

Chapter 1-2

POWER, RESISTORS and SYMBOLS

ACMA Foundation Syllabus 3.5 and 3.6

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Electricity.

Electric Power

The rate of doing work in an electrical circuit is termed *electrical power* and is measured in watts. A common misconception is that electric power is supplied to your house. In reality “electrical energy” is traded and delivered to your house.

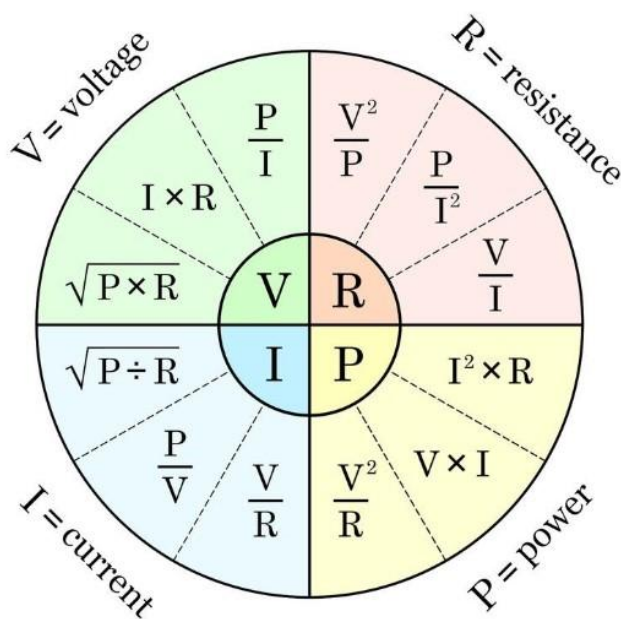
The first place you probably encountered watts is in light bulbs. Brake lights in cars are around 20 watts and taillights are around 10 watts. From this we now know that the higher the wattage of the bulb, the brighter it is.

The formula for electrical power in a resistive circuit is shown below.

$$P = I \times E \quad P = I^2 \times R \quad P = \frac{E^2}{R}$$

P = electrical power in watts
 I = current in amperes
 E = electromotive force in volts
 R = resistance in ohms

Ohm's law tied I, E and R together. So now if we know two of the quantities, we can calculate the other. This relationship is depicted in the formula circle below



Examples:

1. What power is dissipated when 12 V is applied across a load with 0.5 A flowing?

$$P = I \times E = 0.5 \times 12 = 6 \text{ W}$$

2. What power is dissipated when 2 A flows through a 10 Ω load?

$$P = I^2 \times R = 2^2 \times 10 = 4 \times 10 = 40 \text{ W}$$

3. What power is dissipated when 12 V is applied to a 10 Ω load?

$$P = \frac{E^2}{R} = \frac{12^2}{10} = \frac{144}{10} = 14.4 \text{ W}$$

There is a video explaining the derivation of the power formulae from Ohms Law. Go [HERE](#).

Electric Energy

Electrical energy, opposed to electrical power, is generated by central power stations and is usually provided for public consumption through a grid system.

Electrical energy is measured in the unit kilowatt-hour (kWh). One kilowatt of power for one hour and this is the common billing unit for electrical energy.

Resistors

Resistor ratings

Resistors are a common component in electronics and the resistor is described by its resistance and the power it can dissipate in watts.

Small sized resistors are usually carbon, but high wattage resistors are usually wire wound with heatsinks to dissipate the heat.

Resistors with power ratings of more than 1W are usually referred to as power resistors, resistors and specifically for their power dissipating abilities.

The value of a resistor is displayed by colour bands on the resistor.

Resistors come in various designs.

Fixed Resistors

Are resistors whose value is predetermined and marked with colour bands.



Variable Resistor (Sometimes called a Potentiometer or Pot)

Is a resistor whose value can be varied through a specified range.



Wire Wound Resistors

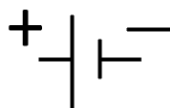
These are usually special resistors designed to dissipate a lot of heat.



Electronic Symbols

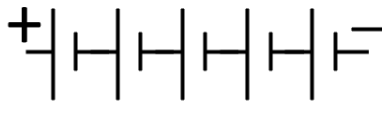
Conductors (Wires) Represented by lines. 

Cell

 A cell is a single unit of a battery.

Hint: The larger vertical strip on the symbol could be broken to make a plus sign.


Battery

 A collection of cells.

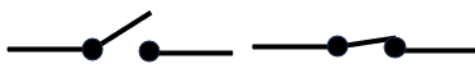
Resistor

 Usually identified by R and the size e.g. R1 330 (300 Ω)

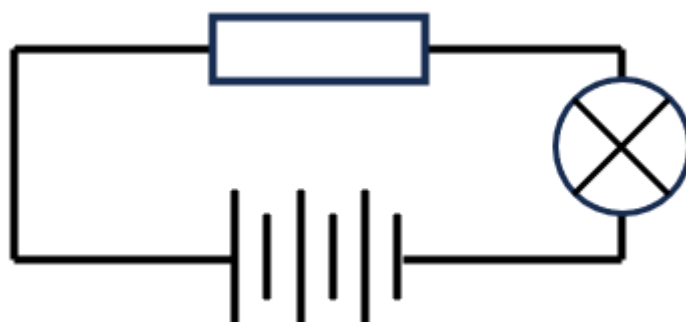
Lamp

 Usually identified by voltage and wattage e.g. 12 V 10 W.

Switch


Open Closed

Circuit Diagram



Other symbols from page 87 in the manual.

Fuse

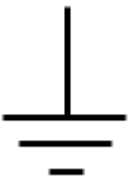


Fuses are rated in amperes (amps) and voltage e.g. 12 V 2 A

Antenna (Must know)



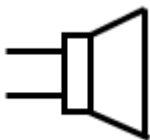
Earth (Must know)



Microphone



Speaker



Go to the Chapter 1-2 Questions.

Have fun and stay safe.