Lab 1-Soldering Arduino

Learning Outcomes:

- I know what Arduino is
- I can solder pins onto an Arduino Nano

Background:

Arduino is a simple and easy to use hardware and software platform. They are reasonably inexpensive, open source, and easy-to-use. Arduino sells different types of boards which are better for different kinds of projects. Arduino Uno is probably the most popular board.

Arduino Uno. Image courtesy of Arduino

The board that we'll be using is a shrunken version of Arduino Uno called Arduino Nano.
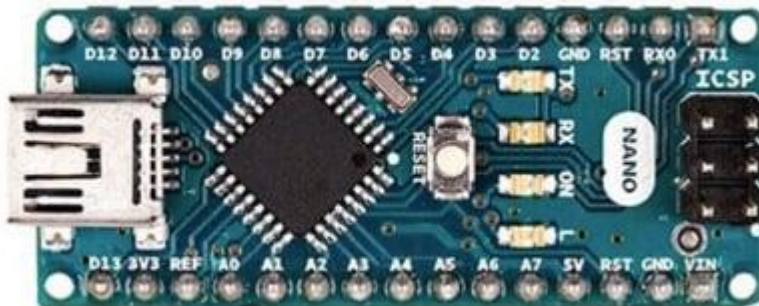
Arduino Nano. Image courtesy of Arduino

Because of its smaller size the Arduino Nano is better fit for some projects where space is a concern.

Arduino boards utilize a component called a microcontroller. The microcontroller is the little black square on the nano and the black rectangle on the uno. The specific microcontroller for

the Arduino Nano is typically an ATmega168 or ATmega 328. Microcontrollers are different from microprocessors. A microcontroller is optimized to perform a specific task repeatedly; however, it is not like a computer which uses microprocessors and can perform a variety of tasks. (More on the difference between microcontrollers and microprocessors here) This means when we upload code to our Arduino it will run that code forever until it dies or we cut the power.

The objective for today's lab is to:
      1) solder pins onto our Arduino Nano.

Step 1 Soldering Arduino Nano:

The Arduino you received probably doesn't have pins attached quite yet. The method we use to attach them is called soldering.

Soldering Station. Image courtesy of Amazon.

Soldering is the process of joining two metal parts together using a metal filler. Solder is what we call the metal filler we melt and flow to join the parts together. It might help you to think of the solder as the glue that holds the two parts together and the soldering iron as a hot glue gun.

To solder our Arduino Nano, we will need:
1. the components we want to solder (i.e. Arduino Nano and pins)
2. soldering wire
3. a soldering iron
4. a fan or well-ventilated area

Safety:

CAUTION: It is important that you follow the proper safety procedures to not harm yourself or others!
- Don't touch the tip of the soldering iron while it is hot. Return it to the stand when you are finished soldering a component to avoid accidentally touching it.
- Work in a well-ventilated area and use a fan to avoid ingesting smoke from the solder. Lead solder fumes are hazardous. Solder containing a rosin-based flux produces fumes that can result in occupational asthma, worsen existing asthmatic conditions, and can cause eye and upper respiratory tract irritation.
- Solder usually contains lead, which is poisonous. Do not eat or drink while soldering. Wash your hands after using solder.

Soldering:

Start soldering by first making a mechanical connection between the two components you want to solder. This means to hold them in place before trying to apply the solder. You can use the helping hands to assist with this, but for the Arduino Nano use your breadboard. Place your header pins into the breadboard and put the Arduino PCB onto the pins. Using the breadboard this way makes sure the pins are perpendicular with the board.

Helping hands. Image courtesy of Amazon.

Next, heat the components with the tip of your soldering iron before trying to apply the solder. When the connection is hot, push the soldering wire into the joint. The solder should melt and bind to the parts. Don't melt the solder and then try to apply it to the joint—it will not work. You want the solder to bind to the Arduino Nano and the pins. If done improperly you will have a poor joint which will not allow electricity to flow.

Tips:
- You can apply a small amount of solder to the tip of your iron before heating the joint. This is called tinning and will help the solder iron conduct heat better.
- Use a small amount of solder each time. It's easier to add solder than to take it away. If you do end up using too much you can remove solder using a desoldering gun.
- Use a multimeter to check continuity as you go along. There is nothing more frustrating than soldering a bunch of components, and then finding out there's a short somewhere but you don't know which component it might be. (Watch the continuity videos below for more information)

Extra Materials:

Please read/watch these extra materials before soldering. It will really help you to do a better job and avoid having to desolder a shorted Arduino Nano.
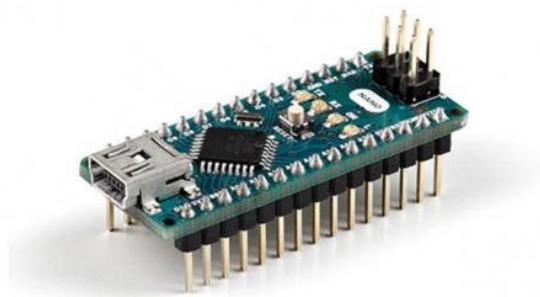
BEST RESOURCE: How-To-Videos
How to Solder an Arduino Nano
Electronics Primer: How to Solder Electronic Components
Soldering Tutorial for Beginners: Five Easy Steps
Multimeters - Resistance and Continuity
Ohms vs. Continuity for HVAC techs

Once you're done soldering the pins the finished Arduino Nano should look something like this:

Finished Arduino Nano. Image courtesy of Arduino