

Introduction to Robotics

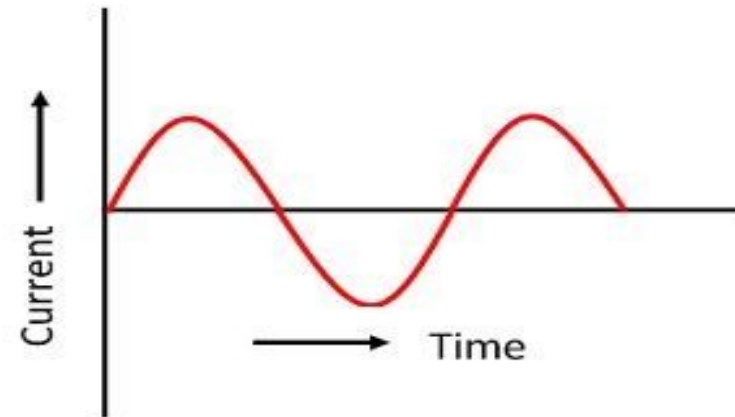
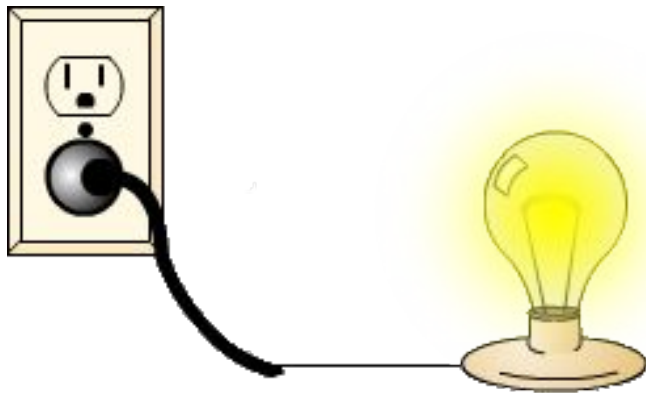
Electronics in Robotics

Topics to Covered

- ✓ Electricity
- ✓ Voltage
- ✓ Electronic Circuit
- ✓ Resistor
- ✓ Capacitor
- ✓ Inductor
- ✓ DIODE
- ✓ LED
- ✓ Transistor
- ✓ Integrated Circuit

Alternative current: AC

The direction of current in an alternating current is always changed. The frequency of alternating current in our country is 50 Hz. In daily life we usually run TV, fan, tube light, AC etc. through alternating current

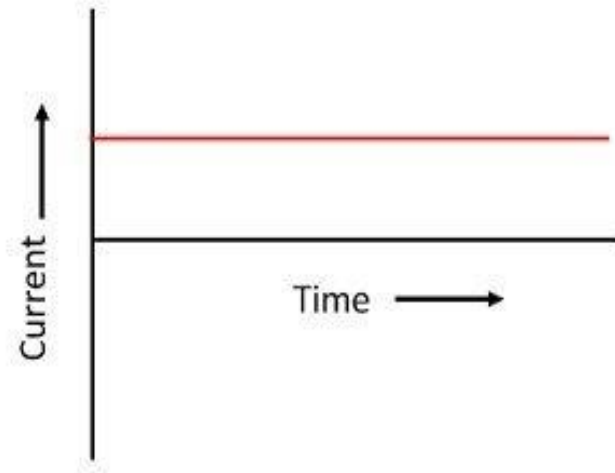


Alternating Current Wave

Circuit Globe

Direct current: DC

Direct current does not change the direction of current, it always flows in the same direction. Electrical energy can be stored through direct current. Which we call battery.



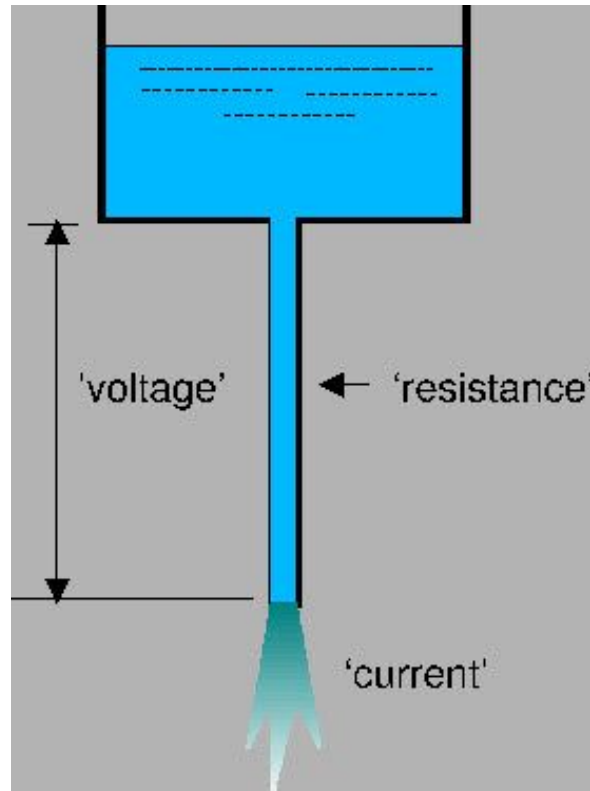
Direct Current

Circuit Globe

Voltage

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Voltage is a type of electrical pressure. The amount of potential energy between two points on a circuit is called voltage. The unit of voltage and the symbol is V. By a voltmeter we can measure the voltage.



Electronic Circuit

Electronic circuit is the path of flow of electricity.

There are two types of electronics circuit:

1. Series circuit
2. Parallel circuit

Series Circuit:

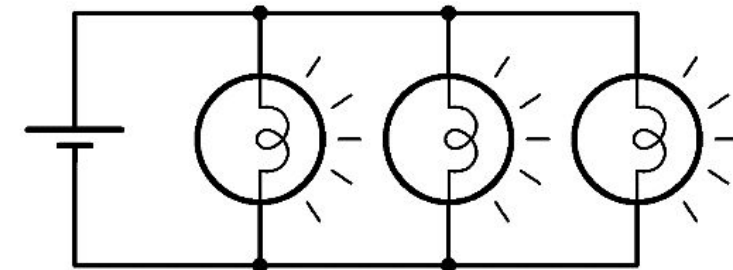
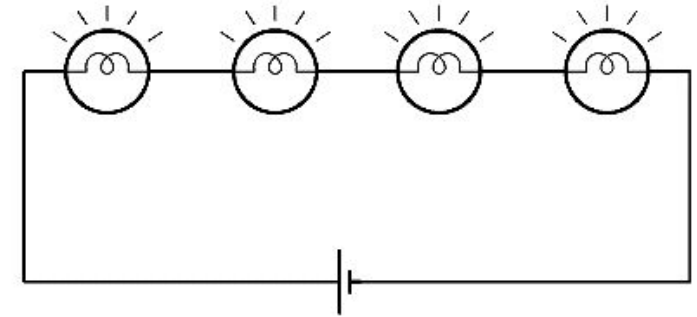
When multiple loads are connected one after the other to an electrical source, there is only one path of current flow, called a series circuit. In series circuit,

1. The same current flows through each load.
2. The sum of the voltage drops of all the loads is equal to the source voltage.
3. The sum of the resistances of the loads is equal to the total resistance.

Parallel Circuit:

One end of each of the multiple loads is connected to a common point and the other ends are connected to another common point which creates multiple paths for current flow, called parallel circuit. In parallel circuit,

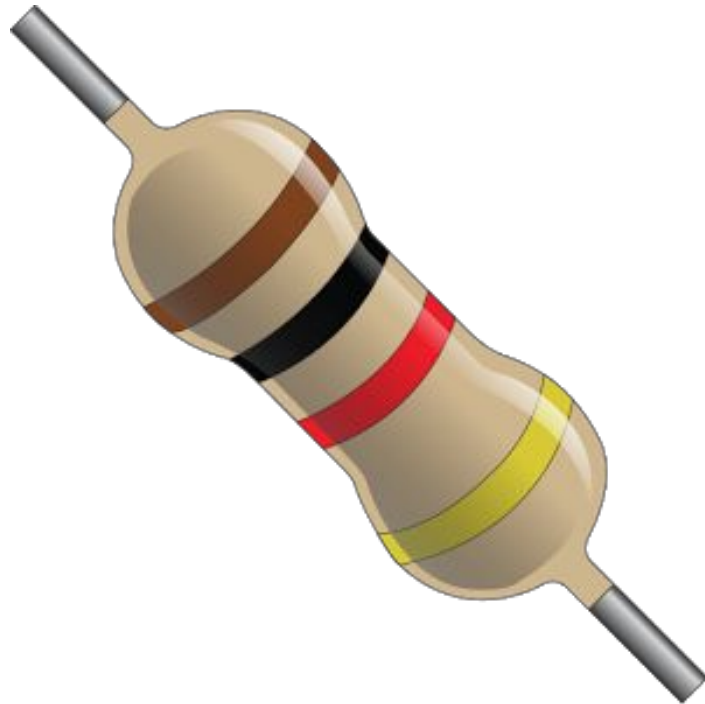
1. The voltage at each load is equal.
2. The current is different in each load.
3. The sum of the current of each load is equal to the total current of the circuit.



Resistors

Resistor:

A resistor is a two-way passive electronics device that blocks the flow of electricity in a circuit. Resistance is expressed by R . Its unit is ohm (Ω). There are two types of resistor



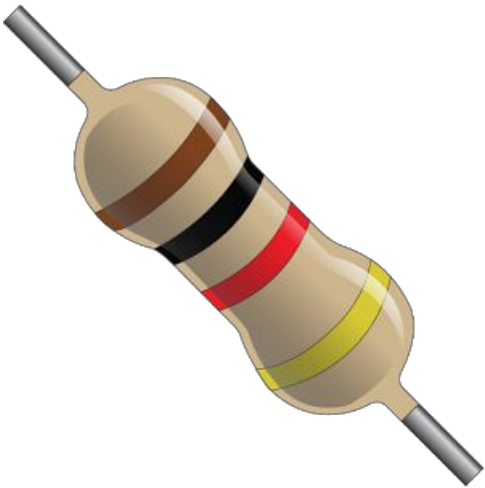
Resistor



Circuit Symbol

Fixed resistor:

Resistors whose value is specified during production cannot be changed later are called fixed resistor.



Circuit Symbol

Variable Resistor:

Resistors whose values can be changed as needed are called variable resistors.



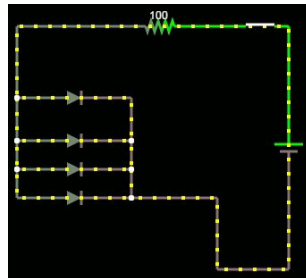
Circuit Symbol



Resistors

Fixed resistor: resistors whose value is specified during production cannot be changed later are called fixed resistor.

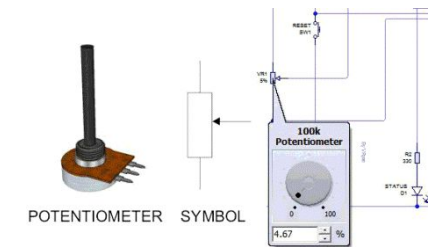
This is the physical device look like and this is the circuit symbol of the fixed resistor. In this circuit a resistor is used to limit the current, you will noticed here, before resistor the flow of current is high and after resistor flow of current us low.



Variable Resistor:

Resistors whose values can be changed as needed are called variable resistors.

This is the physical device look like and this is the circuit symbol of variable resistor. The resistivity of the variable resistor can changed by a movable nov.



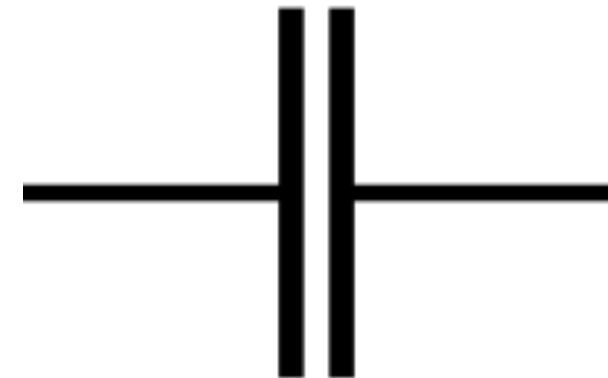
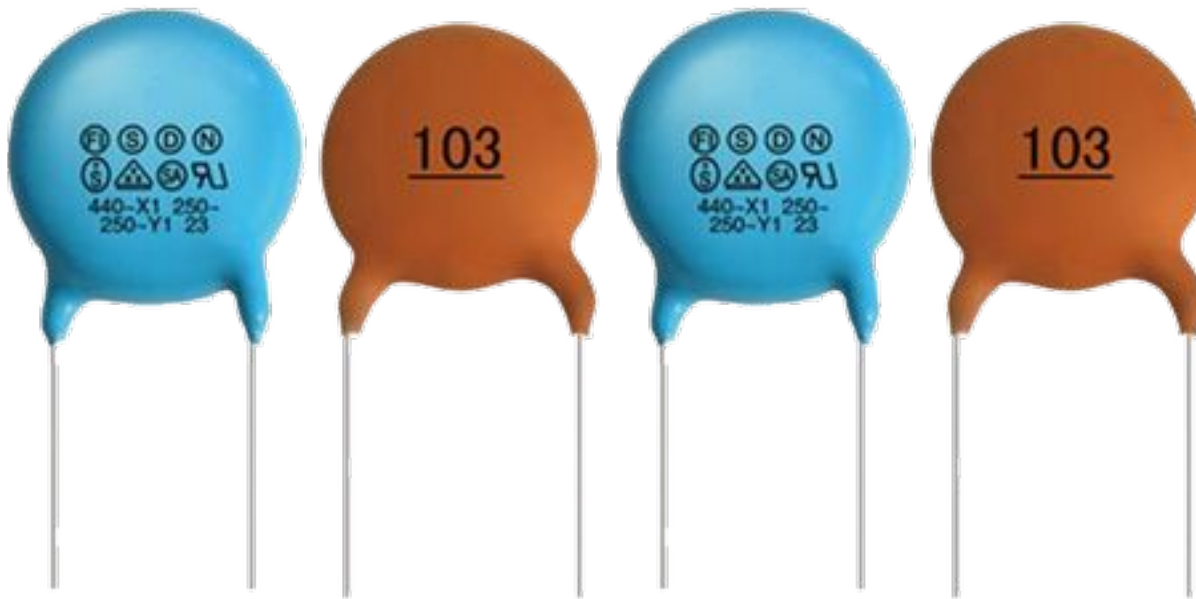
Capacitor

The device that is formed by separating the two plates by placing an insulating material between two conductive plates is called a capacitor. Capacitors can be compared to rechargeable batteries, which have the ability to hold a small amount of charge. The unit of capacitor is Faraday (F).



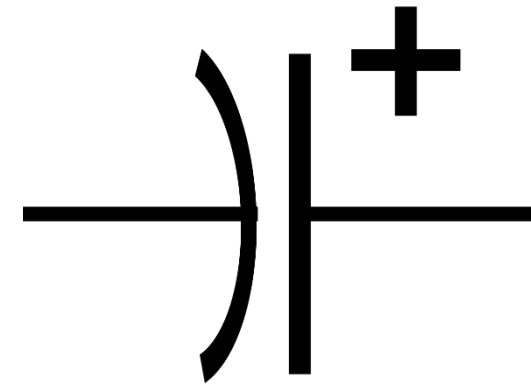
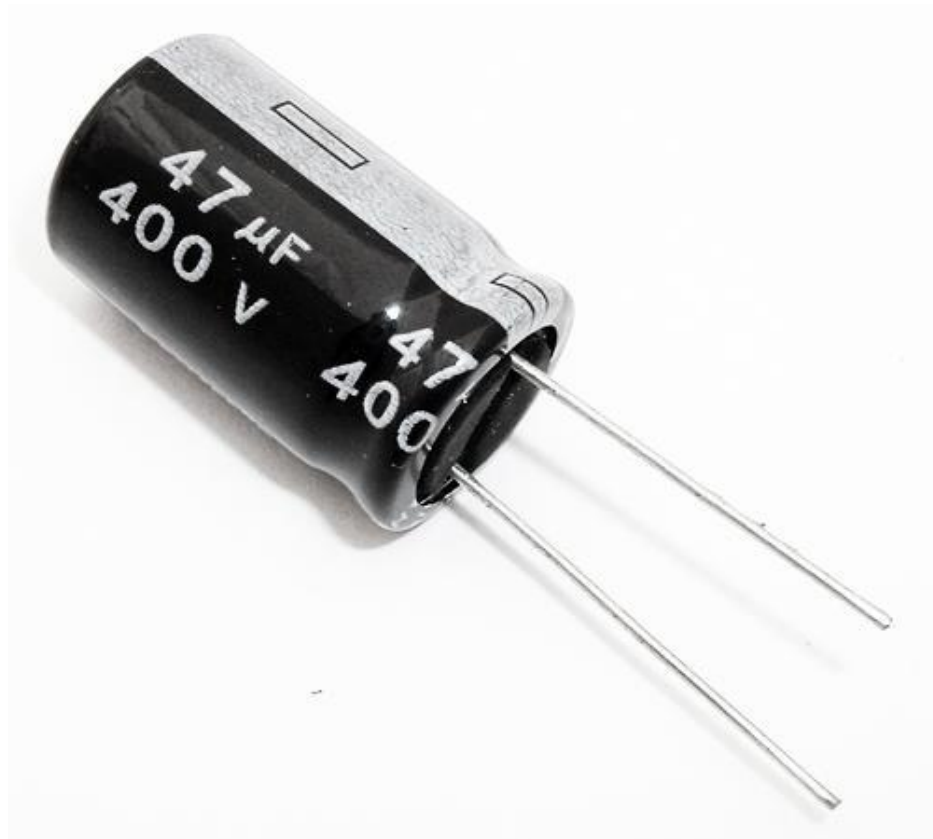
Ceramic capacitor

A ceramic capacitor is a fixed-value capacitor where the ceramic material acts as the dielectric. There is no polarity here. We can use this for both AC and DC signal.



Electrolytic capacitor

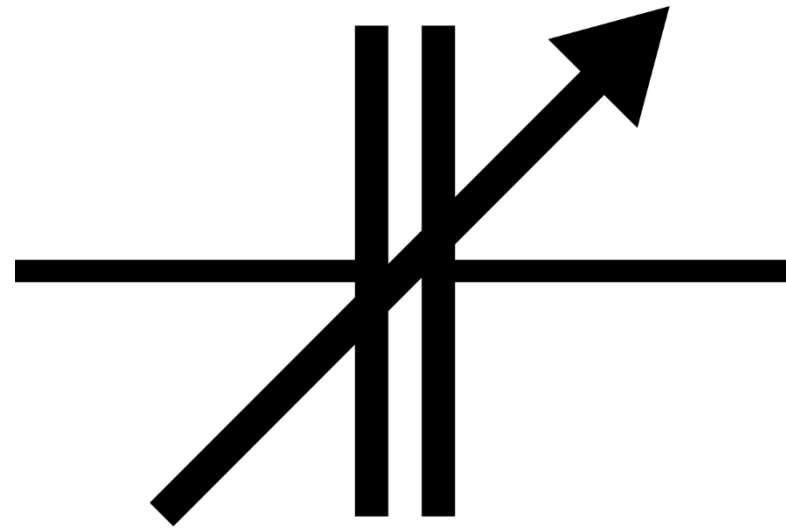
Electrolytic capacitor is a polarized capacitor, It has high capacity to produce more capacitance in less space. This capacitor only can use in DC circuits.



Circuit Symbol

Variable capacitor:

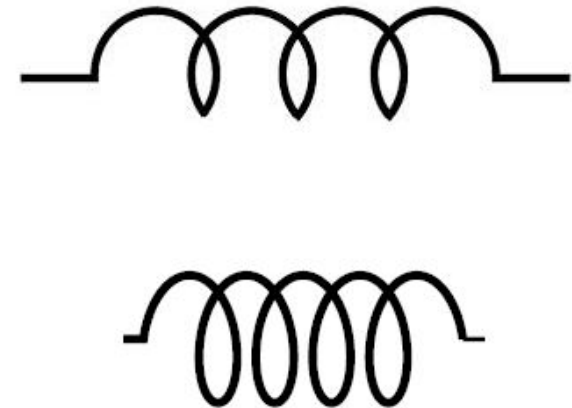
The value of this type of capacitor can be increased or decreased as required. It is basically a combination of many plates. The plates are arranged with movable nov. The value of the capacitor can be reduced or increased by rolling the nov. This type of capacitor is mainly used for tuning purpose.



Circuit Symbol

Inductor

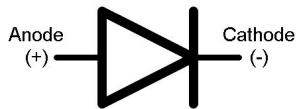
An inductor is a passive electronic component that stores energy in the form of a magnetic field. In its simplest form, an inductor consists of a wire loop or coil. The inductance is directly proportional to the number of turns in the coil. Inductance also depends on the radius of the coil and on the type of material around which the coil is wound.



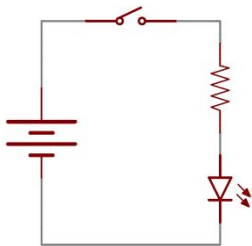
Diodes

Diode:

A diode is a two-end electronic device that allow the flow of electricity in one direction in a circuit only. This tendency to flow in one direction is called rectification which helps in the formation of DC current from AC current.



General Purpose diode



LED

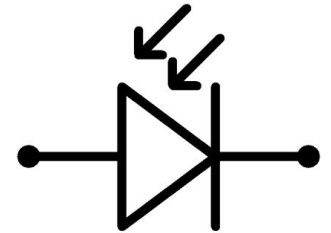
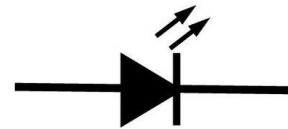


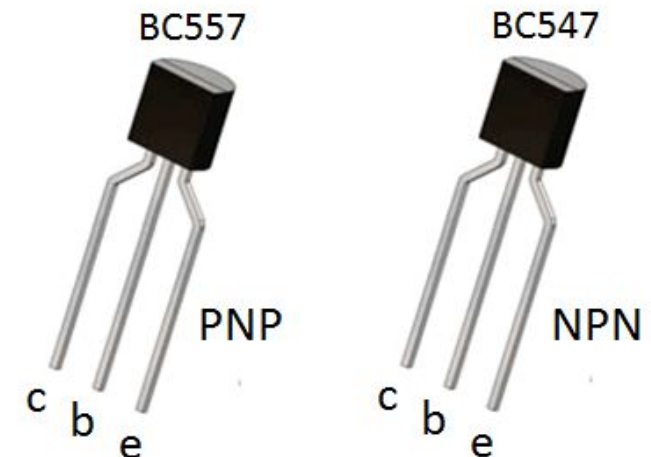
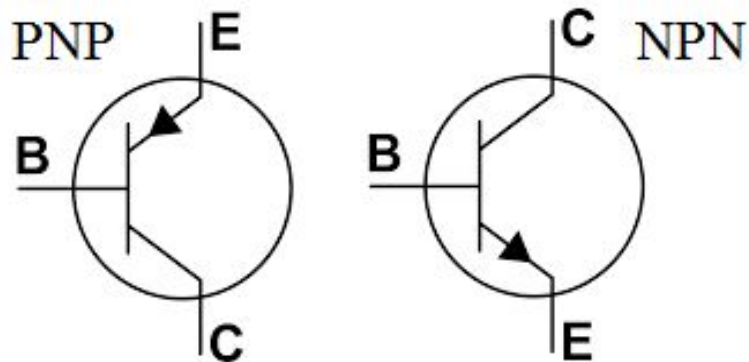
Photo Diode

Transistor

A transistor is a semiconductor electronic device used to amplify or switch electrical signals and electrical power. Transistors are made by placing an N-type semiconductor between two P-type semiconductors or a P-type semiconductor between two N-type semiconductors.

There are two types of transistors according to their structure

1. PNP Transistor (PNP Transistor)
2. N.P.N. Transistor (NPN Transistor)



Integrated Circuit (IC):



Integrated Circuit (IC):

Integrated Circuit is a set of one or more electronic circuits. Which consists of thousands or millions of tiny resistors, capacitors and transistors. Integrated circuits are also called chips or microchips. That are used to make electronics devices more efficient and smaller in size. Before using any IC, you must read its datasheet well, otherwise any kind of accident can happen.



Thanks all