

1. Table 1: Multimeter Practice (teams of 2)

Check out Sparkfun's excellent multimeter info page:

<https://learn.sparkfun.com/tutorials/how-to-use-a-multimeter>

Challenges/Questions

1. Try checking the voltage of an AA battery
2. Try checking the voltage of a 9V battery
3. Why do we not use the $V\sim$ setting to measure the voltage in a battery?
4. Pick a random resistor from your kit and try using the multimeter to determine the resistor value. Compare your results with:
<https://www.digikey.ca/en/resources/conversion-calculators/conversion-calculator-resistor-color-code-4-band>
Why might they be slightly different?
5. Repeat #4 at least twice more.
6. Use the multimeter to check the continuity of a wire
7. Check the continuity of at least 3 other components from your kit
8. Check the continuity of a few different parts of your Arduino (while unplugged) – Which parts are connected?
9. Why is it helpful to check continuity?
10. Create a simple battery powered LED circuit (like we did in Lab 1). Use your multimeter to check the current at a point within the circuit.

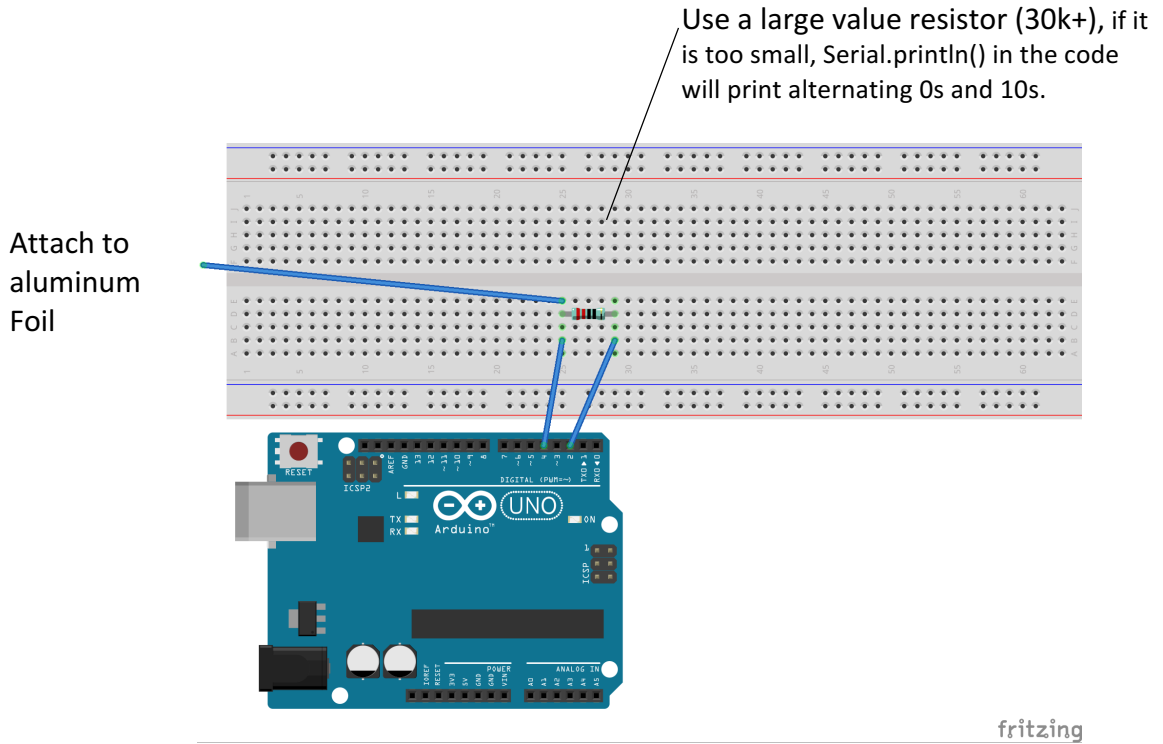
Stretch Goal

11. Upload a Blink sketch to your Arduino microcontroller, and connect an LED so that it's flashing on and off (<https://www.arduino.cc/en/Tutorial/Blink>). Connect the multimeter to measure the current at a point in the circuit. How does it change?
12. Reconnect the circuit you made in step 11 so the LED is flashing again without the multimeter attached. Use your multimeter to measure the voltage drop around the LED. This allows you to see the amount of voltage the LED is using

2. Table 2: DIY sensors (individually)

Some cool sensors can be easily made using everyday materials. In this activity you will make a Capacitive sensor – a kind of touch sensor, that requires little or no force to activate.

Schematic:



Code

//You will need to add the CapacitiveSensor library, available here:

<https://playground.arduino.cc/Main/CapacitiveSensor?from=Main.CapSense>

//Learn how to install libraries here: <https://www.arduino.cc/en/Guide/Libraries>

//This code is modified from: <http://www.instructables.com/id/How-To-Use-Touch-Sensors-With-Arduino/>

```
#include <CapacitiveSensor.h>
```

```
CapacitiveSensor cs_4_2 = CapacitiveSensor(4,2); // 10M resistor between pins 4 & 2, pin 2 is sensor pin, add a wire and or foil if desired
```

```
// To add more sensors...
```

```
//CapacitiveSensor cs_4_6 = CapacitiveSensor(4,6); // 10M resistor between pins 4 & 6, pin 6 is sensor pin, add a wire and or foil
```

```
//CapacitiveSensor cs_4_8 = CapacitiveSensor(4,8); // 10M resistor between pins 4 & 8, pin 8 is sensor pin, add a wire and or foil
```

```
void setup()
```

```
{  
  cs_4_2.set_CS_Autocal_Millis(0xFFFFFFFF); //Calibrate the sensor...  
  Serial.begin(9600);  
}
```

```
void loop()
```

```
{  
  long total1 = cs_4_2.capacitiveSensor(30);  
  Serial.println(total1);  
  delay(10);  
}
```

Goals

1. Get a foil capacitive sensor working on your computer.
2. Consider what you could use this type of sensor for.
3. Try placing the foil in different places/surface types, or using a different sizes of foil or resistors.

Stretch Goals

1. Now that your capacitive sensor is working, try using it to control an LED connected to the microcontroller.

3. Table 3 Soldering Practice

Goals

1. Try soldering wires together, until you feel comfortable