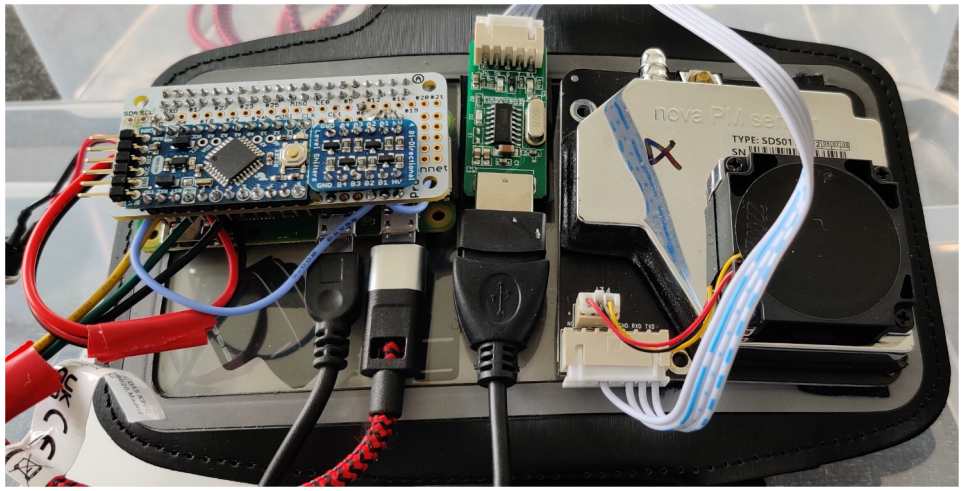
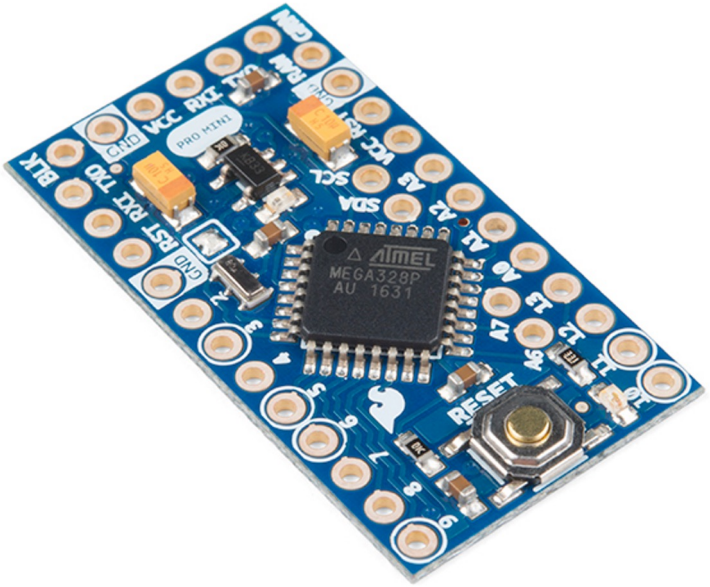
Building the Pollution Painter Kit for *'Air of the Anthropocene'*

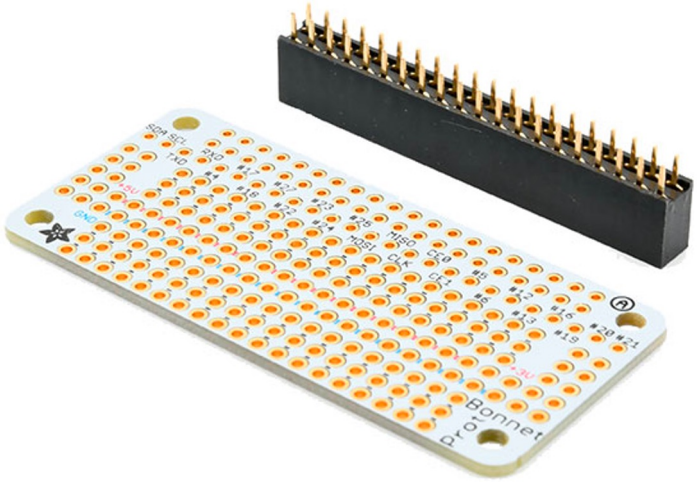
'Luchtkwaliteit in Beeld'

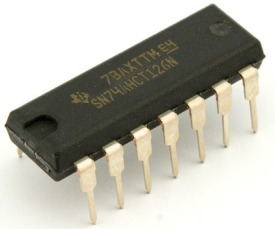


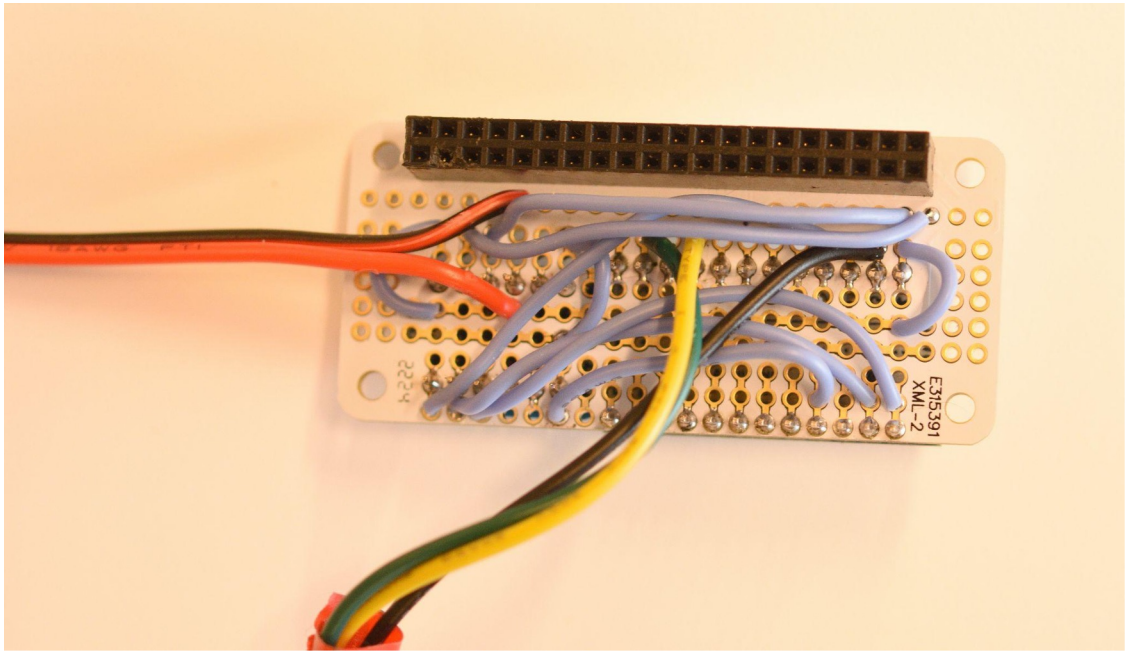
Preparing the Arduino

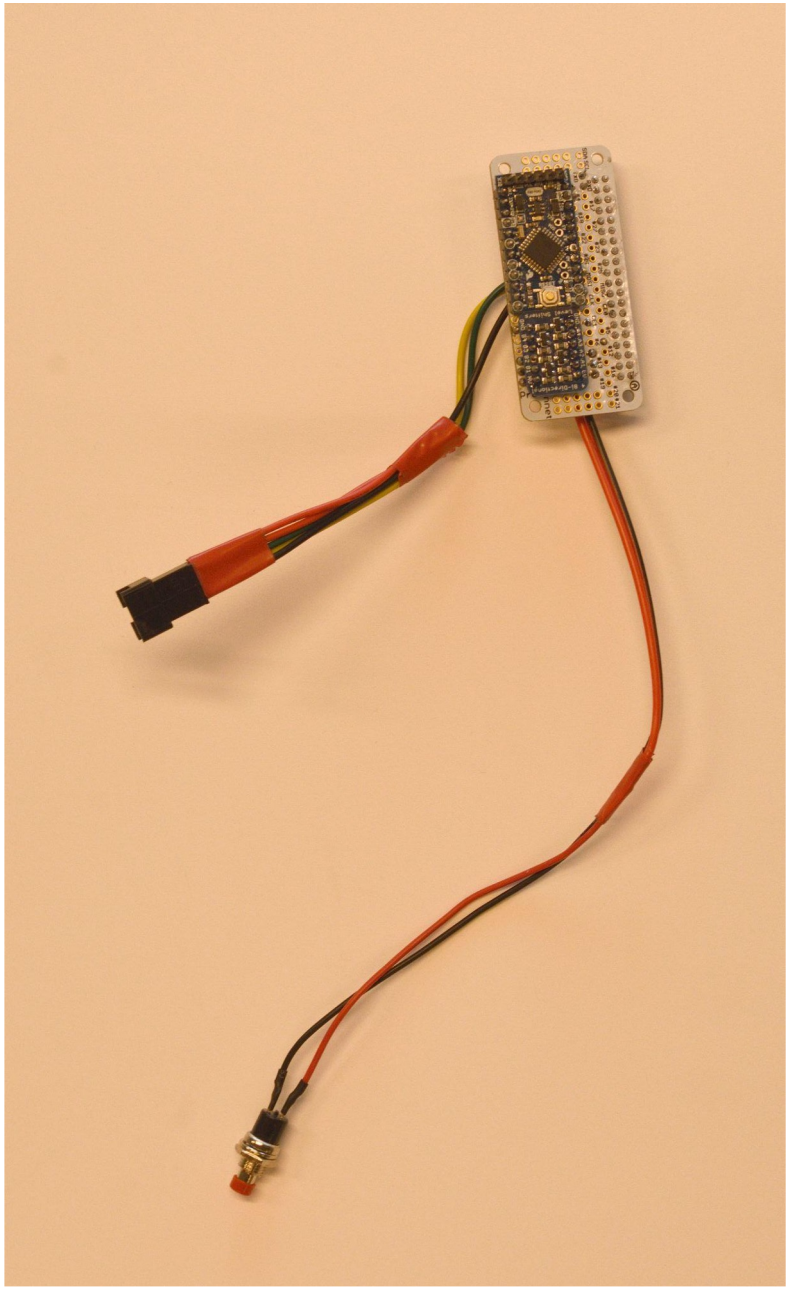
het Arduino voorbereiden

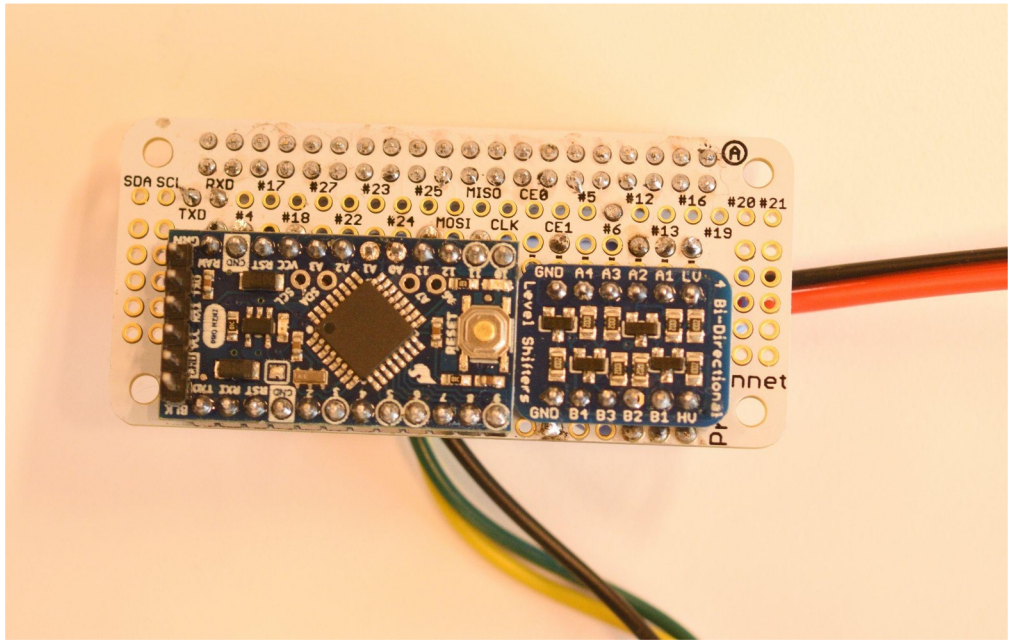




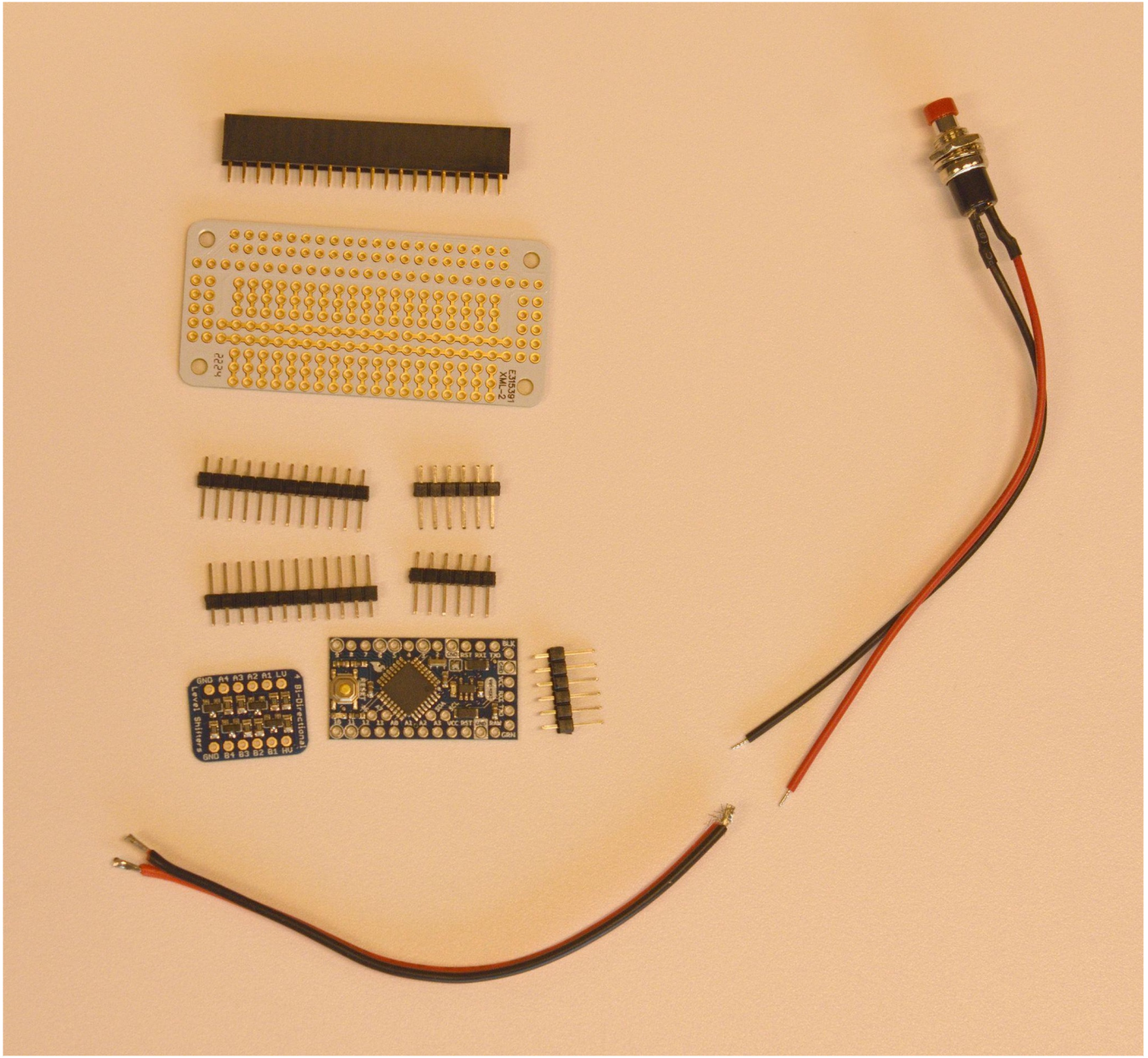




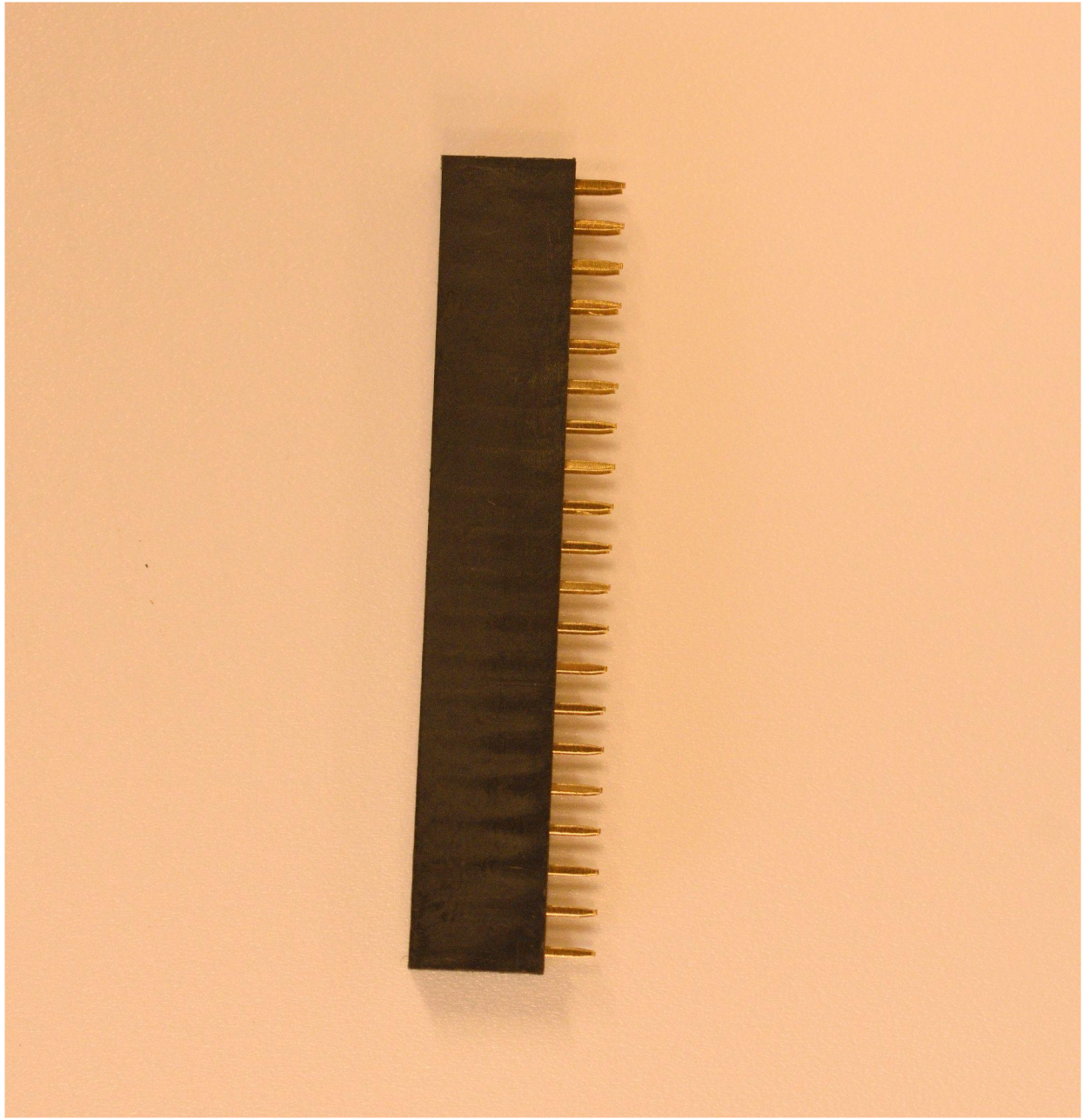




0. This is how the device will look like once it is built



0. These are all the pieces you need to build the device



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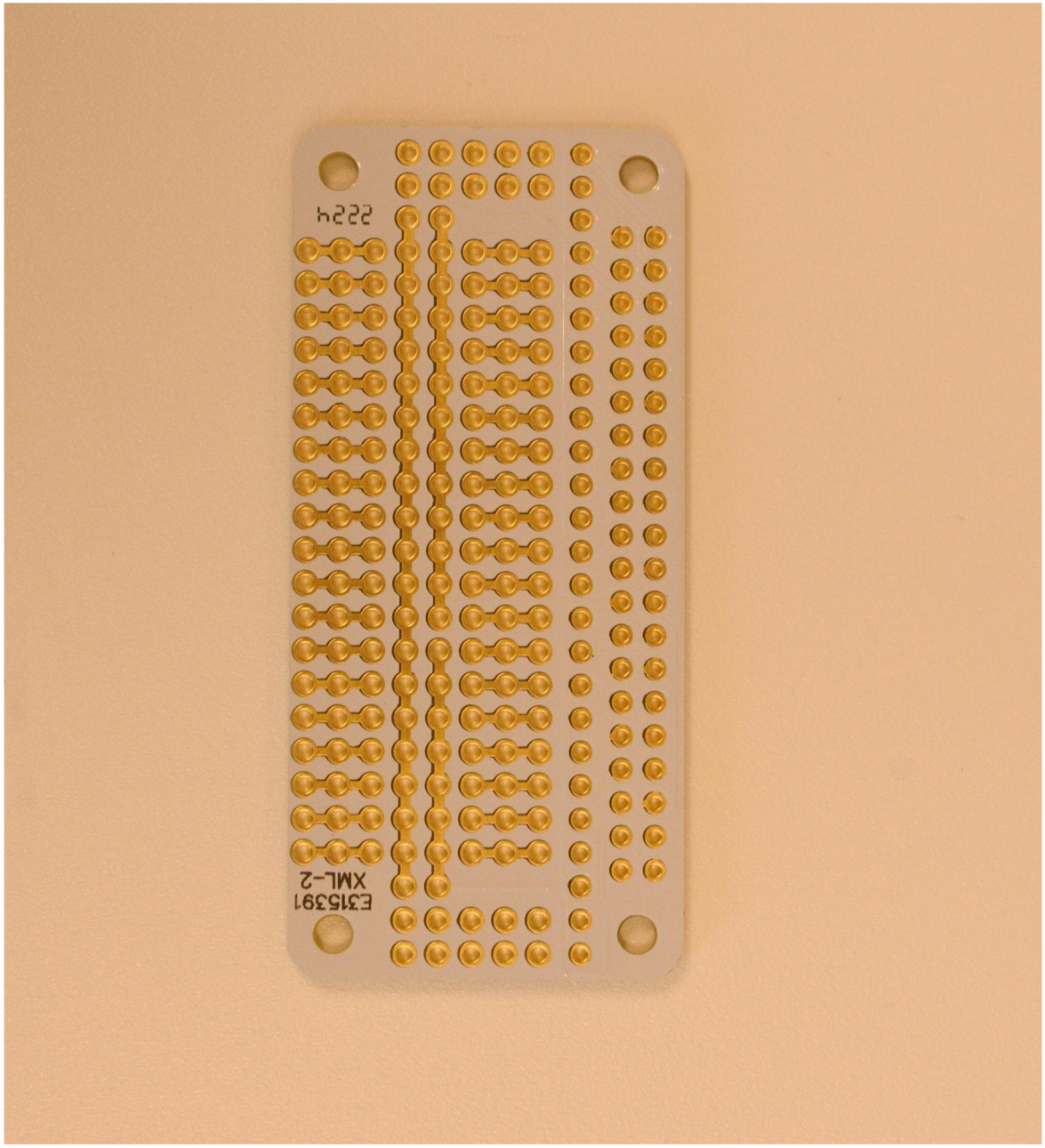

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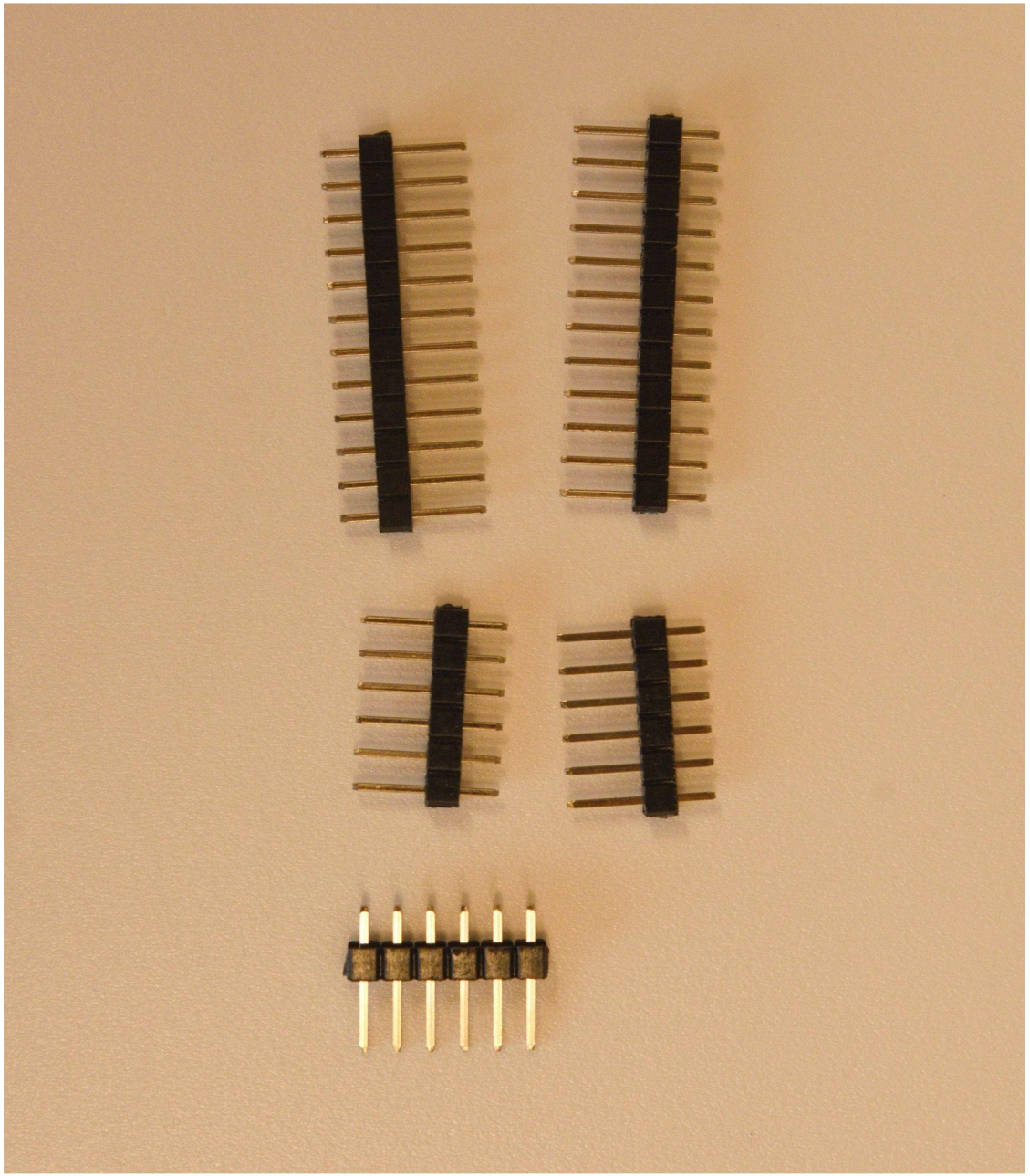

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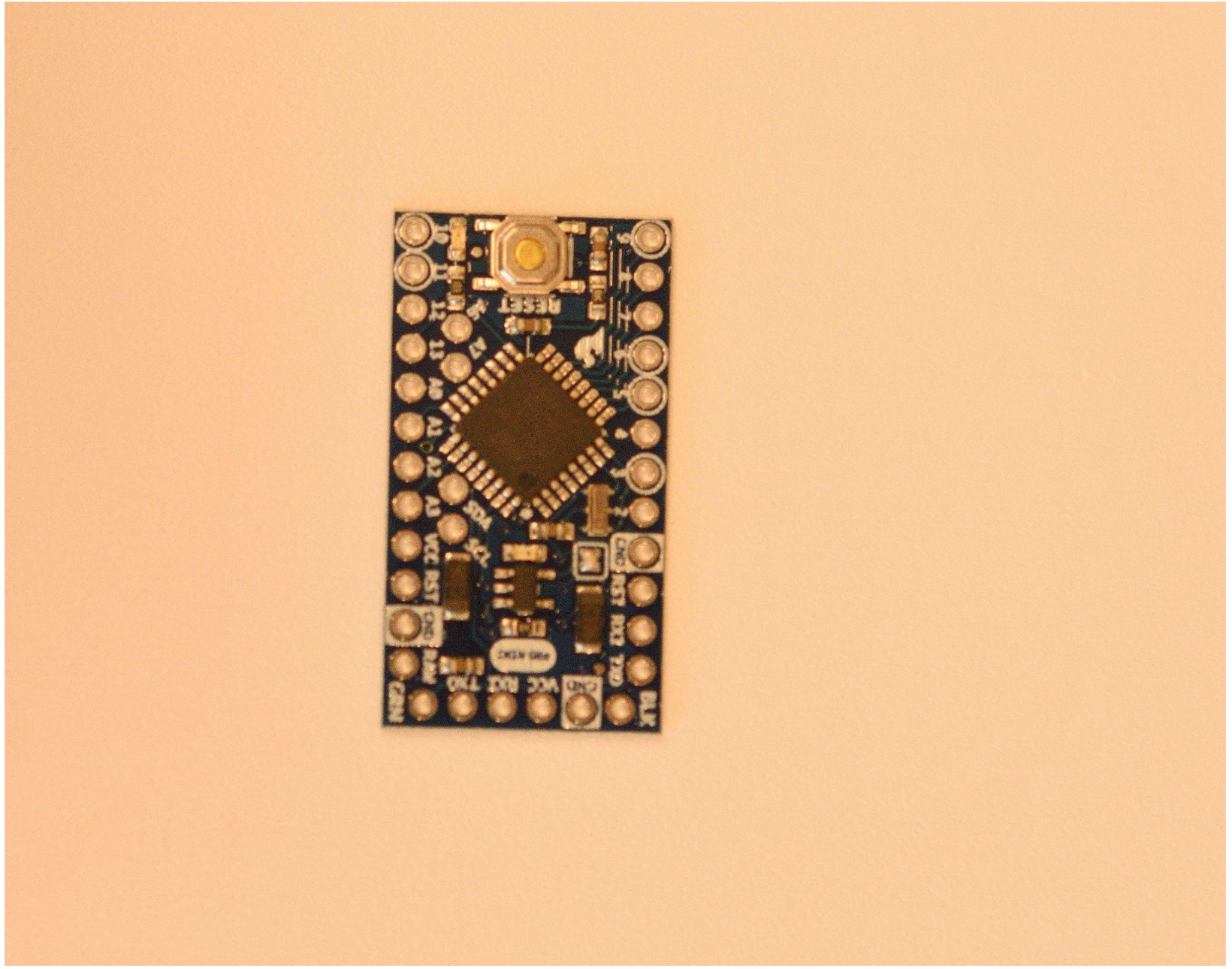

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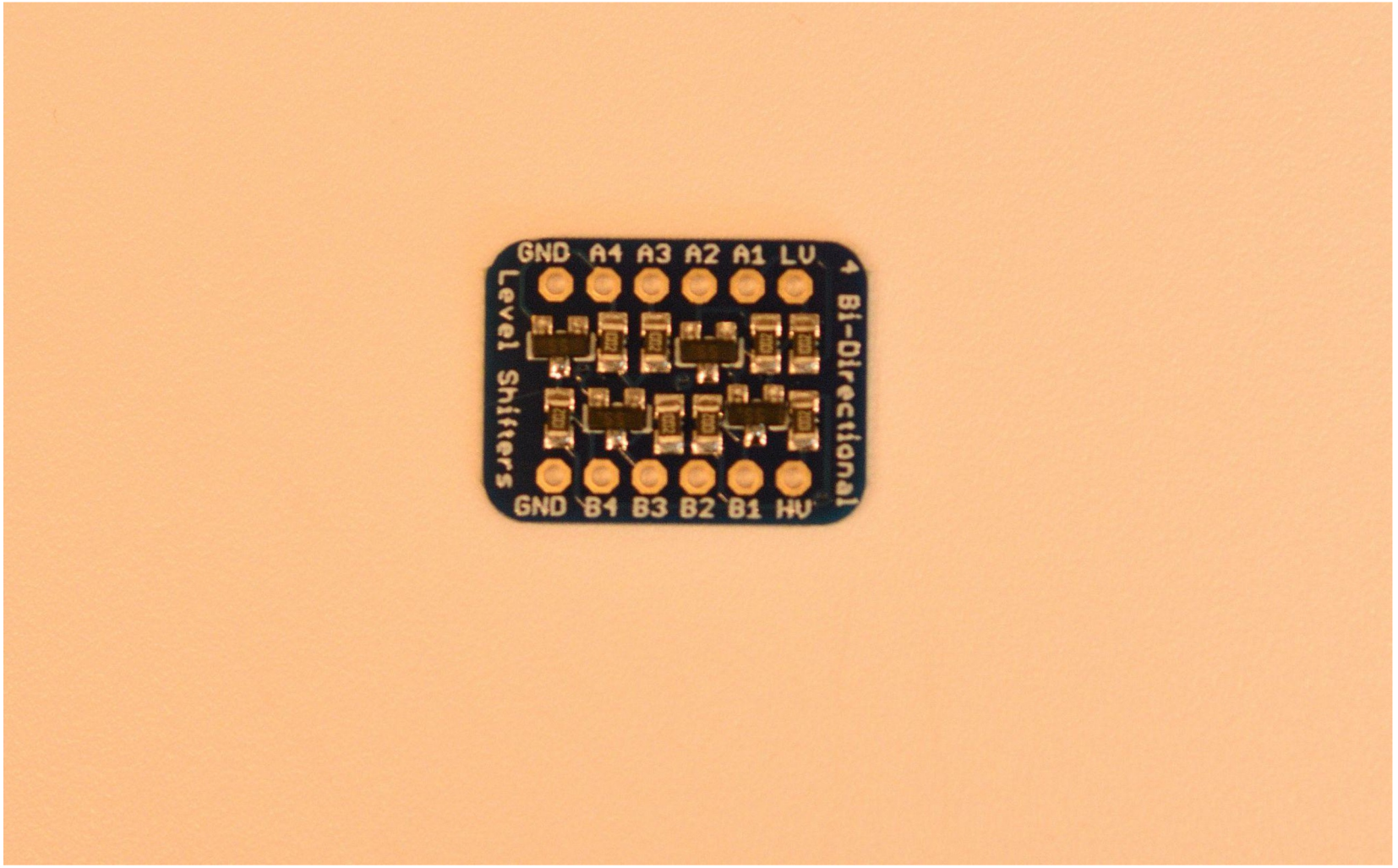

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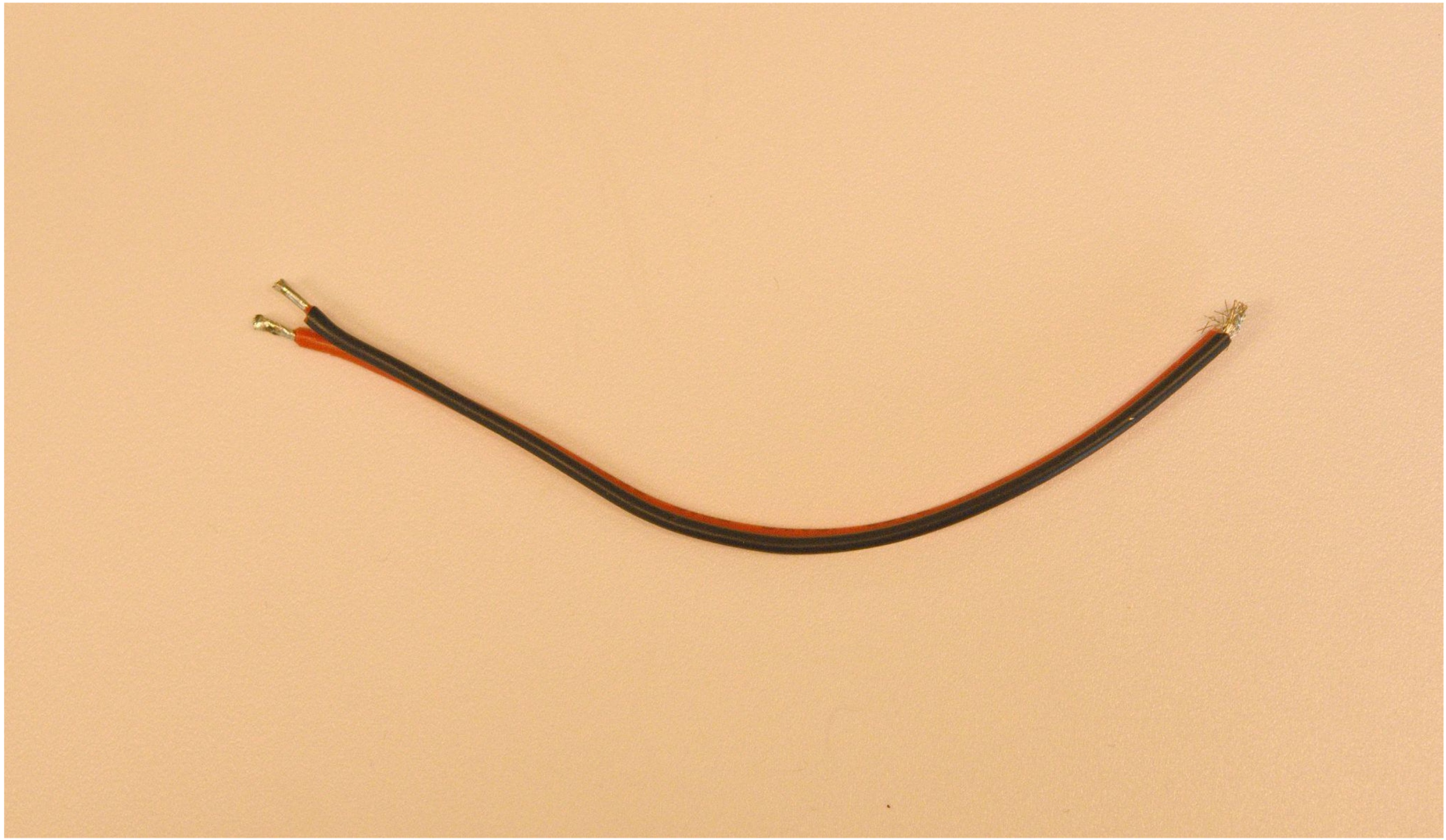

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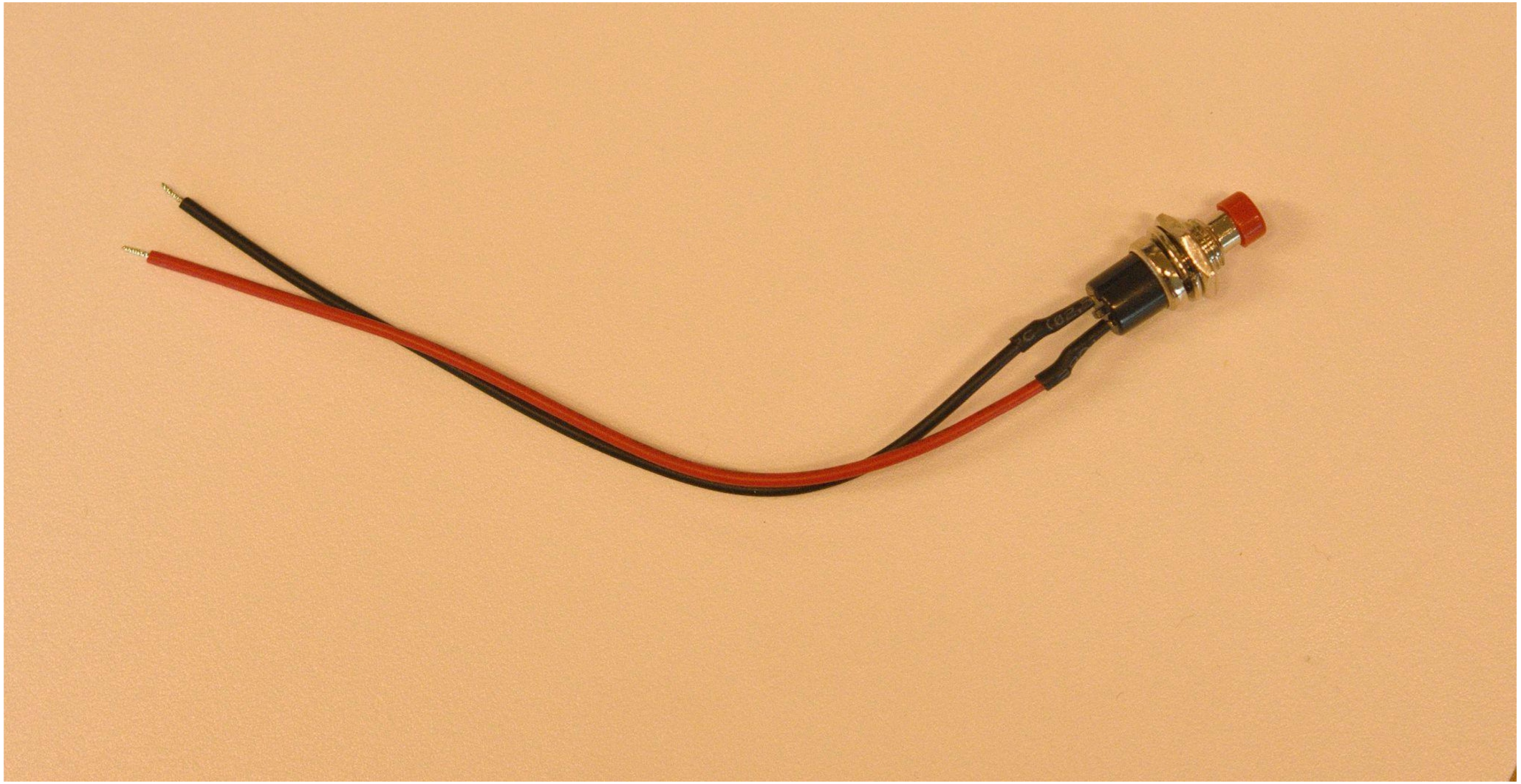

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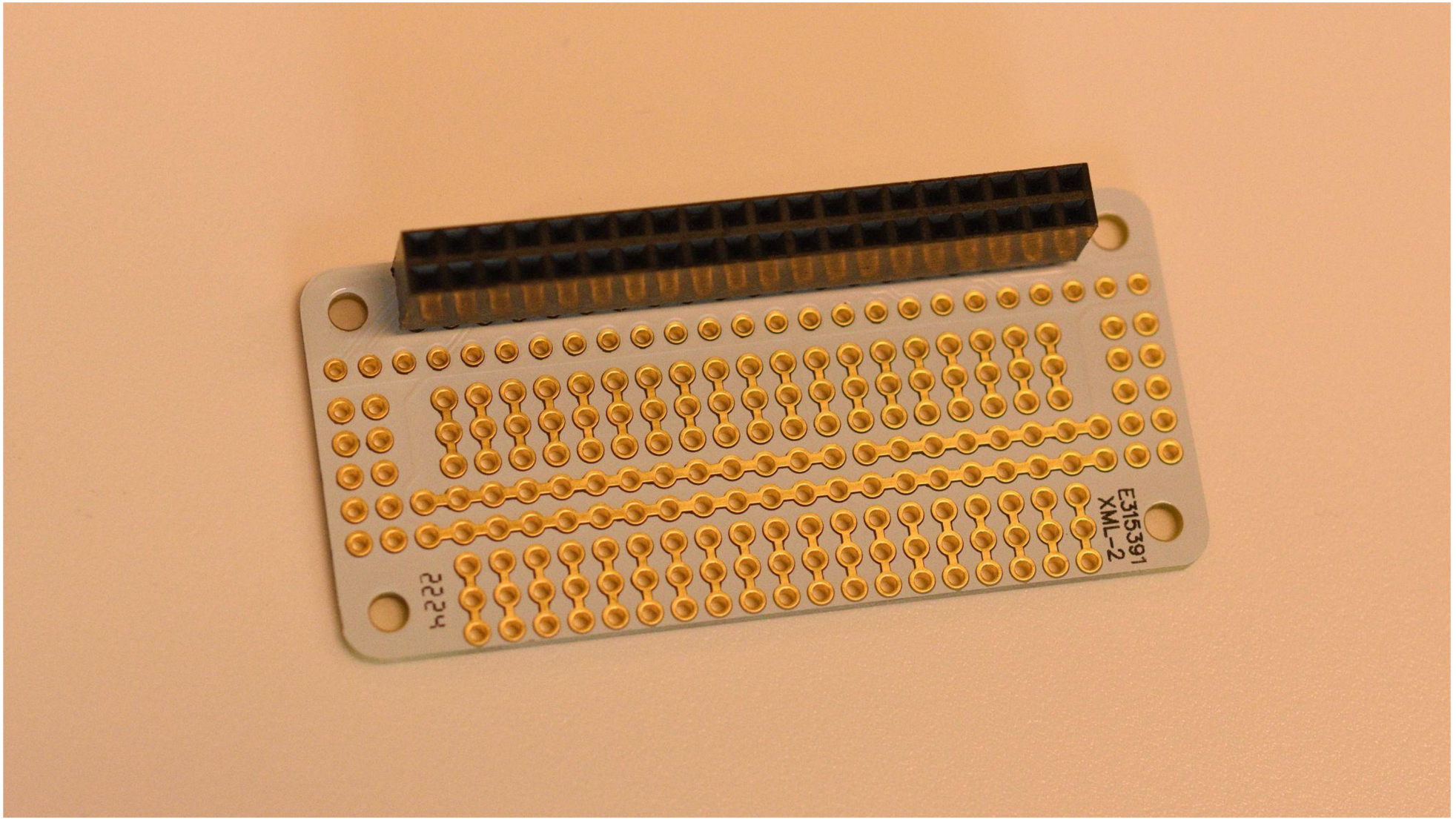
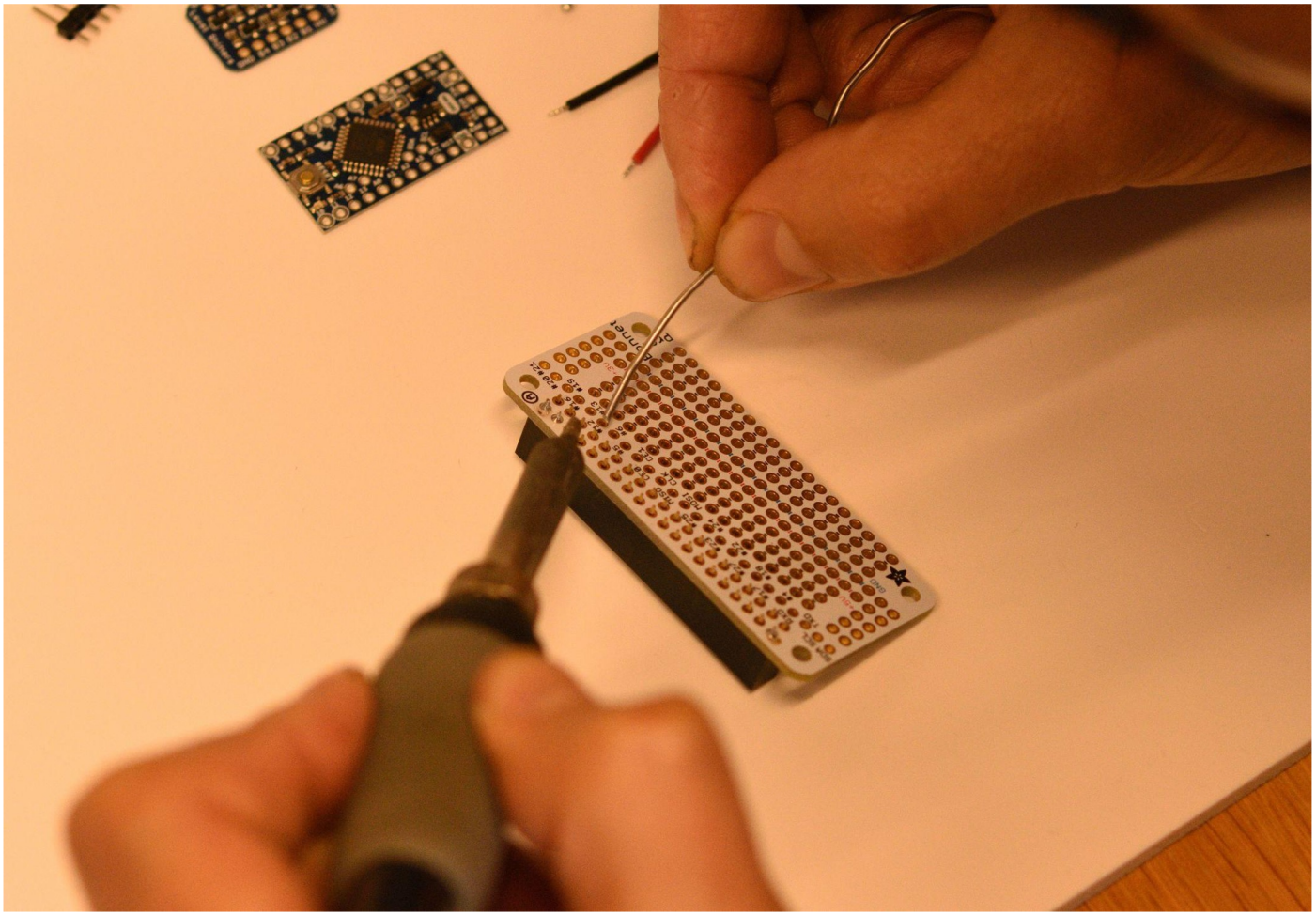
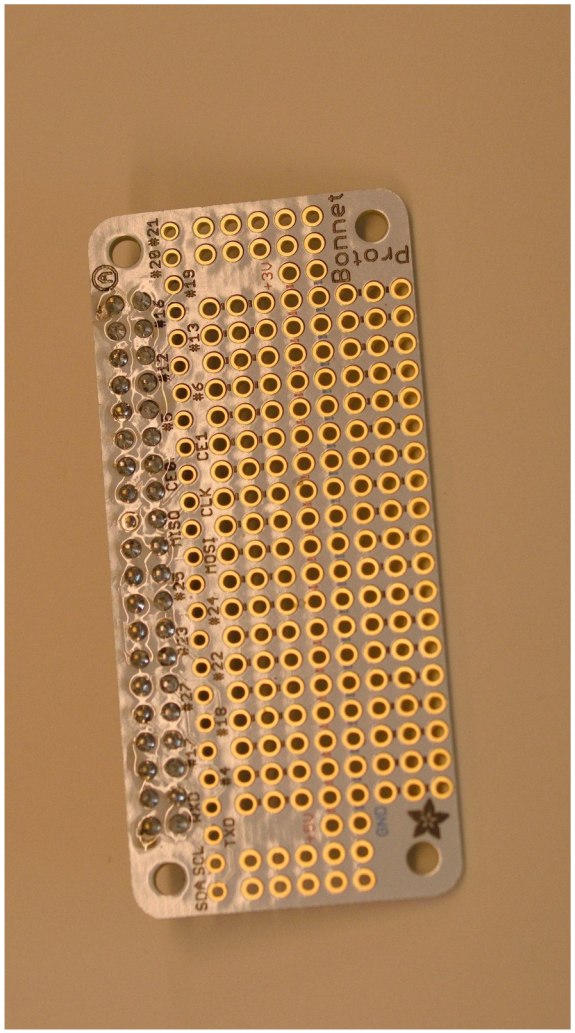
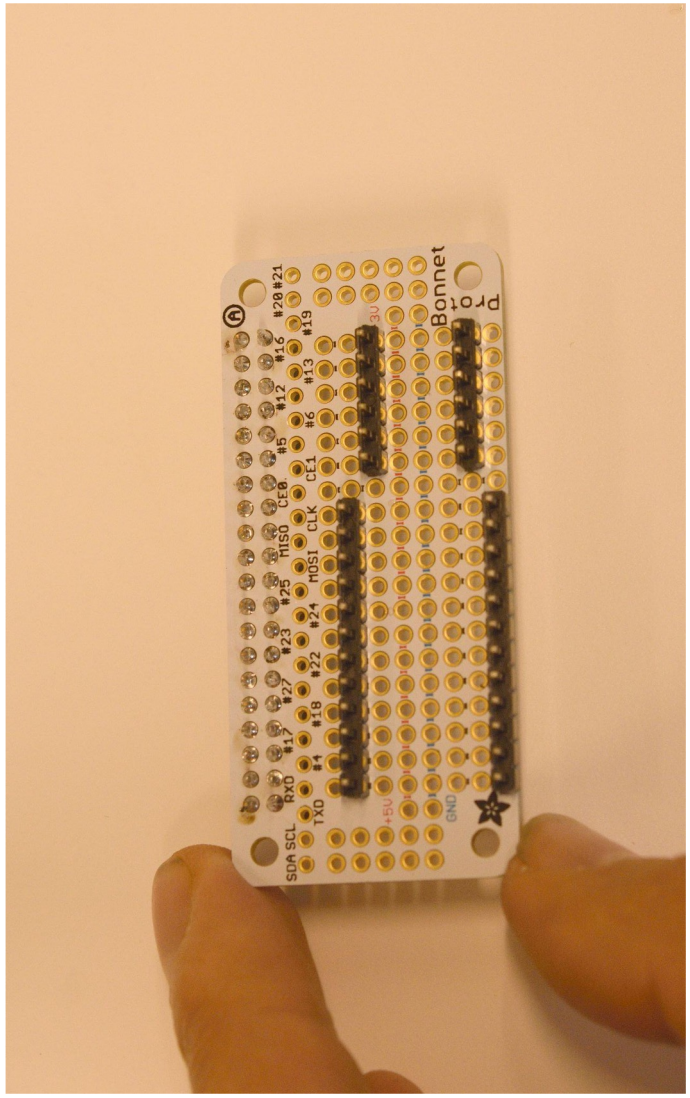


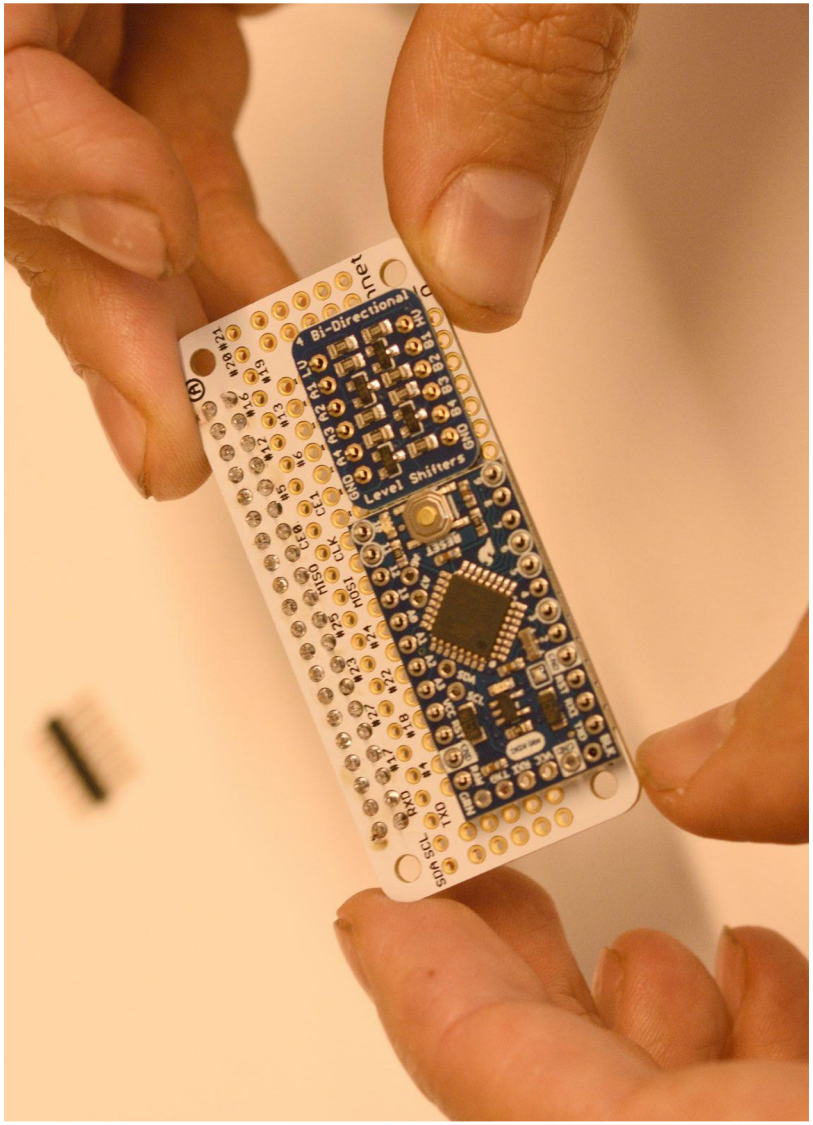
1. I.D. header strip , make sure that the pins are poking through to the side with the text on





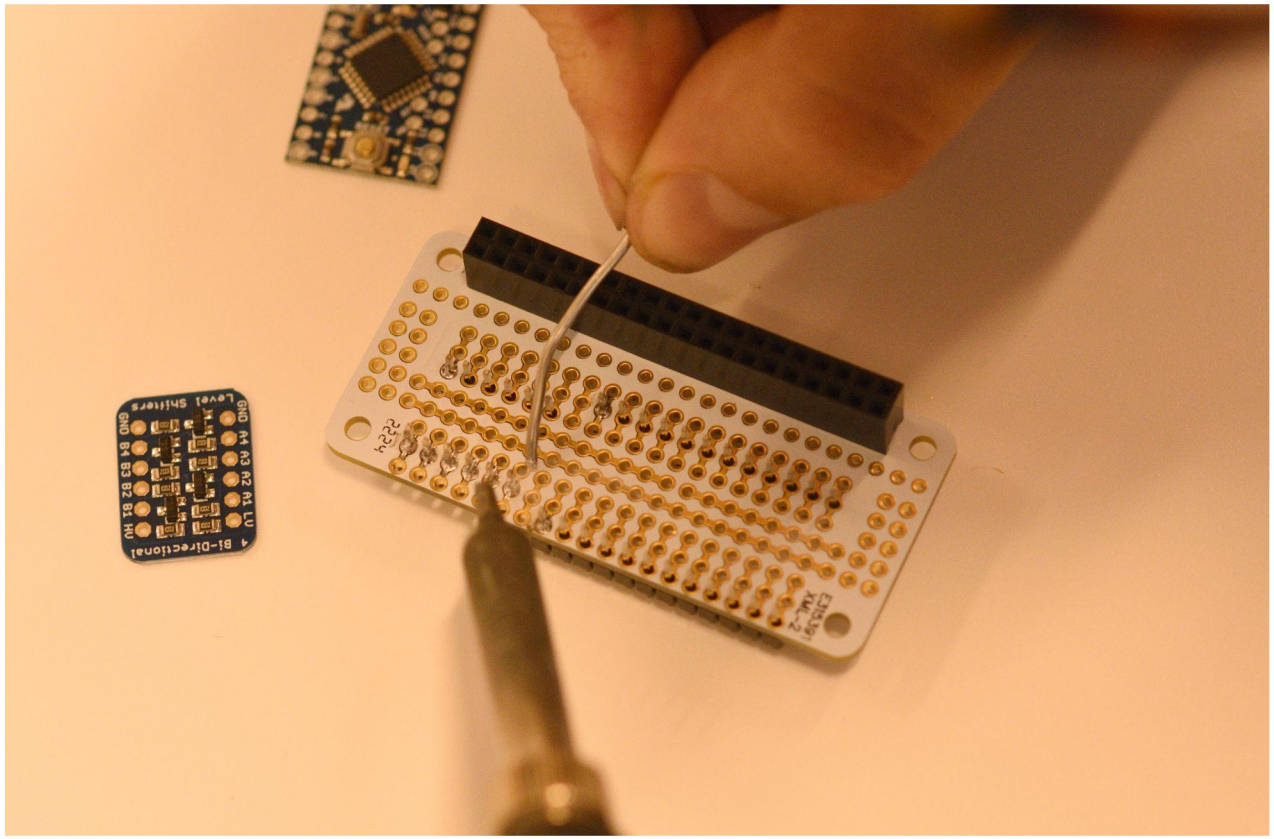
1. It’s always best with this to solder one pin in the corner and test that it’s not bent, and if it’s not flat then I solder the pin in the other corner, and then just go very quickly along the row.When soldering, less is more, more solder does not make a better joing. Solder one side, heat the pin, and then go to the other side of the pin, and get a nice pyramid shape to the pin. If you get a flat joint it’s not good.

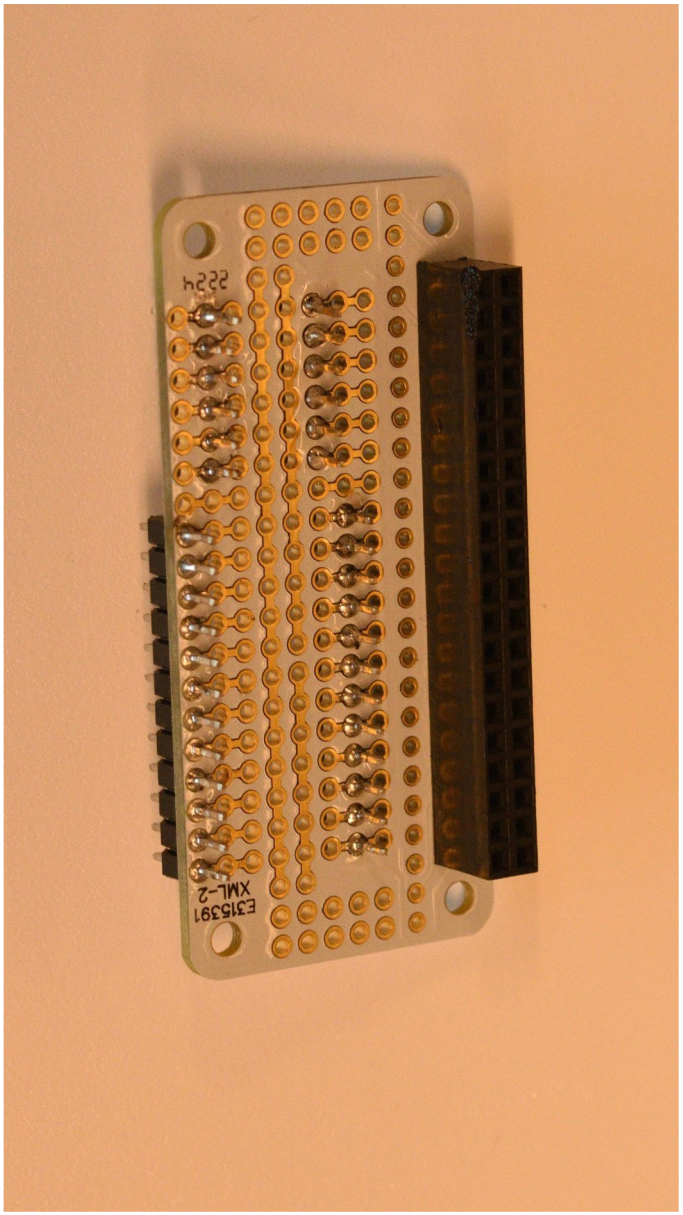




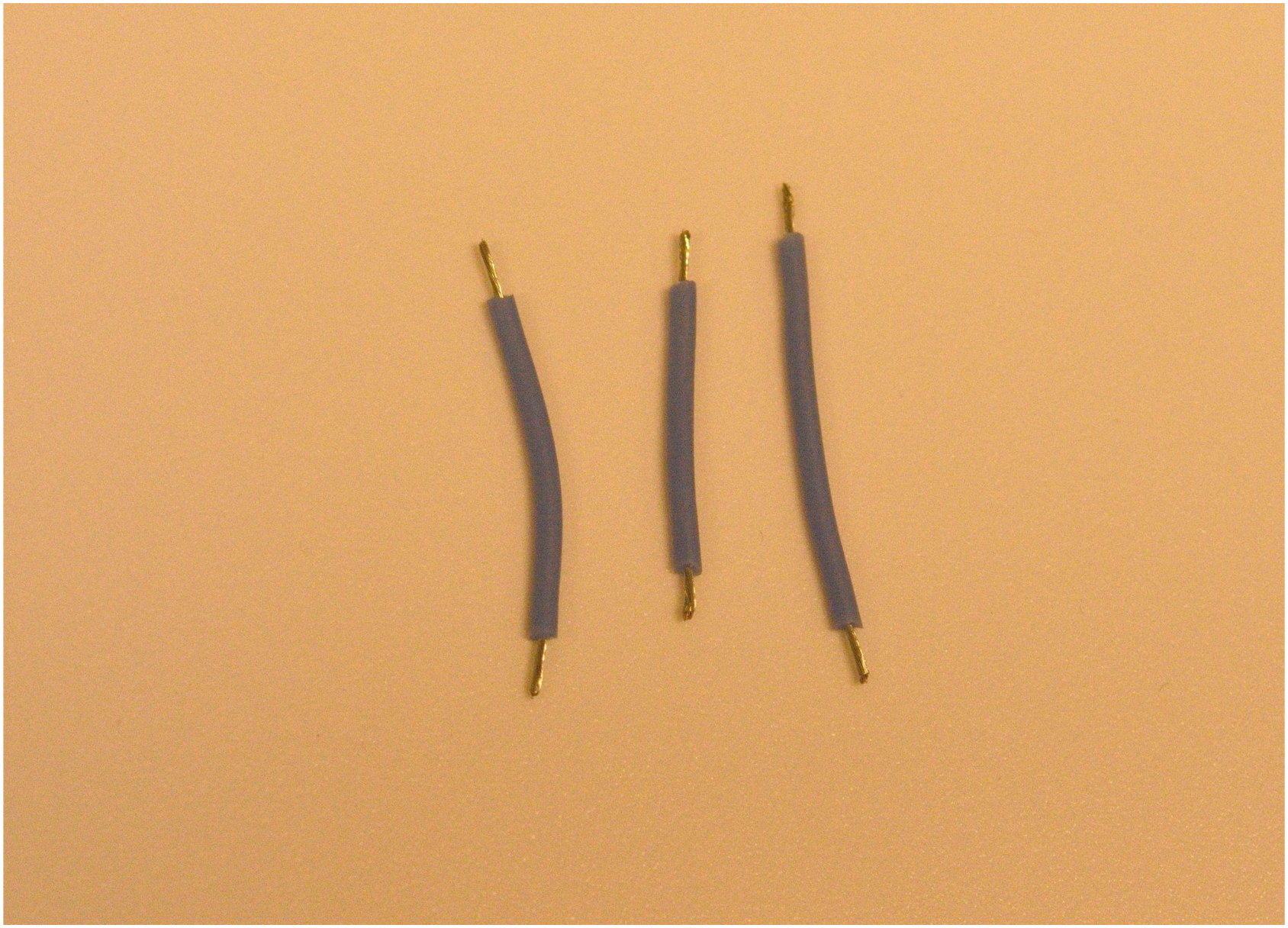
2. This next bit is a bit hard to explain – the header strips are go on the other side , which requires that the holes are counted to replicate – test it out first that they are in the right place before soldering them in, the are to hold the Raspberry Pi – photo of the exact placing. Note that the longside of the pin is on the bottom

2. Test that you have it right by placing the Arduino boards on top and checking that they fit in the pin – the level shifter. Robin has tried to do it with less bits but didn’t get it working

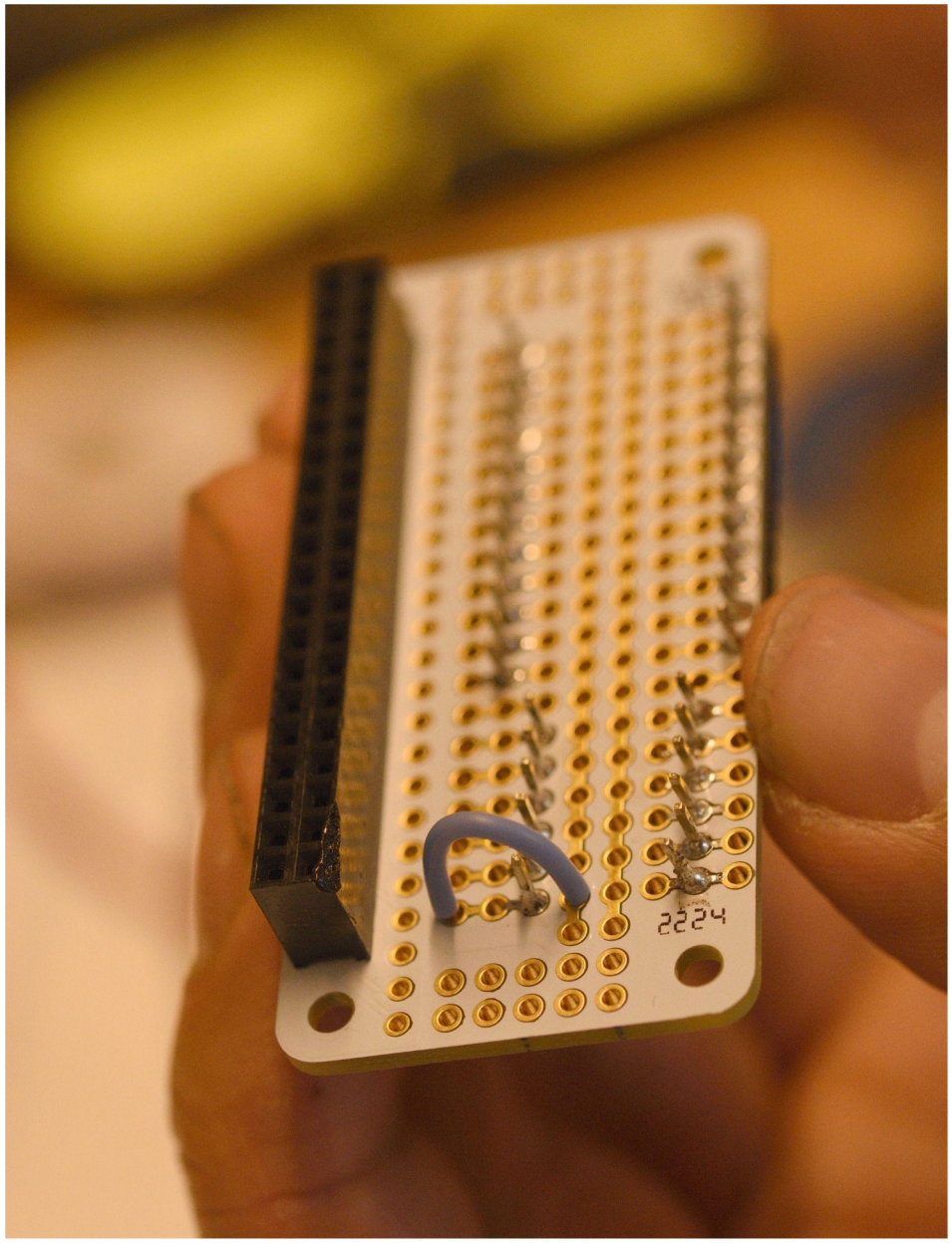


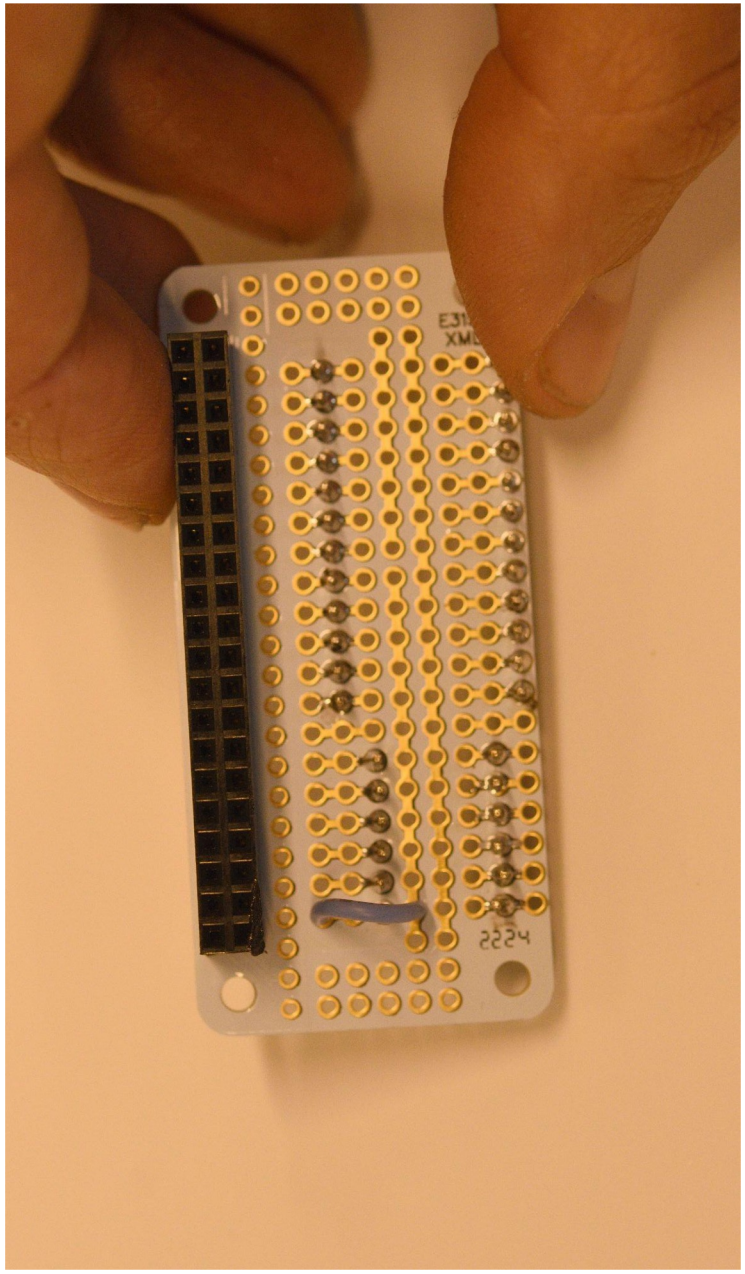


3. Flip it on its back you can see that its flat – solder one top corner of each to make sure the plastic is flat. Make sure that the plastic around the headers are straight and flat, and then the rest can be soldered in.

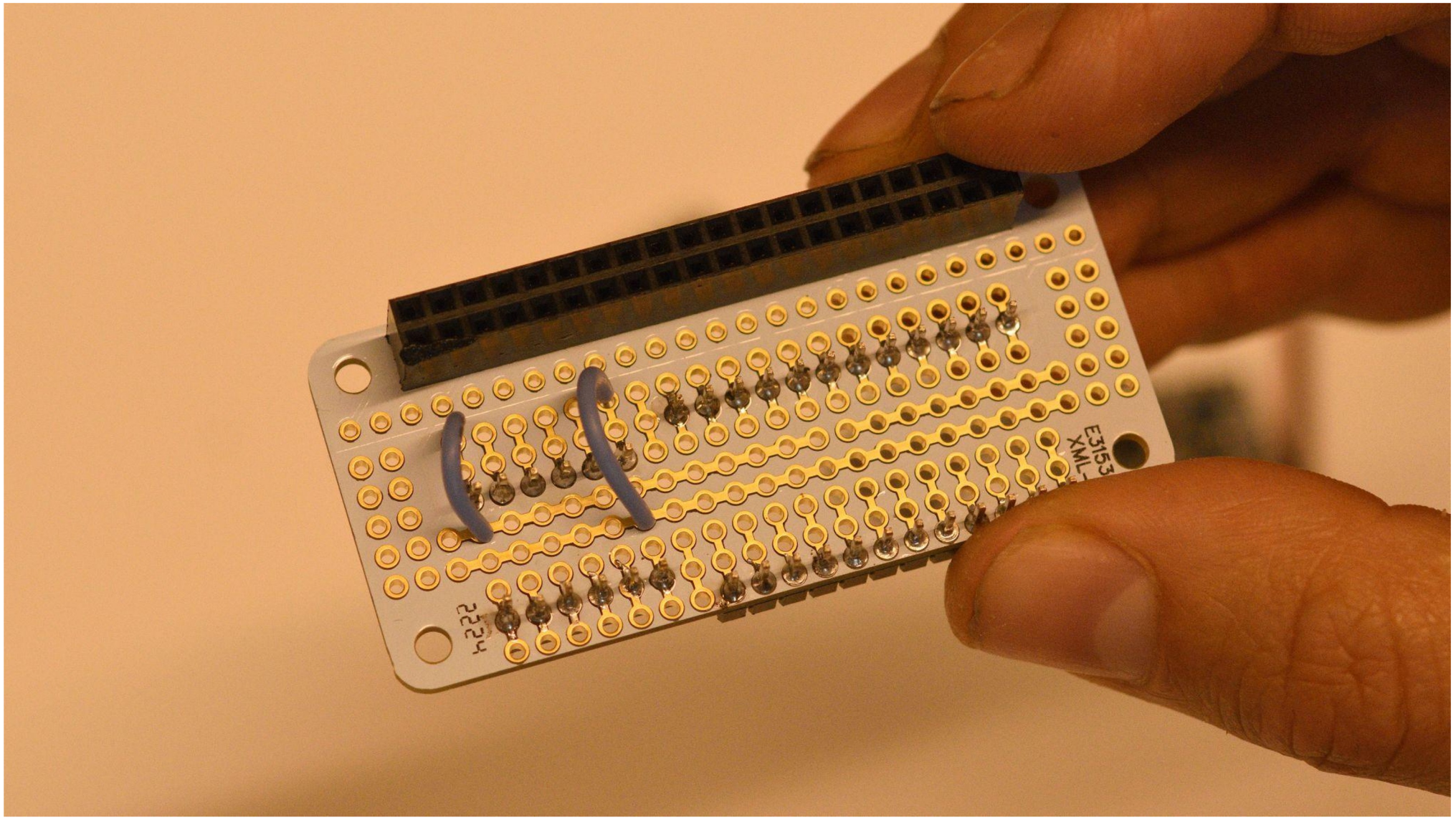


4. When that bit is done you flip it on its back – the first bit that will be soldered in is the low voltage side of the level shifter to the 3.3 volt line of the Raspberry Pi. Cut three short sections of wire to measure at the same length, strip off the plastic to expose the copper at each end, diagram to show exactly where they go





5.1 The next short wire is the ground connection for the level shifter, it’s the Pi side ground. They go in like this (blue loops)



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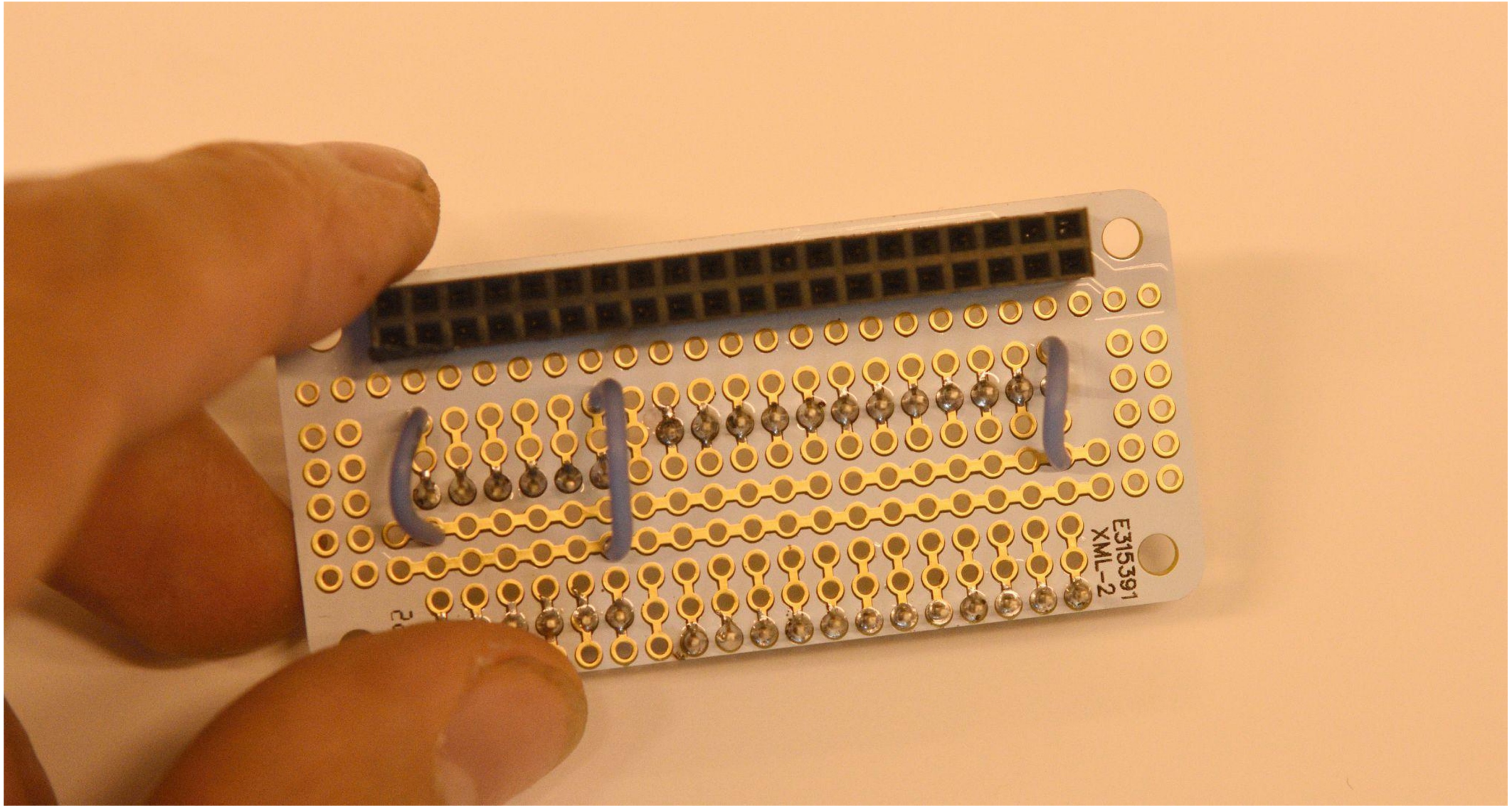
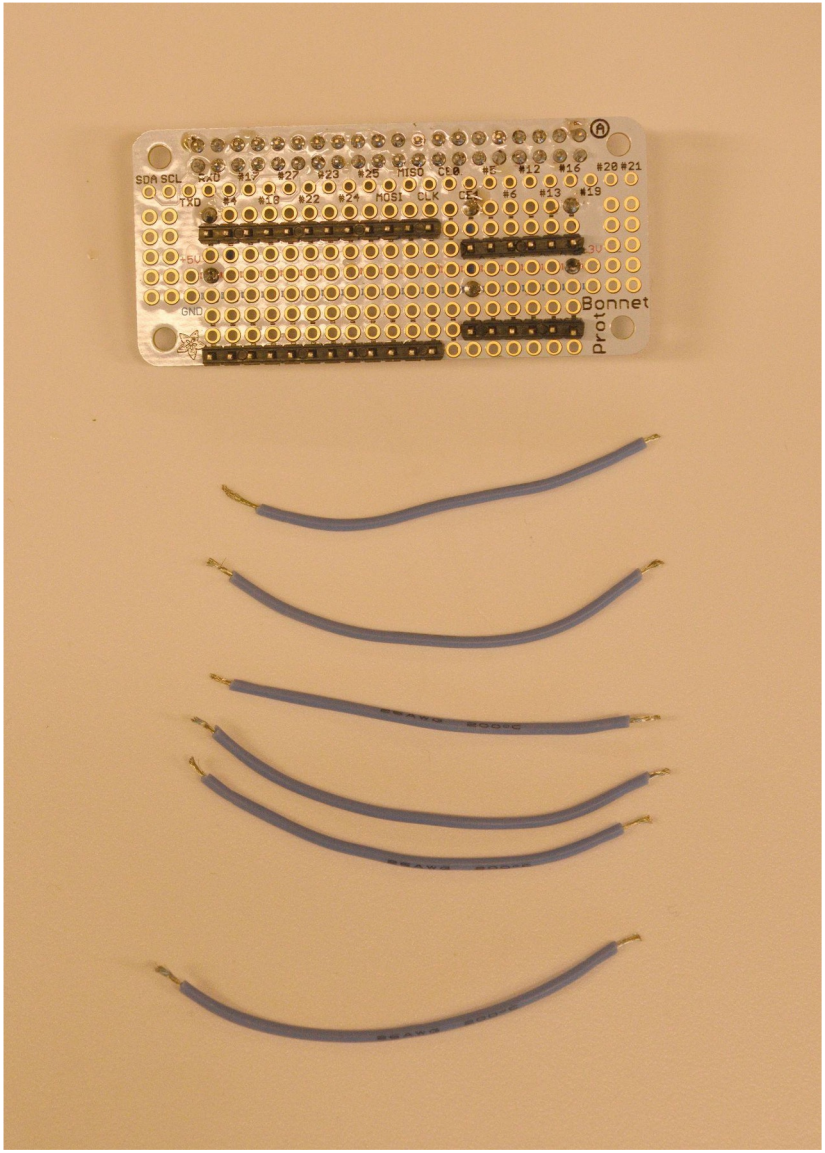
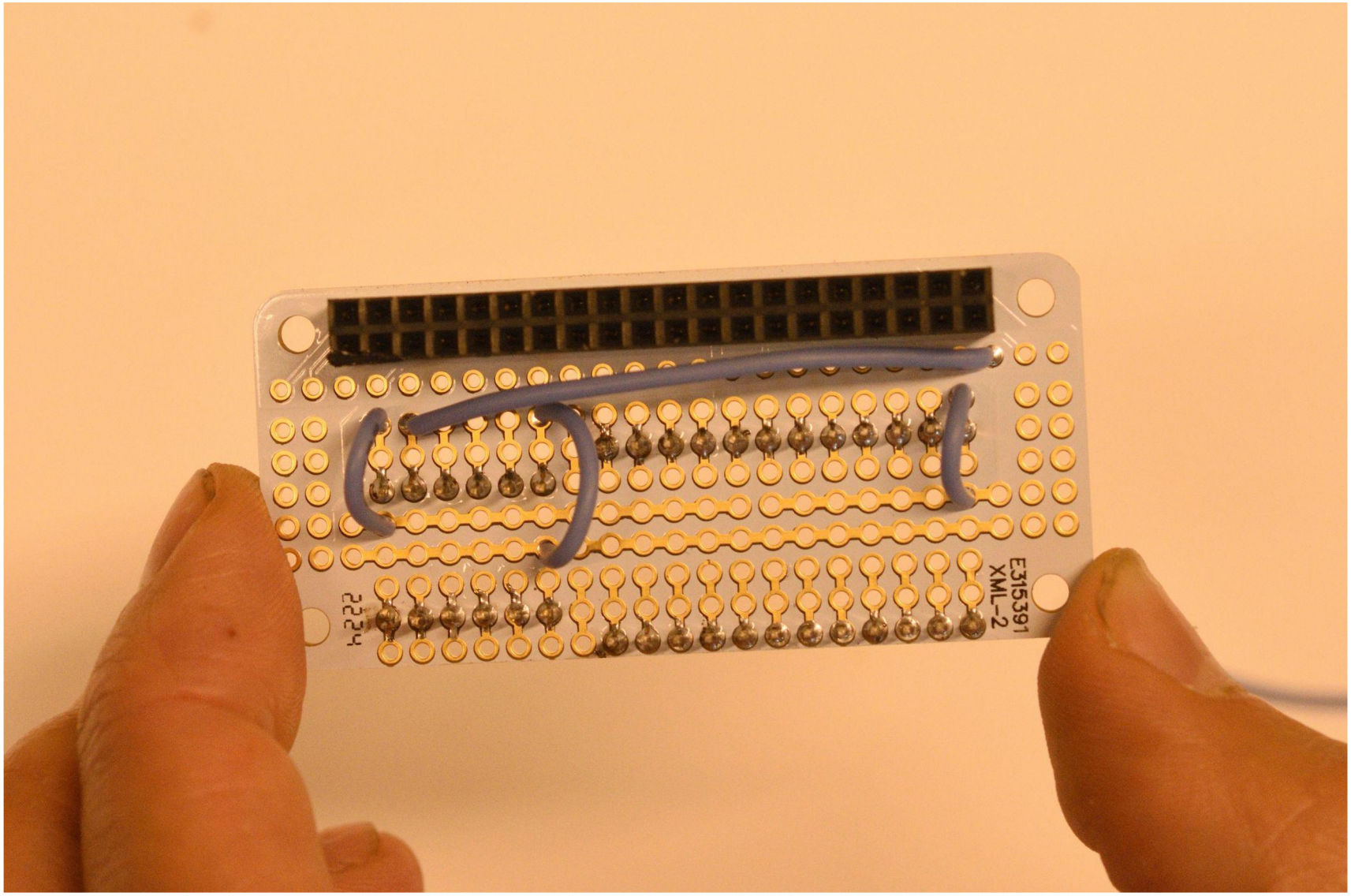


5.3 The next short wire is the ground connection for the level shifter, it’s the Pi side ground. They go in like this (blue loops)

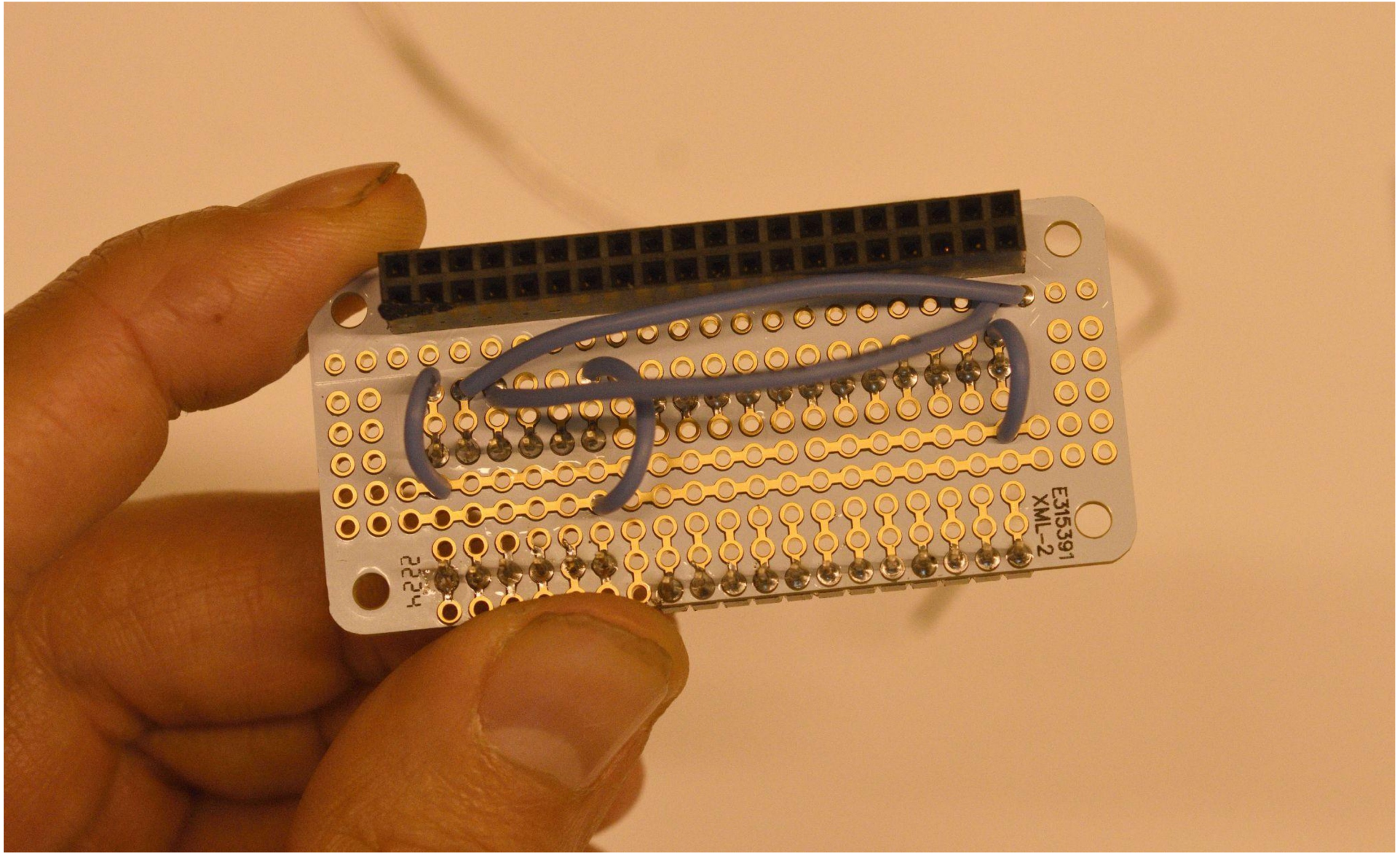
6? The five voltage line from the Raspberry Pi goes into connection for the Arduino.



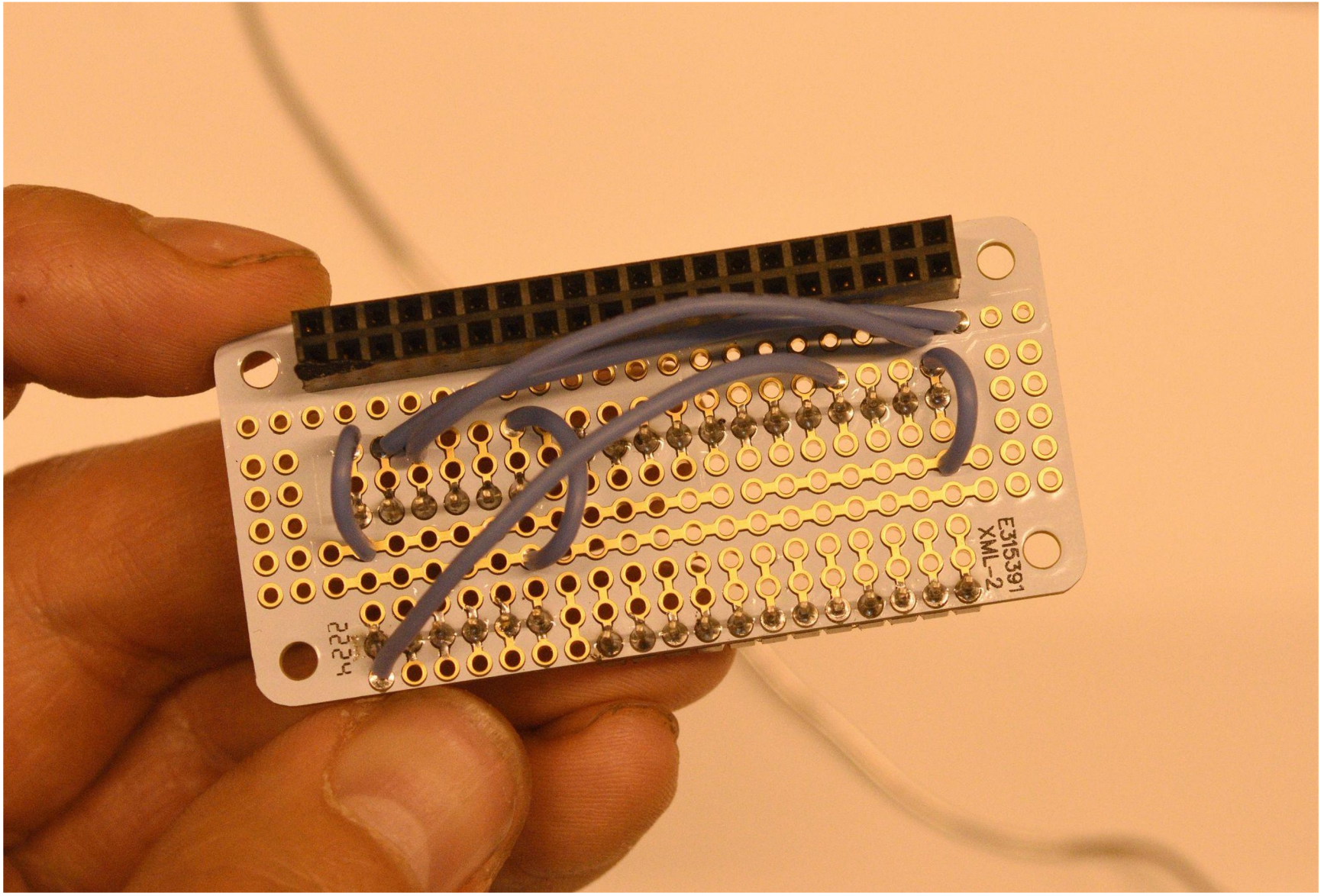
7. Cut six longer wires approximately little finger length (one inch’ish).



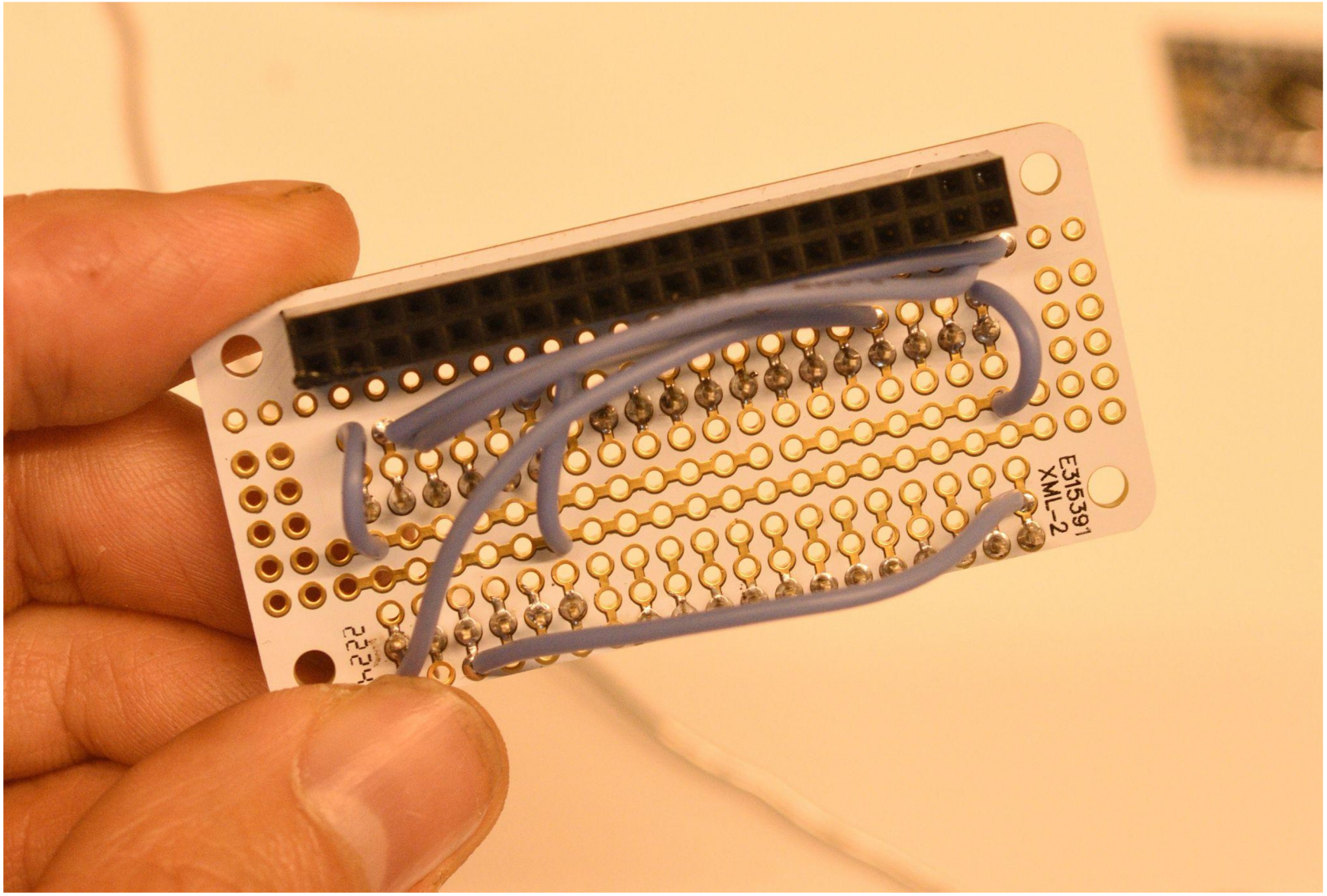
8. Transmit on the Raspberry Pi to A1 on the bi-directional board, connecting the serial ports of the Pi and Arduino so we can send commands, via the level shifter because the Pi is a 3.3 volts to the Arduino with is 5 volts.



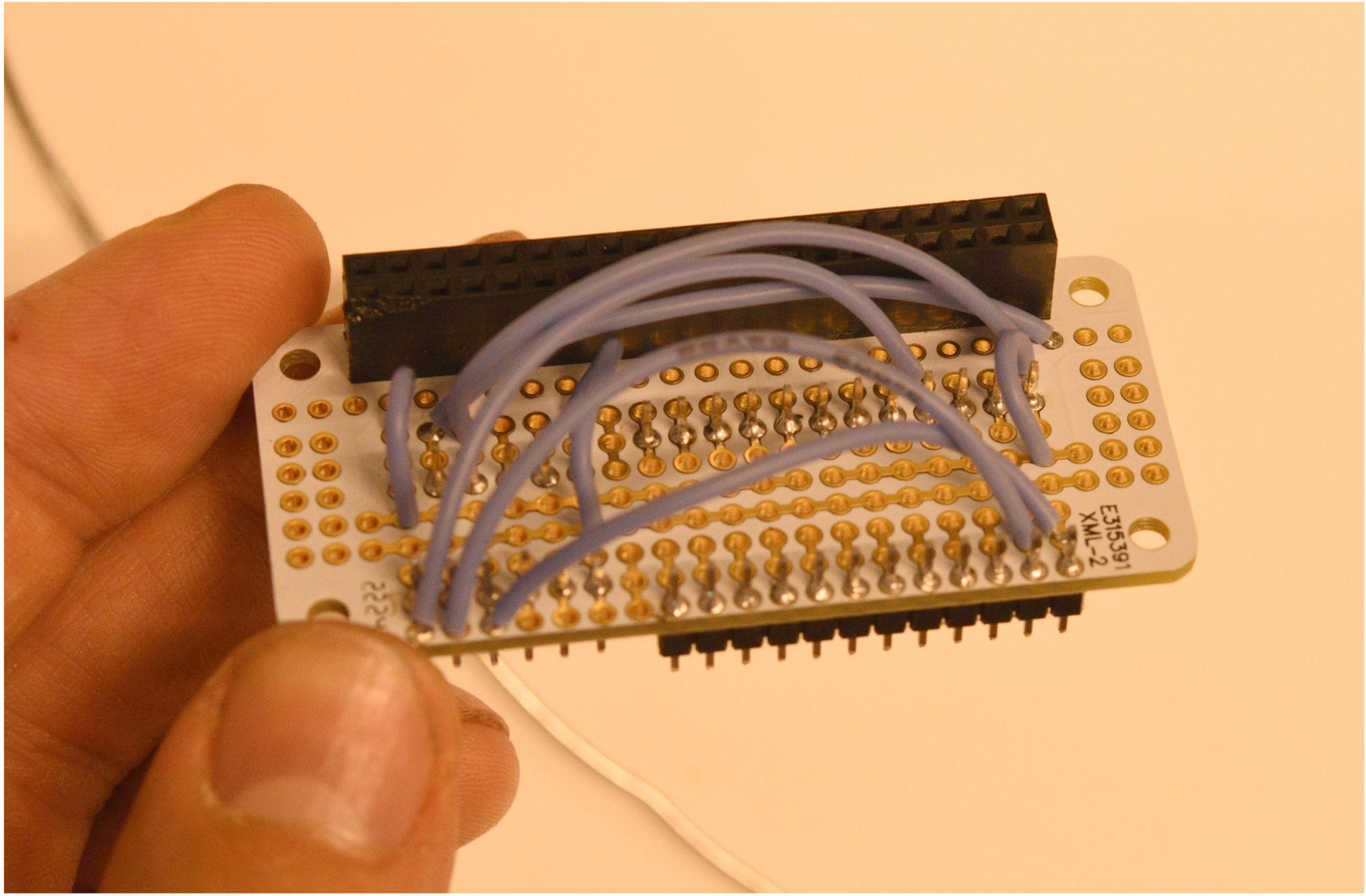
9. So the new wire is connectiong A2 on the level shifter to receive on (3 in on one side, 2 in on the other side) (5th wire)



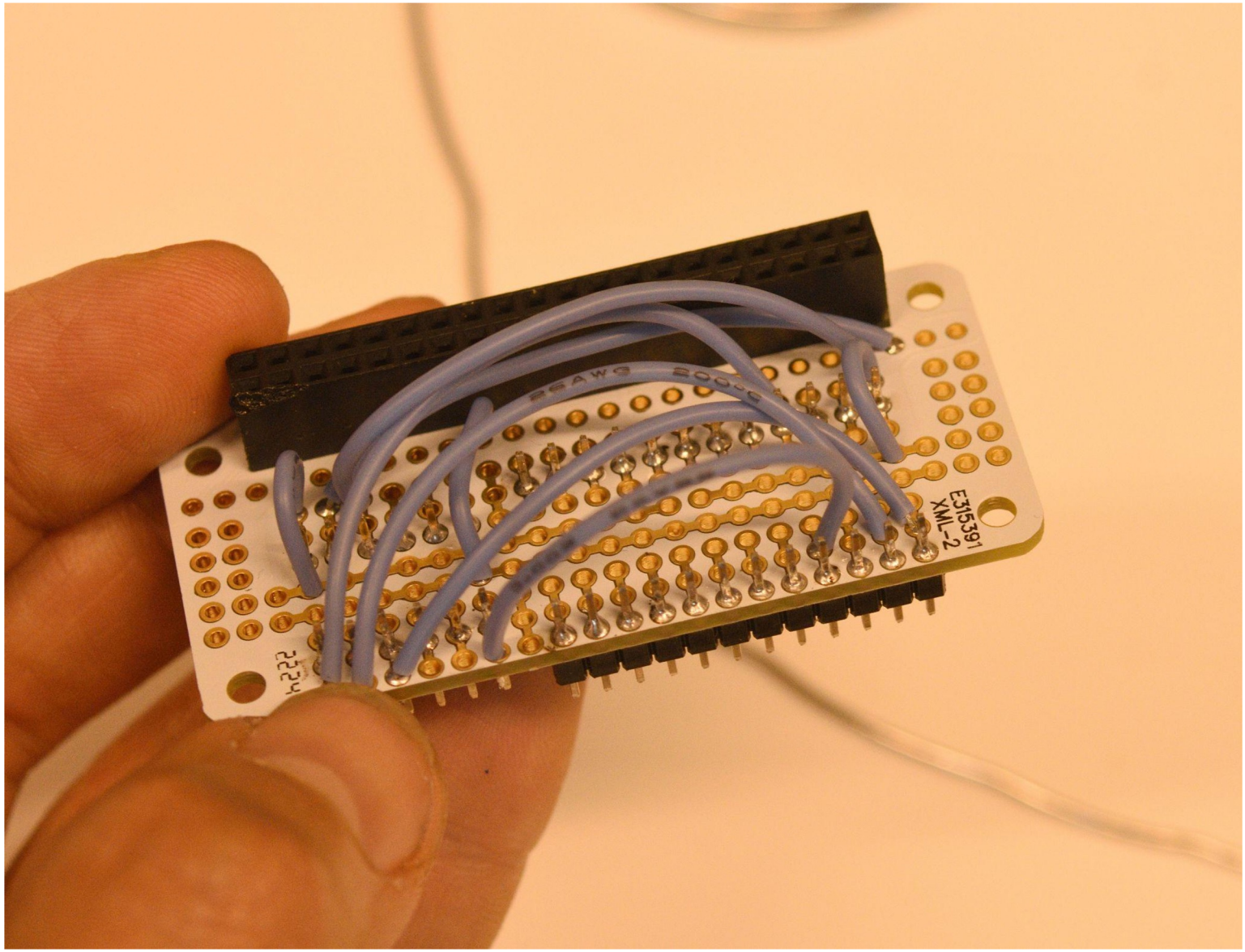
10. The 6th wire is connecting the high voltage side of the level shifter to Vcc (5 volt line) on the Arduino



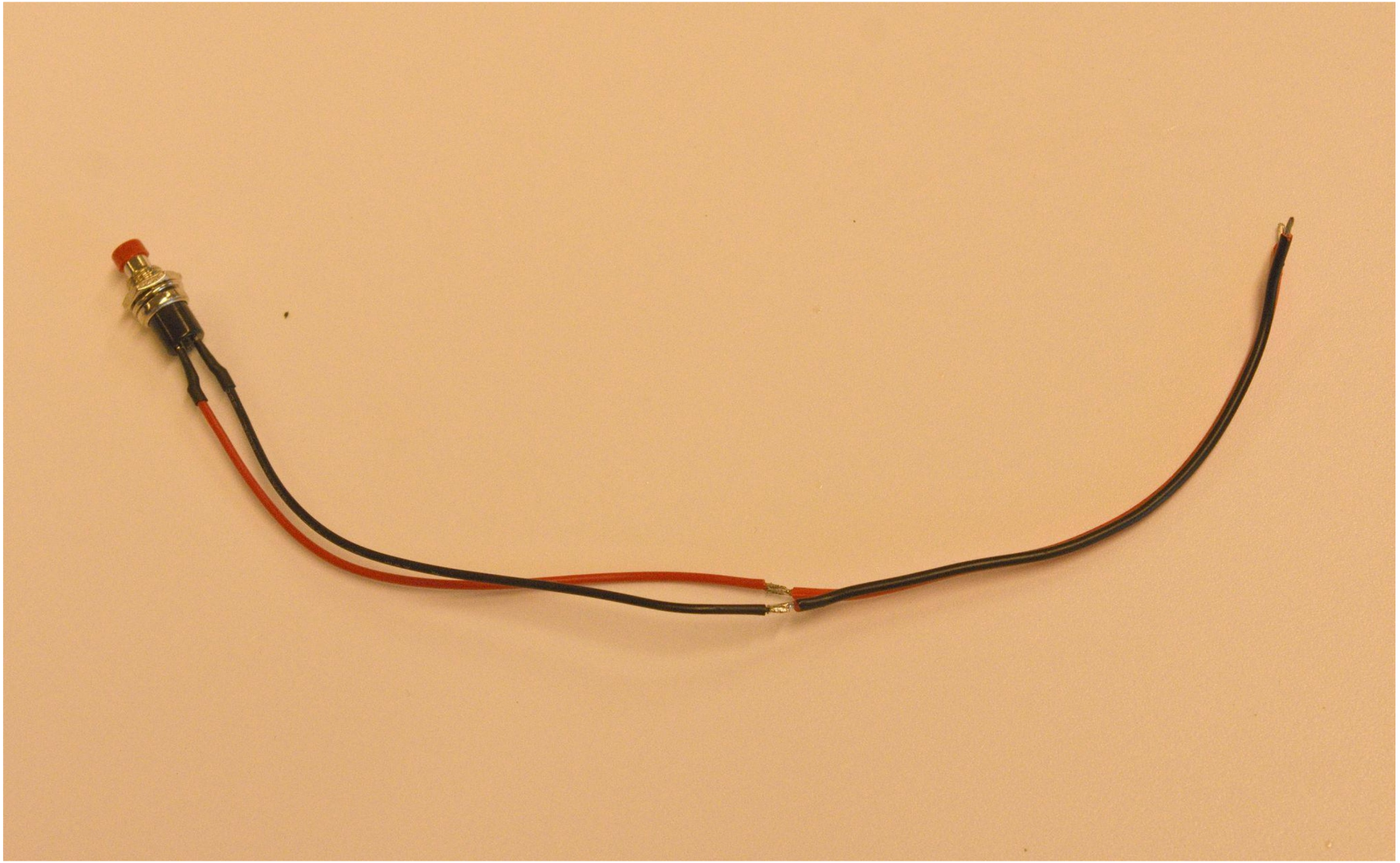
11. The 7th wire is connecting the transmit on the Arduino to B2 on the bidirectional level shifter.



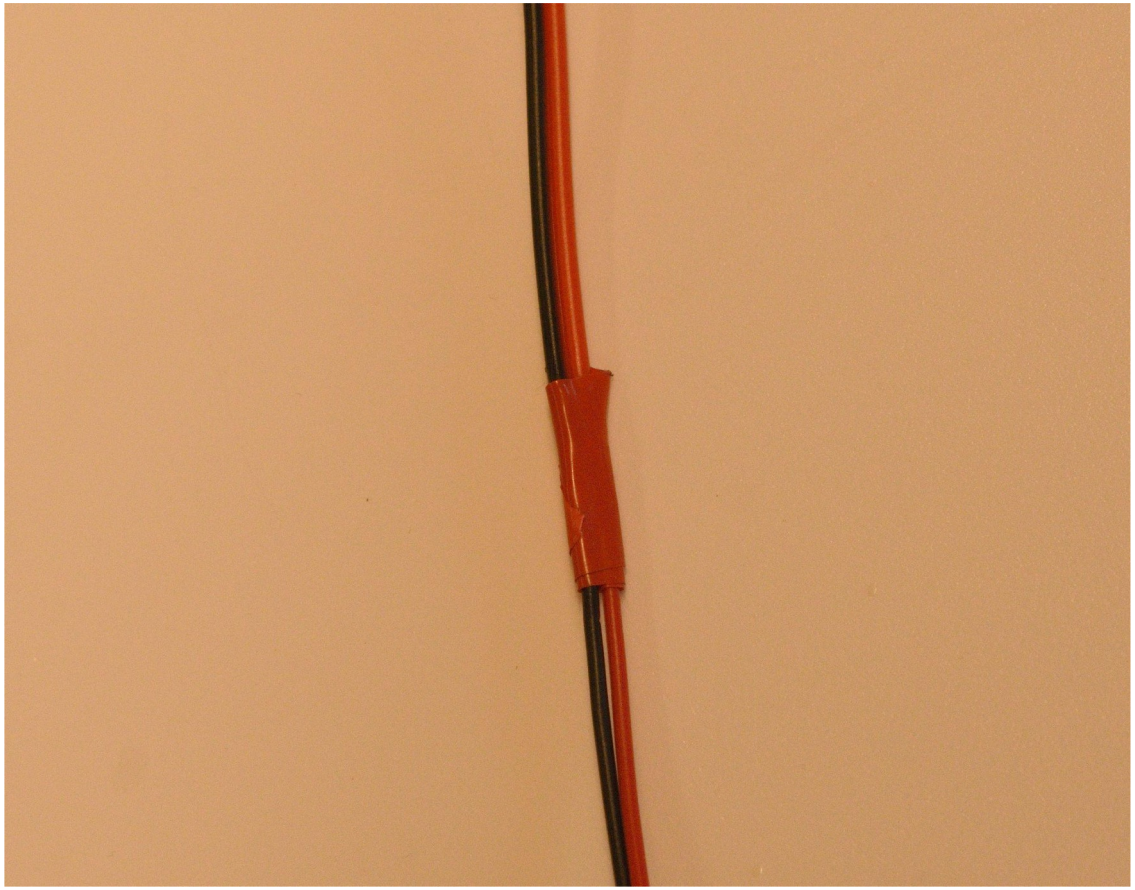
12. The 8th wire is connecting B1 on the bidirectional to receive RX on the Arduino.

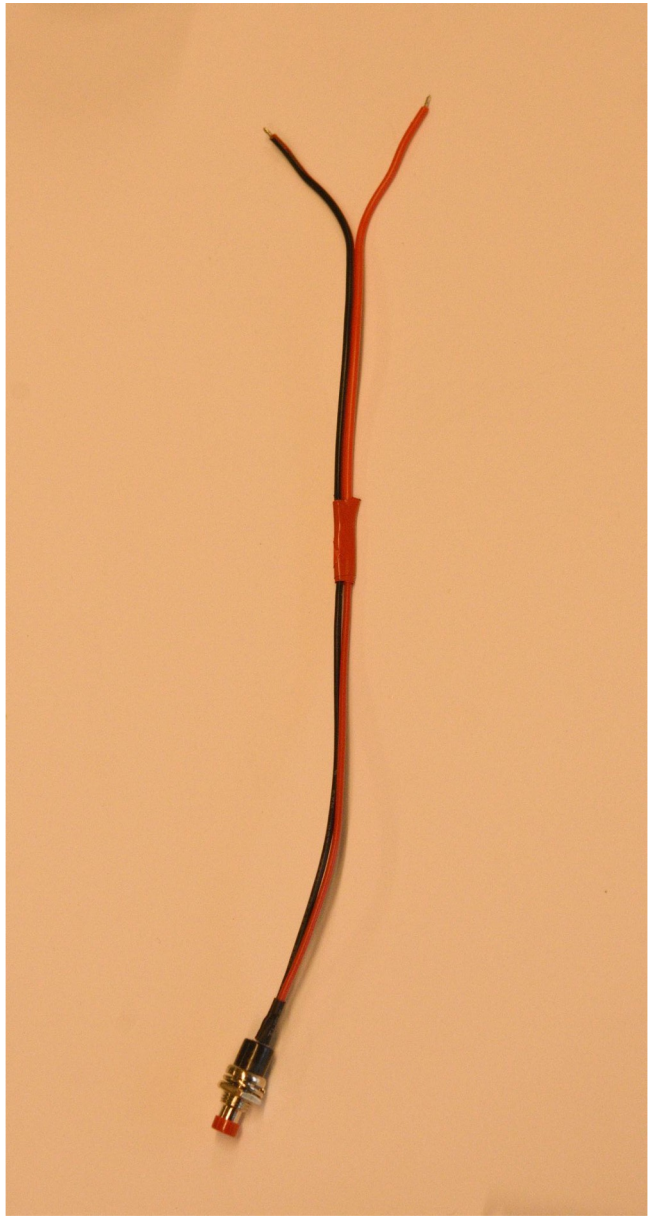


13. The last long cable is connecting ground on the Arduino to ground on the bidirectional board on the high voltage side.



14 Next is the trigger cable, tape the red and black wires together to keep them aligned and tidy,





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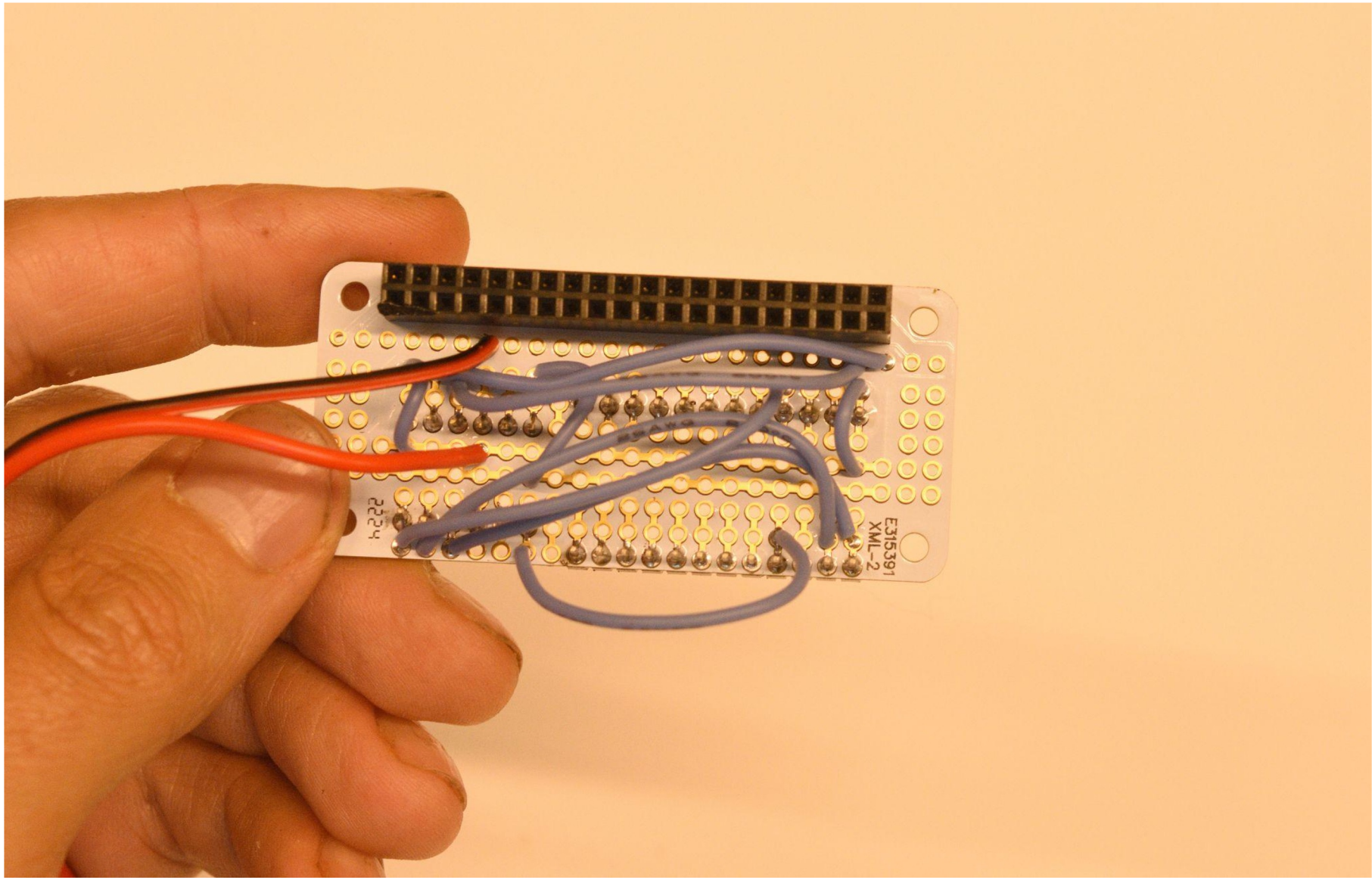
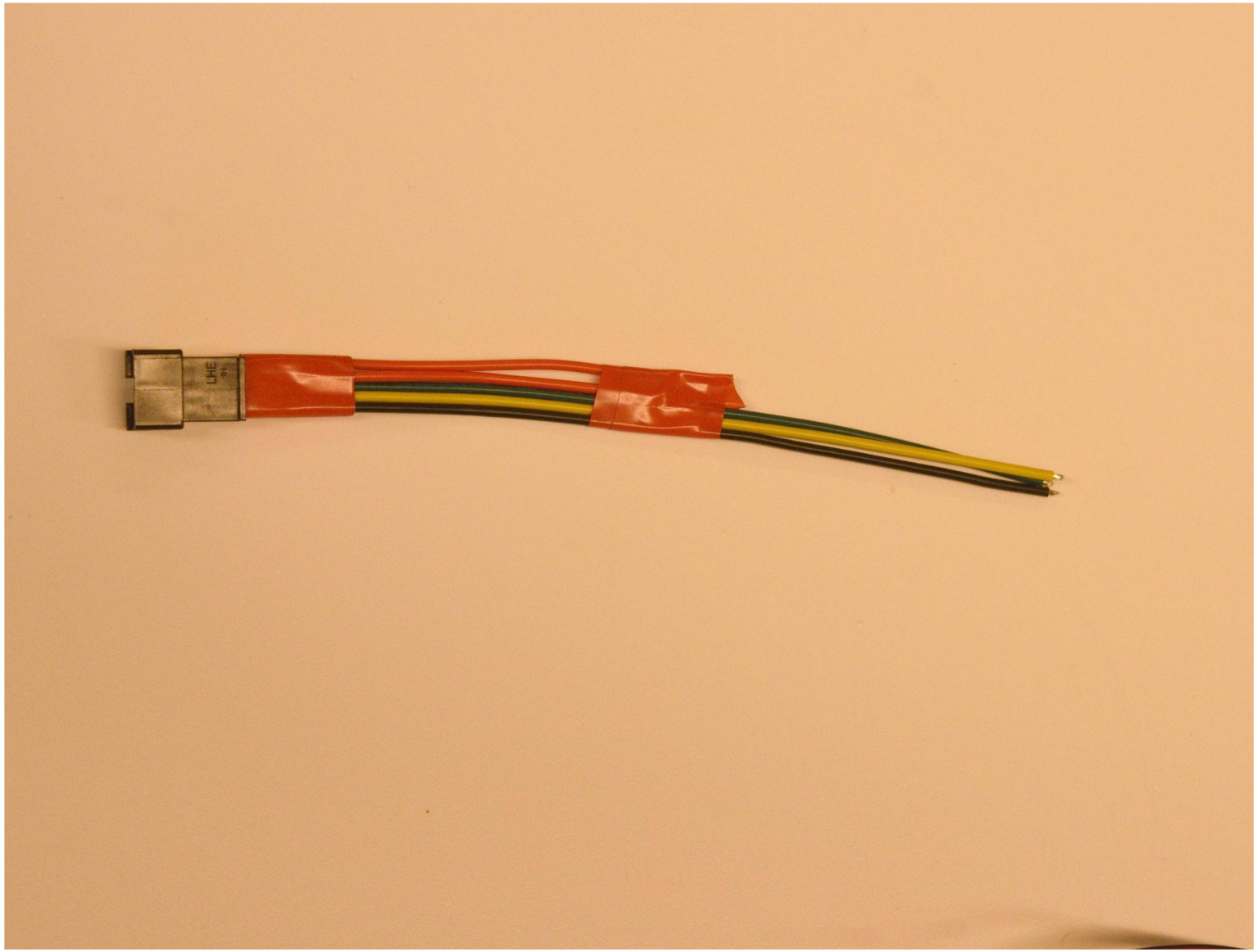
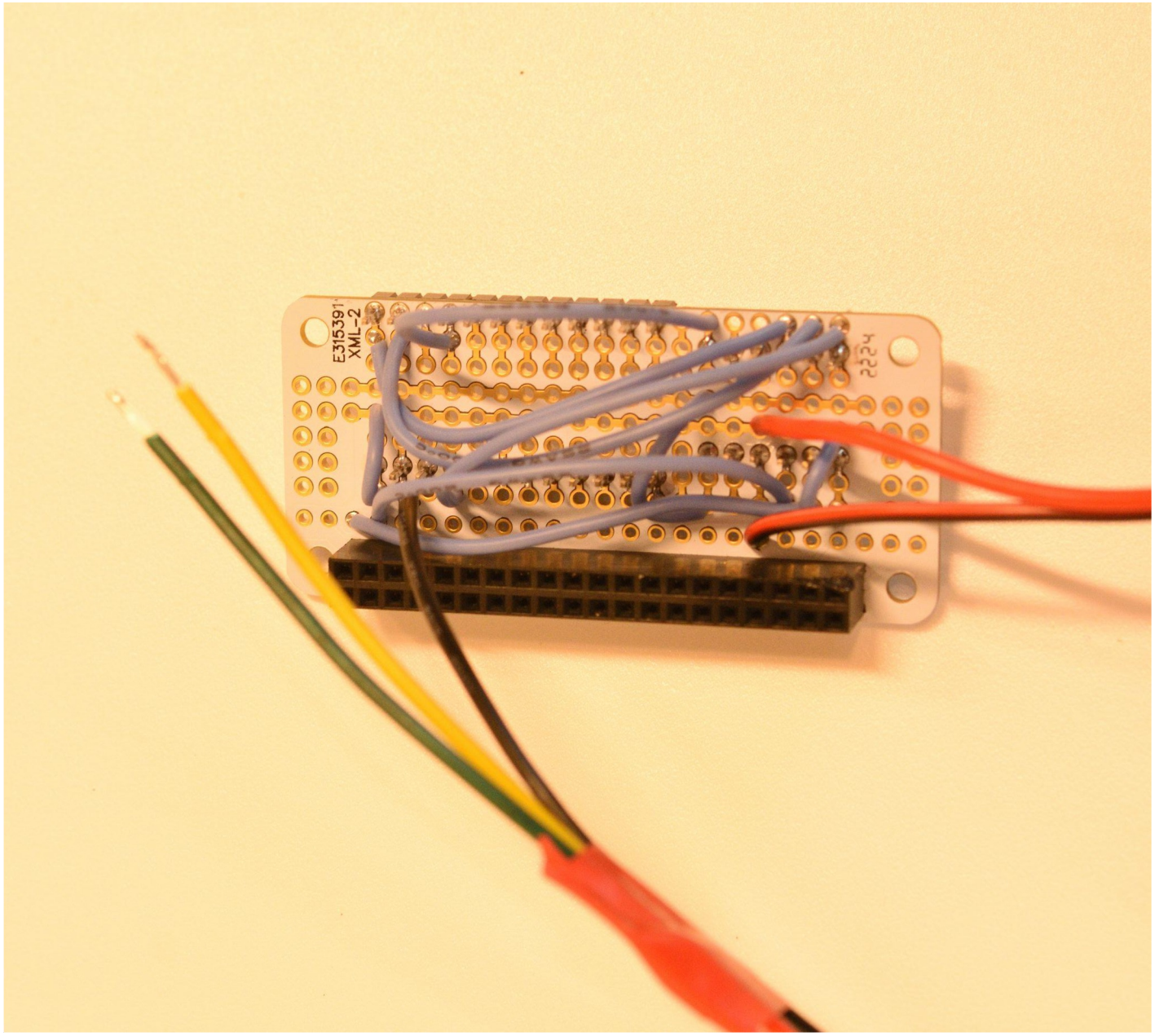


15 The black wire is going to gpi0 and the red wire on the switch is going to the 3.3 volt line

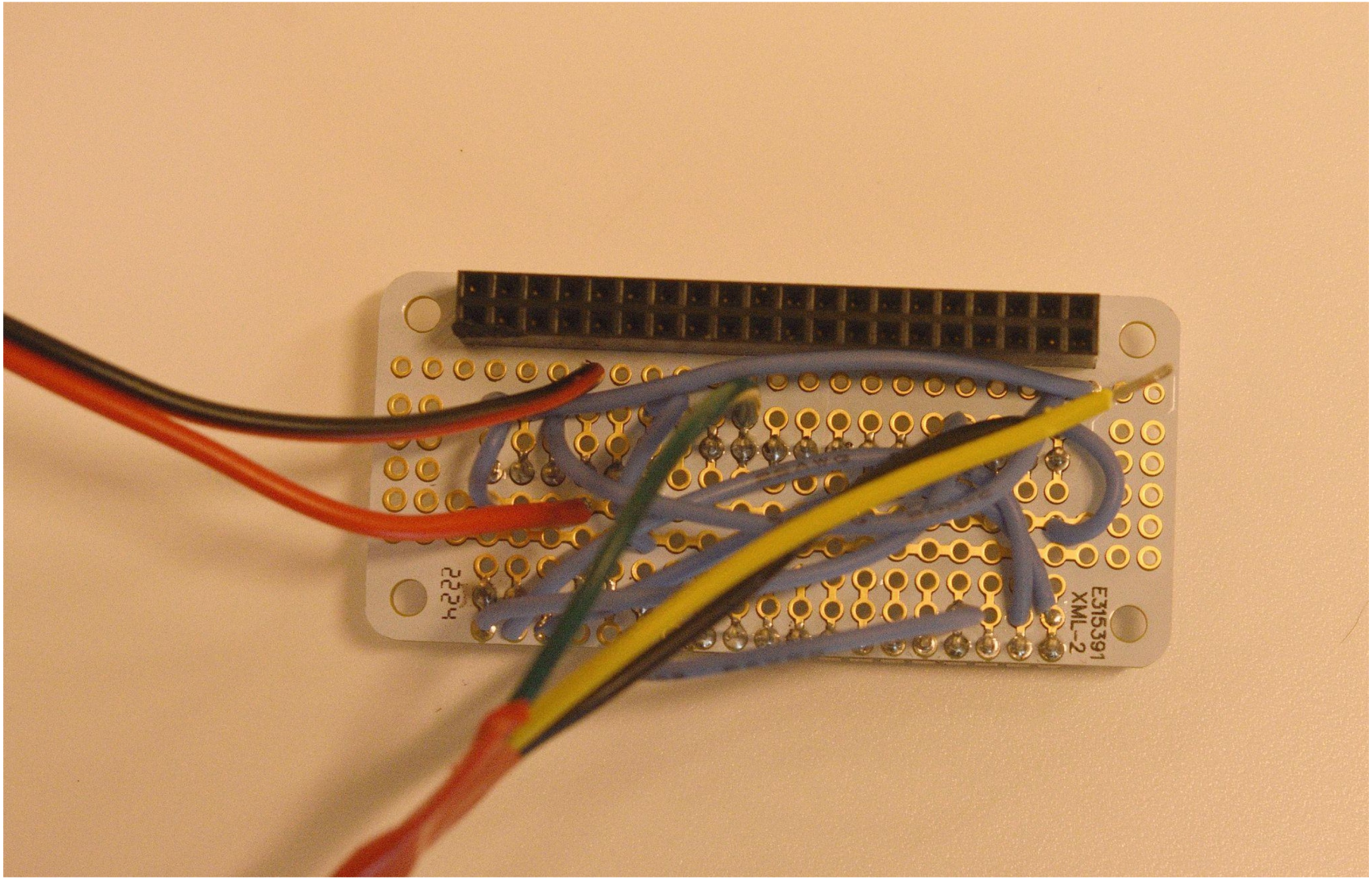
16. App called Touch OSC – this is how to get the readings off the sensor, it's also how you set all the settings on the Raspberry Pi. OSC is a protocol for making GUIs for anything, you can make interfaces for projects. The old one "original" is needed



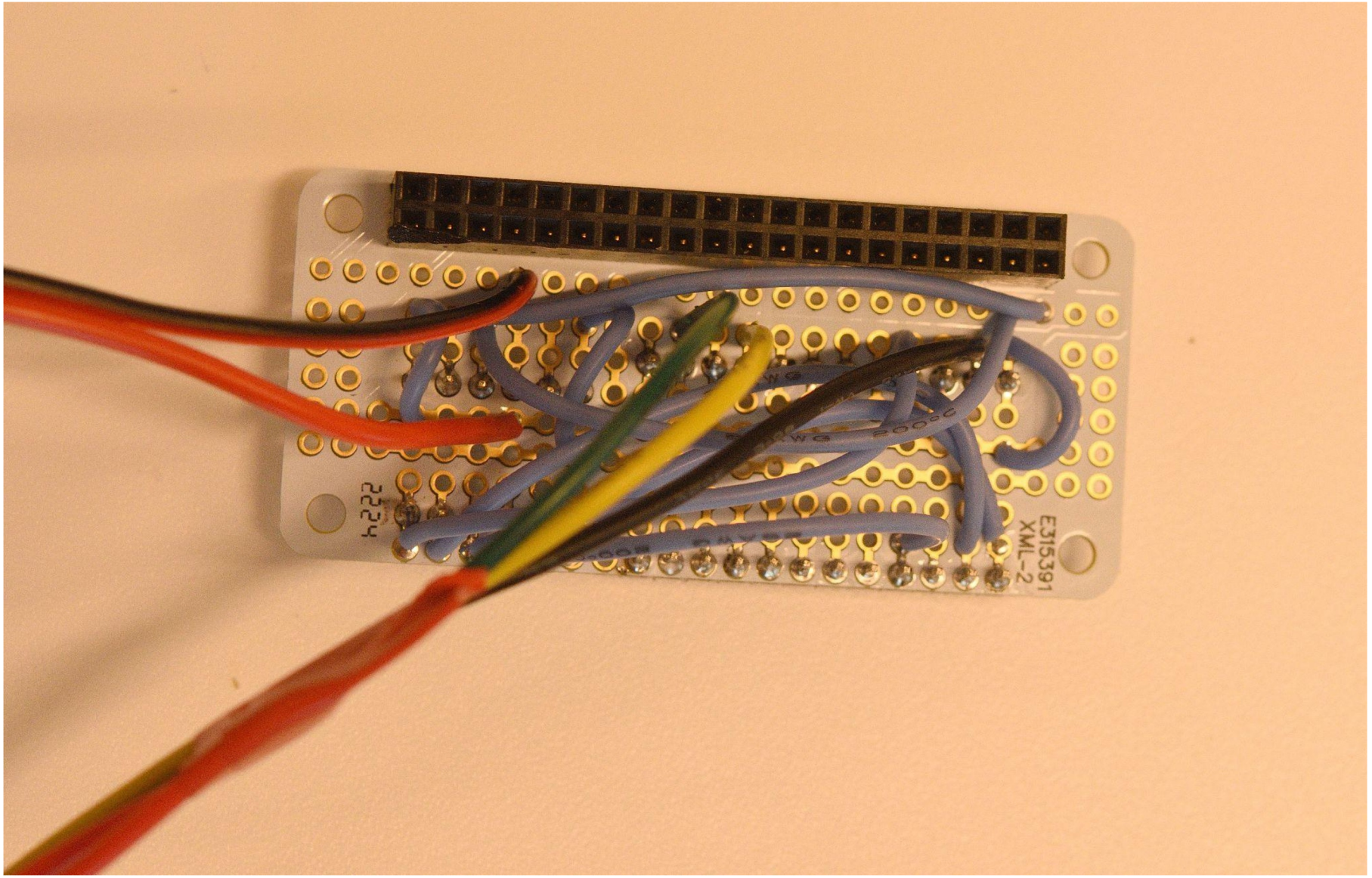
17 The firevolt wire for the LED also needs taping up to keep the wires tidy (the colours will vary from product to product, they are not relevant).



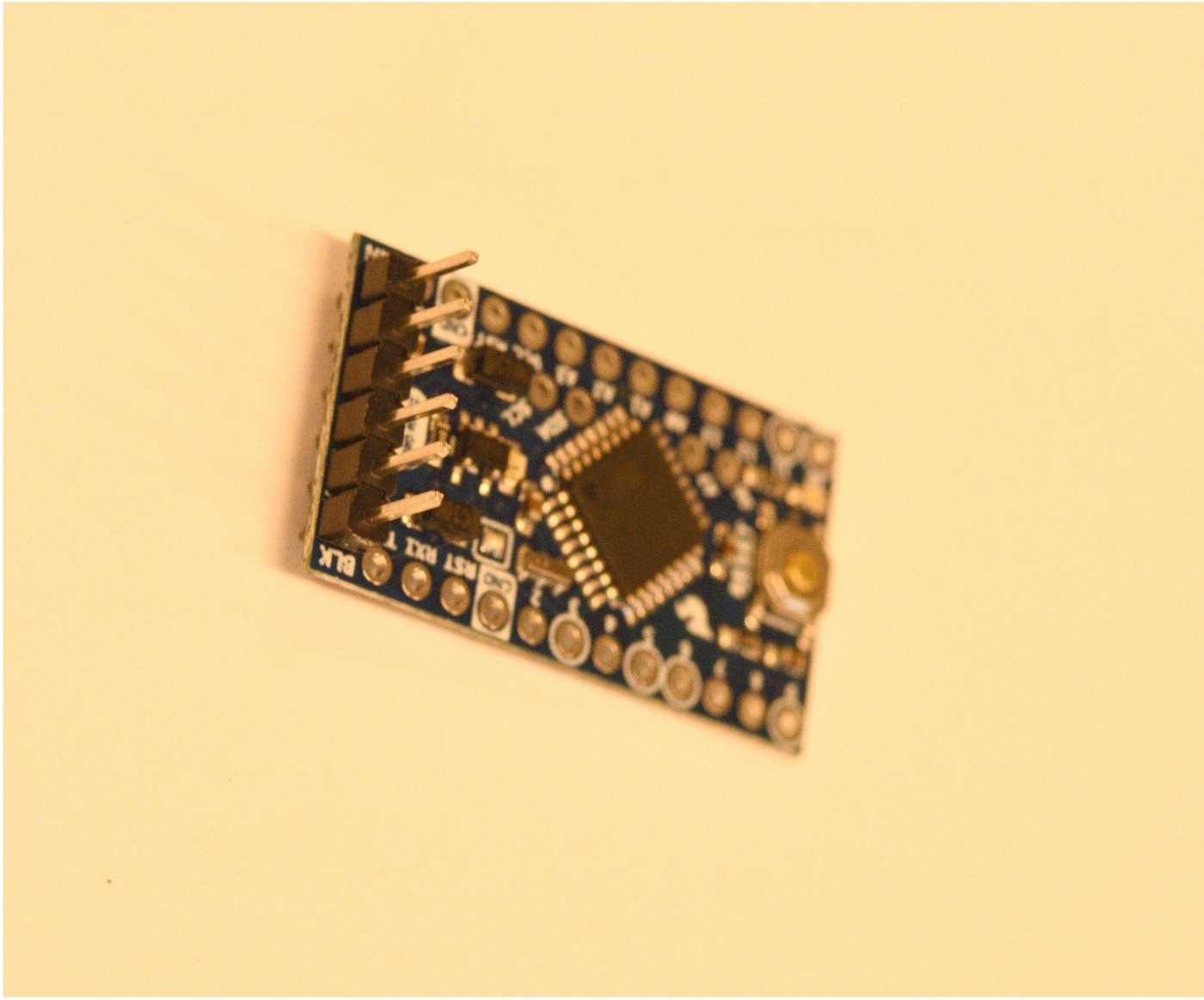
18 The next wire is connection ground of the LEDs to ground on the LED strip.Then Ground on the Arduino to ground on the data line of the LEDs



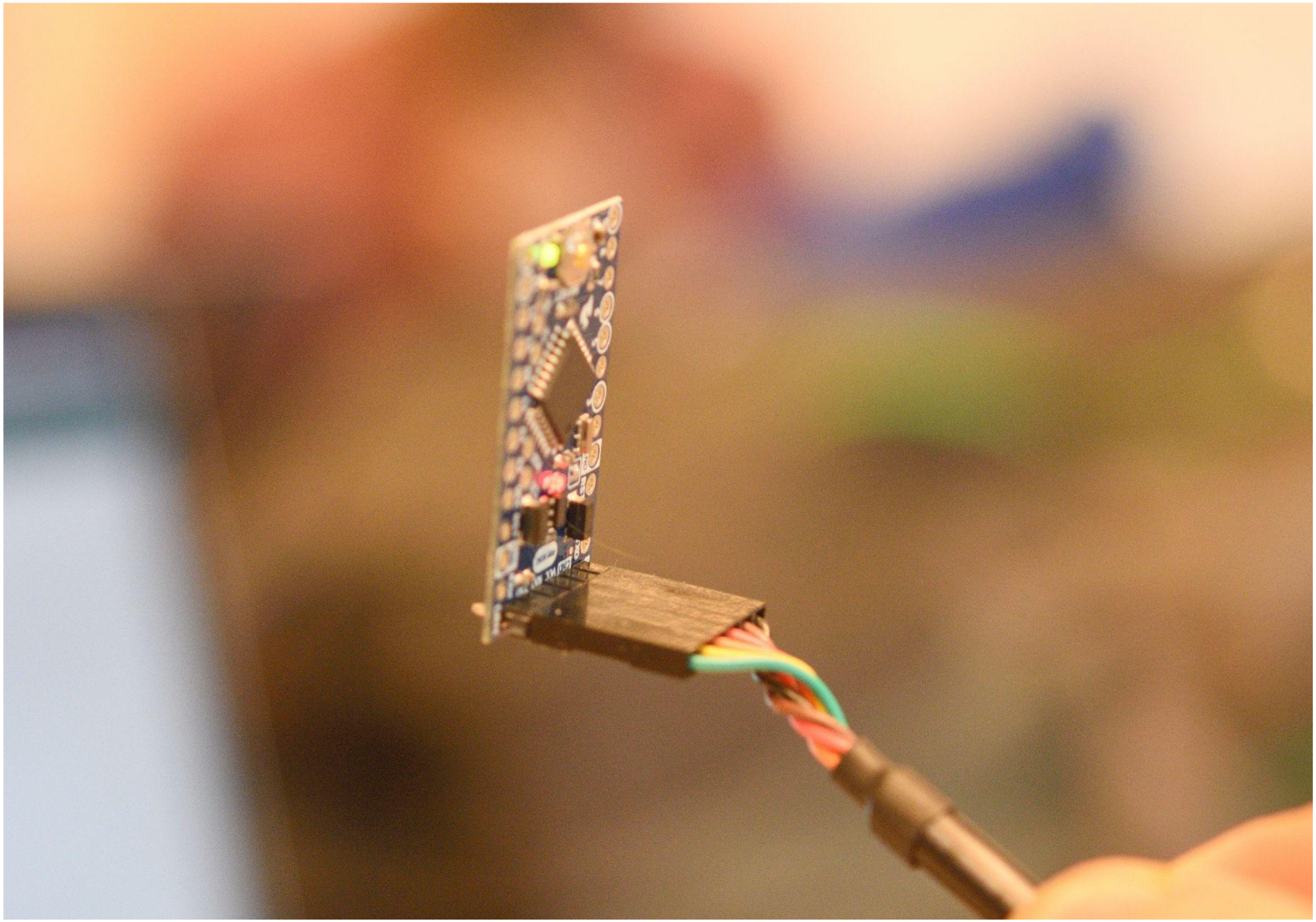
19 Next is pin 11 on the Arduino to SDI on the data line



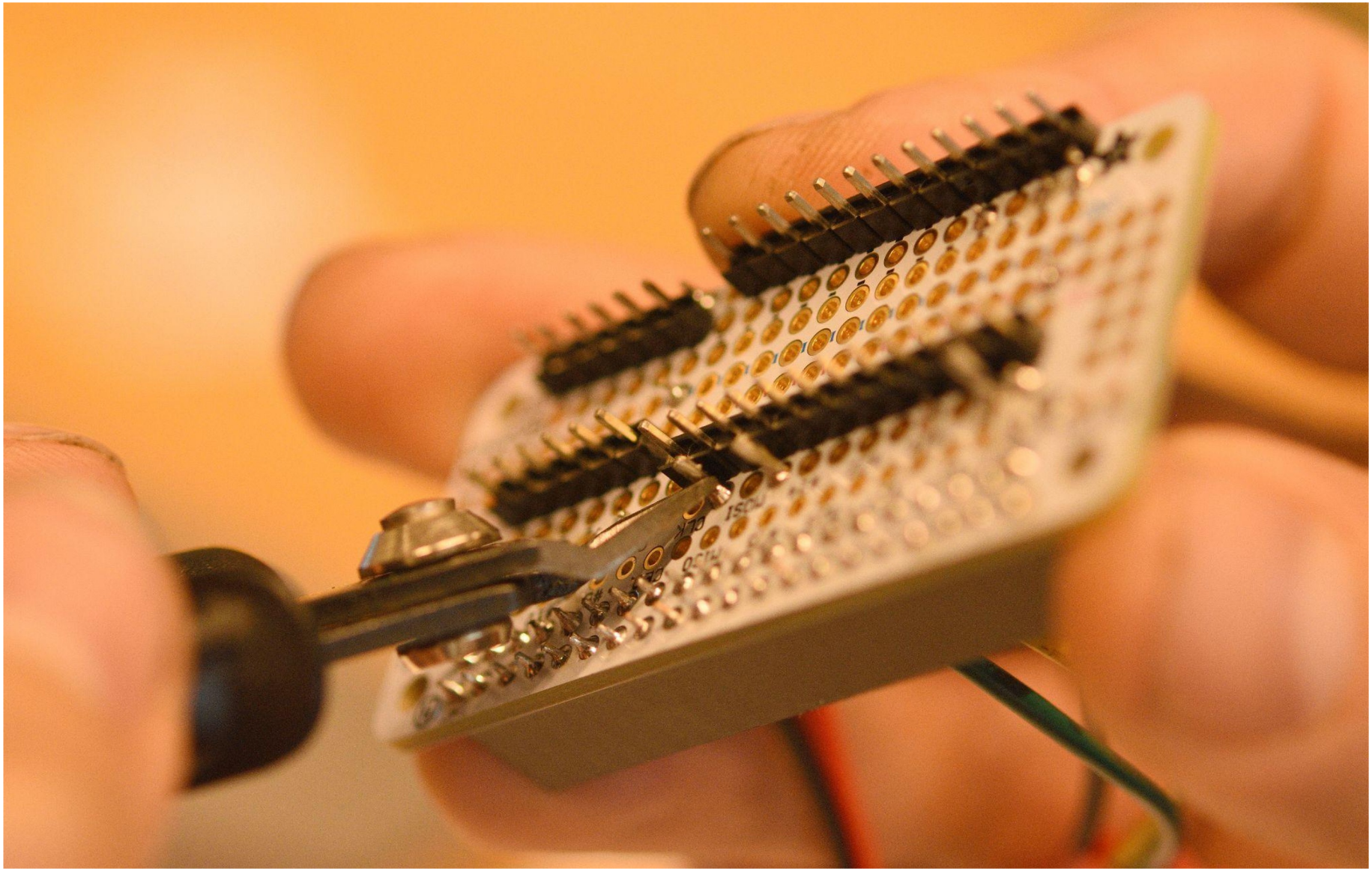
20 Pin 13 to clock on the LED data line



21 Stick the header on the Arduino



22 Flash the Arduino with the source code that Robin will supply.



23 The bare minimum needed on the Arduino is the chip and the voltage regulator, and you programme them with these special cables which are 5 or 10 quid

1.I.D. header strip , make sure that the pins are poking through to the side with the text on
2.It's always best with this to solder one pin in the corner and test that it's not bent, and if it's not flat then I solder the pin in the other corner, and then just go very quickly along the row.When soldering, less is more, more solder does not make a better joing. Solder one side, heat the pin, and then go to the other side of the pin, and get a nice pyramid shape to the pin. If you get a flat joint it's not good.
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4. Test that you have it right by placing the Arduino boards on top and checking that they fit in the pin – the level shifter. Robin has tried to do it with less bits but didn't get it working

8. 5-Flip it on its back you can see that its flat – solder one top corner of each to make sure the plastic is flat. Make sure that the plastic around the headers are straight and flat, and then the rest can be soldered in.
9. When that bit is done you flip it on its back – the first bit that will be soldered in is the low voltage side of the level shifter to the 3.3 volt line of the Raspberry Pi. Cut three short sections of wire to measure at the same length, strip off the plastic to expose the copper at each end, diagram to show exactly where they go . (5th passage)
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11. The five voltage line from the Raspberry Pi goes into connection for the Arduino.

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13. Transmit on the Raspberry Pi to A1 on the bi-directional board, connecting the serial ports of the Pi and Arduino so we can send commands, via the level shifter because the Pi is a 3.3 volts to the Arduino with is 5 volts.
14. So the new wire is connectiong A2 on the level shifter to receive on (3 in on one side, 2 in on the other side) (5th wire)
15. The 6th wire is connecting the high voltage side of the level shifter to Vcc (5 volt line) on the Arduino
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19. Next is the trigger cable,
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21. The black wire is going to gpi0 and the red wire on the switch is going to the 3.3 volt line
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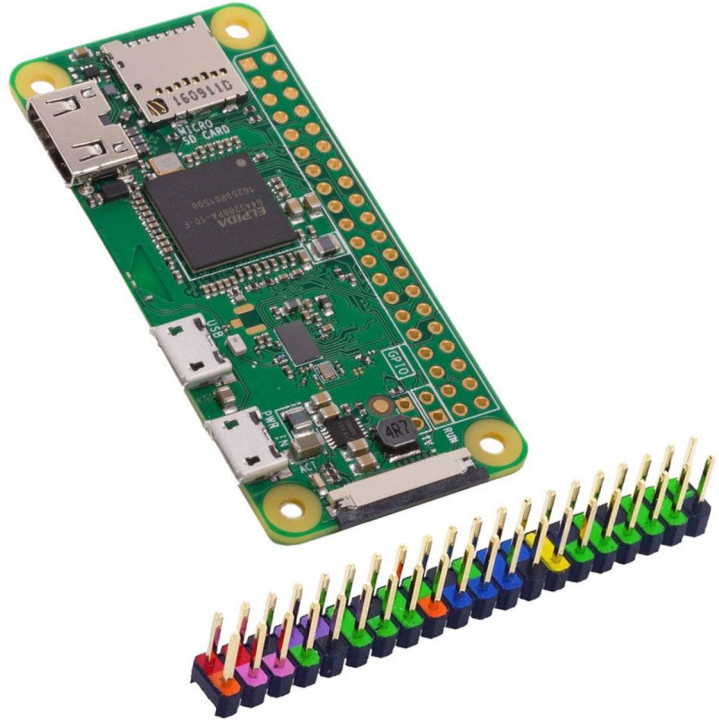
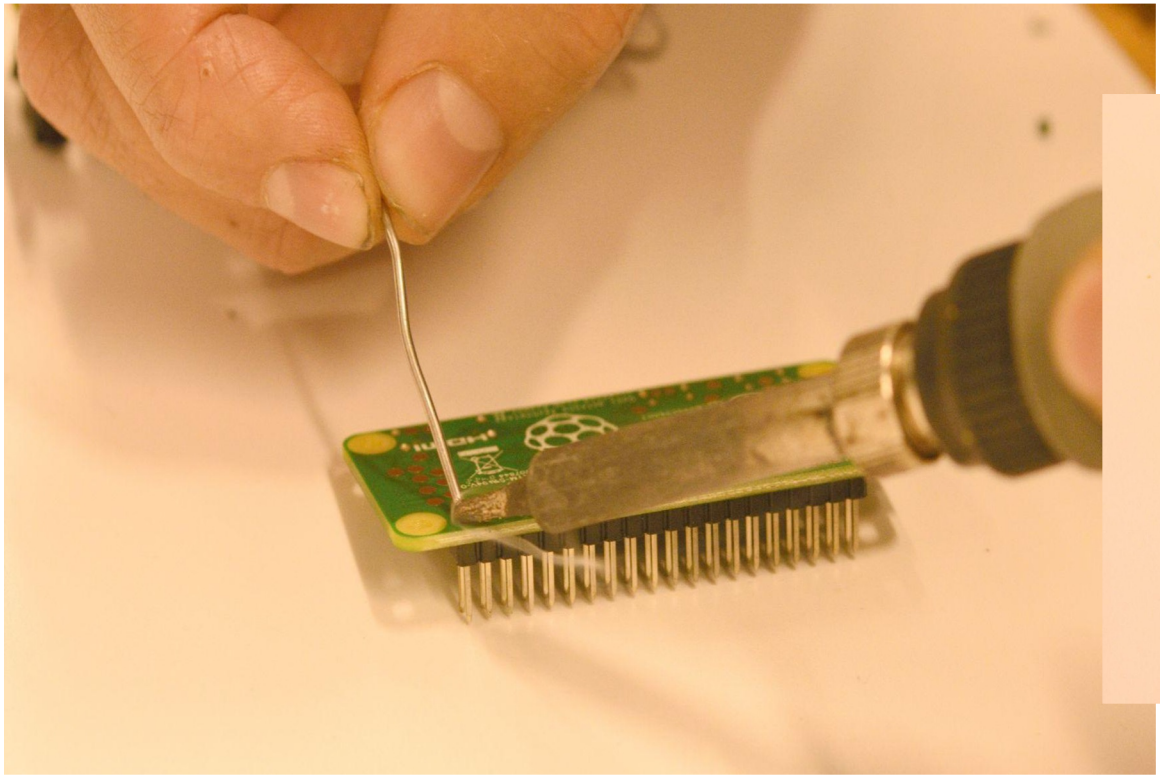
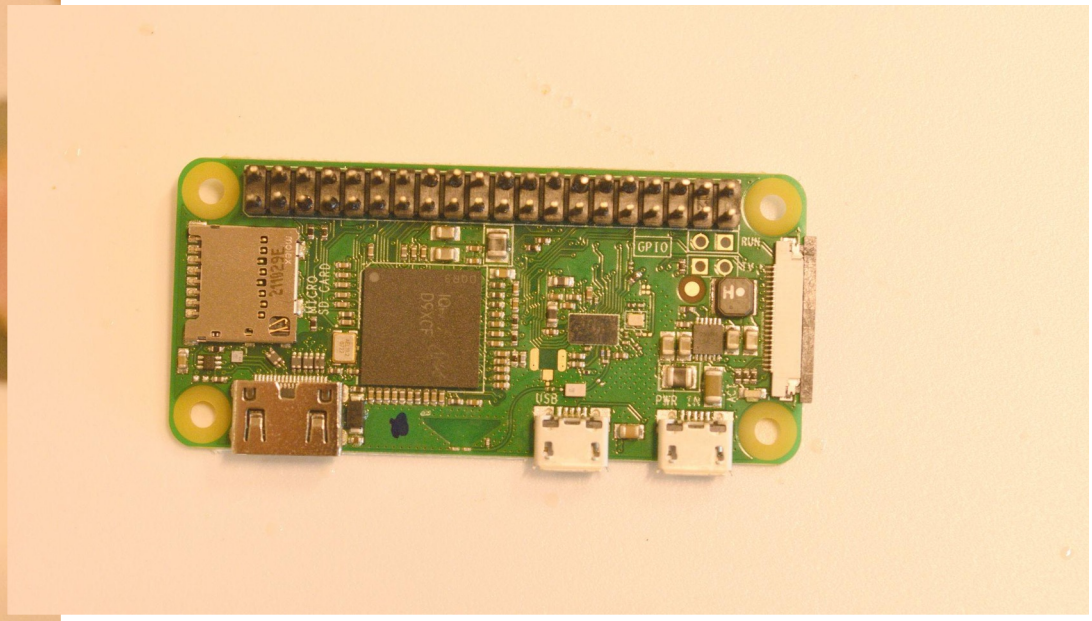
25. Then Ground on the Arduino to ground on the data line of the LEDs
26. Next is pin 11 on the Arduino to SDI on the data line
27. Pin 13 to clock on the LED data line
28. Stick the header on the Arduino
29. Flash the Arduino with the source code that Robin will supply.
30. The bare minimum needed on the Arduino is the chip and the voltage regulator, and you programme them with these special cables which are 5 or 10 quid
31. Trim the excess wire where they might prevent the board from being flat, and then you can fit the level shifter and the Arduino on top, and solder them in

Preparing the Raspberry Pi

Het Raspberry Pi voorbereiden

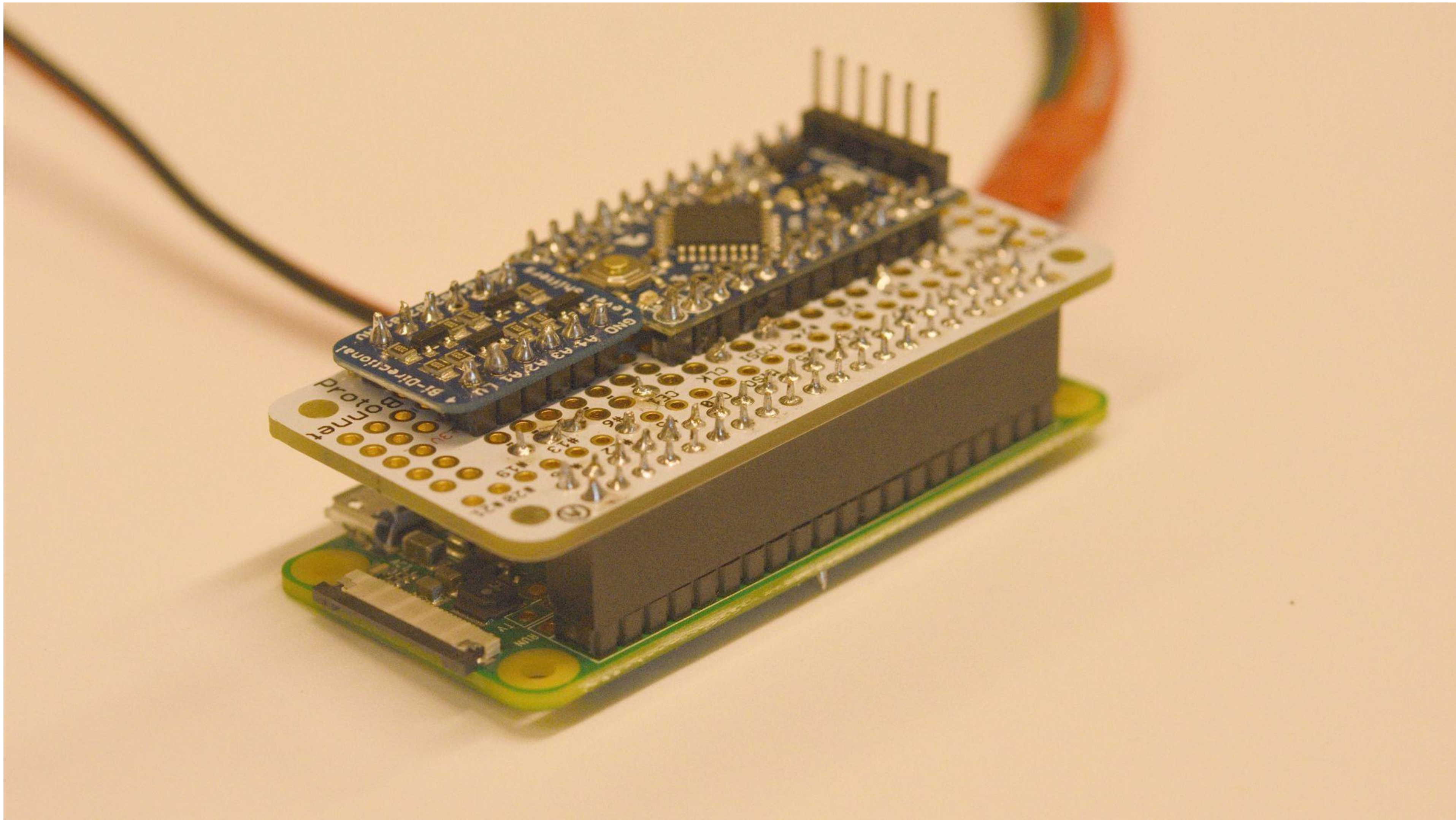


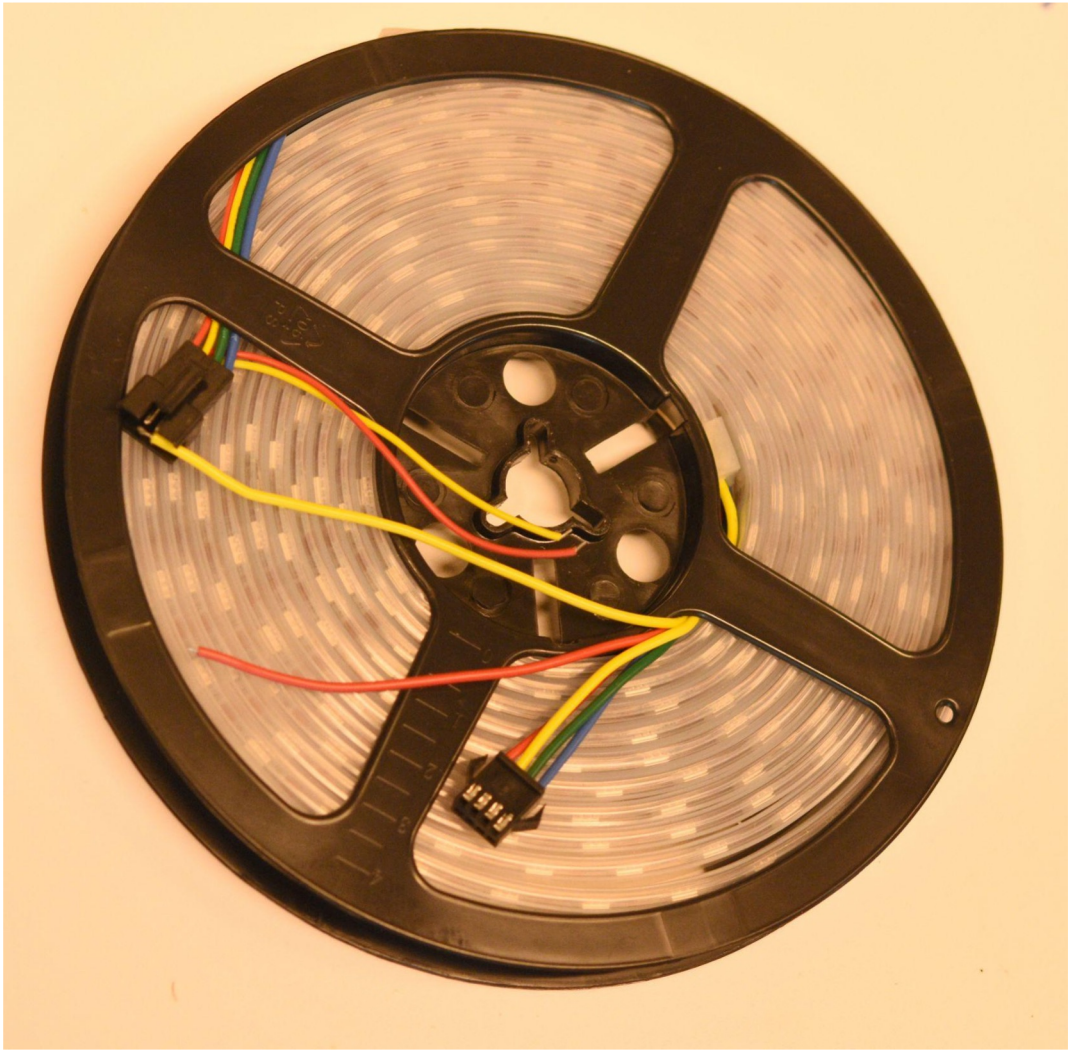




We start with soldering the header strip on the Pi so that that it is stable and doesn’t rock around

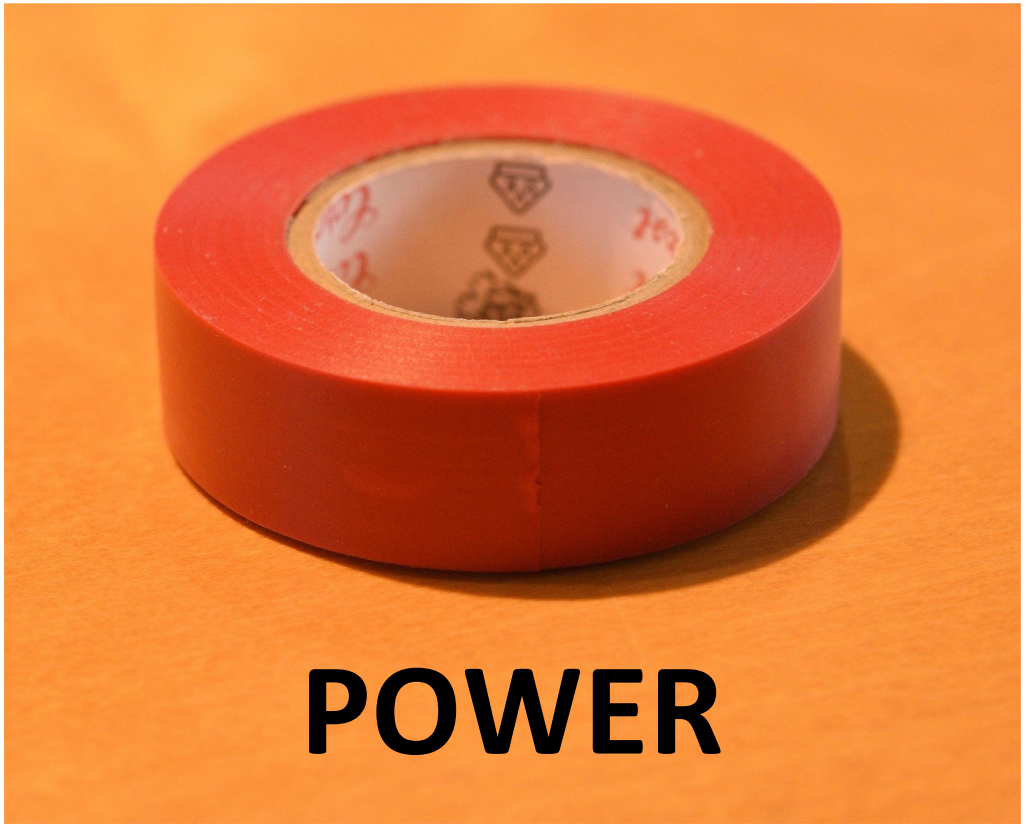
We beginnen met het solderen van de header strip aan de Raspberry Pi om het stabiel te maken


Bi-Directional
GND



Take a two meter LED strip. In this next step we are going to make sure that the strip is powered.

Neem een LED-strip van 2 meter. In de volgende stap gaan we deze van stroom voorzien

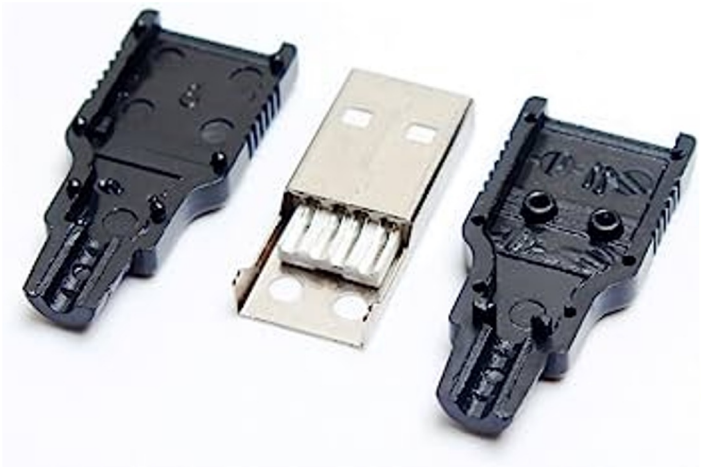


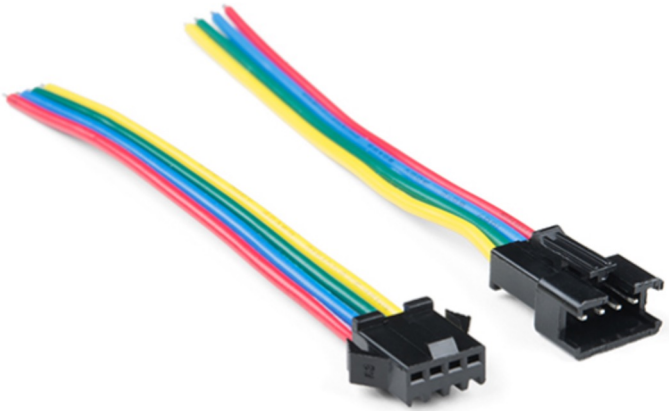
Have two colours of insulation tape handy - we will use the red tape for the power cord, and the black tape for the data cord - this will help keep all of the elements clear and help you not plug in the wrong cables by accident. Getting it wrong won't hurt per se, but it also won't help.

We gaan twee kleuren isolatietape gebruiken: zwart voor data, rood voor stroom. Zo kunnen we later de verschillende kabels goed uit elkaar houden.

Building the Power Cable

De Stroomkabel maken



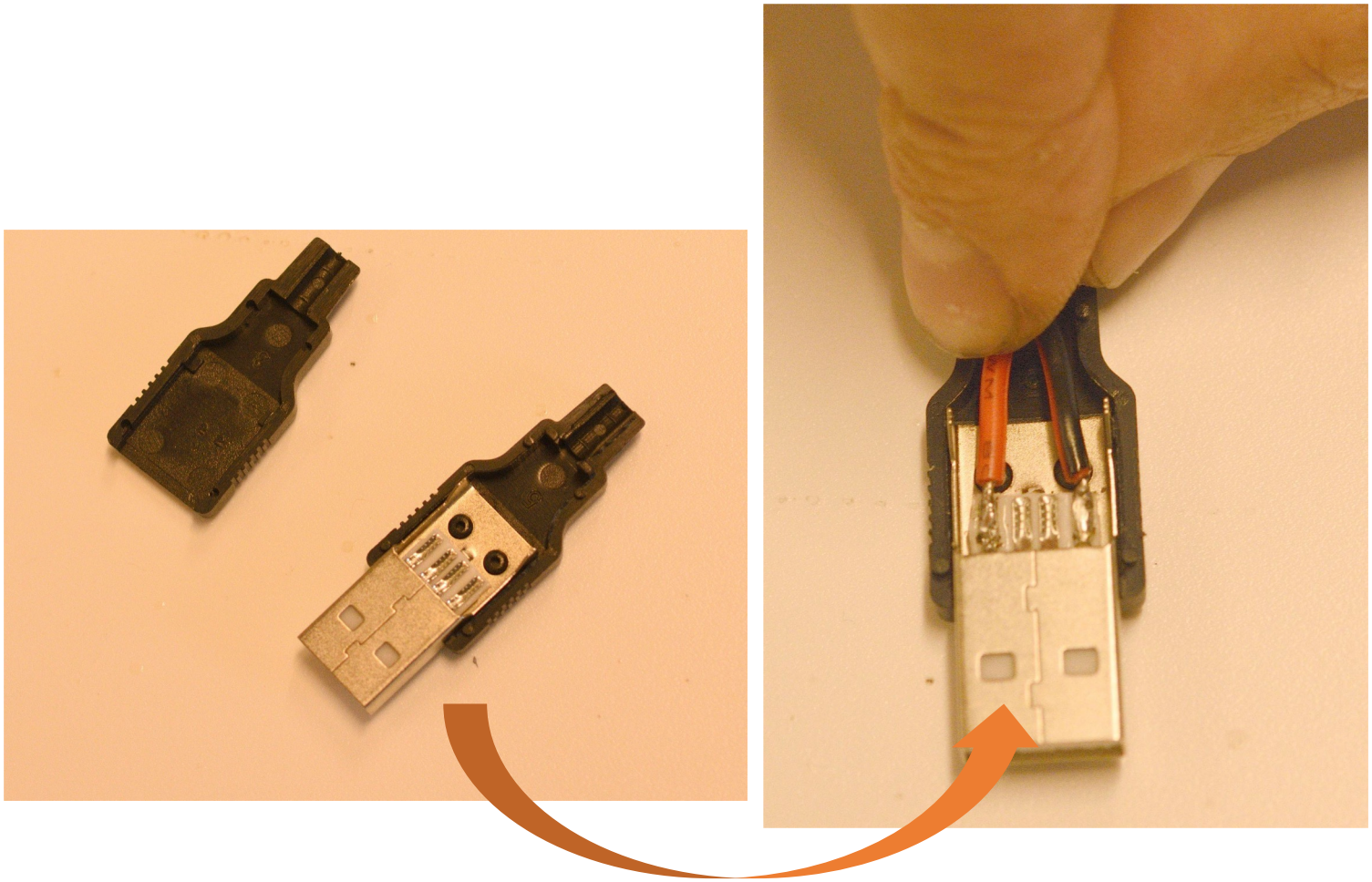


hip height

ankle height

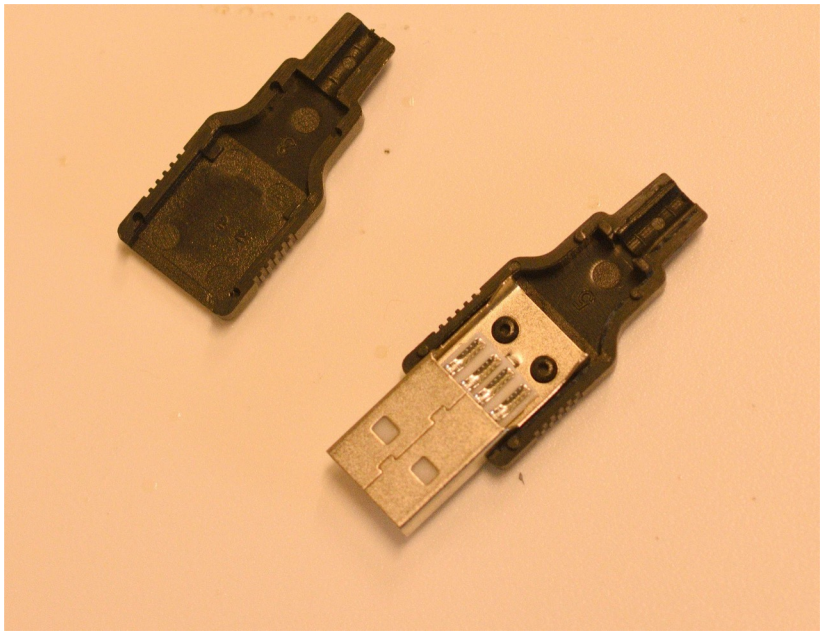
Cut a meter and a half of the power wire – approximately the length of your leg so that the power bar in you pocket doesn't have a wire trailing too far behind you (you don't want it blowing around and getting caught on stuff).

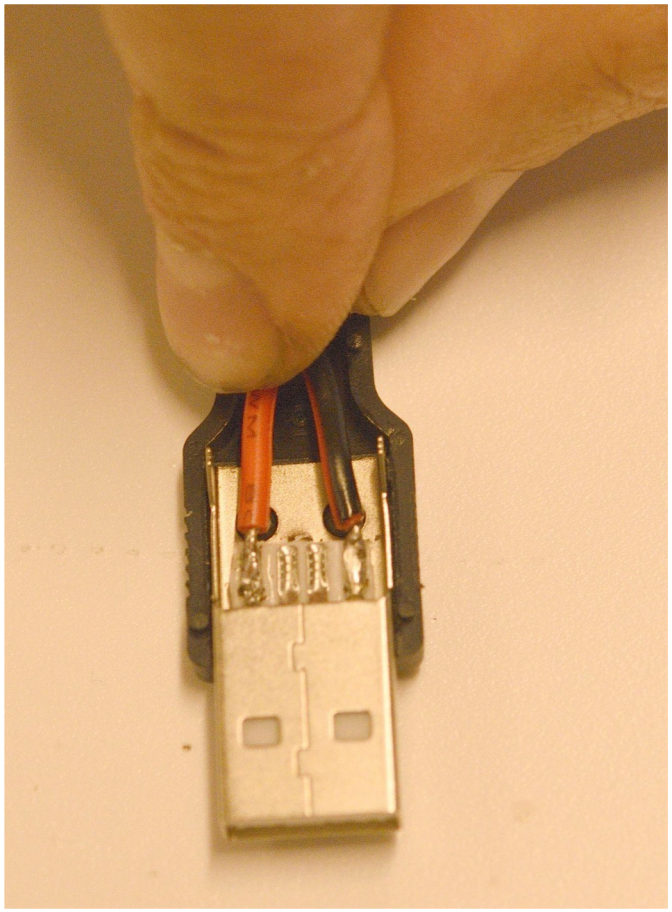
Knip ongeveer anderhalve meter aan draad af (ongeveer de lengte van je been). Deze draad gaat van de onderkant van de LED-strip naar een powerbank in je broekzak. De draad moet dus lang genoeg zijn. Maar ook niet zo lang dat je erover struikelt!



One side of the wire needs to be connected to a USB head. Solder the wire to the USB-head as shown in the picture.

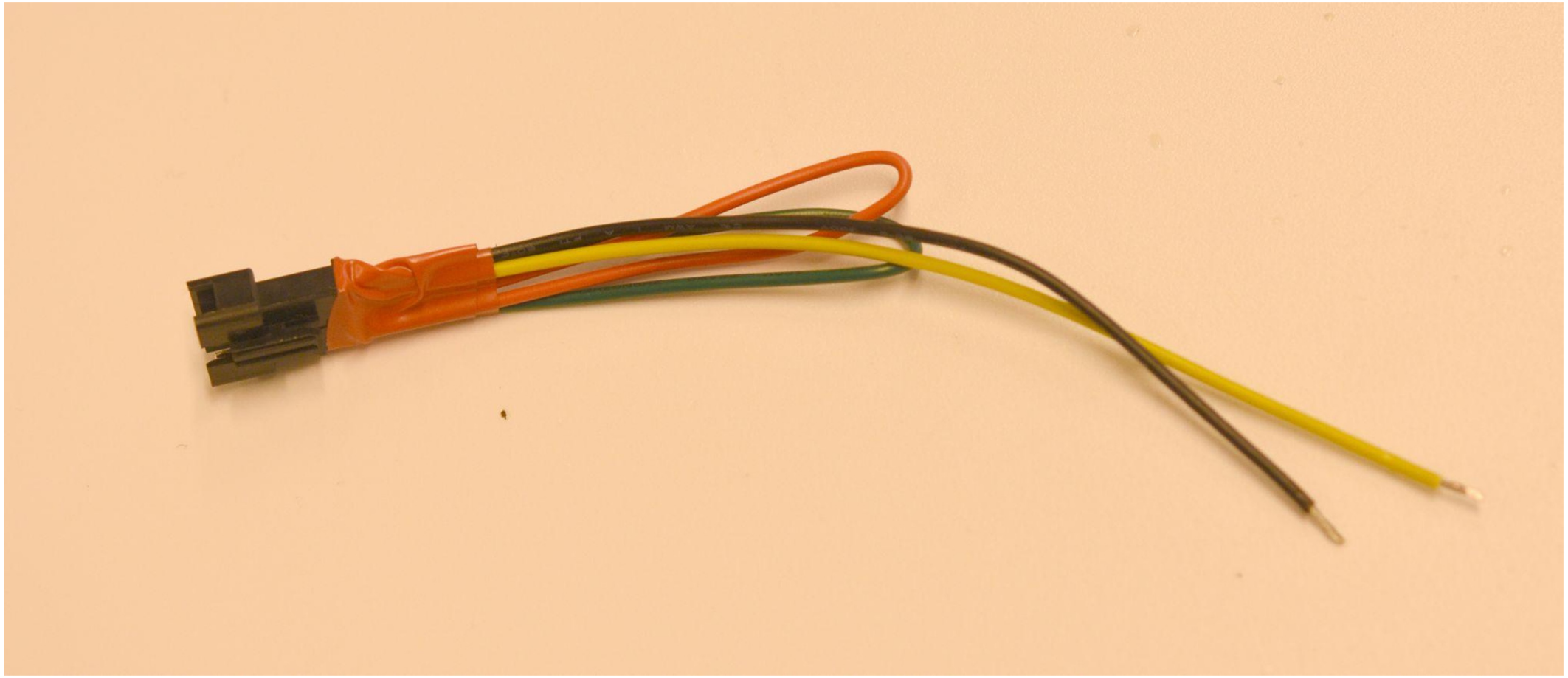
De ene kant van de draad moet verbonden worden aan een USB-aansluiting. Soldeer de draad aan de USB-aansluiting zoals aangegeven op het plaatje.





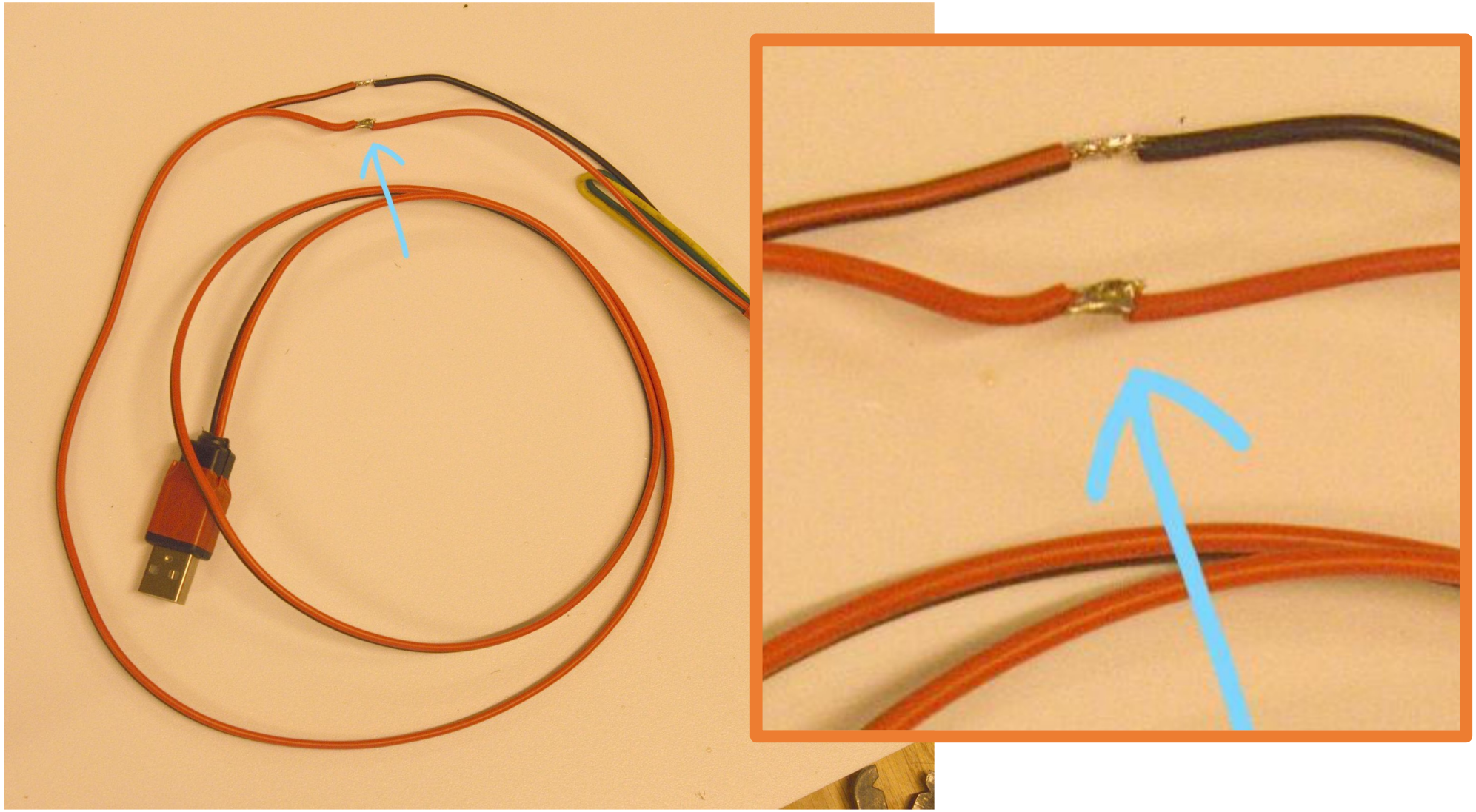
Now you can tape the head together with red tape (so we know it’s the power cable)

Nu kan je de USB- dichttapen met rode tape (zo weten we dat het de stroomkabel is)



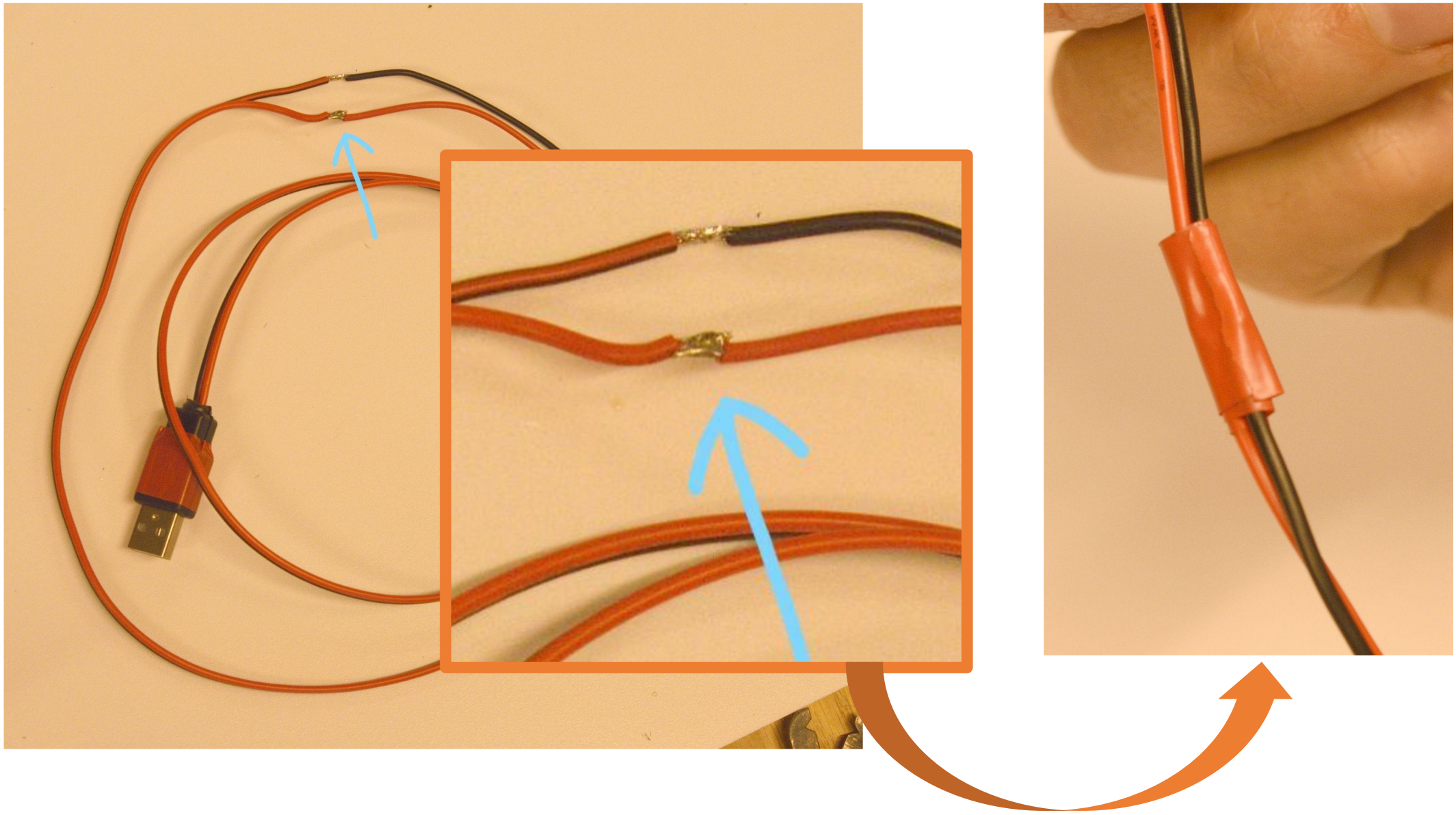
The other side of the power wire needs to be connected to a LED-connector. But we need only 2 cables of that connector. Fold the other cables backwards and tape them so they won't get loose

De andere kant van de stroomkabel moet verbonden worden aan een LED-connector. We hebben daar maar twee kabels van nodig dus vouw de anderen terug en tape ze vast zodat ze niet meer loskomen.



Solder the red wire to the red wire and solder the yellow wire to the red/black wire

Soldeer de rode draad aan de rode draad en de gele draad aan de zwarte draad

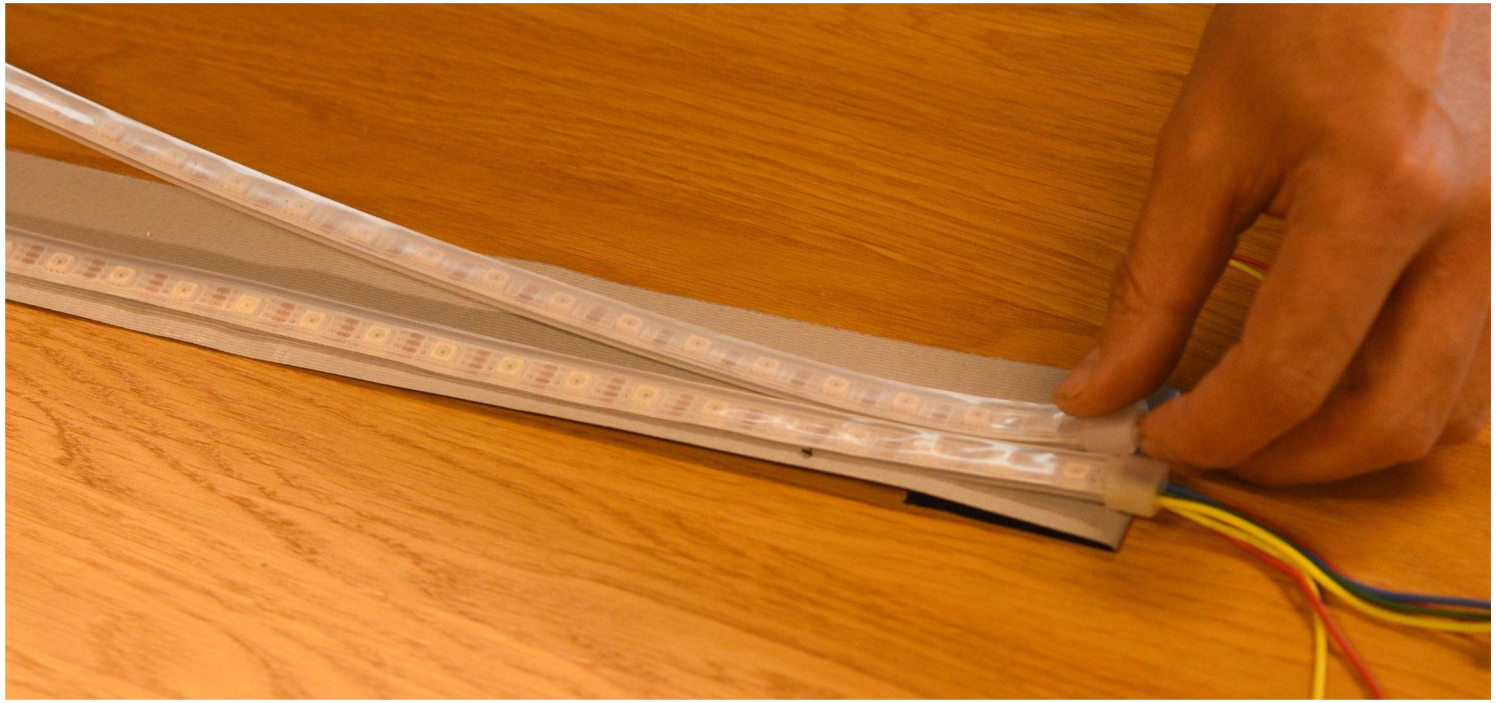


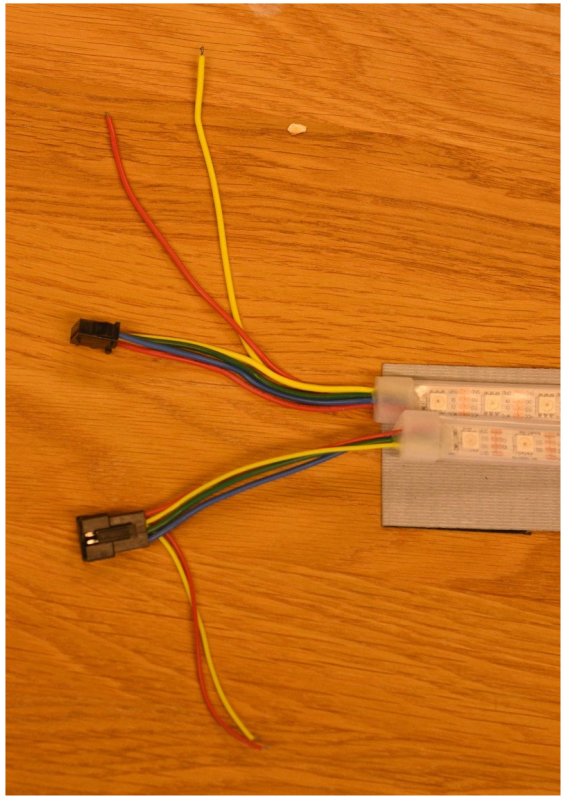
Tape each of these soldered wires separately with red tape so they don’t touch. Then tape them together. The power cable is done!

Tape rond de gesoldeerde draden zodat ze elkaar niet kunnen aanraken. Daarna kan je de draden aan elkaar tapen. De stroomkabel is klaar!

Building the LED strip

De LED-strip maken



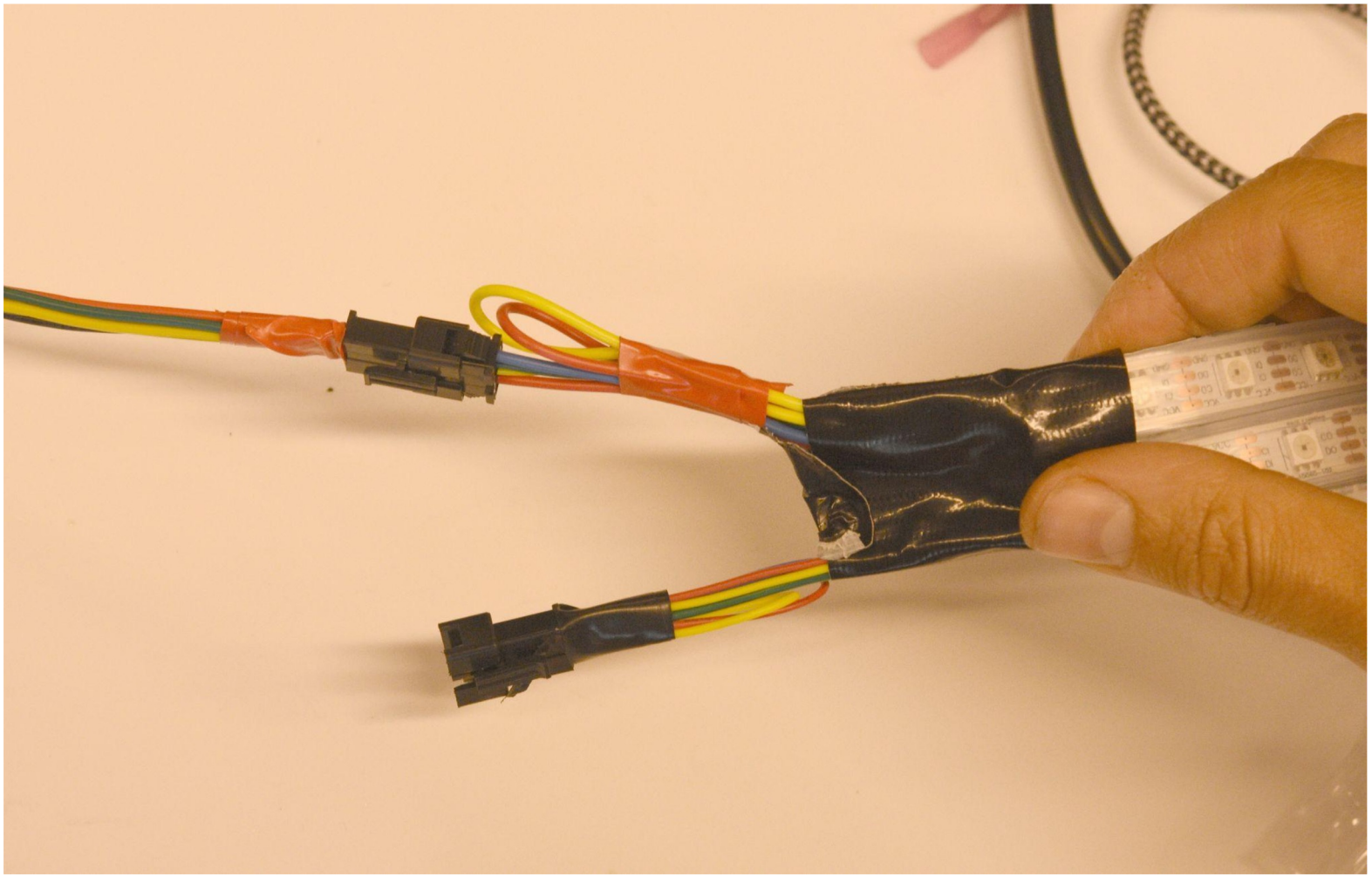


Roll out the LED-strip and lay it flat. Loop it around at the top so it comes back. Roll out about one meter of gaffer tape and lay it sticky side up. Put the LED-strip on the tape: make sure that they are not aligned!

Rol de LED-strip van de spoel af. Buig hem in het midden zodat beide kanten met draden aan dezelfde kant zitten. Rol ongeveer een meter aan zwarte ducttape uit en leg het met de plakkand naar boven. Plak de LED-strip op de tape: maar zorg ervoor dat de LED's niet precies naast elkaar zitten!

Cut the excess gaffer tape on the sided of the LED-strips. Tape-off the bended end so it doesn’t go loose.

Knip de overige tape aan de zijkanten van de LED-strips af. Tape ook het uiteinde van de LED-strip (het gebogen gedeelte) zodat dat niet losraakt.

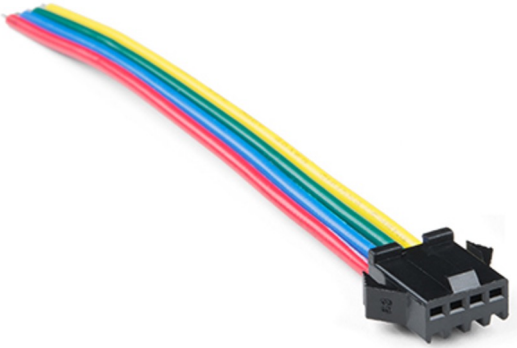


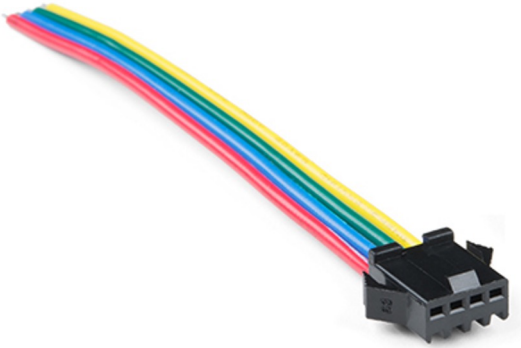
Tape the wired part of the LED-strip as well so it’s well protected!

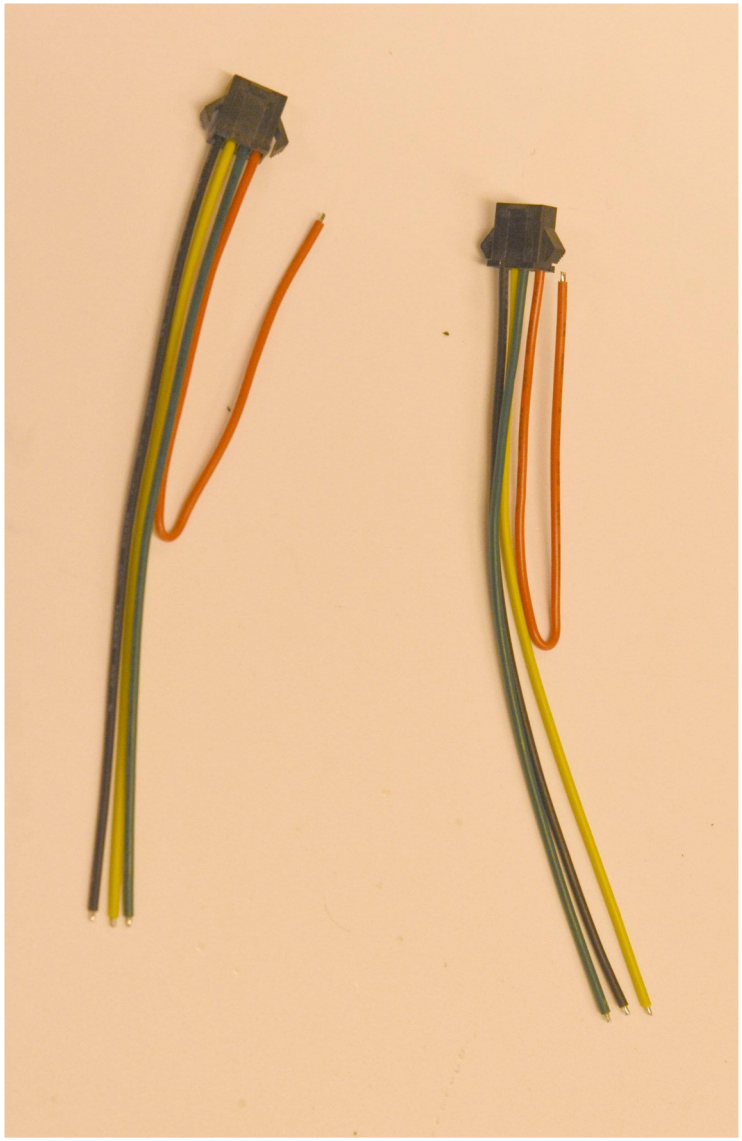
Tape ook de bedrade zijde van de LED-strip zodat deze goed beschermd is.

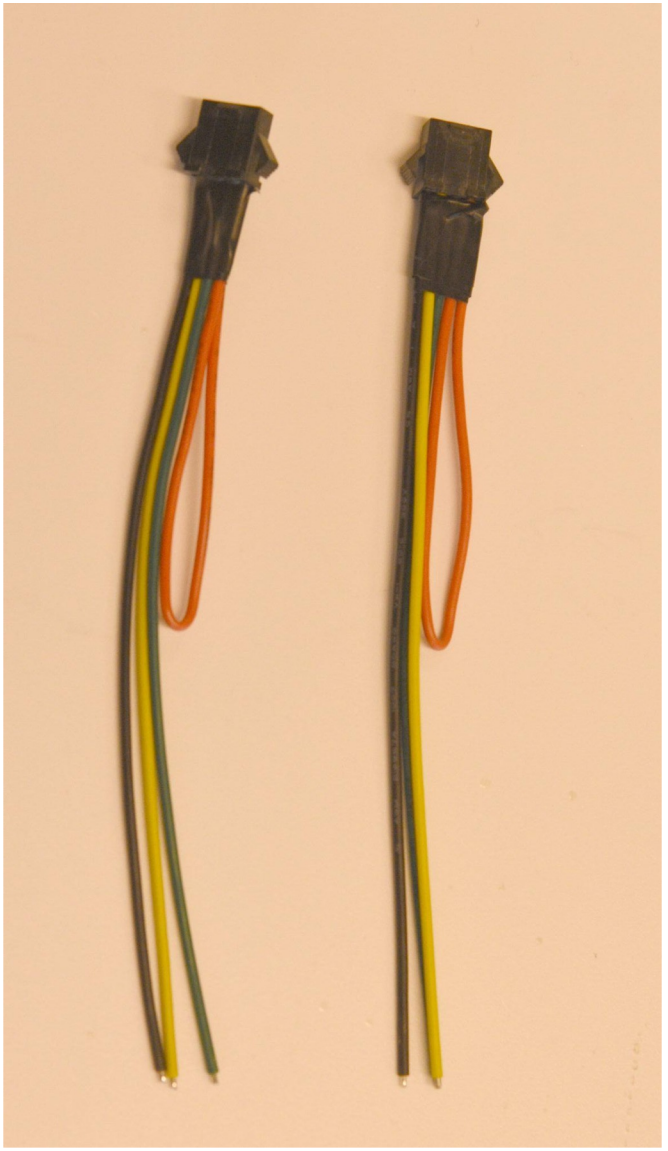
Building the Data Cable

De Datakabel maken







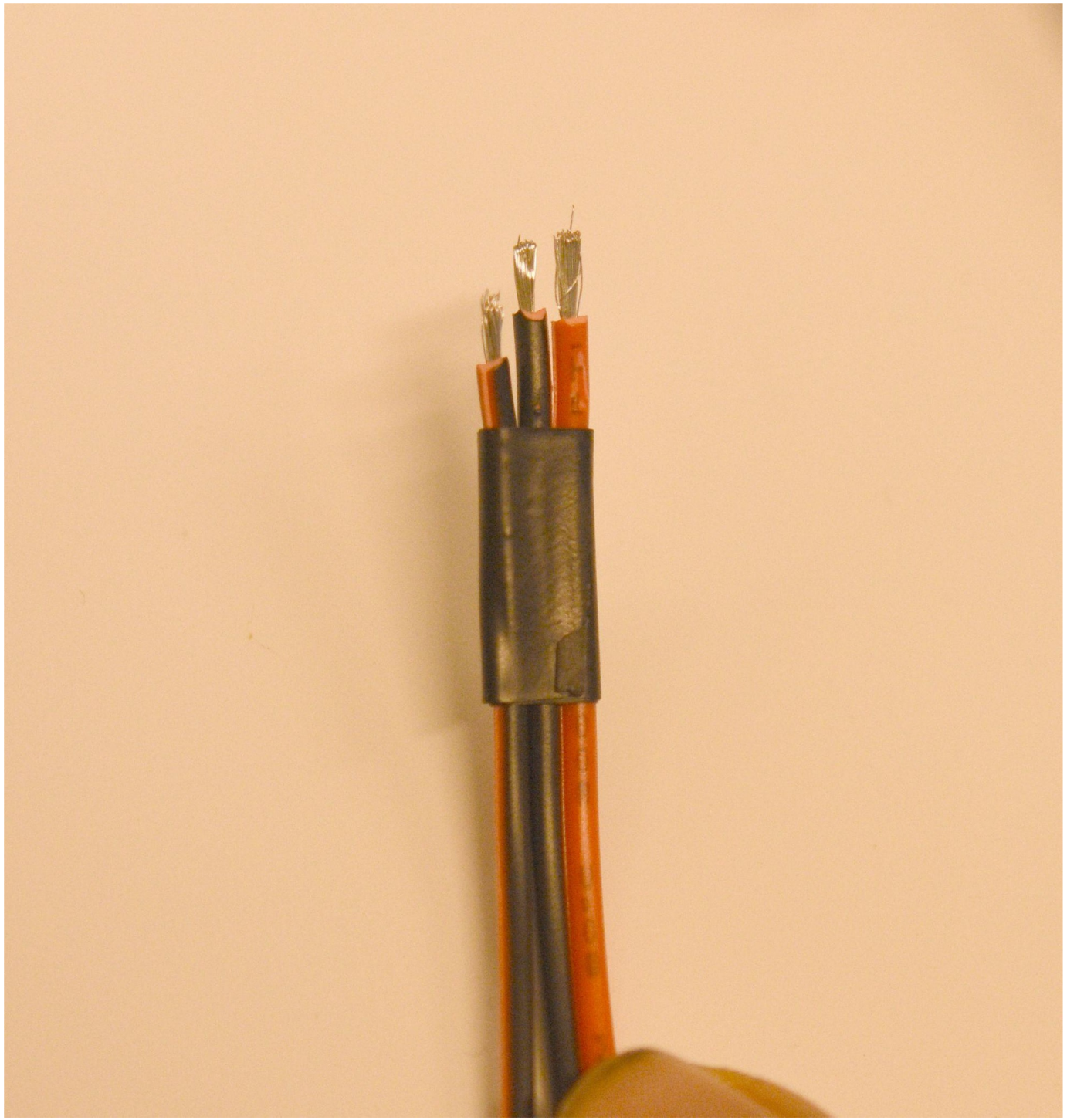


To make the data cable, take two female LED cable heads, fold up the ends and use black insulation tape to colour code the cable.

Om de datakabel te maken hebben we twee LED kabel connectors nodig. We hebben maar 3 van de vier kabels nodig dus vouw de rode naar achter en tape de kabel uit de weg met zwarte tape.

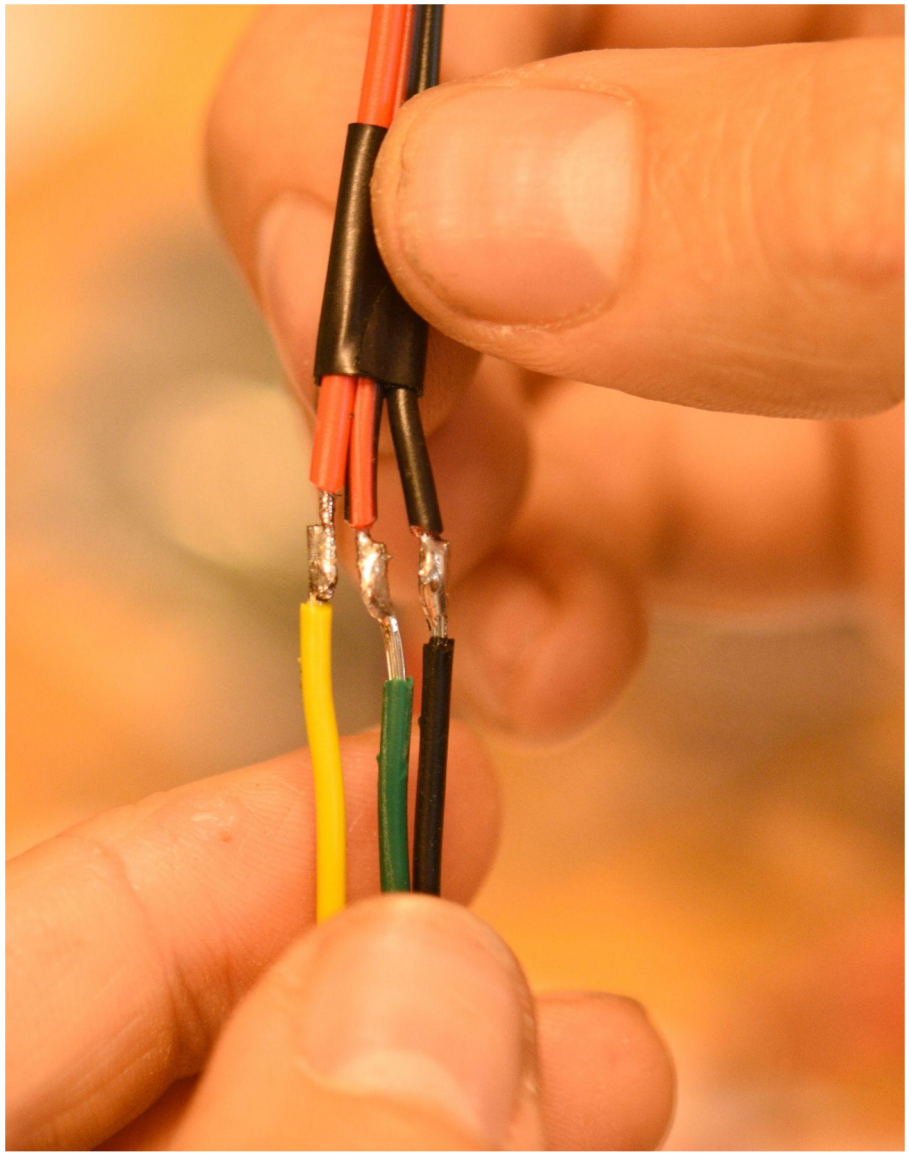
Cut a cable as long as your elbow to your ankle. We need three wires in total, so either cut twice, or share with a neighbour!

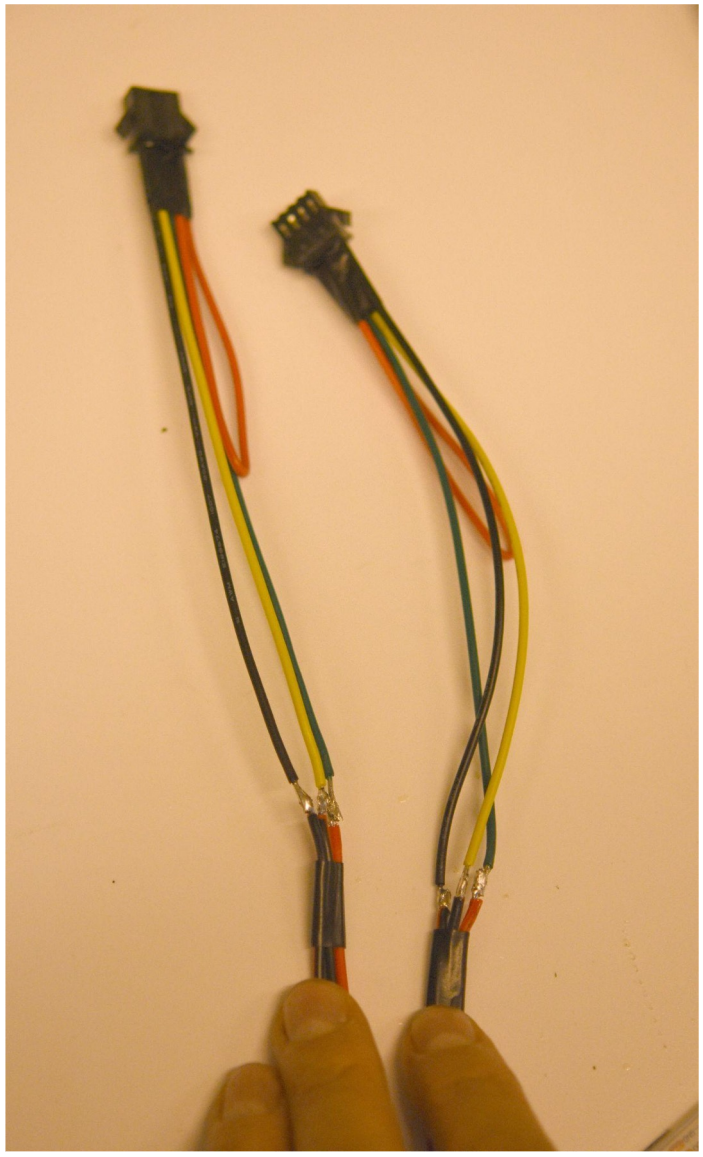
Knip een kabel ongeveer tot de lengte van je elleboog tot je enkel. We hebben in totaal 3 draden nodig dus knip twee keer of deel een kabel met een buurman!



Tape the outside of the cable for better cable management

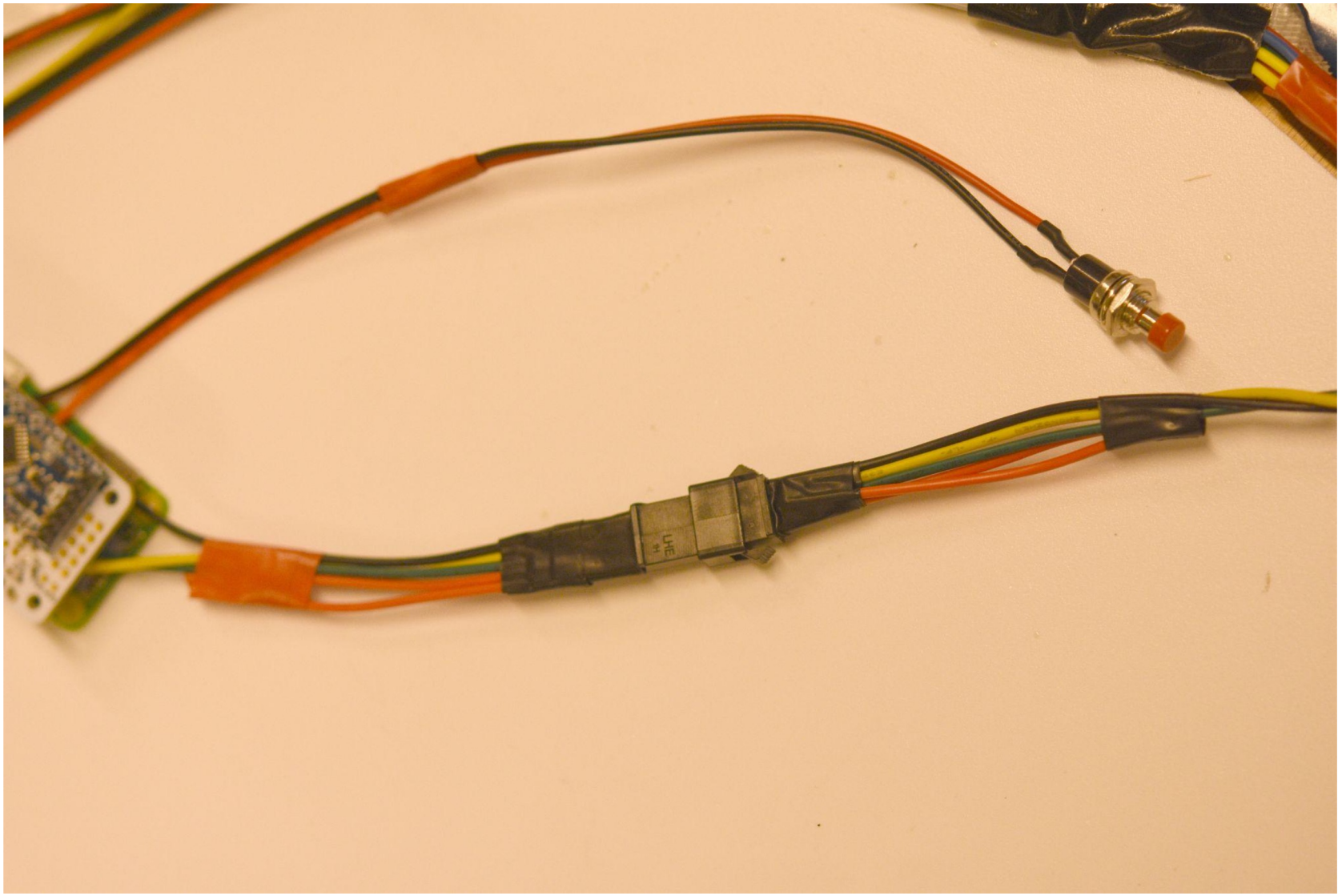
Tape de draadjes samen zodat ze makkelijker te hanteren zijn!





Solder the wires to the LED-connectors on both sides. Then tape them over for protection!

Soldeer de draden aan de LED-connectoren aan beide kanten. Tape ze daarna over zodat ze goed beschermd zijn!



Plug it all in!

Plug het allemaal in!

- Power ground at the USB end, after having soldered the wires. The female LED connector is now connected to the power ground – red to red and black to black. And tape them together to strengthen. You might want to have spares handy of the cables, and they are a classic point of failure.
- To make the data cable, take two female LED cable heads, fold up the ends and use black insulation tape to colour code the cable. This cable should be as long as your elbow to your ankle. Solder the wires together and tape them over for security – black goes to the black over the length of it, red goes to red over the length of it, etc – the colour in the middle doesn't matter.
- When you insulate, you don't just wrap the tape around all of the wires, you need to insulate each of the wires from each other, so that no bare metal touches across the wires.s
- You need good gaffer tape – bring incense for testing – MORE gaffer tape. More insulating tape in more colours
- Loop the LEDs so that they are side-by-side and the lights themselves are staggered.
- Put tape on the desk, sticky side up, fold the end tip over to hold against the table, place the LEDs on top side by side – being careful that the LEDs are not looping but can lie flat.
- The green light will want to be taped over so that it's not showing up as a green streak in your photos

Trouble-shooting Notes

LED – if the LEDs stop connecting, you can cut them off at the gold bits
Note to self – Ada Fruit tutorials are the gold standard – the original idea for the light painter comes from there. (Citation ☺️)

Sticker the names to the kit, so that the flash names can be recorderd per kit

Fritzing – showing the steps with circuit diagrams

Intructions on the Night – attendees at the Kennis Café start at this point

32. We start with soldering the header strip on the Pi so that that it is stable and doesn't rock around
33. Now take a two meter LED strip - we are going to make sure that the strip is powered.
34. To make the power cable, take a male head (with pins), fold over the data and clock wires (red and green in this example – colours may differ with different brand LEDs) and tape them up, cut a meter and a half of wire – approximately the length of your leg so that the power bar in you pocket doesn't have a wire trailing too far behind you (you don't want it blowing around and getting caught on stuff).
35. Solder the red wire to the 5 volt USB connection, to power the LED strips via the powerbank
36. You might need to trim the USB heads if they are a bit tight for the wire, to give them a USB head. Tape that closed to hold well. Have two colours of insulation tape, it is handy for colour-coding and labling so that you know which one is which.
37. Tape up the ends of the loose wires for the LED strip using black tape for data and red tape for power. Keep the colour coding to not plug the wrong cables into the wrong thing by accident – won't hurt per se, but also won't help.
38. Power ground at the USB end, after having soldered the wires. The female LED connector is now connected to the power ground – red to red and black to black. And tape them together to strengthen. You might want to have spares handy of the cables, and they are a classic point of failure.
39. To make the data cable, take two female LED cable heads, fold up the ends and use black insulation tape to colour code the cable. This cable should be as long as your elbow to your ankle. Solder the wires together and tape them over for security – black goes to the black over the length of it, red goes to red over the length of it, etc – the colour in the middle doesn't matter.
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44. The green light will want to be taped over so that it's not showing up as a green streak in your photos

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