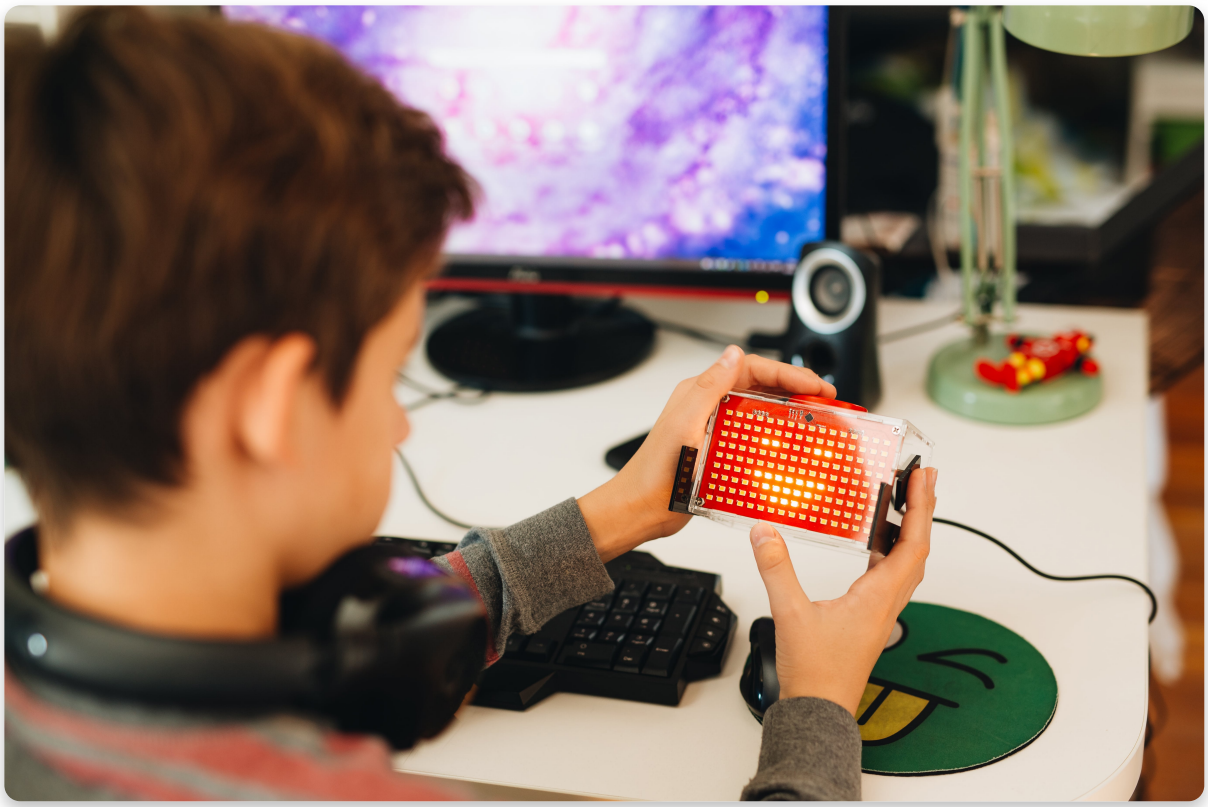
Spencer Build Guide

Introduction

The beginning

Welcome to CircuitMess Spencer build guide!



Spencer after assembly

In this build guide, we'll carefully walk you through all the steps of the assembly to make sure you successfully bring your Spencer to life!

This DIY project should be exciting and fun regardless of your previous knowledge of electronics. We hope you're ready and excited to start working on your own voice assistant. Let's get making!

Check out the anatomy guide before you start to learn more about the components you're about to assemble.

In the anatomy guide, you'll learn all about Spencer's components on the main board in more depth.

- You can check it out here!

Age group

Like it says on the box, Spencer is designed for anyone who's at least **11 years old.**

Some of the assembly steps should be approached carefully, so make sure to have an adult jump in if you need some help with soldering or tightening the bolts later in the process. It's okay to ask for help.

Don't worry though! We'll go through the assembly step by step and provide some useful tips along the way. We'll give you a heads-up if there's something important to keep in mind while assembling.

Assembly time

It should take you approximately 4 hours to fully assemble your Spencer.

Of course, the assembly time depends on your previous knowledge and experience. If you don't have any experience yet, don't worry! It just might take you a little longer to get into the groove and overcome the challenges in the beginning.

Skills

You don't need to have any specific skills before getting your hands dirty with this DIY project.

The main objective here is to have fun and learn something new.

So hold on tight, read all the instructions, and get ready to have fun! This is a great opportunity and your first step in your big engineering career.

What you'll learn with Spencer

Spencer's main goal is to provide an educational STEM experience and motivate you to learn something new in the future.

This can serve as a great introduction to the world of electronics and, hopefully, be the first step in your big engineering career!

What's in the box?

Let's check out what's in the box!

You must be pretty excited to start assembling! But first, we must carefully go over the list of components to make sure you have all of them.

In case something is missing, please contact us at **contact@circuitmess.com** and we'll get back to you as soon as possible.

Here is the list of components:

Spencer box

1. **Front display circuit board**
2. **Main circuit board**
3. **Acrylic casing (6 clear protective plastic parts)**
4. **Micro USB cable**
5. **Big red button**
6. **Speaker**
7. **Bag with electronic components**
8. **Spencer's arms (x2) and legs (x2)**

We'll explain the purpose of each component in detail in the following chapter.

Meet the components

In this chapter, you'll learn more about each component you have in your box.

Front display circuit board

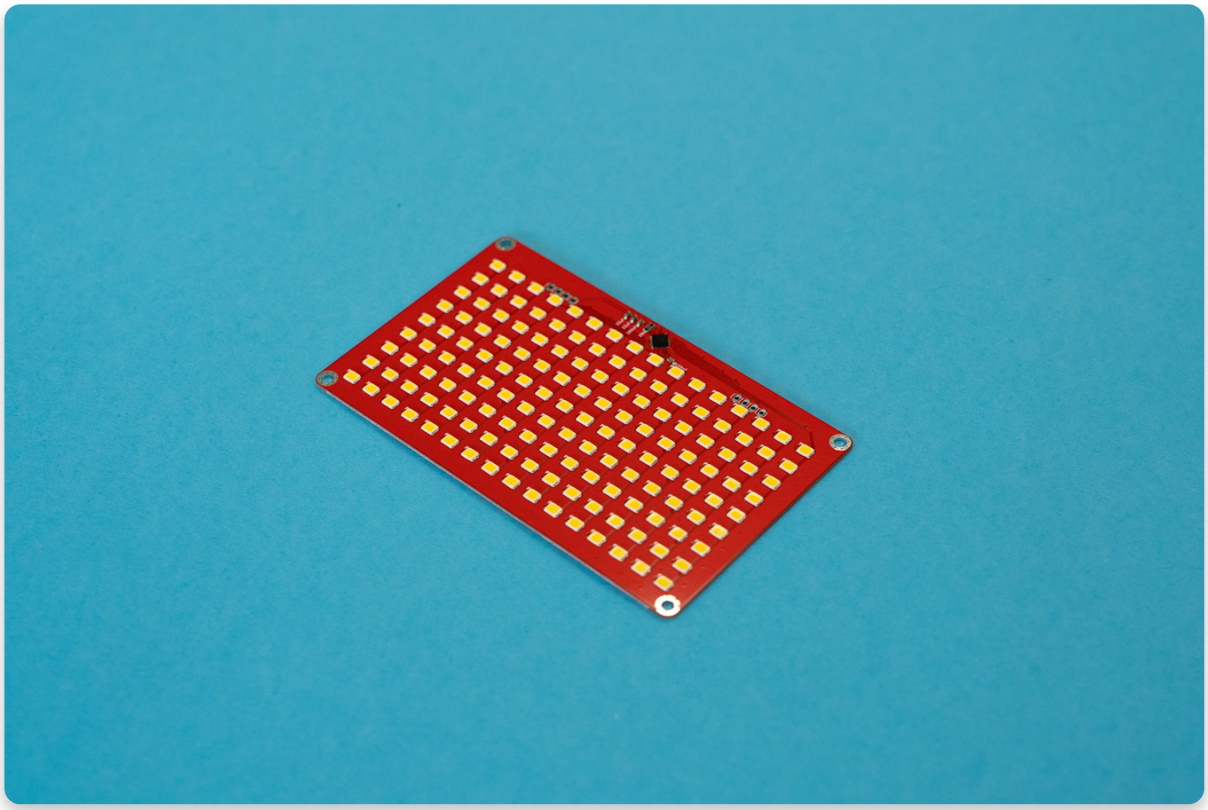
This component is Spencer's main visual output device. The circuit board has 144 individually controllable white LEDs.

LED stands for Light Emitting Diode. LEDs are the most common light-emitting component used on most modern electronics as various status indicators.

"Individually controllable LEDs" means that you can set each and every LED to a different value (on, off).

The LEDs can also be dimmed to 255 different values meaning that you can adjust their brightness.

The black square on the top of the circuit board is an LED driver chip. This chip receives commands from the main processor and takes care of the LEDs by turning them on or off, or dimming their brightness.



Main circuit board

This PCB has various different components on it that are all needed for Spencer to be smart:

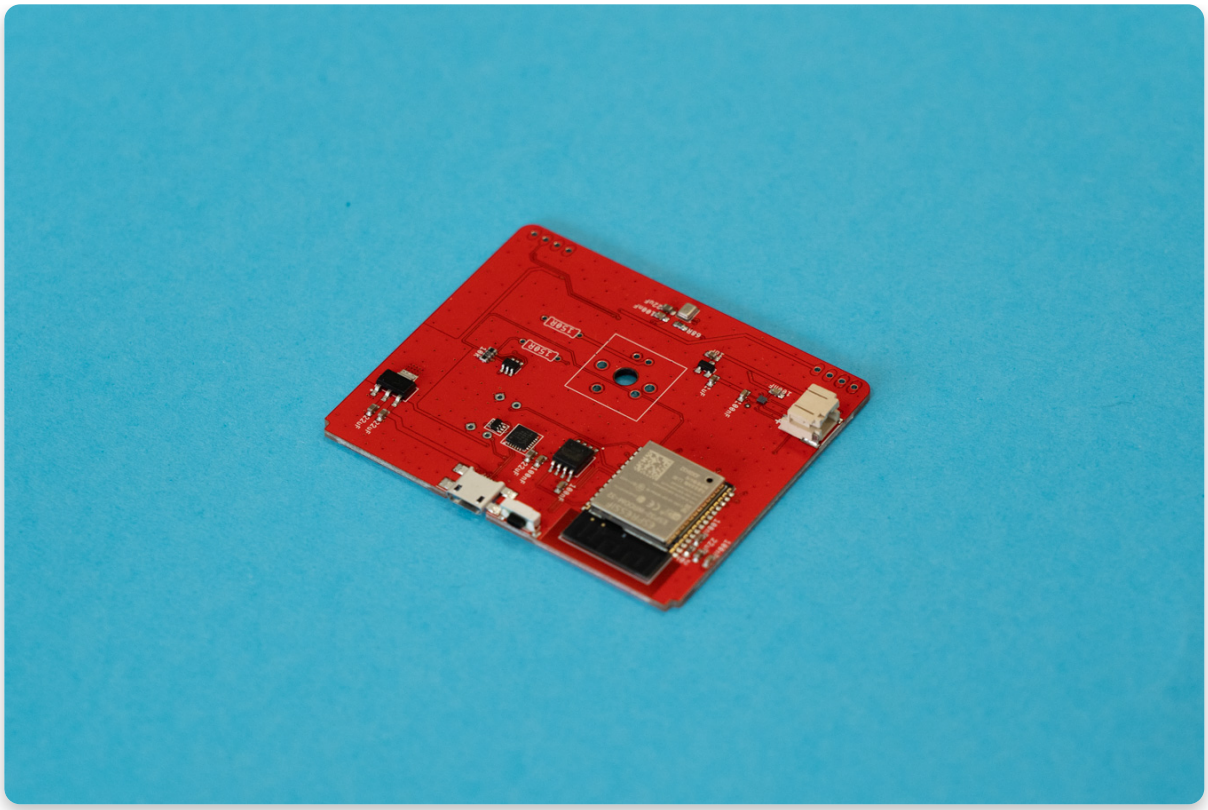
- ESP32 dual-core processor with built-in WiFi chipset; this component handles all the processing and network communication

- TFA9882 DAC (digital to analog converter) with built-in amplifier; this chip helps your Spencer "talk" by listening to signals from the ESP32 processor and converting it to an analog signal that is sent to the speaker

- Micro USB port - your Spencer gets electrical power through this connector

- 16MB flash memory chip - this chip stores animations and sound files

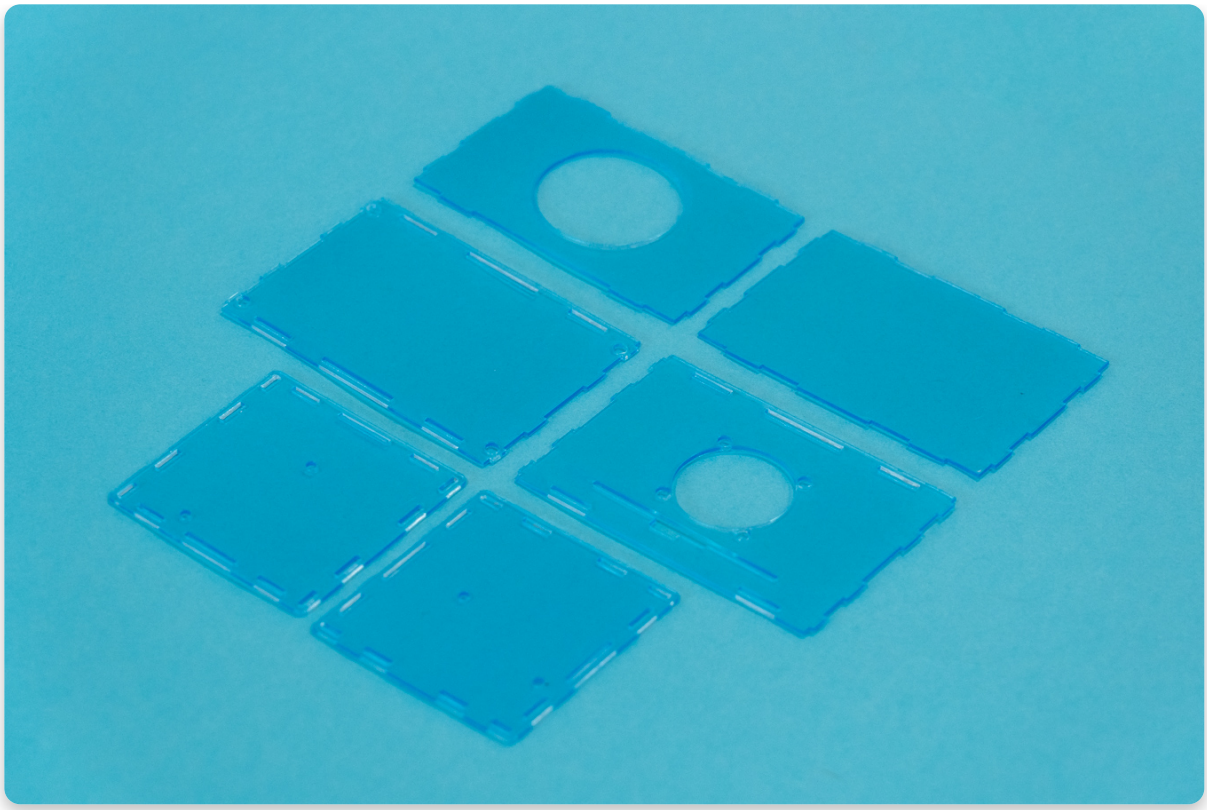
- Microphone - Spencer hears you using this component



Acrylic casings

These acrylic casings are not only used to keep everything in place, but they also protect all the components inside.

There is a protective layer on each of the casings that need to be peeled off before assembling all of them. Feel free to do that a bit later since the plastic layer keeps the casings from being scratched or damaged.



Micro USB cable

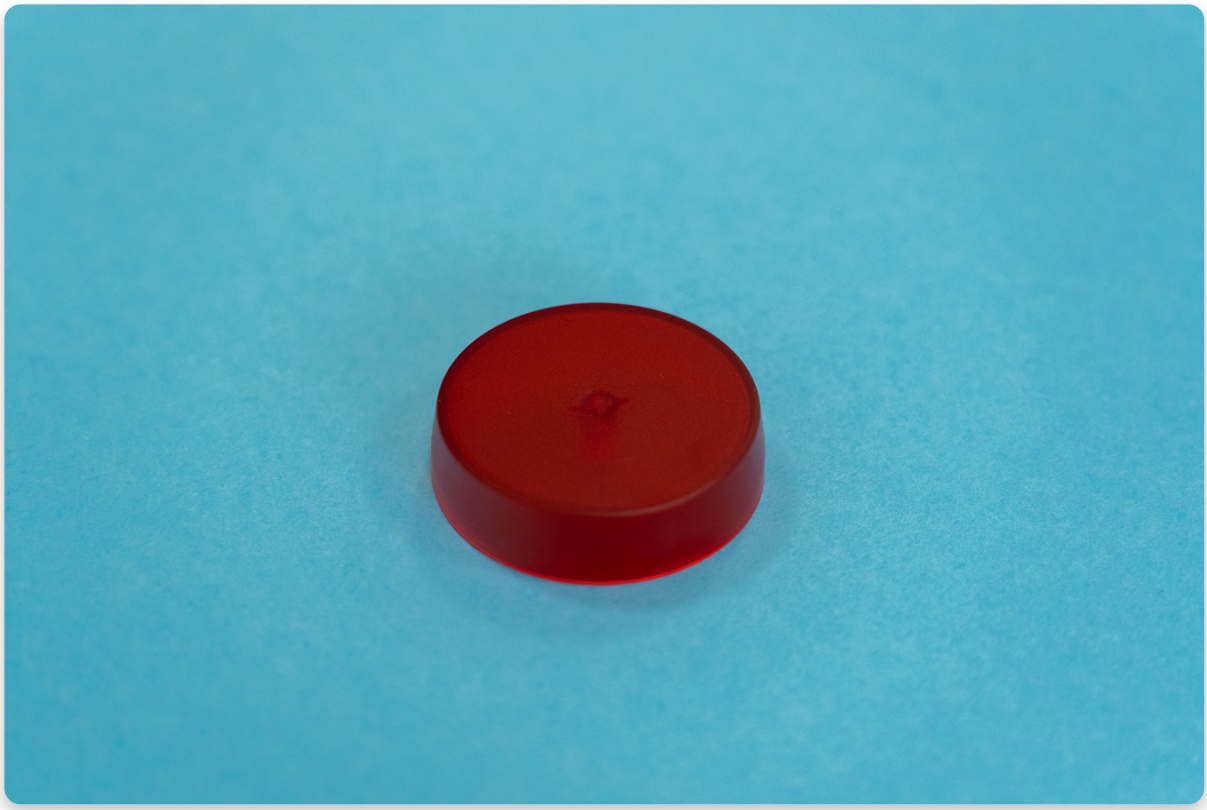
You can connect Spencer to your computer with this USB cable.

Since Spencer doesn't have a battery, it needs to be connected to a power source with this cable all the time.

Big red button

This component will mark the final step of the assembling - the big red button that goes on Spencer's head.

Be prepared to hit that button every time you want to say something to Spencer.



Speaker

A 5-watt speaker that helps your Spencer talk.

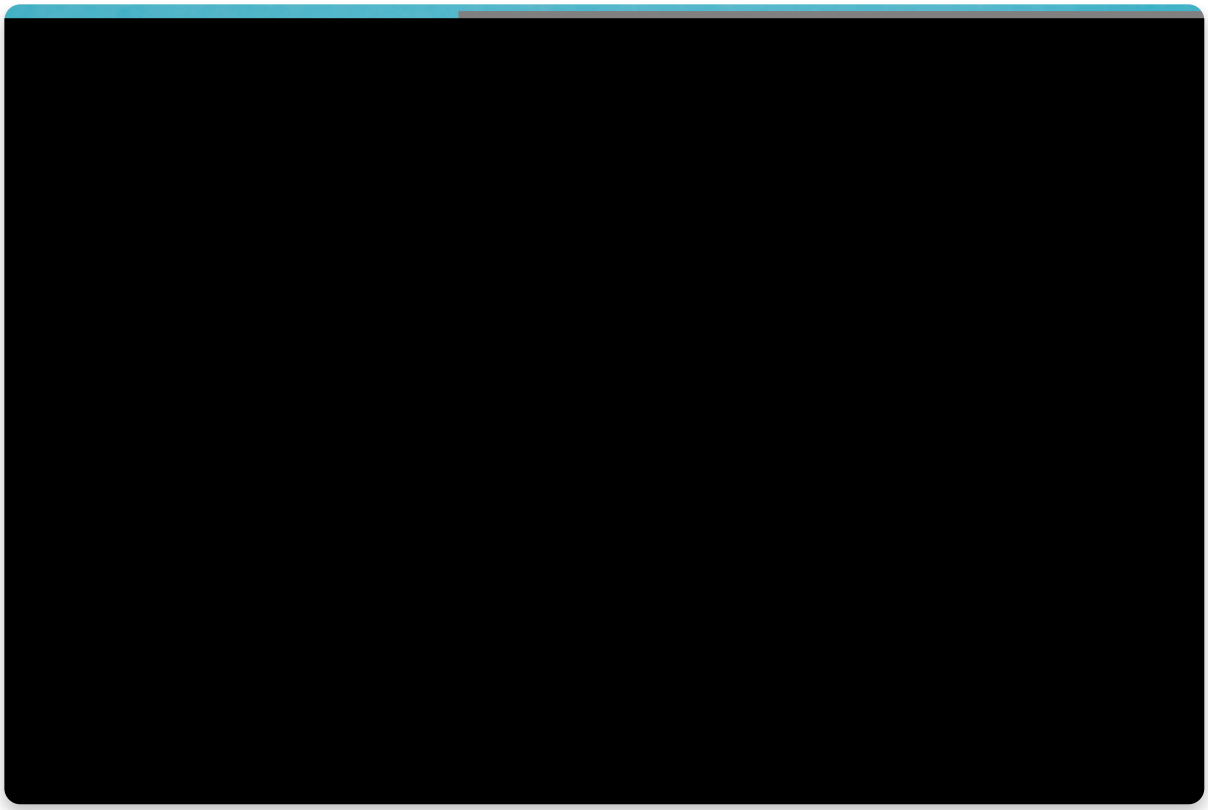
Speakers usually have the number of watts written on them. The bigger and louder the speaker is, the more watts it has.

Speakers have an electromagnetic coil in them that makes the speaker's membrane move when an electrical current is applied.
The membrane is this wobbly black piece of rubber on the top of the speaker. When the membrane moves, it makes the air particles move (vibrate). We, humans, perceive these air movements and vibrations as sound.

Spencer's arms and legs

These are Spencer's elegant arms and legs. He might complain about them not being long enough to play any sports, but they are quite cool. Don't you think?

Keep in mind that you will also have to peel off the protective layer from these acrylic parts in one of the future steps in the build guide.



Bag with small electronic components

This bag contains many bolts and spaces that you'll use for assembling and casing up your Spencer.

Each step will define how many bolts or spacers you'll need, so make sure to get the correct size before assembling.

Meet the tools

Mandatory tools

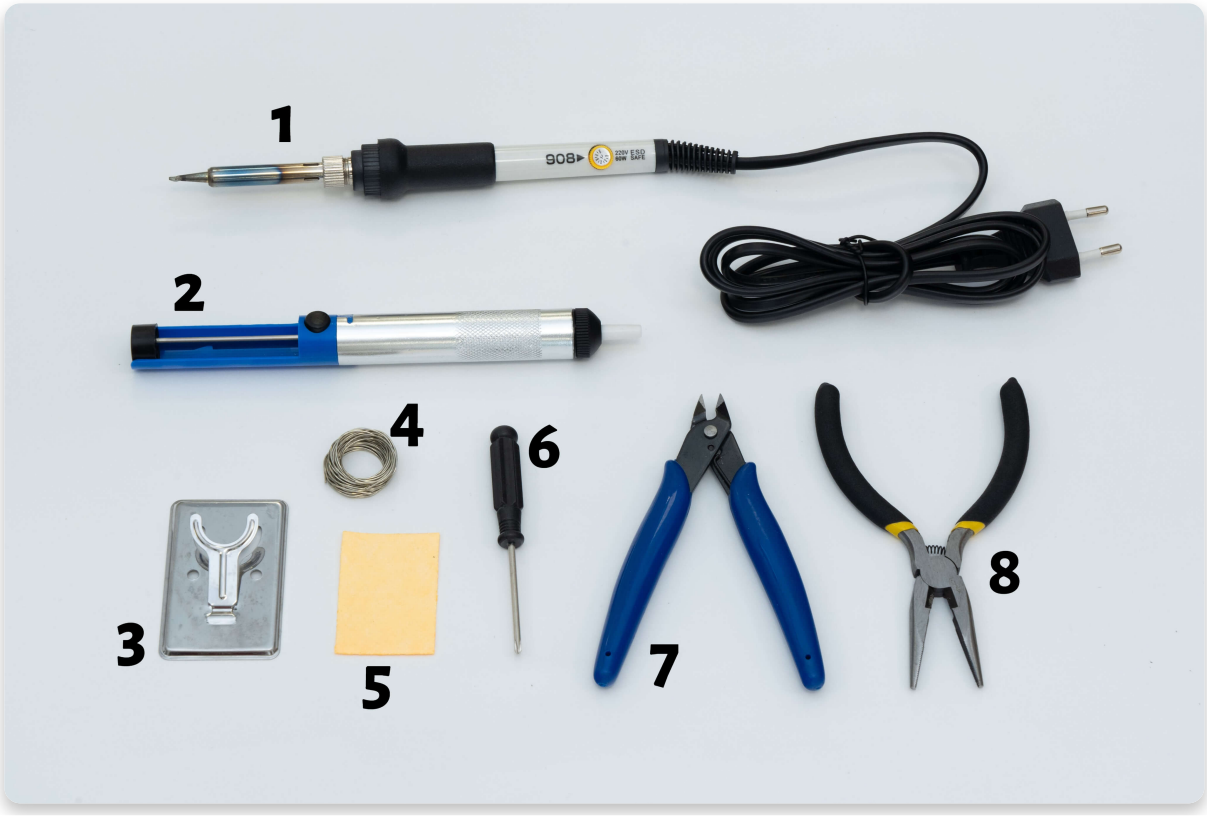
In this chapter, we'll explain what tools you'll need to assemble your Spencer.

If you have your CircuitMess Tools pack in front of you, you should be all set!

In case you got the Spencer kit without the Tools pack, this is a good time to borrow some of the tools or purchase them.

This is your Tools pack box

The tools required are essential whenever you are assembling, fixing, or modifying electronic devices and are the tools of the trade for every maker/hardware hacker/modder/electrician.



1. **Soldering iron**
2. **Desoldering vacuum tool (solder sucker)**
3. **Soldering iron stand**
4. **A small reel of rosin-cored solder**
5. **Cleaning sponge**
6. **Phillips screwdriver**
7. **Diagonal cutter pliers**
8. **Needle-nose pliers**

Soldering iron

This is the most important tool in a maker's arsenal.
For Spencer's assembly, any entry-level soldering iron will suffice.

If you plan to dive into the world of DIY projects, you should consider getting a more expensive one with more features. There are also many soldering irons with interchangeable tips that can be particularly useful when working with much smaller components.

There are two types of soldering irons you could have received in your tools pack. The first one is white with a temperature regulator, and the second one is blue with a small metal button. Both of them will do the job of soldering the components in place and there is no big difference between them.

Also, it is good to know that all our soldering irons are lead free!

You will find the instructions on how to properly solder and take care of both soldering irons in the next chapter.

Soldering iron #1

Soldering iron #2

Soldering sponge

This small piece doesn't seem like much until you soak it in some water. It then turns into a super solder-cleaning sponge! Use it after soldering a couple of joints to remove the excess solder from the tip of your iron. Make sure that the sponge isn't dripping wet or bone dry - it should be damp.

Diagonal cutter pliers

With pliers like these, you'll be able to trim the legs of soldered components and cut wires!

We prefer this type shown in the picture (Plato, model 170), but any other type will do.

Diagonal cutter pliers

Needle-nose pliers

You're going to need pliers like these when assembling the casing, or when plugging in some tricky connectors!

They're generally useful when doing some fine mechanical work.

Needle-nose pliers

Standard cross screwdriver

You'll need this cross (Phillips) screwdriver to assemble the casing together.

A standard 2.0mm cross screwdriver should do the trick.

Desoldering vacuum tool (solder sucker)

This tool is useful when cleaning up soldering mistakes, but it isn't necessary for assembly.

If you plan on doing some hacking, modding, or hardware repairs in the future, having this is always a good idea.

Standard cross screwdriver

Desoldering vacuum tool

Additional, useful tools

Helping third hand with magnifier

This could make your soldering experience a little more enjoyable, especially when doing some more complicated projects.

Helping hand with a lot of additional tools

Multimeter

A multimeter can be used for many things: testing tricky connections, measuring battery voltage, testing resistors & capacitors, measuring the current consumption, and more.

It's a useful tool when you're trying to figure out what went wrong with any electronics kit.

Multimeter

Solder wick

You can use solder wick along with the desoldering vacuum tool to clean up any soldering mistakes. Just put it on the wrongly soldered joint and press on it with a hot soldering iron, then it will soak up the excess solder like a sponge!

Useful for fixing solder joints when they cannot be easily reached with a solder sucker.

Solder wick

Assembly

Soldering

The first thing that you'll do as a part of the Spencer assembly process is soldering!

Have you ever done that before? If your answer is no, we suggest you look at the following few links where you'll find useful tutorials and blogs about soldering. It will only take you 10 minutes to get into the zone and understand how it's done. Here are the links:

- Adafruit's video tutorial featuring Collin Cunningham – A tutorial featuring Collin Cunningham, a super charismatic electronics guru.
- Adafruit's standard soldering tutorial – A great and thorough video tutorial. An absolute must-read, even if you know how to solder. Make sure to check the "common soldering mistakes" section at the end.
- Sparkfun's video soldering tutorial – Another well-made how-to-solder video tutorial.
- Sparkfun's standard soldering tutorial – A detailed tutorial made by Sparkfun.

There are several rules of soldering that everybody, regardless of their skill level, should follow at all times.

- **Never inhale the dust and the fumes that can be produced by the soldering iron!** These can be hazardous, so please don't inhale them.

- **Never touch the tip of the soldering iron!** Even if the soldering iron is turned off or completely disconnected from the power source, there is still a possibility that it's very hot and, therefore, can cause very uncomfortable pain if touched. Always keep it facing away from your hands. If you're finished with the soldering iron, unplug it from the power source and leave it to cool off for at least five minutes before putting it back in the box.

- **Clean the soldering iron!** The sponge is your best friend while soldering. Make sure to use it often and clean your soldering iron if you wish to have an easy and simple soldering experience. Carefully hold one part of the sponge with one hand and wipe the tip of the soldering iron on the other part of the sponge to remove the extra solder. Repeat the process until the tip of the iron is nice and clean from the old solder.

- **Check your solder joints twice (at least)!** Most of the malfunctions in the world of electronics are due to bad solder joints, so regardless if this is your

first or 100th soldering project, always make sure to inspect your joints multiple times before proceeding to the next step.

- **Keep the soldering iron on the stand when you're not using it.**
- **Know how much solder is needed!** Make sure to put just enough solder, not too much, and not too little, since both can cause the device to malfunction.
- **Don't leave any residual solder on the board!** The solder should only be on the parts where the pins connect to the board. Everything else should be clean. Little pieces of solder all over the board are a big no-no!

Now go over these rules a couple of times so you don't forget them!

If you follow these rules, your soldering experience should be easy peasy.

Using the soldering iron

Soldering iron is very easy to use but only when used properly.

If you have purchased the CircuitMess tools pack with your Spencer, you have gotten one of the two soldering iron models in your box:

- White soldering iron with a temperature regulator
- Blue soldering iron with a small metal button

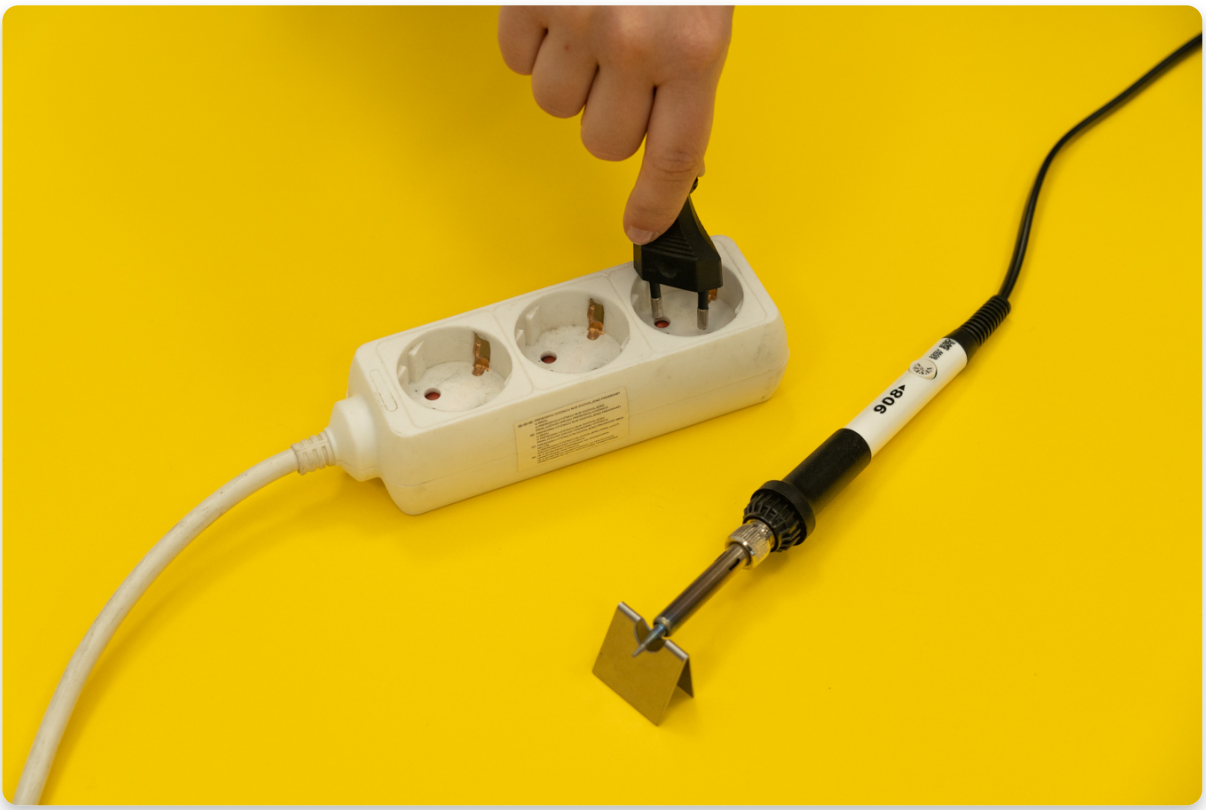
Remember the rules mentioned previously? Good! Let's go over the instructions on how to use the white soldering iron first. In case you have the model with a small metal button, scroll down to see the right instructions.

If you're using your soldering iron for the first time or need help with cleaning its tip, check our **video tutorial**.

White soldering iron with temperature regulator

Step 1

Set up your soldering iron so it stands on the stand - as shown in the photo. After that, plug it into a power outlet.



Step 2

Set the temperature to **350°** by turning the regulator. There is a small black arrow next to the regulator wheel, so make sure that it points to the right temperature, like in the photo.

Your soldering iron is now ready to use, but give it a minute or two, so it can heat up. The safest way to let it heat up is to leave it on the stand while you wait!

Set the temperature to 350°

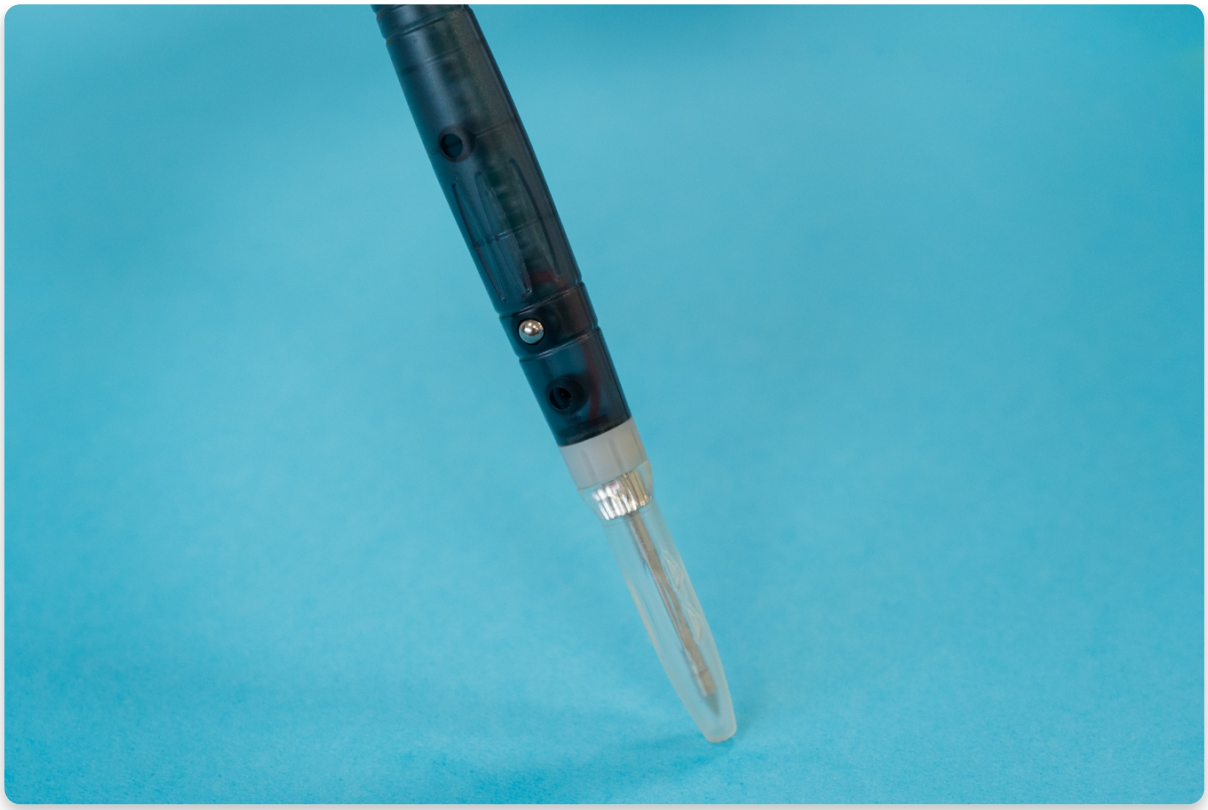
Step 3

Once you're done with soldering (don't worry, we'll let you know when that time comes), you'll unplug the iron from the power outlet to turn it off.

Please use the soldering iron stand every time you are not using the soldering iron to make sure you don't burn the surface or the circuit board!

Make sure to not touch the soldering iron tip for at least five minutes after you have turned it off.

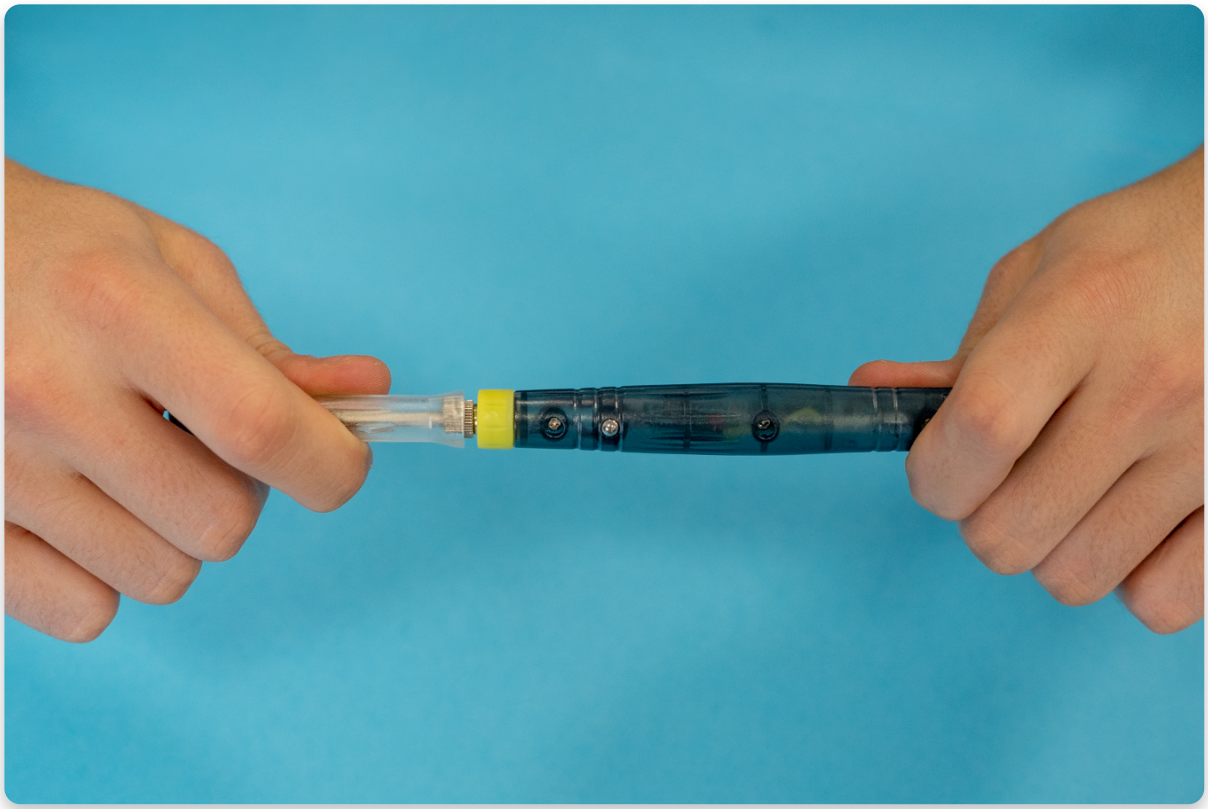
Soldering iron with a small metal button

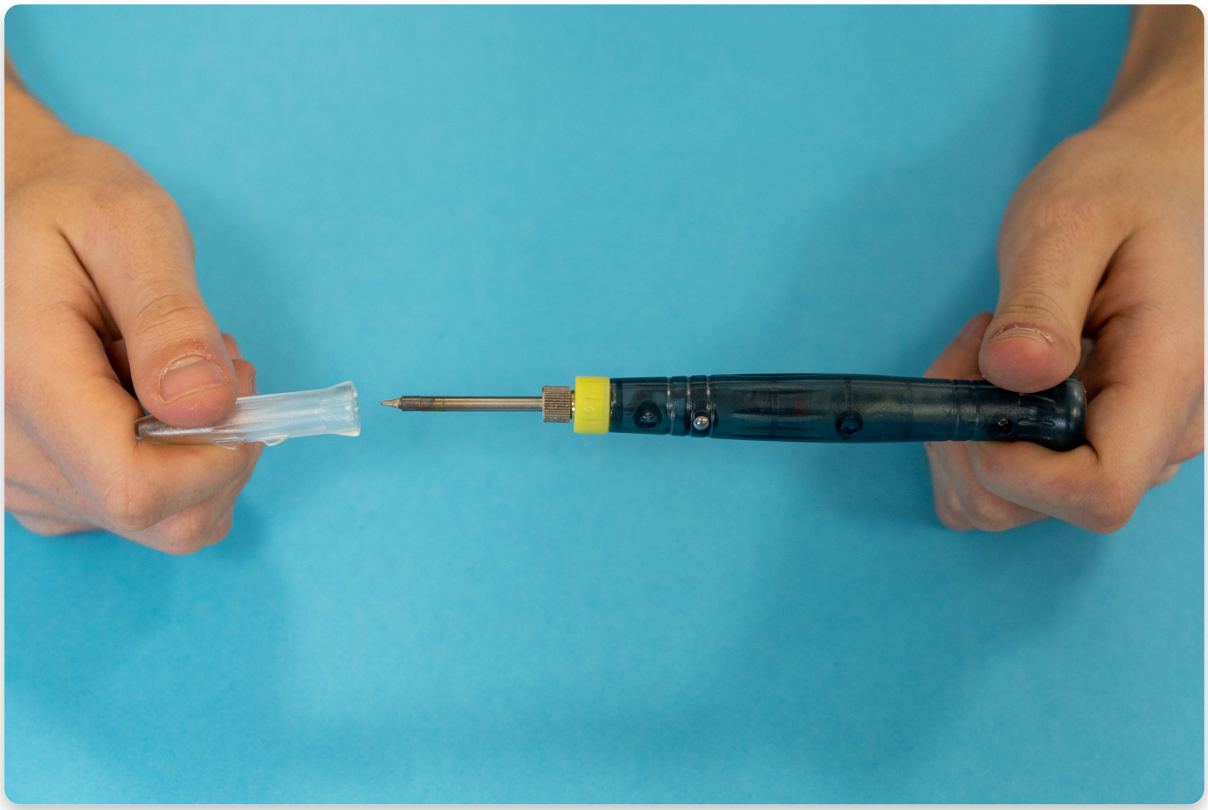


Soldering iron with a small metal button

Step 1

Firmly pull the cap off, do not unscrew it!





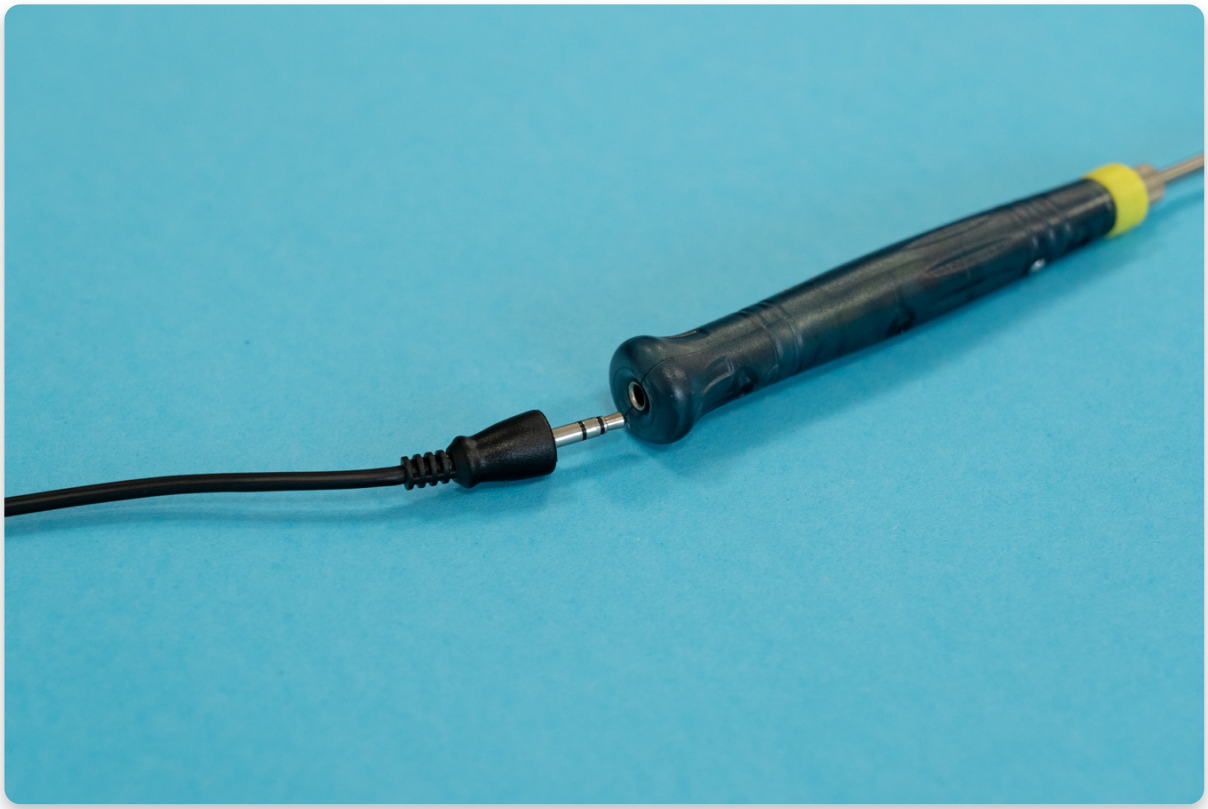
The correct way of taking the plastic cap off

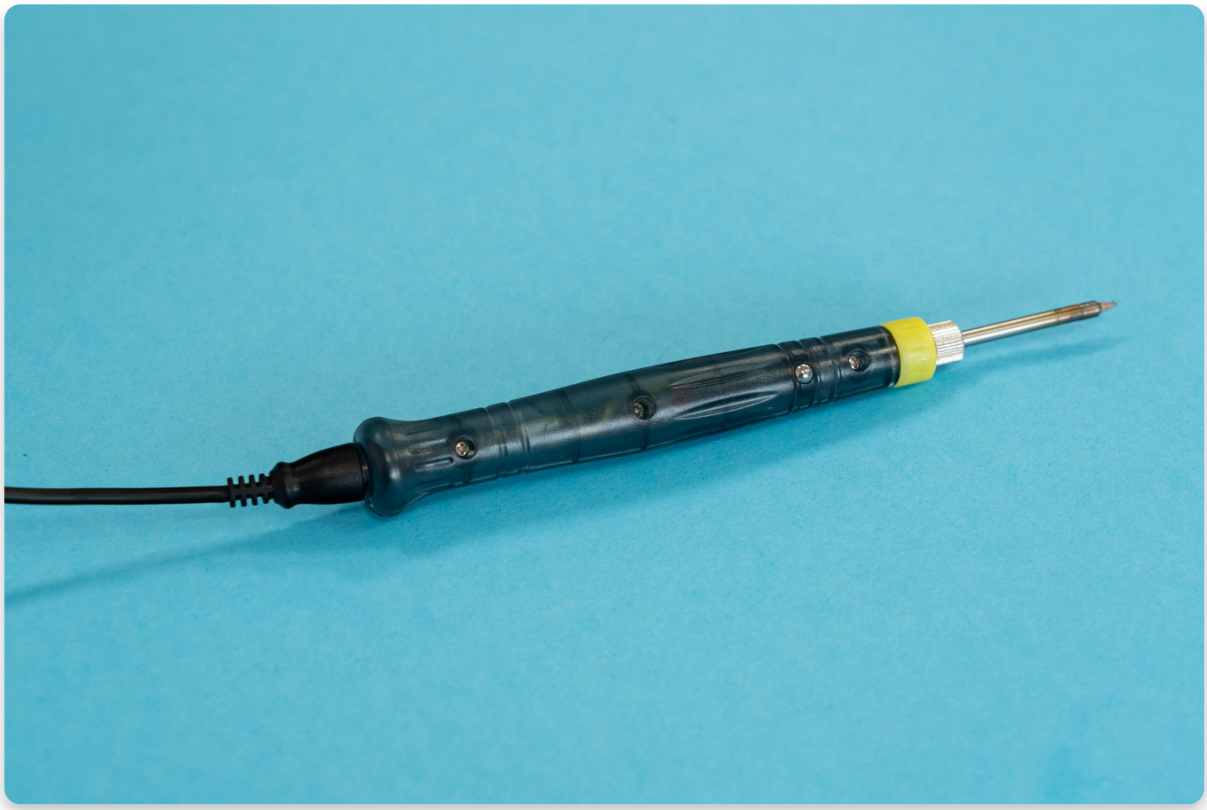
The metal ring is necessary for the soldering iron to function.

If you accidentally remove the metal ring along with the cap, screw it all back on and remove the cap so the ring stays in its place.

Step 2

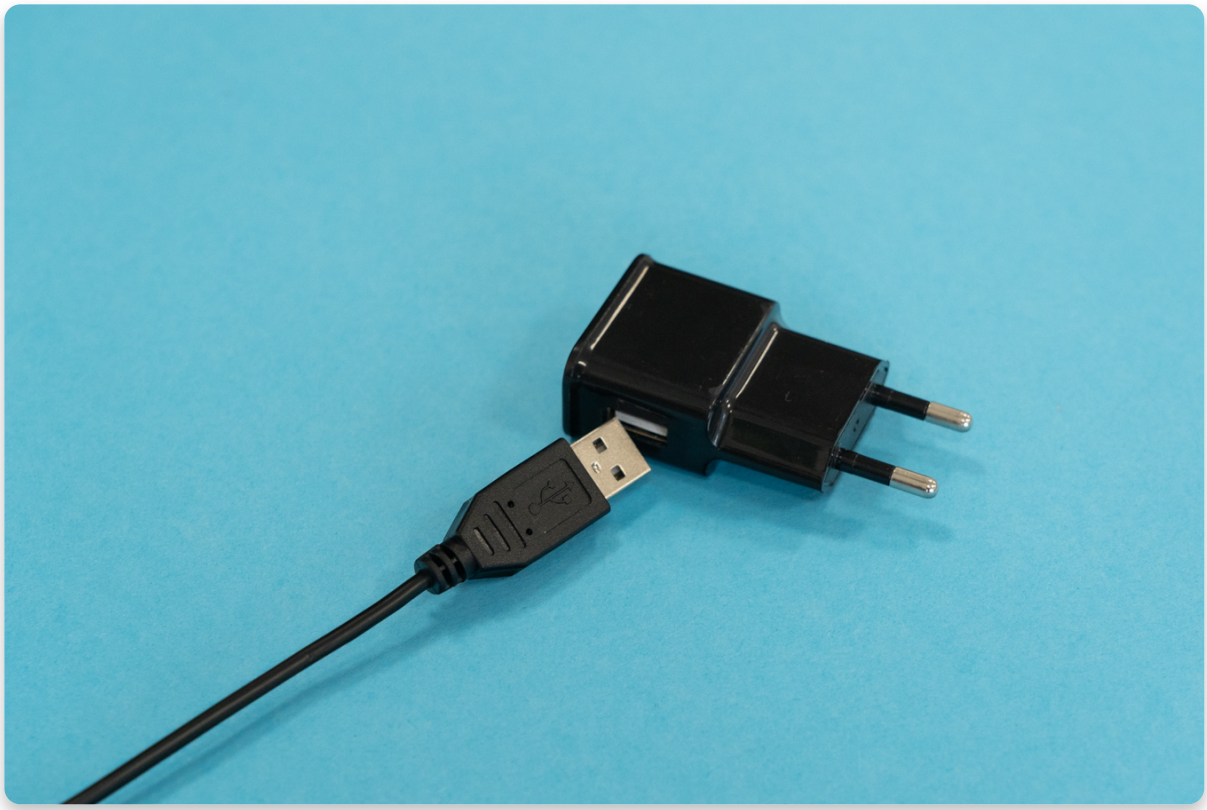
Plug the soldering iron's power cable.

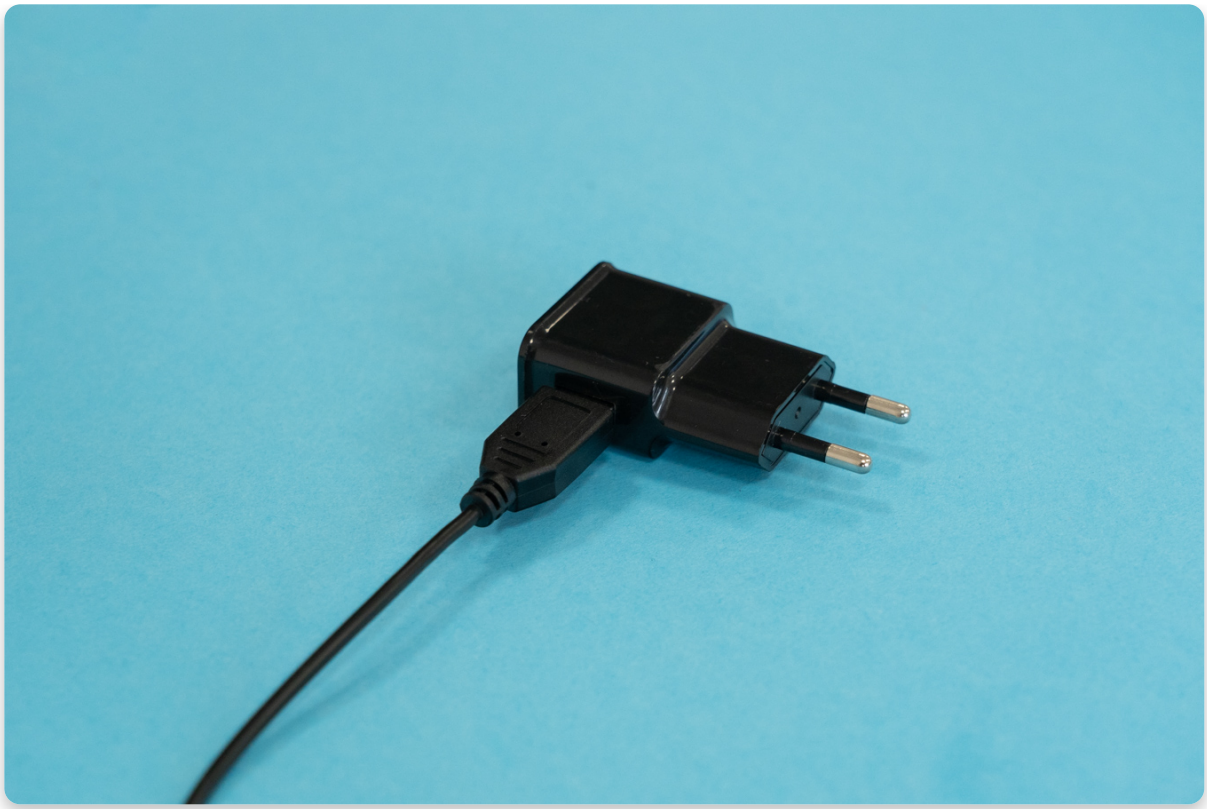


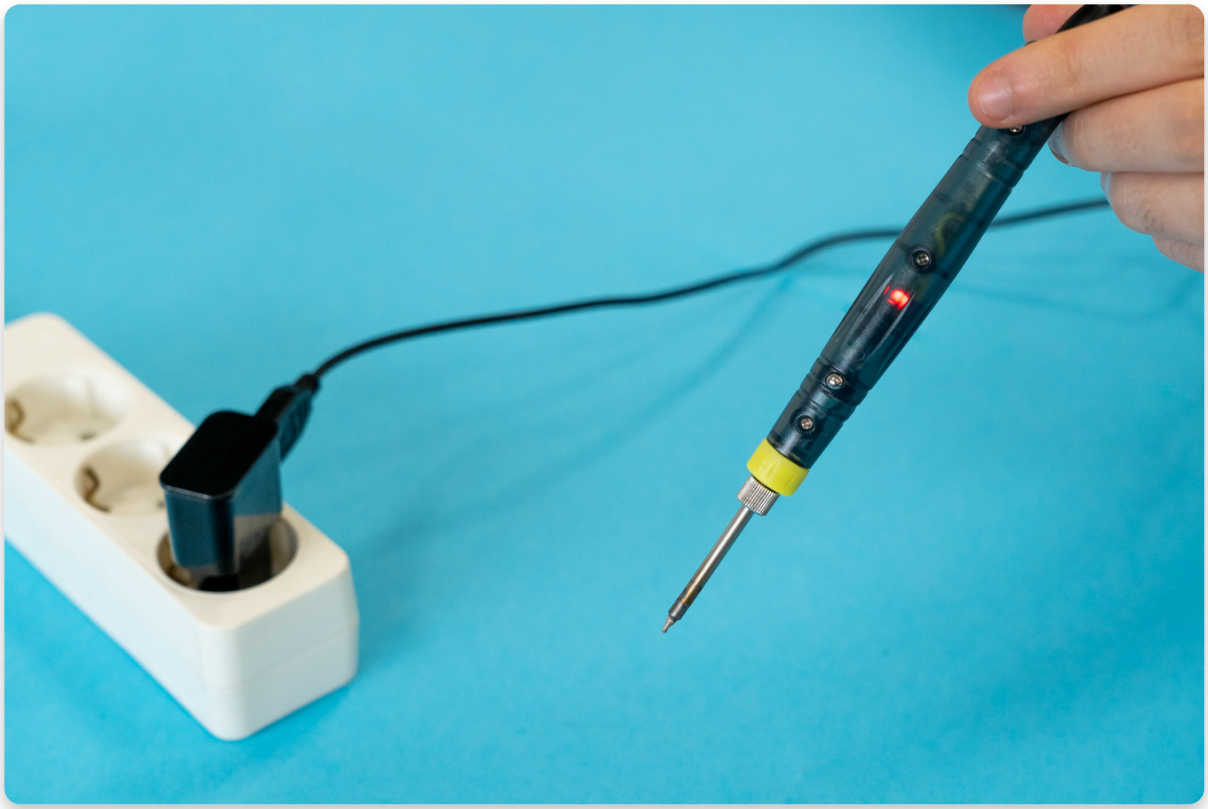


Step 3

Plug the power cable into the provided power adapter and then into a power outlet.







Plug the power brick into a power outlet

Step 4

In case you have this type of soldering iron, all you need to do is turn it on by pressing the small metal button at the top of the iron.

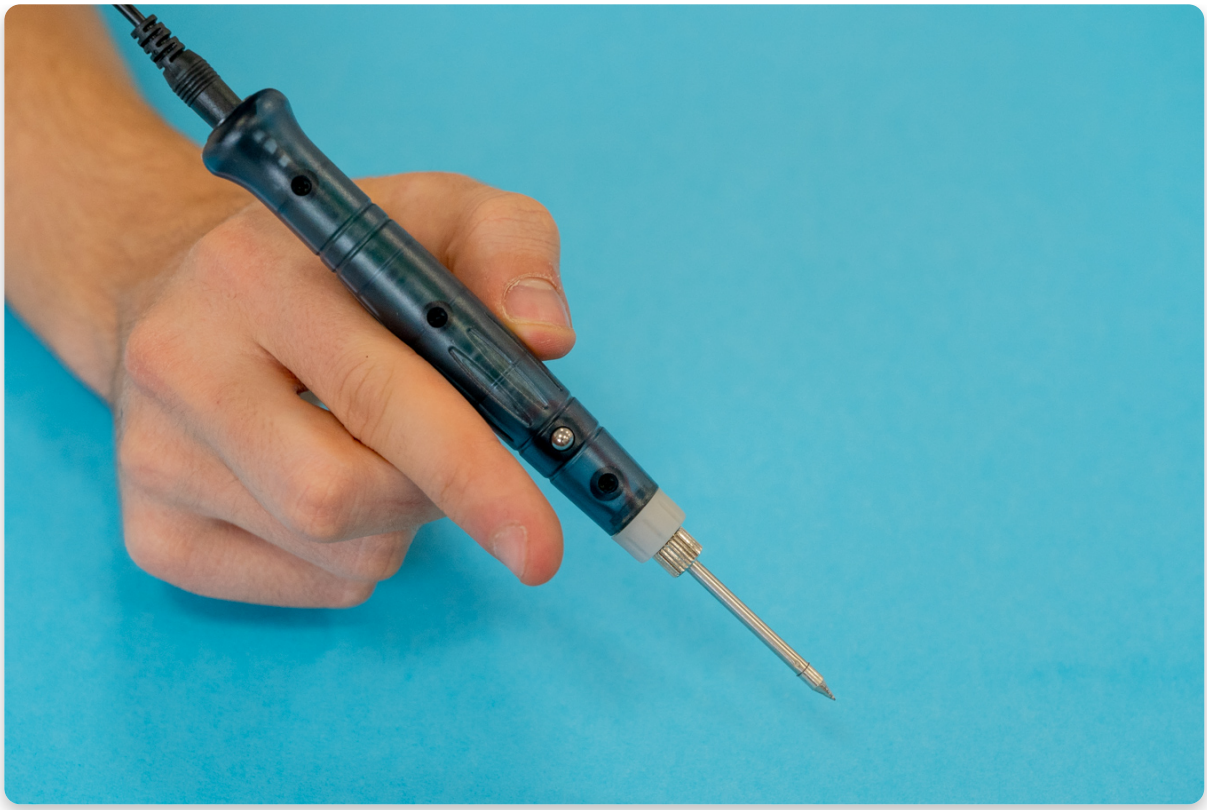
Once you press the button, you should see a blue light signaling that it's turned on.

As long as the blue light is on, your soldering iron is turned on as well.

The blue light means that the soldering iron is turned on

Once you're done with soldering, turn off the iron by pressing the same metal button.

The light will be switched off immediately. However, this does not mean that the iron is cold. **Make sure not to touch the soldering iron tip for at least five minutes after you have turned it off.**



If the blue light is off, this means that the soldering iron is turned off as well

FIRST USE!

Make sure to do this before the first use:

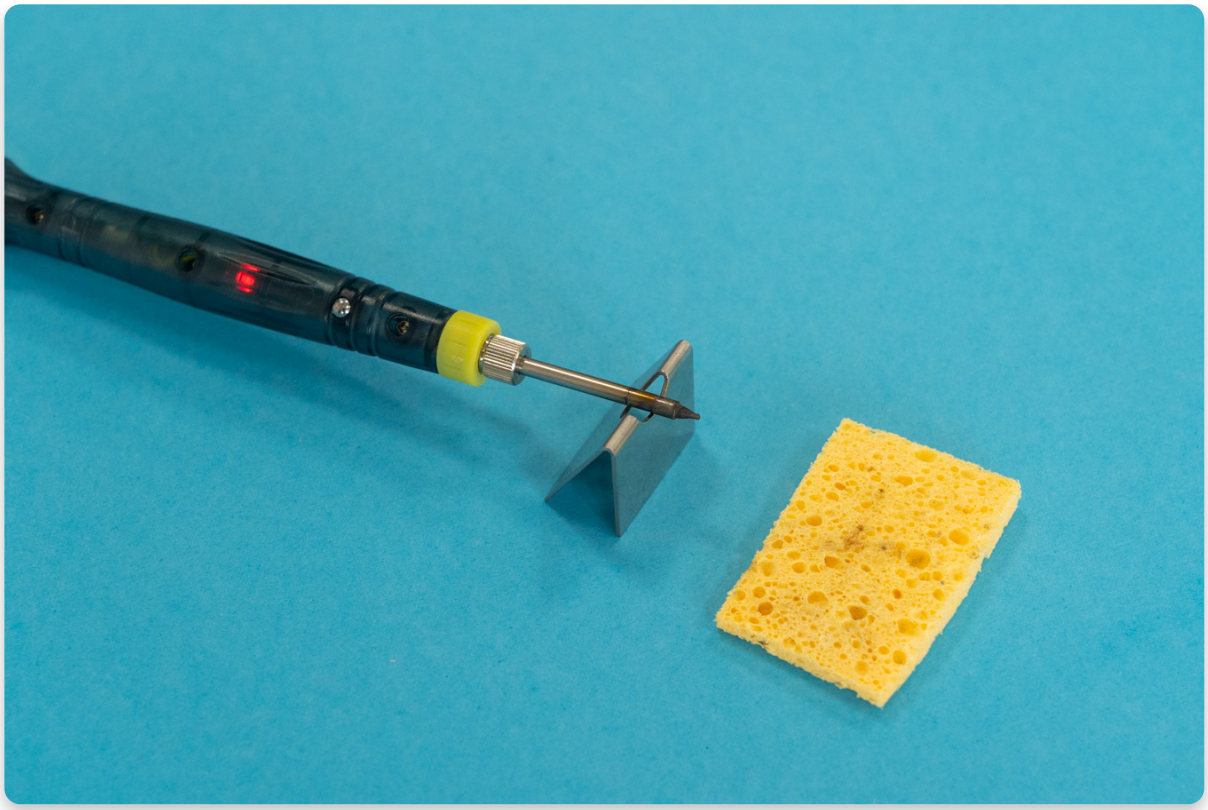
- **Tighten the metal ring with needle-nose pliers from your Tools pack.**
- **Secondly, melt some solder so that the tip of the iron gets covered with the solder. You should then see a shiny metal layer on the tip that will prevent overheating and burning.**

Click on this link to see the video that shows two necessary steps!

Keep the soldering iron on the stand when you're not using it!

Always keep it facing away from your hands.

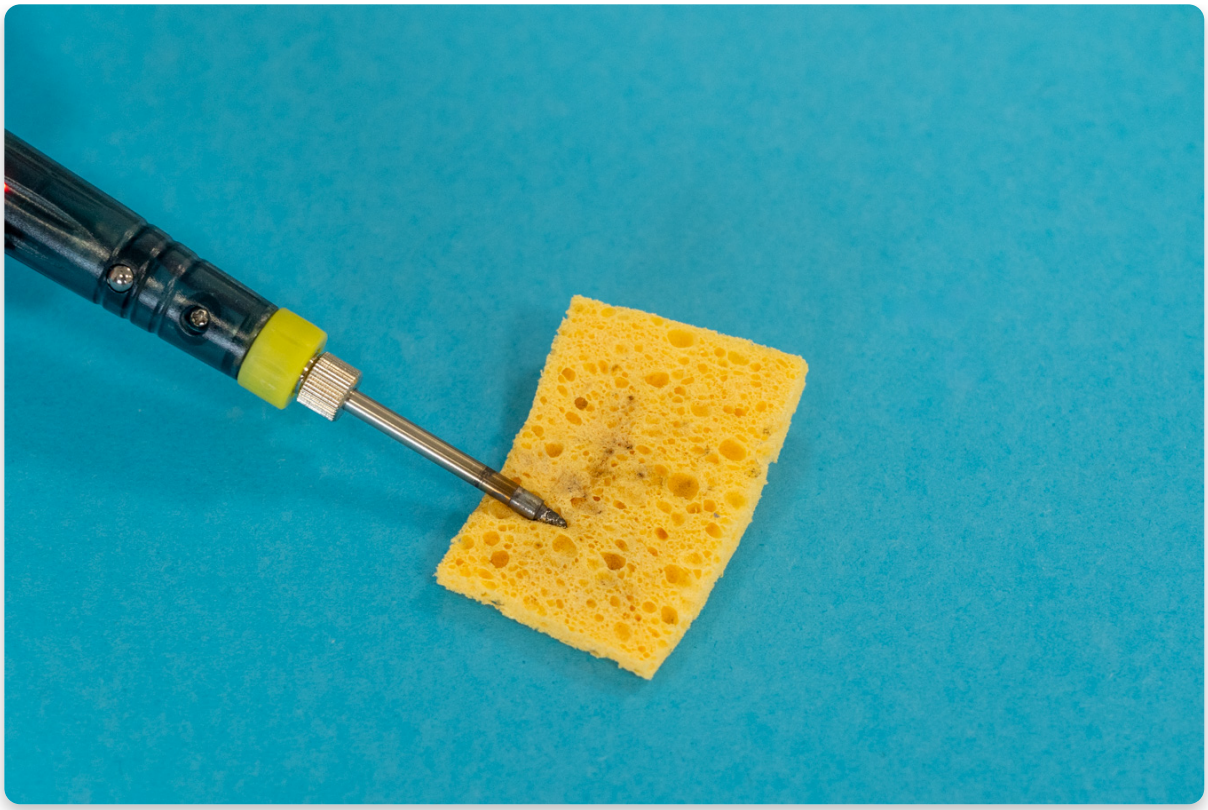
If you're finished with soldering, unplug it from the power source and leave it to cool off for at least five minutes before putting it back in the box.



The safest place to put the soldering iron is the stand, facing away from your hands

Use the sponge for cleaning the soldering iron after a few solder joints!

Carefully hold one part of the sponge with one hand and wipe off the soldering iron on the other part of the sponge, so that the extra solder gets removed. Repeat the process until the tip of the iron is nice and clean from the old solder.



Cleaning the tip of the soldering iron

Now that you know how to use the soldering iron, it's time to learn how to solder.

The first important step is to make your little soldering space. Remove everything from the table beside the soldering iron, sponge, stand, solder, and the components that you will use for soldering. Have at least 1 meter (3 feet) of space in all directions cleared.

Also, it wouldn't be a bad idea to protect the table with some heat resistant material (wooden sheet, aluminum, or soldering pad).

Do not use any type of fabric since it can easily catch fire! You can also use an old desk that you don't care about damaging or a clean piece of stone if you have a yard.

Now make sure to connect your soldering iron to the power source and prepare it for use by following the instructions provided.

You must be eager to start soldering by now! Go to the next chapter to see what you should be soldering, and we can start assembling!

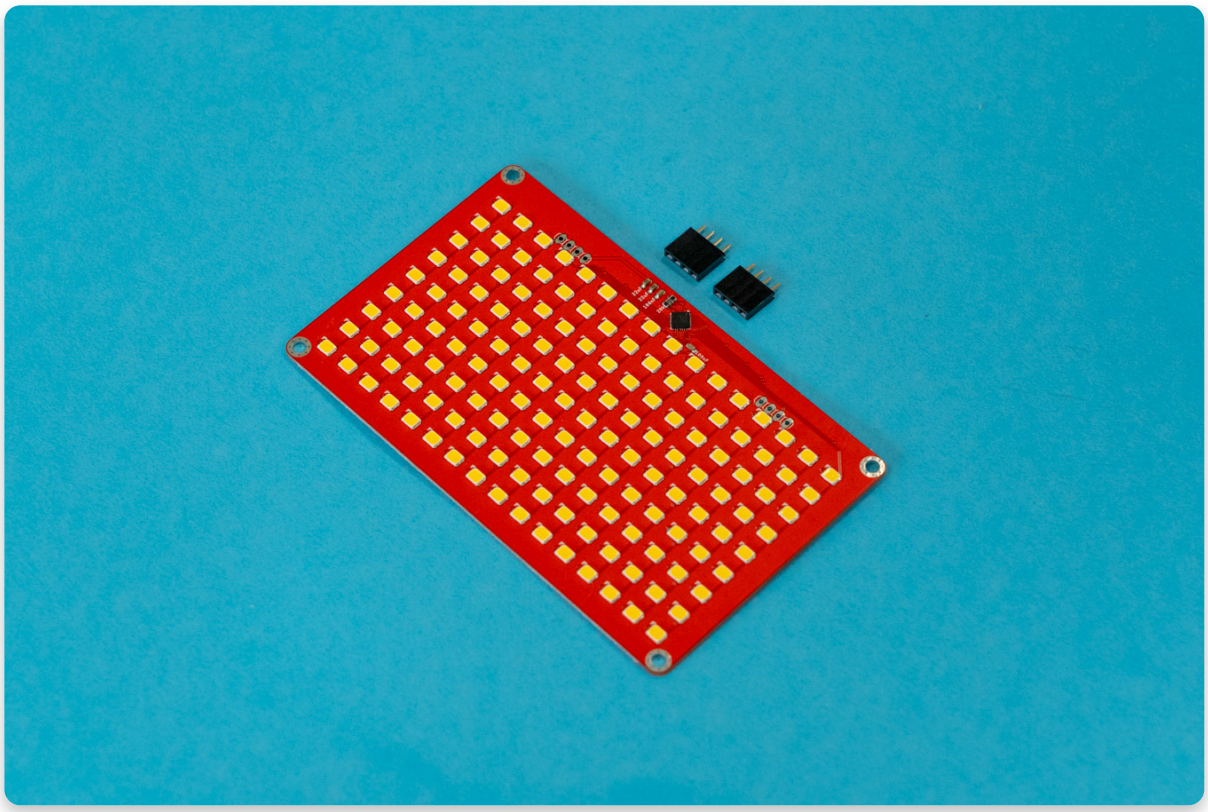
Chapter One- Soldering the components

Ready to start soldering?

In this chapter, we'll explain how to solder all the components. You'll see many photos that will lead you through the process and make it easy to follow.

Part One - Soldering the first two components

Here are the components you will need for the first step. Take your display circuit board and two female pin headers that you see in the photo below.



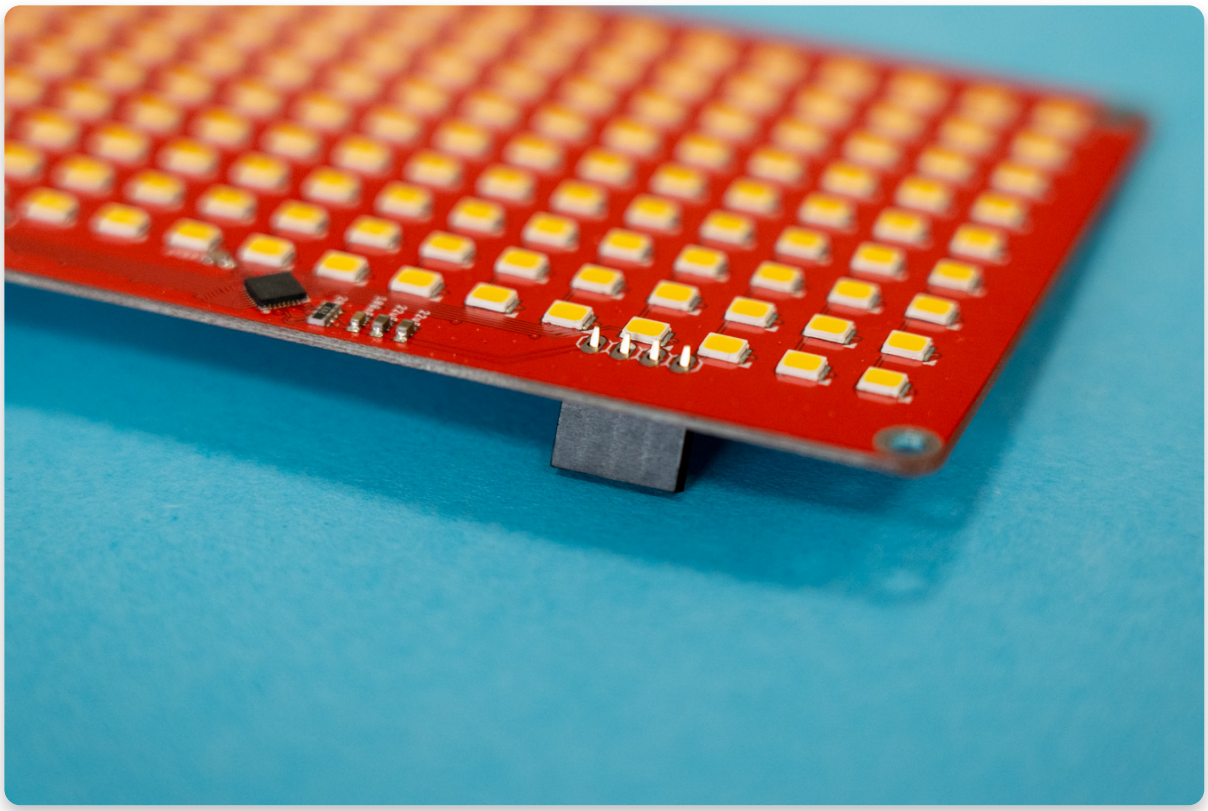
Display circuit board + 2 female header pins

Turn the display board upside down and find the holes on the top of the board. Since there are two pin headers that you'll have to solder to the board, there are two places where those pin headers should go. It is hard to miss them because they are located just above the board's display on the left and the right side.

It's important that you insert the pin headers from the back of the board like in the photo below.

Insert the pin header from the backside of the board

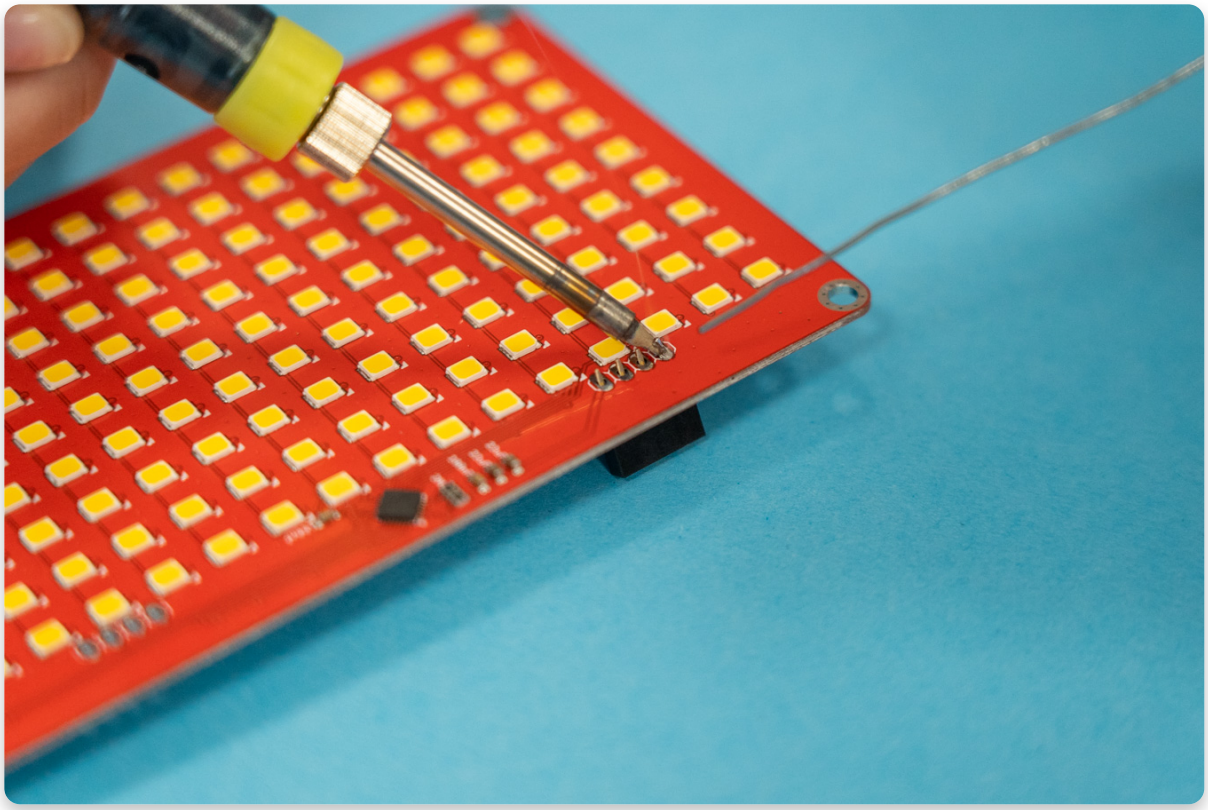
Now turn the display board again and adjust it so that the pin header stays in one place.

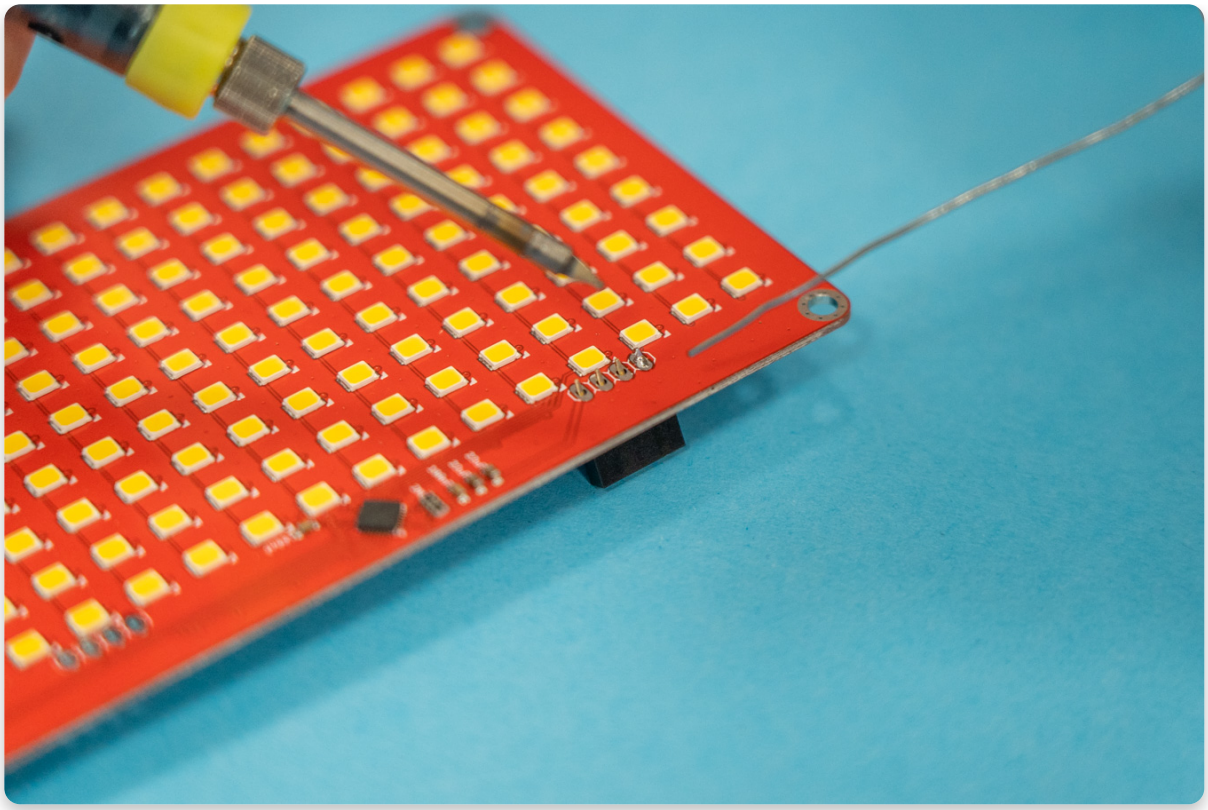


Now it's time to solder the first pin!

Firstly, carefully place the soldering iron on the first pin, so that it’s touching both the pin and the little plated area around the hole that the pin is going through.

Leave it like that for about ten seconds so it heats up and then apply the tip of the solder to it. The solder should easily melt and spread evenly around the joint.



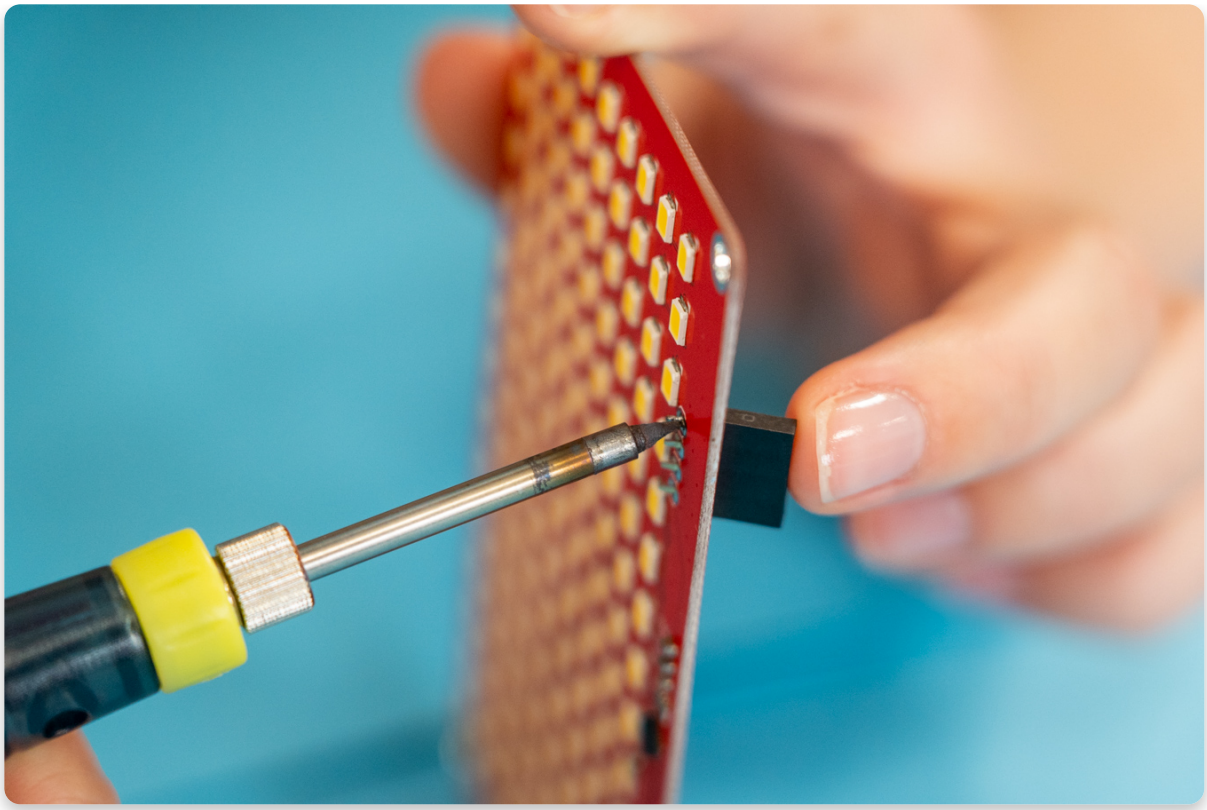


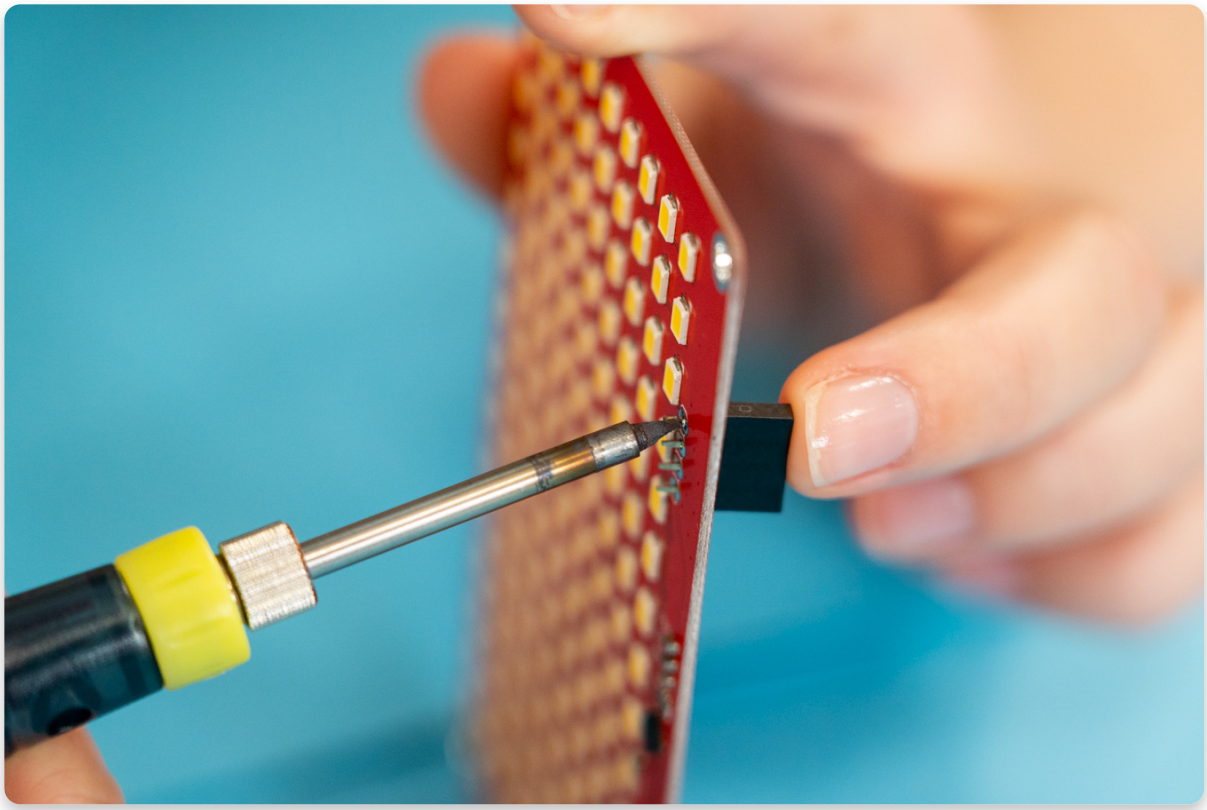
Make sure to create a volcano-like shape so that the base of the joint is filled with solder but the top is getting thinner and thinner.

Before you repeat this step for the other three pins, let's make sure your pin header sits at the right angle.

If you think your pin header is not soldered at the right angle, take the board and, while holding it, reheat the component so that it sits straight.

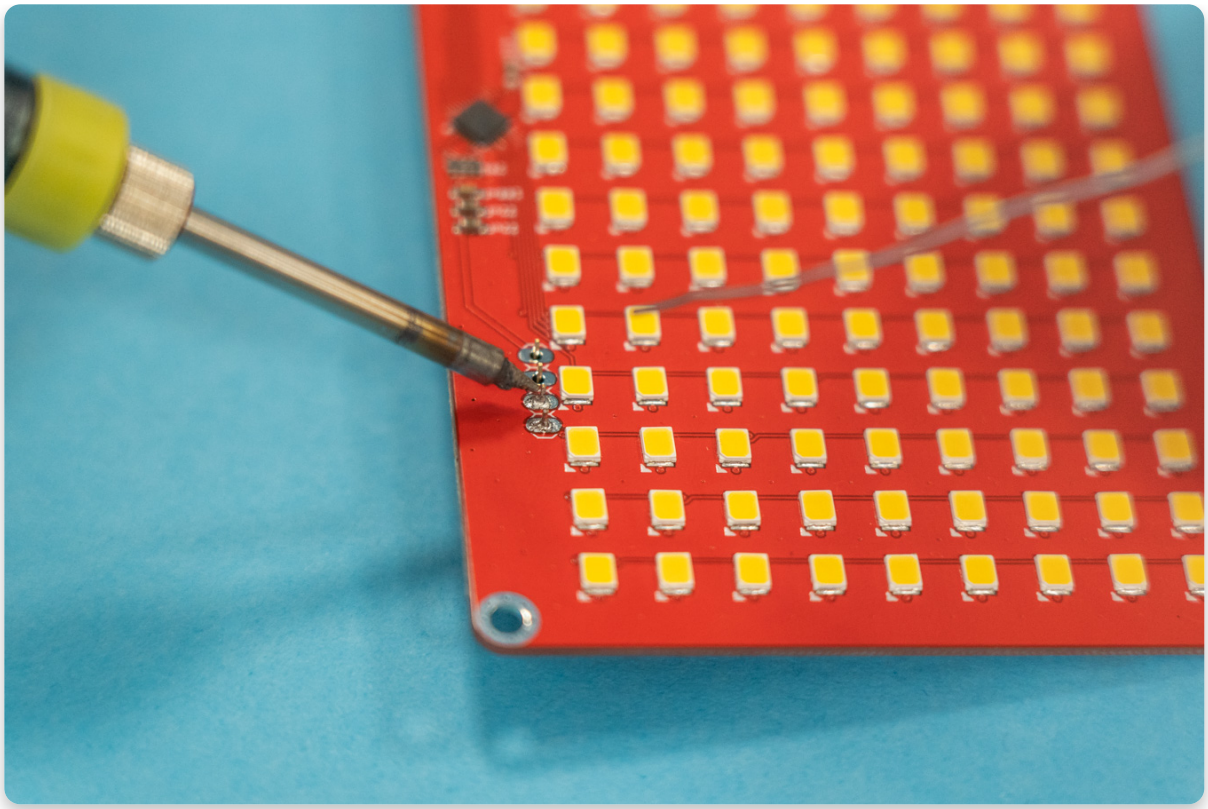
To resolder the header, you simply need to place the soldering iron tip to that one pin that you just soldered and adjust it with your finger as soon as the iron melts the solder. Once you remove the soldering iron tip, the solder should cool off and stay as it is, holding the header straight.

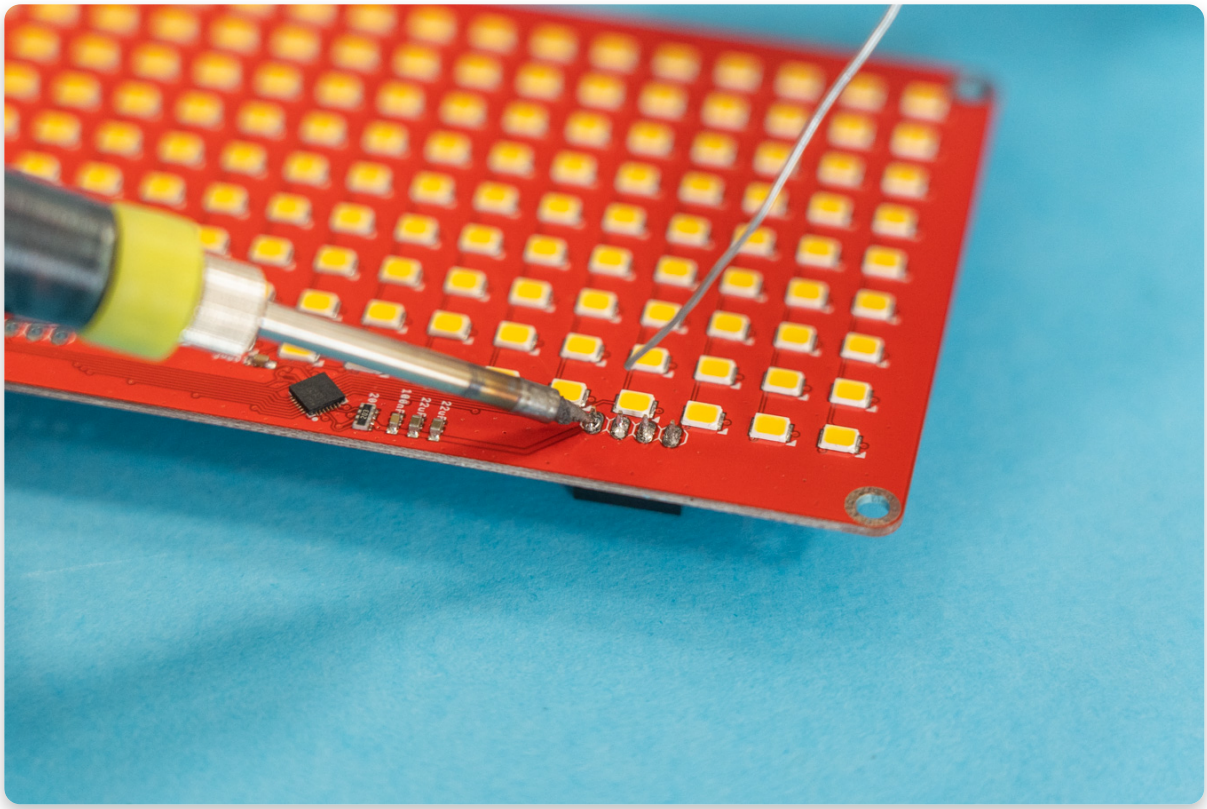




Adjust the header with your finger

After you adjust the header's first pin, it's time to solder the other three pins. Take your soldering iron and some solder and keep on soldering.





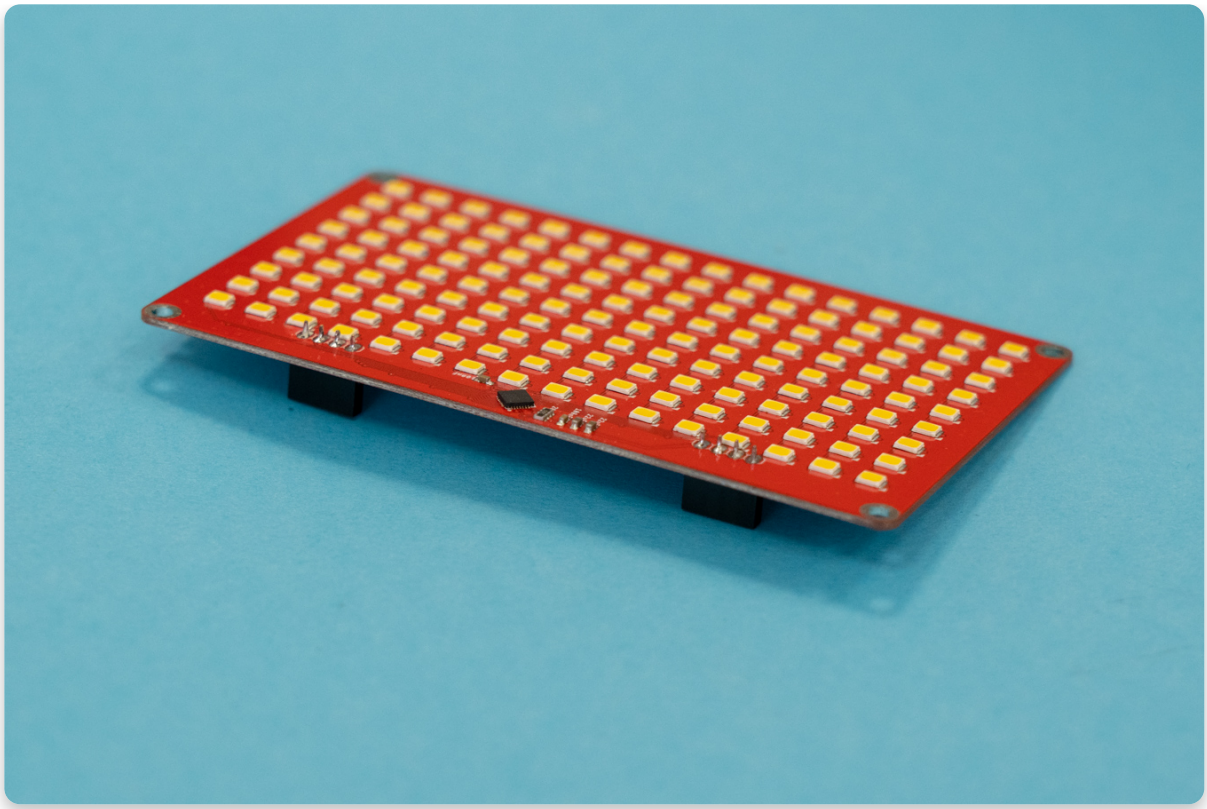
Your soldering joints should look like small volcanos - more solder at the bottom, less at the top

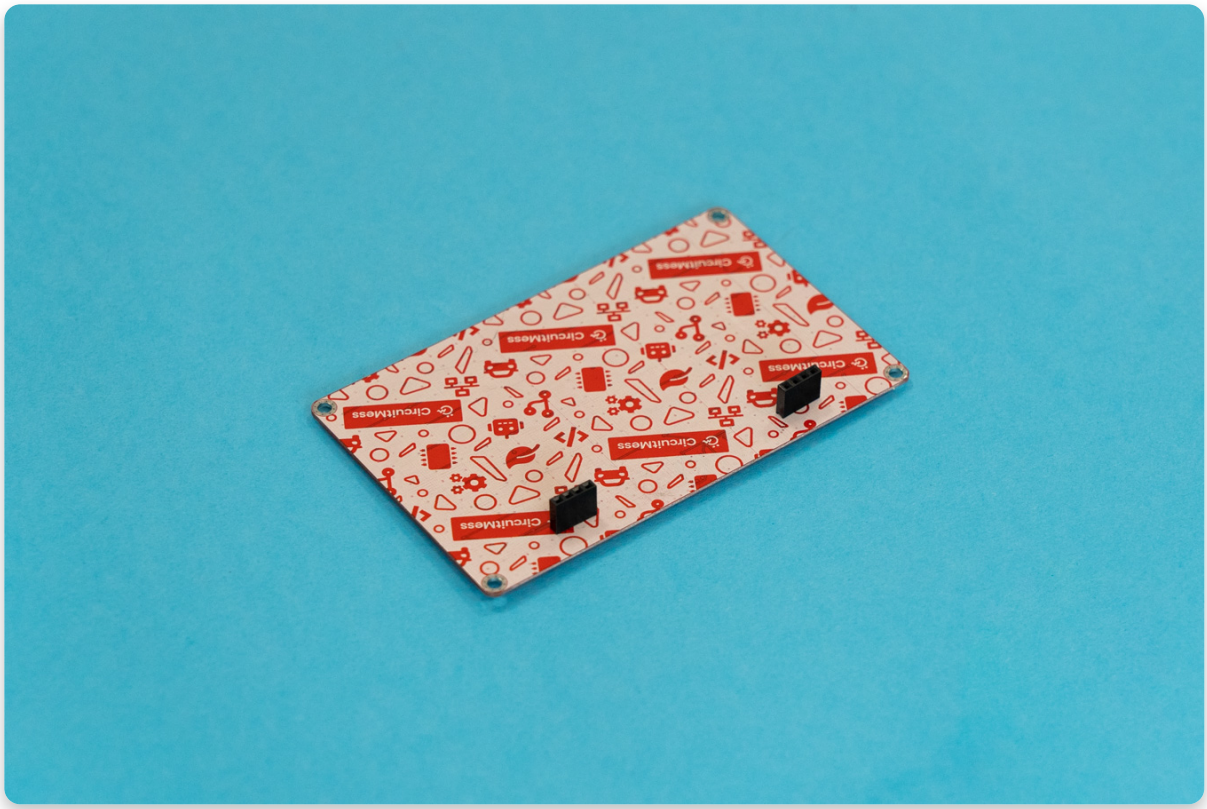
The first pin header is soldered to the board. Congratulations! Now do the same with the second pin header.

Turn the board upside down again and insert the component. After that, start with soldering the first pin and then adjust the header before soldering all the rest.

Insert the second pin header

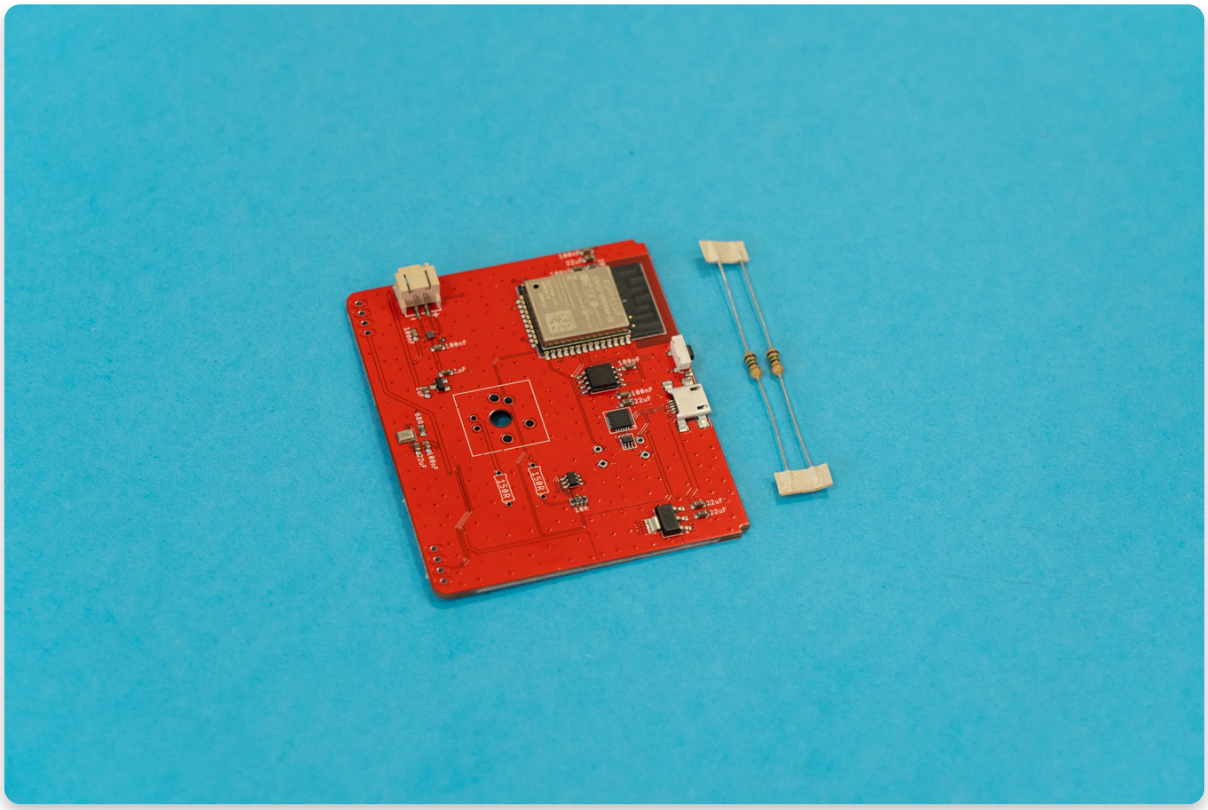
If you successfully soldered both pin headers, your display board should look like this:





Part Two - Resistors

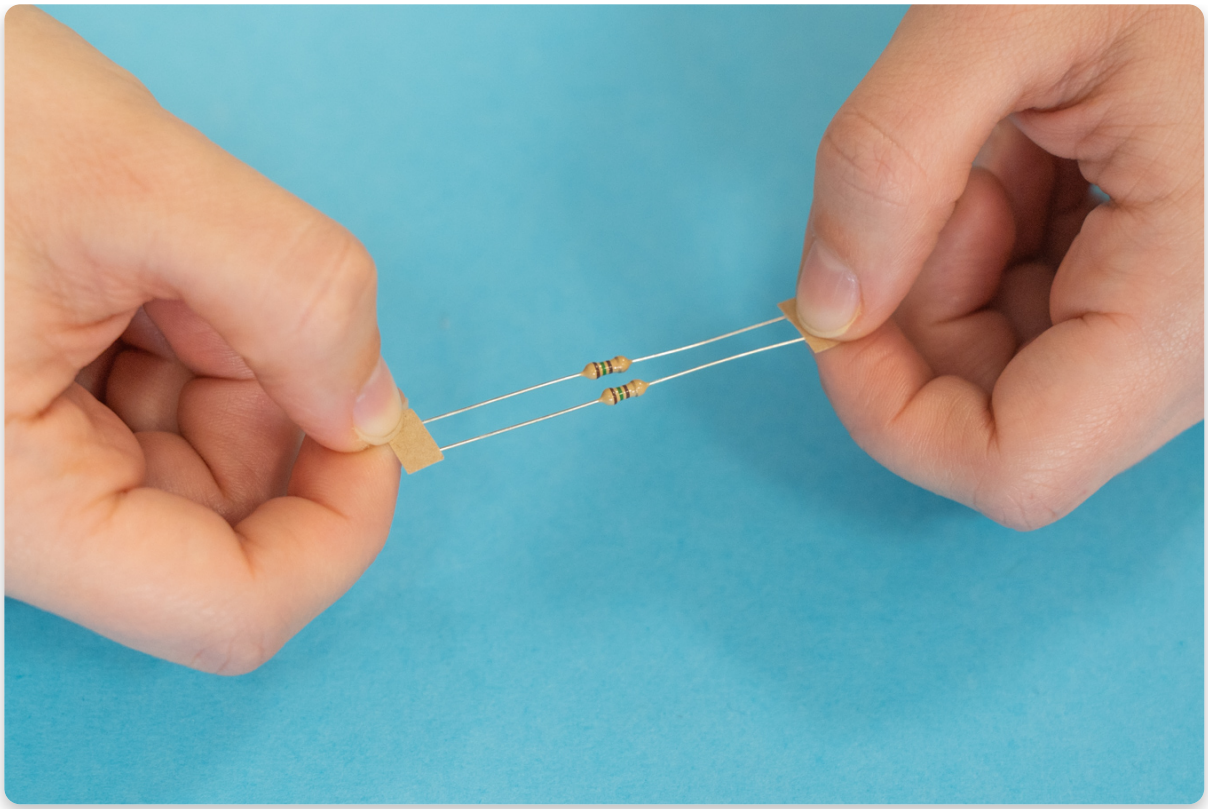
You will need the main circuit board and two resistors for this part of the assembly.

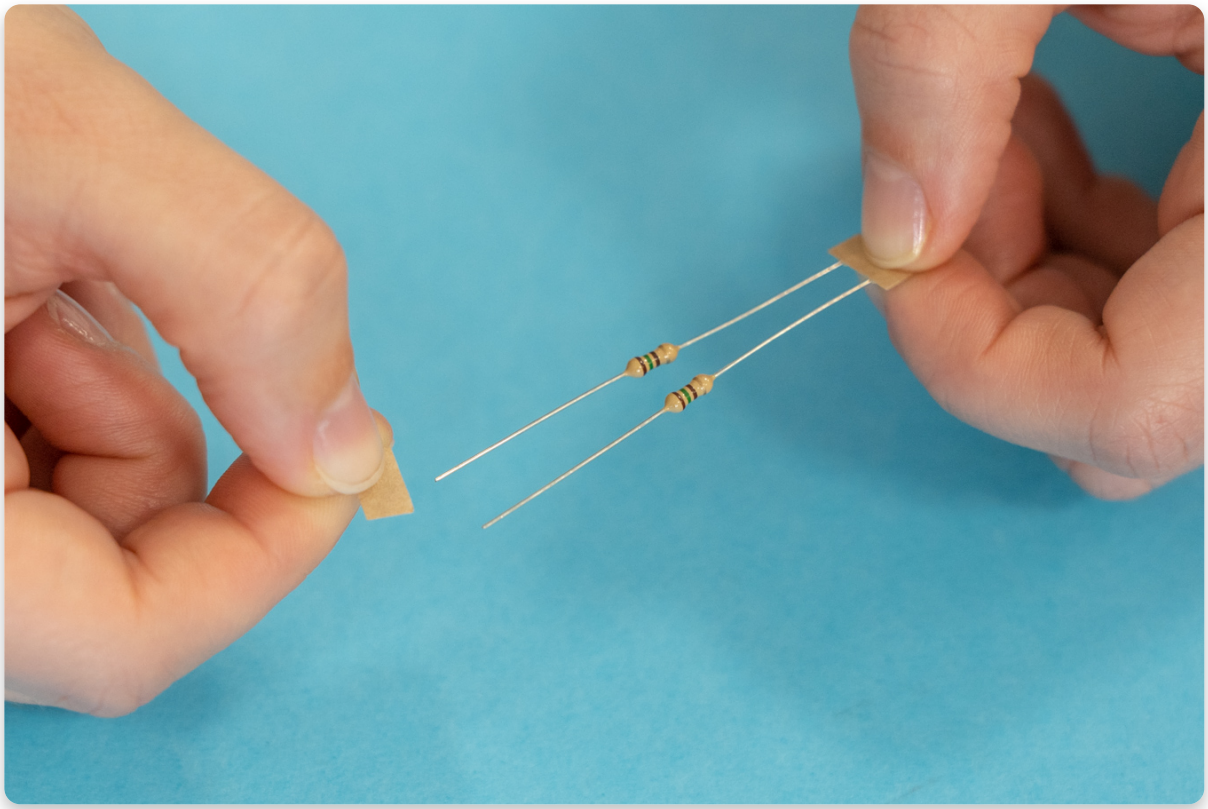


Main circuit board + 2 resistors

Resistors are standard passive two-lead electronic components that implement electrical resistance as a circuit element. Spencer needs these resistors so they can adjust signal levels and regulate current flow.

Start by removing the protective paper from the legs of the resistor.

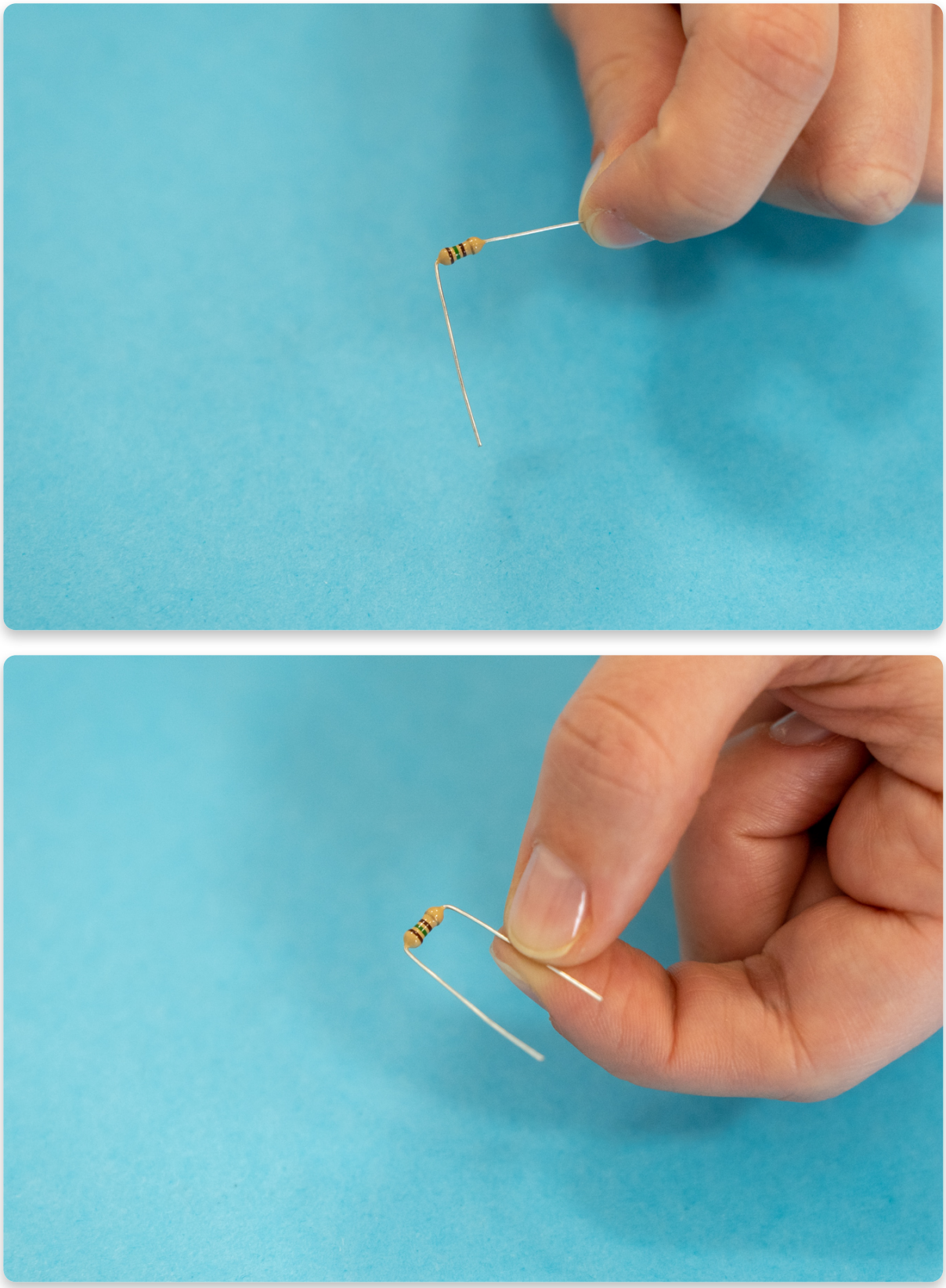




Remove the protective paper

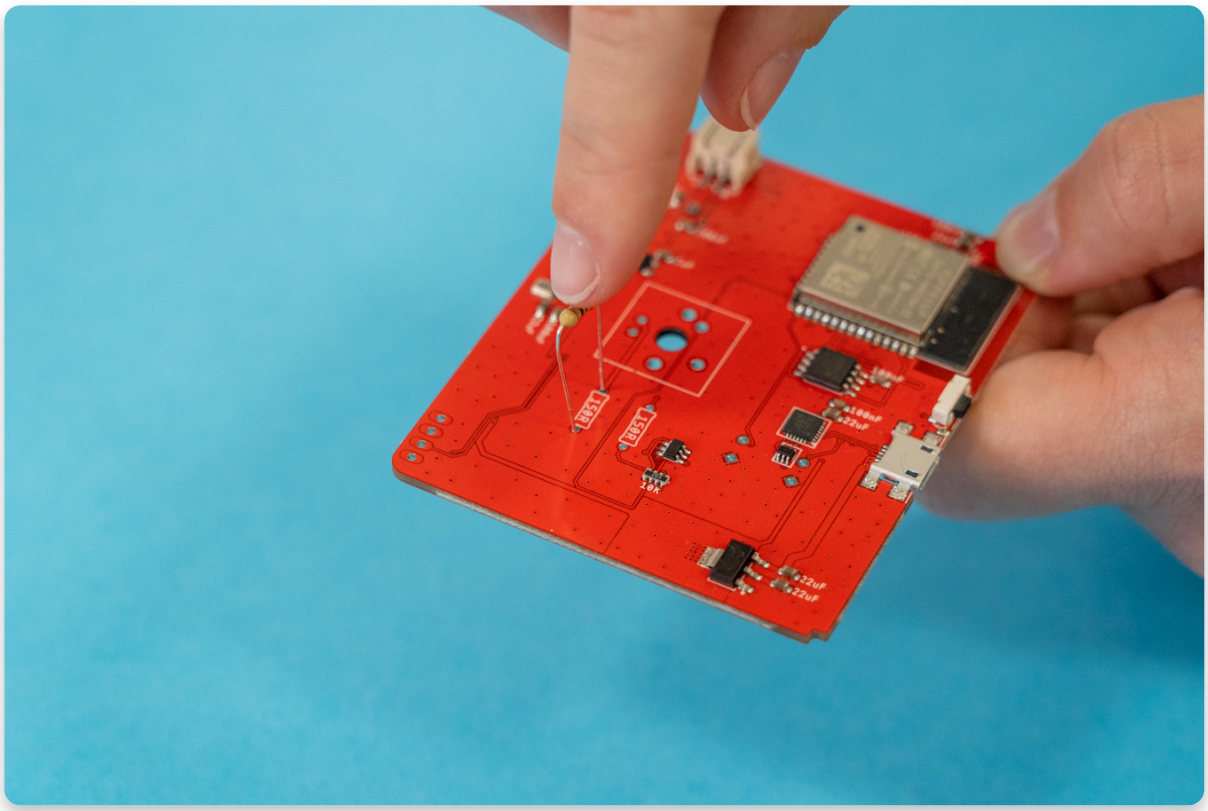
Once you remove the paper, you'll have to fold the resistor legs so they bend right where the resistor is.

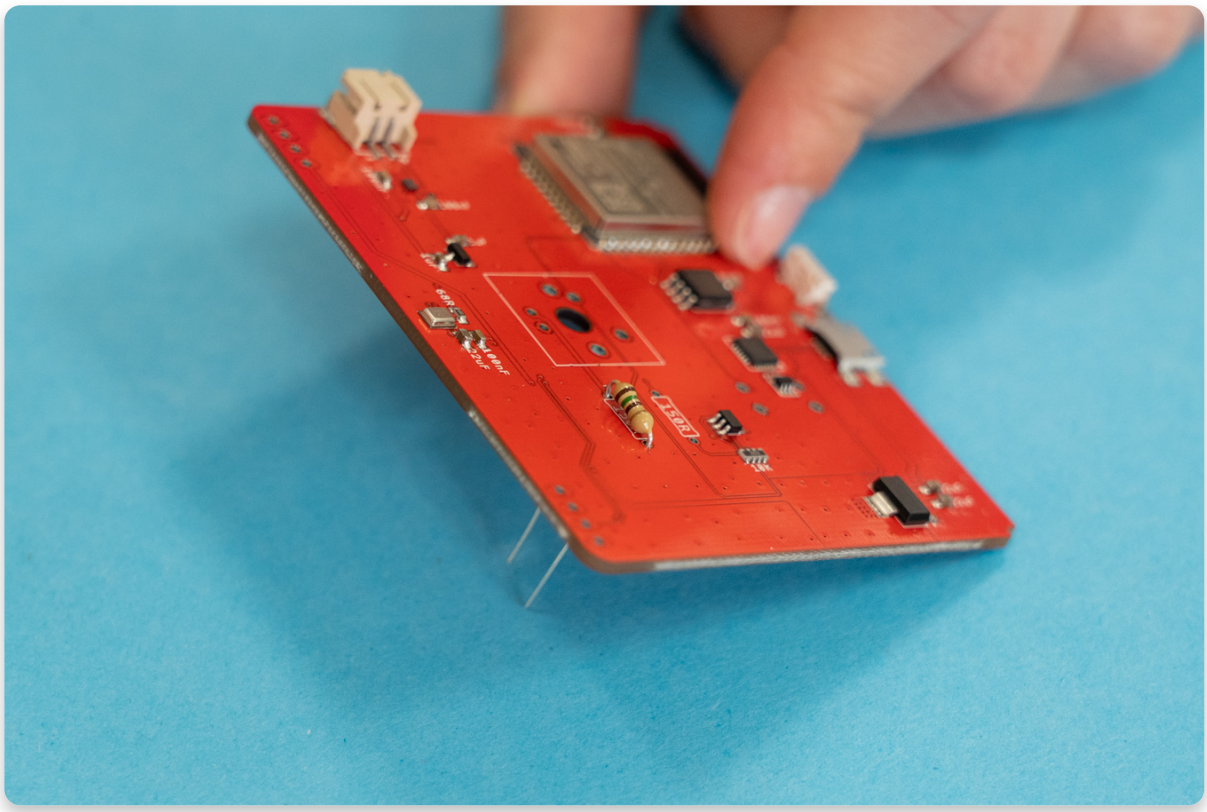
Take a look at the photo below.



The resistor should easily be inserted if you bend the legs like this

Now take the main circuit board and insert the resistors from the upper side of the board. You can see that the place where resistors should go is marked with 150R.





Push the resistor all the way to the board

Once you inserted the first resistor, it's time to solder it to the board. Repeat the same process as before. Flip the board upside down and place the soldering iron tip to the resistor lead so it touches both the lead and the little plated area. Add some solder and make the connection!

Soldering this resistor should be easier than soldering the pin header since the joints are not as close as in the pin header case.

Cut all the legs off the components you've soldered using your **diagonal cutter pliers**.

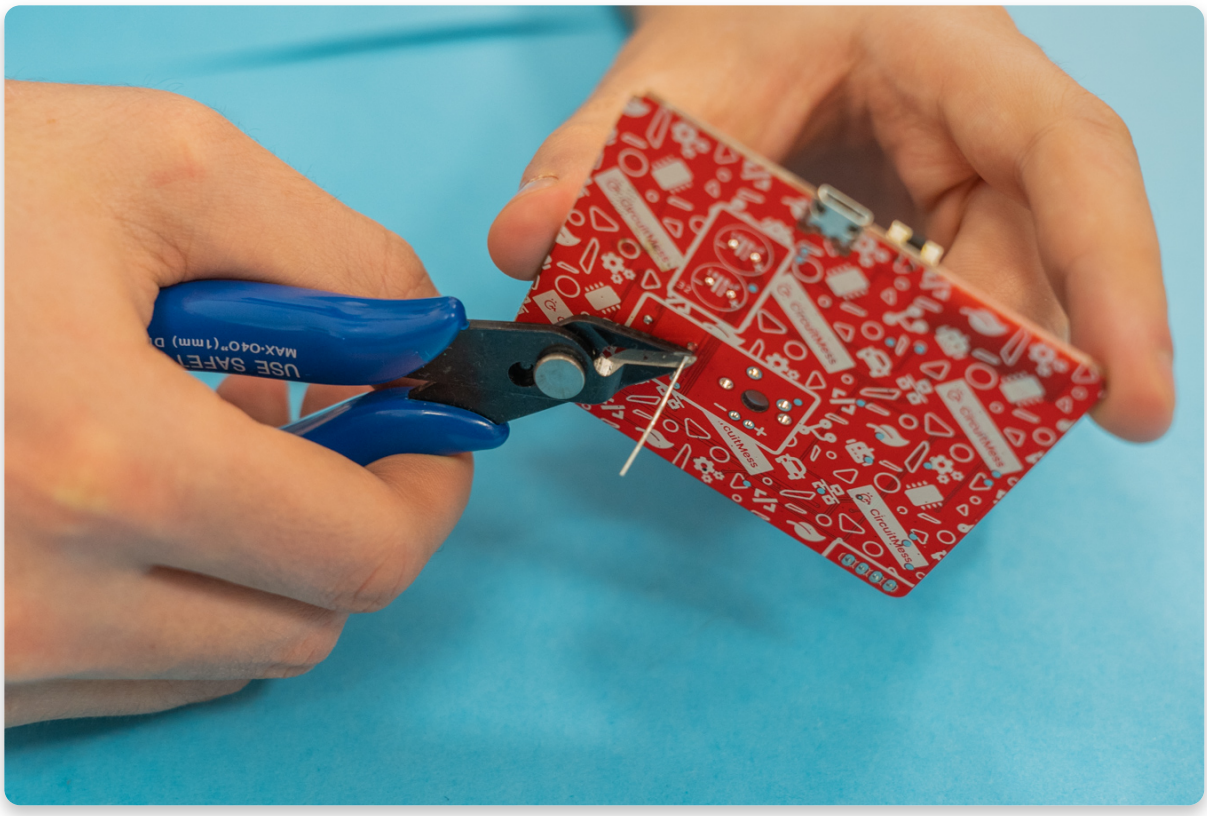
Remember

Face the board away from yourself when cutting the legs. If you cut them carefully, the legs shouldn't fly around, but make sure to face the board towards the table just in case.

Cut the resistor legs like this

Now repeat the same process for the second resistor. Bend the legs, insert the resistor from the upper side of the board, and solder it from the bottom side of the board.

Solder the second resistor

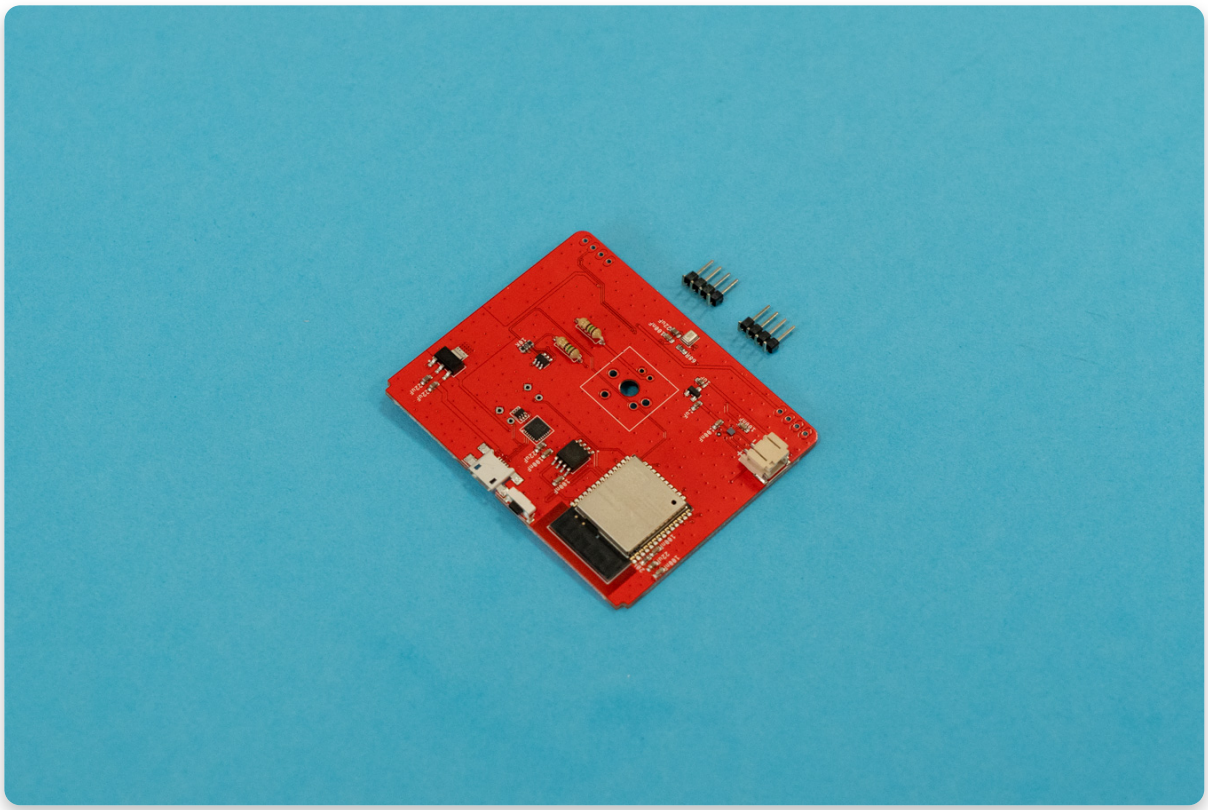


Cut the legs from the second resistor using your diagonal cutter pliers

Part three - soldering more pin headers

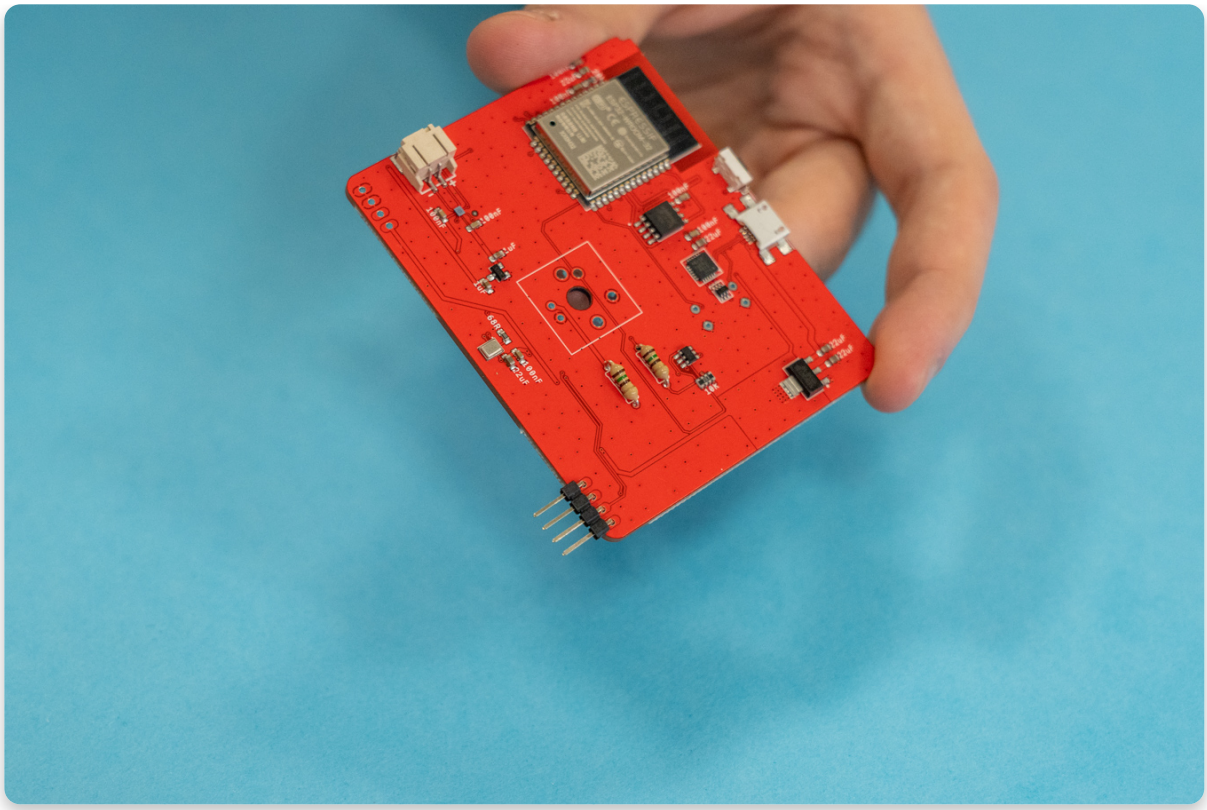
It's time to solder some more pin headers. These male pin headers will enable us to connect the main circuit board to the display circuit board.

Here are all the components you need for this step.



Main circuit board + 2 male pin headers

Insert the first pin header from the upper side of the board. The holes are located in the corners at the top of the board.



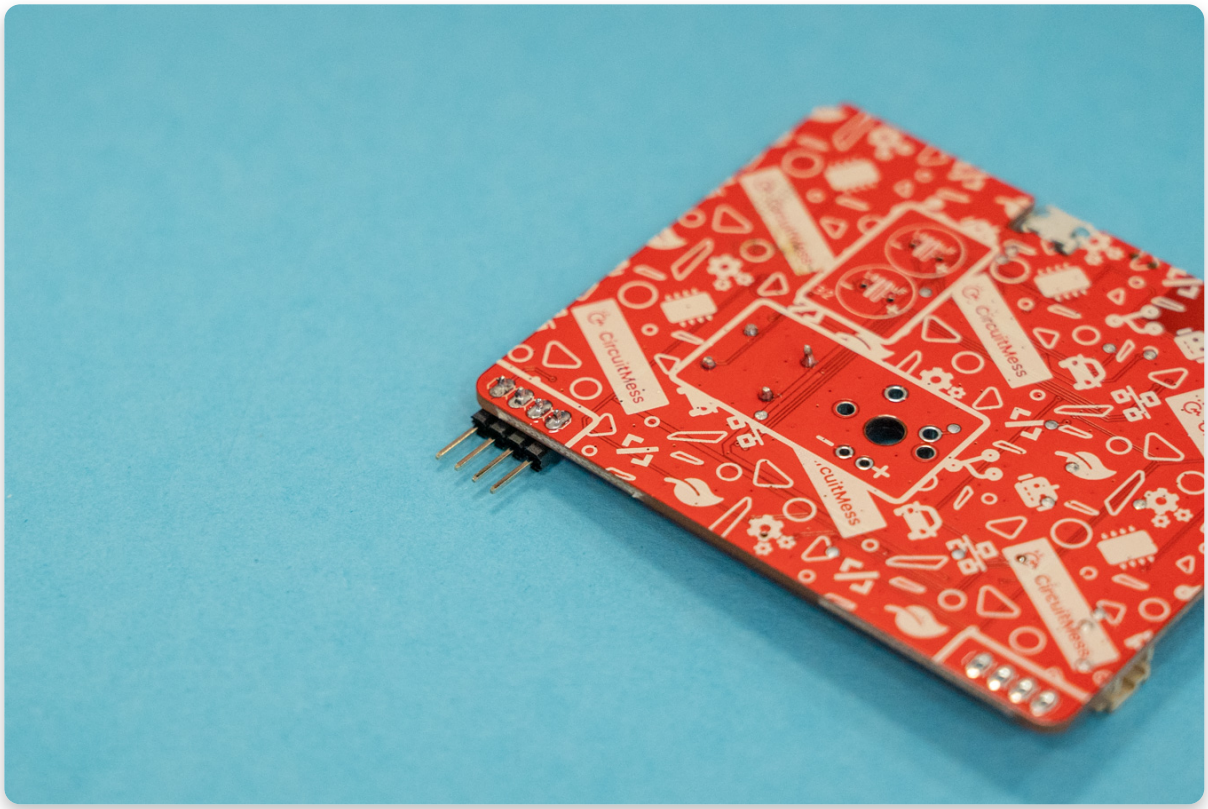
This header is inserted from the back of the board. Make sure that you put the rounded part of the pins on the board!

This might be a little bit tricky because the header will fall out by itself if there's nothing to support it while you solder. Therefore, we came up with a solution that you can see below.

Pro tip

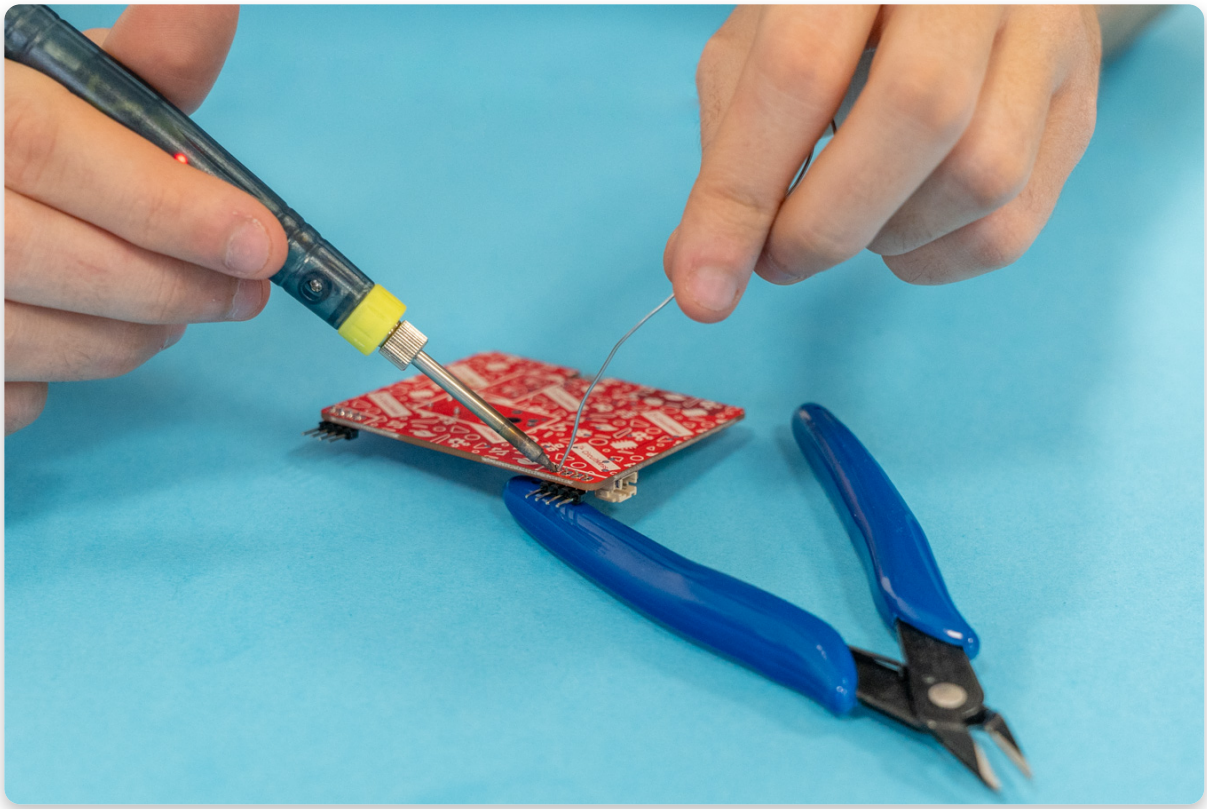
Use the pliers as support when soldering the header to keep the main board in balance.

Soldering the male pin header



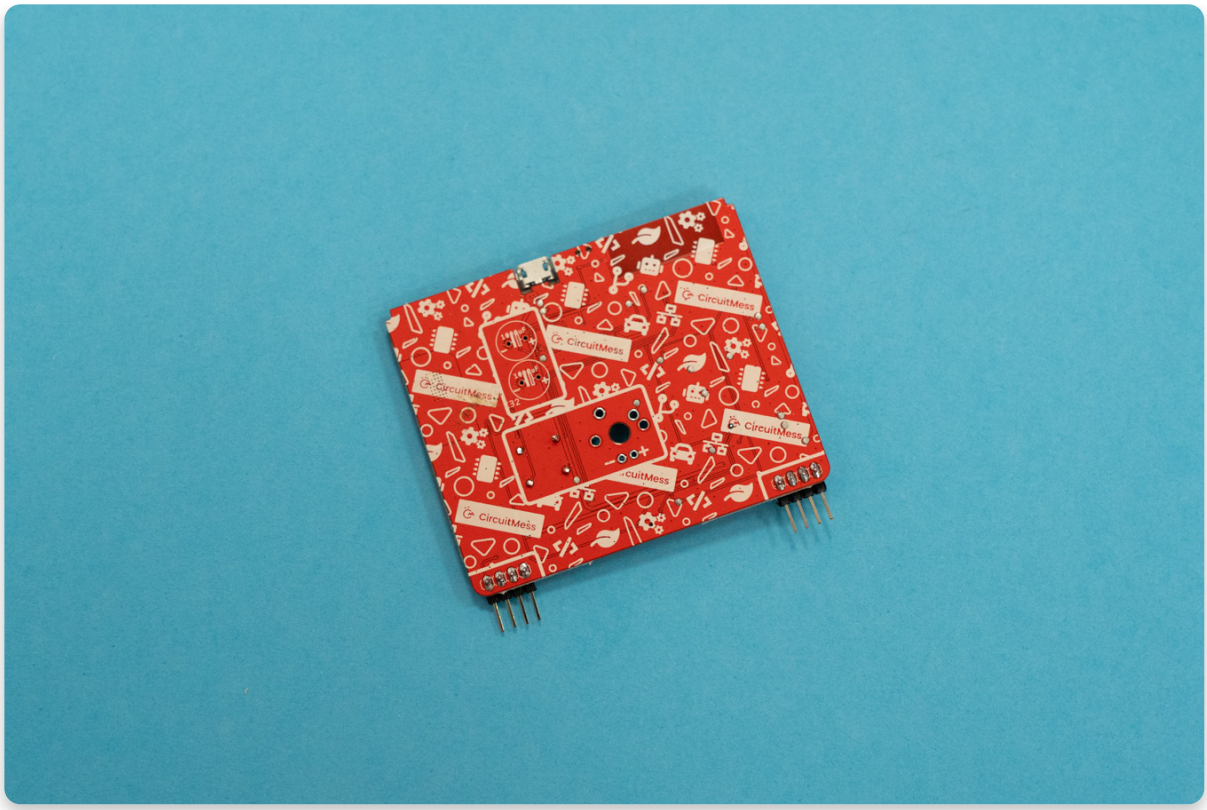
The first pin header soldered to the board

When you finish soldering the first header, proceed with soldering the second one. Repeat the process, and feel free to use the pliers to balance the board and hold the pin in one place.

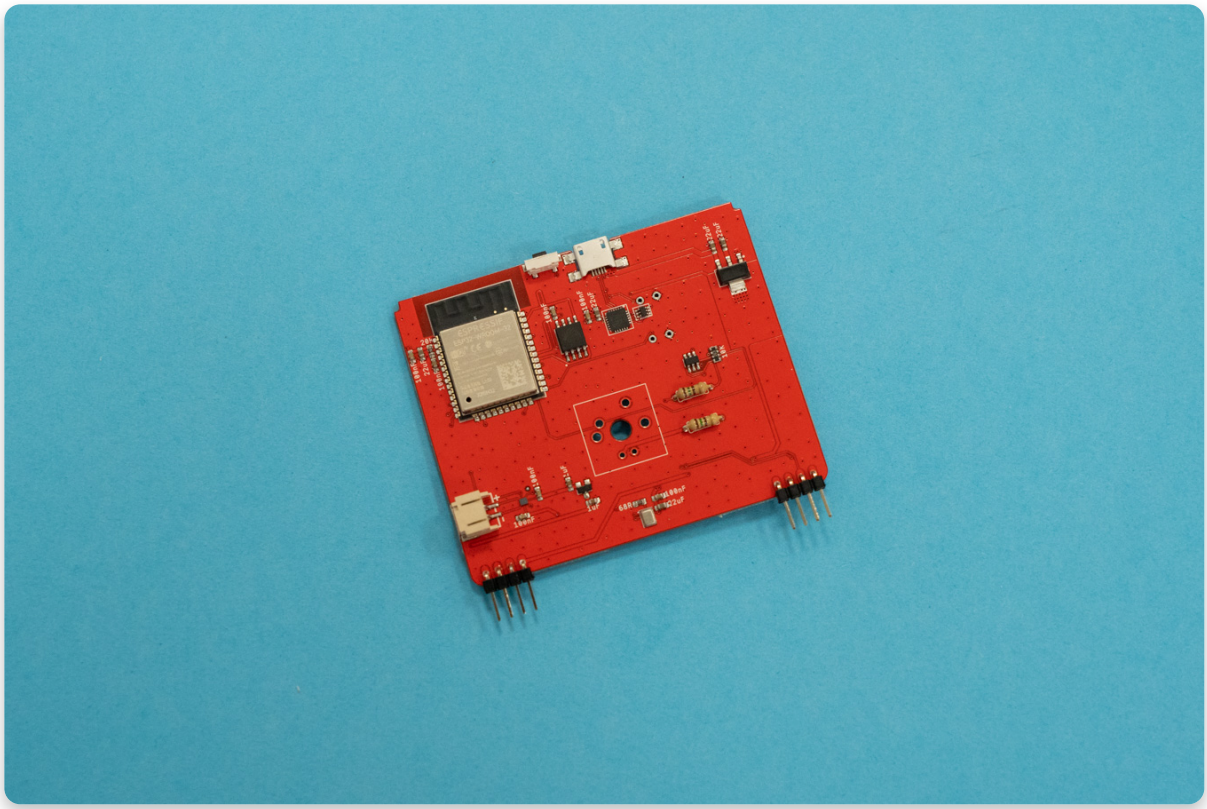


You're doing great! Keep up the good work, there are only a few more components that need to be soldered to the board.

Your main board should look like this by now if you managed to solder the resistors and male pin headers.



Main circuit board from the back

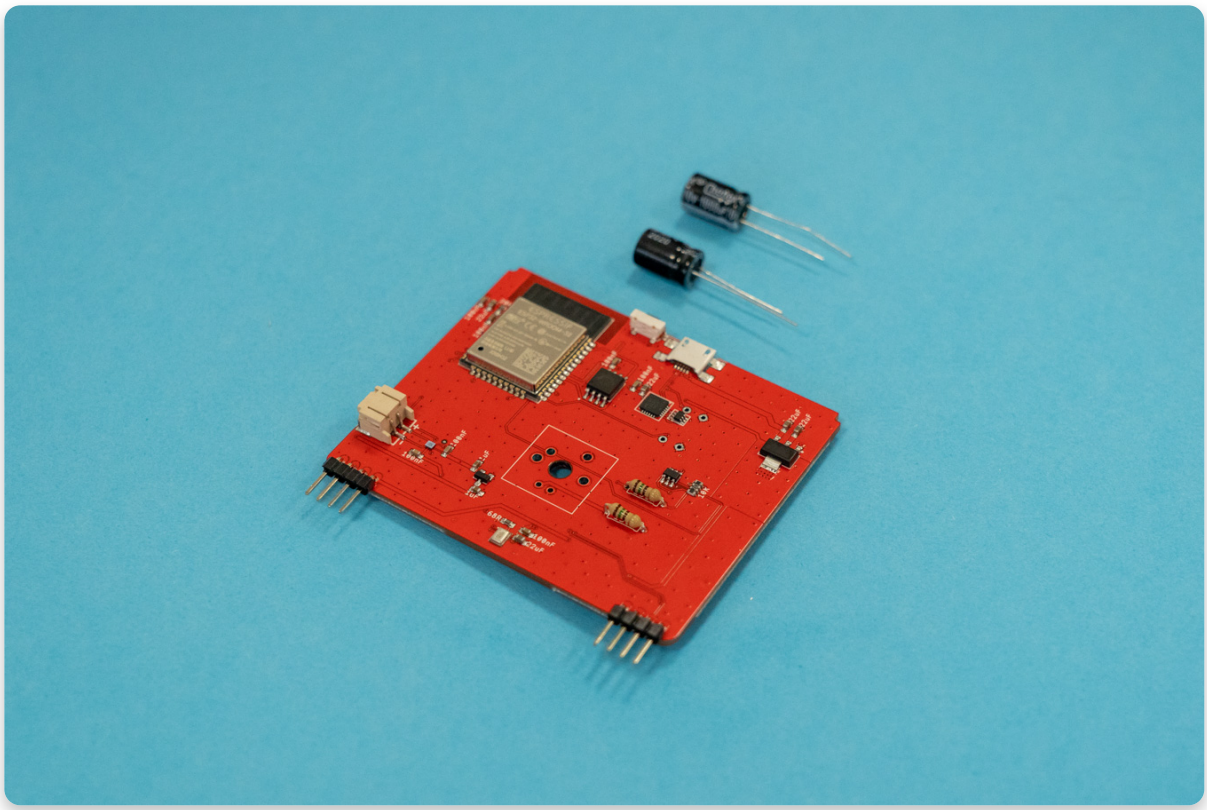


Main circuit board from the front

Part four - Soldering the capacitors

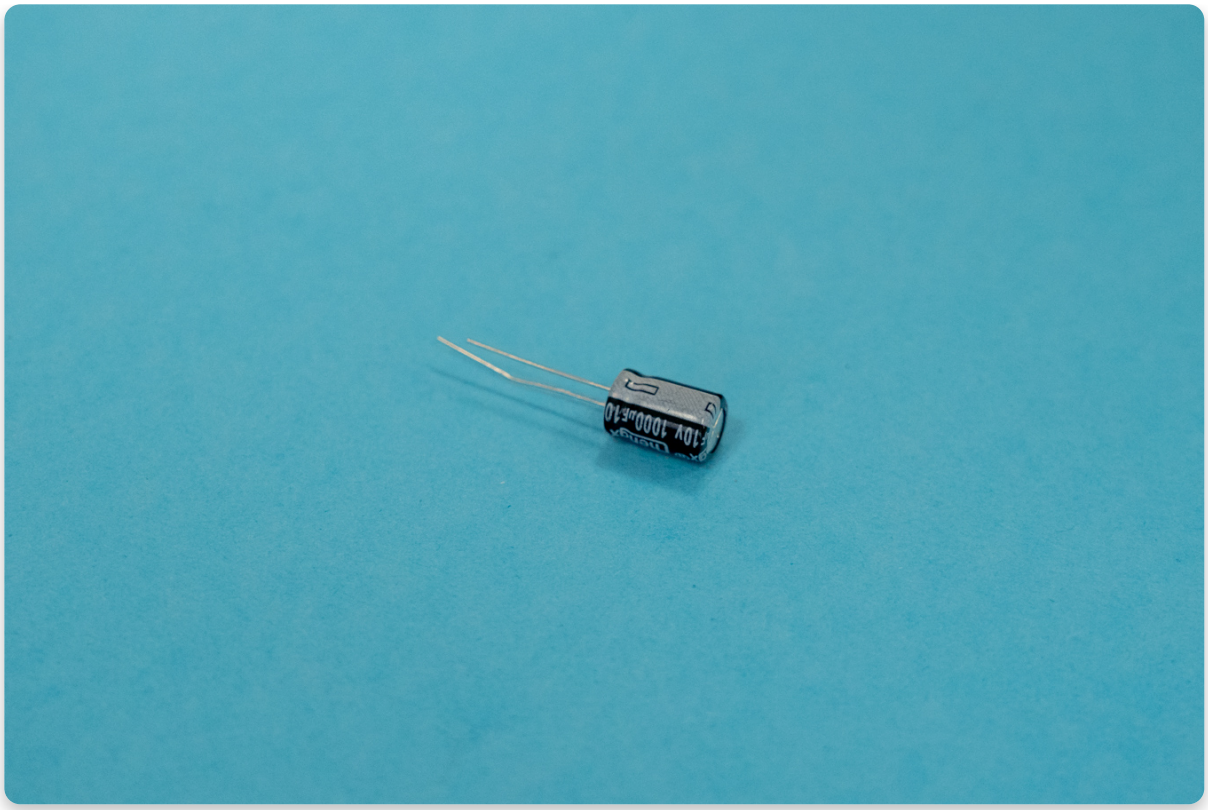
In the next step, you'll solder the two capacitors.

These look like small black barrels with two legs. They’re used for filtrating noise and ensuring that Spencer's circuitry is powered with clean and stable electrical current.



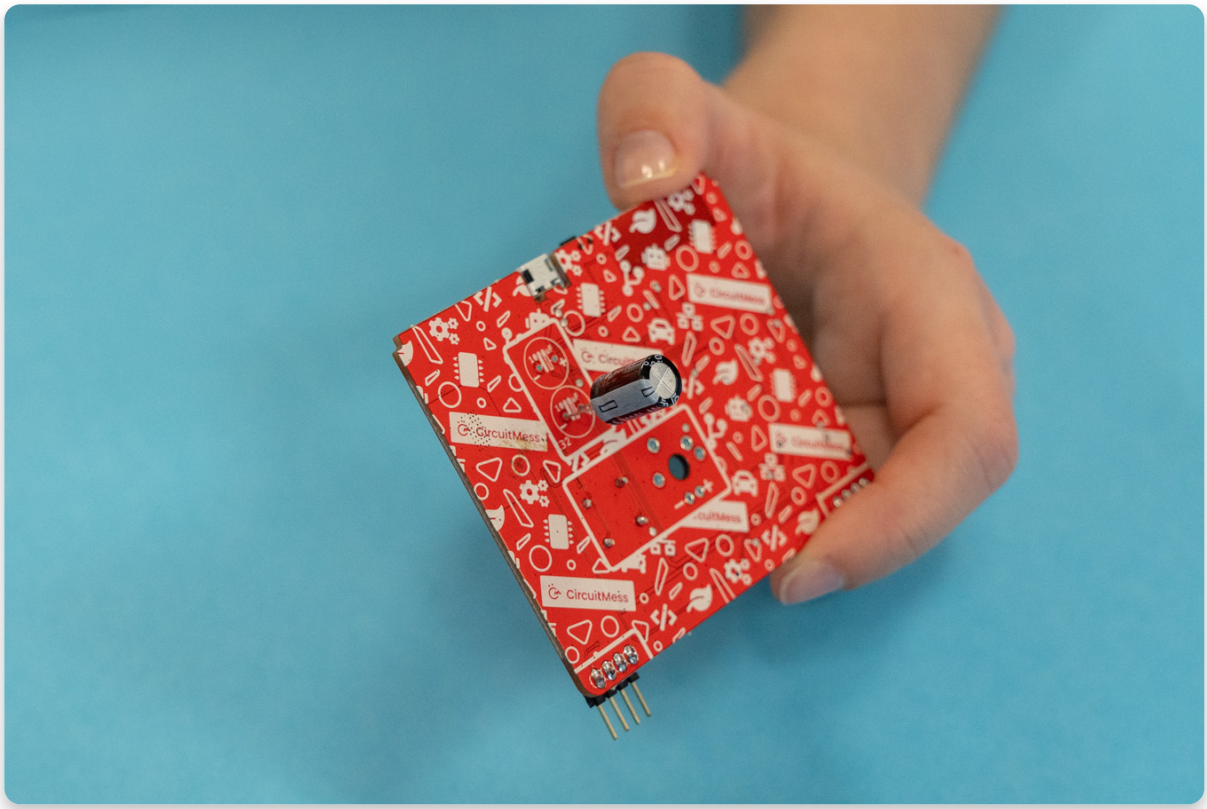
Main circuit board + 2 capacitors

The polarity of the capacitors is indicated with the big white minus (-) sign on the capacitors (the big white stripe).

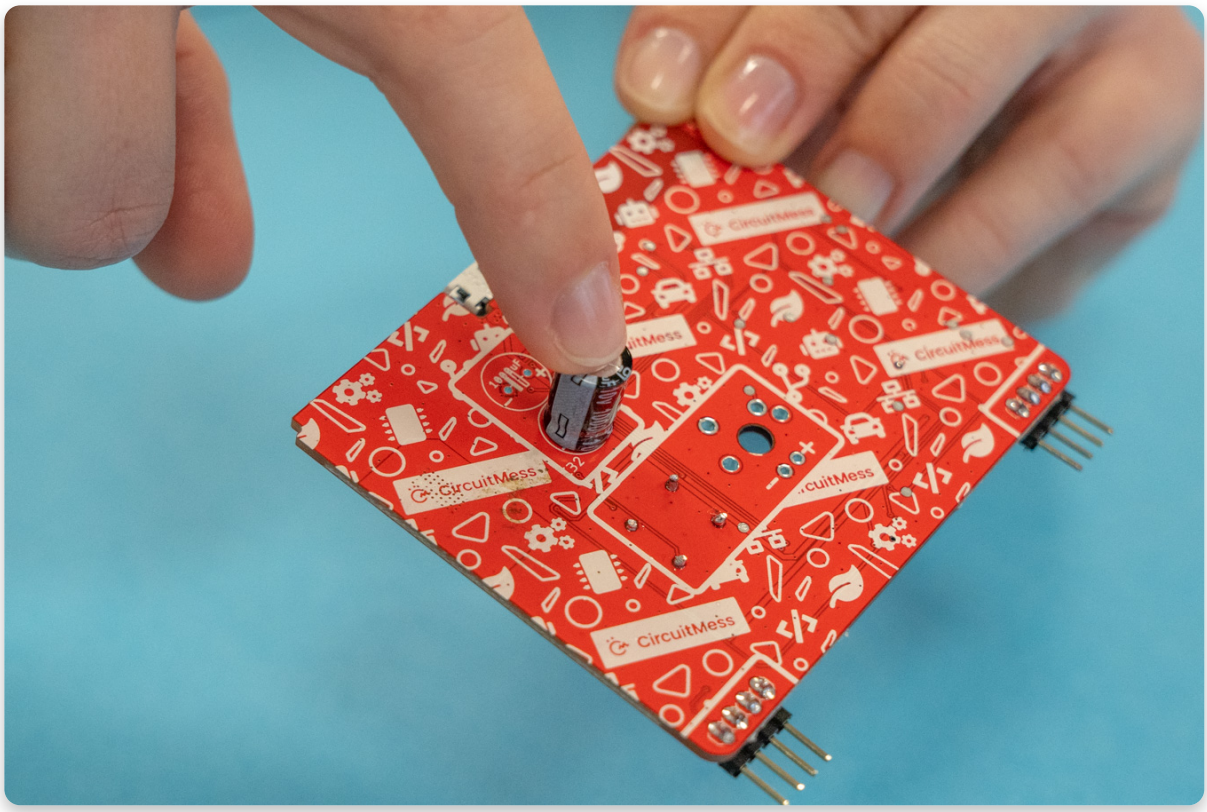


Flip the board upside down so you face the back side of it. The place for capacitors is marked by (-) and (+) polarity, so make sure to insert the capacitors correctly.

The big white stripe that indicates the (-) polarity should be in line with the (-) mark on the board.



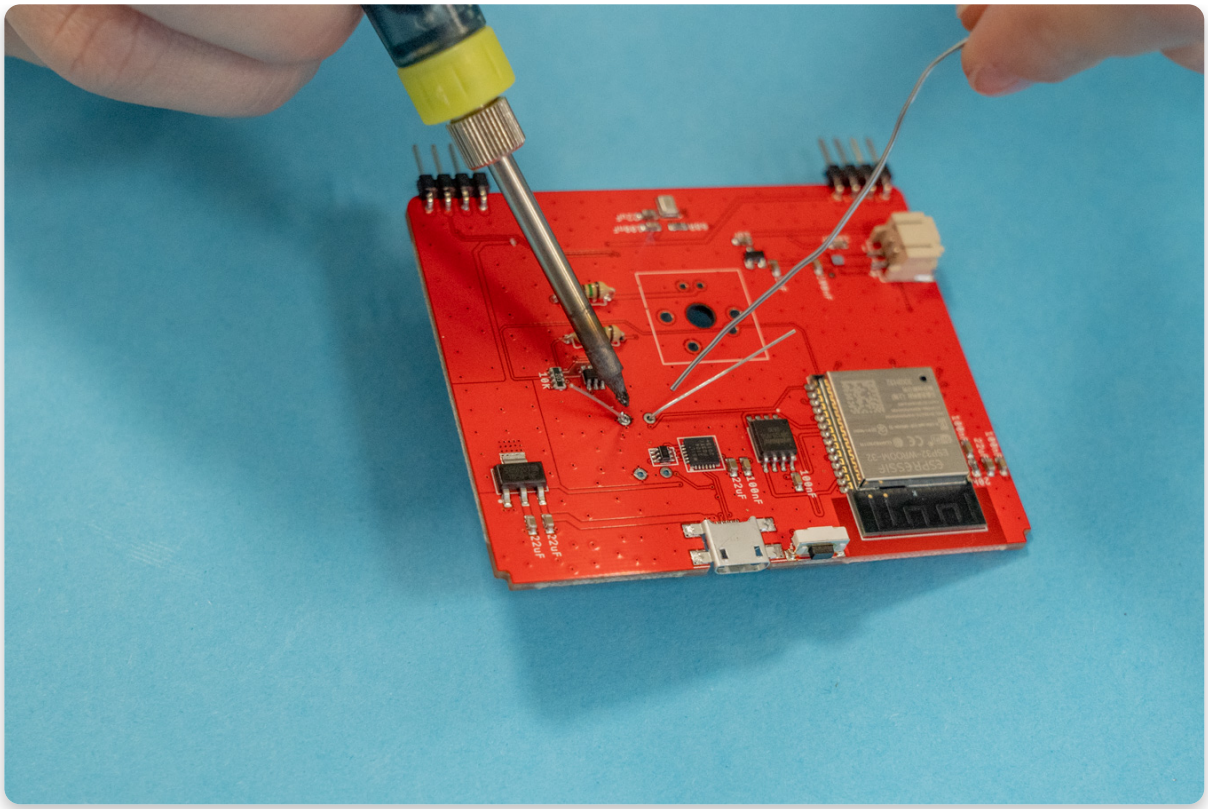
Match the polarity of the capacitor with the polarity marked on the board

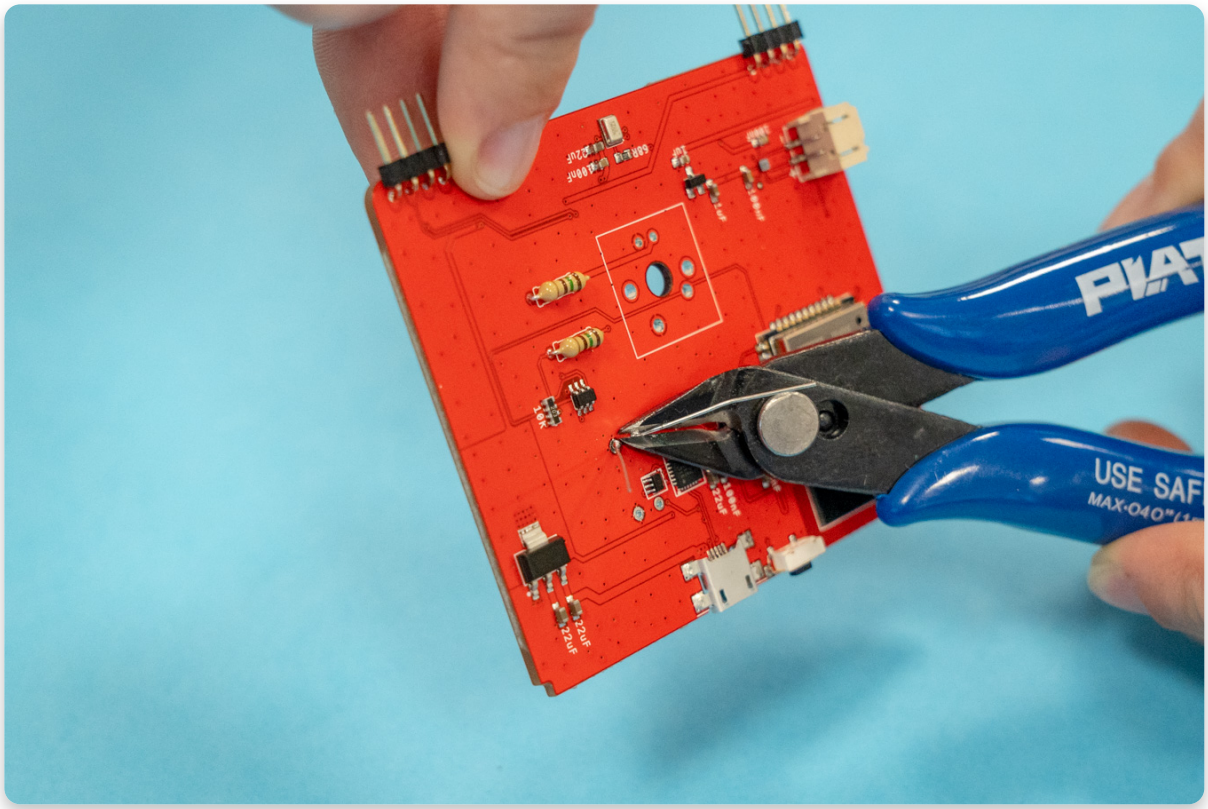


Insert the capacitor

Pro tip

When you insert the capacitor, bend the legs of the capacitor so that it doesn't fall out from the board while you're soldering it.

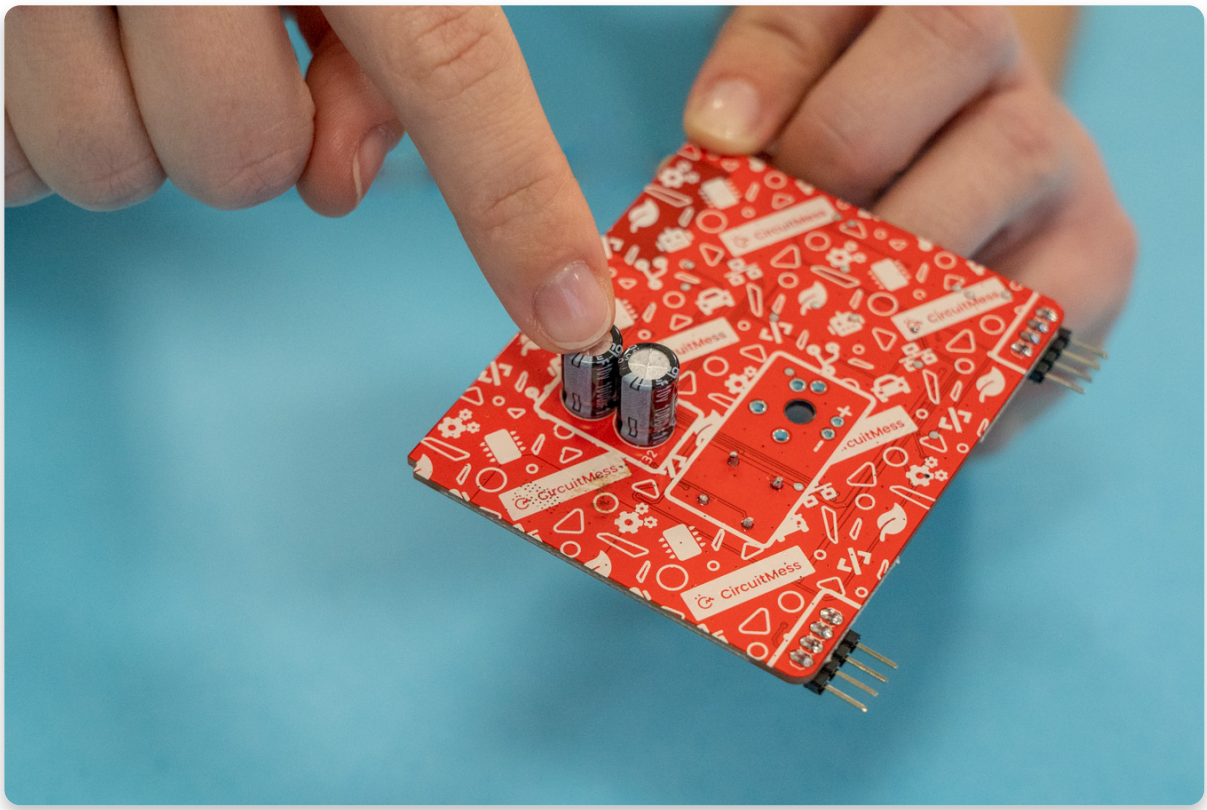




Cut the remaining part of the capacitor legs with your diagonal cutter pliers

Repeat the same process with the second capacitor.

Make sure to insert it correctly according to the polarity that's marked on the capacitor itself and the main circuit board.



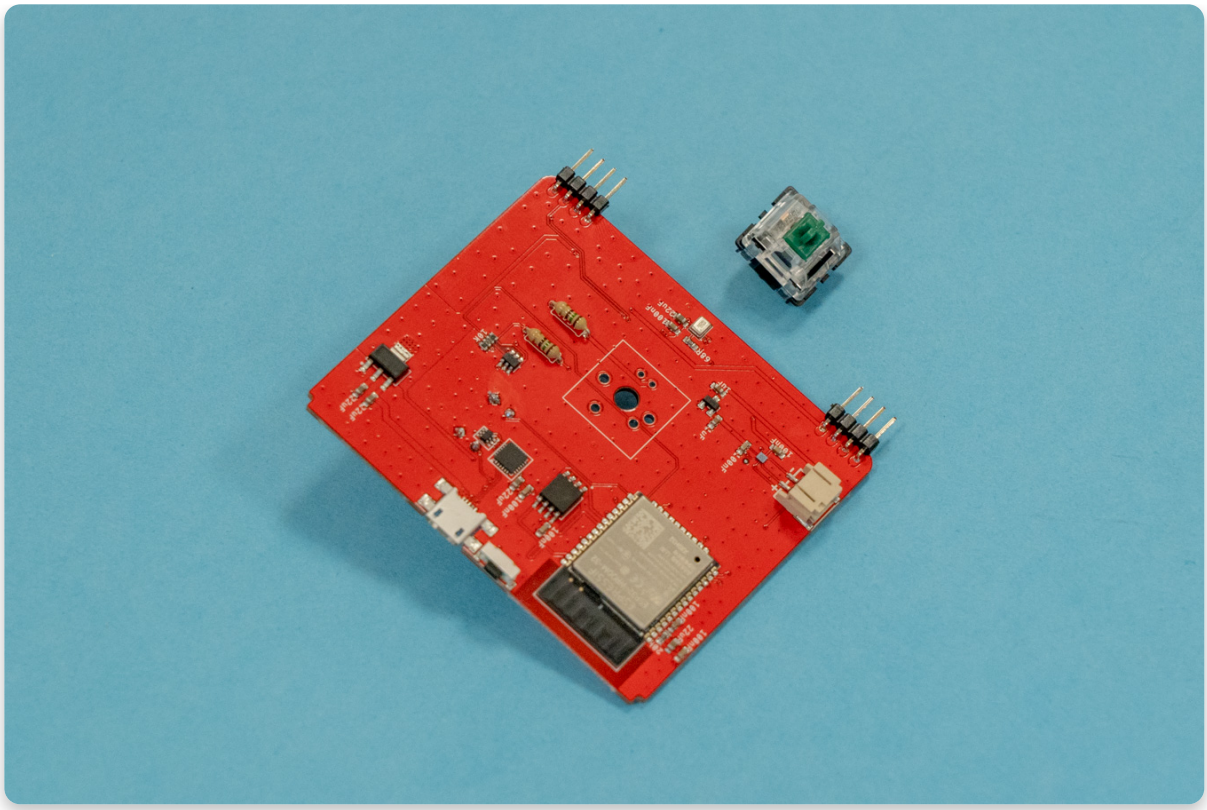
Insert the second capacitor

Don't forget to cut all the legs from both capacitors!

Part five - Soldering the button

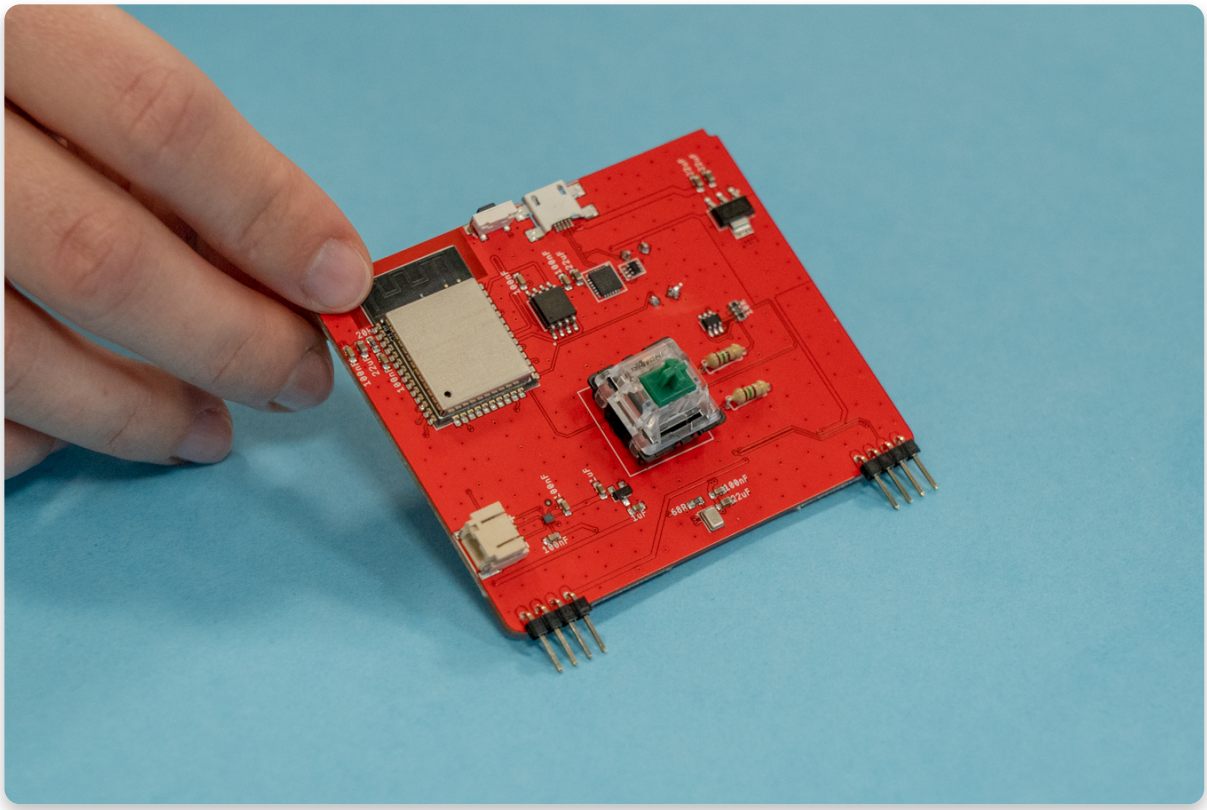
Finally, this button and the LED light are the last components you'll have to solder to the board.

Once you solder this button, you will put the big red button cover to finalize Spencer's look.



Main circuit board + button

Insert the button from the front side of the board, like in the photo below, then solder it from the back side.

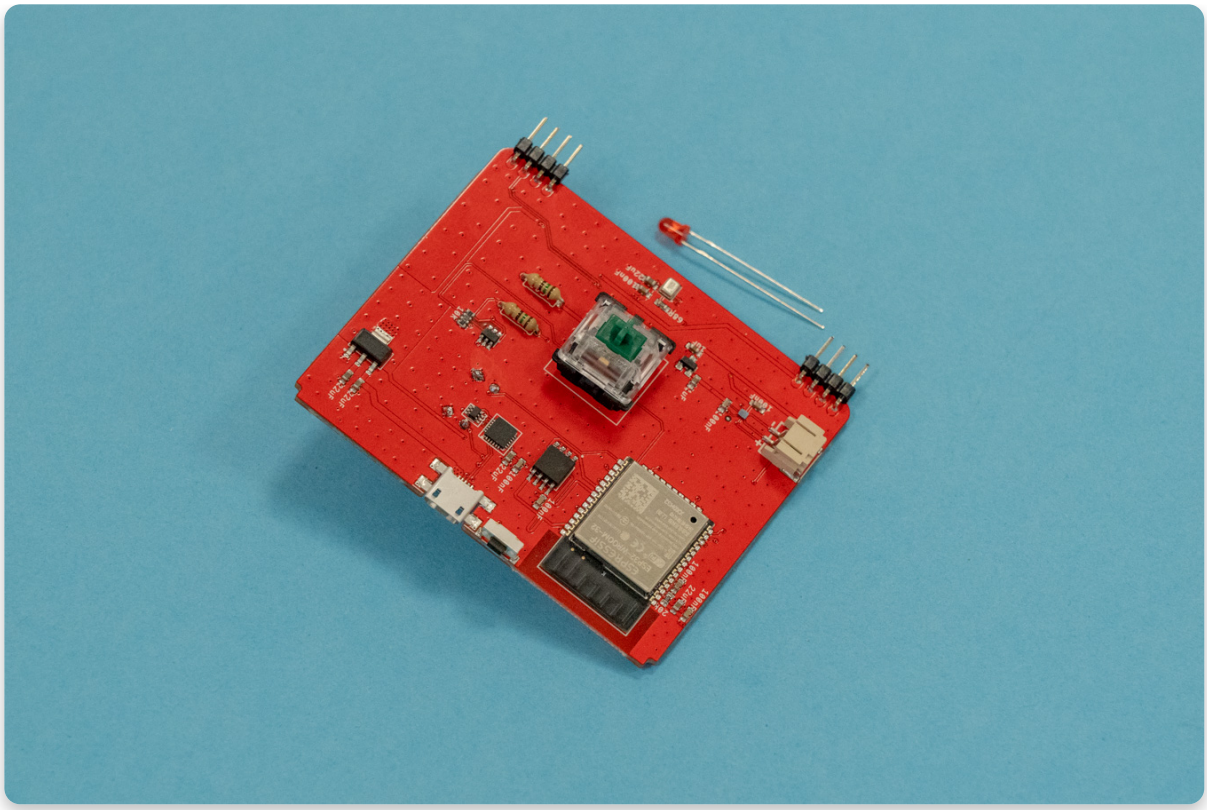


There are only two pins that you have to solder here. The other two holes below the button should stay as they are. Please see the following photo to make sure you soldered everything correctly.

The button is now soldered

The last step in this chapter is soldering the LED light.

You did a great job so far soldering all the components! After this step, you'll switch from your soldering iron to your screwdriver to assemble the casing for Spencer.

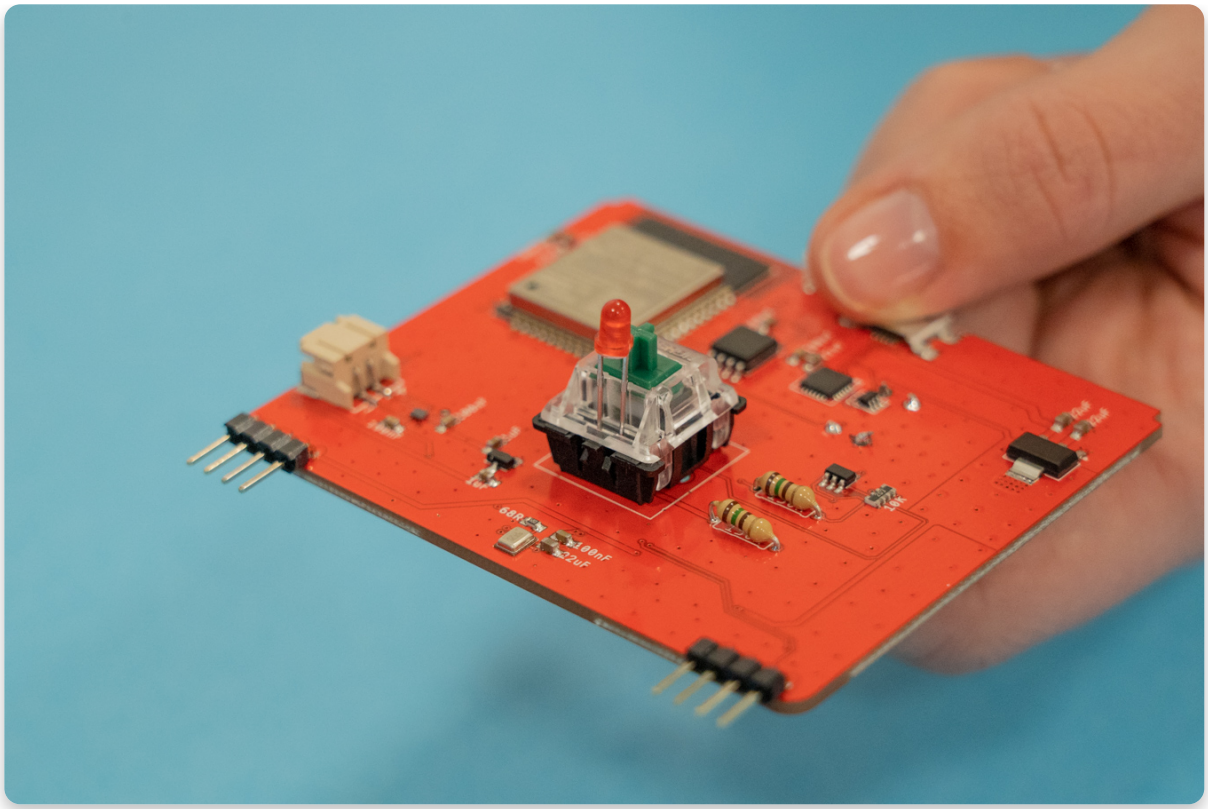


Main circuit board + LED light

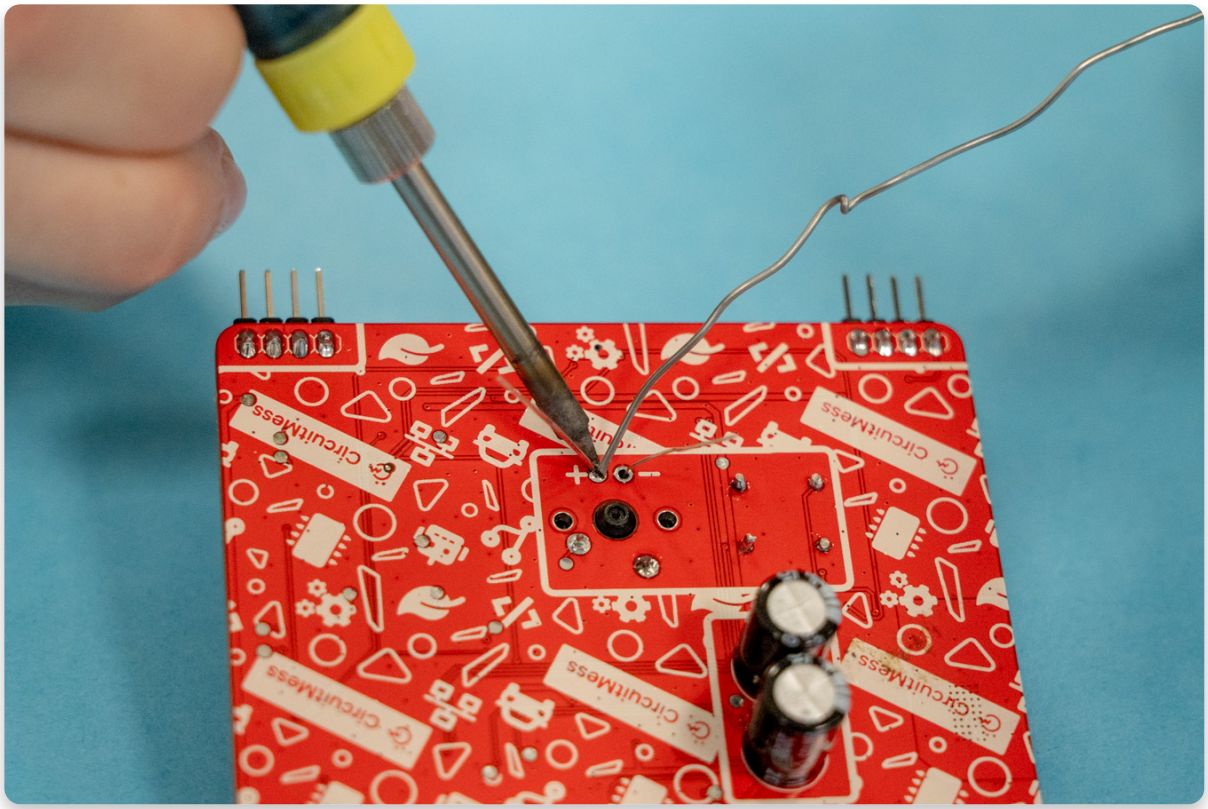
Watch out for the polarity again!

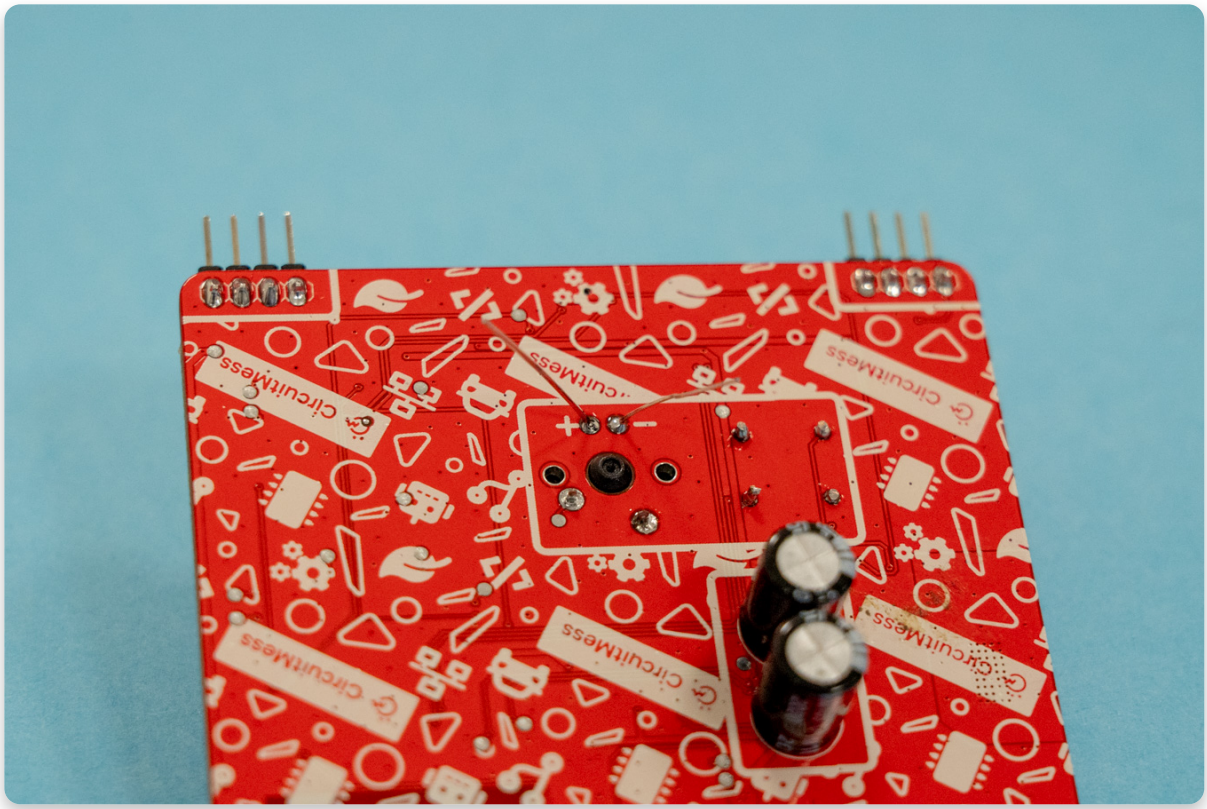
Just like when you soldered the capacitors, you'll have to check for the polarity before soldering the LED light.

You might have noticed that one of the LED light legs is shorter than the other. **Make sure to match the shorter lead to the (-) polarity marked on the board and the longer one to the (+) polarity!**

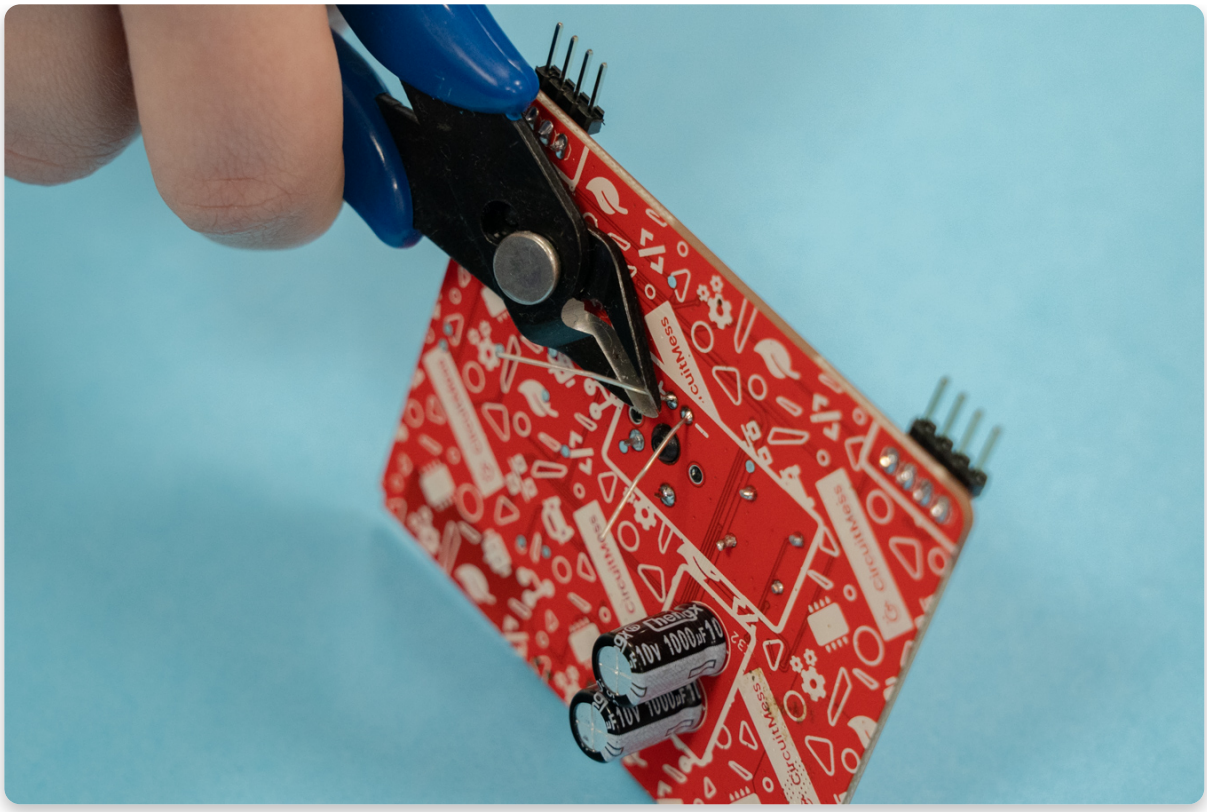


The shorter lead is matched to the (-) polarity and the longer lead is matched to the (+) polarity on the board!





Solder the LED light



Cut the rest of the legs with your diagonal cutter pliers

In the following chapter, we'll show you how to make the first check to see if the lights and the sound work when you turn ON your partially assembled Spencer.

Good job, let's move on!

If you need help with cleaning the tip of your soldering iron, please check our **video tutorial.**

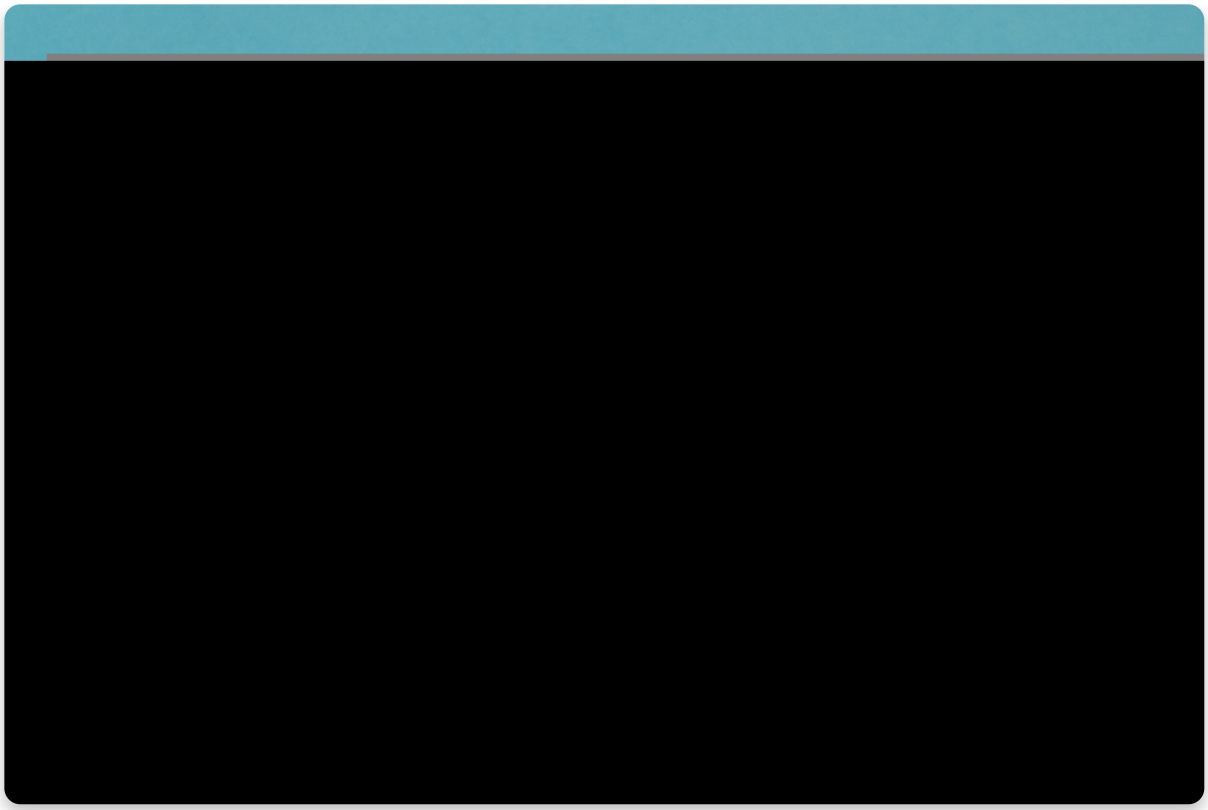
Chapter Two - First check

Let's take a couple of more steps before checking if everything works!

We are now done with soldering and we're moving on to assembling everything by hand or tightening the components with a screwdriver.

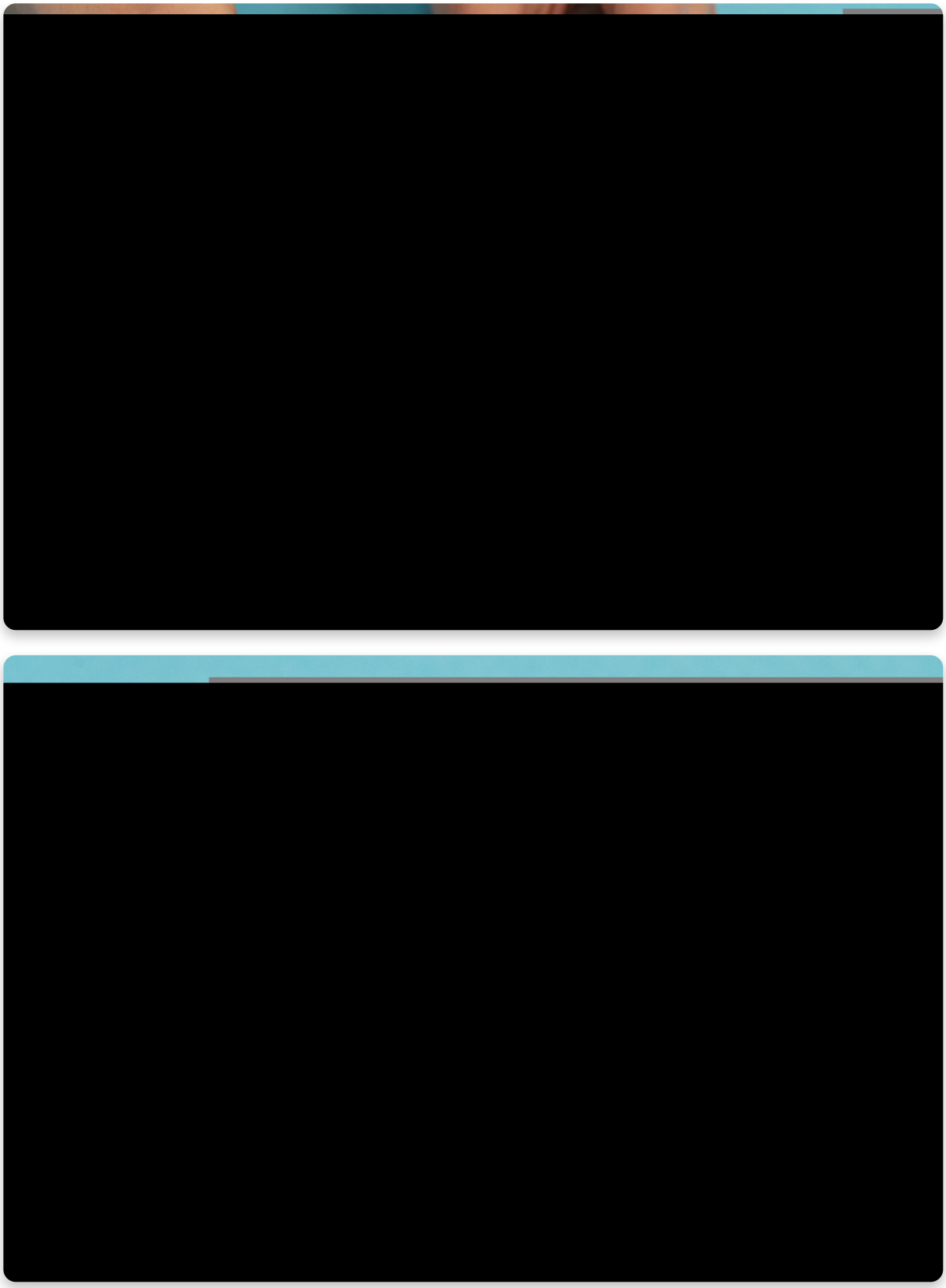
It's time to connect the display board with the main circuit board and the speaker.

Connect the boards



Display board, main circuit board and speaker

Firstly, we'll connect the two boards. Take your display board and your main circuit board and find the pin headers on each. Once you find the headers, you can go on and connect them so that you place the pins from the main circuit board in the headers on the display board.



Two boards are now connected

Connect the speaker

Now that you connected the display board to see Spencer's face, messages, and other visual elements, it's time to give it connect the speaker so that you can hear what Spencer has to say!

Find the port on the side of the main circuit board and connect the speaker as shown in the photo.

The correct way to connect the speaker

First check

To do the first check, you'll need to connect your Spencer to the power supply with your micro USB cable.

Take your micro USB cable

Insert the USB cable to the USB port on the main circuit board

Insert the USB cable to the power brick and connect it to the power outlet

Spencer's display board should light up and you should hear Spencer's voice!

Yes! Spencer passed the first check!

If the display doesn't light up, that most probably means that one of the components is not properly soldered. Check for any bad solder joints, solder bridges, unsoldered pins, and residual solder somewhere on the board. **ALWAYS disconnect the power supply before starting the soldering process!**

After fixing the soldering joints, repeat the process of the first check to see if the display lights up and you can hear the sound coming from the speaker.

In case this doesn't help, reach out to us via contact@circuitmess.com, and we'll do our best to help out! Make sure to attach a few photos of your soldering joints on the boards so we can troubleshoot as soon as possible.

Chapter Three - Casing up

Welcome to the next step where you'll see how to assemble the casing for your Spencer!

This might be the most fun part of the whole process so let's start by peeling off the protective layers.

Each of the acrylic casing parts has a protective layer on both sides that needs to be peeled off. They are not yet fully transparent, but they should be once you finish this step!

All the casings should be transparent once you remove the protective layer

We'll put the casing on the display board first. For this step, you'll need to take your display board, the protective casing layer, 4 metal bolts, and 8 spacers.

Make sure to use the correct casing layer. This one is the biggest one without the big hole in the middle and only 4 small holes in each corner where the metal bolts go.

Display board, metal bolts, spacers, and the correct casing layer

Place all 4 bolts into all 4 holes in the corner of the casing layer. On the back side of the casing, place one spacer that you'll tighten by screwing the bolt from the other side

This is how the casing should look like when you tighten all the bolts and spacers in 4 corners

Place the protective casing on the display board so that the spacers touch the board and the bolts face towards you. By placing it like this, you'll be able to tighten the bolts when you place the casing on the board.

Place the casing on the display board

Take the remaining 4 spacers and place them on the board from the back so you can tighten the casing from each side by using the screwdriver.

This is how the board should look like after you placed the first casing layer

In the following step, you'll assemble the casing from the back where the speaker should go.

Take the biggest casing layer with a smaller hole in the middle - that's where the speaker goes. This layer also has a long, thin hole on top of the speaker hole.

You will need 4 bolts and 4 spacers for this step.

Place the speaker on the casing layer

You can notice that the long, thin hole above the speaker isn't symmetrical. This is because the reset button on the main circuit board should go where the hole has a bit bigger opening. Try to place the speaker as shown in the photo and see if you placed it correctly by fitting the casing layer with the back side where the reset button is.

Insert the bolts in each of the four holes around the speaker from the front side of the casing

Place the spacer on the back side of the casing

Tighten the bolts with the screwdriver

This is how the back casing should look like after you tighten the speaker

Now that you prepared your front and back casing, you should start assembling Spencer's arms and legs!

Start by peeling off the protective layer just like you did with the transparent casings. Arms and legs also have a protective layer on both sides, so don't forget to remove all of it.

Remove the protective layer

Take the smaller transparent casing layer and fit Spencer's leg just like in the photo below.

Make sure to place the leg so that the bolt fits the hole closer to the corner of the casing. The bolt that's fixing the arm will go to the hole closer to the center of the casing.

Place one leg on the transparent casing

Place one spacer on the other side of the casing

Tighten the bolt with the screwdriver

Repeat the same step for the second side casing and the second leg.

 These casings are not symmetrical, so be careful when choosing which side to place the leg to

The following step is done on only one of the previous side casing parts.

Therefore, take one side casing layer that already has the leg attached, one arm, one metal bolt, and 3 black nylon spacers (2 long and 1 short).

All components that you need for the following step

Place the arm so that the metal bolt fits the hole that is closer to the center of the casing.

Hold the metal bolt and the arm from one side of the casing while screwing the long nylon spacer and fixing the bolt so it stays in one place.

Add the shorter black nylon spacer and one longer spacer again and screw them until they are tightened.

Fix the first long spacer

Add one shorter spacer

Finally, add another long spacer

Excellent! We're halfway through the casing chapter already.

You can now leave Spencer's elegant arms and legs aside for a moment.

So far, you've successfully assembled the front and the back layer and this means that you still need to assemble the top and the bottom layer.

You have two casing layers left, so let's get making!

Casing layers you will need for this step

The top casing layer is the one with a big hole in the middle where the red button goes.

You might have noticed that all the casings have puzzle-like shapes on the edges. These shapes will now enable you to assemble everything without much trouble.

Simply place the top layer so that it fits the front layer puzzle shapes. Casings should fit right into each other and shouldn't fall apart if you assemble them correctly.

Connect the top and the front casing layer

Take the last casing layer that will be the bottom one. This layer is the simplest design since there are no holes, so it's hard to miss it.

Place it so that it fits the puzzle shapes on the front casing layer.

Connect the bottom casing layer

Lastly, place the back side of the casing so it fits the rest of the construction. Make sure it sits tightly.

Pro tip

Use the rubber band to hold everything in one place while you assemble Spencer's side casings

Let's add Spencer's arms and legs now!

Take the side casing layer where you already placed one arm and those black nylon spacers. Place it on one side and put the other casing on the opposite side as well.

This side doesn't have an arm yet

Thanks to the puzzle-like assembling technique, the casing should be tight enough already. There is still one arm to be placed on one side of the casings.

You'll need one last screwdriver for that.

Tighten the arm with the screwdriver

Congrats! You came all the way to the end of this chapter, and your Spencer is already starting to look handsome!

If you assembled everything correctly, you should be able to remove the rubber band now

Make sure you turned off your soldering iron! Unplug it from the power source, place it on the soldering iron stand and let it cool off for at least 5 minutes before

you put it away in your tools box.

Chapter Four - Finishing touches

You must be very excited to turn ON your DIY voice assistant by now!

Let's cover some finishing touches so you get your Spencer ready to meet you.

The big red button

This is the one component that you'll use most often - every time you hit this button, Spencer will be ready to hear your commands.

Fit the small cross shape

Don't let it slip

To prevent your Spencer from sliding on the smooth surface or damaging the casing, you can add these anti-slip stickers.

Turn your Spencer upside down so you can stick these stickers on the bottom side of its casing.

Stick the anti slip sticker

What's next?

The fun begins now!

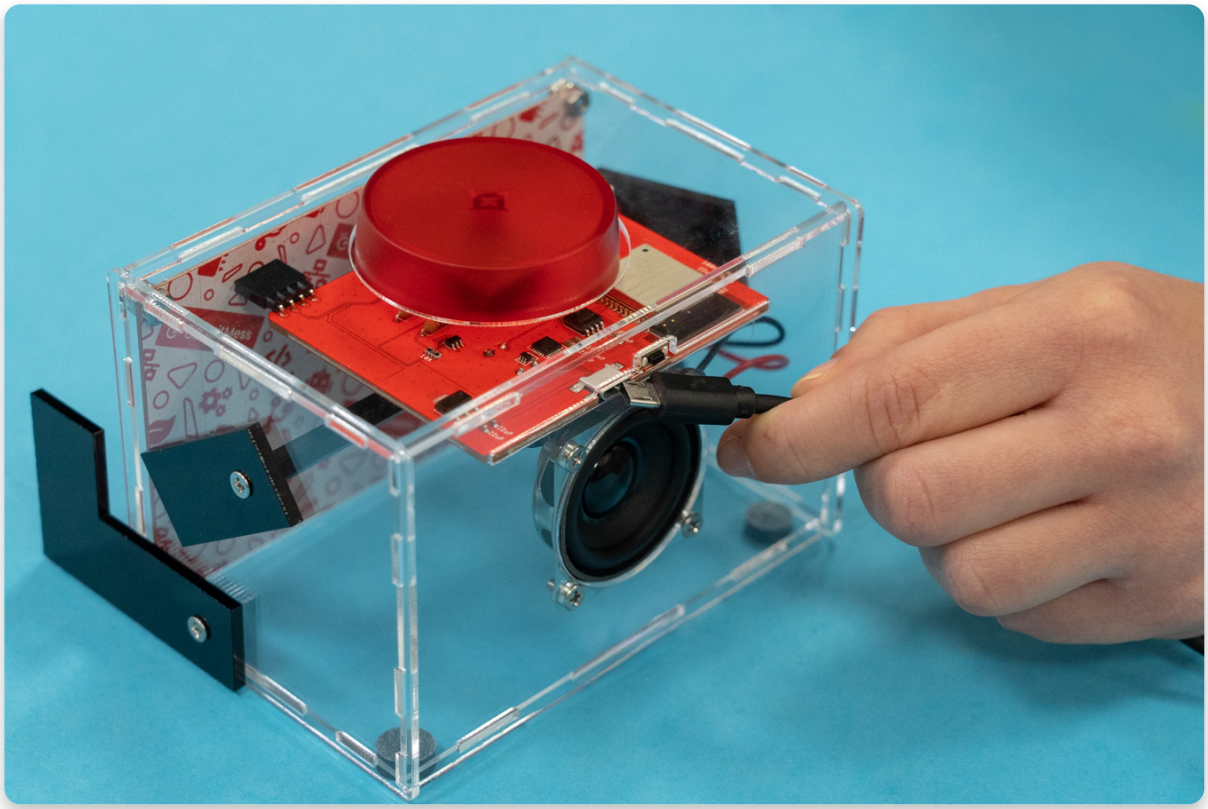
You did an awesome job assembling all the components together and we hope you're now ready to learn about the software!

In this chapter, we'll show you how to manage Spencer's settings and start the conversation.

1. Connect Spencer to your computer

Use the USB micro cable to connect Spencer to your computer. Spencer should come to life as soon as you do that, and you'll be able to configure its settings in CircuitBlocks.

Some users have reported that Spencer's settings don't work when Spencer is plugged into a USB3.0 port, so if you're having issues configuring Spencer, please try plugging him into a USB2.0 port.



Connect your Spencer to your computer

2. Download CircuitBlocks

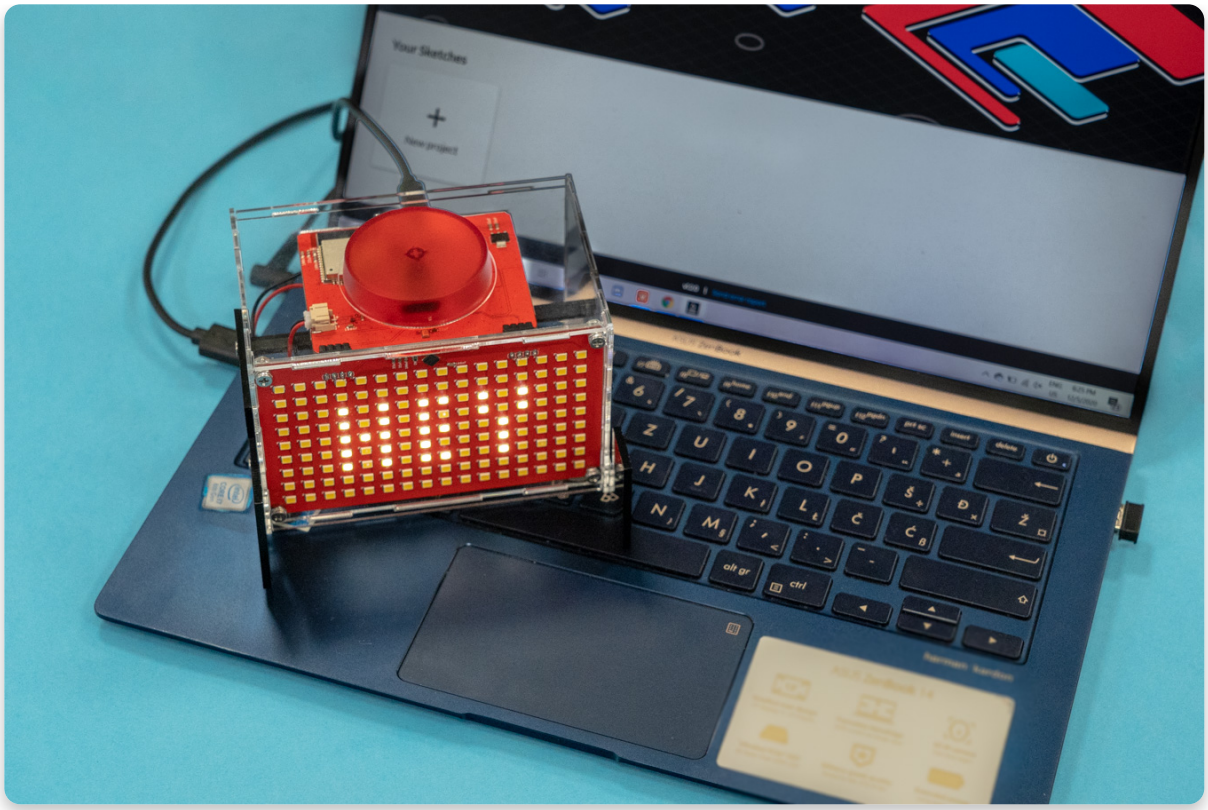
CircuitBlocks is a graphical programming interface that helps you get into embedded programming.

With CircuitBlocks, you will be able to code your device by connecting logic blocks to generate code for STEM Box projects as well as for other CircuitMess products like Nibble and Ringo.

You need to download CircuitBlocks to configure your Spencer and connect it to your WiFi network.

You can download the latest CircuitBlocks version here.

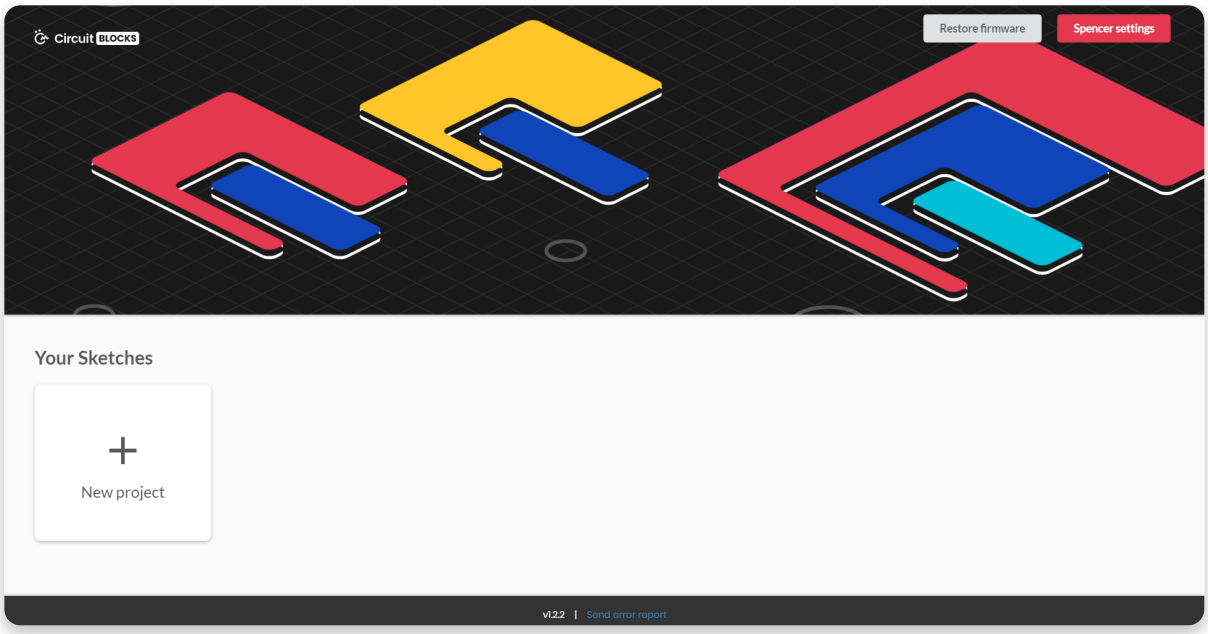
CircuitBlocks works with Mac, Linux, or Windows PCs. If you encounter any issues with the installation, please reach out via contact@circuitmess.com and we'll help.



3. Keep your Spencer connected to your computer and open CircuitBlocks

Once you download and open CircuitBlocks, you should see this on your screen.

To configure Spencer's WiFi and temperature scale, click **Spencer settings** in the top right corner.



Click on 'Spencer settings'

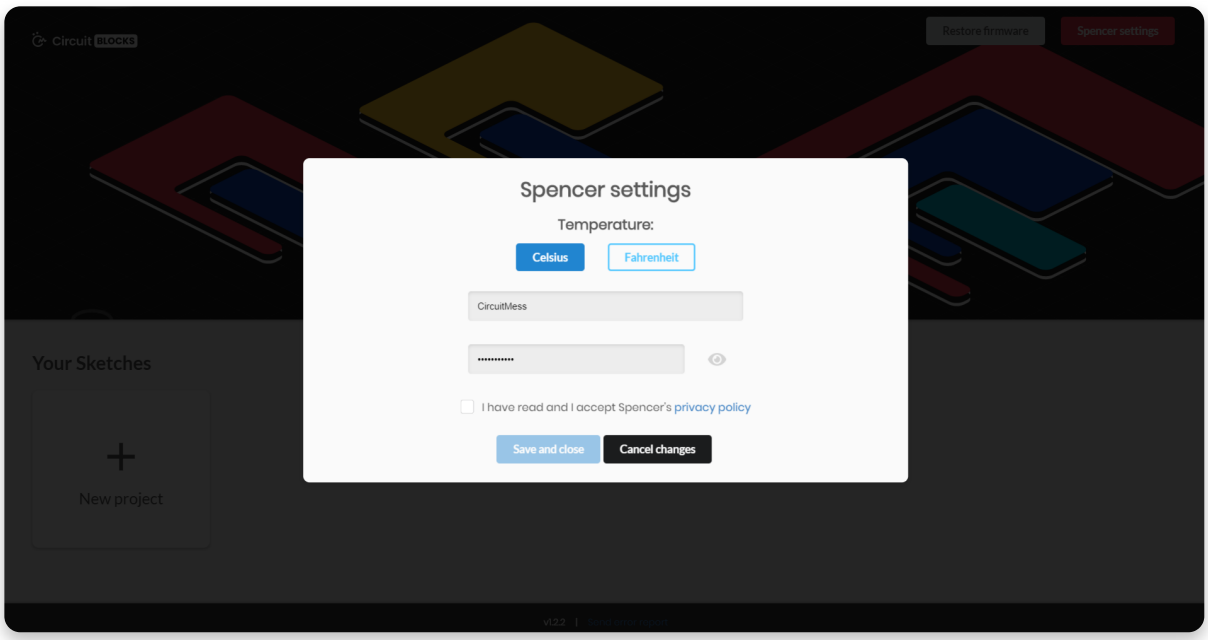
4. Spencer settings

This white box should pop up when you click on Spencer settings.

- **Set the temperature scale.** As you can see in the box, you can choose between the Celsius and Fahrenheit scale. Spencer will use this setting when telling you the weather forecast!
- **Connect to your WiFi network.** You can connect Spencer to your WiFi network by manually filling out the network name and password. If you're not sure about these details, open your WiFi settings on your phone and check the name of the network. Please note that Spencer can't connect to 5GHz (AC) networks.

Spencer only works with 2.4GHz (IEEE 802.11 b/g/n) WiFi access points. 5GHz (IEEE 802.11 ac) networks, unfortunately, aren't supported.

If you have selected the temperature scale and filled out the WiFi network details, read and accept the privacy policy and click on **Save and close**.

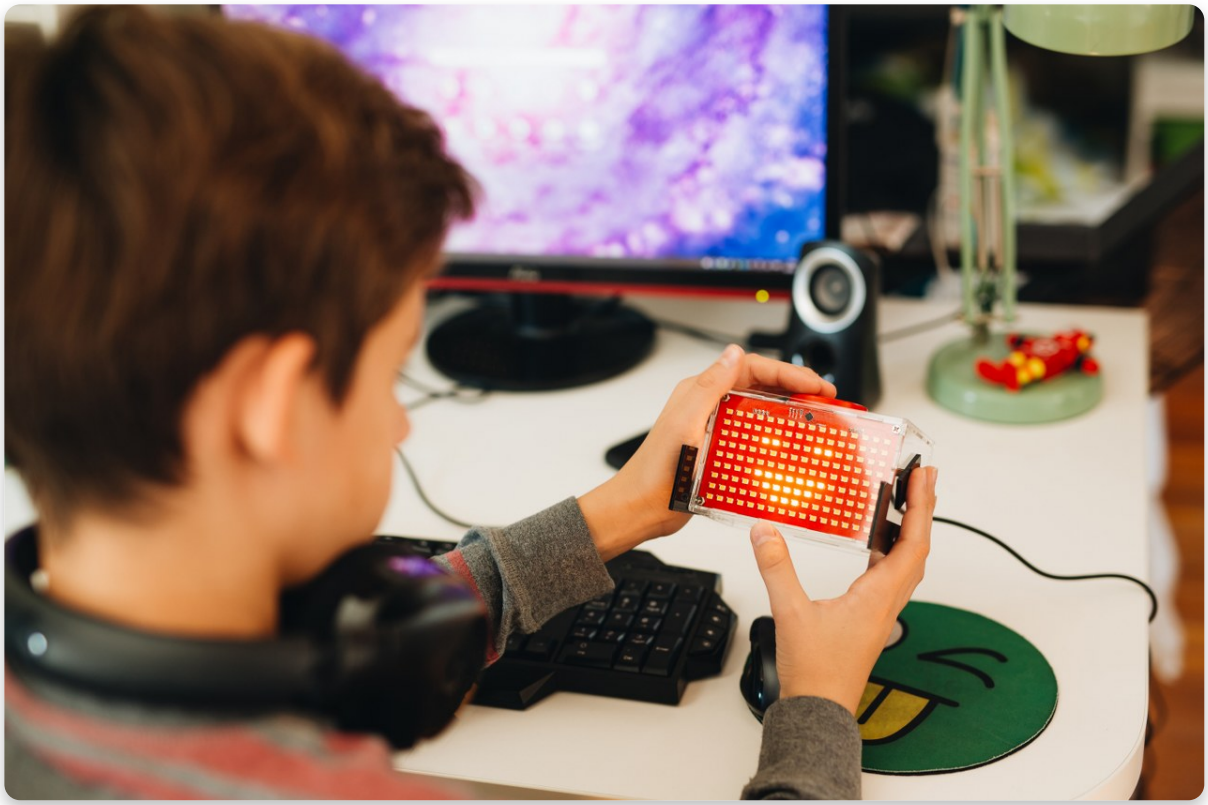


Spencer should connect to your WiFi network now.

Spencer coding tutorial

Check out the Spencer coding tutorial on this link.

In this tutorial, we'll help you set up CircuitBlocks, get Spencer ready for coding, and code a few simple apps.



Break the ice, start the conversation!

- [x] Push the big red button, and Spencer will listen to your command for a maximum of 3,5 seconds!

Here is a list of questions and commands you can say to Spencer. Don't be shy! This is just the beginning. If you train your Spencer well enough, he will learn about many more conversation topics and commands.

Tell me a joke!

What's your name?

Who are you?

How are you?

How are you feeling?

What can you do?

Help me!

Hello

Hi

Welcome

Salutations

What’s the weather like today?

What’s the weather like tomorrow?

Do you believe in horoscope?

Can you predict my future?

How old are you?

When were you born?

Do you have a girlfriend?

Do you have a boyfriend?

What is your favorite color?

Do you have a brother?

Do you have a sister?

Who is your creator?

Who designed you?

Who made you?

Who is your maker?

What is the purpose of life?

What should I do with my life?

Did you find the meaning of life?

Where do you come from?

Where is your home?

Where did you come from?

Can you switch to a different language?

Can you change your speech to a different language?

Can you switch to German?

Alexa

Alexa, can you do this?

Is your name Alexa?

Siri

Cortana

Google

Bigsby

What do you do in your free time?

What is up?

Do you have anything interesting to share with me?

How's it going?

Are you married?

Were you divorced?

Are you interested in marriage?

Are you single?

Can you be my boyfriend?

Can you be my friend?

Can I change your name?

Can I give you a nickname?

Change name.

Can you call me differently?

My name is John.

Spencer, can you talk like a pirate?

Let's do pirate talk.

Happy international pirate day.

What are you doing right now?

How did you learn English?

How can you speak?

Who is the current president?

How was your day?

What is your favorite movie?

Do you like films?

What's on Netflix?

Are you ok?

Is everything ok Spencer?

Are your systems running ok?

Find me a recipe for this.

What goes into this recipe?

Where is my phone?

Find my phone.

Ring my phone.

Long time no see.

I didn't see you for a long time.

Good to see you Spencer.

Tell me a story.

What sound does a firetruck make?

Fire truck mode

Sound like a fire truck.

What sound does a cat make?

What sound does a dog make?

What sound does a horse make?

What sound does a goat make?

What sound does a pig make?

What sound does a cow make?

What sound does a donkey make?

What sound does a chicken make?

What sound does a rooster make?

What sound does a bird make?

What sound does an owl make?

What sound does a duck make?

What sound does a turkey make?

What sound does a frog make?

What sound does a lion make?

What sound does a truck make?

What sound does an angry crowd make?

What sound does a ghost make?

Transform into a spaceship.

Who is here with you?

Let's play a game.

Sing me a song.

Beatbox

What do you eat?

Can you cook?

What is your favorite food?

Do you believe in love?

Do you believe in aliens?

Good morning!

Wake up.

Good evening!

Good day!

Good night!

You are my friend.

Is this the real life?

Initiate a call

Call friend

Turn off lights

Increase the temperature

Turn on the TV

Please buy me a boat!

Serenade me!

Sing me a love song.

It's my birthday.

Who is your crush?

Do you have a celebrity crush?

Merry Christmas!

Tell me a pick-up line

Can you tell me a compliment?

Do you find me pretty?

Do I need an umbrella today?

Tell me a secret.

What do you think of me?

What's your favorite song?

Give me a high five.

Order Uber

Call an Uber

Where is my passport?

What is my password?

I forgot my login details.

Where is my package?

Track my package.

Are you lonely?

I do not like this.

I love this!

Tell me a scary story.

Read me a poem.

What is your mission?

I am your father.

Are you sky net?

Make me a sandwich.

Spencer, activate cheat codes.

Do a barrel roll

It is not my birthday.

Did you fart?

Can you burp?

Beam me up scotty.

Set volume to: low, medium, high.

Set brightness to: low, medium, high.

More tutorials on how to code and customize your Spencer are being cooked as we speak. Stay tuned for our future Kickstarter and Blog updates.