

Course and Section _____

Names _____

Date _____

MULTIMETER AND POWER SUPPLY EXPERIMENT

Introduction

This goal is for you to gain familiarity with the lab equipment such as the multimeter and power supply that are used in electrical experiments. In this lab, we will explore the resistance, the AC and DC voltage and capacitance measurements. We will also learn how to use the power supply at your desk.

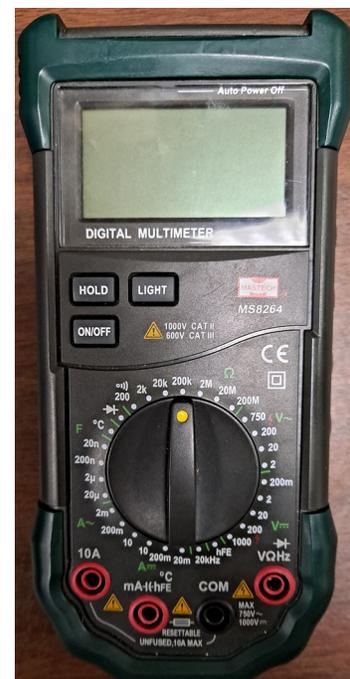
Equipment

Mastech Multimeter. Power supply. Banana cables. Resistor 470 Ω . Capacitor 0.1 μF . Battery 1.5 V.

Theory

The functions of the multimeter are selected with rotary switch. The symbols are designed to illustrate the functionality given the following set of conventions.

Symbol	Symbol function
$V \sim$	AC voltage
$A \text{---}$	DC Current
$V \text{---}$	DC Voltage
\tilde{A}	Alternating current
F	Capacitance
Ω	Ohms
HOLD	Hold Button



Mastech MS8264

The black terminal at the bottom of the multimeter is used for the common connection (COM). The three red terminals are used to measure voltage, resistance and frequency ($V\Omega Hz$), currents up to 10 Ampere (10A), milli-currents and capacitance (mAF).

PART 1 – Resistance

Step 1. To measure the resistance of an object set the rotary dial of the multimeter in the Ω position.

Step 2. Attach a probe (or cable) to the red terminal labeled $V\Omega Hz$. Attach the other probe (or cable) to the black terminal labeled COM.

Step 3. If the display shows only a 1 (as in the figure on the right) adjust the rotary dial to increase in steps the range for the max value of resistance. If the reading is still the 1 after you reach 200 $M\Omega$, that means the resistance of the object is greater than 200 $M\Omega$.



Analysis

Record the results of all measurements in the table below. Include all units as necessary.

1. Take a measurement of resistance with the probes connected to each other (touching).
2. Take a measurement of resistance when the probes are not connected.
3. Take a measurement of resistance when each probe is touching one of your thumbs.

Probe	Ohms
Connected	
Not Connected	
Touching Thumbs	

4. Measure the resistance of the resistor, of the capacitor and the 1.5 V battery. Record your measurements into the column Ohm (+) of the table below. Then take another the measurement with the leads reversed. Record your measurements in the table below in the column Ohms (-)

Component	Ohms (+)	Ohms (-)
Resistor		
Capacitor		
1.5V Battery		

PART 2 – Voltages and Capacitance

Step 1. To measure the DC Voltage across an object set the multimeter to V_{DC}
 To measure the AC Voltage across an object set the multimeter to V_{AC}

5. Take a measurement of both DC and AC voltage with the probes connected to each other (touching).
6. Take a measurement of both DC and AC voltage when the probes are not connected.
7. Take a measurement of both DC and AC voltage when each probe is touching one of your thumbs.

Probe	DC Voltage	AC Voltage
Connected		
Not Connected		
Touching Thumbs		

8. Measure the DC Voltages across the resistor, the capacitor and the 1.5 V battery. Record your measurements into the column DC (+) of the table below. Then take a second measurement with the leads reversed. Record your measurements in the column DC (-).

9. Measure the AC Voltages across the resistor, the capacitor and the 1.5 V battery. Record your measurements into the column AC (+) of the table below. Then take a second measurement with the leads reversed. Record your measurements in the column AC (-).

Component	DC Voltage (+)	DC Voltage (-)	AC Voltage (+)	AC Voltage (-)
Resistor				
Capacitor				
1.5V Battery				

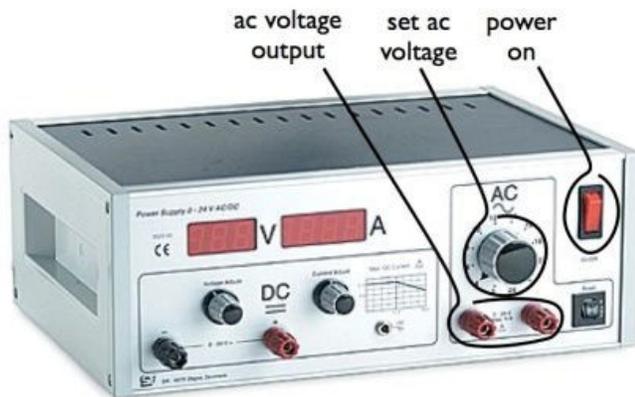
Step 2. To measure the capacitance of an object set the multimeter to F .

10. Measure the capacitance of the capacitor. Its nominal value is $0.1 \mu\text{F}$. Calculate the % error

Nominal	Measured	% error
$0.1 \mu\text{F}$		

PART 2 – Voltage and Power Supply

The power supplies is used to generate DC or AC voltages. Use the dial to select a voltage and relative output plugs. Two models of power supply are available: you can use either one.



Procedure

Step 1. Plug both cables from the multimeter into the AC voltage output terminals.

Step 2. Turn on the power supply and use the dial on the power supply to set different output AC voltages.

Analysis

Record the results of all measurements in the table below.

11. Measure the output AC voltage corresponding to four different AC voltages from the power supply. If you read small values (<1 V for all settings) then the circuit breaker is possibly blown on the power supply. Push the black button below the power switch and try again or check with the TA.

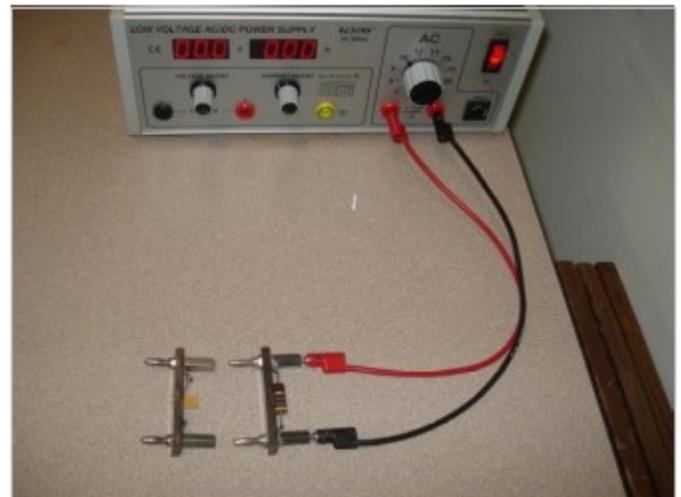
AC Voltage output set on the power supply	AC Voltage reading on the meter

12. Does the voltage setting number match the measured voltage?

13. Does the polarity of the meter matter when measuring AC voltage? Reverse the leads confirm your prediction.

Step 3. Connect a resistor with the AC power supply as shown to the right. Set the AC output = 6 V Measure the AC and DC voltages across it. Input your data in the table below.

Step 4. Connect a capacitor with the AC power supply as shown to the right. Set the AC output = 6 V Measure the AC and DC voltages across it. Input your data in the table below.



14. Table with your data

Component	AC Volts	DC Volts
Resistor		
Capacitor		

TURN OFF YOUR POWER SUPPLY AND MULTIMETER