EEE/CpE64LAB #0 Introduction to Lab Equipment

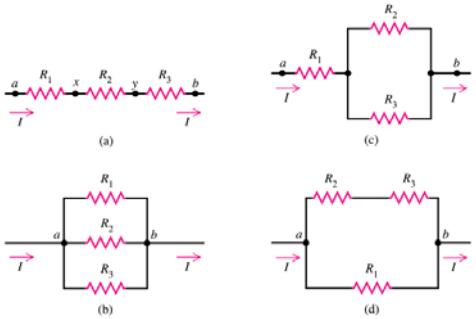
LAB OBJECTIVES

1. Familiarization with the breadboard
2. Use of switches as inputs and light emitting diodes (LEDs) as outputs
3. Using resistors for LED current limiting
4. Connecting resistors in series and parallel
5. Using a DVM to measure voltages and resistors
6. Learning resistor color code comparing to resistor values
7. Learning to create schematics

LAB PROCEDURE

Lab 0 Part 1 Examine the breadboard. Your instructor will describe it to you, but you may not understand it until you use it. The breadboard can be set up with both switches (for inputs) and Light Emitting Diodes, LEDs (for outputs). This board is used when for testing circuit designs. The circuit designs and programs should be created prior to coming to lab. Investigate the breadboard and determine where the lines of continuity are (what lines of holes are connected to other lines of holes).

Lab 0 Part 2 Choose 3 or 4 resistors and measure their resistance compare to the resistor color code. Connect resistors in series and parallel, measure the total resistance and voltages across each resistor with a Digital Multimeter, DMM, compare to calculations, use each of the 4 combinations show below.



Reference Information:
Video on Series and parallel resistors (http://www.youtube.com/watch?v=9O8Di5gugiA)
Video on resistors and reading the color code
(http://www.youtube.com/watch?v=HrZZMhWZiFk&feature=fvwrel)
Video on how to use a Digital Multimeter
(http://www.youtube.com/watch?v=bF3OyQ3HwfU&feature=related)
How to Wire Circuits from Schematics
http://www.youtube.com/watch?v=vJUX9cvyYjU

Lab 0 Part 3 Connect a current limiting resistor and LED to light the LED. Video on bread boarding and lighting LEDs, (http://www.youtube.com/watch?v=k9jcHB9tWko&feature=relmfu)

Lab 0 Part 4 Use the Analog Discovery kit and connect it according to the instructions in the following videos:

Analog Discovery Quickstart #1: Getting Started
http://www.youtube.com/watch?v=aYgFKIsrOYQ

Analog Discovery Quickstart #2: Voltage Tool
http://www.youtube.com/watch?v=Gdl7hPFaPWI

Analog Discovery Quickstart #3: Voltmeter Tool
http://www.youtube.com/watch?v=Va1lURqbmew

Lab 0 Part 5 Use Multisim to create "breadboard" schematic of 7400 NAND Gate IC. 7400 Data sheet

Use Multisim for the schematic drawings for this lab.

Multisim tutorials:
What is NI Multisim?
http://www.youtube.com/watch?v=vyy_5t2QMCQ

Logic Gates Testing using Multisim
http://www.youtube.com/watch?v=1pVcys-3qS0

Multisim Logic Simulation
http://www.youtube.com/watch?v=R2P3YJkZT6w

Appendix B: Resistors

Resistors

Resistors are electronic components that obey Ohm's law: Voltage across a resistor is equal to the current through the resistor times the resistance of the device.

$$V = I * R$$

Resistance is measured in ohms ( ). Current and voltage are related by the resistance of the object, if voltage is kept constant and resistance rises, current will fall. Likewise if resistance decreases, more current will flow, meaning the measure of the current will rise. While many devices have resistance, including the wire used in these labs, the only resistance that we will be concerned with in this manual is the resistance attributed to actual resistors. Manufactured resistors come in various forms, however those used here will be standard ¼ watt resistors that follow the conventional color code that describes their value.

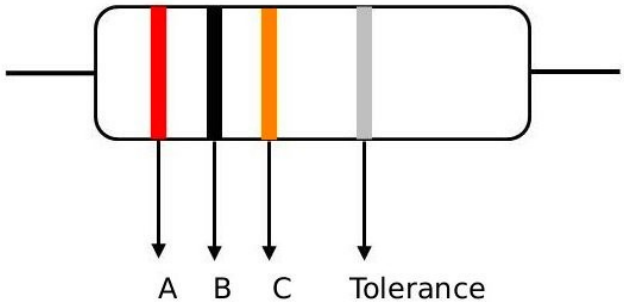


Exhibit B.1: Sample Resistor

Each resistor has four colored stripes as shown in the figure above. Each stripe corresponds to a number as shown in Table 36. The formula for the value of each resistor is listed below.

Generic Formula: A B x 10^C

Which for this case yields: 2 0 x 10^3 or 20,000 Ω.

COLOR	VALUE	MNEMONIC
Black	0	*Better*
Brown	1	*Be*
Red	2	*Right*
Orange	3	*Or*
Yellow	4	*Your*
Green	5	*Great*
Blue	6	*Big*
Violet	7	*Venture*
Gray	8	*Goes*
White	9	*West*

Table 36: Color Codes

The first two stripes indicate the numerical value of the resistance, the third the exponent of ten which will be multiplied by the numbers from the first two stripes, and the fourth a tolerance of the resistor. The diagram above illustrates how the first three stripes are used to calculate the value of the resistor as well as the diagram below. The mnemonic is often suggested as a means of remembering the color

code. The tolerances will not be utilized in this lab manual. Another example is provided in Exhibit B.2. Applying the formula to obtain the value for this resistor is left as an exercise for the reader.

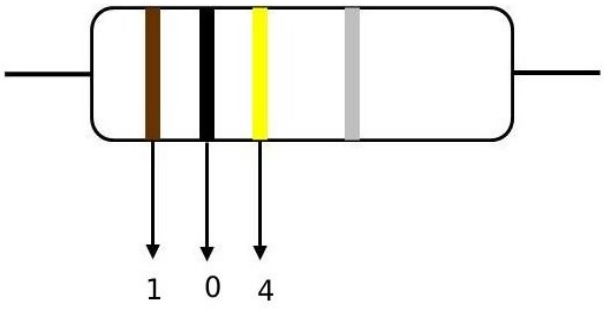
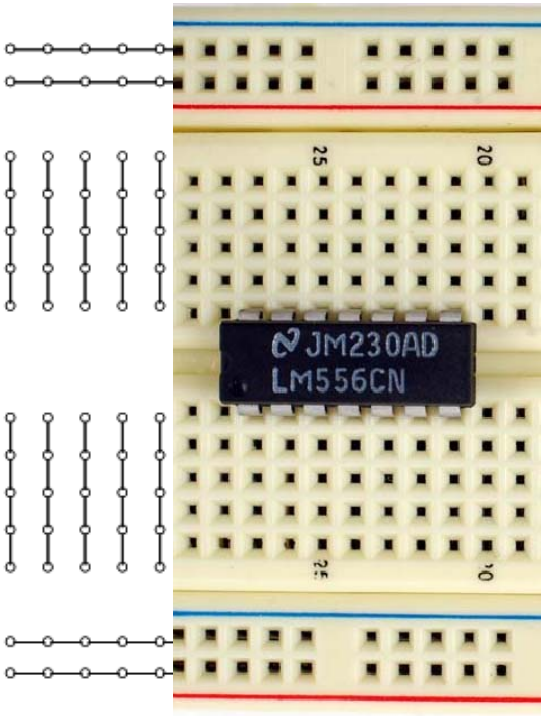
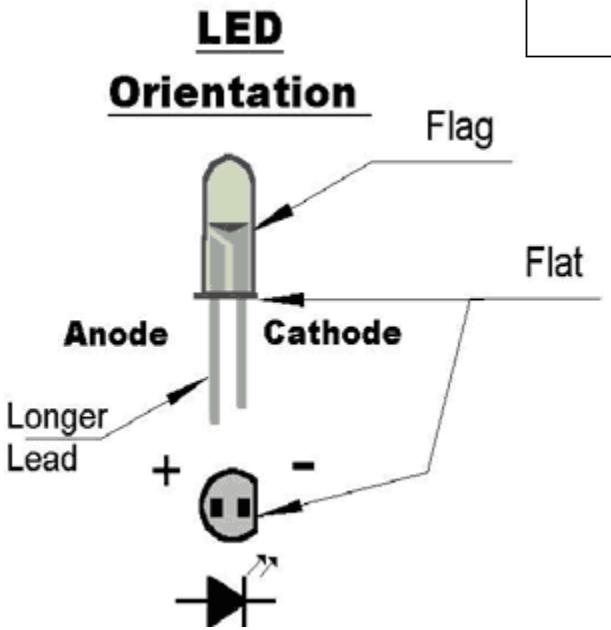


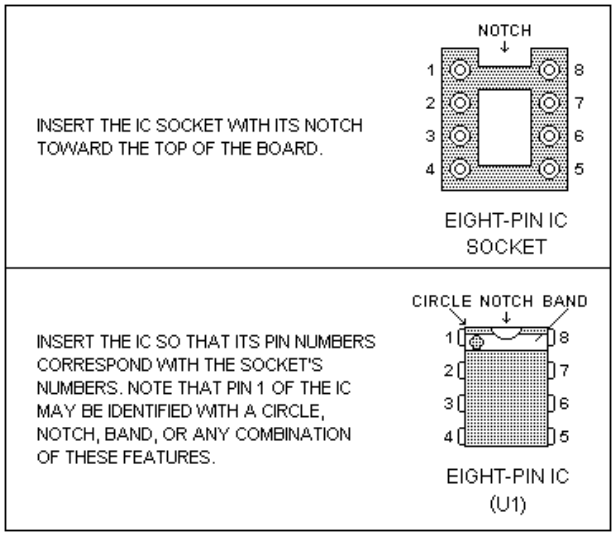
Exhibit B.2: 100,000 Ohm Resistor

General Information

— Bread Boards
— LED's
— IC's







Digital Multimeter