The College of New Jersey
School of Engineering
Department of Electrical and Computer Engineering

ENG 142 **Fundamental Engineering Design** **Prof Jesson**

Lab # 1: Breadboard Basics and Measuring Electrical Quantities

Part I: Breadboard Basics

A breadboard is a construction base for prototyping of electronics. The term is commonly used to refer to solderless breadboard. Because the solderless breadboard does not require soldering, it is reusable. This makes it easy to use for creating temporary prototypes and experimenting with circuit design. A variety of electronic systems may be prototyped by using breadboards, from small analog and digital circuits to complete central processing units (CPUs) [1].

Figure 1 shows a typical small breadboard which is suitable for building simple circuits. Breadboards have many tiny sockets (called 'holes') arranged on a 0.1" grid. The leads of most components can be pushed straight into the holes. ICs are inserted across the central gap with their notch or dot to the left. Wire links can be made with single-core plastic-coated wire of 0.6mm diameter (the standard size). Stranded wire is not suitable because it will crumple when pushed into a hole and it may damage the board if strands break off. The top and bottom rows are linked horizontally all the way across as shown by the red and black lines on the diagram. The power supply is connected to these rows, + at the top and 0V (zero volts) at the bottom [2].

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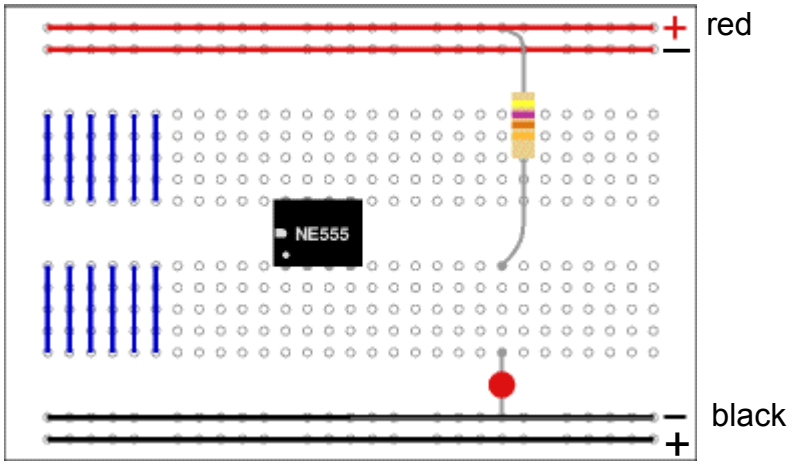


Figure 1. Typical Breadboard with Socket Interconnections.

Follow the following steps to create a breadboard from the schematic shown below, Figure 2:

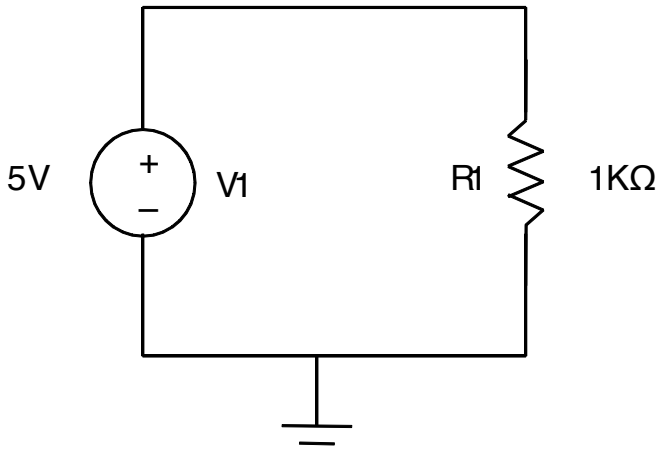
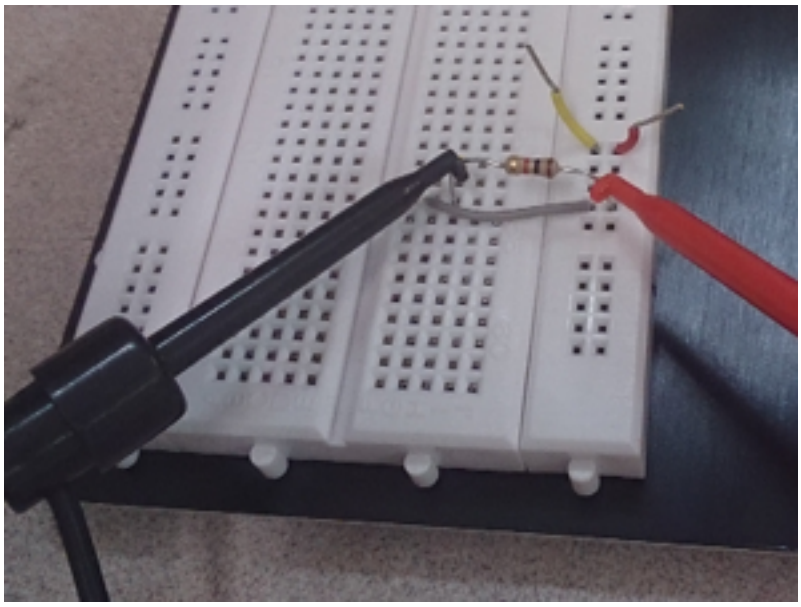


Figure 2. Circuit Diagram.

Step 1:

Build the circuit as shown if Figure 3 and apply the test probes across the resistor:



Note:
You can prepare the wire jumpers by cutting and stripping the insulation as show in Figure 4 - wire station (found in back of the electronics stockroom) and stripper tool:

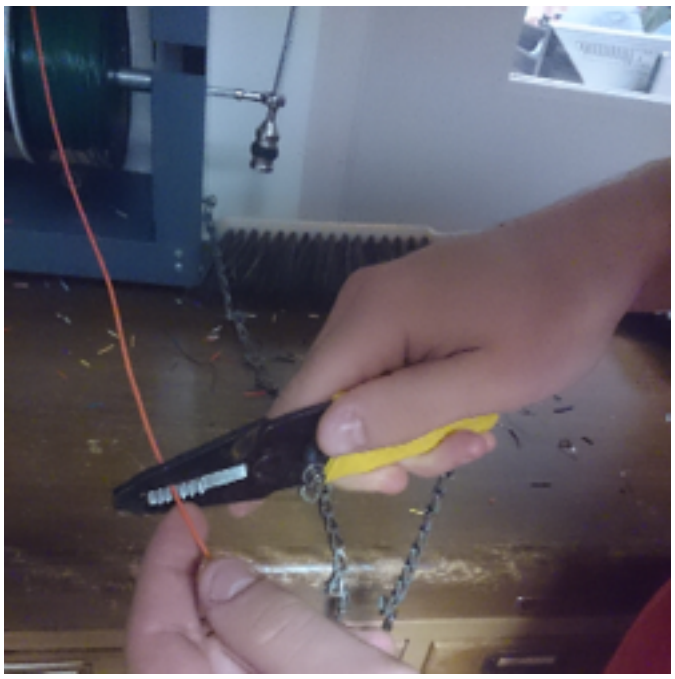


Figure 4. Preparing Jumpers

Part II: Measuring Electrical quantities

Identify and find the components of the circuit as shown in Figure 2. Wire the circuit using wires and the breadboard provided. Measure the resistance of R1 using the multimeter. Write your measurement in the lab notebook and in the matrix below (Figure 5):

Nodes	Resistance	Nodes	Resistance
Across Resistor	0.98170KΩ	Breadboard GND to Resistor	0.650Ω

Figure 5. Resistance Measurements

Figure 6. Resistance Measurements

Now Measure the voltage ACROSS R1 and ACROSS V1 (the power supply). Write your measurements below and in your Engineering Notebook(for Calculations):.

Nodes	Vres	Nodes	V
Voltage Across R1	5.239 V	Voltage Across V1	5.2415 V

Figure 7. Voltage Measurements

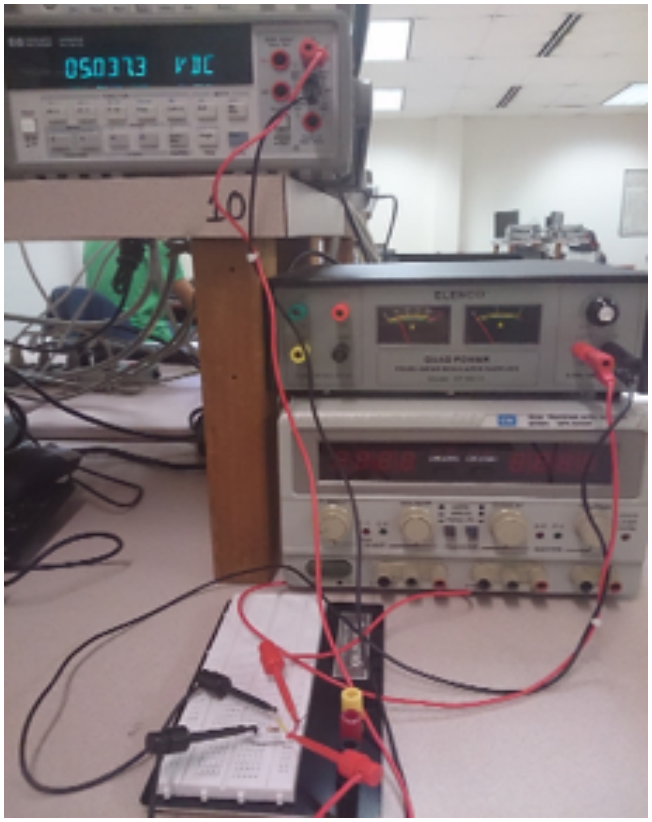


Figure 8. Voltage Measurements with 5V Power Supply

Measure the current (I) flowing THROUGH the circuit. Write your measurements below and in your Engineering notebook (for calculations).

Nodes	Ires	Nodes	Is
Current through R1	5.197 mA	Current Delivered by V1	5.195 mA

(current is identical throughout because the circuit is in a single path)

Figure 9. Current Measurements

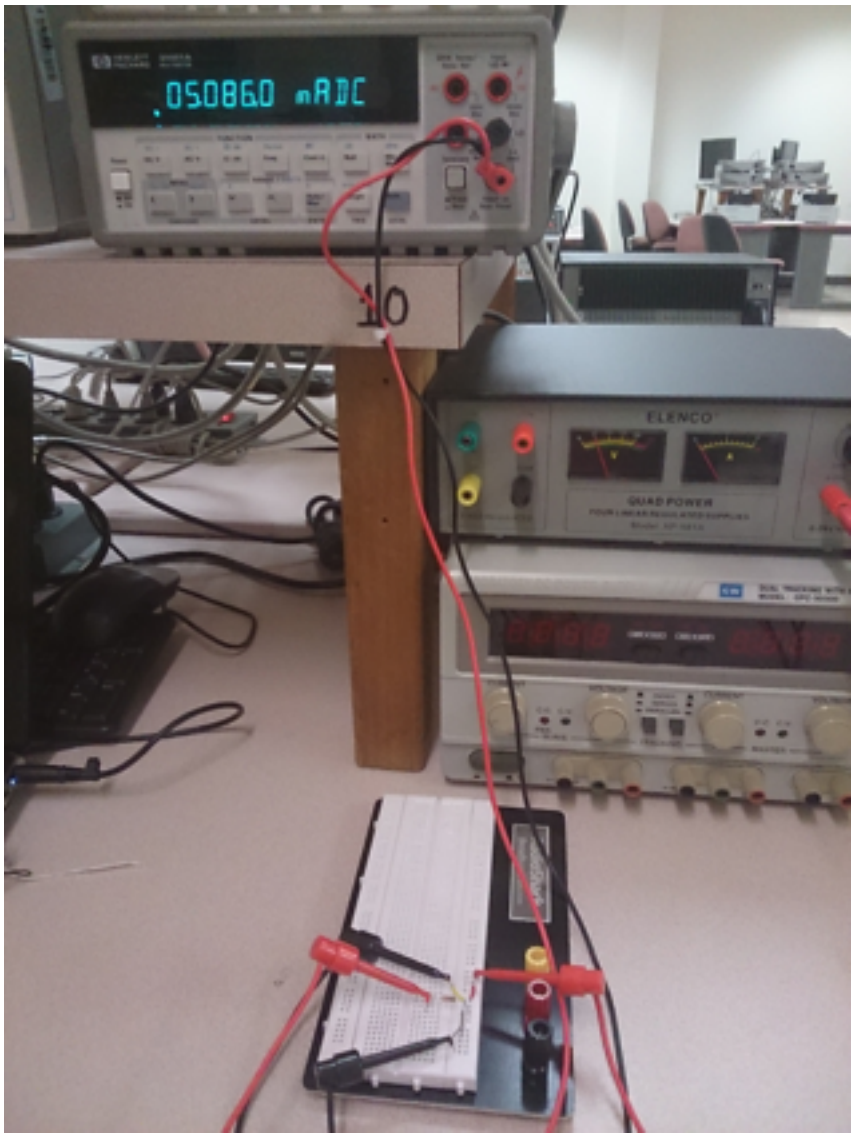


Figure 10. Current Measurements,
NOTE THE CURRENT PATH AND METER TERMINATION CHANGES

Discuss and answer following questions in the lab report.

- Describe how resistance, voltage, and current are measured in a circuit, use Ohms Law to describe this relationship:

- Is the measured resistance of R1 within tolerance:

$$Tolerance = \left|1 - \left(\frac{Measured}{Specified}\right)\right| \times 100$$

, (Remember Gold = 5%, Silver = 10%)

- Is the measured value of the voltage across R1 (VR1) within 10% tolerance if the ideal value of VR1 is 5V?

- What relationship, if any, exists between the voltages V1 and VR1?

- Explain any Problems and Learning's you had during this lab and Your Solution(s)

*** Attach this handout at the end of your lab report.**

Your Name: _____

Part I: Breadboard Basics

Lab Date: _____ Check by: _____

Lab Partner(s): _____

Part II: Measuring Electrical Quantities

Lab Date: _____ Check by: _____

Lab Partner(s): _____

[1] Wikipedia, available at: http://www.widipedia.org
[2] The electronics club, available at: http://www.kpsec.freeuk.com/breadb.htm