Swarm 2 build

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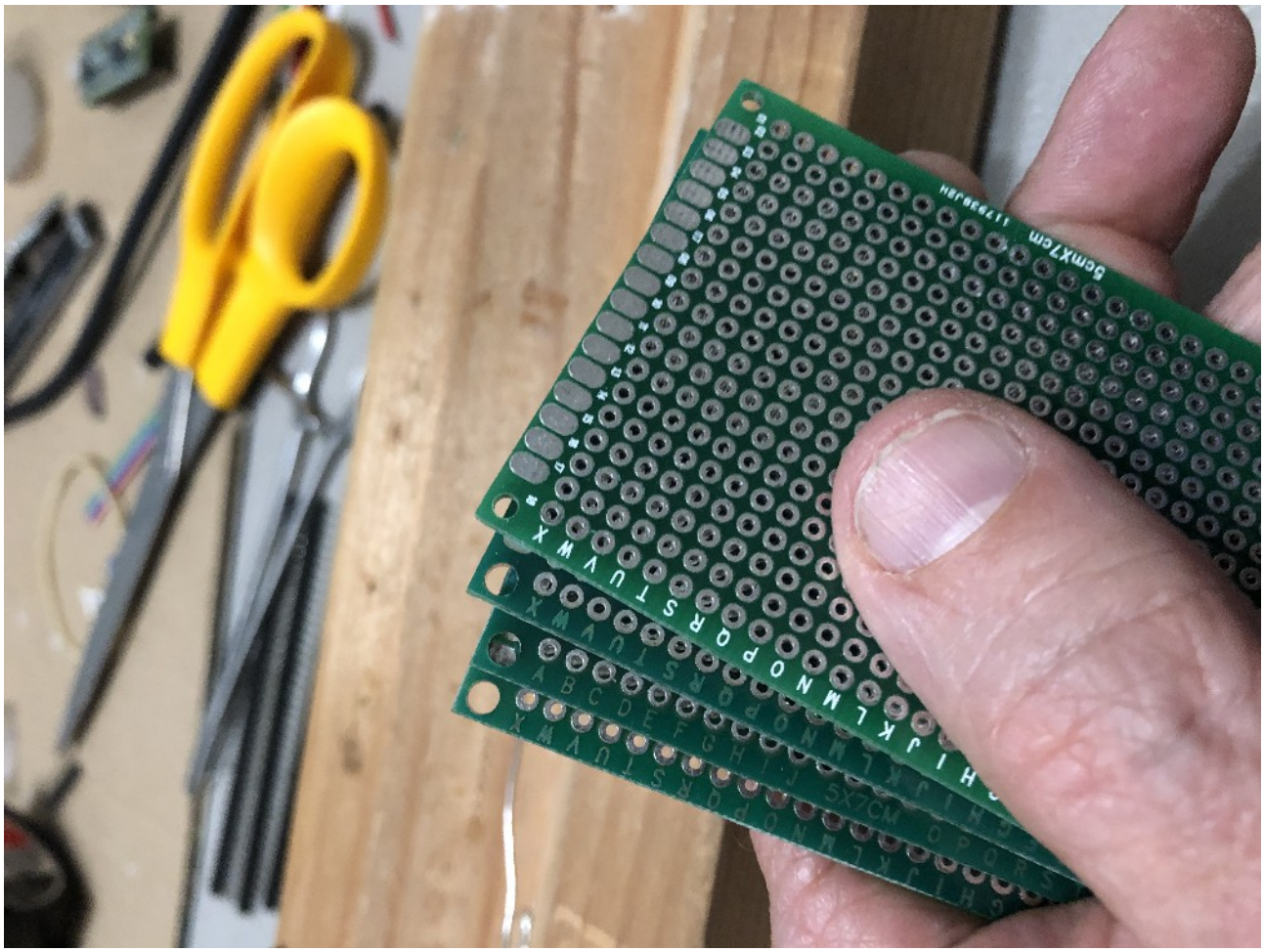
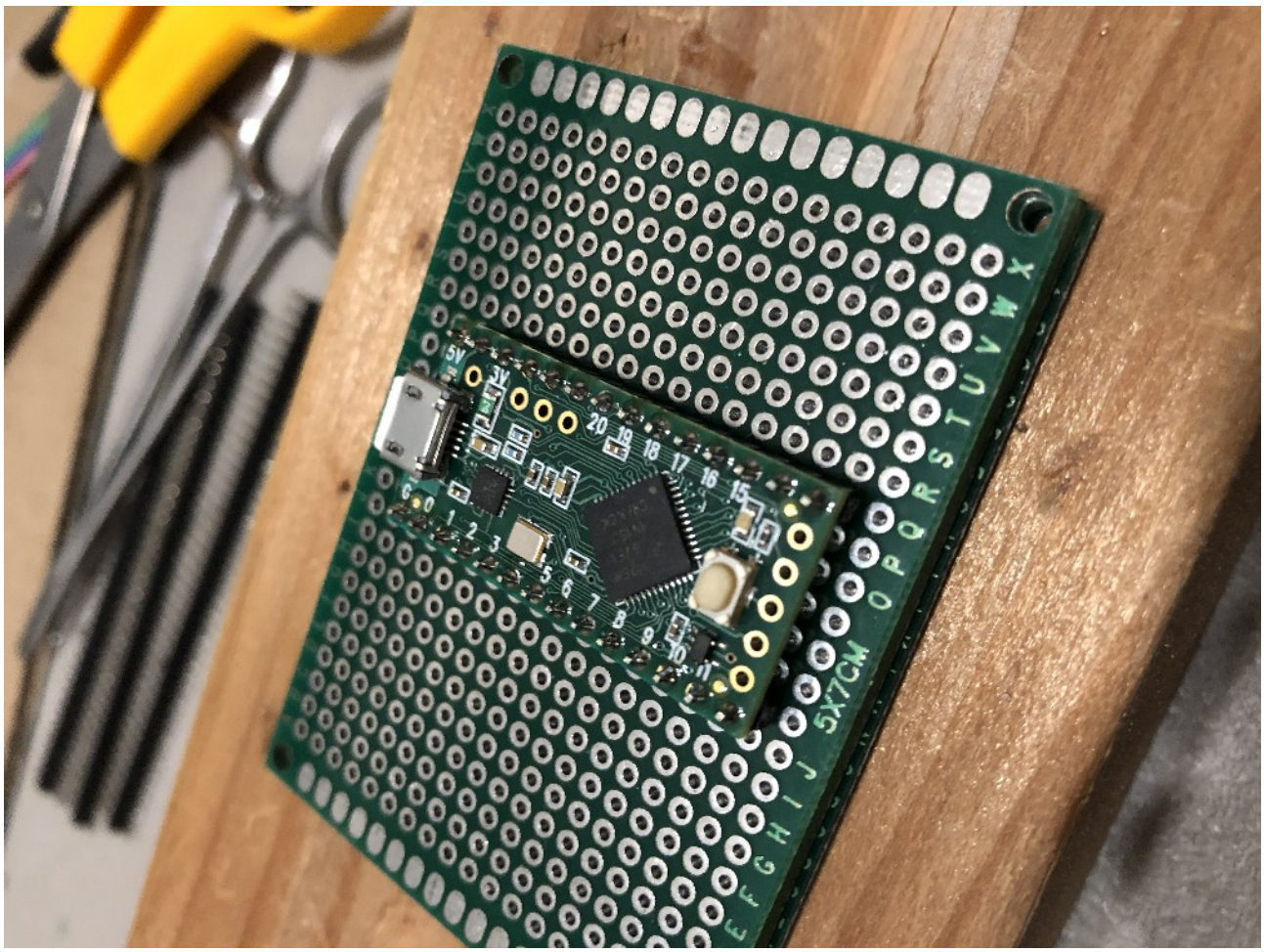
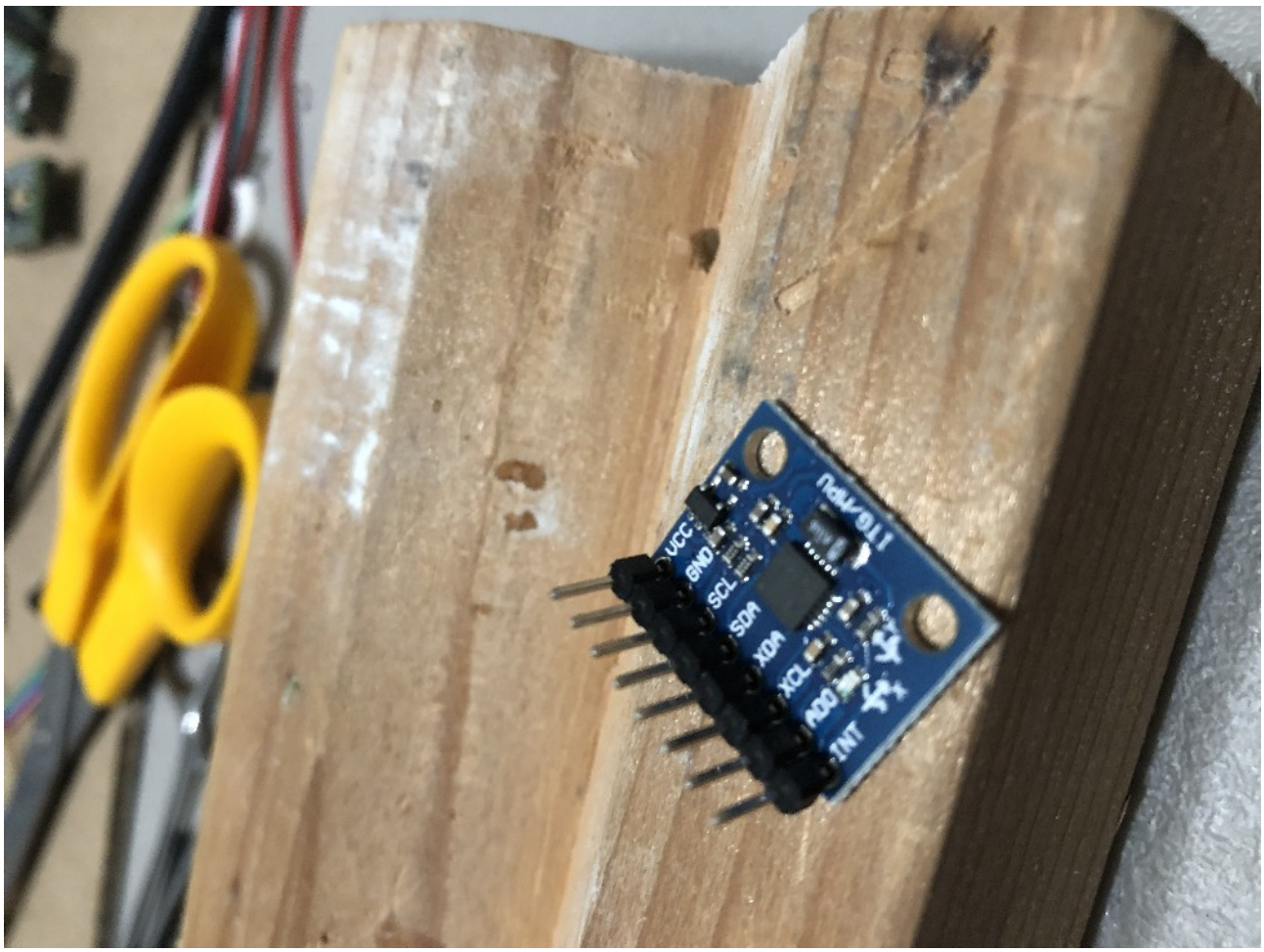


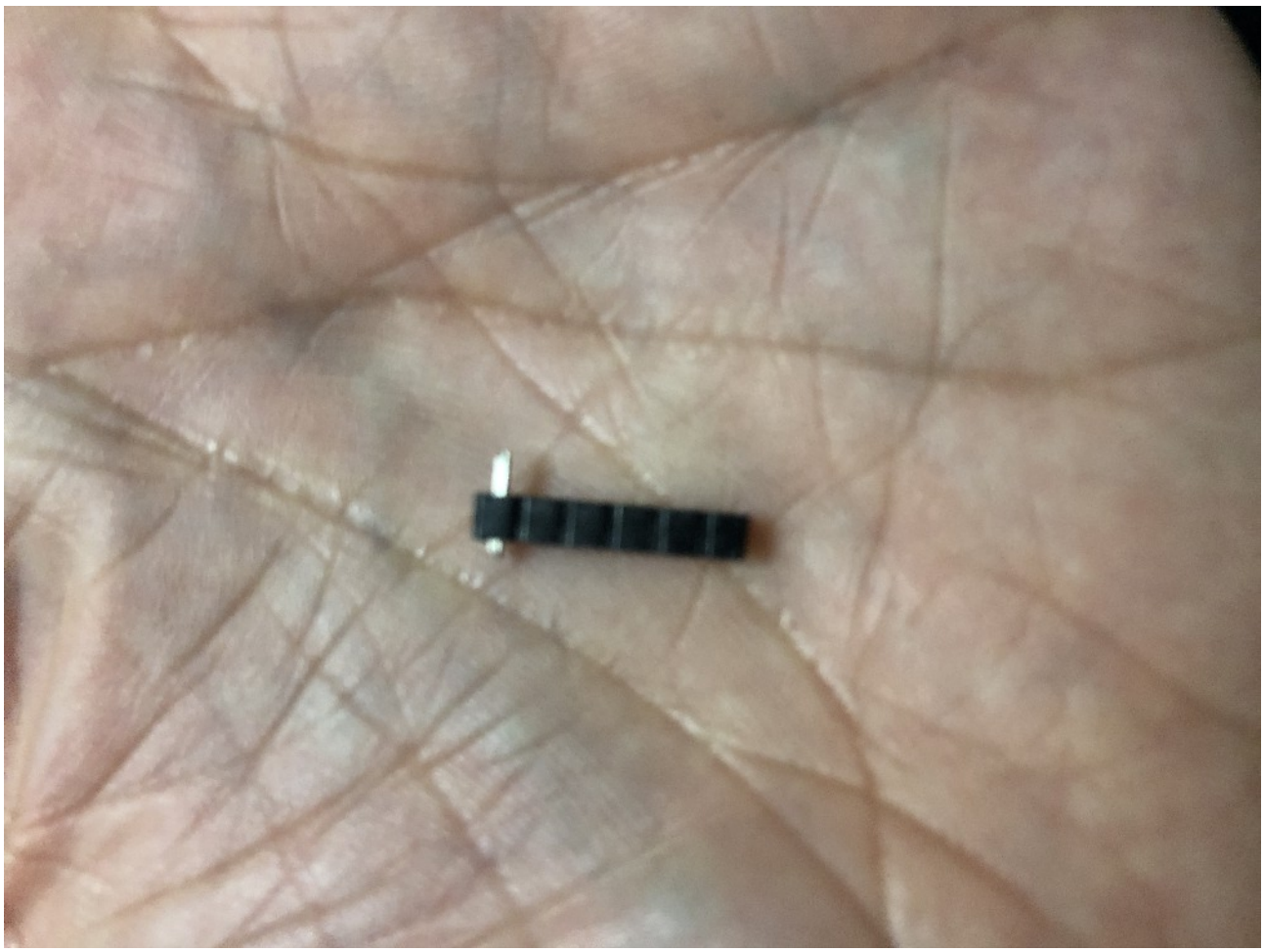
I use prototyping boards to help align pins when soldering



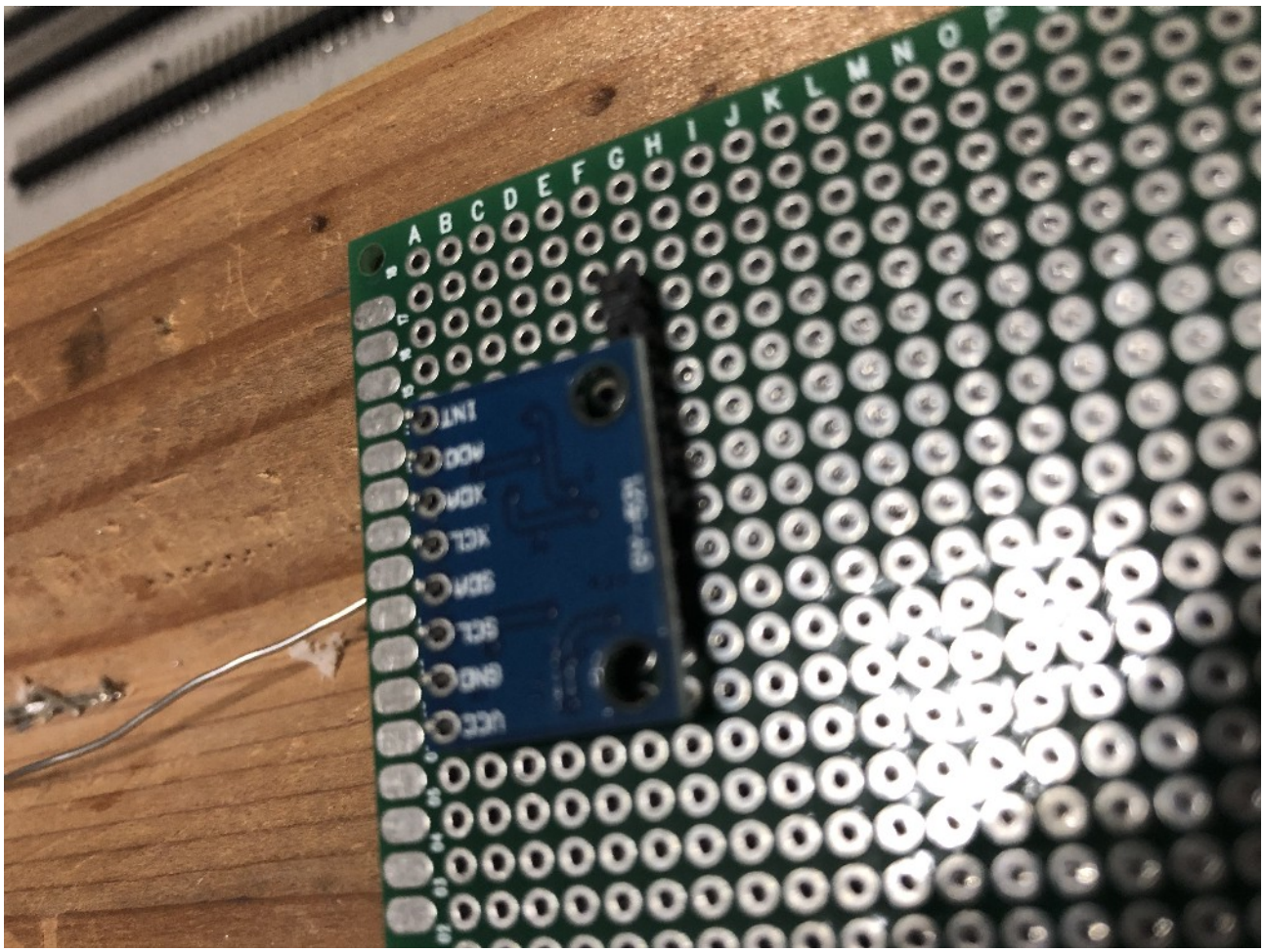
Put the pins into a stack of proto boards and then put the Teensy LC board on top, and solder. This helps align the pins.



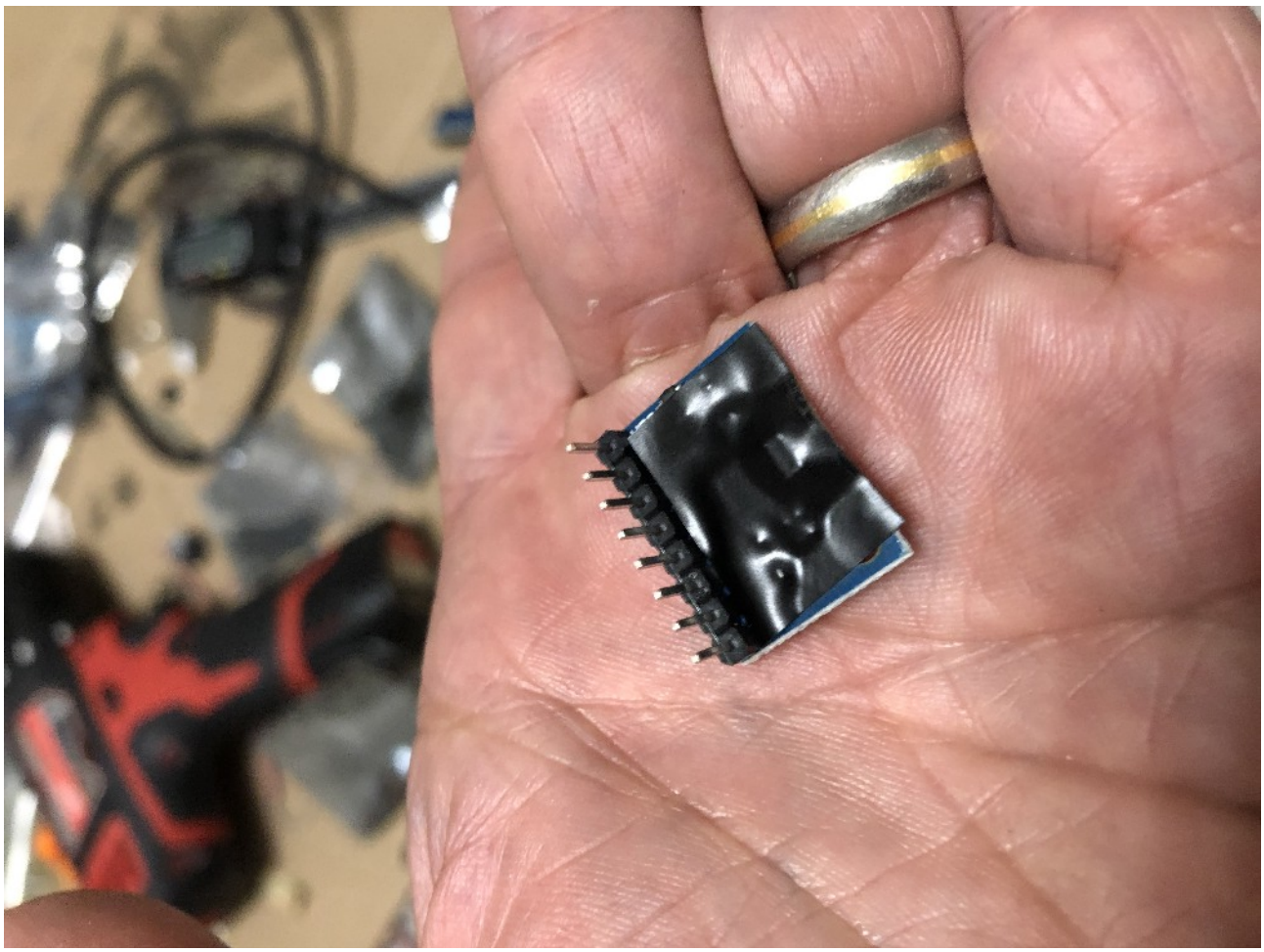
The pins for the Accelerometer board are soldered to go up instead of down.



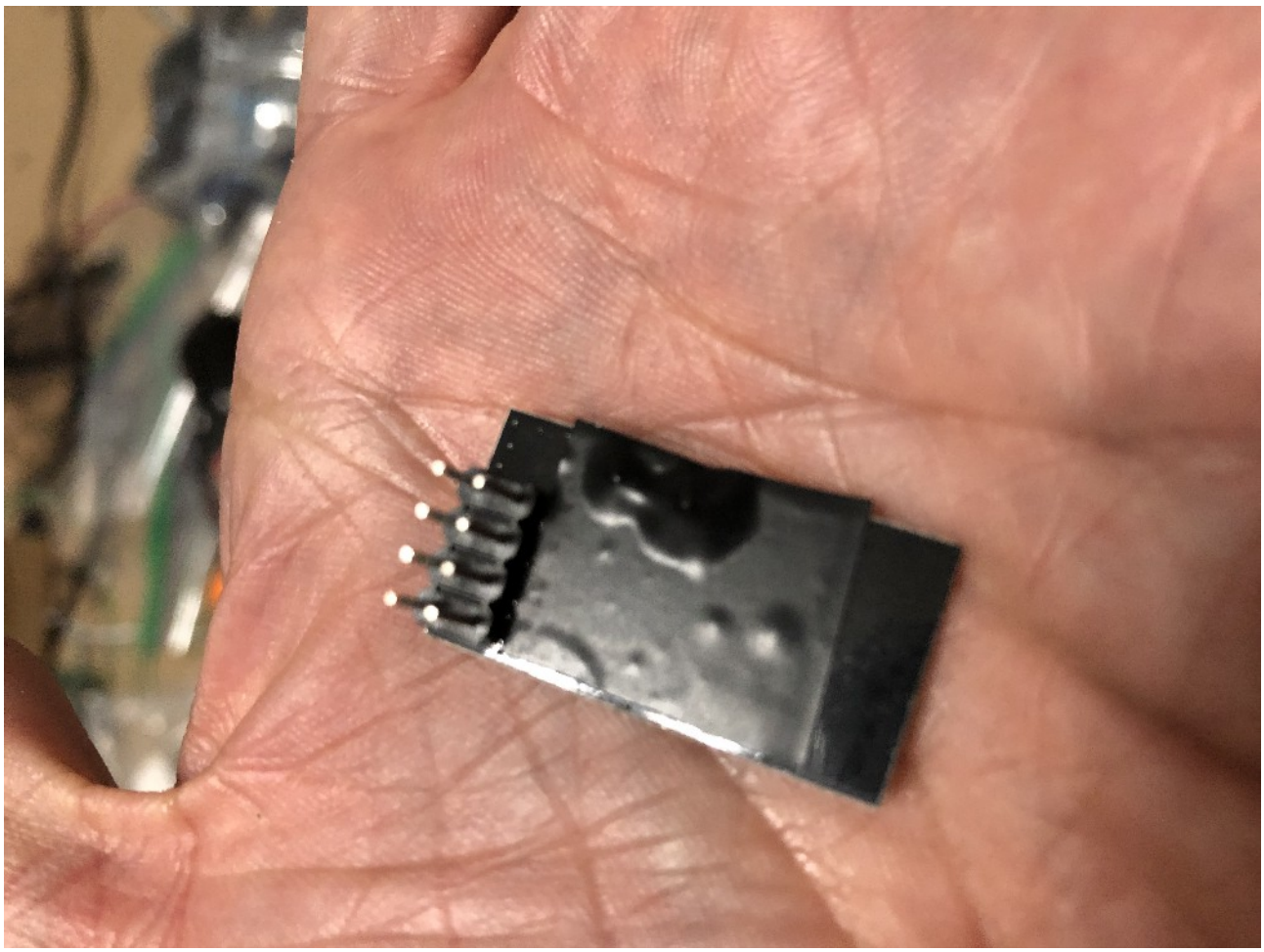
I modified a pin connector that can be used to wedge between boards to keep the spacing even when soldering boards together.



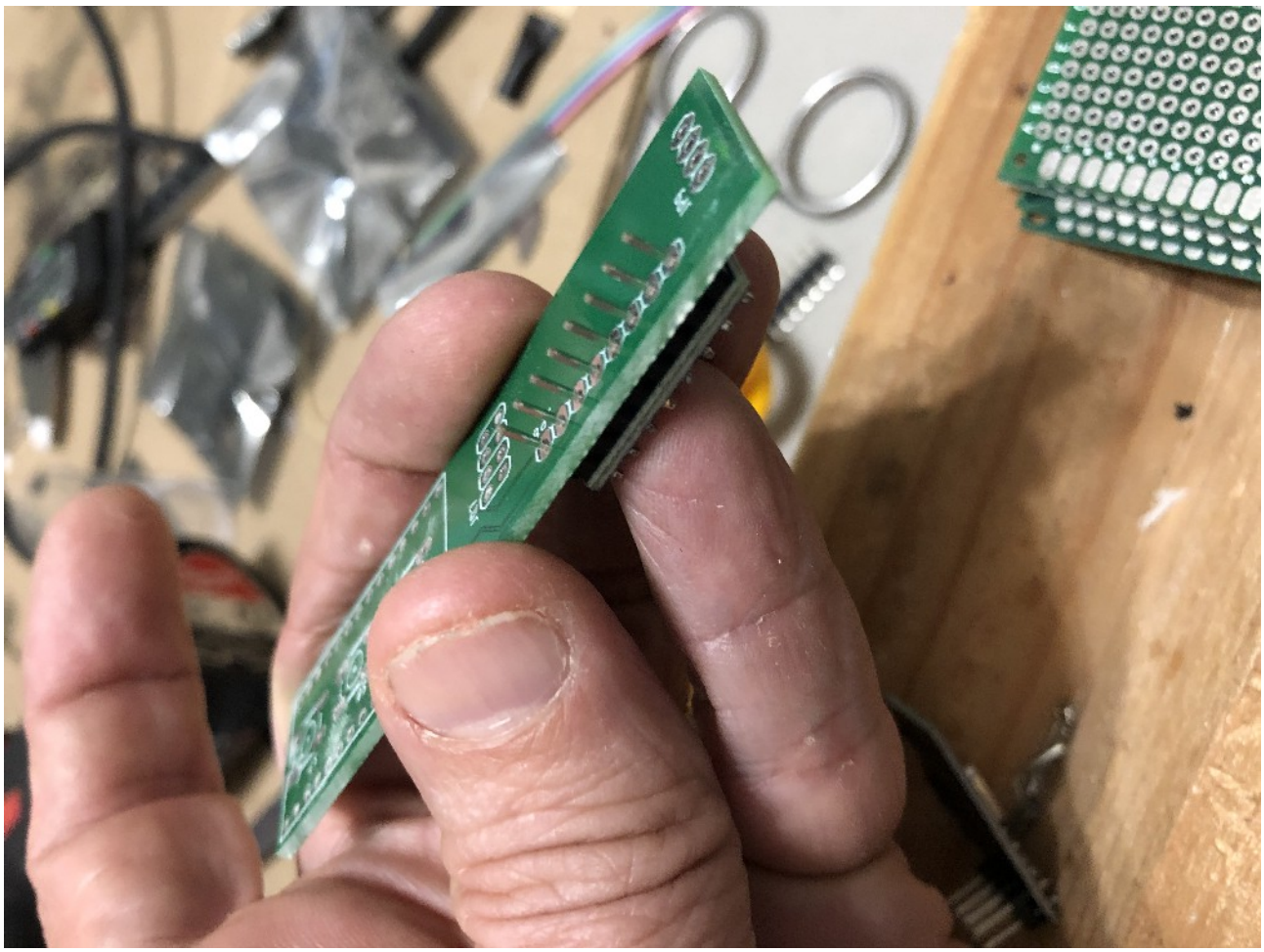
Here, the little wedge is used to prop up the side of the board across from the pins, so the pins will solder on at a good 90 degree angle.



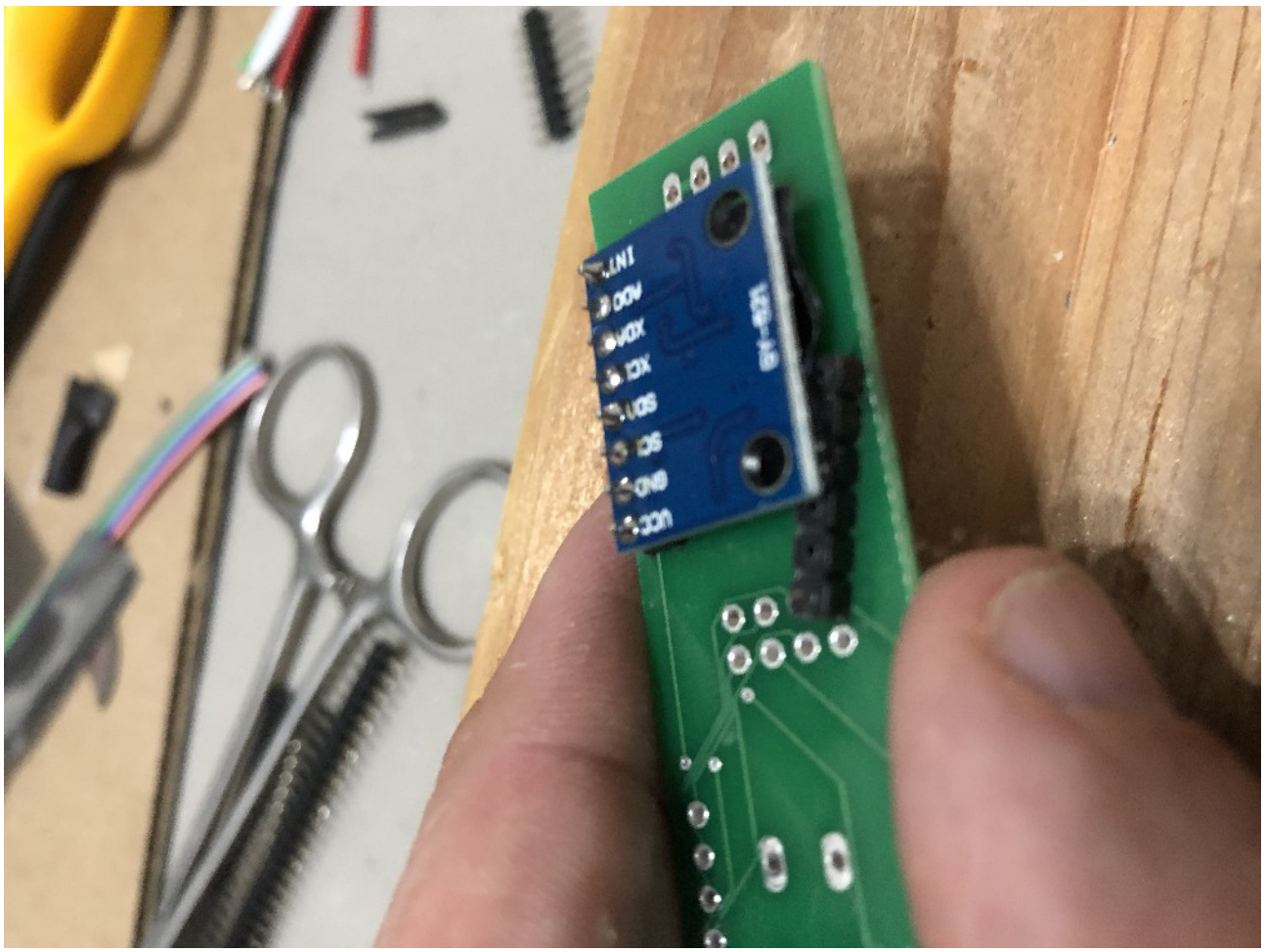
Put some electrical tape on top of the board, to assure when its soldered to the bottom of the swarm board, its insulated.



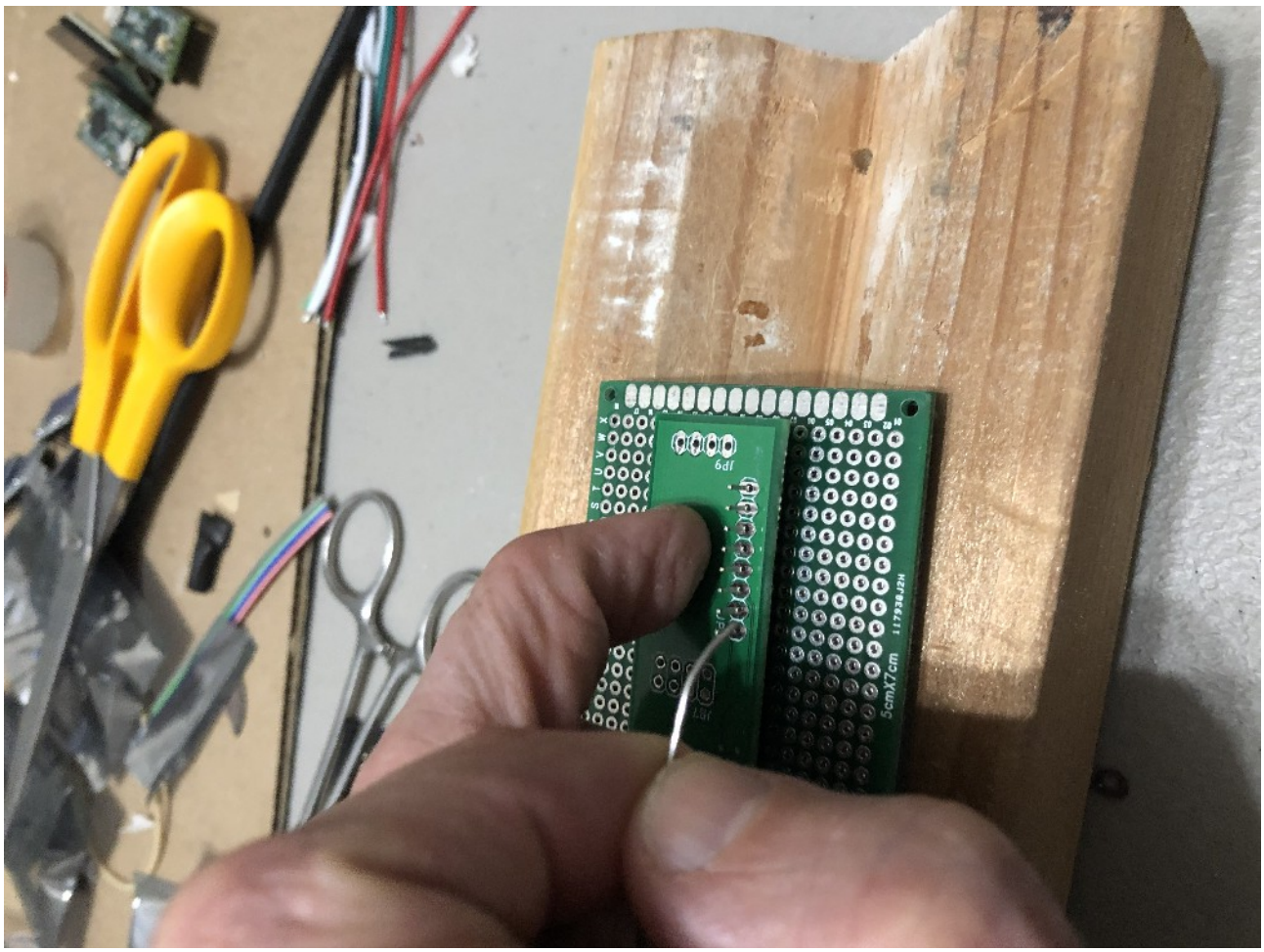
Do the same with the bottom of the NFR24L01 radio module.



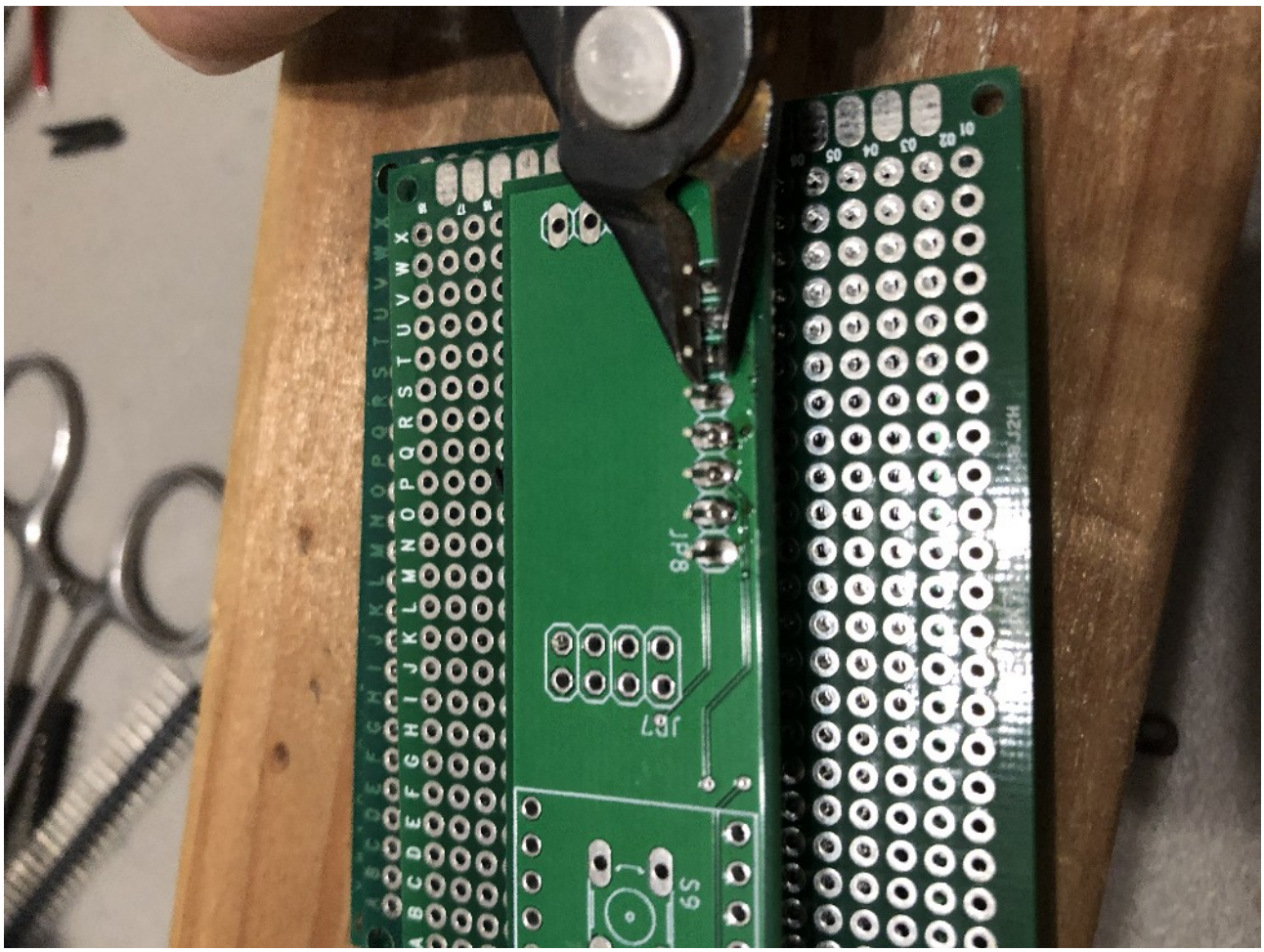
Solder the accelerometer board to the bottom of the swarm board.



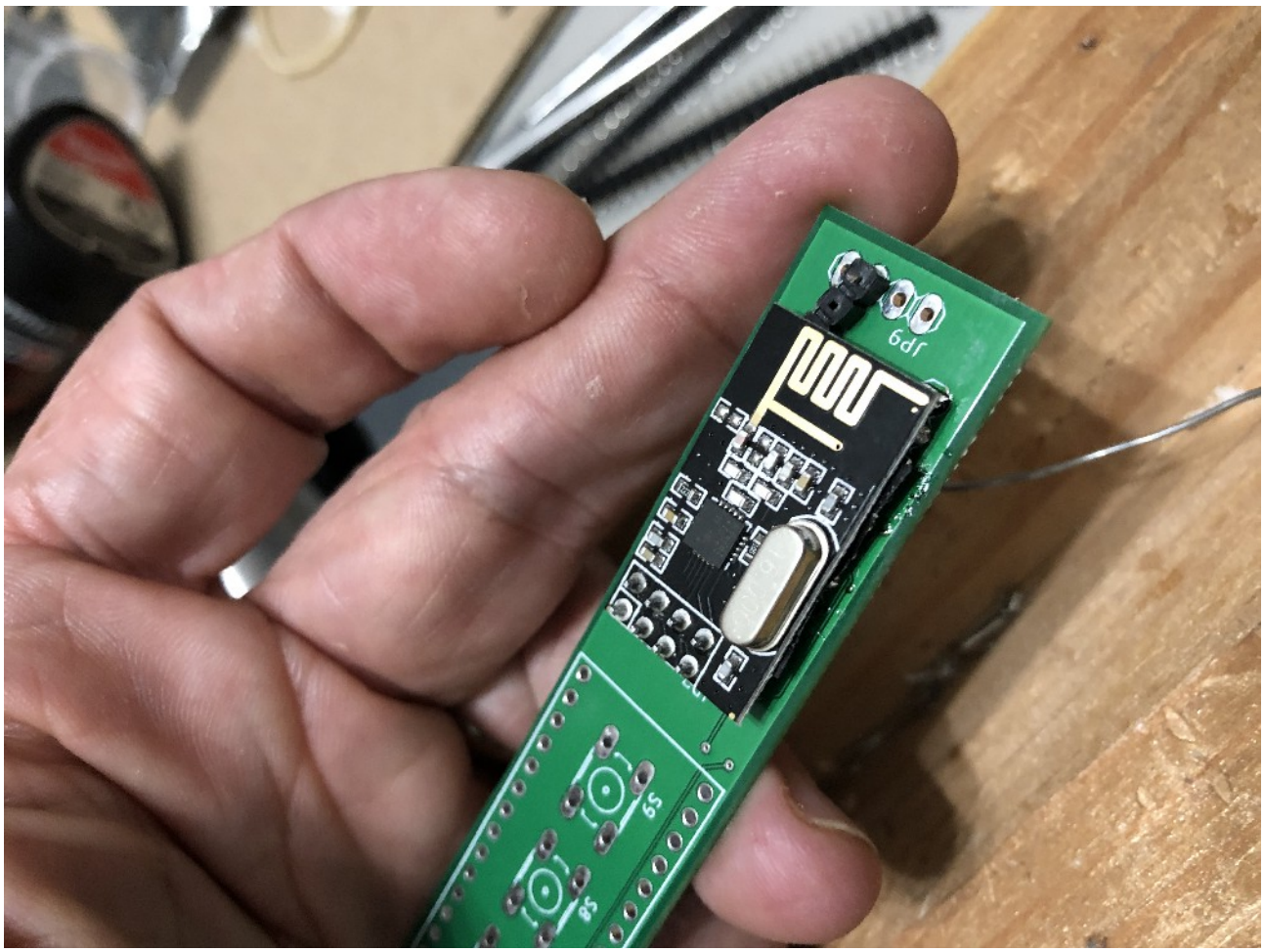
Use the little wedge to get the alignment



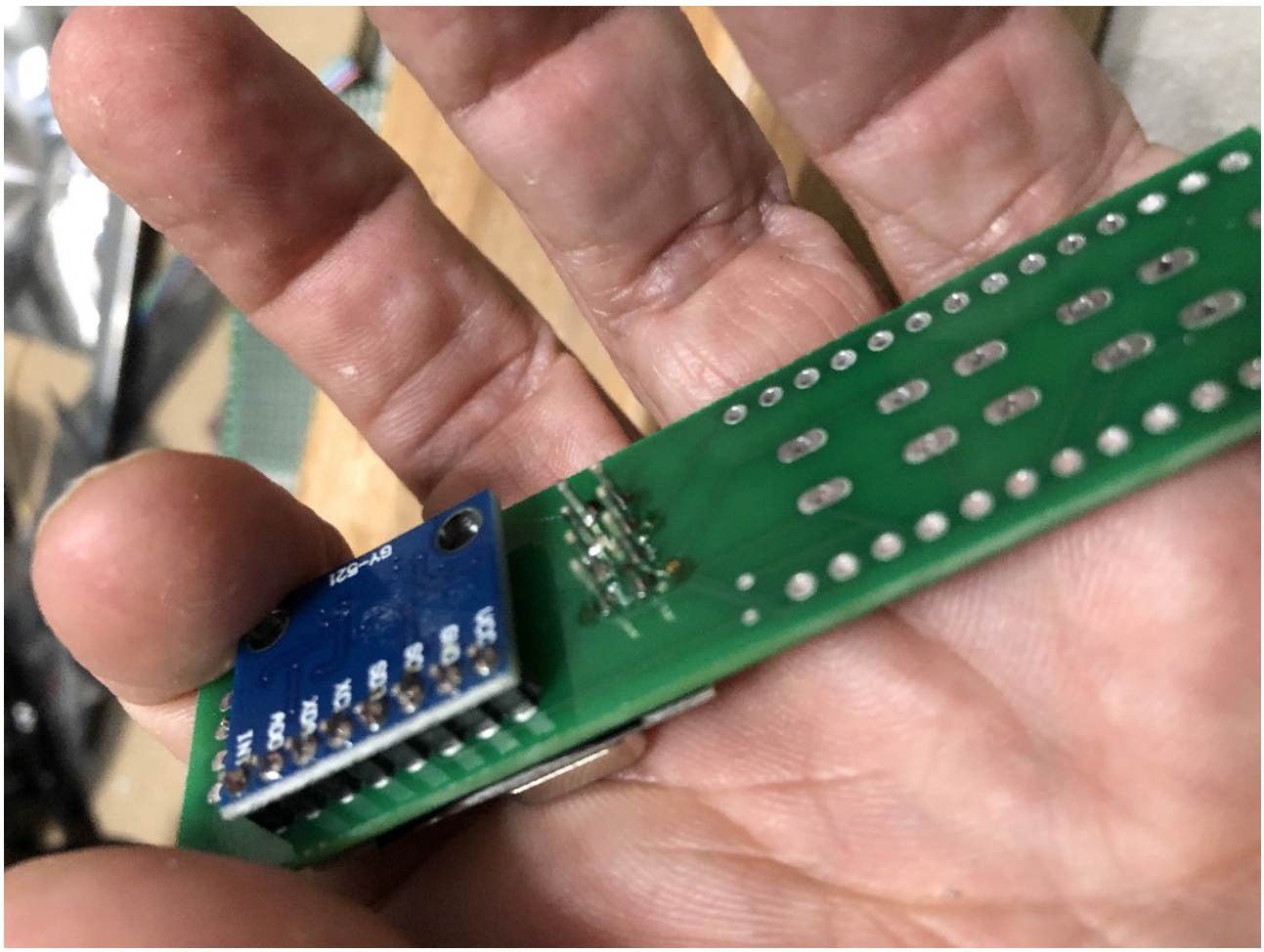
Soldering the accelerometer board to the bottom.



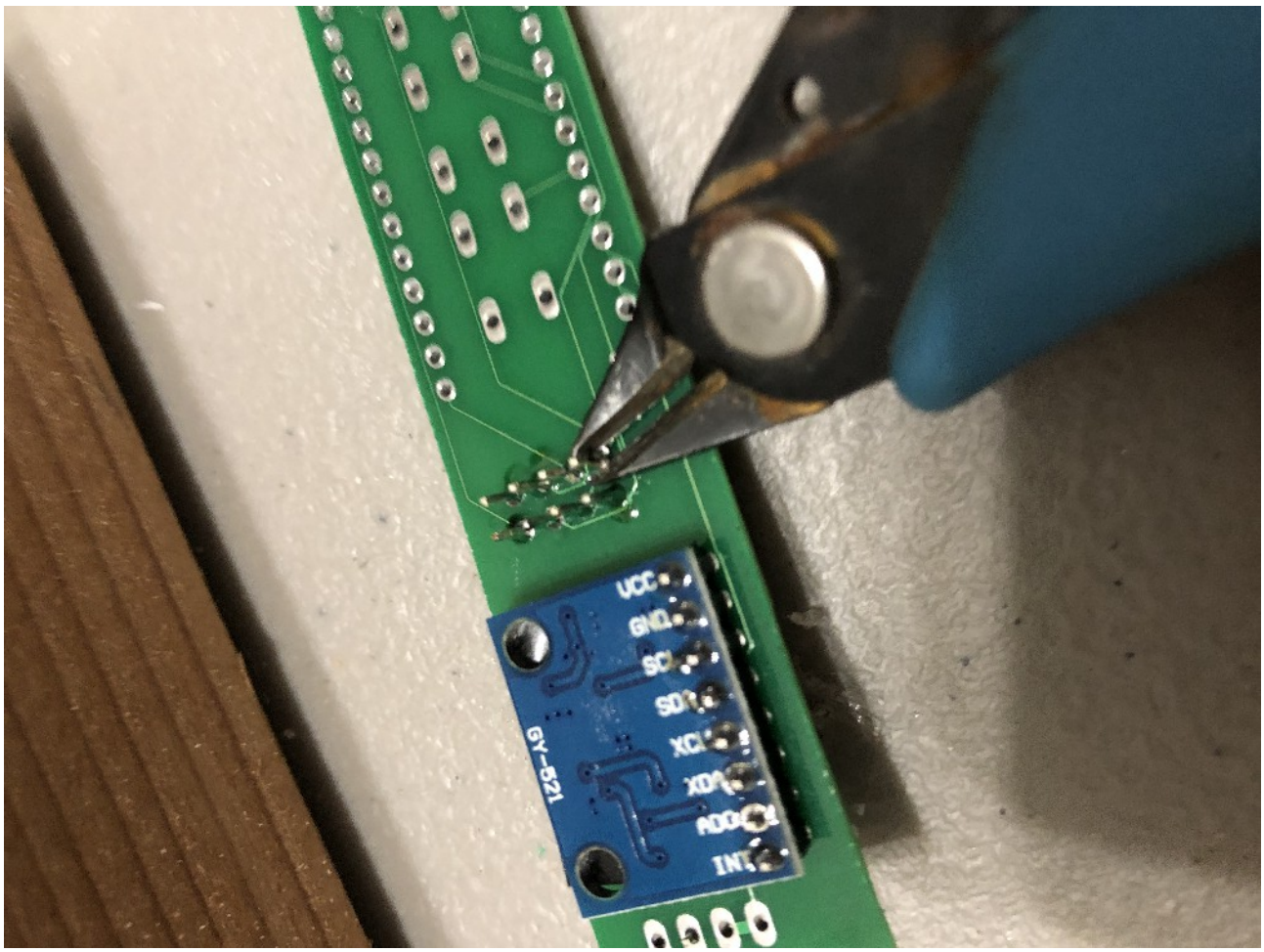
Trim these pins as close as you can, because the radio module is going to get really close above it.



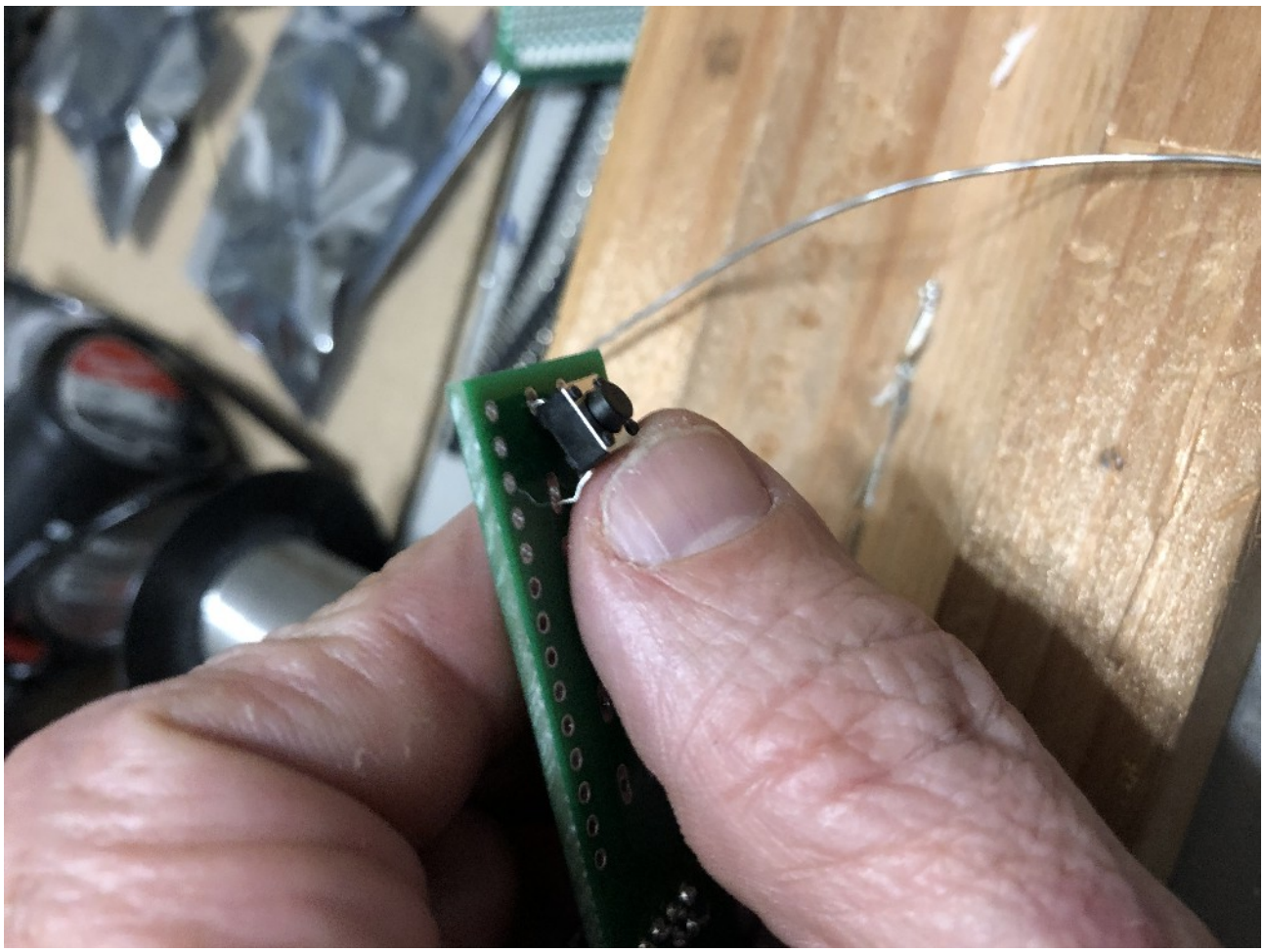
Here is the radio module with the wedge again for alignment.



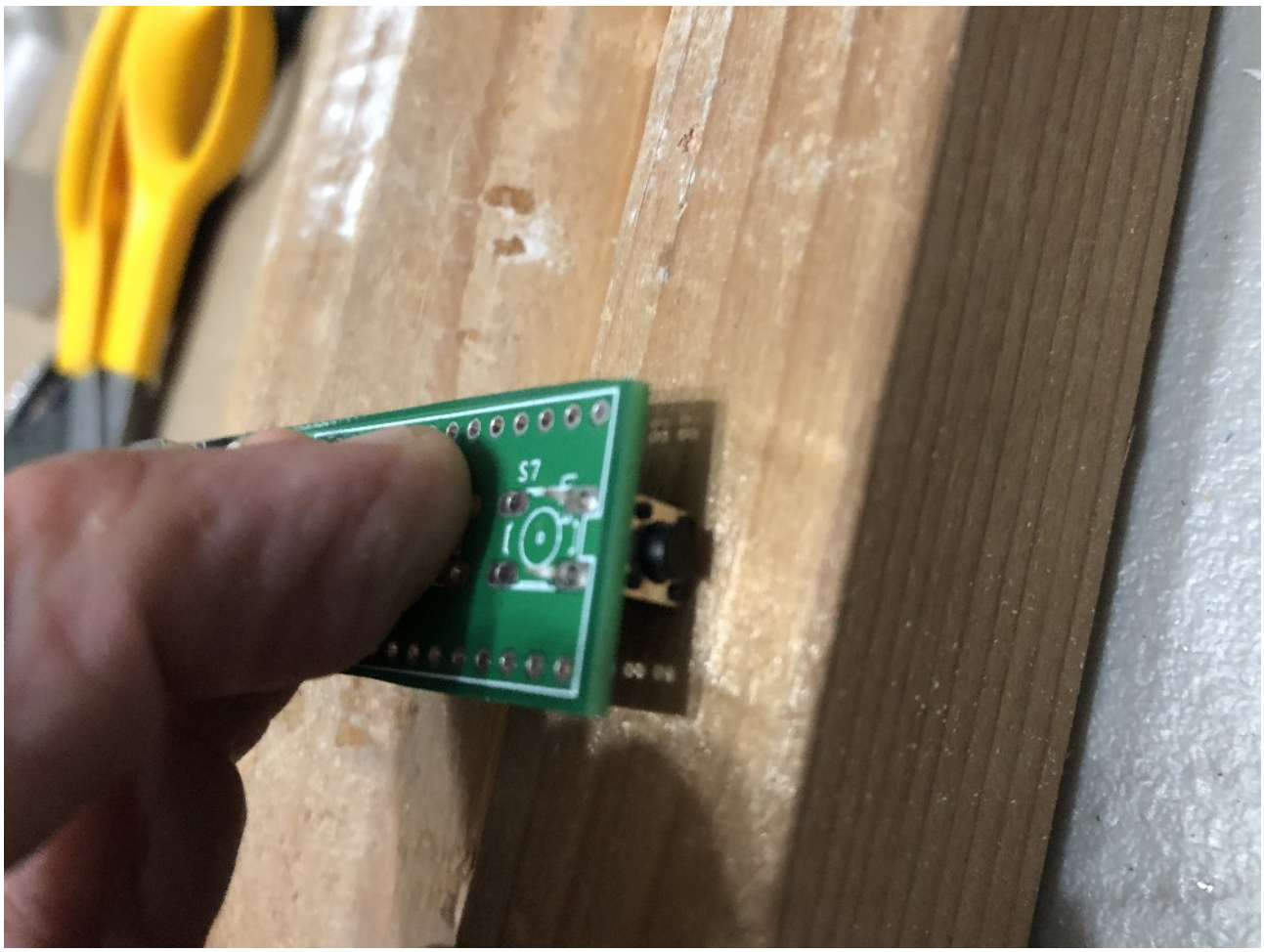
Both boards soldered on.



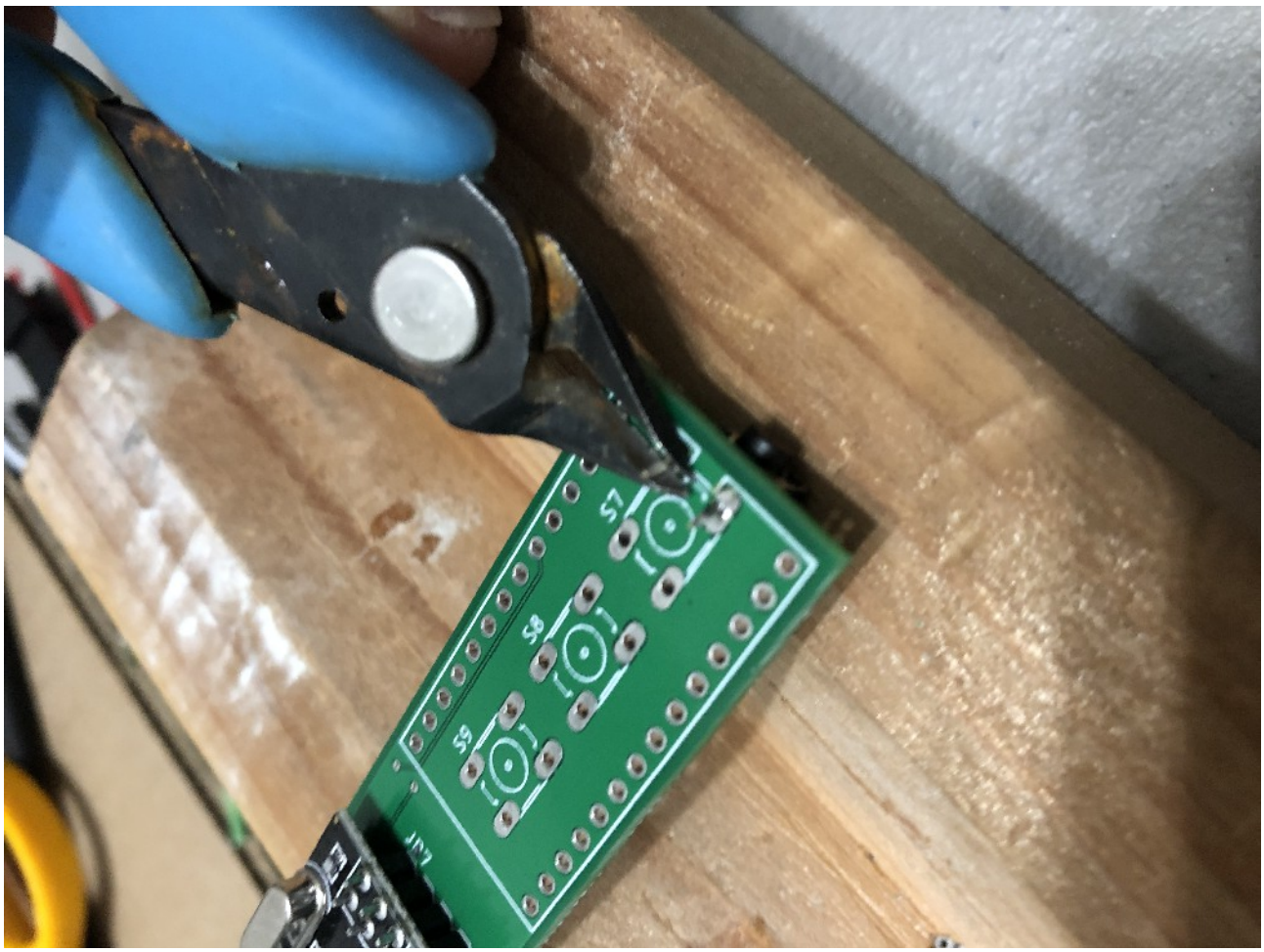
I trim the radio pins, but you really dont need to.



The push button only attaches with two pins, because its going to face out at 90 degrees

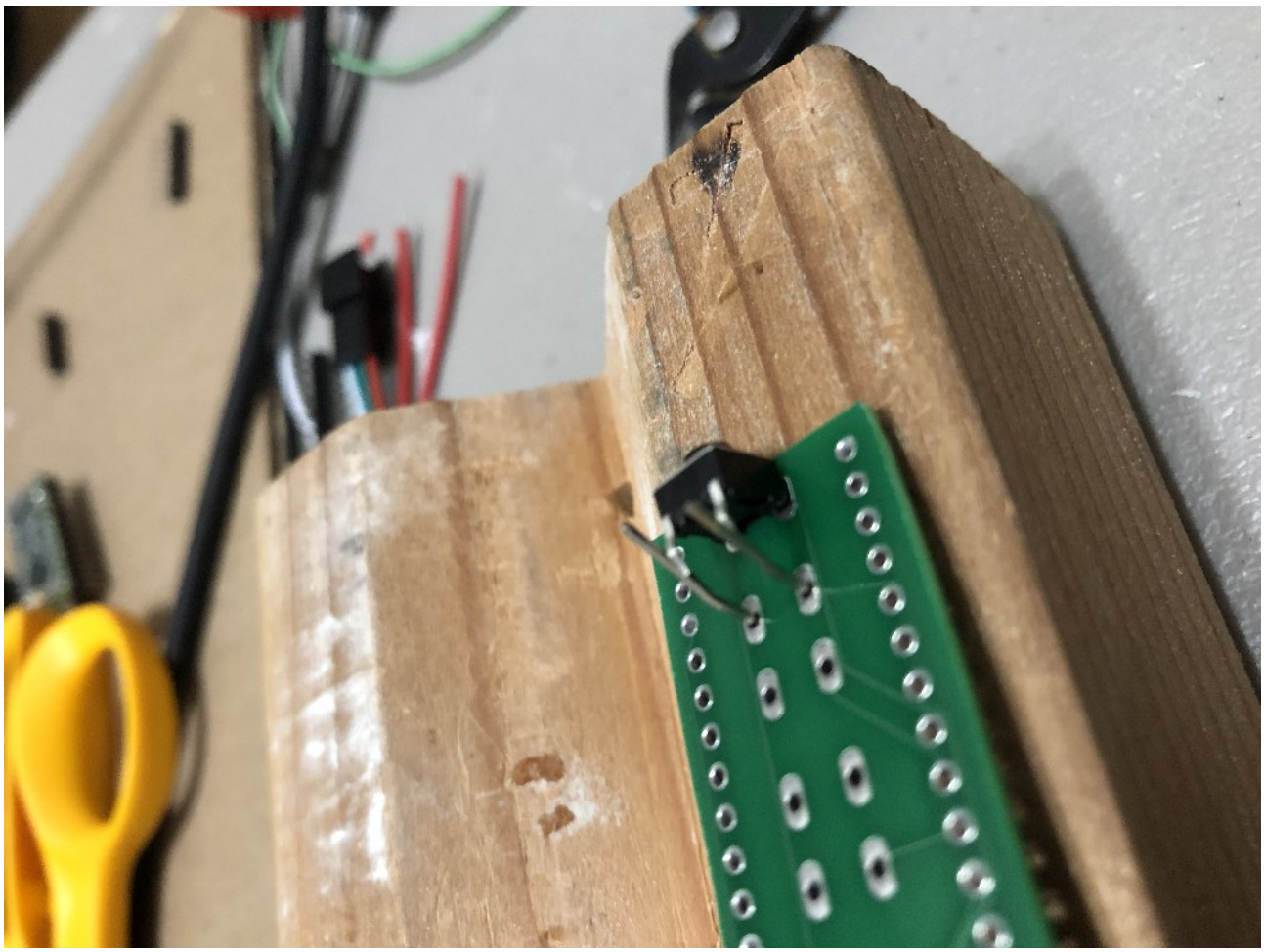


A good way to align before soldering

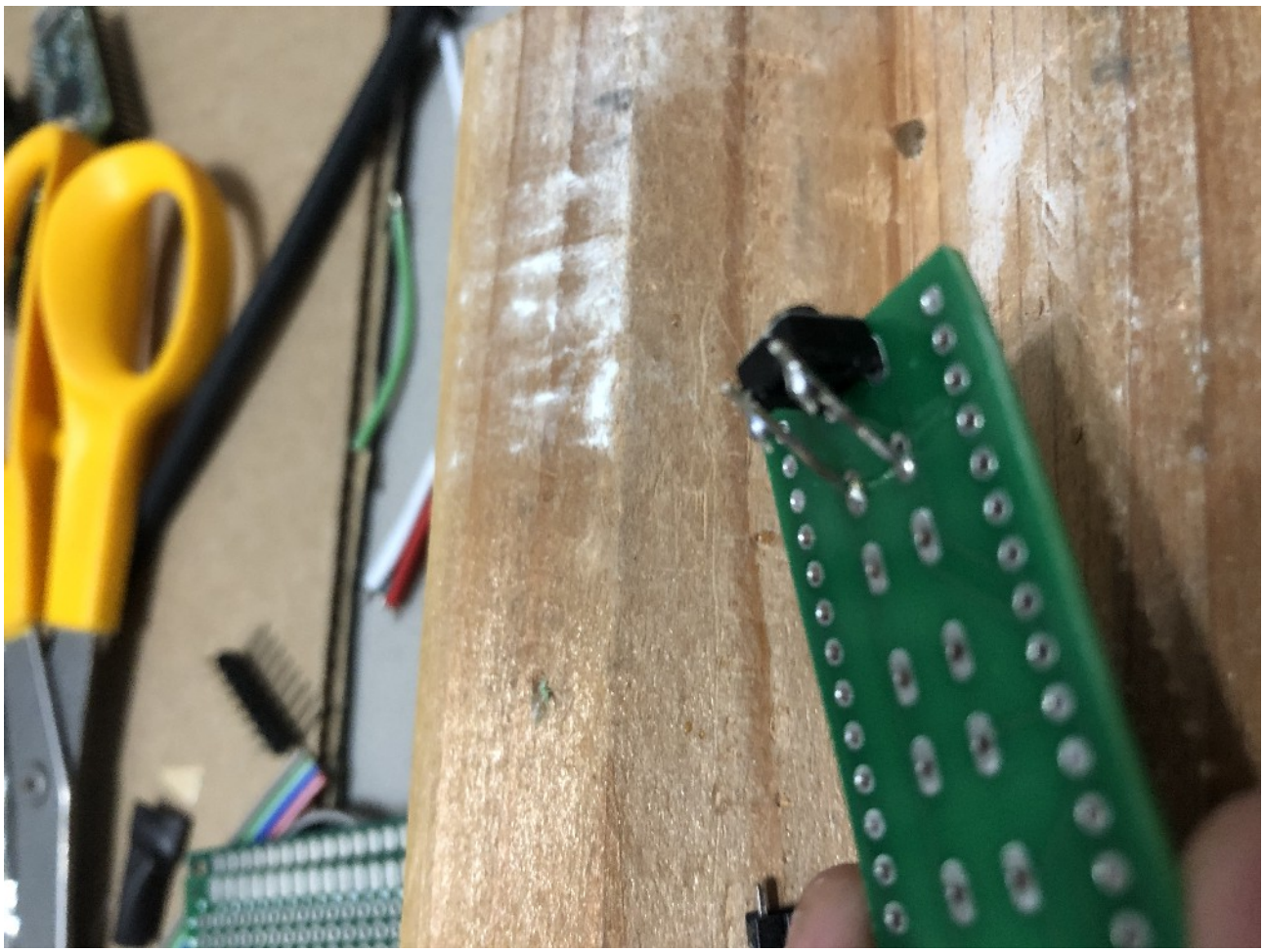


trim these, because the teensy board is going to get close.

There are left over pins from the accelerometer. I use pins from here for the next step.

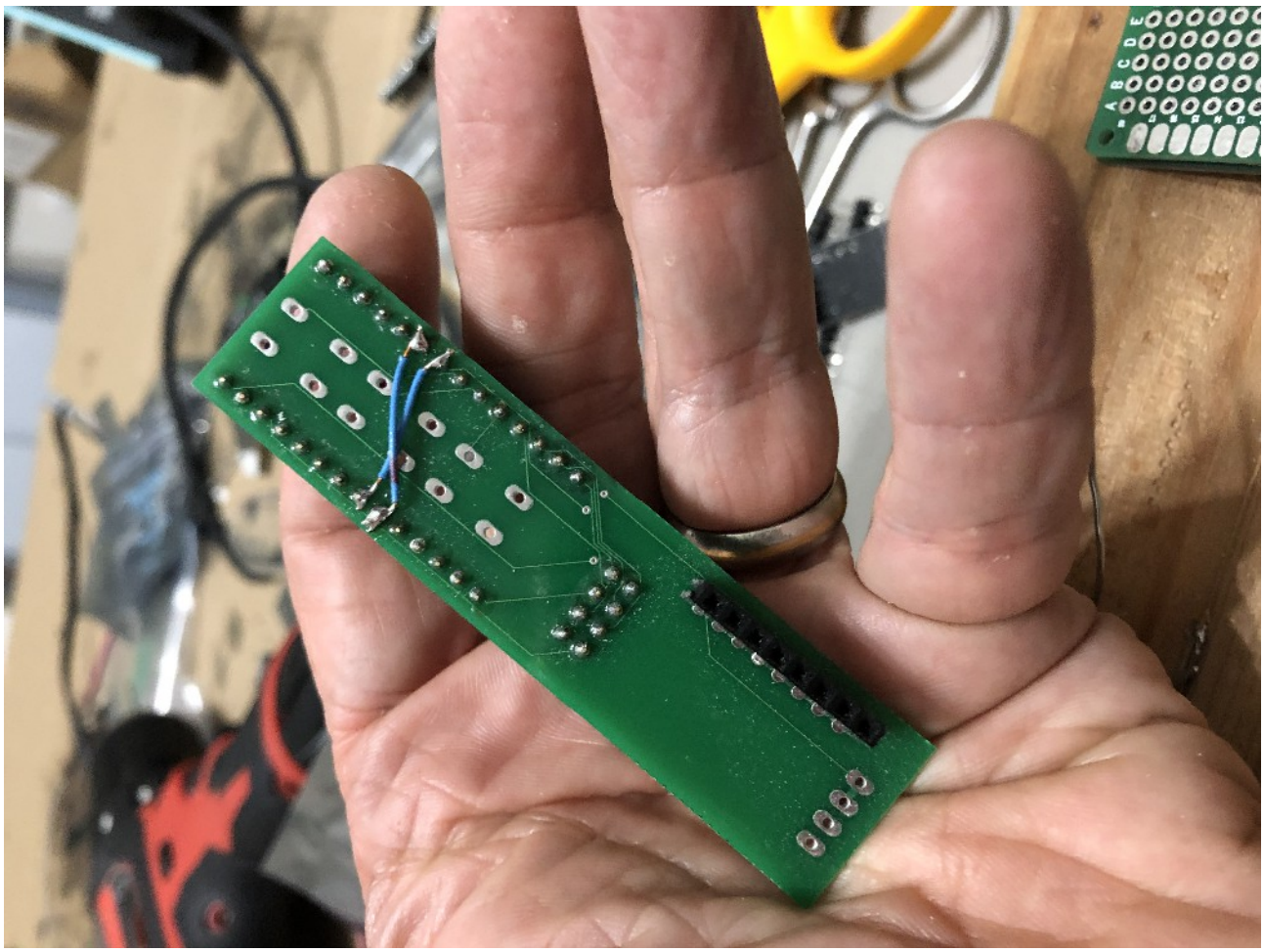


We need to build up support on the back side of the button for strength.



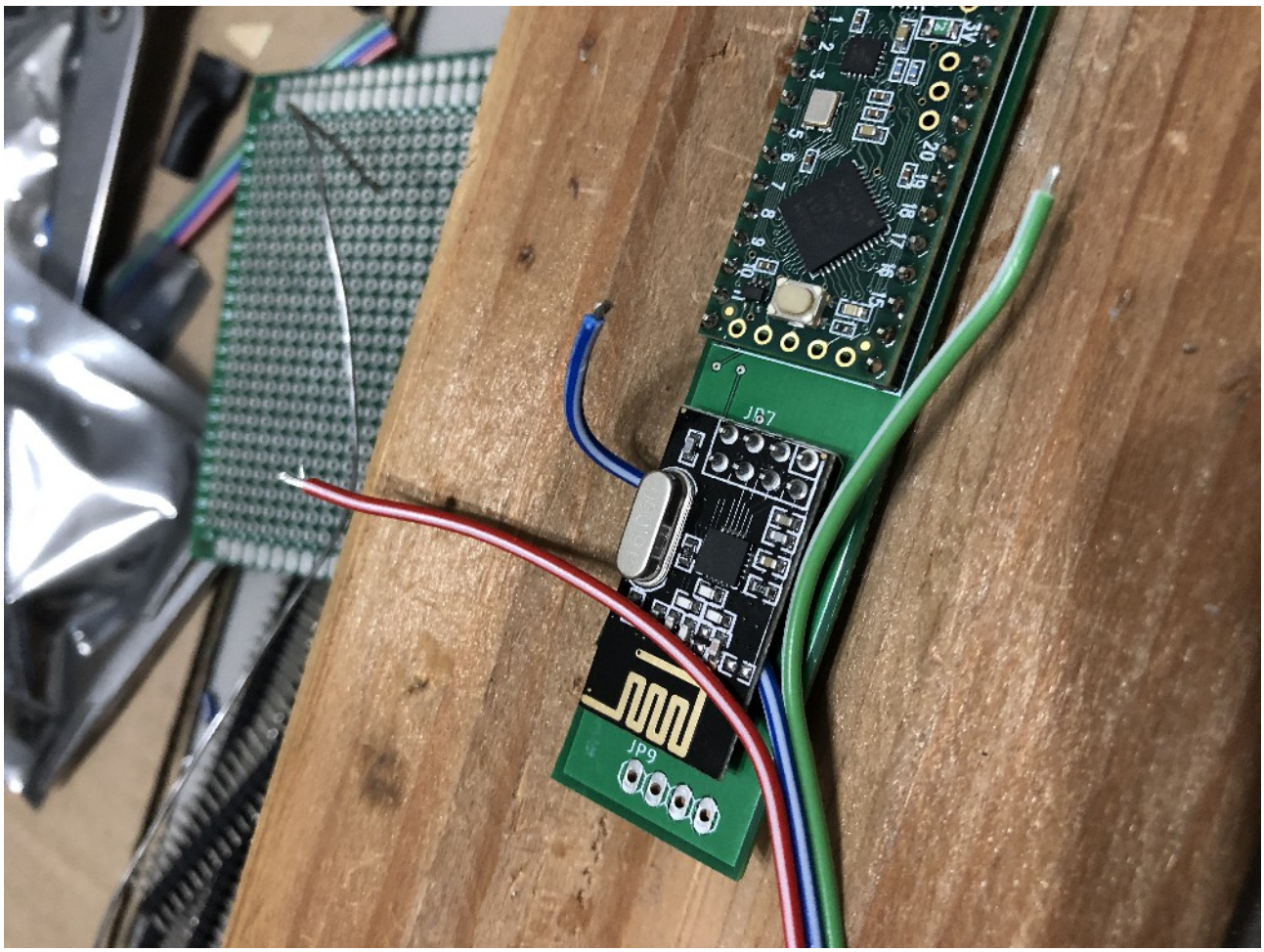
These two diagonal pins are structural only. The PC board holes are not connected to any CPU pins.

Time to add the teensy LC board. After you solder these together, bend the pins inward to help the finished assembly slide into the tube.

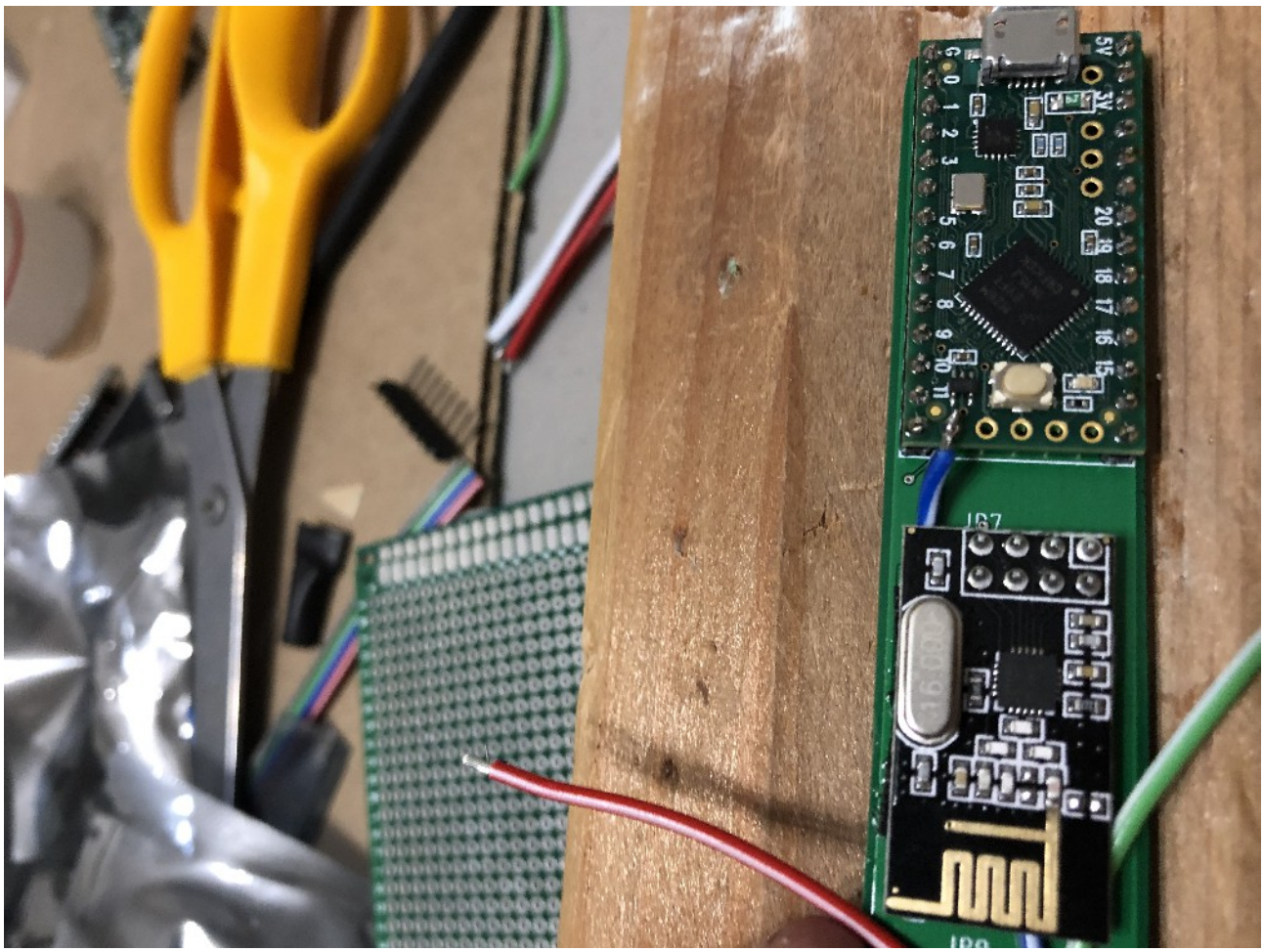


This picture is from a different build, but it is very important This is the back side of the first rev of the Swarm II board. This is the same side as the button and the acceleometer, although they are not in this picture. You must solder these two jumper wires on, or the radio wont work. This is because of a flaw in the board design. I hooked the radio up to the analog pins instead of the digital pins.

You will need about 1 foot for 3 conductor wire for the LED output.

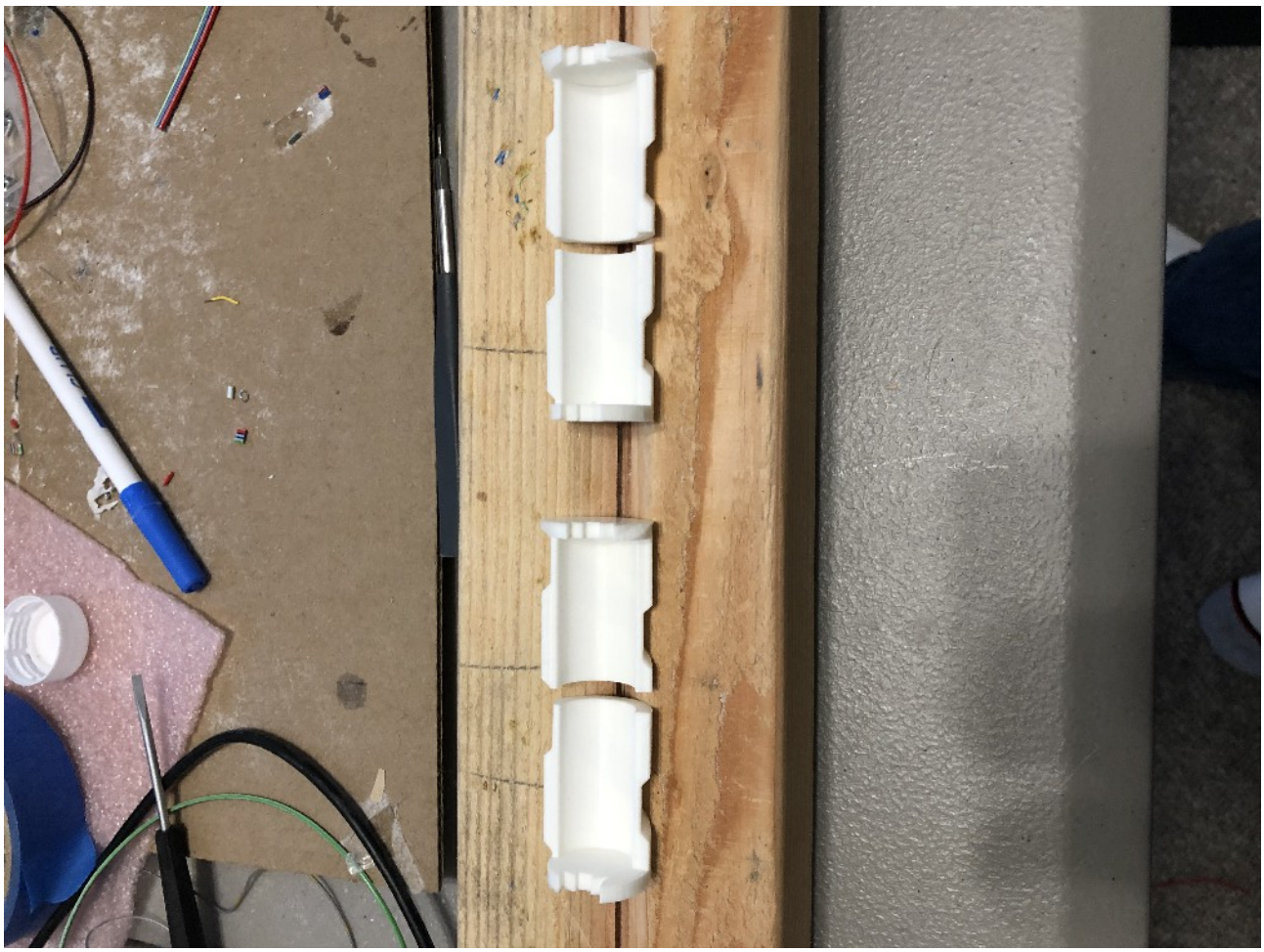


Run the data wire under the radio.

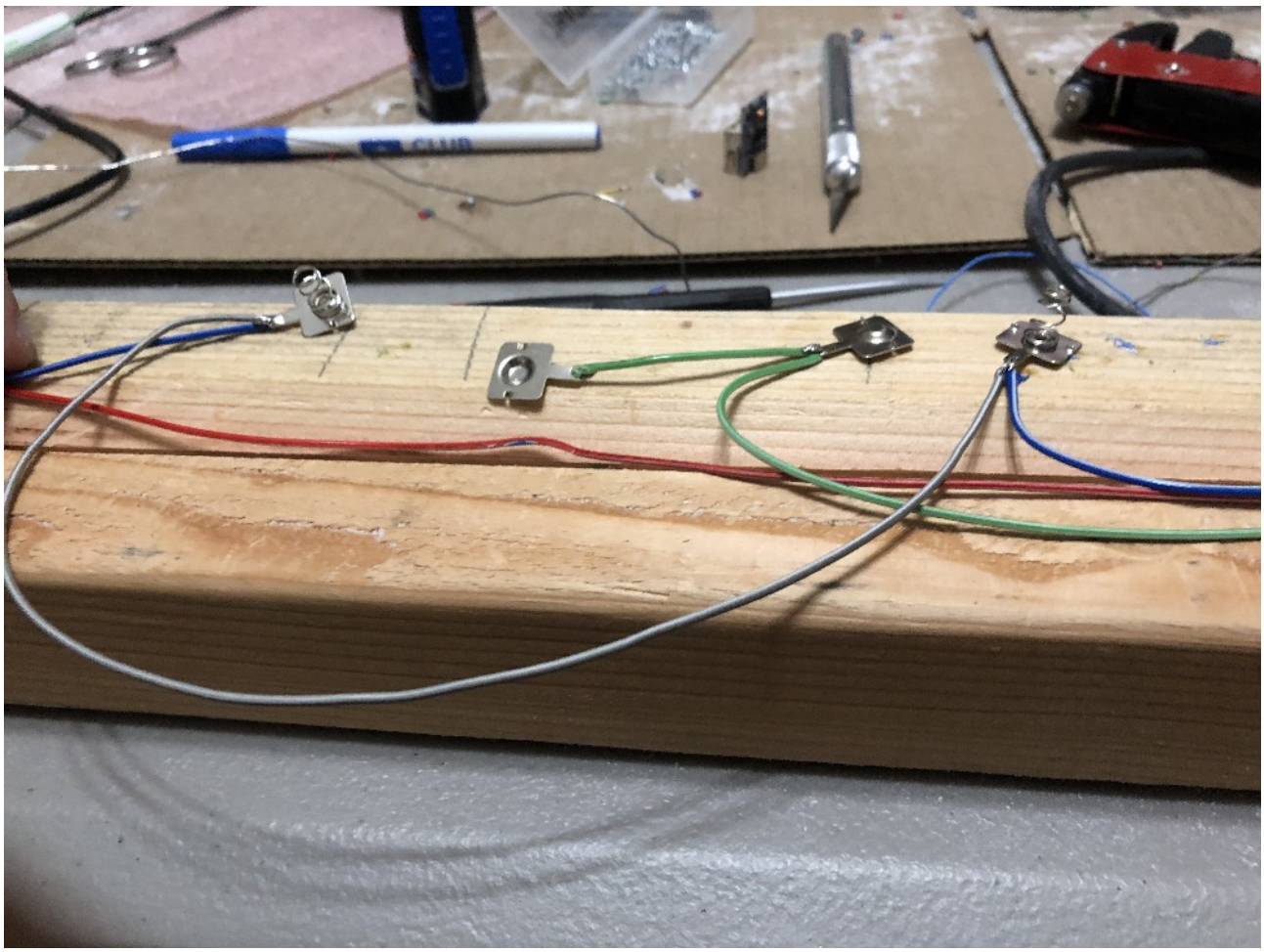


The data line solders to this hole on the end of the teensy LC board. This is a special level shifted output that provides a 5V digital output, especially for driving LED strips.

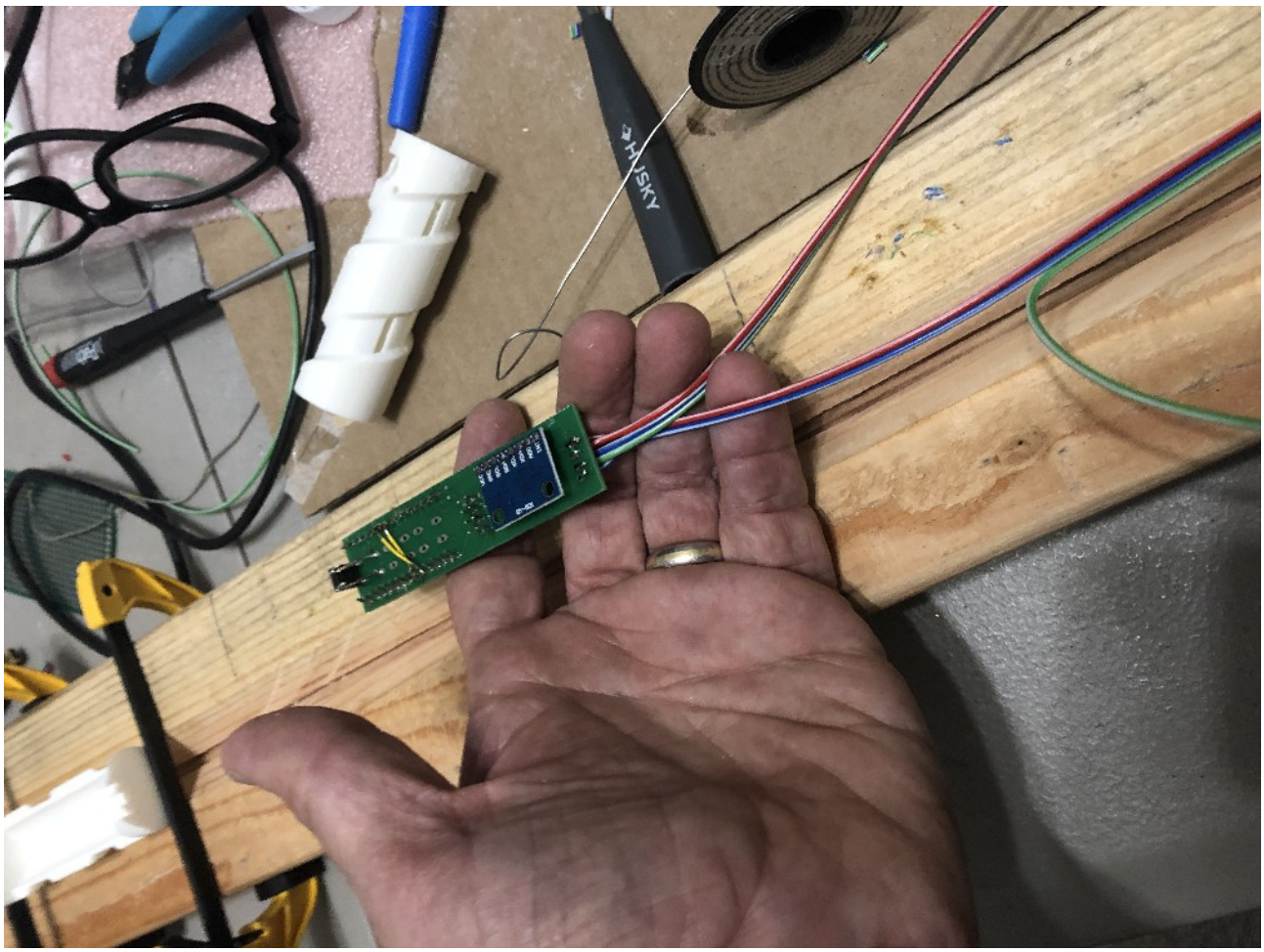
The end of the swarm board has 4 holes. 2 for power and 2 for ground. The inner 2 will go to the LED strip. In this case, the red is power, green is ground, and blue is data. The two outside pins are also power and ground, and will eventually go to the power supply.



Lets start building the rest of the tube. There are 4 battery holder pieces. Each battery holder uses 2 different pieces. Be careful to look at the pieces, and use one of each shape to make holders. You can glue each pair together first.

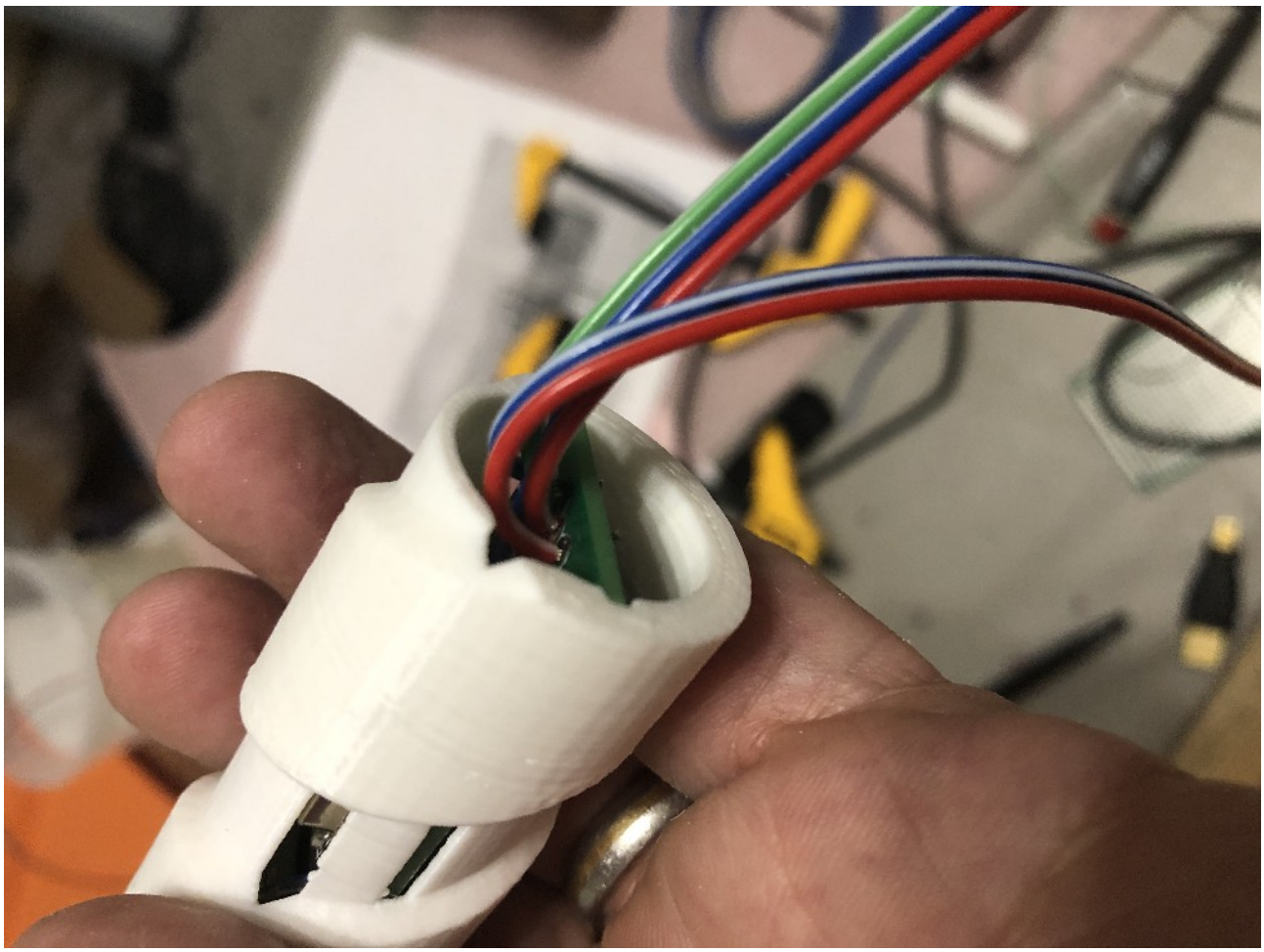


The wiring harness looks like this. The green wire is the power from the positive terminals of the batteries. The wire from these goes off to the right side of the picture where it will connect to the charger unit. The blue wire is the ground, and connects to the negative side of the batteries. It connects to bothe the charger unit and the CPU. Notice that the red wire just passes through. This is the main power supply between the charger and the CPU.

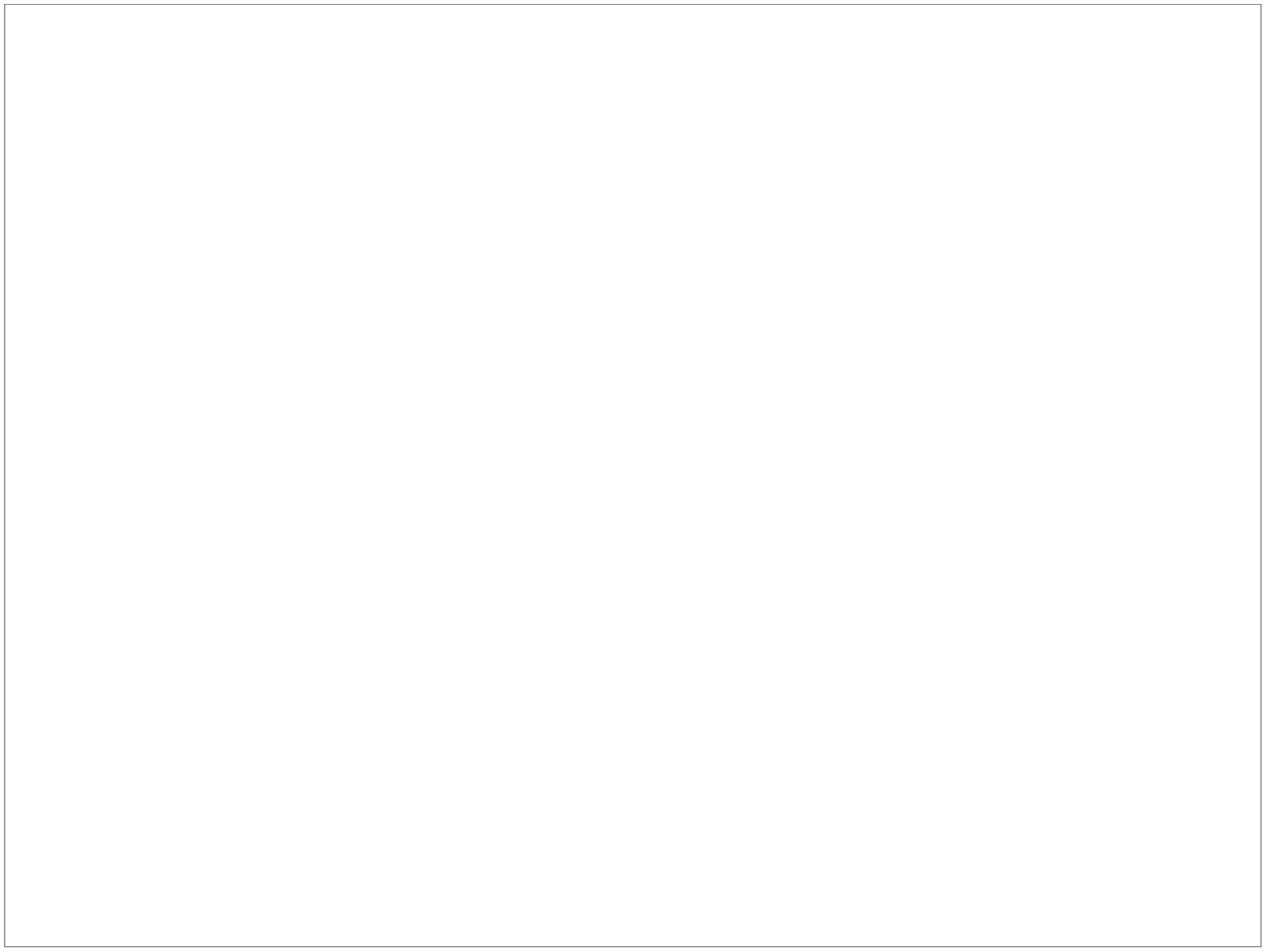


The red and blue from the harness supply power to the CPU. Notice the two yellow jumpers on the CPU board. These are the patch for the first rev of the Swarm II board. I describe this earlier in this document. Make sure you do this before you go on.

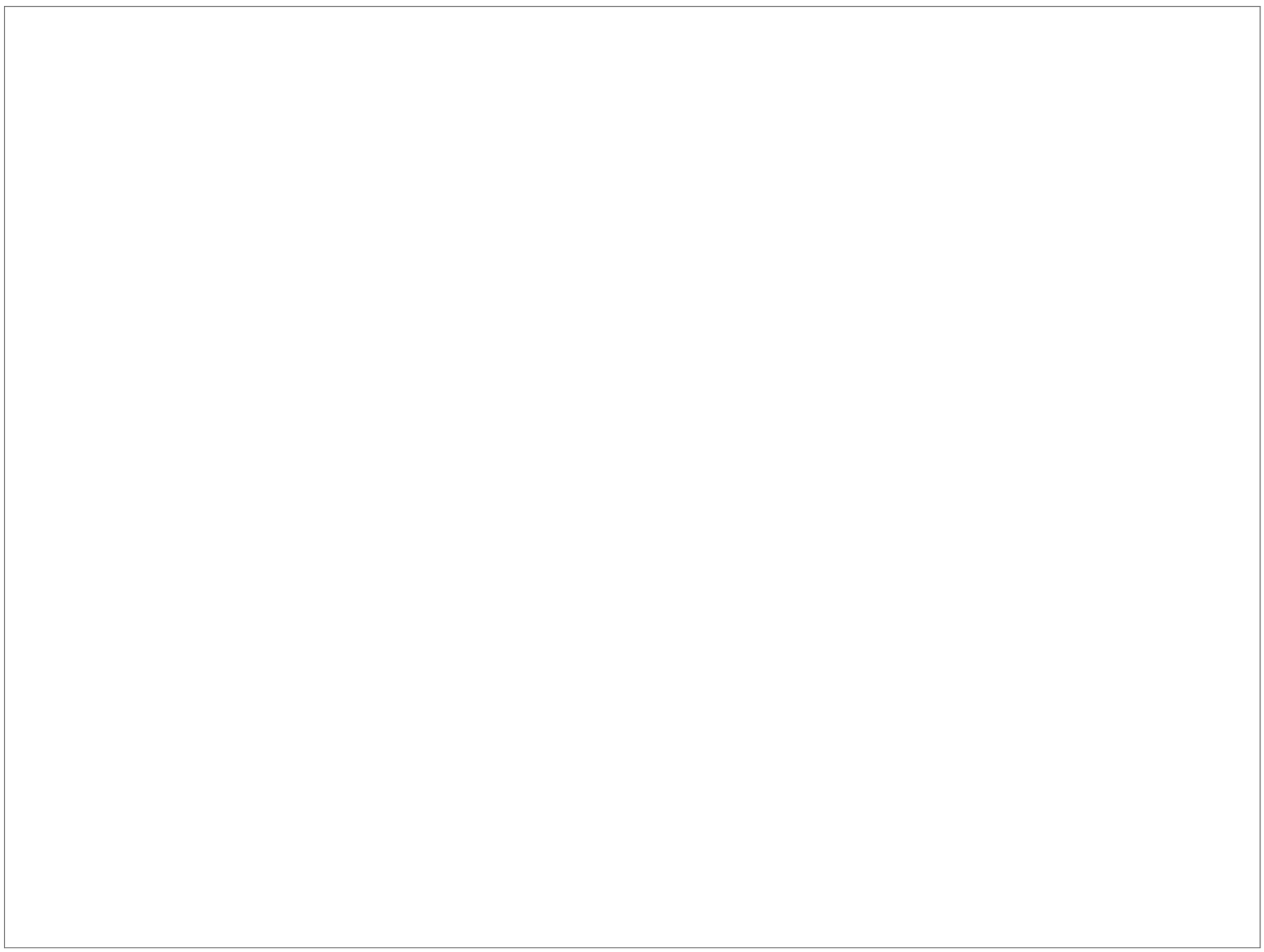
Slide the swarm assembly into the CPU tube. It slides in on the groove, and the radio crystal will just fit into the cutout. This is a tight fit.



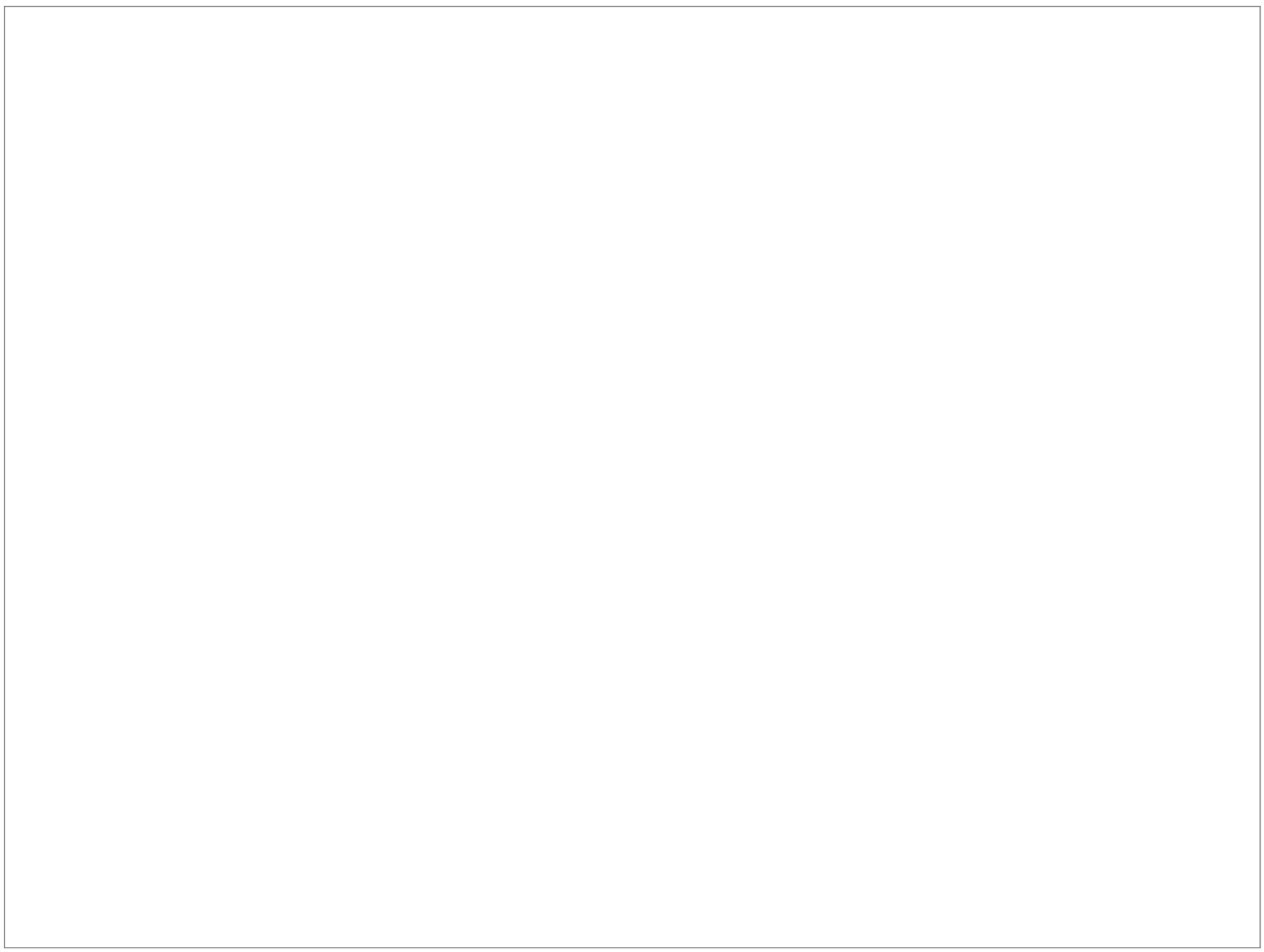
All the way in. It stops up against a ridge at the other end that keeps it from falling out.



Using a screw driver helps the LED wire exit the hole as you feed it through the back side.

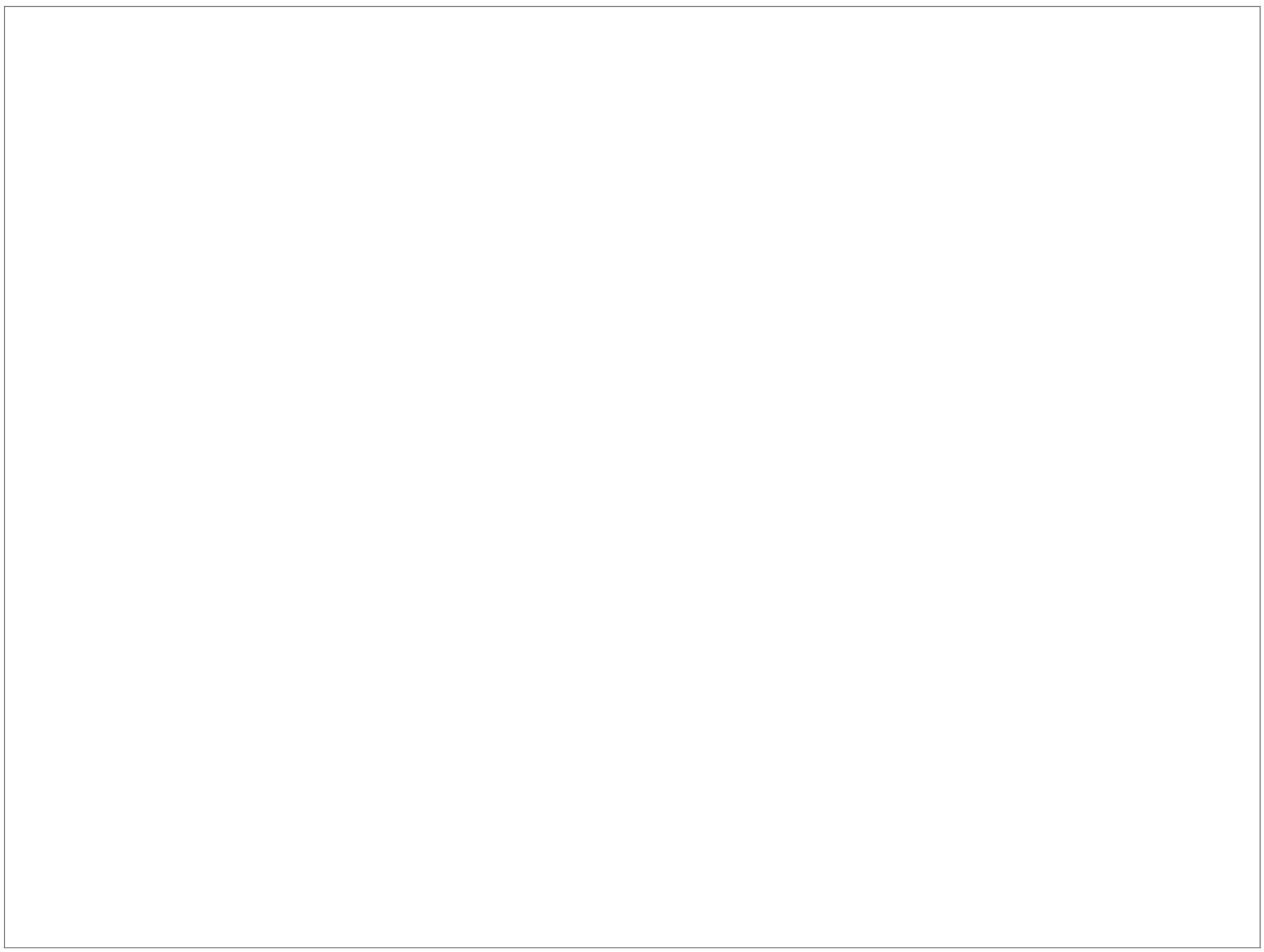


CPU in place

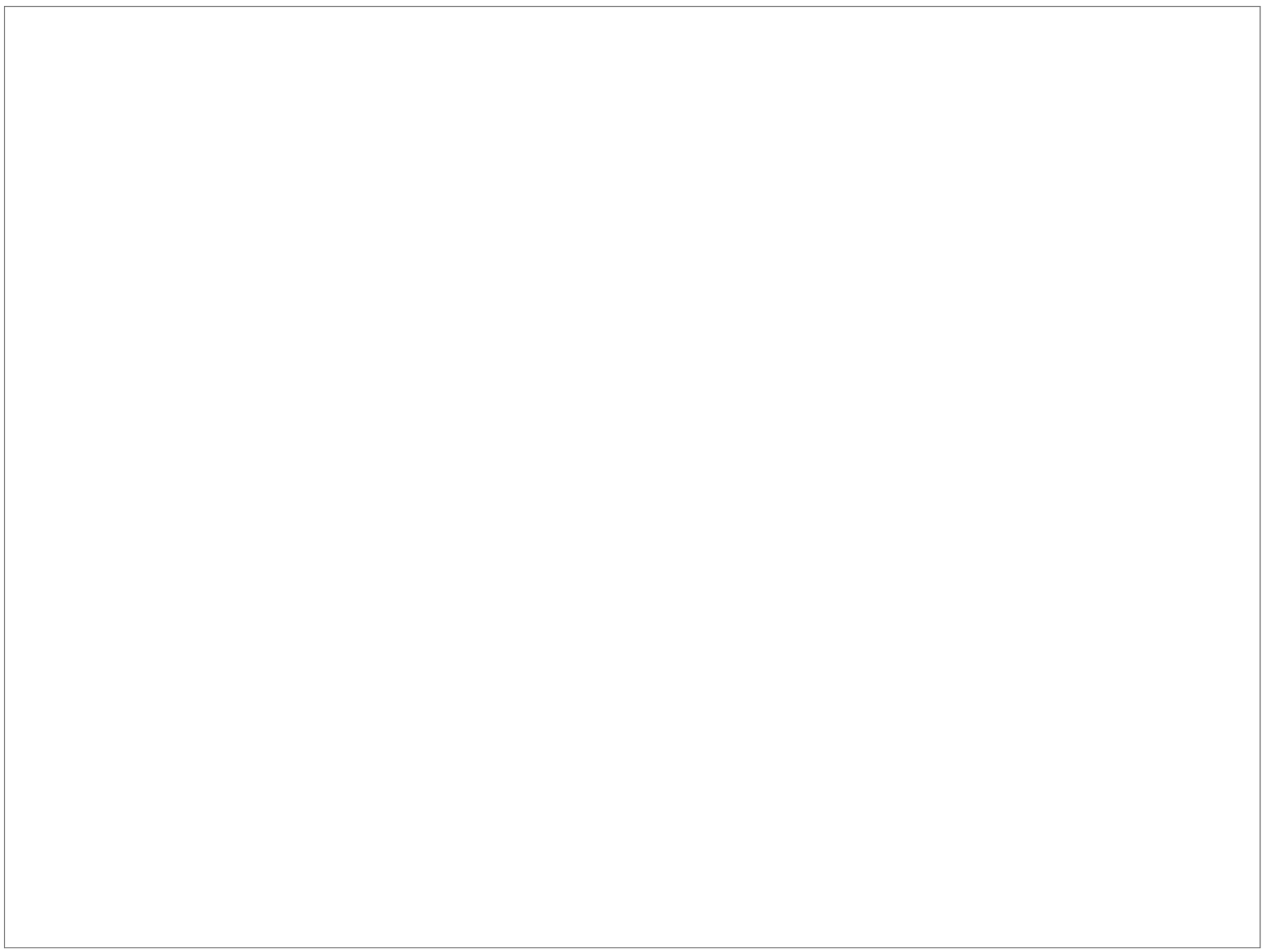


There are 4 longish tubes. Two are a little shorter. These two go on the CPU side of the batteries. The orientation doesnt matter.

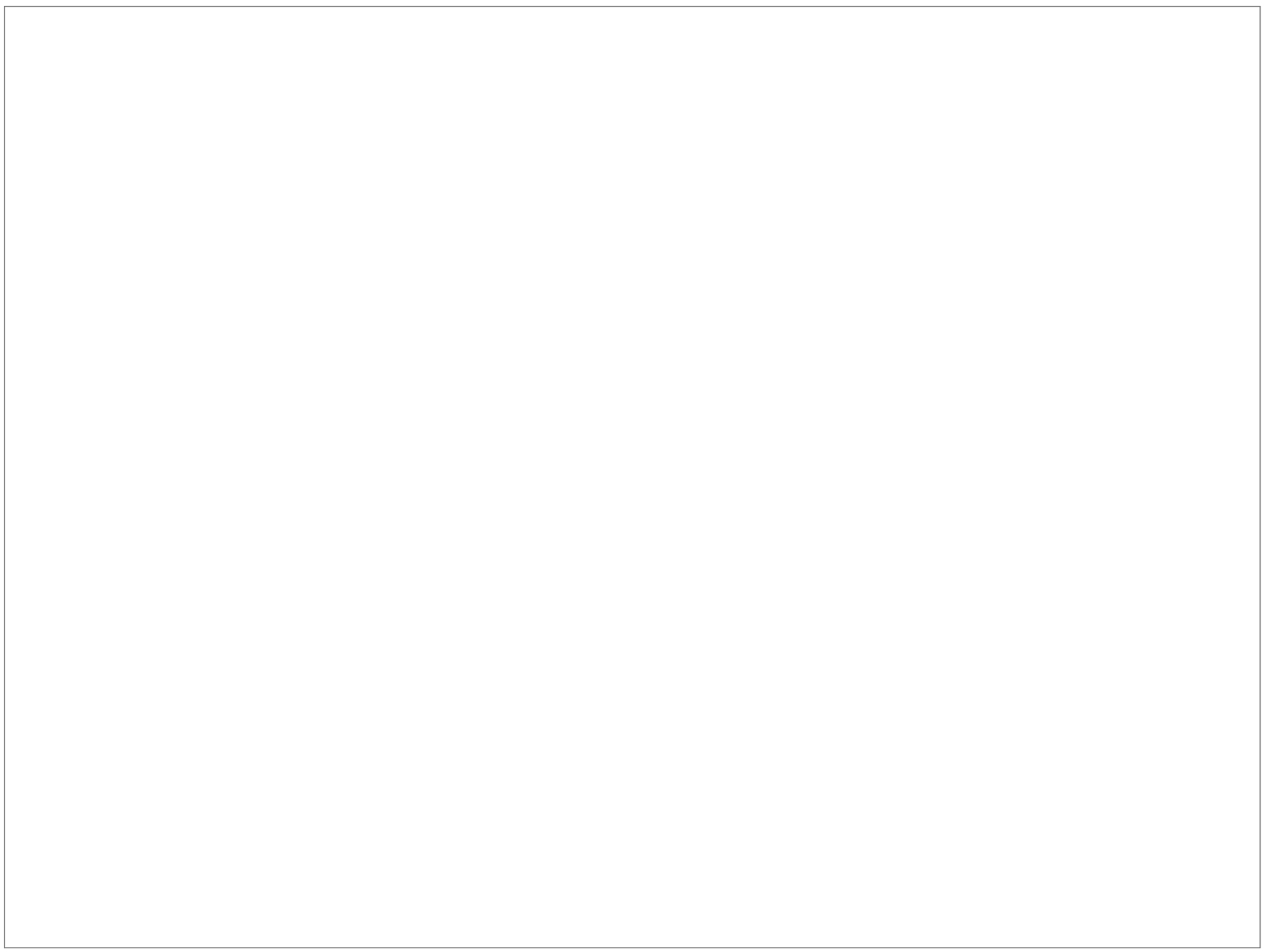
Glue it to the CPU aligning the LED slot so the spiral notch matches. This will glue the board into place so it cant come out.



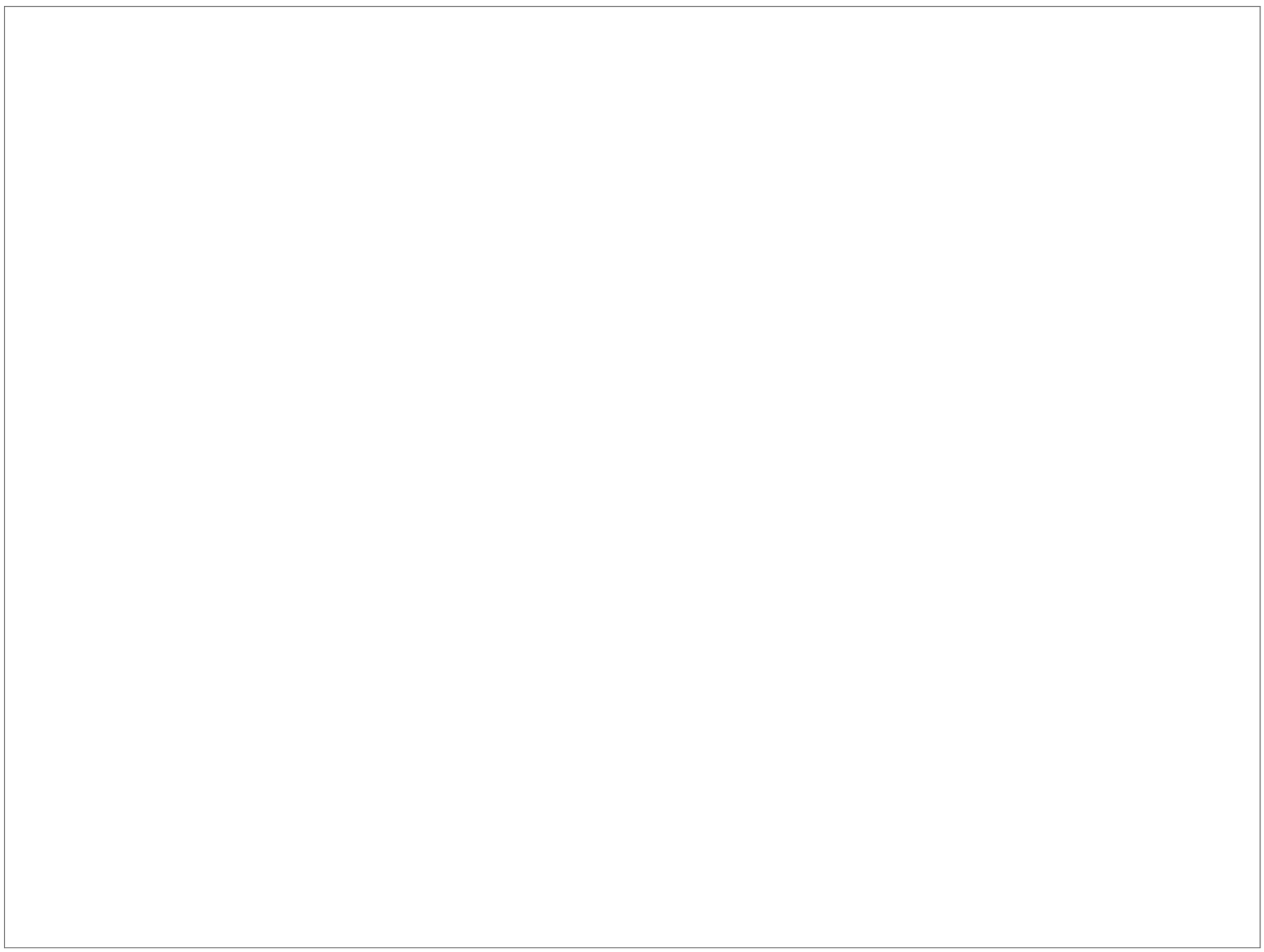
I find it really useful to have these mini clamps to hold pressure on the tubes while they set. Here we see the second shorter tube getting ready to be glued in place.



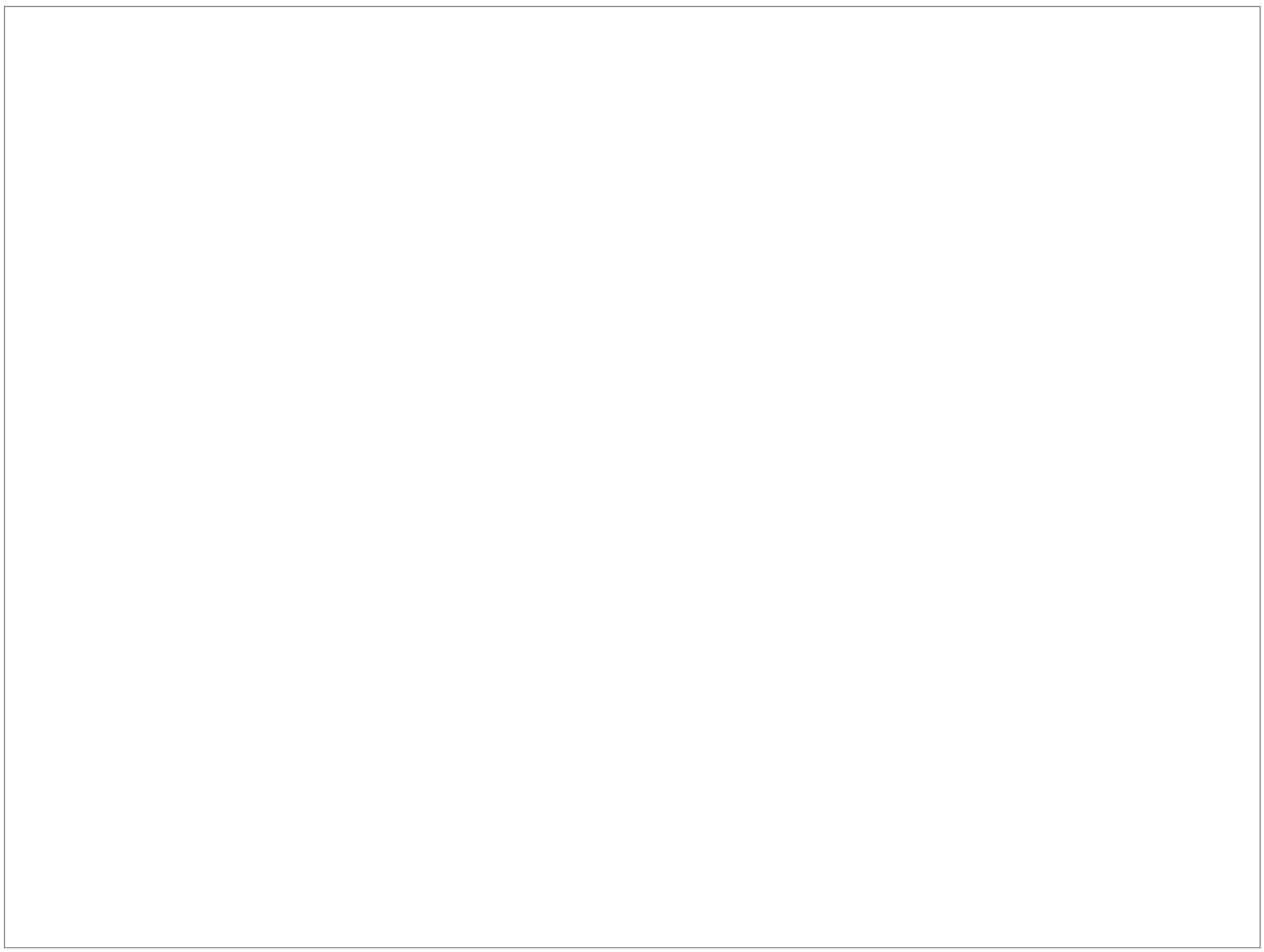
There are 3 short spacers. These go between the battery holdrs, and on each side of the battery holders. The help the wire transition from the outer edge where they pass around the batteries, to the inside of the tube. Alighn the first so the cut is towards the battey box. The other 2 will be in exactly the same orientation.



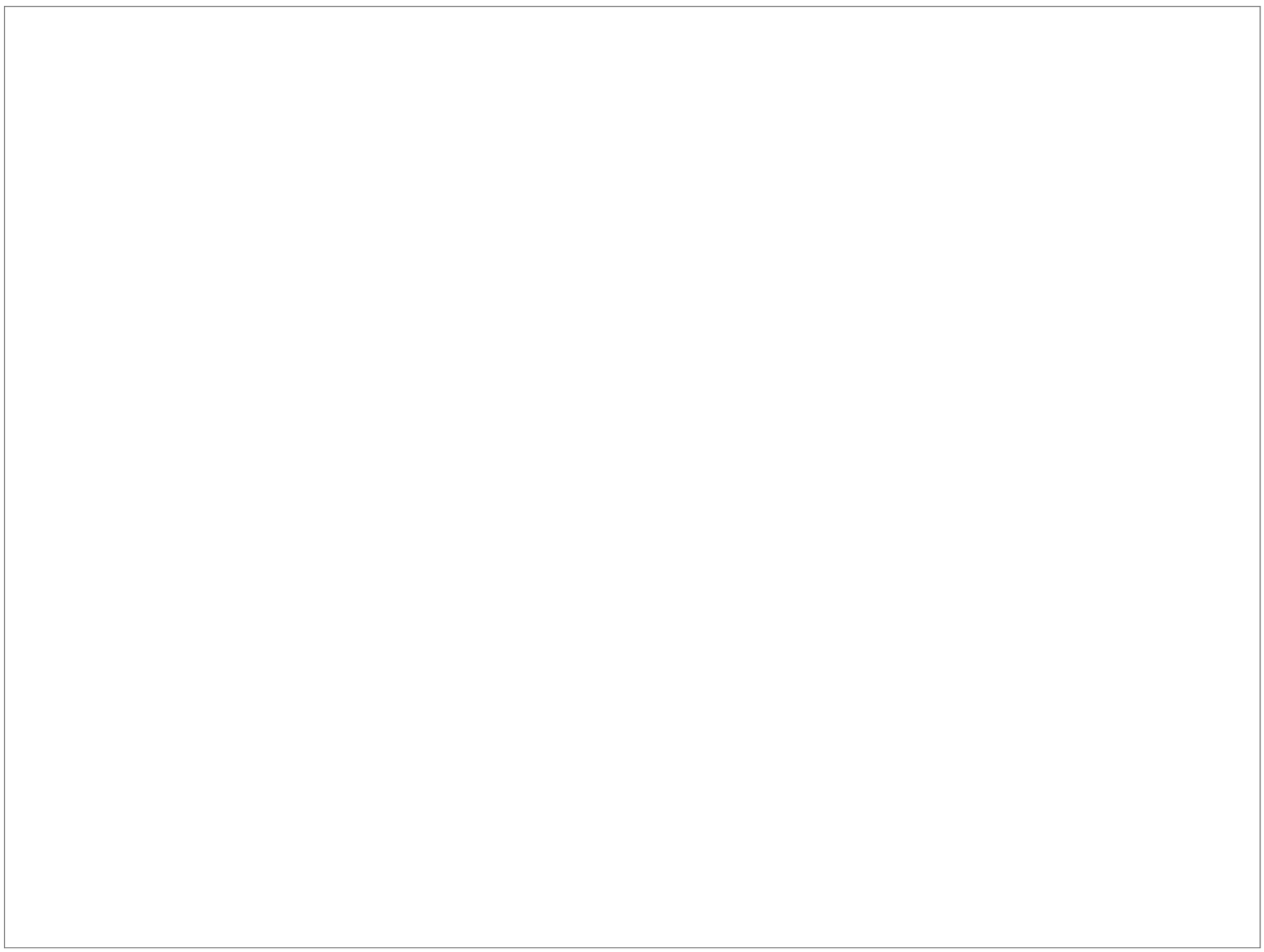
The first spring terminal will glue onto the battery box. Its important that the battery box aligh with the notch of the last piece you glued on to the tube, so pay attention to the next couple pictures before you start gluing.



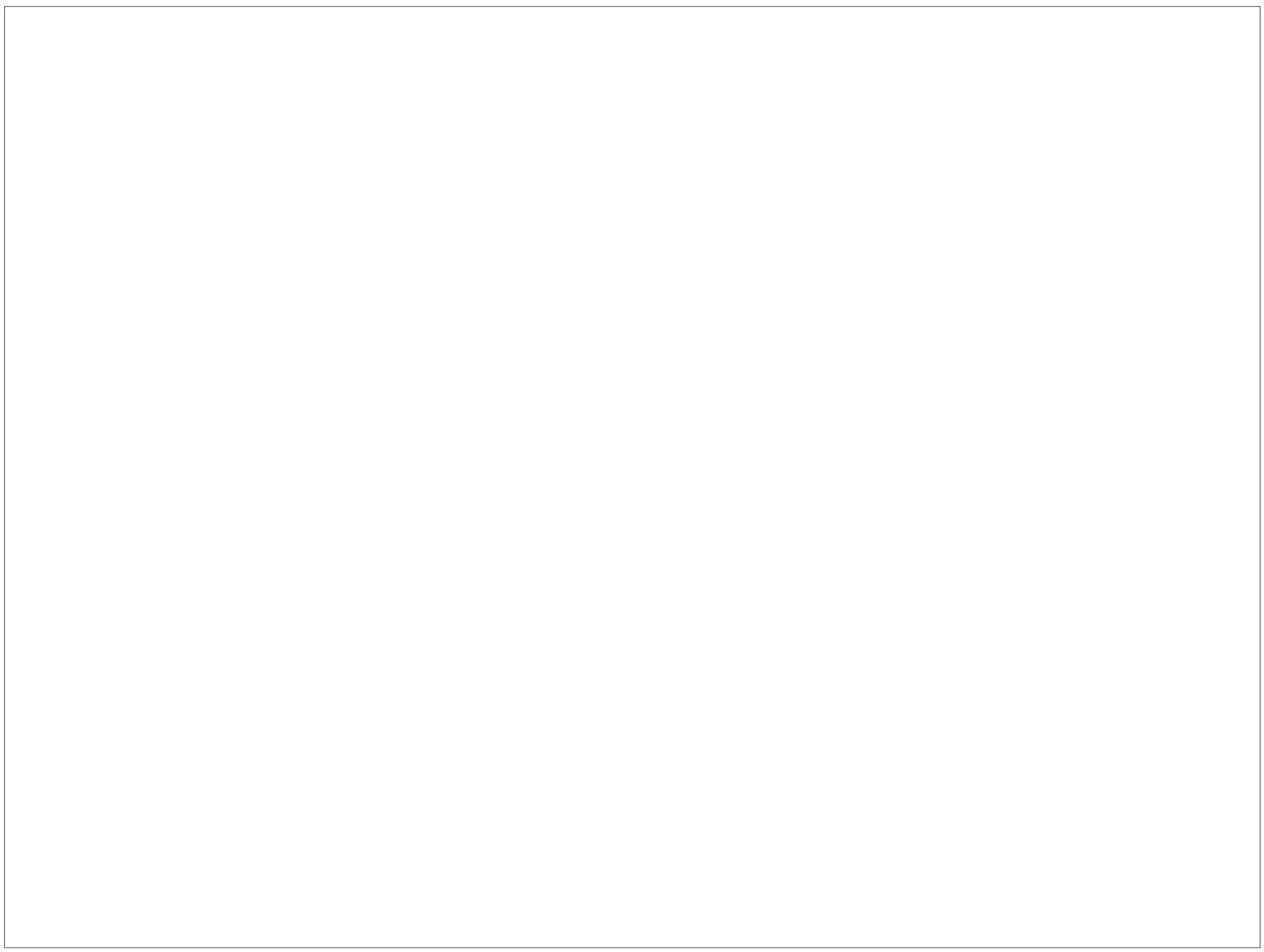
Put a dab of glue on the terminal and glue it in the box using a battery to help hold it in place. Look really close at the spiral led grooves in this picture get it right before you glue it in place. This is really important.



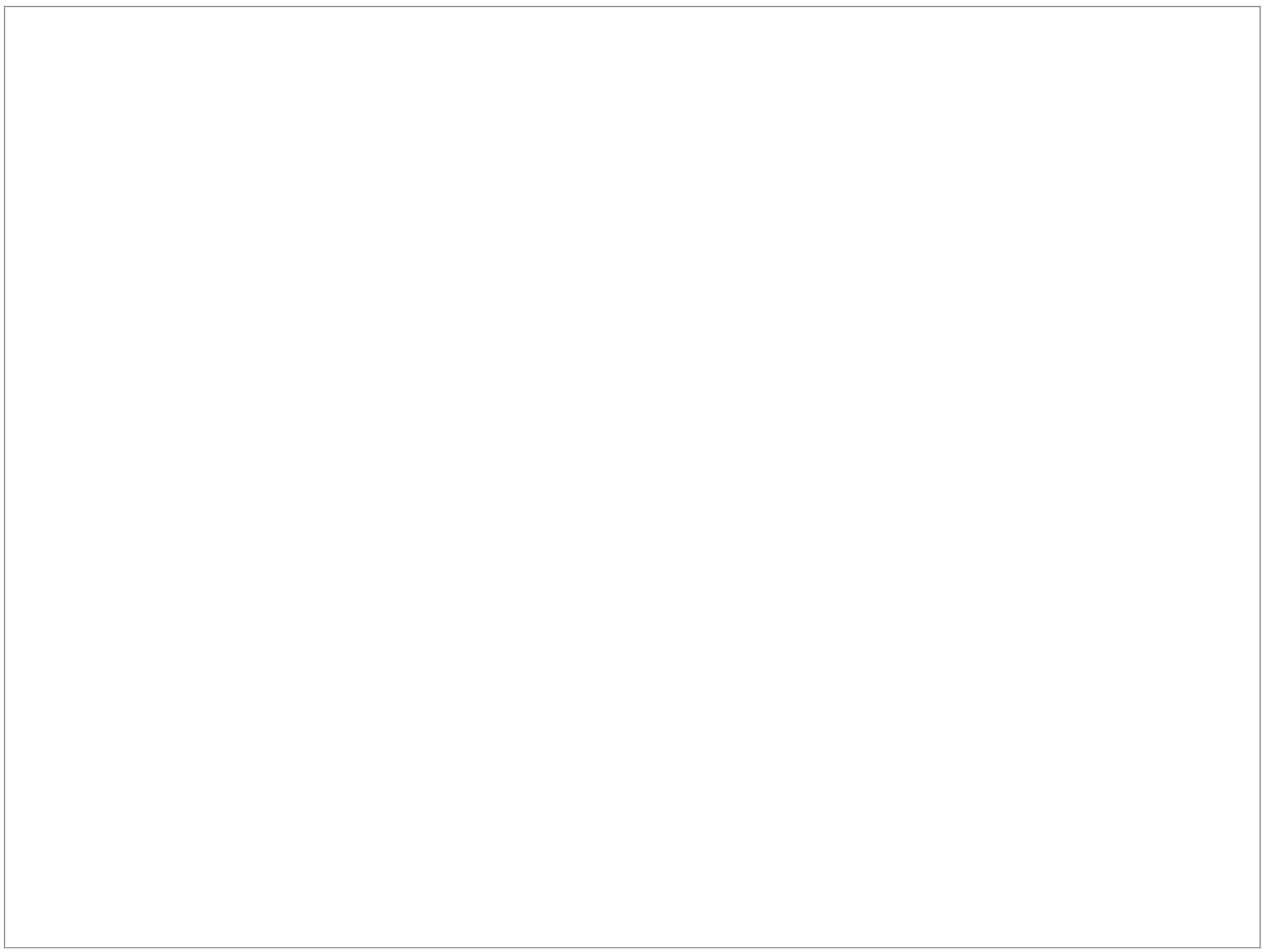
Glue the positive terminal in too, using the battery to hold it in place. While you are doing this, be careful that none of the positive or negative wires anywhere on the harness can touch each other, because this battery has power, and if they touch, the will short out. After the glue dries, remove the battery



Glue the battery holder to the existing tube. You should be able to see where it aligns with the notch the wires come out of.

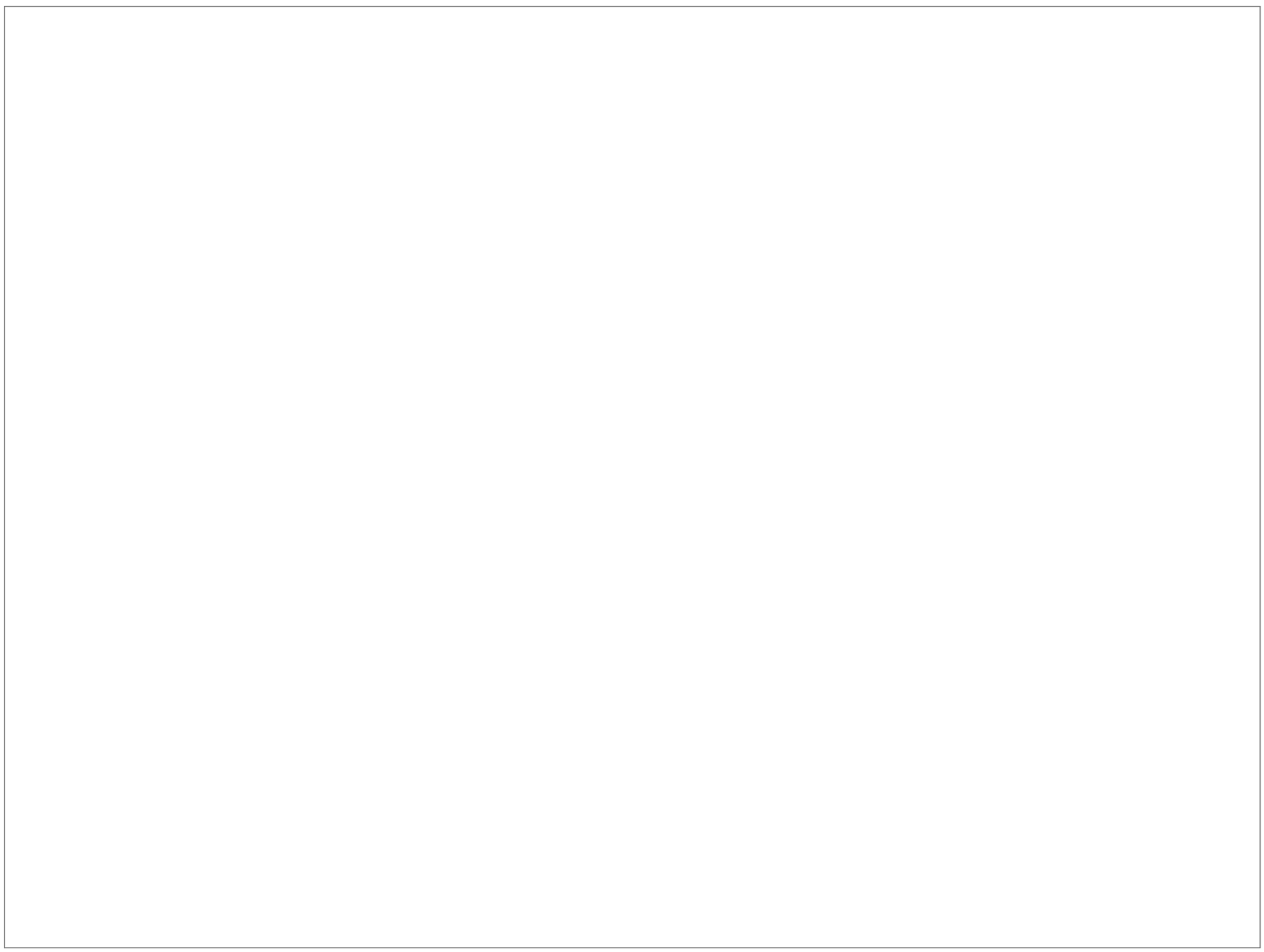


Glue another short tube on in the same alignment as the first.

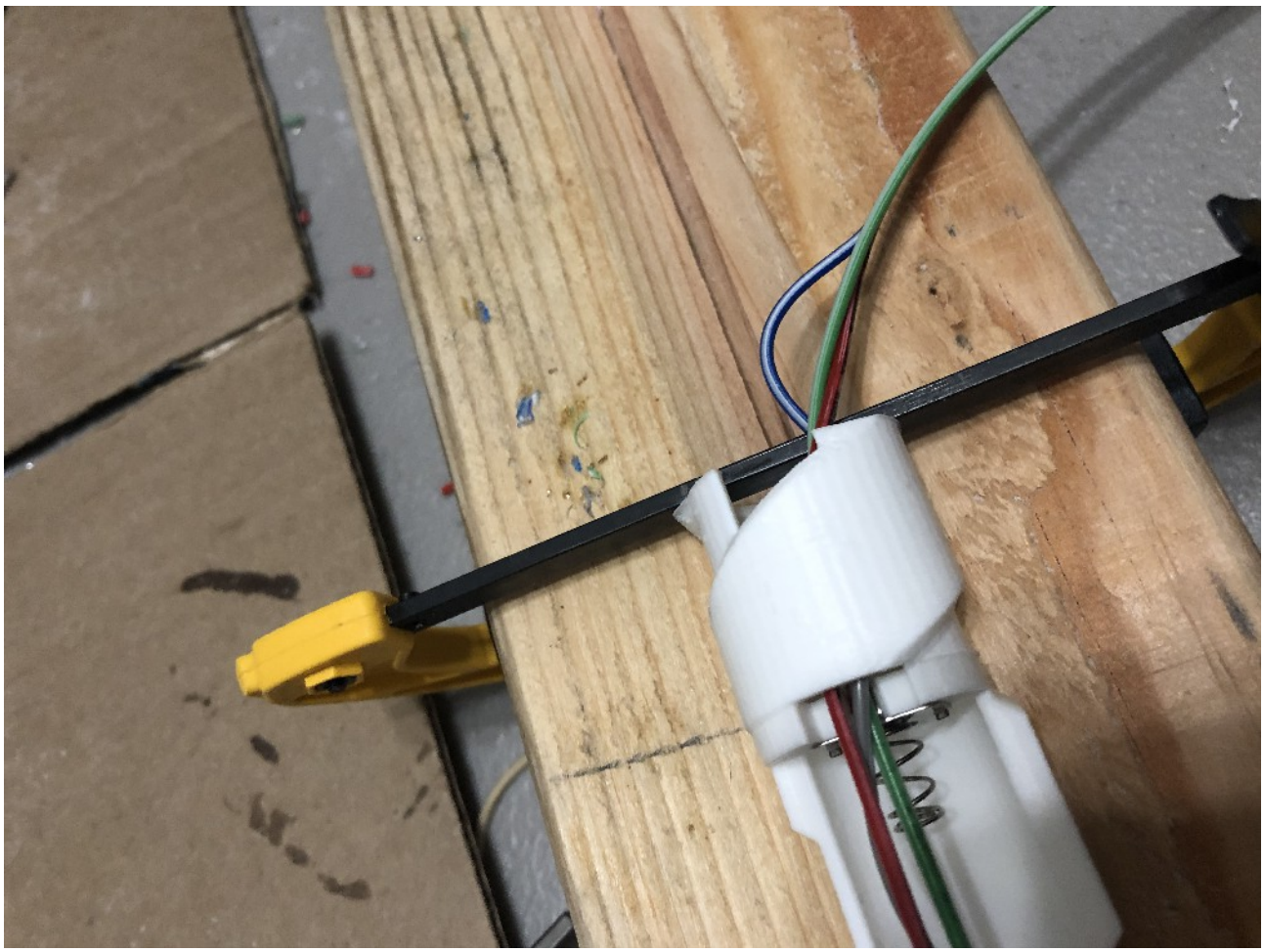


The second battery box has the terminals reversed, so the positive tabs are in the center, and the negative tabes are on the outside for both batteries.

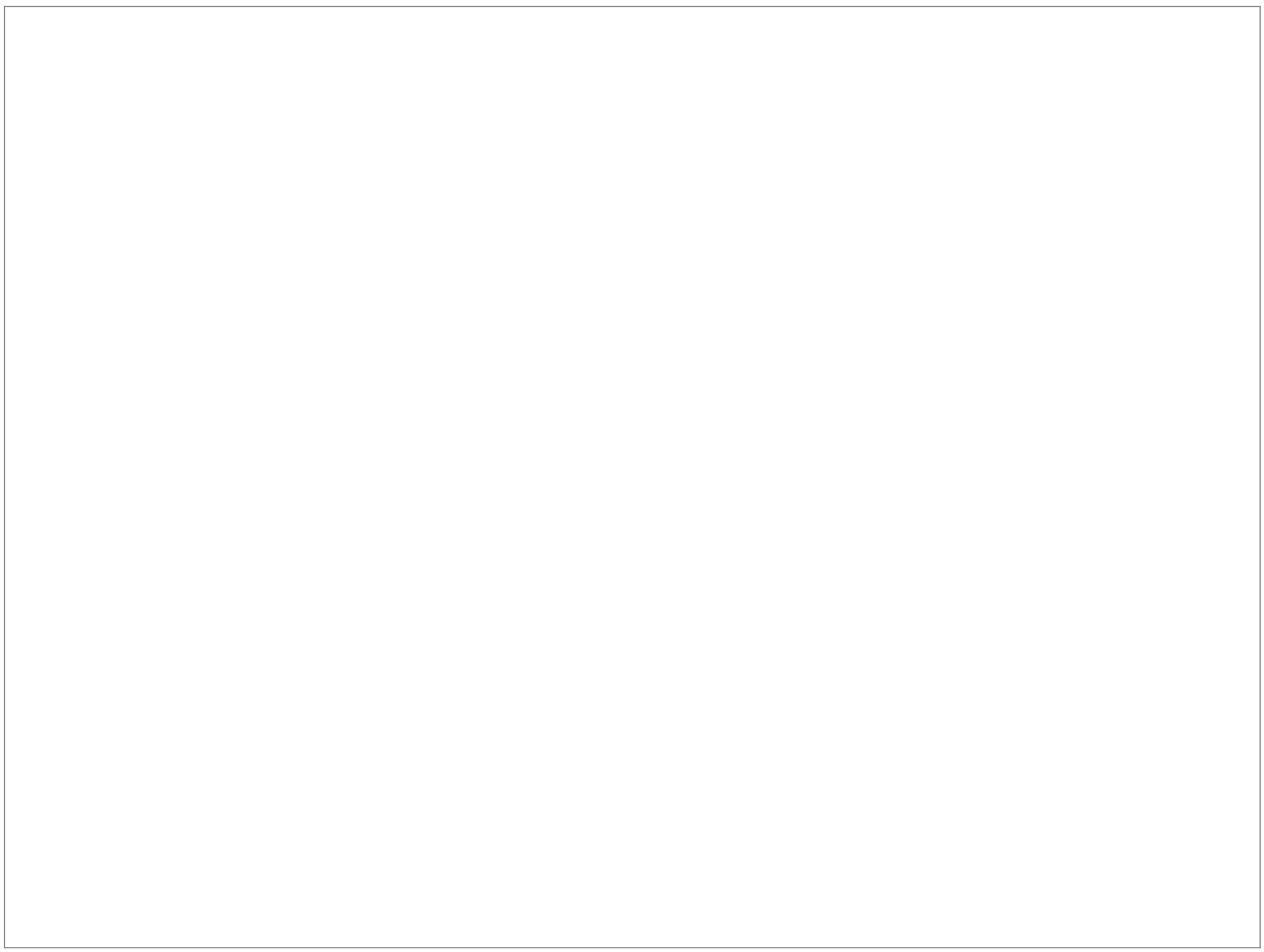
Again, remove the batteries after they set, this will be important because you dont want live power for the next steps.



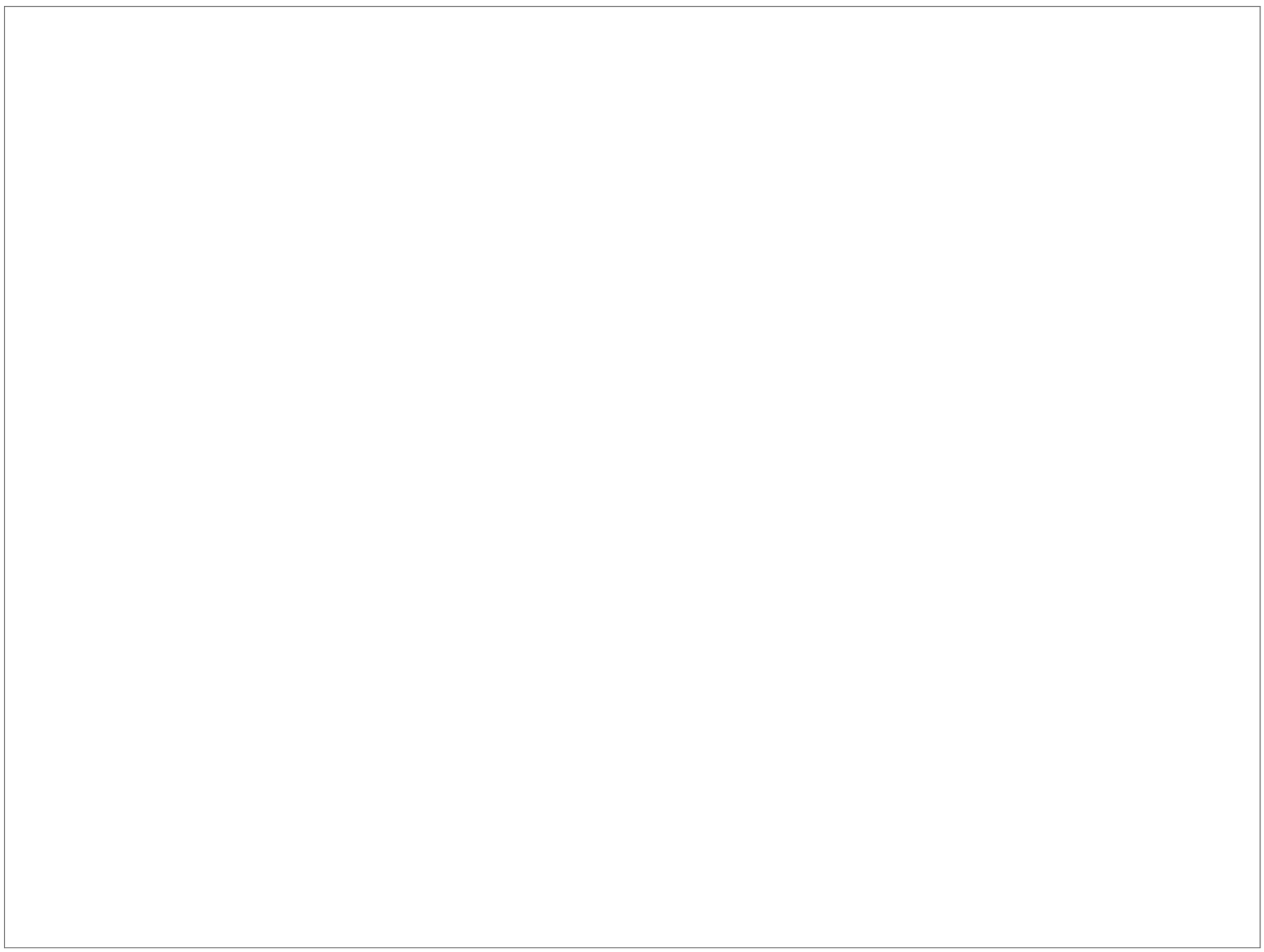
After you get the power tabs glues in place, glue the second battery box to the tube, line up the wiring notch.



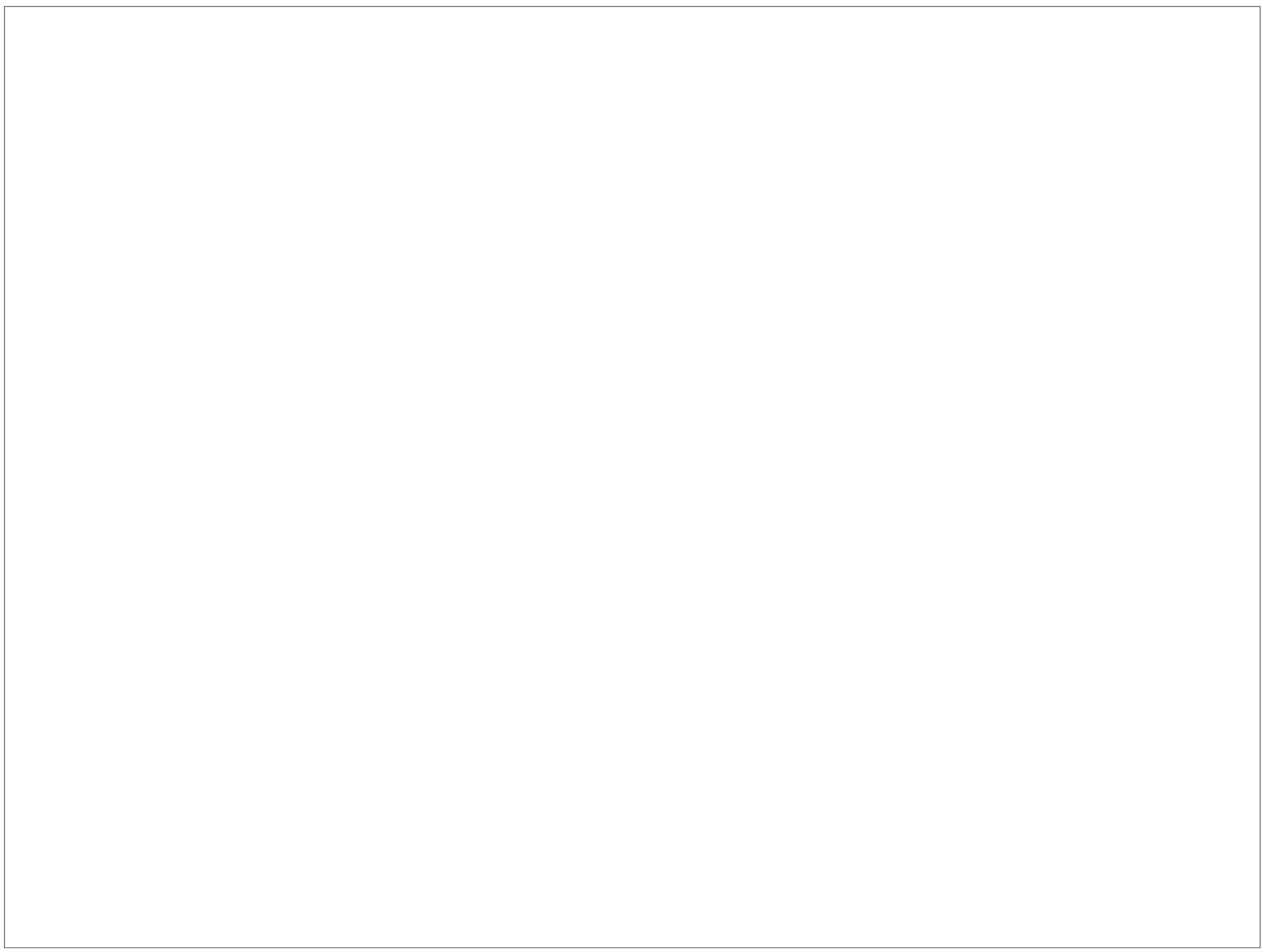
Glue on the last of the 3 short tubes in the same alignment.



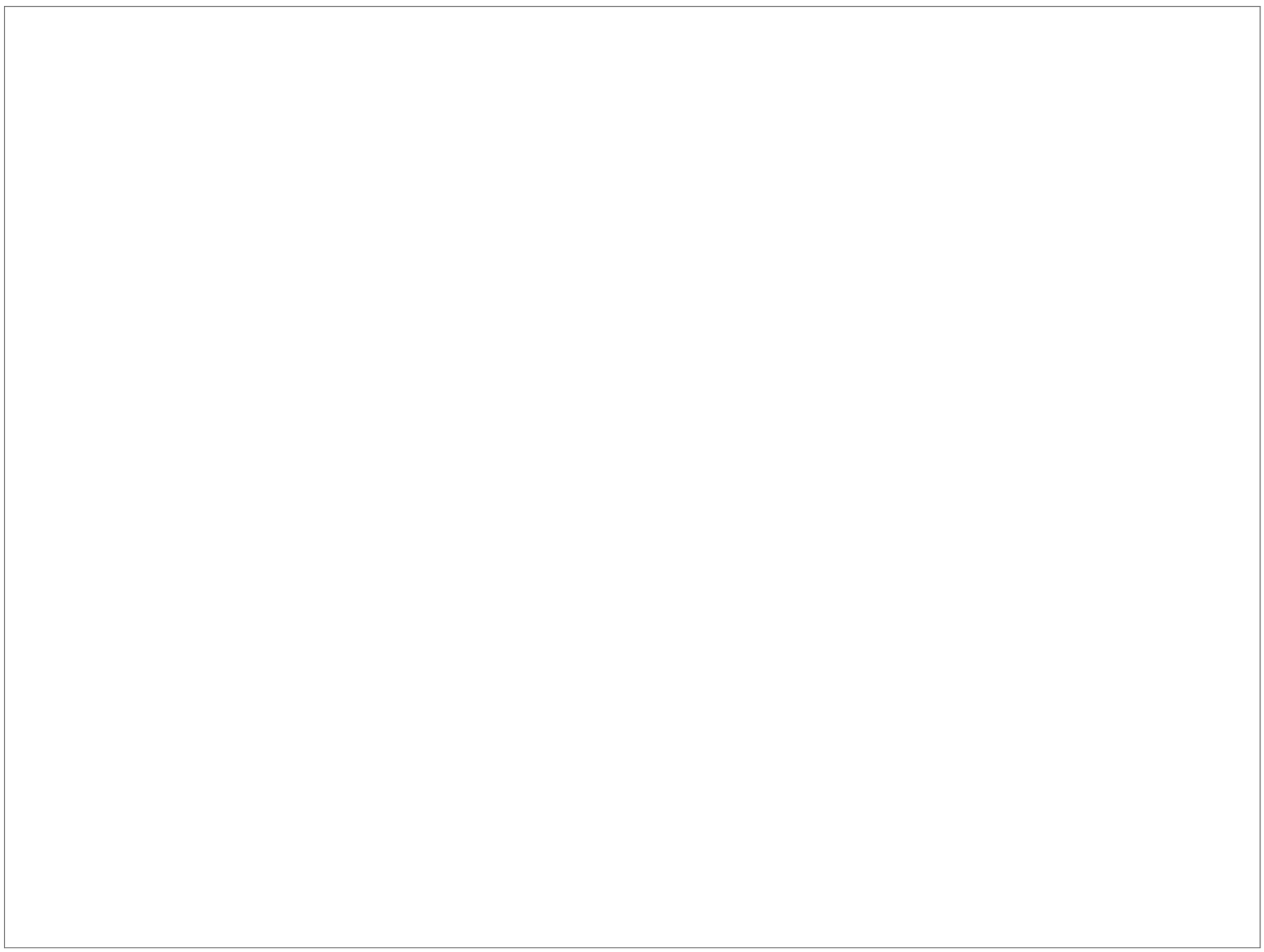
You can now glue on the remaining two longer tubes in any orientation, just make sure the LED notch keeps wrapping around the tube.



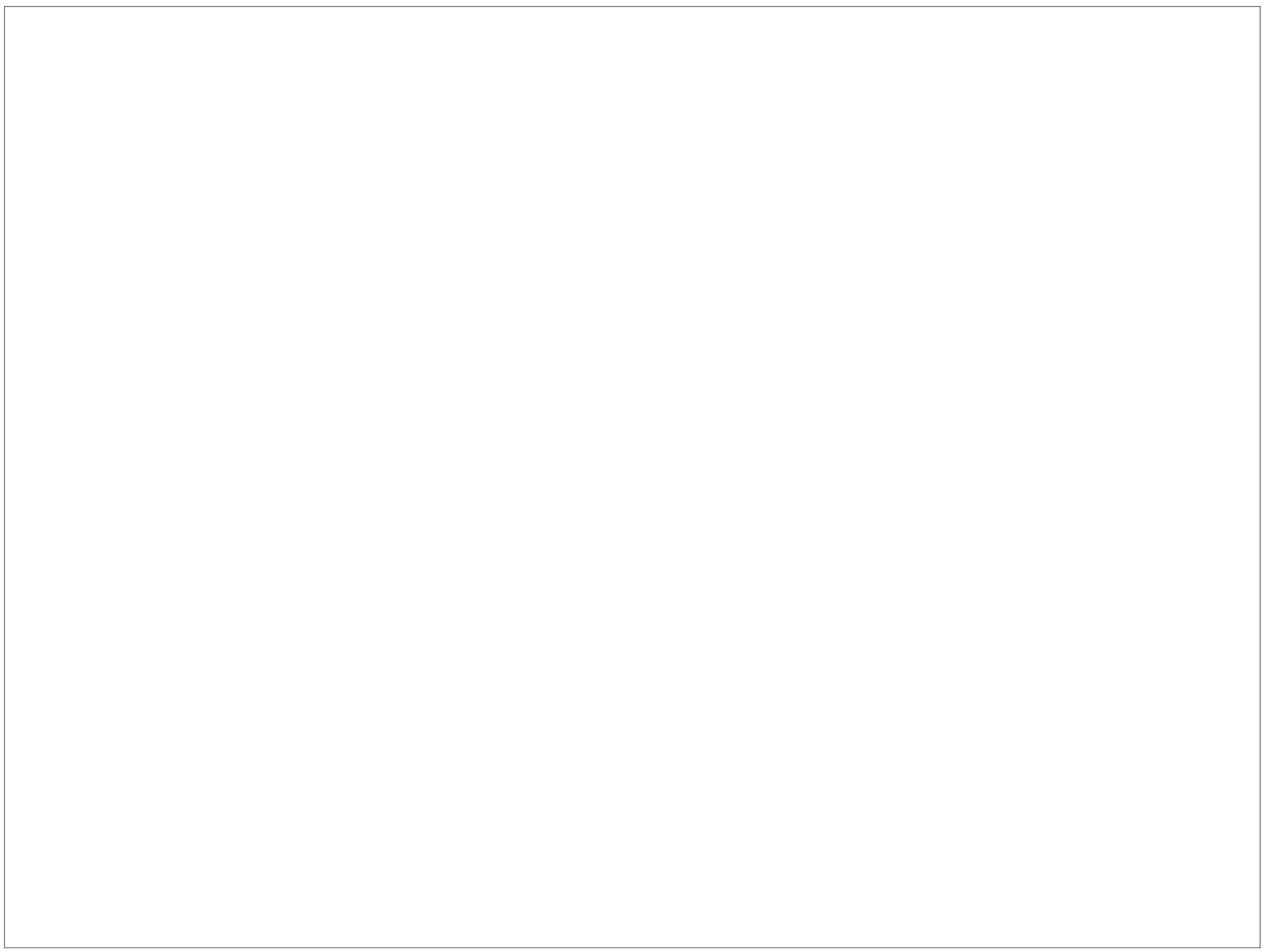
Cut the harness wire to about 3 inches and strip.



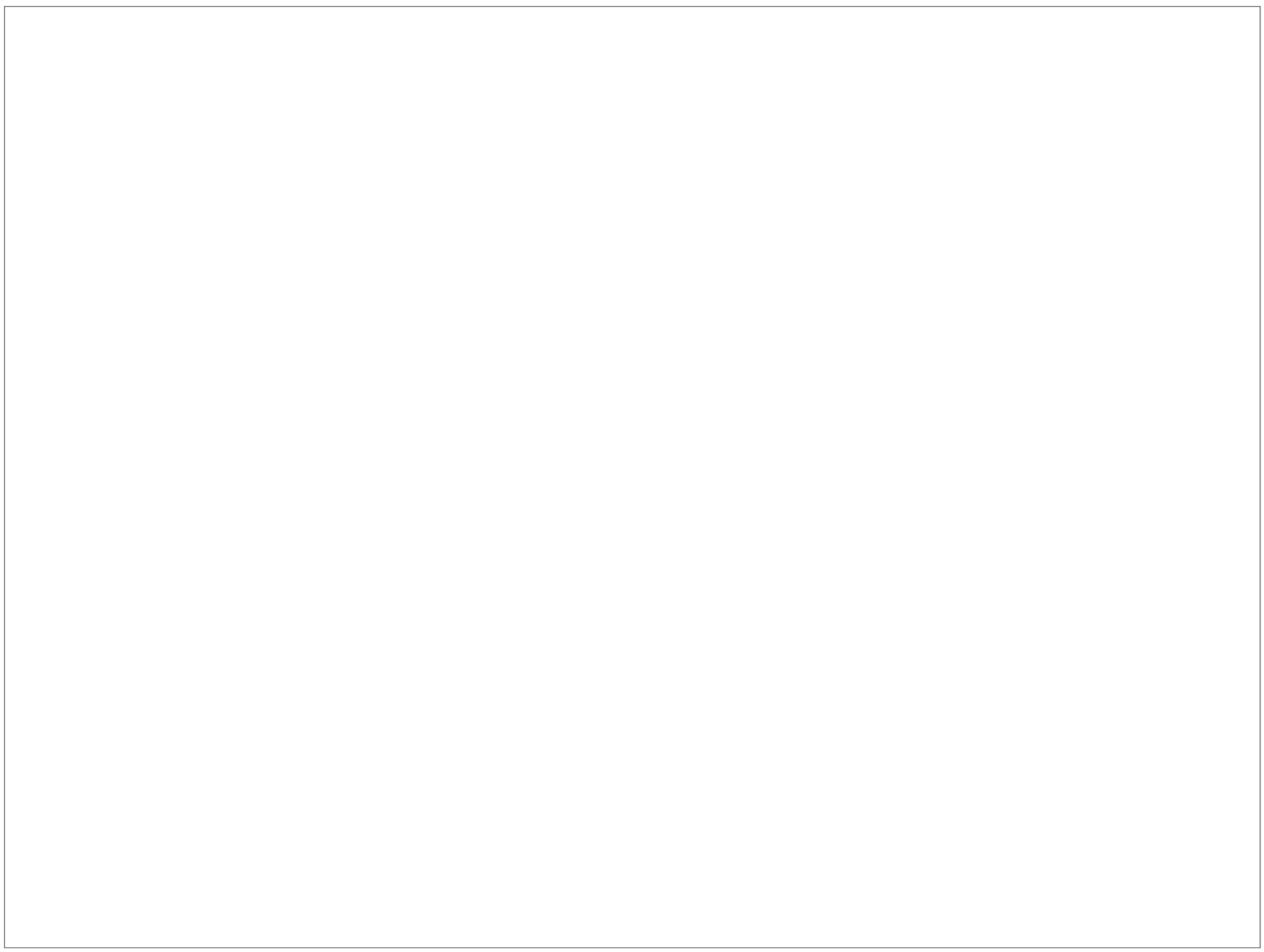
The USB charger board comes from a standard battery stick. We dont need the normal output connector, so cut it off.



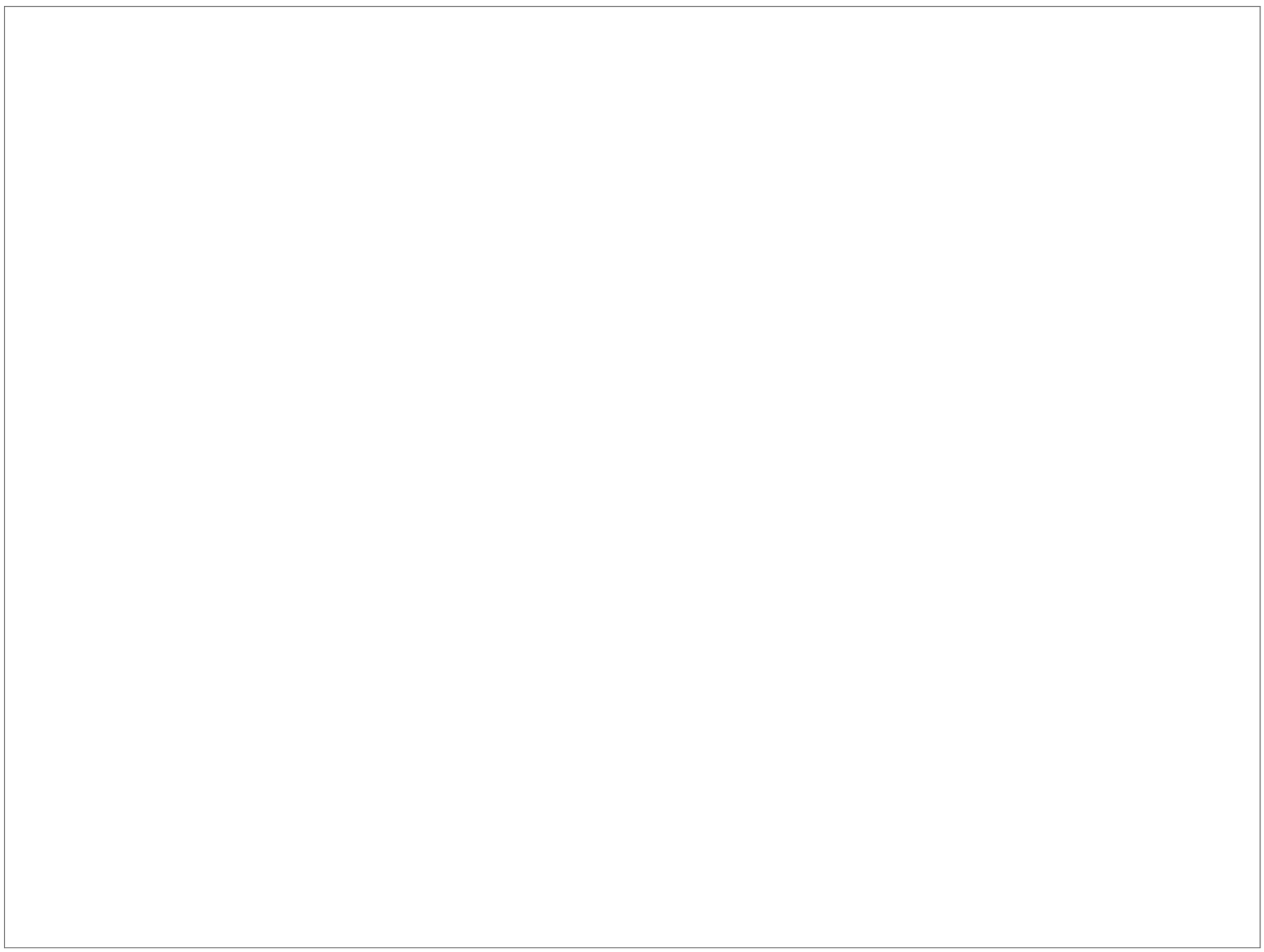
Look at this picture really closely. Solder a wire from the power switch to this solder point on the PC board. This is a 5V output.



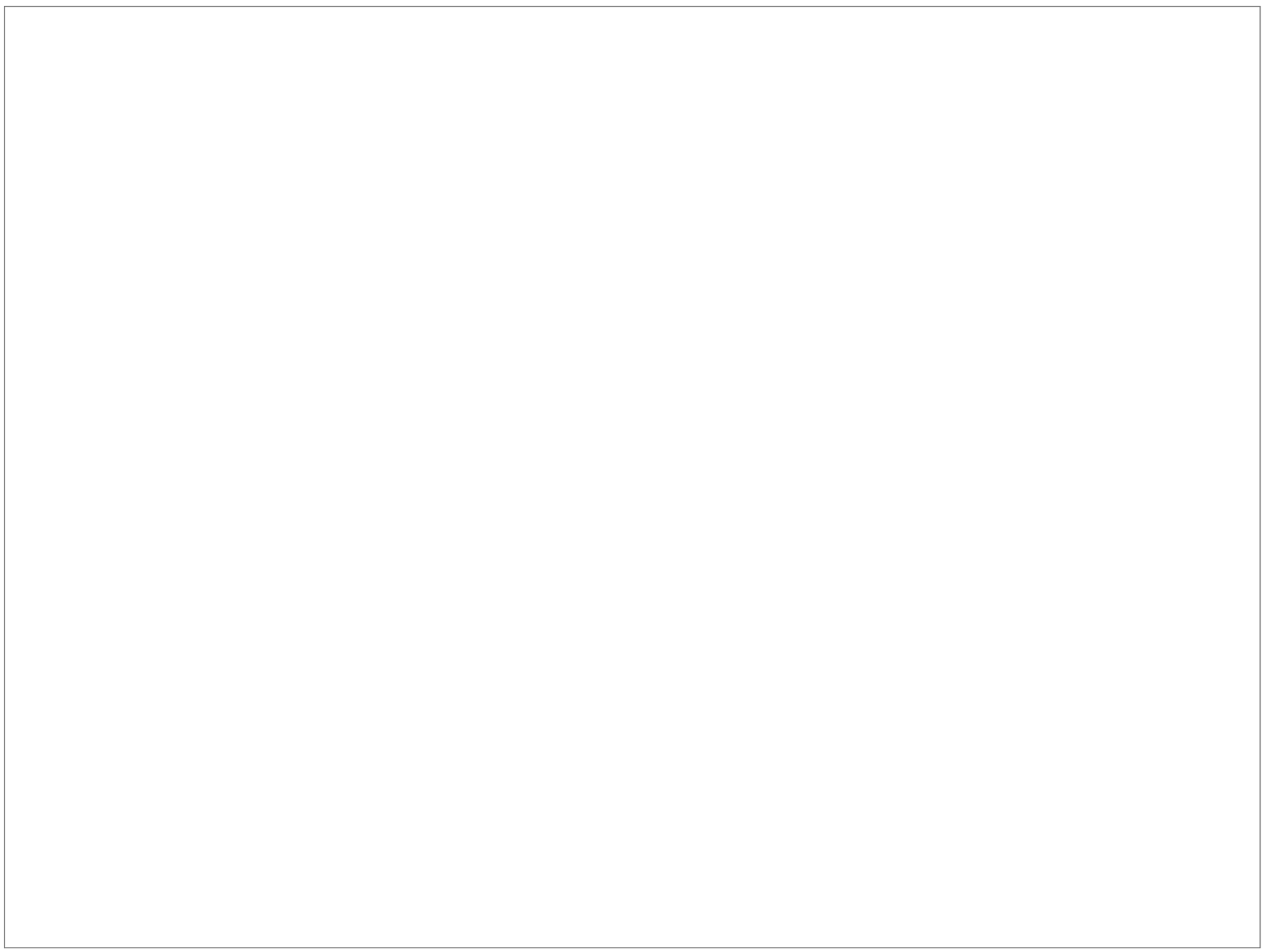
The green wire is power from the battery, and connects to the B+ terminal. The blue wire goes to the negative side of both batteries, and the ground of CPU board. It connects to the B- terminal. The switch is connected to 5V out on the charger board, and switches the power to the CPU through the red wire that passes over the batteries directly to the CPU board.



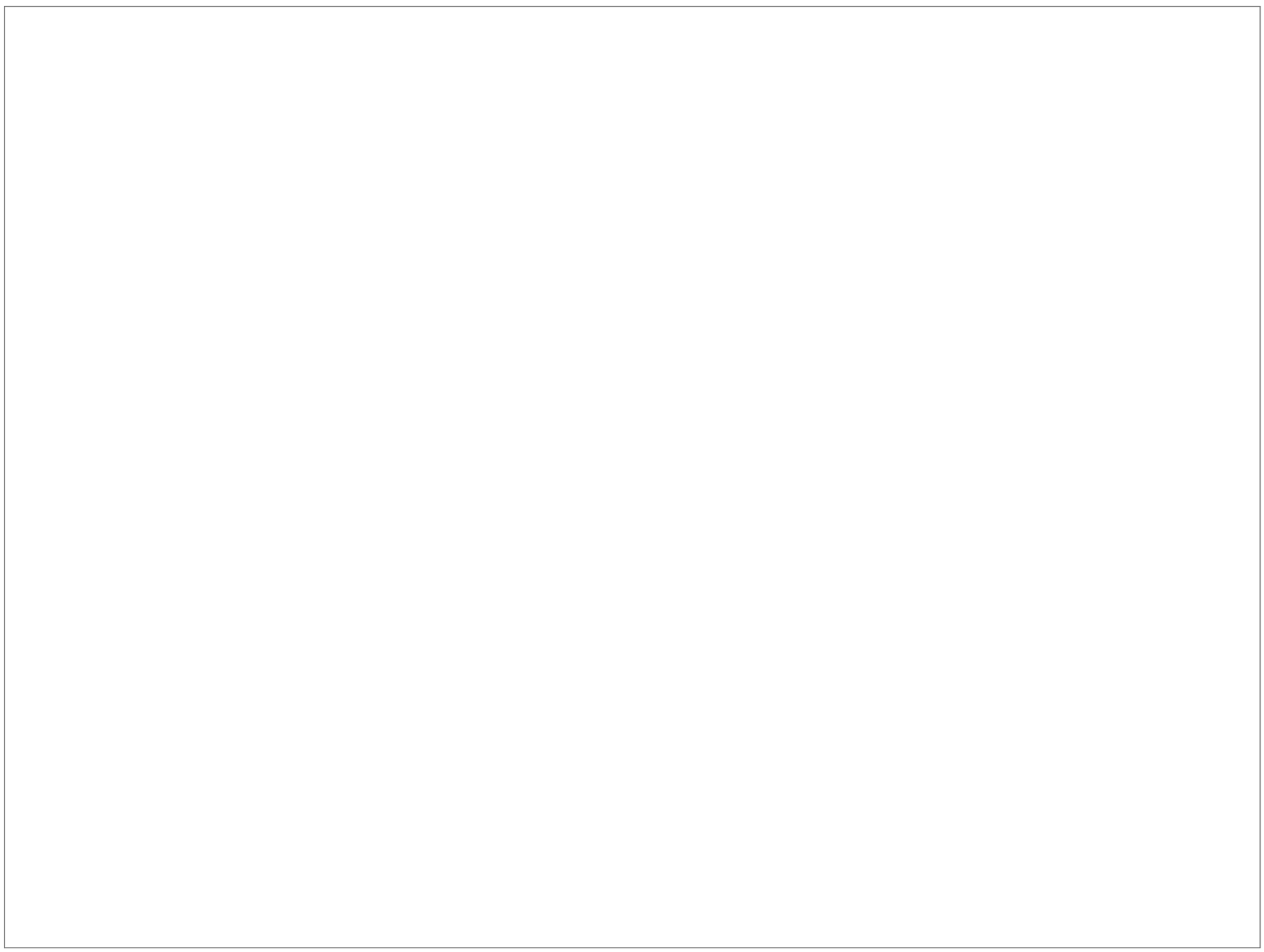
This is all you need of the switch



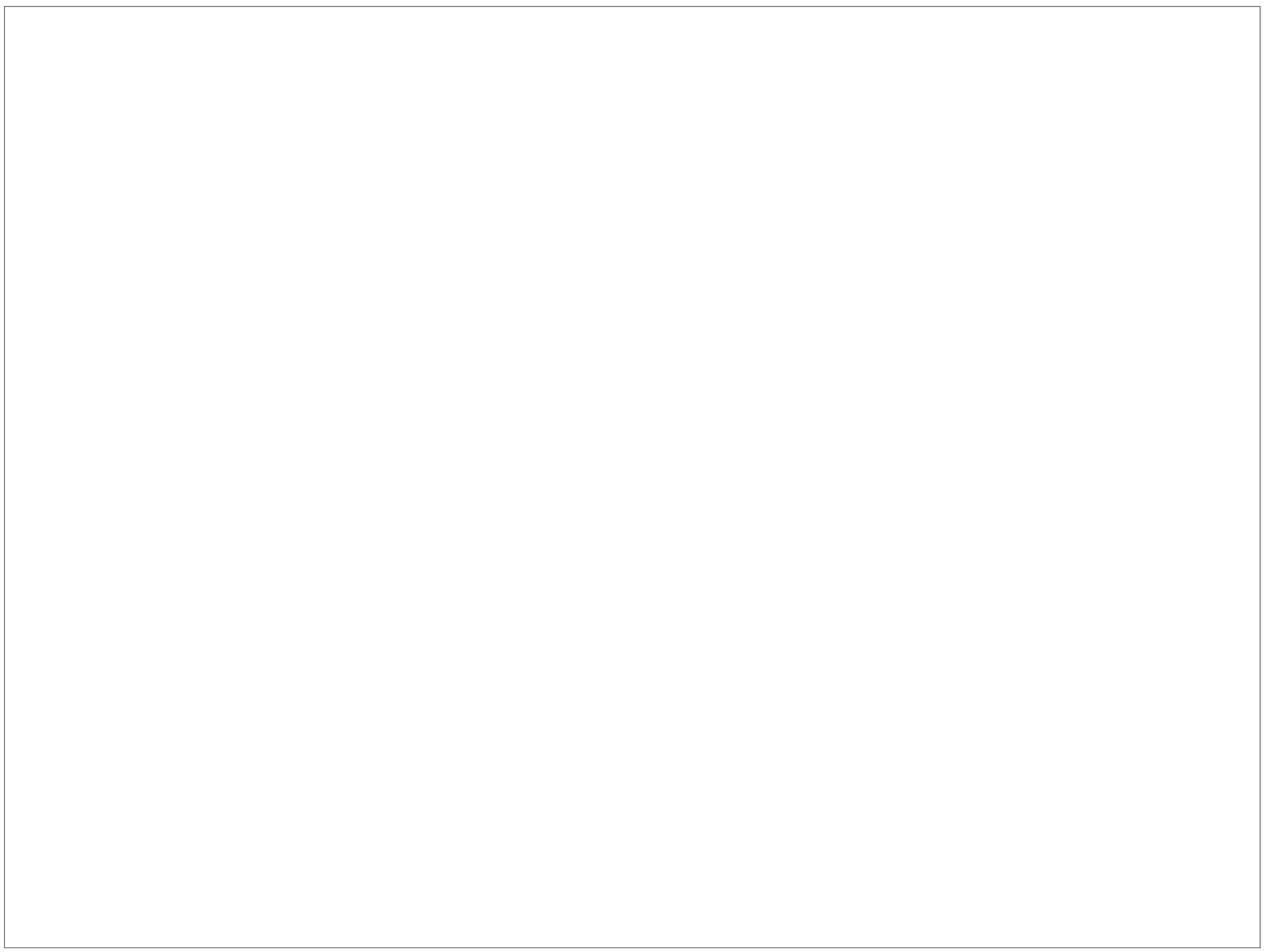
drop the nut in the charger holder.



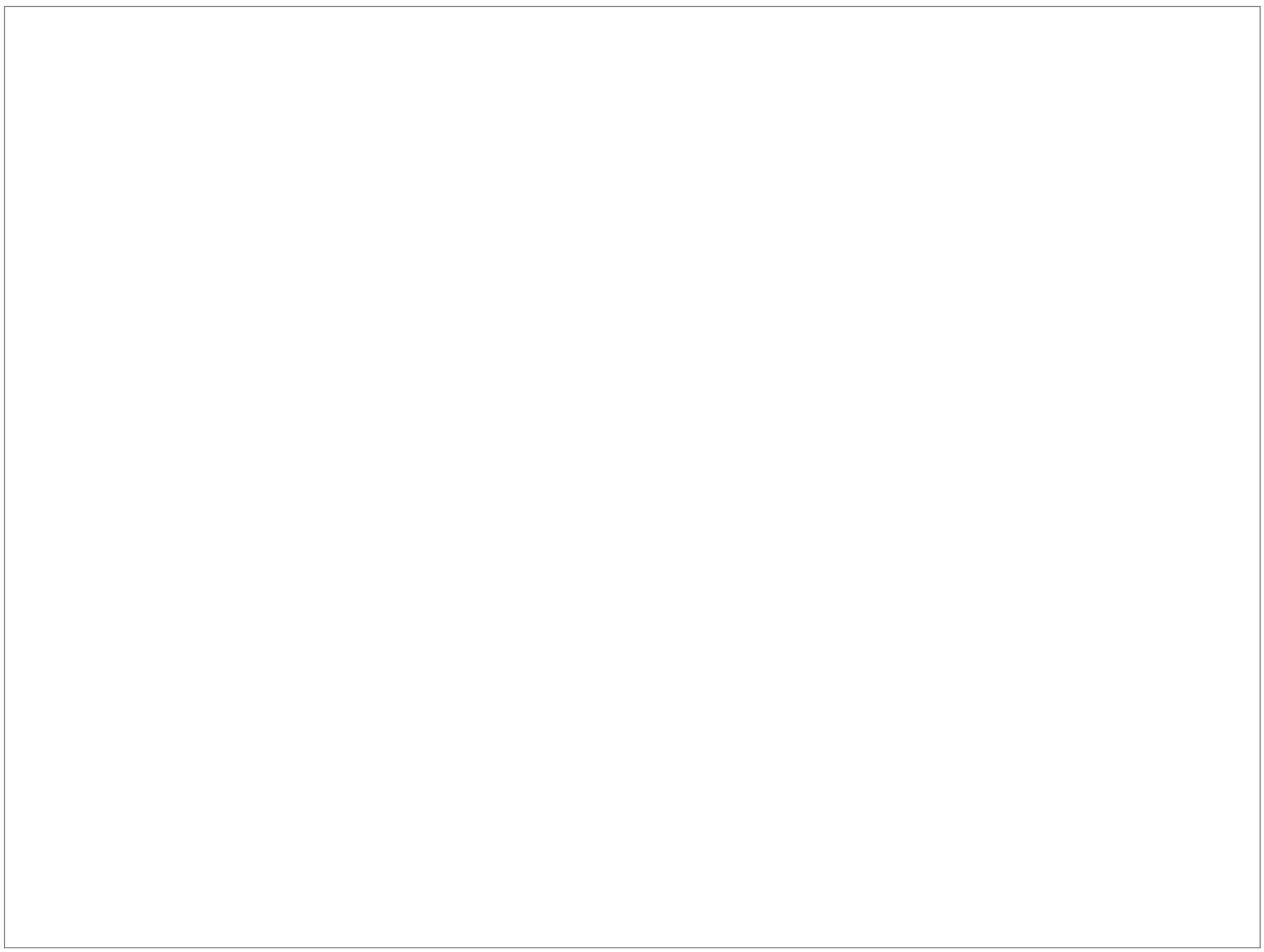
Screw the switch into it.



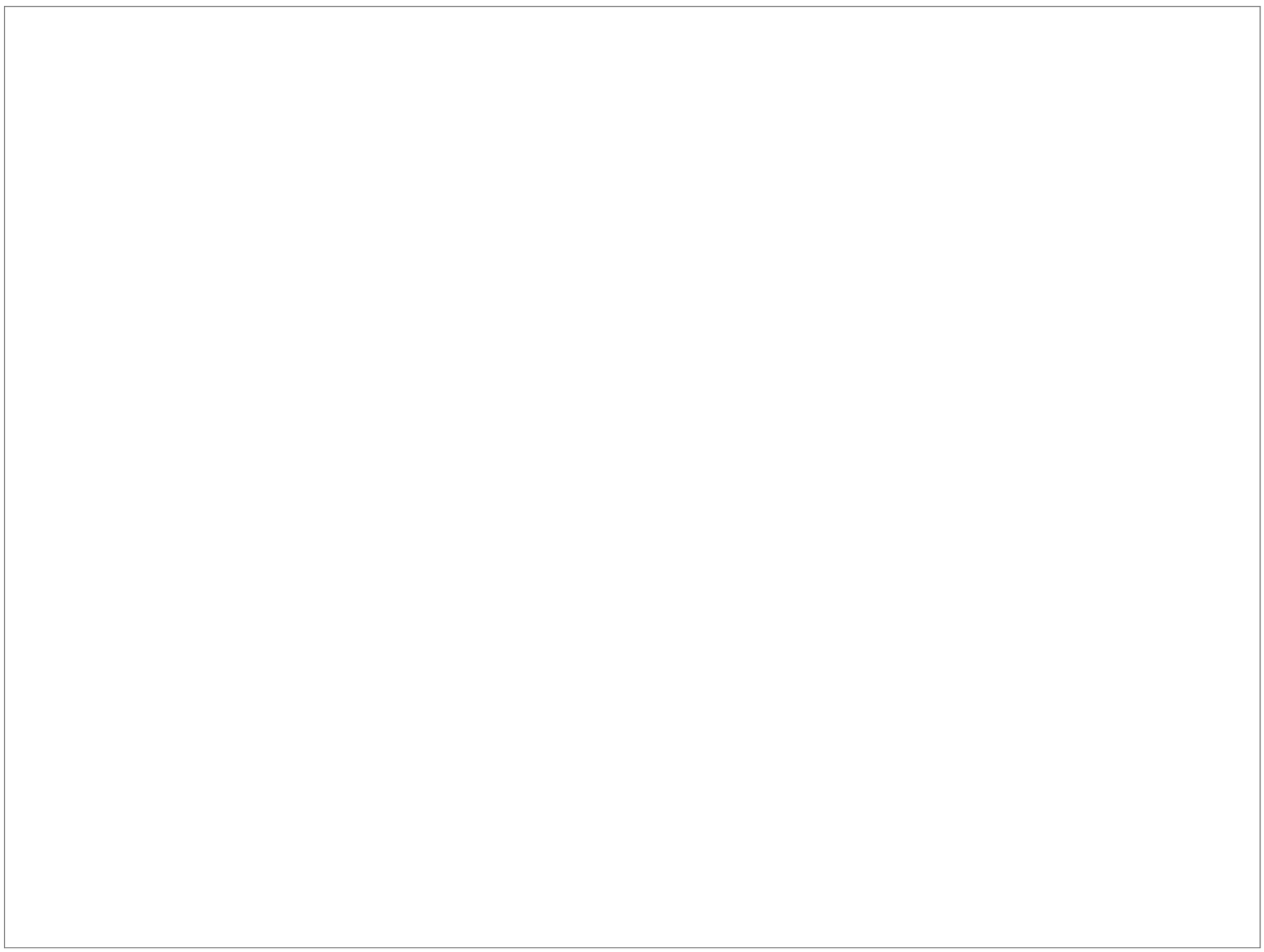
The charger board slides into the holder like this.



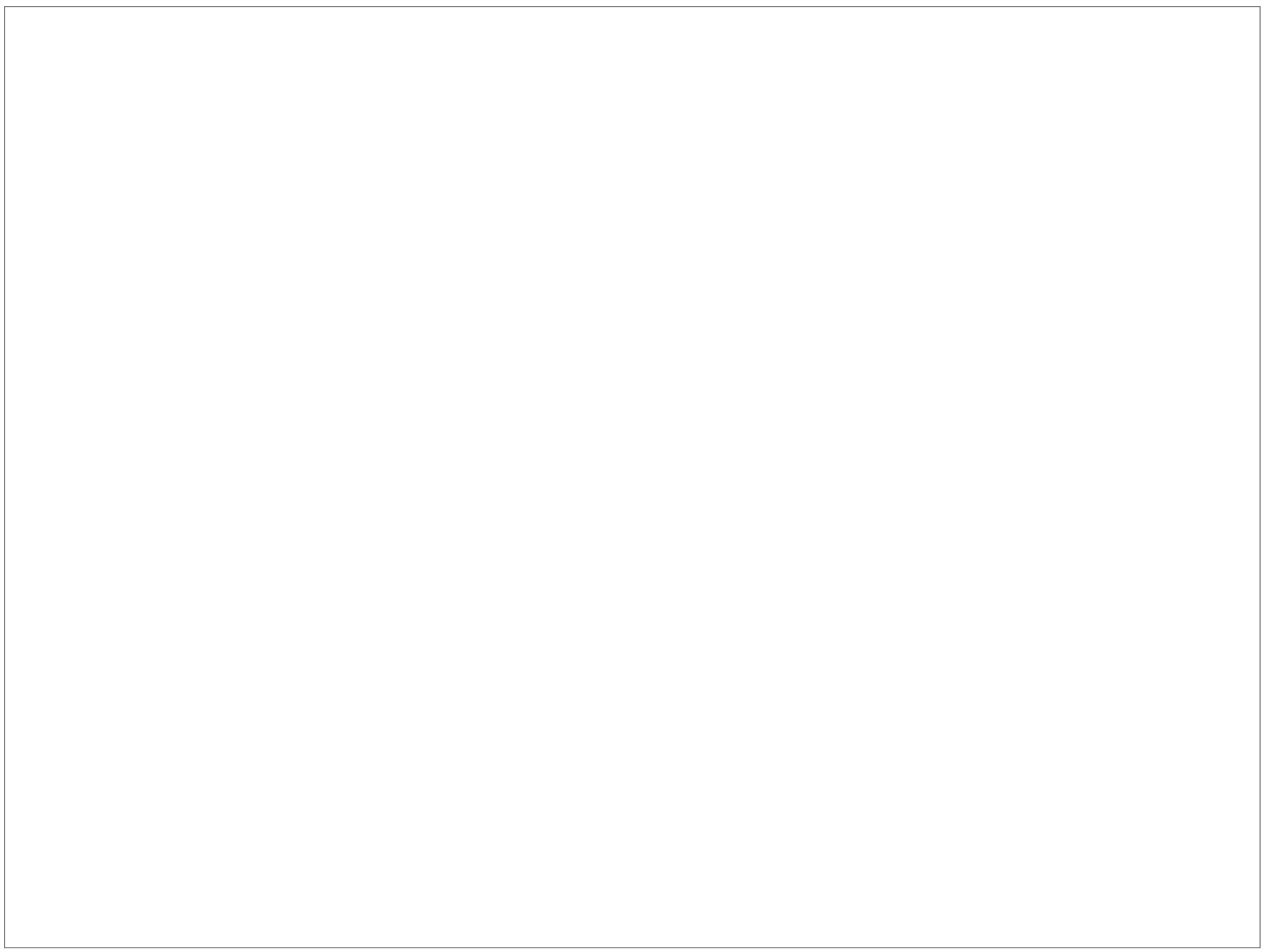
This is what is looks like before you glue it onto the tube. Sorry, I dont have a picture of gluing it on to the tube. The orientation doesnt matter, cause the LED notch ends at this point. Just fins a way to cram the wires into the tube and glue it on. I use the clamps to hold it all together till it all sets.



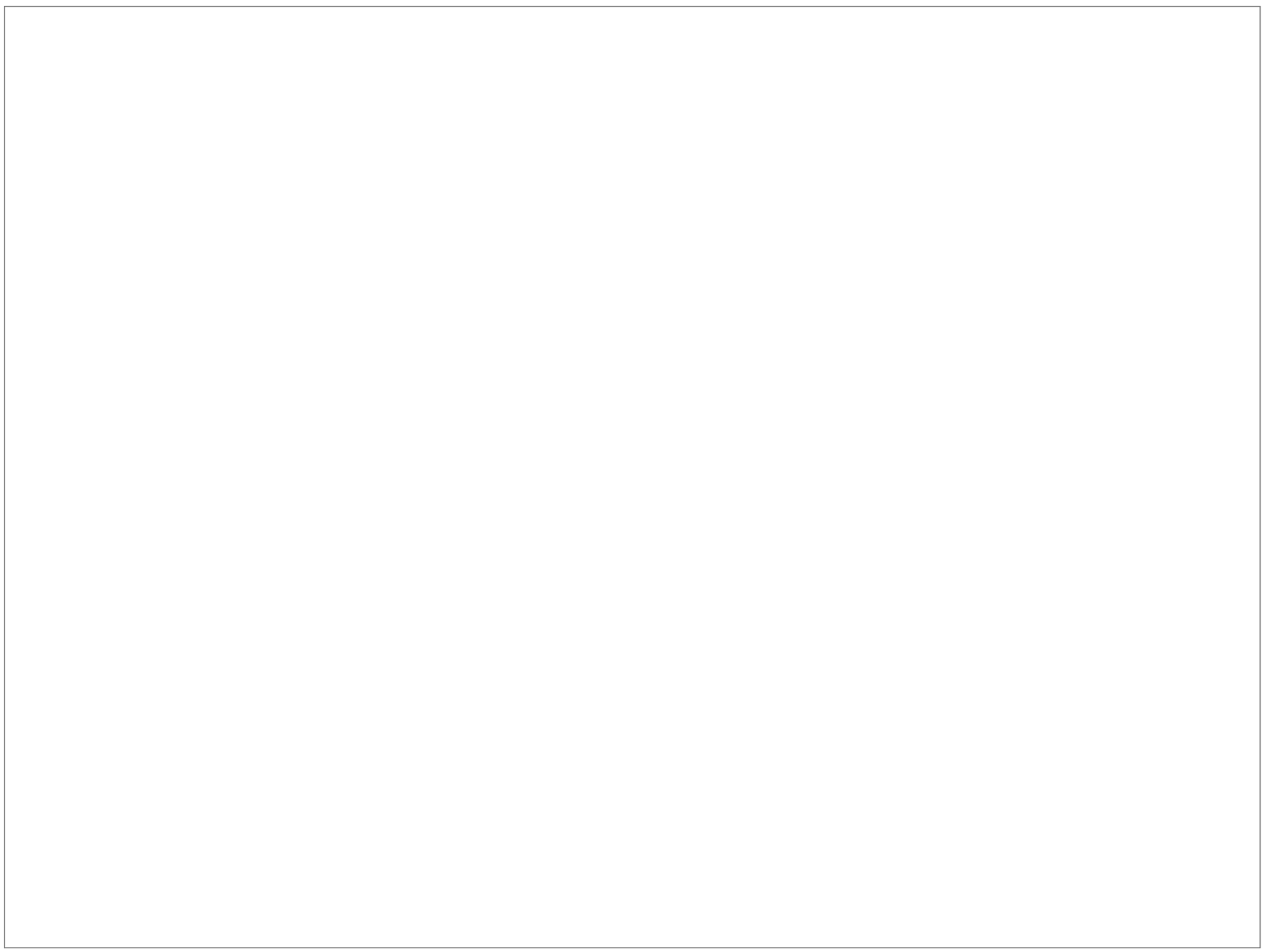
When you cut the LED wire, its going to wrap around to this point.



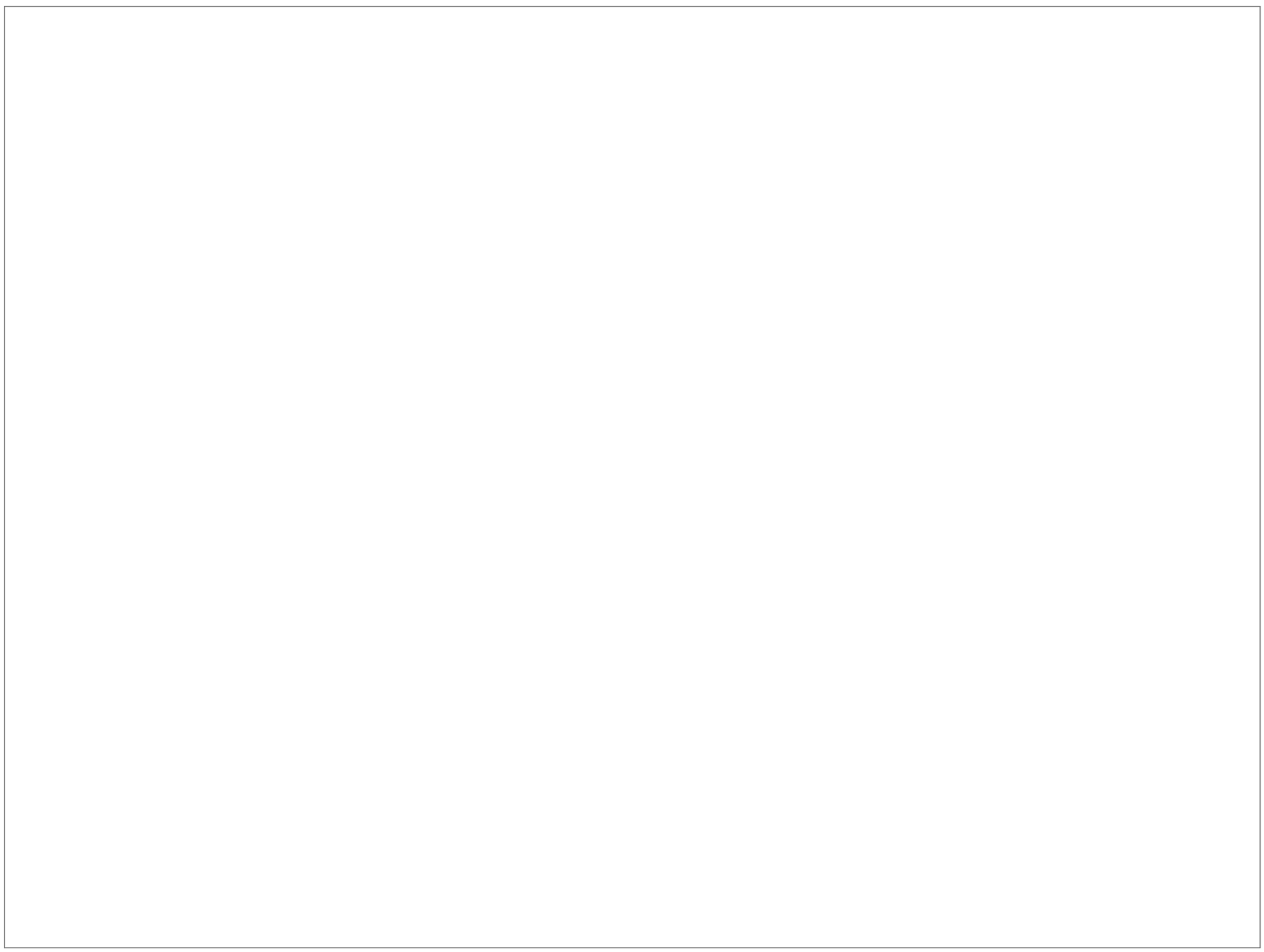
When soldering on the LED wires, get the polarity right, and remember the data wire is the same one that went undet the radio, and soldered directly to the end on the Teensy board.



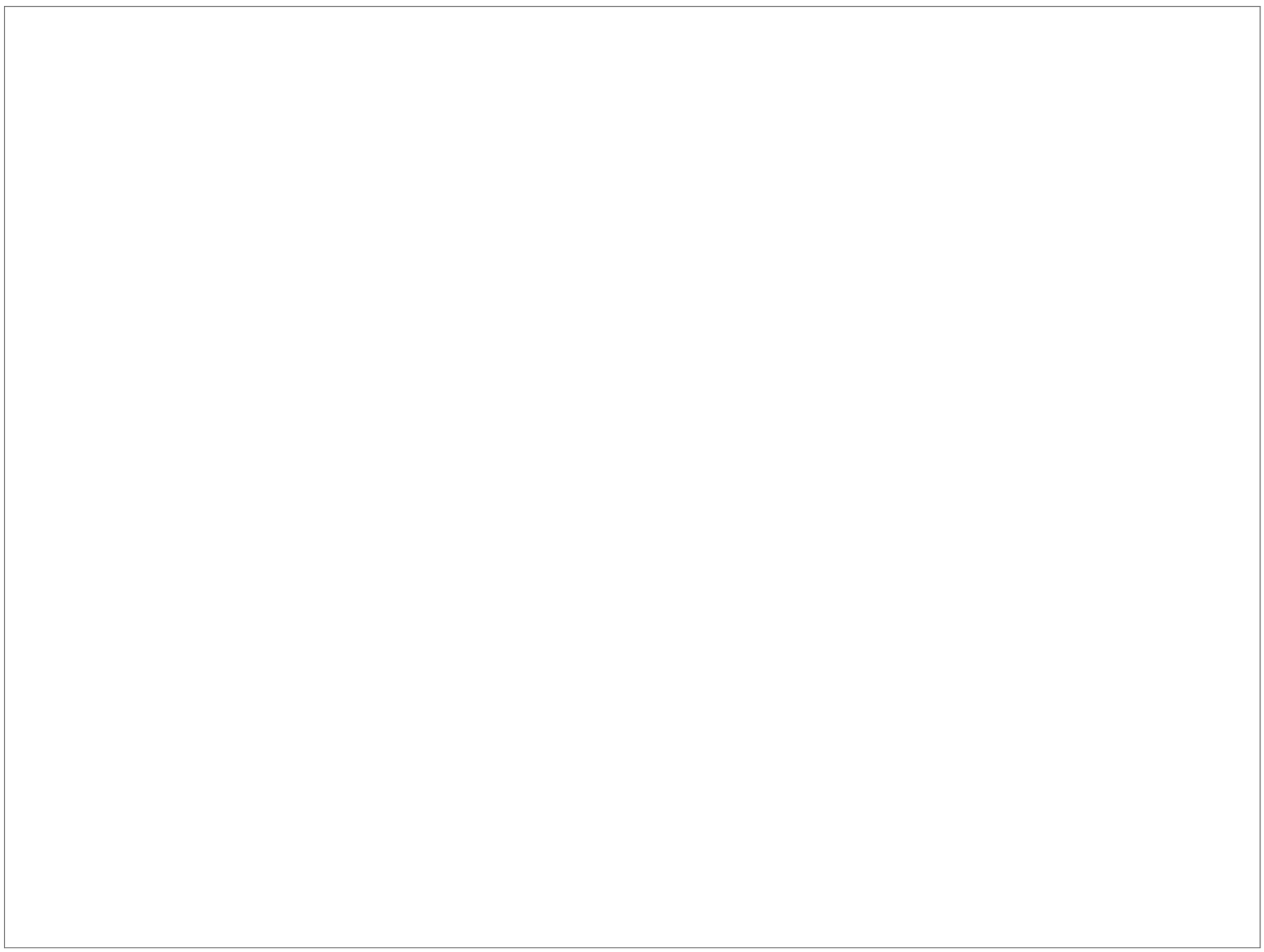
Here it is ready to wrap. Now is a good time to test the setup. Program the board, an see if the strip works. Put in the batteries, and see if power works. You might find it easier to wrap the led strip with the batteries removed until right before the covers go on, so I recommend removing the batteries before starting the led wrap.



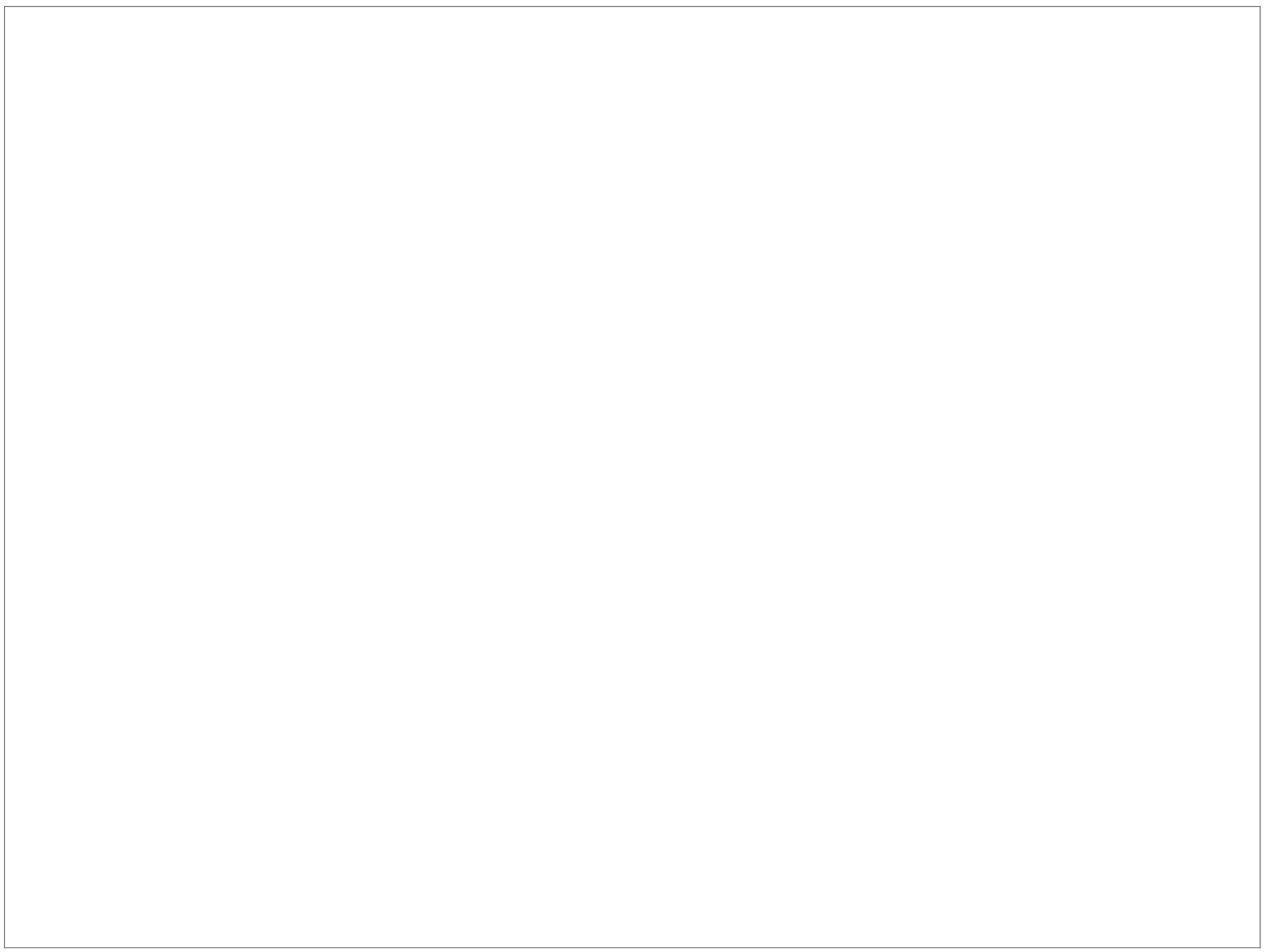
wrap it around the tube. Its doesnt have to be really tight, but make it secure. I remove the tape from the back of the strip as I go so it stickes to the tube. If you wrap it too tight, there will be extra at the end you have to cut off. This will be 150 pixels at 60 pixels per meters , or 2.5 meters of strip.



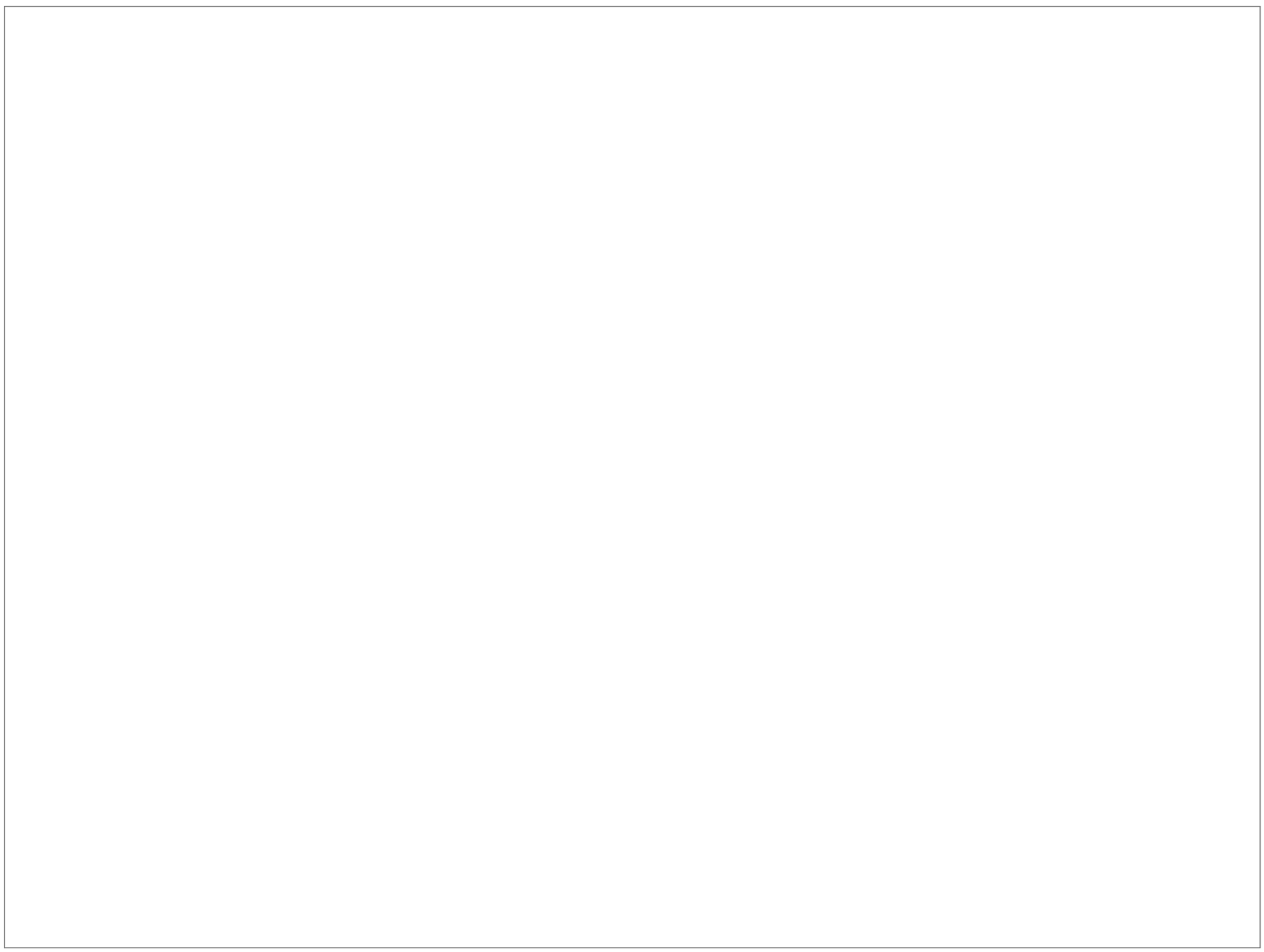
When you get to the battery box, put in the battery cover on. Make sure the wires fit into the cut out and dont get pinched between the battery and the cover. Wrap the strip a little tight around the battery to help it squeeze down for fitting in the outer shief. Dont break the strip, just make it snug here.



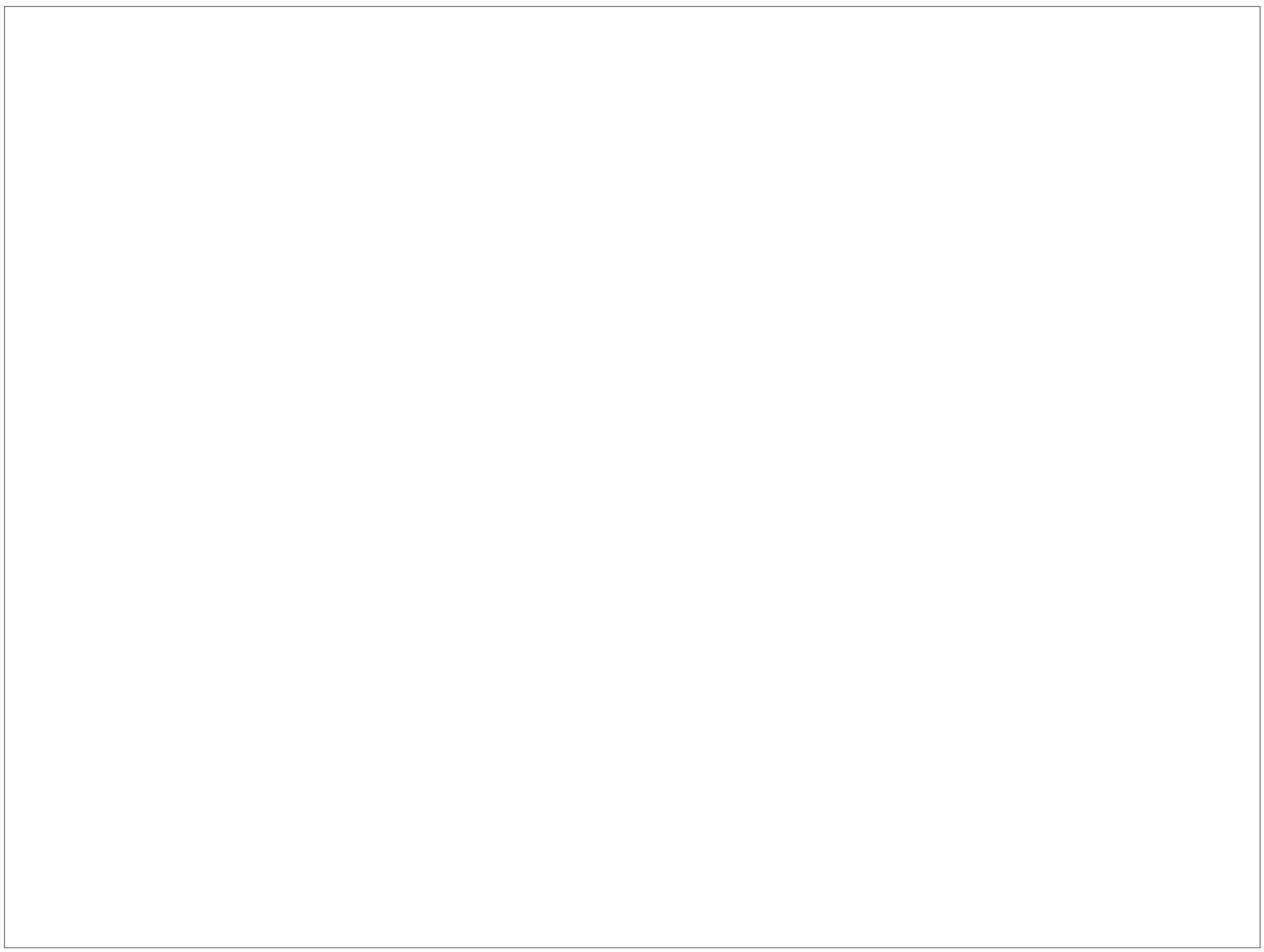
Try to close the gap on thebattery cover.



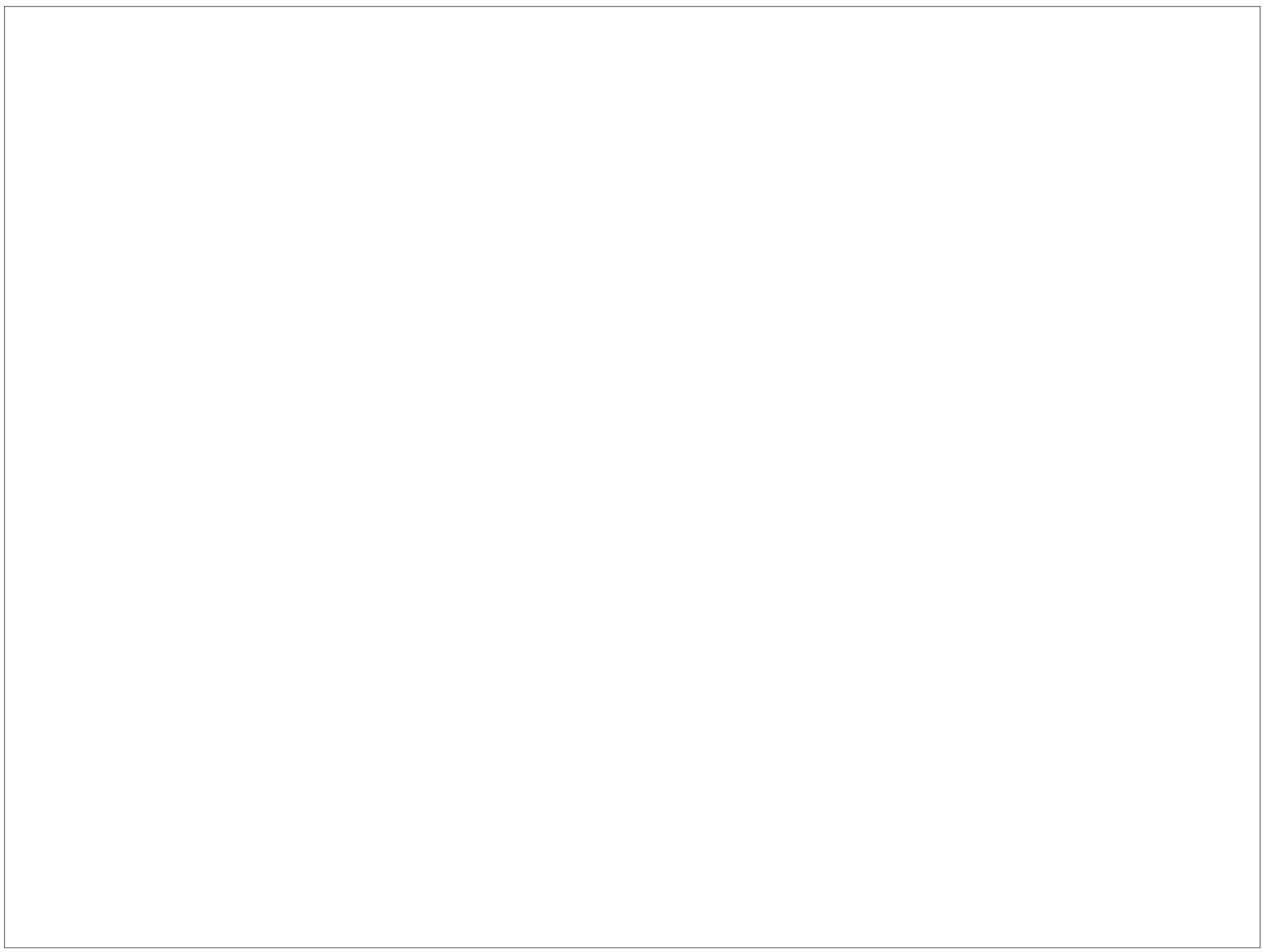
When i built this one, I was rolling the strip off a 5 meter roll, and had to desolder the strip to seperate the 2 per roll I was using.



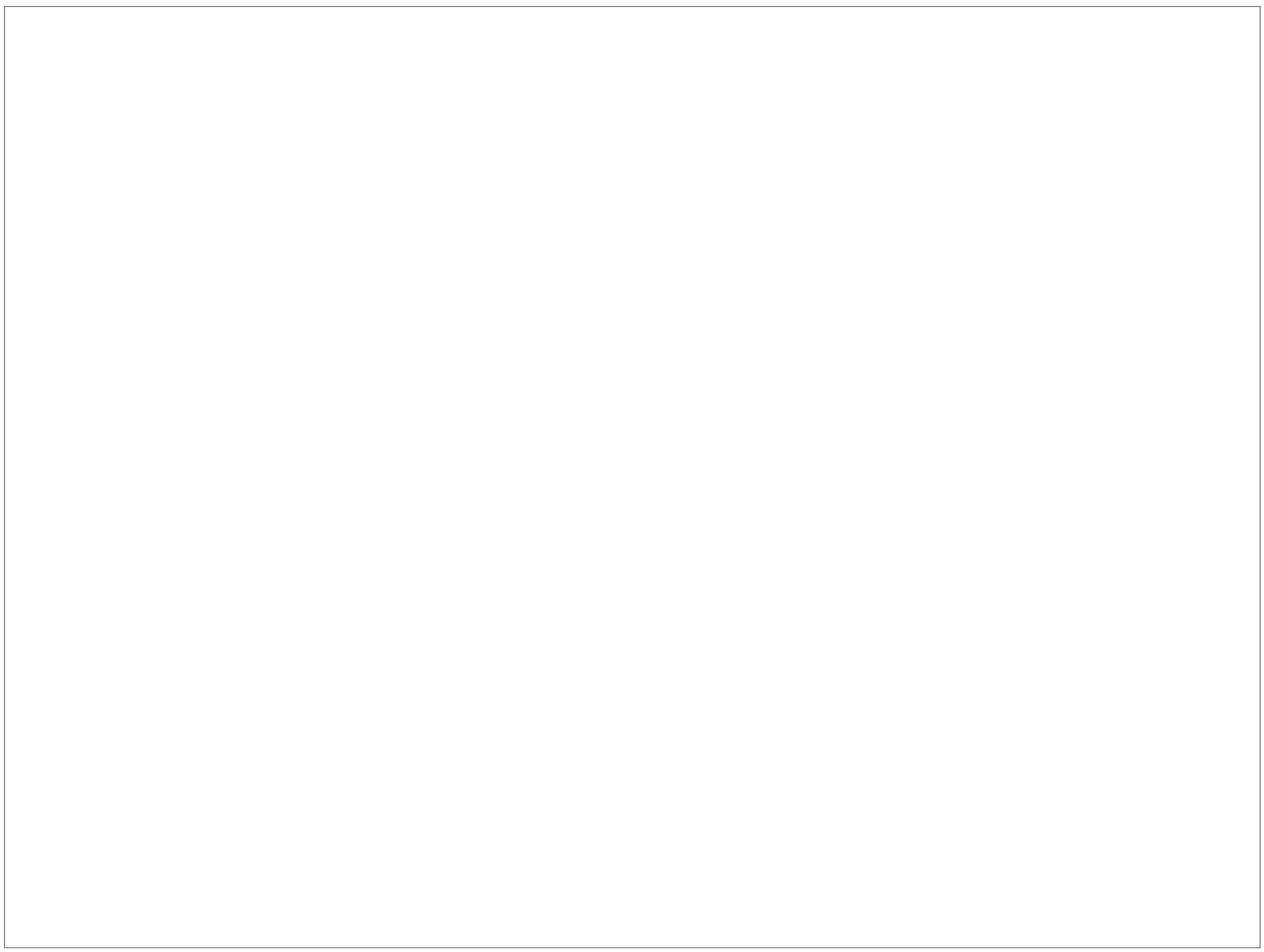
I was also just a littl too tight, so had to clip the corner of the board.



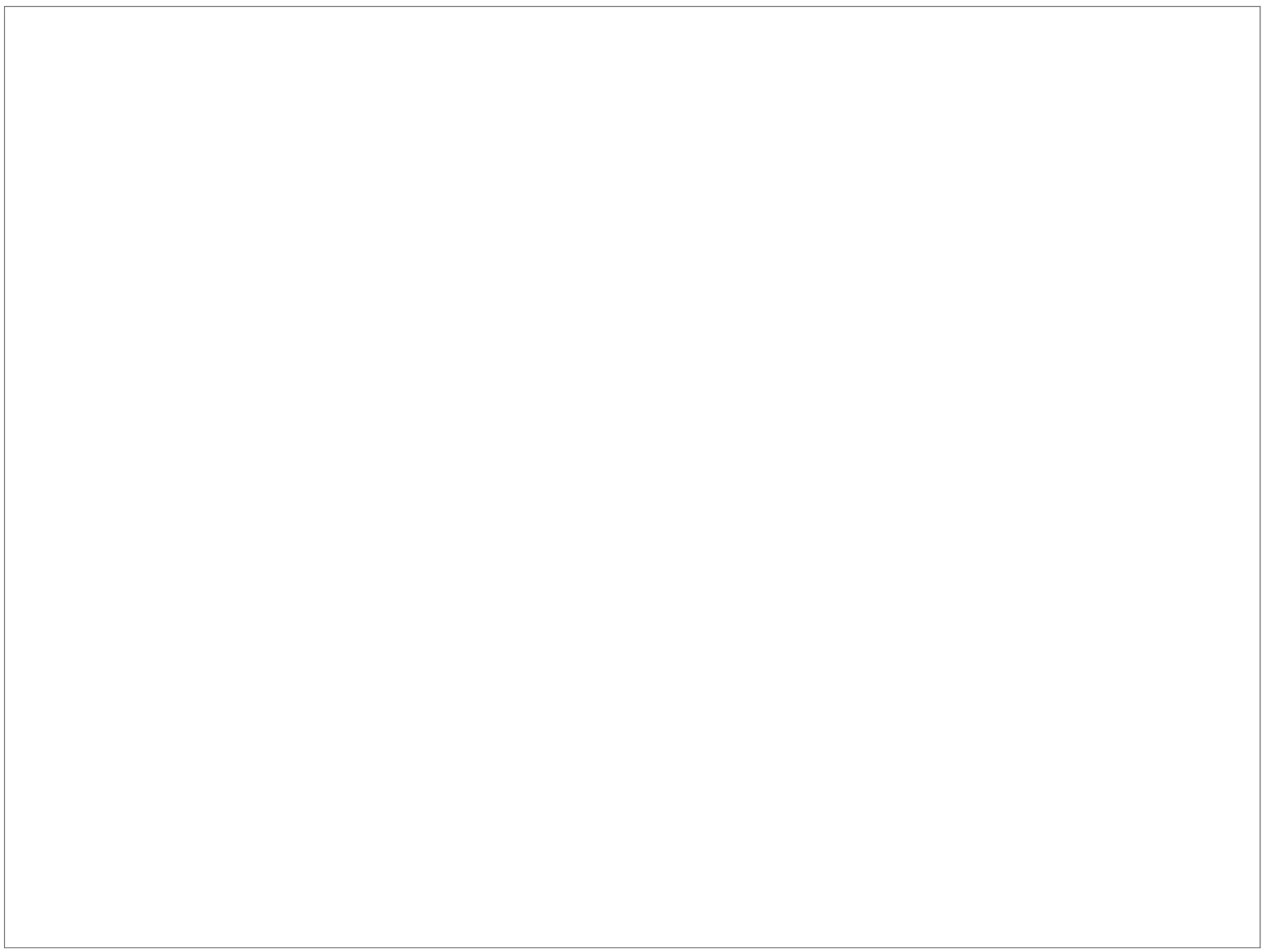
Start sliding the outer shief starting with the CPU end.



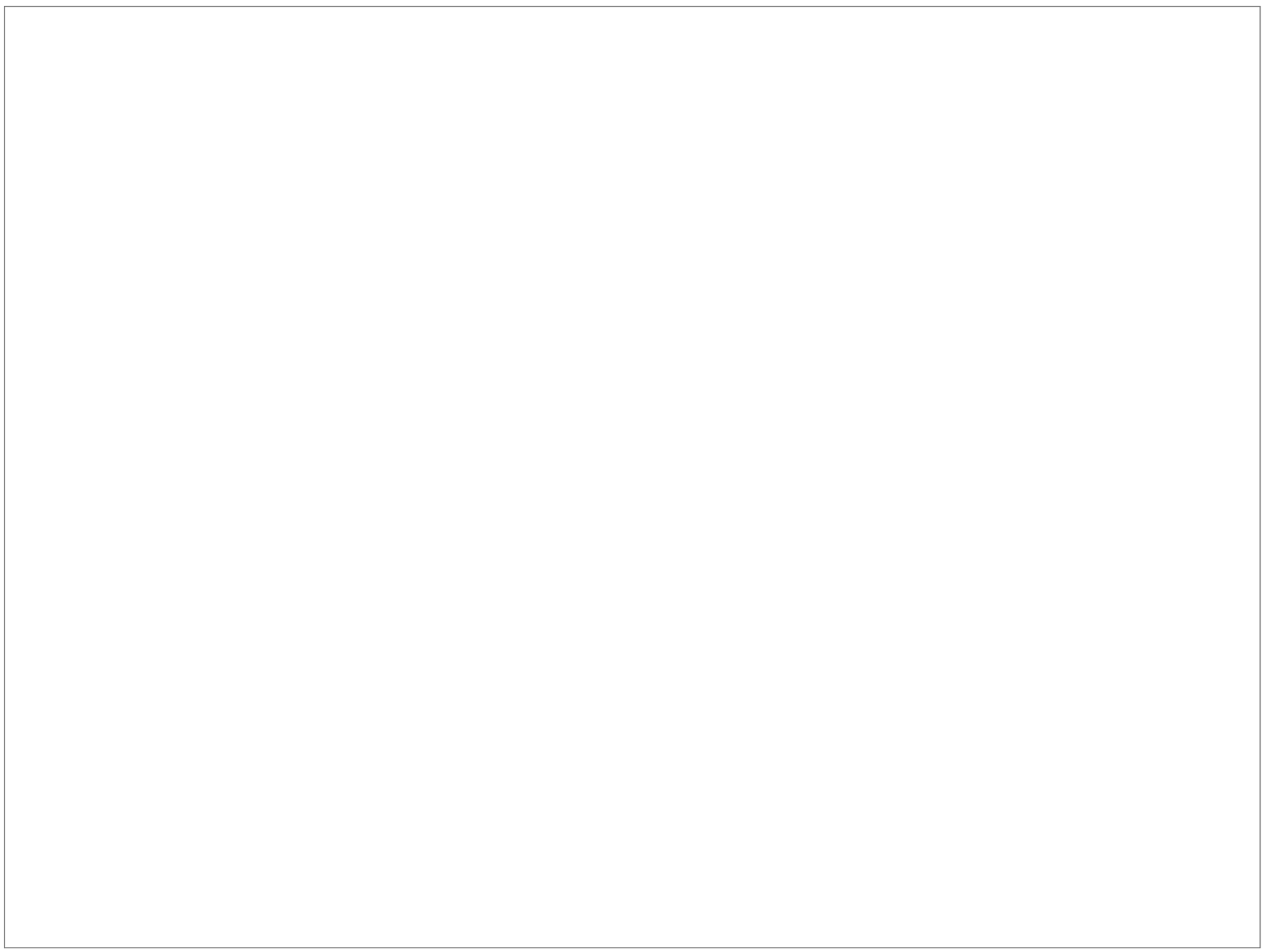
It tends to get caught up around the battery holders and covers. Ease it over these areas with a little gentle pressure on the ridges that it gets hung on.



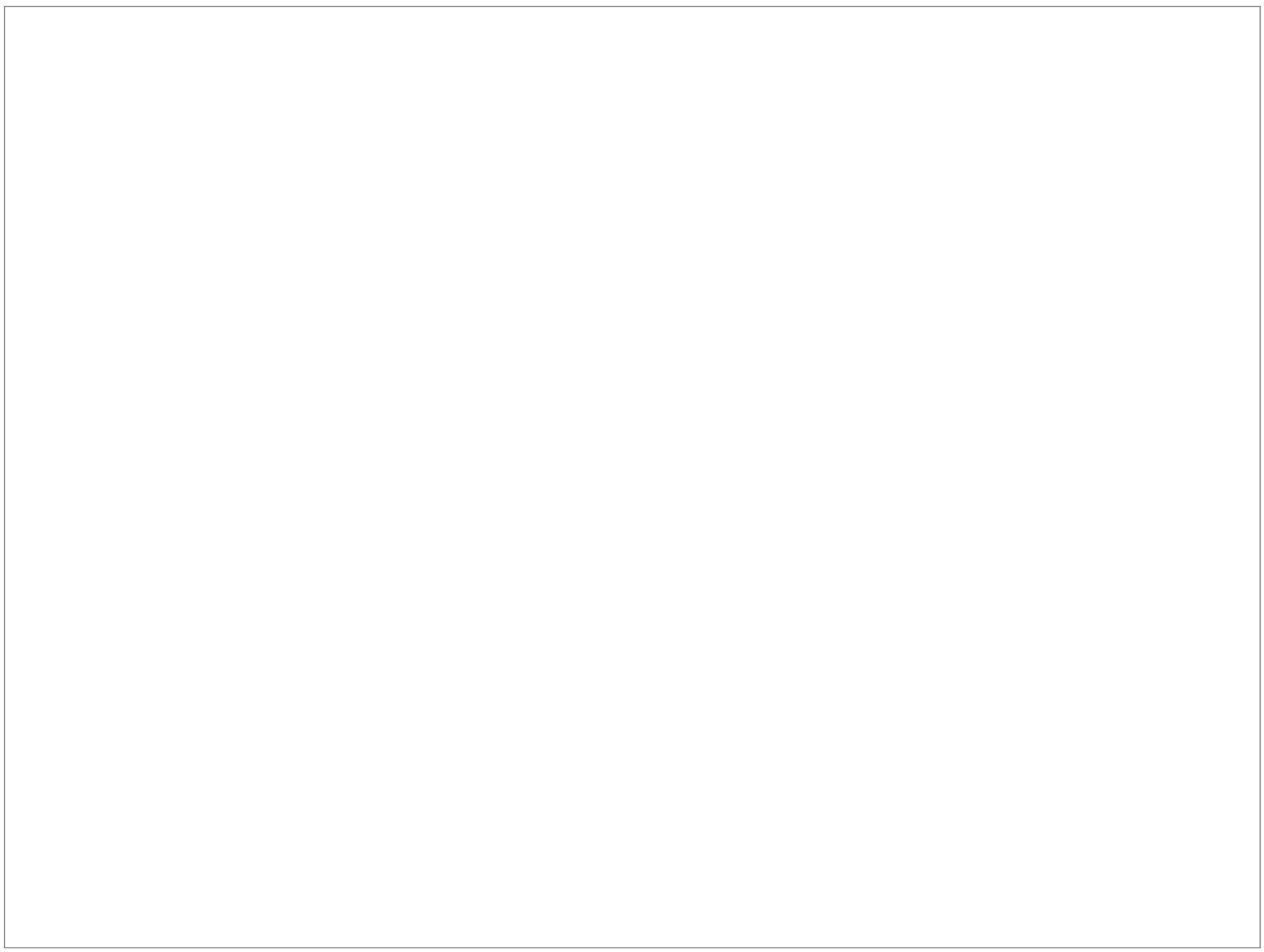
The final push makes it flush with the charger end.



There are 4 holes for tiny screws that keep it from sliding out.
You can drill these out and put in the screws.



There will be excess at the CPU end, cut it off.



And finally, you can put the end caps on. Thats it, fully assembled.