

Experiment No: M4

Experiment Name: "Electric Circuits"

Objective:

1. Comparing the values of the resistors by reading them using the "Resistor Color Code" and measuring them with a multimeter.
2. Calculating equivalent resistances and drawing circuit diagram

Keywords:

Resistor, equivalent resistance, Resistor Color Code, circuit diagram

Theoretical Information:

"**Resistance**" is a term used in electricity and electronics, which signifies the electrical resistance of a material or component. Resistance measures a material's ability to resist the flow of electrical current and is measured in ohms (Ω).

Resistance is used in electrical circuits to control current, reduce voltage, enable temperature sensors, and in many electronic applications. Resistance is typically achieved through components called resistors. A resistor typically has a specific ohm value determined by its size, material, and shape.

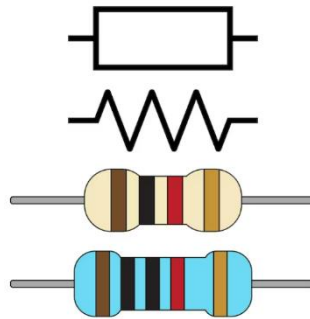


Figure 1 . Representation of resistance with various symbols

The resistance of a wire can be expressed as

$$R = \frac{\rho L}{A} \quad (1)$$

ρ , resistivity

L , length

A , area

A reference tool used to determine the values of resistors based on their color-coded bands is called a “**Resistor color code chart**”. In electronic circuits, resistors are often marked with color bands to indicate their resistance values and tolerances.

Typically, resistor color codes use a set of four or five colored bands. Four-band codes are commonly used for carbon film resistors, while five-band codes are used for metal film or precision resistors. Here's an example of a four-band resistor color code and their meanings:

- 1st Band (First Band): The first band represents the first digit of the resistance value.
- 2nd Band (Second Band): The second band represents the second digit of the resistance value.
- 3rd Band (Multiplier): The third band represents the multiplier that determines the power of ten by which the first two digits are multiplied to get the resistance value.
- 4th Band (Tolerance): The fourth band indicates the tolerance or accuracy of the resistor's value. Common tolerance values are $\pm 1\%$, $\pm 5\%$, and $\pm 10\%$.

By interpreting the colors of these bands, you can determine the resistance value and tolerance of a resistor according to the color code chart. This information is crucial when selecting and using resistors in electronic circuits.

Equivalent resistance, also known as total resistance, refers to the total resistance value in an electrical circuit when multiple resistors are connected together, either in series or in parallel. It simplifies a complex circuit into a single resistor that has the same effect on current flow as the original arrangement of resistors.

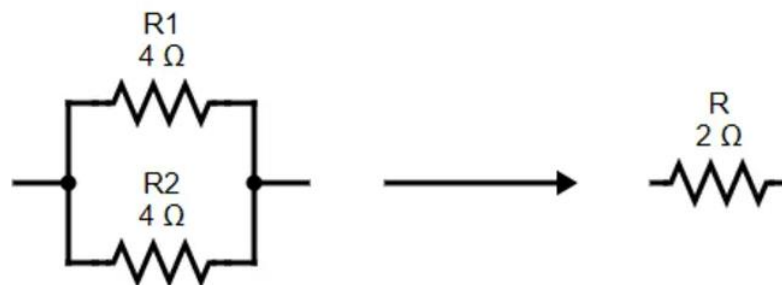


Figure 2. *Equivalent resistance*

Finding the equivalent resistance is useful for simplifying complex circuits for analysis, making circuit design more manageable, and determining overall current and voltage characteristics in a circuit.