ECE 2054 Lab 02 Procedure Spring 2012

Submit this completed worksheet to scholar!

Include the units for all of your measurements.

Name: Grader

NOTE: Your name is required! No Name = 0, no credit!

A. Modified Lab-in-a-Box manual Experiment 1 - Breadboard Basics

If you find that some of your resistance measurements are higher than 10 Ohms, but not registering as an overflow when digital Multimeter is set to its lowest scale, please show this to your GTA as there may be a problem with your ANDY board, an issue with your digital Multimeter, or you are using an incorrect method to make this measurement. Any one of these issues will affect your ability to complete this and future labs properly so please address this issue promptly.

1. Read the general descriptions of the ANDY board and the digital multimeter given in the lab lecture notes. Also read the ANDY Board User Manual and Test Procedure (posted on the OPEL site) and be sure that you have performed the entire acceptance test procedure as described therein.

   Following the concepts of Figure 3, verify the electrical connections in the Breadboard. Be sure to orient your breadboard in the same way as the picture. Record overflow, ovfl or ∞ for open circuit measurements.

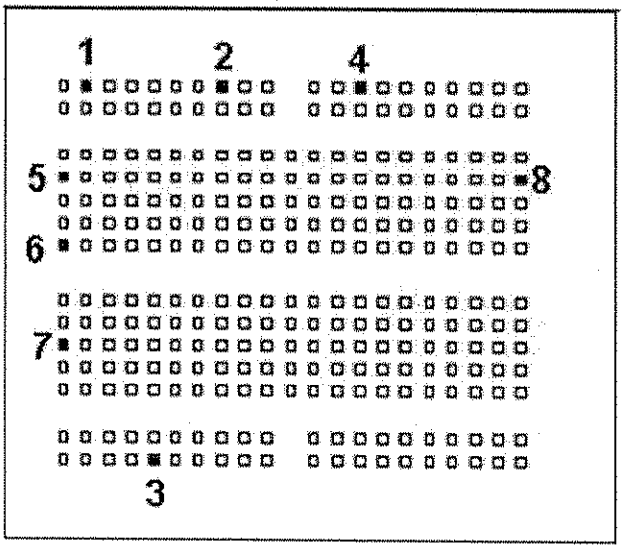


Figure 3: Breadboard measurement locations.

∞, open circuit, lo, overflow, etc.

Measured Resistances for instructions 2 - 8						
R_{12} Low	R_{13}	R_{24} Low	R_{56} Low	R_{67}	R_{58}	R_{15}
0.2Ω	∞	0.2Ω	0.2Ω	∞	∞	∞

(low value varies)

2. Measure the resistance within one row in the power bus. This is (typically) from points 1 to 2 in Figure 3

3. Measure the resistance between vertically separated rows of power busses. This is (typically) from points 1 to 3 in Figure 3.

4. Measure the resistance between horizontally separated rows in the power busses. This is (typically) from points 1 to 4 or 2 to 4 in Figure 3.

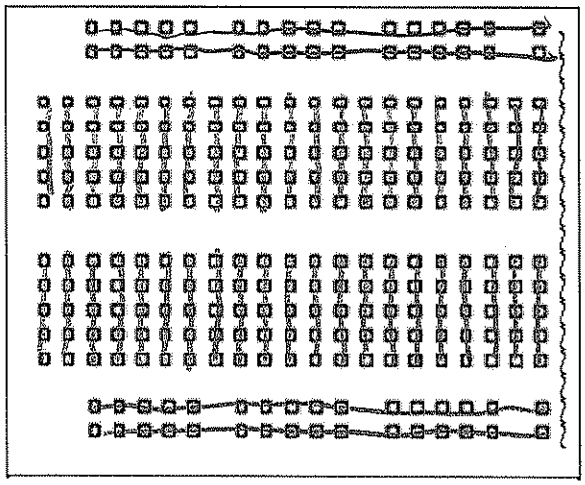
5. Measure the resistance within one vertical column in the working area. This is (typically) from points 5 to 6 in Figure 3

6. Measure the resistance between vertically separated columns in the working area. This is (typically) from points 6 to 7 in Figure 3.

7. Measure the resistance between horizontally separated columns in the working area. This is (typically) from points 5 to 8 in Figure 3.

8. Measure the resistance between rows and columns (i.e., between the power busses and the columns in the working area.) This is (typically) from points 1 to 5 in Figure 3.

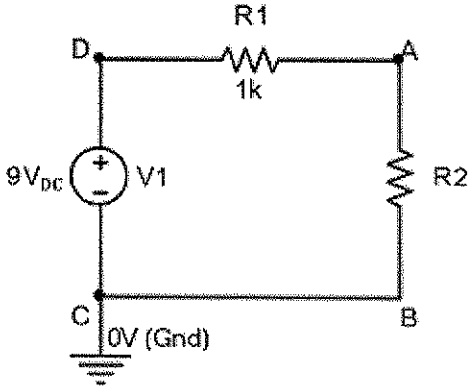
9. Complete the partial breadboard drawing (below) to mark the back plane connections. This should show a sufficient number of columns to be representative of the breadboard. For future reference, you may wish to draw and save a copy of your drawing with your lab kit.



Students should mark at least enough to indicate they understand the connections

B. Modified Lab-in-a-Box manual Experiment 3 - Ohms Law
(use the modified measurement procedure and questions below)

1. Construct the circuit below (Experiment 3 Fig 1)
Use good wiring practice (short wires, Red for power, black for Ground).



Use a 1kΩ resistor for R1.

For resistor R2 use a resistor marked Brown-Green-Brown-Gold 

2. Use the resistor color code to determine the nominal value of R2 in Ω, and the tolerance in %.

   Calculate the expected current flowing through R2 and the expected voltage across R2.

$I = \frac{9V}{1150\Omega} = 7.83mA$

$V = I \times 150 = 1.17V$

R2 value	Tolerance	Expected I_{R2}	Expected V_{R2}
150Ω	5%	7.83mA	1.17V

3. R1 and R2 form a voltage divider circuit, where the source voltage divides proportionally between R1 and R2. The current through R1, R2, and the source are all the same because they form a simple series circuit.

   Build the circuit of Experiment 3 Fig 1 on your ANDY board. The 9V source and the 0V Gnd are found above the breadboard section of the ANDY board.

4. Use the multimeter to measure V_{R2}.

   Open the circuit and use the meter to measure the current flowing through R2.

   Using Ohms Law, calculate the value of R2 $= V_{meas} / I_{meas}$.

Measured V_{R2}	Measured I_{R2}	Calculated R2
1.180 V	7.62mA	154. Ω

(values vary)

5. Remove the resistor from the breadboard and measure R2's resistance.

   Calculate the % difference between your measured resistance and the calculated resistance in #4.
   Calculate the % difference between your measured resistance from #4 and the marked nominal resistance decoded in #2.
   Is this resistor within the tolerance spec? Based on your measurements, is this resistor acceptable?

Measured R2	Measured % difference from calculated value	Measured % difference from nominal value	Within tolerance?
149.15Ω	3%	2.2%	yes
Based on the measurements and tolerance, is this resistor acceptable?			yes

After you have completed the Lab procedure,

1. **Go to the "Tests and Quizzes" on Scholar, and answer the questions in the Lab 02 Quiz.**
   The questions cover the concepts from the lab lecture notes, and the values you measured in the Lab procedure. **Make sure that you see the "successful submission" message after you submit your quiz!**

2. **Submit this worksheet to scholar assignment "Lab 02 Worksheet"**
   Make sure that you see the "successful submission" message after you submit your worksheet!

3. Take your computer with this worksheet, the wired A&D board, the meter and Probe leads to the OpEL and **Validate your Lab before the due date and time.**

   10 points will be deducted for any item (meter, probe lead, etc.) that you must borrow from the GTA to validate.

ECE 2054 Lab 02 Validation Procedure – Spring 2012 **Name** GTA

Validation must be completed by the deadline

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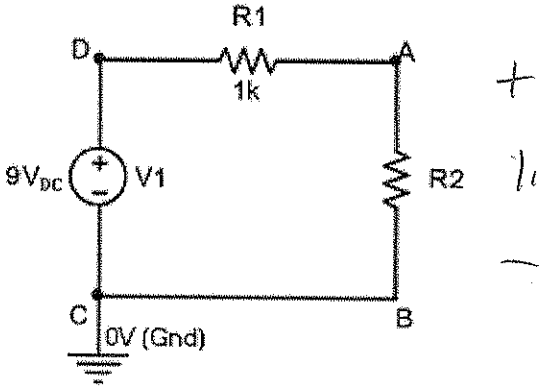
Optional: GTA initials _____ **validation grade** _____ **date** _____

1. The GTA will point to several locations on the breadboard, and ask you to explain which of the breadboard holes are connected to each location. (25 points)

2. Use the Multimeter to measure the Voltage from A to B with maximum accuracy/resolution. (25 points)



use wires, clipped to meter probes, to measure V and I.

Do not clip meter lead directly to resistor leads (-5)

Meter Range Used = 2VDC Measured Voltage = 1.180V (varies)

3. Measure the current that flows from B to C (through the circuit) with maximum accuracy/resolution. (25 points)

Note: Place the Red meter lead in the 10A jack and use the meter 10A setting to test your connections first. Then if the current is below 0.10A, adjust the meter leads and range for maximum accuracy/resolution.

Meter Range Used = 20mA Measured Current = 7.81mA

4. The GTA will evaluate your wiring practice and color coding, probe connections, component values, and meter setup / measurement techniques. (25 points) Red wire for +9V, ok for meter probe
Black wire for ground, ok for meter probe

5. You must remove all components and wiring from the breadboard before the GTA will record your grade.

6. **IMPORTANT:** The GTA will swipe your hokie passport and enter your grade into the data base.

Before you leave the lab, check your email for the card swipe confirmation and the accuracy of your grade.

Do not leave the lab until you have verified that your grade was submitted correctly.

If there is an email delay and you cannot wait for your confirmation, have the GTA add his or her initials, your grade, and the date at the top of the page.

7. Save the confirmation email until your grade appears correctly in scholar