EECE 2150 - Circuits and Signals: Biomedical Applications

Lab 1

Breadboards

Part 1. From circuit diagram to circuit on breadboard

A breadboard (protoboard) is thin plastic board used to hold electronic components (resistors, capacitors, transistors, chips, etc.) that are wired together. It is used to develop prototypes of electronic circuits.

The breadboard has spring clip contacts (holes) arranged in matrices with certain blocks of clips already wired together. Figure 1 shows the contacts which are already wired together. Green marks the standard groups of 5 holes that are connected together that form the bulk of the board. In addition, the boards typically have long interconnected rows of holes down the middle that are used for power supply rails, marked with red and blue lines in Figure 1.The components and wires are plugged into the holes to create the circuit patterns.

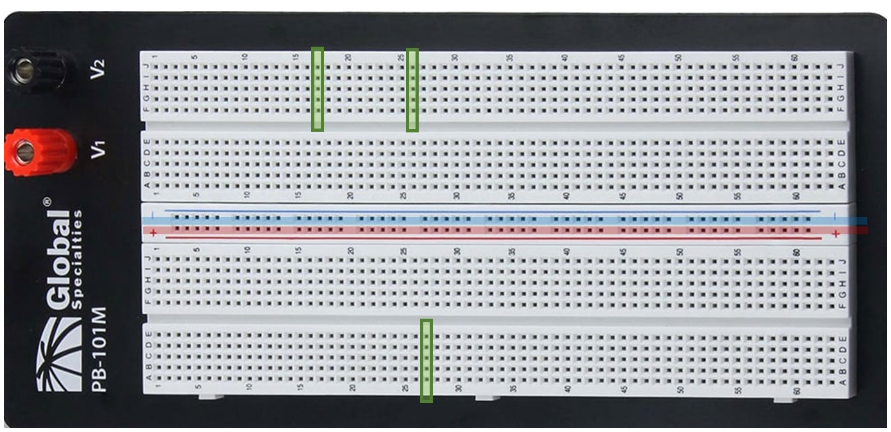


Figure 1 : A picture of a breadboard showing contacts that are already wired together. Contacts along the blue strip are all wired together, contacts along the red strip are all wired and contacts along any set of 5 adjacent points highlighted in green are wired together

Figure 2 shows a circuit diagram translated into a circuit on the breadboard. The power supply (the circle labeled V_s is not shown but would be connected to the red and black wires connects to ground and V_s^+.

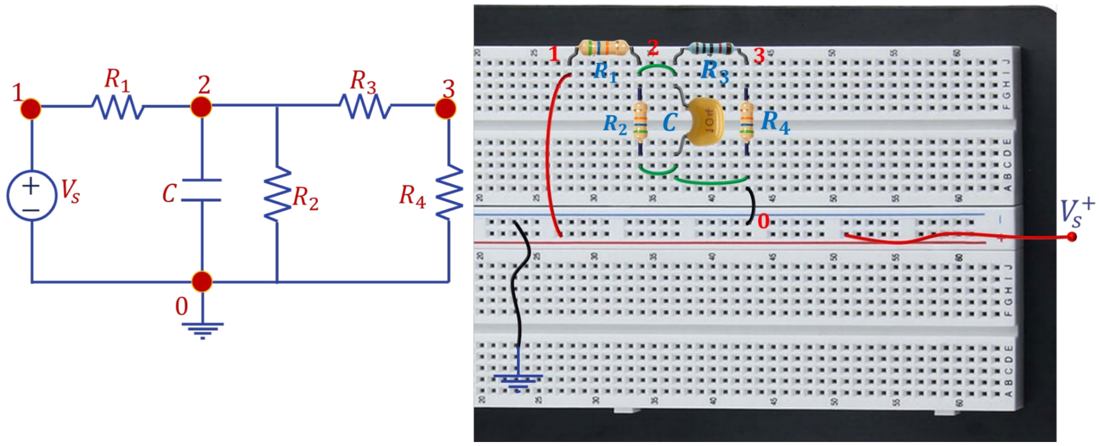
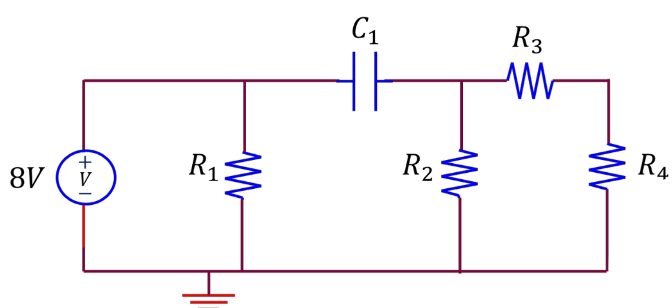


Figure 2 : Example showing wiring of a circuit on a bread board. The schematic of the circuit is shown to the left and the breadboard to the right shows the wired components and the corresponding nodes

Following the example above and the discussion in class, build the circuit shown in Figure 3 on your breadboard. You can use any resistors and capacitor, values are not important for this exercise. Note that you will have to cut and strip wires to make the interconnections. Connect the Vs^+ wire to the red post and the ground wire to the black or green post. **When you are done, document your work with a photograph for the lab report.** Then dismantle the circuit and save the components and wires for future circuits. Note: We have not learned how to analyze these circuits yet. This is fine!



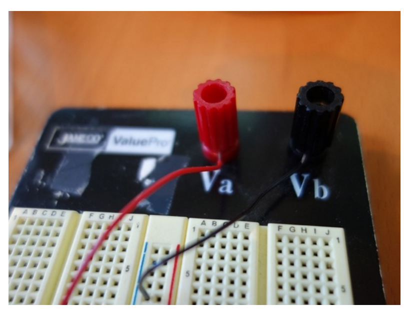


Figure 3. Circuit to build on breadboard.

Figure 4, example of power connection

Part 2. Building an LED circuit

In this part of the experiment we will building a circuit, connecting it to the power supply and performing a few measurements. We will set the power supply to 5V DC sfor the circuit. We will also use the voltmeter option in the DMM to measure the voltage across the different components.

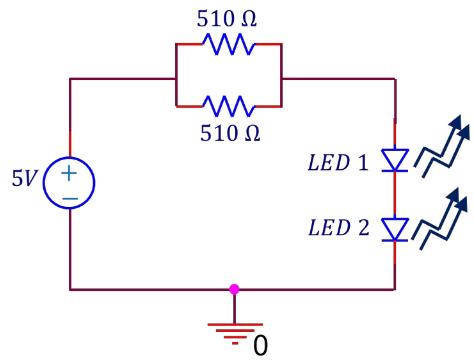
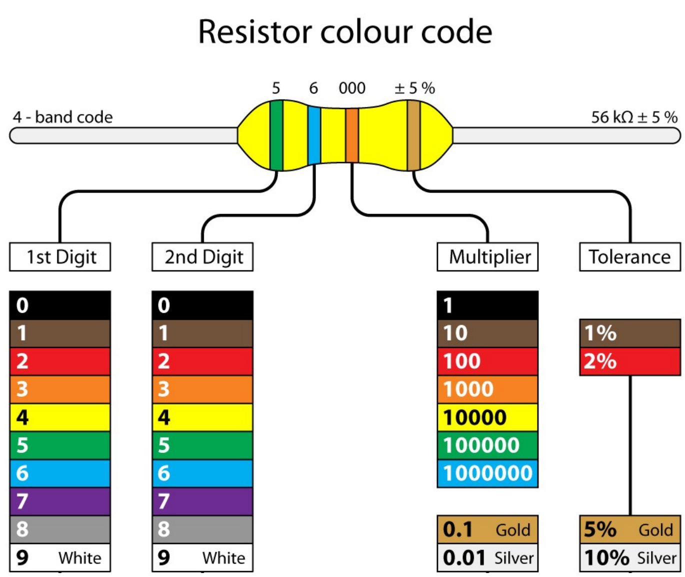


Figure 3. LED circuit

2.1 Build this circuit on your breadboard. You can use either 510Ω or 470Ω resistors. You can also use any color (or color combination) that you want for the LEDs but be careful not to use the infrared LEDs if you want to see the light! Note that the ***direction of the LEDs*** is important because ***LEDs are polarized and will pass current in one direction only***. See the spec sheet online. The longer lead corresponds to the anode (positive side). If they do not light up this is probably the issue. Try flipping the LEDs to see this effect.



2.2 Using the voltmeter, measure the voltage drop across each circuit element.

Note that the instruments automatically connect to the computer when powered on. To establish local control, push the local button on the multimeter and the unlock soft key on the power supply (circled above). The signal generator (future lab) has a similar local button with slightly different labeling.

Q1: What voltage drops you measured across ***R1, R2, LED1 and LED2***? Did you measure any negative voltages? If so, why is this?

Q2: Did the two LEDs have the same voltage drop? If the LEDs are different colors, which one had the larger voltage drop? Usually the voltage drop across similar LEDs is roughly proportional to the energy of the photons emitted!

Q3: Did your circuit work the first time? Do you think that circuits constructed on protoboards typically work the first time?

For the Lab Report:

Reports need to be submitted on Canvas one week after the session in which the lab work is finished. If you are not finished with the lab work, it is your responsibility to finish the work during any of the laboratory office hours during the week. Every lab report should include:

1. A brief Introduction explaining what the experiment is about and/or why we are doing it in the context of the class (not a procedure!) and;

2. Answers to all all numbered boldface questions and the data to back up those answers. (For example, a table of voltage measurements, or an oscilloscope trace, or a screen grab of a MATLAB figure or a Bode plot) and;

3. A Conclusion describing what you and learned (again, not a procedure!).

Typically the introduction and conclusion are each a short paragraph (1-3 sentences). Please keep (for your sake and ours!) the lab reports as brief as possible consistent with being complete. Late Lab reports will be accepted with a 10% penalty up to one day late, and not at all after that.

Department of Electrical Engineering, Northeastern University.
Last updated: 9/7/23, N. McGruer, 9/3/20, N. McGruer and I. Salama, 9/4/19, N. McGruer, 8/29/18, N. McGruer, 8/10/15, M.Niedre; 70 minutes.