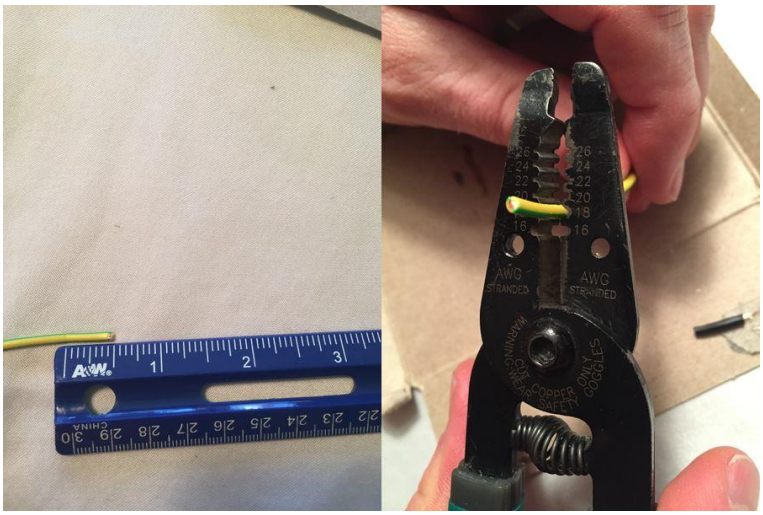
Turn on the solder box. It is important to keep the solder box and iron in a safe area. You should only turn the iron on when you are ready to use it. Keep flammable objects away from the iron at all times. Remember to turn the box off as soon as you are done using it. Add water to the sponge below the soldering iron holder. This sponge can be used to clean the tip of your iron.

1. **Clean the tip**
   When the iron is hot, start with cleaning the tip to remove old solder from it. You can use a wet sponge, a copper scouring pad or something similar.

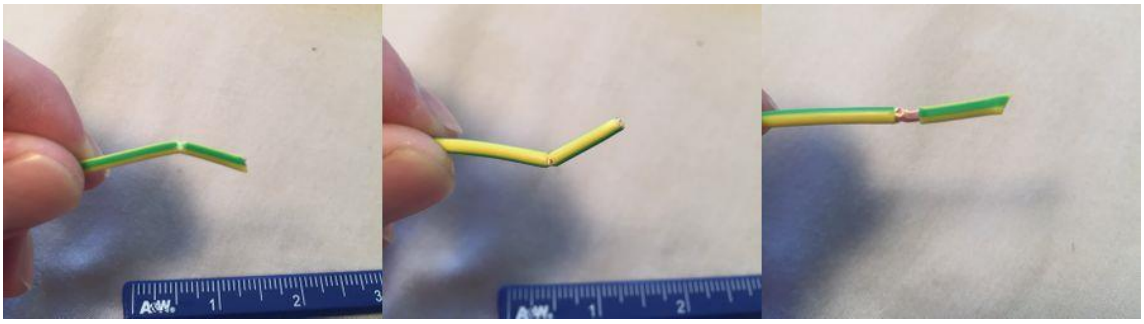
2. **Tinning the tip**
   Before you start soldering, you should tin the tip of the soldering iron. This makes the tip transfer heat faster and thereby making the soldering easier and faster. If you get any droplets of tin on your tip, use a sponge. **Pick up some solder with the iron.** Picking the solder up with the iron is easiest for smaller wires. You can do this by touching the tip of the iron about an inch from the end of the string of solder. The iron should automatically soak the solder right onto the tip of your iron. If the iron is hot enough, the solder should flow right onto the copper when you touch the iron to it.

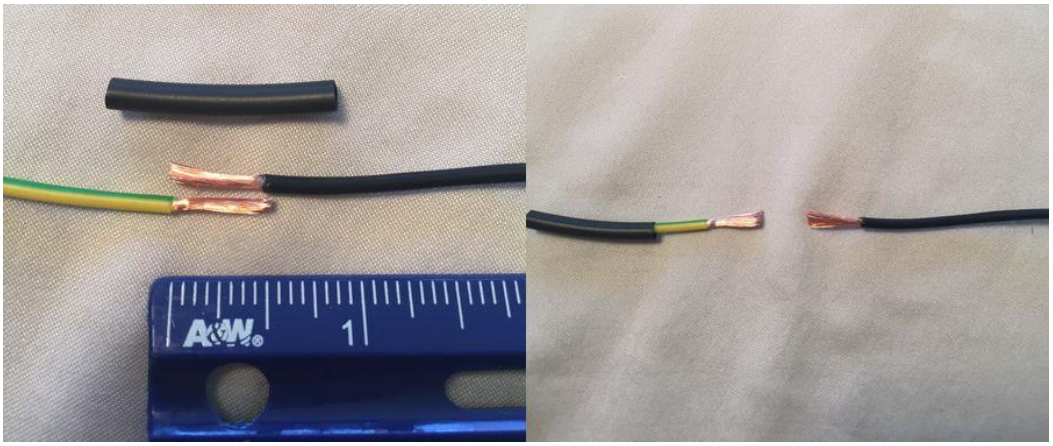
3. **Score or make a slight incision on the wire jacket.** You want to make the score about ½" from the end of each wire that will be soldered. To do this, you can use a pair of wire strippers, or a razor blade. Be careful, you do not want to cut the actual copper wire as it will take away from its conducting strength.

- Determine the size of the wire and use the appropriate sized hole to properly strip the wire. If you do not know the size of the wire, test out the holes in the strippers to find the one that cuts into the jacket without cutting the wire.
- Clamp down on the wire with the right sized hole. Now you will turn the wire 90 degrees in rotation and do the same thing. Do this a couple more times so that you have a good line around the whole wire jacket. If you are just using a razor blade, don't forget to make the incision around the whole circumference of the jacket.



4. **Pull the unwanted jacket off.** Once you have that slight cut in the jacket, you should be able to bend the jacket back and forth until the jacket comes loose. You can do this with the strippers or with your fingers. If it does not come loose right away try making a little deeper cut into the jacket. The idea is to get the piece of jacket off without sacrificing any copper threads.

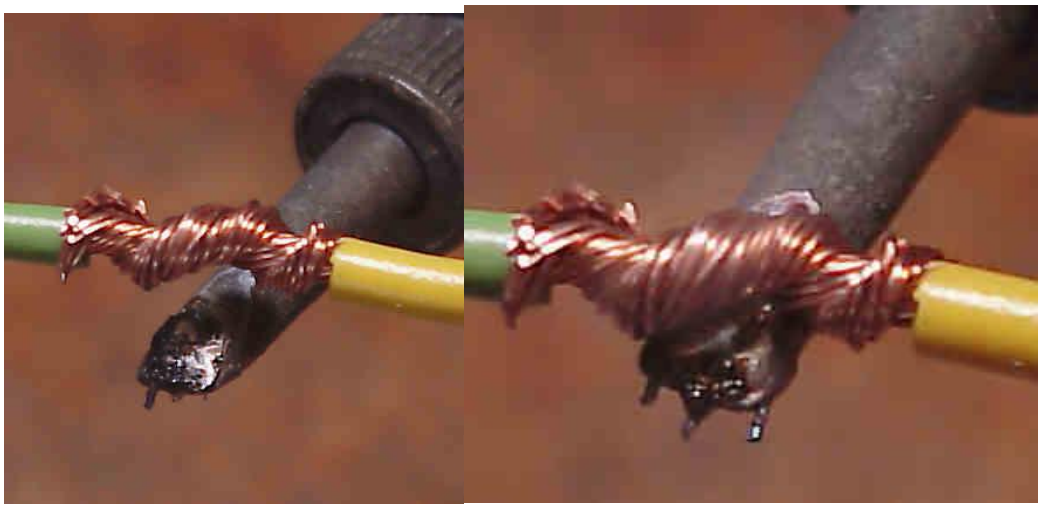




Cut a piece of shrink tube and slide it onto one of the wires (If you are using electrical tape to cover your joint, skip this step). If you are using shrink tube to cover your connection, you will want to slide the shrink tube onto the wire before connecting the wires. The piece of shrink tube should be longer than the area being soldered.

- The shrink tube should cover some of the jacket on each end and the ½" connection you are making. Use your scissors to cut a 1-1 ½" piece of shrink. You may test the shrink tube on a piece of the wire before getting started to make sure the tubing will shrink down to the size of the wire. Most shrink tube reduce to about 1/3 of its size after being heated.

5. **Apply the iron to the copper wire**. Melt a little ball of solder onto the iron



...and immediately place the soldering iron under the twisted wires (if possible) so that the little ball of solder fills much of the gap between the soldering pencil and the wire. Since heat rises, placing the iron under the joint will heat it faster. The little ball of solder works as a heat conductor and will very rapidly conduct the heat from the soldering pencil's tip into the wires. If the ball of solder does not seem like it is contacting the wire very well, without removing the pencil from the joint, melt just a bit more solder in there by feeding the end of the solder wire into the tip. This will not only increase the contact area of the solder to the wire but it will also add a bit of flux that helps the solder adhere to the wire at this time.

After about two or three seconds, start to feed solder, slowly at first, into the void between the pencil and the wire. You should soon see the solder is flowing into the twisted wires. When that happens, increase the feed rate of the solder into the joint, and you can now also feed a little into the top of the joint. Don't move the iron's placement, jut take the end of the solder wire and touch it to the tip of the joint. Continue to feed solder until the individual wires are almost filled with solder and the entire joint has turned silver. When that happens, stop feeding the solder in and immediately but gently remove the soldering iron.

7. **Inspect the joint.** The wires should now be fully joined. Look at all sides of the connection. Sometimes if the solder doesn't flow properly, the back side of the connection may not have enough solder to properly join the wire resulting in a weak connection. A slight tug on the wires can be used to ensure a good bind.

After soldering, let the joint cool for about thirty seconds to a minute or so before handling. If you were successful you should have:

* A pair of wires tightly joined together

* The joint between them is very shiny

* No hardened dribbles or drops of solder hanging off the joint

* No little wires sticking out of the joint.

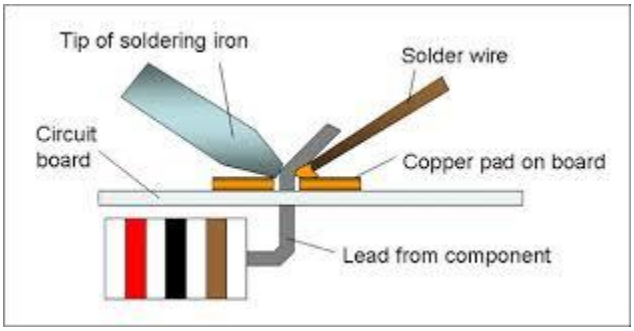
* A union only slightly larger than each of the wires themselves.

Soldering on a PCB

How to solder through-hole components on a PCB starts by placing the part in its hole. Bend the leads of the part so that it stays in its place.

Put the tip of the iron on the pad so that it heats both the lead of the part and the pad of the circuit board. Heat them for a second or so before you apply solder. Remove the iron and the solder wire and inspect your solder joint to see if it looks okay.

A good solder joint has kind of a cone shape.



Watch out for “cold solder joints”

Always make sure that you apply enough heat, otherwise you might end up with a “cold solder joint”. Such a solder joint might look okay without actually providing the connection you want. This can lead to some serious frustration when your circuit doesn’t work and you are trying to figure out why. When you look at a cold solder joint up close, you’ll see that it has a small gap between the solder and the pin.