gc3ds: GameCube controller to 3DS adapter

Installation guide, regular 3DS.
3DS XL Guide is out! see here.

This document only serves as a general guide of this project, I make no guarantee that your result of following this guide will be successful(although I did), and I take no responsibility if you manage to break stuff or hurt yourself while attempting this modification. Do not try this if you don't have experience in electronics.

Before starting, read through EVERYTHING FROM BEGINNING TO END in this document first. Make sure that you have all the parts and tools that was used, and you're sure that you have what it takes to complete this project.

Project main page: http://goo.gl/SyRLb5

Video: https://www.youtube.com/watch?v=seAI9W9SYjo

https://www.youtube.com/watch?v=yhoC7w3nZws

Source code and schematics: https://github.com/dekuNukem/gc3ds

Parts list:
https://docs.google.com/spreadsheets/d/1Zn6B7LS_Fjm-IIFg_gtSEX4vyMsDikPHXBdn-rX0lfU/edit#gid=0

Sample modification gallery: http://imgur.com/a/YZrVK

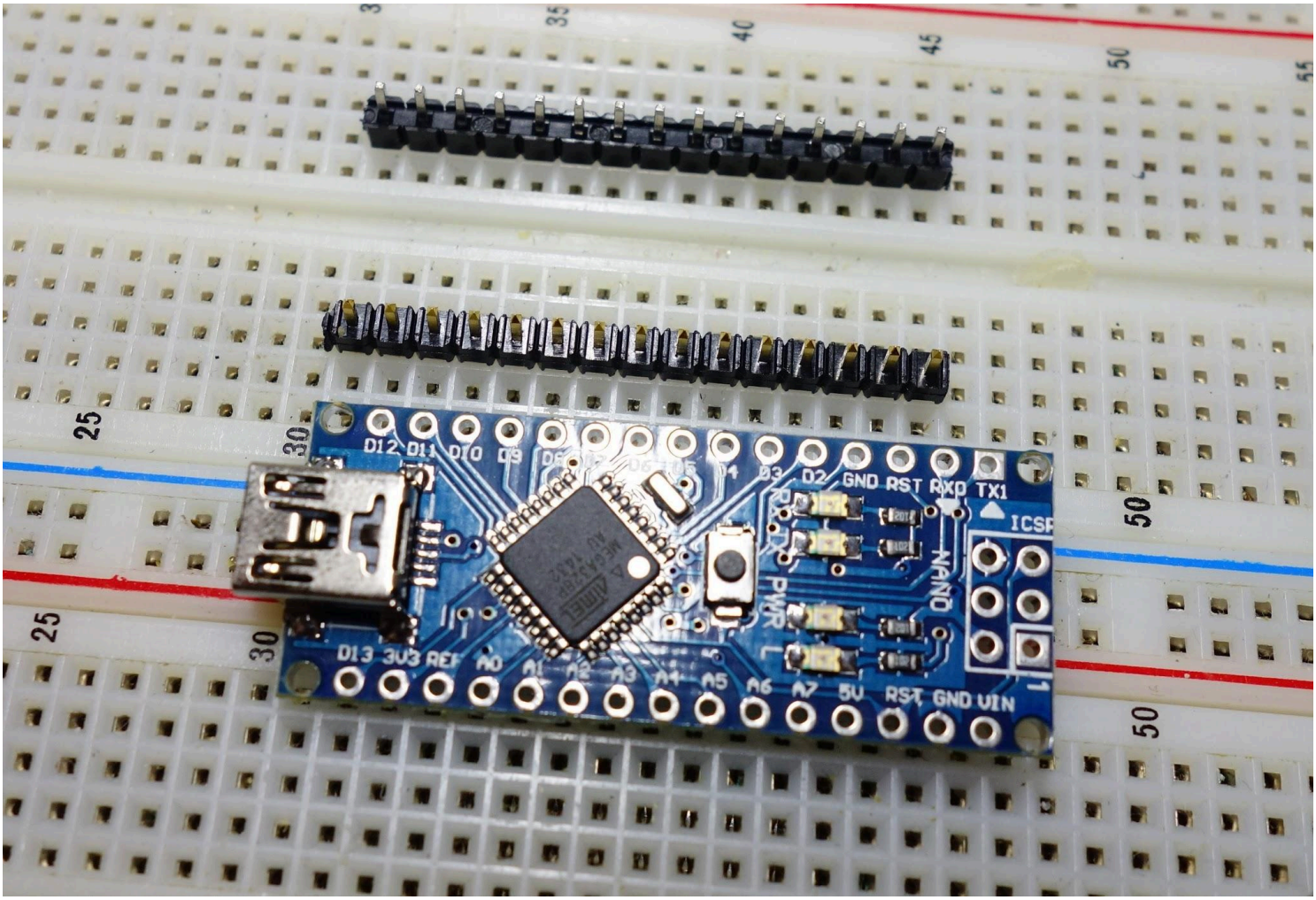
Contact me: dekuNukem@gmail.com

The microcontroller used in this project is the Arduino Nano. It uses the same ATmega328 chip as the popular Arduino UNO, but has a much smaller footprint, two extra pins, uses more popular mini-usb cable, and being MUCH

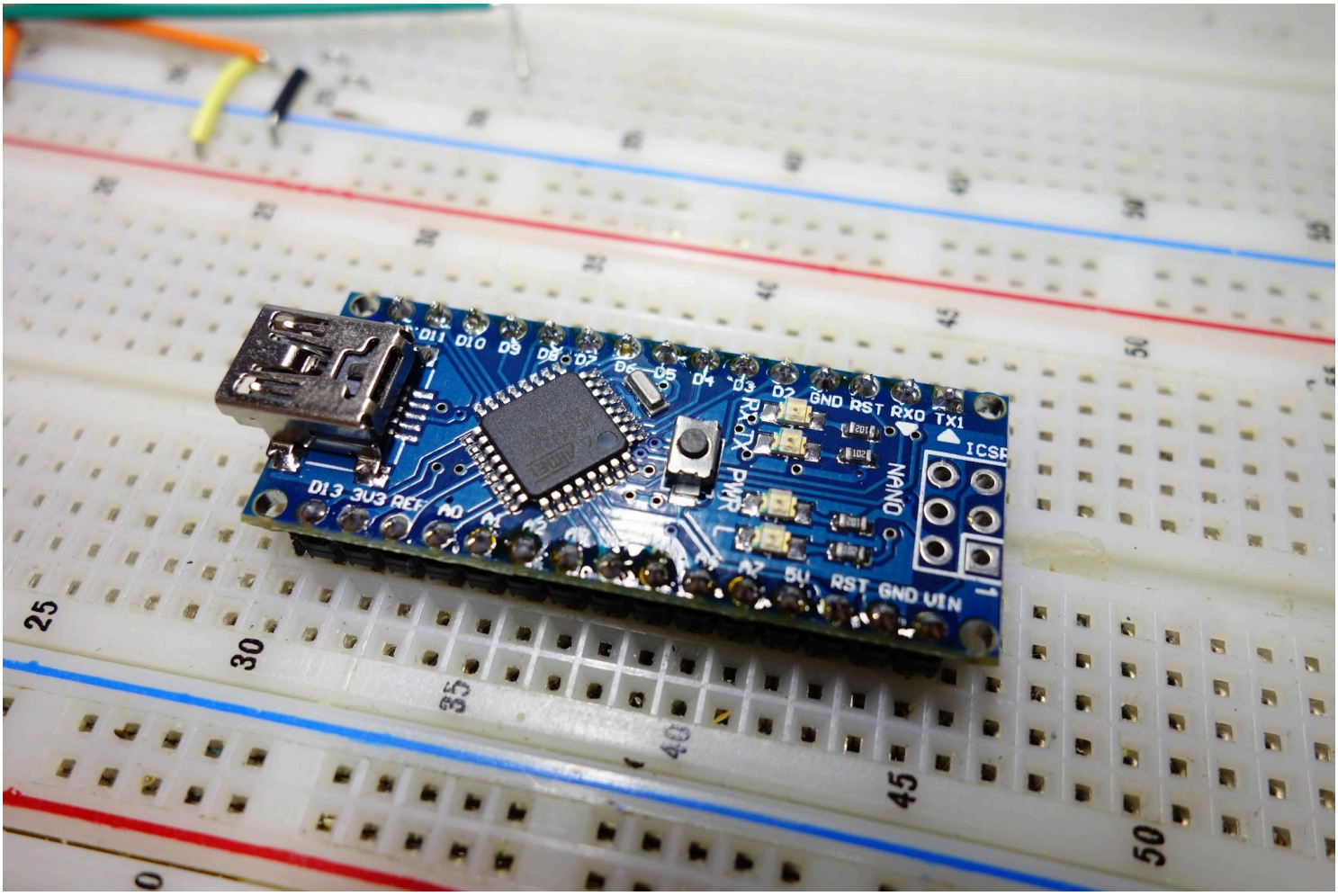
cheaper, only around $3 on ebay. This also means this project should work with all ATmega328-based dev boards, be it UNO, Nano, Pro Mini, or even bare Atmega328 with Arduino Bootloader. Make sure the chip runs at 5V 16MHz, otherwise it will not be fast enough to read GameCube controller.

If you buy the Nano new, it probably comes with headers unsoldered, so you might as well solder it on as a warm-up. If you don't even know how to solder, it's probably a bad idea to attempt this project. There are plenty of tutorials on how to solder, like this. Take a look and practice it on something else.

What I would do is to plug the header into a breadboard, then put the microcontroller on top of it, then solder all the pins:



Like this:



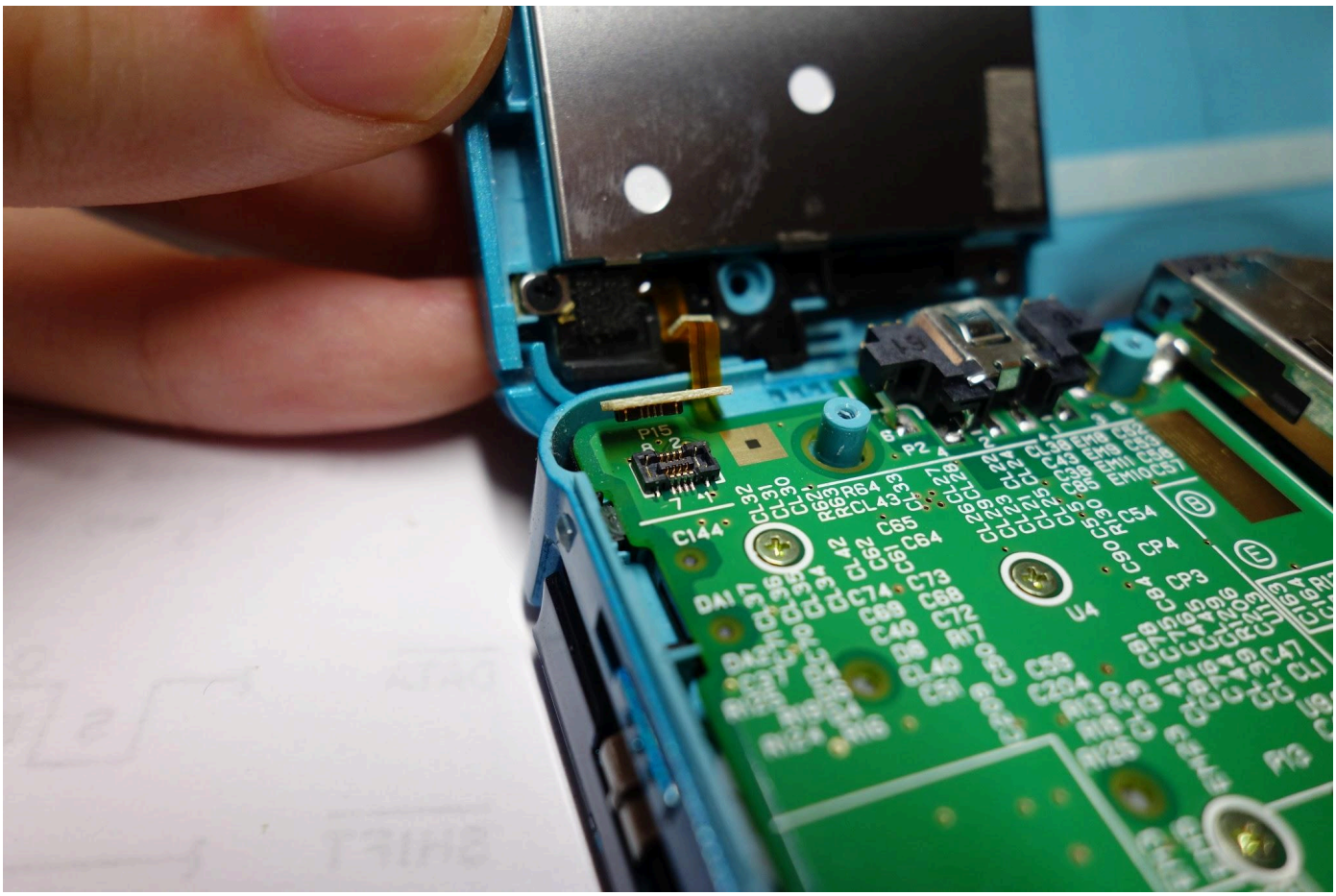
Moving onto the 3DS, loosen 4 screws in the back, they won't come off completely so don't keep trying.

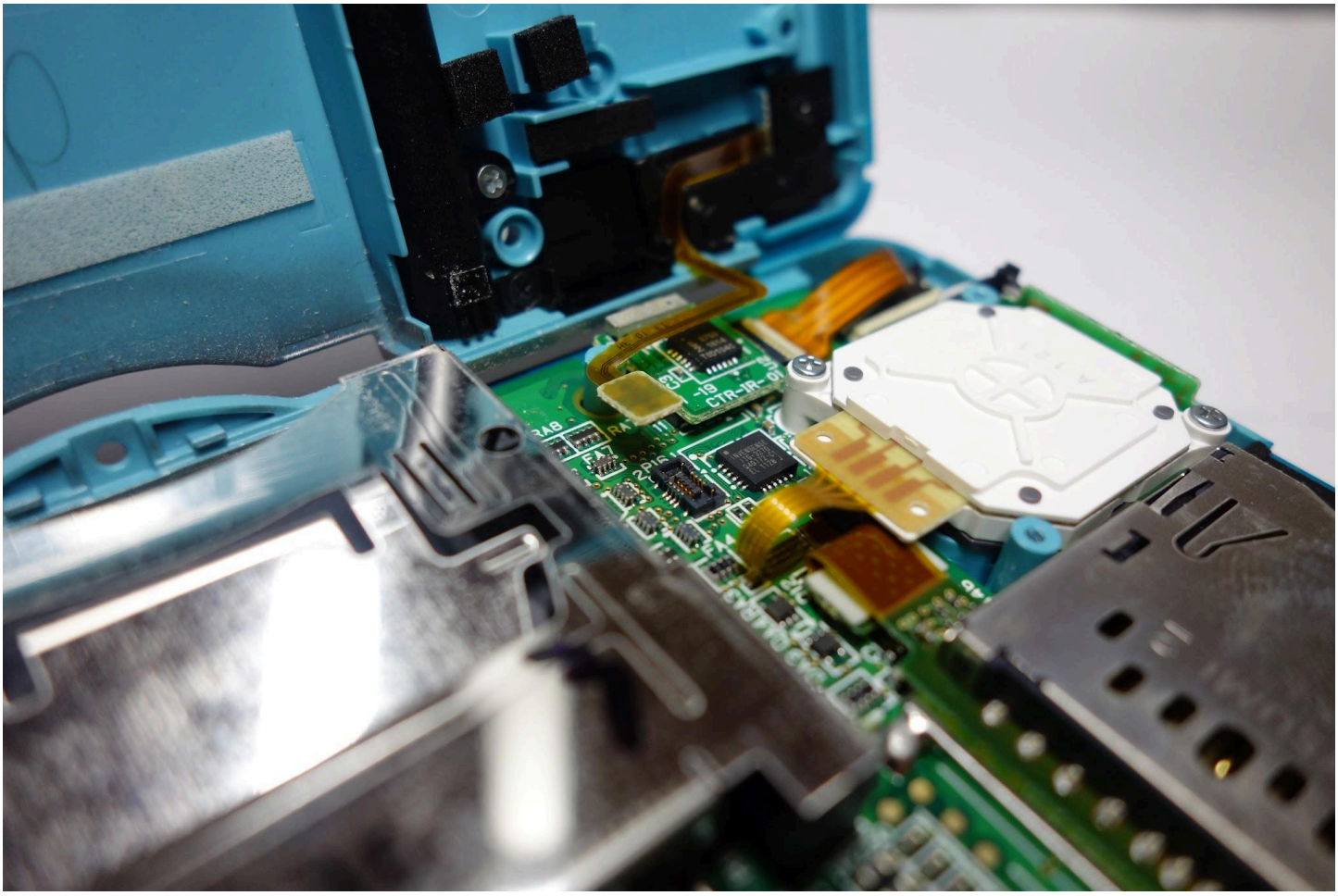
The back cover should flip open and come off, revealing the battery.

Take off the battery, then highlighted screws, don't forget the one in purple circle. And don't lose them.

Slowly lift up the lower case, notice the L and R button ribbon cable in the circle?

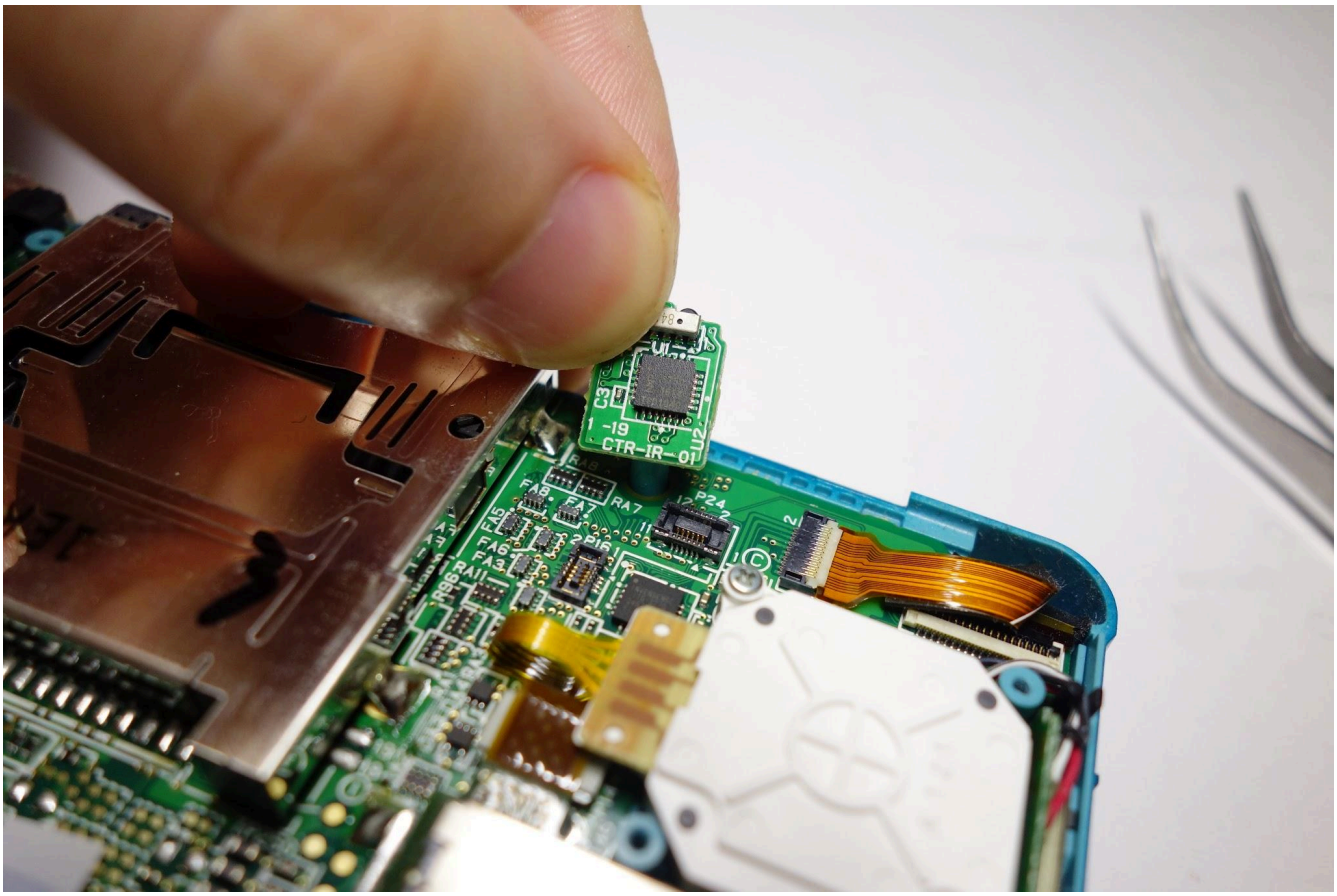
carefully lift up the L and R button connector



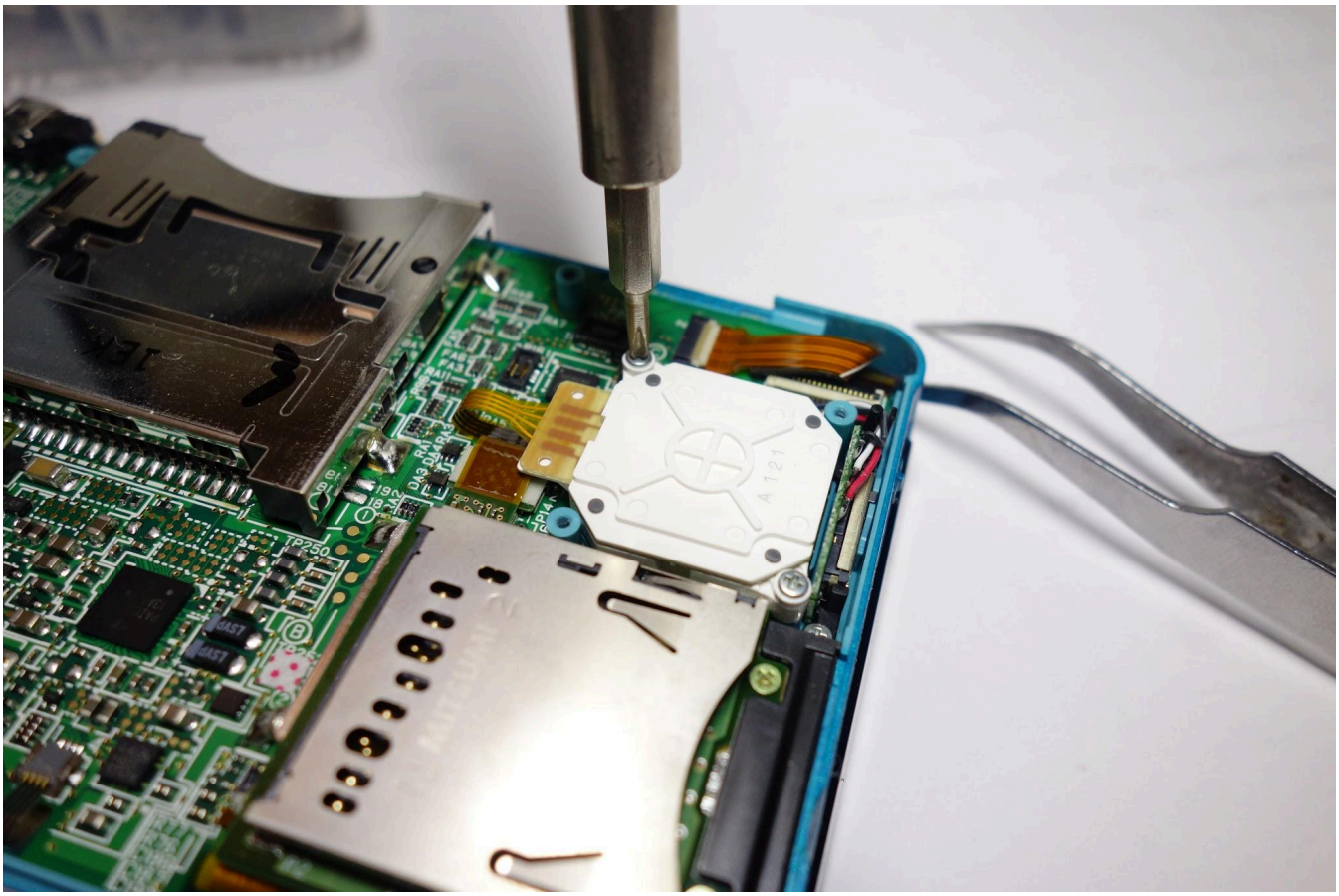


Now you can finally put the lower case away, the underside of 3DS’s motherboard is now in full view.

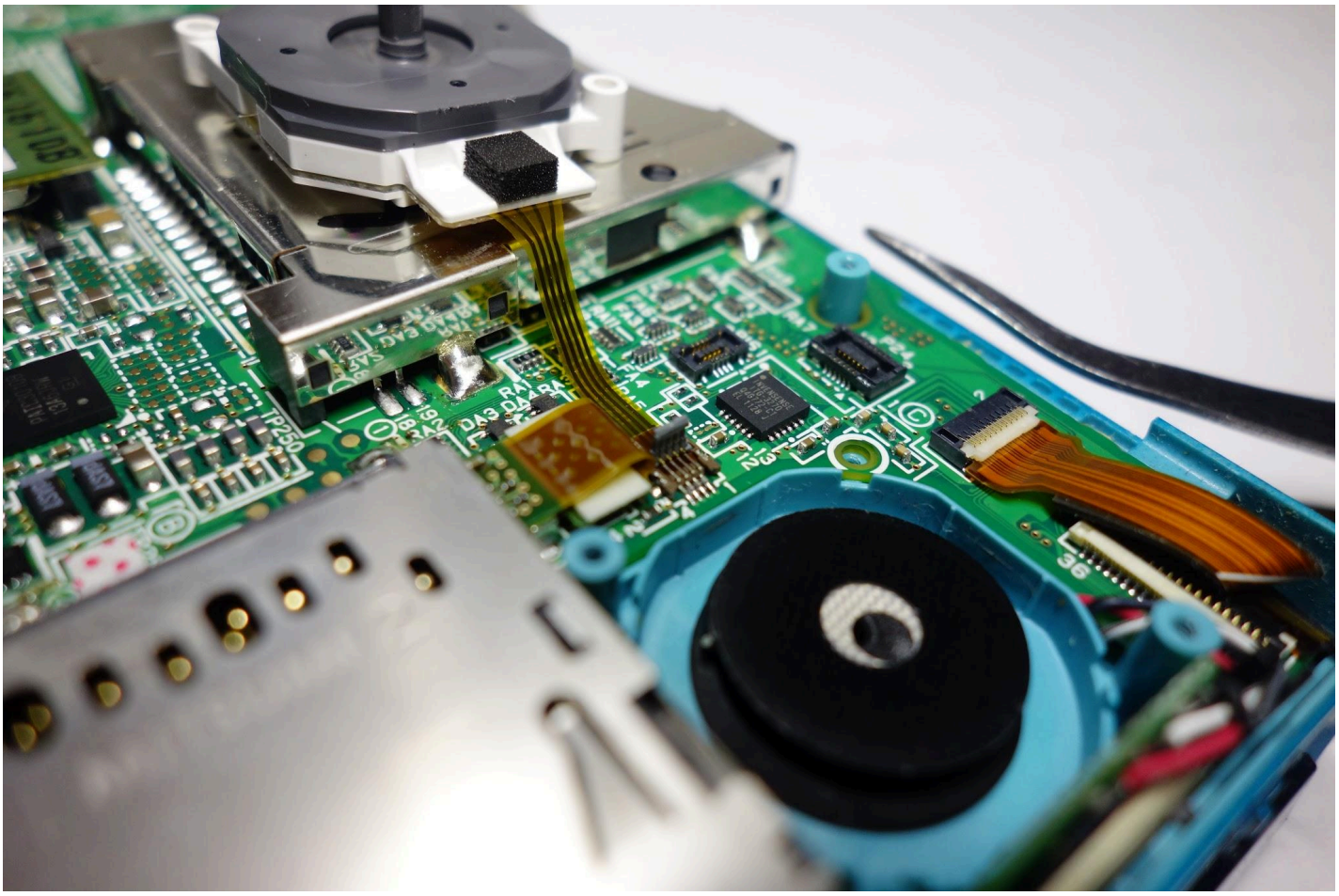
However, we need to get to the other side of the motherboard, so we'll have to disconnect a bunch of stuff first. Starting from the easy ones, the infrared module is located near top right corner of the circuit board, disconnect it by slowly and gently pulling it out of the socket.



next up is the circle pad, undo the two screws holding it down:



Flip it over and you should see the ZIF connector holding the flat cable. Always be slow and gentle around those things, there are a bunch of them and if you break any your whole 3DS will be basically toast. (carefully and slowly)Flip up the grey tab on top, and pull the cable out.

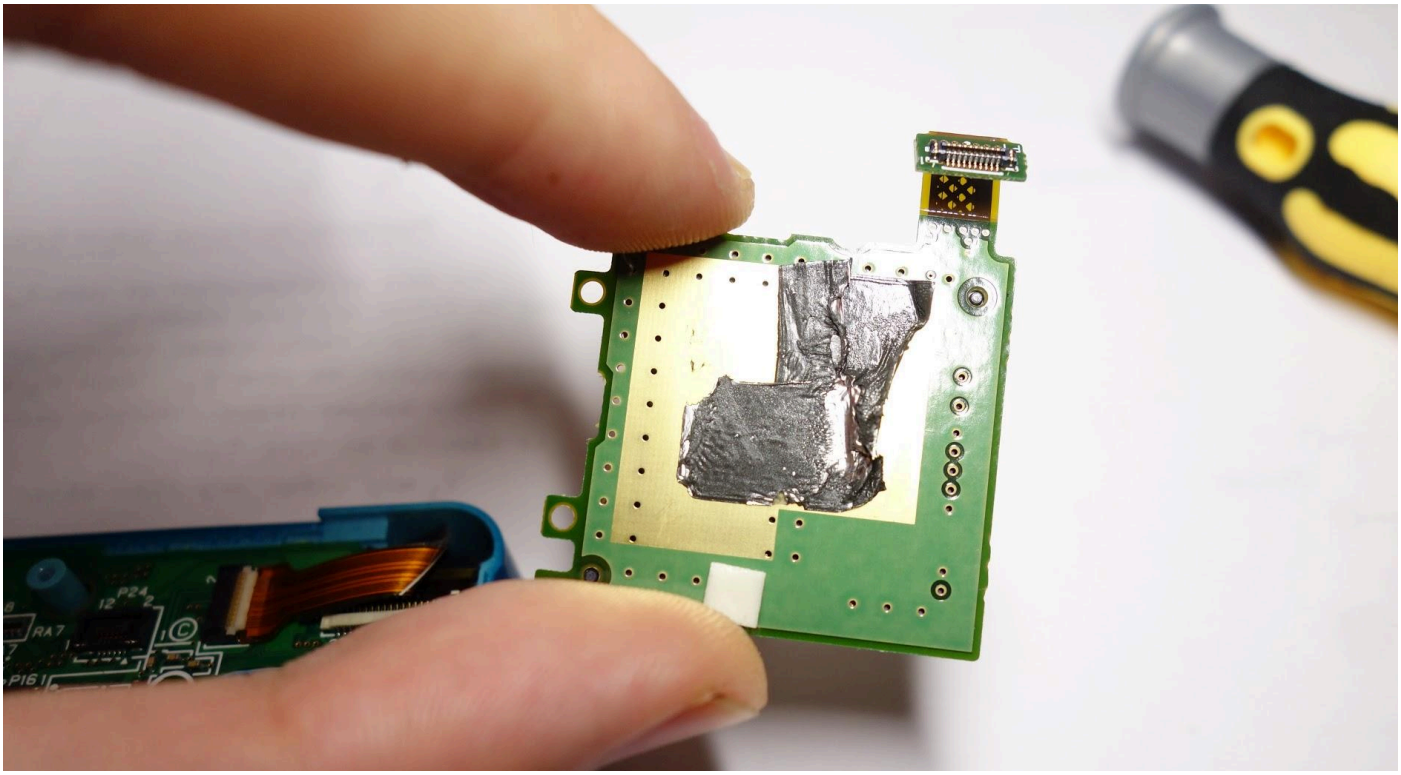


Now you have the circle pad, put it aside as we'll work on it later.

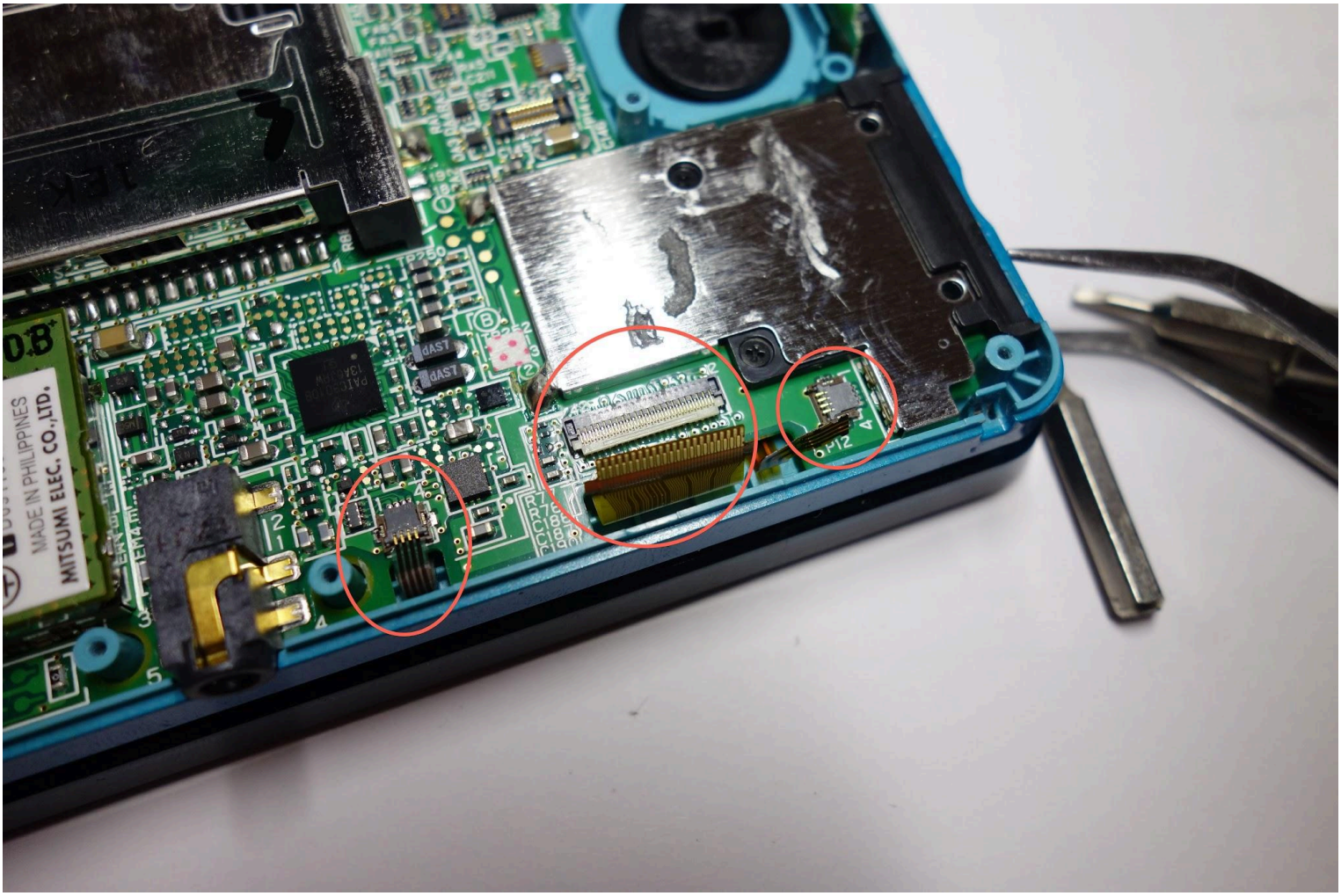
The next to come out is SD card module, disconnect the connector, undo the two screws.

You'll probably realize that it still won't come off, that's because Nintendo used some adhesives to tape it down, insert a credit card or something similar underneath to loosen it, as always be gentle and don't rush it.

Eventually it should come off, see the black tape? put it away.

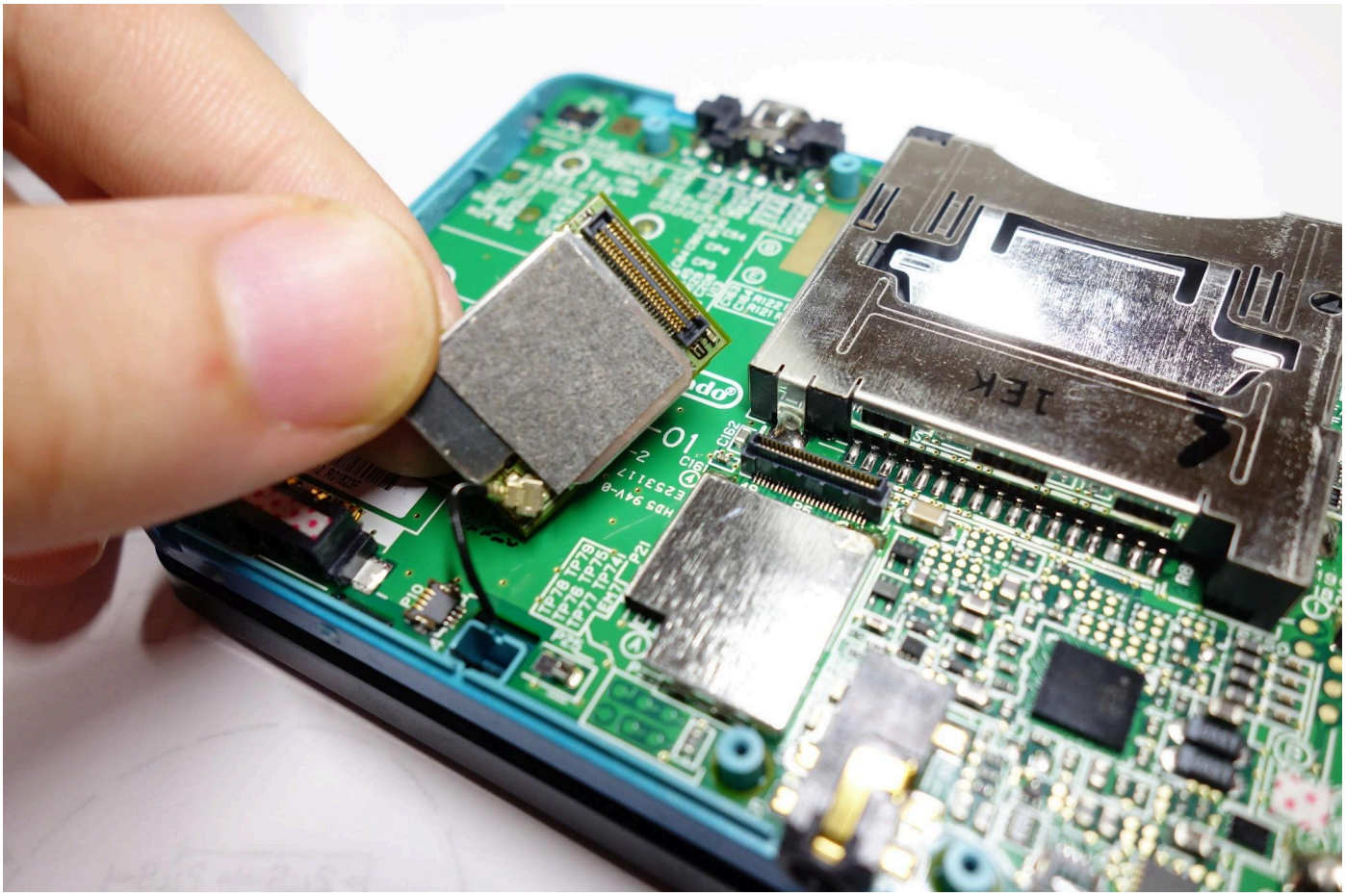


Disconnect the three ribbon cables underneath the SD module you just took off. For the wider flat cable in the middle, gently flip up the white tab, then pull the cable out. Break it and your 3DS is toast.



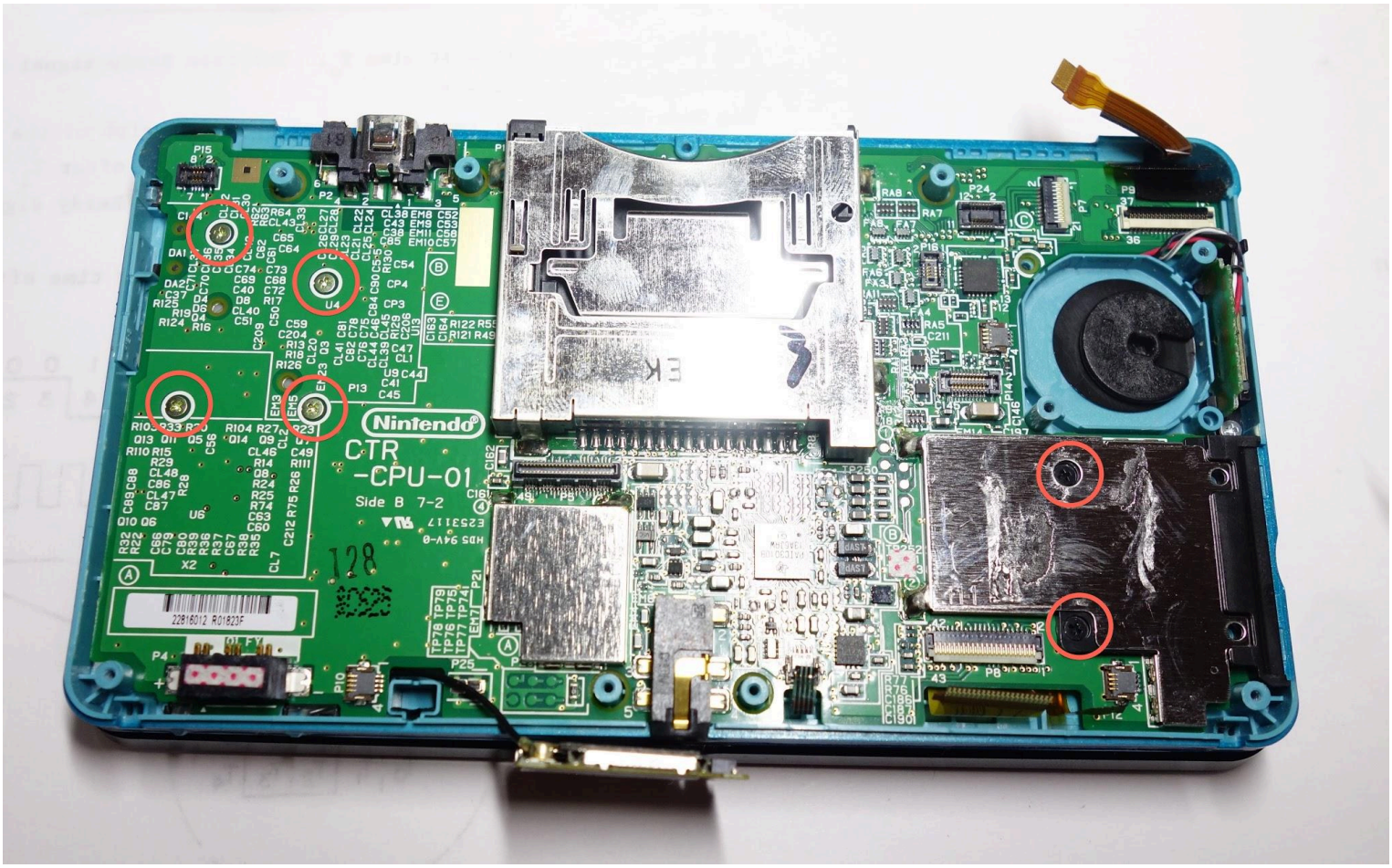
Pull out the microphone with a tweezer, like the one seen throughout the pictures so far, then disconnect its flat cable.

Now it’s WiFi module’s turn, disconnect it as well, you can leave the antenna wire on.

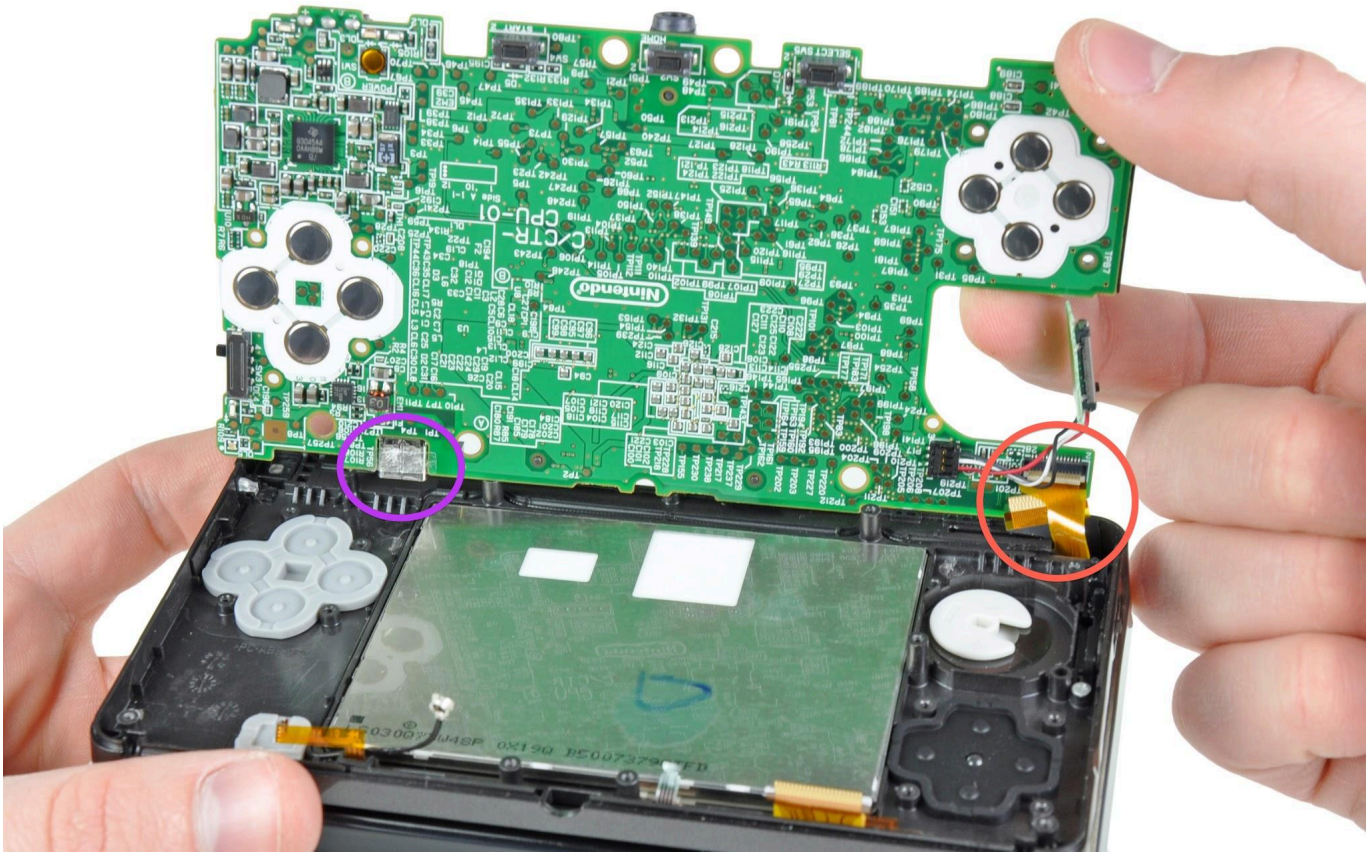


Now moving to the top right corner of the motherboard, disconnect this two flat cables.

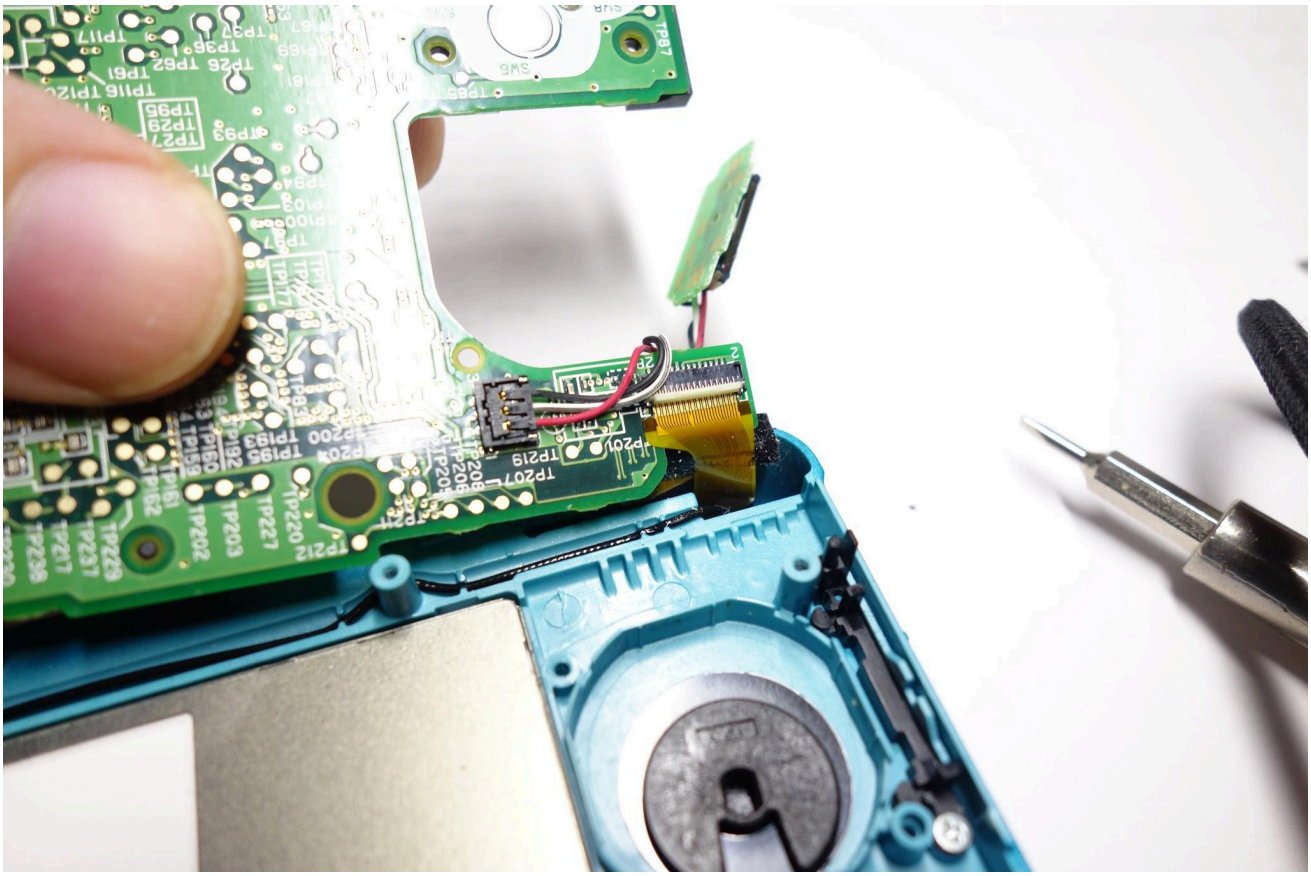
With everything out of the way, it’s time to flip it over. Undo screws in the red circles.



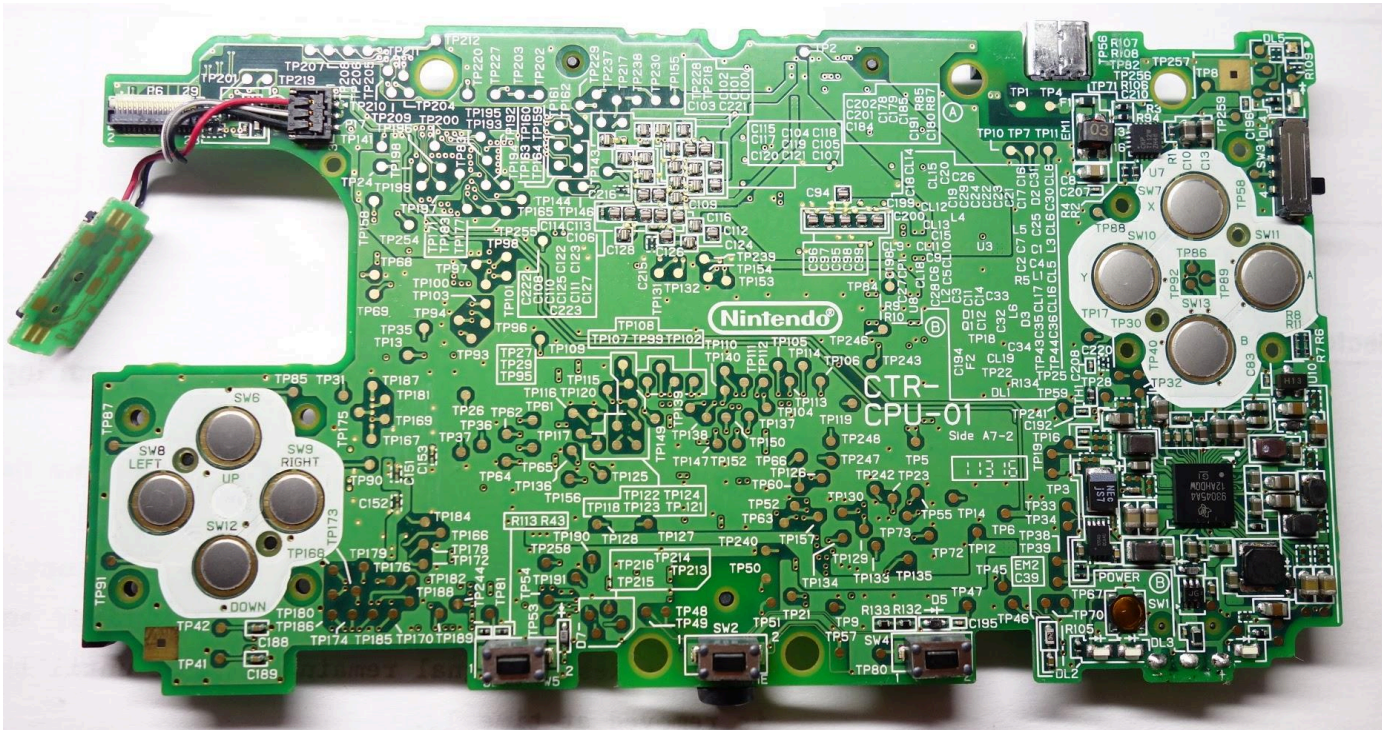
Now you can try to flip the motherboard over. Nintendo used some adhesive underneath the charger socket to make it rather difficult, and there is one other flat cable on the other side of the circuit board, so it you try too hard you'll rip if right off, then you can kiss goodbye to your 3DS. Be gentle and slow.
I forgot to take the picture so I'll be using ifixit's picture here. You can see the double-side table in the purple circle making things difficult, and the fragile flat cable in the ride circle.



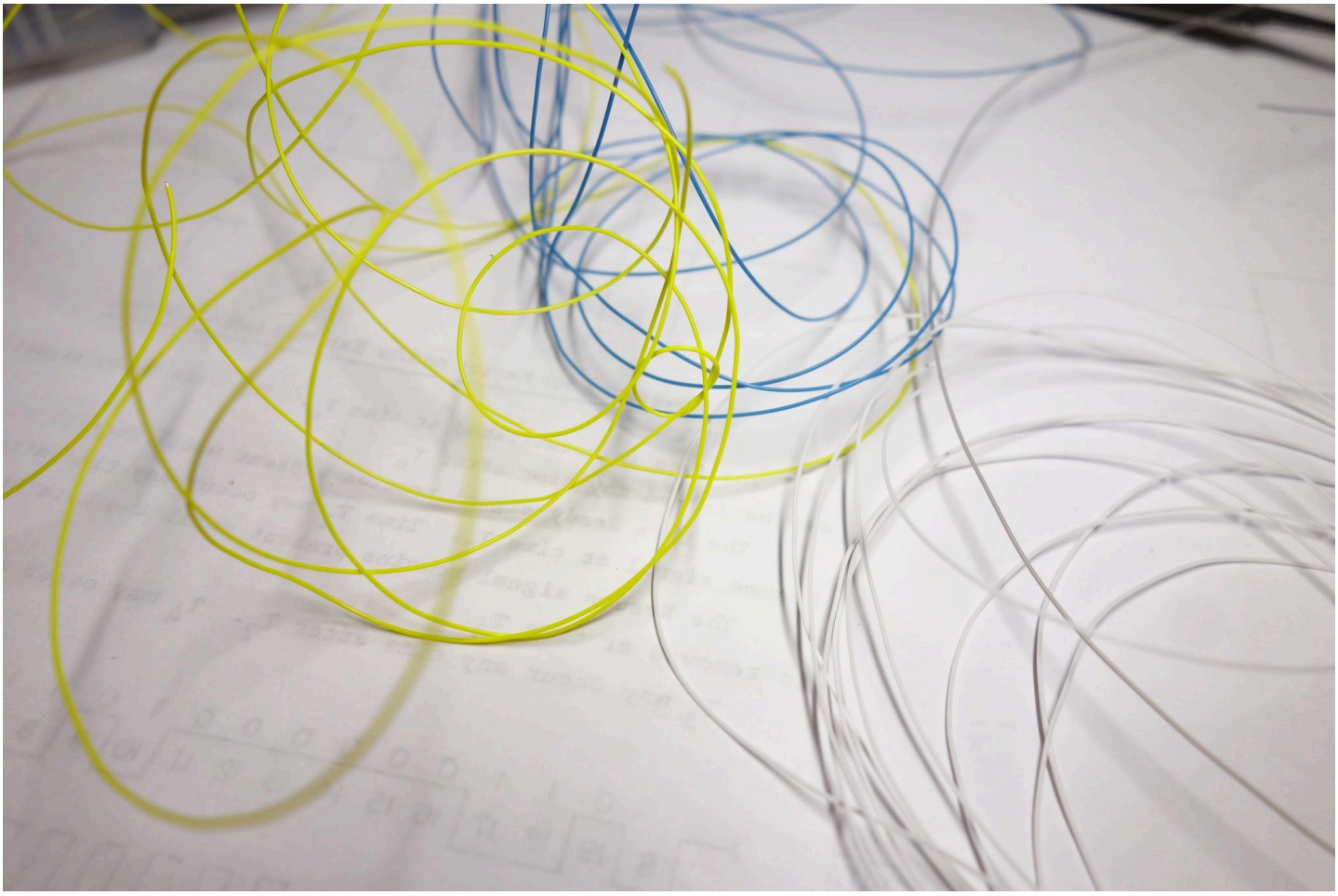
After you managed that, disconnect that ribbon cable. Now you're half way there!



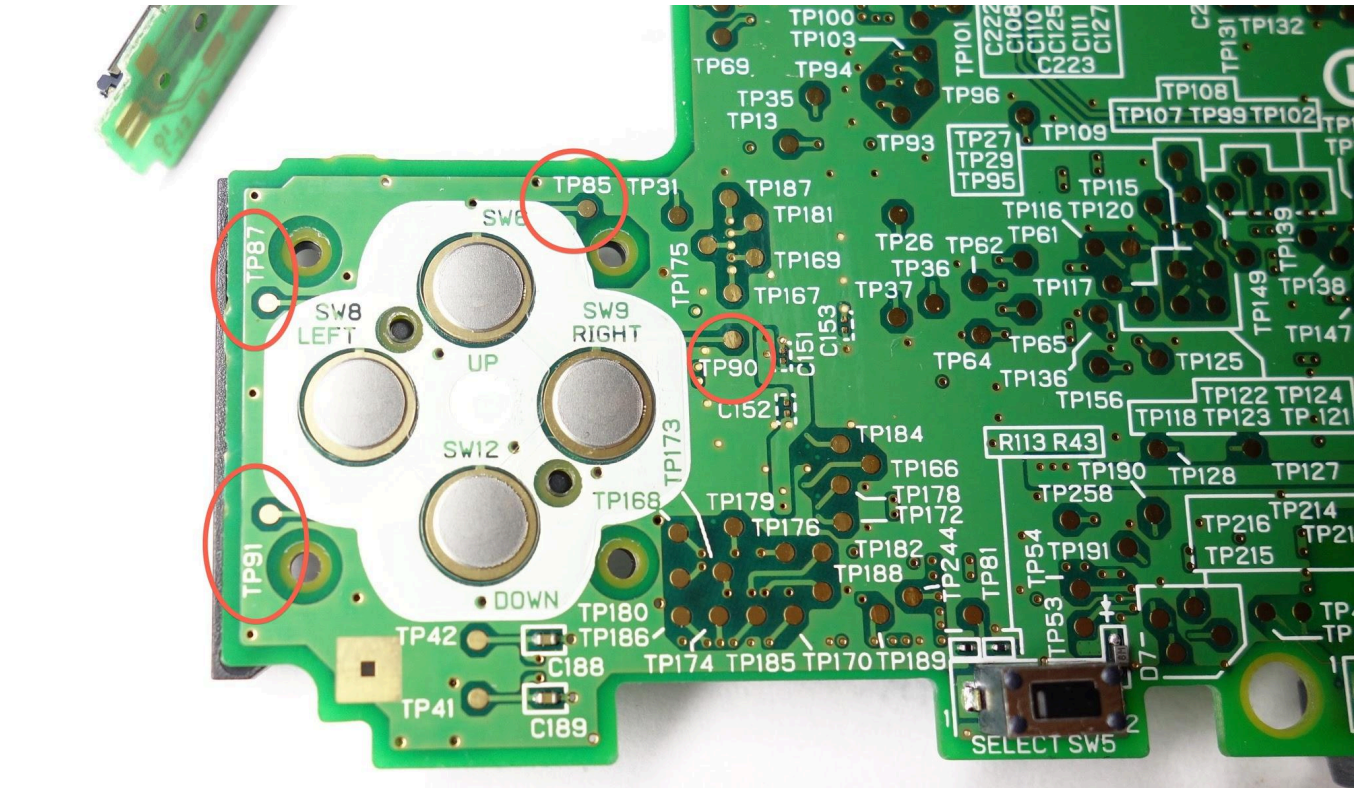
Now you should have the motherboard by itself. It should look like this:



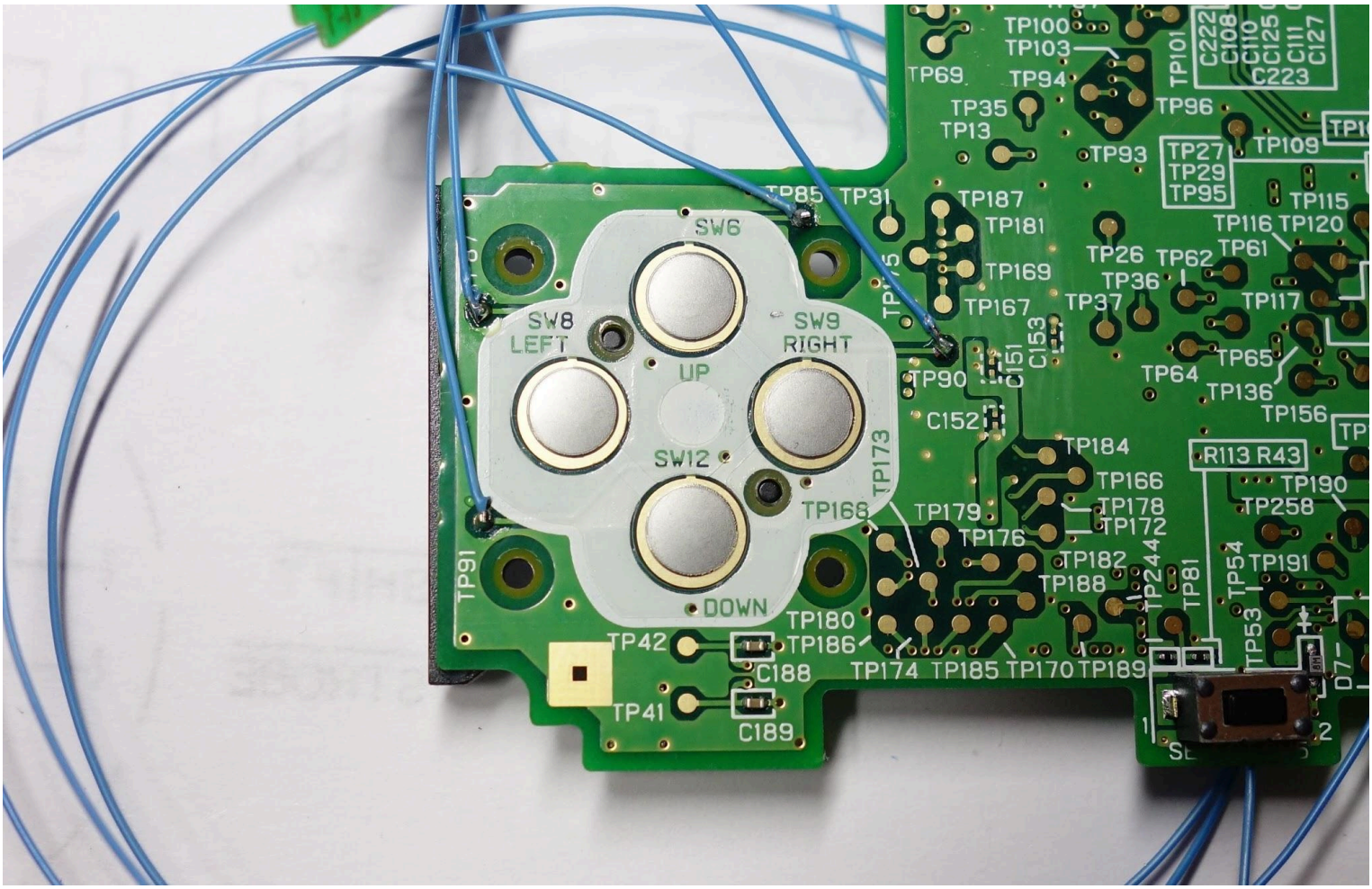
I hope you have some wires ready at this moment, I strongly recommend using wires thinner than 28 AWG, so it would be easier to assemble. Those wires are exactly 28AWG.



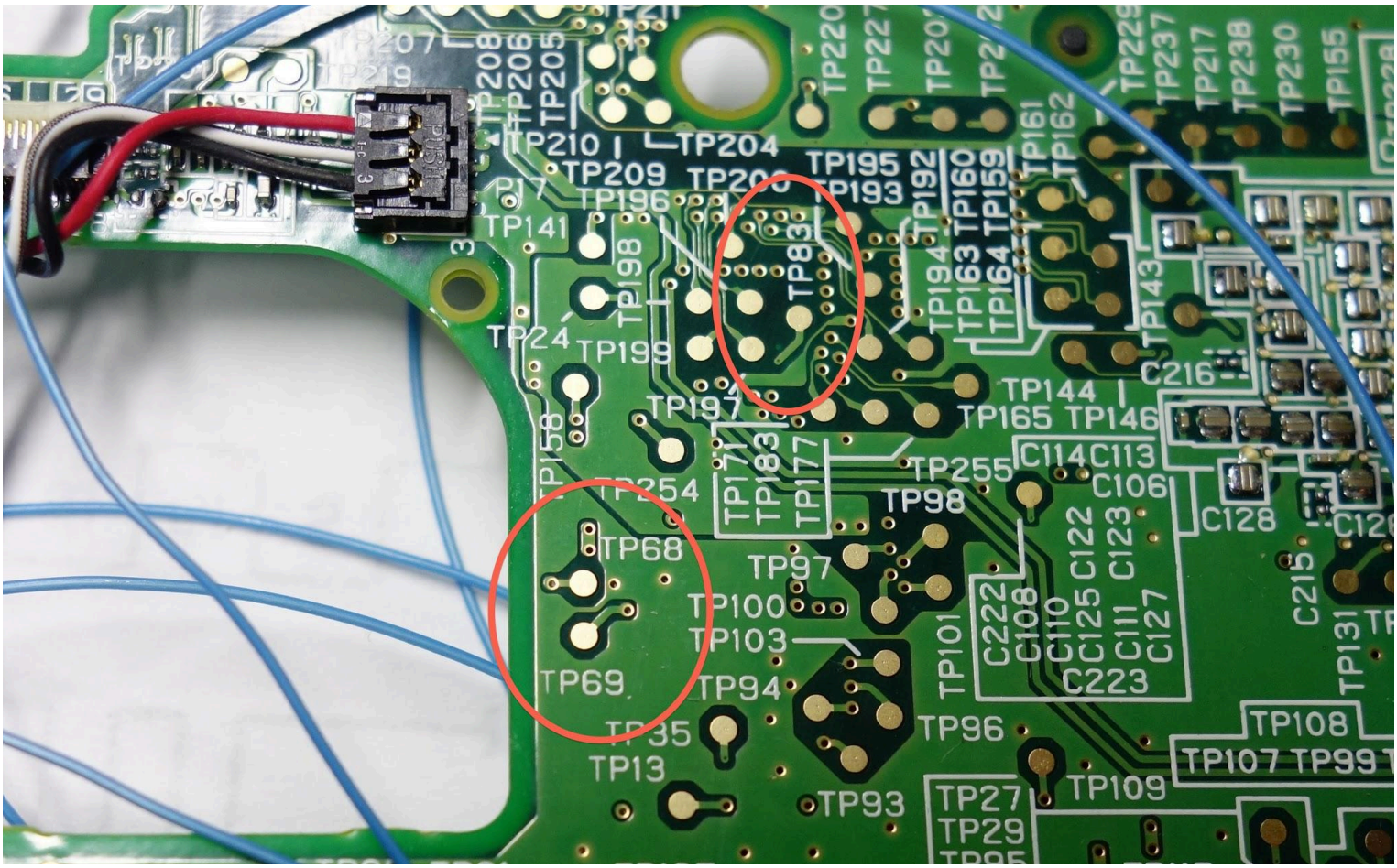
Take a look at where d-pad should be on the motherboard, see those little test points? We're going to solder wires to them so the Arduino can map GameCube controller to the 3DS. TP 85 is for up, TP87 for left, TP91 for down, and TP90 for right.



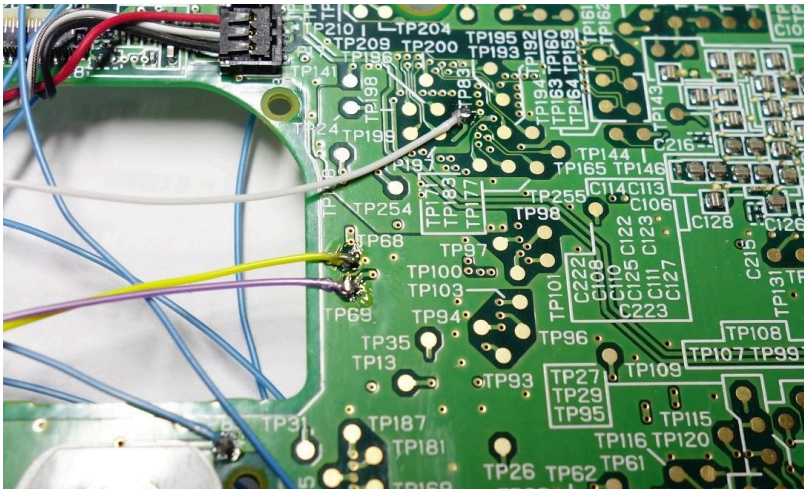
Solder the thin wires onto the test pads. One important thing to keep in mind is that you will have to figure out which wire is which after putting the 3DS back together, so take a lot of pictures, and use different colored wires.



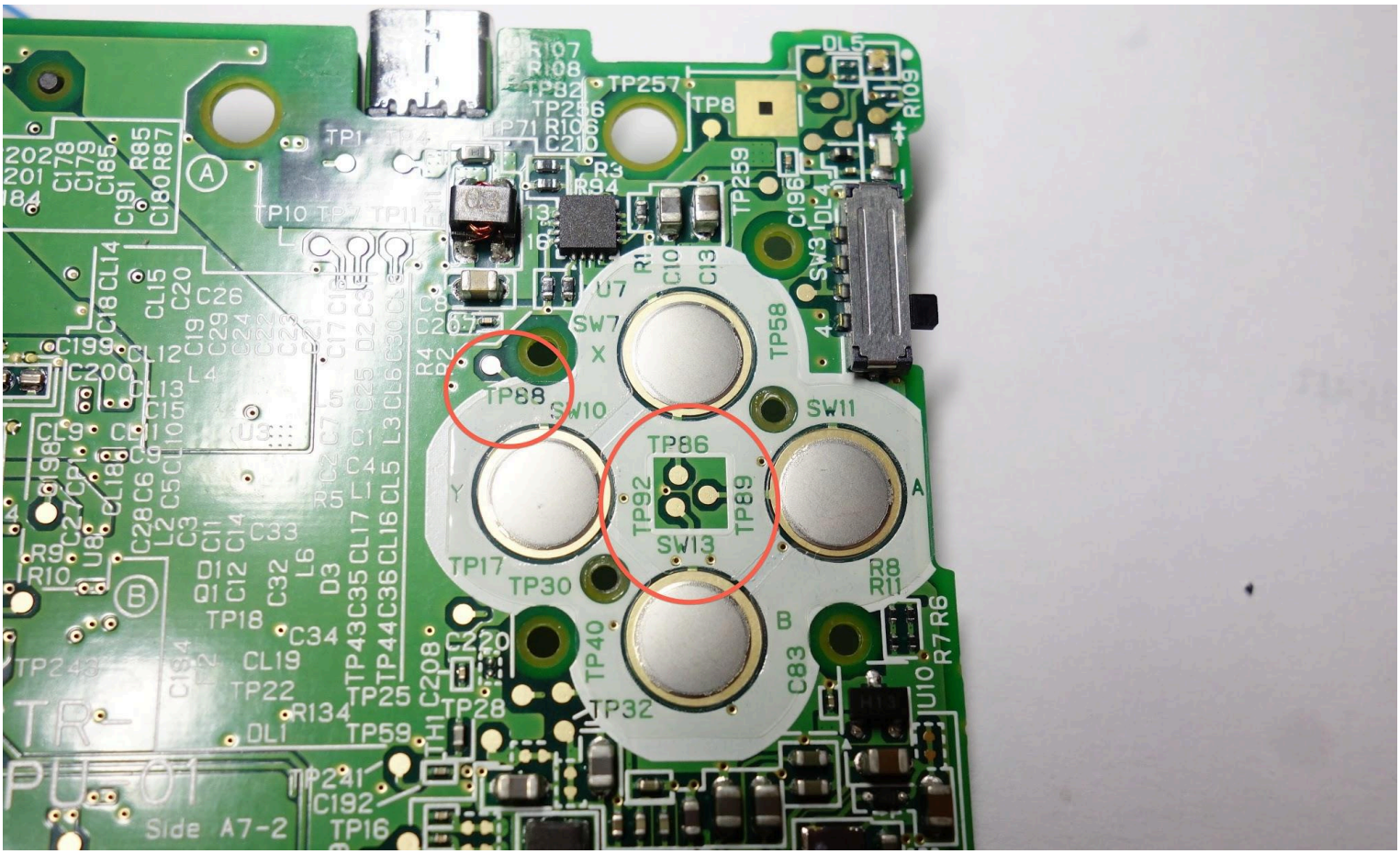
Next up are the test points for circle pad input and L button. TP68 is 3DS analog input Y, TP69(heh) is 3DS analog input X, a voltage between 0 to 1.8V to those pin indicates the position of circle pad. Solder wires to those. TP 83 is R button.



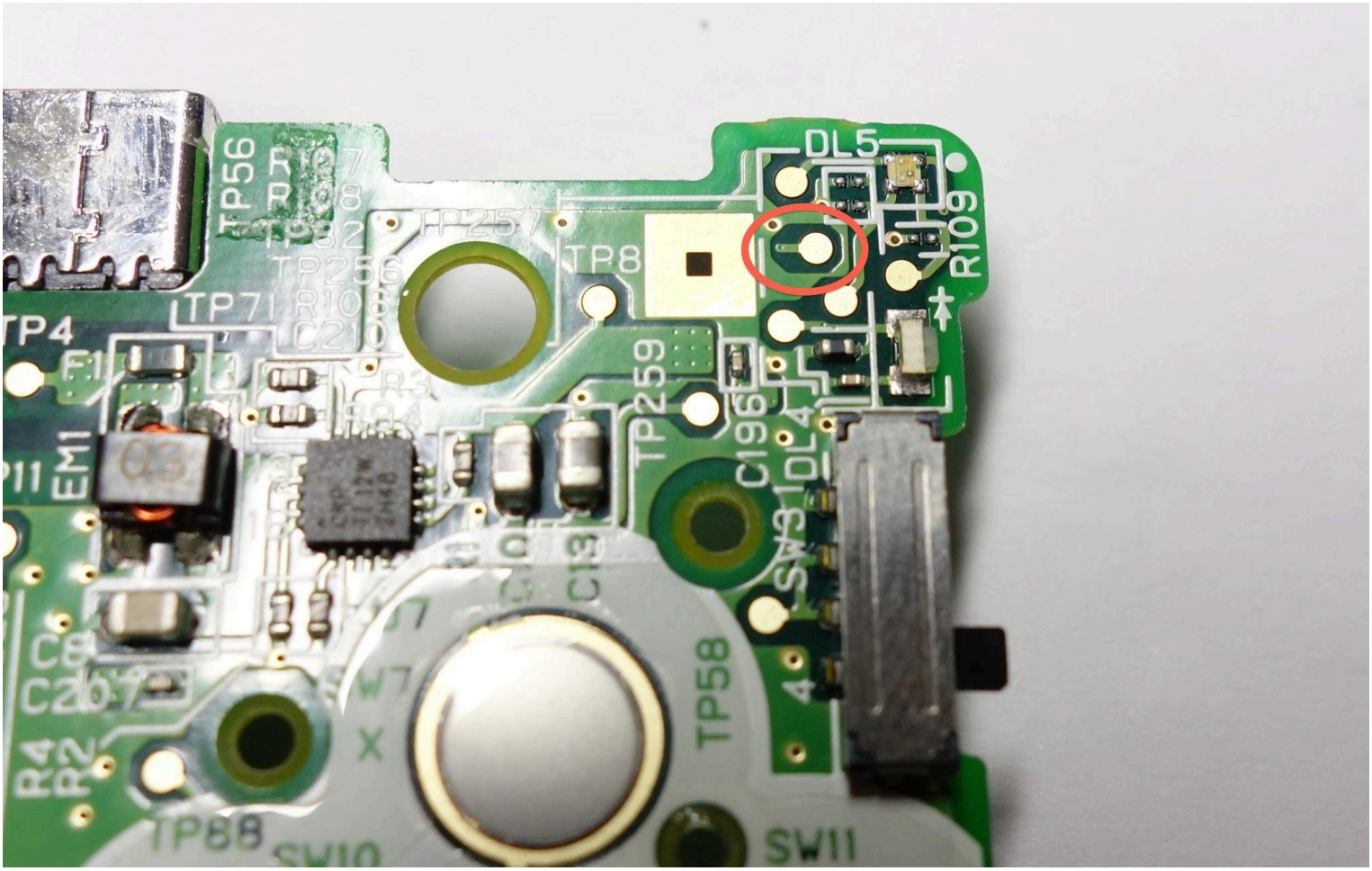
Like so:



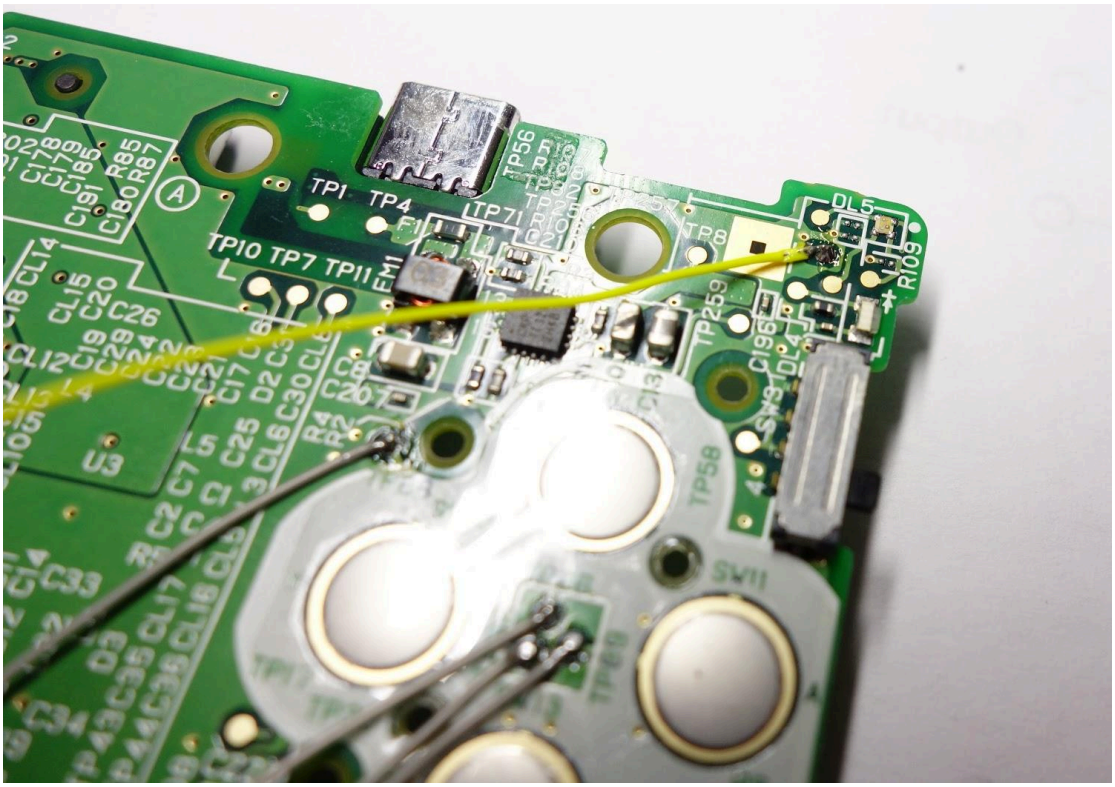
Now it’s time to move on to the other side of the circuit board, where you’ll find TP88 for Y button, TP86 for X button, TP92 for B button, TP89 for A button, solder the wires.



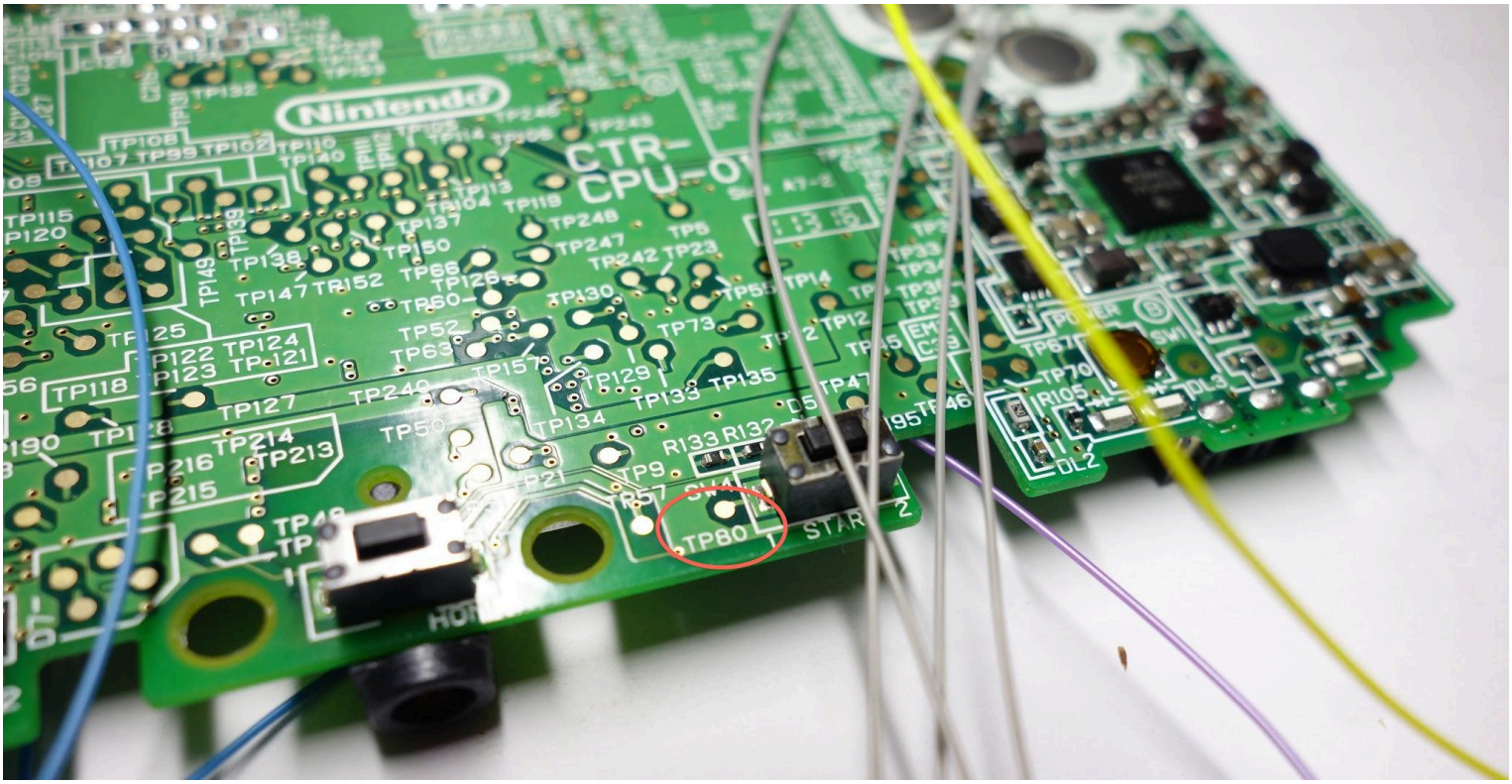
The test point for R button is in the circle, make sure you get the right one.



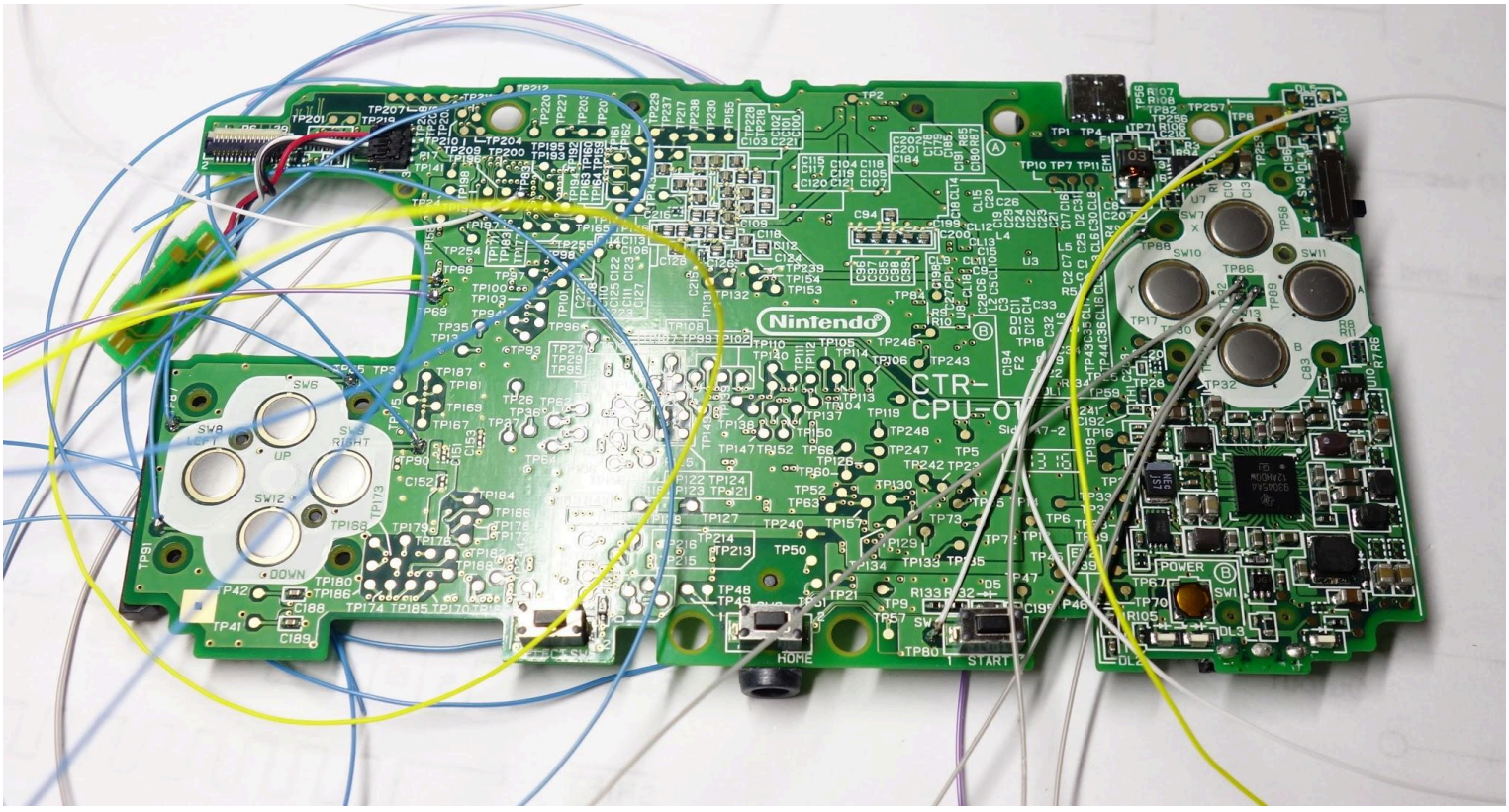
Like this:



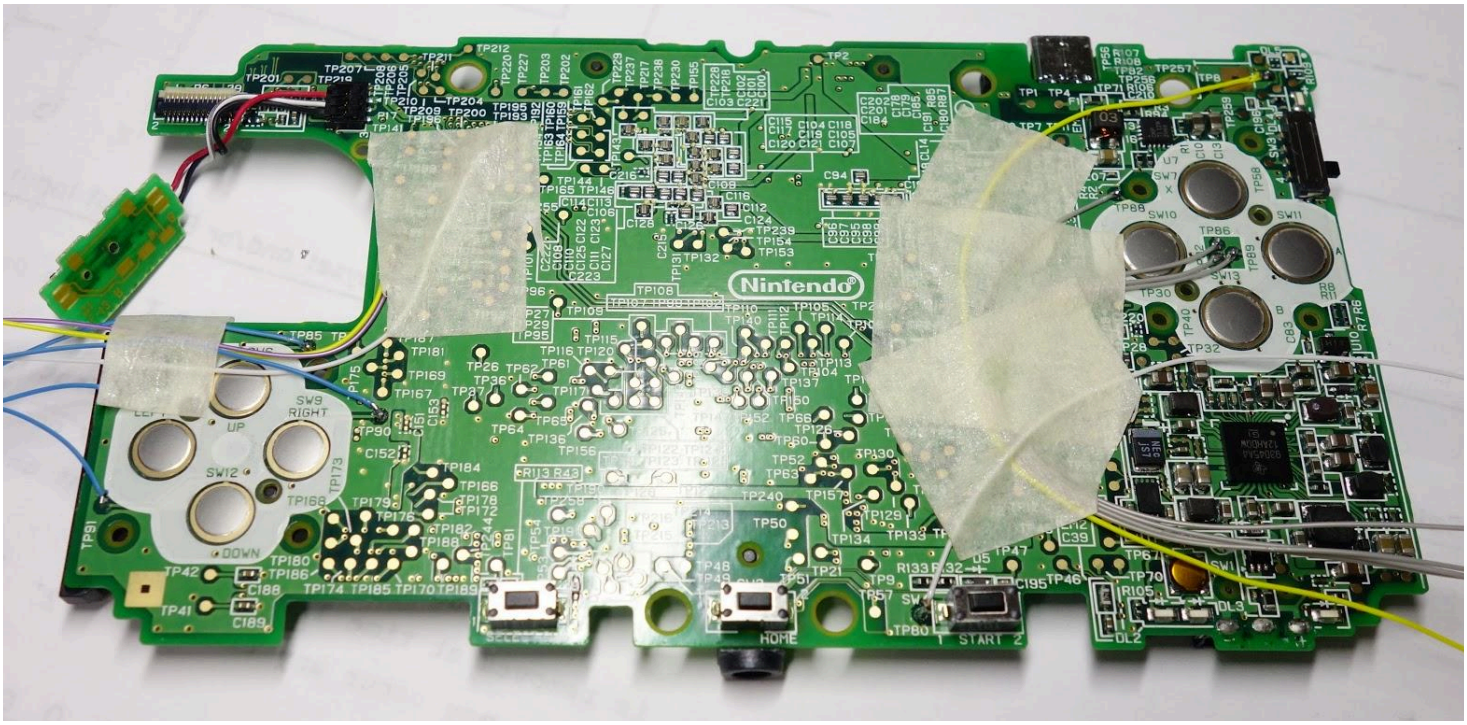
TP80 is start button, you know what to do.



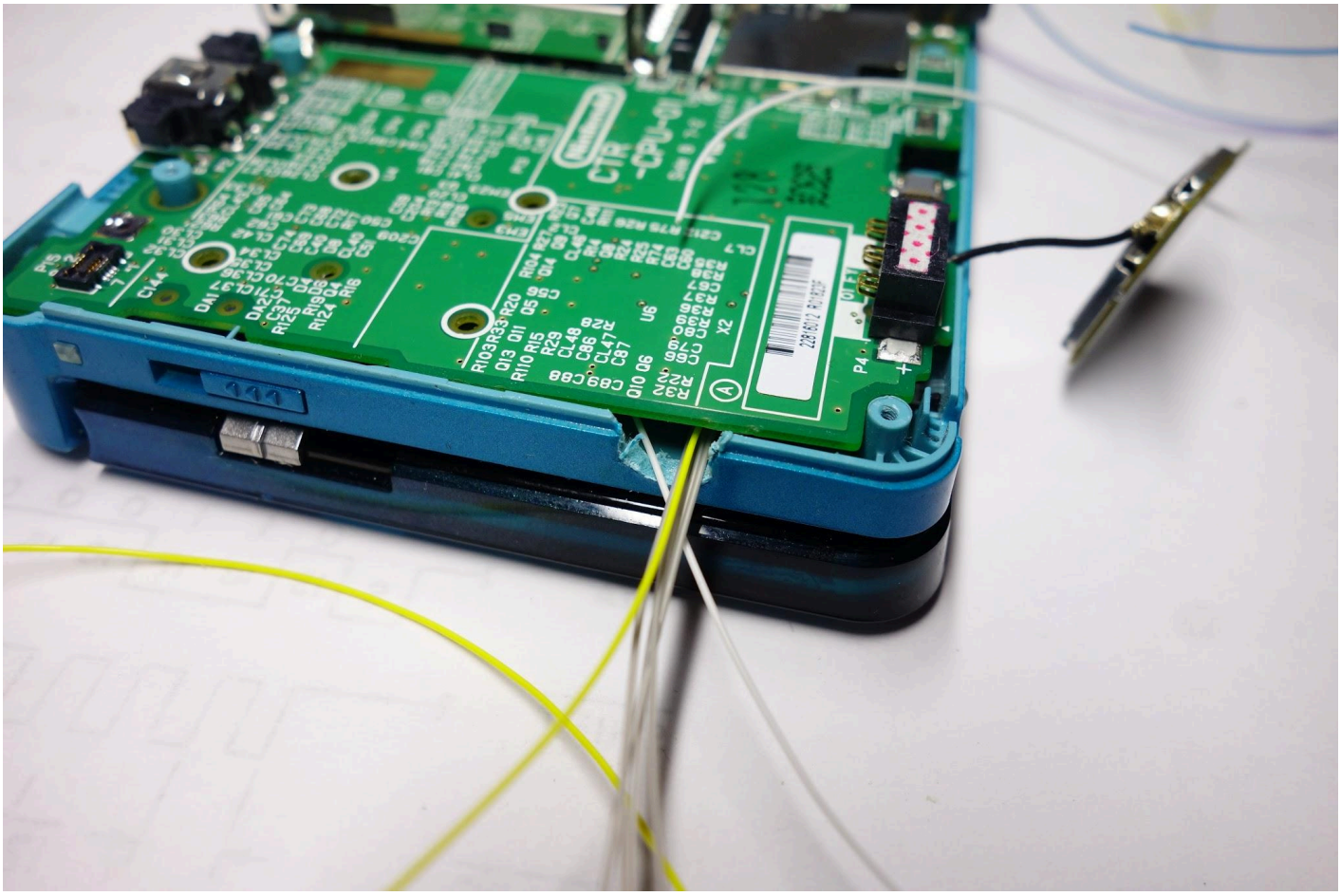
By now all the soldering is done on this side, and it will look like a mess



What I would suggest is to use some masking tape to tape the wires down, so they won't move about all over the place in the next steps.

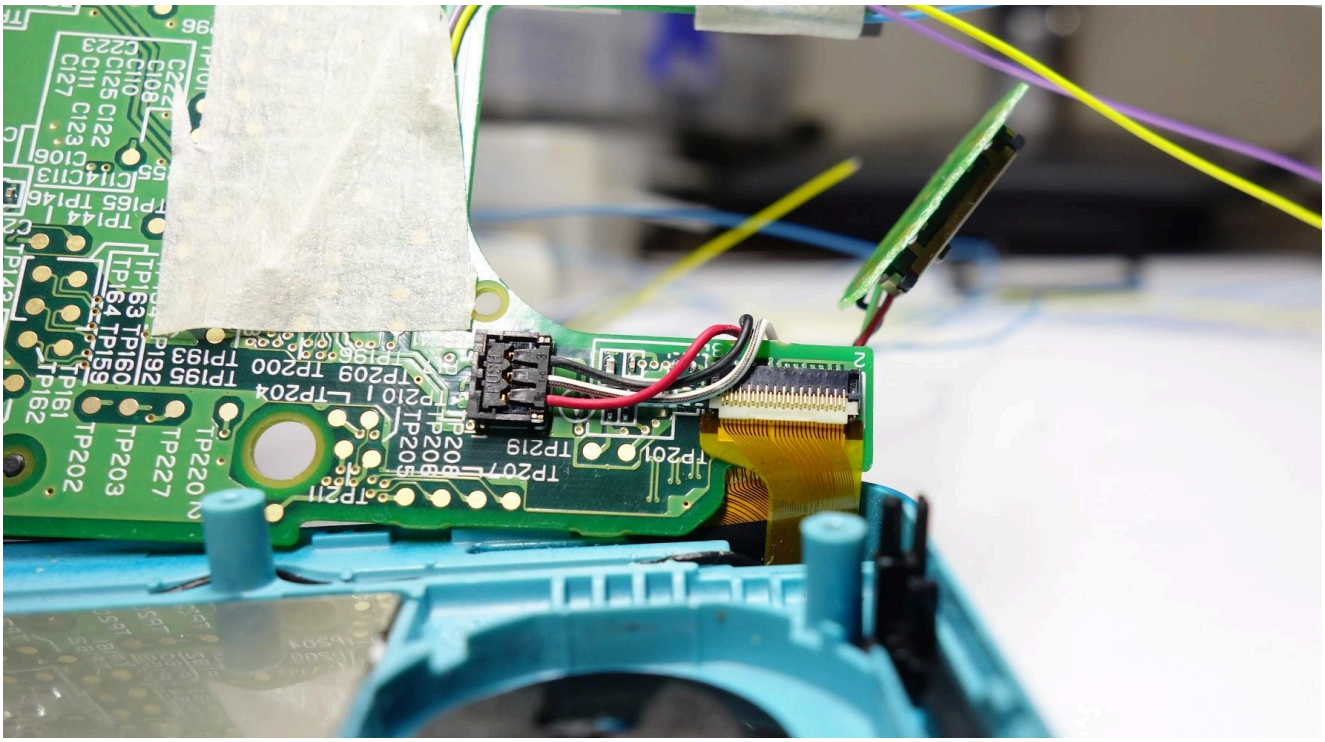


Try to put the motherboard back into the 3DS, you'll realize that the wires have to come out somewhere. I would just cut a small opening on the sides, but of course you can do whatever you want.



Now we're ready to put the motherboard back. Make sure those wires that you soldered on isn't overlapping buttons on the circuit board, otherwise that button will be hard or impossible to press down. Then there comes the most

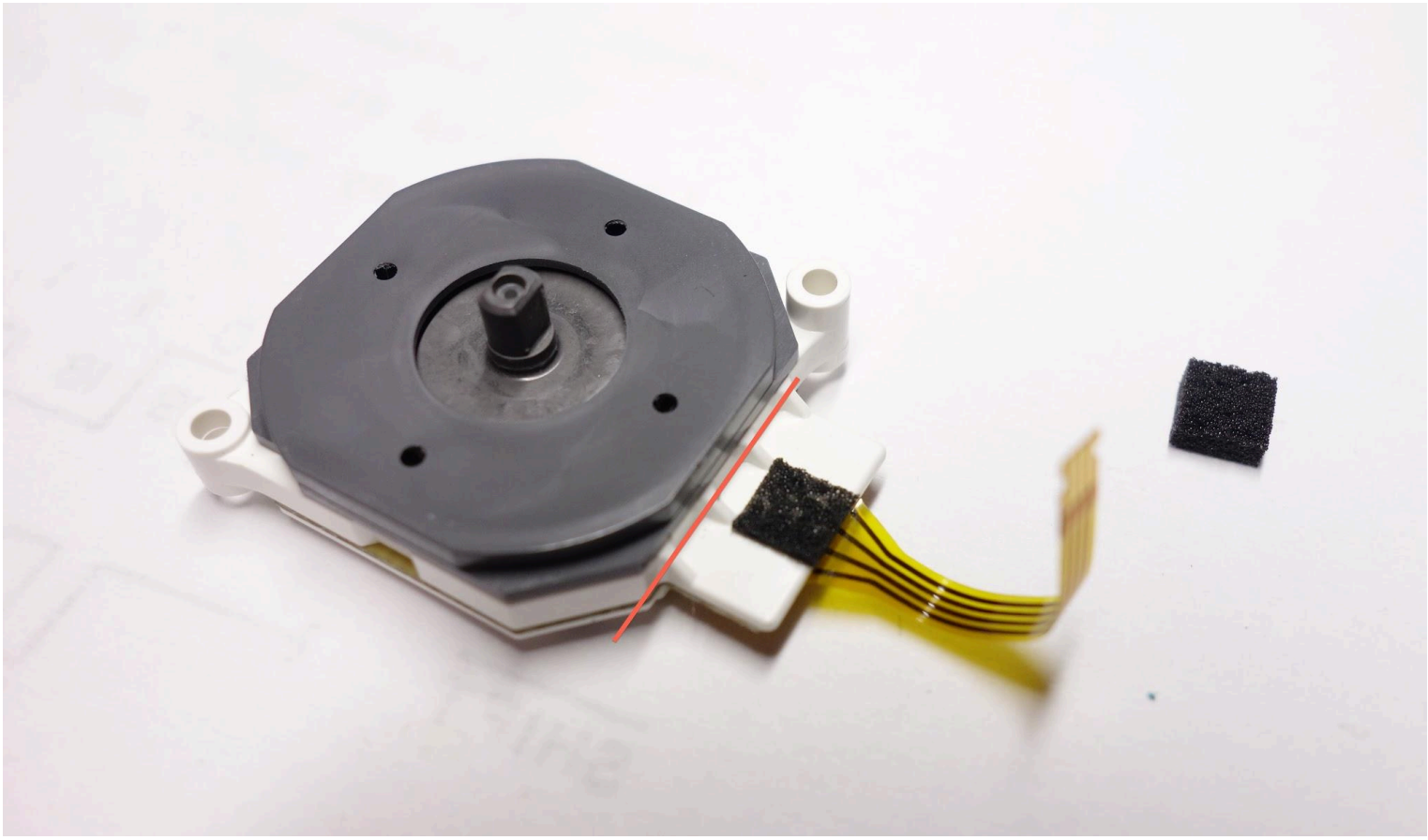
daunting task: reconnecting that flat cable on the back side. Flip up the white tab on the top of the connector, use a tweezer to guide the flat cable all the way into the socket, then flip the white tab back down and press it shut. Always remember that if you break it the entire 3DS will be dead. Be calm and don’t rush. It should look like this after being reconnected.



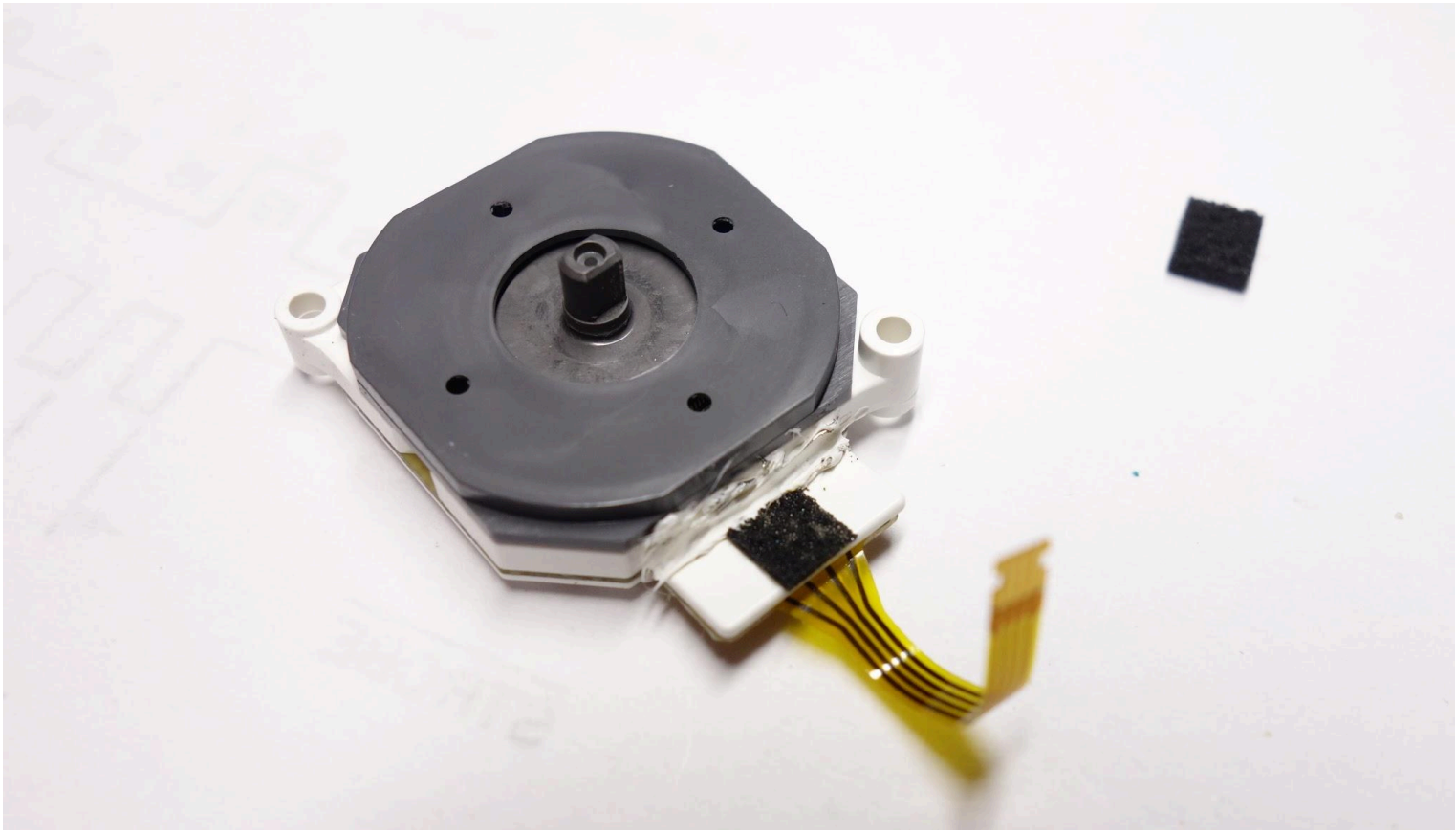
Flip the circuit board back into the 3DS enclosure, make sure the wires are coming out of the openings you cut earlier(red circle).

Now that the motherboard is back in place, all we need is to connect those modules and flat cables that we disconnected earlier. Look at the beginning of this guide and reconnect everything except the circle pad.
To maintain the portability, we still want to be able to switch between using the build-in circle pad and gc controller, the next steps are for this part.

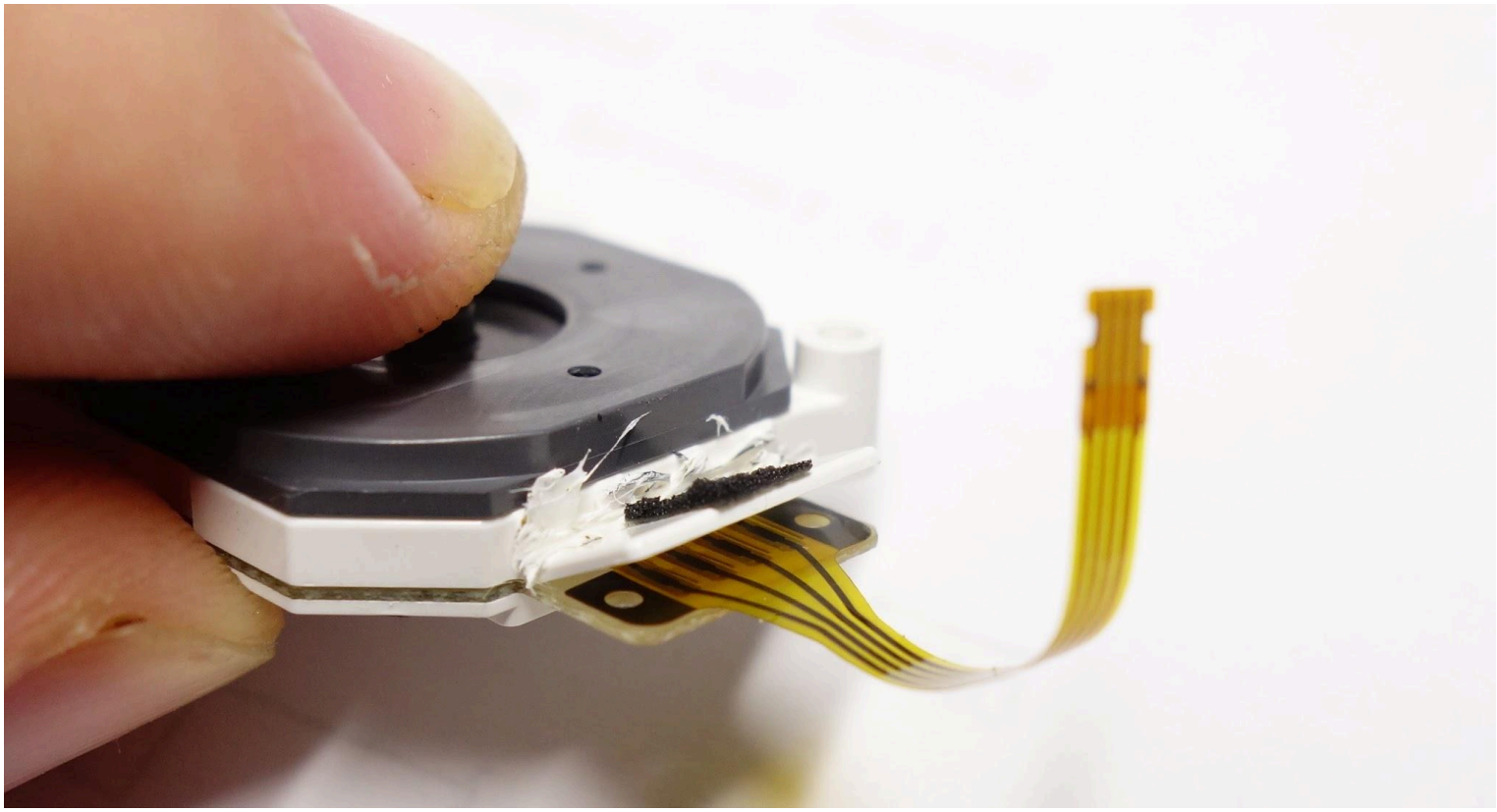
Position the circle pad like this, we want to cut off the white plastic tab to reveal the ribbon cable below.



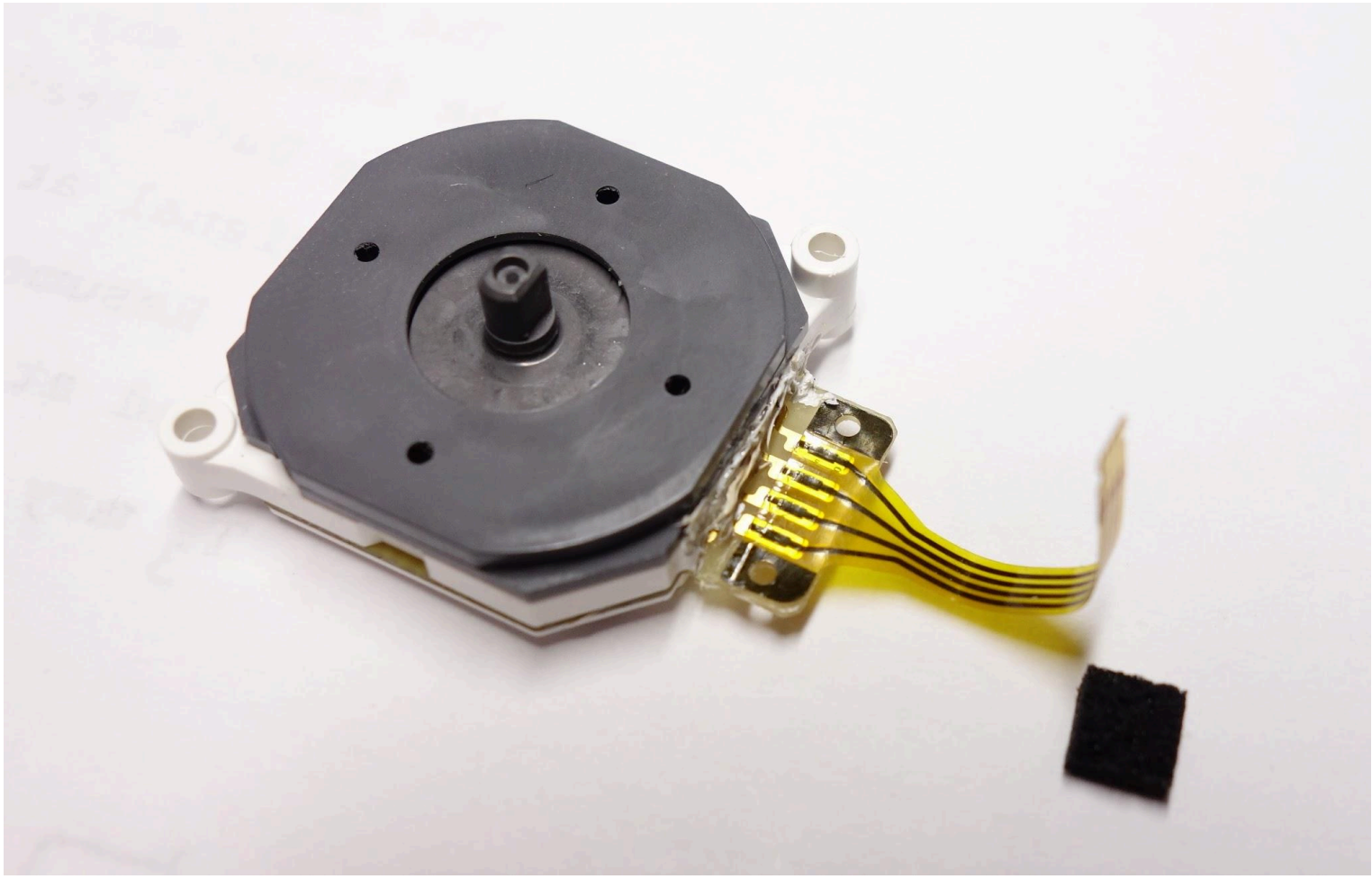
The lazy way is to just use the soldering iron to melt the plastic along the red line in the above pic



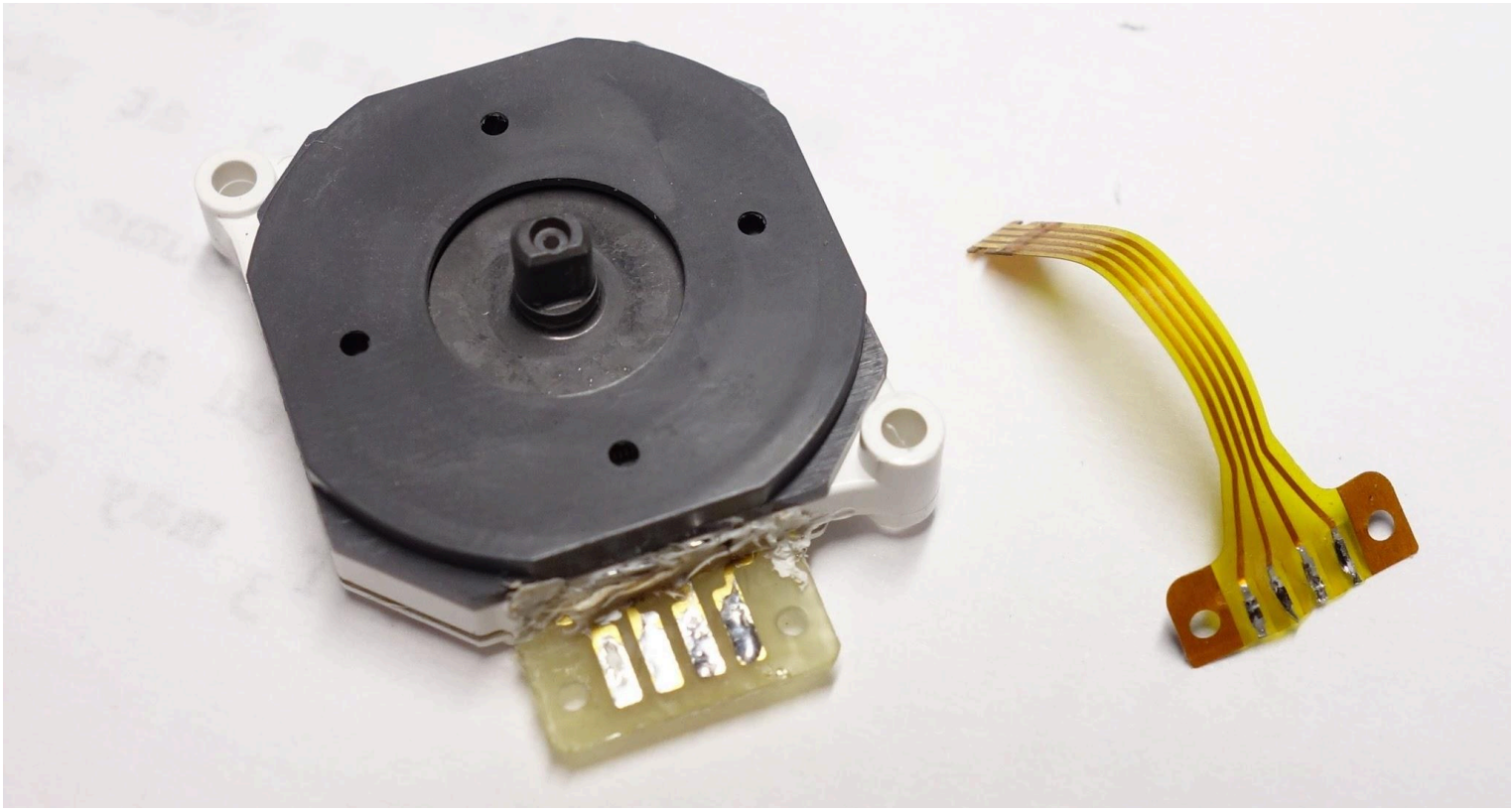
And then lift it up



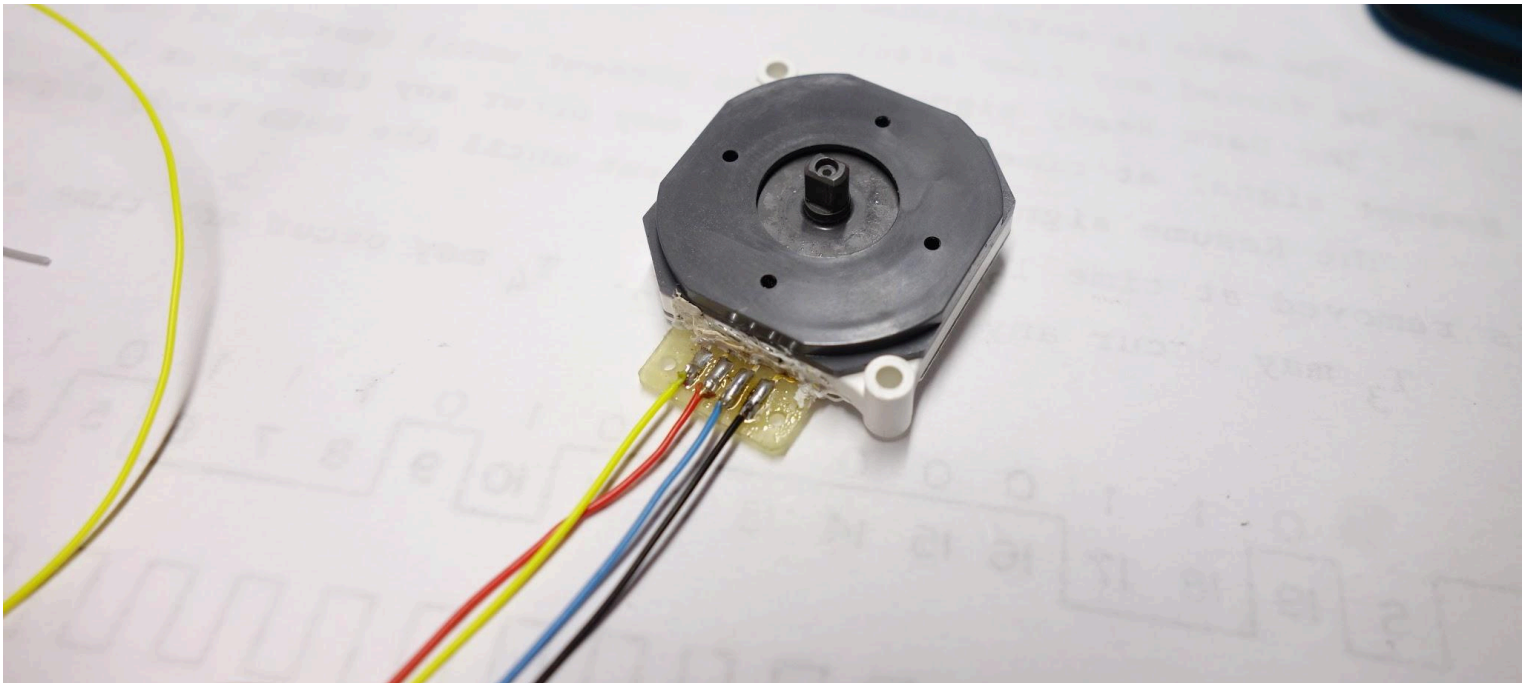
And twist or cut off the white plastic tab, so you can see the solder points of the cable



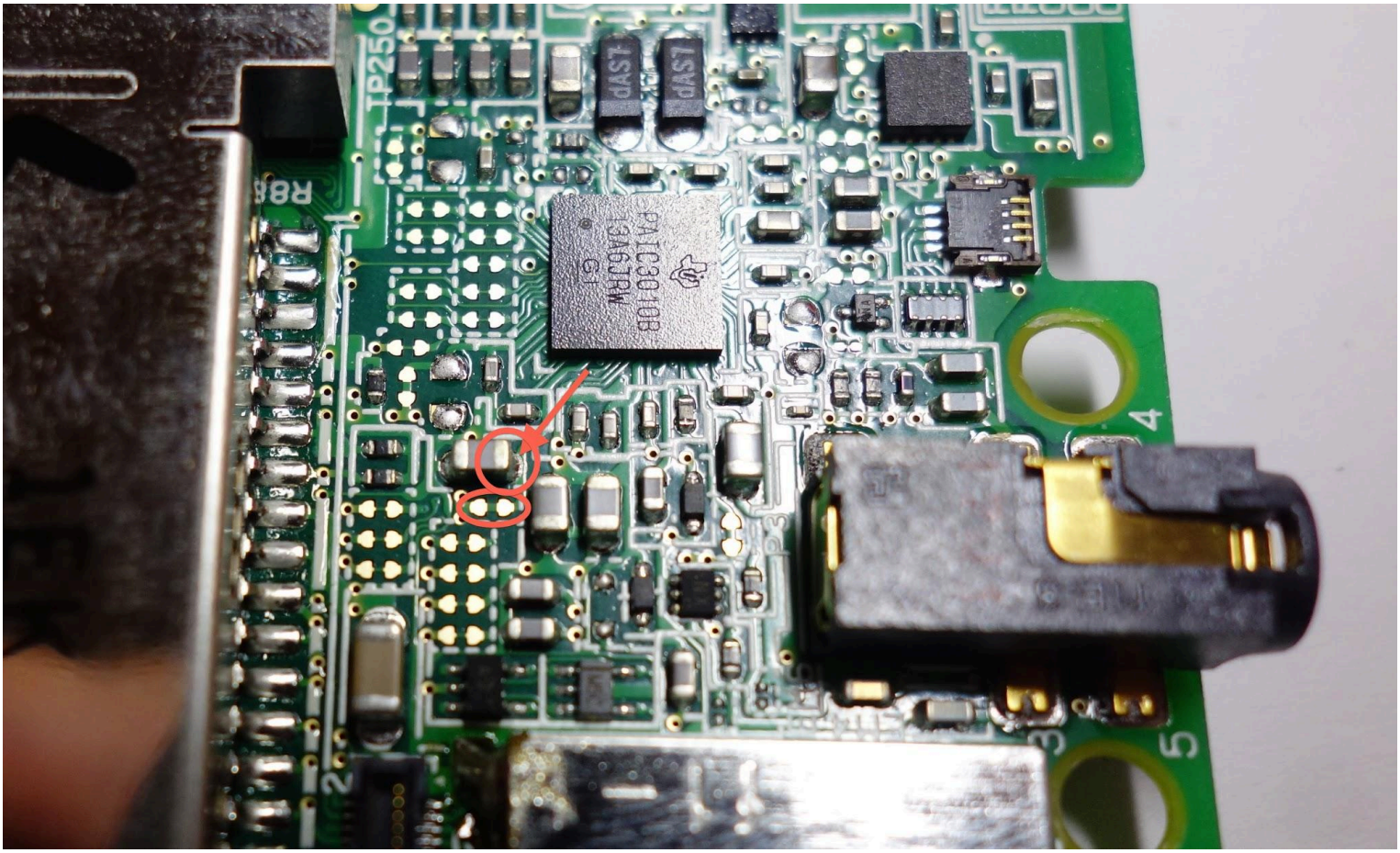
Desolder the flat cable by inserting the tip between the cable and the contact, we don’t need this cable anymore so you can try other means to get it off.



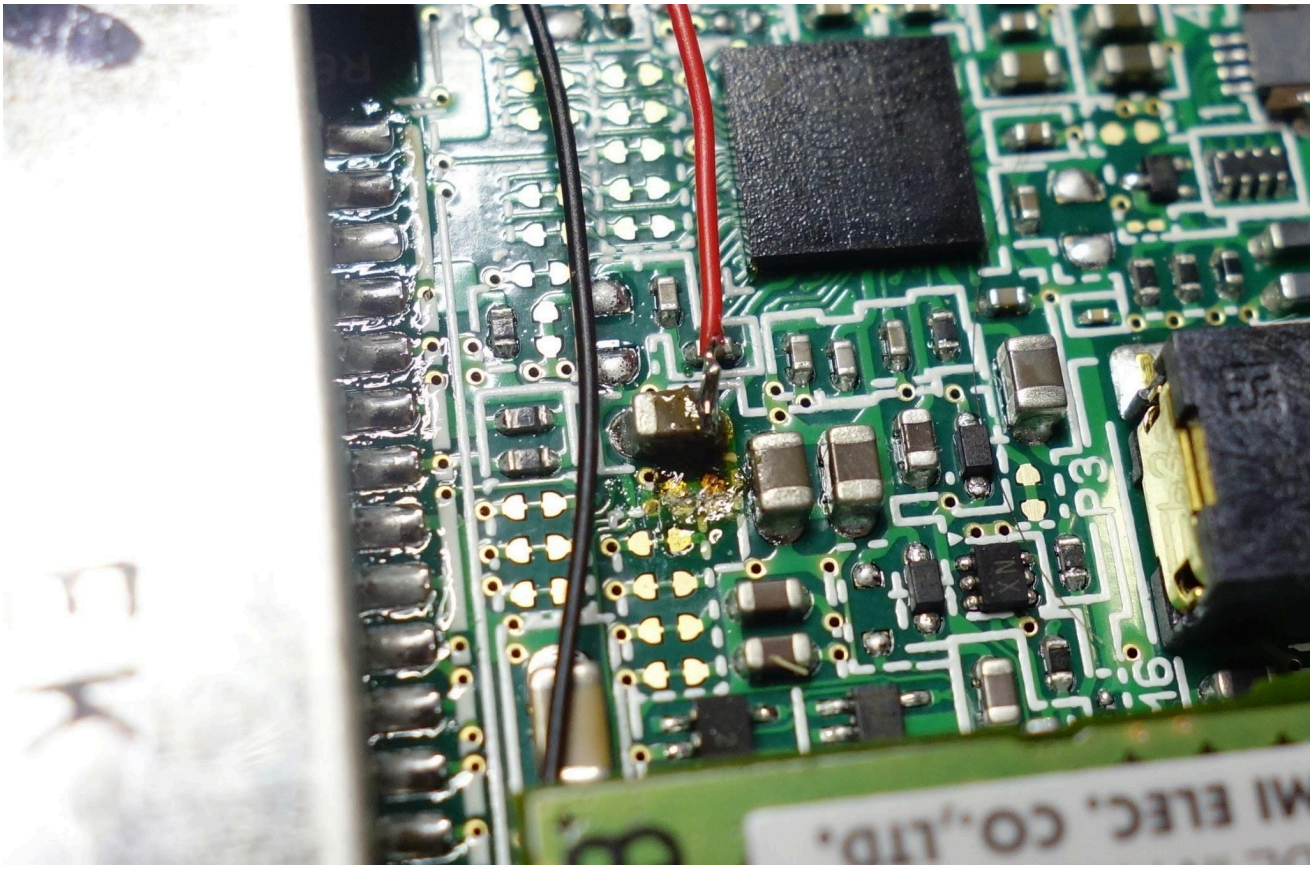
Solder 4 new wires to the contact, the pinout are, from left to right, build-in circle pad y potential, 1.8V, build-in circle pad x potential, ground.



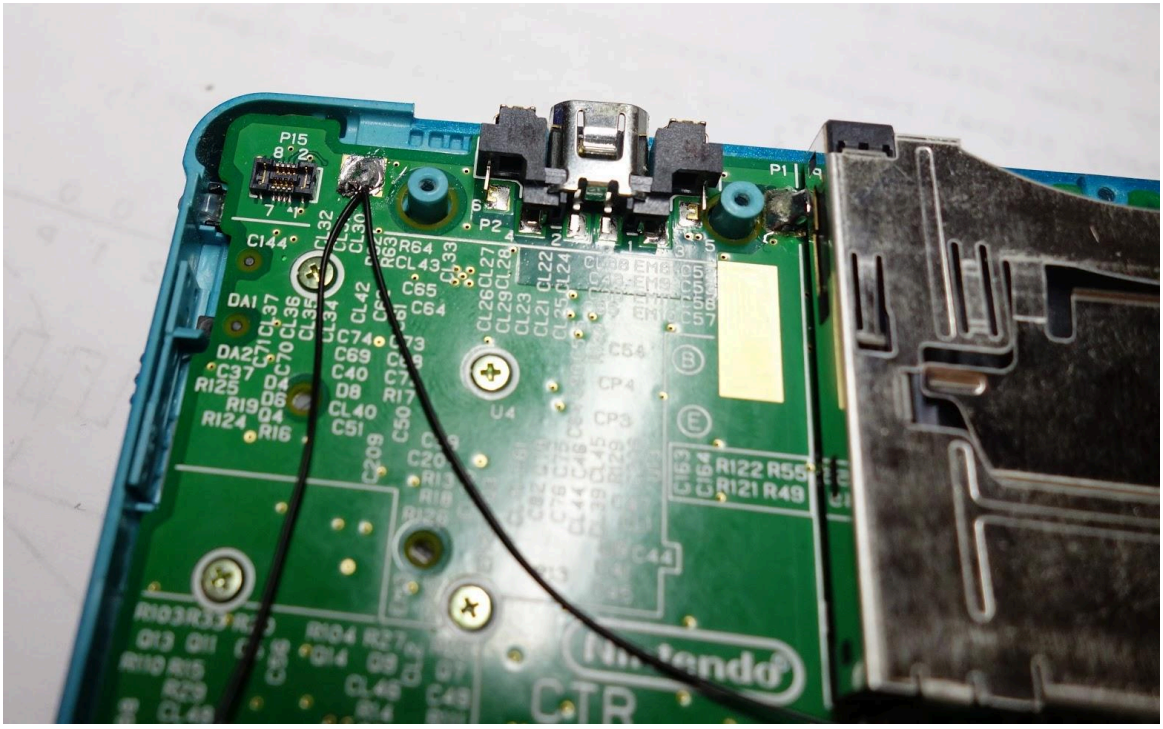
Now put the circle pad back into the 3DS and tighten its two screws. Find the red circled area in the mother board.



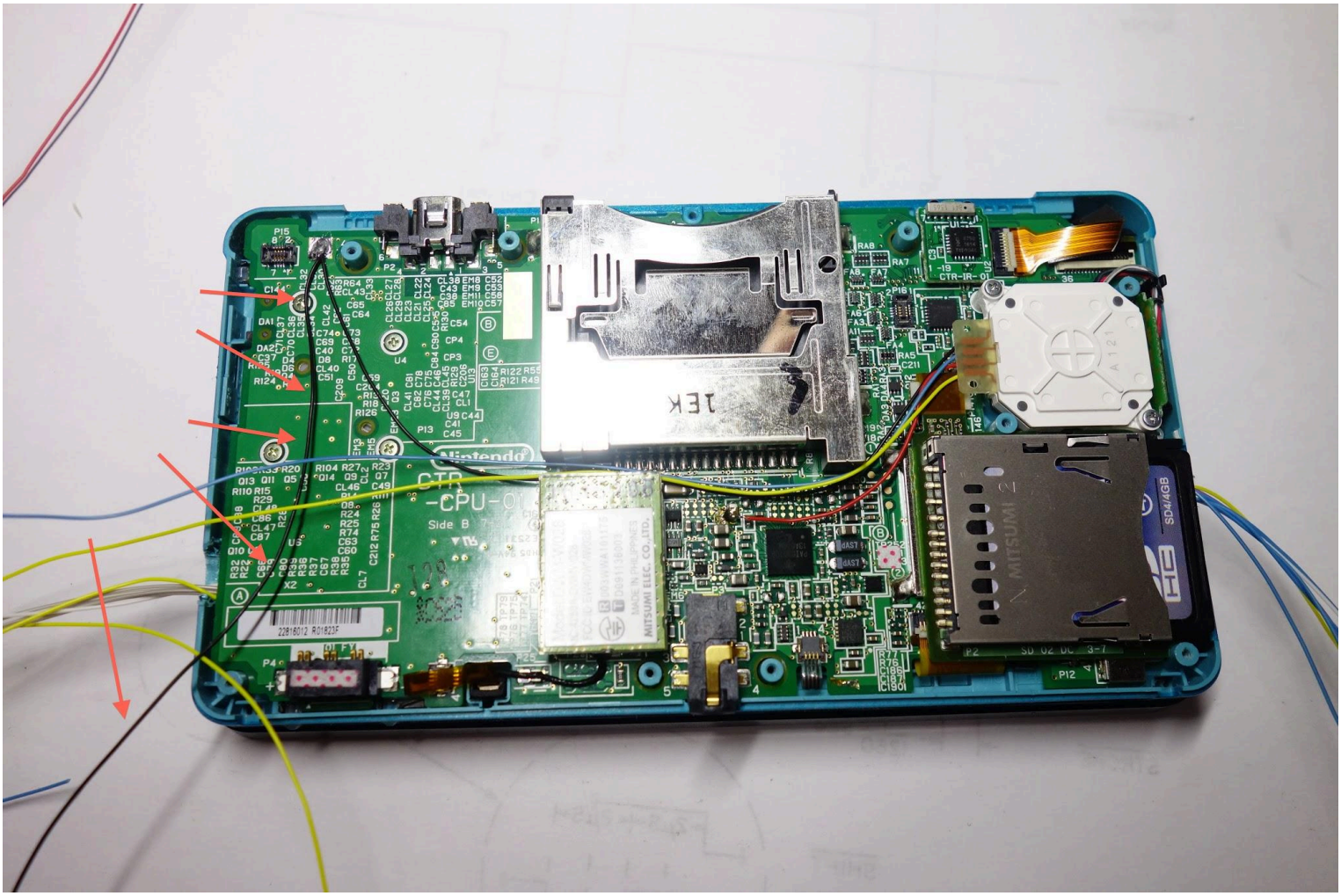
That's where circle pad's 1.8V supply comes from, solder the 1.8V wire to here, in this case, the red wire. You can try to solder it to the pad(lower circle), but I found it easier to just solder it to the capacitor(upper circle with the arrow), make sure it's the correct side, see the pic above.



For the ground wire on the circle pad, solder it to the ground pad on the circuit board.



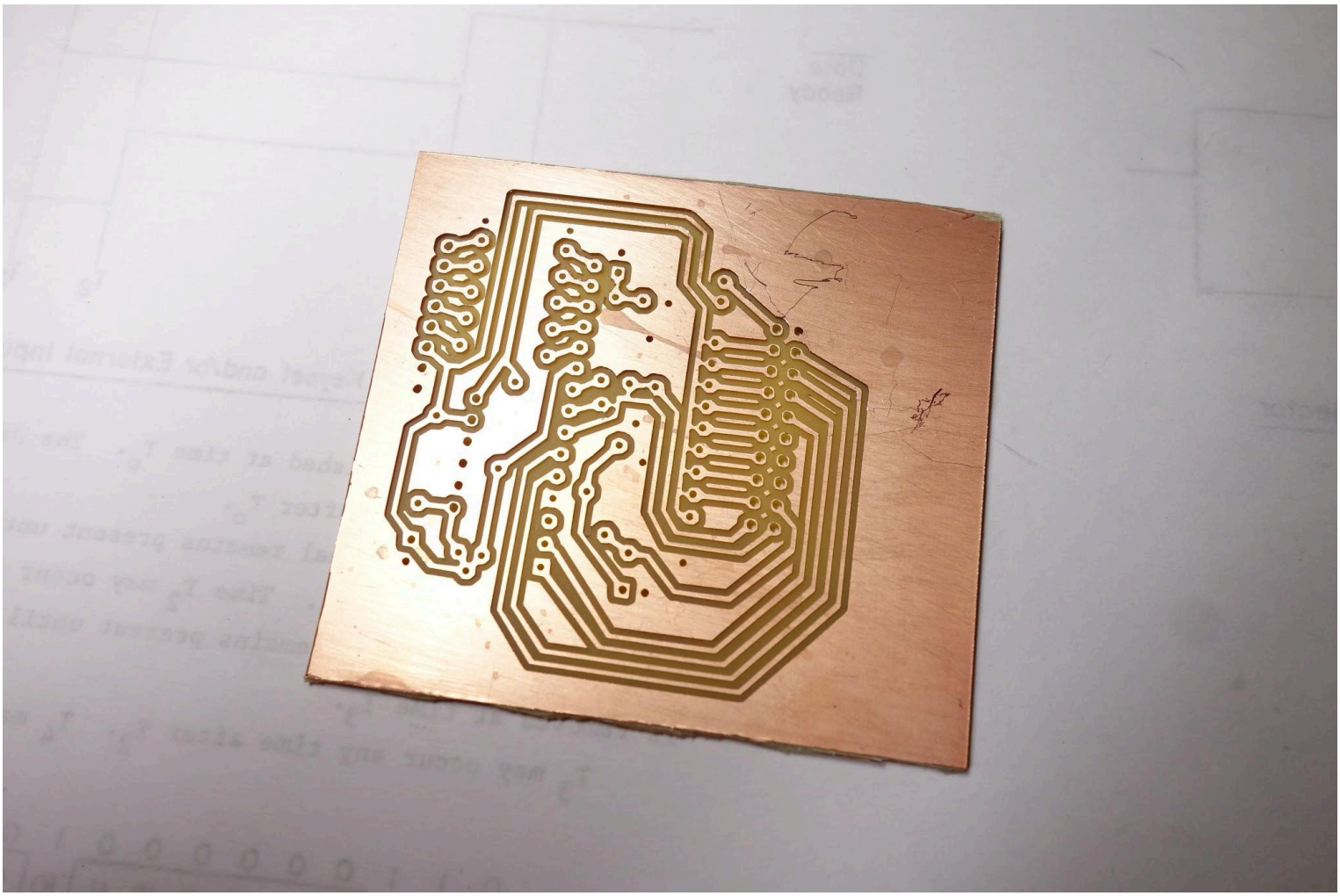
The other two wires on the circle pad goes out of the 3DS. It should like look like picture below.
Now we're finally done with the 3DS modification, but before putting it back together don't forget to solder a wire to 3DS ground and have it come out, as in the black wire with arrows pointing to it below.



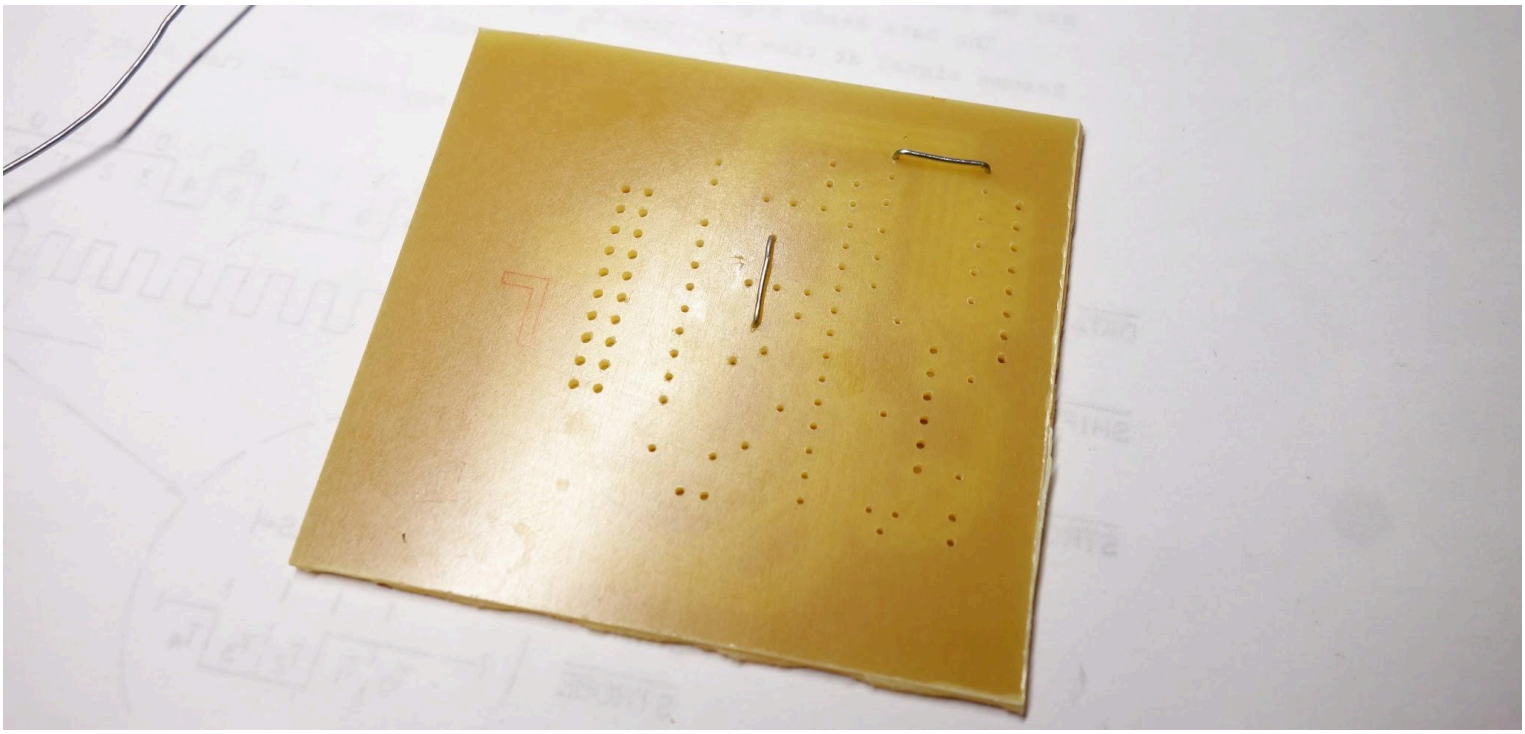
Put on the back case, don’t forget to press the L and R button’s connector to the motherboard.

Put the battery back in and back cover on, if you done everything right it should turn on just fine. The circle pad might go mad but don’t worry about it.

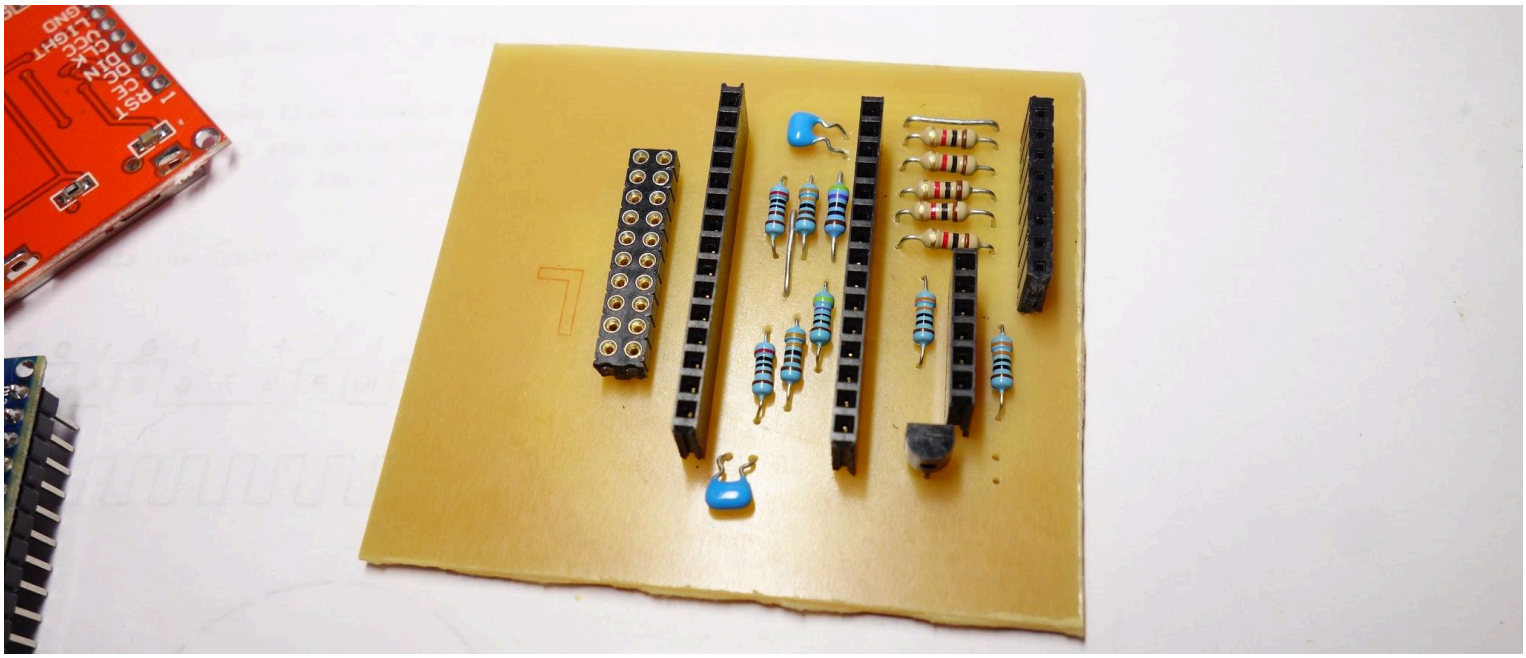
Now for the circuit board, you'll have to somehow make one, or design your own with a protoboard. Or you can order a pre-assembled one from me and skip right to the end, see the main page for information.



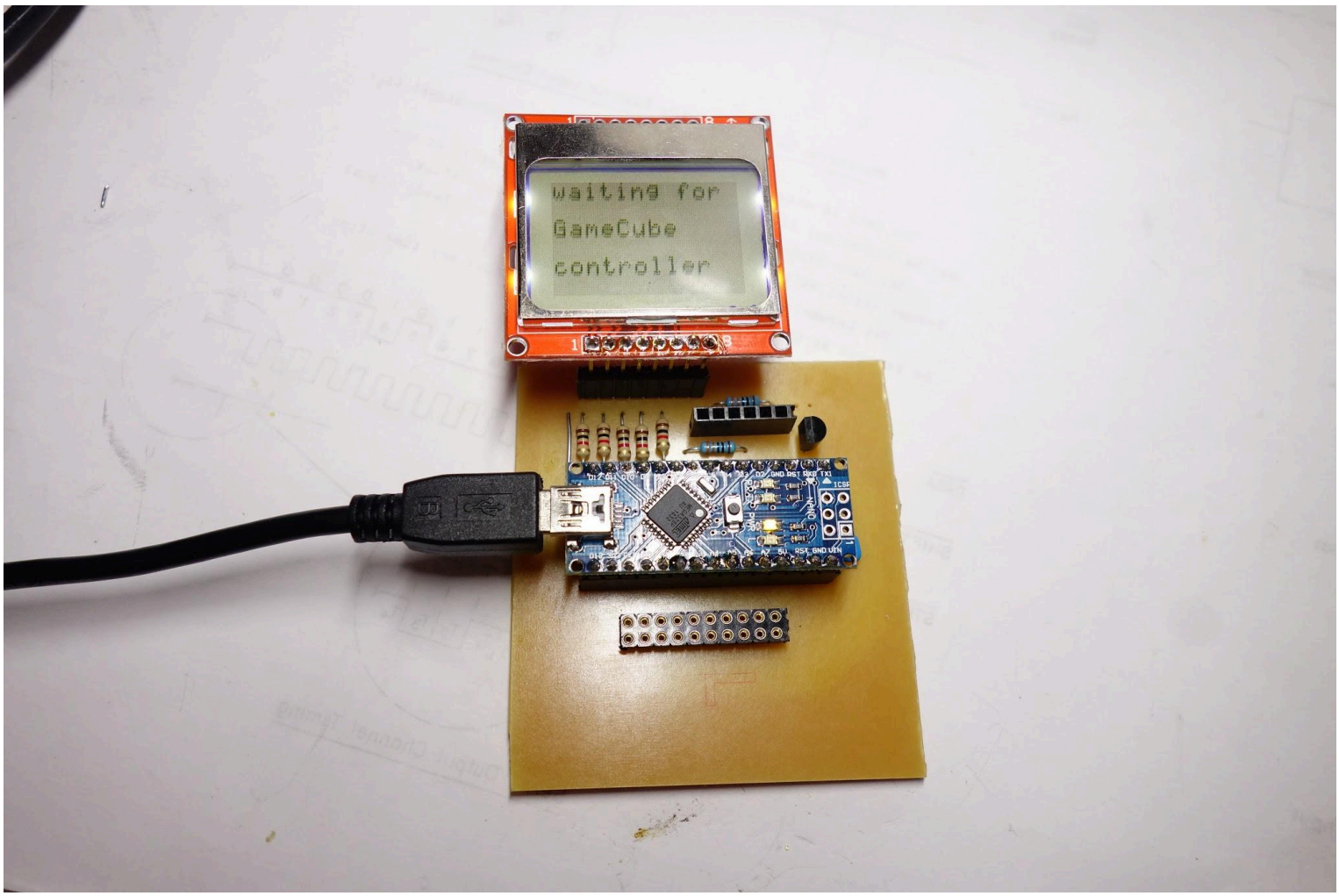
I'm not going to tell you how to solder a basic through-hole circuit board, if you don't know how you shouldn't be doing this in the first place. One thing to notice is that there are two bridges connecting the ground planes, they are 0 ohm resistors in the schematic but you can just use a plain wire like this.



Here is the finished board.



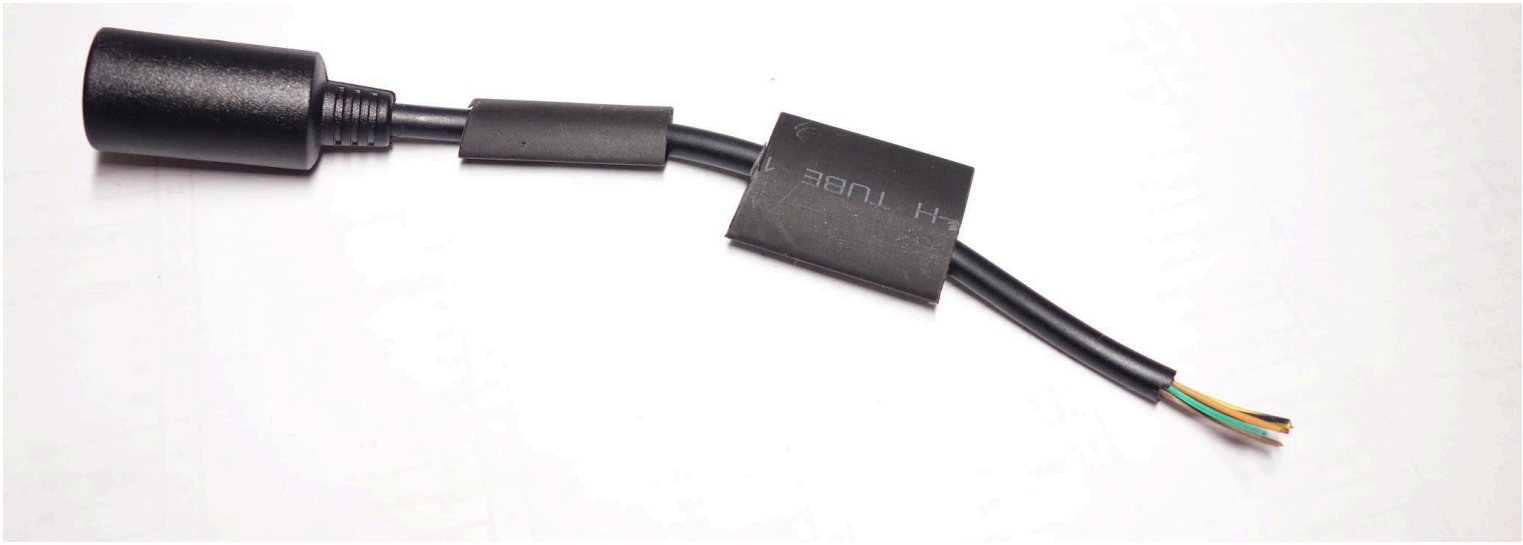
The screen used in this project is the LCD used in old Nokia phones, they are around two dollars on ebay, search “arduino nokia LCD”. The one I used was from ebay, it may have a different pinout if you buy it from sparkfun or adafruit.
Solder a header on LCD, make sure you do it on the correct side. plug it in like this and it it should work:



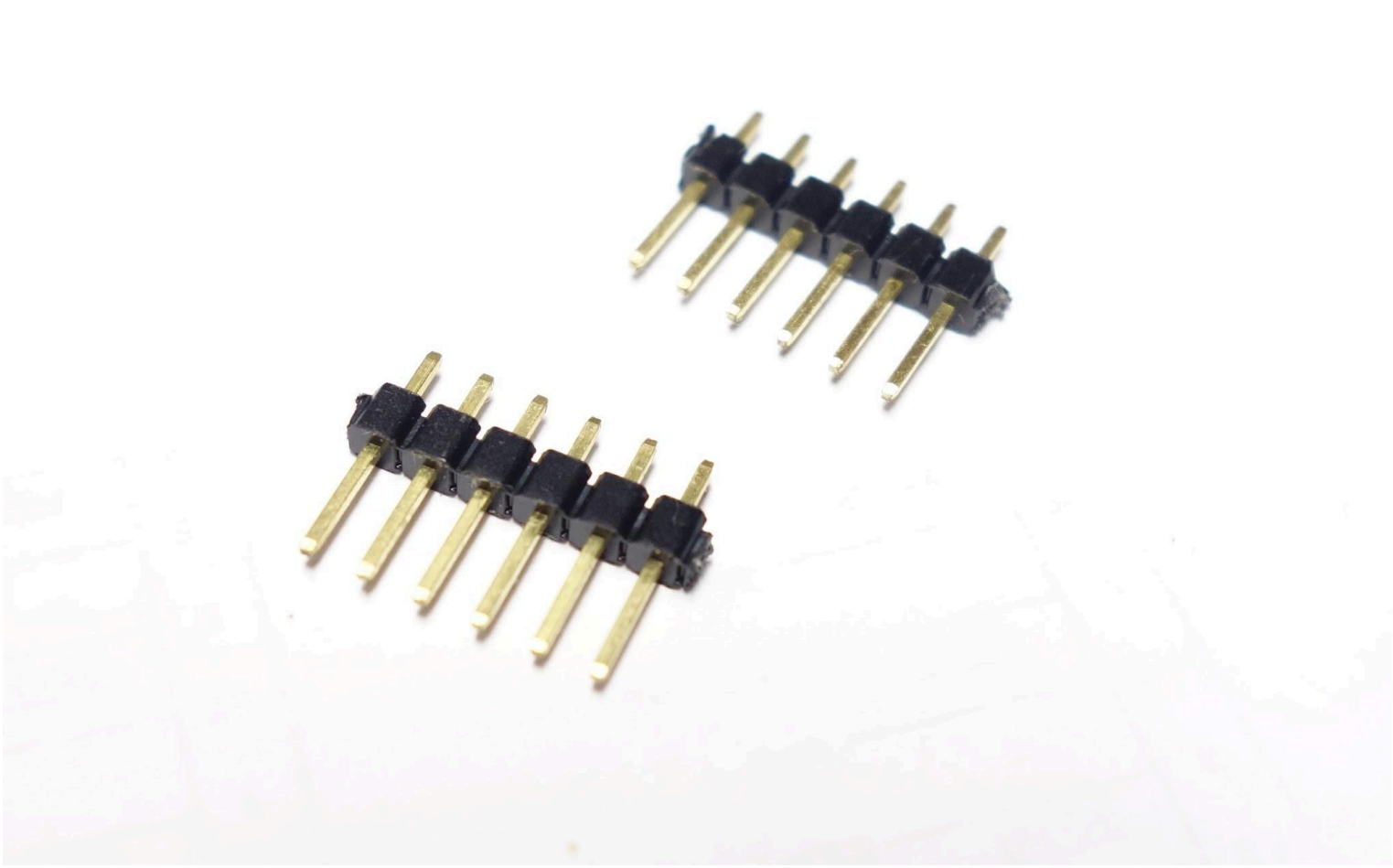
Now we're done with the PCB, it's time to make a GameCube connector so you can plug it into the circuit board, I used regular gc controller extension cable like this:

Cut it in half, keep the female end, and strip away the outer insulation.

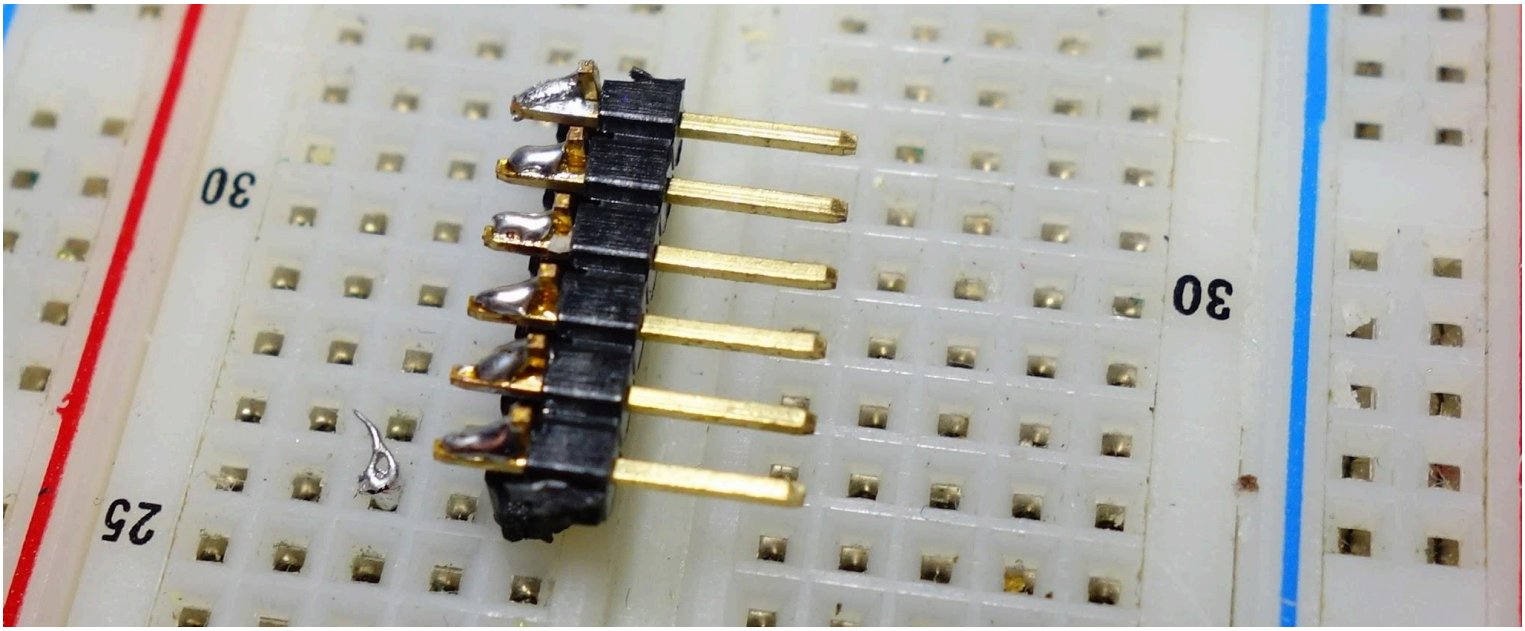
I have a bunch of heat shrink tubes, so I used some to make the finished cable look better and more durable.



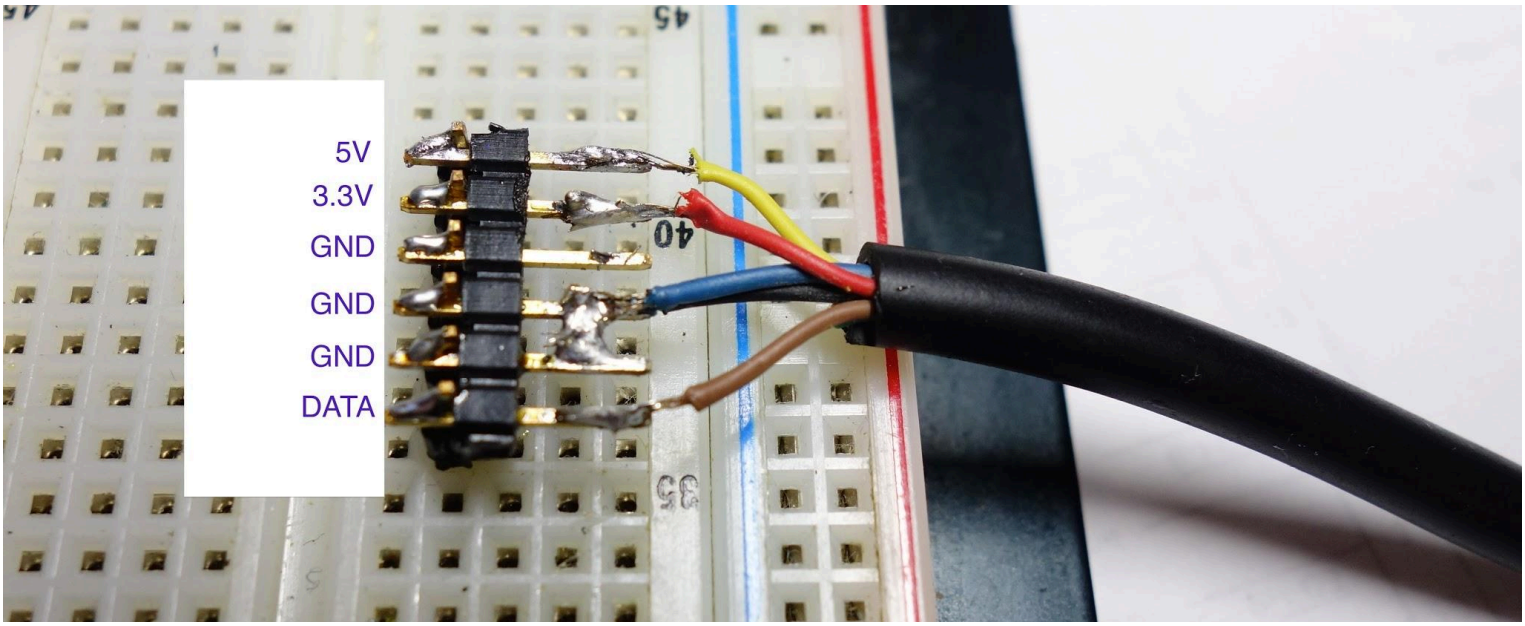
At this point what you need is a right angle male pin header, I don’t have that, so I had to improvise.



What I did was soldering together two straight male pin headers to make it right angle.



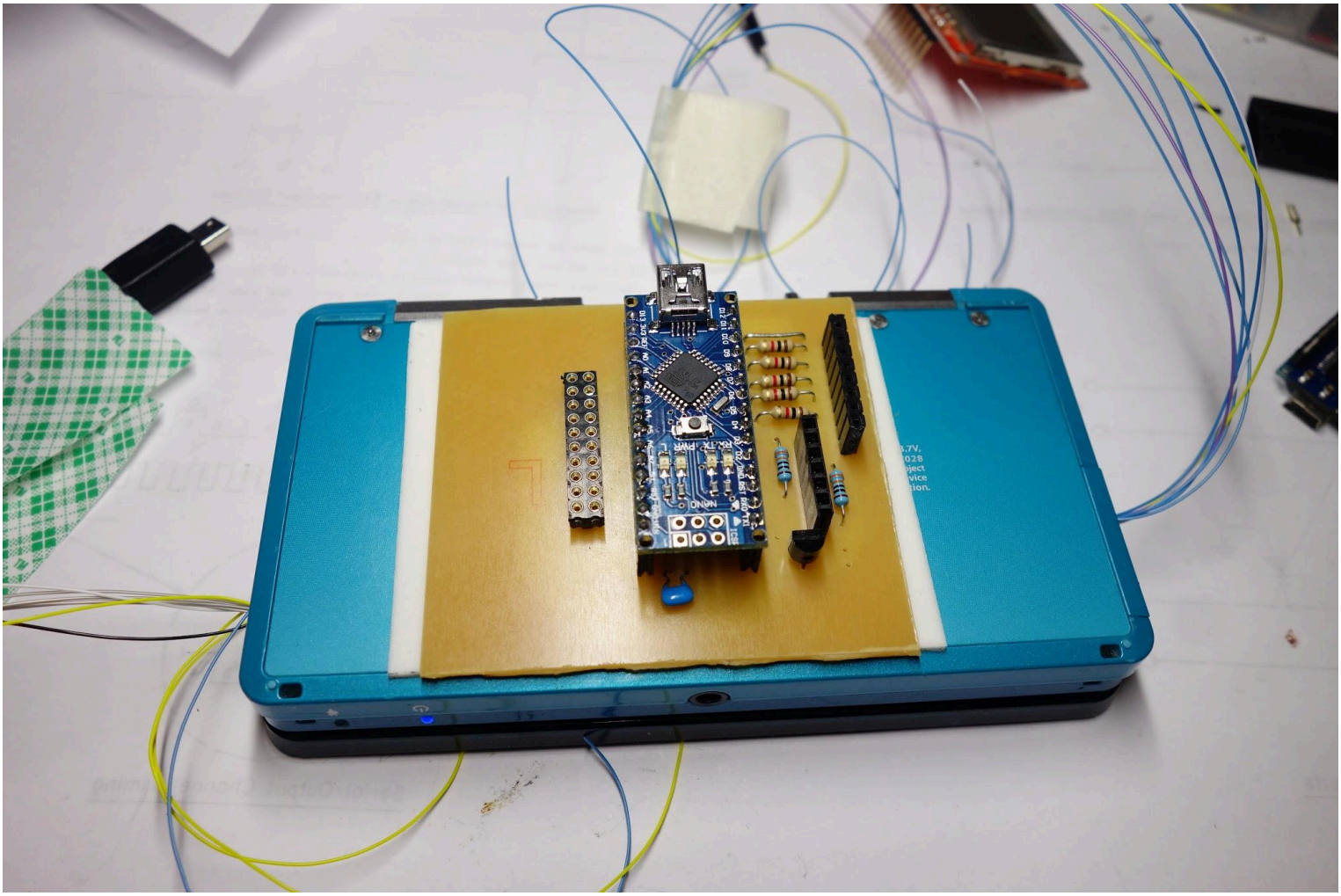
Then just solder the wires from the gc cable. See the pinout here. The color of your wires may be different from mine, always use a multimeter continuity test to find out which wire is which.



Then shrink the heat shrink tube with a heat gun, so it wraps around and provide insulations.

After making sure that the circuit board is working, we're going to use some mounting tape to attach it to the back of the 3DS.

Like this:



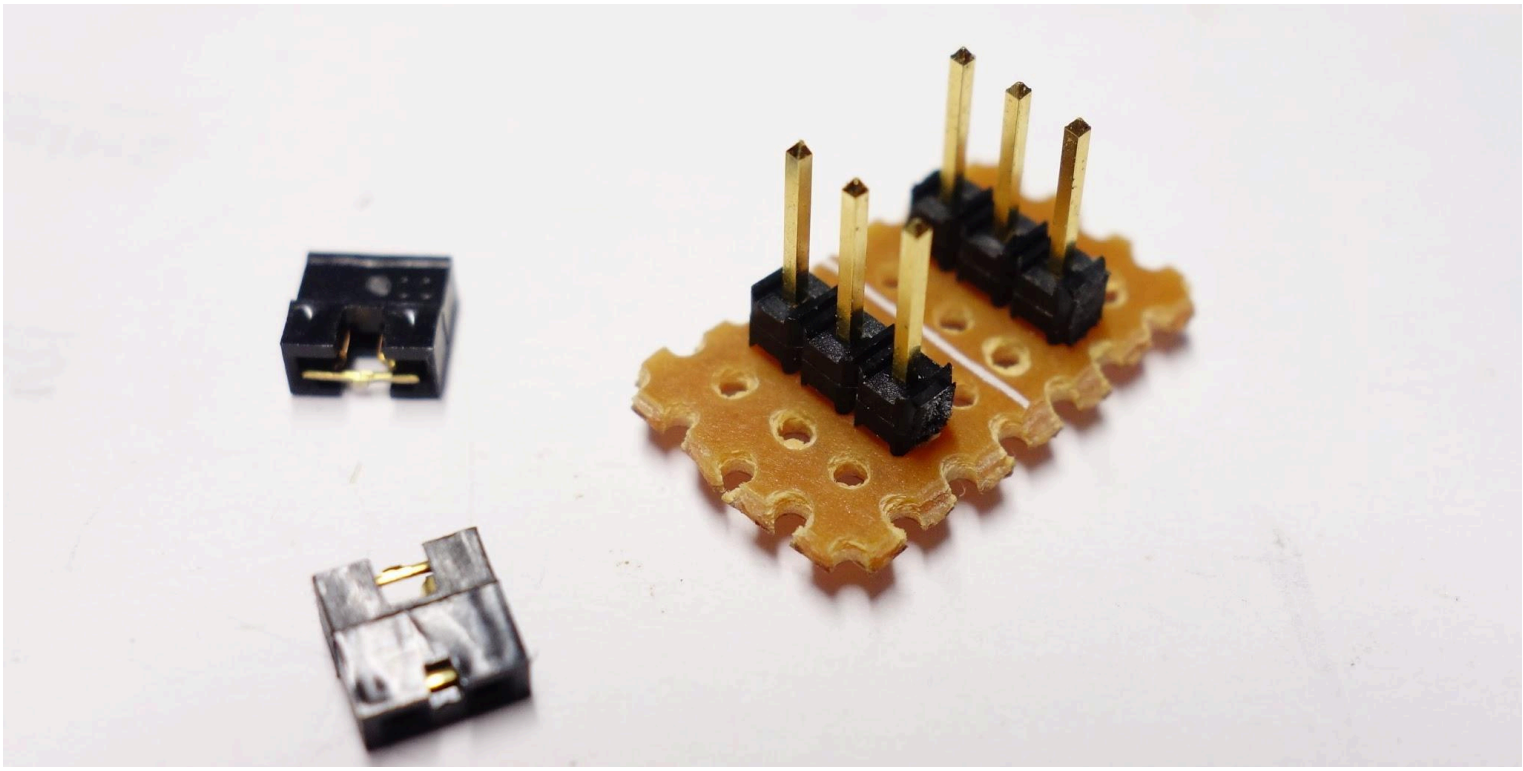
Now the final step:

[Take a look at here to see your circuit board pinout, then solder all the wires.]

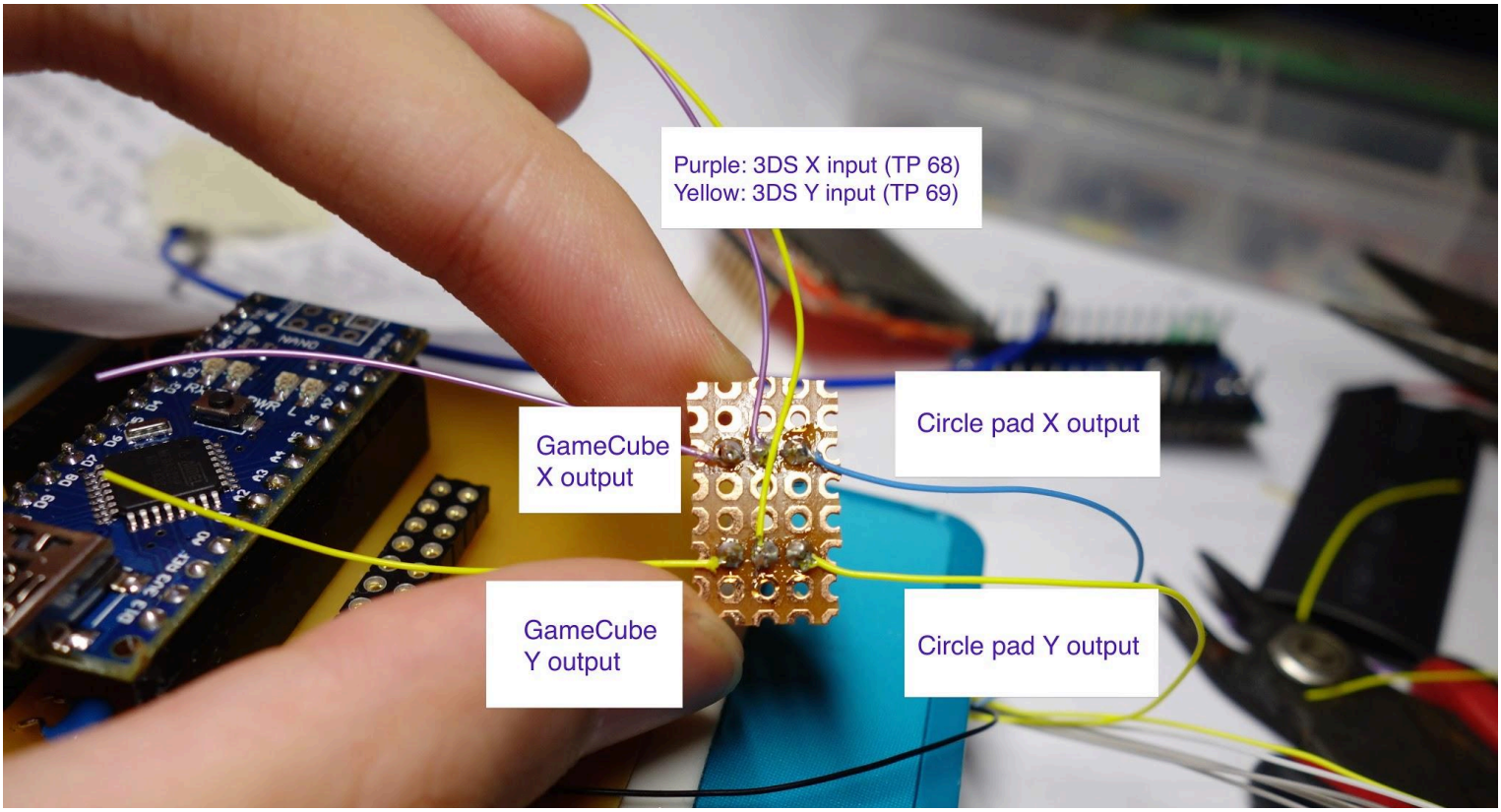
[After that, take a look at the user manual to see how to use it.]

If you have the v1 board, you'll need to make a separate input source selector. If you have v2 or above (basically after Oct 6th) you can stop reading now.

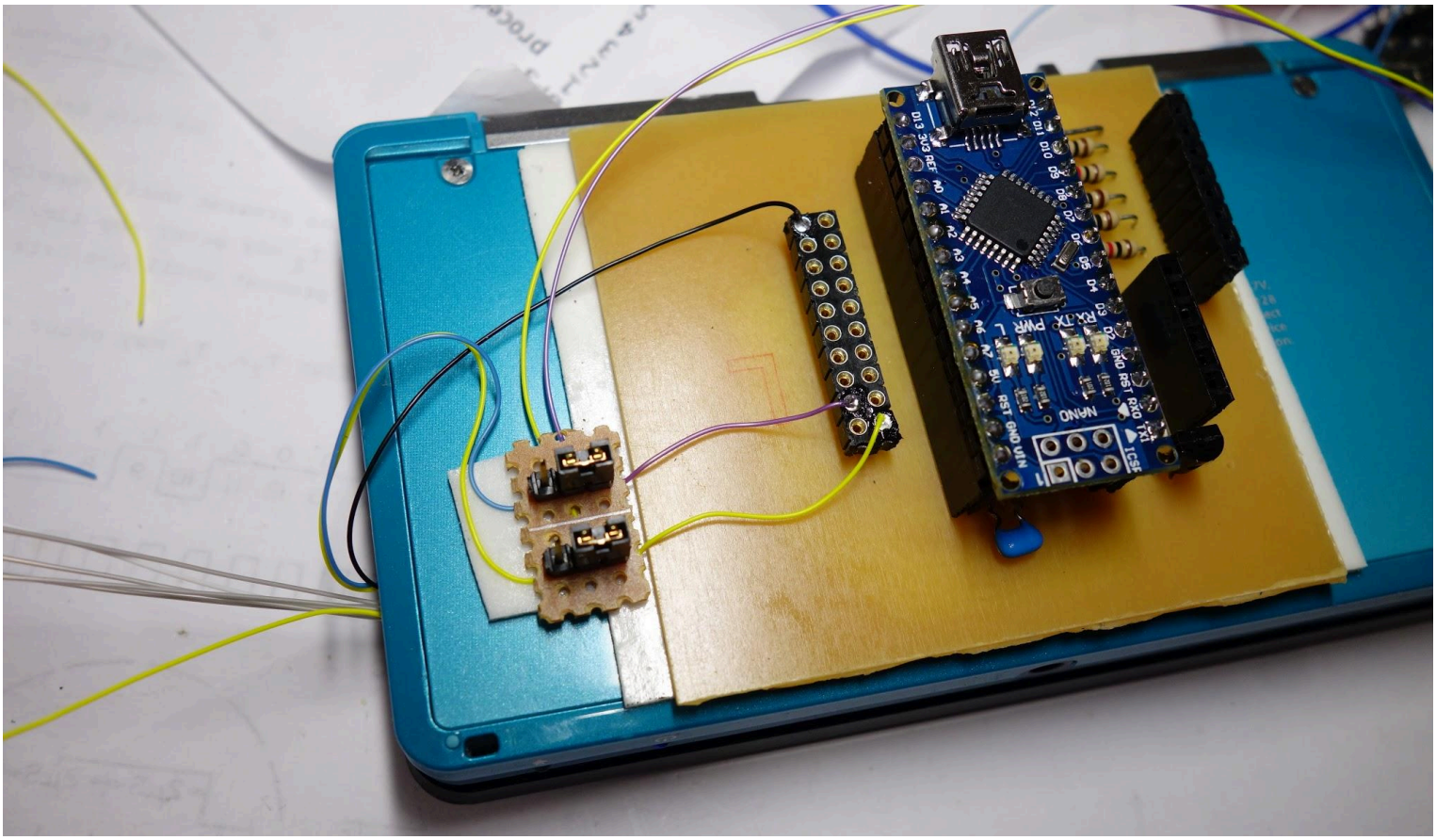
I used two 3-pin headers and two jumpers:



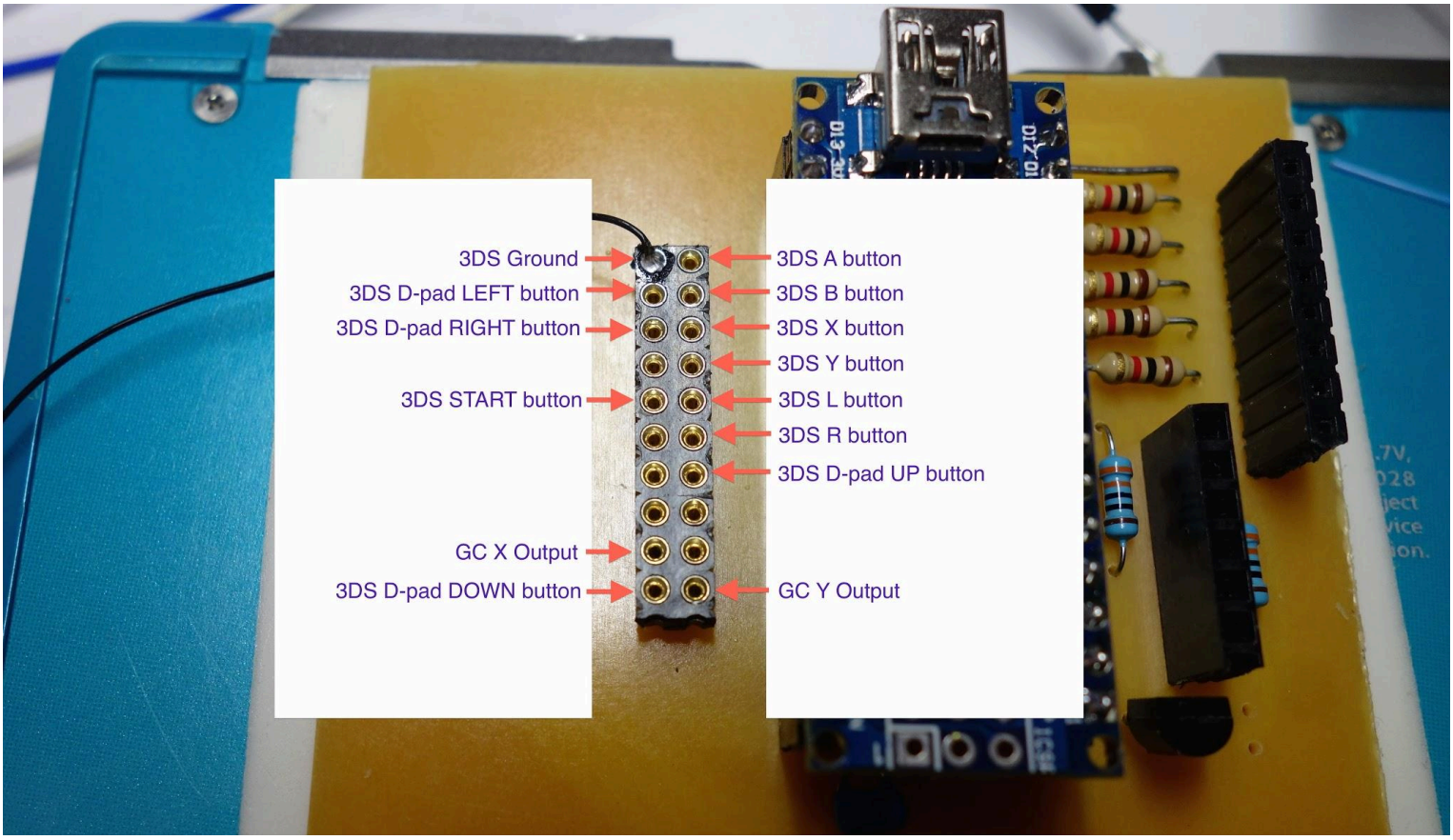
Here is the detail, the "circle pad X/Y output" are the wires we soldered on the circle pad itself, and "gamecube X/Y output" is on the circuit board you just assembled .

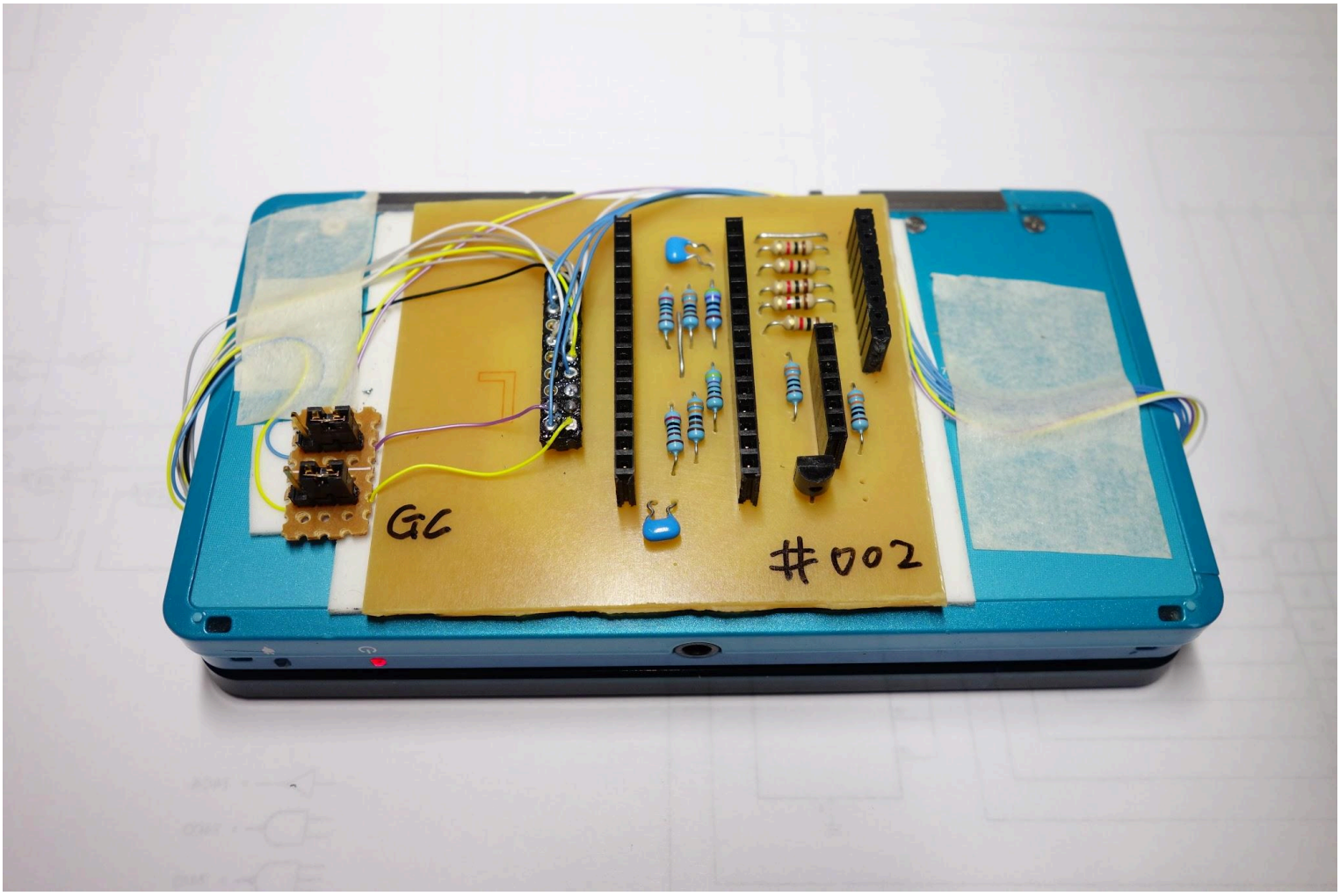


So when the jumper is connecting the left two, 3DS accepts circle pad inputs from the internal circle pad, and when right two, 3DS accepts circle pad inputs from arduino.



Solder on rest of the wires to complete the project.





Think it’s working? See the User’s Manual to find out how to use it!!