Dhaka International University

Department of Computer Science and Engineering

PHY-104: Electricity and Magnetism Lab

Experiment 1

Familiarization of different equipment involved with Electrical Circuit Lab

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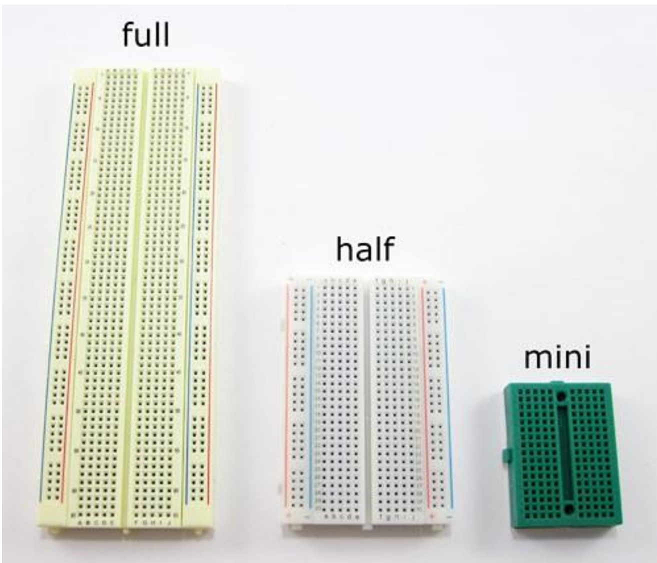
Objective

The objective of the experiment is to learn about the commonly used equipment used in the lab and how to properly use it.

Breadboard

A breadboard is a rectangular plastic board with a bunch of tiny holes in it. These holes let you easily insert electronic components to **prototype** (meaning to build and test an early version of) an electronic circuit, like this one with a battery, switch, resistor, and an LED (light-emitting diode). Some other prototyping boards are: Perfboard, Stripboard, Veroboard etc.

Modern breadboards are made from plastic, and come in all shapes, sizes, and even different colors. While larger and smaller sizes are available, the most common sizes you will probably see are "full-size," "half-size," and "mini" breadboards.



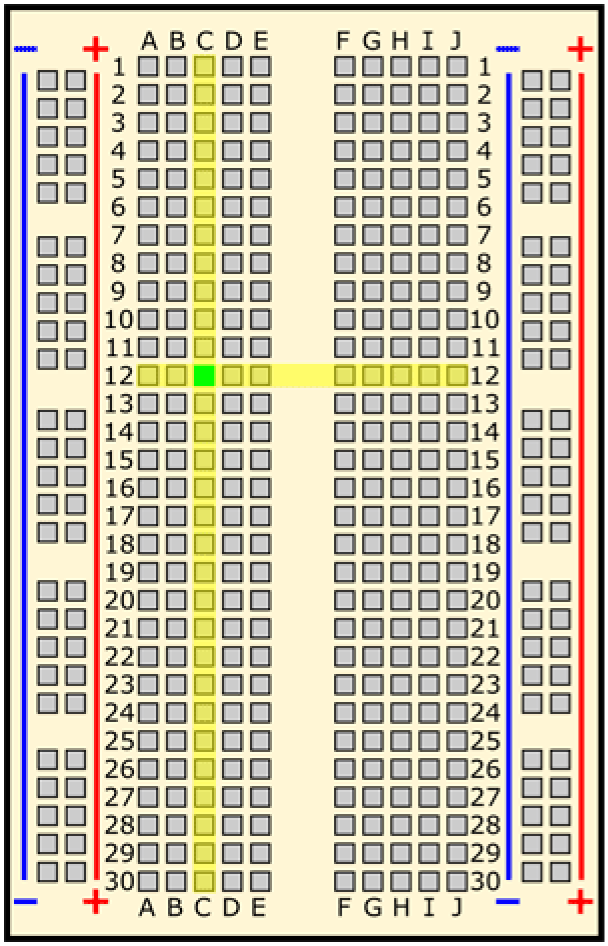
The leads can fit into the breadboard because the inside of a breadboard is made up of rows of tiny metal clips. This is what the clips look like when they are removed from a breadboard.

When you press a component's lead into a breadboard hole, one of these clips grabs onto it.

Most breadboards have some numbers, letters, and plus and minus signs written on them. What does all that mean? While their exact appearance might vary from breadboard to breadboard, the general purpose is always the same. These labels help you locate certain holes on the breadboard so you can follow directions when building a circuit. If you have ever used a spreadsheet program like Microsoft Excel® or Google Sheets™, the concept is exactly the same. Row numbers and column letters help you identify individual holes in the breadboard, just like cells in a spreadsheet. For example, all of the highlighted holes are in "column C."

All of the highlighted holes are in "row 12."

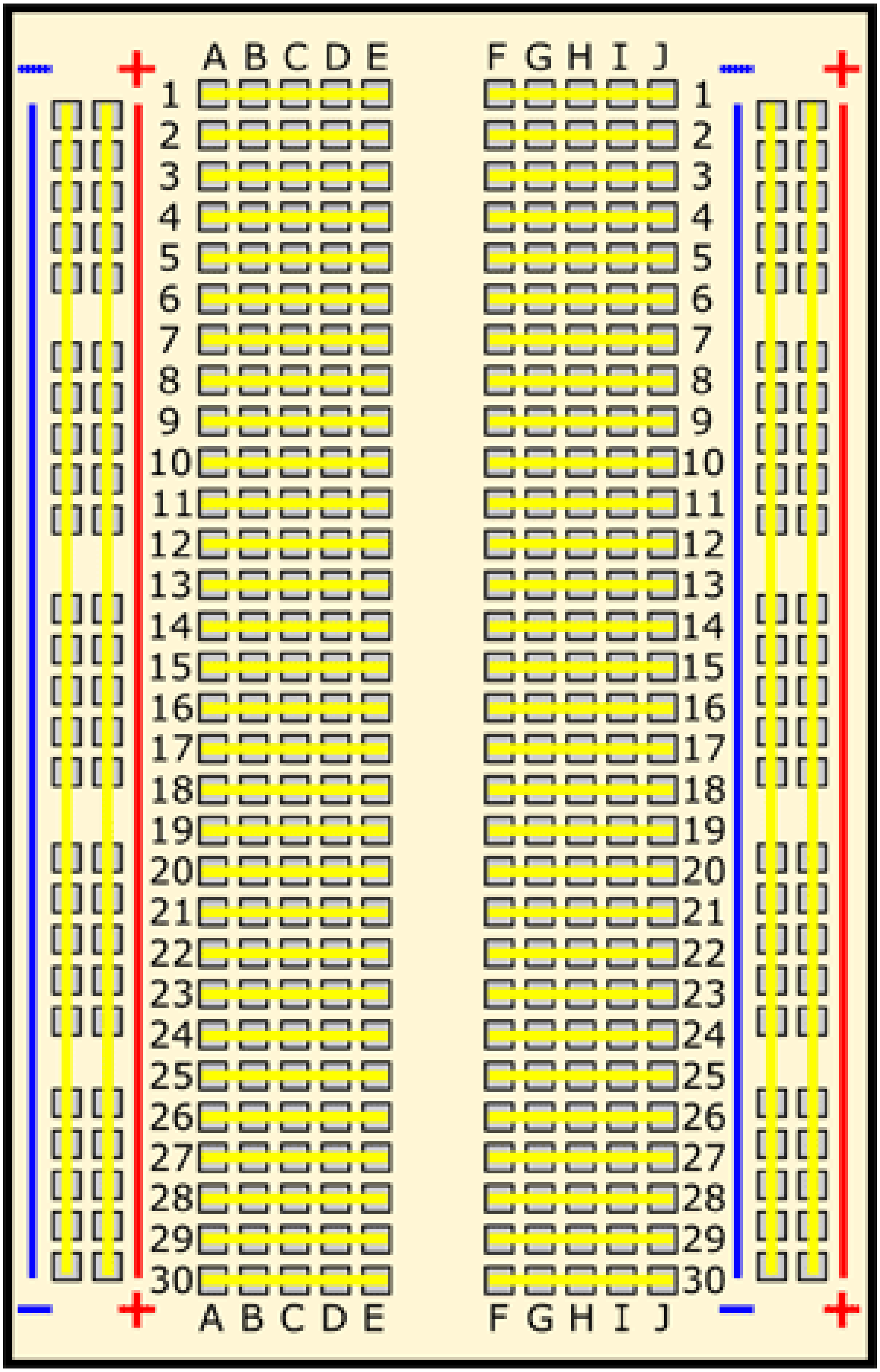
“Hole C12" is where column C intersects row 12.



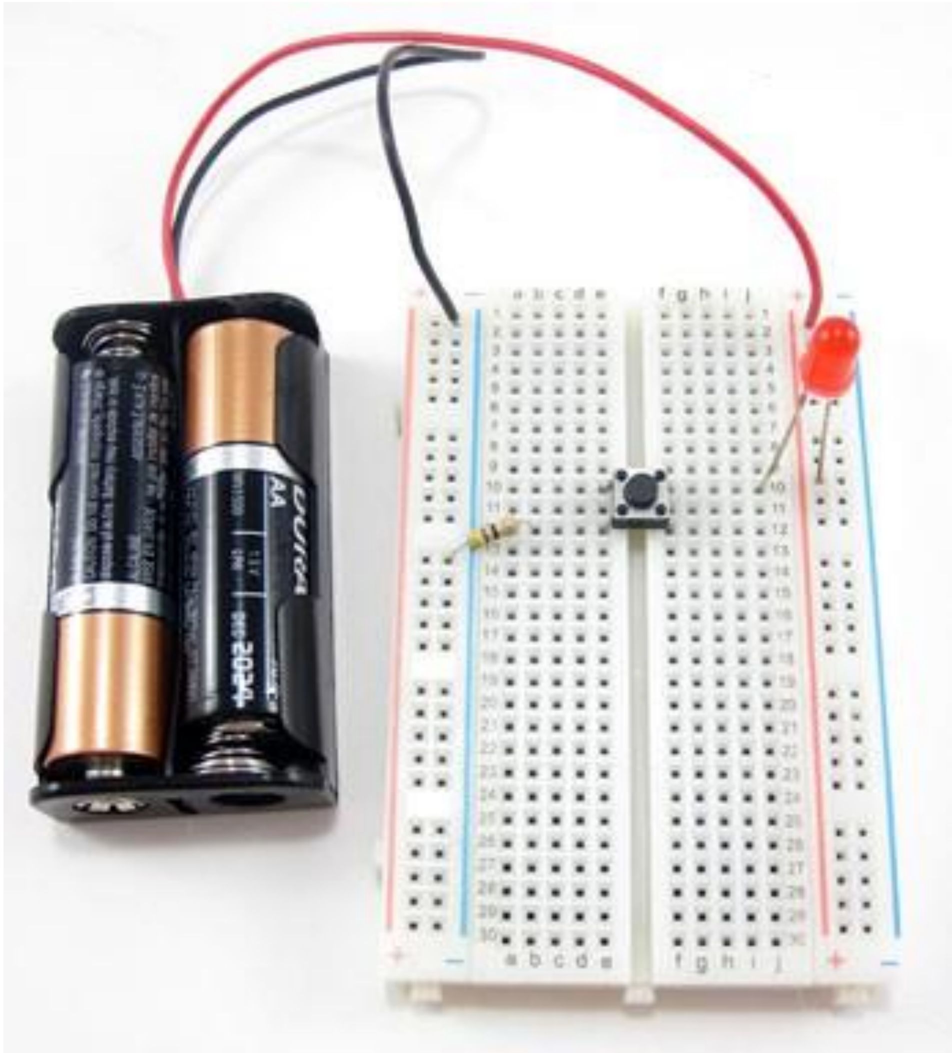
The strips are typically marked by red and blue (or red and black) lines, with plus (+) and minus (-) signs, respectively. They are called the **buses**, also referred to as **rails**, and are typically used to supply electrical power to your circuit when you connect them to a battery pack or other external power supply.

Positive	Negative
Power	Ground
Plus sign (+)	Minus sign (-)
Red	Blue or Black

Remember that the inside of the breadboard is made up of sets of five metal clips. This means that each set of five holes forming a half-row (columns A–E or columns F–J) is electrically connected. For example, that means hole A1 is electrically connected to holes B1, C1, D1, and E1. It is *not* connected to hole A2, because that hole is in a different row, with a separate set of metal clips. It is also *not* connected to holes F1, G1, H1, I1, or J1, because they are on the other "half" of the breadboard—the clips are not connected across the gap in the middle. Unlike all the main breadboard rows, which are connected in sets of five holes, the buses typically run the entire length of the breadboard (but there are some exceptions). This image shows which holes are electrically connected in a typical half-sized breadboard, highlighted in yellow lines.



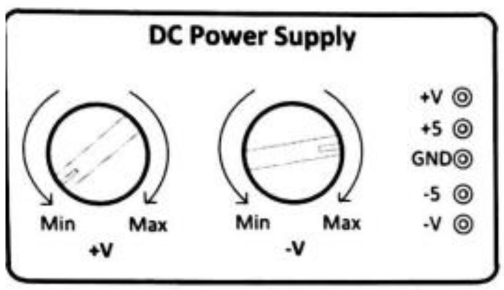
Closely observe the breadboard circuit diagram.



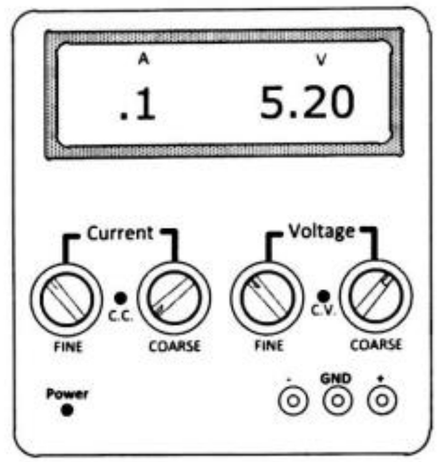
DC Power Supply

A DC stands for direct current, which is electrical current that flows in one direction, the electron in dc current, electric charge flow from the point of low potential to point of high potential, they move from the negative terminal to the positive terminal, which results, currents in the opposite direction (from positive to negative).

In the lab, you may have two DC source in the workbench. One can be found in the trainer board Fig. 1(a) and another is an individual DC power supply module Fig. 1(b).



(a) Trainer board DC source



(b) DC power supply module

Figure 1: DC Power Sources.

Trainer board DC source:

Trainer board DC power supply can deliver two variable and two fixed DC voltage at the same time. The variable voltage can be adjusted using the two dial.

Voltage output at pin	Value	Type
+V	1.2 V to 20 V	Variable
+5	5V	Fixed
+5	-5V	Fixed
-V	-1.2 V to -20V	Variable

DC power supply module:

The DC power supply module can deliver voltage ranging from 0V to 30V.

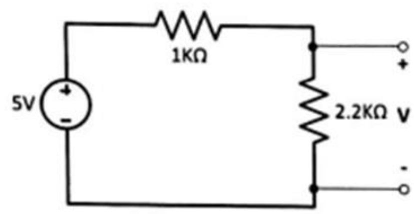
1. To set a particular voltage turn on the power supply.
2. To change the voltage in big step use the coarse dial and to precisely vary the voltage use the fine dial in the voltage group.
3. Observe the output voltage change.

The coarse and fine dial in the current group is used to set the maximum current limit at the output.

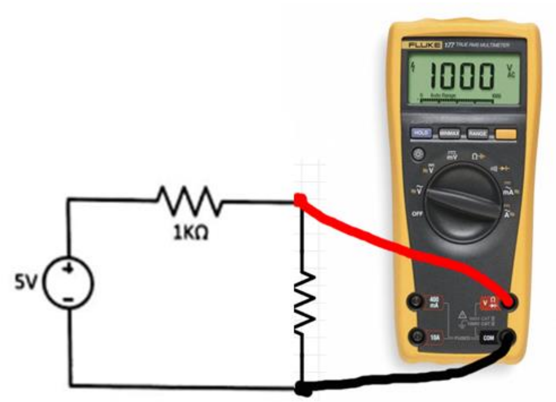
Measuring Voltage:

1. To measure the voltage across the 2.2 kΩ resistor circuit in Fig 2 (a), construct the circuit as shown in Fig. 2 (b).
2. Rotate the multimeter dial in the V position,
3. Connect the red and black multimeter lead as shown in the Fig. 2 (**parallel to the resistor**)
4. Multimeter should display the voltage.

Warning: while measuring voltage multimeter dial SHOULD NOT be in mA (current) position. It might destroy/ damage the meter.



(a)



(b)

Figure 2: Circuit Diagram and actual connection for measuring voltage.

Measuring Current:

1. To measure the current in the series circuit in Fig 3(a) construct the circuit and the create a break the circuit as shown in Fig 3(b)
2. Rotate the multimeter dial in the mA position.
3. Connect the red and black multimeter lead as shown in the Fig. 3 (b) (in series with the circuit).
4. Multimeter should display the current.

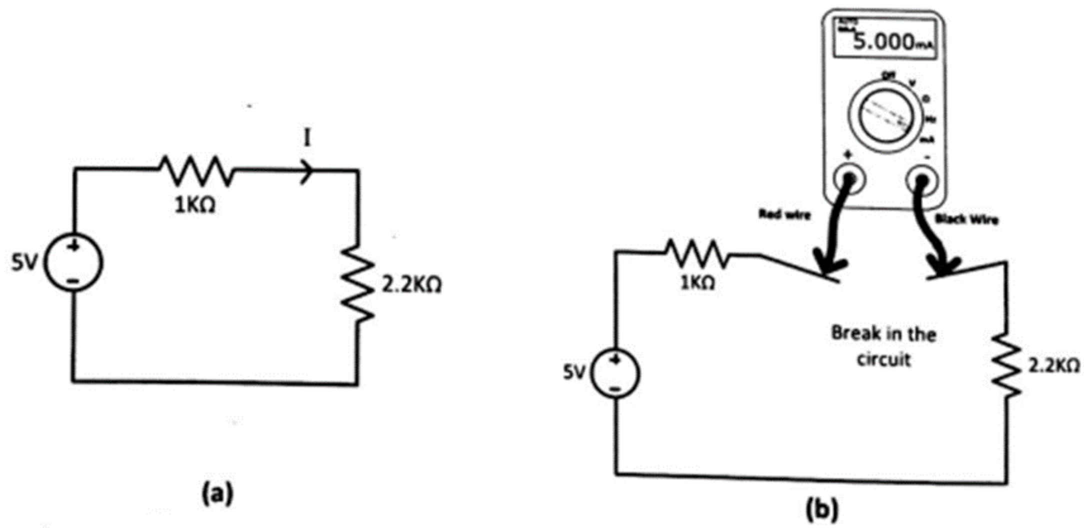


Figure 3: Circuit Diagram and actual connection for measuring current.

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