CPE 1140

Circuits / DC Circuit Fundamentals Lab

Fall 2021

Laboratory Report
Lab# 2
Lab Series DC Circuit Analysis

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Laboratory Date: 9/16/2021

Date of Submission: 9/18/2021

Part A:

Resistor base value Ω	Resistor tolerance ranges Ω	Resistor measured value Ω
R_1(470)	446.500 - 493.500	466.050
R_2(620)	589.000 - 651.000	618.560
R_3(1000)	950.000 - 1050.000	992.410
R_{123}(series)	1985.500 - 2194.500	2077.800

Resistor series measurements	Resistors in series values kΩ
$R_{\text{series predicted}}$	2.090
$R_{\text{sum of measured}}$	2.077
R_{123}	2.078
R_{321}	2.078

Part A of this lab was to connect a set of resistors in a line which is known as series.

Since addition is commutative the order of summing doesn't matter. In this case the order of the resistors still output the same resistance.

The measured results were slightly less than what is predicted but within tolerance ranges.

Part B:

Source E =5.046 V
R_{123} = 2.078 $k\Omega$
I_s = 2.000mA
I_{321}(A) = 2.4288 mA
I_{123}(A) = 2.4274 mA
I_{123}(B) = 2.4280 mA
I_{123}(C) = 2.4285 mA

The objective of part b is to do a current measurement of the series circuit at different points in the series. The result was higher since the measured sum of the resistors were slightly lower than predicted. The result was higher since the measured sum of the resistors were slightly lower than predicted.

I realized I made a mistake in the lab since I inverted the direction of the measurement rather than the reversing the resistors like the instructions said I did it in my home lab. I assume the objective is to realize that the order of the resistors doesn't effect the flow of current in a series circuit.

Part C:

Predicted values:

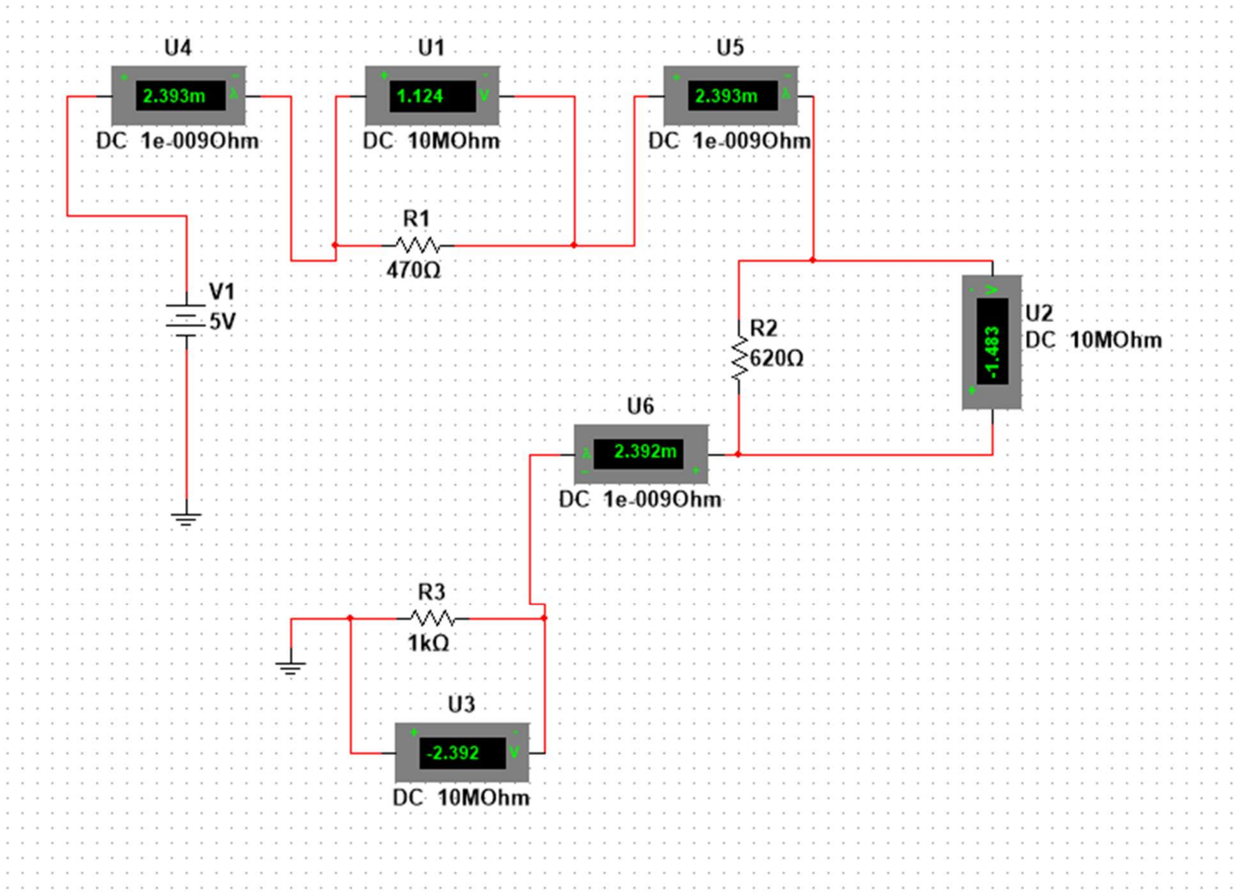
Resistor	Voltage Drop across R (V)
R_1: 470 Ω	V_1 =1.124
R_2: 620 Ω	V_2 =1.483
R_3: 1000 Ω	V_3 =2.392
R_{series}:2090Ω	V_{series} =4.999

Experimental values:

Voltage Drop across R (V)
V_1 =1.131
V_2 =1.503
V_3 =2.412
$V_{total\ summed}$ = 5.046
$V_{total\ measured}$ = 5.047
V_{source} = 5.046

Since the resistors were measured to be lower than the predicted values the measured voltage drop across the resistors were also lower. The sum of the voltage drops, the measured voltage drops across all resistors, and the voltage sources was nearly identical. This experiment proved that the voltage drop can be predicted with the ratio of the target resistor over the resistance of the system given it is wired in series.

Part D:


U4
2.393m
DC 1e-009Ohm
U1
1.124
DC 10MOhm
U5
2.393m
DC 1e-009Ohm
R1
470Ω
V1
5V
R2
620Ω
U2
-1.483
DC 10MOhm
U6
2.392m
DC 1e-009Ohm
R3
1kΩ
U3
-2.392
DC 10MOhm

Part E:

Confict in labeling so I named the power section part E.

Table 1:

Resistor	Voltage Drop across R (volt)
R1: 470 Ω	V1 =1.124
R2: 620 Ω	V2 =1.483
R3: 1000 Ω	V3 =2.392

R_t = 2090.000Ω	
I_s =2.000mA	

$P = I^2R$ is the requested equation

Table 5:

Resistor	Power dissipated (W)
R_1	P_1 =0.001880
R_2	P_2 =0.002480
R_3	P_3 =0.004000

Interesting I learned that c rounds the answer if requested 3 digits. I am breaking the 3 digit rule for this objective since c programing reported R1 and R2 to have the same power consumption if I didn't

The power consumption is well below the 0.5 watts.

Part F:

I measured the resistance of a series circuit and that the location in the series circuit didn’t matter. We measured the current at different points in a series circuit and that the current was nearly the same. I did verify the sum of the voltage drops is equal to the source voltage. The ratio of measured resistor / total resistance with the scaler of source voltage was as predicted. I