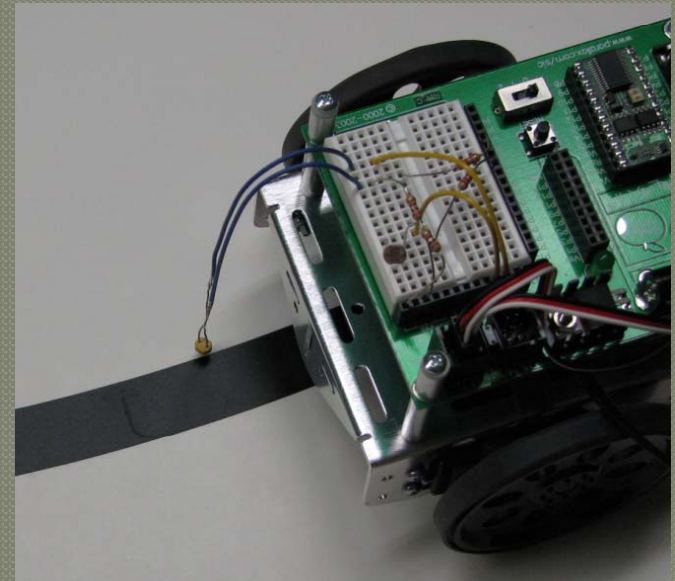


Soldering Safely

Freshman Engineering
Louisiana Tech University



Objective

- The objective of this tutorial is to prepare you for safe and successful soldering.
- Soldering is an integral skill in freshman engineering education.
- Learning to solder will help you in future engineering courses.

What is soldering?

- Soldering in the context of this class is the joining of metals through the heating of an easily melted, metallic material (solder).
- Soldering is useful for extending the length of circuit component wires and connecting circuit components together.
(Here 2 resistors are joined in series.)



Soldering Hazards

- Because the tip of a soldering iron can get up to 750 degrees F (this varies depending on the model), soldering is a fire hazard.
- Not only is soldering a fire hazard, but fumes associated with soldering are dangerous, especially to asthmatics.
- Materials used in soldering may contain lead or other toxins.
- Because of these hazards, it is important to practice safety first.



Soldering Equipment

- Equipment needed for extending the leads on the photoresistors is shown below.



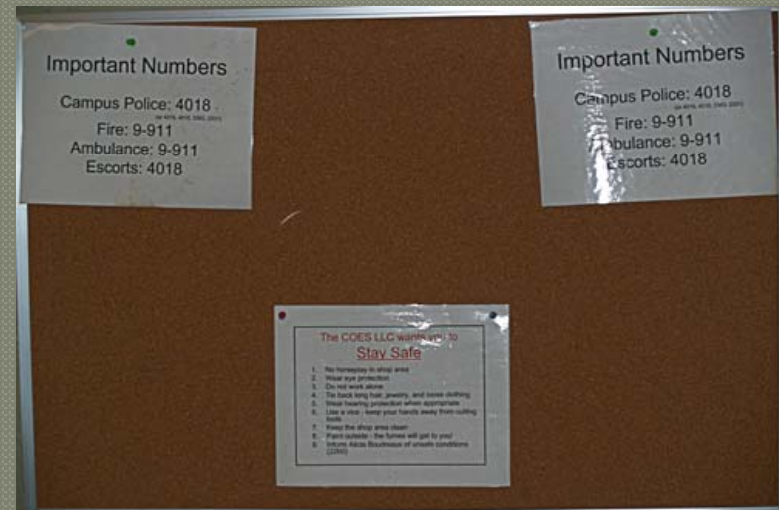
Safety Step 1 - Location

- Location is the most important decision when it comes to soldering.
- You should only solder in workshops and places with safety equipment nearby.
- Do not solder in rooms with carpeting or in your dorm rooms!



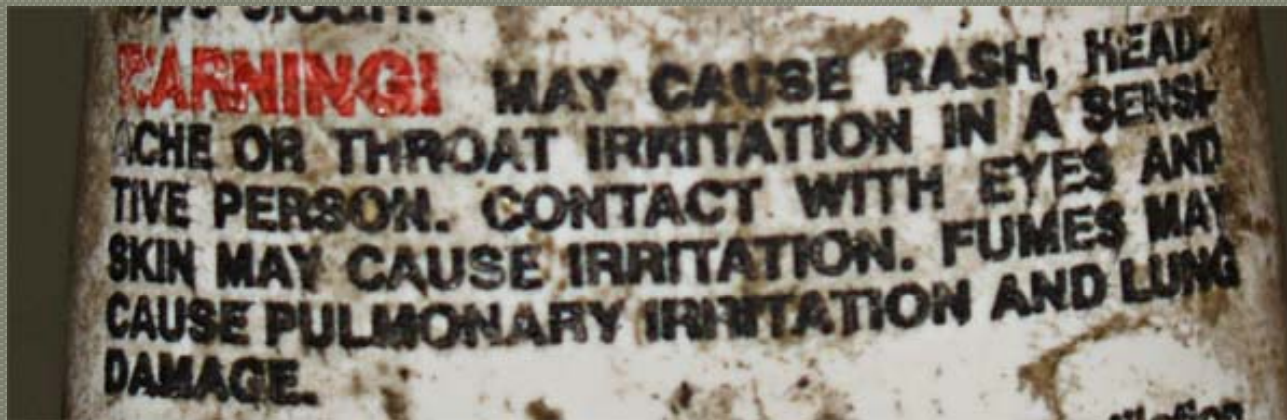
Step 2- Safety equipment

- Make sure that you are aware of the location of ALL safety equipment.
- The most important pieces of equipment for soldering are a first aid kit and a fire extinguisher.
- Respect your workshop and follow safety procedures. You may not think you need eye protection, but you often share a workshop with other students.



Step 3- Read all warning labels

- Reading all warning labels when you first use something is a good practice in engineering.
- Soldering chemicals, equipment, and flux may have information on how you should treat their fumes.
- Some soldering chemicals are lead based, and these should be handled with special precaution. When using lead products, wash your hands and take ventilation precautions.



Materials

- Now that you are informed about the safety precautions, get to know the materials you will be working with:
 - The Soldering Iron – This tool's tip heats up to melt the solder.
 - The Solder – The solder you will use will likely be silver-based. It has a low melting point.
 - The Flux – The flux is a chemical cleaner that prepares surfaces for soldering.

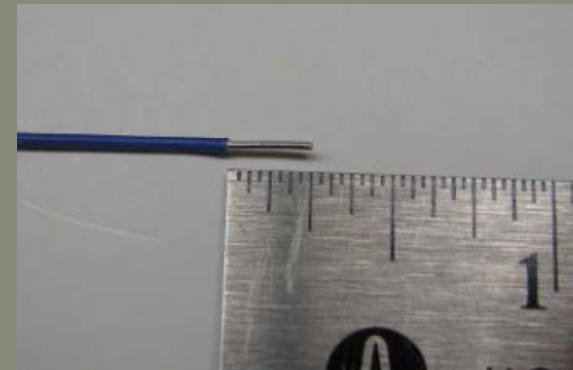
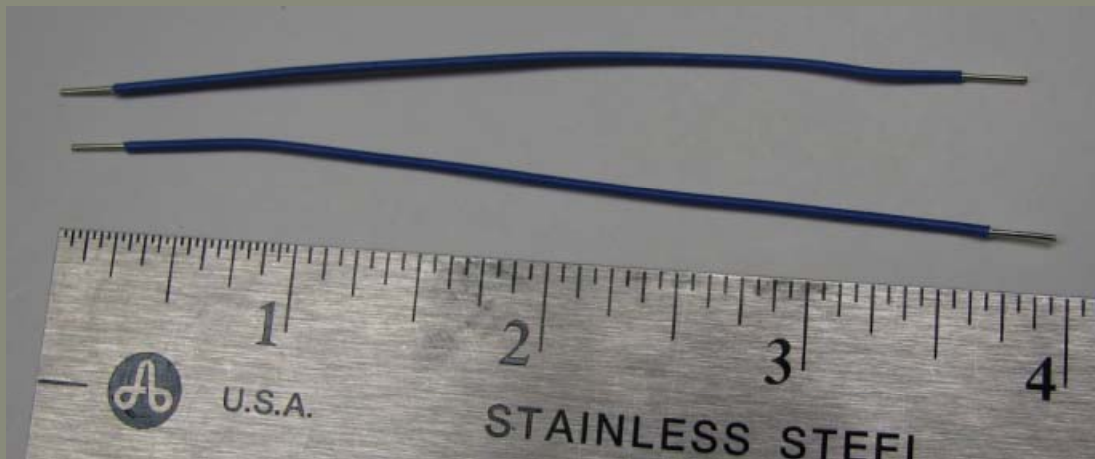
How to solder

- First, set up your workstation. Always keep your soldering iron on its proper mount when it is not in use.
- The soldering iron may take several minutes to heat up. Do not place your hands near the iron to feel if it is hot.



Prepare your wires

- For the photoresistor extensions, cut two 4-inch pieces of wire, and strip approximately $\frac{1}{4}$ inch of insulation from each end.



Applying flux and tinning the soldering iron

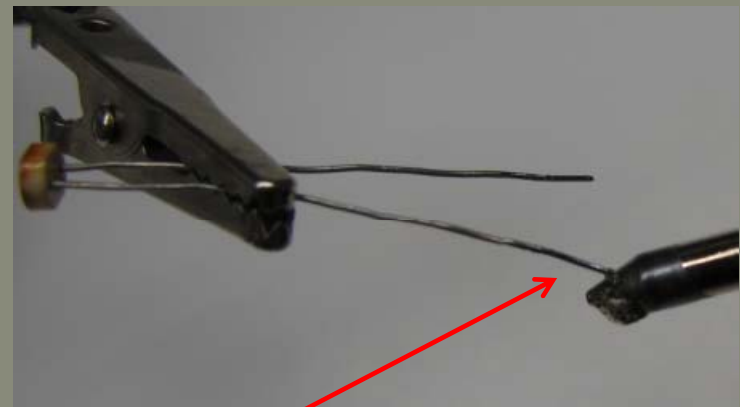
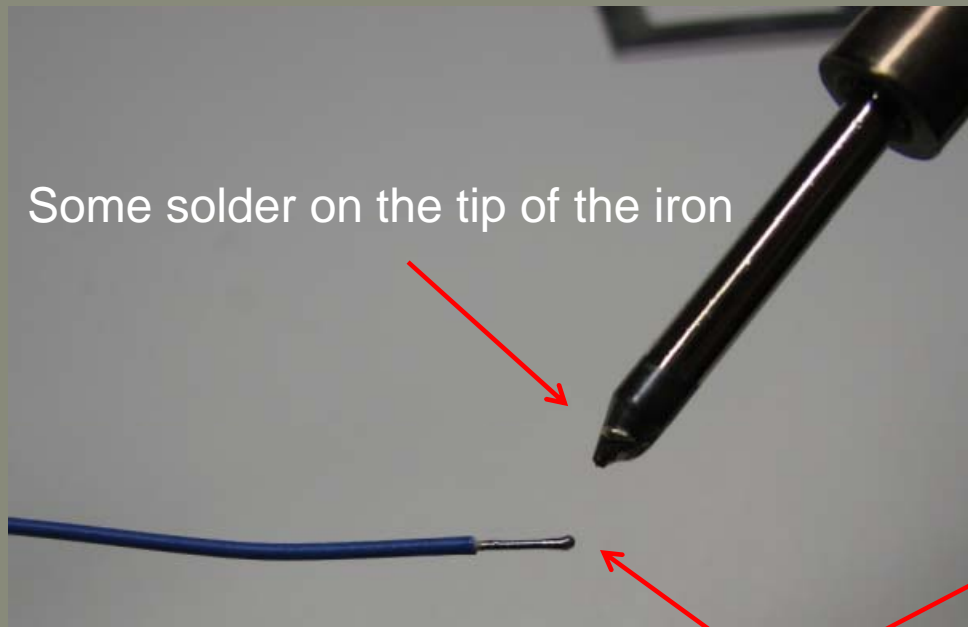
- First, apply the flux to both workpieces that you are connecting.
- We will be attaching extensions to photoresistors.
- After applying the flux, place the workpieces together.
- “Tin” the tip of the soldering iron with a small amount of solder, as shown in the figure.



Pre-tinning the wires

- When joining two wires, it is helpful to tin the parts of both wires that will be soldered together; a vise is handy for holding wires. Just touch the tip of the soldering iron to the wire ends (flux already applied).

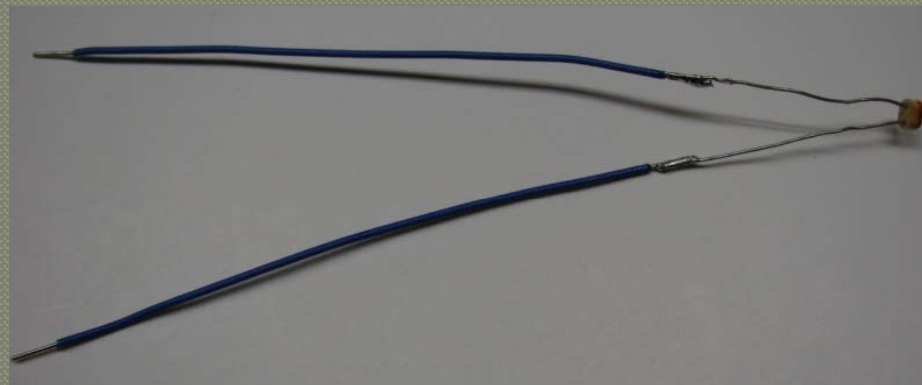
Some solder on the tip of the iron



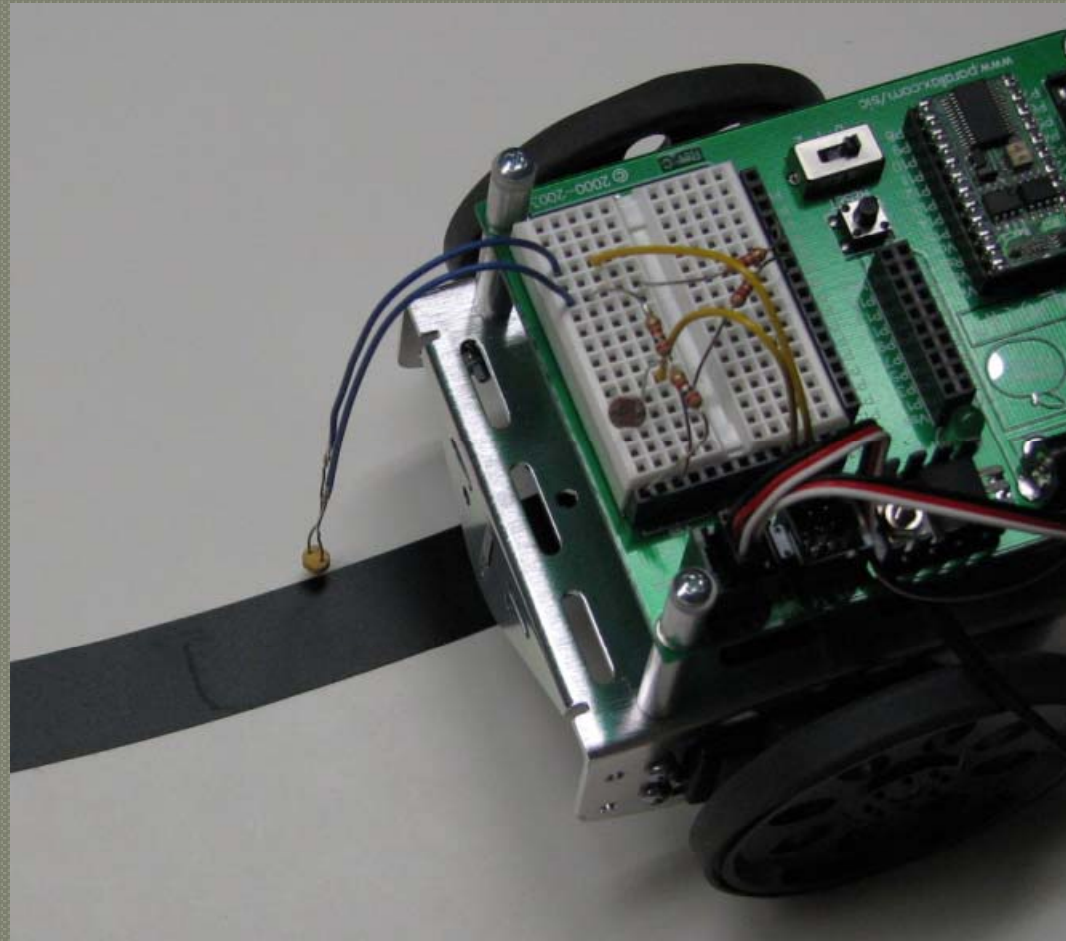
A thin layer of solder surrounds the wires (they have been tinned)

Soldering the joint

- Press the tinned soldering iron to the pre-tinned workpieces, thus applying heat.
- Add enough solder to make a strong joint. You won't need to add much (if any) since you have pre-tinned the wire ends.
- The finished product should look like this:



Boe-Bot with photoresistor extension



Clean up your workstation

- Whenever you are completely finished soldering, follow your workshop's cleanup protocol.
 - Turn off the soldering iron and let it sit for at least a half-hour so that it can cool.
 - Package and seal all of your flux.
 - Allow the room to ventilate.