

OBJECTIVES

In this lab you will meet and get to know your TA. She/he will discuss the lab rules and policies. You will also construct (solder and assemble) several printed circuit boards (PCBs).

REQUIRED MATERIALS

- As stated in the [Lab Rules and Policies](#), do the following:
 - Submit your entire pre-lab report through Canvas **BEFORE** entering the lab (as specified).
 - Print parts 16 a through d of the pre-lab report for submission to your TA as you enter lab. In future labs, your TA **may** not require you submit this paper part of the report, but assume that this is required unless your TA explicitly tells you that it is not required for future labs.
- Read/save the following documents:
 - [Out of the Box µPAD 2.0 Assembly Guide](#)
 - [µPAD 2.0 Parts List ??](#)
 - [Electronic Assembly handout](#)
- Toolbox, DAD/NAD, and multimeter (from 3701)
- Soldering iron (available for use **in lab**)
- uPAD kit (distributed in lab)

DISCUSSION

- Prior to arriving in lab, read and understand the lab policies (as described in the [Lab Rules and Policies](#) document).
- Upon arriving to your lab, meet and get to know your TA. After introductions, your TA will administer your first lab quiz. Lab quizzes are related to the work that you will do prior to coming to lab.
- After the quiz, your TA will present a short demonstration on soldering; these skills will aid you in building your **µPAD 1.4 (ATXMega128A1U) Development Board** kit (including four other PCBs, referred to as the single *memory base* PCB and the three *backpack* PCBs). After observing your TA demonstrate proper soldering techniques, you will be required to practice soldering on some practice boards.
- After the demo, you will solder and assemble your PCBs.

MAKING ELECTRICAL CONNECTIONS

The [Electronic Assembly handout](#) discusses how to solder, a technique to make a good electrical and mechanical connection between two parts. Figure 1 shows a proper solder joint.

If you have a soldering iron and solder from *Intro to ECE*, do **not** use it without explicit instruction from your TA. (The soldering irons from *Intro to ECE* have unregulated heating and may get too hot for our boards. Also, the solder that is distributed in this course is different than what we use. Mixing solder may lead to unreliable connections; poor soldering irons and soldering technique can burn PCB traces.)

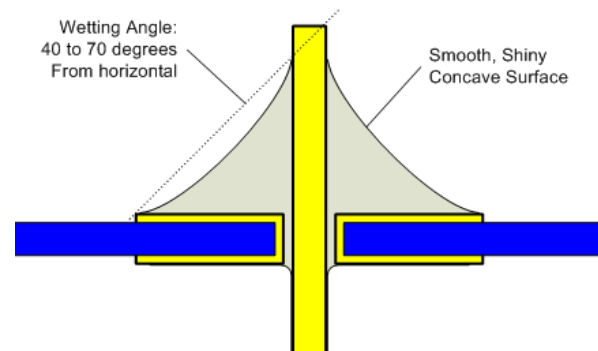


Figure 1: Proper soldering joint (figure from Adafruit)

Prior to the summer 2017 semester, we wire wrapped in 3744. Wire wrapping is another technique (an alternative to soldering) to make a good electrical and mechanical connection between two parts by wrapping wires around pins. Figure 2 shows an example of proper wire wrapping. In EEL 3701C, you made electrical connections with breadboards. We no longer wire wrap in our course, saving students countless hours and frustration.

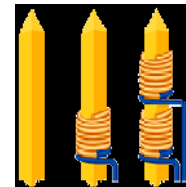


Figure 2: Proper wire wrapping

PRE-LAB PROCEDURE

Read **all** the documents listed in the following sections. Answer the pre-lab questions and complete your first pre-lab report that you will submit through Canvas (as specified in the [Lab Rules and Policies](#) document). Note that your first (Lab 0) pre-lab report will be very short and will only include a few of the items that will be included in all future lab reports. You **MUST** include sections a) through d) for all lab reports (even if there is not much to write for these sections). For this lab, answers to the prelab questions can be found in the referenced lab documents.

There are no programs to write for this lab, but when there are, you **must** create a **flowchart** or write pseudo-code **before** writing **any** program in this course. This will help you formulate a plan of attack for the code. Flowcharts or pseudocode, when needed, must be included (as stated in the [Lab Rules and Policies](#), part 16 g) in your pre-lab report.

Note: Pre-lab requirements **MUST** be accomplished **PRIOR** to coming to your lab.

PRE-LAB QUESTIONS

- How late can you arrive for lab and still be admitted?
- How late can you arrive for lab and still be allowed to take the lab quiz?
- When are your prelab submissions to Canvas due?
- What minimum lab average is required to be **eligible** to pass the course?
- What is the lab makeup policy if you miss a single lab?

6. Can you drop this lab if ... a) you overslept? b) a project for another class is due?
7. When soldering a wire to a pin, what should the soldering iron touch and what should the un-melted solder touch?

REMINDER OF LAB POLICY

Re-read the [Lab Rules and Policies](#) so that you are sure of the deliverables that are due **prior** to the start of your lab.

PRE-LAB REQUIREMENTS SUMMARY

1. Answer all pre-lab questions.
2. Submit the Canvas file as required.
3. Print the required parts of your pre-lab report to turn in to your TA (as stated in the *Lab Rules and Policies*, part 16a-16d). Submit this to your TA upon entering your lab.

Note: Pre-lab requirements **MUST** be accomplished **PRIOR** to coming to your lab.

IN-LAB PROCEDURE

Lab Rules and Policies / Introductions:

Upon entering lab, your TA will discuss the lab rules and policies (that you should have already read and agreed to as part of Homework 0) and then give you a general introduction to the laboratory and what will be expected from you for the semester.

Quiz:

After introductions, your TA will administer your first lab quiz. Prepare by reading and understanding the assigned documents.

Parts Kit:

After your quiz, you will obtain your 3744 lab kit from your TA. These parts will be used in the labs throughout the semester. **Verify** that your kit has **all the parts** listed on the checklist provided. **Immediately notify** your TA about any missing parts. You will be responsible for any parts missing after you attend your first lab.

Board Construction:

Your TA will demonstrate proper soldering techniques. After you practice your soldering, you may begin assembling your board. **Carefully** follow the instructions in the [Out of the Box \$\mu\$ PAD 2.0 Assembly Guide](#). For every major component, solder two pins (on opposite corners of the component) and **have your TA check your work before completing the soldering for that component**. Do **NOT** be overconfident; failure to follow this procedure will result in unnecessary errors that might cost significant **time, money, and LAB POINTS**. If you are not sure, ask first, **BEFORE** soldering.

While waiting for the TA to check your work, continue working through the *μ PAD Assembly Guide*. As stated above, be sure to check with your TA regularly to verify that you are correctly building your PCBs.

You are expected to remain in lab until you are finished with the required soldering (or until your lab ends). If you do not finish soldering, you must finish before your next lab (Lab 1) begins; this means going to a TA office hour, or soldering at home.