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EEC 134
Application Note
PCB Assembly
Team RF Eater

Application Note for PCB Assembly

Introduction

PCB (Printed Circuit Board) Assembly is to populate a bare board with electronic components in order to make it functionally. There are a variety of techniques to assemble the PCB. Since PCB plays a significant role in our Senior Design Project. Design and assembly PCBs are both very important skill we should learn during the process of finishing this project. This application note will introduce several tools and methods to you need to assembly the PCBs.

Solder

Solder have a lower melting point than the electronic components it is intended to join. Therefore, it is easy to melt the solder into fluid and apply it to hold the electronic components on the PCBs, which have metal contact pads on them. Also, the solder is resistant to oxidative and corrosive effects so it will be able to keep the whole board in a good condition.

Two types of Solder

A. Solid Solder



Figure 1. Spool of solder

Solid solder is the most common kind of solder in laboratory. Also, this kind of solder is very easy to use. Solid solder is often used to fill larger holes on PCBs shown as the holes circled in the figure 2 below. Soldering irons are mostly used tools for this kind of solder.

The cons of this kind of solder is that it is a little bit difficult to use when we want to hold some tiny electronic components on the PCBs.

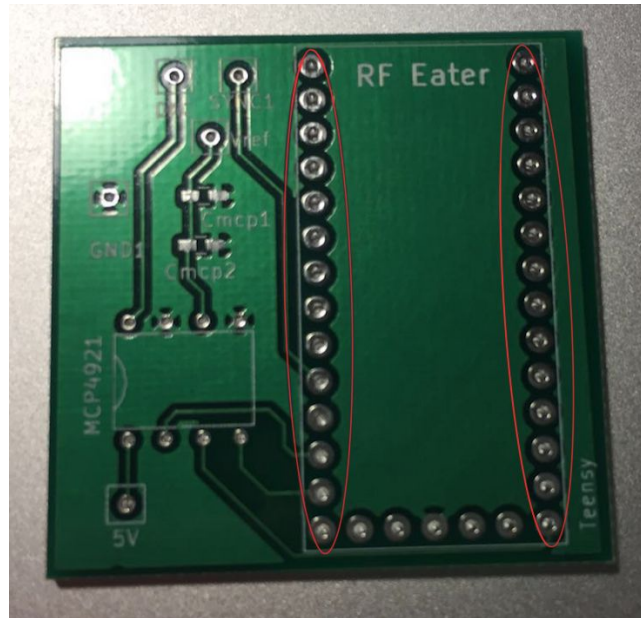


Figure 2. Examples of the larger holes that need to use the solid solder



Figure 3-a. Soldering iron station



Figure 3-b. Details of Soldering Irons

B. Solder paste

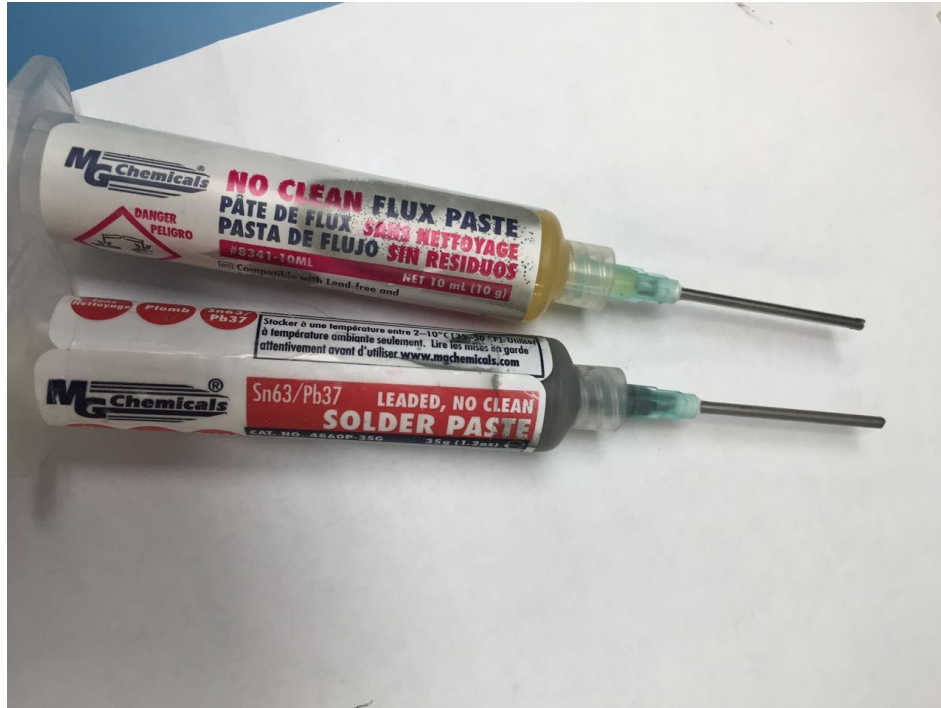


Figure 4. Solder paste and Flux

This kind of solder is always used for adhering tiny electronic components on PCBs. The solder paste always comes with Flux. When using this kind of solder, we always mix it with flux. The advantage of this solder is that it is suitable to fabricate a bunch of electronic components in one time. However, during the time of fabricating all the components, it is easy to touch the nearby components. If this happens, you will need to re-fabricating those components again. Hence, be careful is very important when using this kind of solder.

Tools needed for this kind of solder are hot plates and ovens.



Figure 4. Hot plate



Figure 5. LPKF's premiere Convection Oven

Heat Method

After settling down all the electronic components on the PCBs using solder paste and flux. Make sure to use the heat tools to fix all of the components.

A. Hot plate

The hot plate will heat up the whole PCB in order to melt the solder paste. The temperature of the hot plate always not very high because we do not want to burn the whole PCBs, therefore, you will need a long time to wait for the solder paste melting. If the waiting time is too short, the components will not be able to adhere on the board, so the PCB will not work. During the quarter 1, I only used the hot plate to heat the PCBs. The waiting time is too short to melt the paste. As a consequence, one of the PCB is not working at all. SO! One thing you should keep in mind is always be patient when using the hot plate.

B. Convection Oven

During the quarter 2, I went to the EFL in the Bainer Hall to assembly the PCBs, the LPKF's Convection Oven are more useful than the hot plate. The only thing to do is to put PCB in the oven. Waiting time for this method is very short. Once the PCBs are ready, the oven will play a short ring. I highly recommend this method. It is pretty helpful.

Soldering Method

A. Using the solid solder

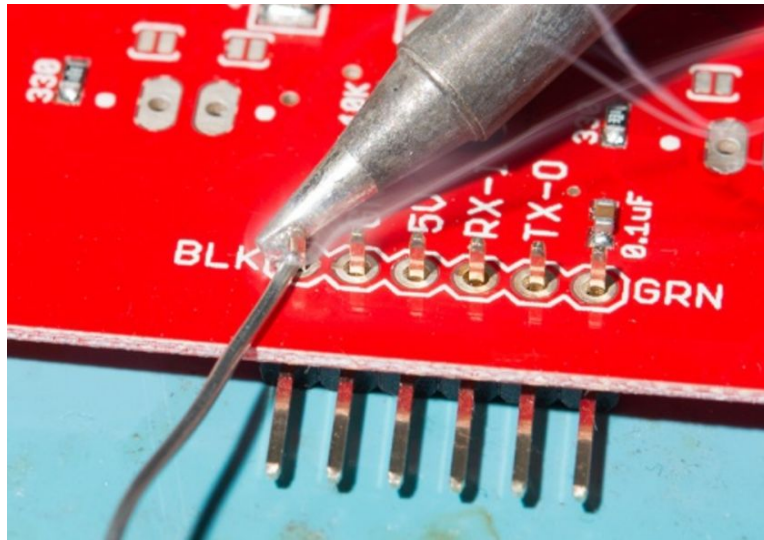


Figure 6. Method by using the solid solder

1. First, let all the pins go through the holes on the PCBs.
2. Second you can melt some solder on the solder pin before you start to adhere components on the boards. This can make the following process of the soldering more smooth.
3. After melting some solder on the solder tip, you can start to put the solder on one side of the pin, then put the solder pin on the other side of the pin. You can then make several solder prism on the PCBs by melting the solder.

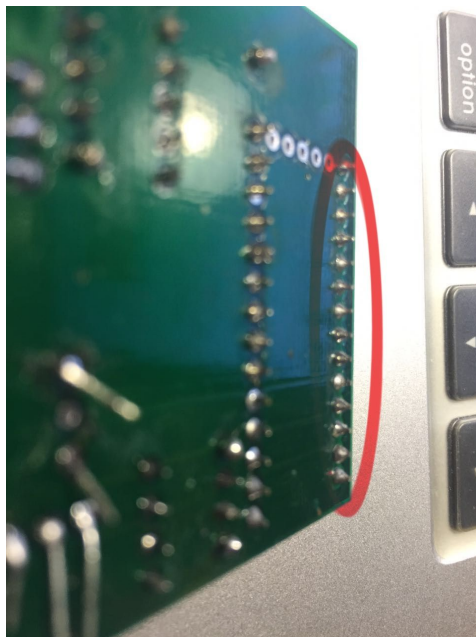


Figure 7. Examples of the “Solder prism”

B. Using the solder paste

1. First step of this method is to mix the solder paste and flux together.
2. Then cover the metal contact pad on the PCB with the mix of the solder. You do not have to worry about putting much on the metall contact pads will short the circuit. When heating the PCB, the solder will automatically stick on the pads. Exceed solder will not short the circuit!
3. After cover the metal pads with solder paste, it is time to put all the electronic components of the PCBs.
4. Last step is to put the PCB into the convection oven to make sure that the components are adhering on the PCB.

Other useful tools

A. Third hand



Figure 8. Third hand

This is one of the best helper for solderers. The two alligator clips can help you easily hold the PCBs. An amazing magnifying glass can help you to see the position of the components clearly. Especially when you soldered somethings like output pin, which makes your PCB cannot keep still, before you adhere the tiny components on them, this tool will be very helpful.

B. Solder Vacuum Pump



Figure 9. Solder Vacuum Pump

This tool allows you to pull the melted solder out from the connection between the components and the PCBs. It is easy to use. All you need to do is to press the plunger, heat up the solder you want to remove. Then push the black button.

C. Solder Wick



Figure 10. Solder Wick

This is similar with the solder vacuum pump. It is used for clean up the exceed solder on your PCB. It will wick up the solder.

Good Place!!

Last but not the least, I strongly suggest you to go to the EFL in the Bainer Hall. You can find all of the useful tools introduced above. Also, there will be professional people help you with all your problems about soldering PCBs.



Figure 11. EFL in Bainer Hall