Android Controlled Car Jack

K. S. Joshi[1], Shubham Bhagutre[2], Swapnil Bhosale[3], Swapnil Shinde[4], Kadambri Bamne[5], Anup Surange[6]

[1]*Principal of Dr. A. D. Shinde Collage of Engineering, Gadhinglaj-416502, Maharashtra, India*
[23456]*Students of Mechanical Department, Dr. A. D. Shinde Collage of Engineering, Gadhinglaj-416502, Maharashtra, India*

ABSTRACT:-The project is designed to control the direction of car jack by using an android phone with the help of Bluetooth device. The direction of the DC motor is depending on the signal which is coming from mobile. Hence, if we press UP, this is present on your mobile then the relay1 & relay4 gets ON, so the motor rotates in forward direction. And if when we press DOWN from mobile the relay2 & realy3 gets ON then the motor rotates in backward direction.

When we start the device it will ask via LCD display that, "PLEASE CONNECT PHONE & PRESS THE KEY". So when we pressing the key from mobile then the mobile is connected to the device. Whenever we press UP then the motor rotates in forward direction by using relay1 & relay4 logic & jack moves on UPWARD direction. When we press STOP button then the motor gets stop & remains in steady state. Vice versa, whenever we press DOWN then the motor rotates in backward direction with the help relay2 & relay3 logic & jack moves on DOWNWARD direction. This project uses the above principle to control the direction of the jack by using android phone. The relays are interfaced to the Bluetooth module for receiving signals from mobile and delivering desired output for direction control of the DC motor. Each and every status of the device displayed on LCD.

KEYWORDS: Aqua, Noise, Porous, Charcoal, Lime water, pollution, sound etc.

I. INTRODUCTION:-

Jack can be stated as the device for lifting of the heavy objects. Particularly to raise the automobile or any vehicle off the ground so that the defective wheel can be fixed or replaced. There are various types of jack they are:- 1) Jackscrew: These are the jacks similar to that of the scissor jacks and also it is the simplest kinds of still being used for cars. We can also find electrically operated car scissors which are operated by 12v dc directly from the car. 2) House jack: It is mainly used for the repair of the buildings by lifting the foundation of the buildings. 3) Hydraulic jack: This jack uses hydraulic power to lift heavy objects. It is basically used by shop work. Hydraulic jacks can find applications in lift elevators in medium and low rise buildings. 4) Pneumatic jack: Pneumatic jack is similar to that of the hydraulic jack except that it is operated by a compressed air without any need for the human intervention. This eliminates user to operate hydraulic mechanism. 5) Strand jack: It is specialized hydraulic jack which is specially used to grip steel cables. It is frequently used in strand in concerts which is capable of lifting hundreds of tons mainly used in construction and engineering Automatic Jack system is used to jack the car during road side emergency i.e. tire puncher. A device which is mechanical jack is used to lift heavy equipments, all the part of the vehicle which in order to facilitate vehicle maintenances or breakdown repairs [6]. Experience of changing a flat tire is not pleasant. Variety of car jacks have been developed for lifting up the vehicles been produced nowadays. With the manual work of changing the flat tire has been difficult for the elderly and handicapped. It requires physical work such as squatting position or prolonged bent to operate the jack. During this work which is squatting position or bent where in it gives a back ache problem in due oftime. A toggle Jack is operated by turning a lead screw. With this case of jack, a little force is applied in the horizontal plane which uses to raise or lower large load [7].A thread which is more often used is acme, as this thread can resist the large loads and very strong imposed on the jackscrews and by wear it is not being weakened over many rotations [8]. A normal jack purposed to hold up to 1000 kilograms, when test is conducted by consumer affairs has revealed that it stops to work after reaching 250 kilograms and physical damage takes place when it has a weight close to its 1000 kilograms capacity [9]. As the test conducted jack has capacity to

buckle under the weight to subject to withstand [10]. The purpose of this project is to develop an automatic car jack system which is easy to install and operate, which is also able to lift and lower the car without involving much physical effort. Our paper gives detailed of the design and analysis of modified automatic car jack

"Android-based advanced car lifting system using Bluetooth", the scopes of research were on developing an integrated system to the car that can be used through wireless remote control. In the process of obtaining a suitable design, the customer needs will translate to the engineering characteristic to obtain the concepts that need to be modified and fabricated. From the house Power Supply: This section is meant for supplying Power to all the sections mentioned above. It basically consists of a Transformer to step down the 230V ac to 9V ac followed by diodes. Here diodes are used to rectify the ac to dc. After rectification the obtained rippled dc is filtered using a capacitor Filter. A positive voltage regulator is used to regulate the obtained dc voltage.

The HC-05 is a Bluetooth module used for Wireless communication. It is used for one to one communication. It has 6 pins namely Enable, VCC, GND, TX, RX, and State. When Enable pin is provided with 3.3V or 5V, the module gets on. Else module doesn't work. VCC should be provided with 3.3V or 5V and GND should be provided with the ground. The two pins TX and RX are used for transmitting and receiving data wirelessly. When module gets connected to a device, the pin State gets high, else it will be low.

We are using relays as 'and' gates. Two relays are used forand-ing the voltage at 2, 4 pins of Arduino and output voltage from inverted switch at maximum height and this and-ed voltage will be given to positive terminal of DC motor. Two relays are used for adding the voltage at 7, 8 pins of Arduino and output voltage from inverted switch at minimum height. Further, the voltage will be added to given negative terminal of DC motor. When we press Up in the App 2, 4 pins will have 5V and 7, 8 pins will have 0V. When we press Down in the App 2, 4 pins will have 0V and 7, 8 pins will have 5V. When we press Stop in the App 2, 4 pins will have 0V and 7, 8 pins will have 0V.

Manual jack is converted to automatic one by establishingan interface between the app, electronic circuit, DC motor and the gearbox. When the controller receives signals, the relay

of quality, the best concept will be valued, based on the weighted rating method. Then the configuration design was analyzedaccording to the function factor and critical issue that the design that had been implementing was according to the specification. In this paper, we employed a reduction gearbox to transmit the motor power to the lead screw to facilitate the motion of Jack. The power supply to the motor which is derived from the car battery is monitored and directed using a circuit built to serve the purpose. An automotive jack is a device used to raise all or part of a vehicle into the air in order to facilitate repairs. Most of the

passes the 12V DC to the motor which drives the gear train, which in turn rotates the lead screw of the jack. When the lead screw turns clockwise the arms of the jack lift i.e., the carrier plate lifts up. And similarly, when the lead screw rotates anti-clockwise the carrier plate comes down. Since the jack is automatic, it should stop at the topmost and the bottom most position itself. To achieve this attribute, we have put two contact breaker switches on the arms of the jack. As the jack reaches the topmost position, the switches by the virtue of the position are pressed and the contact with the power supply breaks. Similar is the case when the jack reaches the lowest position. The scissor jack is used in the proposed design which is easily available in the market at low prices according to our requirements of the amount of load to be lifted. The task left is to make the jack automatic. Firstly, we have to use a high torque DC motor. It can efficiently run the gear train. Since we need to reduce the

1. Exhaust Manifold Reactor:

It is the modification of after burner. It is also known as the Thermal Reactor. Oxidation of CO and HC mainly depends upon the temperature and the retention time. Oxidation of CO and HC increases with temperature and retention time. Temperature required for the effective oxidation of CO and He is about 600° to 700°C. Thermal reactor does the function of oxidation of CO and HC in pressure of High temperature. A thermal reactor is an enlarged manifold that is mounted on Cylinder head. The main objective of the system is to provide a rapid mixing of exhaust gases with the secondary air injected into the exhaust port in order to get uniform temperatures and uniform mixture composition. It has a provision to retain the gases at high temperatures for longer time in order to get higher conversion efficiency30mm.

HARDWARE DESCRIPTION
Voltage Transformer
One of the main reasons that we use alternating AC voltages and currents in our homes and workplace's is that AC supplies can be easily generated at a convenient voltage, transformed (hence the name transformer) into much higher voltages and then distributed

The reason for transforming the voltage to a much higher level is that higher distribution voltages implies lower currents for the same power and therefore lower I^2R losses along the networked grid of cables. These higher AC transmission voltages and currents can then be reduced to a much lower, safer and usable voltage level where it can be used to supply electrical equipment in our homes and workplaces, and all this is possible thanks to the basic
Voltage Transformer.

A Typical Voltage Transformer
The **Voltage Transformer** can be thought of as an electrical component rather than an electronic component. A transformer basically is very simple static (or stationary) electro-magnetic passive electrical device that works on the principle of Faraday's law of induction by converting electrical energy from one value to another.

The transformer does this by linking together two or more electrical circuits using a common oscillating magnetic circuit which is produced by the transformer itself. A transformer operates on the principals of "electromagnetic induction", in the form of Mutual Induction.

Mutual induction is the process by which a coil of wire magnetically induces a voltage into another coil located in close proximity to it. Then we can say thattransformers work in the "magnetic domain", and transformers get their name from the fact that they "transform" one voltage or current level into another.

Transformers are capable of either increasing or decreasing the voltage and current levels of their supply, without modifying its

frequency, or the amountof Electrical Power being transferred from one winding to another via the magnetic circuit.

A single phase voltage transformer basically consists of two electrical coils of wire, one called the "Primary Winding" and another called the "Secondary Winding". For this tutorial we will define the "primary" side of the transformer as the side that usually takes power, and the "secondary" as the side that usually delivers power. In a single-phase voltage transformer the primary is usually the side with the higher voltage.

These two coils are not in electrical contact with each other but are instead wrapped together around a common closed magnetic iron circuit called the "core". This soft iron core is not solid but made up of individual laminations connected together to help reduce the core's losses.
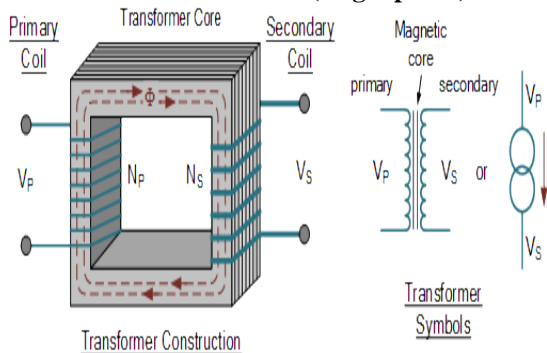
The two coil windings are electrically isolated from each other but are magnetically linked through the common core allowing electrical power to be transferred from one coil to the other. When an electric current passed through the primary winding, a magnetic field is developed which induces a voltage into the secondary winding as shown.

Single Phase Voltage Transformer
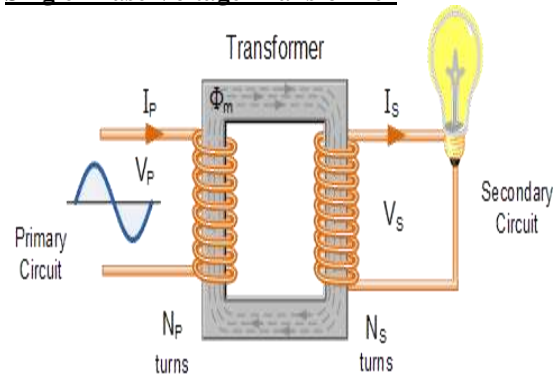
In other words, for a transformer there is no direct electrical connection between the two coil windings, thereby giving it the name also of an Isolation Transformer. Generally, the primary winding of a transformer is connected to the input voltage supply and converts or transforms the electrical power into a magnetic field. While the job of the secondary winding is to convert this alternating magnetic field into electrical power producing the required output voltage as shown.

Transformer Construction (single-phase)

Transformer Construction

- Where:
- V_P - is the Primary Voltage
- V_S - is the Secondary Voltage
- N_P - is the Number of Primary Windings
- N_S - is the Number of Secondary Windings
- Φ (phi) - is the Flux Linkage

Notice that the two coil windings are not electrically connected but are only linked magnetically. A single-phase transformer can operate to either increase or decrease the voltage applied to the primary winding. When a transformer is used to "increase" the voltage on its secondary winding with respect to the primary, it is called a **Step-up transformer**. When it is used to "decrease" the voltage on the secondary winding with respect to the primary it is called a **Step-down transformer**.

However, a third condition exists in which a transformer produces the same voltage on its secondary as is applied to its primary winding. In other words, its output is identical with respect to voltage, current and power transferred. This type of transformer is called an "Impedance Transformer" and is mainly used for impedance matching or the isolation of adjoining electrical circuits.

The difference in voltage between the primary and the secondary windings is achieved by changing the number of coil turns in the primary winding (N_P) compared to the number of coil turns on the secondary winding (N_S).

As the transformer is basically a linear device, a ratio now exists between the number of turns of the primary coil divided by the number of turns of the secondary coil. This ratio, called the ratio of transformation, more commonly known as a transformers "turns ratio",(TR). This turns ratio value dictates the operation of the transformer and the corresponding voltage available on the secondary winding.

It is necessary to know the ratio of the number of turns of wire on the primary winding compared to the secondary winding. The turns ratio, which has no units, compares the two windings in order and is written with a colon, such as 3:1 (3-to-1). This means in this example, that if there are 3 volts on the primary winding there will be 1 volt on the secondary winding, 3 volts-to-1 volt. Then we can see that if the ratio between the number of turns changes the resulting voltages must also change by the same ratio, and this is true.

Transformers are all about "ratios". The ratio of the primary to the secondary, the ratio of the input to the output, and the turns ratio of any given transformer will be the same as its voltage ratio. In other words for a transformer: "turns ratio = voltage ratio". The actual number of turns of wire on any winding is generally not important, just the turns ratio and this relationship is given as:

A Transformers Turns Ratio

$$\frac{N_P}{N_S} = \frac{V_P}{V_S} = n = \text{Turns Ratio}$$

Assuming an ideal transformer and the phase angles: $\Phi_P \equiv \Phi_S$

Note that the order of the numbers when expressing a transformers turns ratio value is very important as the turns ratio 3:1 expresses a very different transformer relationship and output voltage than one in which the turns ratio is given as: 1:3.

Transformer Basics Example No1

A voltage transformer has 1500 turns of wire on its primary coil and 500 turns of wire for its secondary coil. What will be the turns ratio (TR) of the transformer.

$$\text{T.R.} = \frac{N_P}{N_S} = \frac{\#\text{Pri.Coils}}{\#\text{Sec.Coils}} = \frac{1500}{500} = \frac{3}{1} = 3:1$$

This ratio of 3:1 (3-to-1) simply means that there are three primary windings for every one secondary winding. As the ratio moves from a larger number on the left to a smaller number on the right, the primary voltage is therefore stepped down in value as shown.

Transformer Basics Example No2

If 240 volts rms is applied to the primary winding of the same transformer above, what will be the resulting secondary no load voltage.

$$\text{T.R.} = 3:1 \text{ or } \frac{3}{1} = \frac{V_P}{V_S} = \frac{\#\text{Pri. Volts}}{\#\text{Sec. Volts}} = \frac{240}{V_S}$$

$$\therefore \text{Sec. Volts, } V_S = \frac{V_P}{3} = \frac{240}{3} = 80 \text{ volts}$$

Again confirming that the transformer is a "step-down transformer as the primary voltage is 240 volts and the corresponding secondary voltage is lower at 80 volts.

Then the main purpose of a transformer is to transform voltages at presetratios and we can see that the primary winding has a set amount or number of windings (coils of wire) on it to suit the input voltage. If the secondary output voltage is to be the same value as the input voltage on the primary winding, then the same number of coil turns must be wound onto the secondary core as there are on the primary core giving an even turns ratio of 1:1 (1-to-1). In other words, one coil turn on the secondary to one coil turn on the primary.

If the output secondary voltage is to be greater or higher than the input voltage, (step-up transformer) then there must be more turns on the secondary giving a turns ratio of 1:N (1-to-N), where N represents the turns ratio number. Likewise, if it is required that the secondary voltage is to be lower or less than the primary, (step-down transformer) then the number of secondary windings must be less giving a turns ratio of N:1 (N-to-1).

Transformer Action

We have seen that the number of coil turns on the secondary winding compared to the primary winding, the turns ratio, affects the amount of voltage available from the secondary coil. But if the two windings are electrically isolated from each other, how is this secondary voltage produced?

We have said previously that a transformer basically consists of two coils wound around a common soft iron core. When an alternating voltage (V_P) is applied to the primary coil, current flows through the coil which in turn sets up a magnetic field around itself, called mutual inductance, by this current flow according to Faraday's Law of electromagnetic induction. The strength of the magnetic field builds up as the current flow rises from zero to its maximum value which is given as$d\Phi/dt$.
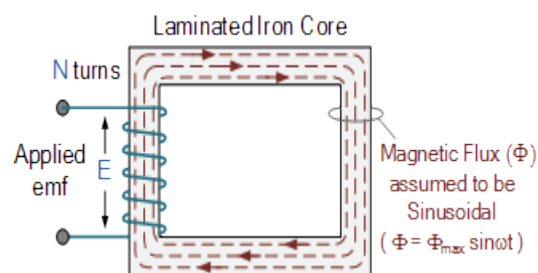
As the magnetic lines of force setup by this electromagnet expand outward from the coil the soft iron core forms a path for and concentrates the magnetic flux. This magnetic flux links the turns of both windings as it increases and decreases in opposite directions under the influence of the AC supply.

However, the strength of the magnetic field induced into the soft iron core depends upon the amount of current and the number of turns in the winding. When current is reduced, the magnetic field strength reduces.

When the magnetic lines of flux flow around the core, they pass through the turns of the secondary winding, causing a voltage to be induced into the secondary coil. The amount of voltage induced will be determined by: $N.d\Phi/dt$ (Faraday's Law), where N is the number of coil turns. Also this induced voltage has the same frequency as the primary winding voltage.

Then we can see that the same voltage is induced in each coil turn of both windings because the same magnetic flux links the turns of both the windings together. As a result, the total induced voltage in each winding is directly proportional to the number of turns in that winding. However, the peak amplitude of the output voltage available on the secondary winding will be reduced if the magnetic losses of the core are high.

If we want the primary coil to produce a stronger magnetic field to overcome the cores magnetic losses, we can either send a larger current through the coil, or keep the same current flowing, and instead increase the number of coil turns (N_P) of the winding. The product of amperes times turns is called the "ampere-turns", which determines the magnetising force of the coil.

So assuming we have a transformer with a single turn in the primary, and only one turn in the secondary. If one volt is applied to the one turn of the primary coil, assuming no losses, enough current must flow and enough magnetic flux generated to induce one volt in the single turn of the secondary. That is, each winding supports the same number of volts per turn.

As the magnetic flux varies sinusoidally, $\Phi = \Phi_{max} \sin\omega t$, then the basic relationship between induced emf, (E) in a coil winding of N turns is given by:

emf = turns x rate of change

$$E = N\frac{d\Phi}{dt}$$

$$E = N \times \omega \times \Phi_{max} \times \cos(\omega t)$$

$$E_{max} = N\omega\Phi_{max}$$

$$E_{rms} = \frac{N\omega}{\sqrt{2}} \times \Phi_{max} = \frac{2\pi}{\sqrt{2}} \times f \times N \times \Phi_{max}$$

$$\therefore E_{rms} = 4.44 f N \Phi_{max}$$

- Where:
- f - is the flux frequency in Hertz, $= \omega/2\pi$
- N - is the number of coil windings.
- Φ - is the flux density in webers

This is known as the **Transformer EMF Equation**. For the primary winding emf, N will be the number of primary turns, (N_P) and for the secondary winding emf, N will be the number of secondary turns, (N_S).

Also please note that as transformers require an alternating magnetic flux to operate correctly, transformers cannot therefore be used to transform or supply DC voltages or currents, since the magnetic field must be changing to induce a voltage in the secondary winding. In other words,**transformers DO NOT operate on steady state DC voltages**, only alternating or pulsating voltages.

If a transformers primary winding was connected to a DC supply, the inductive reactance of the winding would be zero as DC has no frequency, so the effective impedance of the winding will therefore be very low and equal only to the resistance of the copper used. Thus the winding will draw a very high current from the DC supply causing it to overheat and eventually burn out, because as we know I = V/R.

Transformer Basics Example No3

A single phase transformer has 480 turns on the primary winding and 90 turns on the secondary winding. The maximum value of the magnetic flux density is 1.1T when 2200 volts, 50Hz is applied to the transformer primary winding. Calculate:

a). The maximum flux in the core.

b). The cross-sectional area of the core.

$$\Phi_{max} = \beta \times A$$

$$\therefore A = \frac{\Phi_{max}}{\beta} = \frac{0.0206}{1.1} = 0.0187m^2$$

c). The secondary induced emf.

$$T.R. = \frac{V_P}{V_S} = \frac{N_P}{N_S}$$

$$\therefore V_S = \frac{V_P \times N_S}{N_P} = \frac{2200 \times 90}{480} = 412.5\,Volts$$
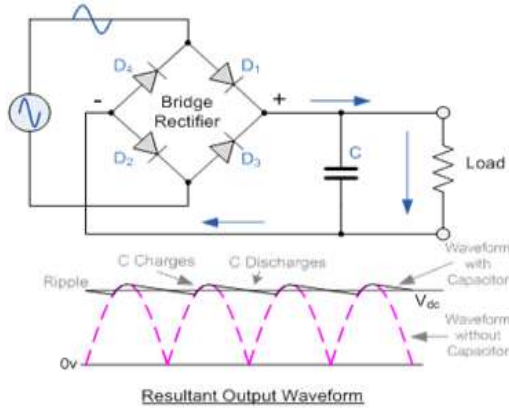
BRIDGE RECTIFIER

Bridge rectifier circuit is a common part of the electronic power supplies. Many electronic circuits require rectified DC power supply for powering the various electronic basic componentsfrom available AC mains supply. We can find this rectifier in a wide variety of electronic AC power devices like home appliances, motor controllers, modulation process, welding applications, etc.

A Bridge rectifier is an Alternating Current (AC) to Direct Current (DC) converter that rectifies mains AC input to DC output. Bridge Rectifiers are widely used in power supplies that provide necessary DC voltage for the electronic components or devices. They can be constructed with four or more diodes or any other controlled solid state switches.

Depending on the load current requirements, a proper bridge rectifier is selected. Components' ratings and specifications, breakdown voltage, temperature ranges, transient current rating, forward current rating, mounting requirements and other considerations are taken into account while selecting a rectifier power

supply for an appropriate electronic circuit's application.

Resultant Output Waveform

This bridge rectifier uses diodes for rectifying the input as shown in the figure. Since the diode is a unidirectional device that allows the current flow in one direction only. With this configuration of diodes in the rectifier, it doesn't allow the power to vary depending on the load requirement. So this type of rectifier is used in <u>constant or fixed power supplies</u>.
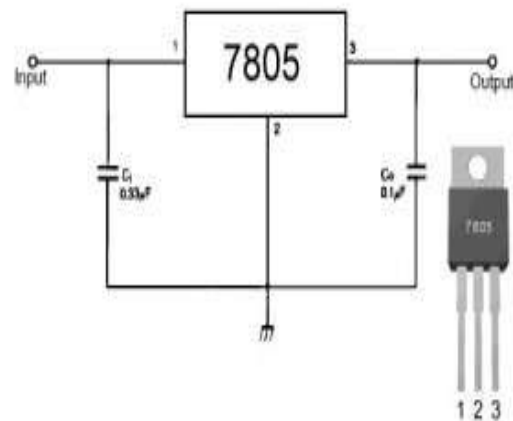
REGULATOR
This test is performed to check whether the voltage at different terminals is according to the requirement or not. We take a multi meter and put it in voltage mode. Remember that this test is performed without microcontroller. Firstly, we check the output of the transformer, whether we get the required 12 v AC voltage.

Then we apply this voltage to the power supply circuit. Note that we do this test without microcontroller because if there is any excessive voltage, this may lead to damaging the controller. We check for the input to the voltage regulator i.e., are we getting an input of 12v and an output of 5v. This 5v output is given to the microcontrollers' 40th pin. Hence we check for the voltage level at 40th

pin. Similarly, we check for the other terminals for the required voltage. In this way we can assure that the voltage at all the terminals is as per the requirement

Features
• Output Current up to 1A.
• Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V.
• Thermal Overload Protection.
• Short Circuit Protection.
• Output Transistor Safe Operating Area Protection.

Description
The LM78XX/LM78XXA series of three-terminal positive regulators are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a Wide range of applications. Each type employs internal current limiting, thermal shutdown and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output Current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

Internal Block Diagram
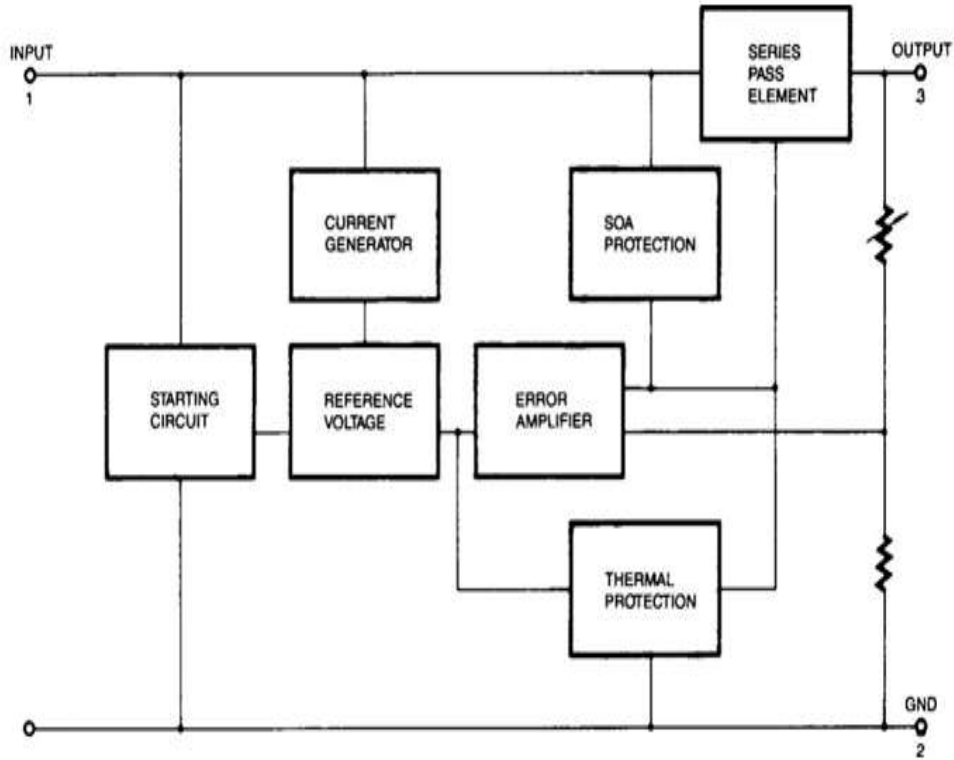
BLOCK DIAGRAM OF VOLTAGE REGULATOR

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage (for VO = 5V to 18V)	VI	35	V
(for VO = 24V)	VI	40	V
Thermal Resistance Junction-Cases (TO-220)	RθJC	5	°C/W
Thermal Resistance Junction-Air (TO-220)	RθJA	65	°C/W
Operating Temperature Range (KA78XX/A/R)	TOPR	0 ~ +125	°C
Storage Temperature Range	TSTG	-65 ~ +150	°C

TABLE 4.2(b): RATINGS OF THE VOLTAGE
REGULATOR

MICROCONTROLLER IC: (89C51)
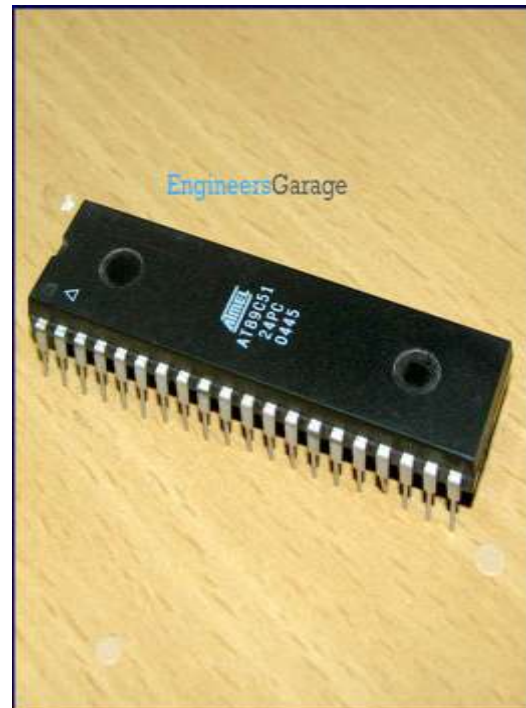
DISCRIPTION:

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4 Kbytes of Flash Programmable and Erasable Read Only Memory (PEROM). The device is manufactured using Atmel's high density non-volatile memory technology and is compatible with the industry standard MCS-51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory program- mer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications.

The AT89C51 provides the following standard features: 4 Kbytes of Flash, 128 bytes of RAM, 32 I/O lines, two 16-bit timer/counters, five vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator and clock circuitry. In addition, the AT89C51 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The idle mode stops the CPU while allowing the RAM, timers/counters, serial port and interrupt system to continue functioning.

The power down mode saves the RAM contents but freezes the oscillator disabling all other functions until the next hardware reset.

FEATURES:

☐ Compatible with MCS-51 Products
☐ 4 Kbytes of In-System Reprogrammable Flash Memory. Endurance   1,000 Write/Erase Cycles
☐ Fully Static Operation: 0 Hz to 24 MHz
☐ Three-Level Program Memory Lock
☐ 128 x 8-Bit Internal RAM
☐ 32 Programmable I/O Lines
☐ Two 16-Bit Timer/Counters
☐ Six Interrupt Sources
☐ Programmable Serial Channel
☐ Low Power Idle and Power down Modes

PIN DAIGRAM:
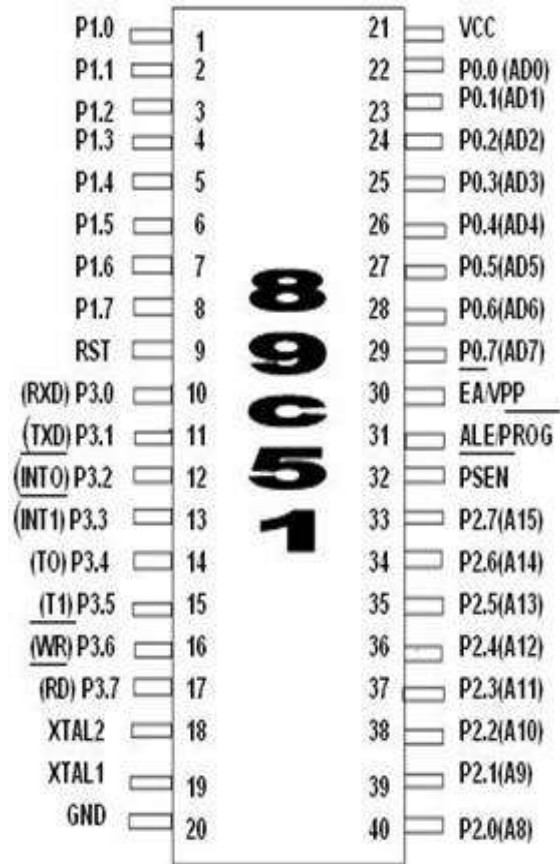
Description of pin diagram:

- **VCC:** Supply voltage.
- **GND:** Ground.
- **Port 0**

Port 0 is an 8-bit open drain bidirectional I/O port. As an output port each pin can sink eight TTL inputs. When 1s are written to port 0 pins, the pins can be used as high-impedance inputs. Port 0 may also be configured to be the multiplexed low order address/data bus during accesses to external program and data memory. In this mode P0 has internal pull-ups. Port 0 also receives the code bytes during Flash programming, and outputs the code bytes during program verification. External pull-ups are required during program verification.

- **Port 1**

Port 1 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 1 output buffers can sink/source four TTL inputs. When 1s are written to Port 1 pins they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 1 pins that are externally being pulled low will source

Current (IIL) because of the internal pull-ups. Port 1 also receives the low-order address bytes during Flash programming and program verification.

- **Port 2:**
Port 2 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 2 output buffers can sink/source four TTL inputs. When 1s are written to Port 2 pins they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 2 pins that are externally being pulled low will source current (IIL) because of the internal pull-ups. Port 2 emits the high-order address byte during fetches from external program memory and during accesses to external data memory that uses 16-bit addresses (MOVX @ DPTR). In this application it uses strong internal pull-ups when emitting 1s. During accesses to external data memory that uses 8-bit addresses (MOVX @ RI), Port 2 emits the contents of the P2 Special Function Register. Port 2 also receives the high-order address bits and some control signals during Flash programming and verification.

- **Port 3**
Port 3 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 3 output buffers can sink/source four TTL inputs. When 1s are written to Port 3 pins they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 3 pins that are externally being pulled low will source current (IIL) because of the pull-ups. Port 3 also serves the functions of various special features of the AT89C51 as listed below:

Port Pin	Alternate Functions
P3.0	RXD (serial input port)
P3.1	TXD (serial output port)
P3.2	$\overline{INT0}$ (extenal interrupt 0)
P3.3	$\overline{INT1}$ (extenal interrupt 1)
P3.4	T0 (timer 0 extenal input)
P3.5	T1 (timer 1 external input)
P3.6	$\overline{WR}$ (extenal data memory write strobe)
P3.7	$\overline{RD}$ (extenal data memory read strobe)

Port 3 also receives some control signals for Flash programming and Programming verification.

- **RST**
Reset input. A high on this pin for two machine cycles while the oscillator is running resets the device.

- **ALE/PROG**
Address Latch Enable output pulse for latching the low byte of the address during accesses to external memory.
This pin is also the program pulse input (PROG) during Flash programming.
In normal operation ALE is emitted at a constant rate of 1/6 the oscillator frequency, and may be used for external timing or clocking purposes. Note, however, that one ALE pulse is skipped during each access to external Data
Memory. If desired, ALE operation can be disabled by setting bit 0 of SFR location 8EH. With the bit set, ALE is active only during a MOVX or MOVC instruction. Otherwise, the pin is weakly pulled high. Setting the ALE-disable bit has no effect if the microcontroller is in external execution mode.

- **PSEN:** Program Store Enable is the read strobe to external program memory. When the AT89C51 is executing code from external program memory, PSEN is activated twice each machine cycle, except that two PSEN activations are skipped during each access to external data memory.

- **EA/VPP:** External Access Enable. EA must be strapped to GND in order to enable the device to fetch code from external program memory locations starting at 0000H up to FFFFH. Note, however, that if lock bit 1 is programmed, EA will be internally latched on reset. EA should be strapped to VCC for internal program executions. This pin also receives the 12-volt programming enable voltage (VPP) during Flash programming, for parts that require 12-volt VPP.

- **XTAL1:** Input to the inverting oscillator amplifier and input to the internal clock operating circuit.
- **XTAL2:** Output from the inverting oscillator amplifier.
- RESET Circuit
- RESET is an active High input When RESET is set to High, microcontroller goes back to the power on state. The microcontroller is reset by holding the RST high for at least two machine cycles and then returning it low.
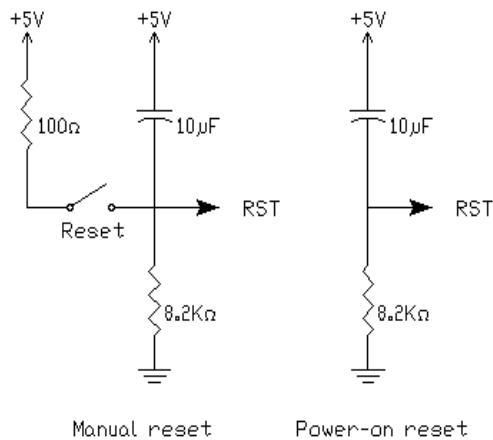
- The reset line of the 8051 operates in an opposite fashion in comparison to many other microcontrollers, like the PIC, AVR, etc.
- During normal operation, the reset pin is normally held low through the use of a weak pull down resistor, 8.2KΩ in this case.
- A reset occurs when the capacitor is shorted through the switch which in effect momentarily pulls the reset pin high, resetting the device.
- When the switch is released the capacitor begins to charge, once again pull the reset pin low for normal operation**.**
- The capacitor is to cause a proper reset when power is first applied. When power is applied, the capacitor begins to charge and holds the reset line high (until it is charged) for long enough to ensure that the 8051 gets a proper start up condition.
- The microcontroller uses the crystal for precisely that: to synchronize it's operation. Effectively, the 8051 operates using what are called "machine cycles." A single machine cycle is the minimum amount of time in which a single microcontroller instruction can be executed. although many instructions take multiple cycles.
- microcontroller has an on-chip oscillator. It needs an external crystal thats decides the operating frequency of the microcontroller .
- This can be achieved in two ways,,
- The crystal is connected to pins 18 and 19 with stabilizing capacitors. 12 MHz (11.059MHz) crystal is often used and the capacitance ranges from 20pF to 40pF.
- The oscillator can also be a TTL clock source connected with a NOT gate as shown

LIQUID CRYSTAL DISPLAY

This is the first interfacing example for the Parallel Port. We will start with something simple. This example doesn't use the Bi-directional feature found on newer ports, thus it should work with most, if not all Parallel Ports. It however doesn't show the use of the Status Port as an input for a 16 Character x 2 Line LCD Module to the Parallel Port. These LCD Modules are very common these days, and are quite simple to work with, as all the logic required running them is on board.

LCD Background:

Frequently, an 8051 program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to an 8051 is an LCD display. Some of the most common LCDs connected to the 8051 are 16x2 and 20x2 displays. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

Fortunately, a very popular standard exists which allows us to communicate with the vast majority of LCDs regardless of their manufacturer. The standard is referred to as HD44780U, which refers to the controller chip which receives data from an external source (in this case, the 8051) and communicates directly with the LCD.

FIG 4.8: LCD

44780 LCD BACKGROUND

The 44780 standard requires 3 control lines as well as either 4 or 8 I/O lines for the data bus. The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used the LCD will require a total of 7 data lines (3 control lines plus the 4 lines for the data bus). If an 8-bit data bus is used the LCD will require a total of 11 data lines (3 control lines plus the 8 lines for the data bus).
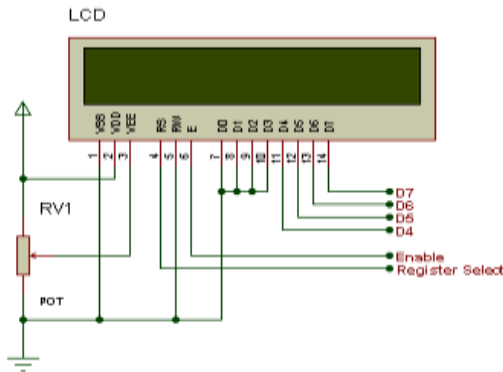
The three control lines are referred to as **EN**, **RS**, and **RW**.

The **EN** line is called "Enable." This control line is used to tell the LCD that you are sending it data. To send data to the LCD, your program should make sure this line is low (0) and then set the other two control lines and/or put data on the data bus. When the other lines are completely ready, bring **EN** high (1) and wait for the minimum amount of time required by the LCD datasheet (this varies from LCD to LCD), and end by bringing it low (0) again.

The **RS** line is the "Register Select" line. When RS is low (0), the data is to be treated as a command or special instruction (such as clear screen, position cursor, etc.). When RS is high (1), the data being sent is text data which should be displayed on the screen. For example, to display the letter "T" on the screen you would set RS high.

The **RW** line is the "Read/Write" control line. When RW is low (0), the information on the data bus is being written to the LCD. When RW is high (1), the program is effectively querying (or reading) the LCD. Only one instruction ("Get LCD status") is a read command. All others are write commands--so RW will almost always be low .Finally, the data bus consists of 4 or 8 lines (depending on the mode of operation selected by the user). In the case of an 8-bit data bus, the lines are referred to as DB0, DB1, DB2, DB3, DB4, DB5, DB6, and DB7.

Relay Driver IC ULN2003

A Relay driver IC is an electro-magnetic switch that will be used whenever we want to use a low voltage circuit to switch a light bulb ON and OFF which is connected to 220V mains supply. The required current to run the relay coil is more than can be supplied by various integrated circuits like Op-Amp, etc.Relays have unique properties and are replaced with solid state switches that are strong than solid-state devices. High current capacities, capability to stand ESD and drive circuit

isolation are the unique properties of Relays. There are various ways to drive relays.Some of the Relay Driver ICs are as below.

- High side toggle switch driver
- Low side toggle switch driver
- Bipolar NPN transistor driver
- N-Channel MOSFET driver and
- Darlington transistor driver
- ULN2003 driver

Relay Driver IC Circuit
Relays are components that permit a low-power circuit to control signals or to switch high current ON and OFF which should be electrically isolated from controlling circuit.

The Required Components
- Diode
- 6-9V Relay
- 9V Battery or DC Power Supply
- BC547B Transistor
- 1K Ohm Resistor
- Second Input Voltage Source
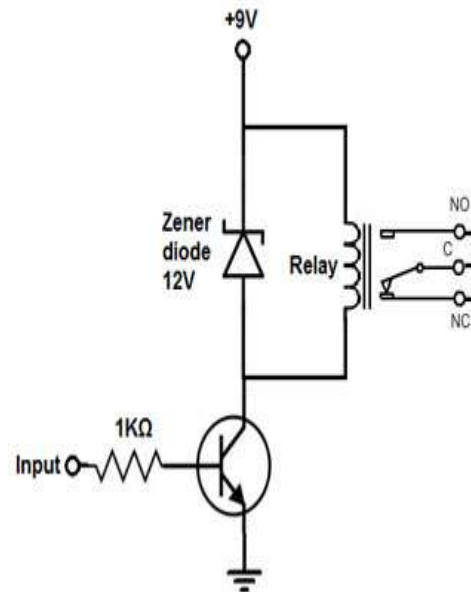
Relay Driver IC Circuit

In order to drive the relay, we use transistor and only less power can be possibly used to get the relay driven. Since, transistor is an amplifier so the base lead receives sufficient current to make more current flow from Emitter of Transistor to Collector. If the base once gets power that is sufficient, then the transistor conduct from Emitter to Collector and power the relay.

The Transistor's emitter-to-collector channel will be opened even though no input current or voltage is applied to Base lead of Transistor. Therefore, blocking current flows through relay coil.

The emitter-to-collector channel will be opened and allows current to flow through relay's coil if enough current or voltage is applied as input to the base lead. AC or DC Current can be used to power the relay and circuit.Relays are electromagnetic devices which allow low-power circuit to switch a high current ON and OFF switching devices with the help of an armature that is moved by an electromagnet.

Driver Circuit is used to boost or amplify signals from micro-controllers to control power switches in semi-conductor devices. Driver circuits take functions that include isolating the control circuit and the power circuit, detecting malfunctions, storing and reporting failures to the control system, serving as a precaution against failure, analyzing sensor signals and creating auxiliary voltages.

Driver Circuits

A typical digital logic output pin supplies only tens of MA of current. External devices such as high-power LEDs, motors, speakers, light bulbs, buzzers, solenoids and relays can require hundreds of MA and they need same voltages. In order to control small devices which use DC, a transistor-based driver circuit is used to amplify current to the required levels. If the voltage and current levels are in perfect range, the transistor acts like a high-current switch controlled by the lower current digital logic signal. A discrete BJT is used at times in place of MOSFET transistor especially on older or low voltage circuits as shown below.
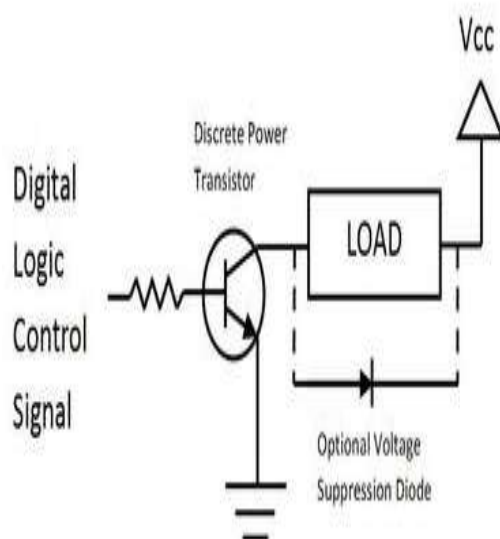
Driver Circuit
Basic Driver Circuit using a BJT Transistor

PNP, NPN, or MOS transistors are also be used. Transistor provides current gain. The resistor used on the base of the transistor is 1K ohm. On inductive loads (i.e., motors, solenoids, relays), a diode is often connected backwards across the load to suppress the voltage spikes (back EMF) generated when turning devices OFF.

Inductor V = L* di/dt

A negative voltage spike is produced when turning the device OFF. A diode is also connected across the transistor instead of the load sometimes in order to protect the transistor. The 2N3904 shown below is a small discrete BJT transistor is used for a driver circuit that required less than 200MA. In this circuit with BJTs, Vcc – higher voltage supply than the logic power supply and 6 or 12V DC is required for motors or relays.

The load is directly connected to battery power and cannot passed through the voltage regulator in battery operated devices. Many devices such as motors have more inflow current spike when they are first turned ON. Be cautious on maximum current ratings.

Advantages of Low Side Driver
More interface options are available which includes popular ULN2003 driver.

- Easy to interface to low voltage logic circuitry.
- Fewer components are used.
- Less expensive NPN drive transistors.
- Relay power reduces load on voltage regulator.
- It uses more commonly obtained NPN drive transistors.
- It is easier to interface relay.
- It is economic.
- Uses Industry standard technique.

The ULN2003 has internal clamp diodes. While these work OK in non-critical applications and it leads to rise of glitches.

The clamp, free-wheeling or commutation diode provides a path for the inductive discharge current to flow when the driver switch is opened. If not provided, it will generate an arc in the switch—while the arc will not generally damage a switch contact, it will cause contact degradation over time—and yes, it will destroy transistors—been there, done that. The diode requirements are non-critical and a 1N4148 signal diode will generally work OK in low power applications.

Avoid emitter follower drivers. If the relay is switched to OFF in 4007 diode eliminates back

e.m.f and safe guards the transistor. ON status of the relay is indicated by LED.

DC Relay Driver IC Circuit

Let us see construction of relay driver circuit for relays that are operated from DC power. In order to drive a DC relay, DC voltage is needed in required quantity to rate a relay and a zenerdiode.Voltage is required for the relay to operate and to open or close its switch in a circuit. Relays exist with a voltage rating. This is known as relay's datasheet to rate its coil voltage. For the function of relay, it must receive this voltage at its coil terminals. Thus, if a relay has a rated voltage of 9VDC, it should get 9 volts of DC voltage for its working. In order to eliminate voltage spikes from a relay circuit, a diode is required for its proper functioning. The coil of a relay acts an Inductor.
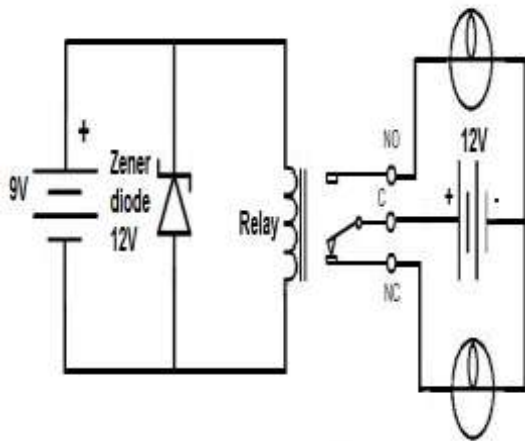
DC Relay Driver Circuit

The inductors are electronic components which withstand changes in current and also the inductors are coils of wires wrapped around a conductive core. Voltage spikes damages all components in a circuit and also damages relay's switch contacts. To prevent these voltage spikes, a diode is kept reverse biased in parallel with the relay which acts as a transient (spike) suppressor eliminates voltage spikes by going into conduction before voltage is formed across the coil. A transient suppressor suppresses these spikes. A diode conducts reverse bias current if voltage reaches a certain threshold. The diode functions to shunt excess power to ground, and the diodes conduct if the voltage reaches breakdown voltage.

The Required Components
- DC Relay
- Diode
- DC Voltage Source or a DC power supply.

The zener diode is placed reverse biased in parallel to the relay.

The Relay used in the above is rated for 9Volts. In this a 9V DC Voltage source feeds the resistor. A Zener diode reverse biased is placed in order to suppress the transients caused by opening and closing the relay. This shunts all excess power to ground if it reaches a particular threshold. This is the process to operate a relay. Driving the loads which were connected to the output taking required power the relay will be closed.

AC Relay Driver IC Circuit

This AC Relay driver IC circuit is a relay that runs with AC power and cannot be run with DC power. In order to run an AC relay, enough AC voltage is required tp rate the relay and transient suppressor. In AC relay circuit we cannot use a diode to remove voltage spikes. This diode conducts an alternate half-cycle with AC power. We use an RC series network by placing across coil in parallel to form a working transient voltage suppressor with an AC circuit. Capacitor absorbs charge which comes excessively and resistor helps to control overflow.Components required to form the circuit is as follows
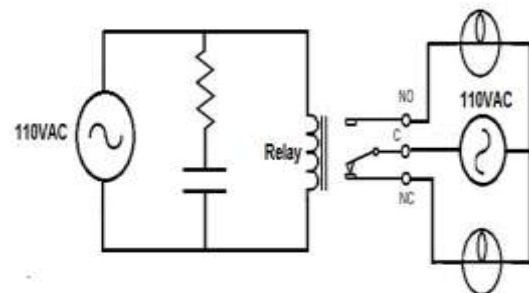
AC Relay Driver Circuit

- AC Relay
- 100 Ohm Resistor
- 0.05 Micro Farad Capacitor
- AC Voltage Source

Be careful with AC Power that comes out directly from wall outlet as it causes Shock. Consult a Professional before taking power from plug into wall outlet.

When we use a relay with rated voltage 110VAC, we should feed it with 110V from an AC power source. To suppress voltage spikes, resistor and capacitor connected in series acts as transient voltage suppressor.

Relay Driver IC ULN2003

The relay driver uln2003 ic is a high voltage and current darlington array ic, it comprises of 7-open collector darlington pairs with common emitters. A pair of darlington is an arrangement of

two bipolar transistors. This IC belongs to the family of ULN200x ICs and various types of this family interface to various logic families. This ULN2003 IC is for 5V TTL and CMOS logic devices. These ICs are used as relay drivers as well as to drive a wide range of loads, line drivers, display drivers etc. This IC is also normally used while driving Stepper Motors. The pairs of darlington in ULN2003 is esteemed at 500mA and can withstand peak current of 600mA.In the pin layout, the i/ps& o/ps are provided reverse to each other. Each driver also has a suppression diode to dissipate voltage spikes while driving inductive loads

Relay Driver IC ULN2003
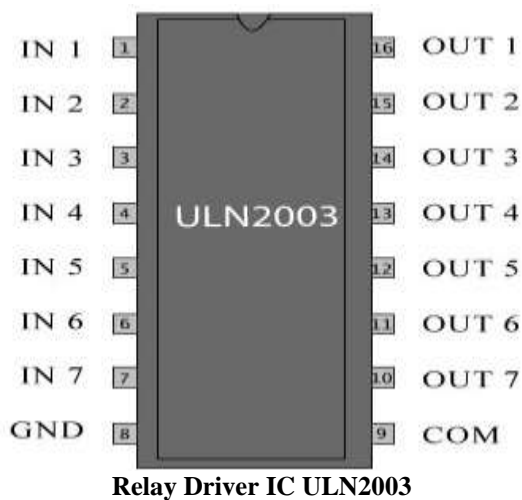
This project is designed for a three-phase-solid-state relay system. It incorporates three single-phase units wherein each phase is controlled individually by power TRIAC with RC snubber network for a zero-voltage switching (ZVS).

Opto-isolators are used in each phase to receive switching signals from a microcontroller of the 8051 family, loads are connected in series with a set of TRIACS driven by an opto-isolator. The microcontroller is designed to generate output pulses after zero voltage pulse to ensure that the load gets switched on at zero cross of the supply waveform.

The zero crossing feature of the TRIAC driver, (an opto-isolator) ensures low noise generation thus avoiding sudden inrush of current on resistive and inductive loads. In this project, two push buttons are used for generating the output pulses from the microcontroller randomly, away from the ZVS ie not coinciding with zero voltage supply voltage of the waveform.

BLUETOOTH MODULE:

As a world leader in short-range wireless connectivity, Laird offers the widest range of high-performance classic Bluetooth and Bluetooth Low Energy (BLE) modules for data and audio applications. With over a decade of experience in the development and production of Bluetooth wireless modules and associated development kits

Wouldn't you love to switch on and off the lights in your house without having to raise a finger? (well, technically you would have to raise a finger or two, but you get the jist of the story). The good news is that you can. All you needs is an arduino, HC-06 bluetooth module, some relays and a little electrical know-how.

In this project, however, we are going to show you how to setup the HC-05, send some data to the Microcontroller and receive and echo and control an LED via bluetooth. At least this should get you started, before you get to control the whole grid with your HC-05...just kidding.
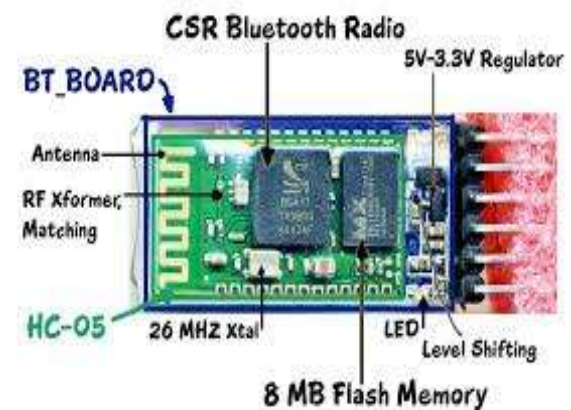
Setting up the HC-05 is as easy as ABC. All you need to know is the pin configuration. The HC-05 has 6 pins: wakeup, VCC, GND, TXD, RXD and State. Right now I will only deal with 3 pins, which are VCC, GND and TXD .

Here is how you should connect the Bluetooth module to your Microcontroller.

HC-06>>> Microcontroller
VCC>>>>3.3v
GND>>>>GND
TXD>>>>RXD
RXD>>>>TXD

The HC-05 acts as a serial port through which you can send and receive data. So using a serial terminal or a Bluetooth customized application on your computer or phone, you can control and monitor your project. I used Teraterm as the serial terminal.

Before, uploading the code to the Microcontroller., disconnect the HC-05 module, since it shares the tx/rx pins and will interfere with the upload. Connect it back once the code has been uploaded successfully

This code enables you to send a string to the Microcontroller. via Bluetooth and get an echo back on your Dispply.

This code allows you to switch on and off an LED using by sending a command to the Microcontroller. via Bluetooth.

Microcontroller Interface
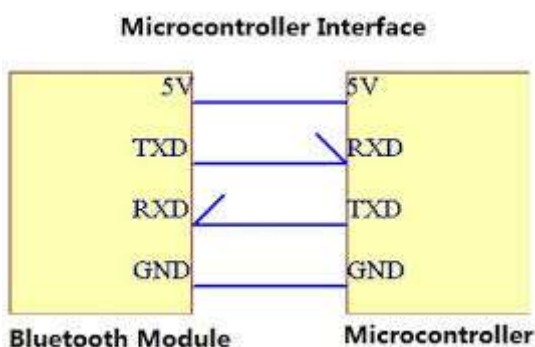
Pair the HC-05 with your android mobile app. or any other Bluetooth device

Once the module is paired. Open Teraterm, or any other serial terminal program you have. Select the serial port that corresponds to the HC-05
Once you successfully connect to the HC-05 serial port you will be able to send strings to your

Microcontroller. and get an echo back. If you have uploaded the second code, you will be able to switch on and off and LED by sending "n" and "f" respectively.

In the Definition part, we declare the LED variable that accepts 12 (in other words the Digital PIN). And the char input that we will further use for accepting the user's instructions.Until now, we have just declared two variables.

Next we have a setup() block where we will initialize a LED and serial communication. So, we have pinMode() and Serial.begin().

In the next loop() block we do all the actual coding. First, we decide whether or not the serial port is available. If yes, then we will do the communication. For that, we have a Serial Method available().

On Yes, we proceed and ask for the user's input via the serial port. And, the read() method is there that accepts input from the serial port.

Whatever value we get from the serial port we store in the input variable that we defined earlier.

And, on input it will decide to turn it on or not.

See, we haven't written any code for Bluetooth communication. So, that's because Bluetooth communication is implicitly Serial Communication. And in Arduino, what you can do with the Serial Monitor in In the Definition part, we declare the LED variable that accepts 12 (in other words the Digital PIN). And the char input that we will further use for accepting the user's instructions.

Before we connect to the Android Phone, install an app that will do the rest of the job. is that you can also implement Bluetooth Serial Communication.

Description: HC-05 is a class-2 bluetooth module with Serial Port Profile, which can configure as either Master or slave. a Drop-in replacement for wired serial connections, transparent usage. You can use it simply for a serial port replacement to establish connection between MCU, PC to your embedded project and etc.

HC-05 Specification:

Bluetooth protocal: Bluetooth Specification v2.0 EDR

Frequency: 2.4GHz ISM ban

Modulation: GFSK(Gaussian Frequency Shift Keying)

Emission power: ≤4dBm, Class 2

Sensitivity: ≤-84dBm at 0.1% BER

Speed: Asynchronous: 2.1Mbps(Max) / 160 kbps, Synchronous: 1Mbps/1Mbps

Security: Authentication and encryption

Profiles: Bluetooth serial port

Power supply: 3.3VDC 50mA

Working temperature: -20 ~ 75Centigrade
Dimension: 26.9mm x 13mm x 2.2 mm

DC MOTOR

A DC motor in simple words is a device that converts direct current(electrical energy) into mechanical energy. It's of vital importance for the industry today, and is equally important for engineers to look into the **working principle of DC motor** in details that has been discussed in this article. In order to understand the **operating principle of dc motor** we need to first look into its constructional feature.
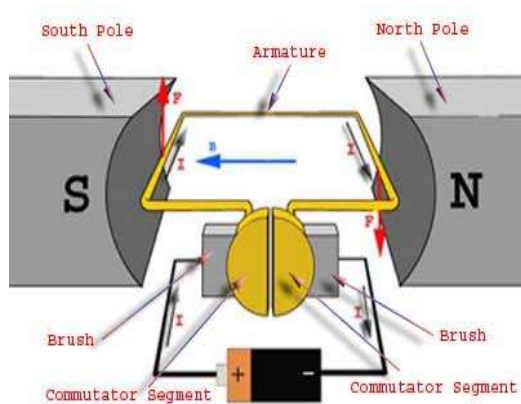

The very basic <u>construction of a dc motor</u> contains a <u>current</u> carrying armature which is connected to the supply end through commutator segments and brushes and placed within the north south poles of a permanent or an electro-magnet as shown in the diagram below. Now to go into the details of the **operating principle of DC motor**its important that we have a clear understanding of <u>Fleming's left hand rule</u> to determine the direction of force acting on the <u>arm</u>
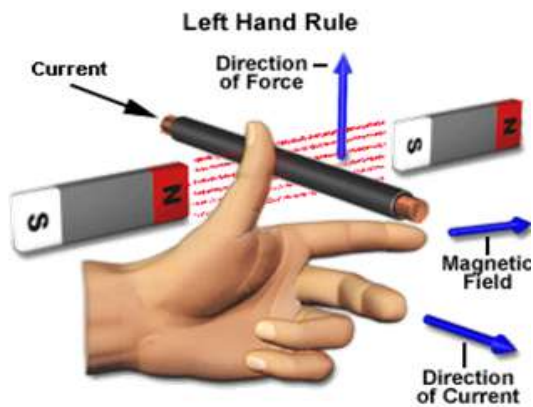
Left Hand Rule

Armature conductors of dc motor <u>Fleming's left hand rule</u> says that if we extend the index finger, middle finger and thumb of our left

hand in such a way that the <u>current</u> carrying conductor is placed in a <u>magnetic field</u> (represented by the index finger) is perpendicular to the direction of <u>current</u> (represented by the middle finger), then the conductor experiences a force in the direction (represented by the thumb) mutually perpendicular to both the direction of field and the <u>current</u> in the conductor.

For clear understanding the **principle of DC motor** we have to determine the magnitude of the force, by considering the diagram below. We know that when an infinitely small charge dq is made to flow at a velocity 'v' under the influence of an electric field E, and a magnetic field B, then the Lorentz Force dF experienced by the charge is given by:-
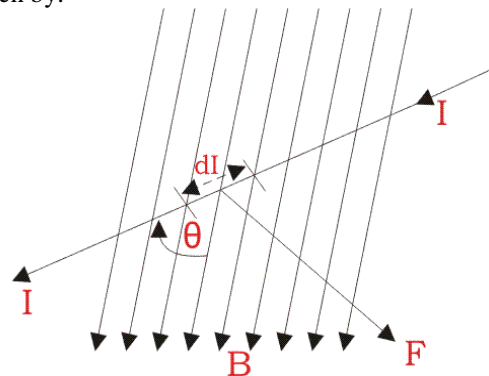
$$dF = dq(E + vB)$$

For the **operation of dc motor**, considering E = 0

$$dF = dq \times v \times B$$

i.e. it's the cross product of dq v and magnetic field B.

$$dF = dq\frac{dL}{dt} \times B \qquad \left[V = \frac{dL}{dt} \right]$$

Where dL is the length of the conductor carrying charge q.

$$dF = dq\frac{dL}{dt} \times B$$

$$or, \ dF = IdL \times B \qquad \left[Since, \ current \ I = \frac{dq}{dt} \right]$$

$$or, \ F = IL \times B = ILB \sin\theta$$

$$or, \ F = BIL \sin\theta$$

From the 1st diagram we can see that the construction of a DC motor is such that the direction of current through the armature conductor at all instance is perpendicular to the field. Hence the force acts on the armature conductor in the

direction perpendicular to the both uniform field and current is constant.

$i.e.\ \theta = 90°$

So if we take the current in the left hand side of the armature conductor to be I, and current at right hand side of the armature conductor to be − I, because they are flowing in the opposite direction with respect to each other.

Then the force on the left hand side armature conductor,

$F_i = BIL\sin 90° = BIL$

Similarly force on the right hand side conductor

$F_r = B(-I)L\sin 90° = -BIL$

∴we can see that at that position the force on either side is equal in magnitude but opposite in direction. And since the two conductors are separated by some distance w = width of the armature turn, the two opposite forces produces a rotational force or a torque that results in the rotation of the armature conductor.

Now let's examine the expression of torque when the armature turn crate an angle of α with its initial position.

The torque produced is given by,

$Torque = (force,\ tangential\ to\ the\ (distance)$

$or,\ \tau = F\cos\alpha \times w$

$or,\ \tau = BILw\cos\alpha$

Where α is the angle between the plane of the armature turn and the plane of reference or the initial position of the armature which is here along the direction of magnetic field.

The presence of the term cosα in the torque equation very well signifies that unlike force the torque at all position is not the same. It in fact varies with the variation of the angle α. To explain the variation of torque and the principle behind rotation of the motor let us do a step wise analysis.
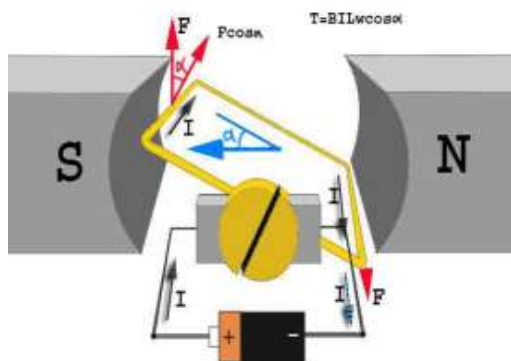
**Step 1:** Initially considering the armature is in its starting point or reference position where the angle α = 0.

$\therefore\ \tau = BILw \times \cos 0° = BILw$

Since α = 0, the term cos α = 1, or the maximum value, hence torque at this position is maximum given by τ = BILw. This high starting torque helps in overcoming the initial inertia of rest
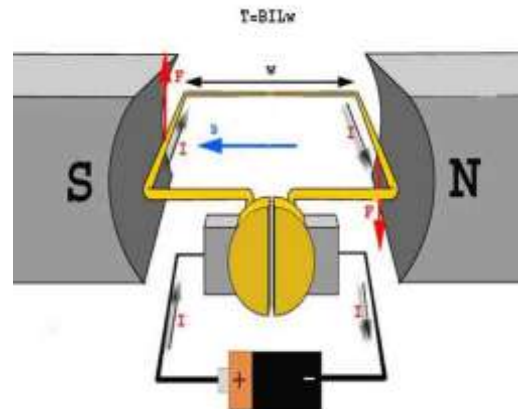
Step 2: Once the armature is set in motion, the angle α between the actual position of the armature and its reference initial position goes on increasing in the path of its rotation until it becomes 90° from its initial position. Consequently the term cosα decreases and also the value of torque.

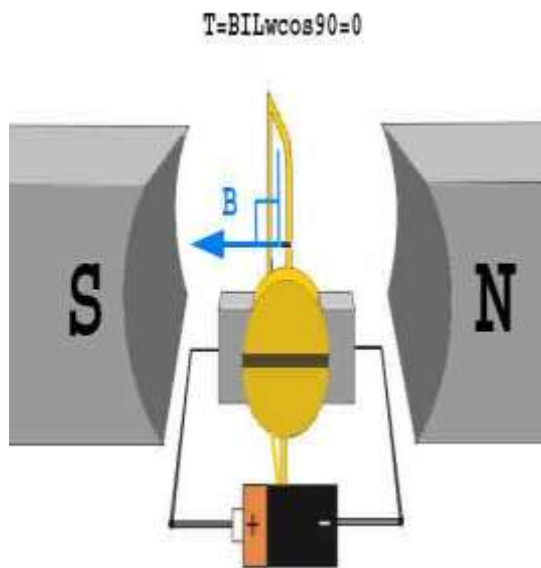The torque in this case is given by τ = BILwcosα which is less than BIL w when α is greater than 0°.
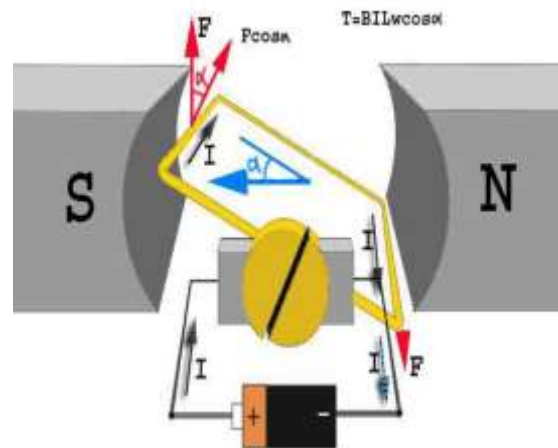
Step 3: In the path of the rotation of the armature a point is reached where the actual position of the rotor is exactly perpendicular to its initial position, i.e. α = 90°, and as a result the term cosα = 0.

The torque acting on the conductor at this position is given by,

$\therefore\ \tau = BIL\omega \times \cos 90° = 0$

i.e. virtually no rotating torque acts on the armature at this instance. But still the armature does not come to a standstill, this is because of the fact that the operation of dc motor has been engineered in such a way that the inertia of motion at this point is just enough to overcome this point of null torque. Once the rotor crosses over this position the angle between the actual position of the armature and the initial plane again decreases and torque starts acting on it again.

RELAY
Basic design and operation.

A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core, an iron yoke which provides a low reluctancepath for magnetic flux, a movable iron armature, and one or more sets of contacts (there are two in the relay pictured). The armature is hinged to the yoke and mechanically linked to one or more sets of moving contacts. It is held in place by a spring so that when the relay is de-energized there is an air gap in the magnetic circuit. In this condition, one of the two sets of contacts in the relay pictured is closed, and the other set is open. Other relays may have more or fewer sets of contacts depending on their function. The relay in the picture also has a wire connecting the armature to the yoke. This ensures continuity of the circuit between the moving contacts on the armature, and the circuit track on the printed circuit board (PCB) via the yoke, which is soldered to the PCB.

When an electric current is passed through the coil it generates a magnetic field that activates the armature, and the consequent movement of the movable contact(s) either makes or breaks (depending upon construction) a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position. Usually this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low-voltage application this reduces noise; in a high voltage or current application it reduces arcing.

When the coil is energized with direct current, a diode is often placed across the coil to dissipate the energy from the collapsing magnetic field at deactivation, which would otherwise generate a voltage spike dangerous to semiconductor circuit components. Such diodes were not widely used before the application of transistors as relay drivers, but soon became ubiquitous as early germanium transistors were easily destroyed by this surge. Some automotive relays include a diode inside the relay case.
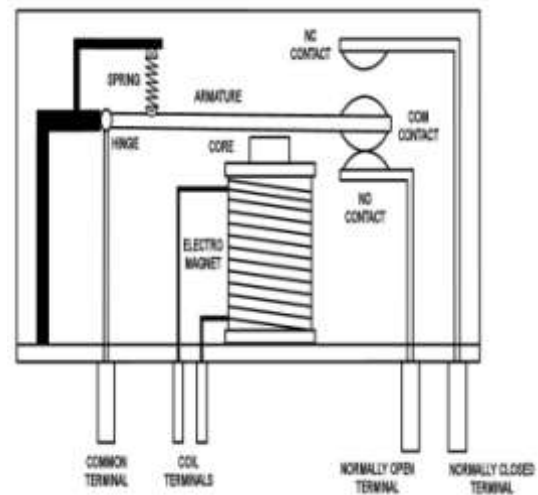
If the relay is driving a large, or especially a reactive load, there may be a similar problem of surge currents around the relay output contacts. In this case a snubber circuit (a capacitor and resistor in series) across the contacts may absorb the surge. Suitably rated capacitors and the associated resistor are sold as a single packaged component for this commonplace use.

If the coil is designed to be energized with alternating current (AC), some method is used to split the flux into two out-of-phase components which add together, increasing the minimum pull on the armature during the AC cycle. Typically this is done with a small copper "shading ring" crimped around a portion of the core that creates the delayed, out-of-phase component,[9] which holds the contacts during the zero crossings of the control voltage.
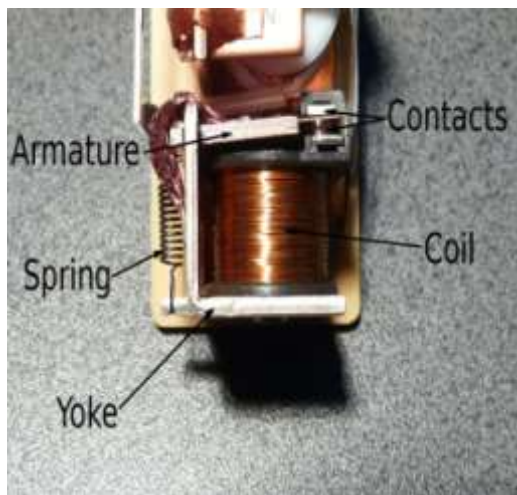
Normally Closed contact and connects to the Normally Open contact instead.

The electromagnet is made of a coil of fine enameled copper wire wound on a plastic bobbin that has an iron core in its center. A magnetic field is created in the iron core when current flows through the coil. The number of turns in the coil and the wire size determine the voltage that must applied to it. Relays are available for operation at almost any voltage but the most common are 5, 6, 9, 12, 24 and 48 volts DC. The coil current also depends on the number of turns and wire size and usually ranges from 30 to 200 milliamperes.

There is no connection between the coil and any of the contacts. The contacts are completely electrically isolated from the circuit that powers the coil.

In a device using a relay where the relay contacts are brought out to a terminal block or other termination, the contacts can be used to switch any type of DC or AC load that is within the voltage and current ratings of the contacts. This is usually marked on the relay.

A relay does not provide power for a load, it just switches power from a power source, on and off, similar to how a wall switch turns a lamp on and off but does not itself provide the power that lights the lamp. Relays are made in many configurations, sizes and shapes, coil voltage and current, contact voltage and current. They are available as:

Single Pole Single Throw SPST either Normally Open or Normally Closed

Single Pole Double Throw SPDT as above

A relay can be compared to a vacuum tube and solid state transistor amplifier because both can use a small voltage and current in one circuit to control a large voltage and current in another circuit. However, unlike tubes and transistors, a relay cannot produce a variable output; It can only switch on and off similar to a logic circuit in a computer. But the relay has the advantage of being able to completely isolate its input circuit from its output.

Below is a drawing of a Single Pole Double Throw (SPDT) relay. A single contact called the Common contact switches between a Normally Closed contact and a Normally Open contact. The Common contact is attached to an armature which is a strip of metal that is hinged at one end and has electrical contacts, usually made of silver, at the other end. A spring pulls the armature up so its contact connects to the Normally Closed contact. An electromagnet below the armature attracts the armature when it is energized and pulls it down so its contact disconnects from the

Double Pole Single Throw DPST either Normally Open or Normally Closed
Double Pole Double Throw DPDT

1N4007
Diodes are used to convert AC into DC these are used as half wave rectifier or full wave rectifier. Three points must he kept in mind while using any type of diode.
1. Maximum forward current capacity
2. Maximum reverse voltage capacity
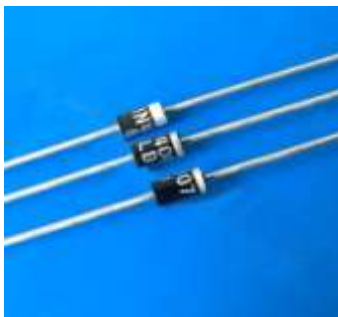3. Maximum forward voltage capacity

Fig: 1N4007 diodes

The number and voltage capacity of some of the important diodes available in the market are as follows:

• Diodes of number IN4001, IN4002, IN4003, IN4004, IN4005, IN4006 and IN4007 have maximum reverse bias voltage capacity of 50V and maximum forward current capacity of 1 Amp.

• Diode of same capacities can be used in place of one another. Besides this diode of more capacity can be used in place of diode of low capacity but diode of low capacity cannot be used in place of diode of high capacity. For example, in place of IN4002; IN4001 or IN4007 can be used but IN4001 or IN4002 cannot be used in place of IN4007.The diode BY125made by company BEL is equivalent of diode from IN4001 to IN4003. BY 126 is equivalent to diodes IN4004 to 4006 and BY 127 is equivalent to diode IN4007.
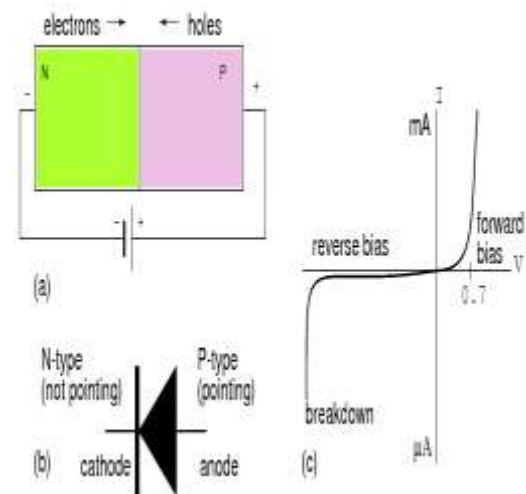

Fig:PN Junction diode

PN JUNCTION OPERATION
Now that you are familiar with P- and N-type materials, how these materials are joined together toform a diode, and the function of the diode, let us continue our discussion with the operation of the PNjunction. But before we can understand how the PN junction works, we must first consider current flow inthe materials that make up the junction and what happens initially within the junction when these twomaterials are joined together.

Current Flow in the N-Type Material
Conduction in the N-type semiconductor, or crystal, is similar to conduction in a copper wire. Thatis, with voltage applied across the material, electrons will move through the crystal just as current wouldflow in a copper wire. This is shown in figure 1-15. The positive potential of the battery will attract thefree electrons in the crystal. These electrons will leave the crystal and flow into the positive terminal ofthe battery. As an electron leaves the crystal, an electron from the negative terminal of the battery willenter the crystal, thus completing the current path. Therefore, the majority current carriers in the N-typematerial (electrons) are repelled by the negative side of the battery and move through the crystal towardthe positive side of the battery.

Current Flow in the P-Type Material
Current flow through the P-type material is illustrated. Conduction in the P material isby positive holes, instead of negative electrons. A hole moves from the positive terminal of the P materialto the negative terminal. Electrons from the external circuit enter the negative terminal of the material andfill holes in the vicinity of this

terminal. At the positive terminal, electrons are removed from the covalentbonds, thus creating new holes. This process continues as the steady stream of holes (hole current) movestoward the negative terminal.

RESISTORS

A resistor is a two-terminal electronic component designed to oppose an electric current by producing a voltage drop between its terminals in proportion to the current, that is, in accordance with Ohm's law:

$$V = IR$$

Resistors are used as part of electrical networks and electronic circuits. They are extremely commonplace in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel/chrome).

The primary characteristics of resistors are their resistance and the power they can dissipate. Other characteristics include temperature coefficient, noise, and inductance. Less well-known is critical resistance, the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance depends upon the materials constituting the resistor as well as its physical dimensions; it's determined by design.

Resistors can be integrated into hybrid and printed circuits, as well as integrated circuits. Size, and position of leads (or terminals) are relevant to equipment designers; resistors must be physically large enough not to overheat when dissipating their power.

A resistor is a two-terminalpassiveelectronic component which implements electrical resistance as a circuit element. When a voltage V is applied across the terminals of a resistor, a current I will flow through the resistor in direct proportion to that voltage. The reciprocal of the constant of proportionality is known as the resistance R, since, with a given voltage V, a larger value of R further "resists" the flow of current I as given by Ohm's law:

$$I = \frac{V}{R}$$

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel-chrome). Resistors are also implemented within integrated circuits, particularly analog devices, and can also be integrated into hybrid and printed circuits.

The electrical functionality of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than 9 orders of magnitude. When specifying that resistance in an electronic design, the required precision of the resistance may require attention to the manufacturing tolerance of the chosen resistor, according to its specific application. The temperature coefficient of the resistance may also be of concern in some precision applications. Practical resistors are also specified as having a maximum power rating which must exceed the anticipated power dissipation of that resistor in a particular circuit: this is mainly of concern in power electronics applications. Resistors with higher power ratings are physically larger and may require heat sinking. In a high voltage circuit, attention must sometimes be paid to the rated maximum working voltage of the resistor.

The series inductance of a practical resistor causes its behaviour to depart from ohms law; this specification can be important in some high-frequency applications for smaller values of resistance. In a low-noise amplifier or pre-amp the noise characteristics of a resistor may be an issue. The unwanted inductance, excess noise, and temperature coefficient are mainly dependent on the technology used in manufacturing the resistor. They are not normally specified individually for a particular family of resistors manufactured using a particular technology.[1] A family of discrete resistors is also characterized according to its form factor, that is, the size of the device and position of its leads (or terminals) which is relevant in the practical manufacturing of circuits using them.

Units

The ohm (symbol: Ω) is the SI unit of electrical resistance, named after Georg Simon Ohm. An ohm is equivalent to a volt per ampere. Since resistors are specified and manufactured over a very large range of values, the derived units of milliohm (1 mΩ = 10^{-3} Ω), kilohm (1 kΩ = 10^{3} Ω), and megohm (1 MΩ = 10^{6} Ω) are also in common usage.

The reciprocal of resistance R is called conductance G = 1/R and is measured in Siemens (SI unit), sometimes referred to as a mho. Thus a Siemens is the reciprocal of an ohm: S = Ω^{-1}. Although the concept of conductance is often used in circuit analysis, practical resistors are always specified in terms of their resistance (ohms) rather than conductance.

Theory of operation
Ohm's law
The behavior of an ideal resistor is dictated by the relationship specified in Ohm's law:

$$V = I \cdot R$$

Ohm's law states that the voltage (V) across a resistor is proportional to the current (I) passing through it, where the constant of proportionality is the resistance (R).

Equivalently, Ohm's law can be stated:

$$I = \frac{V}{R}$$

This formulation of Ohm's law states that, when a voltage (V) is present across a resistance (R), a current (I) will flow through the resistance. This is directly used in practical computations. For example, if a 300 ohm resistor is attached across the terminals of a 12 volt battery, then a current of 12 / 300 = 0.04 amperes (or 40 milliamperes) will flow through that resistor.

Series and parallel resistors

In a series configuration, the current through all of the resistors is the same, but the voltage across each resistor will be in proportion to its resistance. The potential difference (voltage) seen across the network is the sum of those voltages, thus the total resistance can be found as the sum of those resistances:
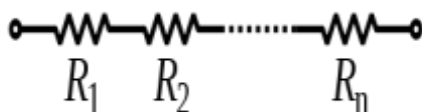
$$R_{eq} = R_1 + R_2 + \cdots + R_n$$

As a special case, the resistance of N resistors connected in series, each of the same resistance R, is given by NR.

Resistors in a parallel configuration are each subject to the same potential difference (voltage), however the currents through them add. The conductances of the resistors then add to determine the conductance of the network. Thus the equivalent resistance (R_{eq}) of the network can be computed:
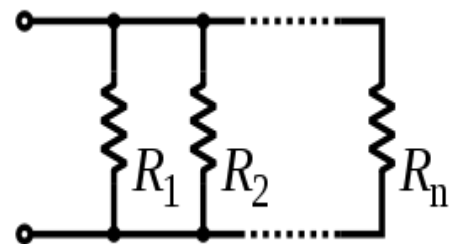

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_n}$$

The parallel equivalent resistance can be represented in equations by two vertical lines "||" (as in geometry) as a simplified notation. For the case of two resistors in parallel, this can be calculated using:

$$R_{eq} = R_1 \| R_2 = \frac{R_1 R_2}{R_1 + R_2}$$

As a special case, the resistance of N resistors connected in parallel, each of the same resistance R, is given by R/N.

A resistor network that is a combination of parallel and series connections can be broken up into smaller parts that are either one or the other. For instance,
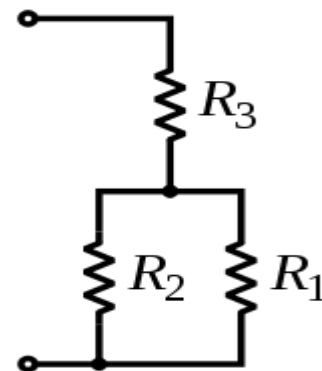
$$R_{\text{eq}} = (R_1 \| R_2) + R_3 = \frac{R_1 R_2}{R_1 + R_2} + R_3$$

However, some complex networks of resistors cannot be resolved in this manner, requiring more sophisticated circuit analysis. For instance, consider a cube, each edge of which has been replaced by a resistor. What then is the resistance that would be measured between two opposite vertices? In the case of 12 equivalent resistors, it can be shown that the corner-to-corner resistance is $5/6$ of the individual resistance. More generally, the Y-Δ transform, or matrix methods can be used to solve such a problem.[2][3]

One practical application of these relationships is that a non-standard value of resistance can generally be synthesized by connecting a number of standard values in series and/or parallel. This can also be used to obtain a resistance with a higher power rating than that of the individual resistors used. In the special case of N identical resistors all connected in series or all connected in parallel, the power rating of the individual resistors is thereby multiplied by N.

Power dissipation

The power P dissipated by a resistor (or the equivalent resistance of a resistor network) is calculated as:

$$P = I^2 R = IV = \frac{V^2}{R}$$

The first form is a restatement of Joule's first law. Using Ohm's law, the two other forms can be derived.

The total amount of heat energy released over a period of time can be determined from the integral of the power over that period of time:

$$W = \int_{t_1}^{t_2} v(t) i(t) \, dt.$$

Practical resistors are rated according to their maximum power dissipation. The vast majority of resistors used in electronic circuits absorb much less than a watt of electrical power and require no attention to their power rating. Such resistors in their discrete form, including most of the packages detailed below, are typically rated as 1/10, 1/8, or 1/4 watt.

Resistors required to dissipate substantial amounts of power, particularly used in power supplies, power conversion circuits, and power amplifiers, are generally referred to as power resistors; this designation is loosely applied to resistors with power ratings of 1 watt or greater. Power resistors are physically larger and tend not

to use the preferred values, color codes, and external packages described below.

If the average power dissipated by a resistor is more than its power rating, damage to the resistor may occur, permanently altering its resistance; this is distinct from the reversible change in resistance due to its temperature coefficient when it warms. Excessive power dissipation may raise the temperature of the resistor to a point where it can burn the circuit board or adjacent components, or even cause a fire. There are flameproof resistors that fail (open circuit) before they overheat dangerously.

Note that the nominal power rating of a resistor is not the same as the power that it can safely dissipate in practical use. Air circulation and proximity to a circuit board, ambient temperature, and other factors can reduce acceptable dissipation significantly. Rated power dissipation may be given for an ambient temperature of 25 °C in free air. Inside an equipment case at 60 °C, rated dissipation will be significantly less; a resistor dissipating a bit less than the maximum figure given by the manufacturer may still be outside the safe operating area and may prematurely fail.

LED

LEDs are semiconductor devices. Like transistors, and other diodes, LEDs are made out of silicon. What makes an LED give off light are the small amounts of chemical impurities that are added to the silicon, such as gallium, arsenide, indium, and nitride. When current passes through the LED, it emits photons as a byproduct. Normal light bulbs produce light by heating a metal filament until its white hot. Because LEDs produce photons directly and not via heat, they are far more efficient than incandescent bulbs. Not long ago LEDs were only bright enough to be used as indicators on dashboards or electronic equipment. But recent advances have made LEDs bright enough to rival traditional lighting technologies. Modern LEDs can replace incandescent bulbs in almost any application.

LEDs are based on the semiconductor diode. When the diode is forward biased (switched on), electrons are able to recombine with holes and energy is released in the form of light. This effect is called electroluminescence and the color of the light is determined by the energy gap of the semiconductor. The LED is usually small in area (less than 1 mm2) with integrated optical components to shape its radiation pattern and assist in reflection.

LEDs present many advantages over traditional light sources including lower energy consumption, longer lifetime, improved robustness, smaller size and faster switching. However, they are relatively expensive and require more precise current and heat management than traditional light sources.

Applications of LEDs are diverse. They are used as low-energy and also for replacements for traditional light sources in well-established applications such as indicators and automotive lighting. The compact size of LEDs has allowed new text and video displays and sensors to be developed, while their high switching rates are useful in communications technology. So here the role of LED is to indicate the status of the components like relays and power circuit etc…

LED Circuits

To build LED circuits, it helps to be familiar with Ohm's law, and the concepts of voltage, resistance, and current. LEDs do not have resistance like a resistor does. LEDs have a dynamic resistance, that is their resistance changes depending on how much current passes through them. But it's easiest to think of them as having NO resistance. This means that if you just connect an LED to a battery, you'll have a short circuit. That's bad. You would probably ruin your LED.

So an LED circuit needs some resistance in it, so that it isn't a short circuit. Actually we need a very specific amount of resistance. Among the specifications for LEDs, a "maximum forward current" rating is usually given. This is the most current that can pass through the LED without damaging it, and also the current at which the LED will produce the most light. A specific value of resistor is needed to obtain this exact current. There is one more complication. LEDs consume a certain voltage. This is known as the "forward voltage drop", and is usually given with the specs for that LED. This must be taken into account when calculating the correct value of resistor to use. So to drive an LED using a voltage source and a resistor in series with the LED, use the following equation to determine the needed resistance:

Ohm's = (Source Voltage - LED Voltage Drop) / Amps

For example, to drive an LED from your car's 12v system, use the following values:

Source Voltage = 13.4 volts (12v car systems aren't really 12v in most cases)

Voltage Drop = 3.6 volts (Typical for a blue or white LED)

Desired Current = 30 milliamps (again, a typical value)

So the resistor we need is:
(13.4 - 3.6) / (30 / 1000) = 327 ohms

CAPACITORS:

A capacitor or condenser is a passive electronic component consisting of a pair of conductors separated by a dielectric. When a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the plates. The effect is greatest between wide, flat, parallel, narrowly separated conductors.
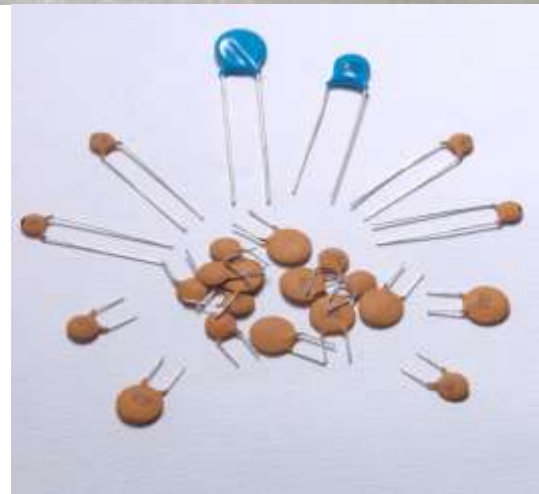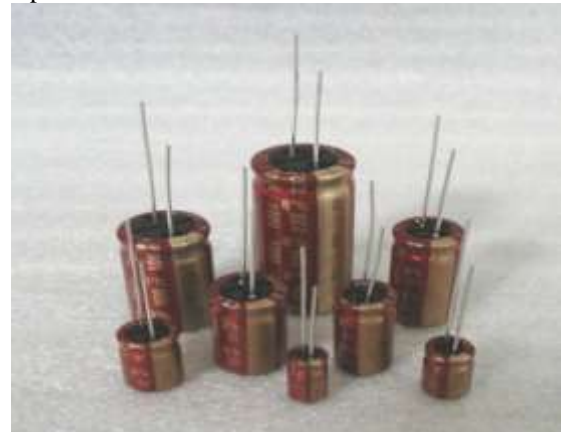
An ideal capacitor is characterized by a single constant value, capacitance, which is measured in farads. This is the ratio of the electric charge on each conductor to the potential difference between them. In practice, the dielectric between the plates passes a small amount of leakage current. The conductors and leads introduce an equivalent series resistance and the dielectric has an electric field strength limit resulting in a breakdown voltage.

The properties of capacitors in a circuit may determine the resonant frequency and quality factor of a resonant circuit, power dissipation and operating frequency in a digital logic circuit, energy capacity in a high-power system, and many other important aspects.

A capacitor (formerly known as condenser) is a device for storing electric charge. The forms of practical capacitors vary widely, but all contain at least two conductors separated by a non-conductor. Capacitors used as parts of electrical systems, for example, consist of metal foils separated by a layer of insulating film.

Capacitors are widely used in electronic circuits for blocking direct current while allowing alternating current to pass, in filter networks, for smoothing the output of power supplies, in the resonant circuits that tune radios to particular frequencies and for many other purposes.

A capacitor is a passiveelectronic component consisting of a pair of conductors separated by a dielectric (insulator). When there is a potential difference (voltage) across the conductors, a static electric field develops in the dielectric that stores energy and produces a mechanical force between the conductors. An ideal capacitor is characterized by a single constant value, capacitance, measured in farads. This is the ratio of the electric charge on each conductor to the potential difference between them.

The capacitance is greatest when there is a narrow separation between large areas of conductor, hence capacitor conductors are often called "plates", referring to an early means of construction. In practice the dielectric between the plates passes a small amount of leakage current and also has an electric field strength limit, resulting in a breakdown voltage, while the conductors and leads introduce an undesired inductance and resistance.

Theory of operation
Main article: Capacitance
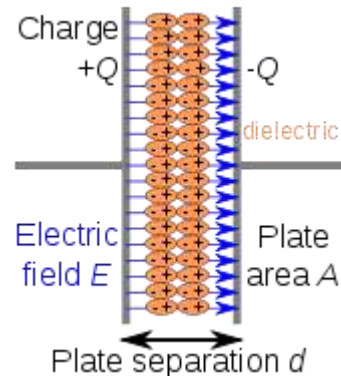
Charge separation in a parallel-plate capacitor causes an internal electric field. A dielectric (orange) reduces the field and increases the capacitance.

A simple demonstration of a parallel-plate capacitor

A capacitor consists of two conductors separated by a non-conductive region[8]. The non-conductive region is called the dielectric or sometimes the dielectric medium. In simpler terms, the dielectric is just an electrical insulator. Examples of dielectric mediums are glass, air, paper, vacuum, and even a semiconductordepletion region chemically identical to the conductors. A capacitor is assumed to be self-contained and isolated, with no net electric charge and no influence from any external electric field. The conductors thus hold equal and opposite charges on their facing surfaces,[9] and the dielectric develops an electric field. In SI units, a capacitance of one farad means that one coulomb of charge on each conductor causes a voltage of one volt across the device.[10]

The capacitor is a reasonably general model for electric fields within electric circuits. An ideal capacitor is wholly characterized by a constant capacitance C, defined as the ratio of charge $\pm Q$ on each conductor to the voltage V between them:[8]

$$C = \frac{Q}{V}$$

Sometimes charge build-up affects the capacitor mechanically, causing its capacitance to vary. In this case, capacitance is defined in terms of incremental changes:

$$C = \frac{dq}{dv}$$

Energy storage

Work must be done by an external influence to "move" charge between the conductors in a capacitor. When the external influence is removed the charge separation persists in the electric field and energy is stored to be released when the charge is allowed to return to its equilibrium position. The work done in establishing the electric field, and hence the amount of energy stored, is given by:[11]

$$W = \int_{q=0}^{Q} V \, dq = \int_{q=0}^{Q} \frac{q}{C} \, dq = \frac{1}{2}\frac{Q^2}{C} = \frac{1}{2}CV^2 = \frac{1}{2}VQ.$$

Current-voltage relation

The current i(t) through any component in an electric circuit is defined as the rate of flow of a charge q(t) passing through it, but actual charges, electrons, cannot pass through the dielectric layer of a capacitor, rather an electron accumulates on the negative plate for each one that leaves the positive plate, resulting in an electron depletion and consequent positive charge on one electrode that is equal and opposite to the accumulated negative charge on the other. Thus the charge on the electrodes is equal to the integral of the current as well as proportional to the voltage as discussed above. As with any antiderivative, a constant of integration is added to represent the initial voltage v (t_0). This is the integral form of the capacitor equation,[12]

$$v(t) = \frac{q(t)}{C} = \frac{1}{C}\int_{t_0}^{t} i(\tau)d\tau + v(t_0)$$

.

Taking the derivative of this, and multiplying by C, yields the derivative form,[13]

$$i(t) = \frac{dq(t)}{dt} = C\frac{dv(t)}{dt}.$$

The dual of the capacitor is the inductor, which stores energy in the magnetic field rather than the electric field. Its current-voltage relation is obtained by exchanging current and voltage in the capacitor equations and replacing C with the inductance L.

Parallel plate model
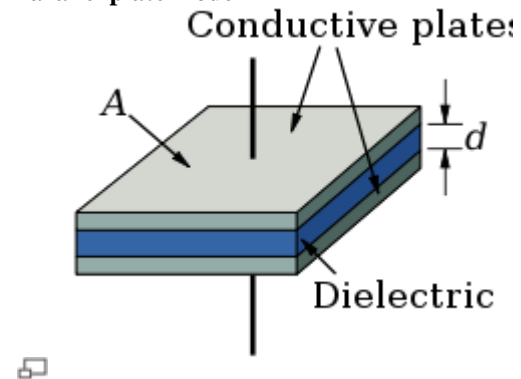
Dielectric is placed between two conducting plates, each of area A and with a separation of d.

The simplest capacitor consists of two parallel conductive plates separated by a dielectric with permittivityε (such as air). The model may also be used to make qualitative predictions for other device geometries. The plates are considered to extend uniformly over an area A and a charge density ±ρ = ±Q/A exists on their surface. Assuming that the width of the plates is much greater than their separationd, the electric field near the centre of the device will be uniform with the magnitude E = ρ/ε. The voltage is defined as the line integral of the electric field between the plates

$$V = \int_{0}^{d} E \, dz = \int_{0}^{d} \frac{\rho}{\varepsilon} \, dz = \frac{\rho d}{\varepsilon} = \frac{Qd}{\varepsilon A}.$$

Solving this for C = Q/V reveals that capacitance increases with area and decreases with separation

$$C = \frac{\varepsilon A}{d}.$$

The capacitance is therefore greatest in devices made from materials with a high permittivity.

DESIGN CALCULATIONS:

There are two components in this project which require a design attention. They are the Silencer pipe and design of non return valve. Till now the design calculations of non return valve are finalized.

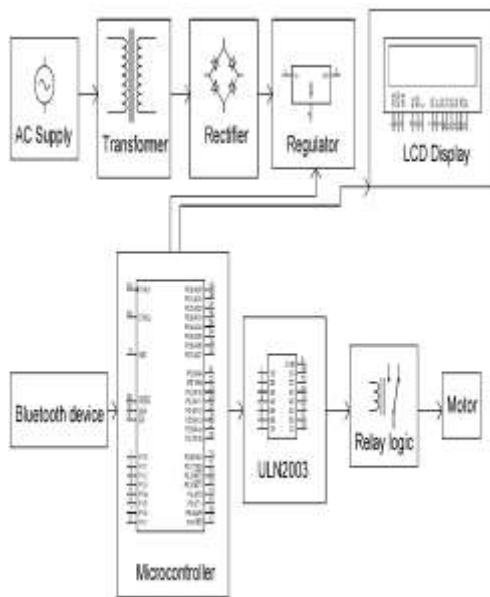### Design of non return Valve:

The material used for non return valve to be used in the project is SAE 1095 annealed. Considering the properties of the above selected material, we have

Yield Stress σy = 380 N/mm²
Youngs Modulus E= 200GPa
Poissons Ratio y = 0.3

BLOCK DIAGRAM

OBJECTIVES:

- The project is designed to control the direction of car jack by using an android phone with the help of Bluetooth device.
- The direction of the DC motor is depending on the signal which is coming from mobile.
- When we start the device it will ask via LCD display that, "PLEASE CONNECT PHONE & PRESS THE KEY".
- Whenever we press UP then the motor rotates in forward direction by using relay1 & relay4 logic & jack moves on UPWARD direction.
- whenever we press DOWN then the motor rotates in backward direction with the help relay2 & relay3 logic &jack moves on DOWNWARD direction.

As the exhaust gases enter into the hydro silencer, the perforated tube converts high mass bubbles into low mass bubbles after that

1. 25%). Then, the raw material is carbonized at lower temperatures (45~900 °C). It is believed that the carbonization/ activation step proceeds simultaneously with the chemical activation. Chemical activation is preferred over physical activation owing to the lower temperatures and shorter time needed for activating material.

A gram of activated carbon can have a surface area in excess of 500 m2 , with 1500 m2 being readily achievable.   Carbon aerogels, while more expensive, have even higher surface areas, and are used in special applications.

Carbon adsorption has numerous applications in removing pollutants from air or water streams both in the field and in industrial processes such as:• Spill cleanup

- Groundwater remediation
- Drinking water filtration
- Air purification
- Volatile organic compounds capture from painting, dry cleaning, gasoline dispensing operations, and other processes.

Activated carbon is also used for the measurement of radon concentration in air.

ADVANTAGES AND APPLICATIONS:

- Easily operated.
- Maintenance cost will be less.
- Parts are easily available in the market.
- This type of system is useful mainly for ladies and old peoples, during the time of puncher they can easily operate and change the wheelSmall / mini cars
- Heavy vehicles like buses and trucks.
- Heavy Utility vehicles (HUV) like crane and harvester.

II.   FUTURE SCOPE:
In future, this project will enhance the fault detection in underground cables using Raspberry PI. It helps to detect which type of fault occurred and exact location of fault also

III.   CONCLUSION:
The proposed model is to reduce the manual work greatly. It uses least manual work for the lifting of the jack. The proposed electric circuit is built using relays, Bluetooth module, and an Arduino. The interface between the mobile phone and circuit is achieved through Bluetooth module and that of between Jack and electronic circuit is gained by a reduction gear box. All that needs to be done is to just tap on the mobile phone. The proposed work can be extended to a single jack that can be fitted to the car and can be moved according to the need.

REFERENCES:
[1].   Kincic S, Papic, M. Impact of Series Compensation on the voltage profile of transmission lines. Power and Energy Society General Meeting PES. 2013; 1-5.
[2].   Shaaban SA, Hiyama, T. Transmission Line Faults Classification Using

Wavelet Transform. 14th International Middle East Power Systems Conference (MEPCON'10). Cairo University, Egypt. 2010;532-537.

[3]. Bendre A, Divan D, Kranz W, Brumsickle W. Equipment failures caused by power quality disturbances. InIndustry Applications Conference. 39th IAS Annual Meeting. Conference Record of the 2004 IEEE. 2004; 1.

[4]. Brumsickle WE, Divan DM, Luckjiff GA, Freeborg JW, Hayes RL. Power quality and reliability. IEEE Industry Applications Magazine. 2005; 11(1): 48-53.

[5]. Bakshi UA, Bakshi MV. Protection And Switchgear. Technical Publications; 2009.

[6]. Lauglo M. Ground Fault 1] Kincic S, Papic, M. Impact of Series Compensation on the voltage profile of transmission lines. Power and Energy Society General Meeting PES. 2013; 1-5.

[7]. Shaaban SA, Hiyama, T. Transmission Line Faults Classification Using Wavelet Transform. 14th International Middle East Power Systems Conference (MEPCON'10). Cairo University, Egypt. 2010;532-537.

[8]. Bendre A, Divan D, Kranz W, Brumsickle W. Equipment failures caused by power quality disturbances. InIndustry Applications Conference. 39th IAS Annual Meeting. Conference Record of the 2004 IEEE. 2004; 1.

[9]. Brumsickle WE, Divan DM, Luckjiff GA, Freeborg JW, Hayes RL. Power quality and reliability. IEEE Industry Applications Magazine. 2005; 11(1): 48-53.

[10]. Bakshi UA, Bakshi MV. Protection And Switchgear. Technical Publications; 2009. Protection of Transmission Lines (Master's thesis, NTNU).

[11]. Jena P, Pradhan AK. A Positive- Sequence Directional Relaying Algorithm for Series Compensated Line. IEEE Transactions on Power Delivery. 2010; 25(4): 2288- 2298.

[12]. Nayak PK, Pradhan AK, Bajpai P. A fault detection technique for the series-compensated line during power swing. IEEE transactions on power delivery. 2013; 28(2): 714-22.

[13]. Izykowski, J., Rosolowski, E., Balcerek, P., Fulczyk, M. and Saha, M.M. Fault Location on Double-Circuit Series-Compensated Lines Using Two-End Unsynchronized Measurements. IEEE Transactions Power Delivery. 2011; 26(4): 2072-2080.

[14]. Pierz, P., Balcerek P. and Saha, M. M. A Method for Internal and External Fault Discrimination for Protection of Series Compensated Double-Circuit Line. IEEE Grenoble Power Tech. 2013; 1-6.