Feng Chia University

Electrical Engineering Fundamentals I Lab

Laboratory 1

Resistance, Voltage, and Current Measurements, Ohm's Law

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I. Introduction

- To be familiar with using digital multimeter and oscilloscope

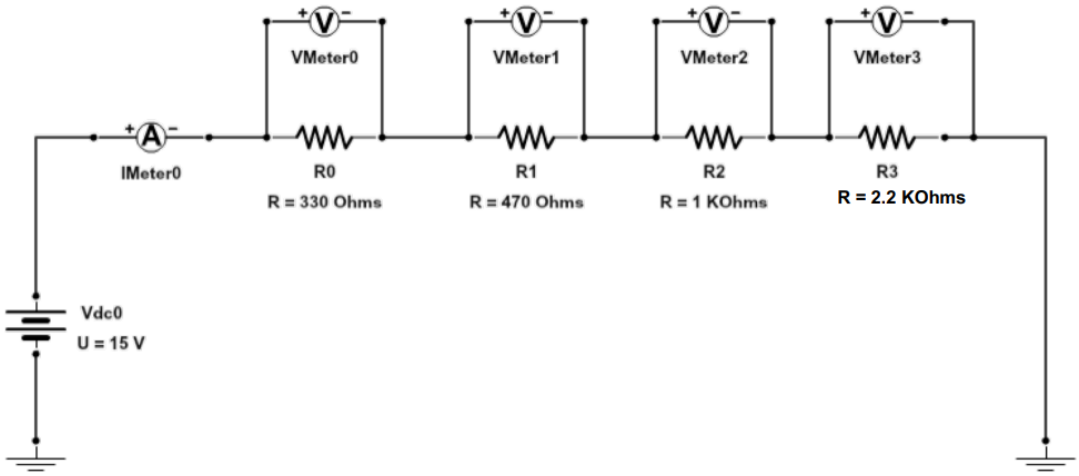
II. Materials

Power Supply, Waveform Generator, Oscilloscope, Digital Multimeter

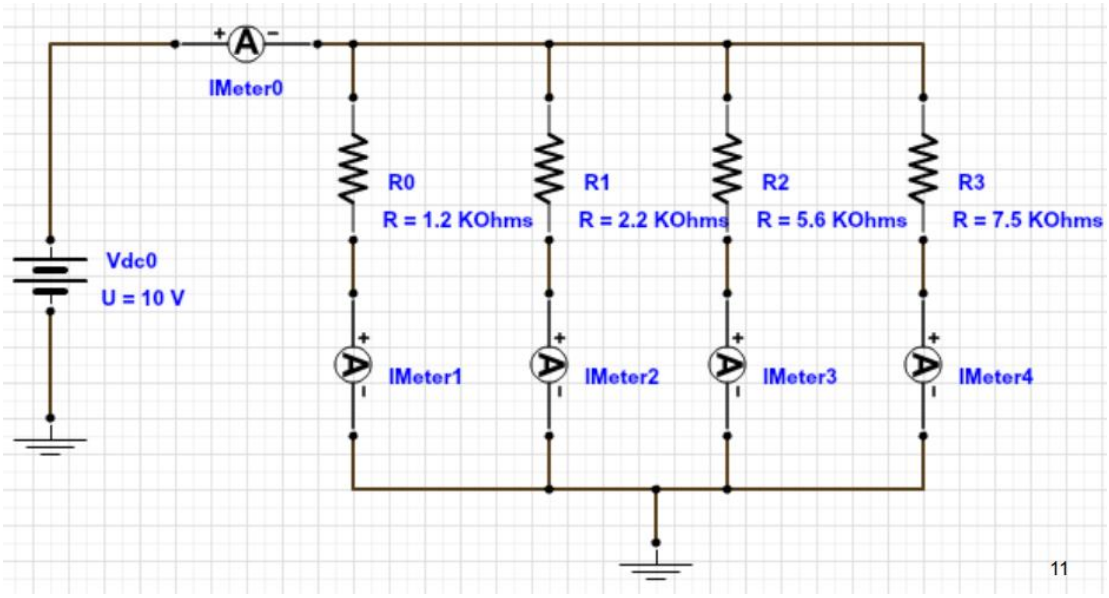
Components

- Resistors
  a. 330 Ω, 470 Ω, 1 kΩ, 2.2 kΩ
  b. 1.2 kΩ, 2.2 kΩ, 5.6 kΩ, 7.5 kΩ
  c. 1 k Ω
- Diode
  a. Zener Diode (V Z < 15 V)

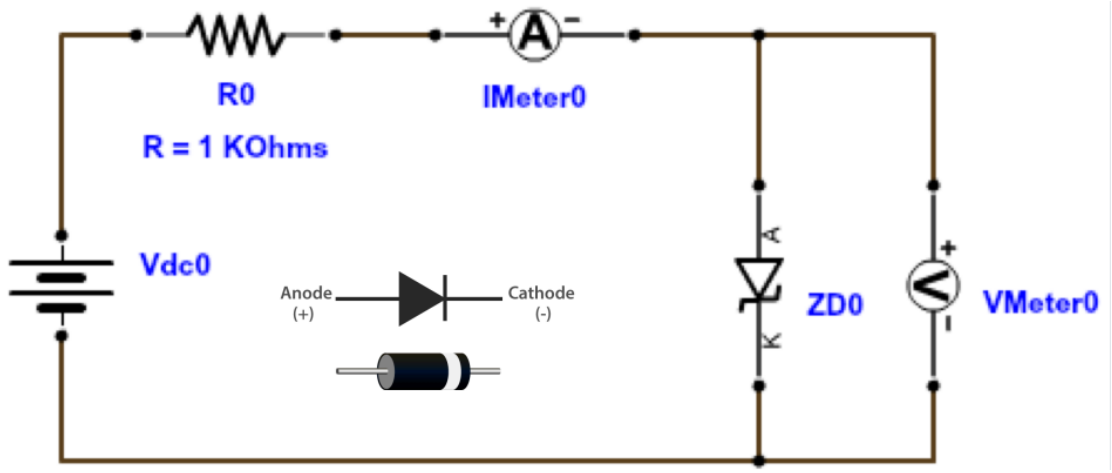
III. Circuit diagram



▲ Figure 1. Circuit of Experiment 1.a Series Circuit



▲ Figure 2. Circuit of Experiment 1.b Parallel Circuit



▲ Figure 3. Circuit of Experiment 1.d The Mystery Component

IV. Methods

Use digital multimeter to measure current, voltage, and resistance.

V. Experiment data

Table 1: Results of the Resistor Measurements

NR	Color Code	kOhm	NOM	DMM	%ERR	TOL
R0	Orange Orange Brown	0.3263	330	326.30	-1.12%	GOLD 5%
R1	Yellow Purple Brown	0.4672	470	467.20	-0.60%	GOLD 5%
R2	Brown Black Red	0.9816	1000	981.55	-1.84%	GOLD 5%
R3	Red Red Red	2.1750	2200	2175.00	-1.14%	GOLD 5%

Table 2: the total current from the source

Theory(mA)	Measured(mA)
3.75	3.8022

Table 3: voltages across each resistor

NR	Theory(V)	Measured(V)
R0	1.2375	1.2405
R1	1.7625	1.7750
R2	3.7500	3.7303
R3	8.2500	8.2591

Table 4: Results of the Resistor Measurements

NR	Color Code	kOhm	NOM	DMM	%ERR	TOL
R0	Brown Red Red	1.1965	1200	1196.50	-0.29%	GOLD 5%
R1	Red Red Red	2.1750	2200	2175.00	-1.14%	GOLD 5%
R2	Green Blue Red	5.7773	5600	5777.30	3.17%	GOLD 5%
R3	Purple Green Red	7.4020	7500	7402.00	-1.31%	GOLD 5%

Table 5: currents from the source and through each resistor

NR	Theory(mA)	Measured(mA)
Total	15.9978	16.0800
R0	8.3333	8.4033
R1	4.5455	4.6040
R2	1.7857	1.7330
R3	1.3333	1.3525

Table 6: current versus voltage for the unknown component

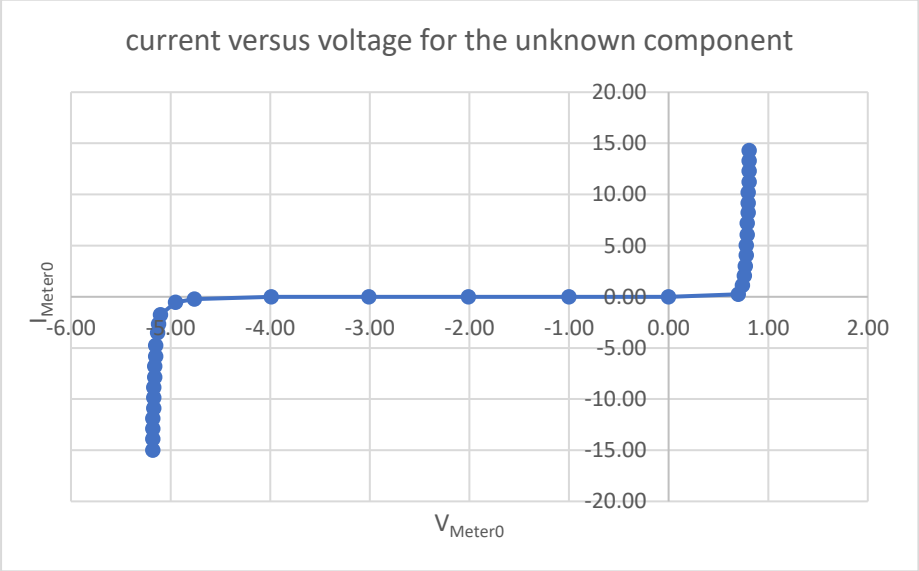
V_{dc0}	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11
V_{Meter0}	-5.18	-5.18	-5.18	-5.18	-5.17	-5.17	-5.17	-5.16	-5.16	-5.15
I_{Meter0}	-14.99	-13.90	-12.91	-11.90	-10.89	-9.87	-8.87	-7.86	-6.81	-5.83

V_{dc0}	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
V_{Meter0}	-5.15	-5.13	-5.12	-5.10	-4.95	-4.76	-3.99	-3.01	-2.01	-1.00
I_{Meter0}	-4.75	-3.50	-2.68	-1.77	-0.55	-0.21	-0.02	0.00	0.00	0.00

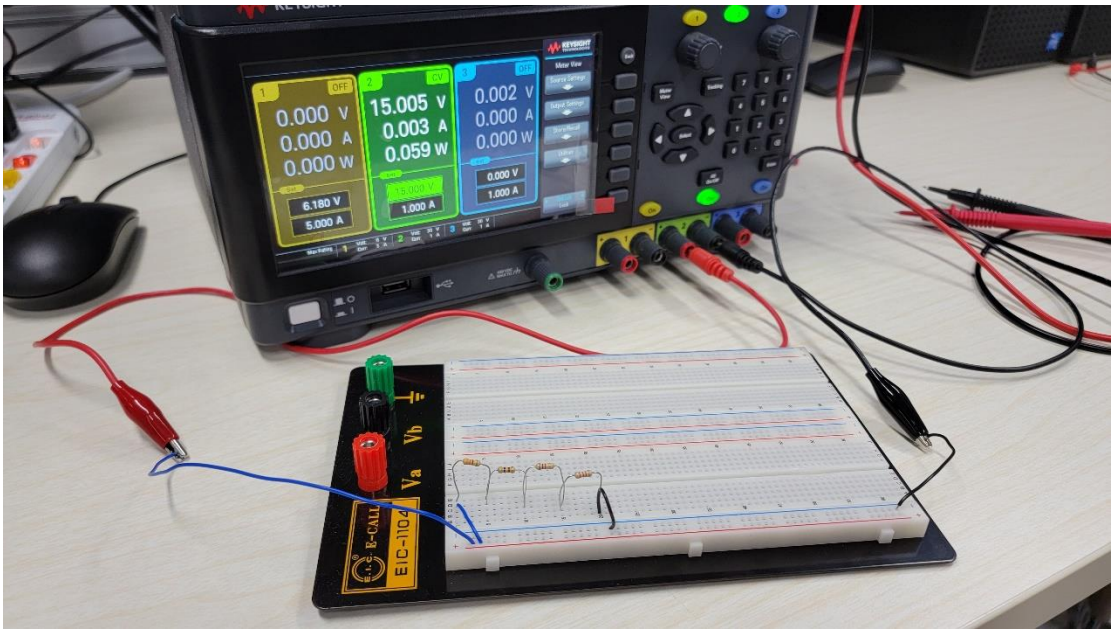
V_{dc0}	0	1	2	3	4	5	6	7	8	9
V_{Meter0}	0.00	0.70	0.74	0.76	0.77	0.78	0.78	0.79	0.79	0.80
I_{Meter0}	0.00	0.24	1.12	2.06	3.00	4.06	5.04	6.07	7.18	8.22

V_{dc0}	10	11	12	13	14	15
V_{Meter0}	0.80	0.80	0.81	0.81	0.81	0.81
I_{Meter0}	9.15	10.20	11.24	12.30	13.29	14.30

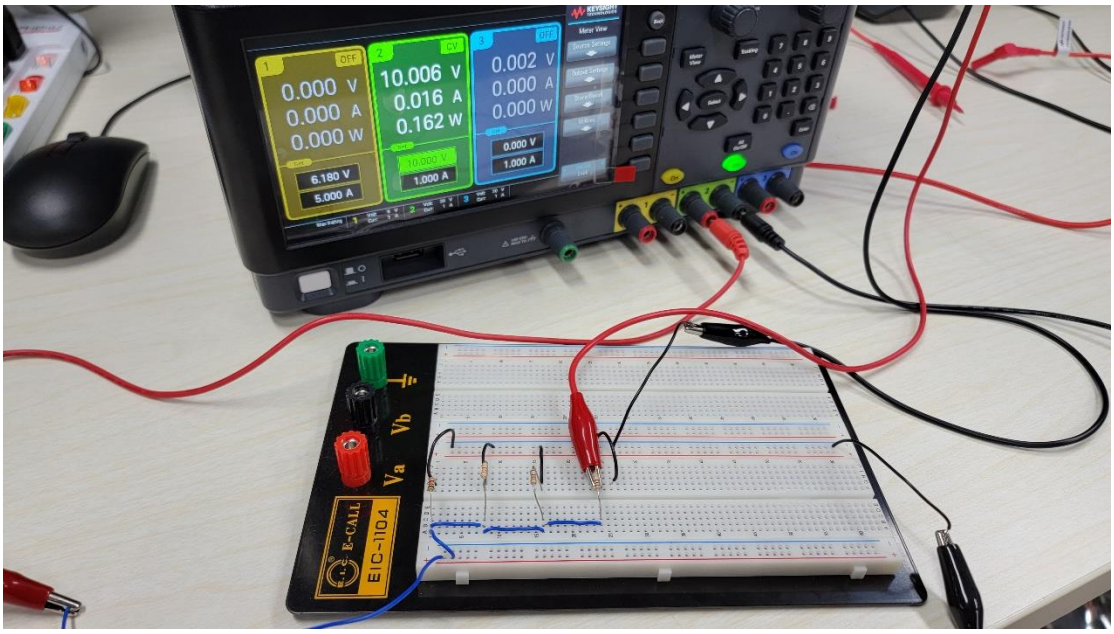
Graph 1: current versus voltage for the unknown component



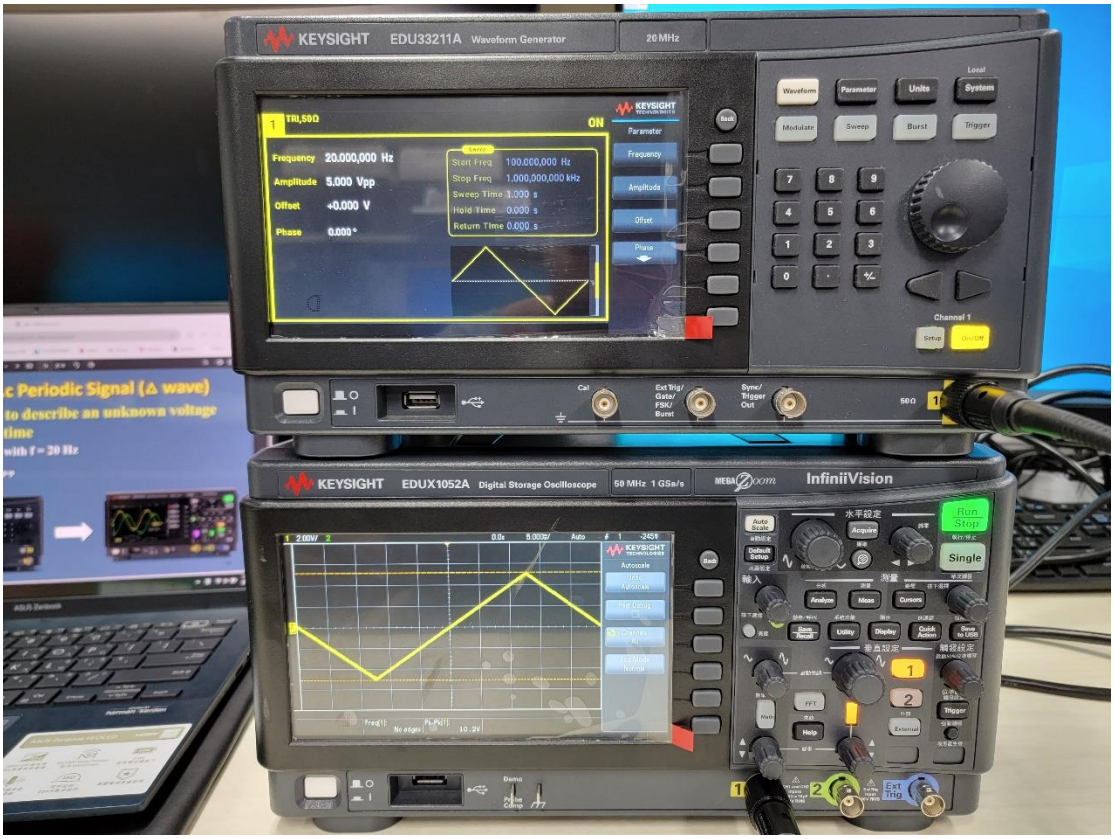
VI. Results



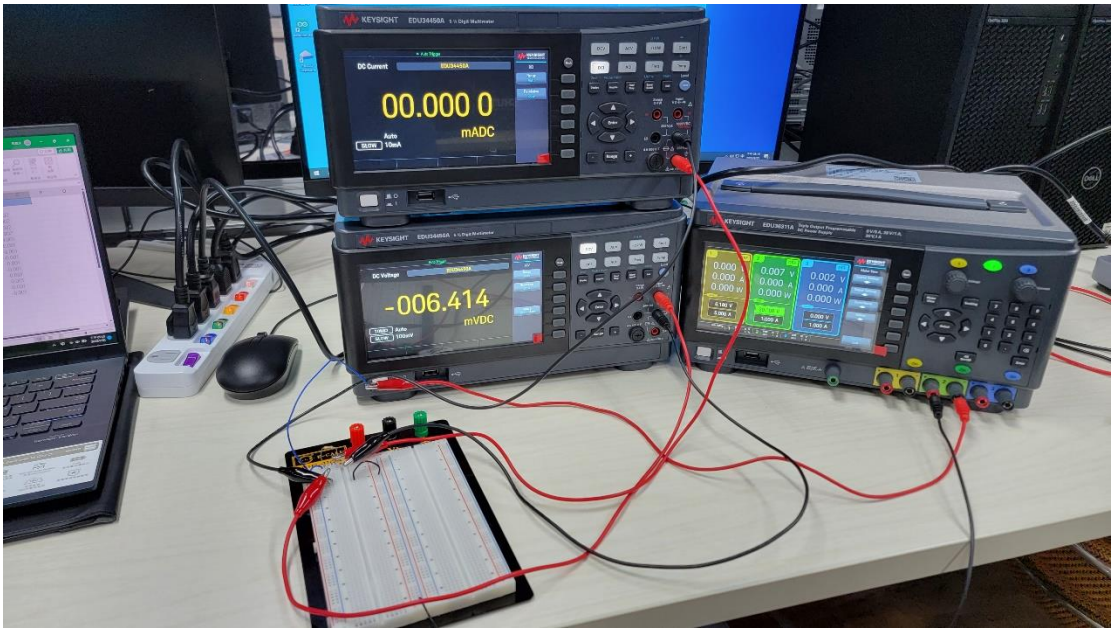
▲ Figure 4. Measure the total current from the source



▲ Figure 5. Measure the current across each resistor



▲ Figure 6. A period of △-wave with f = 20 Hz and amplitude of 10 Vp-p

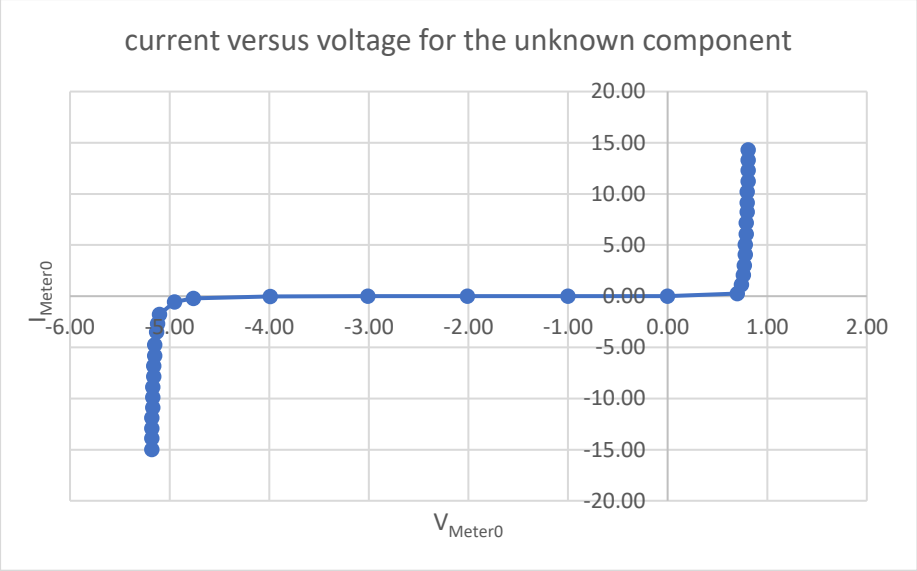


▲ Figure 7. Measure current versus voltage for the diode

VII. Discussion

a.

Graph 1: current versus voltage for the unknown component



While the voltage is between -4.7~0.7, the current of diode will become 0.

VIII. Conclusion

With digital multimeter, we can measure current and resistance in series and voltage in parallel.