

Introduction:

All posted safety guidelines must be followed at all times. The current safety code is posted around N3D and available at <http://engineering.nd.edu/groups/n3d/safety>.

The intention of this tutorial is to introduce you to soldering components to a printed circuit board. In this tutorial, you will solder a small circuit which will allow you to blink an LED at a variable rate depending upon the state of a potentiometer. It will also allow you to turn off the LED using a slide switch.

Soldering Iron Safety:

In this tutorial, we will be using a soldering iron to build a small circuit. For this reason, it is important to first talk about safety when using a soldering iron. Here is a short review of soldering iron safety.

1. A soldering iron is a heated element. The tip is approximately 750 degrees Fahrenheit. Do not touch the heated portion to you or anything that is at risk of being set on fire. Try to avoid wearing loose fitting clothing and similar hindrances when using a soldering iron.
2. Before plugging in an iron check to make sure that the cords are not frayed or exposed.
3. Avoid inhaling the fumes that are produced when soldering, try to work in a well-ventilated area.
4. In between soldering joints place the iron back in the stand
5. After using a soldering iron, wash your hands to lessen your exposure to heavy metals and chemicals found in solder.

Soldering Iron Use:

When first turning on a soldering iron, it is best to clean the tip of the iron. This can be done by allowing the iron to fully be heated then scraping the tip on a wet sponge. It is best to use distilled water for the sponge. Then it is important to tin the iron so that the iron conducts heat better to the joint. Tin the tip by melting a small amount of solder on to it until it has a thin shiny coating. After soldering several joints it is best to clean and then re-tin the tip.

After preparing the iron you are ready to solder a component to a board. The whole process should only take about five seconds. Place the component on the board then heat the board and component using the iron for a second or two. Then touch the solder to the component and board, but avoid touching it to the iron. Then after sufficient solder is placed on at the joint, remove the solder. Then remove the soldering iron from the joint

and allow the board to cool. A good connection should look smooth and shiny with the sides are concave, kind of like a small metallic volcano. If the solder looks more like a ball than a volcano too much solder has been used, while if the joint is not very shiny the joint was not heated properly. For a connection with too much solder simply remove the solder using a wick or solder sucker. For a poorly heated joint, re heat the solder in the joint and then add a little more solder. This is a basic review of how to solder.

1. Clean the tip with a wet sponge
2. Tin the tip with some solder
3. Place the component where you intend to solder it
4. Apply the solder tip to the joint allowing the joint to heat for a few seconds
5. Apply solder to the joint (not the iron) and use enough solder to form a volcano looking connection.
6. Remove the iron and allow to cool.

Solder the circuit:

Each person will be provided a kit to solder together. Solder each component to the board in it appropriate place. When you are finished continue onto the next section. Figure 1 depicts a basic illustration of the circuit being built.

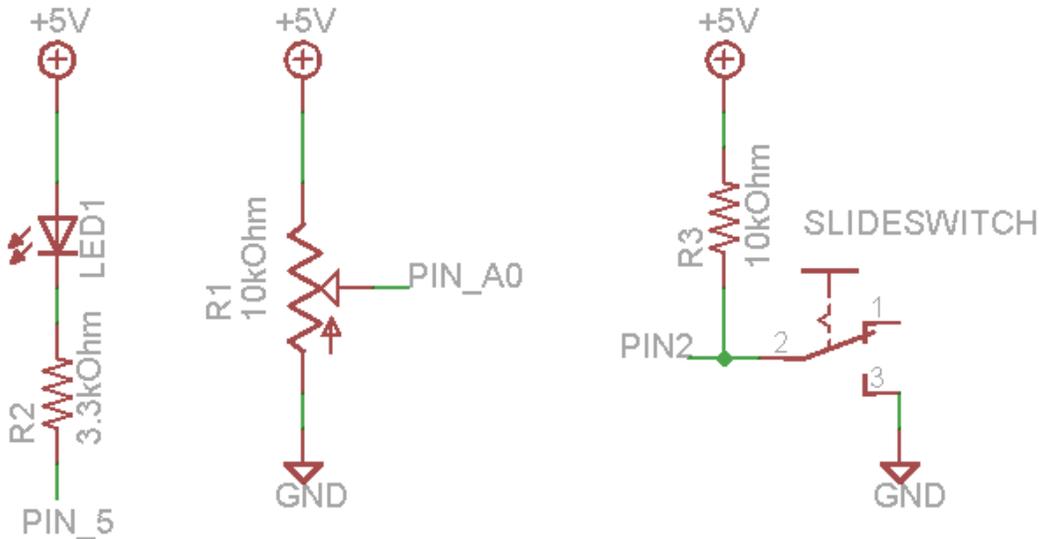


Figure 1: Schematic of circuit to be soldered

Quiz Questions:

1. _____ is the approximate temperature of a fully heated soldering.
2. The fumes from a soldering iron are not at all dangerous to inhale.
 - a) True
 - b) False
3. digitalRead() does which of the following?
 - a) Reads the state of a pin specified returning an integer value between 0 and 1023.
 - b) Writes the state of a digital pin specified with the state specified.
 - c) Reads the state of a digital pin specified.
 - d) None of the above.
4. Interrupts have the disadvantage of potentially disrupting time sensitive portions of code.
 - a) True
 - b) False