Microcontroller Based Home Security System

Bachelor of Technology in

Electronics and Communication Engineering

under the Supervision of

Dr. D.S Saini

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to

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CERTIFICATE

This is to certify that project report entitled "**Microcontroller Based Home Security System**", submitted by **Yakshi Gupta(091072)**, **Diksha Chouhan(091085)** and **Surbhi Guleria(091115)** 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.

Project Supervisor

Date: 28th May 2013

Dr. D.S Saini

Associate Professor

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ACKNOWLWDGEMENT

As we conclude our project with God's grace, we have many people to thank ,for all the help, guidance and support they lent on us, throughout the course of our endeavour.

First and foremost, we thank Dr D.S Saini, our Project Guide, who has always encouraged us to put in our best efforts and deliver a quality and professional output.His methodology of making the system strong from inside has taught us that output is not the End of the project. We really thank him for his time and efforts.

Apart from these, countless events, countless people and several incidents have made a contribution to this project that is indescribable

Date:28th May 2013

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LIST OF COMPONENTS USED

S.NO.	NAME	QUANTITY	COLOUR	PINS
1.	8051 microcontroller	1	Black	40
2.		1	Black	3
3.	Switch	7	Black	-
4.	Diode	5	N.A	2
5.	Transformer	1	Black	-
6.	ULN 2803	1	Black	20
7.	Crystal oscillator	1	N.A	2
8.	Wires		N.A	2
9.	Capacitor-230pf	2	N.A	2
10.	Capacitor-1000μf	1	N.A	2
11.	Capacitor-10μf	1	N.A	2
12.	Capacitor-470μf	1	N.A	2
13.	Relay	1	N.A	5
14.	Regulator 7805	1	N.A	3
15.	Nut bolt	3	N.A	-
16.	Led	2	Red	2
17.	Ir led	1	N.A	2
18.	Photodiode	1	N.A	2
19.	LCD	1	N.A	16

20.	Resistor(56 K)	1	**N.A**	2
21.	Resistor(220 K)	1	**N.A**	2
22.	Resistor(150 K)	1	**N.A**	2
23.	Resistor(1 K)	1	**N.A**	2
24.	Resistor(10 K)	15	**N.A**	2
25.	Connector		**N.A**	-

ABSTRACT

Today's culture is filled with horror stories of home break-ins and burglaries, leaving people to fear that their home may not be protected from the outside world. Indian's want their home to be safe and secure from any would-be intruders.

This desire for security has caused an increase in the demand for sophisticated home security systems. This demand for better home security systems has also drifted over to a need for home automation. With this fact in mind we propose to build a security system, with home automation controls.

Our aim is to construct a Microcontroller Based Home Security System which accepts a 4 digit password and matches it with the pre stored one. And only if the password is correct the person is allowed to enter the house.

Here, we have also interfaced a 8051 Microcontroller with Alarm Buzzer.

CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

This project report is part of our academic curriculum of fourth year. This report comes under major project . this report contains in brief the work done by our group during the 7th and 8th semester in the project MICROCONTROLLER BASED HOME SECURITY SYSTEM.

Our aim is to construct an efficient security system that is mostly used in doors, lockers, big malls, Hotels and Commercial areas. This project is written in 8051 assembly language. It is a simple project with efficient security system and is based on the concept of microcontroller 8051.

1.2 OVERVIEW

For detection of an invalid entry of a person IR transmitter has been used in our project that too in a through beam position. This is such that whenever a person crosses through the ir rays, these rays get blocked and therefore are reflected on the photodiode. Then a high to low pulse is produced by the sensor. This pulse is continuously being monitored by the microcontroller section and when it detects the pulse, it starts a buzzer on the output.

We have also used a lock system in which the person has to enter a four digit password before getting into the house. The microcontroller matches the password and allows person to enter .

1.3 BLOCK DIAGRAM

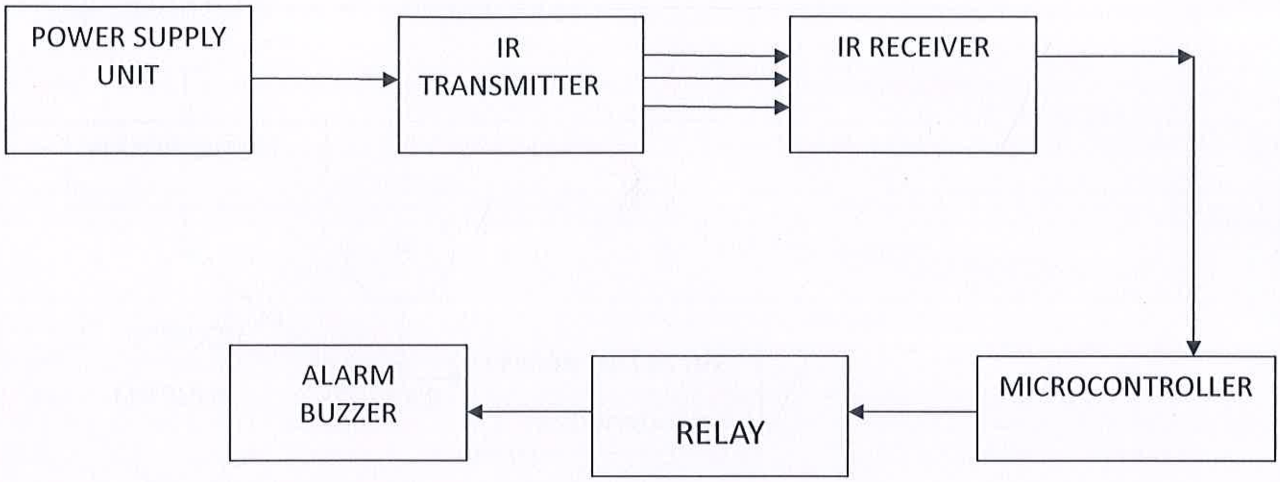

Figure 1.1 : Block Diagram Of The Project

This is the Block Diagram of our project. It explains all the major parts used in the project. The first one being Power Supply Unit. This supply unit consists of Transformer, Rectifier, Input Filter, Output Filter, Regulator and the LED for output detection.

The next block is the IR transmitter which consists of IR LED which constantly emits IR radiations. We also have a photodiode which detects the signals which are reflected upon the photodiode.

Then we have a microcontroller which detects the signal through ULN connected on it. The signal through the Relay is sent to the ULN which further transmits it to the Microcontroller.

The programming done in the microcontroller further performs the tasks and send signals to the LCD to display various captions.

1.4 FLOWCHART

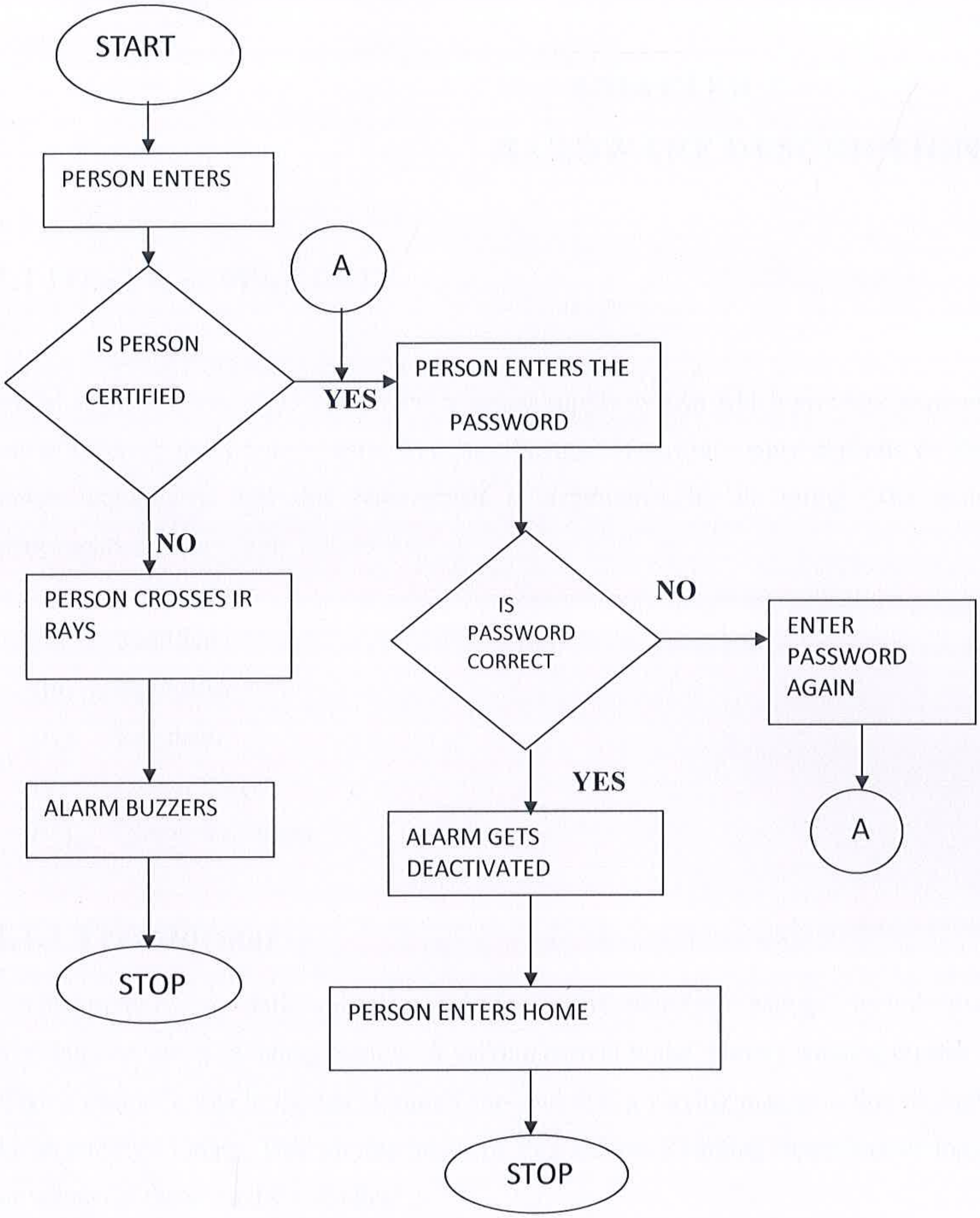

FIGURE 1.2 : Flow Chart Of Project

CHAPTER 2

HARDWARE DESCRIPTION

2.1 POWER SUPPLY UNIT

Initial stage of every electronic circuit is power supply system which provides required power to drive the whole system. The specification of power supply depends on the power requirement and this requirement is determined by its rating. The main components used in supply system are:

(i) Transformer

(ii) Rectifier

(iii) Input filter

(iv) Regulator

(v) Output Filter

(vi) Output Indication

2.1.1 Transformer

A transformer is a static electrical device that transfers energy by inductive coupling between its winding circuits. A varying current in the primary winding creates a varying magnetic flux in the transformer's core and thus a varying magnetic flux through the secondary winding. This varying magnetic flux induces a varying electromotive force or voltage in the secondary winding.

Transformers range in size from thumbnail-sized used in microphones to units weighing hundreds of tons interconnecting the power grid. A wide range of transformer designs are used in electronic and electric power applications. Transformers are essential for the transmission, distribution, and utilization of electrical energy.

STEP-UP AND STEP-DOWN TRANSFORMER

This is a very useful device, indeed. With it, we can easily multiply or divide voltage and current in AC circuits. Indeed, the transformer has made long-distance transmission of electric power a practical reality, as AC voltage can be "stepped up" and current "stepped down" for reduced wire resistance power losses along power lines connecting generating stations with loads. At either end (both the generator and at the loads), voltage levels are reduced by transformers for safer operation and less expensive equipment. A transformer that increases voltage from primary to secondary (more secondary winding turns than primary winding turns) is called a step-up transformer. Conversely, a transformer designed to do just the opposite is called a step-down transformer.

The step-up/step-down effect of coil turn ratios in a transformer is analogous to gear tooth ratios in mechanical gear systems, transforming values of speed and torque in much the same way.

Step-up and step-down transformers for power distribution purposes can be gigantic in proportion to the power transformers previously shown, some units standing as tall as a home. The following photograph shows a substation transformer standing about twelve feet tall

- A transformer designed to increase voltage from primary to secondary is called a step-up transformer. A transformer designed to reduce voltage from primary to secondary is called a step-down transformer.

- The transformation ratio of a transformer will be equal to the square root of its primary to secondary inductance (L) ratio.

2.1.1 (A) The ideal transformer

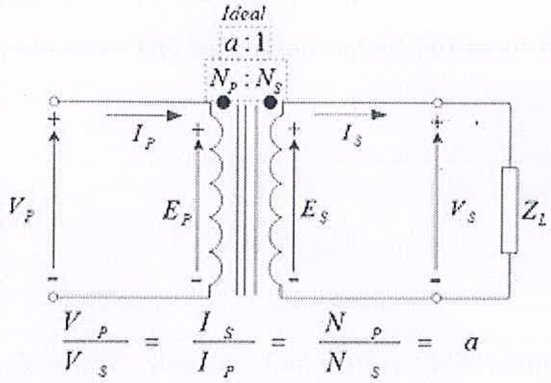

Figure 2.1 : Ideal Transformer

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The ideal, lossless, perfectly-coupled transformer shown in the circuit diagram has primary and secondary windings with N_P and N_S turns, respectively.

The ideal transformer induces secondary voltage $E_S = V_S$ as a proportion of the primary voltage $V_P = E_P$ and respective winding turns as given by the equation

$$\frac{V_P}{V_S} = \frac{E_P}{E_S} = \frac{N_P}{N_S} = a$$

Where,

- $V_P/V_S = E_P/E_S = a$ is the voltage ratio and $N_P/N_S = a$ is the winding *turns ratio*, the value of these ratios being respectively higher and lower than unity for step-down and step-up transformers
- V_P designates source impressed voltage,
- V_S designates output voltage, and,
- E_P & E_S designate respective emf induced voltages.

The main source of power supply used in our project is a transformer. The maximum output power of power supply is dependent on maximum output power of transformer .We determine power from its current and voltage rating. e.g.: if there is a transformer of 12V, 500mA then maximum power delivered by transformer is 6Watt.

It means we can drive a load from this transformer up to 6w.

In our project our maximum power requirement is 1watt. So to provide this power we use 12V/250mA transformer. The maximum output power of this transformer is 4watt.it means it can easily drive load up to 4 watt.

2.1.1RECTIFIER

A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction. The process is known as rectification. Physically, rectifiers take a number of forms, including vacuum tube diodes, mercury-arc valves, solid-state diodes, silicon-controlled rectifiers and other silicon-based semiconductor switches. Rectifiers have many uses, but are often found serving as components of DC power supplies and high-voltage direct current power transmission systems. Rectification may serve in roles other than to generate direct current for use as a source of power. The simple process of rectification produces a type of DC characterized by pulsating voltages and currents (although still unidirectional). Depending upon the type of end-use, this type of DC current may then be further modified into the type of relatively constant voltage DC characteristically produced by such sources as batteries and solar cells.

There are two types of rectifier

1. Half wave rectifier

2. Full wave rectifier

2.1.2 (A) HALF WAVE RECTIFIER

It is a simplest rectifier circuit. It uses only one diode and utilizes alternate half cycles of the input sinusoidal .The circuit consists of a series connection of diode and load resistor. The input to the rectifier is the voltage across the secondary of the transformer. It has alternate positive and negative half cycles.

Half wave rectification of a single-phase supply, either the positive or negative half of the AC wave is passed, while the other half is blocked. Because only one half of the input waveform reaches the output, mean voltage is lower. Half-wave rectification requires a single diode in a single-phase supply, or three in a three-phase supply. Rectifiers yield a unidirectional but pulsating direct current; half-wave rectifiers produce far more ripple than full-wave rectifiers, and much more filtering is needed to eliminate harmonics of the AC frequency from the output.

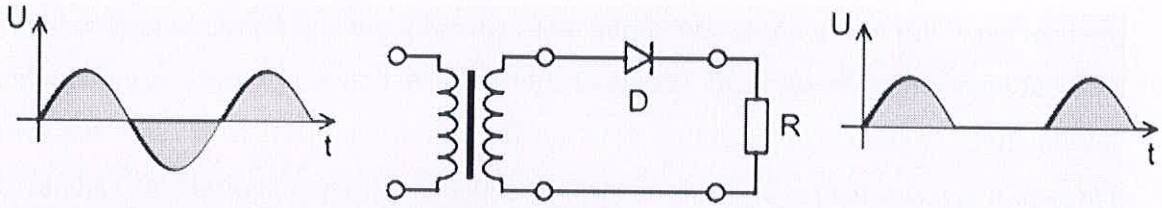

Figure 2.2:Half Wave Rectifier

2.1.2 (B) FULL WAVE RECTIFIER

A full-wave rectifier converts the whole of the input waveform to one of constant polarity (positive or negative) at its output. Full-wave rectification converts both polarities of the input waveform to pulsating DC (direct current), and yields a higher average output voltage. Two diodes and a center tapped transformer, or four diodes in a bridge configuration and any AC source (including a transformer without center tap), are needed. Single semiconductor diodes, double diodes with common cathode or common anode, and four-diode bridges, are manufactured as single components.

For single-phase AC, if the transformer is center-tapped, then two diodes back-to-back (cathode-to-cathode or anode-to-anode, depending upon output polarity required) can form a full-wave rectifier. Twice as many turns are required on the transformer secondary to obtain the same output voltage than for a bridge rectifier, but the power rating is unchanged.

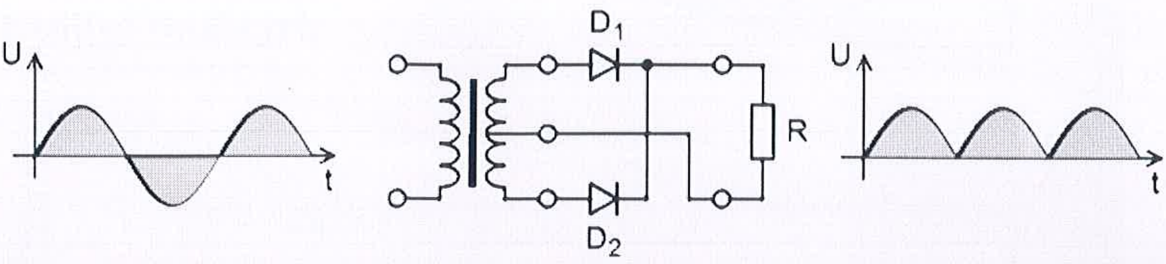

Figure 2.3:Full Wave Rectifier

2.1.2 (C) BRIDGE RECTIFIER

Another type of circuit that produces the same output waveform as the full wave rectifier circuit above, is that of the Full Wave Bridge Rectifier. This type of single phase rectifier uses four individual rectifying diodes connected in a closed loop "bridge" configuration to produce the desired output. The main advantage of this bridge circuit is that it does not require a special centre tapped transformer, thereby reducing its size and cost. The single secondary winding is connected to one side of the diode bridge network and the load to the other side as shown below.

The Diode Bridge Rectifier

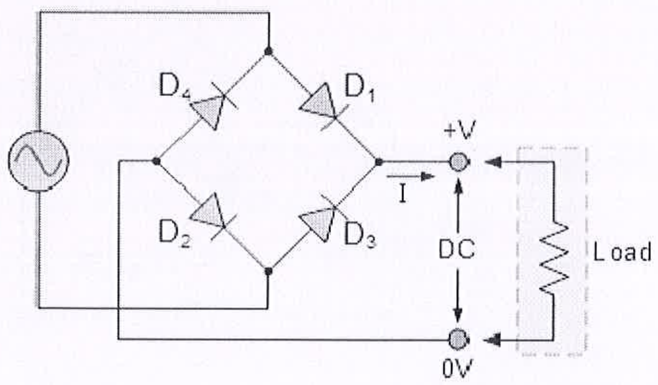

Figure 2.4: Diode Bride Rectifier

The four diodes labeled D_1 to D_4 are arranged in "series pairs" with only two diodes conducting current during each half cycle. During the positive half cycle of the supply, diodes D1 and D2 conduct in series while diodes D3 and D4 are reverse biased and the current flows through the load as shown below.

Positive Half-cycle

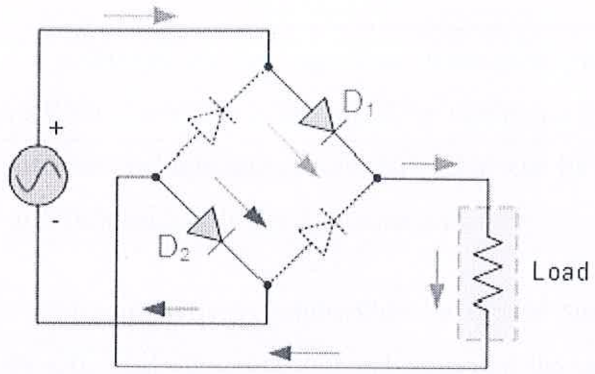

Figure 2.5: Positive Half Cycle

During the negative half cycle of the supply, diodes D3 and D4 conduct in series, but diodes D1 and D2switch "OFF" as they are now reverse biased. The current flowing through the load is the same direction as before.

Negative Half-cycle

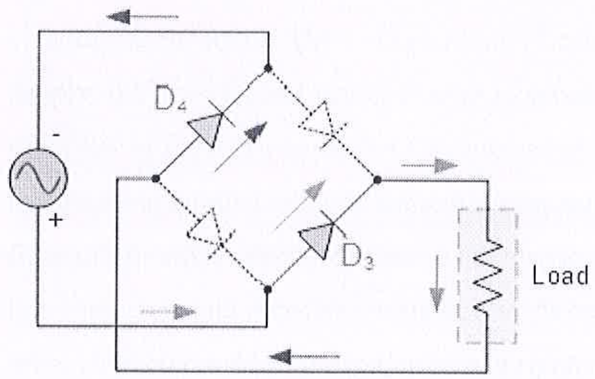

Figure 2.6:Negative Half Cycle

As the current flowing through the load is unidirectional, so the voltage developed across the load is also unidirectional the same as for the previous two diode full-wave rectifier, therefore the average DC voltage across the load is $0.637V_{max}$. However in reality, during each half cycle the current flows through two diodes instead of just one so the amplitude of the output voltage is two voltage drops (2 x 0.7 = 1.4V) less than the input

V_{MAX} amplitude. The ripple frequency is now twice the supply frequency (e.g. 100Hz for a 50Hz supply)

Although we can use four individual power diodes to make a full wave bridge rectifier, pre-made bridge rectifier components are available "off-the-shelf" in a range of different voltage and current sizes that can be soldered directly into a PCB circuit board or be connected by spade connectors.

The image to the right shows a typical single phase bridge rectifier with one corner cut off. This cut-off corner indicates that the terminal nearest to the corner is the positive or +ve output terminal or lead with the opposite (diagonal) lead being the negative or -ve output lead. The other two connecting leads are for the input alternating voltage from a transformer secondary winding.

2.1.3 Input filter

After rectification we obtain dc supply from ac but it is not pure dc it may have some ac ripples .To reduce these ripples we use filters. It comprises of two filters –low frequency ripple filter and high frequency ripple filter. To reduce low frequency ripples we use electrolytic capacitor. The voltage rating of capacitor must be double from incoming dc supply. It blocks dc and passes ripples to ground. A typical capacitor input filter consists of a filter or reservoir capacitor C1, connected across the rectifier output, an inductor L, in series and another filter or smoothing capacitor, C2, connected across the load, RL. A filter of this sort is designed for use at a particular frequency, generally fixed by the AC line frequency and rectifier configuration. When used in this service, filter performance is often characterized by its regulation and ripple.

The capacitor C1 offers low reactance to the AC component of the rectifier output while it offers infinite resistance to the DC component. As a result the capacitor shunts an appreciable amount of the AC component while the DC component continues its journey to the inductor L.

The inductor L offers high reactance to the AC component but it offers almost zero resistance to the DC component. As a result the DC component flows through the inductor while the AC component is blocked.

The capacitor C2 bypasses the AC component which the inductor had failed to block. As a result only the DC component appears across the load RL.

The component value for the inductor can be estimated as an inductance that resonates the smoothing capacitor(s) at or below one tenth of the minimum ac frequency in the power supplied to the filter (100 Hz from a full-wave rectifier in a region where the power supply is 50Hz). Thus if reservoir and smoothing capacitors of 2200 microfarads are used, a suitable minimum value for the inductor would be that which resonates 2200 microfarads (μF) to 10 Hz, i.e. 1 mH. A larger value is preferable provided the inductor can carry the required supply current.

2.1.4 Regulator

Regulator is a device which provides constant output voltage with varying input voltage. The 78XX regulator is a family of self-contained fixed linear voltage regulator integrated circuits. The 78xx family is commonly used in electronic circuits requiring a regulated power supply. For ICs within the family, the *xx* is replaced with two digits, indicating the output voltage (for example, the 7805 has a 5 volt output, while the 7812 produces 12 volts). The 78XX series ICs are positive voltage regulators: they produce a voltage that is positive relative to a common ground. 78xx ICs have three terminals and are commonly found in the TO220 form factor, although smaller surface-mount and larger TO3 packages are available. These devices support an input voltage anywhere from a couple of volts over the intended output voltage, up to a maximum of 35 to 40 volts depending on the make, and typically provide 1 or 1.5 amperes of current . We have used fixed voltage regulator LM7805 in the project. This regulator converts the 12V DC coming from the rectifier into 5V DC.

2.1.5Output filter

It is used to filter out output ripple if any.

2.1.6Output indication

A light emitting diode is a semiconductor light source. LEDs are used as indicator lamps in many devices and are increasingly used for other lightning .Early LEDs emitted low intensity red light but modern versions are available across the visible ultra violet and infrared wavelengths, with very high brightness. LEDs are produced in variety of shapes and sizes and color of plastic lenses is often the same actual color of light emitted. But not always. For instance purple plastic s often used for IR led's, and most blue devices have colorless housing. The main types of LEDs are miniature, high power devices and custom designs such as alpha numeric or multicolor.

We use LED to observe the functioning of our system. If the LED glows it confirms proper functioning of our supply.

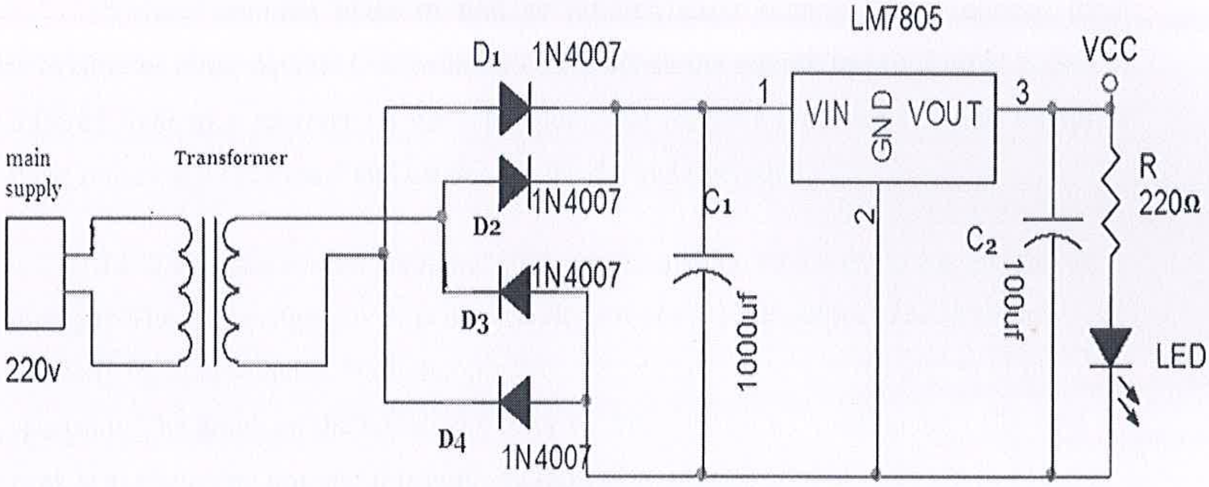

Figure 2.7: Power supply unit

2.2 IR LED

An IR LED, also known as IR transmitter, is a special purpose LED that transmits infrared rays in the range of 760 nm wavelength. Such LEDs are usually made of gallium arsenide or aluminum gallium arsenide. They, along with IR receivers, are commonly used as sensors. The appearance is same as a common LED. Since the human eye cannot see the infrared radiations, it is not possible for a person to identify whether the IR LED is working or not, unlike a common LED.

An infrared LED is, like all LEDs, a type of diode, or simple semiconductor. Diodes are designed so that electric current can only flow in one direction. As the current flows, electrons fall from one part of the diode into holes on another part. In order to fall into these holes, the electrons must shed energy in the form of photons, which produce light.

The wavelength and color of the light produced depend on the material used in the diode. Infrared LEDs use material that produces light in the infrared part of the spectrum, that is, just below what the human eye can see. Different infrared LEDs may produce infrared light of differing wavelengths, just like different LEDs produce light of different colors.

A very common place to find an infrared LED is in a remote control for a television or other device. One or more LEDs inside the remote transmit rapid pulses of infrared light to a receiver on the television. The receiver then decodes and interprets these pulses as a command and carries out the desired operation.

LED colors are often given in "nm", or nanometers, which is the wavelength of the light. The wavelength given is the wavelength of the peak output - LEDs are not perfectly monochromatic, but rather produce wavelengths over a small region of the spectrum. The graph on the left shows color vs. intensity for a typical green LED - the peak is at about 565 nm, but it is emitting light over a range of about 520 nm to 610 nm. Spectral line half-width is the width of this curve at 50% intensity (0.5 on the Y-axis) - for this LED, it is about 30 nm - and is a measure of the "purity" of the color.

Notice the temperature given in the upper right corner of the graph - LEDs emit slightly different colors at different temperatures. They also emit different colors at different currents, especially white LEDs which depend on phosphors to change the colored light of the die to white light.

Infrared LEDs

The infrared band can be divided into Near Infrared (NIR) and Far Infrared (IR). Far infrared is the thermal infrared used to detect hot objects or see heat leaks in buildings, and is way beyond the range of LEDs. (NIR can be further divided into two bands, long wave and shortwave NIR, based on how film and CCD cameras react, which I'll get into elsewhere, else when, and else why.)

Infrared LEDs are sometimes called IREDs (Infra Red Emitting Diodes).

Ultraviolet LEDs

Ultraviolet light is divided into three bands: UV-A, which is fairly innocuous; UV-B, which causes sunburns; and UV-C, which kills things. Most UV-B and all UV-C from the sun is filtered out by the ozone layer, so we get very little of it naturally. LEDs emit UV-A.

400 nm is a pretty common wavelength for UV LEDs. This is right on the border between the violet and ultraviolet, so a significant portion of the light emitted is visible. For this reason 400 nm UV LEDs are sometimes rated in milli candela, even though as much as half of their energy is invisible. LEDs with lower wavelengths, such as 380nm, are usually not rated in milli candela, but in milli watts.

The relationship between luminous flux, luminous intensity, and beam angle means is that focussing a given LED into a tighter beam (decreasing the beam angle) will increase its luminous intensity (brightness) without actually increasing the luminous flux (amount of light) it puts out. Keep this in mind when buying LEDs for illuminating purposes - a 2000 mcd 30° LED puts out just as much light as am 8000 mcd LED with a 15° viewing angle. (The angle is half in both width and height, so the beam is four times as bright.)

2.3 PHOTODIODE

A photodiode is a type of photo detector capable of converting light into either current or voltage, depending upon the mode of operation.

Photo diode is a p-n junction diode operated in reverse bias. It has a transparent window at the depletion region. When light of suitable energy greater than the energy gap of the semiconductor is incident on the junction, then electron hole pairs are created due to absorption of photons. due to electric field of the junction, electrons and holes are separated before they can recombine. The direction of the electric field is such that electrons reach the n-side and holes to the p-side. This gives rise to an EMF and subsequently a photocurrent. The mechanism of the photodiode is like that of a miniaturized solar cell. Their response time is fast, on the order of nanoseconds. As light detectors, they are reverse biased – the reverse current is linearly proportional to the luminance striking diode. A photodiode consists of an active p-n junction which is operated in reverse bias. When light falls on the junction a reverse current flows which is proportional to luminance. The linear response to light makes it an element in useful photo detectors for some applications. It is also used as the active element in light activated switches. Photo diodes can never work under forward bias, period. They are much more efficient under reverse bias conditions where the depletion layer width is much more and the voltage drop is high. This helps in better absorption of the photons which enhances the production of induced current.

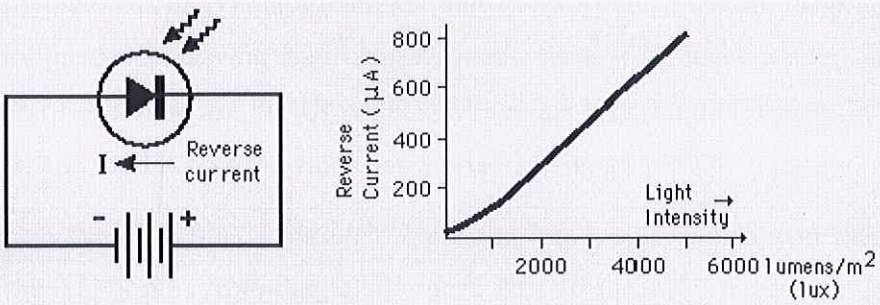

Figure2.7:Photodiode characteristics

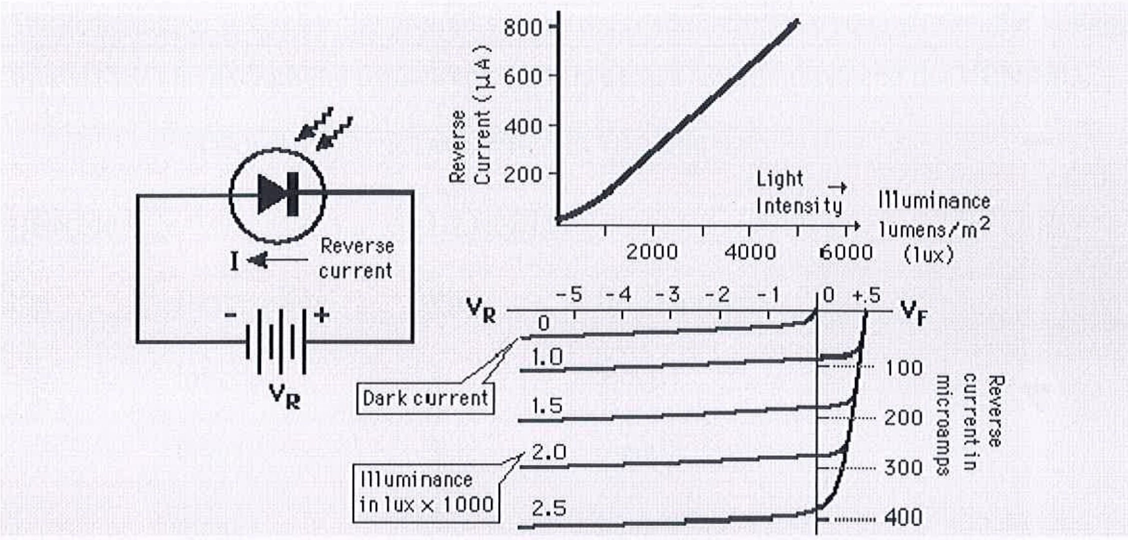

Figure2.8:Photodiode characteristics

2.4 ULN 2803

Two electronic transistors can be connected to form a *Darlington transistor* (sometimes called a Darlington *pair*), which can switch much more current than the collector-emitter circuit of a standard transistor can. You can use darlington transistors to switch up to 500 mA from the output of a parallel-port data pin, which is enough current to drive a mechanical relay or a small electric motor.

Rather than use individual darlington transistors, you can use an integrated circuit specially designed for driving high-current loads from TTL-level inputs. The most common ICs of this type are the ULN2003, which has 7 darlington drivers in a 16-pin DIP package, and the ULN2803, which has 8 drivers in an 18-pin DIP package.

As you can see, pins 1 through 7 are the input pins, which you can connect directly to the output pins from the parallel port. Pins 10 through 16 are the output pins, which you can connect to the circuit you want to control. Pin 8 connects to ground, and pin 9 connects to a voltage source.

The output circuit for a ULN2003/2803 is a little different from what you may expect. Rather than sourcing current for the load, the darlington array sinks the current.

Thus, the output pin is on the ground side of the load circuit. As you can see, the voltage source (Vss) feeds both the load circuit (in this case, a small motor) and the ULN2003.

Table 2.1:Pinout Description of ULN2803

ULN2003		**ULN2803**	
Pin	**Description**	**Pin**	**Description**
1	Input 1	1	Input 1
2	Input 2	2	Input 2
3	Input 3	3	Input 3
4	Input 4	4	Input 4
5	Input 5	5	Input 5
6	Input 6	6	Input 6
7	Input 7	7	Input 7
8	Common ground	8	Input 8
9	Vss	9	Common ground
10	Output 1	10	Vss
11	Output 2	11	Output 1
12	Output 3	12	Output 2
13	Output 4	13	Output 3
14	Output 5	14	Output 4
15	Output 6	15	Output 5
16	Output 7	16	Output 6
		17	Output 7
		18	Output 8

2.5 MICROCONTROLLER 8051

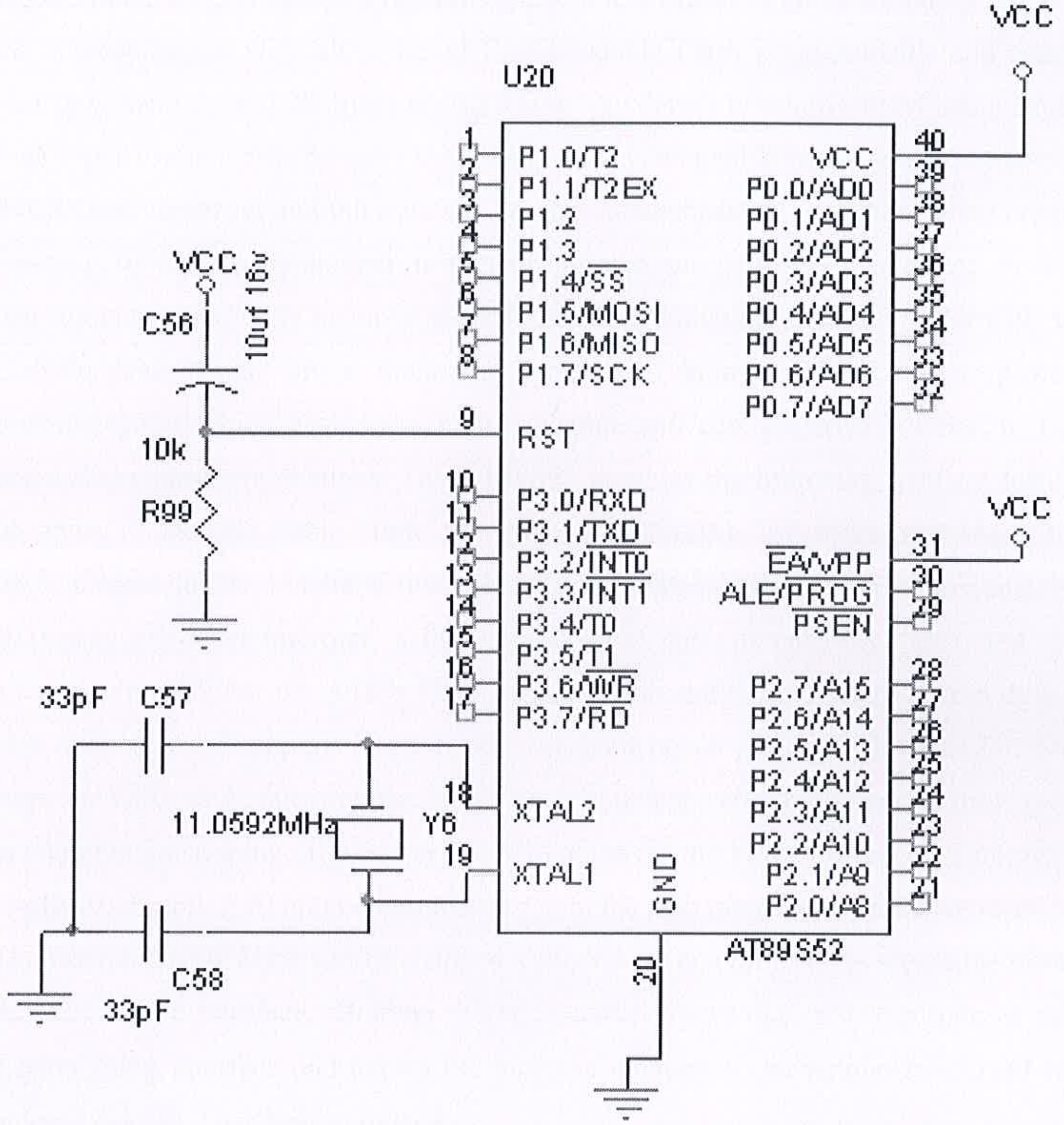

Figure 2.9:Pinout Diagram Of Microcontroller 8051

2.5.1 INTRODUCTION

AT89S52 is an ATMEL controller with the core of Intel MCS-51. It has same pin configuration as give above. The AT89S52 is a low-power, high-performance CMOS 8-bit microcomputer with 8K bytes of Downloadable Flash programmable and erasable read only memory and 2K bytes of EEPROM. The device is manufactured using Atmel's high density nonvolatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out. The on-chip Downloadable Flash allows the program memory to be reprogrammed in-system through an SPI serial interface or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Downloadable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Downloadable Flash, 2K bytes of EEPROM, 256 bytes of RAM, 32 I/O lines, programmable watchdog timer, two Data Pointers, three 16-bit timer/counters, a six-vector two-level interrupt, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power down Mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

The Downloadable Flash can be changed a single byte at a time and is accessible through the SPI serial interface. Holding RESET active forces the SPI bus into a serial programming interface and allows the program memory to be written to or read from unless Lock Bit 2 has been activated.

2.5.2 FEATURES

• Compatible with MCS-51™Products

• 8K bytes of In-System Reprogrammable Downloadable Flash Memory

- SPI Serial Interface for Program Downloading

- Endurance: 1,000 Write/Erase Cycles

• 4.0V to 5.5V Operating Range
• Fully Static Operation: 0 Hz to 33 MHz
• 256 x 8 bit Internal RAM
• 32 Programmable I/O Lines
• Three 16 bit Timer/Counters
• Eight Interrupt Sources
• Full Duplex UART Serial Channel
• Low Power Idle and Power Down Modes
• Interrupt Recovery From Power Down Mode

2.5.3 ADVANTAGES

- Less power consumption
- Low cost
- Less space required
- High speed

2.5.4 PIN DESCRIPTION:

VCC: Supply voltage.

GND: Ground.

PORT 0

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

PORT 1

Port 1 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 1 output buffers can sink/source four TTL inputs. When 1s are written to Port 1 pins, they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 1 pins that are externally being pulled low will source current (IIL) because of the internal pull-ups. In addition, P1.0 and P1.1 can be configured to be the timer/counter 2 external count input (P1.0/T2) and the timer/counter 2 trigger input (P1.1/T2EX), respectively, as shown in the following table .Port 1 also receives the low-order address bytes during Flash programming and verification.

PORT 2

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

PORT 3

Port 3 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 3 output buffers can sink/source four TTL inputs. When 1s are written to Port 3 pins, they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 3 pins that are externally being pulled low will source current (IIL) because of the pull-ups.
Port 3 receives some control signals for Flash programming and verification. Port 3 also serves the functions of various special features of the AT89S52, as shown in the following table.

RST

Reset input. A high on this pin for two machine cycles while the oscillator is running resets the device. This pin drives high for 98 oscillator periods after the Watchdog times out. The DISRTO bit in SFR AUXR (address 8EH) can be used to disable this feature. In the default state of bit DISRTO, the RESET HIGH out feature is enabled

.

ALE/PROG

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

PSEN

Program Store Enable (PSEN) is the read strobe to external program memory. When the AT89S52 is executing code from external program memory, PSEN is activated twice each machine cycle, except that two PSEN activations are skipped during each access to external data memory.

EA/VPP

External Access Enable. EA must be strapped to GND in order to enable the device to fetch code from external program memory locations starting at 0000H up to FFFFH. Note, however, that if lock bit 1 is programmed, EA will be internally latched on reset. EA should be strapped to VCC for internal program executions.

This pin also receives the 12-volt programming enable voltage (VPP) during Flash programming.

XTAL1: Input to the inverting oscillator amplifier and input to the internal clock operating circuit.

XTAL2: Output from the inverting oscillator amplifier

2.6.1 DISPLAY UNIT

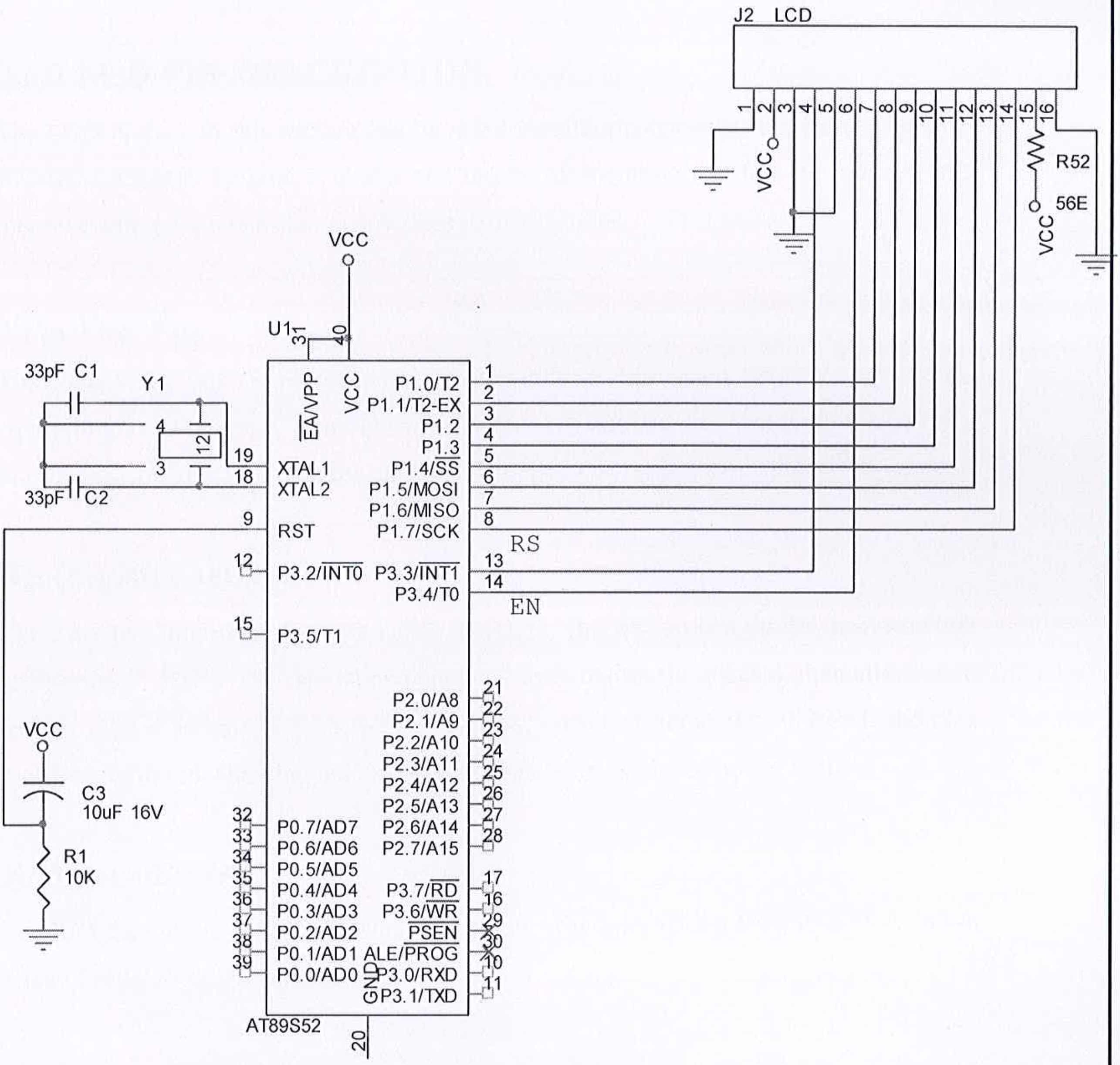

Figure2.10:Pinout Of LCD Display

2.6.2 LCD DISPLAY

Liquid crystal displays (LCD) is a alphanumeric display and widely used in recent years as compared to LEDs. This is due to the declining prices of LCD, the ability to display numbers, characters and graphics, incorporation of a refreshing controller into the LCD, their by relieving the CPU of the task of refreshing the LCD and also the ease of programming for characters and graphics. We have used JHD162A advanced version of HD44780 based LCD.

2.6.3 LCD PIN DESCRIPTION

The LCD discuss in this section has the most common connector used for the Hitatchi JHD162A LCD is 16 pins in a row and modes of operation and how to program and interface with microcontroller is describes in this section

V_{CC}, V_{SS}, V_{EE}

The voltage V_{CC} and V_{SS} provided by +5V and ground respectively while V_{EE} is used for controlling LCD contrast. Variable voltage between Ground and Vcc is used to specify the contrast (or "darkness") of the characters on the LCD screen.

RS (register select)

There are two important registers inside the LCD. The RS pin is used for their selection as follows. If RS=0, the instruction command code register is selected, then allowing to user to send a command such as clear display, cursor at home etc.. If RS=1, the data register is selected, allowing the user to send data to be displayed on the LCD.

R/W (read/write)

The R/W (read/write) input allowing the user to write information from it. R/W=1, when it read and R/W=0, when it writing.

EN (enable)

The enable pin is used by the LCD to latch information presented to its data pins. When data is supplied to data pins, a high power, a high-to-low pulse must be applied to this pin in order to for the LCD to latch in the data presented at the data pins.

D0-D7 (data lines)

The 8-bit data pins, D0-D7, are used to send information to the LCD or read the contents of the LCD's internal registers. To displays the letters and numbers, we send ASCII codes for the letters A-Z, a-z, and numbers 0-9 to these pins while making RS =1. There are also command codes that can be sent to clear the display or force the cursor to the home position or blink the cursor.

We also use RS =0 to check the busy flag bit to see if the LCD is ready to receive the information. The busy flag is D7 and can be read when R/W =1 and RS =0, as follows: if R/W =1 and RS =0, when D7 =1(busy flag =1), the LCD is busy taking care of internal operations and will not accept any information. When D7 =0, the LCD is ready to receive new information.

Each pixel of an LCD typically consists of a layer of molecules aligned between two transparent electrodes, and two polarizing filters, the axes of transmission of which are (in most of the cases) perpendicular to each other. With actual liquid crystal between the polarizing filters, light passing through the first filter would be blocked by the second (crossed) polarizer.

The surface of the electrodes that are in contact with the liquid crystal material are treated so as to align the liquid crystal molecules in a particular direction. This treatment typically consists of a thin polymer layer that is unidirectional rubbed using, for example, a cloth. The direction of the liquid crystal alignment is then defined by the direction of rubbing. Electrodes are made of the transparent conductor Indium Tin Oxide (ITO). The liquid-crystal display is intrinsically a "passive" device, it is a simple light valve. The managing and control of the data to be displayed is performed by one or more circuits commonly denoted as LCD drivers

2.6.4 INTERFACING OF MICROCONTROLLER WITH LCD

In our system we have connected LCD to the controller on Port 0. the register select pin (RS) of LCD is connected with the port 1_0 of controller. EN pin of LCD is connected with Port 1_1 of controller to send the enable pulse .

Table 2.2: LCD Command

LCD COMMAND CODES	
CODE (HEX)	COMMAND TO LCD INSTRUCTION REGISTER
1	Clear display screen.
2	Return home.
4	Decrement cursor. (shift cursor to left)
6	Increment cursor. (shift cursor to right)
5	Shift display right.
7	Shift display left.
8	Display off ,cursor off.
A	Display off, cursor on.
C	Display on, cursor off.
E	Display on , cursor blinking.
80	Force cursor to beginning of 1st line.
C0	Force cursor to beginning of 2nd line.
1C	Shift the entire display to right.

2.7 RELAY UNIT

A relay is an electrically operated switch. The relay contacts can be made to operate in the pre-arranged fashion. For instance, normally open contacts close and normally closed contacts open. In electromagnetic relays, the contacts however complex they might be, they have only two position i.e. OPEN and CLOSED, whereas in case of electromagnetic switches, the contacts can have multiple positions.

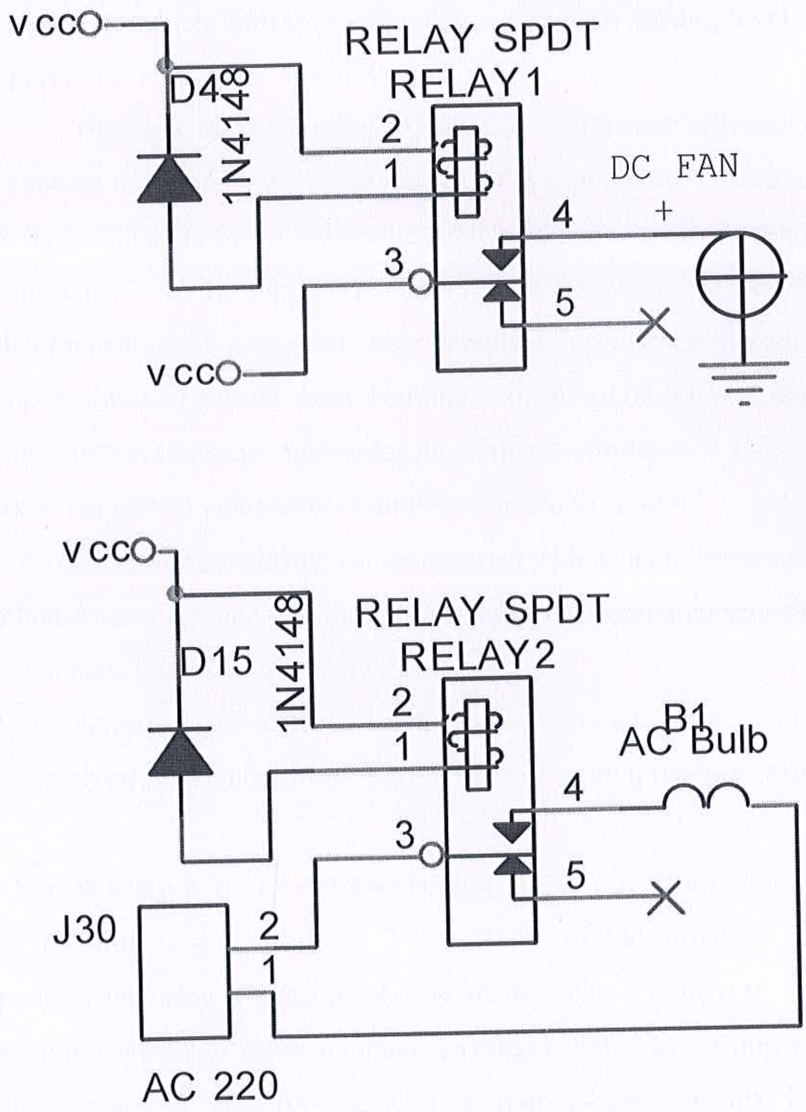

Figure2.11:Relay

2.7.1 NEED FOR THE USE OF RELAY

When an electromechanical relay is de-energized rapidly by a mechanical switch or semiconductor, the collapsing magnetic field produces a substantial voltage transient in its effort to disperse the stored energy and oppose the sudden change of current flow. A 12VDC relay, for example, may generate a voltage of 1,000 to 1,500 volts during turn-off. With the advent of modern electronic systems, this relatively large voltage transient has created EMI, semiconductor breakdown, and switch wear problems for the design engineer. It has thus become common practice to suppress relay coils with other components which limit the peak voltage to a much smaller level. Types of Transient Suppression Utilized with Relays

The basic techniques for suppression of transient voltages from relay coils are shown in Figure 1. As observed here, the suppression device may be in parallel with the relay coil or in parallel with the switch used to control the relay. It is normally preferred to have the suppression parallel to the coil since it can be located closer to the relay (except in the case of PC board applications where either may be used).When the suppression is in parallel with the relay coil, any of the followingmay be used.

A. A bilateral transient suppressor diode that is similar in V-I characteristics to two zener diodes connected cathode to cathode (or anode to anode).

B. A reverse-biased rectifier diode in series with a zener diode such that their anodes (or cathodes) are common and the rectifier prevents normal current flow.

C. A metal-oxide-varistor (MOV).

D. A reversed-biased rectifier diode in series with a resistor.

E. A resistor, when conditions permit its use, is often the most effective

A typical relay will have an accelerating motion of its armature toward the unenergized rest position during drop-out. The velocity of the armature at the instant of contact opening will play a significant role in the relay's ability to avoid "tack welding" by providing adequate force to break any light welds made during the "make" of a high current resistive load (or one with a high in-rush current). It is the velocity of the armature that is most affected by coil suppression. If the suppressor provides a conducting path, thus allowing the stored energy in the relay's magnetic circuit to decay slowly, the armature motion will be retarded and the armature may even temporarily reverse direction. The reversing of direction and re-closing of the contacts (particularly when combined with inductive loads) often leads to random, intermittent "tack welding" of the contacts such that the relay may free itself if operated again or even jarred slightly. Based upon the impact on armature motion and optimizing for normallyopen contacts, the best suppression method is to use a silicon transient suppressor diode. This suppressor will have the least effect on relay dropout dynamics since the relay transient will be allowed to go to a predetermined voltage level and then permit current to flow with a low impedance. This results in the stored energy being quickly dissipated by the suppressor. Transient suppressor diodes are available as bi-directional components and permit the relay to be non-polarized when installed internally. Note that if a uni-directional transient suppressor is used, a rectifier diode must be placed in series with it to block normal current flow and it has little advantage over the use of a zener diode. The transient suppressor should be selected such that its pulse energy rating exceeds any anticipated transient such as coil turn-off or motor "noise" found in the application.

A metal-oxide-varistor will provide results similar to those of transient suppressor diode, but will have a higher "on-state" impedance and will thus allow a higher voltage to be developed. As an example, a 33 volt transient suppressor diode may have a "clamping" voltage between 30 and 36 volts. In comparison, a 33 volt MOV will likely clamp the relay at 45 to 55 volts (based on a typical automotive relay with 130 m

When the additional voltage is no problem, an MOV may save cost over the transient suppressor diode and will also provide a non-polarized relay. The use of a reversed-biased rectifier diode in series with a zener diode will provide the best solution when the relay can be polarized. This suppression is often recommended by Siemens Electromechanical Components (SEC) for use in automotive circuits. The impact on release dynamics is minimal and poses no loss of reliability. This is normally a low-cost method and the only design precaution is to select a zener with an appropriate breakdown voltage and impulse power specifications adequate for the relay in its application. In printed circuit board applications with transistors used as relay drivers, the zener diode can be placed "across" the transistor; that is, for a common emitter circuit, cathode connected to collector and anode connected to the emitter (the series rectifier diode is not used in this type of circuit.

CHAPTER 3

WORKING OF THE PROJECT

1. First connect the main lead with 220 AC socket. Further the 220 volt is stepped down to 12 V ac using 0-12 transformer.
2. Then a bridge rectifier is used to converter 12V AC into 12V DC.
3. Then an electrolytic capacitor is used which reduces the AC ripples which are left over in DC output received from rectifier.
4. After that Regulator LM 7805 is used to convert 12V DC into 5V DC. This regulated 5V DC is further connected with all the component as shown in circuit diagram. This is the main power supply which is used in the project.
5. An IR LED and a photodiode are also connected in the circuit. When an unknown person enters the house without entering the correct password the IR rays get blocked and are therefore reflected at the photodiode. The photodiode then senses these rays coming and makes the P0_7 as low as the microcontroller photo diode output acts as input on P0_7.
6. The microcontroller 8051 then detects the change on the pin and also on the buzzer.
7. A keypad is interfaced on Port 2 of the microcontroller which contains the switches for entering of the password.
8. If the entered password is matched with the programmed password then 8051 Pin P0_1 becomes high which in turn turns ON the relay. This process then breaks the supply of IR rays from the IR LED and disables photo diode. And now when a person passes the IR LED and enters the house there are no IR rays and therefore the buzzer remains OFF.
9. With 8051 microcontroller LCD is interfaced on Port 1. It shows the status of entered password as declared in program and shows weather the entered password is correct or not.

CHAPTER 4

CODING OF MICROCONTROLLER

```
#include<8051.h>

#define lcdprt  P1
#define rs      P3_3
#define en      P3_4

#define s1 P2_0
#define s2 P2_1
#define s3 P2_2
#define s4 P2_3
#define enter P2_4
#define clear P2_5


void string(unsigned char *up);
void delay(unsigned int i);
void disp_dec(unsigned char digit);
void display(unsigned char b);
void init_lcd(void);
void Lcd_Cmd(unsigned char a);


unsigned char name[]={"PASSWORD Match$"};

unsigned char name1[]={"Wrong Password$"};
```

```
unsigned char name2[]={"PATH CLEAR $"};

unsigned char notmatch[]={"WRONG PASSWORD$"};
 unsigned char again[]={"ENTER AGAIN$"};

void main (void)
{
unsigned char e=0;
unsigned char a=0;
unsigned char b=0;
unsigned char s[5]={0,0,0,0,0};

init_lcd();
P0=0xF0;
P0_0=0;
P0_1=0;
P2=0xff;
while(1)

{

// buzer

if(P0_7==0)
{
P0_0=1;

}



 if(s1==0)
```

```
{
        b++ ;

        s[b]=1;
Lcd_Cmd(0x80+b);
display('*');

        delay(50000);
}

        if(s2==0)
{
        b++;

   s[b]=2;

Lcd_Cmd(0x80+b);
display('*');

        delay(50000);


}

   if(s3==0)
{
   b++;

   s[b]=3;

Lcd_Cmd(0x80+b);
display('*');
```

```
        delay(50000);


 }

     if(s4==0)
 {
   b++;
   s[b]=4;

Lcd_Cmd(0x80+b);
display('*');

        delay(50000);


 }


if(enter==0 )
{

e=1;


}

 if(clear==0 )
{
Lcd_Cmd(0x01);
e=0;
```

```
b=0;
P0_1=0;
P0_0=0;
}



if(e==1)
{

if(s[1]==1 && s[2]==2 && s[3]==3 && s[4]==4)

 {

 Lcd_Cmd(0x80);
  string(name);
  Lcd_Cmd(0xC0);
  string(name2);
        P0_1=1;
 }

// if(s[1]!=1 && s[2]!=2 && s[3]!=3 && s[4]!=4)
 else
 {

  Lcd_Cmd(0x80);
  string(notmatch);

  Lcd_Cmd(0xC0);
  string(again);


 }
```

```
  delay(0xffff);
  e=0;

}

}

}

void delay(unsigned int i)
{
while(i!=0)
{
i--;
}
}
void string(unsigned char *p)

                  {
                        while(*p!='$')
                  {
              display(*p);
```

```
                p=p+1;

            }
        }

void Lcd_Cmd(unsigned char A)
{
delay(500);
lcdprt=A;
rs=0;
en=1;
en=0;
}
void init_lcd(void)

{
Lcd_Cmd(0x01);// clear
Lcd_Cmd(0x38); // select 8 bit mode
Lcd_Cmd(0x0c); // display on cursor off
}
void display(unsigned char B)
{
delay(500);
lcdprt=B;
rs=1;
en=1;
en=0;
}
```

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