

1.1: Solderless Breadboards, Open-circuits and Short-circuits

Overview:

The purpose of this lab assignment is to provide users with an introduction to some of the equipment which will be used in subsequent lab assignments. The following topics are discussed:

- breadboards
- use of digital multimeters (DMMs) to measure resistance.

The concept of electrical *resistance* is introduced qualitatively in this lab assignment. A more rigorous discussion of resistance will be presented in later modules and explored more thoroughly in later lab assignments.

Before beginning this lab, you should be able to:

- Define the connectivity between holes in a solderless breadboard (see related background material relative to breadboards)
- State how to use a DMM to measure resistance (see related material relative to DMMs)
- State rules governing proper usage of a lab notebook (see related materials relative to lab notebooks)

After completing this lab, you should be able to:

- Use a breadboard to connect electrical components
- Create open circuits and short circuits on a breadboard
- Identify nodes on a breadboard circuit
- Use a digital multimeter to measure resistance

This lab exercise requires:

- Hand-held DMM
- Solderless breadboard

Symbol Key:

	Demonstrate circuit operation to teaching assistant; teaching assistant should initial lab notebook and grade sheet, indicating that circuit operation is acceptable.
	Analysis; include principle results of analysis in laboratory report.
	Numerical simulation (using PSPICE or MATLAB as indicated); include results of MATLAB numerical analysis and/or simulation in laboratory report.
	Record data in your lab notebook.

General Discussion:

In this portion of the lab assignment, we will examine the connections between different holes in your breadboard using a DMM as an ohmmeter. Specifically, we will see which connections correspond to open circuits and short circuits. We will use jumper wires to change the connectivity between holes on the breadboard.

Pre-lab: None

Lab Procedures:

In this portion of the assignment, we will use the DMM as an ohmmeter to check the connectivity of different nodes on a breadboard. In the circuits below, you may need to use jumper wires in to assist in the connection between the DMM leads and the breadboard.

DATA

1. Using your DMM as an ohmmeter, connect the leads of the DMM to two holes in the same row on your breadboard, as shown in Figure 1(a) below. The DMM should indicate a very low resistance between the holes – generally fractions of an ohm. Record your results in your lab notebook.

DATA

2. Check the resistance between two rows of holes on opposite sides of the central channel of the breadboard, as shown in Figure 1(b) below. Your DMM should indicate a very high – or infinite – resistance between the holes. Record your results in your lab notebook.

Note:

Different ohmmeters have different ways of indicating what they consider to be an infinite resistance. For example, some models may read out an overload (sometimes displayed as OL or a “flashing” number) condition.

DATA

3. Check the resistance between two arbitrary holes (not in the same row) of your breadboard (e.g. between nodes a and c in Figure 1(b)). Your DMM should again indicate a very high or infinite resistance. Record your results in your lab notebook.

DATA

4. Finally, use a jumper wire to connect two different rows on the breadboard. Add a jumper wire between nodes a and c as shown in Figure 1(c). The DMM should indicate that the resistance between these nodes is now very low. Record your results in your lab notebook.

DATA

- In your lab notebook, comment on whether the connections in lab procedures 1 – 4 correspond to “open circuit” or “short circuit” conditions.

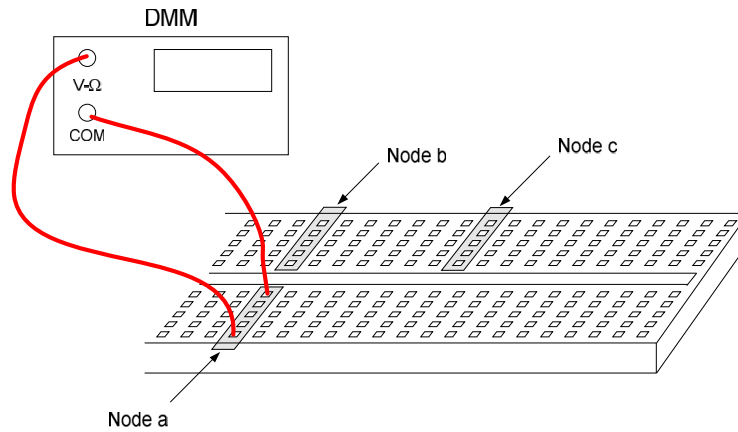


Figure 1(a).

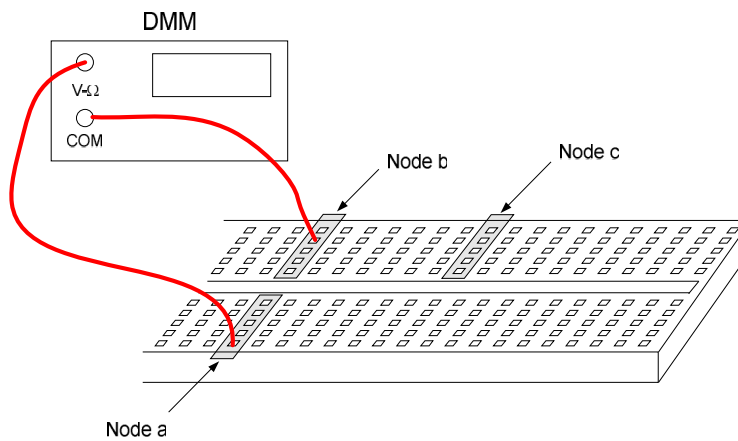


Figure 1(b)

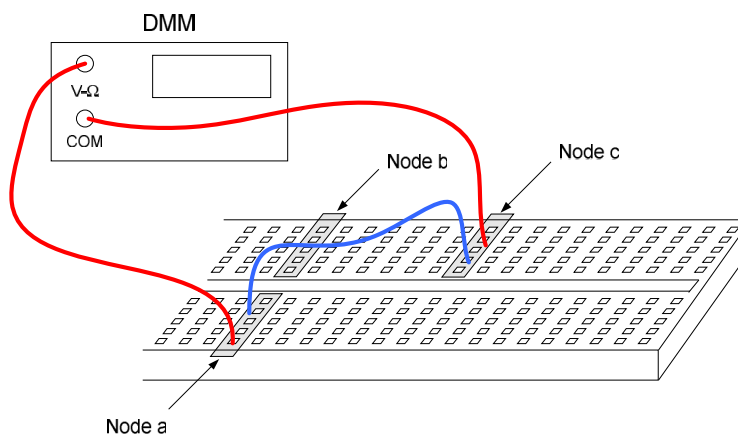


Figure 1(c)