

Class:	EE221L		Semester:	Spring 2022
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Instructor's comments:				

1. Introduction / Theory of Operation

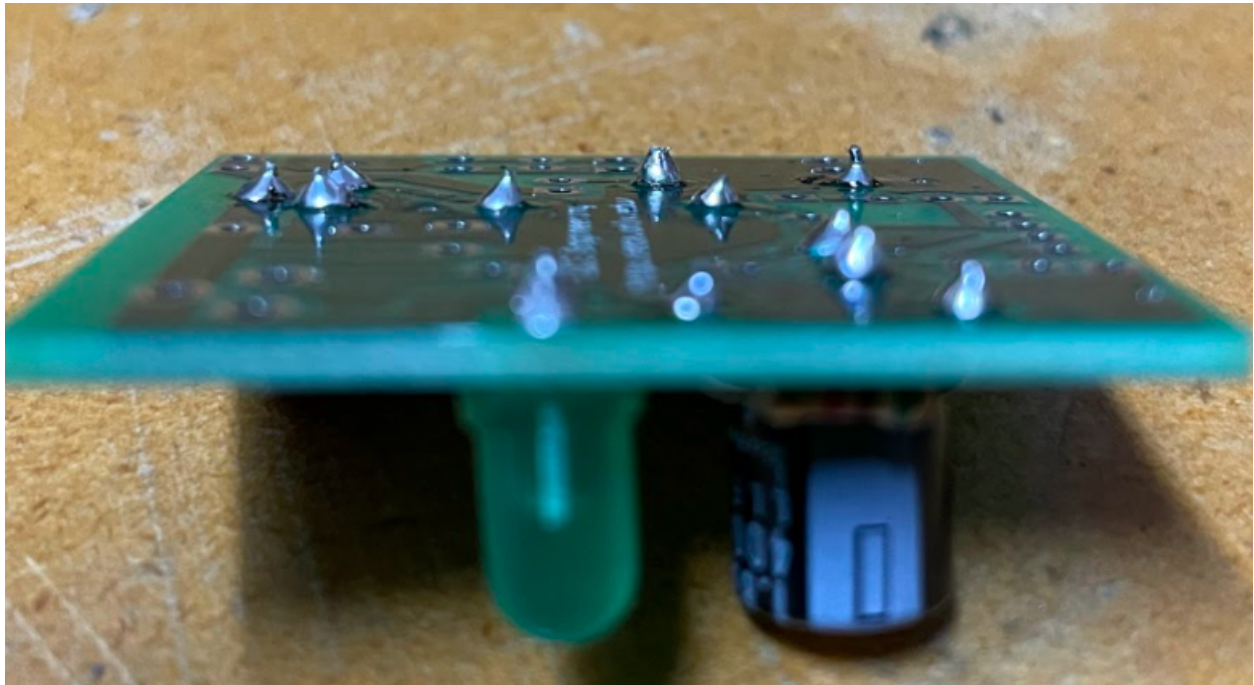
Throughout this lab, I will be learning about soldering methods and soldering circuits onto the Printed Circuit Board (PCB). This lab will involve equipment and components such as the HAKKO FX-888D soldering station, a fluxed solder wire, a wire cutter, circuit components and PCB, and other necessary accessories such as a flux cleaner, desk fan, safety goggles, etc. For electronics, solder utilizes a metal alloy from a tin and lead combination as well as extreme heat for these elements to be melted. The flux for the solder is made of synthetic or natural rosins as well as some activators. The flux is corrosive at solder melting temperatures; therefore, it helps remove the metal oxides. The tip of the solder is measured at temperatures between 650°F to 750°F; therefore, this heat needs to be controlled to properly solder onto the PCB. The thermal mass is how the iron tip will determine the amount of time and proper temperature rise. The surface must have no other oxides or contaminants as this would not allow the solder to be able to have the proper heat to melt. The thermal linkage is the contact between the work and the iron tip where the heat is transferred to this area between the pad and the iron tip; therefore, this thermal linkage area is relatively tiny. Re-soldering should receive the same results as the original soldering connections. Solder joints must be smooth as well as have no forms of sharp edges, looseness, blistering, scratches etc. Successful soldering would have results of adherence when the solder blends into its surface that it is soldered to as well as a small contact angle indicating a bond and continuity. This lab will involve a lot of dangerous instruments if misused; therefore, precaution and tentativeness will be important throughout the entirety of the lab.

2. Prelab

No pre lab is necessary for lab 5.

A green printed circuit board (PCB) is shown, featuring various electronic components and solder joints. The board is labeled "ECE Engineering" and "http://ece.unlv.edu". It has a complex layout of traces and pads, with several components mounted on it, including what appears to be a microcontroller or IC in the center, and various passive components like resistors and capacitors. The board is resting on a wooden surface.

This is the back of the PCB board where I soldered the components from the above picture.



This is a side view of the PCB board with my solder in contact with the PCB board.

4. Answers to questions

Question 1:

The tools needed to solder electrical/electronic components onto the PCB include: a proper solder and flux, an appropriate solder tip for the work, the soldering station, the solder iron, and a sponge (in case of any extra solder). Some extra tools that may be necessary to solder the electrical/electronic components onto the PCB may include: a fan to blow away any fumes and vapors, an anti-static mat, an anti-static wrist strap to prevent any electrostatic discharge damage, or a helping hand to clamp the work and keep your hands free to solder.

Question 2:

The temperature range for a soldering iron to work properly is in between 650°F to 750°F.

Question 3:

There are several precautions needed to be taken into account when soldering. Fumes from the solder must not be inhaled as the lab contained elements of lead and tin. Precautionary measures when handling the soldering irons and components as these tools may be extremely hot. Awareness of location is important as well as the hot iron must be placed in the appropriate holder to prevent any fire damage or excess heat that may result in a fire. This also includes being aware of the hot iron when it is cooling. Turning equipment on and off is also to be taken into consideration as the soldering tool must be cool before it is stored. Lastly, washing hands before using any soldering tools and the solder as there may be excess elements and materials on

your hands that may fall onto the PCB when soldering and to prevent any germs and bacteria when somebody else were to use the soldering equipment.

Question 4:

The most important thing about soldering is to proceed with caution and precision when soldering. Soldering is a very important technique used for electronic components; therefore, we want to prevent any injury or harm done as well as achieve excellent and accurate results. In addition, applying a consistent amount of solder as well as having enough solder is important to keep in mind when trying to achieve great results.

5. Conclusions & Summary

This lab introduced soldering techniques and methods. We first set up the work area by keeping everything around us clean and preventative from any substances that may affect our lab. Then, we gathered all of the materials from the front of the class. The materials included the soldering station, wetting our sponge, PCB boards, and the solid wire with flux. I made sure to cut long strips of the solid wire so that my partner and I would have enough to work with. Then, my partner grabbed resistors, capacitors, LEDs, and other components for us to solder onto the board. Lastly, we plugged the soldering station into an outlet and started soldering these components onto the PCB board. The most problems from this lab came from my unsteady hands. Since I was not able to hold the soldering iron steady, I either applied too little or too much solder. There were a few successful solder joints, and I fixed this error by having the board lay flat on the table and my left hand holding the solid wire about 1.5 inches from the end of the tip. In addition, I was able to get better with more practice, and I felt very confident in my soldering skills towards the end of the lab. Overall, this was the best lab that we've done, and it gave us, students, a lot of flexibility on what we would want soldered onto the PCB board even if it did not work. This was great soldering practice, and I hope we get to solder again in the near future.