

Tips For Soldering

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EEC 134A/B, 2017-2018

Introduction

Every electrical engineer should at least know the basic soldering skills. It is very important to be familiar with the type of tools used to solder different types of components on a printed circuit board (PCB). There are different types of techniques used to solder surface mount components and through hole components. There are mainly two types of soldering methods used in soldering, hot iron and hot plate. It is also important to know how to remove a soldered component from a PCB as a single wrong component on PCB can make so it won't function as desired.

Soldering Safely

While using soldering iron to solder components, it is advised to wear safety glasses at all times. The soldering iron is usually as hot as 700 degrees Fahrenheit, so be extremely caution while operating with it. With that kind of temperature, it can leave burn mark on skin if it made contact with it. It is advised to have the ventilation fan running while working on an soldering project. The fumes produced by the lead based soldering wires can be very harmful. The fumes can cause eye irritations and headaches. Long exposure to the fumes from lead can cause asthma and respiratory infections.

Soldering with Hot Iron

The hot iron soldering works on the simple principle. It usually utilizes a soldering wire which has a very low melting point. Soldering iron melts the solder wire and puts it between two metal surface to form a contact. The soldering wires are usually made of materials like lead, tin, silver or combination of different materials, but they all have very low melting point. The hot iron soldering is typically used to solder the through hole components like resistors and capacitors used in all the labs. Do not use the soldering iron to solder the surface mount components as it is nearly impossible.

General Tips for Hot Iron Soldering: When using hot iron to solder, try to warm up the contact point of the component you are trying to solder and then touch the soldering wire to the contact point. If you try to melt the soldering wire with hot iron and then put it on the through hole component, it will not work most of the time. You will have really hard time getting the melted solder off the hot iron. Use the circuit board holder, so you can adjust the PCB however you need when soldering for convenience. It is advised to use thin head hot iron to solder components for this class for maximum accuracy. Soldering sockets instead of through hole components directly on the PCB can also . Figure 2 shows the hot iron, soldering wire, and circuit board holder that are can be found in Bainer Hall 1230 that can be used to solder PCBs for this class.



Figure 1. Images of Typical Solder Wire, PCB Holder and Hot Iron

Soldering With Hot Plate

Note: Even though there are many hot plates available in the lab, for this class we utilized the Protoflow S instead of hot plate, but they both work on similar principles. Instructions on how to use each of them are included in this report.

Hot plate soldering is mainly used to solder surface mount components as they are nearly impossible to solder using hot iron. The soldering paste is usually used for hot plate soldering. Soldering paste is chemical mixture that usually has lead in it, so when the heat is applied to it, everything evaporates except lead, forming a metal contact between the two components we are trying to solder. First we apply solder paste to the contact points where you want to solder the surface mount component. Then place the component carefully on those contact points. Then heat the PCB using hot plate. Figure 2 shows the commonly used hot plate and solder paste.



Figure 2. Images of Typical Hot Plate and Soldering Paste

General Tips for Hot Plate Soldering: Hot plate soldering requires heating up the PCB, which can damage the PCB and components placed on the PCB if you do it multiple times. So it is

advised to place all the components that you are trying to solder on the PCB together and only heat up the PCB once. I highly recommend that you work on your PCB in Bainer Hall 1230, as that lab room is accessible to everyone and has one of the most useful machine for Hot Plate soldering called ProtoPlace S. ProtoPlace S is built to help hot plate soldering as it has mechanism that can dispense small amount of soldering paste very accurately on the contact surface. It also has a built in magnifying camera which can display the place where you are trying to put the paste on the monitor. ProtoPlace S can also help you place the small resistors and capacitor ICs accurately on your PCB with its Pick and Place function. **If for some reason the ProtoPlace S is not working or occupied by other groups, take out a small amount of soldering paste on side and use a toothpick to apply small amount of it on the contact points. Then use sharp tweezers to put the ICs in place.** When our group was working on the final PCB for our radar system, the machine was broken, so we had to use this technique to solder out ICs on the PCB. Also use the ProtoFlow S instead of Hot Plate to solder the components on the PCB. It uses hot air to heat up the PCB instead of making direct contact with the PCB. This can help reduce the damage done to the PCB while heating it up. Also use some type of wise grips to take out the PCB from the ProtoFlow S as the PCB gets be very hot.



Figure 3. Images of ProtoFlow S and ProtoPlace S

Solder Removal

Sometimes we can make mistakes and solder a wrong components in wrong place or we find that the component isn't working after soldering it. This can be a problem, but not something that can't be fixed. The soldered on surface mount components are easy to remove. **Just heat up the PCB with a hot plate, which will melt the solder and then you can remove the component.** There is a downside to this method, as heating up PCB multiple time can permanently damage it. **Another approach is to use heat gun on the component to heat the solder and use the desoldering pump to remove the solder.** If you just want to remove some excess solder then just scrape it with some file or grinding paper. **Another way to remove solder joint is to melt the solder with a hot iron and using desoldering pump to remove the solder.** This take would require at least two people. Best way to remove solder form the soldered on through hole components is to use the solder wick. Solder wick is thin strip of copper alloy. To use the Solder wick, just place it over the solder and heat it up using hot iron. The solder will melt and attach to the solder wick, hence removing it from the PCB. While using soldering wick to remove the solder, keep wiggling the solder wick otherwise you will just end up soldering the wick on top of the component. Figure 4 shows the typical solder wick and desoldering pump.



Figure 4. Images of Typical Solder Wick and Desoldering Pump

Figure 5 is my group's final PCB for radar system soldered using the soldering techniques mentioned above.

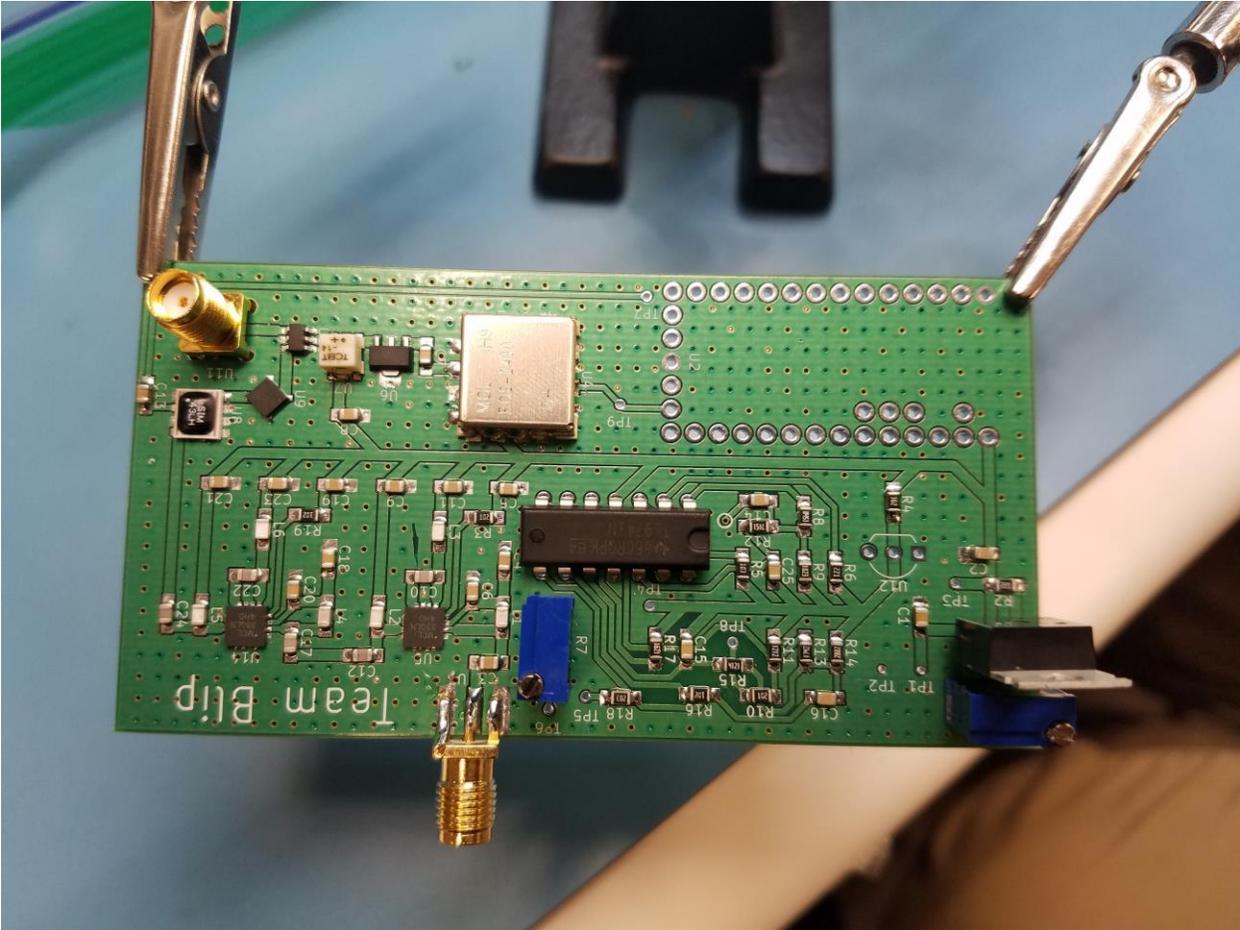


Figure 5. Final PCB Team Blip