Automatic control system by using the boat to remove garbage from the water

A Project submitted in partial fulfillment of the requirements for the Award of Degree of
Bachelor of Science in Electrical and Electronic Engineering

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Certification

This is to certify that this project and thesis entitled "**Automatic control system by using the boat to remove garbage from the water** " is done by Name: Md. Nayamothullah (ID: 153-33-2850) and Name: Mohammad Harun (ID: 153-33-2886), under my direct supervision and this work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

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DEDICATION

I dedicate this Project to our teacher **Engr.Mohammad Mahmudur Rahman).** I hope that this achievement will complete the dream that you had for me all this many years ago when you chose to give me the best education you could.

Table of content:

List of Abbreviations

IC =Integrated Circuit

PCB=Printed Circuit Board

FET= Field Effect Transistor

AC= Alternating Current

V= Volts

Hz= Hertz

DC= Direct Current

SPDT= Single Pole Double Throw

NPN= Negative Positive Negative

PNP =Positive Negative Positive

PN =Positive Negative

LED =Light Emitting Diodes

UK =United Kingdom

OHT =over Head Tank

(UGT GND K)= under Ground Tank Ground Kilo Ohms

List of Symbols

Symbol	Elaboration
Ω	Ohms
µF	Microfarad
nF	Nanofarad
?t	Time Phase
°C	Degree Celsius

ACKNOWLEDGEMENT

It is a great pleasure for authors to express their unfettered gratification, sincere appreciation and profound respect to our respective supervisor **Engr. Mohammad Mahmudur Rahman)**, Senior Lecturer, Department of Electrical & Electronic Engineering, Daffodil International University, for his constructive suggestion, scholastic guidance, constant inspiration, valuable advices and kind cooperation for the successful completion of work on "Automatic water level control with an automatic pump control system". This could not be possible without his help. Space does not allow us to mention each person by name, but we are deeply grateful to everyone associated with this project and thesis. We also wish to complement all our respective concern teachers & staffs of our department of their direct and indirect assistance at different times.

ABSTRACT

Water garbage, the most concerning topic of the current world. Our rivers are polluting in many ways. However, the main reason of pollution is considered by throwing industrial waste to water. The rate of pollution is increasing such an alarming growth that we should have to find the way to solve this problem immediately to give a better world to our future generation. With that hope we have developed a Boat by which we can automatically remove the garbage from water rapidly and save the water from garbage pollution.

This Boat is structured with hardboard and a DC 12 volt motor has been installing to run automatically. There have a switching section unit where we can **start, off and control the speed** of the Boat. In front side of the Boat, we have used a net to filter and withdraw the garbage from the water. The filtered garbage will be kept in a Bin which was placed on the Boat.

CHAPTER-1

INTRODUCTION

1.1 Introduction

The project “Automatic control system by using the boat to remove garbage from the water” is design to remove garbage from the water. Because day-by-day increase garbage in the water. it is a great threat for our country. Despite environmental regulations that protect the quality of streams, lakes, and wetlands, solid waste in the form of trash, litter, and garbage often ends up in these surface waters. Because surface waters collect in low-lying areas, anything that is dropped or blown into a watershed can eventually reach a drainage way. In urban areas, trash and litter (general terms for dry solid waste) often are transported by storm water runoff. In both urban and rural areas, these items sometimes are illegally dumped directly into a water body or wetland, or deposited along riverbanks or lakeshores. Trash also comes from people who fish or participate in other forms of water-related recreation. Regardless of source or type, trash is a form of water pollution.

Ironically, in some circumstances, some discarded items (e.g., tires, plastic containers, and nonorganic construction debris) provide habitat for aquatic organisms. However, trash items are unsightly and are a sign of human neglect or disregard for aesthetic values and natural ecosystems. Despite increased environmental awareness, some people still use waterways as a repository for unwanted items, including couches and mattresses; cars and car parts; bicycles; shopping carts; bags of stolen property; fuel containers; and paint cans.

The most common litter in U.S. streams is household trash, including plastic cups, plastic bags and wrapping materials, fast-food wrappers, plastic bottles, and other plastic containers. Plastics can be especially hazardous to wildlife. Depending on their form they can either be ingested, causing internal organ failure, or they can cause a slow strangulation.

1.2 Objectives

1. To design this project for removing garbage from the water.
2. To protect the water from pollution.
3. To prevent over labor by the project.
4. To Design a simple circuit and find a suitable system for this project.

1.3 Scope of Work

Several scopes and guidelines are listed to ensure the project is conducted within its intended boundary. This is to ensure the project is heading to the right direction to achieve its intended objectives.

The first scope of this project is to understand theoretical aspect of voltage control circuit is including working principles, characteristic of the transistor, and quality. From the analyses of transistor is chosen to make the system work properly.

Meanwhile, the second scope of this project is the development of a strong range finder system. Base on the investigation that previously done, some application of a certain part.

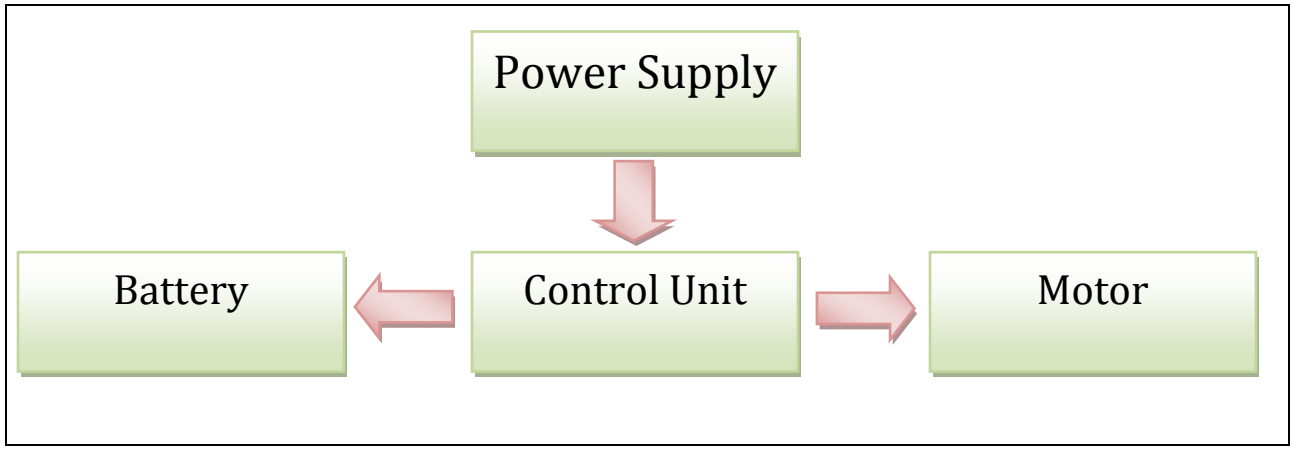


Figure-1: Block diagram of automatic garbage remover

Complete circuit diagram of this project:

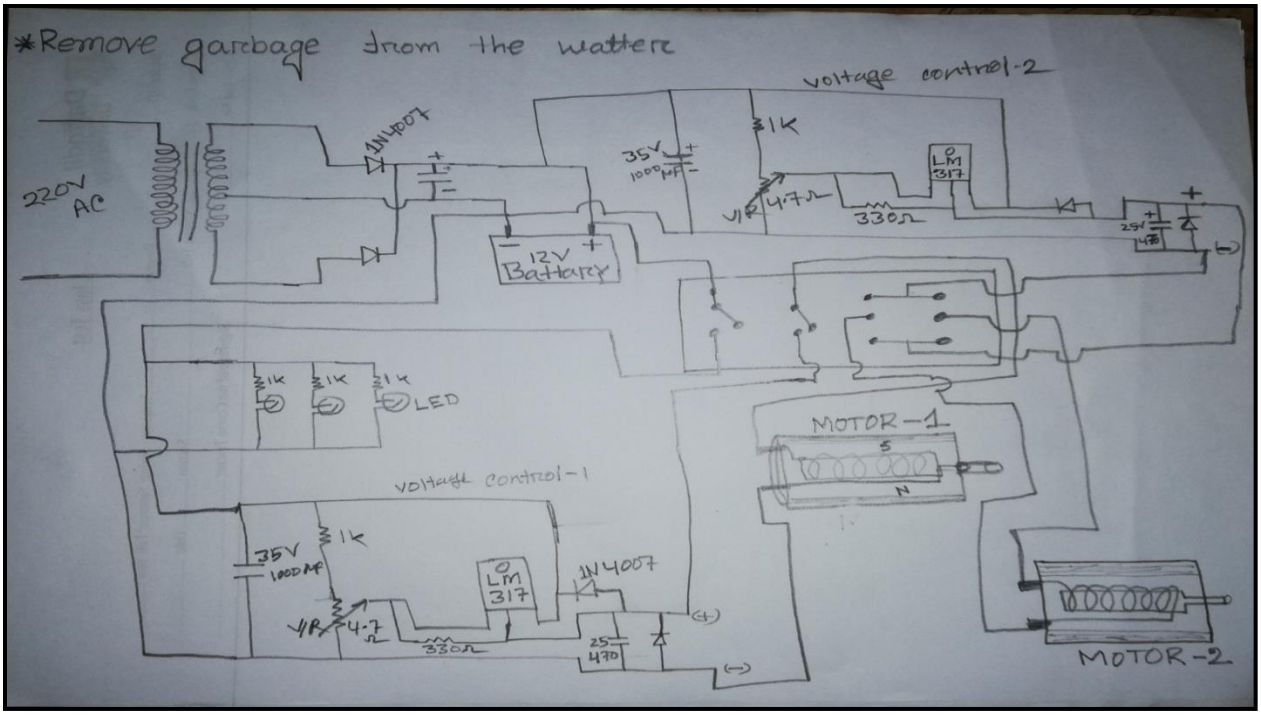


Figure-2: Complete circuit diagram of this project

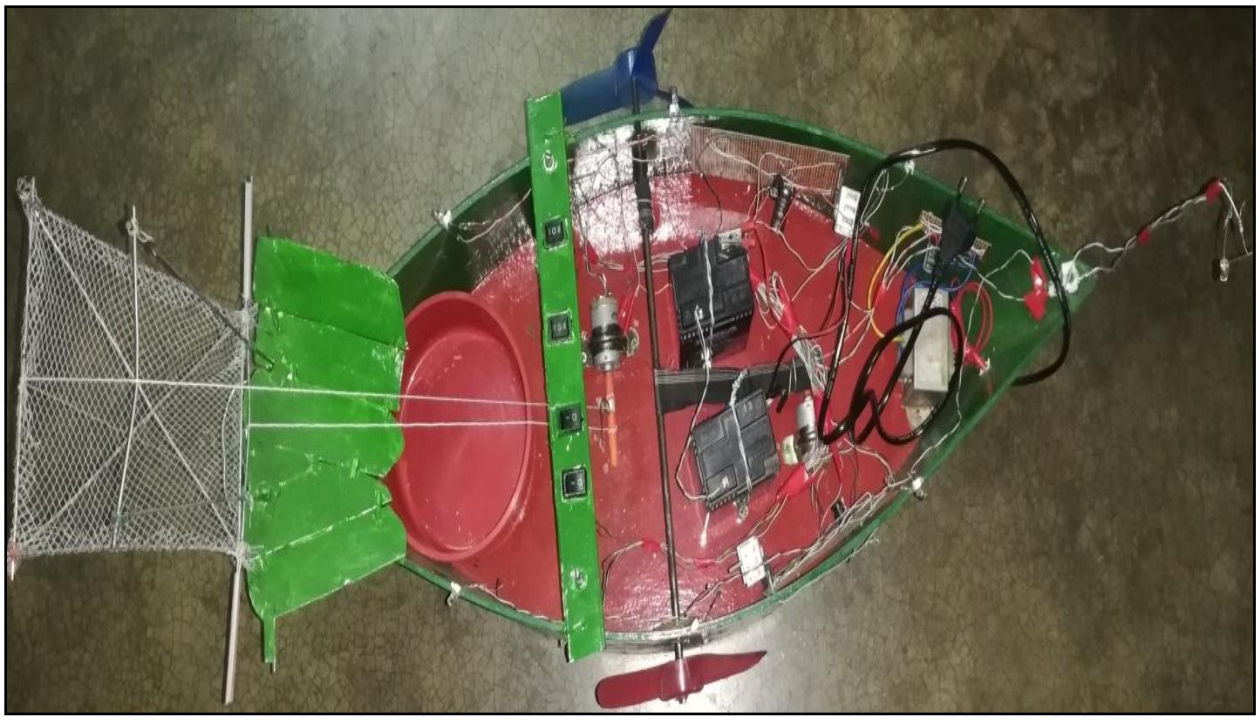


Figure-3: project figure

1.4 Working procedure of this project:

- Power supply section using 12v strep down transformer for convert ac 220 volts to ac 12 volt. After ac convert diode is use for convert ac to dc voltage. Here also use capacitor for filtering the pure dc voltage.
- Voltage control section use for control the dc voltage. So that motor speed can be high**,** low and medium condition.
- Switching section are using for on off the every power supply.
- Here use two motor, one motor use for control the boat and another motor use for control the net.
- Charging section can charge the battery so that reserve the voltage.

CHAPTER 2

LITERATURE REVIEWS

Introduction:

Ocean currents concentrate plastic and different kinds of garbage in five areas in the world. The subtropical gyres, also known as the world's ocean garbage patches .Once in these patches, the plastic will not go away by itself .The challenge of cleaning up the gyres is the plastic pollution spreads across millions of square kilometers and cost billions of dollars to complete.

Review:

An automatic remove garbage control system is very use full for country. Because, day by day increasing the garbage in the water. So we choice this project ,the rubbish bin design to float in marins, inland water ways, residential lakes and harbors ,catches floating debris and liquids by sucking water from the surface and letting if flow out through the bottom of the structure, trapping waste in a catch bag .The designers have even used plastics caught in their first boat to create another waste collector .They are now looking to bring the prototype into production through an Indie go campaign, where you can make a pledge and help boat rid the oceans of waste.

Voltage control circuit:

A voltage control regulator circuit is a system designed to automatically maintain a constant voltage level. A voltage regulator may use a simple feed –forward design or electronic components. Deepening on the design, it may be used to regulate one or more AC or DC voltage.

Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltage used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant .In an electric power distribution system .voltage regulation may be installed a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line.

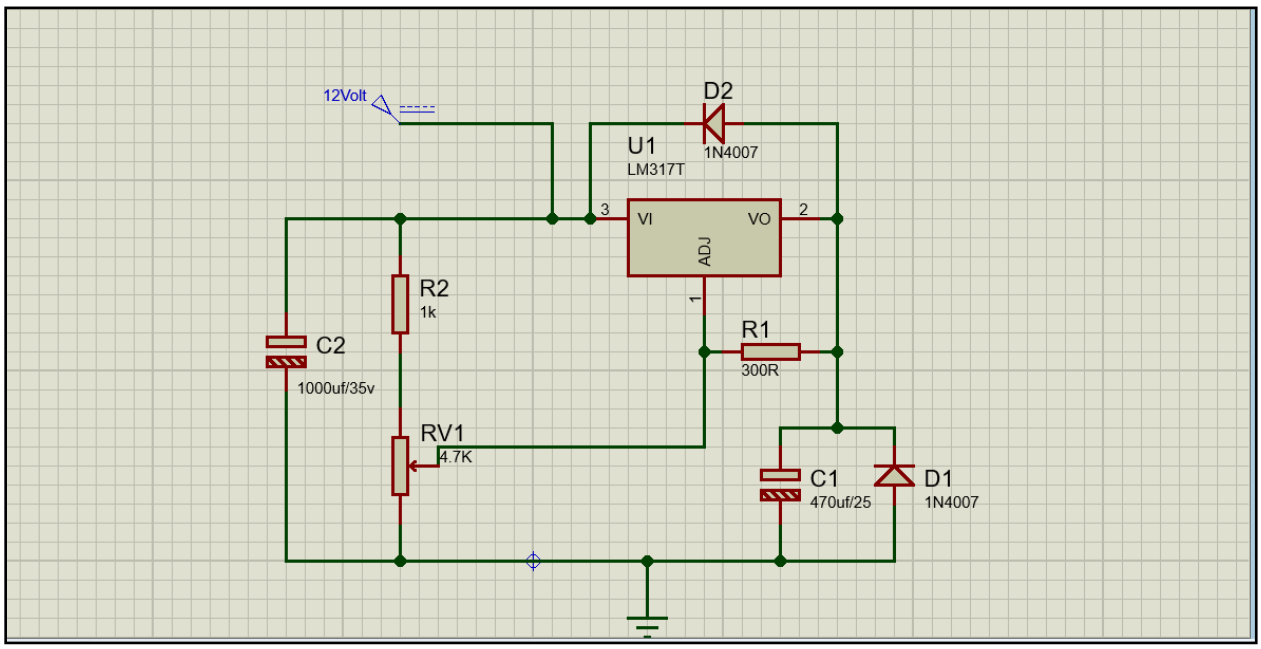


Figure-4: Voltage control circuit

Power supply circuit:

AC Plug:

The first part of the circuit is the AC plug .When we create a DC power supply, it creates DC voltage from the AC mains voltage from a wall outlet .To build a DC power supply purchase a 3-prong AC plug .It can also work with a two –prong AC plug .But having a 3-prong plug is better because ground provides better against possible electric fires.

Transformer:

After the AC plug .we need a step –down transformer .The transformer's job is to take the 120V AC voltage from the mains line and step it down to 24 volts. This is because our DC power supply will supply variable DC voltage of 1-120V .Therefore ,we lower the very high voltage that we get from the mains outlet from the wall into a smaller voltage .It must still exceed the voltage of the DC which we want to create up to 20 VDC variable voltage output, we deed a transformer that converts the mains voltage to a voltage that is higher than this 20V.Astep –down

transformer is a geat device for lowering voltage from a mains AC voltage no longer goes through a negative cycle .With the rectifier ,all off the voltage is rectified positive .

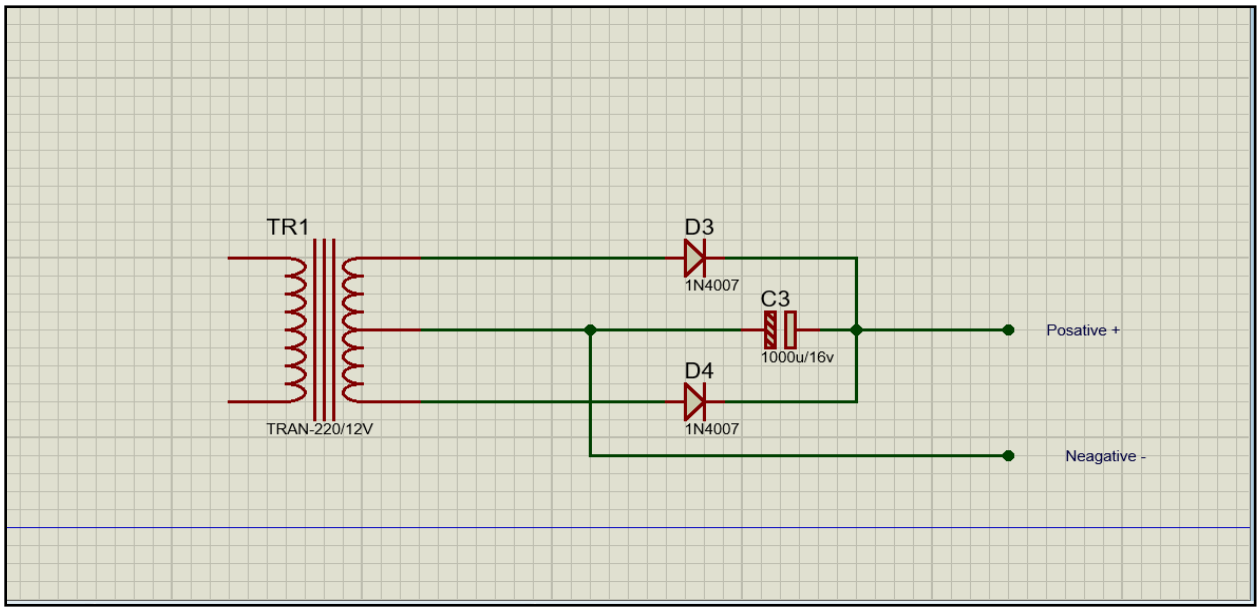


Figure-5: Power Supply Circuit

Switch Control system:

In this section on off all of the dc power

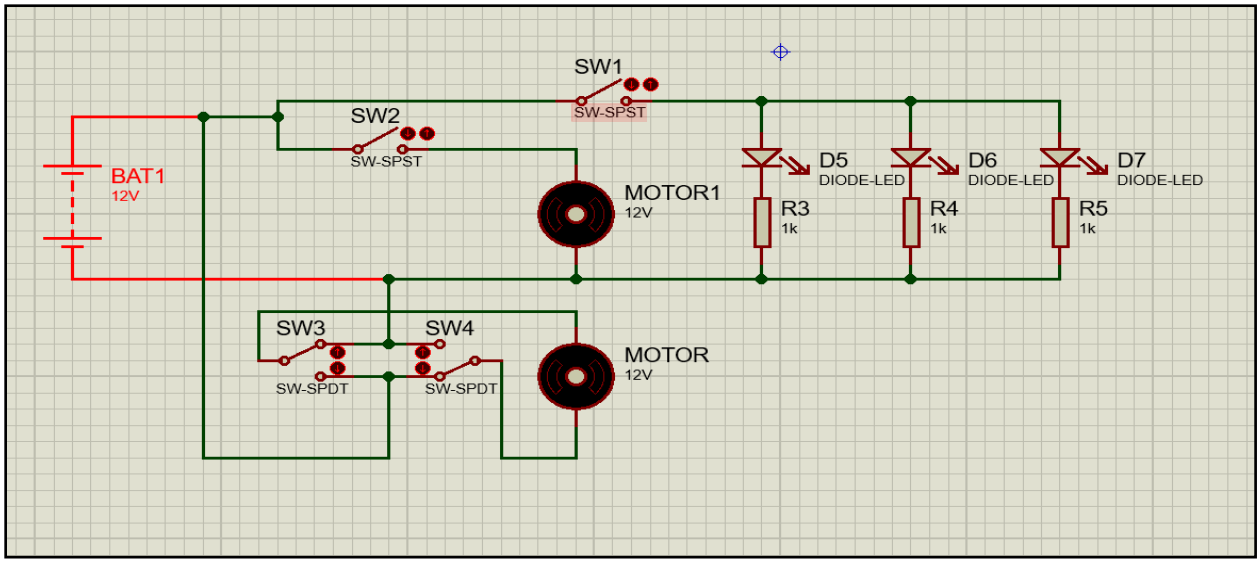


Figure-6: Switch control systems

Problem pace:

Actually we face different problem to complete this project, such as:

- How can we control the motor speed
- To control the total switching section.
- Total charging system

CHAPTER 3

ANALYSIS OF THE SYSTEM COMPONENT

3.1 AC Cable:

AC cable is a factory assembly of insulated conductors protected in an overall flexible interlocked metallic armor ‘sheath’. Armored cable having an aluminum sheath is suitable for use in alternating current circuits only.

Figure-7: Ac Cable

3.2 DC Motor:

A Dc motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of Dc motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor.

Dc motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A dc motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small Dc motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger Dc motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of Dc motors with Ac motors possible in many applications.

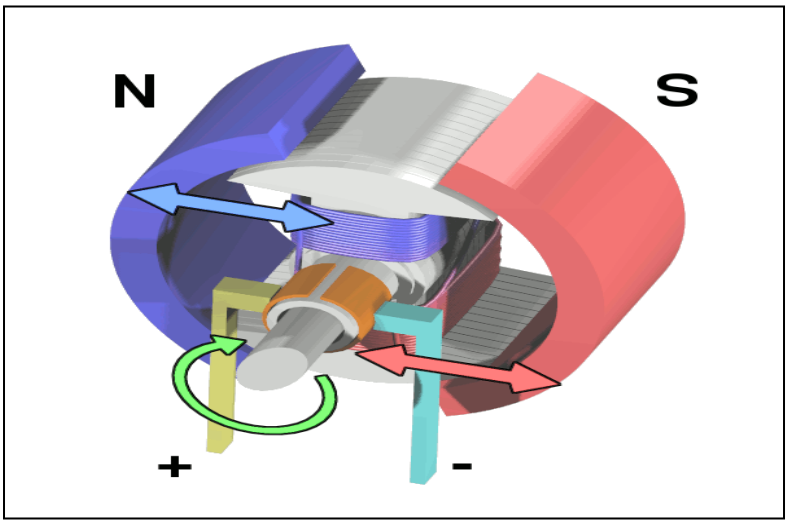


Figure-8: DC Motor

Type of dc motor:

Four Types of Dc Motors and Their Characteristics

- Permanent magnet (Permanent magnet stator),
- Electromagnets connected in series (Wound stator),
- Shunt (Wound stator), or
- Compound (Wound stator)

Permanent Magnet Motors:

He permanent magnet motor uses a magnet to supply field flux.

Permanent magnet Dc motors have excellent starting torque capability with good speed regulation. A disadvantage of permanent magnet Dc motors is they are limited to the amount of load they can drive. These motors can be found on low horsepower applications.

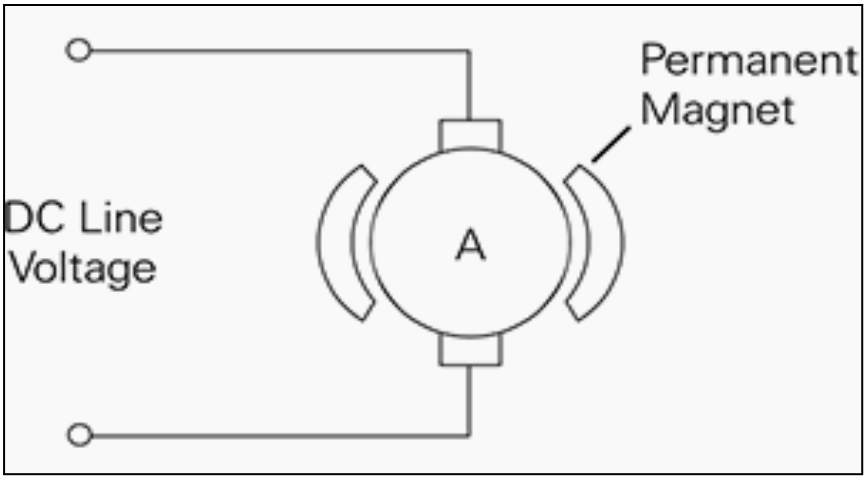


Figure-9: Permanent Magnet Motors

Series Motors:

In a series Dc motor the field is connected in series with the armature. The field is wound with a few turns of large wire because it must carry the full armature current.

A characteristic of series motors is the motor develops a large amount of starting torque. However, speed varies widely between no load and full load. Series motors cannot be used where a constant speed is required under varying loads.

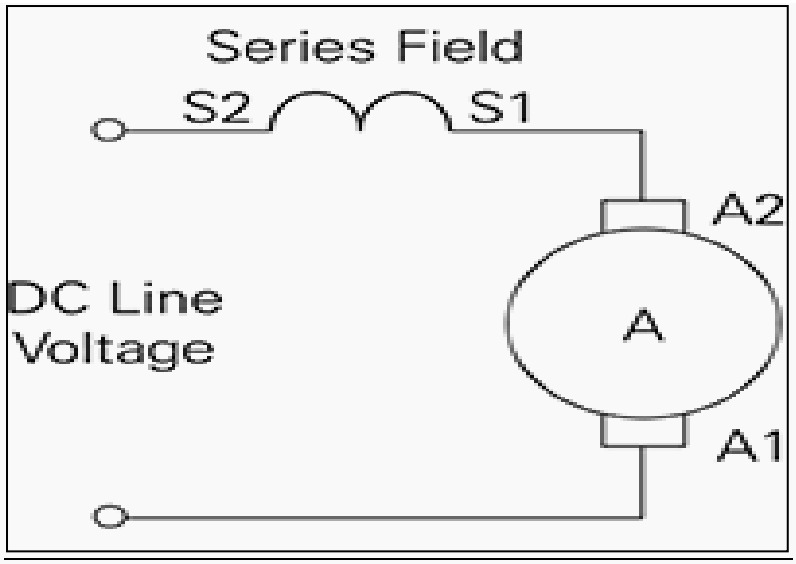


Figure-10: Series Motors

Shunt Motors:

In a shunt motor the field is connected in parallel (shunt) with the armature windings. The shunt-connected motor offers good speed regulation. The field winding can be separately excited or connected to the same source as the armature.

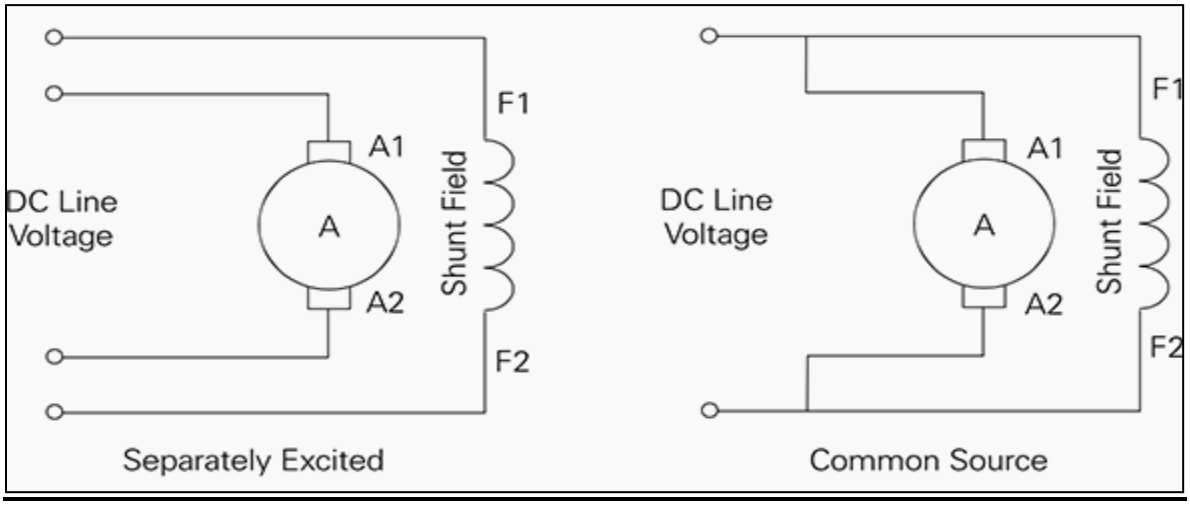


Figure-11: Shunt Motors

Compound Motors:

Compound motors have a field connected in series with the armature and a separately excited shunt field. The series field provides better starting torque and the shunt field provides better speed regulation.

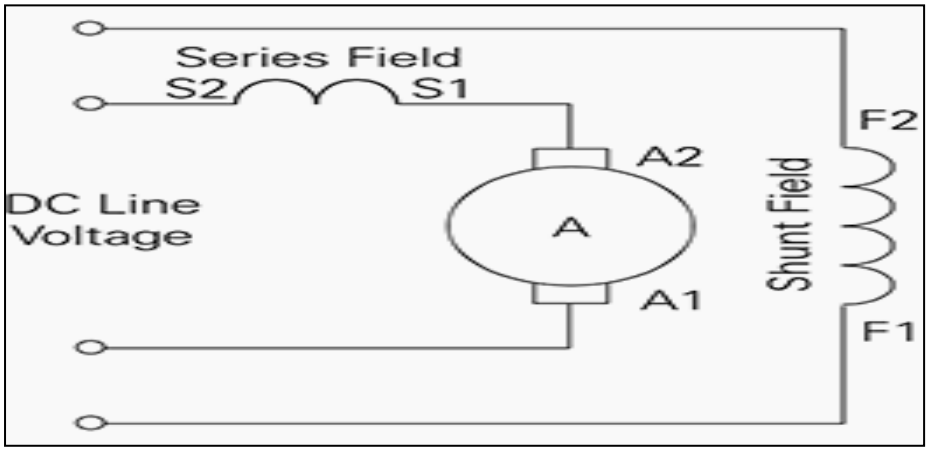


Figure-12: Compound Motors

3.2.1 Capacitor:

A capacitor is a passive two-terminal electronic component that stores electrical energy in an electric field. The effect of a capacitor is known as capacitance. While some capacitance exists between any two electrical conductors in proximity in a circuit, a capacitor is a component designed to add capacitance to a circuit. The capacitor was originally known as a condenser or condensate. The original name is still widely used in many languages, but not commonly in English.

The physical form and construction of practical capacitors vary widely and many capacitor types are in common use. Most capacitors contain at least two electrical conductors often in the form of metallic plates or surfaces separated by a dielectric medium. A conductor may be a foil, thin film, sintered bead of metal, or an electrolyte. The no conducting dielectric acts to increase the capacitor's charge capacity. Materials commonly used as dielectrics include glass, ceramic, plastic film, paper, mica, and oxide layers. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, an ideal capacitor does not dissipate energy.

When two conductors experience a potential difference, for example, when a capacitor is attached across a battery, a field develops across the dielectric, causing a net positive charge to collect on one plate and net negative charge to collect on the other plate. No current actually flows through the dielectric; however, there is a flow of charge through the source circuit. If the condition is maintained sufficiently long, the current through the source circuit ceases. However, if a time-varying voltage is applied across the leads of the capacitor, the source experience an ongoing current due to the charging and discharging cycles of the capacitor.

$$C=Q/V$$

Figure-13: Capacitor

Different type of capacitor:

Polarized capacitor:

An electrolytic capacitor (abbreviated e-cap) is a polarized capacitor whose anode or positive plate is made of a metal that forms an insulating oxide layer through iodization. This oxide layer acts as the dielectric of the capacitor.

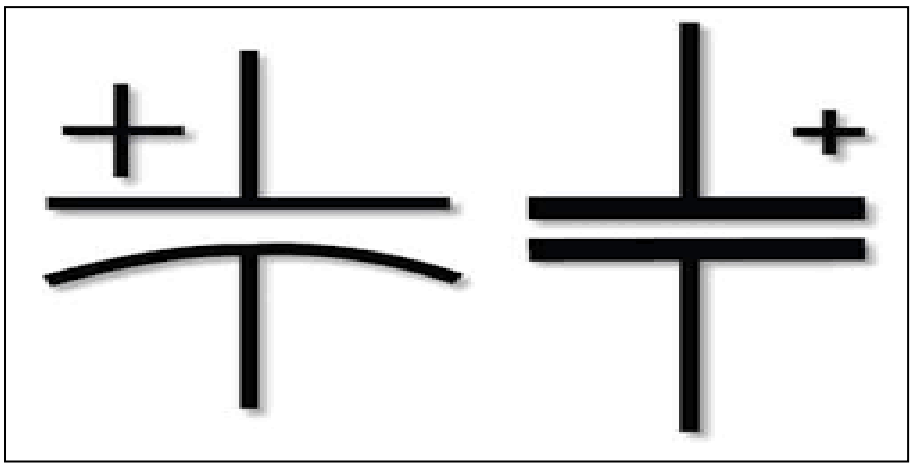


Figure-14: Polarized Capacitor

None polarized capacitor:

A non-polarized capacitor is a type of capacitor that has no implicit polarity it can be connected either way in a circuit. Ceramic, mica and some electrolytic capacitors are non-polarized. You'll also sometimes hear people call them bipolar capacitors.

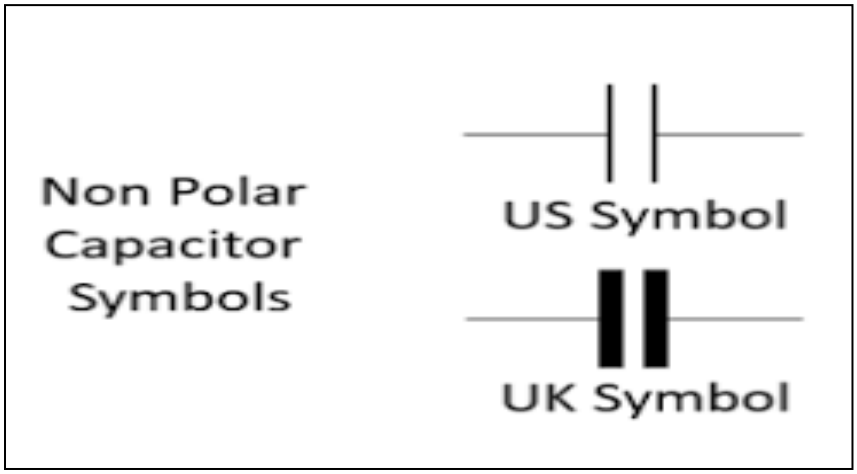


Figure-15: None Polarized Capacitor

Variable Capacitor:

A vacuum variable capacitor uses a set of plates made from concentric cylinders that can be slid in or out of an opposing set of cylinders ‘sleeve and plunger’. These plates are then sealed inside of a non-conductive envelope such as glass or ceramic and placed under a high vacuum. The movable part ‘plunger’ is mounted on a flexible metal membrane that seals and maintains the vacuum. A screw shaft is attached to the plunger, when the shaft is turned the plunger moves in or out of the sleeve and the value of the capacitor changes. The vacuum not only increases the working voltage and current handling capacity of the capacitor, it also greatly reduces the chance of arcing across the plates. The most common usage for vacuum variables are in high-powered transmitters such as those used for broadcasting, military and amateur radio, as well as high-powered RF tuning networks. Vacuum variables can also be more convenient; since the elements are under a vacuum, the working voltage can be higher than an air variable the same size, allowing the size of the vacuum capacitor to be reduced.

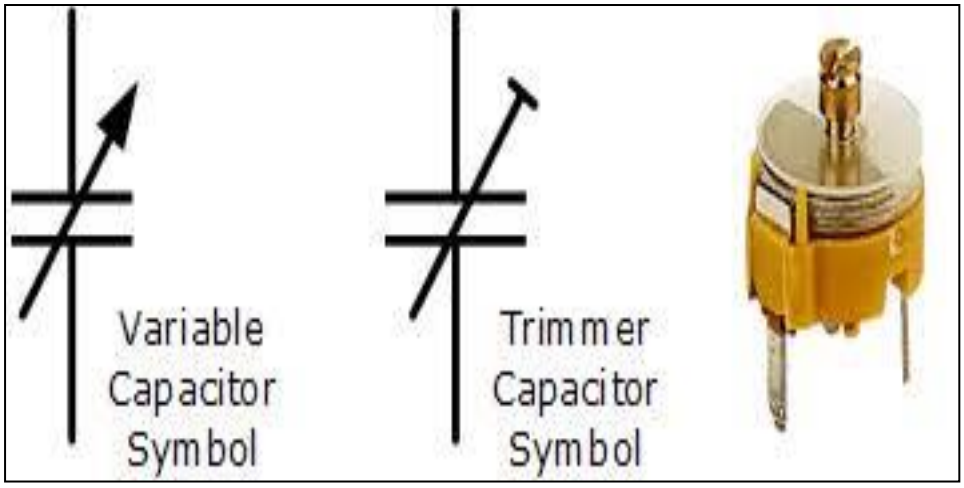


Figure-16: Variable Capacitor

3.2.2 Transformer:

A transformer is a static electrical device ‘sometimes called an electrical machine’ that transfers electrical energy between two or more circuits. A varying current in one coil of the transformer produces a varying magnetic flux, which, in turn, induces a varying electromotive force (EMF) or "voltage" across a second coil wound around the same core. Electrical energy can be transferred between the two coils, without a metallic connection between the two circuits. Faraday's law of induction discovered in 1831 described the induced voltage effect in any coil due to changing magnetic flux encircled by the coil.

Transformers are used for increasing or decreasing the alternating voltages in electric power applications and for matching between differing impedances in low power circuits.

Since the invention of the first constant-potential transformer in 1885; transformers have become essential for the transmission, distribution, and utilization of alternating current electrical energy.[3] A wide range of transformer designs is encountered in electronic and electric power applications. Transformers range in size from RF transformers less than a cubic centimeter in volume to units weighing hundreds of tons used to interconnect the power grid.

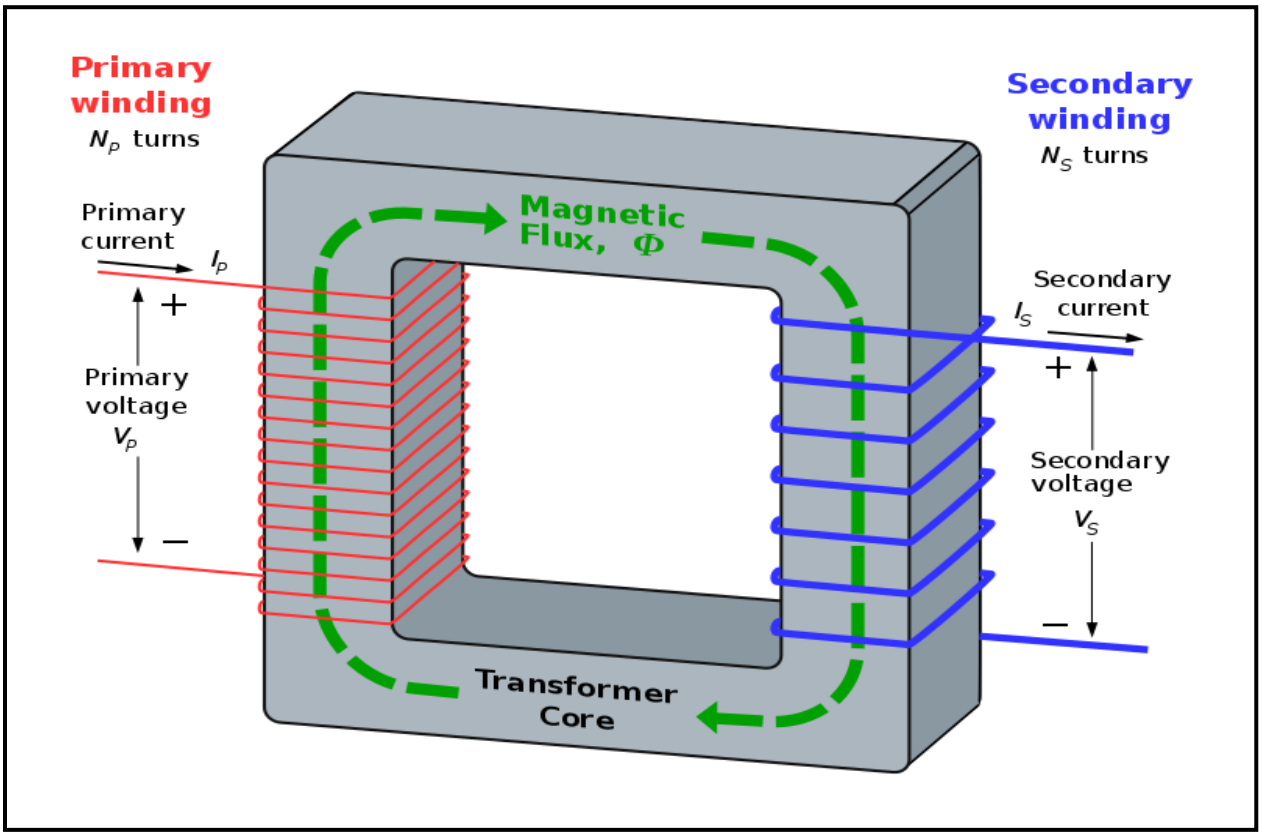


Figure-17: Transformer

VP/VS=NP/Ns and power out = power in or Vs x

IS = UP X IP

VP = primary voltage

NP = number of turns in primary coil

IP = primary input current

VS = secondary output voltage

NS = number of turns on secondary coil

Step-Up Transformer

As the name states that, the secondary voltage is stepped up with a ratio compared to primary voltage. This can be achieved by increasing the number of windings in the secondary than the primary windings as shown in the figure. In power plant; this transformer is used as connecting transformer of the generator to the grid.

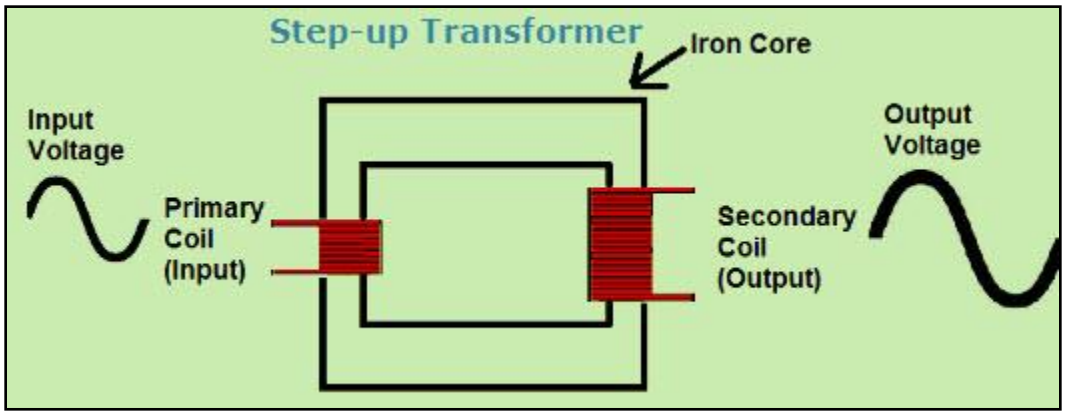


Figure-18: Step-up Transformer

Step-Down Transformer

It used to step down the voltage level from lower to higher level at secondary side as shown below so that it is called as a 'step-down transformer'. The winding turns more on the primary side than the secondary side.

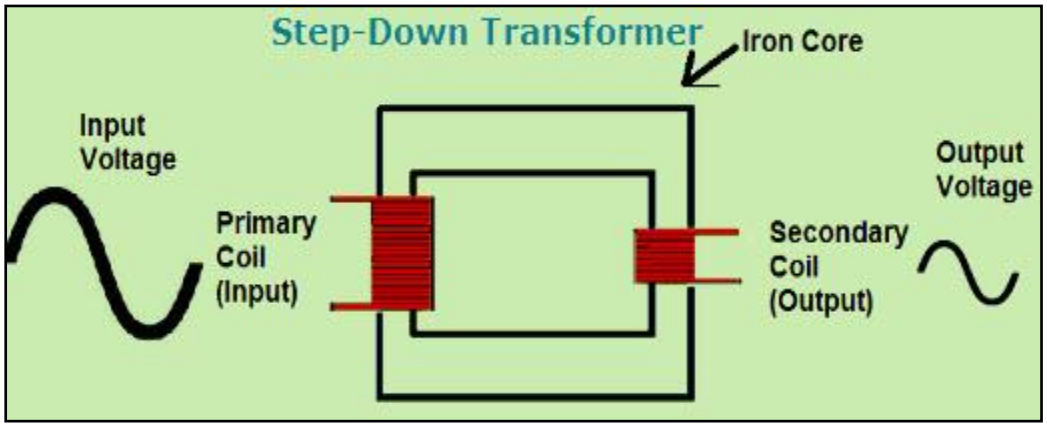


Figure-19: Step-down Transformer

3.2.2. A Center-Tapped Step-Down Transformer

A center-tapped ‘step-down’ transformer is used to provide a suitable voltage to the full-wave rectifier. We specifically selected this transformer so that the device could be connected directly to the wall outlet. Also the center tapping helps us to generate a positive polarity voltage required for the circuit. Rating: 230/12V AC, 50 Hz.

3.2.2. Construction of a Center-Tapped Step-Down Transformer

When an additional wire is connected across the exact middle point of the secondary winding of a transformer, it is called a center tapped transformer. The wire is adjusted such that it falls in the exact middle point of the secondary winding and is thus at zero volts, forming the neutral point for the winding. This is called the ‘center tap’ and this thing allows the transformer to provide two separate output voltages which are equal in magnitude, but opposite in polarity to each other. In this way, we can also use a number of turn ratios from such a transformer.

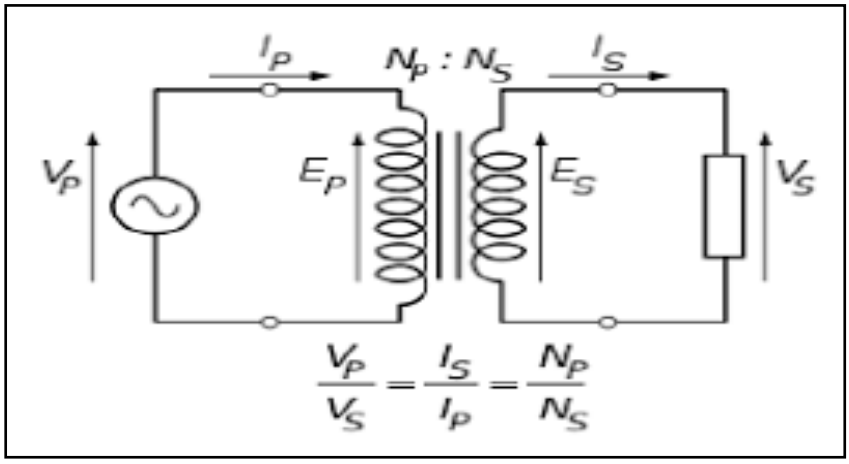


Figure-20: Construction of a Center-Tapped Step-Down Transformer

3.2.2. Working of this Transformer:

The two voltages, between line 1 and neutral and between neutral and line 2 can be named as VA and VB respectively. Then the mathematical relation of these two voltages shows that they are dependent upon the primary voltage as well as the turn ration of the transformer.

VA = (NA / NP) * VP

VB = (NB / NP) * VP

One thing that should be noted here is that both the outputs VA and VB respectively are equal in magnitude but opposite in direction, which means that they are 180 degrees out of phase with each other. For this purpose, we also use a full wave rectifier with a center tapped transformer; to make both the voltages in phase with each other.

3.2.3 Full-Wave Rectifiers:

A rectifier is an electronic circuit that converts Ac voltage to Dc voltage. It can be implemented using a capacitor diode combination. The unique property of diodes; permitting the current to flow in a single direction is utilized in here. It converts an ac voltage into a pulsating dc voltage using both half cycles of the applied ac voltage. Bridge rectifier is a full wave rectifier circuit using the combination of four diodes to form a bridge. It has the advantage that it converts both the half cycles of Ac input into Dc output.

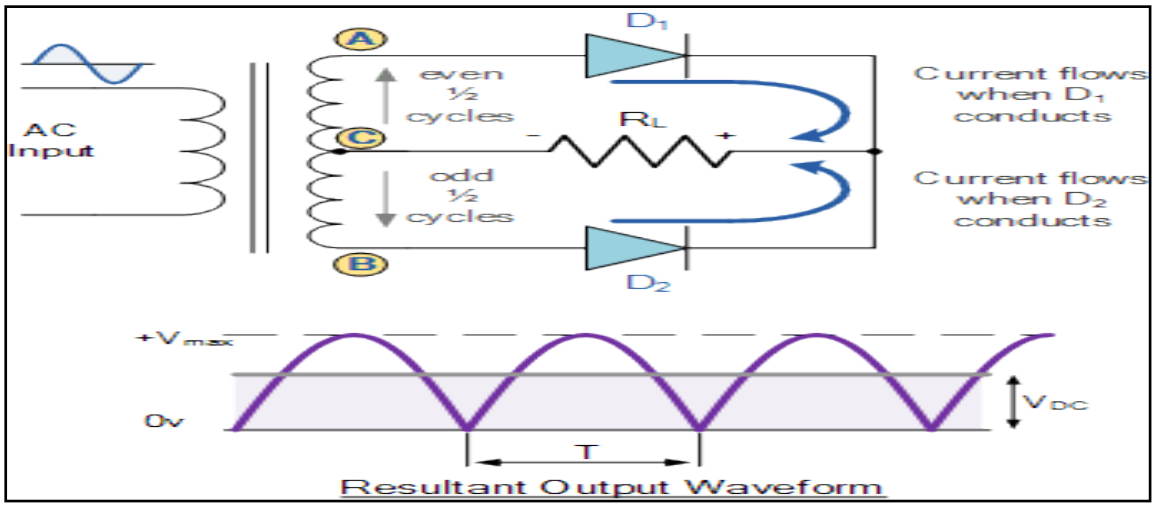


Figure-21: Full-Wave Rectifiers

3.2.3. Working of a Bridge Rectifier:

- During the positive half cycle of secondary voltage, diodes D2 and D3 are forward biased and diodes D1 and D4 are reverse biased. Now the current flows through D2–>Load>D3.
- During the negative half cycle of the secondary voltage, diodes D1 and D4 are forward biased and rectifier diodes D2 and D3 are reverse biased. Now the current flows through D4–>Load–>D1.
- In both the cycles, load current flows in the same direction.
- Addition of a capacitor at the output converts the pulsating Dc voltage to fixed Dc voltage.
- Up to a time period of t=1s input voltage is increasing, so the capacitor charges up to peak value of the input. After t=1s input starts to decrease, then the voltage across the capacitor reverse biases the diodes D2 and D4 and therefore it will not conduct. Now capacitor discharges through the load, then voltage across the capacitor decreases.
- When the peak voltage exceeds the capacitor voltage, diodes D2 or D4 forward biases and as a result capacitor again charges to the peak value. This process continues.

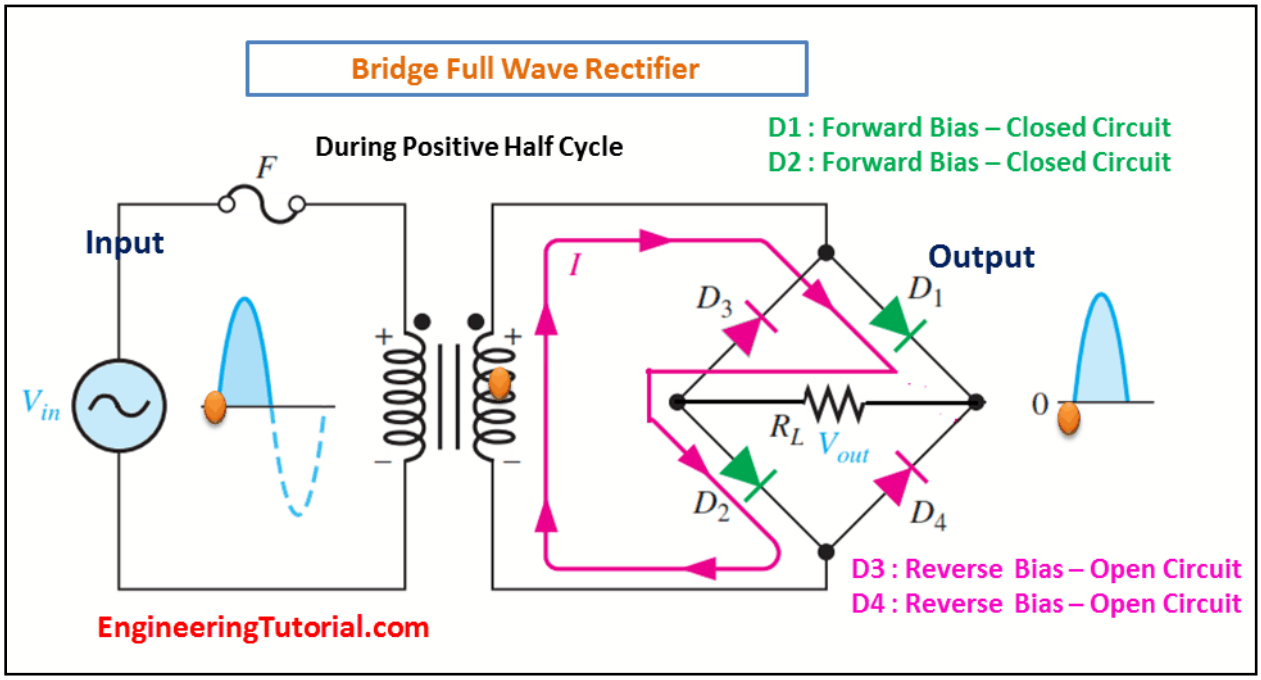


Figure-22: Bridge Rectifier

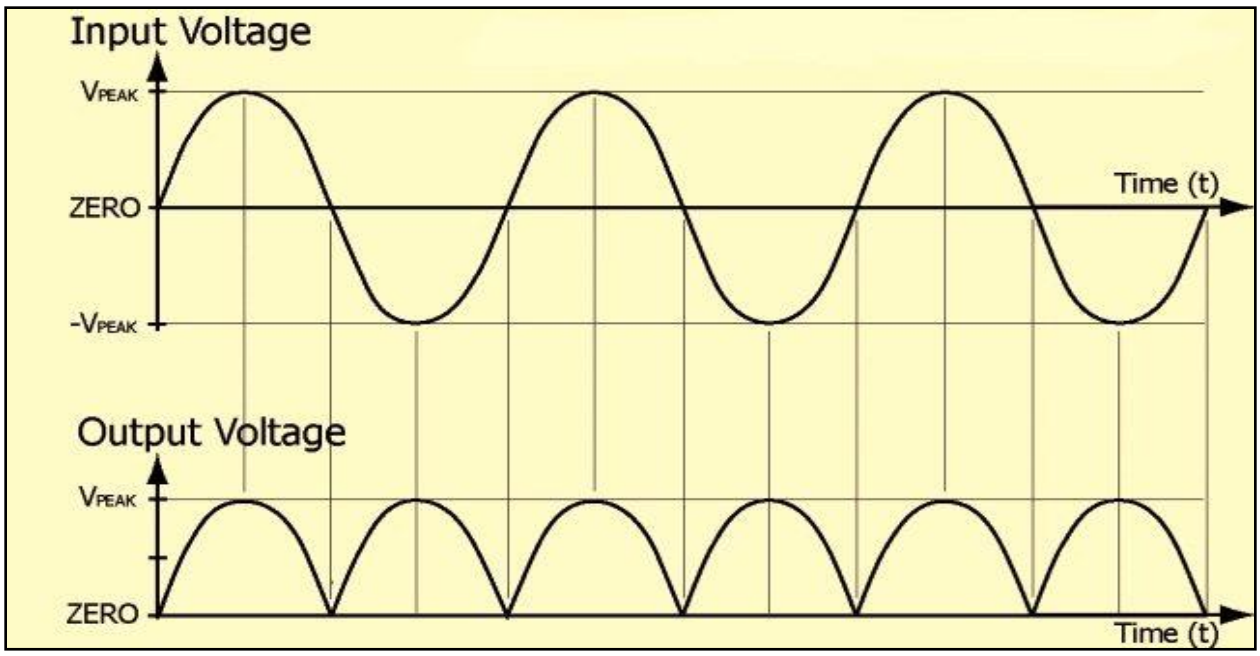


Figure-24: Bridge Rectifier sine wave result

3.2.4 Voltage Regulator:

A voltage regulator also called a "regulator" has only three legs appear to be a comparatively simple device but it is actually a complex in integrated circuit. A regulator converts varying input volt and produces a constant "regulated" output voltage. Voltage regulators are available in a variety of output.

3.2.5 Hitching:

Actually it is used beside the transistor for reduced the temperature.

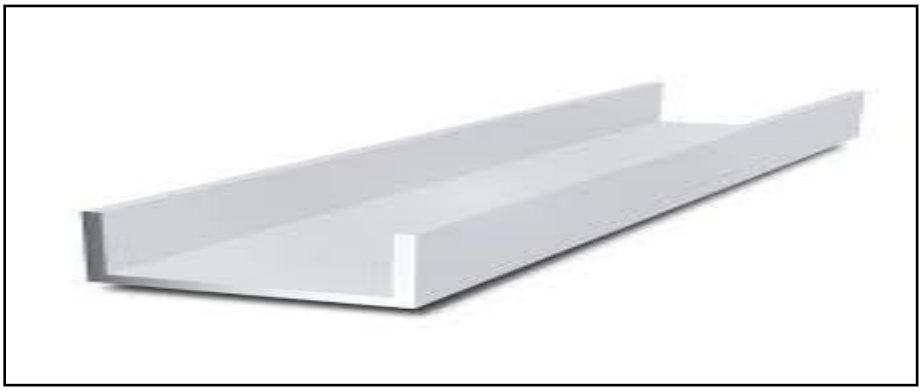


Figure-25: Hitching

3.2.6 Screws and nut:

The rod with threads and a head is a bolt, and alongside it is a nut SCREW. An externally threaded fastener capable of being inserted into the holes inside assembled parts (now come the difference) of mating with a pre formed internal thread or forming its own thread is called a screw.

Figure-26: Screws and nut

3.2.7 Transistor:

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit.

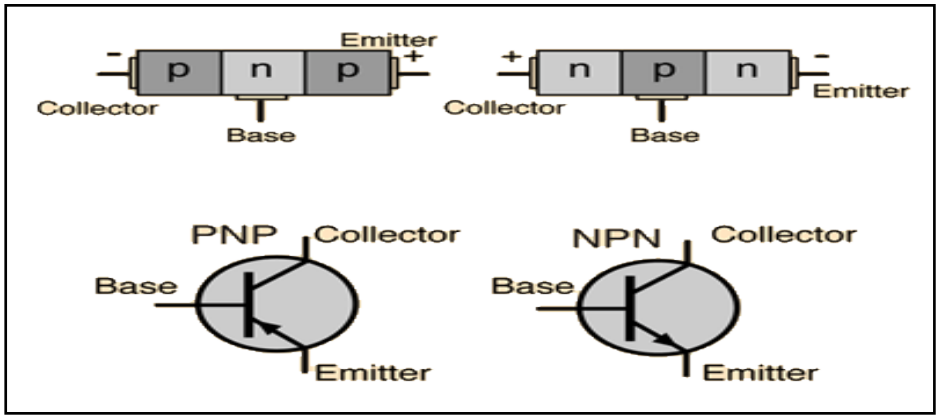


Figure-27: Transistor

A transistor is a semiconductor device, commonly used as an amplifier or an electrically control switch. The transistor is the fundamental building block of the circuitry in computers, cellular phones, and all other modern electronics because of its fast response and accuracy, the transistor is used in a wide variety of digital and analog functions, including amplification, switching, voltage regulation, signal modulation and oscillators. Transistors may be packaged individually or as part of an integrated circuit, some with over a billion transistors in a very small area. They are contain to electronics and there are 2 main types, NPN and PNP

Different type of transistor:

Bipolar Junction Transistor (BJT)

Bipolar Junction Transistors are transistors which are built up of three regions, the base, the collector, and the emitter. Bipolar Junction transistors, different FET transistors, are current-controlled devices. A small current entering in the base region of the transistor causes a much larger current flow from the emitter to the collector region. Bipolar junction transistors come in two major types; NPN and PNP. A NPN transistor is one in which the majority current carrier are electrons. Electron flowing from the emitter to the collector forms the base of the majority of current flow through the transistor. The further types of charge, holes, are a minority. PNP transistors are the opposite. In PNP transistors, the majority current carrier is holes

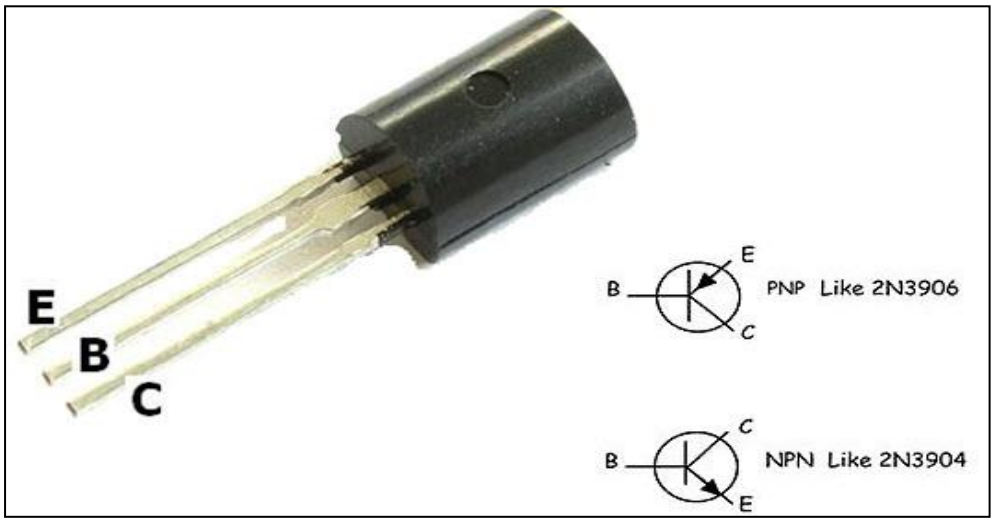


Figure-28: Bipolar Junction Transistor (BJT)

Field Effect Transistor:

Field Effect Transistors are made up of 3 regions, a gate, a source, and a drain. Different bipolar transistors, FETs are voltage-controlled devices. A voltage placed at the gate controls current flow from the source to the drain of the transistor. Field Effect transistors have very high input impedance, from several mega ohms (MΩ) of resistance to much, much larger values. This high input impedance causes them to have very little current run through them. "According to ohm's law, current is inversely affected by the value of the impedance of the circuit. If the impedance is high, the current is very low." So FETs both draw very little current from a circuit's power source

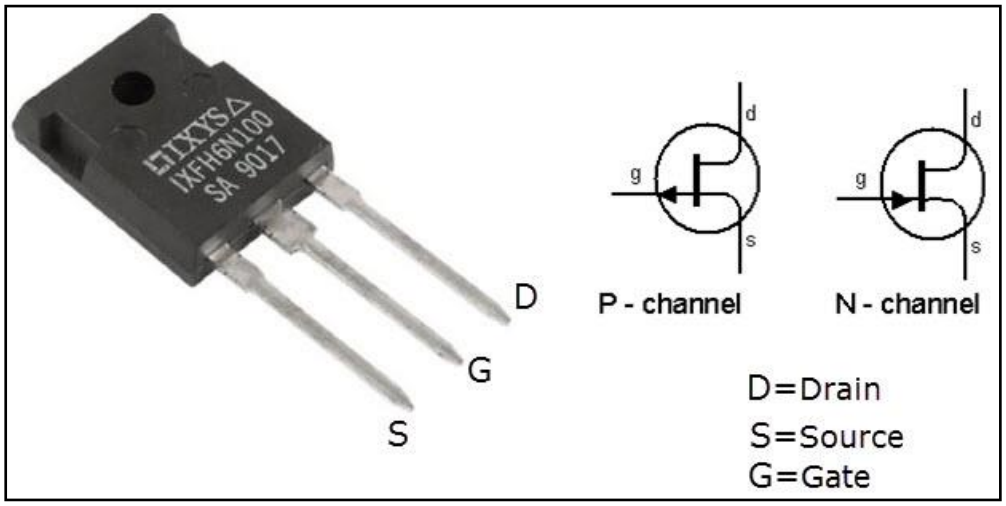


Figure-29: Field Effect Transistor

Hetero junction Bipolar Transistor (HBT):

AlgaAs "Aluminum gallium arsenide) / GaAs (Gallium arsenide" hetero junction bipolar transistors (HBTs) are used for digital and analog microwave applications with frequencies as high as Ku band. HBTs can supply faster switching speeds than silicon bipolar transistors mostly because of reduced base resistance and collector-to-substrate capacitance. HBT processing requires less demanding lithography than GaAs FETs, therefore, HBTs can priceless to fabricate and can provide better lithographic yield.

This technology can also provide higher breakdown voltages and easier broadband impedance matching than GaAs FETs. In assessment with Si bipolar junction transistors (BJTs), HBTs show better presentation in terms of emitter injection efficiency, base resistance, the base-emitter capacitance, and cutoff frequency. They also present a good linearity, low phase noise and high power-added efficiency. HBTs are used in both profitable and high-reliability applications, such as power amplifiers in mobile telephones and laser drivers.

Multiple-Emitter Transistor:

A multiple-emitter transistor is specialize bipolar transistor frequently used as the inputs of transistor transistor logic (TTL) NAND logic gates. Input signals are applied to the emitters. Collector current stops flowing simply, if all emitters are driven by the logical high voltage. Thus performing a NAND is a logical process using a single transistor. Multiple-emitter transistors replace diodes of DTL and agree to reduction of switching time and power dissipation.

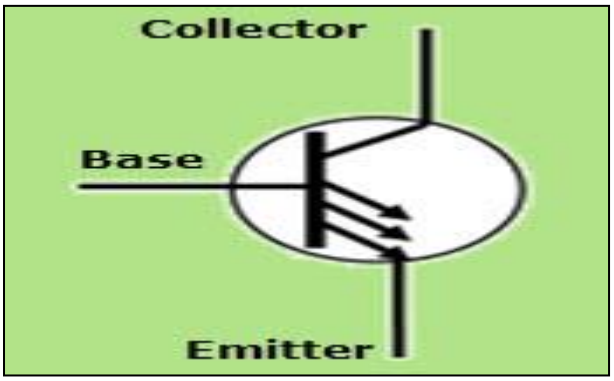


Figure-30: Multiple-Emitter Transistor

Dual Gate MOSFET:

One form of MOSFET that is a particularly popular in several RF applications is the dual gate MOSFET. The dual gate MOSFET is used in many RF and other applications where two control gates are required in series. The dual gate MOSFET is fundamentally a form of MOSFET where, two gates are made-up along the length of the channel one after the other.

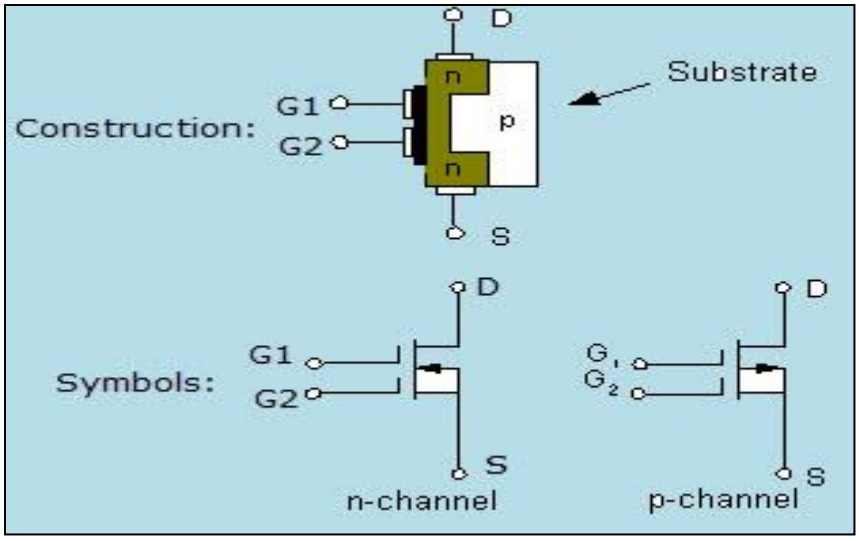


Figure-31: Dual Gate MOSFET

Junction FET Transistor:

The Junction Field Effect Transistor (JUGFET or JFET) has no PN-junctions but in its place has a narrow part of high resistivity semiconductor material forming a "Channel" of either N-type or P-type silicon for the majority carriers to flow through with two ohmic electrical connections at either end normally called the Drain and the Source respectively. There are a two basic configurations of junction field effect transistor, the N-channel JFET and the P-channel JFET. The N-channel JFET's channel is doped with donor impurities meaning that the flow of current through the channel is negative (hence the term N-channel) in the form of electrons.

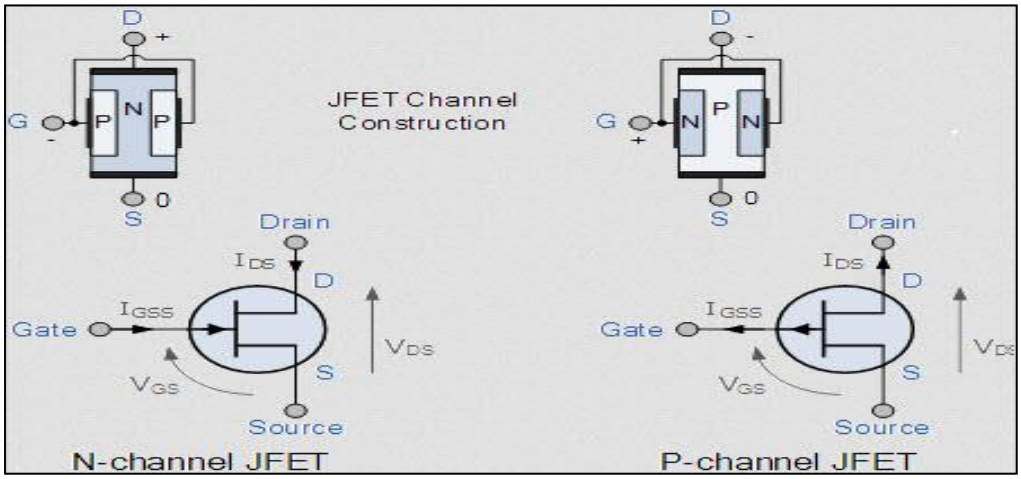


Figure-32: Junction FET Transistor

3.2.7 Transistor Current:

The diagram below shows the two current palls through a transistor. The small base current controls the larger collector current. When the switch is closed, small current flows into the base (B) of the transistor. It is just enough to make LED B glow dimly. The transistor amplifies this small current to allow a larger current to flow through from its collector 'C' to its emitter (E). This collector current is larger enough to make LED C light brightly. When the switch is open no base current flows, so the transistor switches off the collector current. Both LED are off. A transistor amplifiers current and can be used as a switch. This arrangement where the emitter 'E' is in the controlling circuit (base current) and in the controlled circuit (collector current) is called common emitter mode. It is the most widely use arrangement for transistors.

3.2.8 Battery:

An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smart phones, and electric cars.[1] When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode.[2] The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a red oxide reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy.[3]Historically the term "battery" specifically referred to a device composed of multiple cells, however the usage has evolved to include devices composed of a single cell.[4]

Primary (single-use or "disposable") batteries are used once and discarded; the electrode materials are irreversibly changed during discharge. Common examples are the alkaline battery used for flashlights and a multitude of portable electronic devices. Secondary (rechargeable) batteries can be discharged and recharged multiple times using an applied electric current; the original composition of the electrodes can be restored by reverse current. Examples include the lead-acid batteries used in vehicles and lithium-ion batteries used for portable electronics such as laptops and smart phones.

Batteries come in many shapes and sizes, from miniature cells used to power hearing aids and wristwatches to small, thin cells used in smart phones, to large lead acid batteries used in cars

and trucks, and at the largest extreme, huge battery banks the size of rooms that provide standby or emergency power for telephone exchanges and computer data centers.

According to a 2005 estimate, the worldwide battery industry generates US$48 billion in sales each year, with 6 percent annual growth.

Batteries have much lower specific energy "energy per unit mass" than common fuels such as gasoline. In automobiles, this is somewhat offset by the higher efficiency of electric motors in converting chemical energy to mechanical work, compared to combustion engines.

Figure-33: Battery

3.2.9 Resistor:

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage.

Variable resistors can be used to adjust circuit elements “such as a volume control or a lamp dimmer” or as sensing devices for heat, light, humidity, force, or chemical activity.

Figure-34: Resistor

3.2.9.b Resistors in Series:

The total equivalent resistance of resistors in series

Resistance total is the sum of the resistance values:

R total = R1+ R2+ R3+...

So when you add resistors in series, the total resistance is increased.

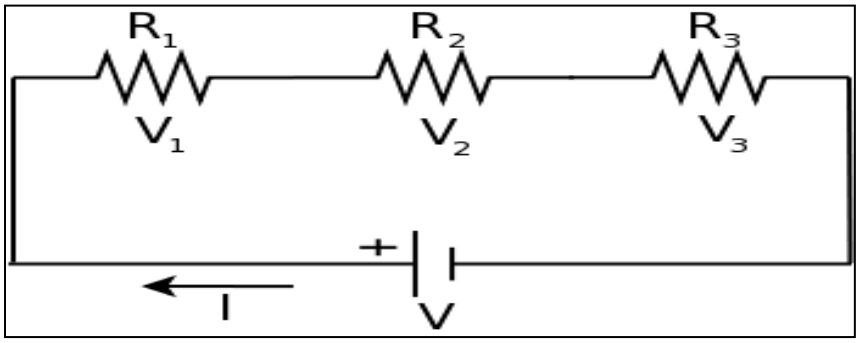


Figure-35: Resistors in Series

3.2.9.c Resistors in parallel:

The sum of the currents through each path is equal to the total current that flows from the source. You can find total resistance in a Parallel circuit with the following formula:

1/RT = 1/**R1** + 1/**R2** + 1/**R3** +...

If one of the parallel paths is broken, current will continue to flow in all the other paths.

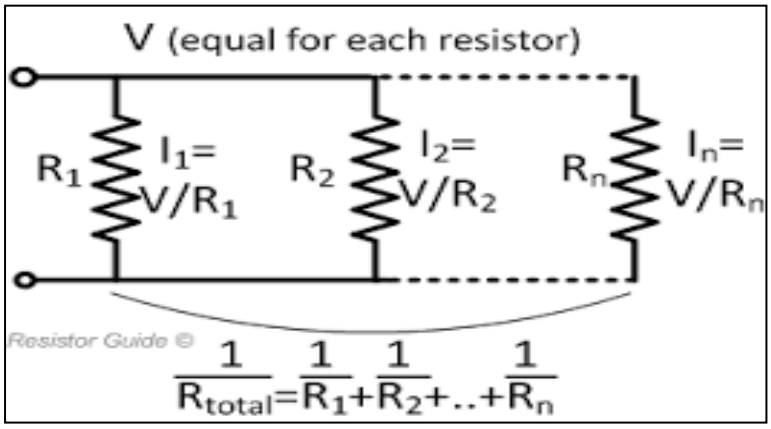
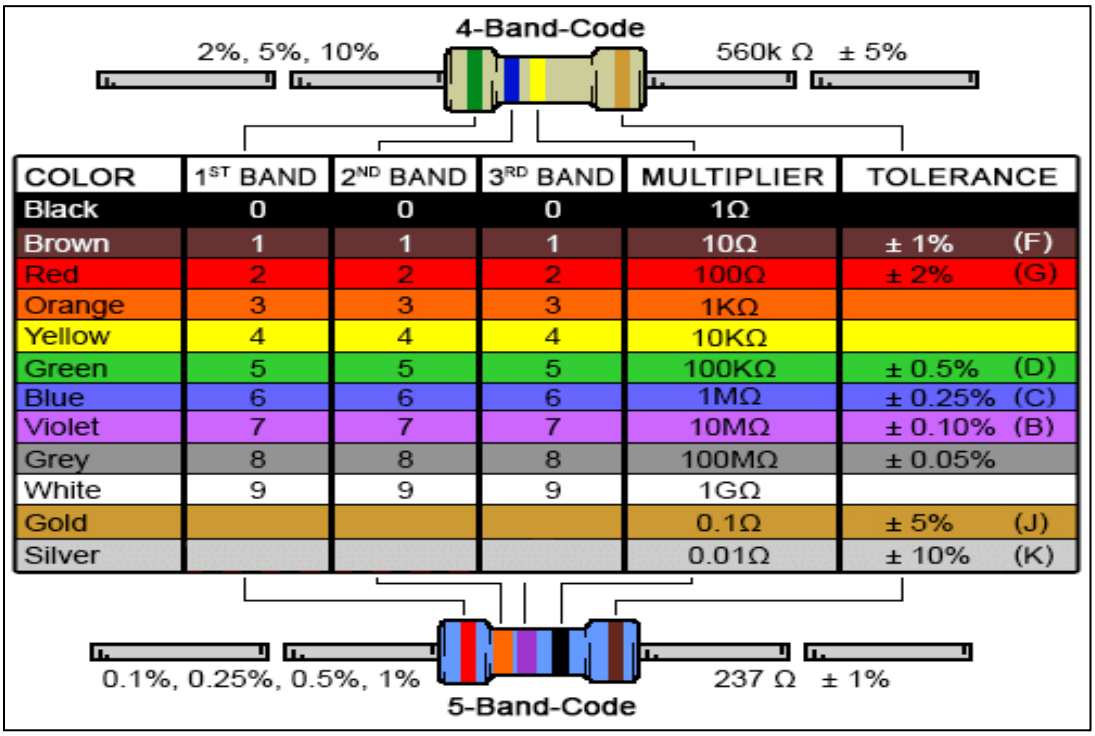


Figure-36: Resistors in parallel

3.2.9.c Resistors Color Code:

The electronic color code was developed in the early 1920s by the Radio Manufacturers Association (RMA), later the Radio Electronics Television Manufacturers' Association(RETMA), now part of the Electronic Industries Alliance (EIA) Therefore, the code was known as RMA, RTMA, RETMA or EIA color code. In 1952, it was standardized in IEC 62:1952 by the International Electro technical Commission (IEC) and since 1963 also published as EIA RS-279. Originally only meant to be used for fixed resistors, the color code was extended to also cover capacitors with IEC 62:1968. The code was adopted by many national standards like DIN 40825 (1973), BS 1852 (1974) and IS 8186 (1976). The current international standard defining marking codes for resistors and capacitors is IEC 60062:2016 and EN 60062:2016. In addition to the color code, these standards define a letter and digit code for resistors and capacitors.

Color bands were used because they were easily and cheaply printed on tiny components. However, there were drawbacks, especially for color blind people. Overheating of a component or dirt accumulation may make it impossible to distinguish brown from red or orange. Advances in printing technology have now made printed numbers more practical on small components. The values of components in surface mount packages are marked with printed alphanumeric codes instead of a color code.



COLOR	1ST BAND	2ND BAND	3RD BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1Ω	
Brown	1	1	1	10Ω	± 1% (F)
Red	2	2	2	100Ω	± 2% (G)
Orange	3	3	3	1KΩ	
Yellow	4	4	4	10KΩ	
Green	5	5	5	100KΩ	± 0.5% (D)
Blue	6	6	6	1MΩ	± 0.25% (C)
Violet	7	7	7	10MΩ	± 0.10% (B)
Grey	8	8	8	100MΩ	± 0.05%
White	9	9	9	1GΩ	
Gold				0.1Ω	± 5% (J)
Silver				0.01Ω	± 10% (K)

Figure-37: Resistors Color Code

Chapter 4:

HARDWARE DEVELOPMENT

4.1 Variable resistor:

Variable resistor An electronic component that is used to vary the amount of current that flows through a circuit. It works by sliding a wiper terminal across a resistive material, typically a thin film or chunk of carbon or a resistive wire made of nickel chromium or tungsten alloys.

Figure-38: Variable resistor

4.2. Diode:

A diode is a two-terminal electronic component that conducts current mostly in one direction (asymmetric conductance); it has low (ideally zero) resistance in one path, and high (ideally infinite) resistance in the other. A diode vacuum tube or thermionic diode is a vacuum tube with two electrodes, a animated cathode and a plate, in which electrons can flow in only one direction, from cathode to plate. A semiconductor diode, the most ordinary type today, is a crystalline piece of semiconductor material with a p–n junction connected to two electrical terminals. Semiconductor diodes were the first semiconductor electronic devices. The innovation of asymmetric electrical conduction crosswise the contact between a crystalline mineral and a metal was made by German physicist Ferdinand Braun in 1874. Today, most diodes are made of silicon, but other equipment such as gallium arsenide and germanium are used.

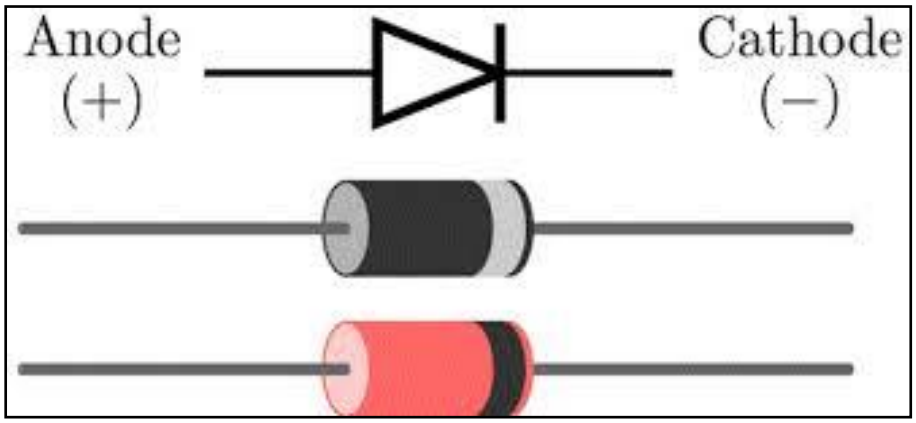


Figure-39: Diode

4.2.a Diode working principle:

A specific arrangement of diodes can convert Ac to pulsating Dc; hence it is sometimes also called as a rectifier. The symbol of a p-n junction diode is shown below, the arrowhead points in the direction of conventional electric current flow. The p-n junction is a basic building block in any semiconductor device.

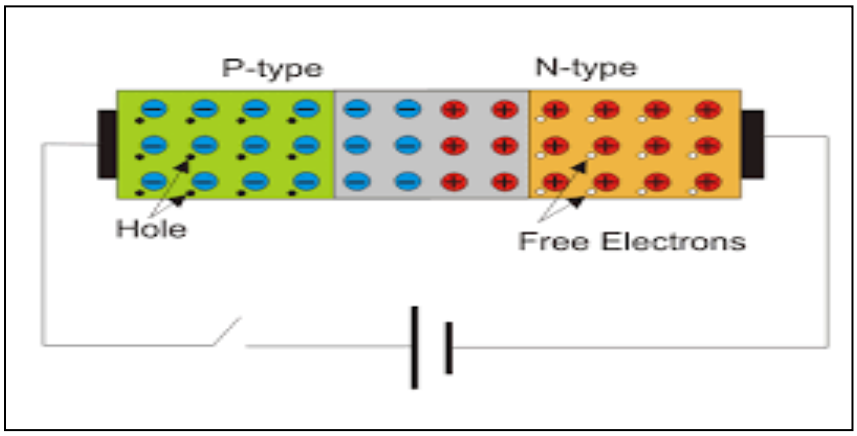


Figure-40: Diode

4.2.b Diode characteristics:

A diode is said to be an Ideal Diode when it is forward biased and acts like a perfect conductor, with zero voltage across it. Similarly, when the diode is reversed biased, it acts as a perfect insulator with zero current through it. The V-I characteristics of the Ideal diode are shown in the figure below.

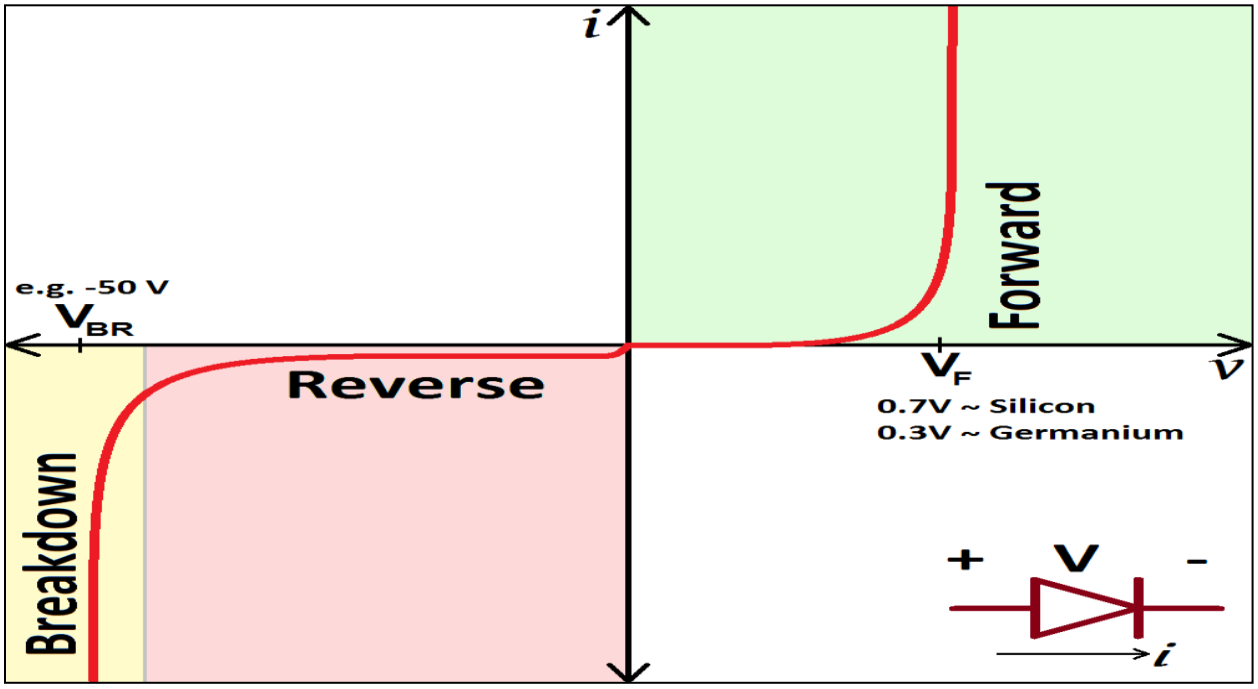


Figure-41: Diode characteristics

4.3 Different Types of Diodes:

There are several types of diodes are available for use in electronics design, namely; Backward diode

- BARITT diode
- Gunn Diode
- Laser diode
- Light emitting diodes
- Photodiode
- PIN diode
- PN Junction
- Scotty diodes
- Step recovery diode
- Tunnel diode
- Varactor diode
- Zenger diode.

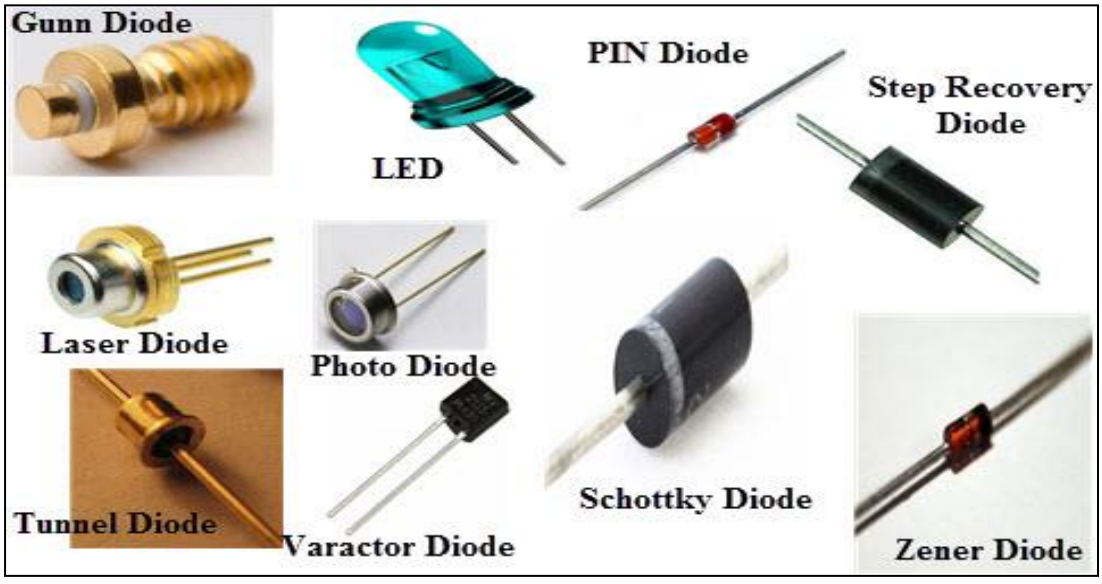


Figure-42: Different Types of Diodes

Backward Diode:

This type of diode is also called the back diode; and it is not widely used. The backward diode is a PN-junction diode that is similar to the tunnel diode in its process. It finds a few special applications where its specific properties can be used

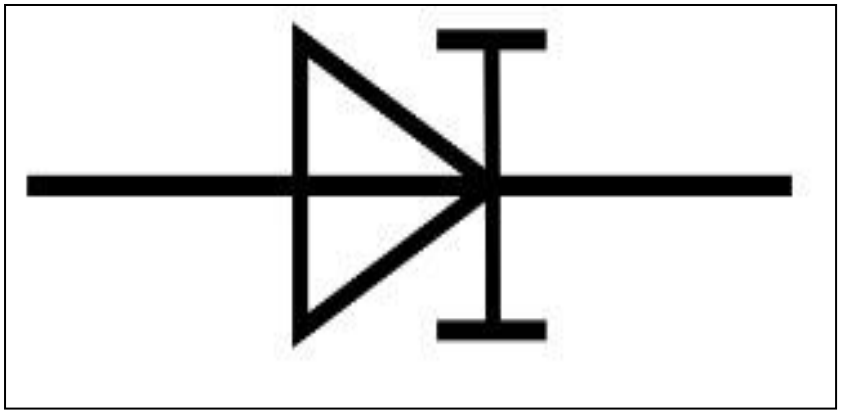


Figure-43: Backward Diode

Gunn Diode:

Gunn diode is a PN junction diode; this sort of diode is a semiconductor device that has two terminals. Generally, it is used for producing microwave signals. Please refer the below link for Gunn Diode Working, Characteristics, and its Applications

Figure-44: Gunn Diode

Laser Diode:

The laser diode is not the similar as the ordinary LED (light emitting diode) because it generates coherent light. These diodes are extensively used in many applications like DVDs, CD drives and laser light pointers for PPTs. Although these diodes are inexpensive than other types of laser generator, they are much more expensive than LEDs. They also have a partial life.

Figure- 45: Laser Diode

Light Emitting Diode:

The term LED stands for light emitting diode; is one of the most standard types of the diode. When the diode is connected in forwarding bias, then the current flows through the junction and generates the light. There are also many new LED developments are changing they are LEDs and OLED.

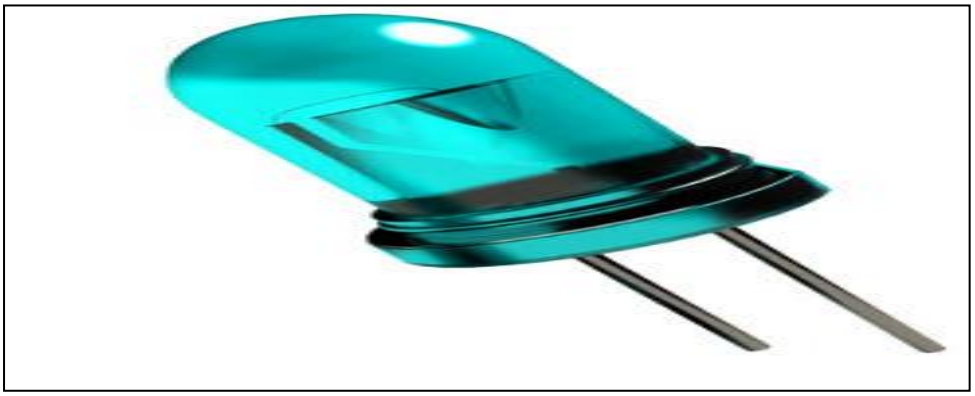


Figure-46: Light Emitting Diode

Photodiode:

The photodiode is used to detect light. It is found that when light strikes a PN-junction it can create electrons and holes. Typically, photodiodes operate under reverse bias condition where even a small amount of flow of current resulting from the light can be simply noticed.

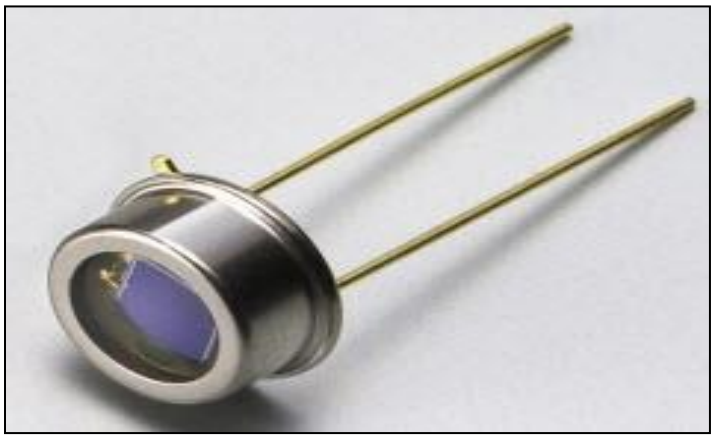


Figure- 47: Photodiode

PIN Diode:

This type of diode is characterized by its construction. It has the standard P-type & N-type regions, but the area between the two regions namely intrinsic semiconductor has no doping. The region of the intrinsic semiconductor has the effect of increasing the area of the depletion region which can be beneficial for switching applications

Figure-48: PIN Diode

PN Junction Diode:

The standard PN junction may be thought of as the normal or standard type of diode in use today. These diodes can come as small signal types for use in RF (radio frequency), or other low current applications which may be called as signal diodes. Other types may be planned for high voltage and high current applications and are normally named rectifier diodes

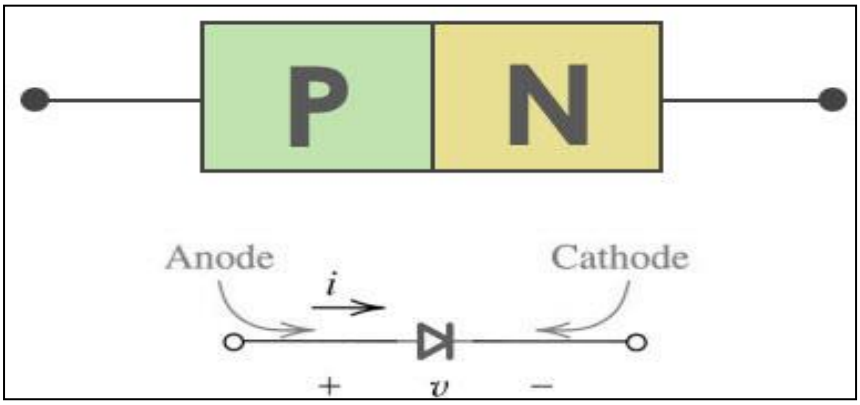


Figure-49: PN Junction Diode

Scotty Diode:

The Scotty diode has a lower forward voltage drop than ordinary Si PN-junction diodes. At low currents, the voltage drop may be between 0.15 & 0.4 volts as opposed to 0.6 volts for a Si diode. To attain this performance they are designed in a different way to compare with normal diodes having a metal to semiconductor contact. These diodes are extensively used in rectifier application, clamping diodes, and also in RF applications. Please refer the below link for Scotty Diode Working and Applications.

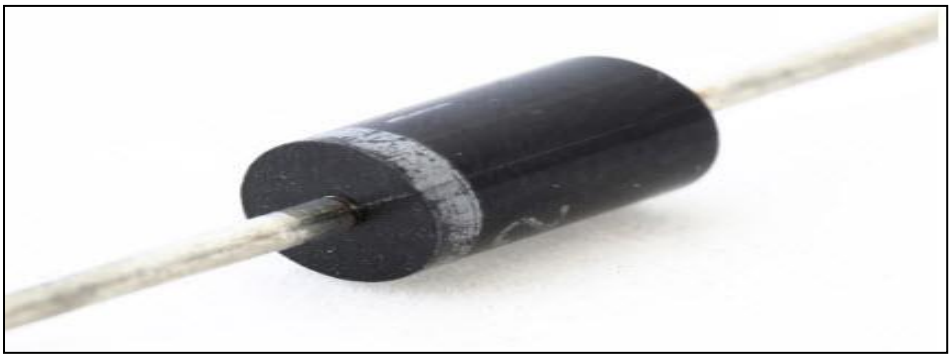


Figure- 50: Scotty Diode

Step Recovery Diode:

A step recovery diode is a type of microwave diode used to generate pulses at very HF (high frequencies). These diodes depend on the diode which has a very fast turn-off characteristic for their operation.

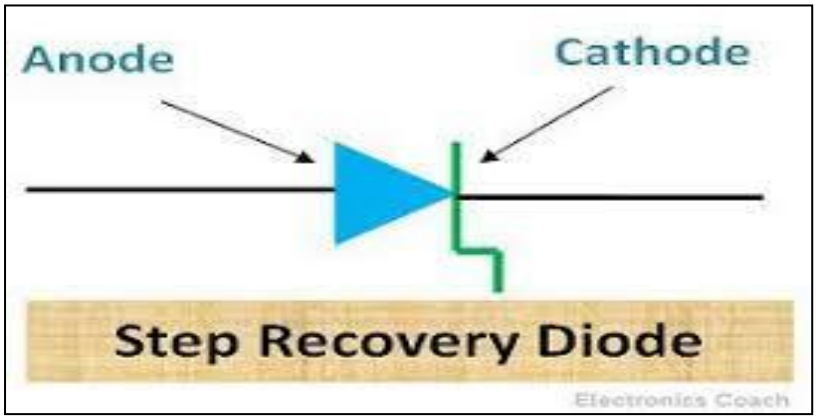


Figure- 51: Step Recovery Diode

Tunnel Diode:

The tunnel diode is used for microwave applications where its performance surpassed that of other devices of the day. Please refer the below link for Tunnel Diode Circuit with Operation and Its Applications.

Figure-52: Tunnel Diode

Varactor Diode or Varian Diode:

A varactor diode is one sort of semiconductor microwave solid-state device and it is used in where the variable capacitance is chosen which can be accomplished by controlling voltage. These diodes are also called as varietal diodes. Even though the "o/p" of the variable capacitance can be exhibited by the normal PN-junction diodes. But this diode is chosen for giving the preferred capacitance changes as they are different types of diodes. These diodes are precisely designed and enhanced such that they allow a high range of changes in capacitance. Please refer the below link for Varactor Diode Working and Its Applications

Figure- 53: Varactor Diode or Varicap Diode

Zener Diode:

The Zener diode is used to provide a stable reference voltage. As a result, it is used in vast amounts. It works under reverse bias condition and found that when a particular voltage is reached it breaks down. If the flow of current is limited by a resistor, it activates a stable voltage to be generated. This type of diode is widely used to offer a reference voltage in power supplies. Please refer the below link for Zener Diode Circuit Working and Its Applications.

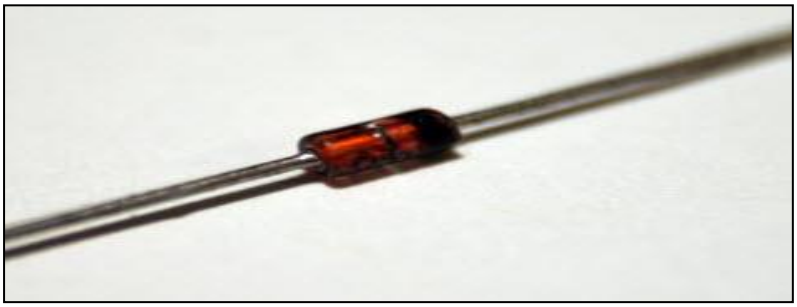


Figure-54: Zener Diode

4.5 Connecting Wires:

A wire is a single, usually cylindrical, flexible strand or rod of metal. Wires are used to bear mechanical loads or electricity and telecommunications signals. Wire is commonly formed by drawing the metal through a hole in a die or draw plate. Wire gauges come in various standard sizes, as expressed in terms of a gauge number. The term *wire* is also used more loosely to refer to a bundle of such strands, as in "multi stranded wire", which is more correctly termed a wire rope in mechanics, or a cable in electricity.

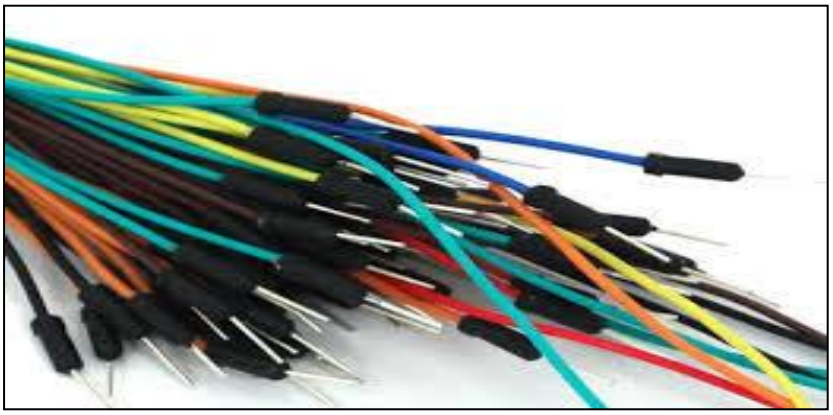


Figure- 57: Connecting Wires

4.6 PCB BOARD:

A printed circuit board (PCB) mechanically supports and electrically connects electronic components or electrical components using conductive tracks, pads and other features etched from one or more sheet layers of copper laminated onto and/or between sheet layers of a non-conductive substrate. Components are generally soldered onto the PCB to both electrically connect and mechanically fasten them to it.

Printed circuit boards are used in all but the simplest electronic products. They are also used in some electrical products, such as passive switch boxes.

Alternatives to PCBs include wire wrap and point-to-point construction, both once popular but now rarely used. PCBs require additional design effort to lay out the circuit, but manufacturing and assembly can be automated. Specialized CAD software is available to do much of the work of layout. Mass-producing circuits with PCBs is cheaper and faster than with other wiring methods, as components are mounted and wired in one operation. Large numbers of PCBs can be

fabricated at the same time, and the layout only has to be done once. PCBs can also be made manually in small quantities, with reduced benefits.

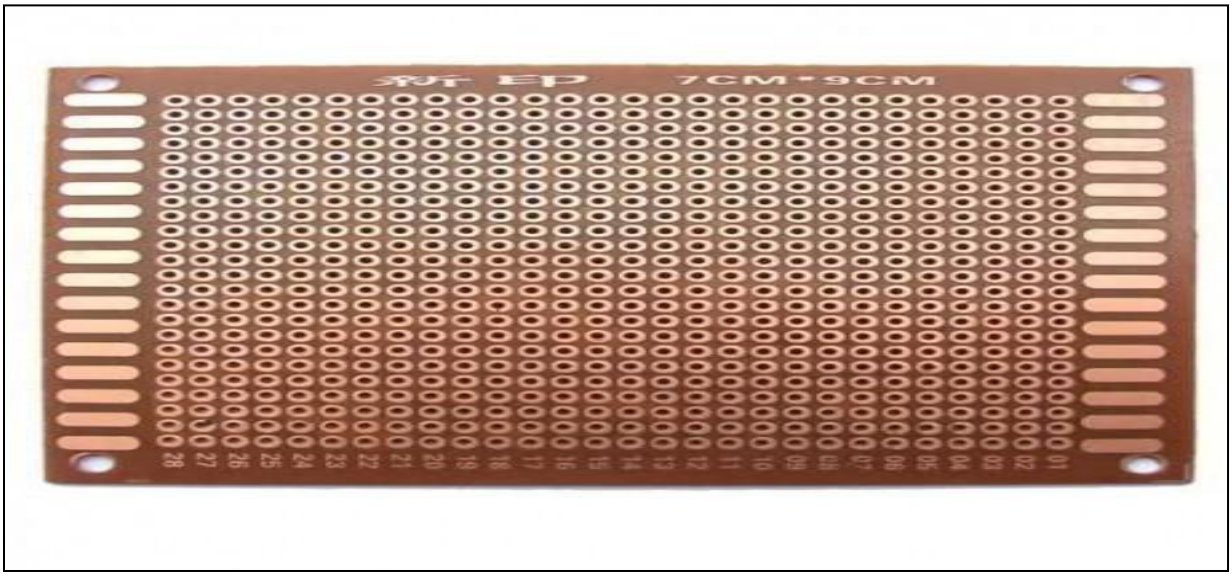


Figure-58: PCB BOARD

Chapter 5

EXTERNAL INSTRUMENT

5.1 SOLDARING IRON:

A soldering iron is a hand tool used in soldering. It supplies heat to melt solder so that it can flow into the joint between two work pieces.

A soldering iron is composed of a heated of a heated metal tip and an insulated handle. Heating is often achieved electrically, by passing an electric current (supplied through an electrical core or battery cables) through a resistive heating element. Cordless irons can be heated by combustion of gas stored in a small tank, often using a catalytic heater rather than aflame. Simple irons less commonly used today than in the past were simply a large copper bit on a handle, heated in a flame.

Figure- 59: Soldering Iron

5.2 AVO Meter:

AVO meter is a British trademark for a line of millimeters and electrical measuring instrument, the brand is now owned by the Mugger Group Limited. The first AVO meter was made by the automatic coil Winder and electrical equipment co. on 1923, and measure direct voltage, direct current and resistance. possibly the best known millimeter of the range was the model 8, which was produced in various version from may 1951 until 2008, the last version was the mark 7.

The millimeter is often called simply an AVO, because the company logo carries the first letters of amps, volt and ohms. The design concept is due to the post office engineer Donald macadam, who at the time of the introduction of the original AVO meter in 1023 was a senior officer in the post office factors department in London.

Figure- 60: AVO Meter.

5.3 Switch:

A switch is an electrical component that can make and break an electrical circuit, interrupting the current or diverting it from one conductor to another. the mechanism of a switch remover or resistor conducting path in a circuit where it is operated by a moving subject such a door, or may be operated by one sensing element for pressure, temperature or flow. A witch will have one or more set of contacts, which may operate simultaneously, sequentially, or alternately. Switch in high password circuit must operate reply to prevent destructive arcing, and may include special feature to assist in rapidly interrupting a heavy current.

Multiple forms of actuators are used for operation by hand or to sense position, level, temperature or flow. Special types are used, for example, for control of machinery, to reverse electric motors, or to sense liquid level. Many specialized forms exist. A common use is control of lighting, where multiple switches may be wired into one circuit to allow convenient control of light fixtures.

by analogy with the devices that select one or more possible paths for electric currents, devices that route information in a computer network are also called "switches" - these are usually more complicated than simple electromechanical toggles or pushbutton devices, and operate without direct human interaction.

Figure- 61: Switch

Types of Electrical Switches:

- Foot Switches
- Level Switches
- Limit Switches
- Membrane Switches
- Pressure Switches
- Pull Chain Switches
- Pushbutton Switches
- Rocker Switches
- Rotary Switches
- Slide Switches
- Push wheel Switches
- Toggle Switches
- Wall Switches

Toggle switch:

- A toggle switch is manually actuated (or pushed up or down) by a mechanical handle, lever or rocking mechanism. These are commonly used as light control switches.
- Most of these switches come with two or more lever positions which are in the versions of SPDT, SPST, DPST and DPDT switch. These are used for switching high currents (as high as 10 A) and can also be used for switching small currents.

- These are available in different ratings, sizes and styles and are used for different type of applications. The ON condition can be any of their level positions, however, by convention the downward is the closed or ON position.

Figure-62: Toggle switch

Slide Switches:

Slide switches are mechanical switches defined by their method of Operation. In this switch there is a slider that moves (slides) from position to position linearly making it easy to ON/OFF circuit or as selector switch with a finger tip easily.

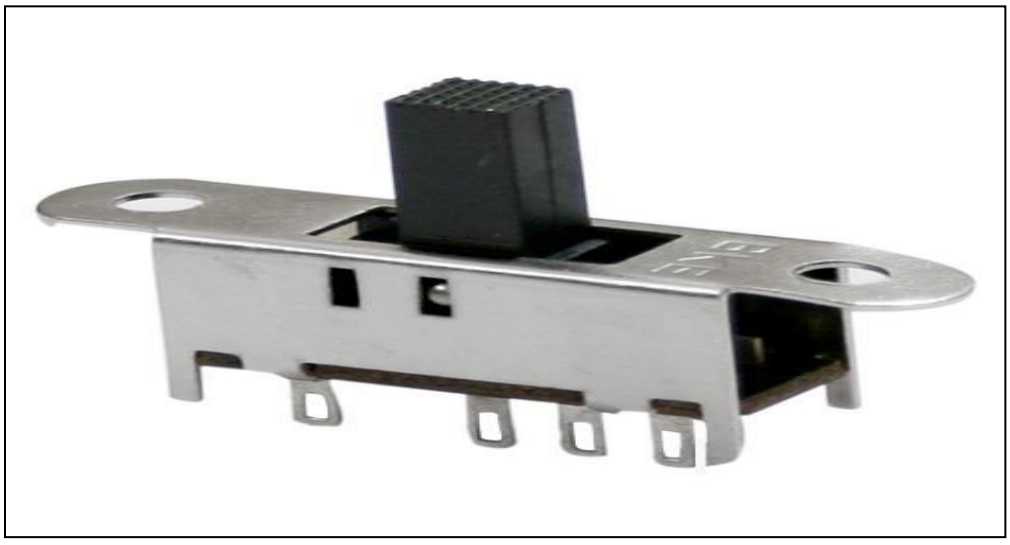


Figure-63: Slide Switches

Wall Switch:

The wall switch is one of the most common and important electrical devices in the home. There are several different types of switches, and although they may look the same when they are installed with their faceplates intact, the various switches look and function differently on the inside.

Most of the common types of switches come in different styles, such as toggle, rocker, slider, or push-button. The style usually does not affect the switch function and wiring.

While switches usually are used for lights, they can be used to turn electrical current on or off for nearly any electrical device. For example, switches sometimes are installed to control the current running to an outlet in order to turn a floor lamp on or off.

Figure-64: Wall Switch

Limit Switch:

- The control schemes of a limit switch are shown in above figure, in which four varieties of limit switches are presented.
- Some switches are operated by the presence of an object or by the absence of objects or by the motion of machine instead of human hand operation. These switches are called as limit switches.
- These switches consist of a bumper type of arm actuated by an object. When this bumper arm is actuated, it causes the switch contacts to change position.

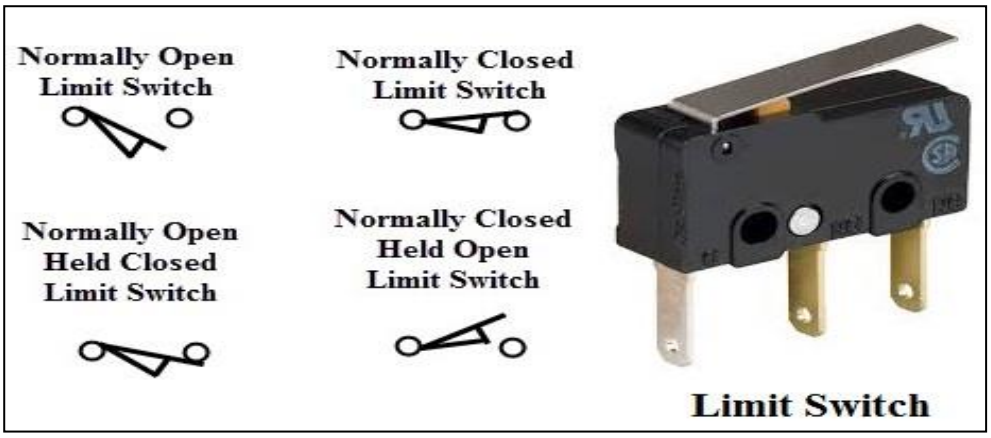


Figure-65: Limit Switch

Pressure Switches:

- These switches are commonly used in industrial applications in order to sense the pressure of hydraulic systems and pneumatic devices.
- Depends on the range of pressure to be measured, these pressure switches are classified into diaphragm operated pressure switch, metal bellow type pressure switch and piston type pressure switch.
- In all these types, pressure detection element operates a set of contacts (which can be either double pole or single pole contacts).
- This switch symbol consist a half-circle connected to a line in which flat part indicates a diaphragm. These switches may be either normally open or normally closed type configurations.

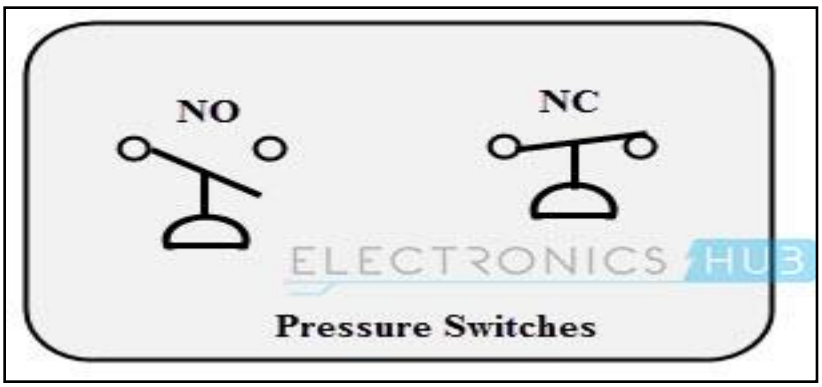


Figure-66: Pressure Switches

Rotary Switches:

- These are used for connecting one line to one of many lines.
- Examples of these switches are range selectors in electrical metering equipment, channel selectors in communication devices and band selectors in multi-band radios.
- It consists of one or more moving contacts (knob) and more than one stationary contact.
- These switches are come with different arrangement of contacts such as single pole 12-way, 3-pole 4-way, 2-pole 6-way and 4-pole 3-way.

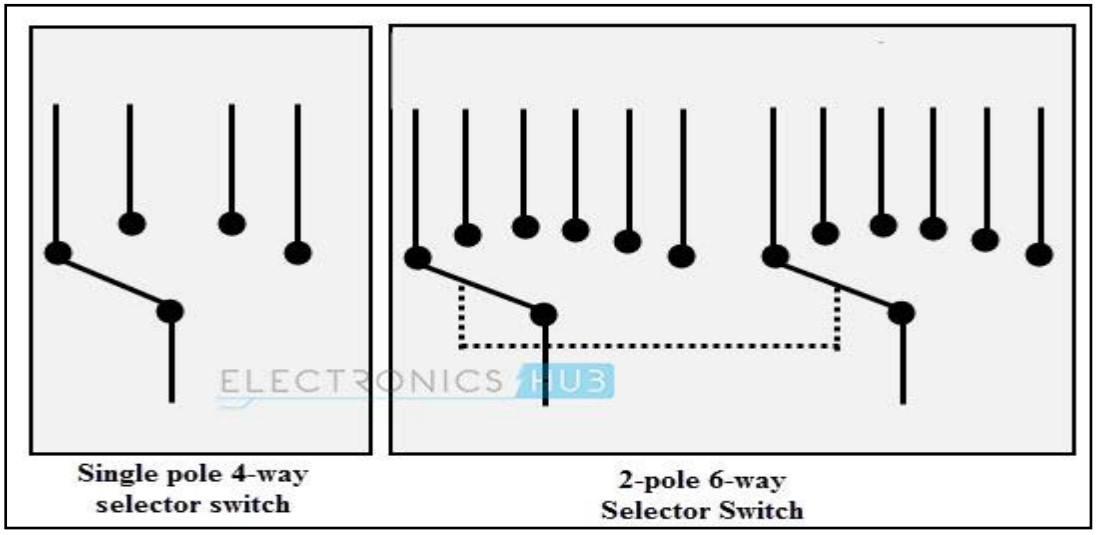


Figure-67: Rotary Switches

Joystick Switch:

- Joystick switches are manually actuated control devices used mainly in portable control equipments.
- It consists of a lever which moves freely in more than one axis of motion.
- Depending on the movement of the lever pushed, one or more switch contacts are actuated.
- These are ideally suited for lowering, raising and triggering movements to the left and right.
- These are used for building machinery, cable controls and cranes. The symbol for the joystick is shown below.

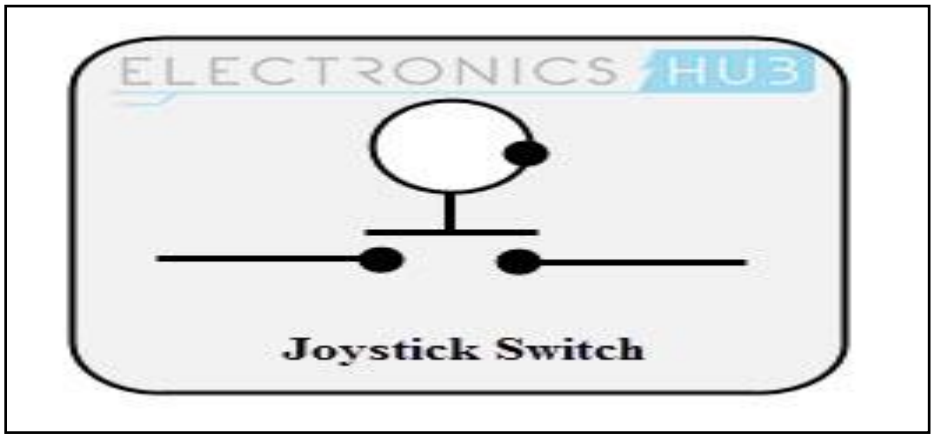


Figure-68: Joystick Switch

Push Button Switch:

- It is a momentary contact switch that makes or breaks connection as long as pressure is applied (or when the button is pushed).
- Generally, this pressure is supplied by a button pressed by someone's finger.
- This button returns its normal position, once the pressure is removed.
- The internal spring mechanism operates these two states "pressed and released" of a push button.

- It consists of stationary and movable contacts, of which stationary contacts are connected in series with the circuit to be switched while movable contacts are attached with a push button.
- Push buttons are majorly classified into normally open, normally closed and double acting push buttons as shown in the above figure.
- Double acting push buttons are generally used for controlling two electrical circuits.

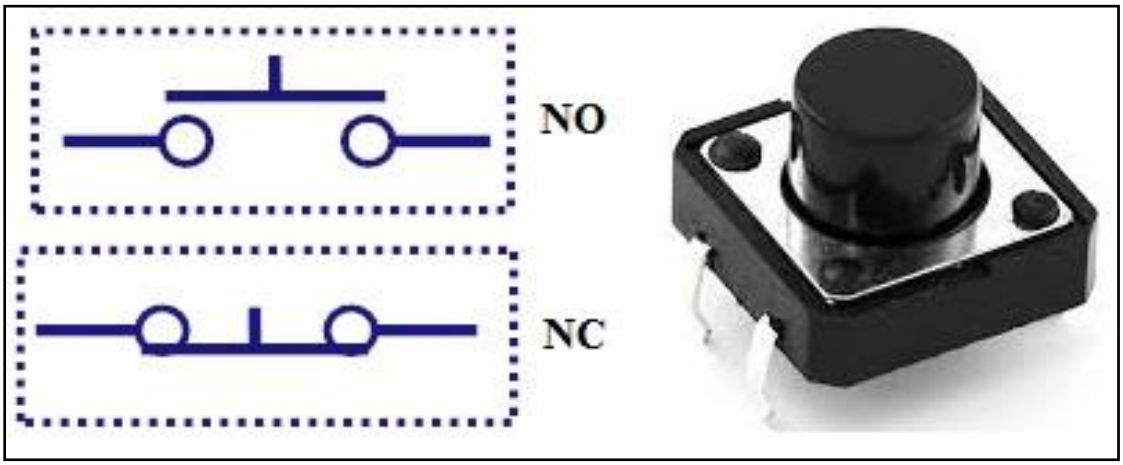


Figure- 68: Push Button Switch

5.7 One way switch:

A one way switch is a basic electrical device used to operate any household electrical or electronic equipment. It works on the principle of make or break. That u may either connect or disconnect a device (say a bulb) by help of it from the electrical circuit.

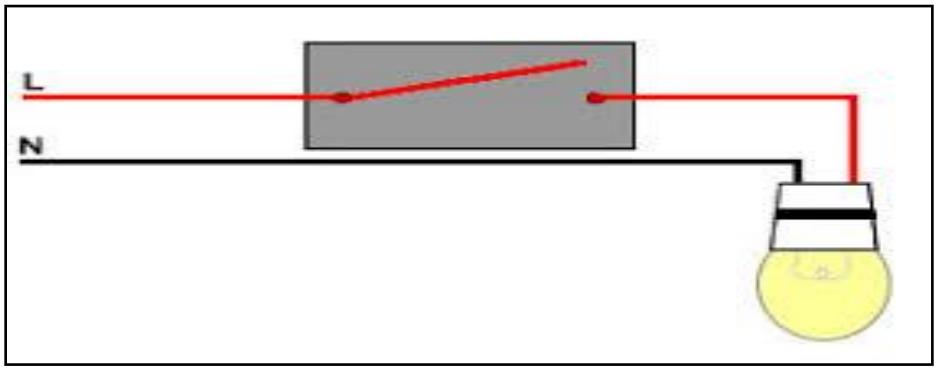


Figure-69: One way switch

5.6 Tow Way Switch:

A Two Way light switch is a simple single pole "changeover" switch with three terminals. These are typically labeled COM, L1, and L2 (Some may label the L1 and L2 positions as "1 Way" and "2 Way").

In one switch position the COM terminal is connected to L1. In the other switch position it changes over so that COM is connected to L2. The design is a "break before make" type, such that the connection to the first terminal is disconnected before the connection to the new one is made.

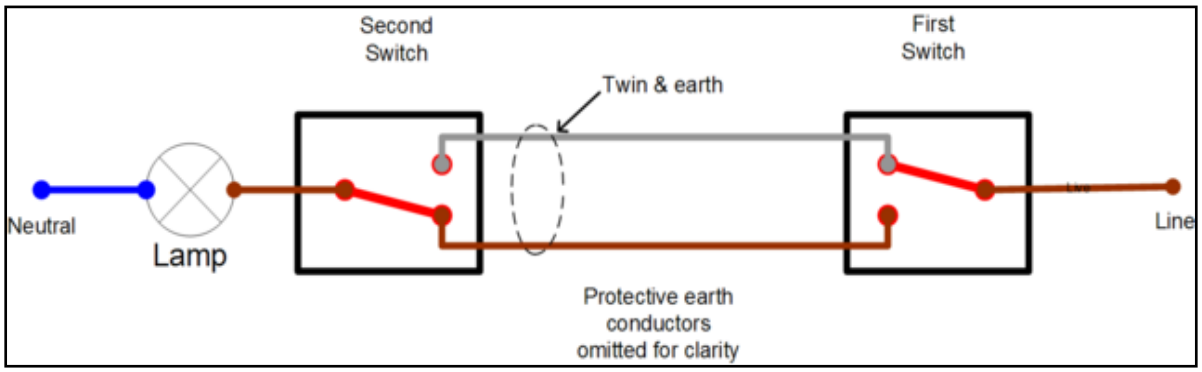


Figure- 70: Tow Way Switch

5.7 Cutter:

Wire cutter 'formerly known as *The Wire cutter*' is a product review website owned by The New York Times Company. It was founded by Brian Lam and purchased by The New York Times Company in 2016 for about $30 million. In the five years from its launch in 2011 to 2016, the company generated $150 million in revenue from affiliate programs with its merchant partners. As of 2018, it had more than 100 employees.

The site focuses on writing detailed guides to different categories of consumer products which recommend just one or two best items in the category. It gains the vast majority of its revenue from affiliate commissions. To prevent bias, the staffs who write its reviews are not informed about what commissions, if any, the site receives for different products. Due to affiliate revenue, the site is less reliant than other blogs and news sites on advertising revenue, although the Wire cutter site has displayed banner ads in the past.

Figure- 71: Cutter

5.8 Wire Steeper:

Wire stripper is one kinds of electronics element that's use for remove the insulator from the wire. A wire stripper is a portable handheld tool used by workers, especially electricians, for removing the protective coating of an electric wire in order to replace or repair the wire. It is also capable of stripping the end portions of an electric wire in order to connect them to other wires or to terminals. A wire stripper is often considered an important tool for professional electricians and other related personnel.

Figure- 72: Wire Steeper

5.8 Bearing:

A **bearing** is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may *prevent* a motion by controlling the vectors of normal forces that bear on the moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.

Rotary bearings hold rotating components such as shafts or axles within mechanical systems, and transfer axial and radial loads from the source of the load to the structure supporting it. The simplest form of bearing, the *plain bearing*, consists of a shaft rotating in a hole. Lubrication is often used to reduce friction. In the *ball bearing* and *roller bearing*, to prevent sliding friction, rolling elements such as rollers or balls with a circular cross-section are located between the races or journals of the bearing assembly. A wide variety of bearing designs exists to allow the demands of the application to be correctly met for maximum efficiency, reliability, durability and performance.

Figure- 73: Bearing

Chapter 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion:

- This system is very beneficial for both rural and urban areas
- It will help to protect water from garbage with minimum cost without using large number of labor force.
- There have lot of industrial garbage which we may recycle and reuse. it will create another income source for our country people.

At last we hope that, we can remove garbage from the water by using this project and we also hope that, it is very helpful for our country.

6.2 Limitations of the Work:

It is significant to know that in this design we used metallic contacts as transistor, which control the voltage increasing and decreasing, but this voltage transistor will very hot ,so we did use hitching, so after every 15 hour, we will off circuit and re-start this circuit connection.

6.3 Future Scopes of the Work:

The Future scope of the setup is to incorporate a more reliable sensing material. That of the present did not used in this project. Along with that, a metal which is not susceptible,

For more ultra-modern, can be connected as a sensor then a more efficient and reliable

Performance can be achieved.

REFERENCE

(1). To find a voltage control circuit wu use this link=https://www.google.com/search?q=voltage+control+circuit&tbm=isch&source=iu&ictx=1&fir=11OTyJKNRBmTDM%252CXAhVVds6wToSXM%252C_&usg=AI4_-kRRzPhEM6tE7vB3_SQ7KGGvKhkJmw&sa=X&ved=2ahUKEwjRh53Ai7nfAhUMKo8KHeH-CfwQ_h0wIHoECAUQBA&biw=1366&bih=608#imgrc=11OTyJKNRBmTDM:

2. To get boat design we use Google link= https://www.google.com/search?q=boat+picture&tbm=isch&source=iu&ictx=1&fir=-6aX26qL9GczkM%253A%252CovuNAGg6KBhu2M%252C_&usg=AI4_-kTYcTKp9sz1d9uGLOHzCoe_Ehn6mw&sa=X&ved=2ahUKEwirx-bYjLnfAhUfS48KHUgYAbIQ9QEwA3oECAQQCg#imgrc=-6aX26qL9GczkM:

3. We also use YouTube link, take helps from our honorable teacher and our good friends