

A definitive PicoFly install guide v.6.2

An attempt to create an all-in-one install guide to answer questions and help with photos

This guide will go over the basics of PicoFly setup, and wants to reiterate, this hardware mod can be installed on **ANY** switch (**including unpatched V1's**) running **ANY** **firmware**. It is CPU-glitch based, which loads a payload before Nintendo-signed software bootloader.

Disclaimer: this guide is written using many different sources of information. It is not my work, I am merely combining it here in this PDF to make it more accessible to the general public. I take no responsibility for anything that may happen to your device, good or otherwise. This guide is provided as-is, and you are responsible for anything that may happen.

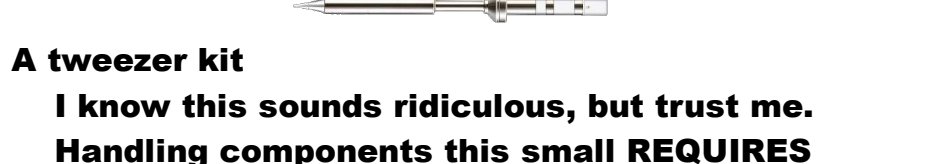
Here there be DRAGONS! DOING THIS MODIFICATION TO YOUR SWITCH MAY CAUSE PERMANENT DAMAGE. I RECOMMEND YOU HAVE THIS DONE BY A PROFESSIONAL INSTALLER.

"Just because a mod is cheap doesn't mean it's easy. - Trust me I learnt the hard way" - Adran (GBATEMP 2023)

SERIOUSLY, if you've NEVER soldered before, this is not the mod for you to attempt yourself. The photos that you've seen to make you so confident you can do this yourself? They're usually in the ballpark of 10-20 times zoom. Most of the things you are seeing on this scale are millimeter or smaller in measurement. This mod requires good lighting, steady hands, all the right equipment, and most of all, experience with soldering. Knowledge of why flux works, and why it is so important to be used in small projects like this cannot be overstated. Please, don't kill your switch, this isn't r/techgore, we don't want to see photos of your ripped traces and your tears stained on the motherboard...

Recommended materials

1) Nintendo Switch (V1, V2, Lite, or OLED) ANY model



2) Soldering station

- Soldering iron that is preferably digitally controlled so you know what temp you solder at
- Solder (some recommend low-temp leaded fluxless solder to make some parts slightly easier)
- Flux (this is NOT optional. When soldering at these scales, flux is absolutely vital to making good solder joints) Applied with the tip of a wooden toothpick is how I usually hit small spots
- A damp sponge and/or brass wire sponge to keep your soldering tip clean. I use both.
- The tip you use can be vital depending on the locations of your soldering points. I use a ts-100 iron and swap between three different tips:

TS100-JL02

TS-BC2

TS-I

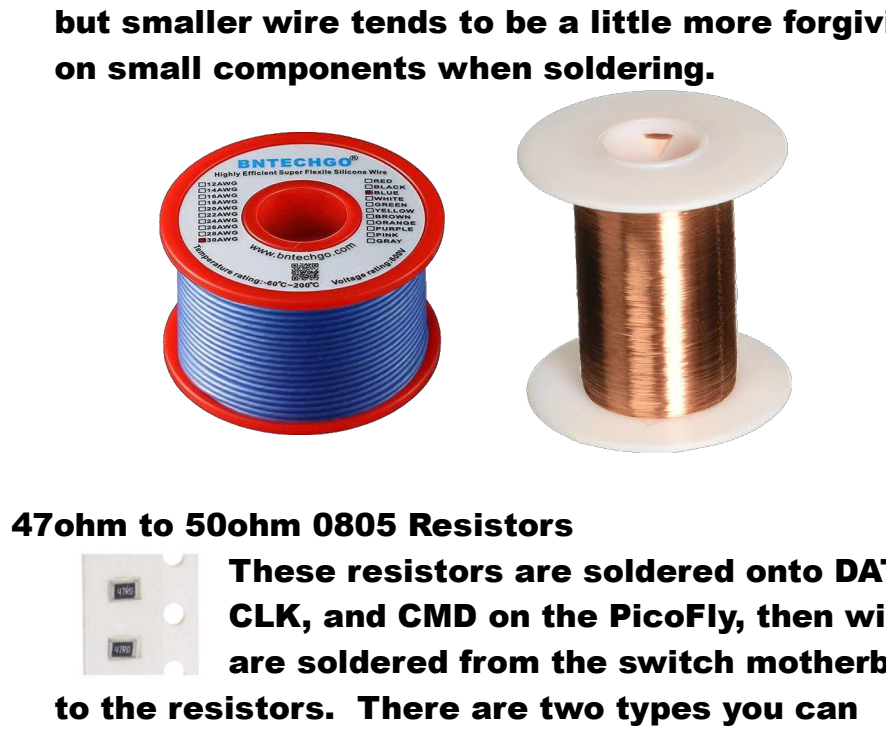
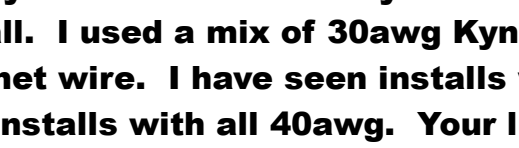


3) A tweezer kit

I know this sounds ridiculous, but trust me. Handling components this small **REQUIRES** fine-point tweezers. You may be able to **SEE** the components without a magnifier or scope, but you won't be able to manipulate and solder things like 0805 (or even smaller) resistors with bare fingers.

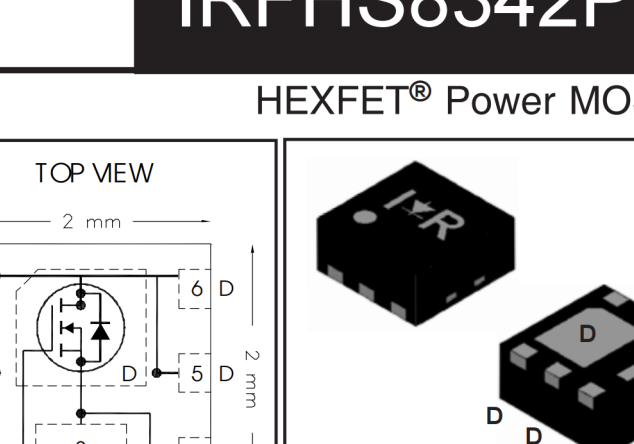
I ordered this kit off of Amazon

<https://www.amazon.com/gp/product/B07S1DMKDX/>

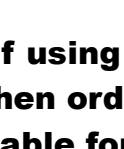


4) Wire

This would seem like a no-brainer, but the type of wire you use can ultimately make or break your install. I used a mix of 30awg Kynar and 40awg magnet wire. I have seen installs with all 30awg, and installs with all 40awg. Your luck may vary, but smaller wire tends to be a little more forgiving on small components when soldering.



5) 47ohm to 50ohm 0805 Resistors



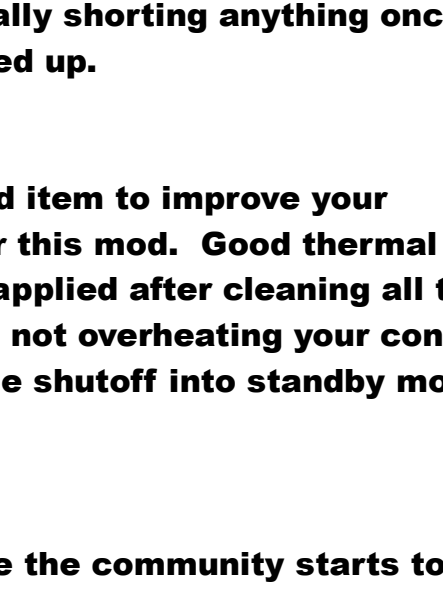
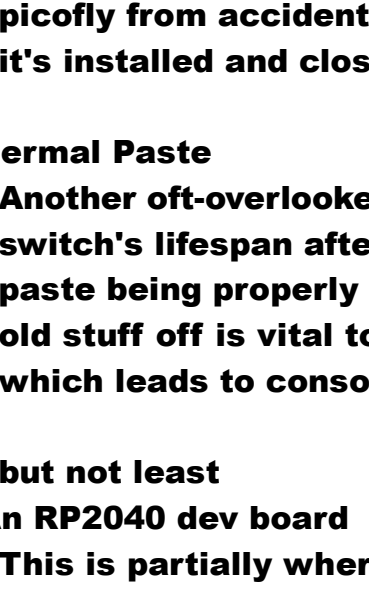
These resistors are soldered onto DAT0, CLK, and CMD on the PicoFly, then wires are soldered from the switch motherboard to the resistors. There are two types you can generally get away with using: 470 and 47R0 The 470 typing are 47 ohms +/-5% whereas 47R0 are 47 ohms +/-1% Other sizes than 0805 will work, but 0805 seem to be easier to fit on the soldering pads of the RP2040-Zero

6) Mosfet(s) or an HWFLY flex cable appropriate to your specific console.

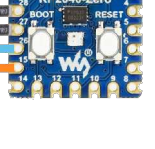
-If using mosfets by themselves, it is recommended that you purchase model IRFHS8342 due to its size and its ability to fit in place under the APU shield

IRFHS8342PbF

HEXFET® Power MOSFET



-If using a flex cable (which has integrated mosfets) then order a V1 cable for Erista models, or a V2 cable for Mariko, Lite, or OLED models (You can also use V3 OLED models, it's a choice of where the flex cable comes out of the APU shield).



Erista



Mariko/Lite/OLED

7) A magnifier of some kind

There are plenty of folks (myself included) that can get away with using a cellphone camera to zoom in and make sure joints aren't bridged and that good solder contact is being made. Others will say you absolutely need a scope to do this job so that you can see all the small components on a well-lit screen while working. It's up to what you're most comfortable with.

8) Kapton Tape

This seems to get overlooked in some cases, but the kapton tape helps to electrically isolate the picofly from accidentally shorting anything once it's installed and closed up.

9) Thermal Paste

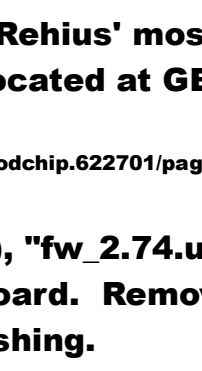
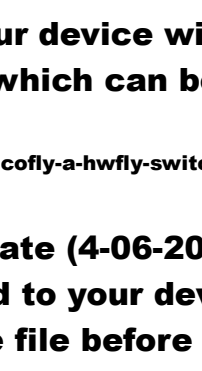
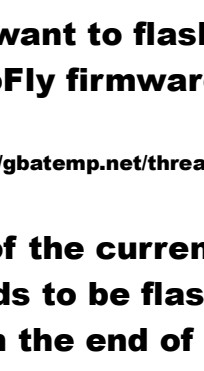
Another oft-overlooked item to improve your switch's lifespan after this mod. Good thermal paste being properly applied after cleaning all the old stuff off is vital to not overheating your console which leads to console shutoff into standby mode.

Last but not least

10) An RP2040 dev board

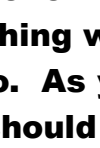
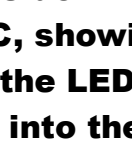
This is partially where the community starts to get divided, beyond what kind of switch you are modding. A vast majority of the community has been using RP2040-Zero boards from Waveshare/Aliexpress, but thanks to Rehius, the firmware dev, several types of dev board are currently supported. I will attempt to list some of the most popularly used ones thus far. For this guide, I am focusing on The RP2040-Zero

~ RP2040-Zero ~ RP2040-One ~ RP2040-Tiny



Check these resistors to make sure they are 47 ohm and not 470 ohm

~ Seeed XIAO-RP2040 ~ Adafruit ItsyBitsy RP2040



See the end of the guide for diagrams of how to wire up the Seeed or the Adafruit

Optional, but recommended

11) UV-cure solder mask

-It cannot be overstated how small these components are. Once your wires are faithfully in place, many would recommend a small amount of solder mask be applied to hold things in place, as well as help insulate connections from shorting

12) Digital Multimeter

-Use this to check your wiring when you are done. It can be used to detect shorts to ground, or in diode mode to detect proper connections. If you don't understand any of that, THIS MOD IS NOT FOR YOU, HAVE A PROFESSIONAL INSTALL IT FOR YOU.

Preparing your PicoFly

Flashing your PicoFly, An Overview

At the heart of all the dev boards is an SoC (System on a Chip) known as the RP2040. It has its own built-in firmware flashing system that involves it presenting itself to your computer as a USB drive.

If it has never been flashed before, simply plugging it into your computer should bring up a window with two files in it. This is the firmware flashing window. If you drag and drop a ".uf2" file into this window, the RP2040 will read the file and attempt to flash it. This will cause the window to close, and the next time you plug the RP2040 in, it will not present itself as a USB drive to your PC.

To reprogram an already-programmed RP2040, there is typically a "boot" button that needs to be held down while being plugged into USB, but when you do this and the window shows up, your firmware file will not be displayed in the window since it IS NOT a storage device. The RP2040 just tricks your computer into treating it like a storage device. Some recommend that between flashes you use a "flash_nuke.uf2" provided by the Raspberry Pi Foundation. This basically just flashes all zeroes to the RP2040 firmware memory to ensure a clean flash of whatever you put on it next.

We want to flash our device with Rehius' most up-to-date PicoFly firmware, which can be located at GBAtemp:

<https://gbatemp.net/threads/picofly-a-hwfly-switch-modchip.622701/page-78#post-10090767>

As of the current date (4-06-2023), "fw_2.74.uf2" is what needs to be flashed to your dev board. Remove the .pdf from the end of the file before flashing.

With this file downloaded, and your RP2040-Zero plugged into your PC, showing the firmware flashing window, keep one eye on the LED of your RP2040-Zero. As you drop the .uf2 file into the window, your LED should flash as the window on your PC closes. This is to indicate firmware flashing success, but the color of this LED is what we are concerned with now.

If the LED flashes Yellow once, GREAT, you don't need to do anything special, however, if you get multiple flashes, or no flash at all, the flash was unsuccessful and you need to attempt flashing the firmware once again.

You can hold the boot button, plug your RP2040-Zero back into your computer, flash the .uf2 to the board again and look for a Yellow LED flash now.

At this point, with a firmware loaded on the board, we can start to prep it to go into the switch.

Conventionally, folks remove the USB-C port and the boot + reset buttons. Below is an example of a finished install with USB-C removed, buttons removed, resistors installed, and as you may notice, a mix of 30awg Kynar (for power supply to RP2040-Zero) and about 36awg magnet wire for the remaining wires.

During this step of removing ports, it is also recommended to add the three resistors to the side of your board. With the boot button removed, some people place their resistors to the inside of the board, rather than hanging from the edge. Both will functionally work.

If you have slow EMMC issues after putting everything together, one possible reason is that you need two additional resistors, one each on CMD and DAT0, like below, for a total of 94 ohms on each line:

There could be other reasons for slow EMMC as well though, like residual flux on solder points, or wires being too thin or too long on CLK, CMD, or DAT0.

On that same note, if you leave flux residue on RST points, your console could instantly reboot after startup, as the RST points are very sensitive.

Time to open up your console and get to work!

Modding your console
UNPLUG YOUR BATTERY
ONCE THE CONSOLE IS
OPEN, BEFORE TOUCHING
ANYTHING ELSE!

There are plenty of guides on Youtube on how to properly mod your console, so I will merely reference those below:

V1 and V2 disassembly:
<https://www.youtube.com/watch?v=QCZ3-fYjpWo>

Lite disassembly:
<https://www.youtube.com/watch?v=GP1DHRs6V2Y>

OLED disassembly:

When you're inside, you'll need tools to solder your wires in

Please Be Advised:
You may see two pads inside one circle in the be

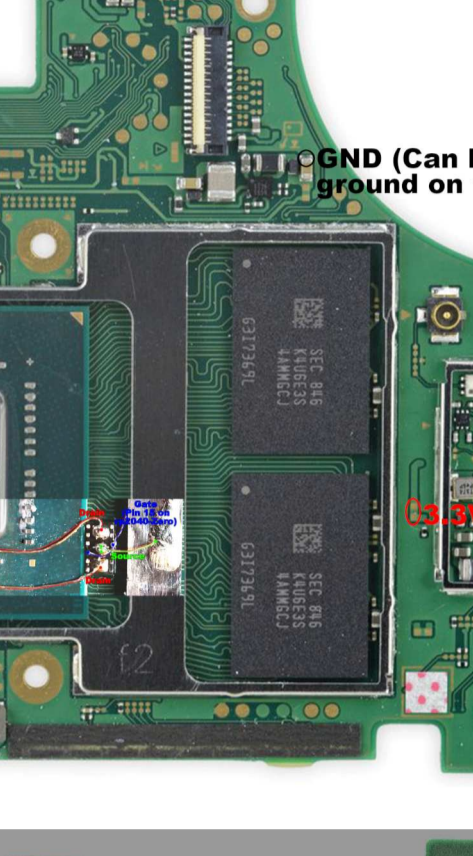
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r pad, or both, wh

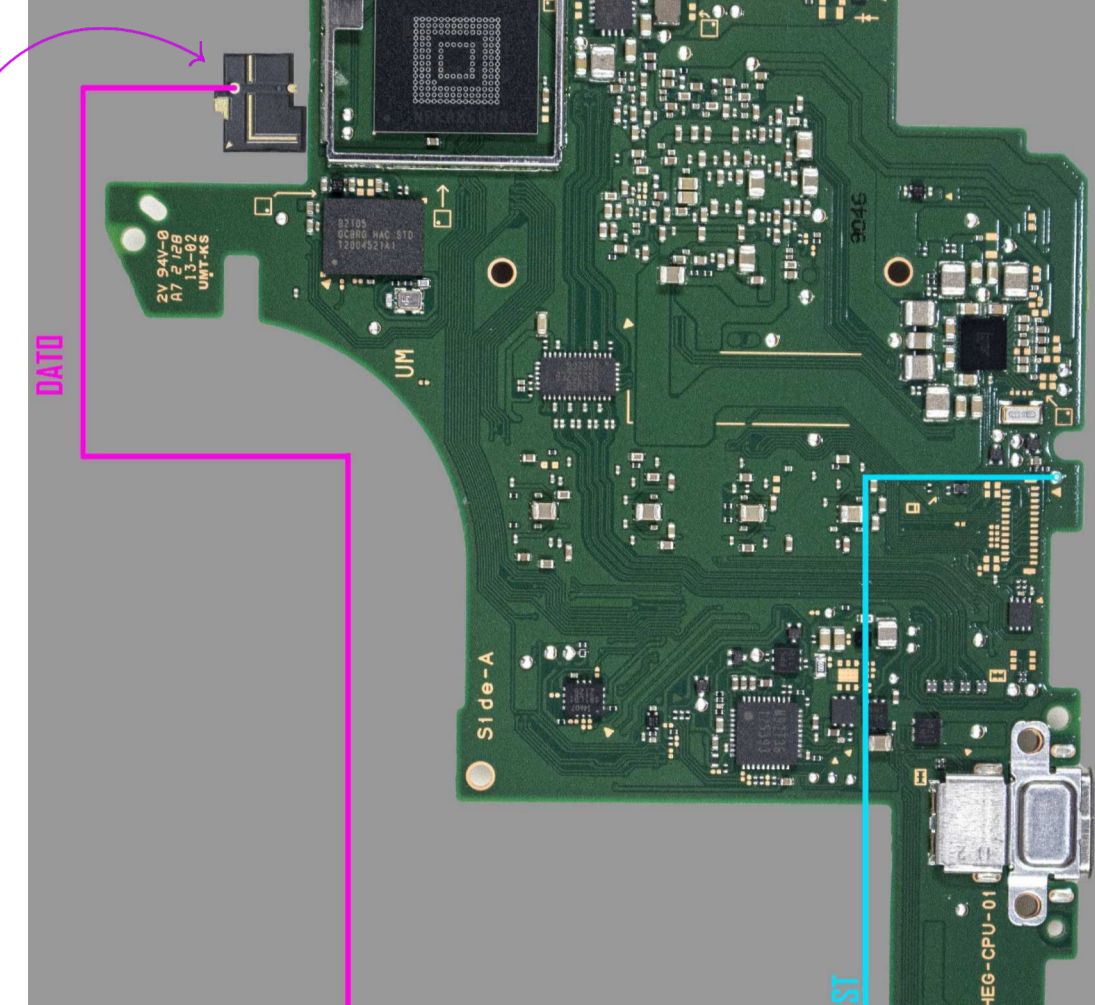
connected to the t
d 4). Do not bridge t
cause an error line

See below to make soldering the two

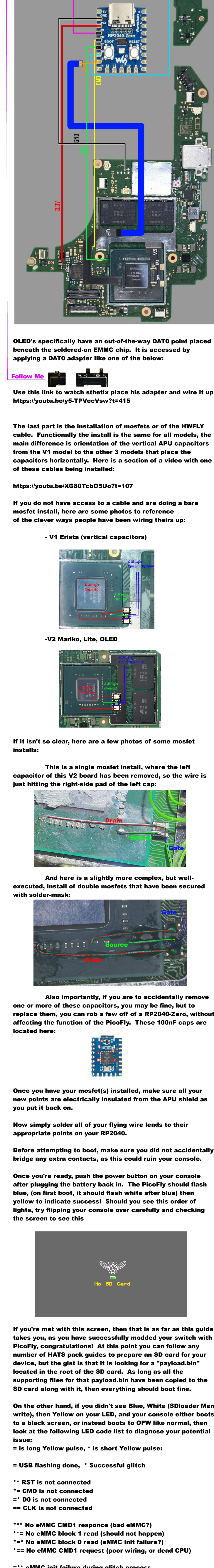


V1/V2 Points:





114



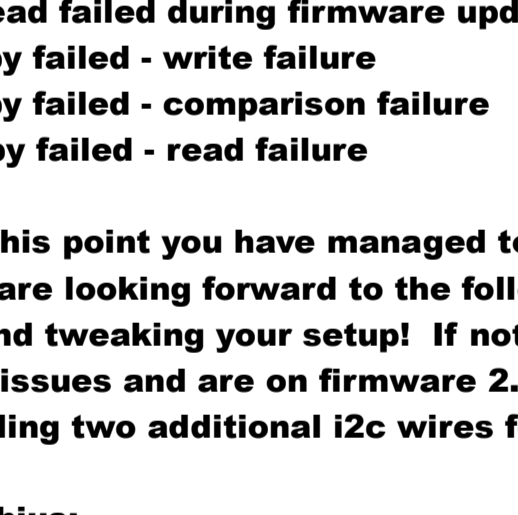
```

==* eMMC init failure during glitch process
==* CPU never reach BCT check, should not happen
==* CPU always reach BCT check (no glitch reaction, check
mosfet)
=== Glitch attempt limit reached, cannot glitch

==== eMMC init failure

```

MC write failure - write failed
MC test failure - read failed



our glitch is unstable (==


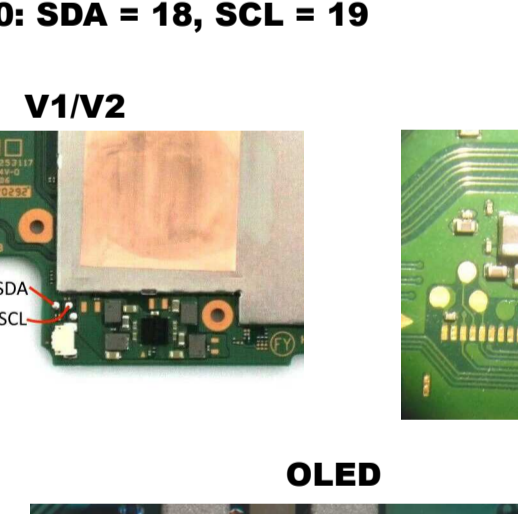
Reset after joycon logo, you can add two more wires to make glitch much better.

board pins:

Waveshare rp2040: SDA=12, SCL=13

Pi Pico: SDA = 19, SCL = 20

XIAO 2040: SDA=3, SCL=4




PicoFly Toolbox
"picofly_toolbox 0.2.bin" (available from Rehlius' post

payload that you can load through Hekate's payload launcher, to interface with your PicoFly. The caveat to this, is that you must be on at least firmware v2.6 to use the toolbox as a feature. This means, if you have previously loaded your PicoFly with an out-of-date firmware, like the frequently circulated "2.5 toshiba + unlock", you must flash at least 2.6 to your PicoFly via USB and a computer before you can

interact with PicoFly using the toolbox.

Once you are on minimum v2.6, you can launch the toolbox to its main menu, which looks like this:



```
[PicoFly Toolbox V0.2.1]
--- Firmware ---
Info
Update
Full boot
Exit
```

```
Update -----
Backup -----
Reset ----- Train Data ----
Power on -----
Back to hekate
Power off -----
```

you hit power on the info option, you will be presented with a screen similar to the one below:

```
Reading firmware info...
Version: 2.62
Firmware hash: 0x5599f45D
Firmware hash: 0x68ff
Fuse count: 3
Press any key
```

Bear in mind, I recreated these images in photo editing software, but this is what is currently displayed on my switch. I have flashed several updates, so my fuse count is greater than 0, and I am currently on v2.64.

Updating

To actually use the tool to update your picofly from V2.6+ to something higher, simply place the desired firmware's ".bin" update in the root of your SD card and name it "update.bin". Launch PicoFly Toolbox, then scroll down once to "Update", by hitting "Vol." one time, then

hit the power button once. The toolbox will now look for the "update.bin" where it is supposed to be, and will flash the firmware provided inside the file. You will be asked to reboot, and may experience slightly longer boot times for the first few boots after updating. This is normal, once the PicoFly re-trains, you will be back to fast boots.

Rolling Back

PicoFly stores the last firmware you flashed from, in the event of a failed flash, it can auto-rollback to whatever version you were flashing from. If in the event you have a successful flash to a higher version, but wish to intentionally rollback to your previously running version, from the menu view of PicoFly, to the main screen.

down twice with the Vol - button being pressed twice, then select Rollback with the power button. Similar to an update, you will be asked to reboot.

SD Loader

To my understanding, SD Loader is the portion of

payloads (such as our custom bootloader of choice, typically Hekate). The "No SD Card" screen is part of this SD Loader portion. To make a backup or restore this portion, just use the two options seen in their respective portion of the menu, but you really shouldn't have to mess with this unless directed to do so.

Training Data Reset

As the name might imply, this is to reset the training data of the PicoFly in the event your boot times have gone awry for some reason. This will clear your training data and allow your PicoFly to attempt relearning new glitch timings for your console. Largely this should be

This guide has been brought to you by Lightningjay, a member of the GBATEMP forums, and in no way implicates them for any harm that may come to you or your devices while following this guide.

As a courtesy, here are some pinouts of alternate boards that PicoFly should be compatible with, thanks to forum member, Dee87, colors added by myself

SEED XIAO-RP2040

Diagram illustrating the connection of the RST, CLK, CMD, DAT, and CPU signals to the SD card pins. The RST signal is connected to pin 1, CLK to pin 2, CMD to pin 3, DAT to pin 4, and CPU to pin 5. A DETECTION signal is also shown connected to pin 6.

Raspberry Pi Pico

- Remove BOOTSEL BUTTON
- Remove Transistor
- Cut Pico under From pin 5-36 above
- Remove Cap
- 3V
- DAT0
- CMD
- GND
- L7A
- RST
- Detection

Cut under Text

