Lab Notebook

Michael Roeback

EECT111-01C

Spring 2014

Professor Andy Bell

Lab Notebook
Reading and Sorting Resistors

Michael Roeback

EECT111-01C

January 23, 2014

Professor Andy Bell

Lab 1 – Reading and Sorting Resistors

Names: Jon Wyatt, Jimmie Rinser, Michael Roeback (bench 5)
Date: 1-23-14

The purpose of this lab is to:
Learn the resistor color code using 15 resistors which must be sorted from smallest to largest value.
Build a resistor kit that includes 15 resistors and, sort resistors based on color code from smallest to largest and measure the resistance of each resistor and verify sorting

Equipment needed:

1 – Digital Multimeter
1 – 15 unique resistors

	Color Code	Measured Value
100 =	Brown black brown	98.17
220 =	Red red brown	219.03
330 =	Orange orange brown	325.73
470 =	Yellow violet brown	462.13
1K =	Brown black red	.992E+3
2.2K =	Red red red	2.192E+3
3.3K =	Orange orange red	3.268E+3
4.7K =	Yellow violet red	4.654E+3
10K =	Brown black orange	9.802E+3
22K =	Red red orange	22.152E+3
33K =	Orange orange orange	33.108E+3
47K =	Yellow violet orange	47.155E+3
100K =	Brown black yellow	99.92E+3
1M =	Brown black green	1.0041E+6
10M =	Brown black blue	10.826E+6

Equipment Used: GwINSTEK GGM-8245, Ser. # CL860334, Cal Date 11 14 12
Observations: All resistors had gold band tolerance all were within tolerance

Lab Notebook
Resistor Variability

Michael Roeback

EECT111-01C

January 29, 2014

Professor Andy Bell

Lab 2 –Resistor Variability

Names: ________Mike Roeback________

Date: ___1-29-14___________________

Sample	Measured Value
1	6.771
2	6.748
3	6.749
4	6.772
5	6.787
6	6.707
7	6.801
8	6.698
9	6.773
10	6.736
11	6.780
12	6.755
13	6.794
14	6.836
15	6.770
16	6.729
17	6.786
18	6.811
19	6.780
20	6.748
21	6.771
22	6.779
23	6.842
24	6.738
25	6.870

The purpose of this lab is to:
Learn the how resistors vary using 25 resistors with the same color code.

Select a set of 25 resistors.
Measure and record the resistance of each resistor.

Equipment needed:

1 – Digital Multimeter
1 – 25 resistors with the same color code.

Resistor color code = _Blue, Grey, Red, Gold____________
Resistor value = __________6.8K ohms_________________
Resistor tolerance = ___5%____________________

Using Microsoft Excel plot the resistor values and determine:

Smallest resistance = ___6.698k__________________
Largest resistance = ____6.870k__________________
Average resistance = ____6.773k__________________
Standard Deviation = ___0.040___________________

Do any of your resistor values exceed the part tolerance? _No___

Equipment Used: DIMM Used ; GwINSTEK GGM-8245 Ser. # CL860334 Cal Date 11 14 12

Observations: All Resistors tested within Tolerance.

Lab Notebook
Series Resistors

Michael Roeback

EECT111-01C

February 6, 2014

Professor Andy Bell

Lab 3 – Series Resistors

Names: Mike Roeback, Cody Kieler, Shane Miller
Date: 06FEB2014

The purpose of this lab is to:
Experiment with series circuits and verify that the simulation, analysis (calculations) and test results all agree.

From the resistor kit select 3 resistors (10K, 2.2K, 4.7K)

Measure and record the value of each resistor. Connect the resistors as shown in Figure 1. Measure and record the total resistance, RT. Then connect the resistors as shown in Figure 2, the 9V come from the Elvis II (Modular Engineering Educational Laboratory Platform). Then measure and record with the Digital Multimeter the current and voltages of the series circuit.

Equipment needed:

1 – Digital Multimeter
1 – Elvis II
3 – Resistors

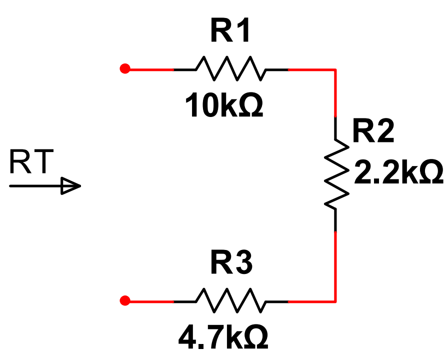


Figure 1

	Measured	Calculated	Simulated
R1 =	10.1E+3	10.0E+3	10.0E+3
R2 =	2.2E+3	2.2E+3	2.2E+3
R3 =	4.7E+3	4.7E+3	4.7E+3
RT =	17.0E+3	16.9E+3	16.9E+3

Measured = using Digital Multimeter
Calculated = based on color code and Excel values
Simulated = Multisim simulation

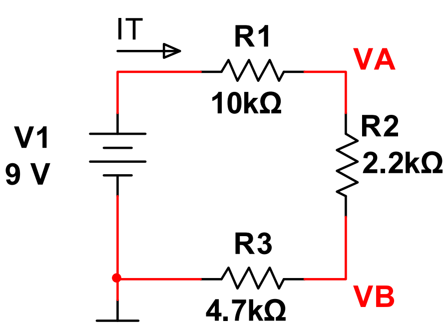
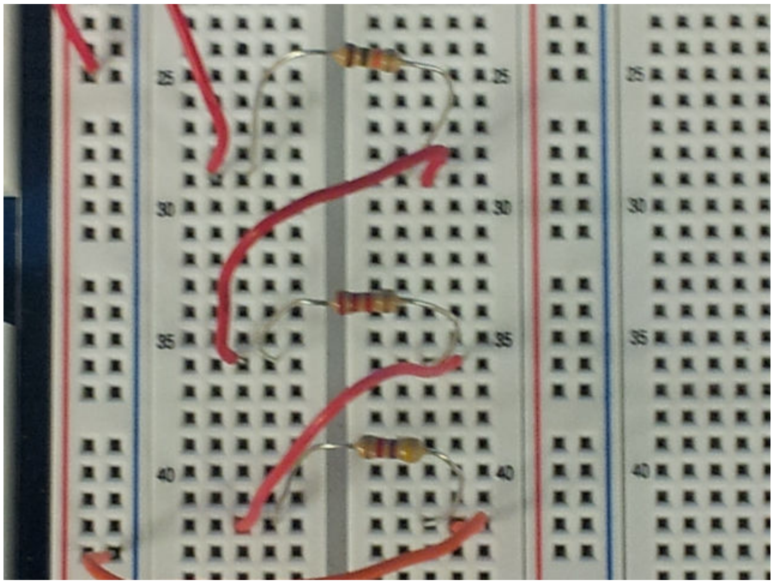


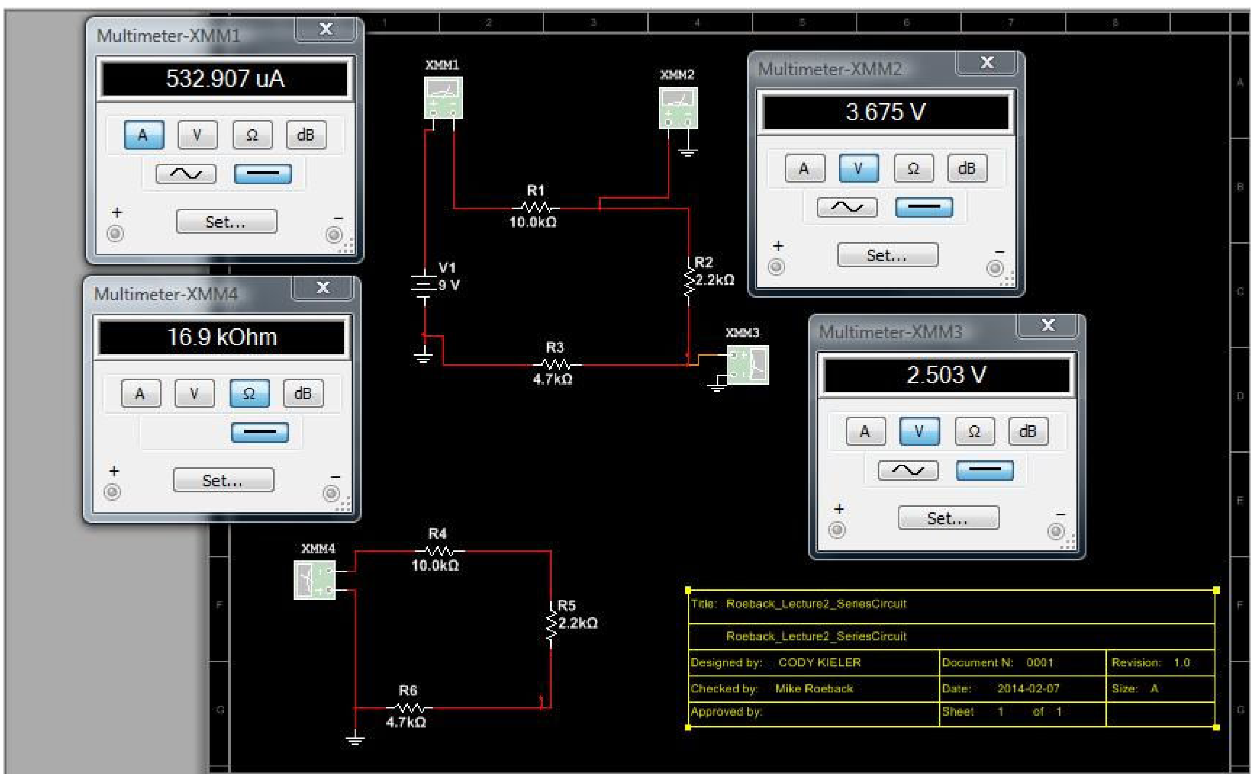
Figure 2

	Measured	Calculated	Simulated
IT =	505.7E-6	532.5E-6	532.9E-6
V1 =	9.002	9	9
VA =	3.670	3.675	3.675
VB =	2.517	2.503	2.503

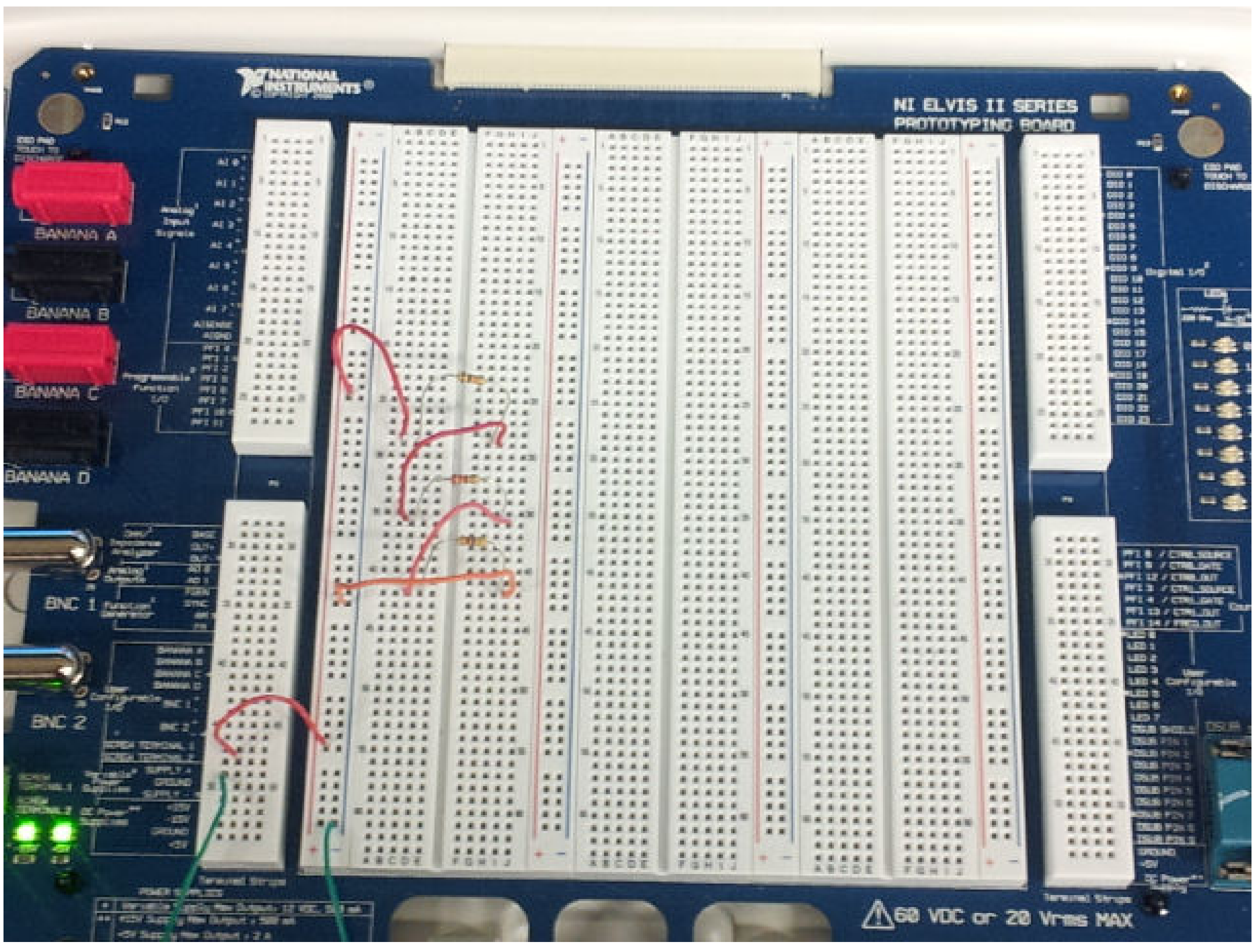
Measured = using Digital Multimeter
Calculated = based on color code and Excel values
Simulated = Multisim simulation



Observations:_____Workstation #6 DMM GwInstek Model# GDM-8245, Ser. #CL860237



Ref	Simulated (MultiSim_12)	Calculated	Measured/Calc.	Actual Measure	Symbol	Formulas
V1=	9	9	9.002	9.002	V	
R1=	10.0E+3	10.0E+3	10.1E+3	10.1E+3	Ω	
R2=	2.2E+3	2.2E+3	2.2E+3	2.2E+3	Ω	
R3=	4.7E+3	4.7E+3	4.7E+3	4.7E+3	Ω	
RT=	16.9E+3	16.9E+3	17.0E+3	17.0E+3	Ω	R1+R2+R3
IT=	532.9E-6	532.5E-6	530.8E-6	505.7E-6	A	V1/RT
VA=	3.675	3.675	3.641	3.670	V	IT*(R2+R3)
VB=	2.503	2.503	2.500	2.517	V	IT*R3



Lab Notebook
Andy's Black Box (Team Project)

Michael Roeback

EECT111-01C

February 13, 2014

Professor Andy Bell

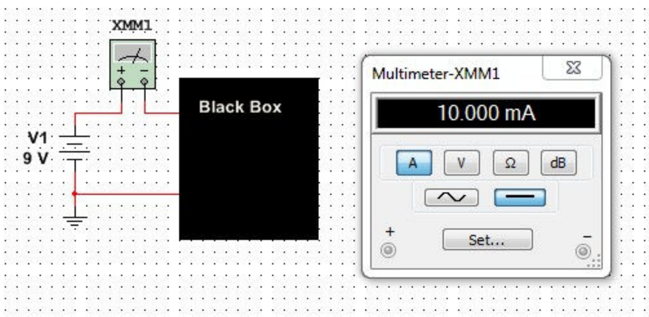
Lab 4 – Black Box Design

Names: Jeff Noggle (Multisim), Ramon Jamili (Elvis Setup), Anas Alrawahi (Presenter), Jon Wyatt (Data Recorder), Mike Roeback (Calculations)

Date: 2/13/2014

The purpose of this lab is to:
Learn about series circuits

The voltage applied to a Black Box is 9V and the measured current draw is 10mA. Design a 3 resistor series circuit that meets the voltage and current requirements using "standard" resistor value.



Equipment needed:

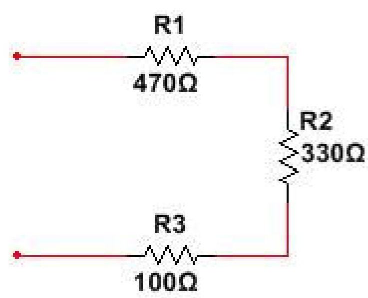
1 – Digital Multimeter
1 – Elvis II
3 – Standard Resistors

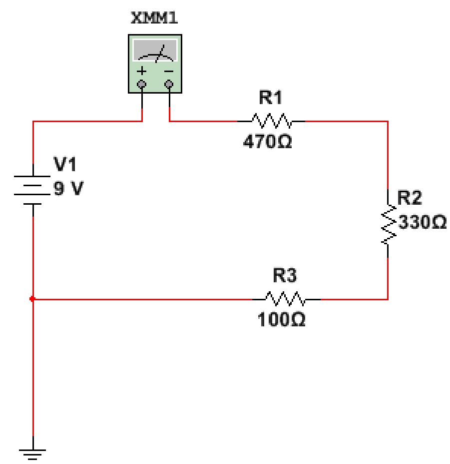
	Measured	Calculated	Simulated
V1 =	9.146	9	9
IT =	10.26mA	10mA	10.001mA
RT =	888Ω	900Ω	900Ω
R1 =	464.35Ω	470Ω	470Ω
R2 =	326.15Ω	330Ω	330Ω
R3 =	97.98Ω	100Ω	100Ω

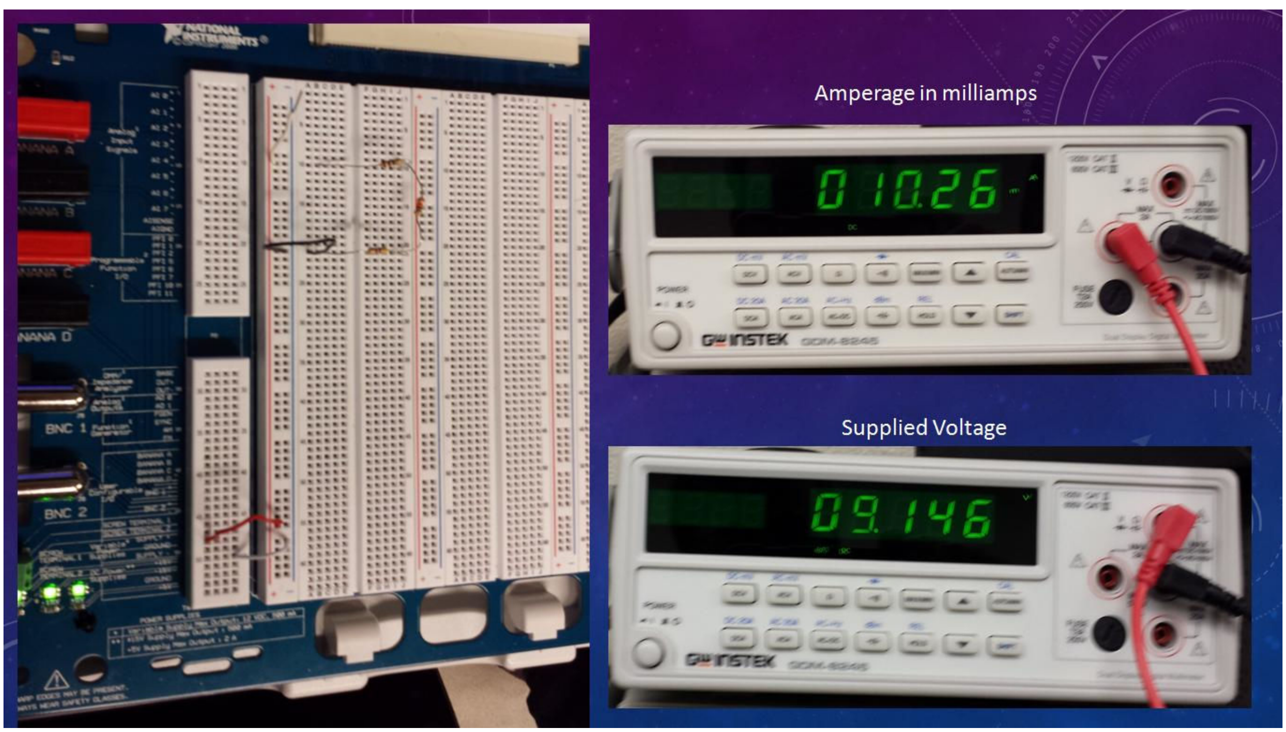
Observations: Unable to adjust voltage on Elvis ran calculation with voltage at a little over simulated and calculated. All resistors had gold band tolerance all were within tolerance.

Equipment Used: GwInstek GGM-8245 SN cl860334 cal date 11 14 12

Ohms					Ω*Amps	Voltage Left	
900.00	Resistance		Resistor Values Used		Voltage Drop	9.0	Supplied Total
9.00	Voltage	R1	470	Ω	4.7	4.3	After R1
10.0E-3	Amperage	R2	330	Ω	3.3	1.0	After R1 and R2
		R3	100	Ω	1.0	0.0	After R1, R2 and R3
R=V/A		RT	900	Ω	9.0		
			0.00	Total left	0.0		







Lab Notebook
MEMS Variable Resistor

Michael Roeback

EECT111-01C

February 20, 2014

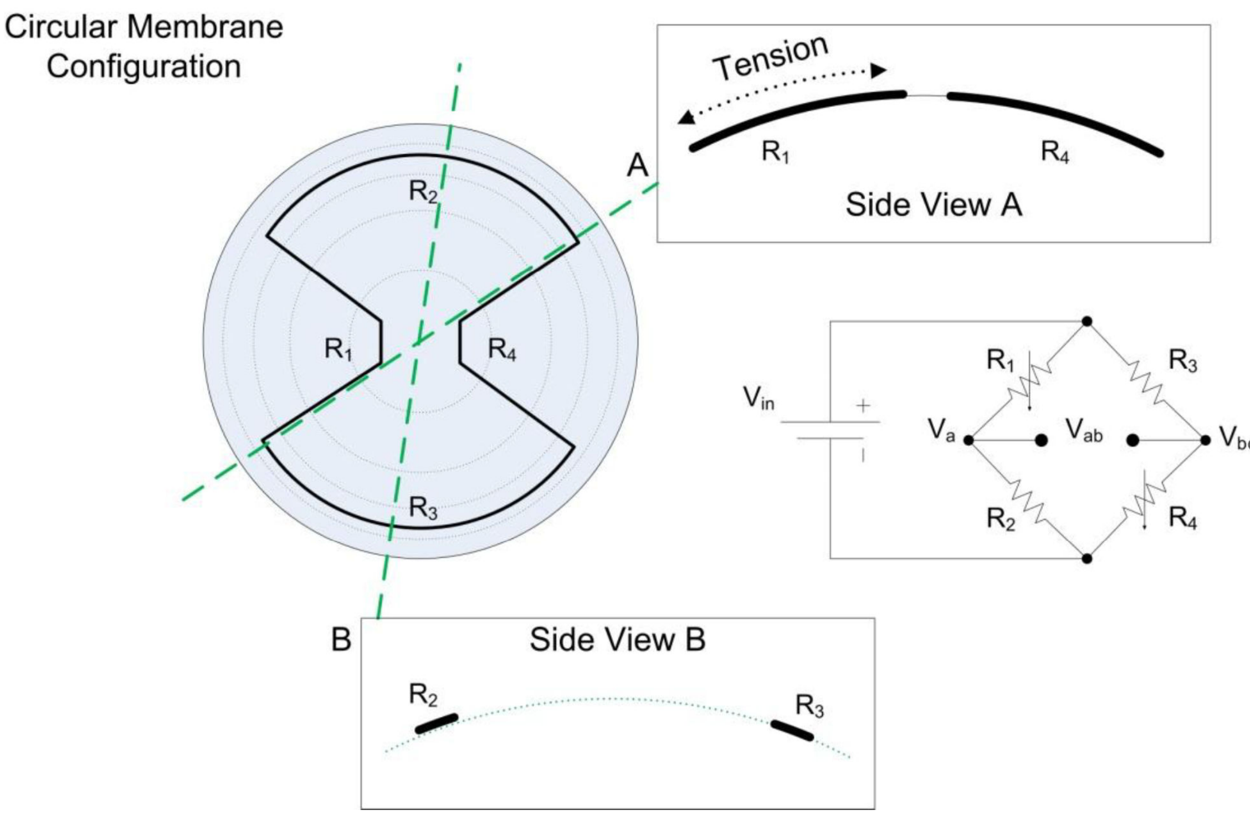
Professor Andy Bell

Lab 5 – MEMS Variable Resistor

Names: Mike Roeback, Jimmie Rinser, Jon Wyatt
Date: ______2/20/2014_______________

The purpose of this lab is to:
Learn about variable resistors and a Wheatstone Bridge

Using the Pressure Sensor Model Kit build resistors R1 – R4 except modify the resistor pattern so that only resistor varies, R1. Make R4 a fixed value resistor so that it has the same "pattern" as R2 and R3.



Equipment needed:

1 – Digital Multimeter
1 – Elvis II
1 – Pressure Sensor Model Kit
10 – paperclips

	Measured
R1 =	
R2 =	
R3 =	
R4 =	

Observations: Built Pressure Sensor but It was never Tested

Lab Notebook
Black Box Design

Michael Roeback

EECT111-01C

February 20, 2014

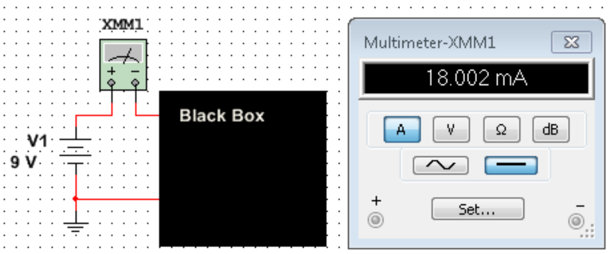
Professor Andy Bell

Lab 6 – Black Box Design

Names: Jonathan Wyatt, Jimmie Rinser, Michael Roeback
Date: 2/20/2014

The purpose of this lab is to:
Learn about parallel circuits

The voltage applied to a Black Box is 9V and the measured current draw is 18mA. Design a 2 resistor series circuit that meets the voltage and current requirements using "standard" resistor value.



Equipment needed:

1 – Digital Multimeter
1 – Elvis II
2 – Standard Resistors

	Design	Measured	Calculated	Simulated
V1 =	9	8.994	9	9
IT =	18	17.687	18	18.002
RT =	2.5	.4963k	.5k	.5k
R1 =	1k	.995k	1k	1k
R2 =	1k	.989k	1k	1k

Lab Equipment Used: GwInstek GGM-8245, SN cl860334, cal date 11 14 12

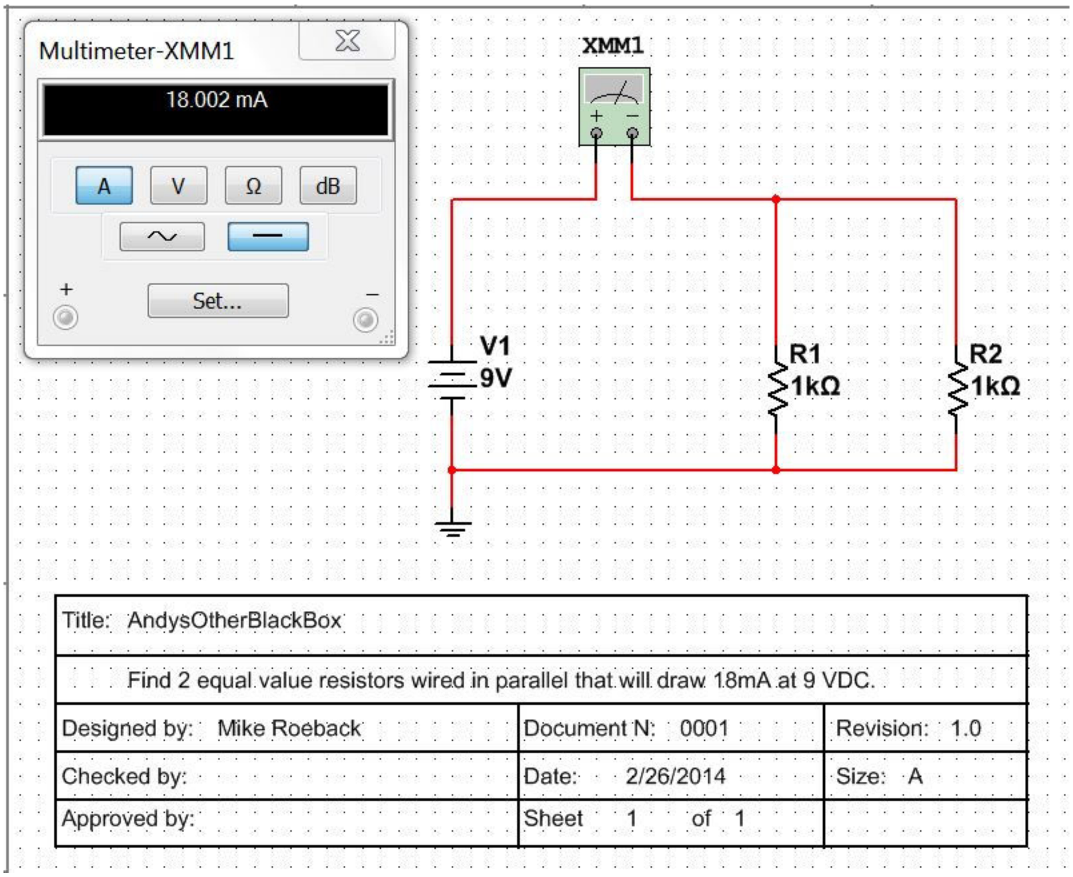
Observations: Though both 1k resistor were within their rated 5% tolerance, they were a little lower resistance then calculated and simulated.

Observations: all resistors had gold band tolerance all were within tolerance

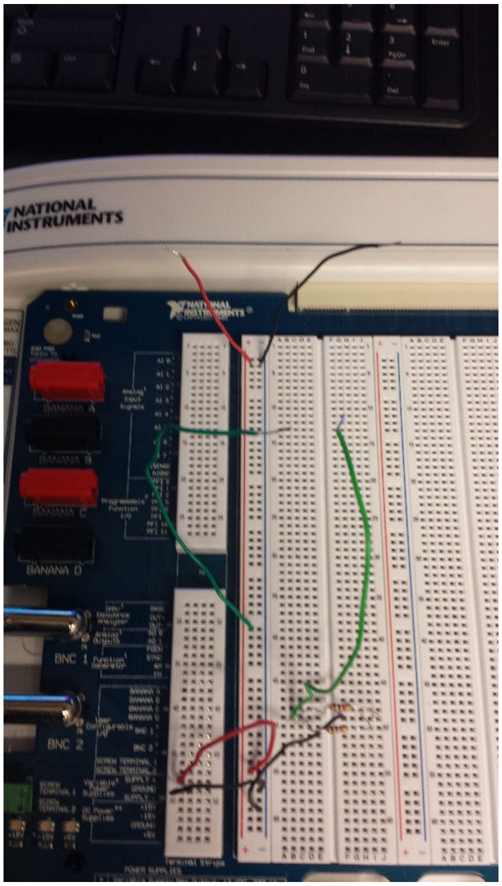
Calculated

AndysOtherBlackBox (Calculated)			
0.009	Current Through R1	9	Total Circuit Voltage
0.009	Current Through R2	0.018	Total Circuit Amperage
500	Total Resistance	1000	R1
1000	Resistor 1 (R1)	1000	R2
1000	Resistor 2 (R2)	500	R1,R2 Product/Sum

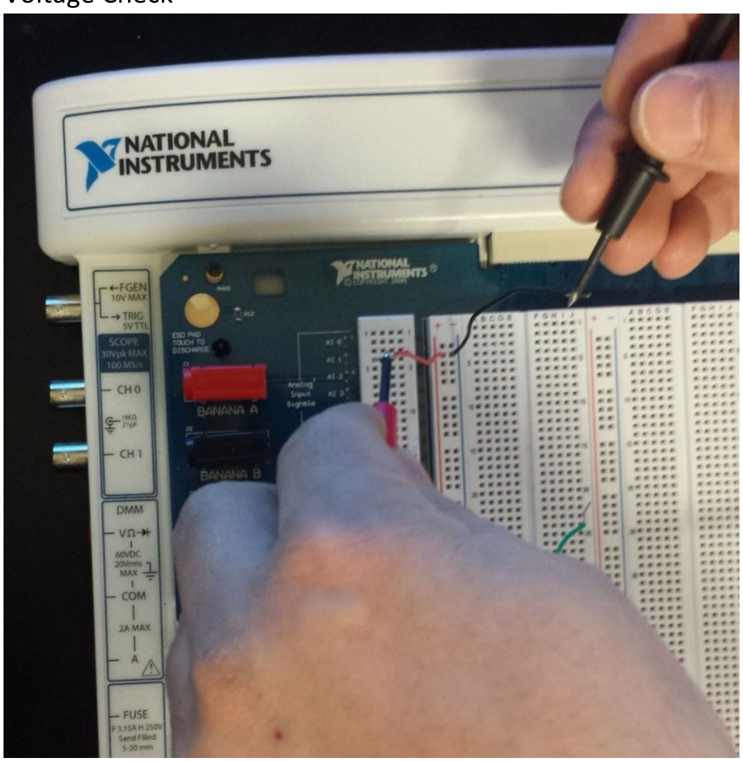
Simulated

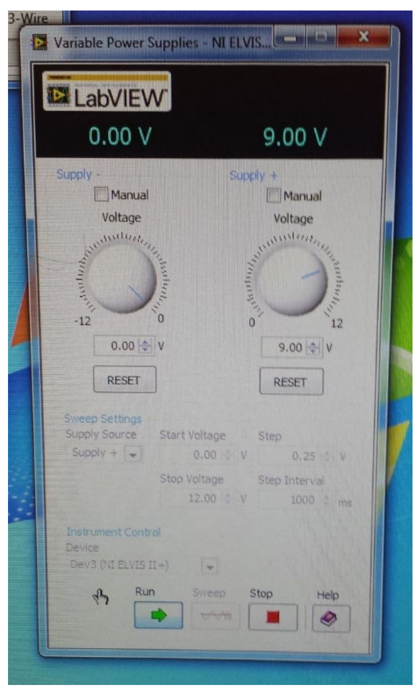


Actual Circuit

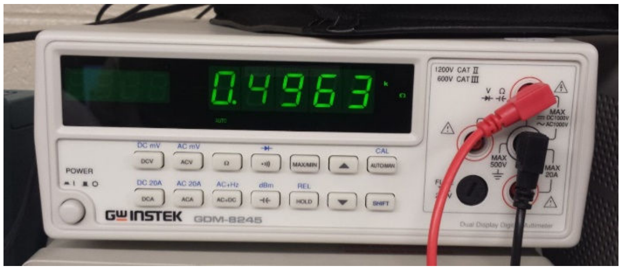


Voltage Check

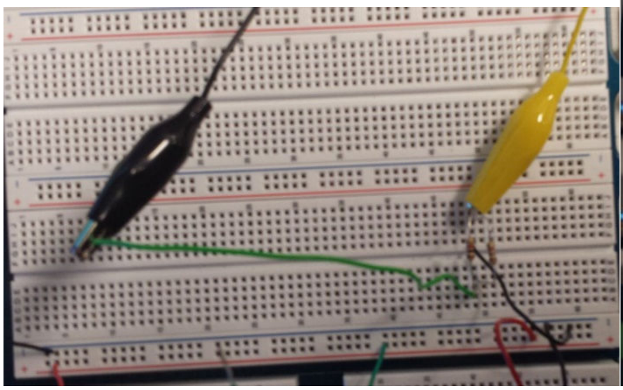


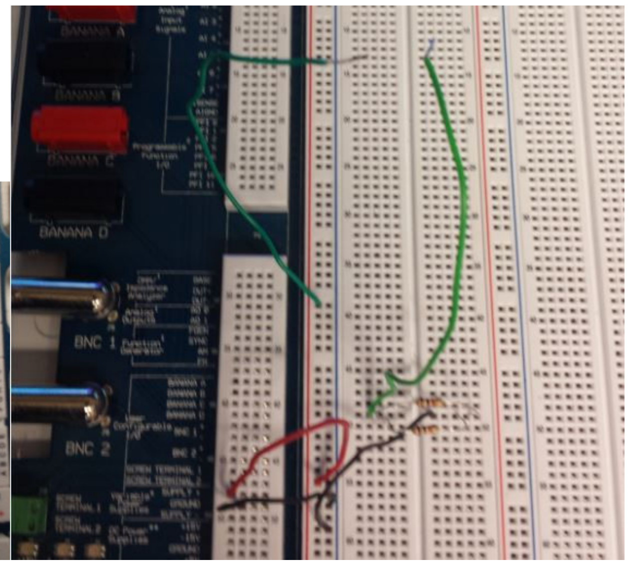


Total Circuit Resistance



Total Circuit Current





Lab Notebook
4 Resistor Parallel Circuit

Michael Roeback

EECT111-01C

February 27, 2014

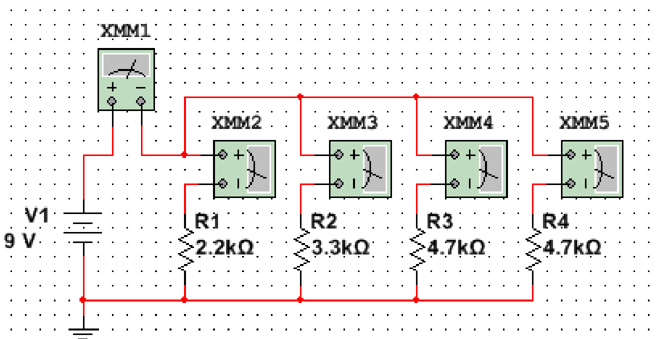
Professor Andy Bell

Lab 7 – 4 Resistor Parallel Circuit

Names: Mike Roeback,
Date: 02/27/2014

The purpose of this lab is to:
Learn about parallel circuits

The voltage applied to 4 parallel resistors x is 9V. Measure all the resistor values, total current and all the branch currents.



Equipment needed:

1 – Digital Multimeter
1 – Elvis II
3 – Standard Resistors

	Design	Measured
R1 =	2.2kΩ	2.1976kΩ
R2 =	3.3kΩ	3.2757kΩ
R3 =	4.7kΩ	4.7193kΩ
R4 =	4.7kΩ	4.6885kΩ

	Measured	Calculated	Simulated
V1 =	9.006	9	9
RT =	843.8E+0Ω	845.2E+0Ω	845.232Ω
I1 =	4.076mA	4.1E-3	4.091E-3
I2 =	2.739mA	2.7E-3	2.727E-3
I3 =	1.902mA	1.9E-3	1.915E-3
I4 =	1.914mA	1.9E-3	1.915E-3
IT =	10.537mA	10.6E-3	10.649E-3

Observations: All Resistors had gold tolerance bands, were ¼ watt and within tolerance.
____
____
Lab Equipment Used: GwInstek GGM-8245, SN cl860334, cal date 11 14 12

Calculated

4 Resistors in Parallel	
V1=	9
R1=	2.2E+3
R2=	3.3E+3
R3=	4.7E+3
R4=	4.7E+3
RT=	845.2E+0
I1=	4.1E-3
I2=	2.7E-3
I3=	1.9E-3
I4=	1.9E-3
IT=	10.6E-3

Amps	IT Off RT
10.6E-3	Amperage
845.2E+0	Resistance
9	Voltage

Pass	IT Check

Amps	I1
0.004090909	Amperage
2.2E+3	Resistance
9	Voltage

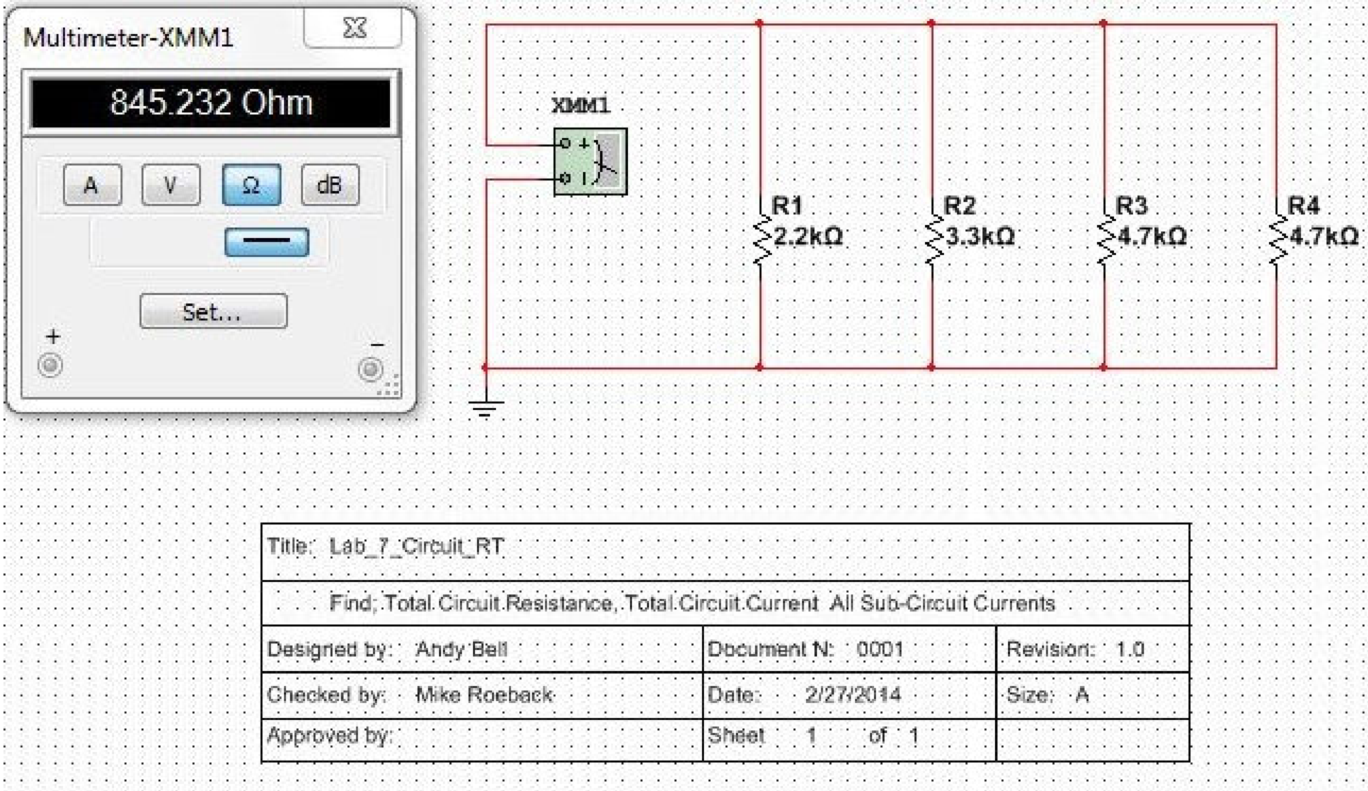
Amps	I2
0.002727273	Amperage
3.3E+3	Resistance
9	Voltage

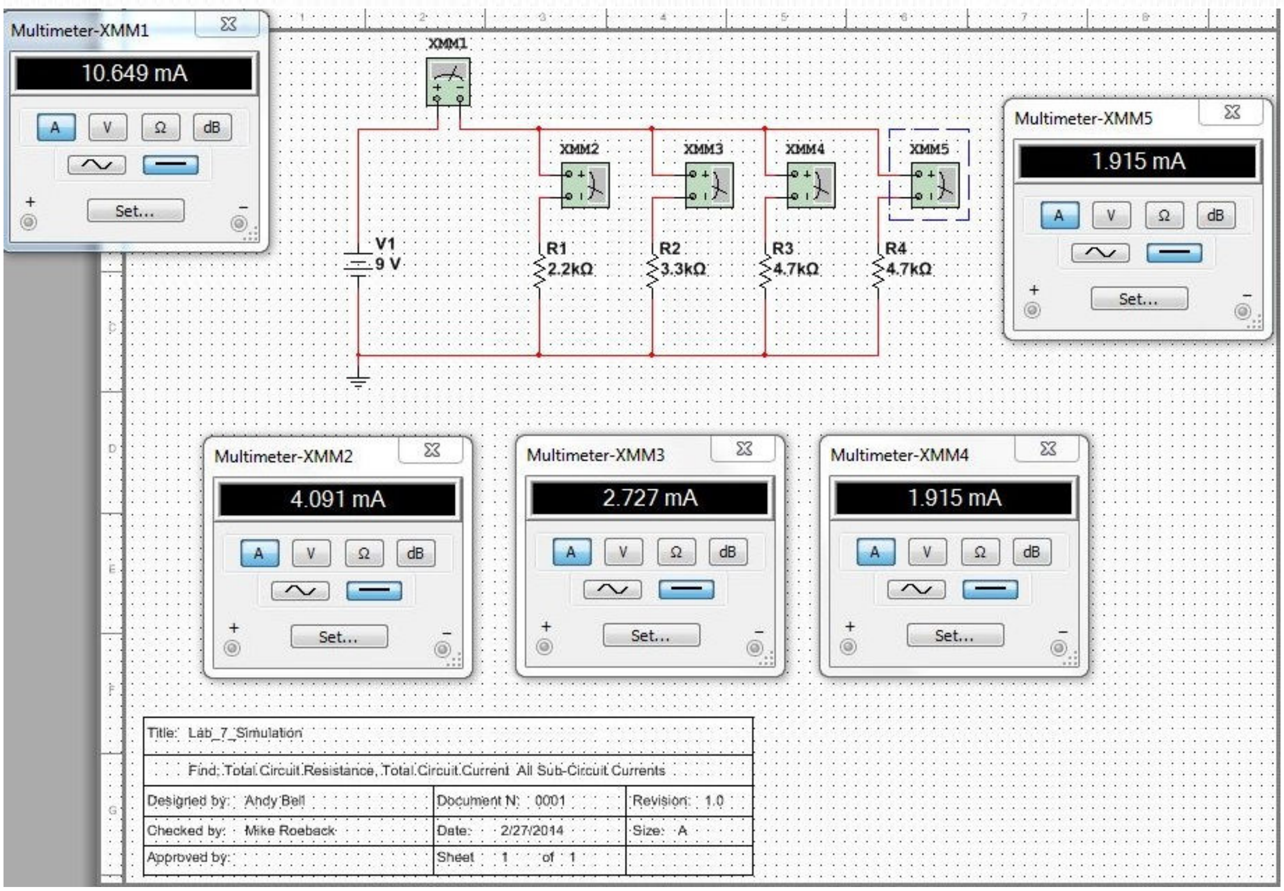
Amps	I3
0.001914894	Amperage
4.7E+3	Resistance
9	Voltage

Amps	I4
0.001914894	Amperage
4.7E+3	Resistance
9	Voltage

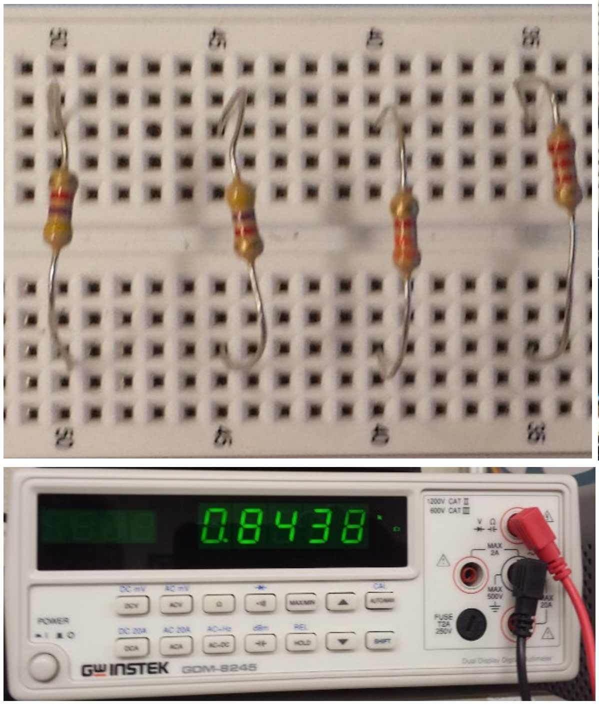
10.6E-3	I1+I2+I3+I4

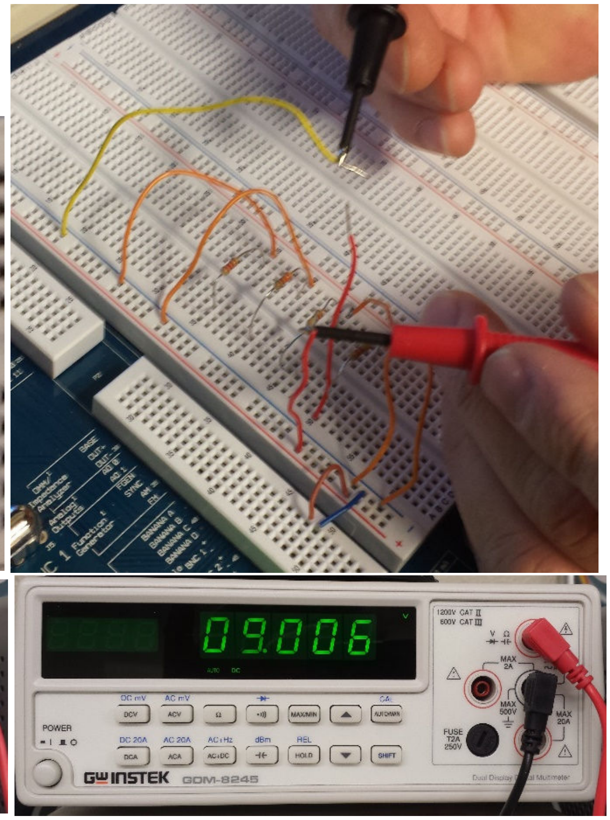
Simulated


Multimeter-XMM1
845.232 Ohm
A
V
Ω
dB
Set...
XMM1
R1
2.2kΩ
R2
3.3kΩ
R3
4.7kΩ
R4
4.7kΩ
Title: Lab_7_Circuit_RT
Find; Total Circuit Resistance, Total Circuit Current All Sub-Circuit Currents
Designed by: Andy Bell
Document N: 0001
Revision: 1.0
Checked by: Mike Roeback
Date: 2/27/2014
Size: A
Approved by:
Sheet 1 of 1


Multimeter-XMM1
10.649 mA
XMM1
XMM2
XMM3
XMM4
XMM5
V1
9 V
R1
2.2kΩ
R2
3.3kΩ
R3
4.7kΩ
R4
4.7kΩ
Multimeter-XMM5
1.915 mA
Multimeter-XMM2
4.091 mA
Multimeter-XMM3
2.727 mA
Multimeter-XMM4
1.915 mA
Title: Lab_7_Simulation
Find; Total Circuit Resistance, Total Circuit Current All Sub-Circuit Currents
Designed by: Andy Bell
Document N: 0001
Revision: 1.0
Checked by: Mike Roeback
Date: 2/27/2014
Size: A
Approved by:
Sheet 1 of 1

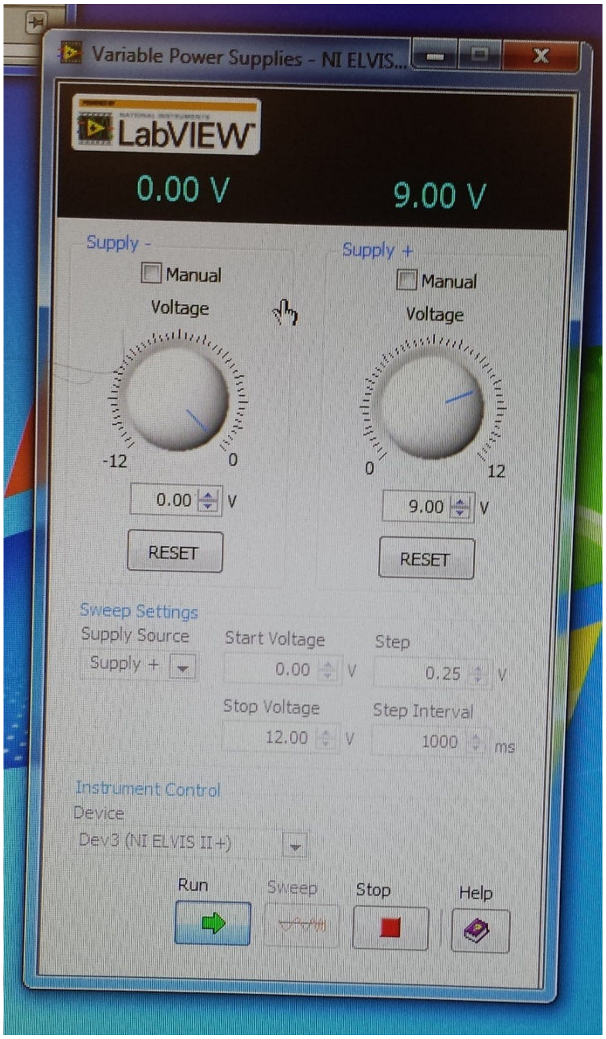
Measured



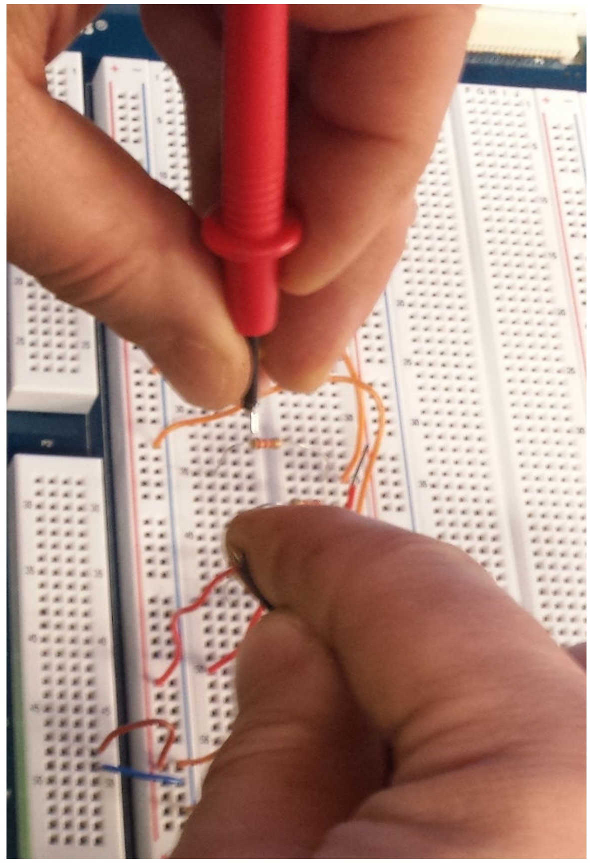


Total Resistance

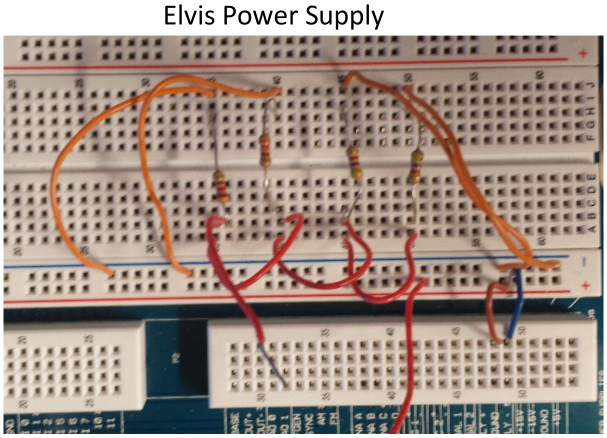
Supplied Voltage



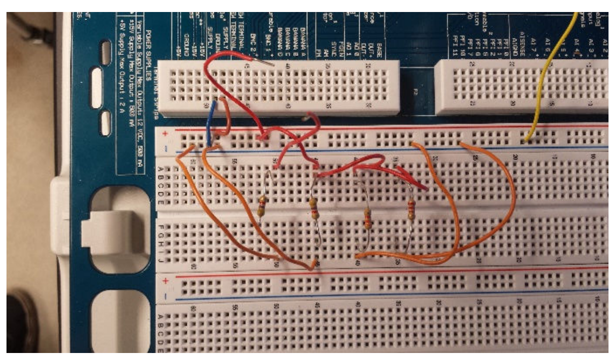
Elvis Power Supply



Testing I1



It Circuit Break-out



I4 Circuit Break-Out

Supply Voltage has changed to 12 volts, Total circuit amperage to remain the same as it was with the 9 volt supply. Make the proper adjustments.

Calculated

4 Resistors in Parallel		Series added
V1=	12	
R1=	2.2E+3	
R2=	3.3E+3	
R3=	4.7E+3	
R4=	4.7E+3	
R5*=		281.7E+0
RT=	1.1E+3	
I1=	5.5E-3	
I2=	3.6E-3	
I3=	2.6E-3	
I4=	2.6E-3	
IT=	10.6E-3	

Amps	IT Off RT
10.6E-3	Amperage
1.1E+3	Resistance
12	Voltage

Pass	IT Check

Amps	IT 9v Circuit
0.010648	Amperage
845.2316	Resistance
9	Voltage

Amps	I1
0.005455	Amperage
2.2E+3	Resistance
12	Voltage

Amps	I2
0.003636	Amperage
3.3E+3	Resistance
12	Voltage

Amps	I3
0.002553	Amperage
4.7E+3	Resistance
12	Voltage

Amps	I4
0.002553	Amperage
4.7E+3	Resistance
12	Voltage

14.2E-3	I1+I2+I3+I4

Resistor Needed	
281.7E+0	Resistance
3.0E+0	Voltage
10.6E-3	Amperage

*R5 added the circuit in series to keep the current the same for 12 volts as it was for 9 volts.

Simulated

Lab Notebook
Andy's 1.3volt Drop Black Box

Michael Roeback

EECT111-01C

March 6, 2014

Professor Andy Bell

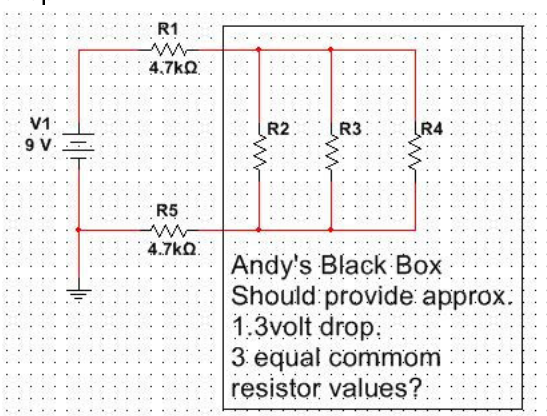
Lab 8 – Andy's 1.3volt Drop Black Box

Names: Mike Roeback, Roman Jamili, Jeff Noogle
Date: 3/6/2014

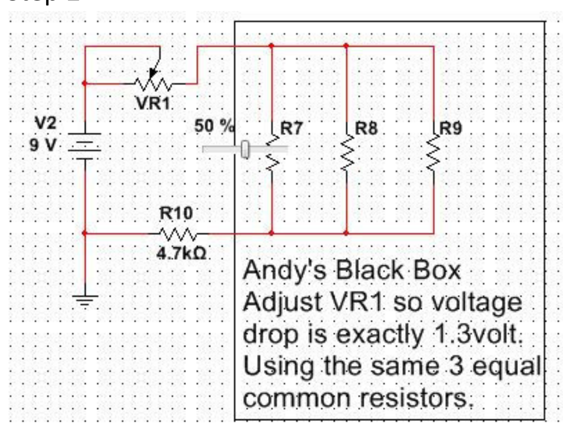
The purpose of this lab is to:
Learn about series-parallel circuits

The voltage applied to 2 resistors (4.7kΩ in Series) and Andy's Black Box is 9V. Andy's black box is wired in series between the 2 resistors. Within Andy's Black Box is 3 common resistors wired in Parallel, all of which are equal value.
Step 1: Determine the value of the resistors within the box if the voltage drop that the box created is approx. 1.3 volts.
Step 2: If the first 4.7kΩ resistor (R1) were to be replaced with a variable resistor (VR1), what value would it be set to if Andy's Black Box were to drop exactly 1.3volts within this circuit?

Step 1



Step 2



Equipment needed:

1 – Digital Multimeter
1 – Elvis II
3 – Standard Resistors
1 – 5kΩ Potentiometer

	Calculated	Simulated
V1 =	9	9
R1 =	4.7kΩ	4.7kΩ
R2 =	4.7kΩ	4.7kΩ
R3 =	4.7kΩ	4.7kΩ
R4 =	4.7kΩ	4.7kΩ
R5 =	4.7kΩ	4.7kΩ
VD =	1.286	1.286

	Calculated	Simulated	Measured
V1 =	9	9	9.008
VR1 =	4.579kΩ	4.579kΩ	4.615kΩ
R2 =	4.7kΩ	4.7kΩ	4.619kΩ
R3 =	4.7kΩ	4.7kΩ	4.584kΩ
R4 =	4.7kΩ	4.7kΩ	4.729kΩ
R5 =	4.7kΩ	4.7kΩ	4.585kΩ
VD =	1.3	1.3	1.3

Observations: Step 1 Performed Calculation and Simulation only. Step 2 Lab work done at Station 4. Jeff and Roman worked on Simulated while I tackled the Calculated.

Black Box Calculator

Supplied Power		9	volts
R1	4.700E+3	3.85	volts
Rbb R1,R2,R3 All in Parallel	1.587E+3	1.3	volts
R5	4.700E+3	3.85	volts
RT	10.987E+3		

Calculate which 3 equal (standard) value resistors provides ~ 1.3v drop in circuit supplied by 9v with a 4.7k Ω resistor wired in series on both sides of it.

Using 3 Parallel Rbb(Rev.1)	4.7E+3	1.567E+3

Correction Calculator

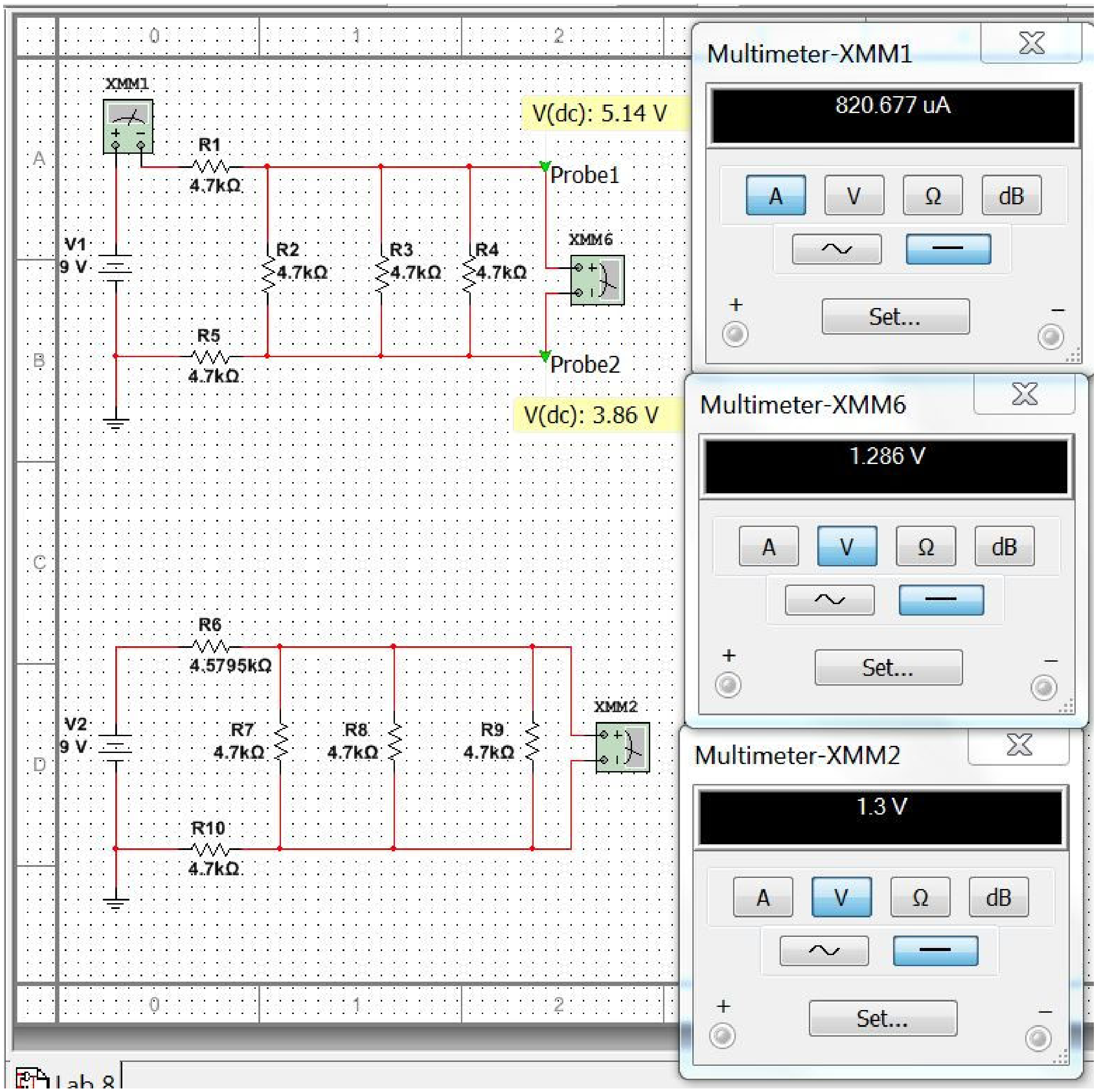
Amps	RT
820.669E-6	Amperage
10.967E+3	Resistance
9	Voltage
Volts	Rbb
1.286	Voltage
820.669E-6	Amperage
1.567E+3	Resistance

Corrected for Standard Value Resistors

Supplied Power		9	volts
R1	4.700E+3	3.86	volts
Rbb R1,R2,R3 All in Parallel	1.567E+3	1.286	volts
R5	4.700E+3	3.86	volts
RT	10.967E+3		

Supplied Power		9	volts
R1	4.579E+3	3.80	volts
Rbb (Rev. 1) R1,R2,R3 All in Parallel	1.567E+3	1.3	volts
R5	4.700E+3	3.90	volts
RT	10.846E+3		

Adjust R1 so that three 4.7k resistor wired in parallel will hold (exactly) a 1.3v drop in the above circuit.



XMM1
R1
4.7kΩ
V(dc): 5.14 V
Probe1
V1
9 V
R2
4.7kΩ
R3
4.7kΩ
R4
4.7kΩ
XMM6
R5
4.7kΩ
Probe2
V(dc): 3.86 V
R6
4.5795kΩ
V2
9 V
R7
4.7kΩ
R8
4.7kΩ
R9
4.7kΩ
XMM2
R10
4.7kΩ
Multimeter-XMM1
820.677 uA
A
V
Ω
dB
Set...
Multimeter-XMM6
1.286 V
A
V
Ω
dB
Set...
Multimeter-XMM2
1.3 V
A
V
Ω
dB
Set...
Lab 8

Lab Notebook
Series/Parallel Resistors

Michael Roeback

EECT111-01C

March 6, 2014

Professor Andy Bell

Lab 9 – Series/Parallel Resistors

Names: Mike Roeback

Date: 3/06/2014

The purpose of this lab is to:
Experiment with series circuits and verify that the simulation, analysis (calculations) and test results all agree.

From the resistor kit select 8 resistors: 2 each 470Ω, 2 each 1kΩ, and 1 each of the following: 2.2kΩ, 3.3kΩ, 4.7kΩ, 10kΩ

Measure and record the value of each resistor. Connect the resistors as shown in Figure 1. Measure and record the total resistance, RT. Then connect the resistors as shown in Figure 2, the 9V come from the Elvis II (Modular Engineering Educational Laboratory Platform). Then measure and record with the Digital Multimeter the current and voltages of the series circuit.

Equipment needed:

1 – Digital Multimeter
1 – Elvis II
8 – Resistors

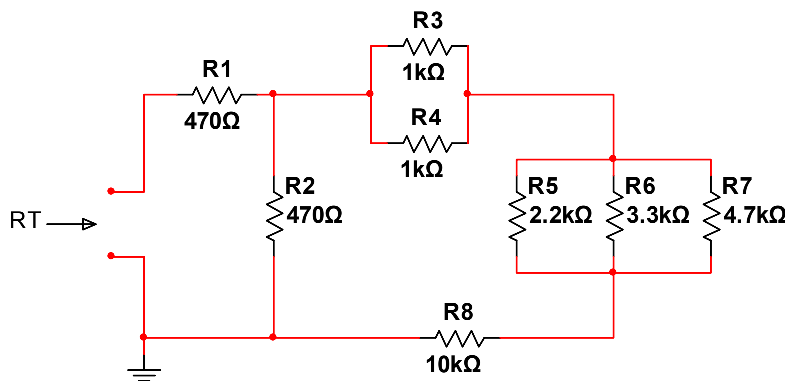


Figure 1
Series/Parallel Circuit

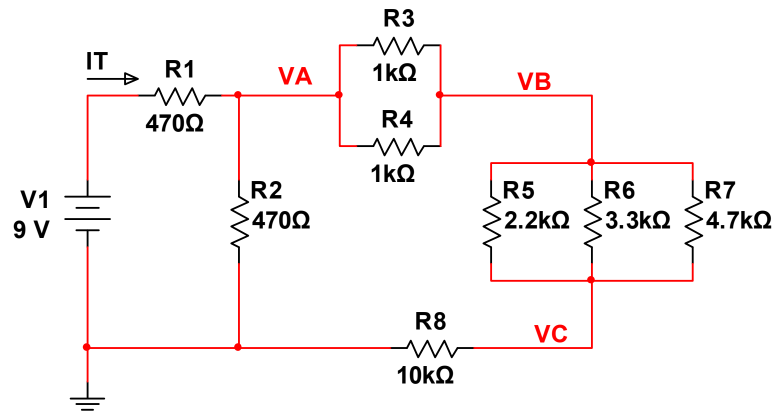
	Expected	Measured
R1 =	470 Ω	
R2 =	470 Ω	
R3 =	1 kΩ	
R4 =	1 kΩ	
R5 =	2.2 kΩ	
R6 =	3.3 kΩ	
R7 =	4.7 kΩ	
R8 =	10 kΩ	

Expected = value you expect it to be
Measured = using Digital Multimeter

	Calculated	Simulated	Measured
R34 =	500	500	
R567 =	1.031E+3	1.031E+3	
R345678 =	11.531E+3	11.531E+3	
R2345678 =	451.593E+0	451.593E+0	
RT =	921.593E+0	921.593E+0	

Calculated = using Excel calculations
Simulated = Multisim simulation
Measured = using Digital Multimeter

	Calculated	Simulated	Measured
V1 =	9.0E+0	9	
IT =	9.766E-3	9.77E-03	
VA =	4.41E+0	4.41	
VB =	4.22E+0	4.22	
VC =	3.82E+0	3.83	



Calculated = using Excel calculations
Simulated = Multisim simulation
Measured = using Digital Multimeter

Adjust R2 so that the VA voltage is equal to 4.5V. Then measure the value of the new R2 and calculate and simulate a value that would produce the 4.5V.

	Measured	Simulated	Calculated
VA =		4.50E+0	4.5
R2 =		489.972E+0	489.972

Calculated = using Excel calculations
Simulated = Multisim simulation
Measured = using Digital Multimeter

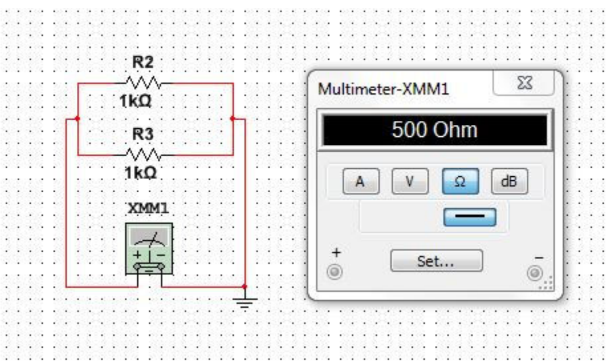
Observations: All Resistances are in ohms, Voltages and DC an current is amperes. Due to time constrains this lab was changed to Calculation and Simulation only by Professor Bell.

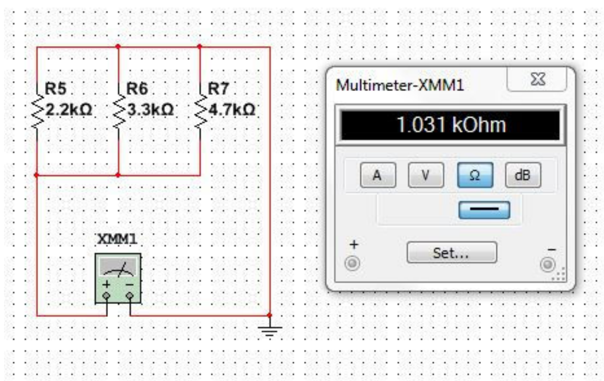
Resistor	Calculated	
R1 =	470	Ω
R2 =	470	Ω
R3 =	1.0E+3	Ω
R4 =	1.0E+3	Ω
R5 =	2.2E+3	Ω
R6 =	3.3E+3	Ω
R7 =	4.7E+3	Ω
R8 =	10.0E+3	Ω

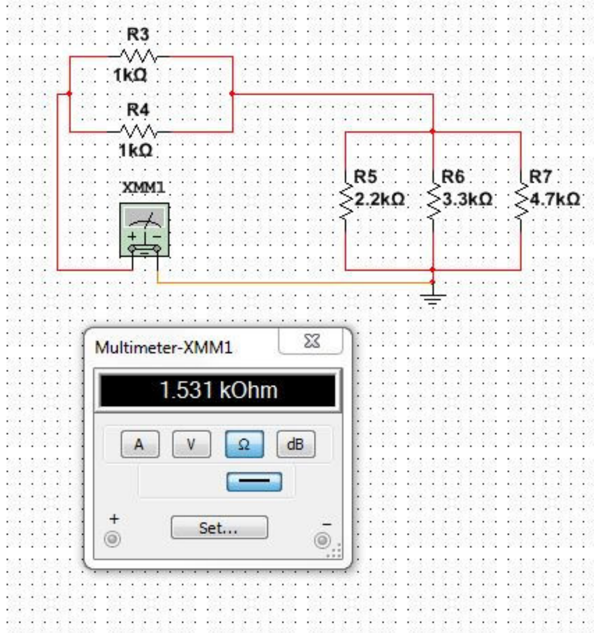
Combos	Calculated Ω	Simulated Ω
R34 =	500	500
R567 =	1.031E+3	1.031E+3
R345678 =	11.531E+3	11.531E+3
R2345678 =	451.593E+0	451.593E+0
RT =	921.593E+0	921.593E+0
I 345678 =	382.472E-6	382.0E-6

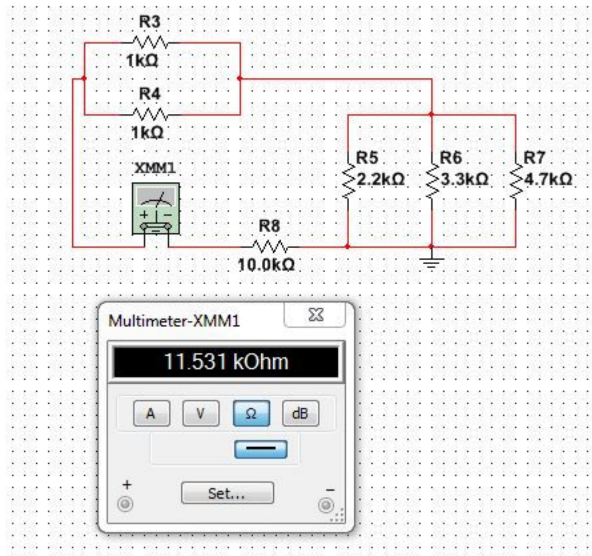
	Calculated	Simulated	
V1=	9.0E+0	9	VDC
IT=	9.766E-3	9.77E-03	Amps
VA=	4.41E+0	4.41	VDC
VB=	4.22E+0	4.22	VDC
VC=	3.82E+0	3.83	VDC

VA Adjusted to 4.5V	Calculated	Simulated
VA=	4.50E+0	4.5
R2=	489.972E+0	489.972
(R2*R345678)/ (R2+R345678) =	470E+0	

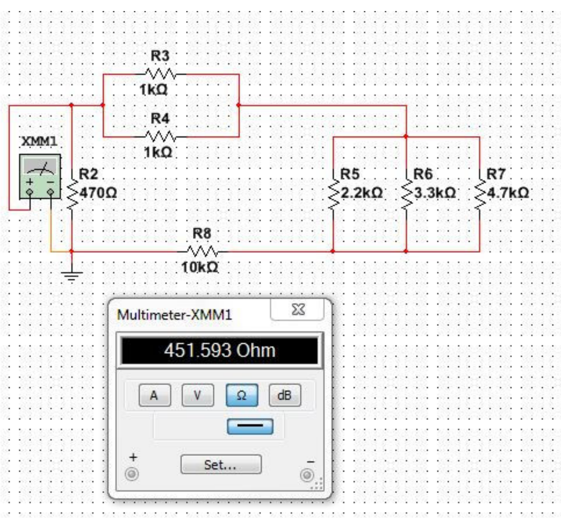


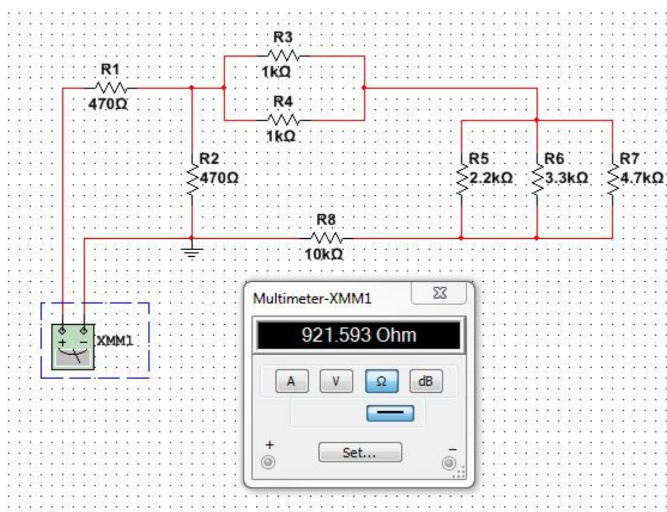




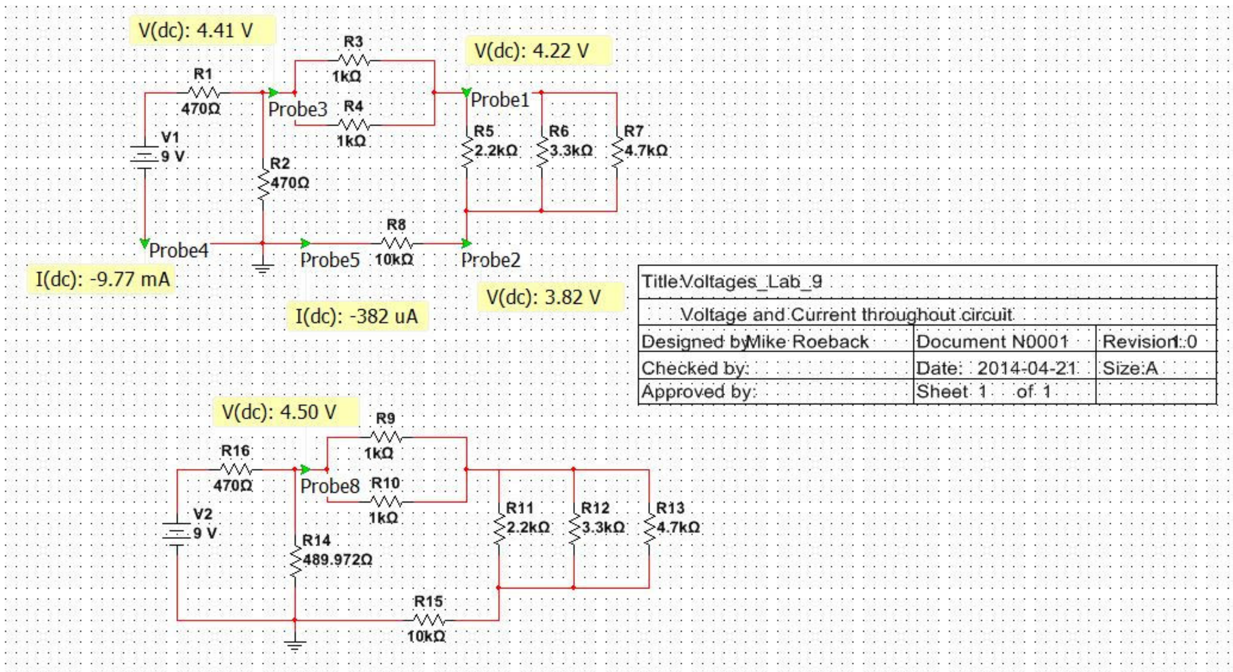


R345678 RT





Voltages & Currents



Lab Notebook
Series/Parallel Capacitors

Michael Roeback

EECT111-01C

April 10, 2014

Professor Andy Bell

Lab 10 – Series/Parallel Capacitors

Names: Michael Roeback, Janice Pemberton, Shane Miller
Date: 4/10/2014

The purpose of this lab is to:
Experiment with series circuits and parallel combinations of capacitors.

The following capacitors are needed (1 each of the following): 10uF, 22uF and 47uF

Measure and record the capacitance of each capacitor using the LCR meter. Connect the capacitors as shown in Figure 1 and measure and record the total capacitance, CT. Then connect the capacitors as shown in Figure 2 and measure and record the total capacitance, CT.

Equipment needed:

1 – LCR Meter
1 – Elvis II
3 – capacitors

	Expected	Measured
C1 =	10 µF	8.18 µF
C2 =	22 µF	17.84 µF
C3 =	47 µF	33.46 µF
CT =	6 µF	5 µF

Expected = value you expect it to be
Measured = using LCR Meter

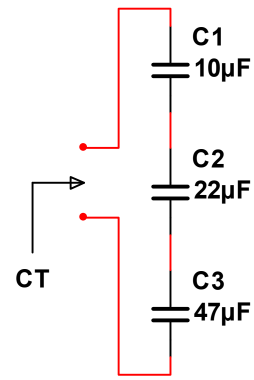


Figure 1
Series Circuit

	Expected	Measured
C1 =	10 µF	8.18 µF
C2 =	22 µF	17.84 µF
C3 =	47 µF	33.46 µF
CT =	79 µF	59.24 µF

Expected = value you expect it to be
Measured = using LCR Meter

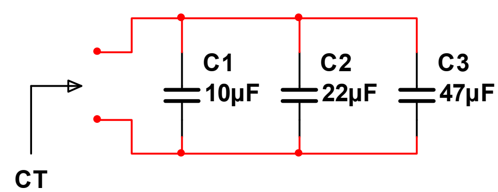
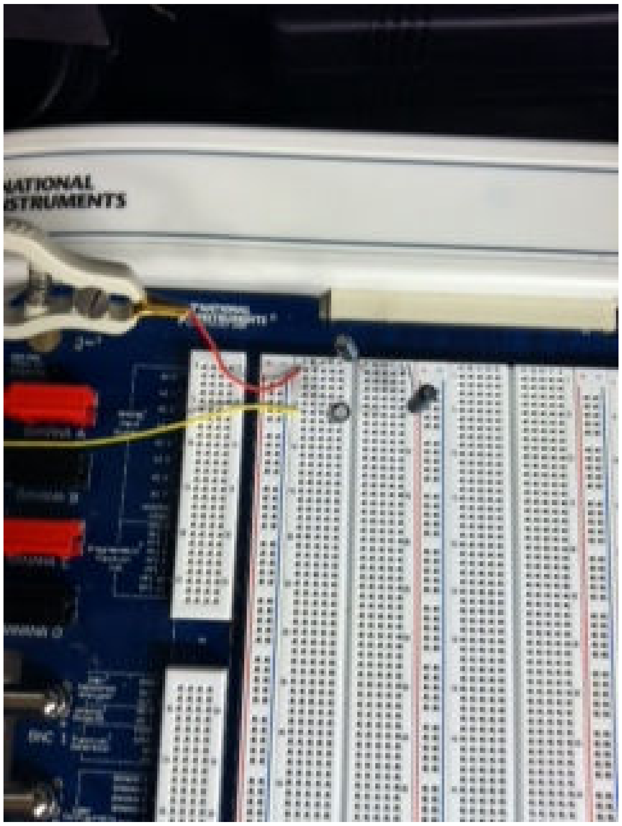
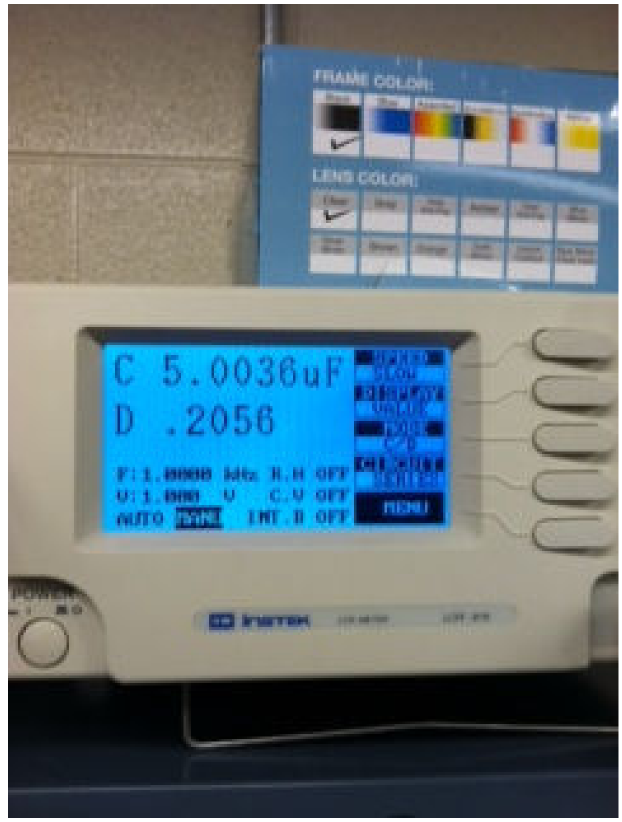


Figure 2
Parallel Circuit

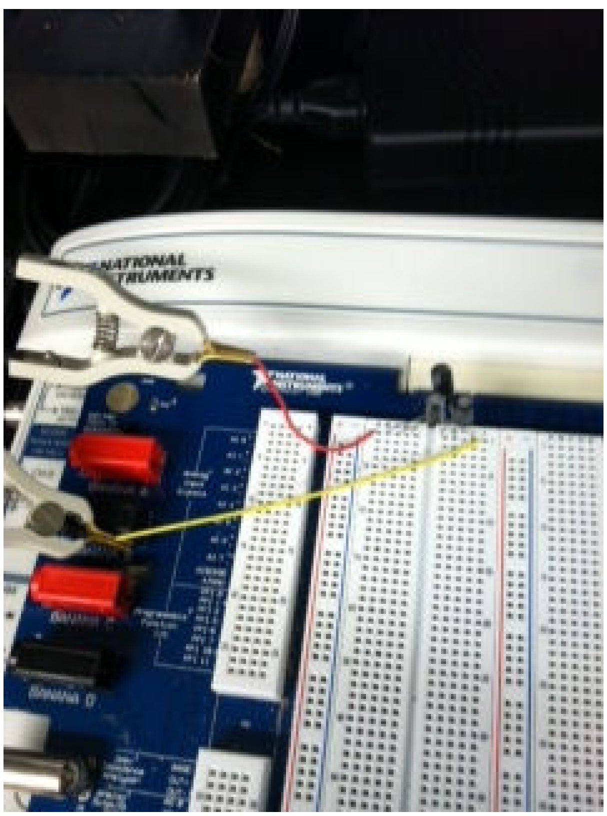
Observations: LCR (Bench 6), SPD=Slow, Dis=Value, Mode=C/D, Circuit=Para (except for CT in series), Lf to Neg. Record of Hundredths Resolution

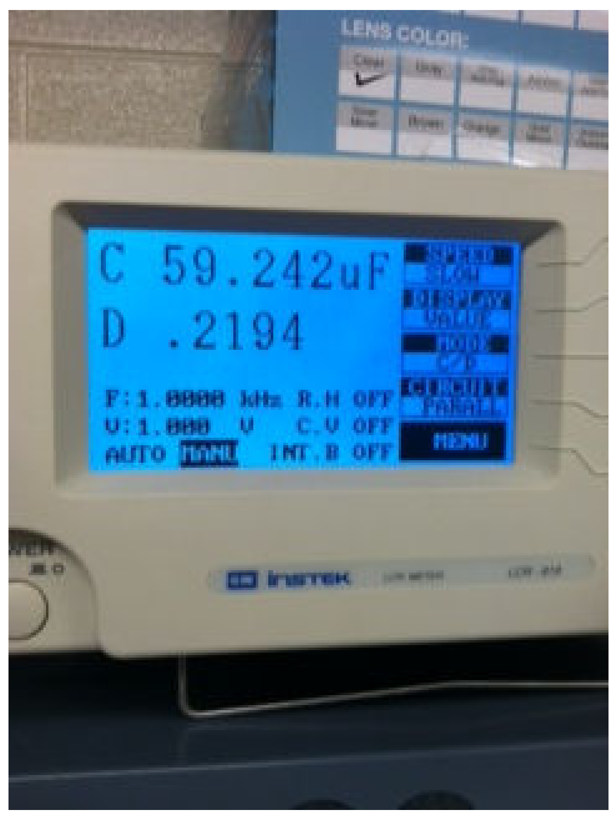
Series Circuit





Parallel Circuit





Lab Notebook
RC Circuit

Michael Roeback

EECT111-01C

April 24, 2014

Professor Andy Bell

Lab 11 – RC Lab

Names: Jon Wyatt, Mike Roeback, Janice Pemberton, Jimmie Risner

Date: 4/24/2014

The purpose of this lab is to:
Experiment with RC (Resistor & Capacitor) circuits.

The following capacitors are needed (1 each of the following): 0.47uF, 1uF and 2.2uF

Measure and record the resistor value using the DMM and measure and record the capacitor values using the LCR meter in Table 1. Connect the resistor and capacitor as shown in Figure 1. Connect the Function Generator to the input at V1 and connect Channel 1 of the Oscilloscope to the input and Channel 2 to the output. Adjust the voltage of the Function Generator to 1Vpp at the frequencies shown in Table 2. Measure the input and output voltages using the Oscilloscope. Record the results in Table 2. Change the capacitor and retest.

Equipment needed:

1 – Digital Multimeter
1 – LCR Meter
1 – Oscilloscope
1 – Function Generator
1 – Elvis II
3 – capacitors
1 – resistor

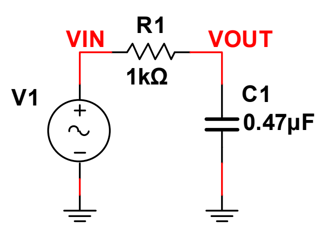


Figure 1
RC Circuit

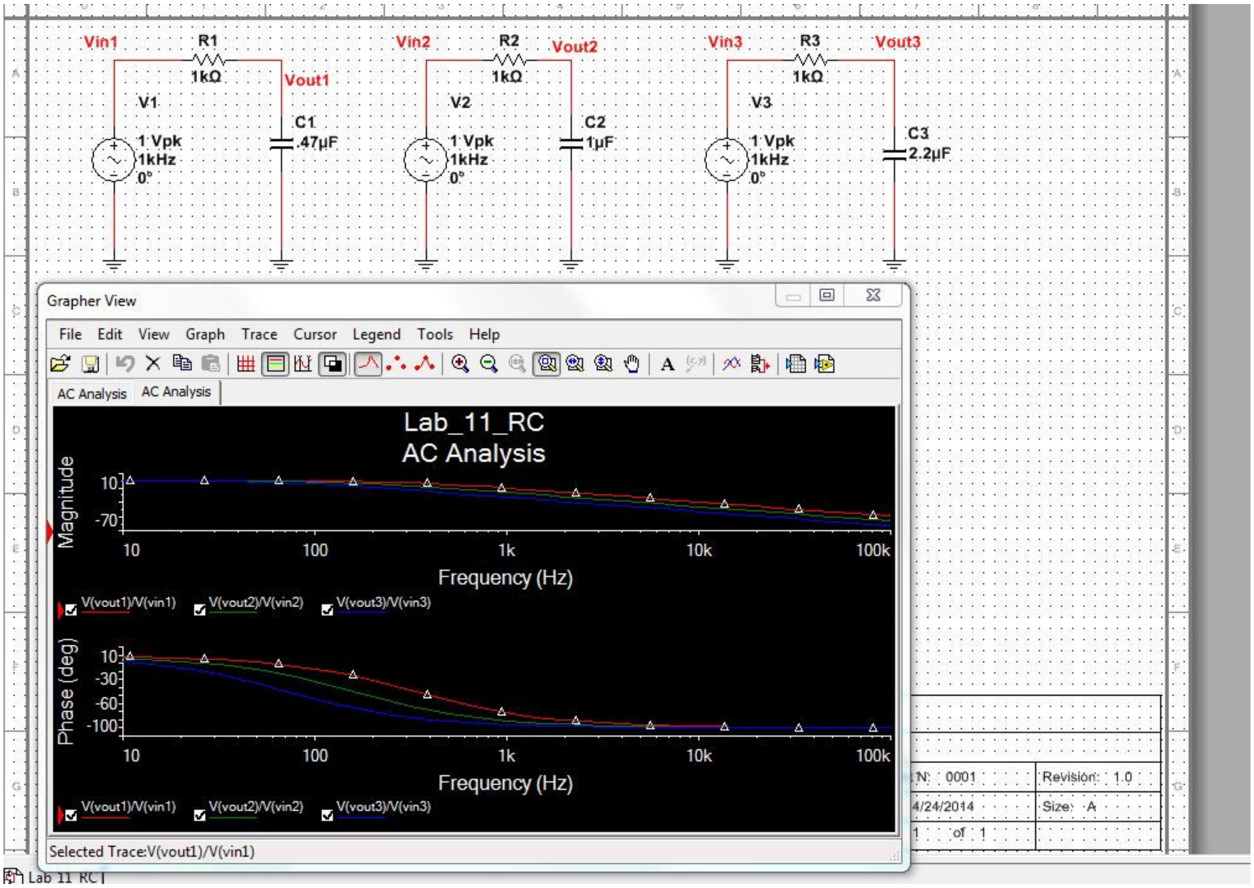
	Capacitance or Resistance Expected	Measured
C1 =	.47 µF	.464 µF
C2 =	1 µF	.915 µF
C3 =	2.2 µF	2.1 µF
R1 =	1k µF	1.001k

Table 1 – Resistance and Capacitances
Expected = value you expect it to be
Measured = using LCR Meter or DMM

Frequency	Output Voltage C = .47µF Expected Output Voltage	Measured Input Voltage	Measured Output Voltage	Output Voltage C = 1µF Expected Output Voltage	Measured Input Voltage	Measured Output Voltage	Output Voltage C = 2.2µF Expected Output Voltage	Measured Input Voltage	Measured Output Voltage
10	1	1	1	.998	1	1	.991	1	1
50	.989	1	1	.954	1	.940	.823	1	.820
100	.959	1	.98	.847	1	.840	.586	1	.600
200	.861	1	.88	.623	1	.620	.340	1	.380
300	.749	1	.76	.469	1	.480	.234	1	.260
400	.646	1	.660	.370	1	.400	.178	1	.220
500	.561	1	.580	.303	1	.340	.143	1	.180
600	.492	1	.520	.256	1	.300	.120	1	.160
700	.436	1	.460	.222	1	.260	.103	1	.160
800	.390	1	.420	.195	1	.240	.090	1	.140
900	.352	1	.380	.174	1	.220	.080	1	.140
1,000	.321	1	.360	.157	1	.200	.072	1	.140
2,000	.167	1	.200	.079	1	.140	.036	1	.120
3,000	.112	1	.160	.053	1	.100	.024	1	.056
4,000	.084	1	.104	.039	1	.056	.018	1	.048
5,000	.068	1	.088	.032	1	.048	.015	1	.048
6,000	.056	1	.080	.027	1	.040	.012	1	.040
7,000	.048	1	.072	.023	1	.032	.010	1	.032
8,000	.042	1	.064	.020	1	.032	.009	1	.032
9,000	.038	1	.064	.018	1	.032	.008	1	.032
10,000	.034	1	.056	.016	1	.032	.007	1	.032

RC Frequency Response
Expected = value you expect it to be
Measured = Using Oscilloscope

Observations: Our first run of measurements were a failure due to a bad 10x switch on the probe measuring the Vout. After a second measuring session our numbers proved compatible with the calculated results. We could have gotten higher resolution if we had continuously adjusted the amplitude for Vout signal on the scope. Bench 6 was used on the first test but results were scrapped. Bench 5 LCR was used for Capacitor measurements, Bench 8 scope was used with bench 5 Elvis for second and final test run.



Vin1
R1
1kΩ
Vout1
V1
1 Vpk
1kHz
0°
C1
.47µF
Vin2
R2
1kΩ
Vout2
V2
1 Vpk
1kHz
0°
C2
1µF
Vin3
R3
1kΩ
Vout3
V3
1 Vpk
1kHz
0°
C3
2.2µF
Grapher View
File Edit View Graph Trace Cursor Legend Tools Help
AC Analysis AC Analysis
Lab_11_RC
AC Analysis
Magnitude
10
-70
10 100 1k 10k 100k
Frequency (Hz)
V(vout1)/V(vin1) V(vout2)/V(vin2) V(vout3)/V(vin3)
Phase (deg)
10
-30
-60
-100
10 100 1k 10k 100k
Frequency (Hz)
V(vout1)/V(vin1) V(vout2)/V(vin2) V(vout3)/V(vin3)
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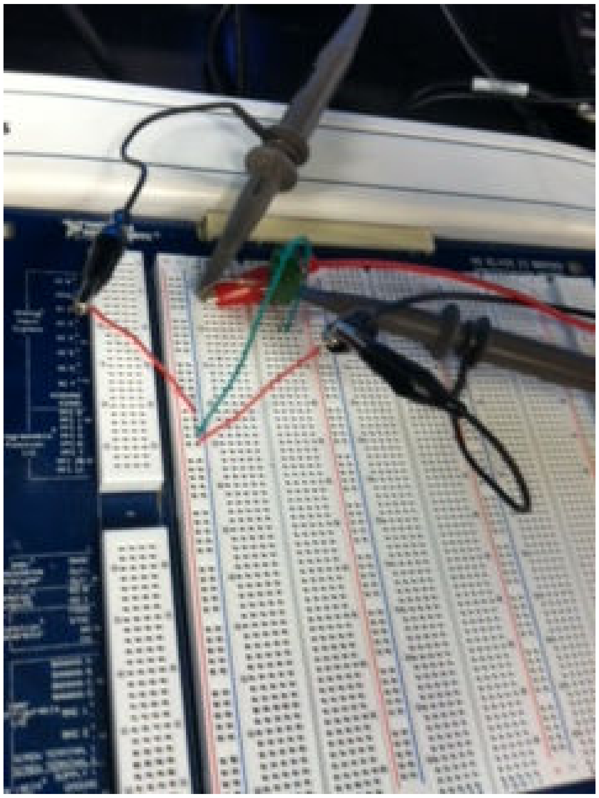
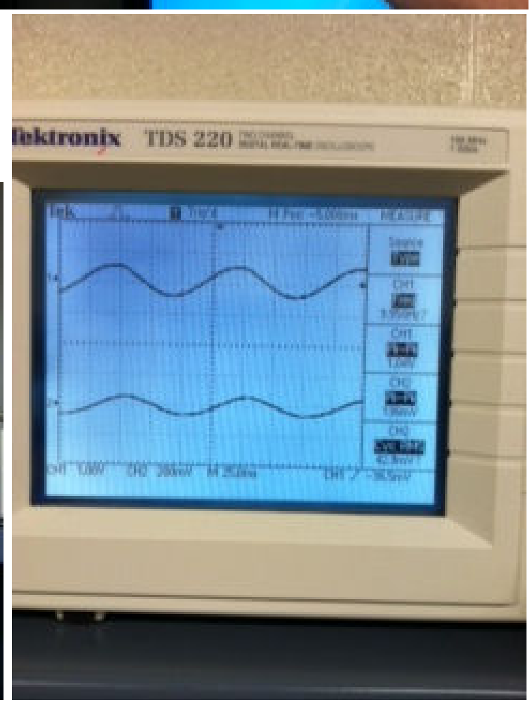
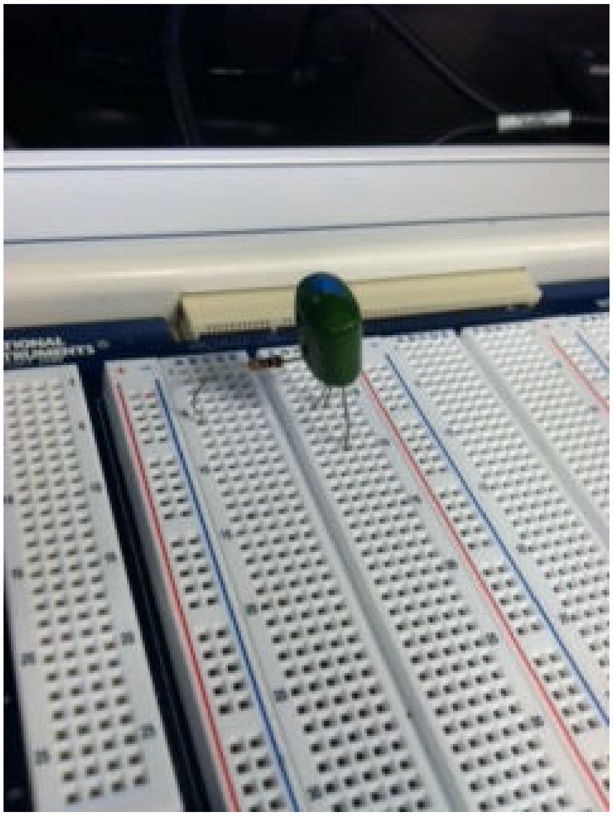
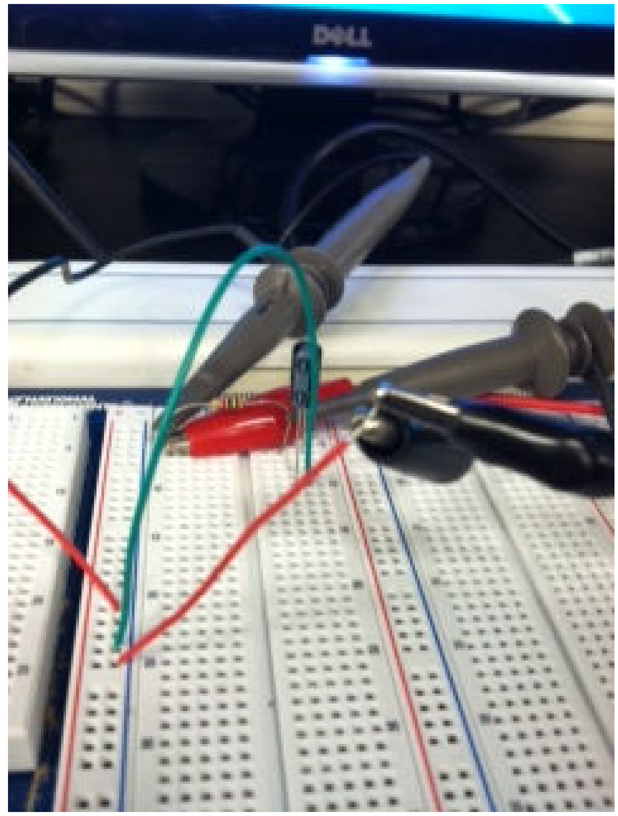
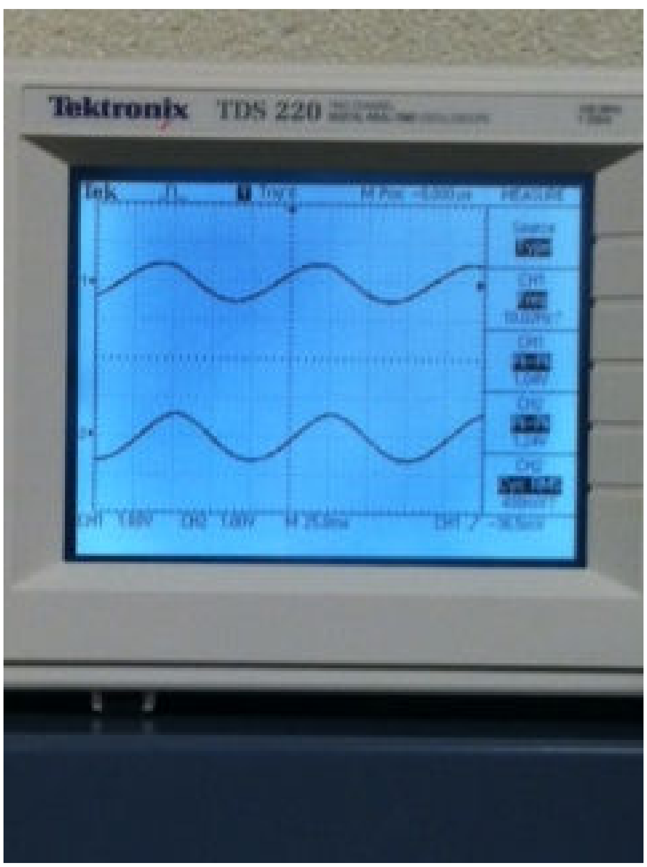
N: 0001
Revision: 1.0
4/24/2014
Size: A
1 of 1
Lab 11 RC




Tektronix
TDS 220




DELL


Tektronix
TDS 220

Lab Notebook
Series/Parallel Inductors

Michael Roeback

EECT111-01C

April 24, 2014

Professor Andy Bell

Lab 11 – Series/Parallel Inductors

Names: Mike Roeback

Date: 4/24/2014

The purpose of this lab is to:
Experiment with series circuits and parallel combinations of inductors.

The following inductors are needed (1 each of the following): 1mH, 2.2mH and 4.7mH

Measure and record the inductance of each inductor using the LCR meter. Connect the inductors as shown in Figure 1 and measure and record the total inductance, LT. Then connect the inductors as shown in Figure 2 and measure and record the total inductance, LT.

Equipment needed:

1 – LCR Meter
1 – Elvis II
3 – Inductors

	Expected	Measured
L1 =	1mH	
L2 =	2.2mH	
L3 =	4.7mH	
LT =	7.8mH	

Expected = value you expect it to be
Measured = using LCR Meter

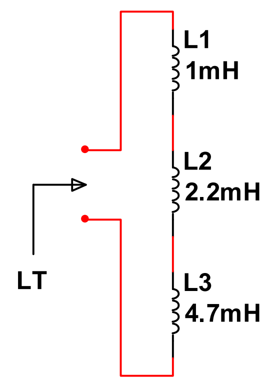


Figure 1
Series Circuit

	Expected	Measured
L1 =	1mH	
L2 =	2.2mH	
L3 =	4.7mH	
LT =	599.768µH	

Expected = value you expect it to be
Measured = using LCR Meter

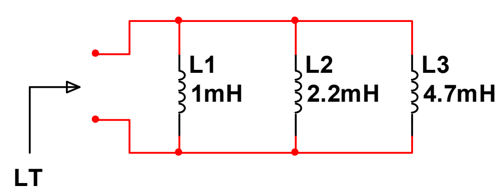


Figure 2
Parallel Circuit

Observations:____

Calculated

Inductor	Henrys
L1	1.0E-3
L2	2.2E-3
L3	4.7E-3
LTSeries	7.9E-3
LTParallel	599.768E-6