



Electric Circuits & Circuit Diagram

Introduction to Electric Circuits

An electric circuit is a closed path that allows electric current to flow through it. Electric circuits are fundamental in electrical and electronic systems, enabling the operation of various appliances and devices. The essential components of an electric circuit include:

- A power source (such as a battery or cell) that provides electrical energy.
- Conducting wires (usually made of copper) to carry the current.
- Electrical appliances (like a bulb, fan, or motor) that utilize the current.
- A switch to control the flow of electricity.

Understanding Electric Current

Electric current refers to the movement of charge carriers (usually electrons) through a conductor. It flows from the positive terminal of the power source, passes through the circuit components, and returns to the negative terminal.

Role of Switches in Circuits

A switch controls the flow of electricity by either allowing or stopping the current. When the switch is closed (ON), the circuit is complete, and electricity flows, enabling devices to function. When the switch is open (OFF), the circuit is broken, and no current flows.

Historical Contributions to Electricity

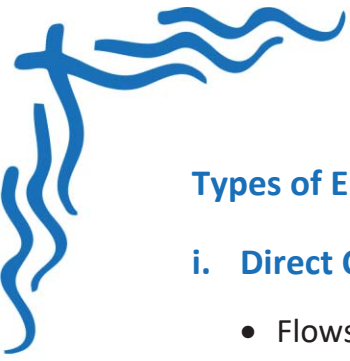
Hans Christian Oersted: Discovered the relationship between electricity and magnetism, forming the foundation of electromagnetism.

Michael Faraday: Demonstrated electromagnetic induction, crucial for transformers and electric motors.

Thomas Edison: Developed practical electric lighting systems and direct current (DC) applications.

Nikola Tesla: Pioneered alternating current (AC) technology and induction motors.

William Sturgeon: Invented the electromagnet and explored its technological applications.



Types of Electric Current

i. Direct Current (DC):

- Flows in a single direction.
- Provided by batteries and cells.
- Used in electronic devices, flashlights, and portable gadgets.

ii. Alternating Current (AC):

- Changes direction periodically.
- The standard form of electricity supplied to homes and industries (50 Hz or 60 Hz frequency).
- Used in appliances, power transmission, and industrial machines.

Components of an Electric Circuit

- Power Source (Cell or Battery):** Provides electrical energy for the circuit.
- Conducting Wires:** Connect the components and allow current to flow.
- Electrical Appliances:** Devices that use electricity (bulbs, fans, motors, etc.).
- Switch:** Controls the connection and disconnection of the circuit.

Working of an Electric Circuit

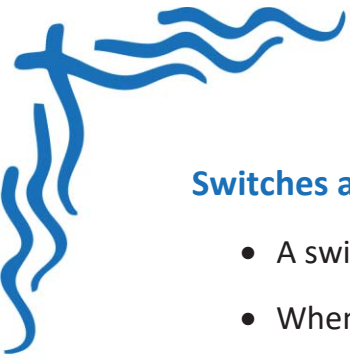
When the circuit is complete, electrical energy is transferred from the power source to the device, causing it to operate.

In a flashlight circuit, the dry cell stores chemical energy, which is converted into electrical energy when the switch is closed. This electrical energy is further converted into light energy by the bulb.

Batteries and Cells

A battery consists of one or more cells. A cell contains a chemical substance that generates electrical energy. Each cell has positive and negative terminals.

- Batteries are used in toys, remote controls, torches, etc.
- When multiple cells are connected in series (positive terminal of one cell connected to the negative terminal of the next), they form a battery, increasing the voltage.



Switches and their Function

- A switch or key is a device used to control the circuit.
- When the switch is ON, it allows current to pass.
- When the switch is OFF, it breaks the circuit, stopping the current flow.

Conducting Wires

Conducting wires are made of materials like copper or aluminum due to their high conductivity.

They connect different circuit components, ensuring efficient current flow.

Circuit Diagram

A circuit diagram represents an electric circuit using standard symbols:

Cell: Longer line represents the positive terminal, shorter line represents the negative terminal.

Battery: Combination of cells.

Switch: Depicted as open (OFF) or closed (ON).

Bulb: Shown with a filament symbol.

Ammeter: Measures current flow in amperes (A).

Voltmeter: Measures voltage across a component (V).

Heating Effect of Electric Current

When electric current passes through a conductor, it faces resistance, generating heat.

Metals like copper and silver have low resistance and do not heat up significantly.

Alloys like tungsten and nichrome have higher resistance, generating more heat.

Appliances like electric heaters, irons, and geysers use this principle.

Electric Fuse

An electric fuse is a safety device that protects circuits from excessive current flow.

- It contains a wire made of low-melting alloy.
- When the current exceeds the safe limit, the fuse wire melts and breaks the circuit, preventing damage and fire hazards.



Modern Circuit Protection – MCB

- Miniature Circuit Breakers (MCB) are used in modern electrical systems.
- They act like a fuse but can be reset instead of being replaced.
- When the current exceeds the limit, the MCB automatically cuts off the supply, preventing electrical hazards.

Summary of Key Terms

- **Alloys:** Combination of metals to enhance properties like conductivity and strength.
- **Filament:** A thin wire that glows when electric current passes through it (used in bulbs).
- **Electric Circuit:** A complete path that allows current to flow.
- **Switch:** A device used to control the flow of electricity.
- **Electric Fuse:** A safety device that prevents overloading and short circuits.