Module: Reading a Potentiometer

There are three basics components to designing and building circuits and controlling them – i) building the circuit, ii) interfacing the circuit to microcontroller board, and iii) writing the program that controls the behavior of the circuit. The 16 experiments included in the SparkFun Inventors' Kit Guide are a well-designed set of procedures that build up these skill sets. Each experiments teaches you a little more about building successively more complex circuits, more about interfacing to the board, and introduces new programming skills and statements.

Reading a Potentiometer

I) Learn to build a circuit that interfaces with one of the analog input Pins on the microcontroller board as well as using the same circuit from experiment 1 as an indicator of how the input to the board changes as you adjust the potentiometer.

II) Reinforce what you learned in the first experiment about how to set up the digital I/O pins in OUTPUT mode so the board generates a signal that will be used to light the LED.

III) Learn to use variables in your program so if you decide to use pin 9 instead of pin 13 you don’t have to change it everywhere in your code.

IV) Reinforce how to use the PinMode, DigitalWrite, and Delay, commands.

V) Learn to use the analogRead command.
Procedures

Using your favorite browser navigate to SparkFun Inventors' Kit Guide at https://learn.sparkfun.com/tutorials/sik-experiment-guide-for-arduino---v32/. On the right side of the page is a list of the experiments including and Introduction. If you have never used an Arduino or a clone you must read this introduction. Although the computers in the lab have the interface software installed this introduction guides you through installing the software on any of your own computers.

OPEN SOURCE – we have chosen the Arduino platform partly because they are part of the Open Source community. This means that all resources, including the schematics and board layout, are free.

So let’s navigate to experiment 2 using the clickable list.

✓ Find the parts in you kit needed to complete the experiment
✓ Run the experiment using the instructions given.
✓ Read all of the Comments that have been lovingly written and included in the program.
✓ Read the short description of A/D conversion – can find link in the Suggested Reading section.

Question 1: In the sidebar are circuit symbols for the components of the circuitry you built and connected to the Arduino/Redboard. Draw the schematic for both the LED circuit and the potentiometer circuit. You can draw them separately or as one drawing since they share the same power source and ground.
Question 2: What does the *analogRead* statement do?

- Isolate the potentiometer to a free space on the breadboard. Probe the potentiometer with 2 DMMs between the pins of the potentiometer as shown below.
- Turn the knob all the way in one direction (does not matter which side).
Question 3: Start turning the potentiometer and tabulate the values of the two resistances at various points until you have turned the potentiometer all the way to the other side. You can use the table provided.

<table>
<thead>
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<th>R as measure by DMM1</th>
<th>R as measured by DMM2</th>
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Question 4: What is a potentiometer?

- Return the potentiometer to its position in the original circuit. Probe the voltage between 5V and pin A0 with one DMM, and probe the voltage between pin A0 and ground the other DMM. Play with how you probe these two voltages so that they are both positive.
- Turn the knob all the way in one direction (does not matter which side).
Question 5:  Start turning the potentiometer and tabulate the values of the two voltages at various points until you have turned the potentiometer all the way to the other side. You can use the table provided.

<table>
<thead>
<tr>
<th>V(5V and pin A0)</th>
<th>V(A0 and GND)</th>
<th>Behavior of LED</th>
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Question 6:  Discuss what the potentiometer does when connected to the analog input pin and how the Arduino/Redboard changes the brightness of the LED in response to turning the knob on the potentiometer.