

Lab 1: Lab Introduction

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1 Objectives

The objective of this lab is to introduce a student to the essential lab equipment that will be used in subsequent labs. Specifically the digital multimeter, voltage supply, and digital simulation software are introduced.

2 Procedure

The multimeter is used primarily to measure voltage. There are two multimeters available and they differ in the resolution of their measurement. One has a resolution of 0.01 volts whereas the other has a resolution of 0.0001 volts. And there is a voltage supply which provides a voltage across different pairs of terminals in either 5 volts or 12 volts. To test the operation of the multimeter and voltage supply the test leads of the meter are connected to the voltage supply and the voltage is read.

Logisim [1] is software that can be used to simulate digital circuits. To introduce the student to this software they should create a basic circuit with a few elements. A good example is to add one AND gate and one OR gate. Then input pins can be connected to the terminals along with an output pin. Then in simulation mode (as opposed to edit mode) the pins can be set hi/low and the output behaviour can be verified.

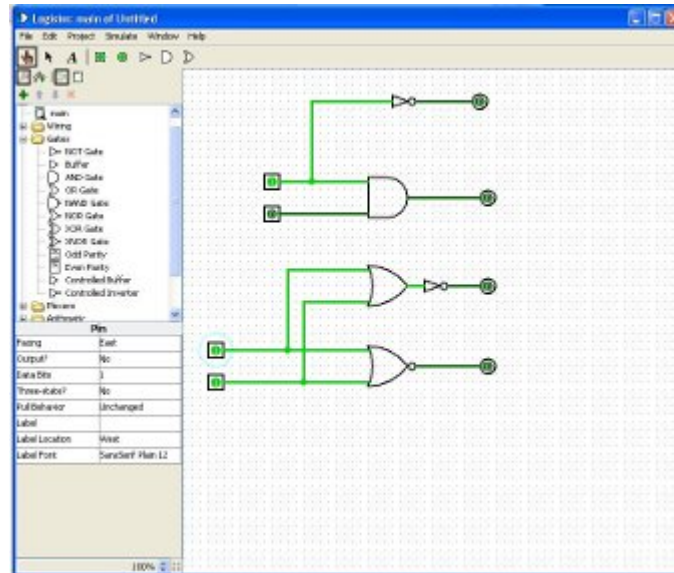


Figure 1: Logisim running under Windows with several gates: AND, OR, NOT.

3 Observations

Connecting the meter to the voltage supply resulted a voltage reading as expected. And if the terminals were reversed the result was a negative value. The labels on the voltage supply suggested the readings should be exactly 5 volts or 12 volts but the actual measurements were quite different. On the 5 volt terminals the lower resolution meter read 5.15 volts and the higher resolution meter read 5.1535 volts. On the 12 volt terminals the lower resolution meter read 12.47 volts and the higher resolution meter read 12.4723 volts.

The simulation of the AND, OR and NOT gates in Logisim behaved as expected and followed their truth table values (Figure 2).

AND		
A	B	out
0	0	0
0	1	0
1	0	0
1	1	1

OR		
A	B	out
0	0	0
0	1	1
1	0	1
1	1	1

NOT	
A	out
0	1
1	0

Figure 2: Truth tables for AND, OR, and NOT gates.

4 Conclusion

This lab was a success in introducing a student to the basic equipment in the lab. The meter and voltage supply read voltages as expected but their readings were significantly biased causing the values to be larger then expected. The digital circuit simulator, Logisim, also worked as expected and the truth tables for AND, OR and NOT were confirmed.

5 References

- [1] Logisim, “Logisim, a graphical tool for designing and simulating logic circuits.” <http://ozark.hendrix.edu/~burch/logisim/>, 2011.