RFID AND GSM BASED LIBRARY MANAGEMENT SYSTEM

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CERTIFICATE

This is to certify that project report entitled "RFID AND GSM BASED LIBRARY MANAGEMENT SYSTEM", submitted Sahil Sood, Anshul Gupta and Paras Thakur in partial fulfillment for the award of degree of Bachelor of Technology in Electronics and Communication Engineering to Jaypee University of Information Technology, Waknaghat, Solan has been carried out under my supervision.

This work has not been submitted partially or fully to any other University or Institute for the award of this or any other degree or diploma.

Date: **Supervisor's Name**

Designation

ACKNOWLEDGEMENT

At this level of understanding it is often difficult to understand the wide spectrum of knowledge without proper guidance and advice. Hence, we take this opportunity to express our heartfelt gratitude to our project guide Mr. Dheeraj Kr. Sharma who had faith in us and allowed us to work on this project. We owe him a great debt of gratitude for without his support, this work wouldn't have been accomplished indeed. We just have no words to express our obligation for this learned and noble scholar.

We also acknowledge our profound sense of gratitude to all the teachers who have been instrumental for providing us the technical knowledge and moral support to complete the project with full understanding.

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ABSTRACT

RFID and GSM based Library Management System is a unique project to be implemented in collage libraries to manage list of books issued automatically and efficiently. It will use the microcontroller and RFID and GSM to identify and manage the books efficiently. Every book will have a unique RFID tag and every student will be provided unique RFID card as ID card for library. When a student swipes his /her card before RFID reader it will display his/her details. If the student wants to issue a book then he/she will swipe his card and the book to be issued before RFID reader and it will issue the book. Next GSM will then send notification to the student registered mobile number giving details of the book issued. Similarly if the student wants to return the book he will swipe his/her card and the book it will automatically removed from his account if issued before to him, and a return notification would be send hence confirming the return. If some other student tries to issue the already issued book then RFID will not allot that book to his/her name as the original user hasn’t returned it hence preventing any theft.

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Sahil Sood

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Anshul Gupta Mr. Dheeraj Kr. Sharma

____________________ Date

Paras Thakur

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CHAPTER 1: INTRODUCTION

1.1 Introduction:

The project aims in designing a library management system which is capable of automatically sending information about book issued to student. The conventional library systems are using Barcode technology which has got many drawbacks like more operational time, need of line of sight with the reader and inability to read through the obstacles. Also barcodes don't provide reliability against theft. RFID on the other hand helps in overcoming all these issues. RFID tags don't require line of sight and don't have to be visible to be read. So, they can be easily embedded in the book. Applications like self-check in check out, shelf management and anti-theft can be easily implemented using RFID. Thus librarian manual burden is reduced and library procedures become speedy and convenient for the book issuer. Also when the due date of returning the book nears, a reminder message can be sent to the book issuer one day in advance. This can be implemented using GSM technology. So our project aims in providing a very reliable and very user friendly solution to overcome this kind of problem. As we know the advancements in the Radio Frequency and GSM technologies and making use of those existing technologies we can design a device which is capable of identifying the book being issued and forward the same to the student on his/her registered mobile number. The basic idea of the system is to employ an RFID tag to the book and send its information to the receivers mobile. To design the entire system we require a microcontroller which acts as a medium of communication between the RF reader and the GSM modem.

1.2 Project Overview:

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers. Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. The ―RFID and GSM based Library Management System using AT89S52 microcontroller is an exclusive project which is used to design a Library Management System which is capable of automatically sending information about book issued to student on his/her registered contact number.

1.3 Thesis:

The thesis explains the implementation of "RFID and GSM based Library Management System" using AT89S52 microcontroller. The organization of the thesis is explained here with:

Chapter 1 Presents introduction to the overall thesis and the overview of the project. In the project overview, a brief introduction of RFID and GSM Library Management System and its applications are discussed.

Chapter 2 Presents the hardware description. It deals with the block diagram of the project and explains the purpose of each block. In the same chapter the explanation of Microcontroller, RFID module, GSM modem, power supplies, LEDs, LCD are considered.

Chapter 3 Presents the project description along with RFID module, GSM modem, and LCD interfacing to microcontroller.

Chapter 4 Presents the results of the project.

Chapter 5: Presents Conclusion, Future scope and Application of the project.

CHAPTER 2: HARDWARE DESCRIPTION

2.1 Introduction

In this chapter the block diagram of the project and design aspect of independent modules are considered. Block diagram is shown in fig: 2.1:

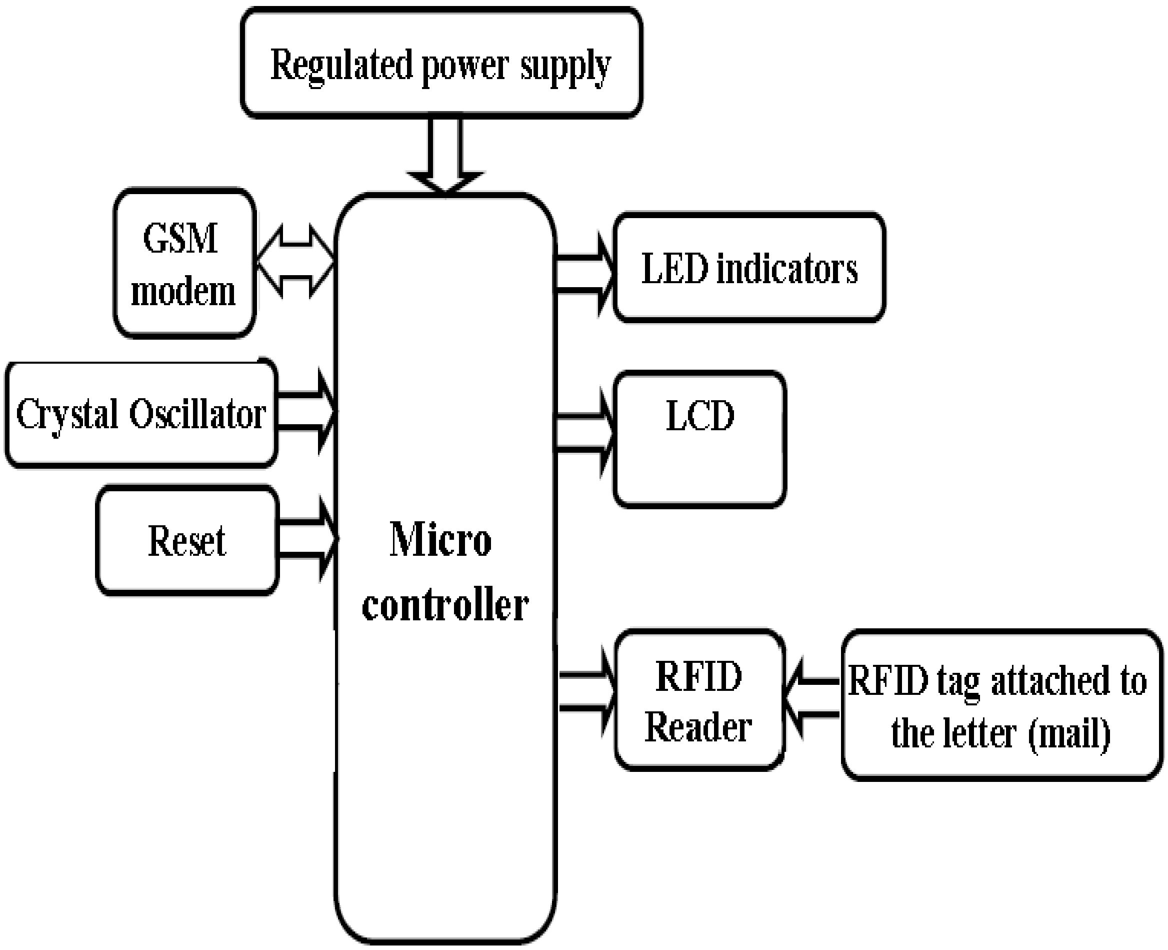


Figure 2.1: Block diagram of RFID and GSM based library management system

The main blocks of this project are:

1. Microcontroller (16F877A)

2. Crystal oscillator

3. Regulated power supply (RPS)

4. LED indicator.

5. RFID Tags

6. RFID module.

7. GSM modem.

8. LCD.

2.2 Micro controller:

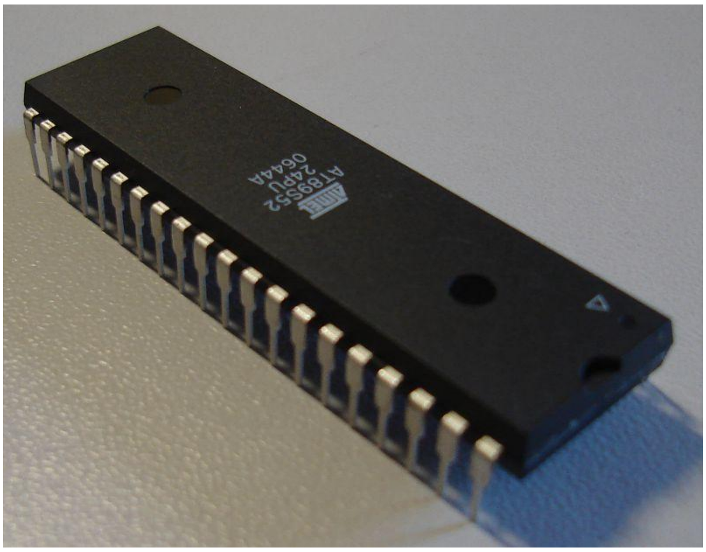


Figure 2.2: Microcontrollers

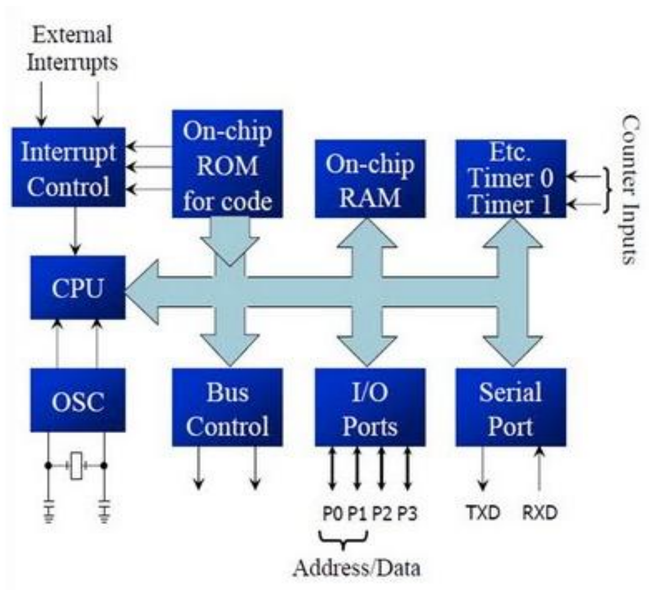
2.2.1 Introduction to Microcontrollers:

Circumstances that we find ourselves in today in the field of microcontrollers had their beginnings in the development of technology of integrated circuits. This development has made it possible to store hundreds of thousands of transistors into one chip. That was a prerequisite for production of microprocessors, and the first computers were made by adding external peripherals such as memory, input-output lines, timers and other. Further increasing of the volume of the package resulted in creation of integrated circuits. These integrated circuits contained both processor and peripherals. That is how the first chip containing a microcomputer, or what would later be known as a microcontroller came about. Microprocessors and microcontrollers are widely used in embedded systems products .Microcontroller is a programmable device. A microcontroller has a CPU in addition to a fixed amount of RAM, ROM, I/O ports and a timer embedded all on a single chip. 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.

2.2.2 Need of microcontrollers:

It reduces the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes.

2.2.3 Block diagram of microcontroller



The 8051 has 128 bytes of RAM,4K bytes of on chip ROM, two timers, one serial port, and four ports(each of 8 bits wide) all on a single chip. Also 8051 can address 64 kilo bytes of external memory because it has 16 address lines.

2.2.4 Other members of the 8051 family

Feature	**8051**	**8052**	**8031**
ROM(on-chip program space in bytes)	4K	8K	0K
RAM(bytes)	128	256	128
Timers	2	3	2
I/O pins	32	32	32
Serial port	1	1	1
Interrupt sources	6	8	6

Table2.2 Members of 8051

2.2.5 Pin configuration of 8051

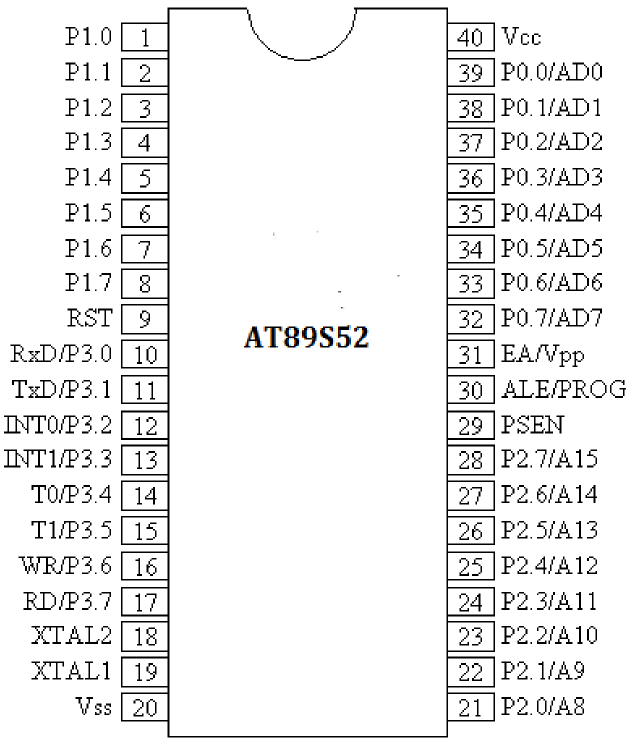


Figure 3.3 Pin Diagram of AT89S52

- **ALE/PROG**: Address Latch Enable output pulse for latching the low byte of the address during accesses to external memory. ALE is emitted at a constant rate of 1/6 of the oscillator frequency, for external timing or clocking purposes, even when there are no accesses to external memory. (However, one ALE pulse is skipped during each access to external Data Memory.) This pin is also the program pulse input (PROG) during EPROM programming.

- **PSEN:** Program Store Enable is the read strobe to external Program Memory. When the device is executing out of external Program Memory, PSEN is activated twice each machine cycle (except that two PSEN activations are skipped during accesses to external Data Memory). PSEN is not activated when the device is executing out of internal Program Memory.

- **EA/VPP:** When EA is held high the CPU executes out of internal Program Memory (unless the Program Counter exceeds 0FFFH in the 80C51). Holding EA low forces the CPU to execute out of external memory regardless of the Program Counter value. In the 80C31, EA must be externally wired low. In the EPROM devices, this pin also receives the programming supply voltage (VPP) during EPROM programming.

- **XTAL1:** Input to the inverting oscillator amplifier.

- **XTAL2:** Output from the inverting oscillator amplifier

- **Port 0:** Port 0 is an 8-bit open drain bidirectional port. As an open drain output port, it can sink eight LS TTL loads. Port 0 pins that have 1s written to them float, and in that state will function as high impedance inputs. Port 0 is also the multiplexed low-order address and data bus during accesses to external memory. In this application it uses strong internal pull-ups when emitting 1s. Port 0 emits code bytes during program verification. In this application, external pull-ups are required.

- **Port 1**: Port 1 is an 8-bit bidirectional I/O port with internal pull-ups. Port 1 pins that have 1s written to them are pulled high by the internal pull-ups, and in that state can be used as inputs. As inputs, port 1 pins that are externally being pulled low will source current because of the internal pull-ups.

- **Port 2:** Port 2 is an 8-bit bidirectional I/O port with internal pull-ups. Port 2 emits the high-order address byte during accesses to external memory that use 16-bit addresses. In this application, it uses the strong internal pull-ups when emitting 1s.

- **Port 3:** Port 3 is an 8-bit bidirectional I/O port with internal pull-ups. It also serves the functions of various special features of the 80C51 Family as follows:

  Port Pin Alternate Function

  P3.0 RxD (serial input port)

  P3.1 TxD (serial output port)

  P3.2 INT0 (external interrupt 0)

  P3.3 INT1 (external interrupt 1)

  P3.4 T0 (timer 0 external input)

  P3.5 T1 (timer 1 external input)

  P3.6 WR (external data memory write strobe)

  P3.7 RD (external data memory read strobe)

- **VCC:** Supply voltage of +5V.

- **VSS:** Circuit ground potential.

- **RST:** It is an input and is active high. Upon applying a high pulse to this pin, the microcontroller will reset and terminate all activities and all values in registers are lost. The reset should of minimum two machine cycles.

2.3 INTRODUCTION TO EMBEDDED C

As we know that the C is a high level language and it is easy to understand, therefore we use C language to program the 8051 and this C language is called embedded C language. The advantages of C language over the assembly language are:

1. It is easier and less time consuming to write program in C.
2. C is easier to modify and upgrade.
3. You can use codes available in function libraries.
4. C code is portable to other microcontrollers with little or no modifications.

2.3.1 DATA TYPES IN C

1. **Unsigned char:** It is an 8 bit data type that takes values from 0-255. If we don't put unsigned keyword in front of char then it becomes signed char.
2. **Signed char:** It is an 8 bit data type that uses the most significant bit to represent +or- signs. Therefore we have only 7 bits for magnitude and giving us values from -128 to +127.
3. **Unsigned int:** It is a 16 bit data type that takes value from 0-65535. It is used to define the 16 bit variables such as memory addresses but it consume lot of memory space.
4. **Signed char:** It is a 16 bit data type that uses most significant bit to represent +or- signs. Thus it takes the value from -32,768 to +32,767.
5. **Sbit(single bit):**It is used to access single-bit addressable registers. It allows us to access the single bits of sfr registers and bit addressable ports.

2.4 REGULATED POWER SUPPLY:

2.4.1 Introduction:

Power supply is a supply 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.

A power supply may include a power distribution system as well as primary or secondary sources of energy such as

- Conversion of one form of electrical power to another desired form and voltage, typically involving converting AC line voltage to a well-regulated lower-voltage DC for electronic devices. Low voltage, low power DC power supply units are commonly integrated with the devices they supply, such as computers and household electronics.
- Batteries.
- Chemical fuel cells and other forms of energy storage systems.
- Solar power.
- Generators or alternators.

2.4.2 Block Diagram:

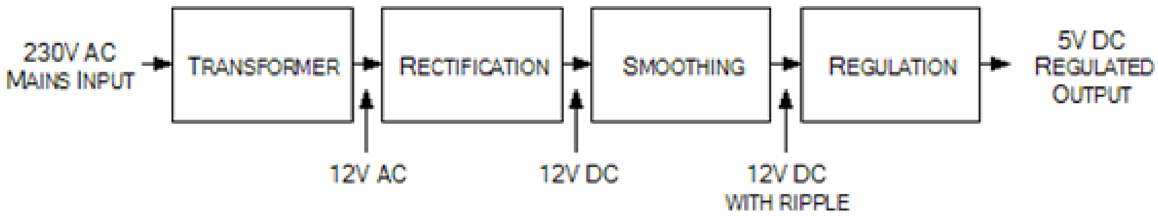


Fig 2.4 Regulated Power Supply

The basic circuit diagram of a regulated power supply (DC O/P) with led connected as load is shown in fig: 2.5.

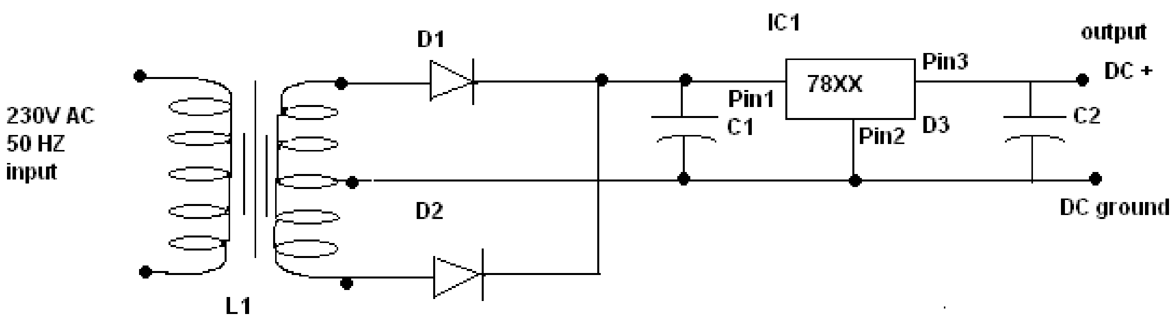


Fig 2.5 Circuit diagram of Regulated Power Supply with Led connection

The components mainly used in above figure are

- 230V AC MAINS
- TRANSFORMER
- BRIDGE RECTIFIER(DIODES)
- CAPACITOR
- VOLTAGE REGULATOR(IC 7805)
- RESISTOR
- LED(LIGHT EMITTING DIODE)

The detailed explanation of each and every component mentioned above is as follows:

2.4.2.1 TRANSFORMATION:

The process of transforming energy from one device to another is called transformation. For transforming energy we use transformers.

Transformers:

A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled conductors without changing its frequency. A varying current in the firstor primary winding creates a varying magnetic flux in the transformer's core, and thus av arying magnetic field through the secondary winding. This varying magnetic field induces av arying electromotive force (EMF) or "voltage" in the secondary winding. This effect is called mutual induction.

If a load is connected to the secondary, an electric current will flow in the secondary winding and electrical energy will be transferred from the primary circuit through the transformer to the load. This field is made up from lines of force and has the same shape as a bar magnet.

If the current is increased, the lines of force move outwards from the coil. If the current is reduced, the lines of force move inwards.

If another coil is placed adjacent to the first coil then, as the field moves out or in, the moving lines of force will "cut" the turns of the second coil. As it does this, a voltage is induced in the second coil. With the 50 Hz AC mains supply, this will happen 50 times a second. This is called MUTUAL INDUCTION and forms the basis of the transformer.

The input coil is called the PRIMARY WINDING; the output coil is the SECONDARY WINDING. Fig: 2.6 shows step-down transformer.

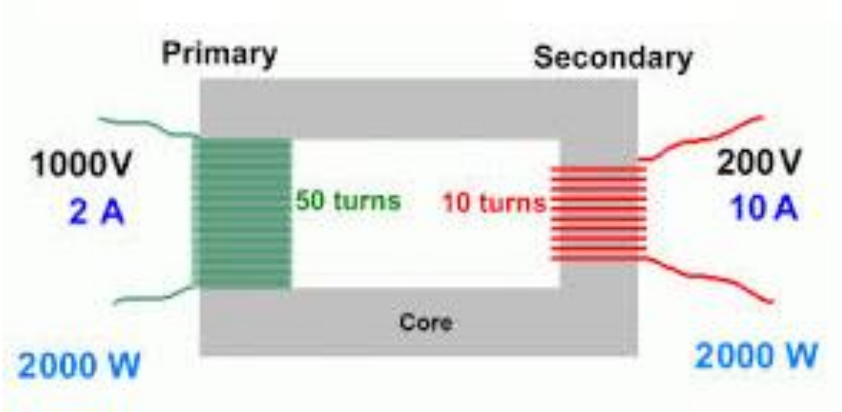


Fig 2.6: Step-Down Transformer

The voltage induced in the secondary is determined by the TURNS RATIO.

$$\frac{\text{PRIMARY VOLTAGE}}{\text{SECONDARY VOLTAGE}} = \frac{\text{NO OF PRIMARY TURNS}}{\text{NO OF SECONDARY TURNS}}$$

For example, if the secondary has half the primary turns; the secondary will have half the primary voltage. Another example is if the primary has 5000 turns and the secondary has 500 turns, then the turn‘s ratio is 10:1.

If the primary voltage is 240 volts then the secondary voltage will be x 10 smaller = 24volts. Assuming a perfect transformer, the power provided by the primary must equal the power taken by a load on the secondary.

To aid magnetic coupling between primary and secondary, the coils are wound on a metal CORE. Since the primary would induce power, called EDDY CURRENTS, into this core, the core is LAMINATED. This means that it is made up from metal sheets insulated from each other. Transformers to work at higher frequencies have an iron dust core or no core at all.

Note that the transformer only works on AC, which has a constantly changing current and moving field. DC has a steady current and therefore a steady field and there would be n induction.

Some transformers have an electrostatic screen between primary and secondary. This is to prevent some types of interference being fed from the equipment down into the mains supply, or in the other direction. Transformers are sometimes used for IMPEDANCE MATCHING. We can use the transformers as step up or step down.

Step Up transformer:

In case of step up transformer, primary windings are every less compared to secondary winding. Because of having more turns secondary winding accepts more energy, and it releases more voltage at the output side.

Step down transformer:

In case of step down transformer, Primary winding induces more flux than these secondary winding, and secondary winding is having less number of turns because of that it accepts less number of flux, and releases less amount of voltage.

2.4.2.2 Battery power supply:

A battery is a type of linear power supply that offers benefits that traditional line-operated power supplies lack: mobility, portability and reliability. A battery consists of multiple electro chemical cells connected to provide the voltage desired. Below picture shows Hi-Watt 9V battery

Hi-Watt 9V Battery

The most commonly used dry-cell battery is the carbon-zinc dry cell battery. Dry-cell batteries are made by stacking a carbon plate, a layer of electrolyte paste, and a zinc plate alternately until the desired total voltage is achieved. The most common dry-cell batteries have one of the following voltages: 1.5, 3, 6, 9, 22.5, 45, and 90. During the discharge of a carbon-zinc battery, the zinc metal is converted to a zinc salt in the electrolyte, and magnesium dioxide is reduced at the carbon electrode. These actions establish a voltage of approximately 1.5 V.

The lead-acid storage battery may be used. This battery is rechargeable; it consists of lead and lead/dioxide electrodes which are immersed in sulphuric acid. When fully charged, this type of battery has a 2.06-2.14 V potential (A 12 volt car battery uses 6 cells in series). During discharge, the lead is converted to lead sulphate and the sulphuric acid is converted to water. When the battery is charging, the lead sulphate is converted back to lead and lead dioxide A nickel-cadmium battery has become more popular in recent years. This battery cell is completely sealed and rechargeable. The electrolyte is not involved in the electrode reaction, making the voltage constant over the span of the batteries long service life. During the charging process, nickel oxide is oxidized to its higher oxidation state and cadmium oxide is reduced. The nickel-cadmium batteries have many benefits. They can be stored both charged and uncharged. They have a long service life, high current availabilities, constant voltage, and the ability to be recharged.

Pencil battery of 1.5V

2.4.2.3RECTIFICATION:

The process of converting an alternating current to a pulsating direct current is called as rectification. For rectification purpose we use rectifiers.

Rectifiers:

A rectifier is an electrical device that converts alternating current (AC) to direct current (DC), a process known as rectification. Rectifiers have many uses including as components of power supplies and as detectors of radio signals. Rectifiers may be made of solid-state diodes, vacuum tube diodes, mercury arc valves, and other components.

A device that it can perform the opposite function (converting DC to AC) is known as an inverter.

When only one diode is used to rectify AC (by blocking the negative or positive portion of the waveform), the difference between the term diode and the term rectifier is merely one of usage, i.e., the term rectifier describes a diode that is being used to convert AC to DC. Almost all rectifiers comprise a number of diodes in a specific arrangement for more efficiently converting AC to DC than is possible with only one diode. Before the development of silicon semiconductor rectifiers, vacuum tube diodes and copper (I) oxide or selenium rectifier stacks were used.

Bridge full wave rectifier: The Bridge rectifier circuit is shown in fig: 2.8, which converts an ac voltage to dc voltage using both half cycles of the input ac voltage. The Bridge rectifier circuit is shown in the figure. The circuit has four diodes connected to form a bridge. The ac input voltage is applied to the diagonally opposite ends of the bridge. The load resistance is connected between the other two ends of the bridge.

For the positive half cycle of the input ac voltage, diodes D1 and D3 conduct, whereas diodes D2 and D4 remain in the OFF state. The conducting diodes will be in series with the load resistance RL and hence the load current flows through RL.

For the negative half cycle of the input ac voltage, diodes D2 and D4 conduct whereas, D1 and D3 remain OFF. The conducting diodes D2 and D4 will be in series with the load resistance RL and hence the current flows through RL in the same direction as in the previous half cycle. Thus a bi-directional wave is converted into a unidirectional wave.

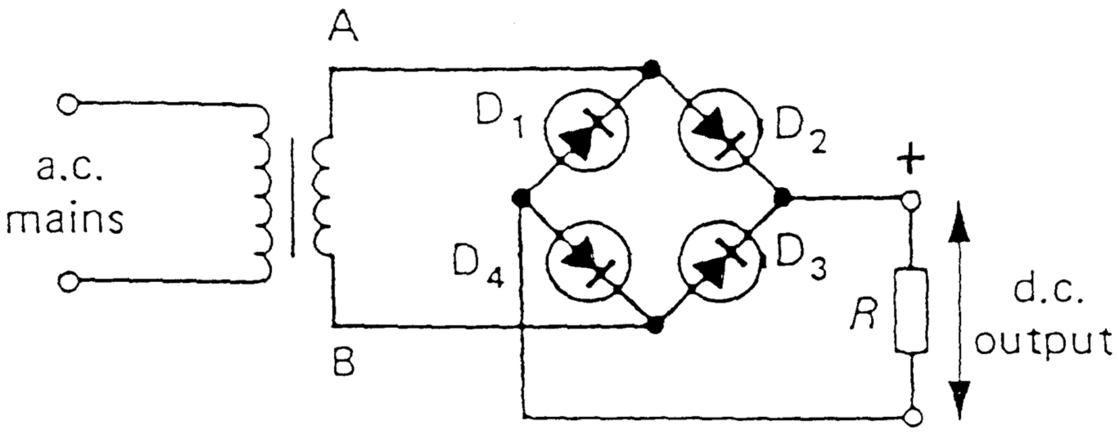


Fig 2.7: Bridge rectifier: a full-wave rectifier using 4 diodes

DB107:

Now -a -days Bridge rectifier is available in IC with a number of DB107. In our project we are using an IC in place of bridge rectifier. The picture of DB 107 is shown in fig: 2.9.

Fig 2.8: DB107

Features:

- Good for automation insertion
- Surge overload rating - 30 amperes peak
- Ideal for printed circuit board
- Reliable low cost construction
- Glass passivated device
- Polarity symbols moulded on body
- Mounting position: Any
- Weight: 1.0 gram

Filtration:

The process of converting a pulsating direct current to a pure direct current using filters is called as filtration.

Filters:

Electronic filters are electronic circuits, which perform signal-processing functions, specifically to remove unwanted frequency components from the signal, to enhance wanted ones.

2.4.2.4 INTRODUCTION TO CAPACITORS:

The Capacitor or sometimes referred to as a Condenser is a passive device, and one which stores energy in the form of an electrostatic field which produces a potential (static voltage) across its plates. In its basic form a capacitor consists of two parallel conductive plates that are not connected but are electrically separated either by air or by an insulating material called the Dielectric. When a voltage is applied to these plates, a current flows charging up the plates with electrons giving one plate a positive charge and the other plate an equal and opposite negative charge. This flow of electrons to the plates is known as the Charging Current and continues to flow until the voltage across the plates (and hence the capacitor) is equal to the applied voltage Vcc. At this point the capacitor is said to be fully charged and this is illustrated below. The construction of capacitor and an electrolytic capacitor are shown in figures 2.9 and 2.10 respectively.

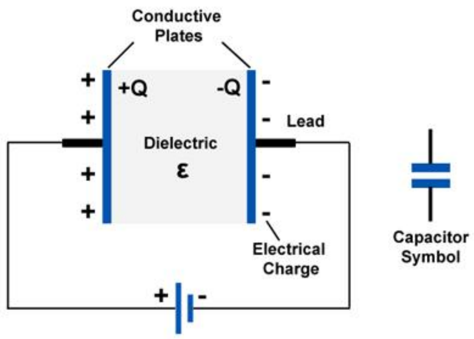


Fig 2.9: Construction Of a Capacitor **Fig 2.10: Electrolytic Capacitor**

Units of Capacitance:

Microfarad (μF)1μF = 1/1,000,000 = 0.000001 = 10^{-6}F

Nanofarad (nF) 1nF = 1/1,000,000,000 = 0.000000001 = 10^{-9}F

Pico farad (pF) 1pF = 1/1,000,000,000,000 = 0.000000000001 = 10^{-12}F

2.4.2.5 REGULATION:

The process of converting a varying voltage to a constant regulated voltage is called as regulation. For the process of regulation we use voltage regulators.

Voltage Regulator:

A voltage regulator (also called a ‗regulator') with only three terminals appears to be a simple device, but it is in fact a very complex integrated circuit. It converts a varying input voltage into a constant regulated 'output voltage'. Voltage Regulators are available in a variety of outputs like5V, 6V, 9V, 12V and 15V. The LM78XX series of voltage regulators are designed for positive input. For applications requiring negative input, the LM79XX series is used. Using a pair of 'voltage-divider 'resistors one can increase the output voltage of a regulator circuit.

It is not possible to obtain a voltage lower than the stated rating. You cannot use a 12Vregulator to make a 5V power supply. Voltage regulators are very robust. These can withstand over-current draw due to short circuits and also over-heating. In both cases, the regulator will cut off before any damage occurs. The only way to destroy a regulator is to apply reverse voltage to its input. Reverse polarity destroys the regulator almost instantly. Fig: 2.11 shows voltage regulator.

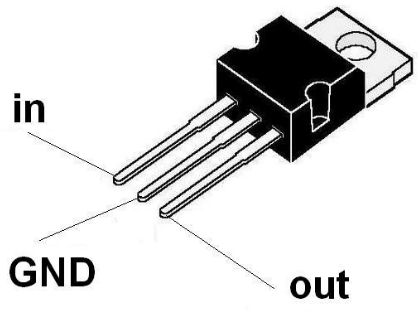


Fig 2.11: Voltage Regulator

Resistors:

A resistor is a two-terminal electronic component that produces a voltage across its terminals that is proportional to the electric current passing through it in accordance with Ohm's law:

$$V=IR$$

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

The primary characteristics of a resistor are the resistance, the tolerance, maximum working voltage and the power rating. Other characteristics include temperature coefficient, noise, and inductance. Less well-known is critical resistance, the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance is determined by the design, materials and dimensions of the resistor.

Resistors can be made to control the flow of current, to work as Voltage dividers, to dissipate power and it can shape electrical waves when used in combination of other components. Basic unit is ohms.

Theory of operation:

Ohm's law:

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

$$\mathbf{V = IR}$$

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

Power dissipation:

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

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

Fig 2.12: Resistor

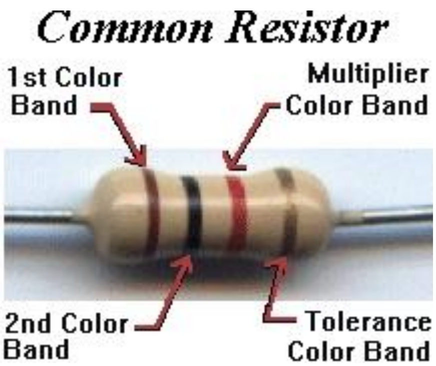


Fig 2.13: Color Bands In Resistor

2.4.2.6 LED:

A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lighting. Introduced as a practical electronic component in 1962, early LEDs emitted low-intensity red light, but modern versions are available across the visible, ultraviolet and infrared wavelengths, with very high brightness. The structure and parts of a led are shown in figures 2.14 and 2.15 respectively.

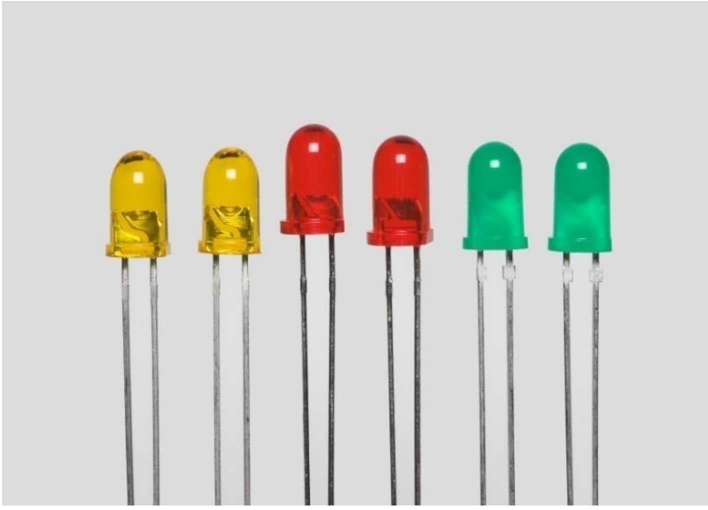


Fig 2.14: LED

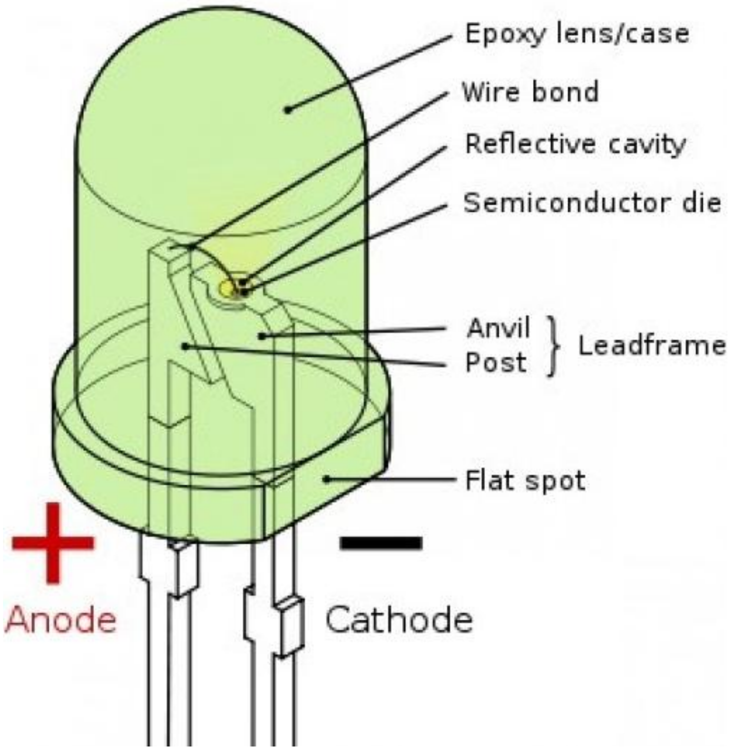


Figure 2.15: Parts of a LED

Working:

The structure of the LED light is completely different than that of the light bulb. Amazingly, the LED has a simple and strong structure. The light-emitting semiconductor material is what determines the LED's color. The LED is based on the semiconductor diode. When a diode is forward biased (switched on), electrons are able to recombine withholds within the device, releasing energy in the form of photons. This effect is called electroluminescence and the color of the light (corresponding to the energy of the photon) is determined by the energy gap of the semiconductor. An LED is usually small in area (less than1 mm2), and integrated optical components are used to shape its radiation pattern and assist in reflection. LEDs present many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved robustness, smaller size, faster switching, and greater durability and reliability. However, they are relatively expensive and require more precise current and heat management than traditional light sources. Current LED products for general lighting are more expensive to buy than fluorescent lamp sources of comparable output. They also enjoy use in applications as diverse as replacements for traditional light sources in automotive lighting (particularly indicators) and in traffic signals. The compact size of LEDs has allowed new text and video displays and sensors to be developed, while their high switching rates are useful in advanced communications technology. The electrical symbol and polarities of led are shown in fig: 2.16.

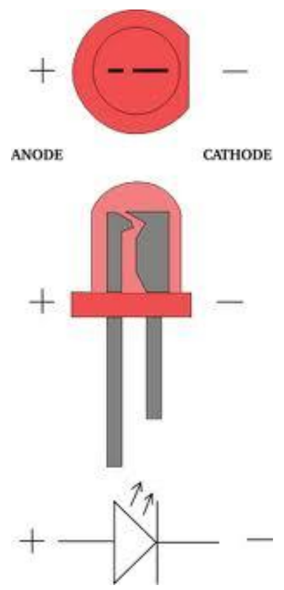


Fig 2.16: Electrical Symbol & Polarities of LED

LED lights have a variety of advantages over other light sources:

- High-levels of brightness and intensity
- High-efficiency
- Low-voltage and current requirements
- Low radiated heat
- High reliability (resistant to shock and vibration)
- No UV Rays

- Long source life
- Can be easily controlled and programmed

Applications of LED fall into three major categories:

- Visual signal application where the light goes more or less directly from the LED to the human eye, to convey a message or meaning.
- Illumination where LED light is reflected from object to give visual response of these objects.
- Generate light for measuring and interacting with processes that do not involve the human visual system.

2.5 RFID MODULE

RADIO FREQUENCY IDENTIFICATION uses a semiconductor (micro-chip) in a tag or label to transmit stored data when the tag or label is exposed to radio waves of the correct frequency.

2.5.1 THE ELEMENTS OF AN RFID SYSTEM

RFID systems fundamentally consist of four elements:

- The RFID tags.
- The RFID readers
- The antennas and choice of radio characteristics,
- The computer network (if any) that is used to connect the readers.

RFID TAGS

The tag is the basic building block of RFID. Each tag consists of an antenna and a small silicon chip that contains a radio receiver, a radio modulator for sending a response back to the reader, control logic, some amount of memory, and a power system. The power system can be completely powered by the incoming RF signal, in which case the tag is known as a passive tag. Alternatively, the tag‘s power system can have a battery, in which case the tag is known as an active tag.

The primary advantages of active tags are their reading range and reliability. With the proper antenna on the reader and the tag, a 915MHz tag can be read from a distance of 100 feet or more. The tags also tend to be more reliable because they do not need a continuous radio signal to power their electronics.

Passive tags, on the other hand, can be much smaller and cheaper than active ones because they don‘t have batteries. Another advantage is their longer shelf life: Whereas activetag‘s batteries may last only a few years, a passive tag could in principle be read many decades after thechip was manufactured

Between the active and the passive tags are the semi-passive tags. These tags have a battery, like active tags, but still use the reader‘s power to transmit a message back to the RFID reader using a technique known as backscatter. These tags thus have the read reliability of an active tag but the read range of a passive tag. They also have a longer shelf life than a tag that is fully active.

Tags come in all shapes and sizes. The smallest tag that has ever been produced is the Hitachimu-chip, which is less than 0.4mm on a side. Designed to be embedded in a piece of paper and used for tracking documents printed in an office environment, the mu-chip can be read only at a distance of a few centimetres. Of course, the mu-chip is a passive tag. With a larger antenna it could have a significantly longer reading range, but that would defeat its purpose.

RFID tags can be promiscuous, in which case they will communicate with any reader. Alternatively, they can be secure, requiring that the reader provide a password or other kind of authentication credential before the tags respond. The vast majority of RFID tags that have been deployed are promiscuous. Not only are these tags cheaper, but the systems also are much easier to manage. Systems that employ passwords or encryption codes require that the codes be distributed in advance and properly controlled. This is an exceedingly difficult management problem.

The simplest RFID chips contain only a serial number, think of this as a 64-bit or 96-bit block of read-only storage. Although the serial number can be burned into the chip by the manufacturer, it is also common for the chips to be programmed in the field by the end user. Some chips will accept only a single serial number, while other chips allow the serial number to be changed after it is burned in. More sophisticated RFID chips can contain read-write memory that can be programmed by a reader. Chips can also have sensors, an example of which is an air pressure sensor to monitor the inflation of a tire. The chips might store the results of the sensor in a piece of read-write memory or simply report the sensor‘s reading to the RFID reader. Chips can also have a self destruct, or ―kill feature. This is a special code that, when received by the chip, causes the chip to no longer respond to commands. For financial applications, the full capabilities of smart cards have been combined with the wireless protocols and passive powering used in RFID. The result is a class of high-capability RFID tags also called contact less smart cards.

RFID tag format:

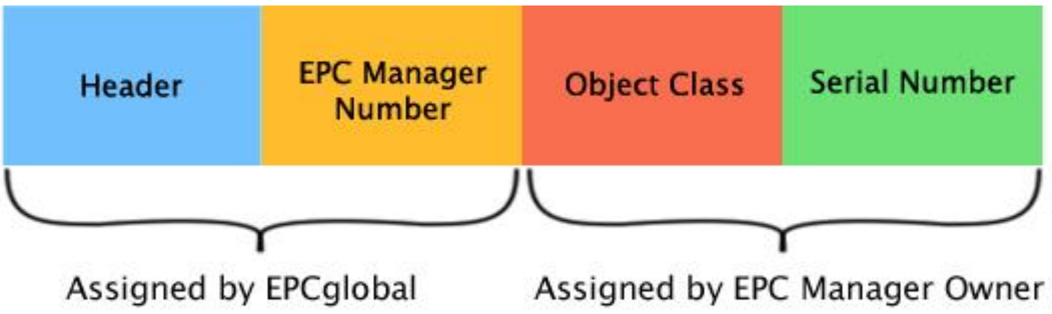


Figure 2.17: Tag format

RFID tags can interfere with each other. When multiple tags are present in a reader‘s field, the reader may be unable to decipher the signals from the tags. For many applications, such as raising the gate in a parking lot, this is not a problem. The systems are optimized so that only one tag is within range at a time. However, for other applications, reading multiple tags at once is essential. For these applications, the tags need to support either an anti-collision protocol or, more commonly, a singulation protocol. A singulation protocol allows a reader to determine that multiple tags are visible and to iterate through the tags, getting them to take turns responding so that each may be read without interference from the others. Electronic

Product Code (EPC) tags are a special kind of tag that follows the EPC standard developed by the MIT Auto-ID Center and is now managed by the trade organization EPC global.

READERS

The RFID reader sends a pulse of radio energy to the tag and listens for the tag‘s response. The tag detects this energy and sends back a response that contains the tag‘s serial number and possibly other information as well. In simple RFID systems, the reader‘s pulse of energy functioned as an on-off switch; in more sophisticated systems, the reader‘s RF signal can contain commands to the tag, instructions to read or write memory that the tag contains, and even passwords.

Historically, RFID readers were designed to read only a particular kind of tag, but so-called multimode readers that can read many different kinds of tags are becoming increasingly popular.

RFID readers are usually on, continually transmitting radio energy and awaiting any tags that enter their field of operation. However, for some applications, this is unnecessary and could be undesirable in battery-powered devices that need to conserve energy. Thus, it is possible to configure an RFID reader so that it sends the radio pulse only in response to an external event. For example, most electronic toll collection systems have the reader constantly powered up so that every passing car will be recorded. On the other hand, RFID scanners used in veterinarian‘s offices are frequently equipped with triggers and power up the only when the trigger is pulled.

Like the tags themselves, RFID readers come in many sizes. The largest readers might consist of a desktop personal computer with a special card and multiple antennas connected to the card through shielded cable. Such a reader would typically have a network connection as well so that it could report tags that it reads to other computers. The smallest readers are the size of a postage stamp and are designed to be embedded in mobile telephones.

ANTENNAS AND RADIO

The RFID physical layer consists of the actual radios and antennas used to couple the reader to the tag so that information can be transferred between the two.

Radio energy is measured by two fundamental characteristics: the frequencies at which it oscillates and the strength or power of those oscillations. Commercial FM broadcast stations in the United States transmit with energy at a frequency between 88MHz and 108MHz, or 1 million isolations per second. The AM spectrum, by contrast, transmits at 500,000 to 1,500,000 oscillations per second, or between 500KHz and 1500KHz. Microwave ovens cook with RF energy that vibrates2.4 billion times each second, which is 2.4GHz.

Most RFID systems use the so-called unlicensed spectrum, which is a specific part of the spectrum set aside for use without a radio license. Popular bands are the low-frequency (LF) band at 125 – 134.2KHz, the high-frequency band at 13.56MHz, the ultrahigh-frequency (UHF) band at 915MHz (in North America; varies in other regions), and the industrial, scientific, and medical (ISM) band at2.4GHz.

The names of the LF, HF, and UHF bands reflect the history of radio‘s development: Radio systems first transmitted at the lower frequencies and moved to the higher frequencies only as technology advanced. For this reason, lower frequency radio gear was traditionally cheaper than equipment that operated at higher frequencies. Today, however, the difference in radio prices more often reflects market sizes, the cost of patents and other licenses, and the result of subsidies or cross-marketing agreements from equipment manufacturers.

Band	Unlicensed frequency	Wavelength	Usage
LF	125-134KHz	2400 meters	Animal tagging and keyless entry
HF	13.56MHz	22 meters	
UHF	865-867MHz(Europe) 915MHz(U.S) 950-956MHz(Japan)	32.8 cm	Smart cards and item management
ISM	2.4GHz	12.5 cm	Item management

Table 2.2 Frequency range and wavelength

When analyzing the energy that is radiated from an antenna, electrical engineers divide the field into two parts: the near field, which is the part of radiation that is within a small number of wavelengths of the antenna, and the far field, which is the energy that is radiated beyond the near field. Because the wavelength of LF and HF devices tends to be much larger than the ranges at which RFID systems typically operate, these systems operate in the near field, while UFH and ISM systems operate in the far field.

As with most radio systems, the larger the antenna on the reader and the tag, the better an RFID system will work because large antennas are generally more efficient at transmitting and receiving radio power than are small antennas. Thus, a large antenna on the reader means more power can be sent to the RFID tag and more of the tag‘s emitted energy can be collecte d and analyzed. A large antenna on the tag means that more of the power can be collected and used to power the chip. Likewise, a large antenna on the chip means that more power can be transmitted back to the reader.

2.5.2 ADVANTAGES OF RFID TECHNOLOGY

RFID technology has a number of advantages.

- RFID tags are very simple to install/inject inside the body of animals, thus helping to keep a track on them. This is useful in animal husbandry and on poultry farms. The installed RFID tags give information about the age, vaccinations and health of the animals.
- RFID technology is better than bar codes as it cannot be easily replicated and therefore, it increases the security of the product.
- Supply chain management forms the major part of retail business and RFID systems play a key role by managing updates of stocks, transportation and logistics of the product.
- Barcode scanners have repeatedly failed in providing security to gems and jewelleries in shops. But nowadays, RFID tags are placed inside jewellery items and an alarm is installed at the exit doors.
- The RFID tags can store data up to 2 KB whereas; the bar code has the ability to read just 10-12 digits.

2.5.3 DISADVANTAGES OF RFID TECHNOLOGY

The RFID technology, though very beneficial, is expensive to install. Small and medium scale enterprises find it costly to use it in their firms and offices.

- It is difficult for an RFID reader to read the information in case of RFID tags installed in liquids and metal products. The problem is that the liquid and metal surfaces tend to reflect the radio waves, which makes the tags unreadable. The tags have to be placed in various alignments and angles for taking proper reading. This is a tedious task when the work involves big firms.
- Interference has been observed if devices such as forklifts and walkie-talkies are in the vicinity of the distribution centres. The presence of mobile phone towers has been found to interfere with RFID radio waves. Wal-Mart, the retail sector giant, has installed billions of RFID tags in their products throughout the world and they have encountered such problems.
- The USA and Europe, for instance, have different range of frequencies that allow RFID tags to function. This makes it mandatory for international shipping companies and other organizations to be aware of the working pattern of other nations also, which can be very time-consuming.
- RFID technology has been referred to as invasive technology. Consumers are apprehensive about their privacy when they purchase products with RFID tags. Once the radio chips are installed in the product, the customer can be tracked and his personal information can be collected by the RFID reader. However, many stores have a facility that deactivates the RFID tags after the product has been purchased.

2.6 Global System for Mobile Communication (GSM)

GSM, which stands for Global System for Mobile communications, reigns (important) as the world‘s most widely used cell phone technology. Cell phones use a cell phone service carrier‘s GSM network by searching for cell phone towers in the nearby area. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz. It is estimated that many countries outside of Europe will join the GSM partnership.

GSM Modem

Need of GSM:

- The GSM study group aimed to provide the followings through the GSM:
- Improved spectrum efficiency.
- International roaming.
- Low-cost mobile sets and base stations (BS)
- High-quality speech
- Compatibility with Integrated Services Digital Network (ISDN) and other telephone company services.
- Support for new services.

GSM – Architecture:

A GSM network consists of several functional entities whose functions and interfaces are defined. The GSM network can be divided into following broad parts.

- The Mobile Station (MS)
- The Base Station Subsystem (BSS)
- The Network Switching Subsystem (NSS)
- The Operation Support Subsystem (OSS)

Following fig shows the simple architecture diagram of GSM Network.

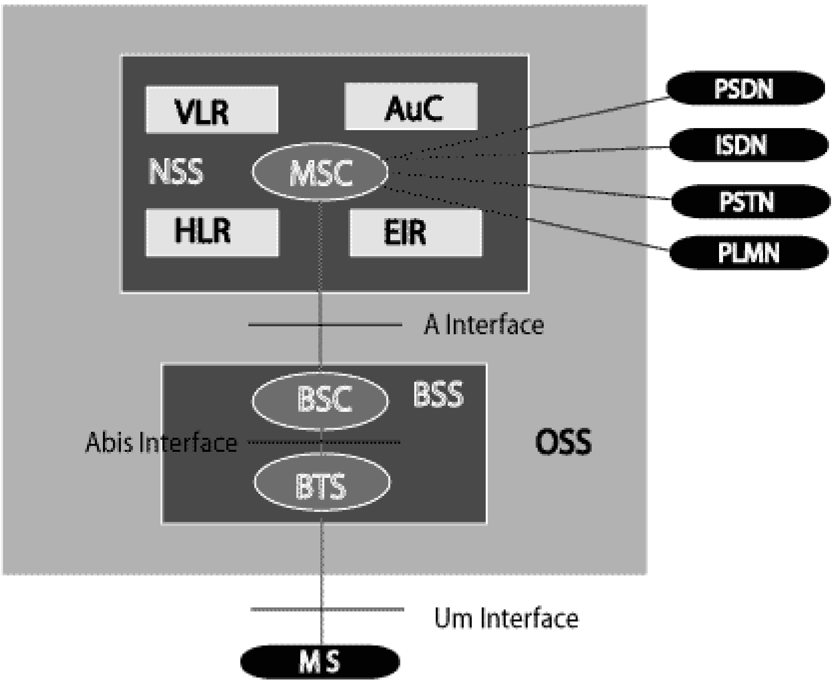


Fig 2.18: GSM Network

The added components of the GSM architecture include the functions of the databases and messaging systems:

- Home Location Register (HLR)
- Visitor Location Register (VLR)
- Equipment Identity Register (EIR)
- Authentication Center (AuC)
- SMS Serving Center (SMS SC)
- Gateway MSC (GMSC)
- Chargeback Center (CBC)
- Transcoder and Adaptation Unit (TRAU)

2.6.1 GSM NETWORK AREAS:

In a GSM network, the following areas are defined:

Cell: Cell is the basic service area, one BTS covers one cell. Each cell is given a Cell Global Identity (CGI), a number that uniquely identifies the cell.

Location Area: A group of cells form a Location Area. This is the area that is paged when a subscriber gets an incoming call. Each Location Area is assigned a Location Area Identity (LAI).Each Location Area is served by one or more BSCs.

MSC/VLR Service Area: The area covered by one MSC is called the MSC/VLR service area.

PLMN: The area covered by one network operator is called PLMN. A PLMN can contain one or more MSCs.

2.6.2 THE GSM SPECIFICATIONS:

Specifications for different Personal Communication Services (PCS) systems vary among the different PCS networks. The GSM specification is listed below with important characteristics.

Modulation:

Modulation is a form of change process where we change the input information into a suitable format for the transmission medium. We also changed the information by demodulating the signal at the receiving end. The GSM uses Gaussian Minimum Shift Keying (GMSK) modulation method.

Access Methods:

Because radio spectrum is a limited resource shared by all users, a method must be devised to divide up the bandwidth among as many users as possible.

GSM chose a combination of TDMA/FDMA as its method. The FDMA part involves the division by frequency of the total 25 MHz bandwidth into 124 carrier frequencies of 200 kHz bandwidth.

One or more carrier frequencies are then assigned to each BS. Each of these carrier frequencies is then divided in time, using a TDMA scheme, into eight time slots. One time slot is used for transmission by the mobile and one for reception. They are separated in time so that the mobile unit does not receive and transmit at the same time.

Transmission Rate:

The total symbol rate for GSM at 1 bit per symbol in GMSK produces 270.833 K symbols/second. The gross transmission rate of the time slot is 22.8 Kbps.GSM is a digital system with an over-the-air bit rate of 270 kbps.

Frequency Band:

The uplink frequency range specified for GSM is 933 - 960 MHz (basic 900 MHz band only).The downlink frequency band 890 - 915 MHz (basic 900 MHz band only).

Channel Spacing: This indicates separation between adjacent carrier frequencies. In GSM, this is 200 kHz.

Speech Coding:

GSM uses linear predictive coding (LPC). The purpose of LPC is to reduce the bit rate. The LPC provides parameters for a filter that mimics the vocal tract. The signal passes through this filter, leaving behind a residual signal. Speech is encoded at 13 kbps.

Duplex Distance:

The duplex distance is 80 MHz. Duplex distance is the distance between the uplink and downlink frequencies. A channel has two frequencies, 80 MHz apart.

Misc:

- Frame duration: 4.615 ms
- Duplex Technique: Frequency Division Duple Xing (FDD) access mode previously known as WCDMA.
- Speech channels per RF channel: 8.

2.6.3 ADVANTAGES OF GSM:

- GSM is already used worldwide with over 450 million subscribers.
- International roaming permits subscribers to use one phone throughout Western Europe. CDMA will work in Asia, but not France, Germany, the U.K. and other popular European destinations.
- GSM is mature, having started in the mid-80s. This maturity means a more stable network with robust features. CDMA is still building its network.

- GSM's maturity means engineers cut their teeth on the technology, creating an unconscious preference.
- The availability of Subscriber Identity Modules, which are smart cards that provide secure data encryption give GSM m-commerce advantages.

2.9 LCD DISPLAY

LCD Background:

One of the most common devices attached to a micro controller is an LCD display. Some of the most common LCD‘s connected to the many microcontrollers are 16x2 and 20x2 displays. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

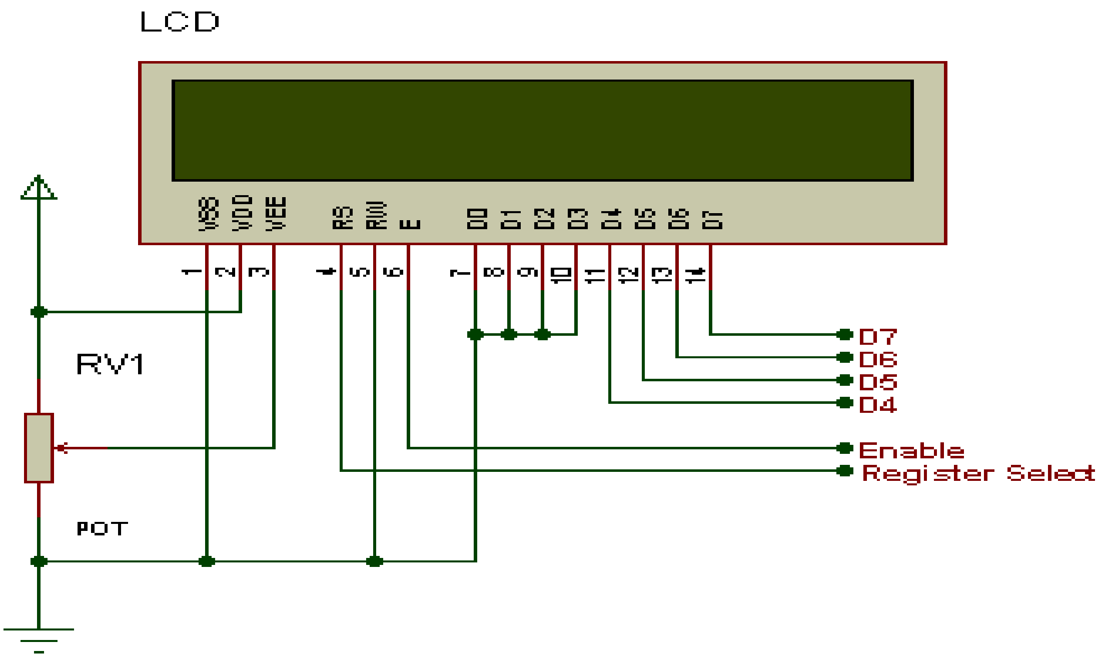


Figure 2.19: LCD Pin diagram

The LCD requires 3 control lines as well as either 4 or 8 I/O lines for the data bus. The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used the LCD will require a total of 7 data lines (3 control lines plus the 4 lines for the data bus). If an8-bit data bus is used the LCD will require a total of 11 data lines (3 control lines plus the 8 lines for the data bus).

The three control lines are referred to as **EN RS,** and **RW**.

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

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

The **RW** line is the "Read/Write" control line. When RW is low the information on data bus is being written to the LCD. When RW is high (1), the program is effectively queryi ng (or reading) the LCD. Only one instruction ("Get LCD status") is a read command. All others are write commands--so RW will almost always be low.

Pin description:

Pin no	Name	Description
Pin no.1	VSS	POWER SUPPLY(GND)
Pin no.2	VCC	POWER SUPPLY(+5V)
Pin no.3	VEE	CONTRAST ADJUST
Pin no.4	RS	DATA I/P=1; INSTRUCTION I/P=0
Pin no.5	R/W	READ=1;WRITE=0
Pin no.6	EN	ENABLE SIGNAL
Pin no.7	D0	DATA BUS LINE 0
Pin no.8	D1	DATA BUS LINE 1
Pin no.9	D2	DATA BUS LINE 2
Pin no.10	D3	DATA BUS LINE 3
Pin no.11	D4	DATA BUS LINE 4
Pin no.12	D5	DATA BUS LINE 5
Pin no.13	D6	DATA BUS LINE 6
Pin no.14	D7	DATA BUS LINE 7

Table 2.3 Pin description of LCD

The LCD requires 3 control lines as well as either 4 or 8 I/O lines for the data bus. The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used the LCD will require a total of 7 data lines (3 control lines plus the 4 lines for the data bus). If an8-bit data bus is used the LCD will require a total of 11 data lines (3 control lines plus the 8 lines for the data bus). The three control lines are referred to as **EN RS,** and **RW**.

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

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

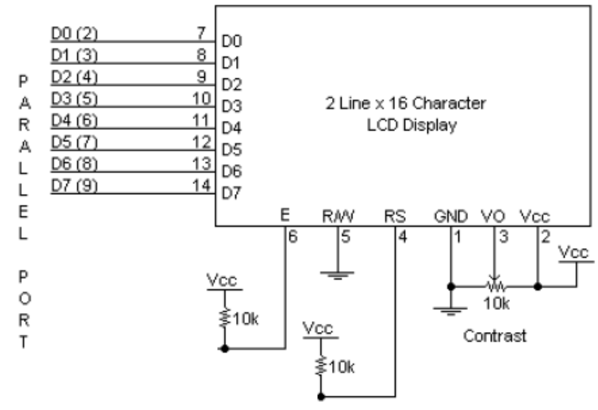

Figure 2.20: Schematic diagram of LCD

Circuit Description:

Above is the quite simple schematic. The LCD panel's Enable and Register Select is connected to the Control Port. The Control Port is an open collector / open drain output. While most Parallel Ports have internal pull-up resistors, there is a few which don't. Therefore by incorporating the two 10K external pull up resistors, the circuit is more portable for a wider range of computers, some of which may have no internal pull up resistors. We make no effort to place the Data bus into reverse direction. Therefore we hard wire the R/W line of the LCD panel, into write mode. This will cause no bus conflicts on the data lines. As a result we cannot read back the LCD's internal Busy Flag which tells us if the LCD has accepted and finished processing the last instruction. This problem is overcome by inserting known delays into our program. The 10k Potentiometer controls the contrast of the LCD panel. Nothing fancy here. As with all the examples, I've left the power supply out. We can use a bench power supply set to 5v or use an onboard +5 regulator. Remember a few de-coupling capacitors, especially if we have trouble with the circuit working properly.

SETB RW

Handling the EN control line:

As we mentioned above, the EN line is used to tell the LCD that we are ready for it to execute an instruction that we've prepared on the data bus and on the other control lines. Note that the EN line must be raised/ lowered before/after each instruction sent to the LCD regardless of whether that Instruction is read or write text or instruction. In short, we must always manipulate EN when communicating with the LCD. EN is the LCD's way of knowing that we are talking to it. If we don't raise/lower EN, the LCD doesn't know we're talking to it on the other lines. Thus, before we interact in any way with the LCD we will always bring the **EN** line low with the following instruction:

CLR EN

And once we've finished setting up our instruction with the other control lines and data bus lines, we'll always bring this line high:

SETB EN

The line must be left high for the amount of time required by the LCD as specified in its datasheet. This is normally on the order of about 250 nanoseconds, but checks the datasheet. In the case of a typical microcontroller running at 12 MHz, an instruction requires 1.08 microseconds to execute so the EN line can be brought low the very next instruction. However, faster Microcontrollers (such as the DS89C420 which executes an instruction in 90 nanoseconds given an 11.0592 MHz crystal) will require a number of NOPs to create a delay while EN is held high. The number of NOPs that must be inserted depends on the microcontroller we are using and the crystal we have selected.

The instruction is executed by the LCD at the moment the EN line is brought low with a final CLR EN instruction.

Checking the busy status of the LCD:

As previously mentioned, it takes a certain amount of time for each instruction to be executed by the LCD. The delay varies depending on the frequency of the crystal attached to the oscillator input of the LCD as well as the instruction which is being executed.

While it is possible to write code that waits for a specific amount of time to allow the LCD to execute instructions, this method of "waiting" is not very flexible. If the crystal frequency is changed, the software will need to be modified. A more robust method of programming is to use the "Get LCDStatus" command to determine whether the LCD is still busy executing the last instruction received.

The "Get LCD Status" command will return to us two bits of information; the information that is useful to us right now is found in DB7. In summary, when we issue the "Get LCD Status" command the LCD will immediately raise DB7 if it's still busy executing a command or lower DB7 to indicate that the LCD is no longer occupied. Thus our program can query the LCD until DB7 goes low, indicating the LCD is no longer busy. At that point we are free to continue and send the next command.

CHAPTER 3: PROJECT DESCRIPTION

In this chapter, schematic diagram and interfacing of PIC16F72 microcontroller with each module is considered.

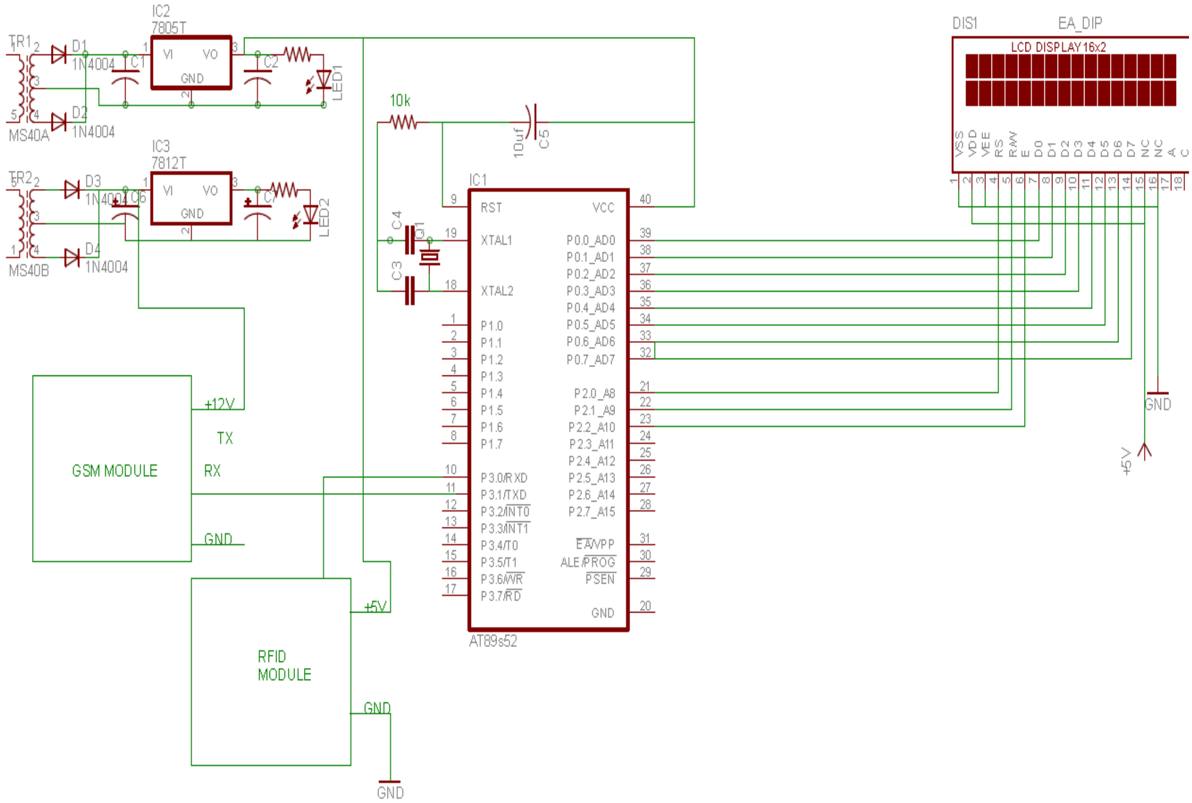

Fig 3.1: Schematic diagram of RFID and GSM based LMS

The above schematic diagram of RFID and GSM based LMS explains the interfacing section of each component with microcontroller, RFID and GSM. Crystal oscillator connected to 9th and 10th pins of micro controller and regulated power supply is also connected to micro controller and LED‘s also connected to microcontroller through resistors. The detailed explanation of each module interfacing with microcontroller is as follows:

3.1 INTERFACING CRYSTAL OSCILLATOR WITH MICRO CONTROLLER:

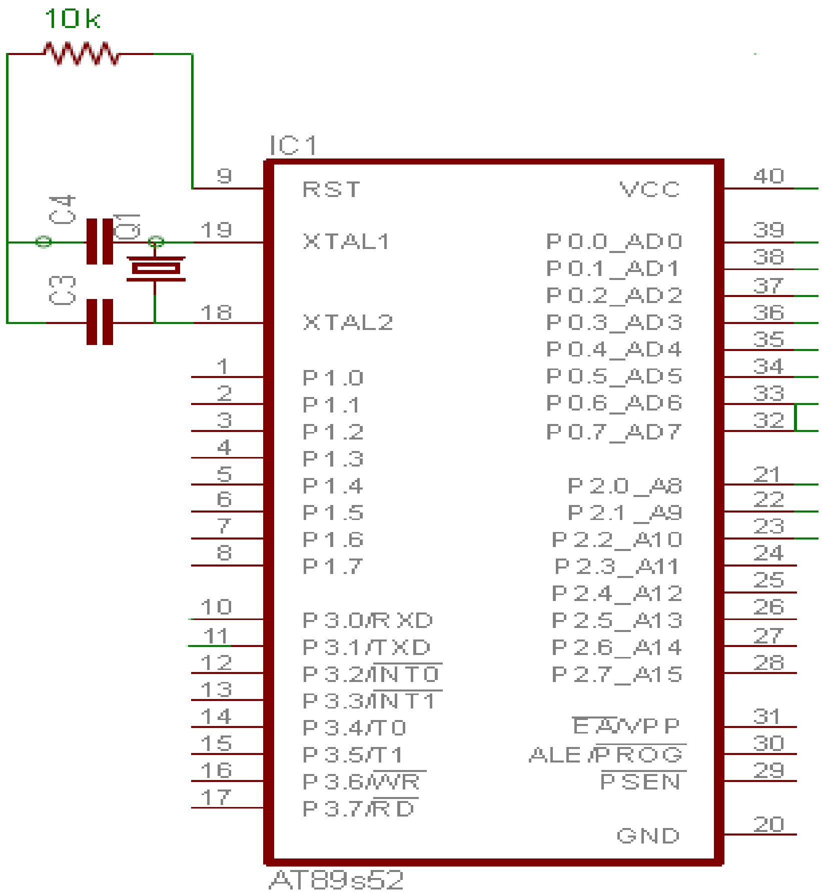

Fig 3.2: Diagram of crystal oscillator interfacing with micro controller

3.2 INTERFACING GSM MODEM WITH MICRO CONTROLLER:

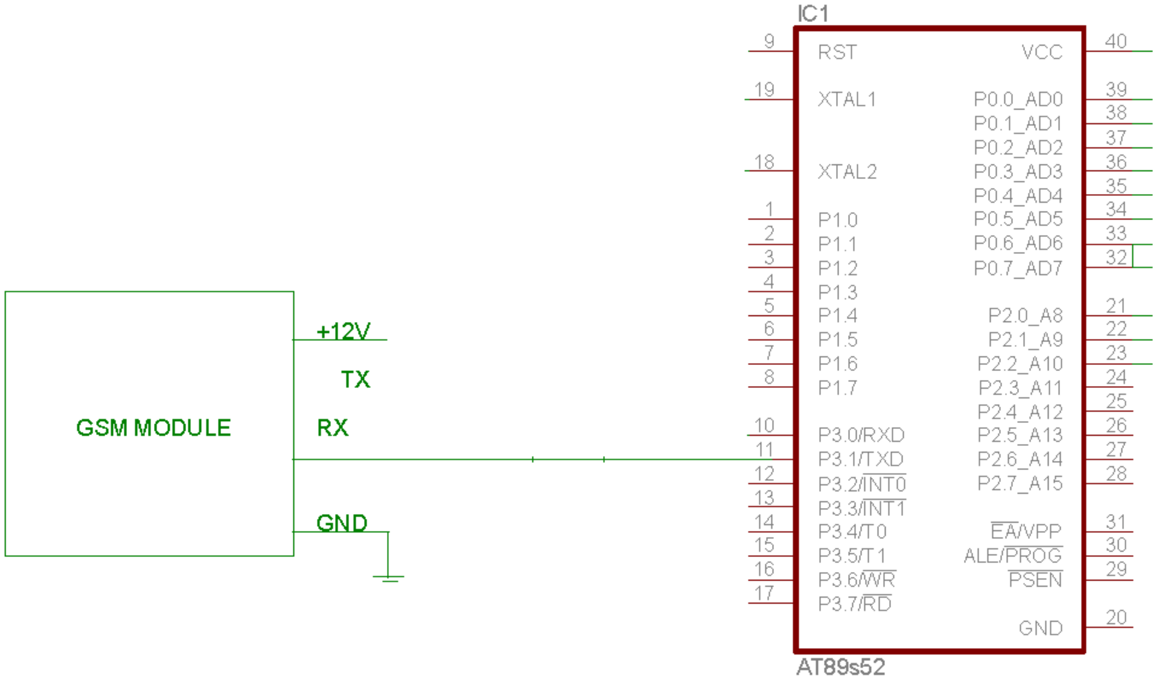

Fig 3.3: Diagram of GSM module interfacing with microcontroller

3.3 INTERFACING RFID MODULE WITH MICRO CONTROLLER:

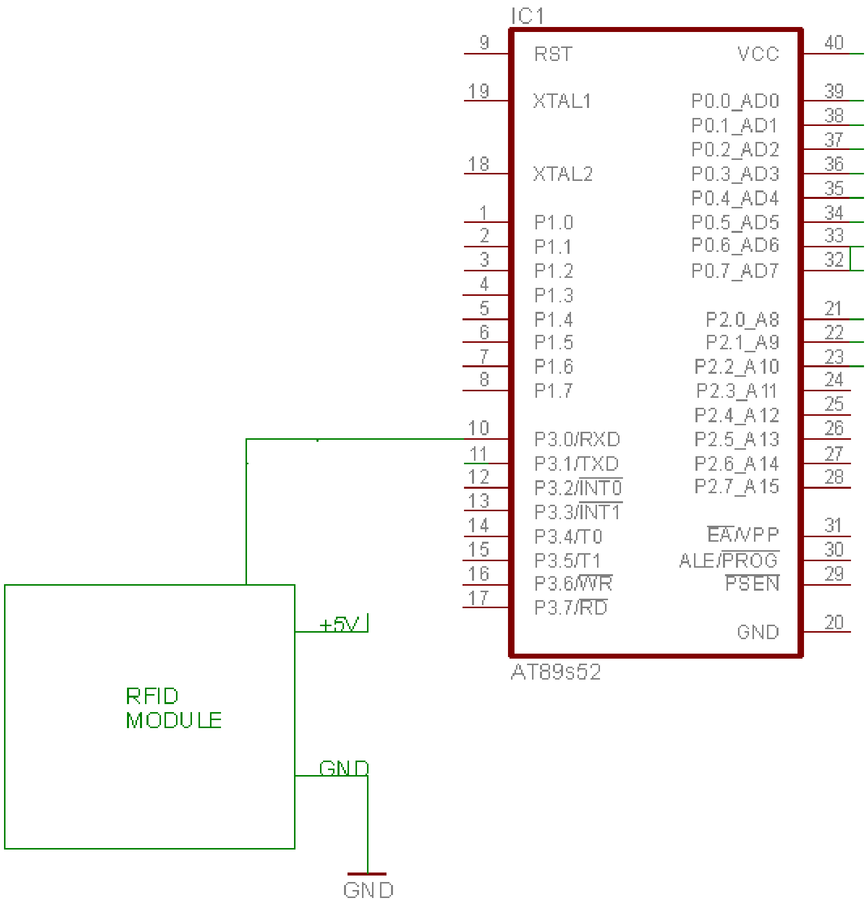

Fig 3.4: Diagram of crystal oscillator interfacing with microcontroller

3.4 INTERFACING LCD WITH MICRO CONTROLLER:

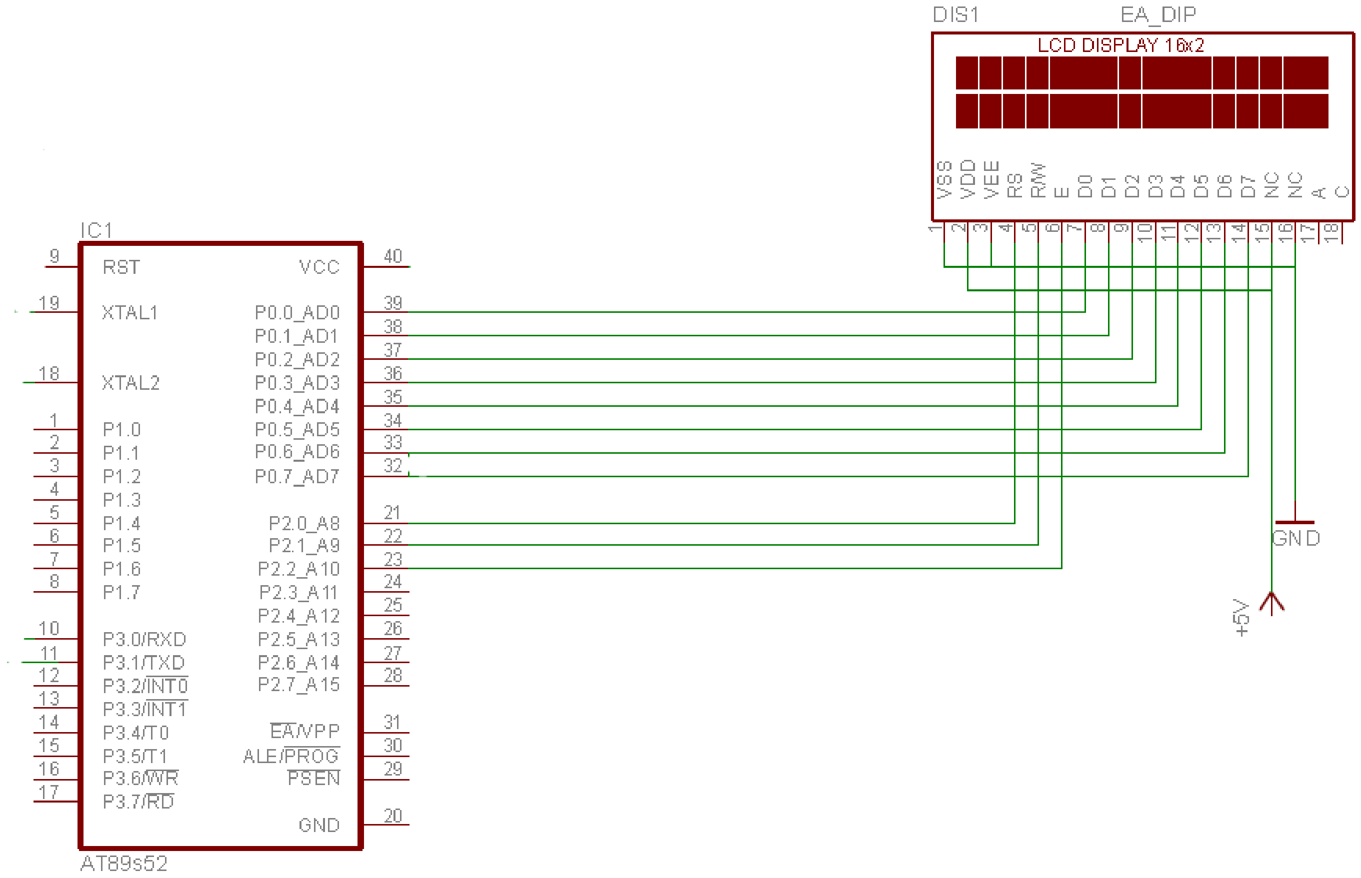

Fig 3.5: Diagram of crystal oscillator interfacing with microcontroller

CHAPTER 4: RESULTS

4.1 RESULT:

The project RFID based Library Management System is a unique project to be implemented in collage libraries to manage the books automatically and efficiently. It will use the microcontroller and RFID reader to identify and manage the books efficiently. Every book will have a unique RFID tag and every student will be provided unique RFID card as ID card for library. When a student swipes his /her card before RFID reader it will display his/her details with no. of books issued to him/her. If the student wants to issue a book then he will swipe his card and the book to be issued before RFID reader and it will issue the book. Similarly if the student wants to return the book he will swipe his card and the book it will automatically removed from his account if issued before to him. If some buddy tries to steal the book and pass from proximity of the RFID reader then it will blow the buzzer to alert the guard at the gate of library

CHATER 5: CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

FUTURE SCOPE:

Our project RFID and GSM Library Management System is mainly intended to design a security control system using RFID technology. The system consists of a RFID reader, LCD display which is interfaced to the Micro Controller. When a RFID tag is placed in front of RFID reader which reads the tag number and this is fed as input to the micro controller. The micro controller is programmed in such a way that the input from RFID reader is checked and displays the respective information on the LCD display. This project can be extended using a GSM module. GSM module sends the alert message to the respective authorities when an authorized card is detected by the RFID reader.

APPLICATIONS:

This system can be practically implemented in real time at places where security is a concern like banks, hospitals, schools, colleges etc.

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