NET1LAB HYBRID CLASS SPRING 2008 GROUP #8

CIRCUIT DESIGN PROJECT: FINAL REPORT

April 25, 2008

Background

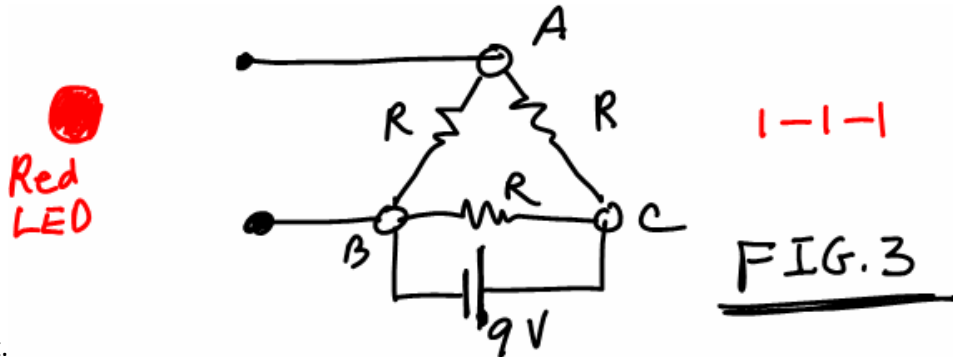
This project mandated us to utilize the knowledge of circuit analysis, kindly bestowed upon us by the great Dr. Charles Kim, as well as knowledge from our Digital Systems Design to design a circuit that would test the internal status of a two-terminal black box using light-emitting diodes. According to WikiPedia.com, a *black box* is "a technical term for a device or system or object when it is viewed primarily in terms of its input and output characteristics."

Simple enough, right? Definitely not. Fortunately, our group consisted of an electrical engineering major, a computer engineering major, and a past electrical now civil engineering major. We were required to employ most of what we have learned thus far as engineering students to tackle this project- thus fulfilling our true objective.

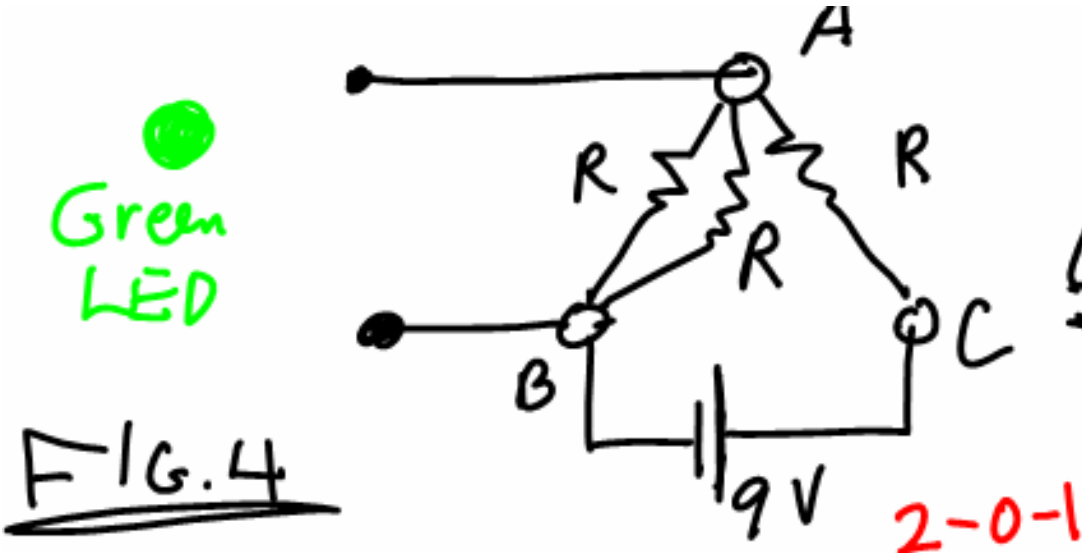
Implementation

We were constrained to using materials, components, equipment, etc. that were available only in the laboratory. Initially we were unaware that we were allowed to use logic gates in our circuit design. This proved to be an even greater challenge! However, we re-read the project description and there it was revealed that we were indeed allowed to use logic gates along with our comparator. We implemented our given resistor formats using PSPICE and recorded the calculated voltages across the terminals.

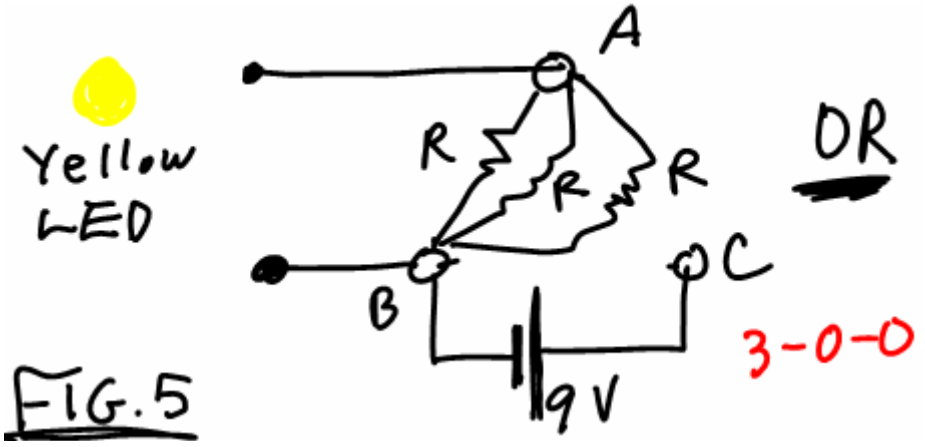
1. Delta Configuration-The resistors share the same value. Across our b and c terminals we connect a 9V Voltage source. This configuration causes the red LED to emit light.



2. 2-0-1 Format-Two resistors are opposite to the third resistor and opposite to 9V source. This configuration will cause the green LED to emit light.

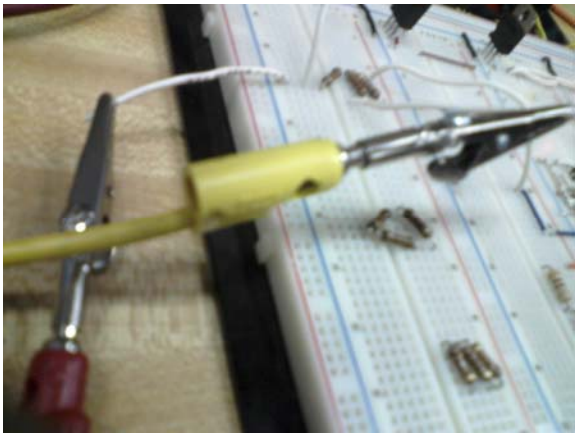


3. 3-0-0 format- For this configuration, three resistors are directly connected to the LED and also connected with the negative side of the battery. The other side of the battery (+) will be connected with a very high value resistor.



These voltages were then used to sketch the setup of our circuit. Our materials were as follows:

- TTL Logic Standard TTL, Schottky, Low Power Catalog(1998)
- AND gate (Quad)
- OR Gate(Quad)
- NOT gate(Six)
- LM324 comparators (Quad)
- Three LEDs (Green, Red, Yellow)
- Voltage Regulators
- Digital Multimeter
- Resistors
- Breadboard
- Tool Kit
- DC Power Supply
- Connecting wires
- LM324 Data Sheet
- A lot of prayer



What makes our design the top design?

Our design could be referred to as the top design of the class for a number of reasons. Perhaps the greatest reason, however, is our use of voltage regulators. A voltage regulator is designed to automatically maintain a constant voltage level. With this constant voltage level, we were able to minimize the number of wires used thus satisfying our requirement of using the fewest amount of components. Our wires were precisely cut to fit comfortably yet efficiently onto the breadboard.