

SOLDERING



What is Soldering?



Soldering is the process of using a filler material (solder) to join pieces of metal together. Soldering occurs at relatively low temperatures (around 400 degrees Fahrenheit). In soldering the filler material becomes liquid, coats the pieces it is brought into contact with, and is then allowed to cool. As the solder cools it hardens, and the two materials are joined. It creates an electrically conductive strong bond between components that can be re-heated (desoldered) if you should ever want to disconnect two items joined together. It's great for joining electrical components and wires and is used in just about everything electronic.

Preparing to Solder



Make sure you are soldering in a well-ventilated area. When solder is heated, there are fumes released that are harmful to your eyes and lungs. It's recommended to use a **fume extractor** which is a fan with a charcoal filter that absorbs the harmful solder smoke.

It's always a good idea to wear protective eye wear in case of accidental splashes of hot solder. Lastly, make sure to wash your hands when done soldering especially if using lead solder.

- **Tinning The Tip**

- Before you can start soldering, you need to prep your soldering iron by tinning the tip with solder. This process will help improve the heat transfer from the iron to the item you're soldering. Tinning will also help to protect the tip and reduce wear.
- Begin by making sure the tip is attached to the iron and screwed tightly in place.
- Turn on your soldering iron and let it heat up. If you have a soldering station with an adjustable temp control, set it to 400' C/ 752'
- Wipe the tip of the soldering iron on a damp wet sponge to clean it. Wait a few seconds to let the tip heat up again before proceeding to step 4.
- Hold the soldering iron in one hand and solder in the other. Touch the solder to the tip of the iron and make sure the solder flows evenly around the tip.

You should tin the tip of your iron before and after each soldering session to extend its life. Eventually, every tip will wear out and will need replacing when it becomes rough or pitted.

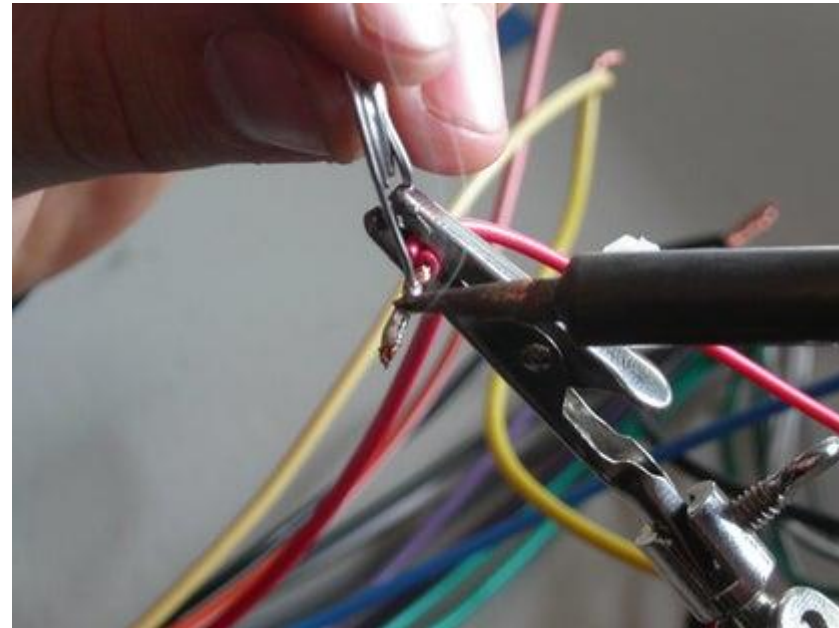
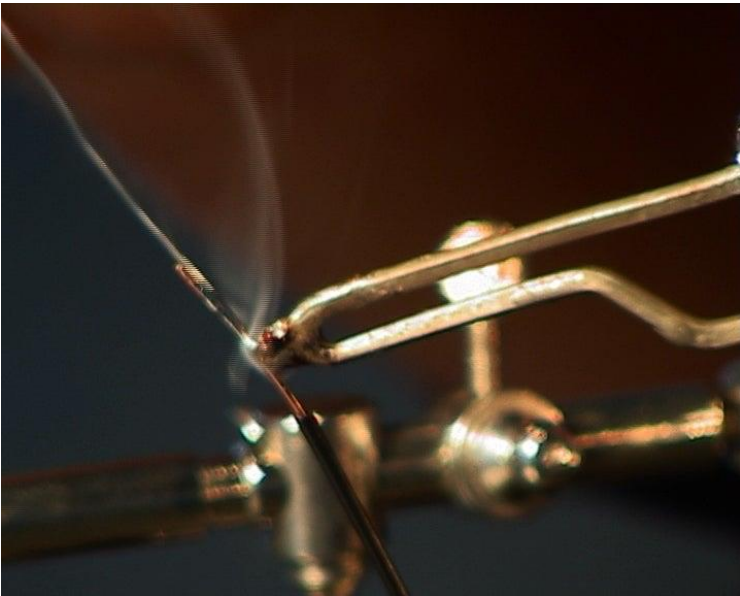
Tools for Soldering

- Soldering Iron
- Solder
- Soldering Iron Tips
- Soldering Iron Holder and Cleaning Sponge
- Tools to work with wires
- Clips to hold your work
- Exhaust Fan
- Safety Goggles
- The materials that you want to join together



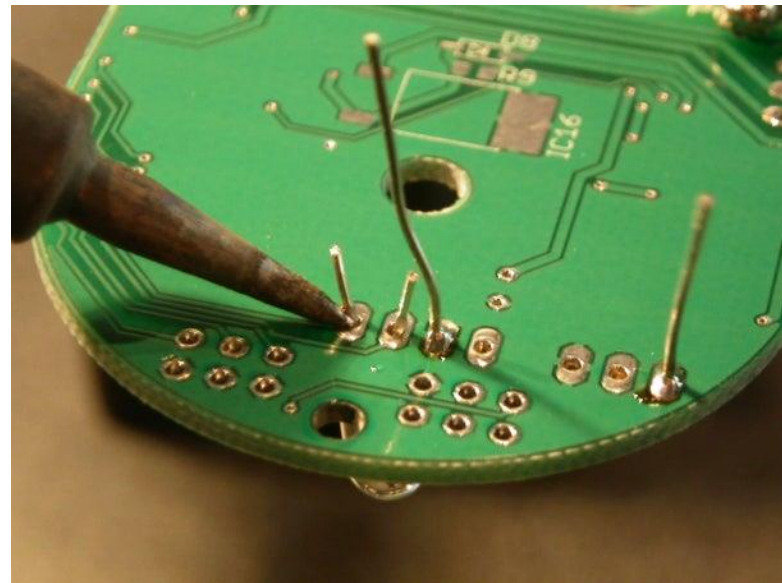
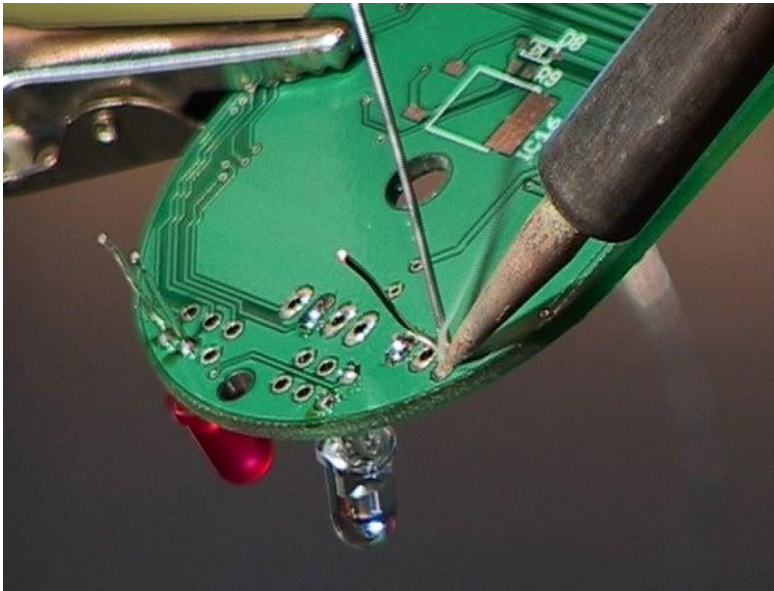
Soldering Wire

With the wires you want to join twisted together and held in place you want a good mechanical bond before you solder. Pick up your soldering iron in one hand and your solder in the other. Touch the tip of the soldering iron to the wires and keep it there. If you touch the solder to the wire and it begins to smoke and melt, the wires are hot enough. Once you've got what you think is enough solder on the joint, pull the solder away and then remove the soldering iron.



Soldering on a Circuit Board

When soldering leads into circuit boards you want to heat the metal contact on the board and the lead itself. Applying too much heat can damage the circuit board or even your components. Once the solder pools a bit and soaked into the joint remove the solder wire and then the iron. Remove the solder a second or two before removing the iron so that the tip of the solder doesn't get stuck to the joint. The solder begins to harden as soon as you remove the iron.



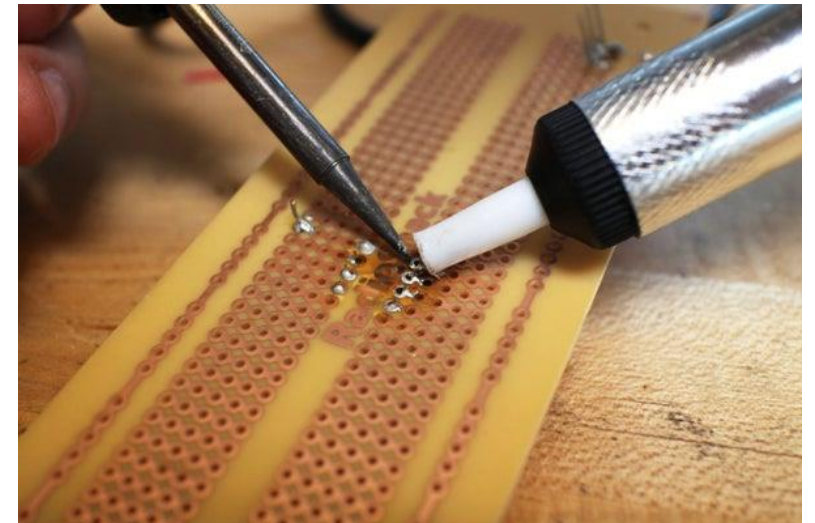
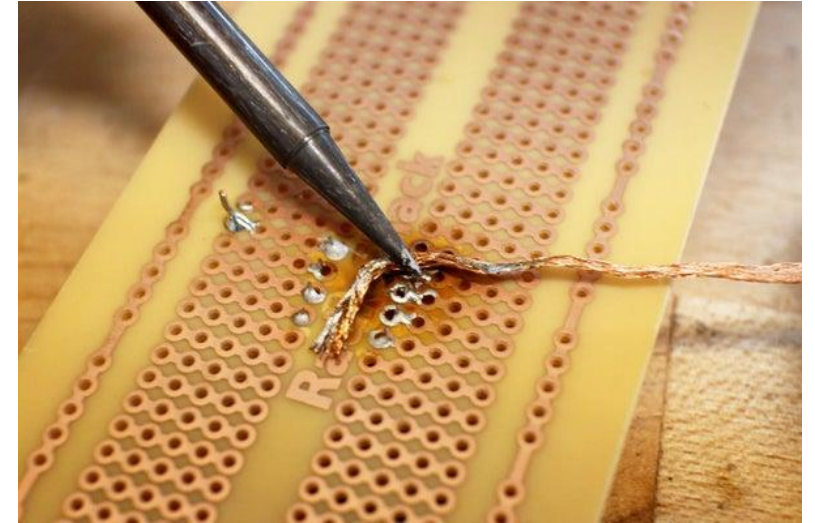
Desoldering

Desoldering braid

- Place the braid over the joint you want to rework.
- Place a hot soldering iron against the braid and desired pin.
- Wait a few seconds. The solder will flow off the pin and onto the braid.
- Remove the braid. The braid will be very hot at this point, so make sure not to touch the braid itself, only the spool.
- Remove the component.
- Repeat steps 1-5 to remove excess solder.

Desoldering pump

- Heat up the solder you want to remove with a soldering iron (some desoldering pumps also come with attached irons).
- Press down on the plunger (If your pump has a bulb, just squeeze the bulb).
- Once the solder is molten, place the tip of the desoldering pump against the solder that you want to remove.
- Release the plunger or bulb. Some desoldering pumps have a release button so that you don't have to hold it the whole time.
- Remove free component.



Types of Solder by Composition



Lead Alloy Solders In this solder type, lead is mixed with other alloys to get the required melting point and tensile strength. They are also known as soft solders. The most commonly used alloy along with the lead in this mixture is tin. They are mixed in the ratio of 60/40 (tin/lead). The melting point of this mixture is 180 to 190°C. The reason that tin is preferred is because of its low melting point. Apart from this, tin also increases the tensile and shear strength. Lead, on the other hand, inhibits the growth of tin whiskers.

Lead-Free Solders As the name suggests, these solders do not contain any lead. The lead-free solders have a higher melting point than the lead alloy solders. You can get tax benefits in the U.S.A if you use lead-free solders. Lead is poisonous to your health and the environment. Hence, the federal government provides incentives to manufacturers using lead-free solders. Instead of nickel, you can use additives such as nickel and conformal coatings to prevent tin whiskers.

Flux-Core Solders The flux core solder is available in the form of wires wound on a cylindrical device. There is a reducing agent present at its core. During soldering, the flux is released, and it removes the oxidized layer formed on the surface of the metal. As a result, the metal surface becomes clean and ready for soldering. Besides removing the oxidized layer, it increases the solder's wetting properties. For soldering electronic components, rosin is used as a flux. For metal joining and plumbing, acid cores are used as a flux.

Flux

Paste Flux Solder paste flux is a gelatinous chemical compound used mainly in combination with solder powder to create solder paste, generally mixed as a 50/50 ratio. Once combined, the paste is a gray, putty-like material. Solder paste flux serves a threefold purpose: Removing any oxidized metal from the surfaces to be soldered.



Liquid Flux Soldering flux is a cleaning agent that prepares surfaces for soldering or brazing to improve electrical contact and form a stable joint. These liquid or paste fluxes remove residues that can prevent solder from adhering and help prevent surface oxidation that can weaken solder joints.

