Lab 1 Resistors/Resistor Color Code

Date: 8/22/12

Team:

Purpose: The purpose of this lab was to learn how to read a resistor using the color code and confirm its value with the DMM.

Procedure: 1. Grab a resistor. 2. Correctly orient the resistor. 3. Using the color code read the resistor. 4. Confirm the value using the DMM

Data:

Orange	Blue	Brown	Gold	360 Ω
3	6	10Ω	±5%	
Gray	Red	Orange	Silver	90K Ω
8	2	1K Ω	±10%	
Red	Red	Red	Gold	2.192K Ω
2	2	100 Ω	±5%	
Brown	Black	Red	Gold	0.993K Ω
1	0	100 Ω	±5%	

Conclusion: We learned how to correctly read a resistor using the color code and how to best check it with the DMM. We initially had trouble reading the resistors because some of them were difficult to correctly orient. I learned that the best way to read the resistor with the DMM is to set it on the table instead of holding it because my body has its own resistance that is also read.

Lab 2 Kirchhoff's Voltage and Current Laws

Date: 8/27/12

Team:

Purpose: To build circuits and test Kirchhoff's laws and use LTSpice to simulate results.

Procedure: 1. Construct the circuit shown using the BreadBoard. 2. Use the DMM to measure the voltage across each resistor and record it. 3. Construct the second circuit shown. 4. Use the DMM to measure the voltage across each resistor and record it. 5. Using the recorded voltages prove Kirchhoff's voltage law for each loop of the first circuit. 6. Using Ohm's law calculate the current flowing through each resistor in the second circuit. Use the calculated values to verify Kirchhoff's Current Law at node A. 7. Use LTSPICE to construct the second circuit and simulate results to compare with your earlier results.

Data:

1.) R1 3.615 V
R2 1.444 V
R3 1.410 V
R4 0.730 V
R5 1.440 V

Loop 1: -5V + 1.410 V + 3.615 V = 0.025 V

Loop 2: +1.440V + 1.444 V + 0.730V - 3.615V = -0.001V

Loop 3: -5V + 1.410 V + 1.440 V + 1.444V + 0.730V = 0.024 V

2.) R1 2.974V $\quad I = \frac{V}{R} \quad \frac{2.974V}{5.1k\Omega} =$ ~~.583mA~~

R3 2.050V $\quad \frac{2.050V}{1k\Omega} = 2.05mA$

R5 2.974V $\quad \frac{2.974V}{2k\Omega} = 1.45mA$

node A $\quad +2.05mA - 1.45mA - 0.583mA = \underline{0.017mA}$

* C:\Program Files (x86)\LTC\LTspiceIV\Draft1.asc

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         --- Operating Point ---

V(n001):        5               voltage
V(n002):        2.94798         voltage
I(R1):          0.000578035     device_current
I(R5):          0.00147399      device_current
I(R3):          0.00205202      device_current
I(V1):          -0.00205202     device_current
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Conclusion: There is a slight difference between our values and the ones provided by LTSPICE. The difference is probably due to the fact that real resistors have a tolerance. With our data we were able to verify both of Kirchhoff's Laws. This lab provided a good first use of LTSPICE.

Lab 3 Voltage Division and Loading Effects

Date: 8/29/12

Team: Michael McManus, Ali Alsarraf

Purpose: To verify voltage division in resistor networks and to explore the effects of "loading" on lab measurements.

Procedure: 1. Construct the circuits shown. 2. Measure the voltage across each resistor. 3. Calculate the values using voltage division. 4. Notice any differences and determine the cause. 5. Determine the resistance of the DMM.

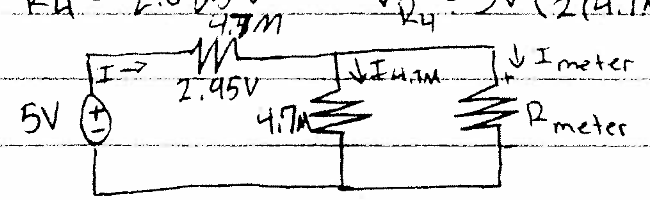
Data:

$R_1 = 2.511\,V$ $\qquad V_{R_1} = 5V\left(\frac{4.7K}{2(4.7K)}\right) = 2.5\,V$

$R_2 = 2.514\,V$ $\qquad V_{R_2} = 5V\left(\frac{4.7K}{2(4.7)K}\right) = 2.5\,V$

$R_3 = 2.060\,V$ $\qquad V_{R_3} = 5V\left(\frac{4.7M}{2(4.7M)}\right) = 2.5\,V$

$R_4 = 2.085\,V$ $\qquad V_{R_4} = 5V\left(\frac{4.7M}{2(4.7M)}\right) = 2.5\,V$



$V_{meter} = 2.05\,V$

$I_{4.7M} = \frac{2.05V}{4.7M}$ $\qquad I_{meter} = I - I_{4.7M}$

$I - I_{meter} - I_{4.7M} = 0$

$\frac{2.95V}{4.7M} - I_{meter} - \frac{2.05V}{4.7M} = 0$

$.1915\,\mu A - I_{meter} = 0$

$I_{meter} = .1915\,\mu A$

$R_{meter} = \frac{2.05V}{.1915\,\mu A} = \underline{10.7\,M\Omega}$

Conclusion: The lab equipment has its own resistance that can throw off the readings received. The voltage division worked for the first circuit since the readings weren't affected by the resistance of the DMM.