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Objectives:

This is the first laboratory where you will deal with such matters as the laboratory reports, safety issues, the resistance color codes, the breadboard, the Lab measurement equipment and simulation software.

Equipment and components required:

1. Circuit construction board (Breadboard).
2. D.C. Power Supply Units.
3. Digital Multimeter.
4. Various Resistors.
5. Wire for connections.

Power supply :

It's a DC power supply used to generate constant voltage " CV "or constant current " CI " . In our lab we using these two DC supply models shown below to provide the circuit by voltage or current or both .

Fig. (a)

Fig. (b)

Figure 1 : (a & b) : DC supply models in our lab

Resistor:

It's manufactured to specific amount of resistance (force encountered for flow of charge happened as result of collision between charge & atom's).

The voltage – current relationship of an ideal resistor is given by

$$V = RI$$

where I is the current flowing through the resistor of resistance R when a voltage V is applied across its terminals. A resistor is conventionally drawn as shown in Figure 1. The unit of resistance is the Ohm (Ω).

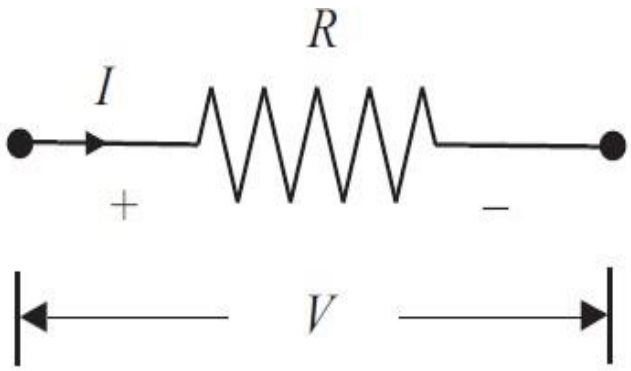
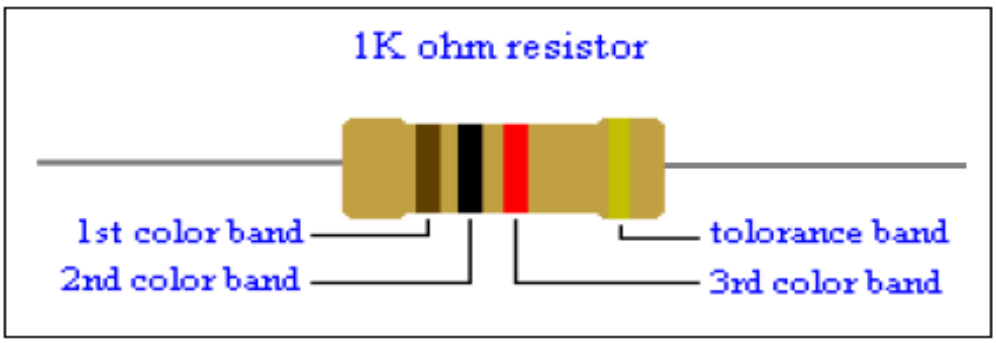


Figure 2: Schematic Representation of a Resistor

The most common resistor is made of carbon and manufactured as a cylinder with axial wire leads. Four colored bands painted around the cylinder body identify the resistance value and its tolerance. The international resistor color code is represented in Figure 3 and Table 1 where the resistance is given by

$$R = AB \times 10^{C} \pm D\%.$$

Figure 3 : Resistor Color Code



Band Color	1st Band #	2nd Band #	*3rd Band #	Multiplier x	Tolerances ± %
Black	0	0	0	1	
Brown	1	1	1	10	± 1%
Red	2	2	2	100	± 2 %
Orange	3	3	3	1000	
Yellow	4	4	4	10,000	
Green	5	5	5	100,000	± 0.5 %
Blue	6	6	6	1,000,000	± 0.25 %
Violet	7	7	7	10,000,000	± 0.10 %
Grey	8	8	8	100,000,000	± 0.05 %
White	9	9	9	1,000,000,000	
Gold				0.1	± 5%
Silver				0.01	± 10 %
None					±20 %

For example, if the color bands from left to right on a resistor are red, violet, orange, and gold, then the resistance is

$$R = \left(27 \times 10^3 \pm 5\%\right)\Omega$$

$$= (27,000 \pm 1,350)\,\Omega.$$

1. Digital Multi-meter :

A multi-meter is a devise used to measure voltage, resistance and current in electronics & electrical equipment.
It is also used to test continuity between to 2 points to verify if there is any breaks in circuit or line.

There are two types of multi-meter Analog & Digital :

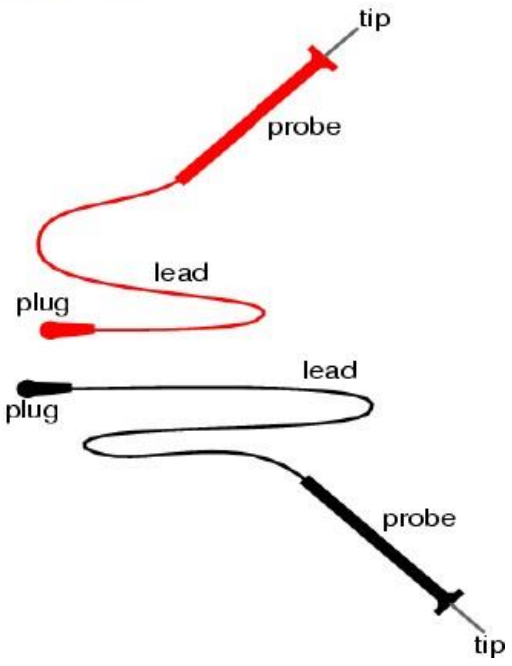
1. Analog has a needle style gauge.
2. Digital has a LCD display (Referenced during our lab)

Meter leads

•**Red** meter lead
Is connected to Voltage/Resistance or amperage port
Is considered the positive connection

•**Probes**
Are the handles used to hold tip on the tested connection

•**Tips**
Are at the end of the probe and provides a connection point



•**Black meter lead**
Is always connected to the common port
Is considered the negative connection

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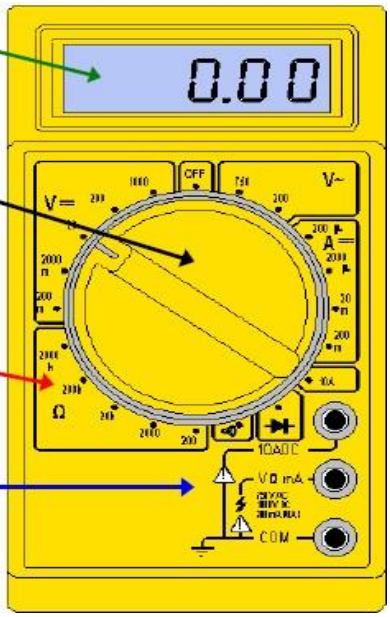
Display & Dial Settings

- **Digital Display**
  Shows measured value.
- **Meter Dial**
  Turn dial to change functions.
  Turn dial to OFF position after use.
- **Panel Indicator**
  Shows each function and setting range to turn dial to.
- **Probe Connections**
  Specific for each function.



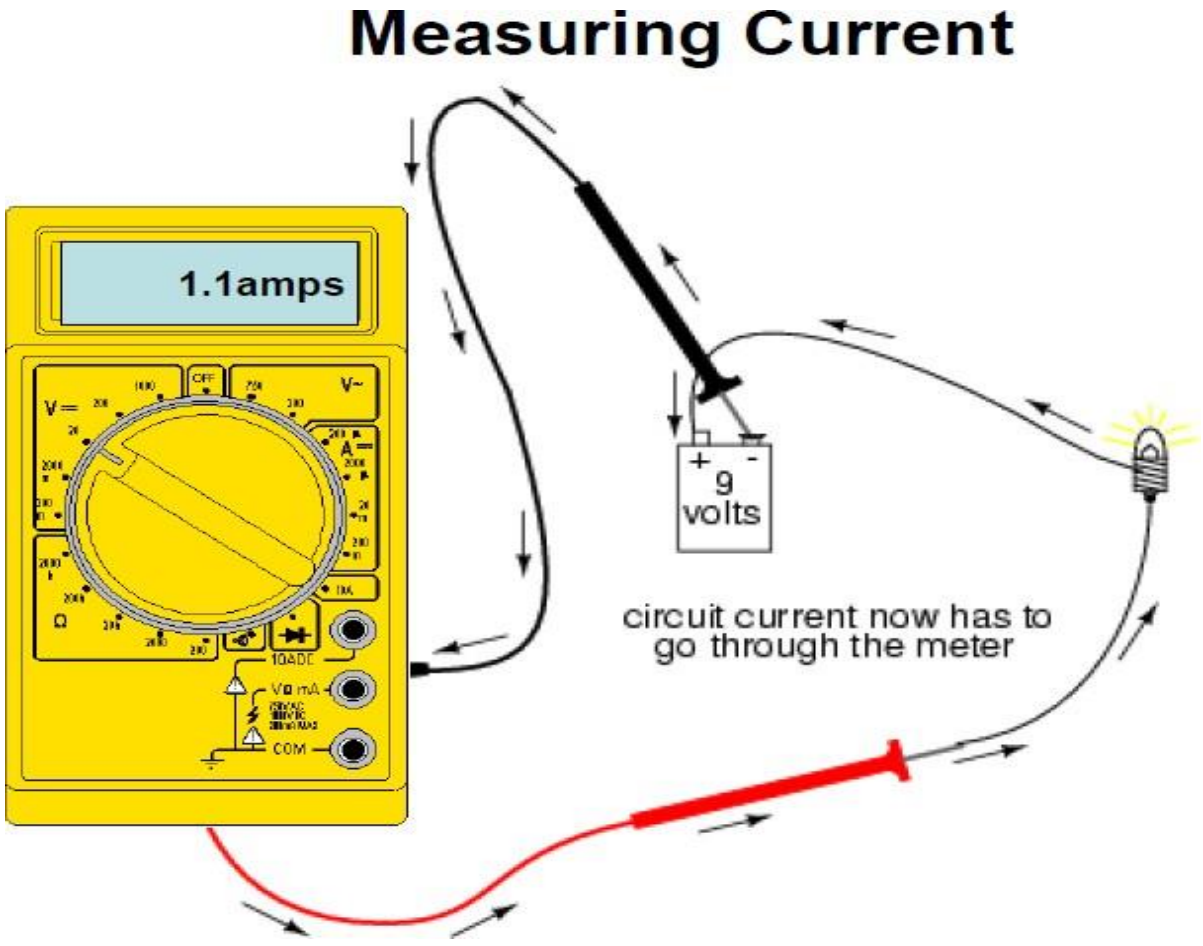
Common DMM Symbols

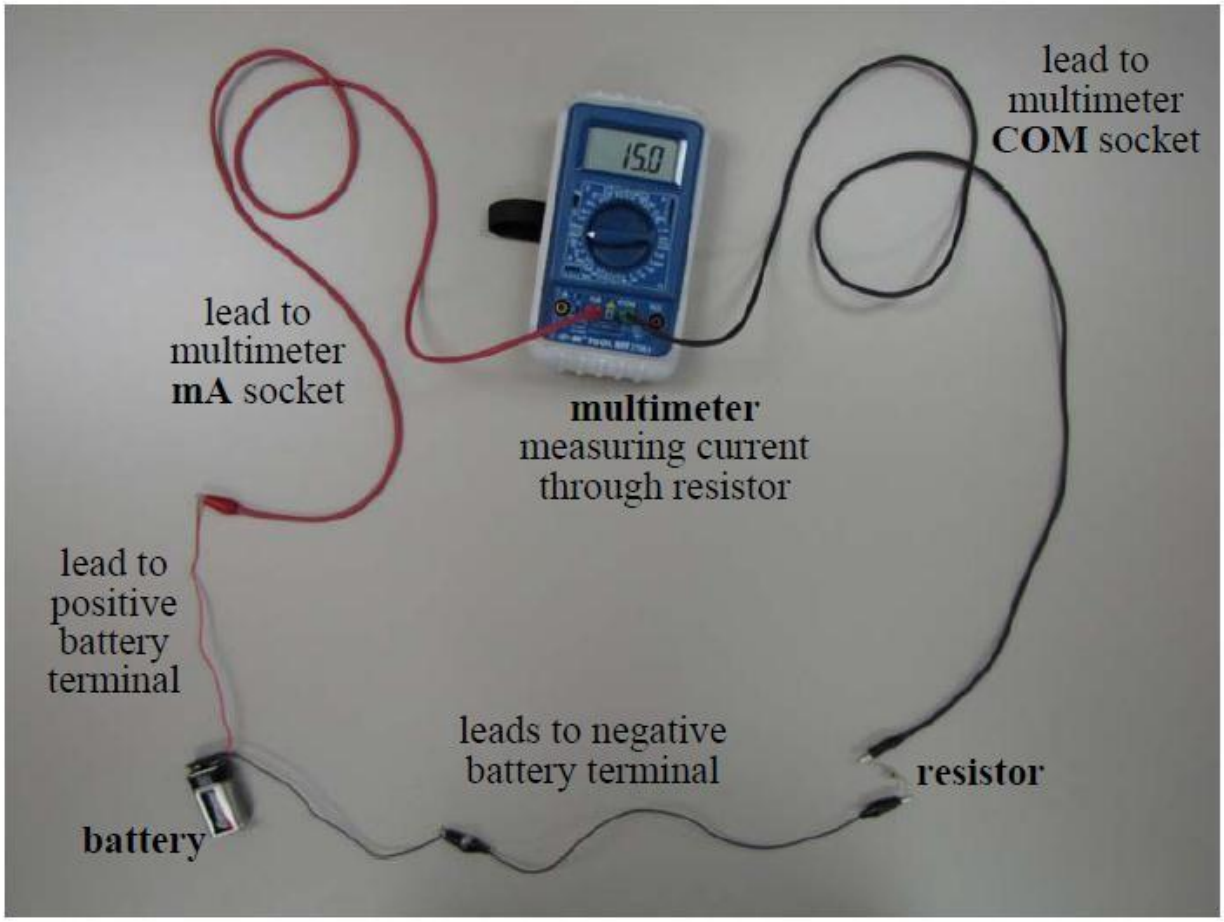
~	AC Voltage		Ground
⎓	DC Voltage	⊣(	Capacitor
Hz	Hertz	µF	MicroFarad
+	Positive	µ	Micro
—	Negative	m	Milli
Ω	Ohms	M	Mega
→|	Diode	K	Kilo
•)))	Audible Continuity	OL	Overload

These symbols are often found on multimeter and schematics.
They are designed to symbolize components and reference values.

The current is the amount of charge flowing through a conductor per unit time, and is measured in amperes, A (1A = 1 coulomb/sec).

The current, I, through a resistor R can be measured with an ammeter (multi-meter set to measure current) connected in series with the (resistor or load). Note that the same current flows in both the ammeter and the resistor. In typical use, the ammeter resistance is much smaller than the resistor resistance, so adding the ammeter to the circuit has little effect on the current.



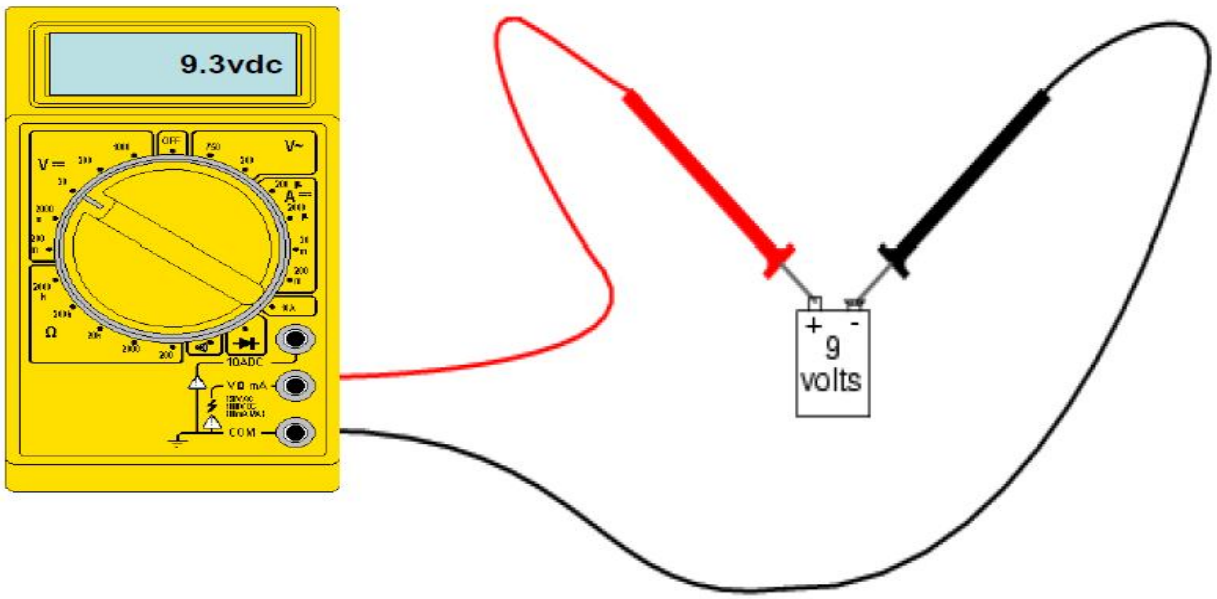


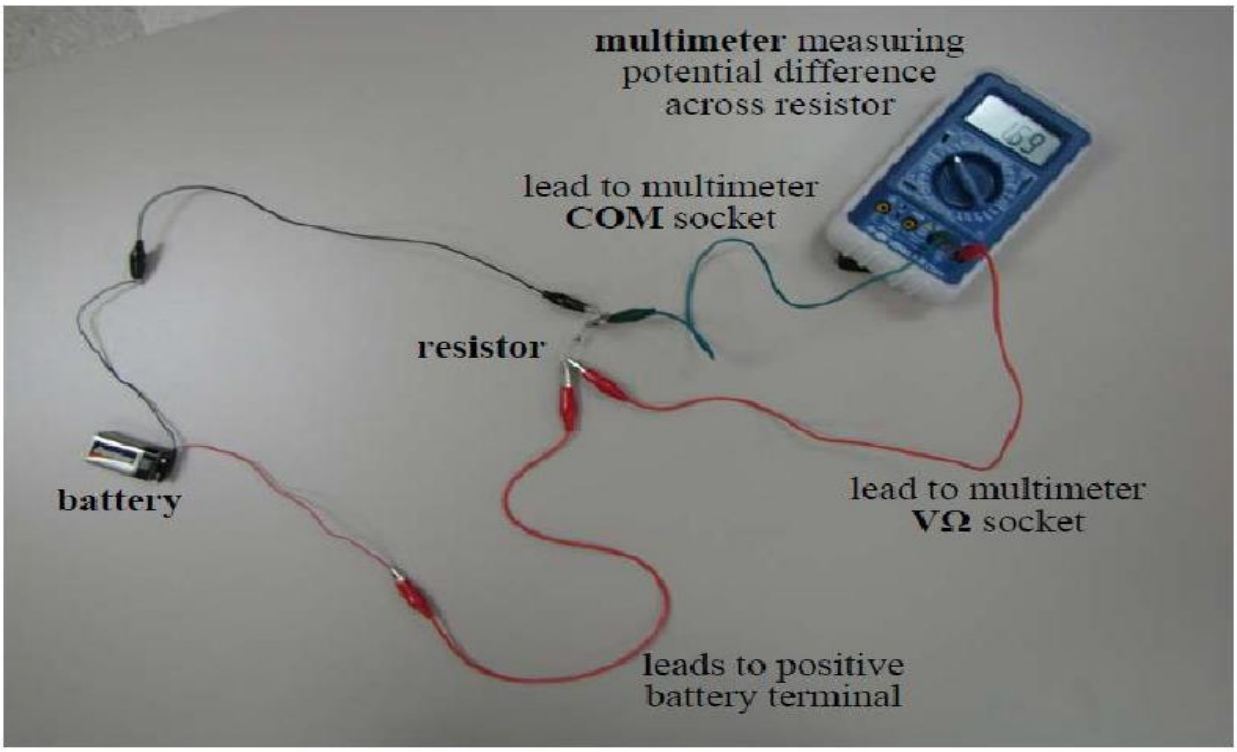
Circuit with Multimeter in Series with Resistor to Measure Current **through** the Resistor

The potential difference (or voltage) is the energy liberated per unit charge flowing through the circuit. It is measured in volts, so that 1 volt

= 1 joule/coulomb. The potential difference, V, between the ends of the resistor can be read on a voltmeter (multi-meter set to measure potential difference, V) connected in parallel with the (resistor or load
). Note that actually a small fraction of the current is diverted through the voltmeter, but for a good voltmeter this current should be negligible compared with the current, I, through the resistor.

Measuring Voltage





Circuit with Multimeter Measuring Potential Difference (Voltage) **across** the Resistor.

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Discussion:

1. Determine the value and tolerance of the resistors shown in the following figure.

2. *Record resistor colors gave to its value in below :*

4.7 KΩ±5% , 910Ω ±10% , 12 Ω ±5%, 6.8KΩ ± 20%

Enumerate *the all types of Resist*or