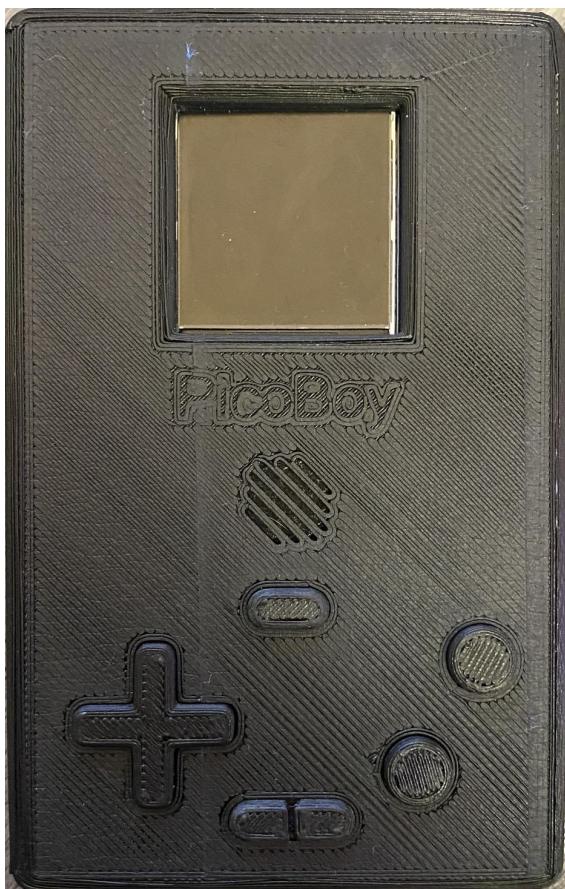
# You Are Done!

You have now built, flashed, and added games to your new PicoBoy! There are many games to choose from with more to come! If you want to share your achievement, you can post a picture of your PicoBoy to the discord server. If you need it, read the user guide for help with your console. (Remember to put in the batteries!)



# Troubleshooting Issues

If you are facing any issues regarding the functionality of the PicoBoy (whether it is working or not), you can troubleshoot it. Some common problems include: bad solder joint, improperly sanded casing, and incorrect part orientation. All of these can be resolved relatively easily if you ask on the [discord](#). Just state the problem you are having and you will get the help you need. Just a note, I may not be available on discord at all times.



I need  
some  
help!