EECE 2150 - Circuits and Signals: Biomedical Applications
Lab 1
Getting started with protoboards

Part 1. From Circuit Diagrams to Protoboards

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 arranged in matrices with certain blocks of clips already wired together. Figure 1 shows the contacts which are already wired together. The boards typically include metal strips along the side that are used for common power rails and signal buses, marked with red and blue lines in Figure 1.

The components and jump wires (assorted wire lengths with pins at both ends) are plugged into the clips to create the circuit patterns.

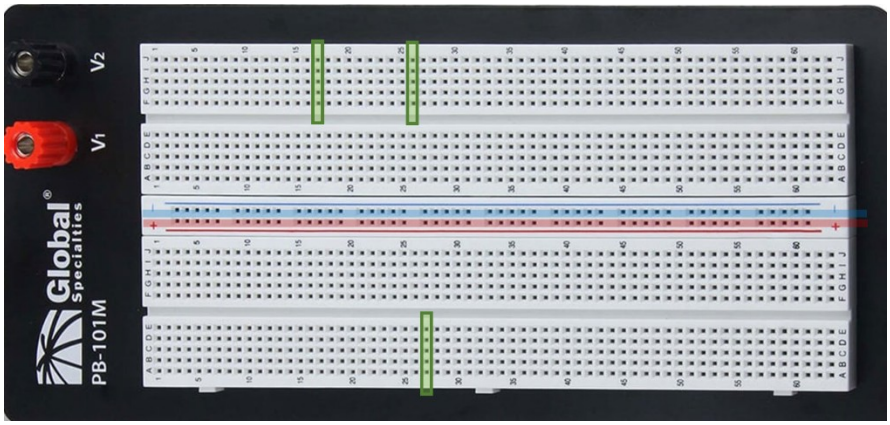


Figure 1 : A picture of a breadboard showing contacts that are already wired together. Contacts along the blue strip are all wired together, contacts along the red strip are all wired and contacts along any set of 5 adjacent points highlighted in green are wired together

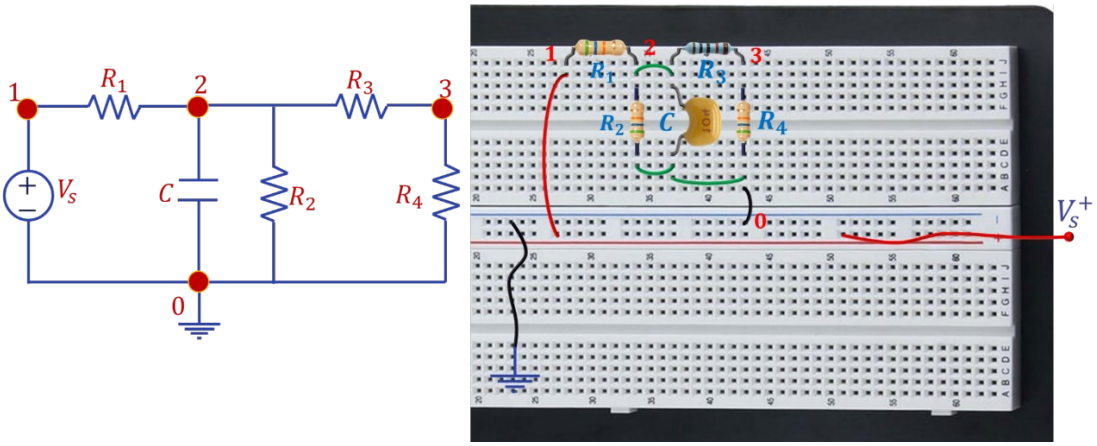


Figure 2 : Example showing wiring of a circuit on a bread board. The schematic of the circuit is shown to the left and the breadboard to the right shows the wired components and the corresponding nodes

Following the example above and the discussion in class, translate the following two circuits shown in Figures 3,4 to the protoboard worksheets on the next two pages.

Note:

1. *You can build the circuit on the protoboard and take a picture for the report or you can use the protoboard work sheet below to sketch the connections on the breadboard*! For now we are just practicing taking a circuit and thinking about how to build it on a protoboard.
2. We have not learned how to analyze these circuits yet. This is fine!

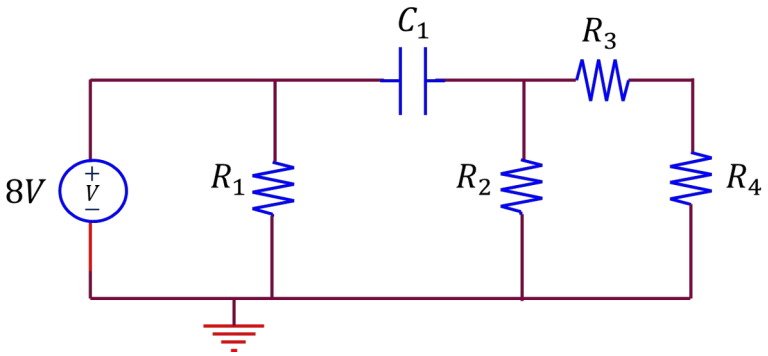


Figure 3. Example Circuit #1.

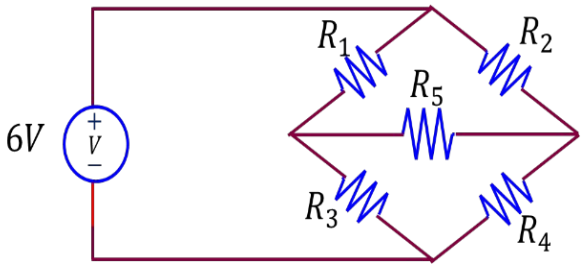
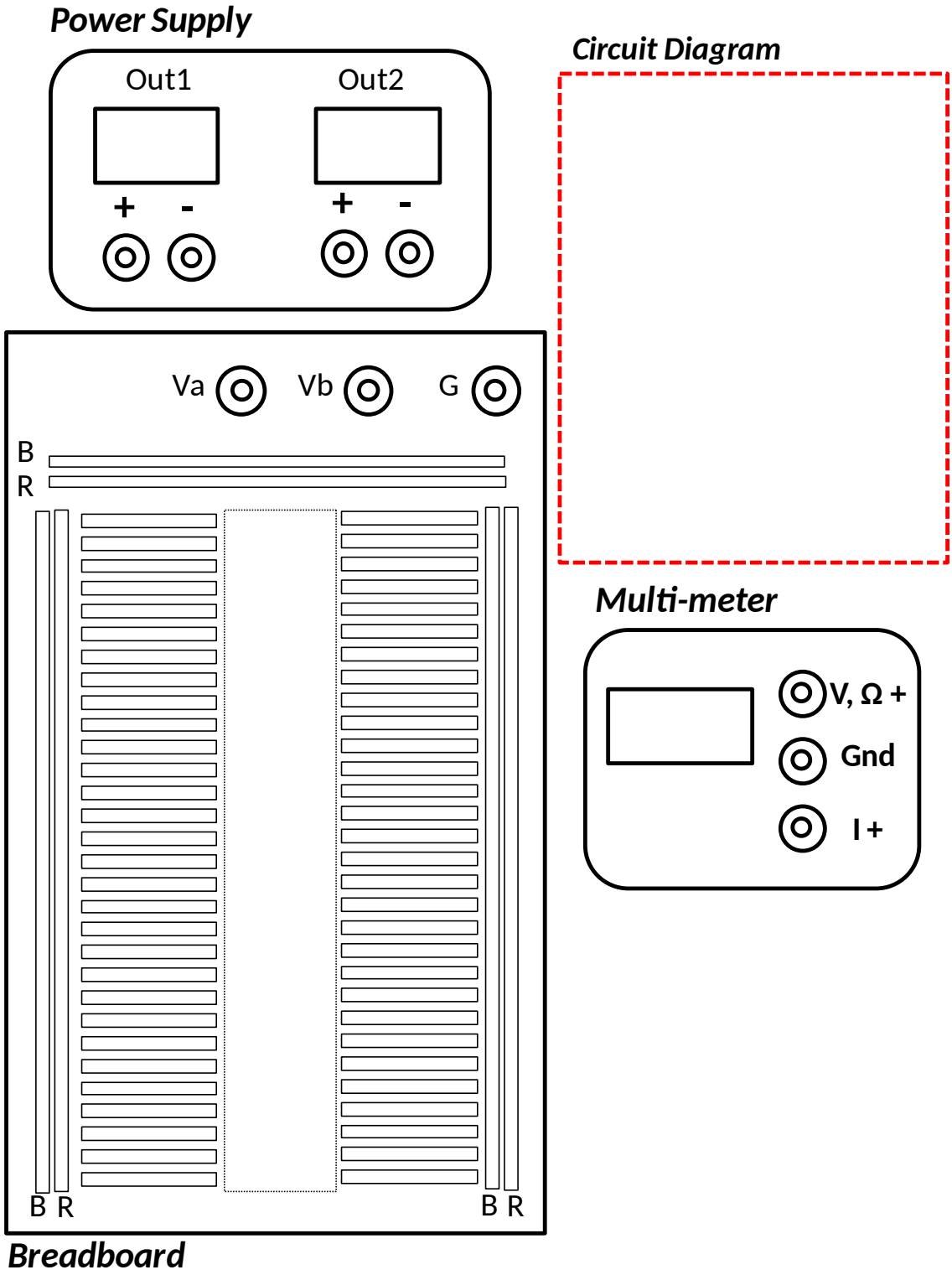


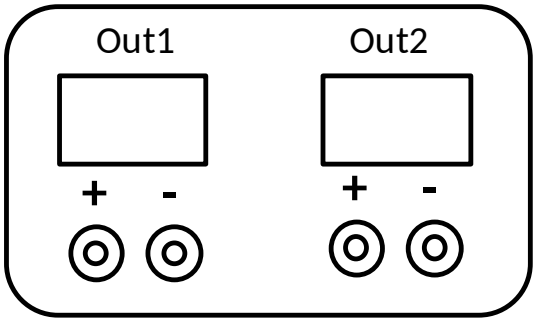
Figure 4, Example Circuit #2

Proto-board Worksheet for Circuit #1

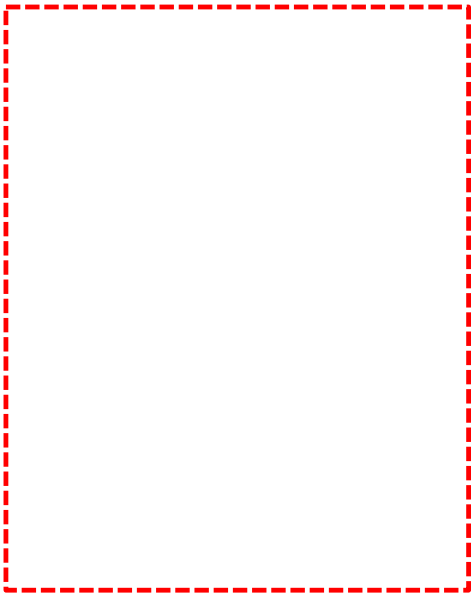


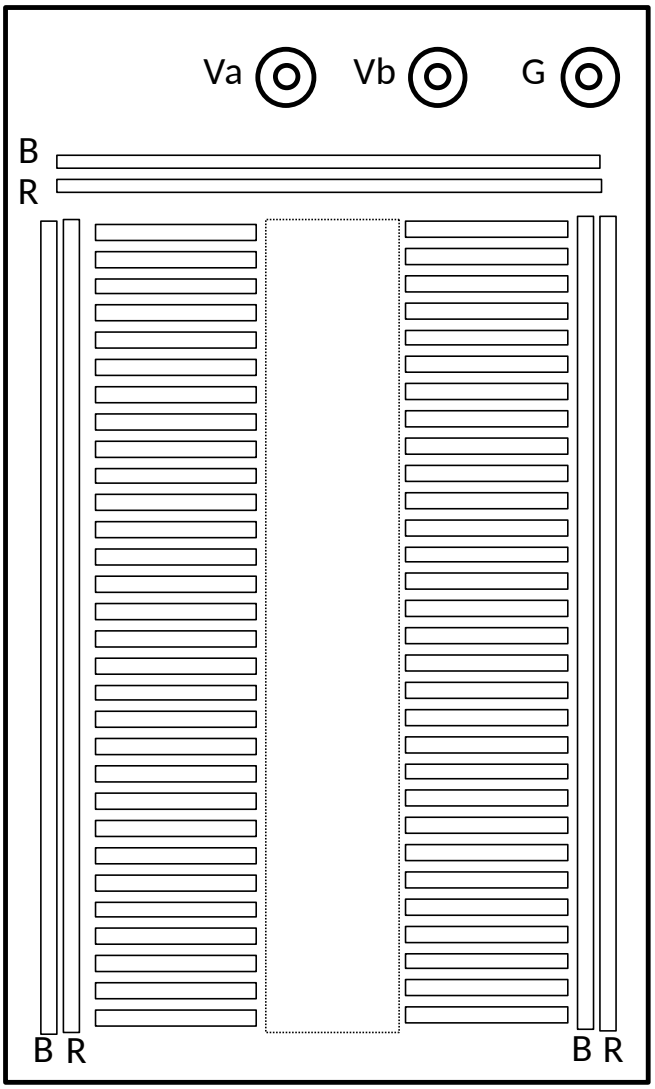
Proto-board Worksheet for Circuit #2

Power Supply



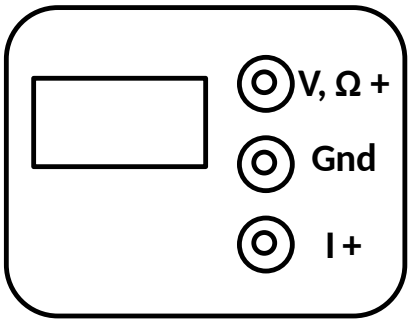
Circuit Diagram





Breadboard

Multi-meter



Part 2. Building a simple LED circuit

In this part of the experiment, we will building a circuit, use the lab equipment to power the circuit and a few measurements.

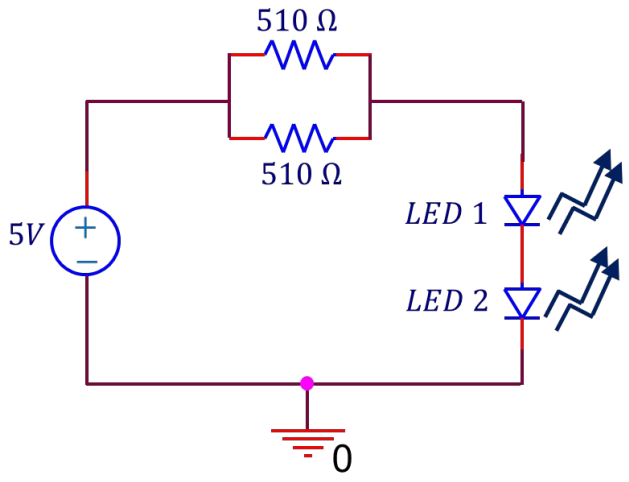


Figure 5. Simple LED circuit

2.1 Build this circuit on your protoboard. You can use either $510\,\Omega$ or $470\,\Omega$ 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 very 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.

Also, the point of this exercise is to get acquainted with proto-boarding. Therefore, take your time and have a look at the various cables and connectors in your toolbox.
Adjust power supply to 5V. Connect the power supply output from (terminals $V^{+¿¿}$ and ground) to your circuit.

2.2 Using the digital multimeter, DMM, and a pair of hook connectors, measure the ***voltage drop across*** each circuit element. To measure a voltage, the positive and negative terminals of the DMM are connected to the terminals of the component. Be sure to have the function of the DMM set to DC Voltage. What voltage drop did you measure across R_1, R_2, ***LED1 and LED2***? Did you measure any negative voltages? If so, why is this?

Part 3 - For the Write-Up...

- To be submitted in one week:
- Submit a paper copy of the 2 protoboard worksheets (or a photo of the component on the protoboard if you used this option).
- Answer the question in 2.2 above.
- Follow instructions for writing lab reports
- Submit electronically on Canvas

Reports will be required for all Labs. They will 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. Please follow instructions for writing lab reports available on Canvas. When you have finished the lab work on a Lab, you should have your Lab Notebook (see below) signed off by a TA or the instructor who will ask a few questions to see if you have understood what you have measured.

IMPORTANT: BEFORE YOU LEAVE THE LAB:

a. Place all of the components that your removed from the red tool box back in that box and return it to the cabinet that houses them
b. Collect all used components and wires from your bench and place them in your group's reusable plastic container. If you are not going to use these components or wires again please discard them in the trash bin located in your lab room.
c. Turn off all of the equipment you have used on your workbench.
d. Make sure you return your protoboard, the equipment wires and your reusable container to the cabinet

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