A

PROJECT REPORT ON

" FACULTY NAMER DISPLAY BY USING RFID "

THIS IS SUBMITTED TO THE JNTU KAKINADA

FOR THE AWARD OF THE DEGREE

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION

ENGINEERING

SUBMITTED BY

K. SURYA PRAKASH	**219H1A0419**
V. ASHOK REDDY	**229H5A0427**
G. PRAKASH RAJU	**229H5A0428**
V.KUMARA SATYAN	**229H5A0430**
M. SONIA	**229H5A0432**

UNDER THE ESTEEMED GUIDENCE OF

Mrs.M. Kalpana devi M.Tech

Associate professor

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

NEWTON'S INSTITUTE OF SCIENCE AND TECHNOLOGY, MACHERLA

(Approved by AICTE New Delhi, Affiliated to JNTUK kakinada)

2021-2025

NEWTON'S INSTITUTE OF SCIENCE AND TECHNOLOGY, MACHERLA

(Approved by AICTE and affiliated to JNTUK, Kakinada)

DECLARATION

The project work entitled " **" FACULTY NAMER DISPLAY BY USING RFID** ", which is submitted by us in partial fulfillment of the requirement for the award of degree Bachelor of Technology in Electronics and Communication Engineering at Newton's institute of Science and Technology, Jawaharlal Nehru Technological University Kakinada comprises only our original work and due acknowledgment has been made in the text to all other materials used. We also declare that this thesis work is the result of our sincere efforts and that it has not been submitted to any other university for the award of the degree or any diploma.

K. SURYA PRAKASH	**219H1A0419**
V. ASHOK REDDY	**229H5A0427**
G. PRAKASH RAJU	**229H5A0428**
V.KUMARA SATYAN	**229H5A0430**
M. SONIA	**229H5A0432**

DEPARTMENT OF ELECTONICS AND COMMUNICATION ENGINEERING

NEWTON'S INSTITUTE OF SCIENCE AND TECHNOLOGY, MACHERLA

CERTIFICATE

This is to certify that the project entitled " **" FACULTY NAMER DISPLAY BY USING RFID** " submitted by **K.SURYA PRAKASH (219H1A0419), V.ASHOK REDDY (229H5A0427), G.PRAKASH (229H5A0428), V.KUMARA SATYAN (229H5A0430)**, **M.SONIA (229H5A0432)** to the Newton's Institute of Science and Technology, Macherla, during academic year 2021-2025 for the award of the degree Bachelor of Technology in Electronics and communication Engineering has been accepted by External Examiners and that these students have successfully defended the project in the Viva Voice examination held today.

Signature of guide

Mrs. M. KALPANA DEVI M. Tech

Associate Professor

Signature of the HOD

Mrs .V.MADHURI M. Tech, (PH.D)

Associate Professor

Signature of Principal

Dr. G.JAGADEESHWAR REDDY M. Tech, PH.D

Signature of External Examiner

ACKNOWLEDGEMENT

We would like to thank **Mrs. M.KALPANA DEVI M.Tech**, in the department of Electronics and Communications Engineering for the immense guidance and cooperation in completing this project work.

We would like to thank with gratitude to **Mrs. V. MADHURI M. Tech, (PH. D)**, head of the department of Electronics and Communication Engineering for providing the facilities for this project work.

We would like to thank our principal **Dr. G. JAGADEESHWAR REDDY M. Tech, PH. D**, for giving the opportunity and encouragement to complete this course of study communication and processing.

We would like to acknowledge the **MANAGEMENT** for extending all the facilities throughout the course of this study.

Acknowledgement is due for all the course coordinators in the department of UG (B-Tech) and the teaching and non-teaching staff for their kind cooperation.

It is a pleasure to acknowledge the affection and inspiration of parents for their extreme tolerance and encouragement during entire course.

We would also thank all my friends who are involved directly and indirectly during the project work.

K. SURYA PRAKASH	**219H1A0419**
V. ASHOK REDDY	**229H5A0427**
G. PRAKASH RAJU	**229H5A0428**
V.KUMARA SATYAN	**229H5A0430**
M. SONIA	**229H5A0432**

INDEX

CHAPTER 1: EMBEDDED SYSTEMS

CHAPTER 2: INTRODUCTION TO PROJECT

CHAPTER 3: ARDUINO UNO

***CHAPTER 4: HARDWARE COMPONENTS**

CHAPTER 5: SOFTWARE

CHAPTER 6: RESULTS

CHAPTER 7: CONCLUSION & FUTURE SCOPE

REFERENCES

ABSTRACT

This project proposes a RFID-based faculty monitoring system to track faculty attendance and manage classroom activities. The system utilizes rfid technology to identify and monitor faculty members, providing real-time attendance records and classroom management features. The system aims to improve faculty accountability, reduce administrative tasks, and enhance overall classroom management.

CHAPTER 1

EMBEDDED SYSTEMS

1.1. INTRODUCTION TO EMBEDDED SYSTEMS

An embedded system is a special-purpose computer system designed to perform one or a few dedicated functions, sometimes with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use.

Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Physically embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

In general, "embedded system" is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems — such as the operating systems and microprocessors which power them — but are not truly embedded systems, because they allow different applications to be load and peripherals to be connected.

An embedded system is some combination of computer hardware and software, either fixed in capability or programmable, that is specifically designed for a particular kind of application device. Industrial machines, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines, and toys (as well as the more obvious cellular phone and PDA) are among the myriad possible hosts of an embedded system. Embedded systems that are programmable are provided with a programming interface, and embedded systems programming is a specialized occupation. Certain operating systems or language platforms are tailored for the embedded market, such as Embedded Java and Windows XP Embedded. However, some low-end consumer products use very inexpensive microprocessors and limited storage, with the application and operating system both part of a single program. The program is written permanently into the system's memory in this case, rather than being loaded into RAM (random access memory), as programs on a personal computer are.

1.2. CHARACTERISTIC OF EMBEDDED SYSTEM

- Speed (bytes/sec): Should be high speed
- Power (watts): Low power dissipation
- Size and weight: As far as possible small in size and low weight
- Accuracy (%error): Must be very accurate
- Adaptability: High adaptability and accessibility
- Reliability: Must be reliable over a long period of time

1.3. APPLICATIONS OF EMBEDDED SYSTEMS

We are living in the Embedded World. You are surrounded with many embedded products and your daily life largely depends on the proper functioning of these gadgets. Television, Radio, CD player of your living room, Washing Machine or Microwave Oven in your kitchen, Card readers, Access Controllers, Palm devices of your work space enable you to do many of your tasks very effectively. Apart from all these, many controllers embedded in your car take care of car operations between the bumpers and most of the times you tend to ignore all these controllers.

- **Robotics:** industrial robots, machine tools, Robocop soccer robots
- **Automotive:** cars, trucks, trains
- **Aviation:** airplanes, helicopters
- Home and Building Automation
- **Aerospace:** rockets, satellites
- **Energy systems:** windmills, nuclear plants
- **Medical systems:** prostheses, revalidation machine.

1.4. MICROCONTROLLER VERSUS MICROPROCESSOR

What is the difference between a Microprocessor and Microcontroller? By microprocessor is meant the general purpose Microprocessors such as Intel's X86 family (8086, 80286, 80386, 80486, and the Pentium) or Motorola's 680X0 family (68000, 68010, 68020, 68030, 68040,etc) These microprocessors contain no RAM, no ROM, and no I/O ports on the chip itself. For this reason, they are commonly referred to as general-purpose Microprocessors. A system designer using a general-purpose microprocessor such as the Pentium or the 68040 must add RAM, ROM, I/O ports, and timers externally to make them functional. Although the addition of external RAM, ROM, and I/O ports makes these systems bulkier and much more expensive, they have the advantage of versatility such that the designer can decide on the amount of RAM, ROM and I/O ports needed to fit the task at hand. This is not the case with Microcontrollers.

A Microcontroller has a CPU (a microprocessor) in addition to a fixed amount of RAM, ROM, I/O ports, and a timer all on a single chip. In other words, the processor, the RAM, ROM, I/O ports and the timer are all embedded together on one chip; therefore, the designer cannot add any external memory, I/O ports, or timer to it. The fixed amount of on-chip ROM, RAM, and number of I/O ports in Microcontrollers makes them ideal for many applications in which cost and space are critical.

In many applications, for example a TV remote control, there is no need for the computing power of a 486 or even an 8086 microprocessor. These applications most often require some I/O operations to read signals and turn on and off certain bits

1.5. MICROCONTROLLERS FOR EMBEDDED SYSTEMS

In the Literature discussing microprocessors, we often see the term Embedded System. Microprocessors and Microcontrollers are widely used in embedded system products. An embedded system product uses a microprocessor (or Microcontroller) to do one task only. A printer is an example of embedded system since the processor inside it performs one task only; namely getting the data and printing it. Contrast this with a Pentium based PC. A PC can be used for any number of applications such as word processor, print-server, bank teller terminal, Video game, network server, or Internet terminal. Software for a variety of applications can be loaded and run. Of course the reason a pc can perform myriad tasks is that it has RAM memory and an operating system that loads the application software into RAM memory and lets the CPU run it. In this robot as the fire sensor senses the fire, it senses the signal to microcontroller. In an Embedded system, there is only one application software that is typically burned into ROM. An x86 PC contains or is connected to various embedded products such keyboard, printer, modem, disk controller, sound card, CD-ROM drives.

CHAPTER 2

INTRODUCTION TO PROJECT

2.1. INTRODUCTION

In this world Mobile Phones and the related technologies are becoming more and more prevalent. Various technical arenas in the field of Telecommunication and Embedded Systems are becoming omnipresent in the people. The use of cell phones has rapidly increased over the last decade and a half Upgradation in networking technologies has encouraged the development and growth of very dense networks. Now-a-days the general mass prefer communicating while on the move therefore landlines usage has been drastically reduced. Notice boards are one of the widely used ones ranging from primary schools to major organizations to convey messages at large. Small innovative steps in making use of technology for regular purposes would have an adverse effect on the environment issues which we are presently concerned about. The main aim of this paper is to design a SMS driven automatic display Board which can replace the currently used programmable electronic display and conventional notice boards. It is proposed to design to receive message in display toolkit which can be used from an authorized mobile phone. The whole process can be described from the transmitter and receiver section. The RFID module receives a message from the authorized mobile phone and the message is extracted by the microcontroller from the RFID module and is displayed on the P 10 LED Display. By using this proposed methodology we can enhance the security system and also make awareness of the emergency situations and avoid many dangers.

2.2. BLOCK DIAGRAM

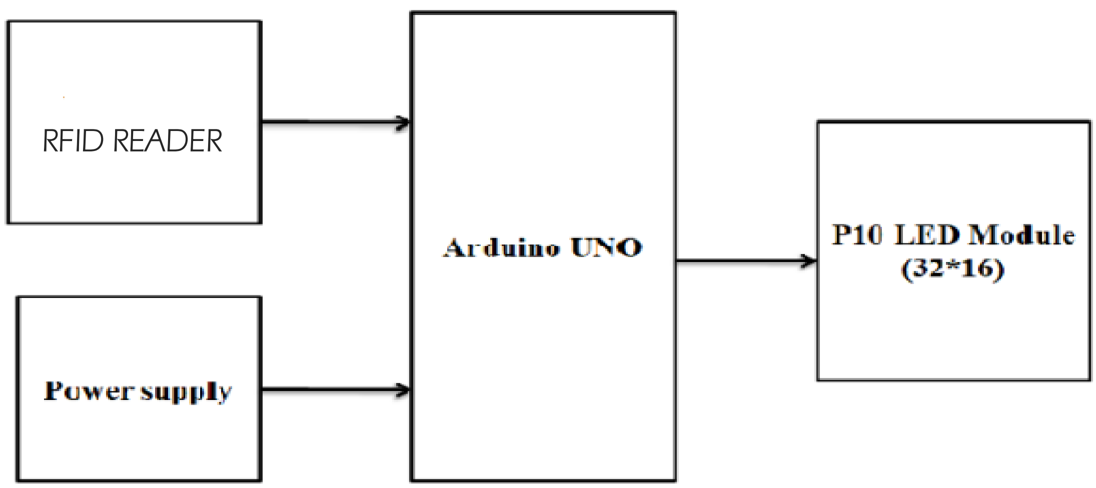


Figure.2.2. Block Diagram of DIGITAL NOTICE BOARD

RFID READER

FIG. RFID READER

RFID is short for Radio Frequency Identification. Generally a RFID system consists of 2 parts. A Reader, and one or more Transponders, also known as Tags. RFID systems evolved from barcode labels as a means to automatically identify and track products and people. You will be generally familiar with RFID systems as seen in:

Contact less Payment Systems:

RFID tags used to carry payment information. RFIDs are particular suited to electronic Toll collection systems. Tags attached to vehicles, or carried by people transmit payment information to a fixed reader attached to a Toll station. Payments are then routinely deducted from a users account, or information is changed directly on the RFID tag.

Access Control:

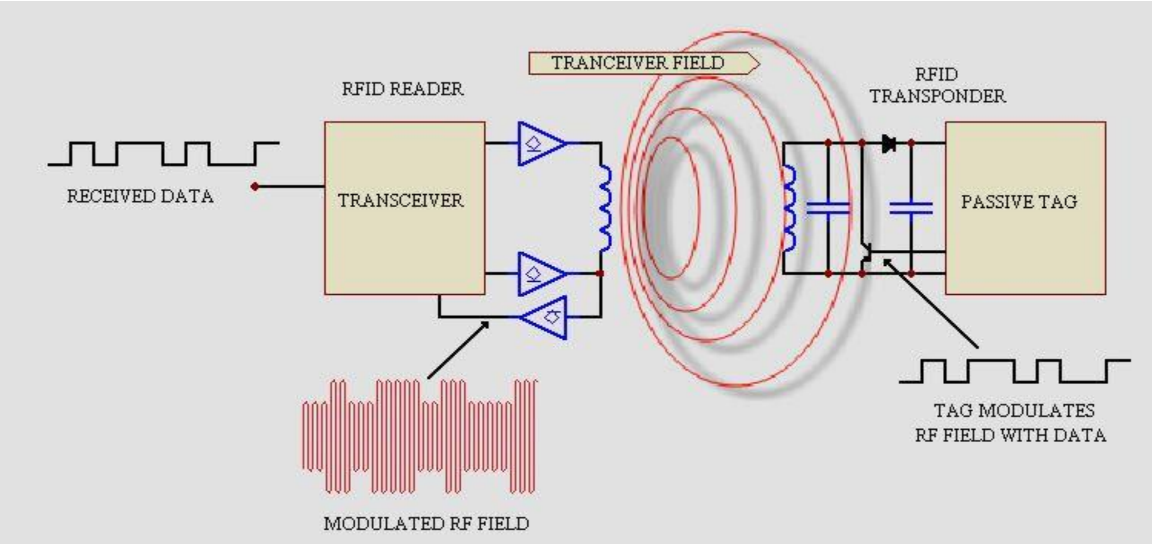
RFID Readers placed at entrances that require a person to pass their proximity card (RF tag) to be "read' before the access can be made.

Product Tracking and Inventory Control:

RFID systems are commonly used to track and record the movement of ordinary items such as library books, clothes, factory pallets, electrical goods and numerous items.

How do RFIDs work?

Shown below is a typical RFID system. In every RFID system the transponder Tags contain information. This information can be as little as a single binary bit , or be a large array of bits representing such things as an identity code, personal medical information, or literally any type of information that can be stored in digital binary format.



Shown is a RFID transceiver that communicates with a passive Tag. Passive tags have no power source of their own and instead derive power from the incident electromagnetic field. Commonly the heart of each tag is a microchip. When the Tag enters the generated RF field it is able to draw enough power from the field to access its internal memory and transmit its stored information. When the transponder Tag draws power in this way the resultant interaction of the RF fields causes the voltage at the transceiver antenna to drop in value. This effect is utilized by the Tag to communicate its information to the reader. The Tag is able to control the amount of power drawn from the field and by doing so it can modulate the voltage sensed at the Transceiver according to the bit pattern it wishes to transmit.

COMPONENTS OF RFID:

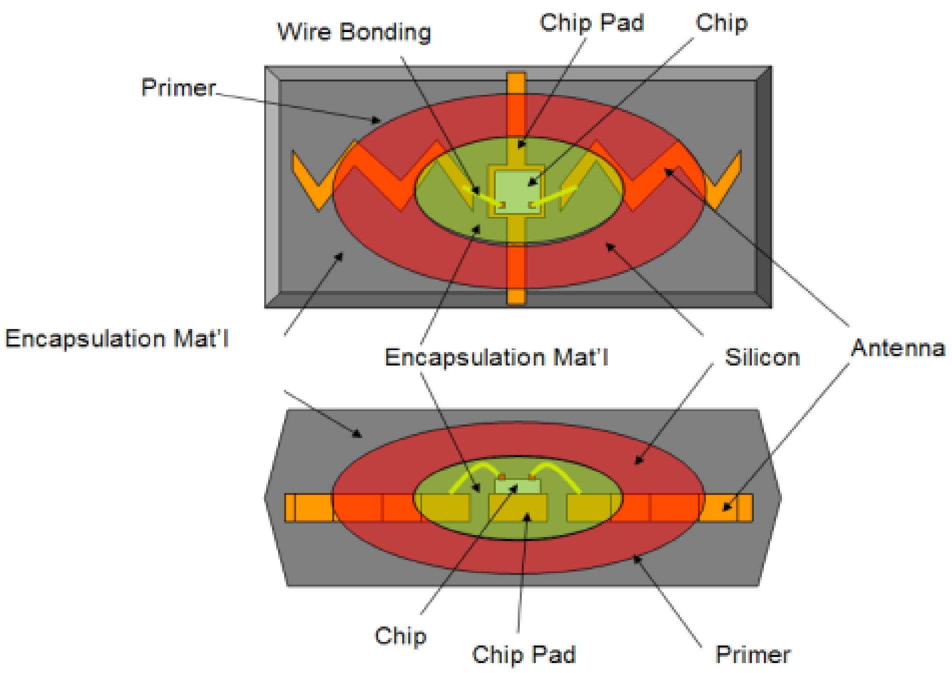
A basic RFID system consists of three components:

- An antenna or coil
- A transceiver (with decoder)
- A transponder (RF tag) electronically programmed with unique information

ANTENNA

The antenna emits radio signals to activate the tag and read and write data to it. Antennas are the conduits between the tag and the transceiver, which controls the system's data acquisition and communication. Antennas are available in a variety of shapes and sizes; they can be built into a door frame to receive tag data from persons or things passing through the door, or mounted on an interstate tollbooth to monitor traffic passing by on a freeway. The electromagnetic field produced by an antenna can be constantly present when multiple tags. If constant interrogation is not required, a sensor device can activate the field.

Often the antenna is packaged with the transceiver and decoder to become a reader (a.k.a. interrogator), which can be configured either as a handheld or a fixed-mount device. The reader emits radio waves in ranges of anywhere from one inch to 100 feet or more, depending upon its power output and the radio frequency used. When an RFID tag passes through the electromagnetic zone, it detects the reader's activation signal. The reader decodes the data encoded in the tag's integrated circuit (silicon chip) and the data is passed to the host computer for processing.



TAGS (Transponders)

An RFID tag is comprised of a microchip containing identifying information and an antenna that transmits this data wirelessly to a reader. At its most basic, the chip will contain a serialized identifier, or license plate number, that uniquely identifies that item, similar to the way many bar codes are used today. A key difference, however is that RFID tags have a higher data capacity than their bar code counterparts.

This increases the options for the type of information that can be encoded on the tag, including the manufacturer, batch or lot number, weight, ownership, destination and history (such as the temperature range to which an item has been exposed). In fact, an unlimited list of other types of information can be stored on RFID tags, depending on application needs. An RFID tag can be placed on individual items, cases or pallets for identification purposes, as well as on fixed assets such as trailers, containers, totes, etc.

Tags come in a variety of types, with a variety of capabilities. Key variables include:

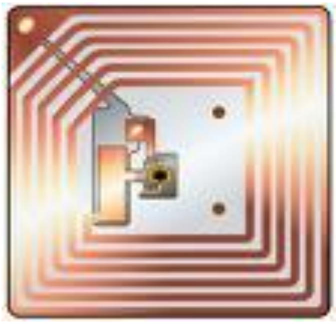
"Read-only" versus "read-write"

There are three options in terms of how data can be encoded on tags:

(1) Read-only tags contain data such as a serialized tracking number, which is pre-written onto them by the tag manufacturer or distributor. These are generally the least expensive tags because they cannot have any additional information included as they move throughout the supply chain. Any updates to that information would have to be maintained in the application software that tracks SKU movement and activity.

(2) "Write once" tags enable a user to write data to the tag one time in production or distribution processes. Again, this may include a serial number, but perhaps other data such as a lot or batch number.

(3) Full "read-write" tags allow new data to be written to the tag as needed—and even written over the original data. Examples for the latter capability might include the time and date of ownership transfer or updating the repair history of a fixed asset. While these are the most costly of the three tag types and are not practical for tracking inexpensive items, future standards for electronic product codes (EPC) appear to be headed in this direction.



RFID TAGS

Data capacity:

The amount of data storage on a tag can vary, ranging from 16 bits on the low end to as much as several thousand bits on the high end. Of course, the greater the storage capacity, the higher the price per tag.

Form factor:

The tag and antenna structure can come in a variety of physical form factors and can either be self-contained or embedded as part of a traditional label structure (i.e., the tag is inside what looks like a regular bar code label—this is termed a 'Smart Label') companies must choose the appropriate form factors for the tag very carefully and should expect to use multiple form factors to suit the tagging needs of different physical products and units of measure. For example, a pallet may have an RFID tag fitted only to an area of protected placement on the pallet itself.

On the other hand, cartons on the pallet have RFID tags inside bar code labels that also provide operators human-readable information and a back-up should the tag fail or pass through non RFID capable supply chain links.

Passive versus active:

“Passive” tags have no battery and "broadcast" their data only when energized by a reader. That means they must be actively polled to send information. "Active" tags are capable of broadcasting their data using their own battery power. In general, this means that the read ranges are much greater for active tags than they are for passive tags—perhaps a read range of 100 feet or more, versus 15 feet or less for most passive tags. The extra capability and read ranges of active tags, however, come with a cost; they are several times more expensive than passive tags. Today, active tags are much more likely to be used for high-value items or fixed assets such as trailers, where the cost is minimal compared to item value, and very long read ranges are required.

Most traditional supply chain applications, such as the RFID-based tracking and compliance programs emerging in the consumer goods retail chain, will use the less expensive passive tags.

Frequencies:

Like all wireless communications, there are a variety of frequencies or spectra through which RFID tags can communicate with readers. Again, there are trade-offs among cost, performance and application requirements. For instance, low-frequency tags are cheaper than ultra high-frequency (UHF) tags, use less power and are better able to penetrate non-metallic substances. They are ideal for scanning objects with high water content, such as fruit, at close range. UHF frequencies typically offer better range and can transfer data faster. But they use more power and are less likely to pass through some materials. UHF tags are typically best suited for use with or near wood, paper, cardboard or clothing products. Compared to low-frequency tags, UHF tags might be better for scanning boxes of goods as they pass through a bay door into a warehouse.

While the tag requirements for compliance mandates may be narrowly defined, it is likely that a variety of tag types will be required to solve specific operational issues. You will want to work with a company that is very knowledgeable in tag and reader technology to appropriately identify the right mix of RFID technology for your environment and applications.

EPC Tags:

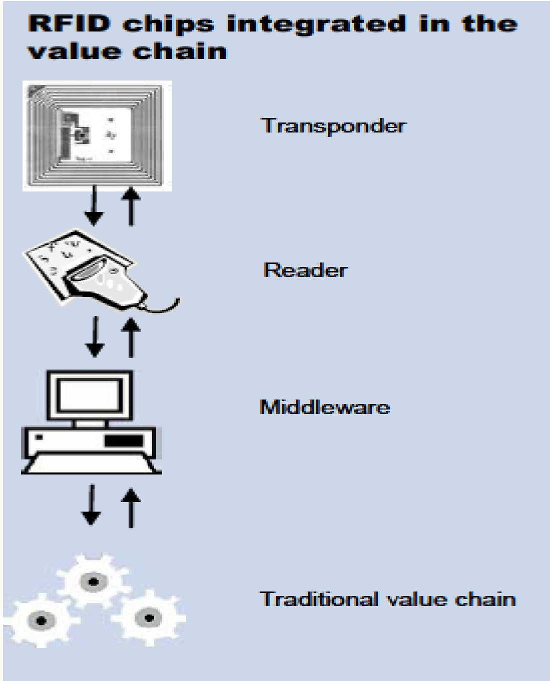
EPC refers to "electronic product code," an emerging specification for RFID tags, readers and business applications first developed at the Auto-ID Center at the Massachusetts Institute of Technology. This organization has provided significant intellectual leadership toward the use and application of RFID technology. EPC represents a specific approach to item identification, including an emerging standard for the tags themselves, including both the data content of the tag and open wireless communication protocols. In a sense, the EPC movement is combining the data standards embodied in certain bar code specifications, such as the UPC or UCC-128 bar code standards, with the wireless data communication standards that have been developed by ANSI and other groups.

RF Transceiver:

The RF transceiver is the source of the RF energy used to activate and power the passive RFID tags. The RF transceiver may be enclosed in the same cabinet as the reader or it may be a separate piece of equipment. When provided as a separate piece of equipment, the transceiver is commonly referred to as an RF module. The RF transceiver controls and modulates the radio frequencies that the antenna transmits and receives. The transceiver filters and amplifies the backscatter signal from a passive RFID tag.

Typical Applications for RFID

- Automatic Vehicle identification
- Inventory Management
- Work-in-Process
- Container/ Yard Management
- Document/ Jewellery tracking
- Patient Monitoring



The Advantages of RFID Over Bar Coding:

1. **No "line of sight" requirements**: Bar code reads can sometimes be limited or problematic due to the need to have a direct "line of sight" between a scanner and a bar code. RFID tags can be read through materials without line of sight
2. **More automated reading**: RFID tags can be read automatically when a tagged product comes past or near a reader, reducing the labor required to scan product and allowing more proactive, real-time tracking.
3. **Improved read rates**: RFID tags ultimately offer the promise of higher read rates than bar codes, especially in high-speed operations such as carton sortation. Greater data capacity: RFID tags can be easily encoded with item details such as lot and batch, weight, etc.
4. **"Write" capabilities**: Because RFID tags can be rewritten with new data as supply chain activities are completed, tagged products carry updated information as they move throughout the supply chain.

Potential uses:

RFID can be used in a variety of applications such as

- Access management
- Tracking of goods and RFID in retail

- Tracking of persons and animals
- Toll collection and contactless payment
- Machine readable travel documents
- Smart dust (for massively distributed sensor networks)
- Location-based services
- Tracking Sports memorabilia to verify authenticity
- Airport Baggage Tracking Logistics

RFID chips:

Future technology:

Radio frequency identification (RFID), the technology of the future, has long established itself in our everyday lives. It is already deployed in various areas ranging from efficient inventory management and road toll collection through to timing the performance of individual participants in mass sporting events. Given RFID's enormous potential it is only right that it is on everyone's lips. FID chips combine the physical world of a product with the virtual world of digital data. The technology meets the needs of companies cooperating in a closely knit value chain.

RFID will soon be considered an indispensable part of the chain. Inefficiencies in the value chain and efforts to shore up internal security are driving demand for RFID. The retail trade is playing a decisive part in the broad-based roll-out of RFID projects. RFID represents an all-encompassing structural business concept that far transcends simply superseding the bar code. Speed of processing, reading error frequency, data protection and privacy issues, progress in standardization, and investment costs are still challenges that will ultimately decide the potential of RFID. RFID projects focused on transparency, reliability or speed of processing are particularly successful. RFID systems will rapidly continue to gain significance. This holds especially in areas where they can be used to manage processes within the value chain.

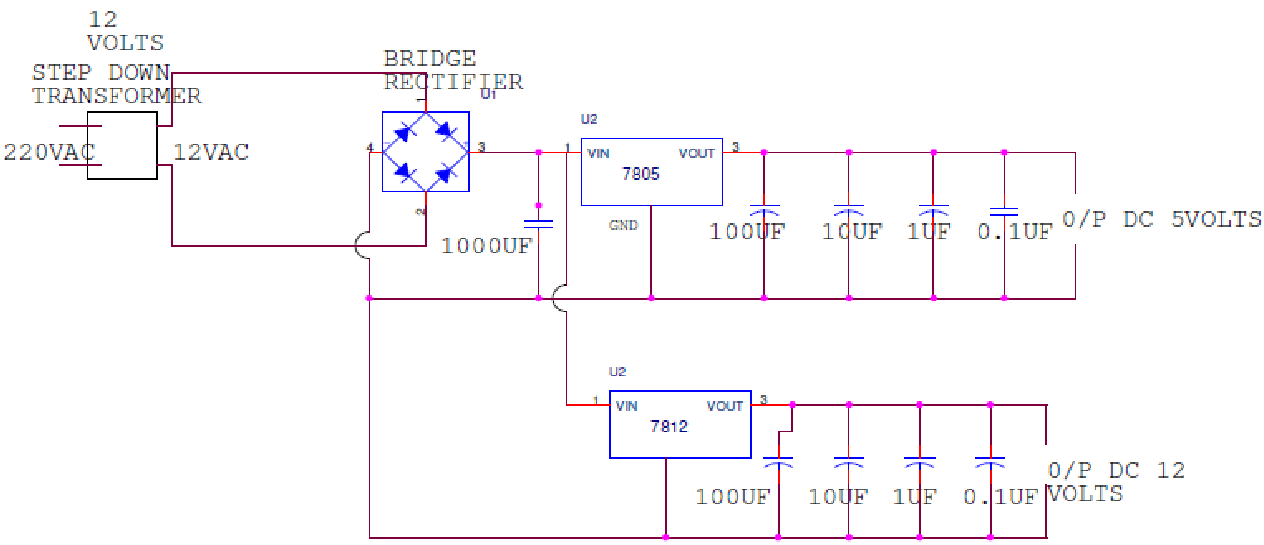
All told, the market for RFID systems is likely to grow globally from EUR 1.5 bn to EUR 22 bn between 2004 and 2010 (average growth rate: +57% p.a.). During the same period, the RFID market in the EU-15 is expected to expand from EUR 0.4 bn to EUR 4 bn (+47% p.a.).

POWER SUPPLY

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others

This power supply section is required to convert AC signal to DC signal and also to reduce the amplitude of the signal. The available voltage signal from the mains is 230V/50Hz which is an AC voltage, but the required is DC voltage (no frequency) with the amplitude of +5V and +12V for various applications.

In this section we have Transformer, Bridge rectifier, are connected serially and voltage regulators for +5V and +12V (7805 and 7812) via a capacitor (1000µF) in parallel are connected parallel as shown in the circuit diagram below. Each voltage regulator output is again is connected to the capacitors of values (100µF, 10µF, 1 µF, 0.1 µF) are connected parallel through which the corresponding output (+5V or +12V) are taken into consideration.



Circuit Explanation

1) Transformer

A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled electrical conductors. A changing current in the first circuit (the primary) creates a changing magnetic field; in turn, this magnetic field induces a changing voltage in the second circuit (the secondary). By adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other.

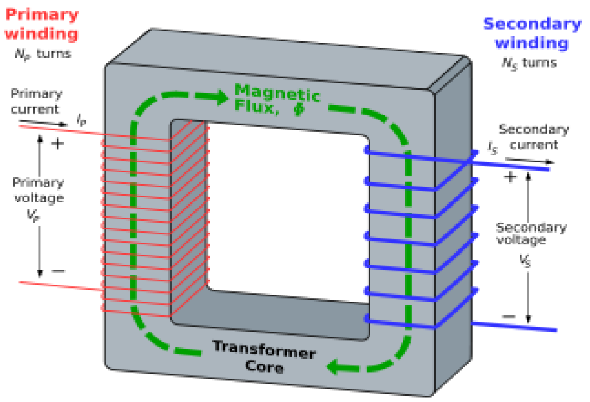
The secondary induced voltage V_S, of an ideal transformer, is scaled from the primary V_P by a factor equal to the ratio of the number of turns of wire in their respective windings:

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

<u>Basic principle</u>

The transformer is based on two principles: firstly, that an electric current can produce a magnetic field (electromagnetism) and secondly that a changing magnetic field within a coil of wire induces a voltage across the ends of the coil (electromagnetic induction). By changing the current in the primary coil, it changes the strength of its magnetic field; since the changing magnetic field extends into the secondary coil, a voltage is induced across the secondary.

A simplified transformer design is shown below. A current passing through the primary coil creates a magnetic field. The primary and secondary coils are wrapped around a core of very high magnetic permeability, such as iron; this ensures that most of the magnetic field lines produced by the primary current are within the iron and pass through the secondary coil as well as the primary coil.



An ideal step-down transformer showing magnetic flux in the core

<u>Induction law</u>

The voltage induced across the secondary coil may be calculated from Faraday's law of induction, which states that:

$$V_S = N_S \frac{\mathrm{d}\Phi}{\mathrm{d}t}$$

Where V_S is the instantaneous voltage, N_S is the number of turns in the secondary coil and Φ equals the magnetic flux through one turn of the coil. If the turns of the coil are oriented perpendicular to the magnetic field lines, the flux is the product of the magnetic field strength B and the area A through which it cuts. The area is constant, being equal to the cross-sectional area of the transformer core, whereas the magnetic field varies with time according to the excitation of the primary. Since the same magnetic flux passes through both the primary and secondary coils in an ideal transformer, the instantaneous voltage across the primary winding equals

$$V_P = N_P \frac{\mathrm{d}\Phi}{\mathrm{d}t}$$

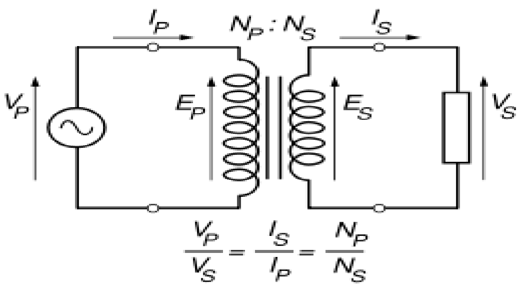
Taking the ratio of the two equations for V_S and V_P gives the basic equation for stepping up or stepping down the voltage

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

<u>Ideal power equation</u>

If the secondary coil is attached to a load that allows current to flow, electrical power is transmitted from the primary circuit to the secondary circuit. Ideally, the transformer is perfectly efficient; all the incoming energy is transformed from the primary circuit to the magnetic field and into the secondary circuit. If this condition is met, the incoming electric power must equal the outgoing power.

$P_{incoming} = I_P V_P = P_{outgoing} = I_S V_S$ giving the ideal transformer equation



$$\frac{V_S}{V_P} = \frac{N_S}{N_P} = \frac{I_P}{I_S}$$

If the voltage is increased (stepped up) ($V_S > V_P$), then the current is decreased (stepped down) ($I_S < I_P$) by the same factor. Transformers are efficient so this formula is a reasonable approximation.

If the voltage is increased (stepped up) ($V_S > V_P$), then the current is decreased (stepped down) ($I_S < I_P$) by the same factor. Transformers are efficient so this formula is a reasonable approximation.

The impedance in one circuit is transformed by the *square* of the turns ratio. For example, if an impedance Z_S is attached across the terminals of the secondary coil, it appears to the primary circuit to have an impedance of

$$Z_S\left(\frac{N_P}{N_S}\right)^2$$

This relationship is reciprocal, so that the impedance Z_P of the primary circuit appears to the secondary to be

$$Z_P\left(\frac{N_S}{N_P}\right)^2$$

Detailed operation

The simplified description above neglects several practical factors, in particular the primary current required to establish a magnetic field in the core, and the contribution to the field due to current in the secondary circuit.

Models of an ideal transformer typically assume a core of negligible reluctance with two windings of zero resistance. When a voltage is applied to the primary winding, a small current flows, driving flux around the magnetic circuit of the core. The current required to create the flux is termed the magnetizing current; since the ideal core has been assumed to have near-zero reluctance, the magnetizing current is negligible, although still required to create the magnetic field.

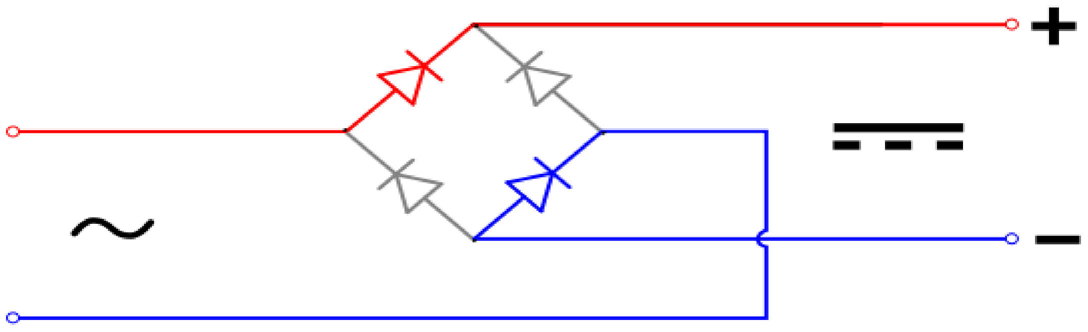
The changing magnetic field induces an electromotive force (EMF) across each winding. Since the ideal windings have no impedance, they have no associated voltage drop, and so the voltages V_P and V_S measured at the terminals of the transformer, are equal to the corresponding EMFs. The primary EMF, acting as it does in opposition to the primary voltage, is sometimes termed the "back EMF". This is due to Lenz's law which states that the induction of EMF would always be such that it will oppose development of any such change in magnetic field.

2. Bridge Rectifier

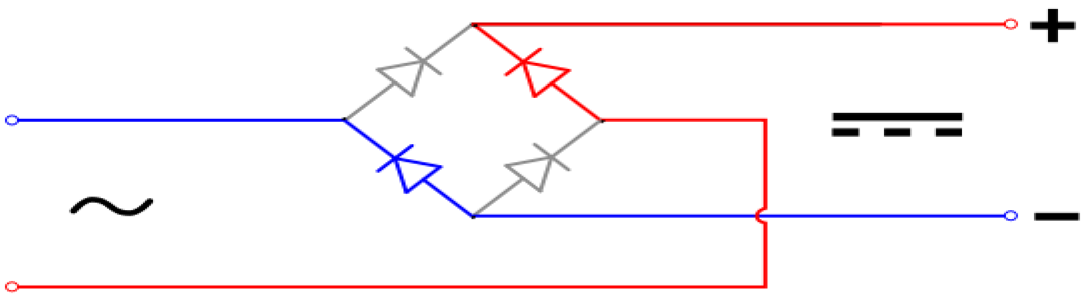
A diode bridge or bridge rectifier is an arrangement of four diodes in a bridge configuration that provides the same polarity of output voltage for any polarity of input voltage. When used in its most common application, for conversion of alternating current (AC) input into direct current (DC) output, it is known as a bridge rectifier. A bridge rectifier provides full-wave rectification from a two-wire AC input, resulting in lower cost and weight as compared to a center-tapped transformer design, but has two diode drops rather than one, thus exhibiting reduced efficiency over a center-tapped design for the same output voltage.

Basic Operation

When the input connected at the left corner of the diamond is positive with respect to the one connected at the right hand corner, current flows to the right along the upper colored path to the output, and returns to the input supply via the lower one.

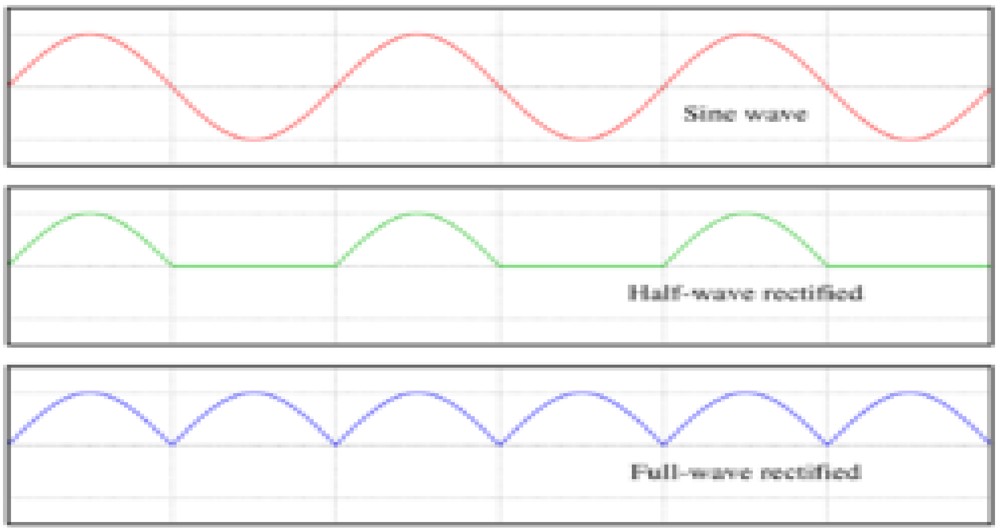


When the right hand corner is positive relative to the left hand corner, current flows along the upper colored path and returns to the supply via the lower colored path.



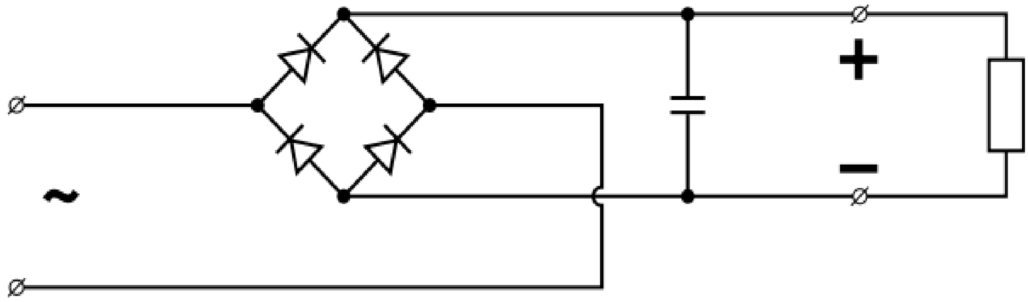
In each case, the upper right output remains positive with respect to the lower right one. Since this is true whether the input is AC or DC, this circuit not only produces DC power when supplied with AC power: it also can provide what is sometimes called "reverse polarity protection". That is, it permits normal functioning when batteries are installed backwards or DC input-power supply wiring "has its wires crossed" (and protects the circuitry it powers against damage that might occur without this circuit in place).

Prior to availability of integrated electronics, such a bridge rectifier was always constructed from discrete components. Since about 1950, a single four-terminal component containing the four diodes connected in the bridge configuration became a standard commercial component and is now available with various voltage and current ratings.



Output smoothing (Using Capacitor)

For many applications, especially with single phase AC where the full-wave bridge serves to convert an AC input into a DC output, the addition of a capacitor may be important because the bridge alone supplies an output voltage of fixed polarity but pulsating magnitude (see diagram above).



The function of this capacitor, known as a reservoir capacitor (aka smoothing capacitor) is to lessen the variation in (or 'smooth') the rectified AC output voltage waveform from the bridge. One explanation of 'smoothing' is that the capacitor provides a low impedance path to the AC component of the output, reducing the AC voltage across, and AC current through, the resistive load. In less technical terms, any drop in the output voltage and current of the bridge tends to be cancelled by loss of charge in the capacitor.

This charge flows out as additional current through the load. Thus the change of load current and voltage is reduced relative to what would occur without the capacitor. Increases of voltage correspondingly store excess charge in the capacitor, thus moderating the change in output voltage / current. Also see rectifier output smoothing.

The simplified circuit shown has a well-deserved reputation for being dangerous, because, in some applications, the capacitor can retain a *lethal* charge after the AC power source is removed. If supplying a dangerous voltage, a practical circuit should include a reliable way to safely discharge the capacitor. If the normal load can not be guaranteed to perform this function, perhaps because it can be disconnected, the circuit should include a bleeder resistor connected as close as practical across the capacitor. This resistor should consume a current large enough to discharge the capacitor in a reasonable time, but small enough to avoid unnecessary power waste.

Because a bleeder sets a minimum current drain, the regulation of the circuit, defined as percentage voltage change from minimum to maximum load, is improved. How ever in many cases the improvement is of insignificant magnitude.

The capacitor and the load resistance have a typical time constant $\tau = RC$ where C and R are the capacitance and load resistance respectively. As long as the load resistor is large enough so that this time constant is much longer than the time of one ripple cycle, the above configuration will produce a smoothed DC voltage across the load.

In some designs, a series resistor at the load side of the capacitor is added. The smoothing can then be improved by adding additional stages of capacitor–resistor pairs, often done only for sub-supplies to critical high-gain circuits that tend to be sensitive to supply voltage noise.

The idealized waveforms shown above are seen for both voltage and current when the load on the bridge is resistive. When the load includes a smoothing capacitor, both the voltage and the current waveforms will be greatly changed. While the voltage is smoothed, as described above, current will flow through the bridge only during the time when the input voltage is greater than the capacitor voltage. For example, if the load draws an average current of n Amps, and the diodes conduct for 10% of the time, the average diode current during conduction must be 10n Amps. This non-sinusoidal current leads to harmonic distortion and a poor power factor in the AC supply.

In a practical circuit, when a capacitor is directly connected to the output of a bridge, the bridge diodes must be sized to withstand the current surge that occurs when the power is turned on at the peak of the AC voltage and the capacitor is fully discharged. Sometimes a small series resistor is included before the capacitor to limit this current, though in most applications the power supply transformer's resistance is already sufficient.

Output can also be smoothed using a choke and second capacitor. The choke tends to keep the current (rather than the voltage) more constant. Due to the relatively high cost of an effective choke compared to a resistor and capacitor this is not employed in modern equipment.

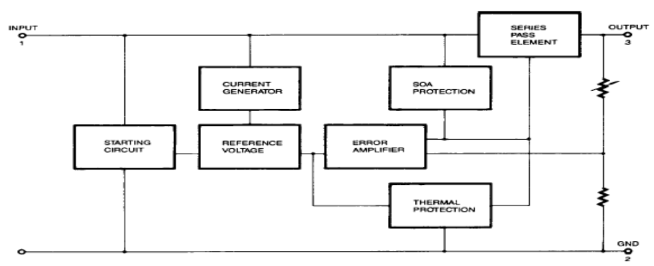
Some early console radios created the speaker's constant field with the current from the high voltage ("B +") power supply, which was then routed to the consuming circuits, (permanent magnets were considered too weak for good performance) to create the speaker's constant magnetic field. The speaker field coil thus performed 2 jobs in one: it acted as a choke, filtering the power supply, and it produced the magnetic field to operate the speaker.

Voltage Regulator

A voltage regulator is an electrical regulator designed to automatically maintain a constant voltage level.

The 78xx (also sometimes known as LM78xx) series of devices is a family of self-contained fixed linear voltage regulator integrated circuits. The 78xx family is a very popular choice for many electronic circuits which require a regulated power supply, due to their ease of use and relative cheapness. When specifying individual ICs within this family, the xx is replaced with a two-digit number, which indicates the output voltage the particular device is designed to provide (for example, the 7805 has a 5 volt output, while the 7812 produces 12 volts). The 78xx line is positive voltage regulators, meaning that they are designed to produce a voltage that is positive relative to a common ground. There is a related line of 79xx devices which are complementary negative voltage regulators. 78xx and 79xx ICs can be used in combination to provide both positive and negative supply voltages in the same circuit, if necessary.

Internal Block Digram



78xx ICs have three terminals and are most commonly found in the TO220 form factor, although smaller surface-mount and larger TrO3 packages are also available from some manufacturers. These devices typically support an input voltage which can be anywhere from a couple of volts over the intended output voltage, up to a maximum of 35 or 40 volts, and can typically provide up to around 1 or 1.5 amps of current (though smaller or larger packages may have a lower or higher current rating).

P10 LED MODULE

Fig. P10 LED Module

A P10 LED display is a type of outdoor LED screen that is commonly used for advertising, information displays, and other visual communications. The term "P10" refers to the pixel pitch, or the distance between the center of one pixel to the center of the next pixel, which is 10 millimeters in this case.

How P10 modules work

- The "P10" refers to the distance between the center of one pixel to the next, which is 10 millimeters.
- Each P10 module contains red, green, and blue LED chips.
- A control system sends signals to each LED module to display content.
- The LEDs can be actuated independently to create a variety of displays and patterns.

Uses of P10 modules

Advertising displays, Signage, Information boards, Traffic displays, LED billboards, Commercial media, Sports broadcasting, Real-time monitoring, and Events.

P10 module specifications 5-volt direct current voltage input, 3500 to 4500 nits of brightness, and Waterproof rating to IP65 regulations.

P10 module control

- You can control P10 modules using low cost microcontrollers like 8051, STM8 or Arduino.

CHAPTER 3

ARDUINO UNO

3.1 Microcontroller:

3.1.1 Introduction:

Microcontroller as the name suggest, a small controller. They are like single chip computers that are often embedded into other systems to function as processing/controlling unit. For example, the control you are using probably has microcontrollers inside that do decoding and other controlling functions. They are also used in automobiles, washing machines, microwaves ovens, toys….etc, where automation is needed.

3.1.2 Arduino Uno Microcontroller:

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means "One" in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5Vpin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts

The power pins are as follows:·

- **VIN.** The input voltage to the Arduino board when it's using an external power source (as opposed to5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.·
- **5V.** The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- **3.3V.**A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND.** Ground pins.

Memory:

The Atmega328 has 32 KB of flash memory for storing code (of which 0,5 KB is used for the bootloader); It has also 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

Input and Output:

Each of the 14 digital pins on the Uno can be used as an input or output, using pin Model(), digital Write(), and digital Read() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 k Ohms. In addition, some pins have specialized functions:

- **Serial: 0 (RX) and 1 (TX).** Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- **External Interrupts: 2 and 3.** These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attach Interrupt () function for details.
- **PWM: 3, 5, 6, 9, 10, and 11.** Provide 8-bit PWM output with the analog Write () function.

- **SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK).** These pins support SPI communication, which although provided by the underlying hardware, is not currently included in the Arduino language.
- **LED: 13.** There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

The Uno has 6 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference () function. Additionally, some pins have specialized

functionality:

- **I2C: 4 (SDA) and 5 (SCL).** Support I2C (TWI) communication using the Wire library. There are a couple of other pins on the board:
- **AREF.** Reference voltage for the analog inputs. Used with analog Reference ().
- **Reset.** Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

Communication:

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '8U2 firmware uses the standard USBCOM drivers, and no external driver is needed. However, on Windows, an *.inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also support I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

3.1.3 ARDUINO UNO BOARD:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

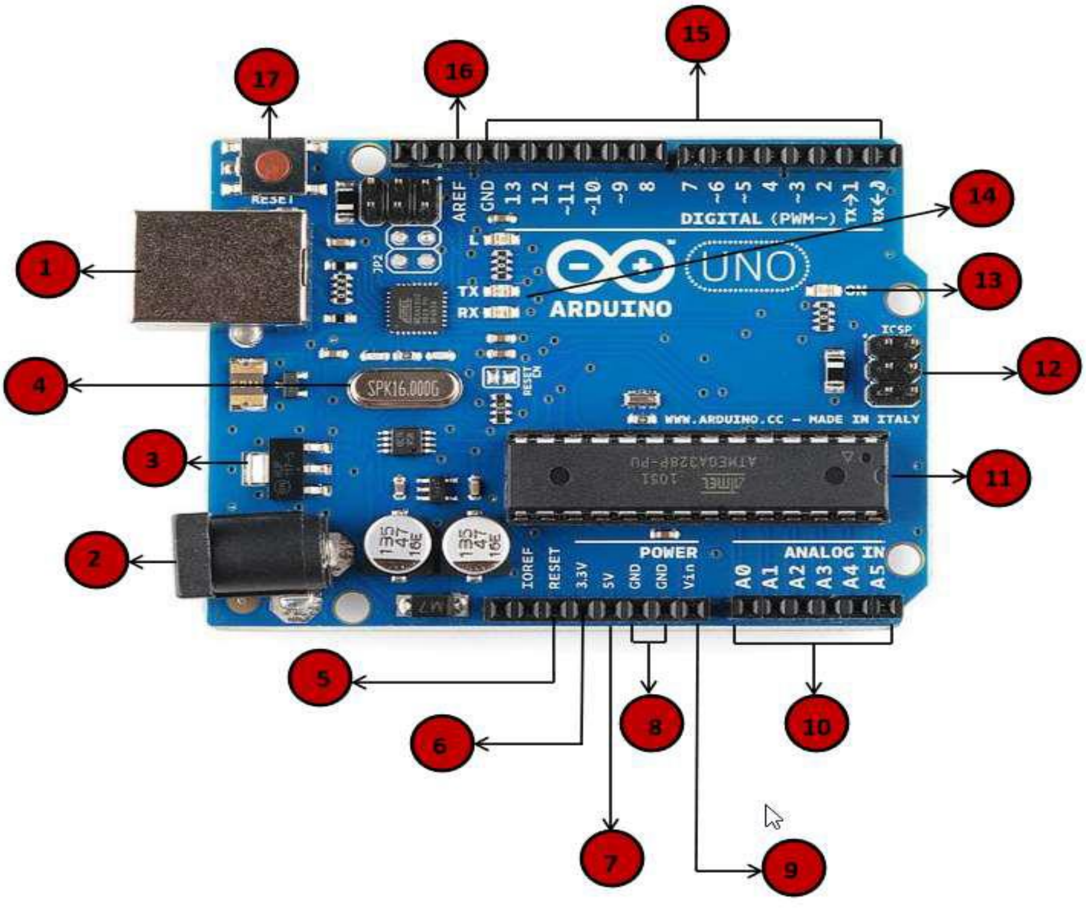


Figure 3.1: Arduino uno board

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converters.

3.1.4 Technical Specifications:

FEATURE	SPECIFICATION
Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

Table 3.1: Arduino uno specifications

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

1. **USB Interface:**Arduino board can be powered by using the USB cable from your computer. All you need to do is connect the USB cable to the USB connection
2. **External power supply:**Arduino boards can be powered directly from the AC mains power supply by connecting it to the power supply (Barrel Jack)
3. **Voltage Regulator:**The function of the voltage regulator is to control the voltage given to the Arduino board and stabilize the DC voltages used by the processor and other elements.
4. **Crystal Oscillator:**The crystal oscillator helps Arduino in dealing with time issues. How does Arduino calculate time? The answer is, by using the crystal oscillator. The number printed on top of the Arduino crystal is 16.000H9H. It tells us that the frequency is 16,000,000 Hertz or 16 MHz.

5-17.Arduino Reset: It can reset your Arduino board, i.e., start your program from the beginning. It can reset the UNO board in two ways. First, by using the reset button (17) on the board. Second, you can connect an external reset button to the Arduino pin labelled RESET (5).

6-9.Pins (3.3, 5, GND, Vin):

- 3.3V (6): Supply 3.3 output volt
- 5V (7): Supply 5 output volt
- Most of the components used with Arduino board works fine with 3.3 volt and 5 volt.
- GND (8)(Ground): There are several GND pins on the Arduino, any of which can be used to ground your circuit.
- Vin (9): This pin also can be used to power the Arduino board from an external power source, like AC mains power supply.

10.Analog pins:

The Arduino UNO board has five analog input pins A0 through A5. These pins can read the signal from an analog sensor like the humidity sensor or temperature sensor and convert it into a digital value that can be read by the microprocessor.

11.Main microcontroller:

Each Arduino board has its own microcontroller (11). You can assume it as the brain of your board. The main IC (integrated circuit) on the Arduino is slightly different from board to board. The microcontrollers are usually of the ATMEL Company. You must know what IC your board has before loading up a new program from the Arduino IDE. This information is available on the top of the IC. For more details about the IC construction and functions, you can refer to the data sheet.

The Atmega8U2 programmed as a USB-to-serial converter. "Uno" means "One" in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards

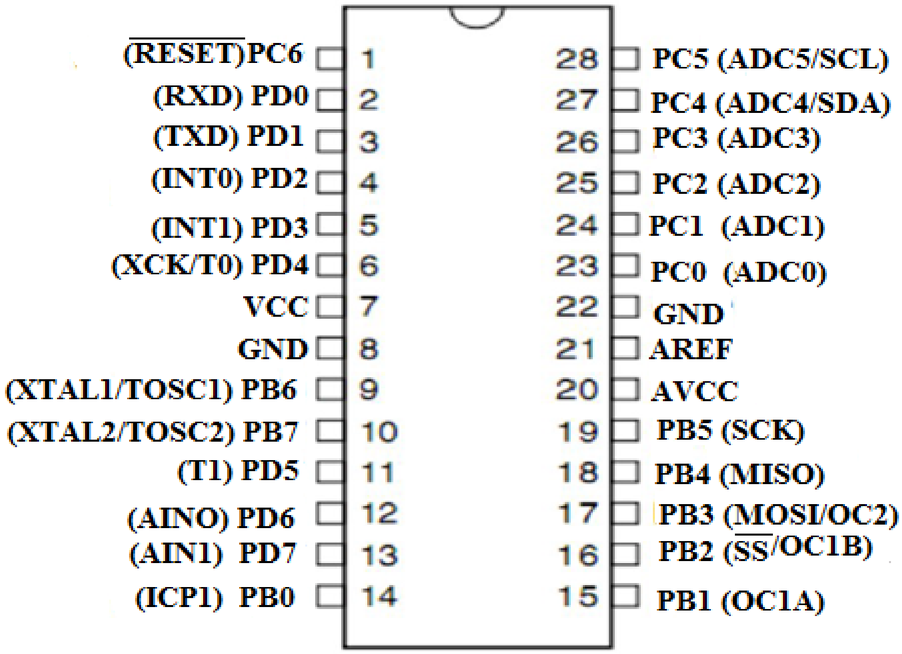


Figure 3.2: Pin diagram

3.1.3.2 Pin Description:

VCC: Digital supply voltage.

GND: Ground.

Port B (PB[7:0]) XTAL1/XTAL2/TOSC1/TOSC2:

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running.

Depending on the clock selection fuse settings, PB6 can be used as input to the inverting Oscillator amplifier and input to the internal clock operating circuit.

Depending on the clock selection fuse settings, PB7 can be used as output from the inverting Oscillator amplifier.

If the Internal Calibrated RC Oscillator is used as chip clock source, PB[7:6] is used as TOSC[2:1] input for the Asynchronous Timer/Counter2 if the AS2 bit in ASSR is set.

Port C (PC[5:0]): Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The PC[5:0] output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs,

Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

PC6/RESET: If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C.

If the RSTDISBL Fuse is unprogrammed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running. Shorter pulses are not guaranteed to generate a Reset.

Port D (PD[7:0]):

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running.

AVCC: AVCC is the supply voltage pin for the A/D Converter, PC[3:0], and PE[3:2]. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC[6:4] use digital supply voltage, VCC.

AREF: AREF is the analog reference pin for the A/D Converter.

ADC [7:6] (TQFP and VFQFN Package Only): In the TQFP and VFQFN package, ADC[7:6] serve as analog inputs to the A/D converter. These pins are powered from the analog supply and serve as 10-bit ADC channels.

12. ICSP pin: Mostly, ICSP (12) is an AVR, a tiny programming header for the Arduino consisting of MOSI, MISO, SCK, RESET, VCC, and GND. It is often referred to as an SPI (Serial Peripheral Interface), which could be considered as an "expansion" of the output. Actually, you are slaving the output device to the master of the SPI bus.

13. Power LED indicator: This LED should light up when you plug your Arduino into a power source to indicate that your board is powered up correctly. If this light does not turn on, then there is something wrong with the connection.

14. TX and RX LEDs: On your board, you will find two labels: TX (transmit) and RX (receive). They appear in two places on the Arduino UNO board. First, at the digital pins 0 and 1, to indicate the pins responsible for serial communication. Second, the TX and RX led (13). The TX led flashes with different speed while sending the serial data. The speed of flashing depends on the baud rate used by the board. RX flashes during the receiving process.

15. Digital I / O: The Arduino UNO board has 14 digital I/O pins (15) (of which 6 provide PWM (Pulse Width Modulation) output. These pins can be configured to work as input digital pins to read logic values (0 or 1) or as digital output pins to drive different modules like LEDs, relays, etc. The pins labeled “~” can be used to generate PWM.

16. AREF:AREF stands for Analog Reference. It is sometimes, used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pins working.

CHAPTER 4

HARDWARE COMPONENTS

4.1.POWER SUPPLY:

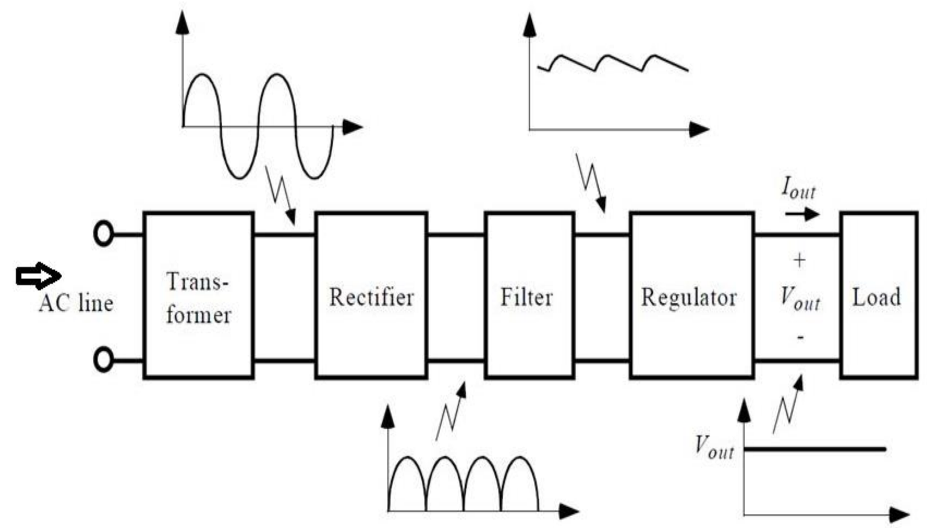


Figure.4.1.power supply

4.1.1. Transformer:

Transformer is a static device used to convert the voltage from one level to another level without change its frequency. There are two types of transformers

1. Step-up transformer
2. Step-down transformer

Step-up transformer converts low voltage level into high voltage level without change its frequency.

Step-down transformer converts high voltage level into low voltage level without change its frequency.

In this project we using step-down transformer which converts 230V AC to 12V AC [or] 230V AC to 5V as shown below.

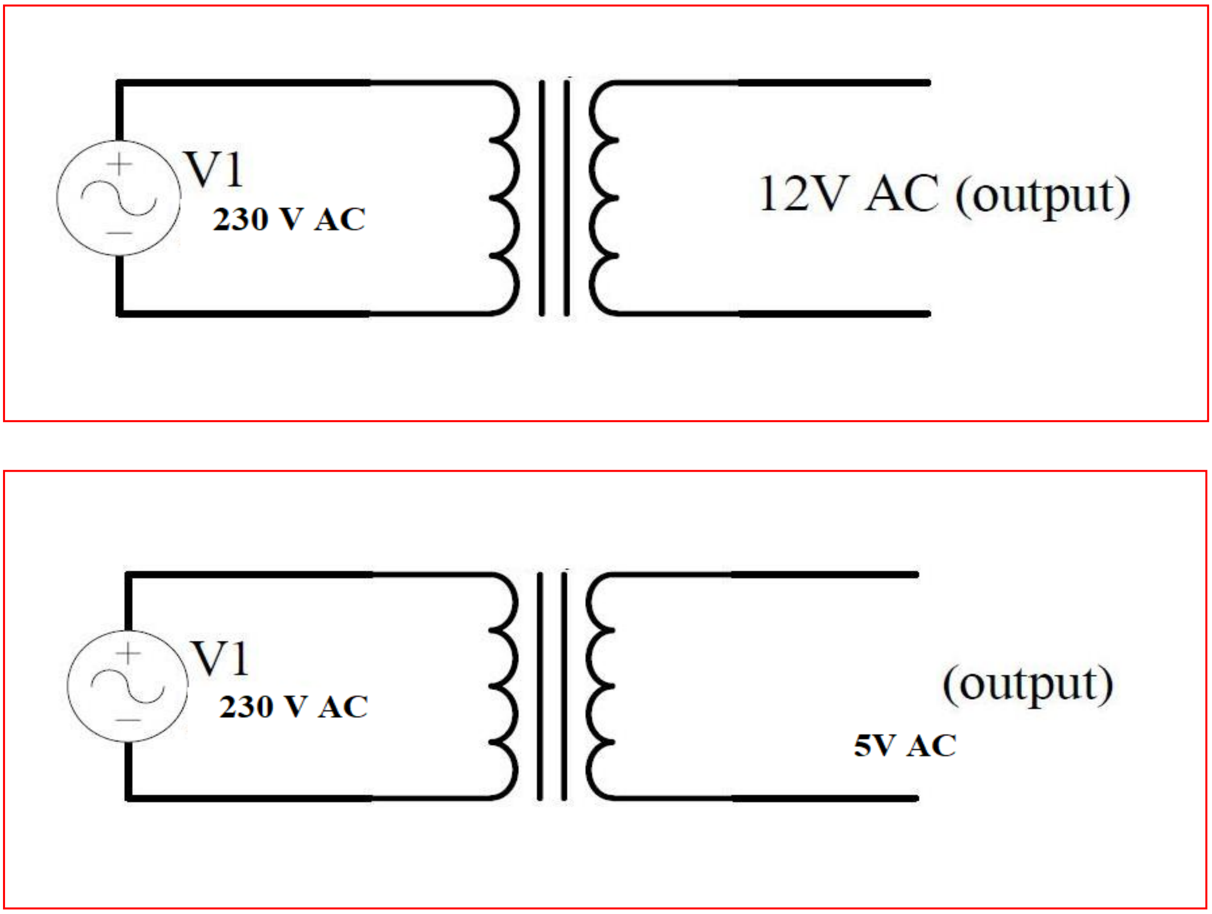


Figure.4.2.Transformers

4.1.2.Diodes:

Diodes allow electricity to flow in only one direction. The arrow of the circuit symbol shows the direction in which the current can flow. Diodes are the electrical version of a valve and early diodes were actually called valves.

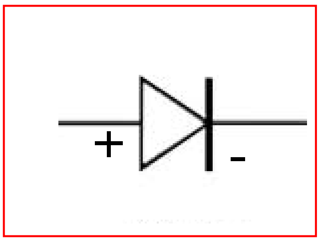


Figure.4.3. Diode Symbol

A **diode** is a device which only allows current to flow through it in one direction. In this direction, the diode is said to be 'forward-biased' and the only effect on the signal is that there will be a voltage loss of around 0.7V. In the opposite direction, the diode is said to be 'reverse-biased' and no current will flow through it.

4.1.3.Rectifier

The purpose of a rectifier is to convert an AC waveform into a DC waveform (OR) Rectifier converts AC current or voltages into DC current or voltage. There are two different rectification circuits, known as **'half-wave'** and **'full-wave' rectifiers**. Both use components called **diodes** to convert **AC into DC**.

The Half-wave Rectifier

The half-wave rectifier is the simplest type of rectifier since it only uses one diode, as shown in figure.

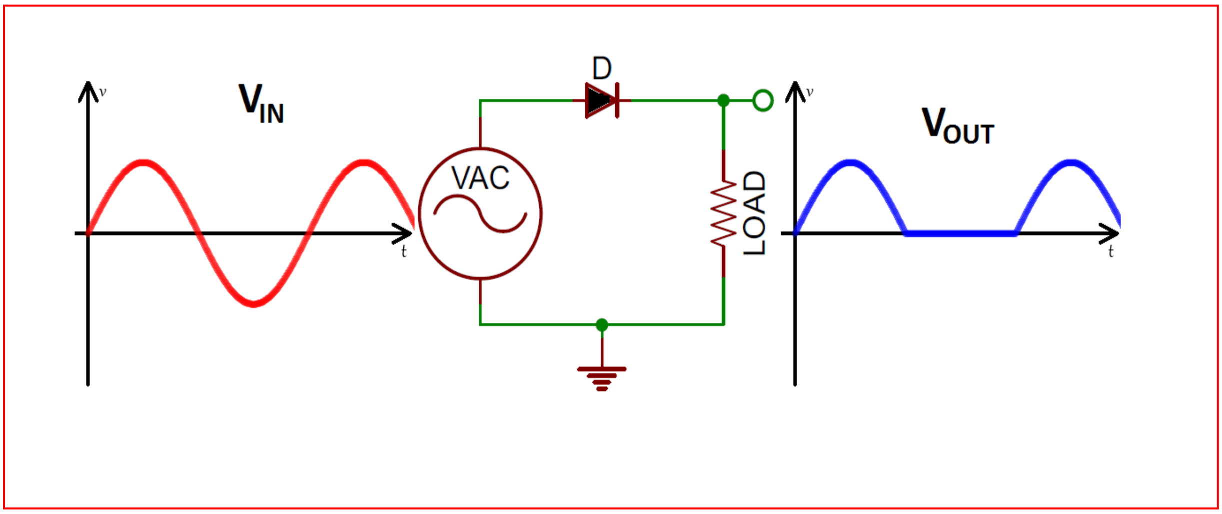
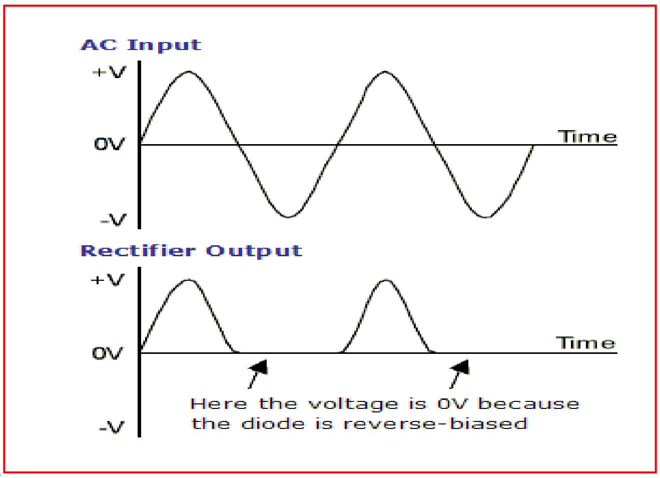


Figure.4.4Half Wave Rectifier

Figure 2 shows the AC input waveform to this circuit and the resulting output. As you can see, when the AC input is positive, the diode is forward-biased and lets the current through. When the AC input is negative, the diode is reverse-biased and the diode does not let any current through, meaning the output is 0V. Because there is a 0.7V voltage loss across the diode, the peak output voltage will be 0.7V less than Vs.



Fi

Figure.4.5Half-Wave Rectification

While the output of the half-wave rectifier is DC (it is all positive), it would not be suitable as a power supply for a circuit. Firstly, the output voltage continually varies between 0V and Vs-0.7V, and secondly, for half the time there is no output at all.

The Full-wave Bridge Rectifier

The circuit in figure 3 addresses the second of these problems since at no time is the output voltage 0V. This time four diodes are arranged so that both the positive and negative parts of the AC waveform are converted to DC. The resulting waveform is shown in figure 4.

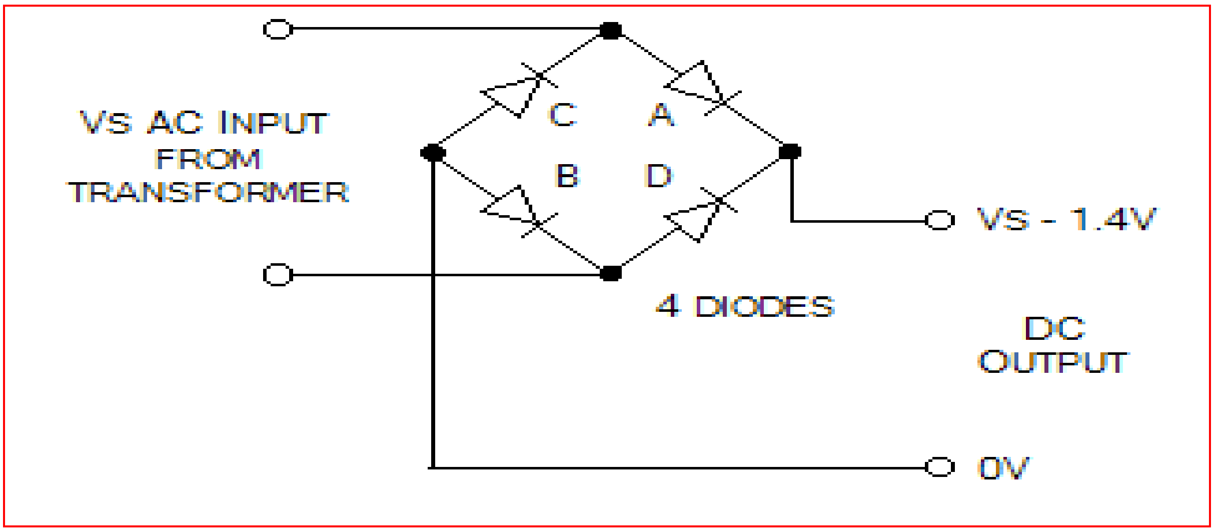


Figure.4.6. Full-Wave Rectifier

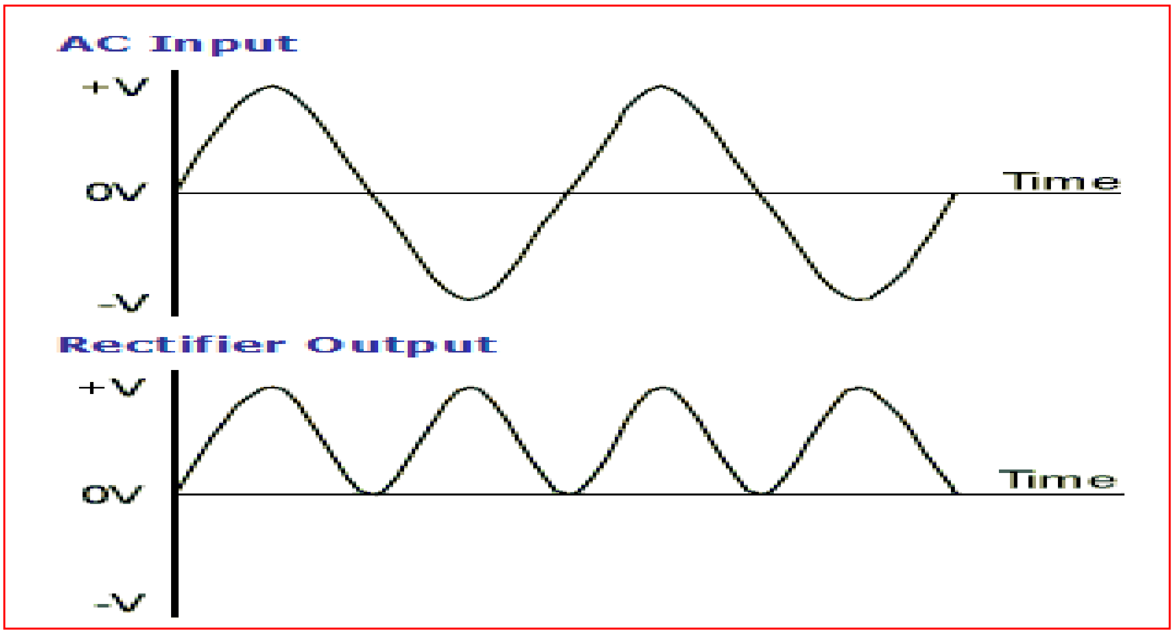


Figure.4.7. Full-Wave Rectification

When the AC input is positive, diodes A and B are forward-biased, while diodes C and D are reverse-biased. When the AC input is negative, the opposite is true - diodes C and D are forward-biased, while diodes A and B are reverse-biased.

While the full-wave rectifier is an improvement on the half-wave rectifier, its output still isn't suitable as a power supply for most circuits since the output voltage still varies between 0V and Vs-1.4V. So, if you put 12V AC in, you will 10.6V DC out.

4.1.4.Capacitor Filter

The **capacitor-input filter**, also called "Pi" filter due to its shape that looks like the Greek letterpi, is a type of electronic filter. Filter circuits are used to remove unwanted or undesired frequencies from a signal.

A typical capacitor input filter consists of a filter capacitor C1, connected across the rectifier output. The capacitor C1 offers low reactance to the AC component of the rectifier output while it offers infinite reactance to the DC component. As a result the AC components are going to ground. At that time DC components are feed to Regulator.

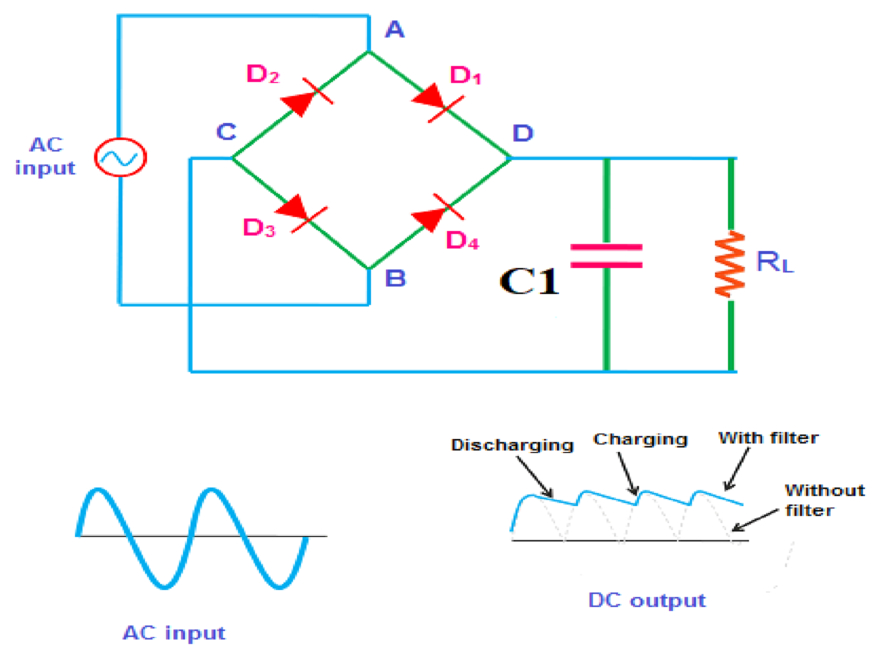


Figure.4.8.Centered Tapped Full-Wave Rectifier with a Capacitor Filter

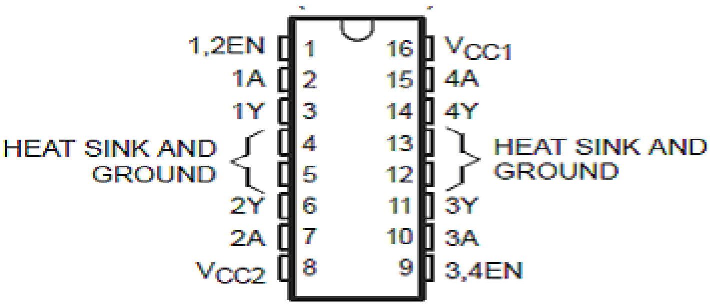
4.1.5. Voltage Regulator:

A **voltage regulator** is an electrical regulator designed to automatically maintain a constant voltage level. It may use an electromechanical mechanism, or passive or active electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages. There are two types of regulator are they.

- Positive Voltage Series (78xx) and
- Negative Voltage Series (79xx)

78xx:'78' indicate the positive series and 'xx' indicates the voltage rating. Suppose 7805 produces the maximum 5V.'05'indicates the regulator output is 5V.

L293D- Current Driver



Pin diagram

Features

- Wide Supply-Voltage Range: 4.5 V to 36 V
- Separate Input-Logic Supply
- Internal ESD Protection
- Thermal Shutdown
- High-Noise-Immunity Inputs
- Functionally Similar to SGS L293 and SGS L293D
- Output Current 1 A Per Channel (600 mA for L293D)
- Peak Output Current 2 A Per Channel (1.2 A for L293D)
- Output Clamp Diodes for Inductive Transient Suppression (L293D)

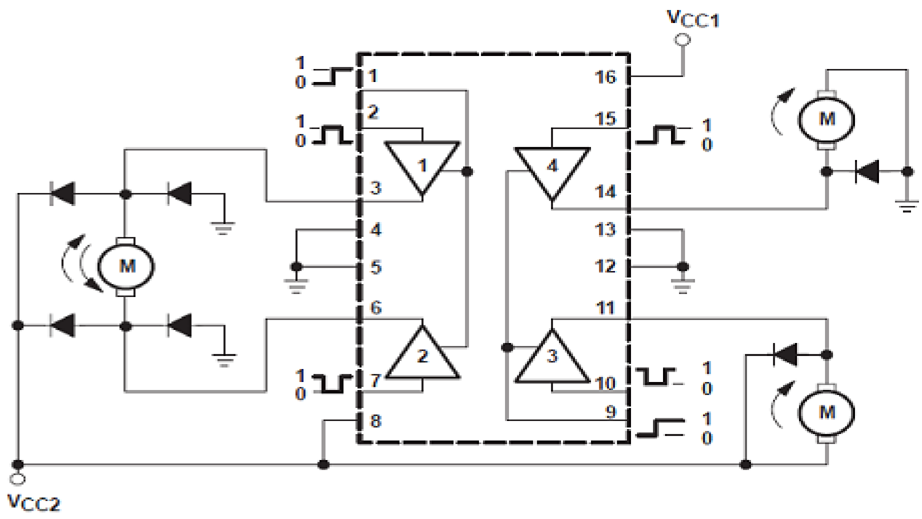
Description

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo- Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications. On the L293, external high-speed output clamp diodes should be used for inductive transient suppression.

A VCC1 terminal, separate from VCC2, is provided for the logic inputs to minimize device power dissipation. The L293 and L293D are characterized for operation from 0 to 70 degree Celsius.

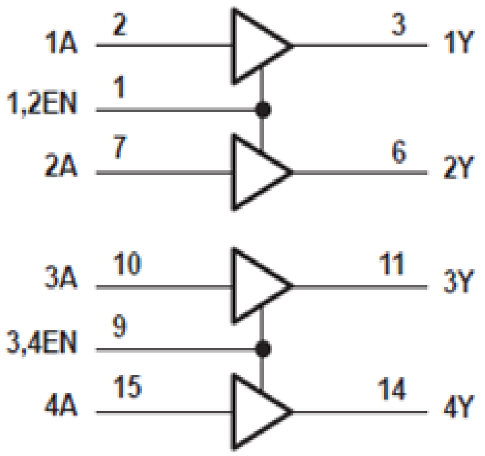
Block Diagram



FUNCTION TABLE
(each driver)

INPUTS†		OUTPUT
A	EN	Y
H	H	H
L	H	L
X	L	Z

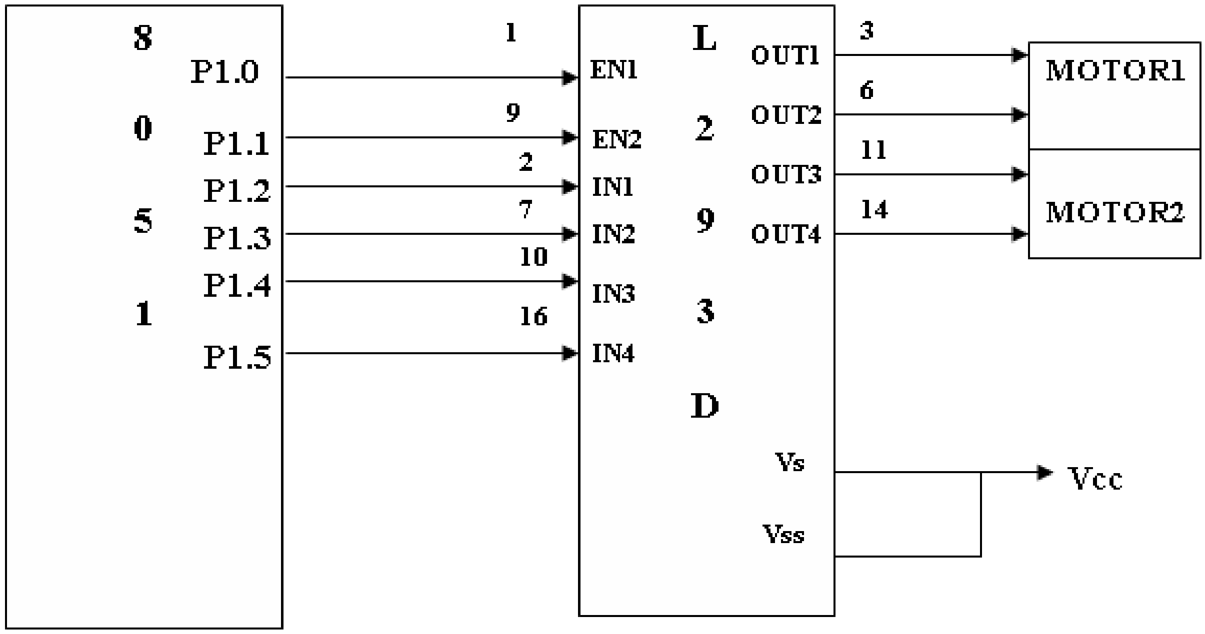
H = high level, L = low level, X = irrelevant,
Z = high impedance (off)
† In the thermal shutdown mode, the output is in the high-impedance state, regardless of the input levels.



Logic Diagram

This chip contains 4 enable pins. Each enable pin corresponds to 2 inputs. Based on the input values given, the device connected to this IC works accordingly.

L293D Interfacing with 8051:



Controlling the Robot to obtain the different directions of movement

	Left Wheel	Right Wheel	Movement
1	Forward	Forward	Forward
2	Backward	Backward	Backward
3	Forward	Stop	Right Turn
4	Stop	Forward	Left Turn
5	Forward	Backward	Sharp Right Turn
6	Backward	Forward	Sharp Left Turn

The DC motor description is carried out in the next section. The L293D output pins will be connected to the two motors of Robot. Thus, the output of L293D depends on the input provided from the microcontroller and the enable pins. It should be remembered that unless the enable pins are not high, whatever input values given to L293D IC will not be applied to the motors in any way.

DC Motors: Electric motors are used to efficiently convert electrical energy into mechanical energy. Magnetism is the basis of their principles of operation. They use permanent magnets, electromagnets, and exploit the magnetic properties of materials in order to create these amazing machines.

There are several types of electric motors available today. The following outline gives an overview of several popular ones. There are two main classes of motors: AC and DC. AC motors require an alternating current or voltage source (like the power coming out of the wall outlets in your house) to make them work. DC motors require a direct current or voltage source (like the voltage coming out of batteries) to make them work. Universal motors can work on either type of power. Not only is the construction of the motors different, but the means used to control the speed and torque created by each of these motors also varies, although the principles of power conversion are common to both.

Motors are used just about everywhere. In our house, there is a motor in the furnace for the blower, for the intake air, in the sump well, dehumidifier, in the kitchen in the exhaust hood above the stove, microwave fan, refrigerator compressor and cooling fan, can opener, garbage disposer, dish washer pump, clocks, computer fans, ceiling fans, and many more items.

In industry, motors are used to move, lift, rotate, accelerate, brake, lower and spin material in order to coat, paint, punch, plate, make or form steel, film, paper, tissue, aluminum, plastic and other raw materials.

They range in power ratings from less than 1/100 hp to over 100,000 hp. The rotate as slowly as 0.001 rpm to over 100,000 rpm. They range in physical size from as small as the head of a pin to the size of a locomotive engine.

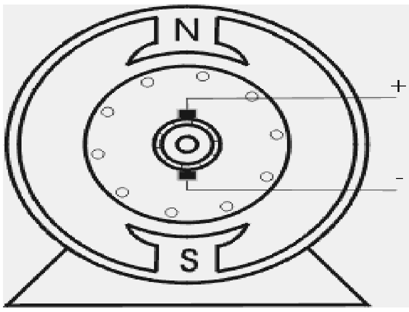
What happens when a wire carrying current is within a magnetic field?

This is the **Left Hand Rule** for motors. The **first finger** points in the direction of the **magnetic field** (first - field), which goes from the North pole to the South pole.

The **second finger** points in the direction of the **current** in the wire (second - current). The **thumb** then points in the direction the wire is **thrust** or pushed while in the magnetic field (thumb - torque or thrust).So, when a wire carrying current is perpendicular to a magnetic field, a force is created on the wire causing it to move perpendicular to the field and direction of current.

The greater the current in the wire, or the greater the magnetic field, the faster the wire moves because of the greater force created. If the current in the wire is parallel to the magnetic field, there will be no force on the wire.

DC Motors

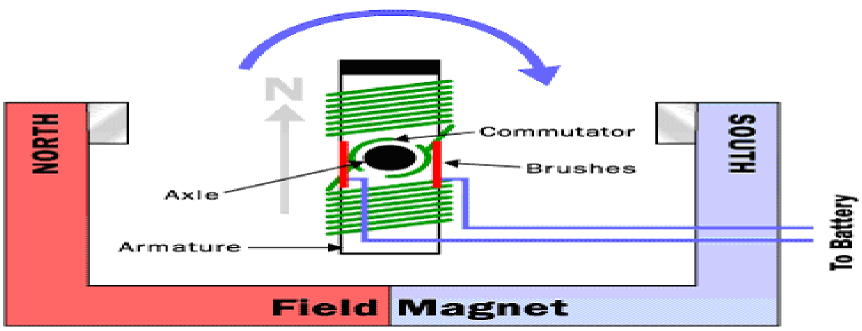


DC motors are fairly simple to understand. They are also simple to make and only require a battery or dc supply to make them run.

A simple motor has six parts, as shown in the diagram below:

- **Armature or rotor**
- **Commutator**
- **Brushes**
- **Axle**
- **Field magnet**
- **DC power supply** of some sort

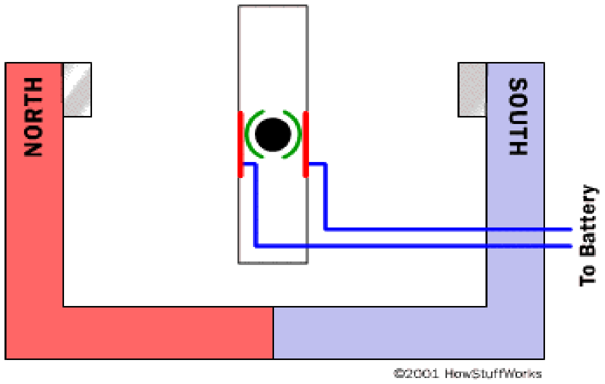
An electric motor is all about magnets and magnetism: A motor uses **magnets** to create motion. If you have ever played with magnets you know about the fundamental law of all magnets: Opposites attract and likes repel. So if you have two bar magnets with their ends marked "north" and "south," then the north end of one magnet will attract the south end of the other. On the other hand, the north end of one magnet will repel the north end of the other (and similarly, south will repel south). Inside an electric motor, these attracting and repelling forces create **rotational motion**.



z

The armature (or rotor) is an electromagnet, while the field magnet is a permanent magnet (the field magnet could be an electromagnet as well, but in most small motors it is not in order to save power).

When you put all of these parts together, here is a complete electric motor:



In the above figure, the armature winding has been left out so that it is easier to see the commutator in action. The key thing to notice is that as the armature passes through the horizontal position, the poles of the electromagnet flip. Because of the flip, the north pole of the electromagnet is always above the axle so it can repel the field magnet's north pole and attract the field magnet's south pole.

Even a small electric motor contains the same pieces described above: two small permanent magnets, a commutator, two brushes, and an electromagnet made by winding wire around a piece of metal. Almost always, however, the rotor will have **three poles** rather than the two poles as shown in this article. There are two good reasons for a motor to have three poles:

- It causes the motor to have better dynamics. In a two-pole motor, if the electromagnet is at the balance point, perfectly horizontal between the two poles of the field magnet when the motor starts, one can imagine the armature getting "stuck" there. This never happens in a three-pole motor.
- Each time the commutator hits the point where it flips the field in a two-pole motor, the commutator shorts out the battery (directly connects the positive and negative terminals) for a moment. These shorting wastes energy and drains the battery needlessly. A three-pole motor solves this problem as well.

It is possible to have any number of poles, depending on the size of the motor and the specific application it is being used in.

Types of Motors

Split Phase

The split phase motor is mostly used for "medium starting" applications. It has start and run windings, both are energized when the motor is started. When the motor reaches about 75% of its rated full load speed, the starting winding is disconnected by an automatic switch.

Uses: This motor is used where stops and starts are somewhat frequent. Common applications of split phase motors include: fans, blowers, office machines and tools such as small saws or drill presses where the load is applied after the motor has obtained its operating speed.

Capacitor Start

This motor has a capacitor in series with a starting winding and provides more than double the starting torque with one third less starting current than the split phase motor. Because of this improved starting ability, the capacitor start motor is used for loads which are hard to start. It has good efficiency and requires starting currents of approximately five times full load current. The capacitor and starting windings are disconnected from the circuit by an automatic switch when the motor reaches about 75% of its rated full load speed.

Uses: Common uses include: compressors, pumps, machine tools, air conditioners, conveyors, blowers, fans and other hard to start applications.

Horsepower & RPM

Horsepower

Electric motors are rated by horsepower, the home shop will probably utilize motors from 1/4 HP for small tools and up to 5 HP on air compressors. Not all motors are rated the same, some are rated under load, others as peak horsepower and hence we have 5 HP compressors with huge motors and 5 Hp shopvacs with tiny little motors. Unfortunately, all 5 HP compressor motors are not equal in actual power either; to judge the true horsepower the easiest way is to look at the amperage of the motor. Electric motors are not efficient, most have a rating of about 50% due to factors such as heat and friction and some may be as high as 70%.

This chart will give a basic idea of the true horse power rating compared to the ampere rating. Motors with a higher efficiency rating will draw fewer amps, for example a 5 HP motor with a 50% efficiency rating will draw about 32 amps at 230 VACS compared to about 23 amps for a motor with a 70% rating.

TRUE HP	AMPS at 115VAC	AMPS at 230 VAC
¼	3.2-2.3	1.6-1.2
1/3	4.3-3.1	2.2-1.5
½	6.5-4.6	3.2-2.3
¾	9.7-7.0	4.9-3.5
1	13.0-9.3	6.5-4.6
1 ½	19.5-13.9	9.7-7.0
2	25.9-18.5	13.0-9.3
5	64.9-46.3	32.4-23.2

A quick general calculation when looking at a motor is 1 HP = 10 amps on 110 volts and 1 HP = 5 amps on 220 volts.

RPM

The shaft on a typical shop motor will rotate at either 1725 or 3450 RPM (revolutions per minute). The speed of the driven machine will be determined by the size of pulleys used, for example a 3450 RPM motor can be replaced by a 1750 RPM motor if the diameter of the pulley on the motor is doubled. The opposite is true as well but if the pulley on the 1750 RPM motor is small it is not always possible to replace it with one half the size. It may be possible to double the pulley size on the driven machine if it uses a standard type of pulley, (not easily done on air compressors for example).

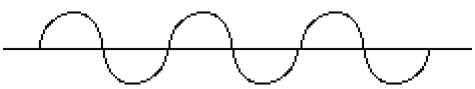
Electronic speed reducers such as the ones sold for routers will not work on induction type motors.

Phase, Voltage & Rotation

Whether or not you can use a motor will likely depend on these factors.

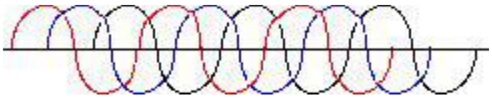
Single Phase

Ordinary household wiring is single phase, alternating current. Each cycle peaks and dips as shown. To run a three-phase motor a phase converter must be used, usually this is not practical, it is often less expensive to change the motor on a machine to a single-phase style.



Three Phase

This is used in industrial shops, rather than peaks and valleys the current supply is more even because of the other two cycles each offset by 120 degrees.



Voltage

Many motors are dual voltage i.e., by simply changing the wiring configuration, they can be run on 110 volts or 220 volts. Motors usually run better on 220 volts, especially if there is any line loss because of having to use a long wire to reach the power supply.

Motors are available for both AC and DC current, our typical home wiring will be AC. There are DC converters available which are used in applications where the speed of the motor is controlled.

Rotation

The direction the shaft rotates can be changed on most motors by switching the right wires. The direction of rotation is usually determined by viewing the motor from the shaft end and is designated as CW (clockwise) or CCW (counter-clockwise).

Inside the Wipers

The wipers combine two mechanical technologies to perform their task

1. A combination electric motor and worm gear reduction provides power to the wipers.
2. A neat linkage converts the rotational output of the motor into the back-and-forth motion of the wipers.

On any gear, the ratio is determined by the distances from the center of the gear to the point of contact. For instance, in a device with two gears, if one gear is twice the diameter of the other, the ratio would be 2:1.

One of the most primitive types of gears we could look at would be a wheel with wooden pegs sticking out of it.

The problem with this type of gear is that the distance from the center of each gear to the point of contact changes as the gears rotate. This means that the gear ratio changes as the gear turns, meaning that the output speed also changes. If you used a gear like this in your car, it would be impossible to maintain a constant speed you would be accelerating and decelerating constantly.

Worm gears

These are used when large gear reductions are needed. It is common for worm gears to have reductions of 20:1, and even up to 300:1 or greater.

Many worm gears have an interesting property that no other gear set has: the worm can easily turn the gear, but the gear cannot turn the worm. This is because the angle on the worm is so shallow that when the gear tries to spin it, the friction between the gear and the worm holds the worm in place. The worm gear is shown in the below figure.

Fig: Worm gear

Motor and Gear Reduction

It takes a lot of force to accelerate the wiper blades back and forth across the windshield so quickly. In order to generate this type of force, a worm gear is used on the output of a small electric motor.

The worm gear reduction can multiply the torque of the motor by about 50 times, while slowing the output speed of the electric motor by 50 times as well. The output of the gear reduction operates a linkage that moves the wipers back and forth.

Inside the motor/gear assembly is an electronic circuit that senses when the wipers are in their down position. The circuit maintains power to the wipers until they are parked at the bottom of the windshield, and then cuts the power to the motor. This circuit also parks the wipers between wipes when they are on their intermittent setting.

Linkage

A short cam is attached to the output shaft of the gear reduction. This cam spins around as the wiper motor turns. The cam is connected to a long rod; as the cam spins, it moves the rod back and forth. The long rod is connected to a short rod that actuates the wiper blade on the driver's side. Another long rod transmits the force from the driver-side to the passenger-side wiper blade.

Operational Specifications of Motors are shown in below Table.

S.No	Feature	wiper motor
1	Voltage	12V
2	Torque	36Nm
3	Current	4A
4	Power	17HP
5	Speed	80RPM
6	Angle of wipe	100 deg

Description of the wiper motors selected

The motor is two pole design having high energy permanent magnets, together with a gear box housing, having two stages of gear reduction. power from the motor is a transferred by a three-start worm on a extension of the armature shaft through a two stage gear system.

A ball bearing system is provided on the commutate end of the armature to minimize the friction losses and thereby increase torque of the wiper motor. Power from the final gear arm spindles. A special inbuilt limit switch ensures in applying regenerative braking to the OFF position.

Thermal protector is connected in series with armature to avoid burning of armature under locked position. Consistent parking of the wiper arms and blades in the correct position is there by ensured. The side on which the arms come to rest is preset to requirements.

Electrical connections are made to the motor via a non-reversible in line plug and socket assembly. This type of connections ensures that the correct motor polarity is maintained when the motor is connected to the vehicle wiring. The wiper motor incorporates radio interference capacitor.

BLUETOOTH:

Fig: Bluetooth Dongle

This module enables you to wireless transmit & receive serial data. It is a drop in replacement for wired serial connections allowing transparent two way data communication. You can simply use it for serial port replacement to establish connection between MCU or embedded project and PC for data transfer. Bluetooth Core V2.0 compliant module with SPP. The module is designed to be embedded in a host system which requires cable replacement function. Typically the module could interface with a host through the UART port.

The module could be used in many different applications Example:

• Hand held terminals

• Industrial devices

•Point-of-Sale systems

• PCs

• Personal Digital Assistants (PDAs)

• Computer Accessories

• Access Points

• Automotive Diagnostics Units

We supply module with 9600 baud rate in ready to use with PC. You will need a USB Bluetooth Adapter at PC side or Bluetooth Enabled Laptop to connect to our Bluetooth module. Module supplied by us with this setting: 9600 baud rate, Pair Code: 0000 The Bluetooth module works on 3.3V level only. High voltage like 5V will permanently damage the module, so please take care in using it.

If your application requires to be operated at 5V then use a LM1117-3.3 regulator to convert the 5V level to 3V3 level as required by module. Also protect the RXD pin against 5V TXD signal by inserting 1K resistor in series to module RXD pin.

If you wish to connect this module to PC's Serial port which is at RS232 level, then you need to add MAX232 circuit as shown above. Status LED flashes at different rates to indicate

This module could both act a SPP master and a SPP slave. When in master mode, the module could search for all the working SPP slave devices around and the host could select which to connect. When it is in slave mode, it will listen for connection request from another SPP master device. Bluetooth UART provides the main interface to exchange data with other host system using the RS232 protocol. An external commands set is provided for the host system to control and configure AUBTM-20. Four signals are provide for UART function. TXD and RXD transmit data between AUBTM-20 and the host. NRTS and NCTS provides the RS232 hardware flow control mechanism. All UART pins are CMOS logic with signal levels of 0V to VDD. UART is initially configured to work at 9600 bps baud rate, 8-bit, no parity and 1 stop bit. The host could reconfigure the UART by issuing command.

CHAPTER 5

SOFTWARES

5.1 Introduction to Arduino IDE

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

The key features are:

- Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
- You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).
- Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a USB cable.
- Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.
- Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.

After learning about the main parts of the Arduino UNO board, we are ready to learn how to set up the Arduino IDE. Once we learn this, we will be ready to upload our program on the Arduino board.

5.1.1 Arduino data types:

Data types in C refers to an extensive system used for declaring variables or functions of different types. The type of a variable determines how much space it occupies in the storage and how the bit pattern stored is interpreted.

The following table provides all the data types that you will use during Arduino programming.

Void:

The void keyword is used only in function declarations. It indicates that the function is expected to return no information to the function from which it was called.

Example:

```
Void Loop ()

{

// rest of the code

}
```

Boolean:

A Boolean holds one of two values, true or false. Each Boolean variable occupies one byte of memory.

Example:

Boolean state= false; // declaration of variable with type boolean and initialize it with false.

Boolean state = true; // declaration of variable with type boolean and initialize it with false.

Char:A data type that takes up one byte of memory that stores a character value. Character literals are written in single quotes like this: 'A' and for multiple characters, strings use double quotes: "ABC".

However, characters are stored as numbers. You can see the specific encoding in the ASCII chart. This means that it is possible to do arithmetic operations on characters, in whichthe ASCII value of the character is used. For example, 'A' + 1 has the value 66, since theASCII value of the capital letter A is 65.

Example:

Char chr_a = ‘a’ ;//declaration of variable with type char and initialize it with character a.

Char chr_c = 97 ;//declaration of variable with type char and initialize it with character 97.

Unsigned char:

Unsigned char is an unsigned data type that occupies one byte of memory. The unsigned char data type encodes numbers from 0 to 255.

Example: Unsigned Char chr = 121 ; // declaration of variable with type Unsigned char and initialize it with character y

Byte:

A byte stores an 8-bit unsigned number, from 0 to 255.

Example:byte m = 25 ;//declaration of variable with type byte and initialize it with 25

int:

Integers are the primary data-type for number storage. **int** stores a 16-bit (2-byte) value. This yields a range of -32,768 to 32,767 (minimum value of -2^15 and a maximum value of (2^15) - 1).

The **int** size varies from board to board. On the Arduino Due, for example, an **int** stores a 32-bit (4-byte) value. This yields a range of -2,147,483,648 to 2,147,483,647 (minimum value of -2^31 and a maximum value of (2^31) - 1).

Example: int counter = 32 ;// declaration of variable with type int and initialize it with 32.

Unsigned int:

Unsigned ints (unsigned integers) are the same as int in the way that they store a 2 byte value. Instead of storing negative numbers, however, they only store positive values, yielding a useful range of 0 to 65,535 (2^16) - 1). The Due stores a 4byte (32-bit) value, ranging from 0 to 4,294,967,295 (2^32 - 1).

Example: Unsigned int counter= 60 ; // declaration of variable with type unsigned int and initialize it with 60.

Word:

On the Uno and other ATMEGA based boards, a word stores a 16-bit unsigned number. On the Due and Zero, it stores a 32-bit unsigned number.

Example word w = 1000 ;//declaration of variable with type word and initialize it with 1000.

Long:

Long variables are extended size variables for number storage, and store 32 bits (4 bytes), from 2,147,483,648 to 2,147,483,647.

Example: Long velocity= 102346 ;//declaration of variable with type Long and initialize it with 102346

Unsigned long: Unsigned long variables are extended size variables for number storage and store 32 bits (4 bytes). Unlike standard longs, unsigned longs will not store negative numbers, making their range from 0 to 4,294,967,295 (2^32 - 1).

Example: Unsigned Long velocity = 101006 ;// declaration of variable with type Unsigned Long and initialize it with 101006.

Short:

A short is a 16-bit data-type. On all Arduinos (ATMega and ARM based), a short stores a 16-bit (2-byte) value. This yields a range of -32,768 to 32,767 (minimum value of -2^15 and a maximum value of (2^15) - 1).

Example: short val= 13 ;//declaration of variable with type short and initialize it with 13

Float: Data type for floating-point number is a number that has a decimal point. Floating-point numbers are often used to approximate the analog and continuous values because they have greater resolution than integers.

Floating-point numbers can be as large as 3.4028235E+38 and as low as 3.4028235E+38. They are stored as 32 bits (4 bytes) of information.

Example: float num = 1.352;//declaration of variable with type float and initialize it with 1.352.

Double: On the Uno and other ATMEGA based boards, Double precision floating-point number occupies four bytes. That is, the double implementation is exactly the same as the float, with no gain in precision. On the Arduino Due, doubles have 8-byte (64 bit) precision.

Example: double num = 45.352 ;// declaration of variable with type double and initialize it with 45.352.

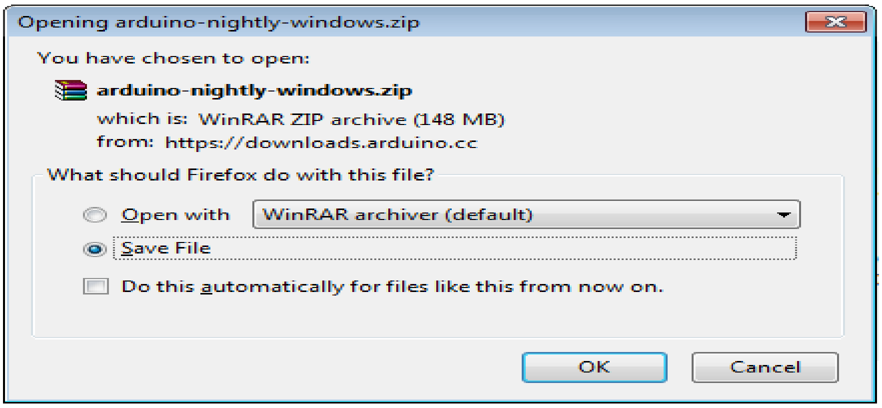
In this section, we will learn in easy steps, how to set up the Arduino IDE on our computerand prepare the board to receive the program via USB cable.

Step 1: First you must have your Arduino board (you can choose your favorite board) anda USB cable. In case you use Arduino UNO, Arduino Duemilanove, Nano, Arduino Mega2560, or Diecimila, you will need a standard USB cable (A plug to B plug), the kind youwould connect to a USB printer as shown in the following image.

Figure 5.1: USB Cable

Step 2: Download Arduino IDE Software.

You can get different versions of Arduino IDE from the Download page on the Arduino Official website. You must select your software, which is compatible with your operating system (Windows, IOS, or Linux). After your file download is complete, unzip the file.

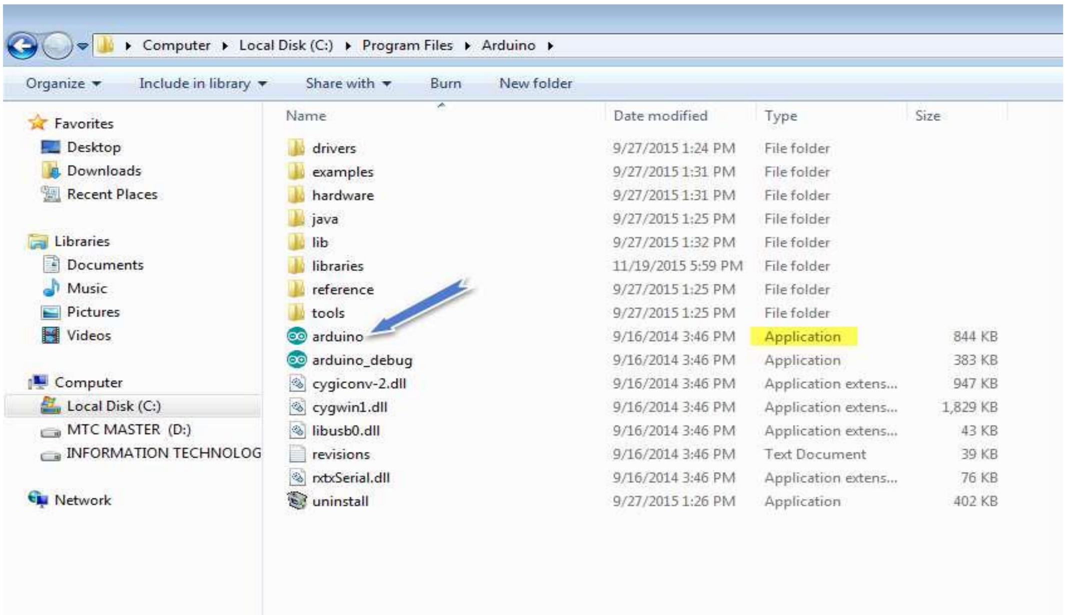


Step 3: Power up your board.

The Arduino Uno, Mega, Duemilanove and Arduino Nano automatically draw power from either, the USB connection to the computer or an external power supply. If you are using an Arduino Diecimila, you have to make sure that the board is configured to draw power from the USB connection. The power source is selected with a jumper, a small piece of plastic that fits onto two of the three pins between the USB and power jacks. Check that it is on the two pins closest to the USB port. Connect the Arduino board to your computer using the USB cable. The green power LED (labeled PWR) should glow.

Step 4: Launch Arduino IDE.

After your Arduino IDE software is downloaded, you need to unzip the folder. Inside the folder, you can find the application icon with an infinity label (application.exe). Doubleclick the icon to start the IDE.

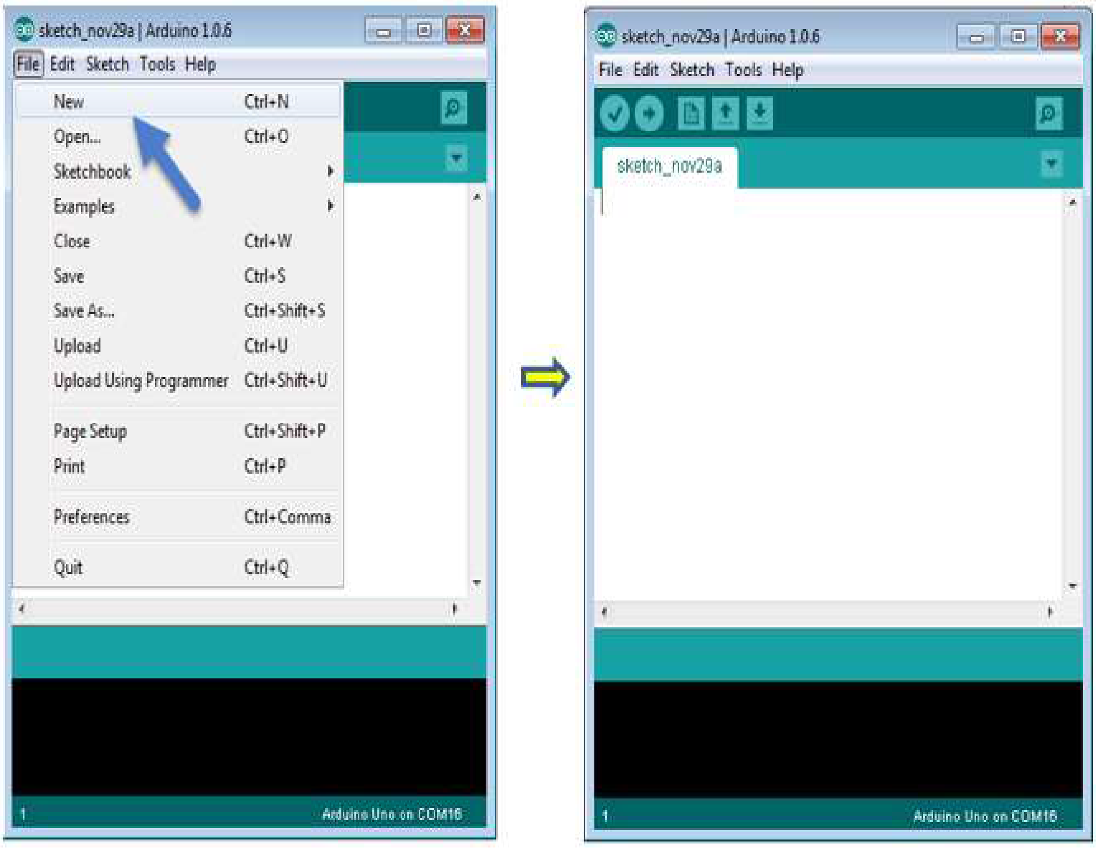


Step 5: Open your first project.

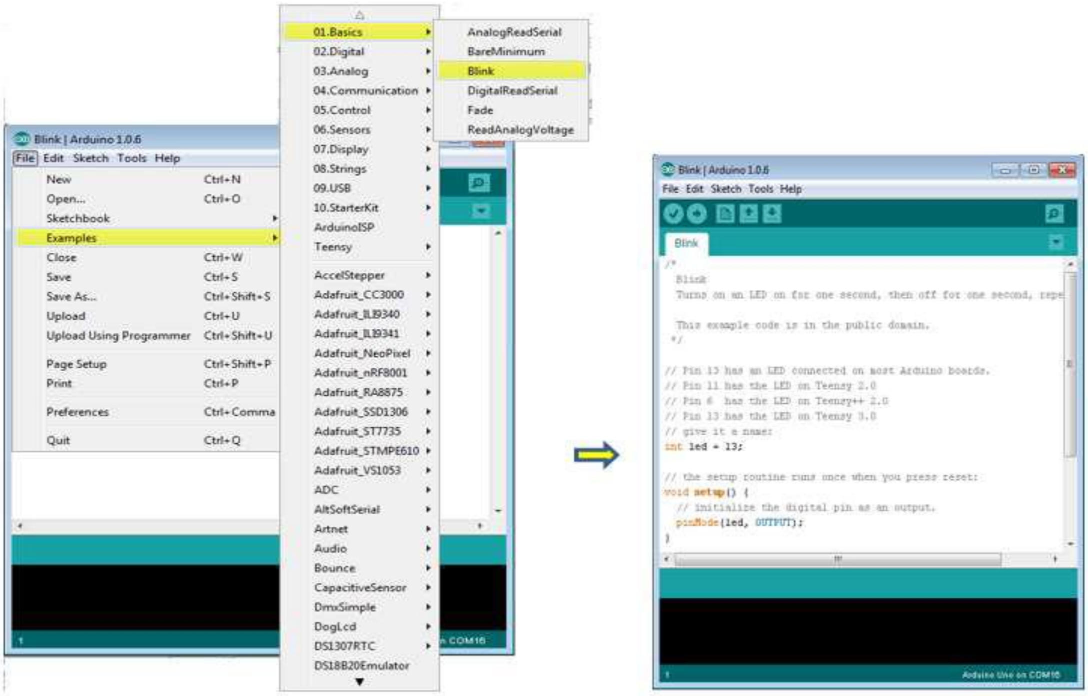
Once the software starts, you have two options:

- Create a new project.
- Open an existing project example.

To create a new project, select File --> New.To open



To open an existing project example, select File -> Example -> Basics -> Blink.

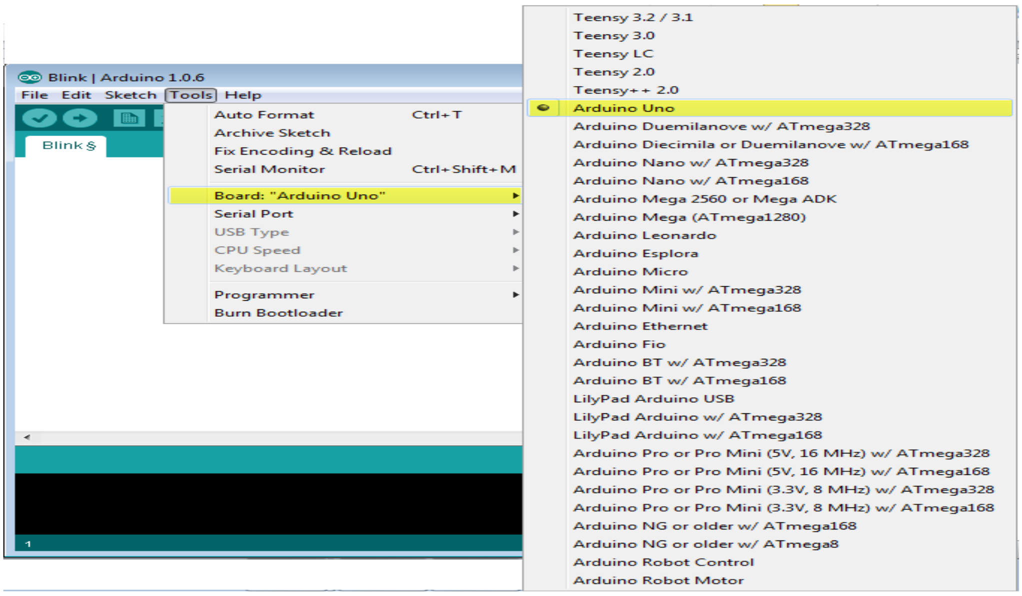


Here, we are selecting just one of the examples with the name **Blink**. It turns the LED on and off with some time delay. You can select any other example from the list.

Step 6: Select your Arduino board.

To avoid any error while uploading your program to the board, you must select the correct Arduino board name, which matches with the board connected to your computer.

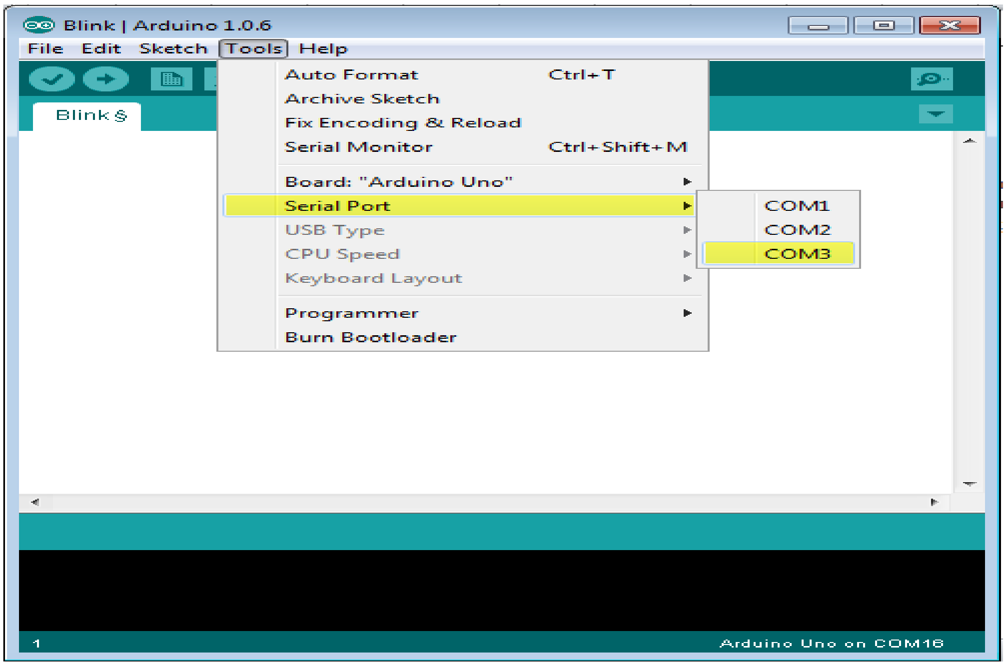
Go to Tools -> Board and select your board



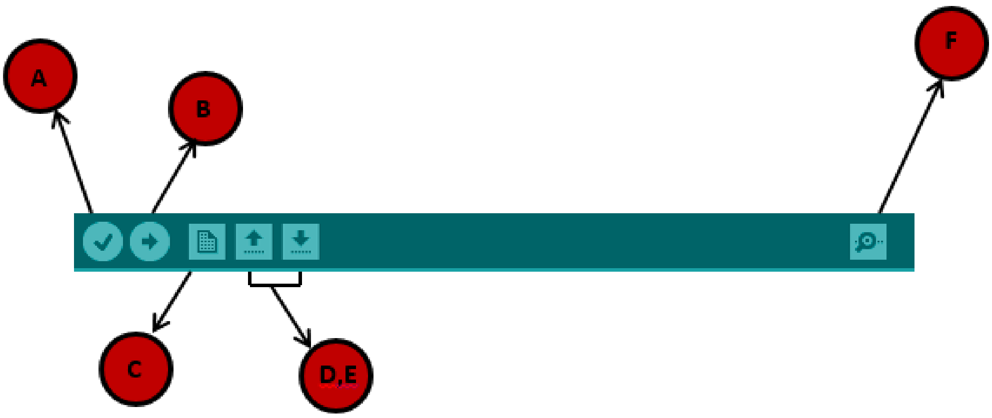
Here, we have selected Arduino Uno board according to our tutorial, but you must select the name matching the board that you are using

Step 7: Select your serial port.

Select the serial device of the Arduino board. Go to **Tools** ->**Serial Port** menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your Arduino board and re-open the menu, the entry that disappears should be of the Arduino board. Reconnect the board and select that serial port.



Step 8: Upload the program to your board. Before explaining how we can upload our program to the board, we must demonstrate the function of each symbol appearing in the Arduino IDE toolbar.



A- Used to check if there is any compilation error.

B- Used to upload a program to the Arduino board.

C- Shortcut used to create a new sketch.

D- Used to directly open one of the example sketch.

E- Used to save your sketch.

F- Serial monitor used to receive serial data from the board and send the serial data to the board.

Now, simply click the "Upload" button in the environment. Wait a few seconds; you will see the RX and TX LEDs on the board, flashing. If the upload is successful, the message "Done uploading" will appear in the status bar.

Note: If you have an Arduino Mini, NG, or other board, you need to press the reset button physically on the board, immediately before clicking the upload button on the Arduino Software.

Arduino programming structure

In this chapter, we will study in depth, the Arduino program structure and we will learn more new terminologies used in the Arduino world. The Arduino software is open-source. The source code for the Java environment is released under the GPL and the C/C++ microcontroller libraries are under the LGPL.

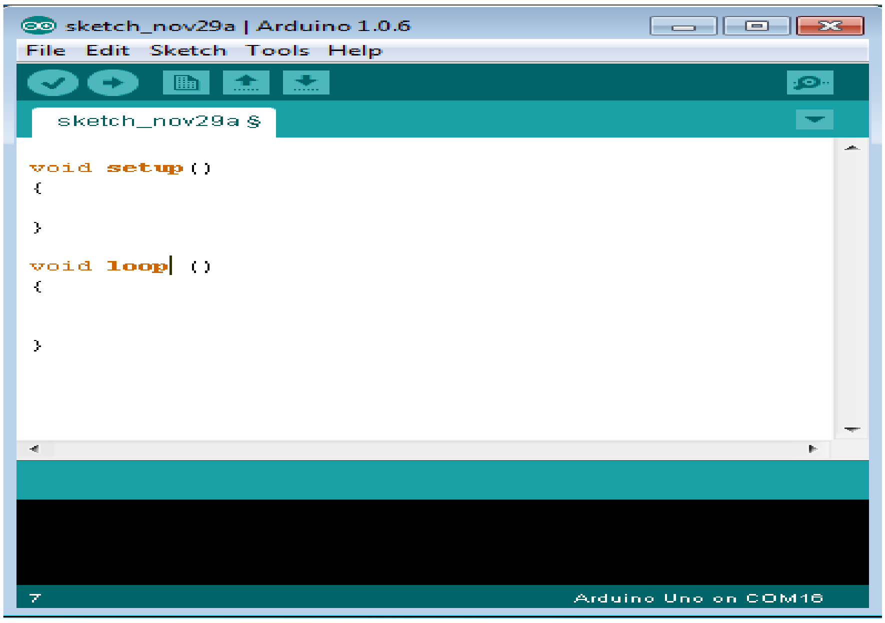
Sketch: The first new terminology is the Arduino program called "**sketch**".

Structure

Arduino programs can be divided in three main parts: **Structure**, **Values** (variables and constants), and **Functions**. In this tutorial, we will learn about the Arduino software program, step by step, and how we can write the program without any syntax or compilation error.

Let us start with the **Structure**. Software structure consists of two main functions:

- Setup () function
- Loop () function



Void setup ()

{

}

PURPOSE:

The **setup()** function is called when a sketch starts. Use it to initialize the variables, pin modes, start using libraries, etc. The setup function will only run once, after each power up or reset of the Arduino board.

INPUT

OUTPUT

RETURN

Void Loop ( )

{

}

PURPOSE:

After creating a **setup()** function, which initializes and sets the initial values, the **loop()** function does precisely what its name suggests, and loops secutively, allowing your program to change and respond. Use it to actively control the Arduino board.

INPUT

OUTPUT

RETURN

CHAPTER 6

RESULTS

6.1. RESULTS

Figure.6.1. Photocopy of

CHAPTER 7

CONCLUSION AND FUTURE SCOPE

7.1. CONCLUSION

As the technology is advancing every day the display board systems are moving from Normal hand writing display to digital display. Further to Wireless display units. This paper develops a photo type laboratory model wireless notice board system with GSM modem connected to it, which displays the desired message of the user through an SMS in a most populated or crowded places. This proposed system has many upcoming applications in educational institutions and organizations, crime prevention, traffic management, railways, advertisements etc. Been user friendly, long range and faster means of conveying information are major bolsters for this application. By using this proposed methodology we can enhance the security system and also make awareness of the emergency situations and avoid many dangers.

7.2. FUTURE SCOPE

A commercial modal can be able to display one message at a time. By including priority conditions we can enhance the project. Robots can be controlled in a similar fashion by sending command to the robots. As this technology emerges, in may be new device and hence new markets will evolve. The project itself can be modified to achieve a compete Home Automation All paragraphs must be indented. All paragraphs must be justified, i.e. both left-justified and right-justified.

REFERENCES

1] Muhammad Ali Mazidi, Janice G. Mazidi, Rolin D. McKinlay, The 8051 microcontroller and embedded systems using assembly and C, 2nd edition 01-Sep-2007,Pearson Education India.

[2] SMS And MMS Interworking In Mobile Networks Arnaud Henry-Labordère , Artech House mobilecommunications, 2004 - Technology & Engineering.

[3] Ayala, Kenneth J. (1996), The 8051 Microcontroller Architecture, Programming and Applications, DelmarPublishers, Inc. India Reprint.

[4] GSM telecommunication standards, June 2000 Second edition, European Telecommunications Standards Institute.

[5] M Samiullah, NS Qureshi,"SMS Repository and Control System using GSM-SMS Technology," European journal of scientific research, 2012.

[6] http://hktiit.ee.ust.hk/technology/TT_wireless.htm.

[7] www.wikipedia.org [8] Redl, Siegmund M.; Weber, Matthias K.; Oliphant, Malcolm W (February 1995). An Introduction to GSM. Artech House. [9] "RS232 Tutorial on Data Interface and cables". ARC Electronics. 2010. Retrieved 28 July 2011.