

RF BASED HOTEL INTIMATION SYSTEM

Project Report submitted in partial fulfillment of the requirement for the
degree of

Bachelor of Technology.

in

Electronics and Communication Engineering

under the supervision of

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Submitted By

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CERTIFICATE

This is to certify that project report entitled “RF BASED HOTEL INTIMATION SYSTEM” , submitted by VIVEK PANDEY, 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.

Signature of Supervisor: Kaushlendra

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Date : 26-05-2014

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VIVEK PANDEY

DATE ..26-05-2014.

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ABSTRACT

Radio Frequency technology is key to many aspects of electronics these days. With many systems from cellular to other wireless technologies including, Wi-Fi, WiMAX, RFID, and many other systems using RF signals. We are going to implement Radio Frequency Based Hotel Intimation System by using AT89S52 Microcontroller, switches & Radio Frequency transmitter & receiver. By pressing the switches on the transmitter side we can decide the menu order and it will be displayed on the LCD at the receiver side. The communication between transmitter and receiver is wireless through an antenna using Radio Frequency transmitter & receiver.

CHAPTER - 1

INTRODUCTION TO RADIO FREQUENCY

1.1 INTRODUCTION:

Radio frequency (RF) is a rate of oscillation in the range of around 3 kHz to 300 GHz, which corresponds to the frequency of radio waves, and the alternating currents which carry radio signals. RF usually refers to electrical rather than mechanical oscillations; however, mechanical RF systems do exist.

Although radio *frequency* is a rate of oscillation, the term "radio frequency" or its abbreviation "RF" are also used as a synonym for radio – i.e. to describe the use of wireless communication, as opposed to communication via electric wires.

To receive radio signals an antenna must be used. However, since the antenna will pick up thousands of radio signals at a time, a radio tuner is necessary to tune into a particular frequency (or frequency range). This is typically done via a resonator – in its simplest form, a circuit with a capacitor and an inductor form a tuned circuit. The resonator amplifies oscillations within a particular frequency band, while reducing oscillations at other frequencies outside the band. Another method to isolate a particular radio frequency is by oversampling (which gets a wide range of frequencies) and picking out the frequencies of interest, as done in software defined radio.

The distance over which radio communications is useful depends significantly on things other than wavelength, such as transmitter power, receiver quality, type, size, and height of antenna, mode of transmission, noise, and interfering signals. Ground waves, tropospheric scatter and sky waves can all achieve greater ranges than line-of-sight propagation. The study of radio propagation allows estimates of useful range to be made.

Table:-1 Frequencies of radio spectrum

Frequency	Wavelength	Designation	Abbreviation
3 – 30 Hz	$10^5 - 10^4$ km	Extremely low frequency	ELF
30 – 300 Hz	$10^4 - 10^3$ km	Super low frequency	SLF
300 – 3000 Hz	$10^3 - 100$ km	Ultra low frequency	ULF
3 – 30 kHz	100 – 10 km	Very low frequency	VLF
30 – 300 kHz	10 – 1 km	Low frequency	LF
300 kHz – 3 MHz	1 km – 100 m	Medium frequency	MF
3 – 30 MHz	100 – 10 m	High frequency	HF
30 – 300 MHz	10 – 1 m	Very high frequency	VHF
300 MHz – 3 GHz	1 m – 10 cm	Ultra high frequency	UHF
3 – 30 GHz	10 – 1 cm	Super high frequency	SHF
30 – 300 GHz	1 cm – 1 mm	Extremely high frequency	EHF
300 GHz - 3000 GHz	1 mm - 0.1 mm	Tremendously high frequency	THF

CHAPTER-2

HARDWARE DESCRIPTION

The microcontroller is the combination of the hardware and the software which is used to do about the specific task. A micro-controller can be compared to a small stand alone computer, it is a very powerful device, which is capable of executing a series of pre-programmed tasks and interacting with other hardware devices.

2.1 DIFFERENCE BETWEEN THE MICROCONTROLLER AND THE MICROPROCESSOR

Table:-2 Difference Between Microcontroller And Microprocessor

Microprocessor	Microcontroller
In the microprocessor CPU stand alone, RAM, ROM, input\output ports, timers and the serial ports are separate.	In microcontroller CPU, RAM, ROM, input\output ports, timers and the serial ports all are on the single chip.
In microprocessor designer can decide the amount of RAM,ROM and the input/output ports	In microcontroller the RAM, ROM, input\output ports are fixed.
The microprocessors are expensive and versatile.	These are used where the cost, power and space are critical.
The microprocessors are used where we perform the multipurpose task.	The microcontrollers are used in the specific task.
It is concerned with the rapid movement of the code and the data from the external address to the chip.	It is concerned with the rapid movement of the bits within the chip.

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 AT89S52

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry.



Fig:-1 AT89S52

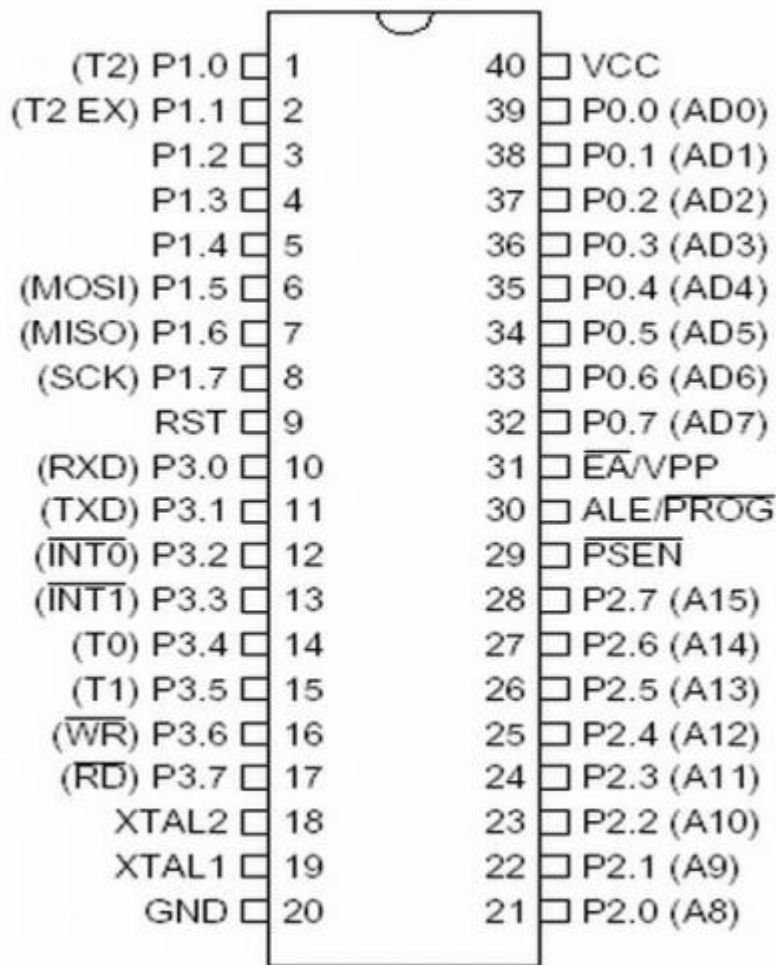


Fig-2 Pin Out Diagram

2.3 INTERFACING WITH LCD

2.3.1 Pin description of LCD:

LCD Board Pinout

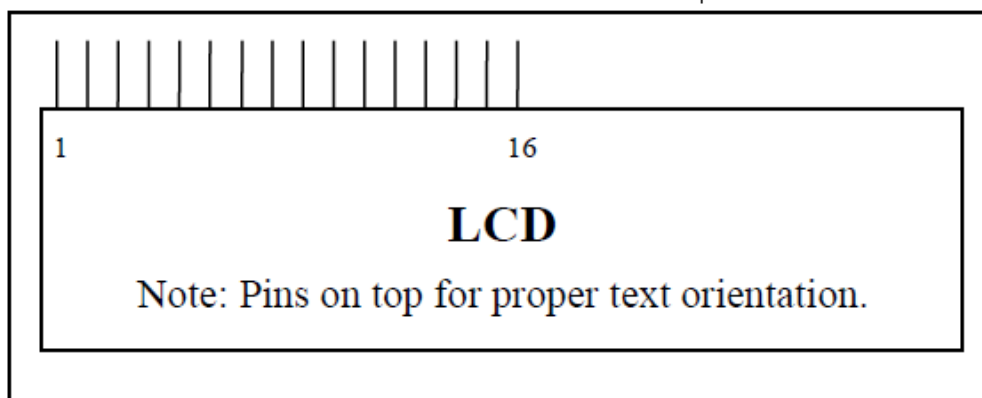


Fig:-3 LCD Pin Out

Table:-3 LCD Pin Out Description

Pin No	Symbol	Details
1	GND	Ground
2	Vcc	Supply Voltage +5V
3	Vo	Contrast adjustment
4	RS	0->Control input, 1-> Data input
5	R/W	Read/ Write
6	E	Enable
7 to 14	D0 to D7	Data
15	VB1	Backlight +5V
16	VB0	Backlight ground

2.3.2 LCD Initialization:

This is the pit fall for beginners. Proper working of LCD depend on the how the LCD is initialized. We have to send few command bytes to initialize the lcd. Simple steps to initialize the LCD

1. Specify function set:

Send **38H** for 8-bit, double line and 5x7 dot character format.

2. Display On-Off control:

Send **0FH** for display and blink cursor on.

3. Entry mode set:

Send **06H** for cursor in increment position and shift is invisible.

4. Clear display:

Send **01H** to clear display and return cursor to home position.

2.3.3 Algorithm to send data to LCD:

1. Make R/W low
2. Make RS=0; if data byte is command RS=1; if data byte is data (ASCII value)
3. Place data byte on data register
4. Pulse E (HIGH to LOW)

5. Repeat the steps to send another data byte

2.4 TRANSFORMER:



Fig:-4 Transformer

Transformer is a device that transfers electrical energy from one circuit to another through inductively coupled conductors — the transformer's coils or "windings".

Transformers, the conductors are commonly wound around a single iron-rich core, or around separate but magnetically coupled cores. A varying current in the first or "primary" winding creates a varying magnetic field in the core (or cores) of the transformer. This varying magnetic field induces a varying electromotive force (EMF) or "voltage" in the "secondary" winding. This effect is called mutual induction. If a load is connected to the secondary circuit, electric charge will flow in the secondary winding of the transformer and transfer energy from the primary circuit to the load connected in the secondary circuit. The secondary induced voltage V_S , of an ideal transformer, is scaled from the primary V_P by a factor equal to the ratio of the number of turns of wire in their respective windings: By appropriate selection of the numbers of turns, a transformer thus allows an alternating voltage to be stepped up — by making N_S more than N_P — or stepped down, by making it

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

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

Transformers are of two types:

1. Step up transformer
2. Step down transformer

In power supply we use center tap transformer. We apply 220V AC on the primary of center tap transformer.

BASIC PARTS OF A TRANSFORMER

In its most basic form a transformer consists of:

A primary coil or winding.

A secondary coil or winding.

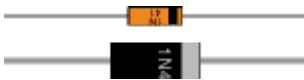
A core that supports the coils or windings.

The primary winding is connected to a 60-hertz ac voltage source. The magnetic field (flux) builds up (expands) and collapses (contracts) about the primary winding. The expanding and contracting magnetic field around the primary winding cuts the secondary winding and induces an alternating voltage into the winding. This voltage causes alternating current to flow through the load. The voltage may be stepped up or down depending on the design of the primary and secondary winding.

2.5 RECTIFIER

The main component of rectifier circuit is diode. Thus before explaining rectifier we should know about diodes.

Diodes:

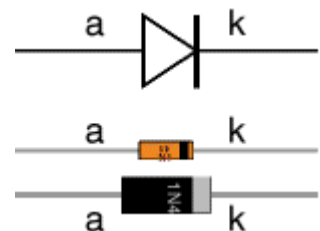


Circuit symbol:



Connecting and soldering

Diodes must be connected the correct way round, the diagram may be labeled a or + for anode and k or - for cathode (yes, it really is k, not c, for cathode). The cathode is marked by a line painted on the body. Diodes are



labeled with their code in small print; you may need a magnifying glass to read this on small signal diodes.

Small signal diodes can be damaged by heat when soldering, but the risk is small unless you are using a germanium diode (codes beginning OA...) in which case you should use a heat sink clipped to the lead between the joint and the diode body. A standard crocodile clip can be used as a heat sink.

Rectifier diodes are quite robust and no special precautions are needed for soldering them.

FULL WAVE RECTIFIER

If we need to rectify AC power to obtain the full use of *both* half-cycles of the sine wave, a different rectifier circuit configuration must be used. Such a circuit is called a full-wave rectifier. One kind of full-wave rectifier, called the center-tap design, uses a transformer with a center-tapped secondary winding and two diodes, this circuit's operation is easily understood one half-cycle at a time.

Consider the first half cycle, when the source voltage polarity is positive (+) on top and negative (-) on bottom. At this time, only the top diode is conducting; the bottom diode is blocking current, and the load "sees" the first half of the sine wave, positive on top and negative on bottom. Only the top half of the transformer's secondary winding carries current during this half-cycle. During the next half-cycle, the AC polarity reverses. Now, the other diode and the other half of the transformer's secondary winding carry current while the portions of the circuit formerly carrying current during the last half-cycle sit idle. The load still "sees" half of a sine wave, of the same polarity as before: positive on top and negative on bottom.

One disadvantage of this full-wave rectifier design is the necessity of a transformer with a center-tapped secondary winding. If the circuit in question is one of high power, the size and expense of a suitable transformer is significant. Consequently, the center-tap rectifier design is only seen in low-power applications.

The full-wave center-tapped rectifier polarity at the load may be reversed by changing the direction of the diodes. Furthermore, the reversed diodes can be paralleled with an existing positive-output rectifier. The result is dual-polarity full-wave center-tapped rectifier.

The Capacitor Filter:

Capacitor passive electronic component consisting of a pair of conductors separated by a dielectric. When a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the plates.

An ideal capacitor is characterized by a single constant value, capacitance, which is measured in farads.

$$C = Q / V$$

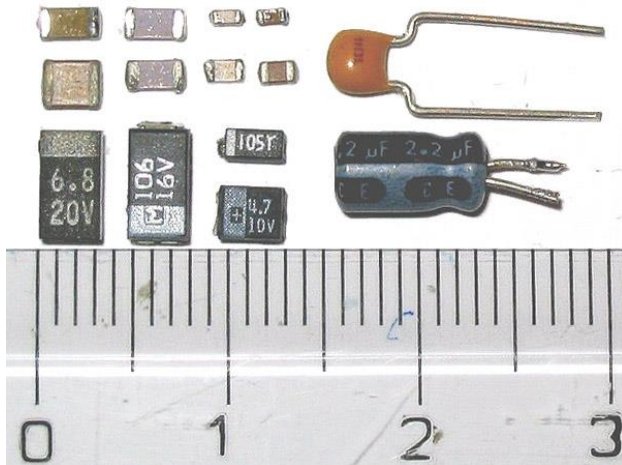


Fig:-5 Capacitor

In a way, a capacitor is a little like a battery. Although they work in completely different ways, capacitors and batteries both store electrical energy. If you have read how Batteries Work, then you know that a battery has two terminals. Inside the battery, chemical reactions produce electrons on one terminal and absorb electrons at the other terminal.

BASIC

Like a battery, a capacitor has two terminals. Inside the capacitor, the terminals connect to two metal plates separated by a dielectric. The dielectric can be air, paper, plastic or anything else that does not conduct electricity and keeps the plates from touching each other. You can easily make a capacitor from two pieces of aluminum foil and a piece of paper. It won't be a particularly good capacitor in

terms of its storage capacity, but it will work. In an electronic circuit, a capacitor is shown like this:
When you connect a capacitor to a battery, here's what happens:

- The plate on the capacitor that attaches to the negative terminal of the battery accepts electrons that the battery is producing.
- The plate on the capacitor that attaches to the positive terminal of the battery loses electrons to the battery.

Function

Capacitors store electric charge. They are used with resistors in timing circuit because it takes time for a capacitor to fill with charge. They are used to smooth varying DC supplies by acting as a reservoir of charge. They are also used in filter circuits because capacitors easily pass AC (changing) signals but they block DC (constant) signals.

Capacitance

This is a measure of a capacitor's ability to store charge. A large capacitance means that more charge can be stored. Capacitance is measured in farads, symbol F. However 1F is very large, so prefixes are used to show the smaller values.

Three prefixes (multipliers) are used, μ (micro), n (nano) and p (pico):

- μ means 10^{-6} (millionth), so $1000000\mu\text{F} = 1\text{F}$
- n means 10^{-9} (thousand-millionth), so $1000\text{nF} = 1\mu\text{F}$
- p means 10^{-12} (million-millionth), so $1000\text{pF} = 1\text{nF}$

Capacitor values can be very difficult to find because there are many types of capacitor with different labeling systems!

There are many types of capacitor but they can be split into two groups, polarized and un-polarized. Each group has its own circuit symbol.

2.6 REGULATOR IC (7805)

It is a three pin IC used as a voltage regulator. It converts unregulated DC current into regulated DC current. Normally we get fixed output by connecting the voltage regulator at the output of the filtered DC (see in above diagram). It can also be used in circuits to get a low DC voltage from a high DC

voltage (for example we use 7805 to get 5V from 12V). There are two types of voltage regulators 1. Fixed voltage regulators (78xx, 79xx) 2. Variable voltage regulators (LM317)

In fixed voltage regulators there is another classification 1. +ve voltage regulators 2. -ve voltage regulators POSITIVE VOLTAGE REGULATORS this include 78xx voltage regulators. The most commonly used ones are 7805 and 7812. 7805 gives fixed 5V DC voltage if input voltage is in (7.5V, 20V).

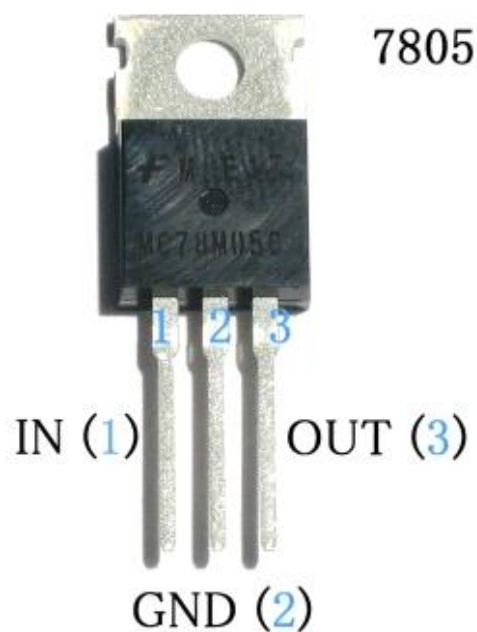


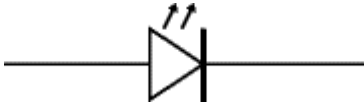
Fig:- 6 IC 7805

2.7 LED

Light Emitting Diodes



Circuit symbol:

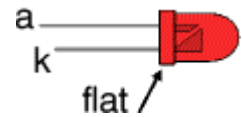


Function:

LEDs emit light when an electric current passes through them.

Connecting and soldering:

LEDs must be connected the correct way round, the diagram may be labeled + for anode and k or - for cathode (yes, it really is k, not c, for cathode!). The cathode is the short lead and there may be a slight flat on the body of round LEDs. If you can see inside the LED the cathode is the larger electrode (but this is not an official identification method).

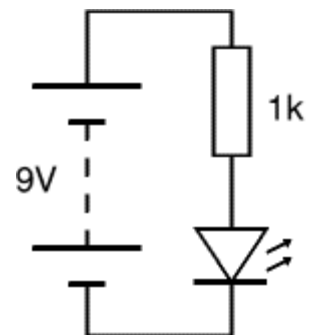


LEDs can be damaged by heat when soldering, but the risk is small unless you are very slow. No special precautions are needed for soldering most LEDs.

Testing an LED

Never connect an LED directly to a battery or power supply! It will be destroyed almost instantly because too much current will pass through and burn it out.

LEDs must have a resistor in series to limit the current to a safe value, for quick testing purposes a 1k Ω resistor is suitable for most LEDs if your supply voltage is 12V or less. Remember to connect the LED the correct way round!



2.8 IC LM324

LM324 is a 14pin IC consisting of four independent operational amplifiers (op-amps) compensated in a single package. Op-amps are high gain electronic voltage amplifier with differential input and, usually, a single-ended output. The output voltage is many times higher than the voltage difference between input terminals of an op-amp.

These op-amps are operated by a single power supply LM324 and need for a dual supply is eliminated. They can be used as amplifiers, comparators, oscillators, rectifiers etc. The conventional op-amp applications can be more easily implemented with LM324.

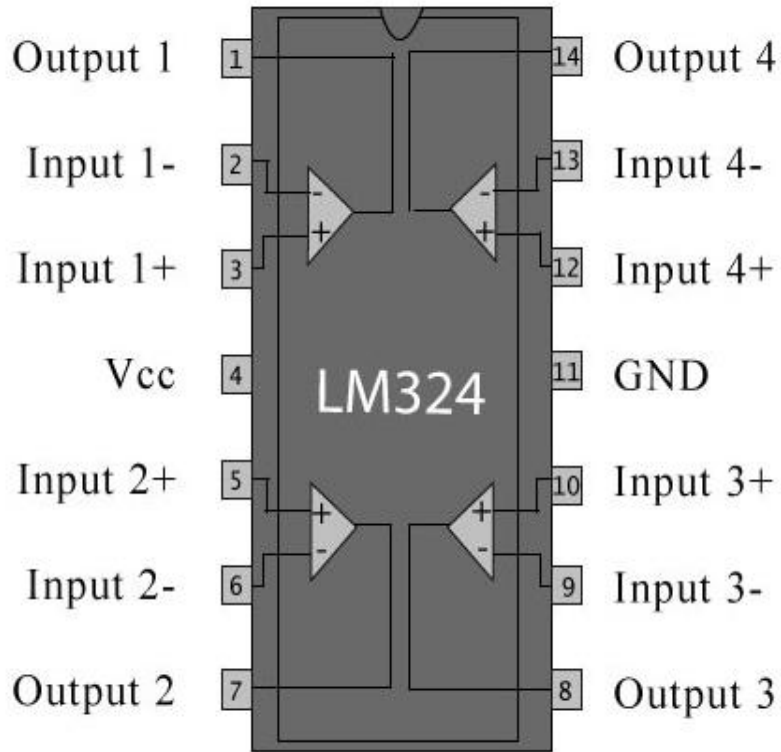


Fig:- 7 Pin Diagram Of LM324

Table:-4 Pin Out Description Of IC LM324

Pin NO	Function	Name
1	Output of 1 st comparator	Output 1
2	Inverting input of 1 st comparator	Input 1-
3	Non-inverting input of 1 st comparator	Input 1+
4	Supply voltage; 5V (up to 32V)	Vcc
5	Non-inverting input of 2 nd comparator	Input 2+
6	Inverting input of 2 nd comparator	Input 2-
7	Output of 2 nd comparator	Output 2

8	Output of 3 rd comparator	Output 3
9	Inverting input of 3 rd comparator	Input 3-
10	Non-inverting input of 3 rd comparator	Input 3+
11	Ground (0V)	Ground
12	Non-inverting input of 4 th comparator	Input 4+
13	Inverting input of 4 th comparator	Input 4-
14	Output of 4 th comparator	Output 4

2.9 RF TRANSMITTER AND RECEIVER:

The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK).

Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line-of-sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. Next, RF transmission is more strong and reliable than IR transmission. RF communication uses a specific frequency unlike IR signals which are affected by other IR emitting sources.

This **RF module** comprises of an **RF Transmitter** and an **RF Receiver**. The transmitter/receiver (Tx/Rx) pair operates at a frequency of **434 MHz**. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps. The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

The RF module is often used alongwith a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder.

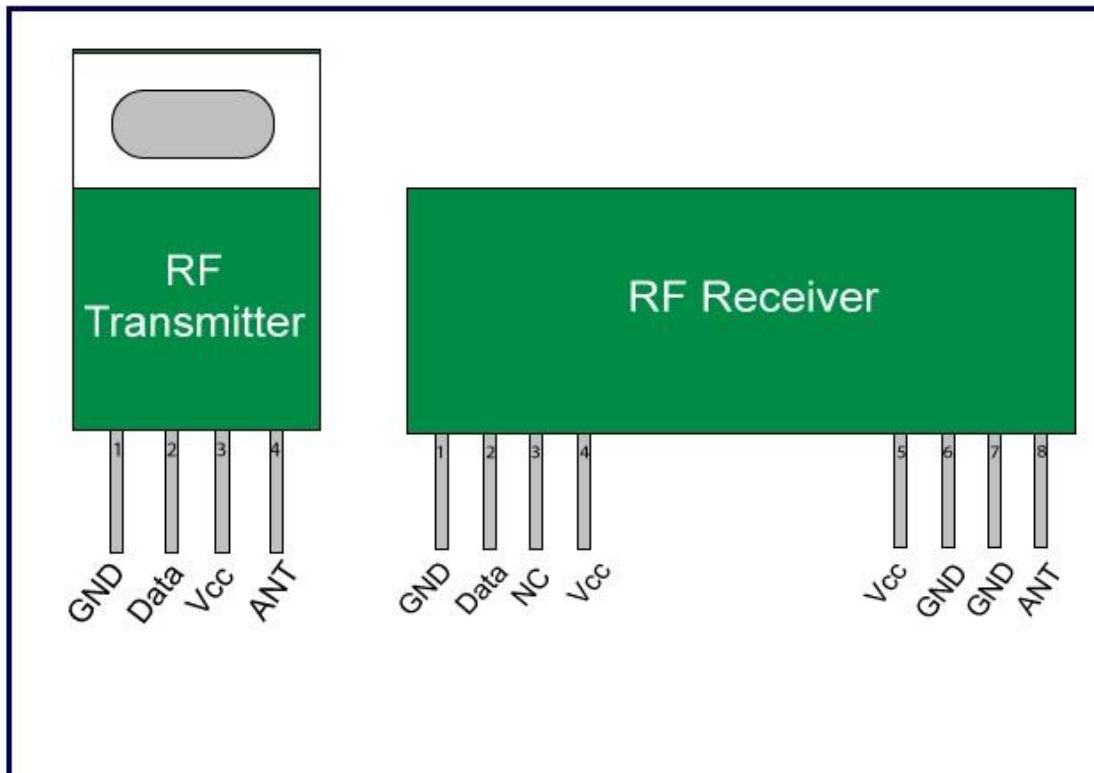


Fig:-8 RF Transmitter And Receiver

Table:- 5 RF Transmitter & Receiver Pin Description:

RF Transmitter

Pin No	Function	Name
1	Ground (0V)	Ground
2	Serial data input pin	Data
3	Supply voltage; 5V	Vcc
4	Antenna output pin	ANT

RF Receiver

Pin No	Function	Name
1	Ground (0V)	Ground
2	Serial data output pin	Data
3	Linear output pin; not connected	NC
4	Supply voltage; 5V	Vcc
5	Supply voltage; 5V	Vcc
6	Ground (0V)	Ground
7	Ground (0V)	Ground
8	Antenna input pin	ANT

Supply voltage:

The receiver module contains a voltage regulator to guarantee stable performance in the given range of supply voltage. The design was made for operation with a battery. Supply voltage must be used within specified voltage. The module shows unstable function with a voltage lower than specified. If a voltage connected to the Vcc (+) and Ground (-) terminal is beyond the maximum voltage given in the technical specification or is reversed, the module will be permanently damaged. To enable a low minimum voltage, no internal circuit is used to prevent damage by incorrect polarity. If a higher supply voltage is available then a simple diode can be inserted in the connection line to the Vcc terminal to prevent damage by incorrect polarity. The diode must be rated for the maximum supply current detailed in the technical specifications.

Outputs:

At the receiver side 3 output (AF, DATA and RSSI) signals and one control terminal are available. AF output is the analog output from the FM detector circuit. The DATA output is a digital output. This is the signal after AF signals pass through a band pass filter and comparator. For simple FSK modulation of digital data, the DATA out terminal can be used. The signal can be easily connected

to other digital circuits. The receiver has no internal mute circuit to avoid delays and achieve maximum sensitivity. The AF and DATA output will show noise on the output when no signal is received. Valid data signals can be detected by utilizing the RSSI output. The third output is called RSSI. It is an indicator of the received signal strength. It can be used to drive an external mute circuit. The control terminal can be used to control Vcc supply for the internal circuit.

Antennas:

Most important for effective data transmission is selection of a good antenna, and RF grounding, both for the transmitter and the receiver. Without an antenna it is impossible to transmit data over a long distance. The receiver has a simple antenna input pin. Any suitable UHF antenna can be connected to it. The easiest way to connect an antenna to the RF is to solder a 17.3 cm (433-434 MHz) wire directly to the antenna input. If the receiving antenna is installed away from the receiver module, a 50-Ohm coax antenna wire can be used. The shielding of the antenna wire should be soldered to the case near the antenna input.

It is possible, but not recommended to connect the receiver module and the antenna by a connection on a PCB. This will decrease the receiver performance in most cases.

In most cases the following basic rules will help you.

- Connect an antenna with 50-Ohm impedance.
- Lambda/4 whip antenna length is approximately 17.3 cm for 434 MHz.
- Place the antenna vertically, straight up or down from the transmitter and receiver module.
- Do not cover the antenna with metal parts.
- The connection of the metal surface of the transmitter case to a larger metal part (ground plane) will increase radiation efficiency. Such metal parts should not be placed near the antenna.
- The human body can have a similar effect to metal objects. Pocket transmitters should be held in the hand and held in a position away from the body and pointed in the direction of the receiver.
- Best range is achieved if the transmitter and receiver antenna are in direct line of sight. Any object in between the transmitter and receiver antenna, and metallic objects in particular, will decrease the range.
- The transmission is influenced by reflections of the transmitter signal on metallic surfaces and building. There is possibility that data errors will occur due to overlapping of the direct and reflected signals.

CHAPTER-3
CIRCUIT & BLOCK DIAGRAM

3.1 RF TRANSMITTER:

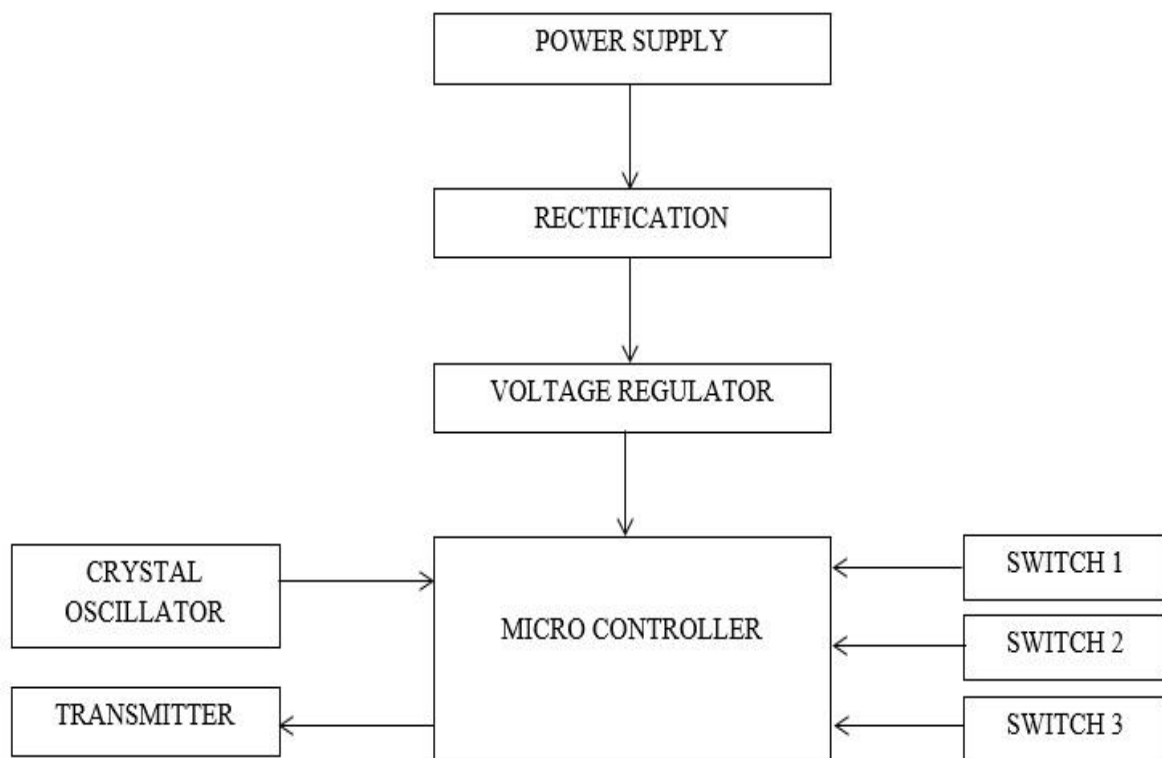


Fig:-9 Block Diagram Of RF Transmitter

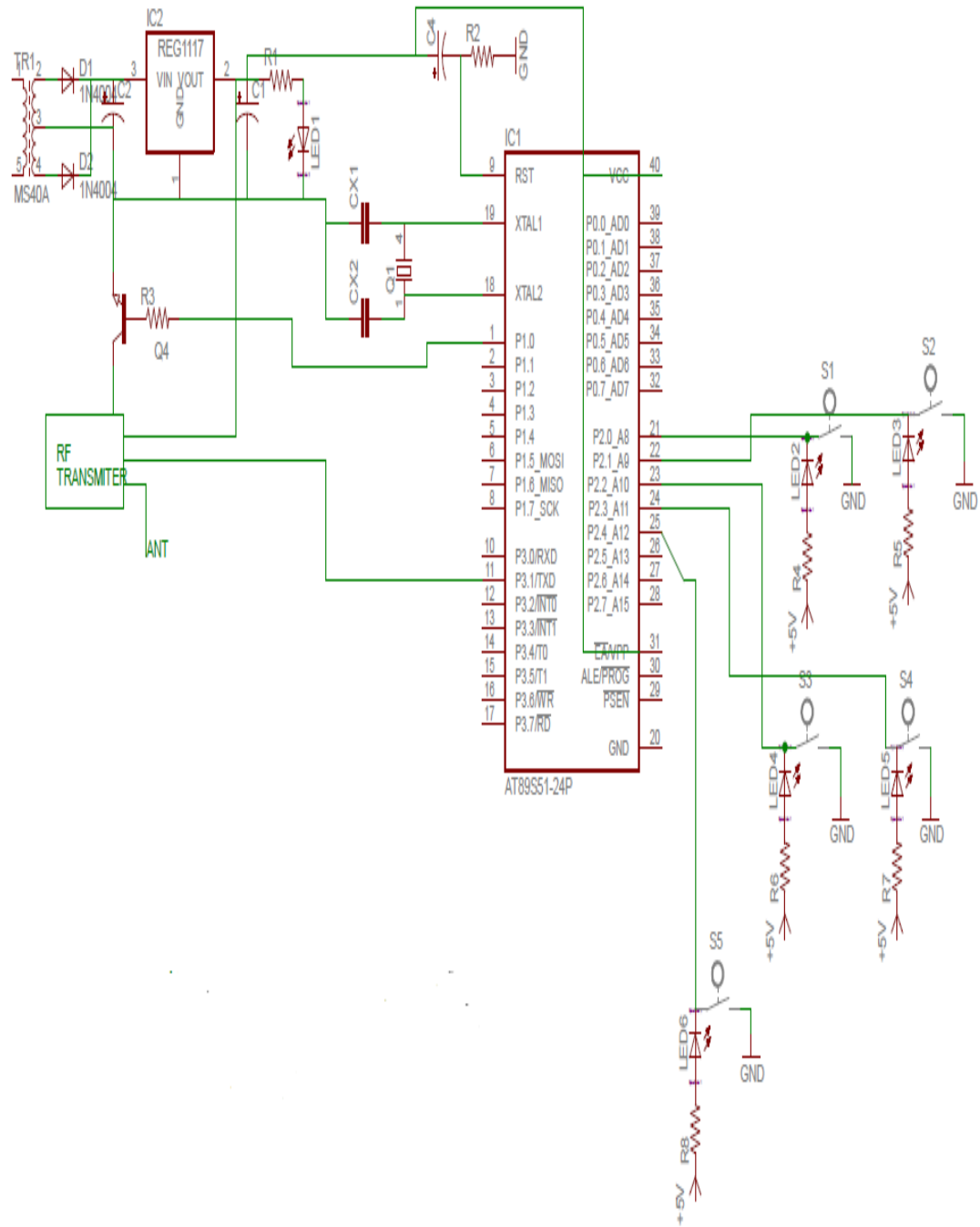


Fig:-10 RF Transmitter

3.2 RF RECEIVER:

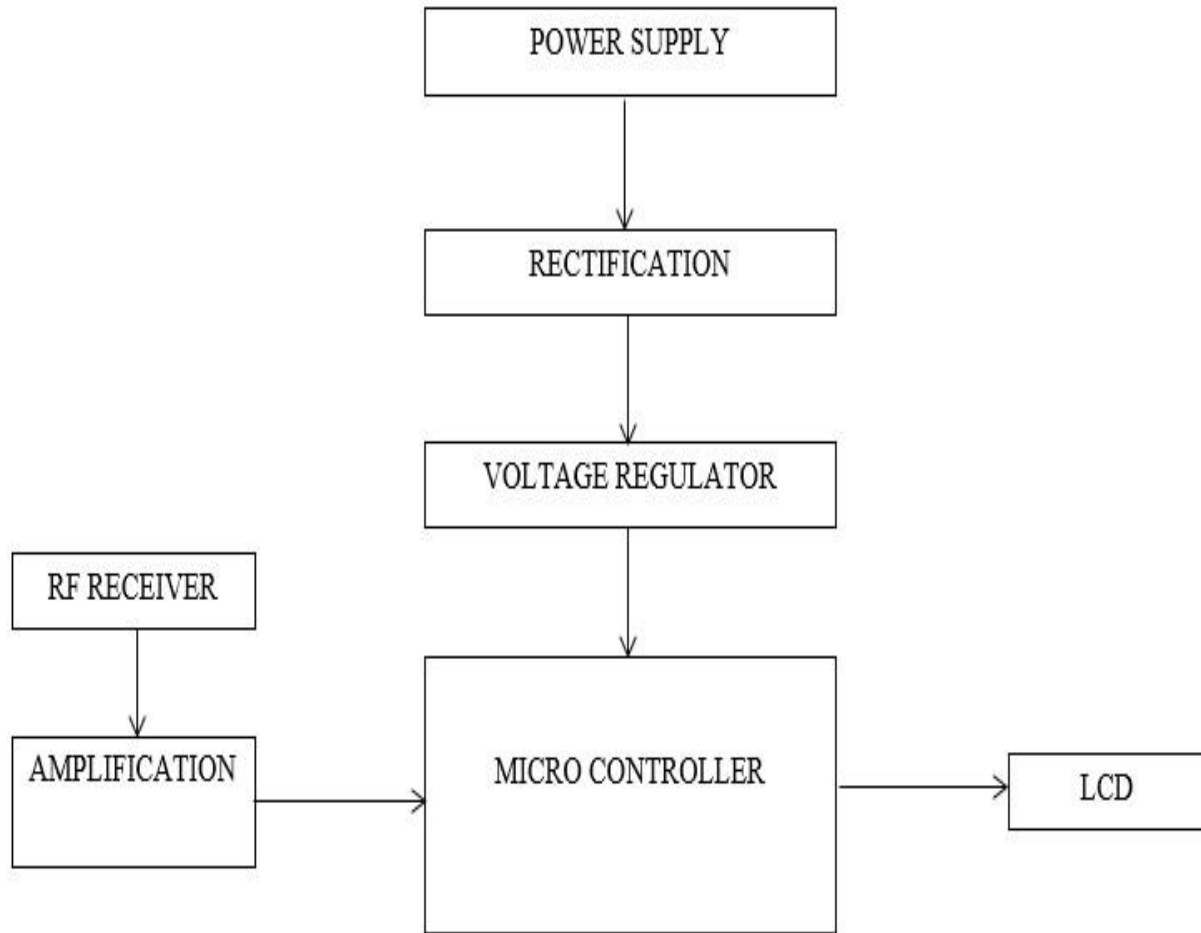


Fig:-11 Block Diagram Of RF Receiver

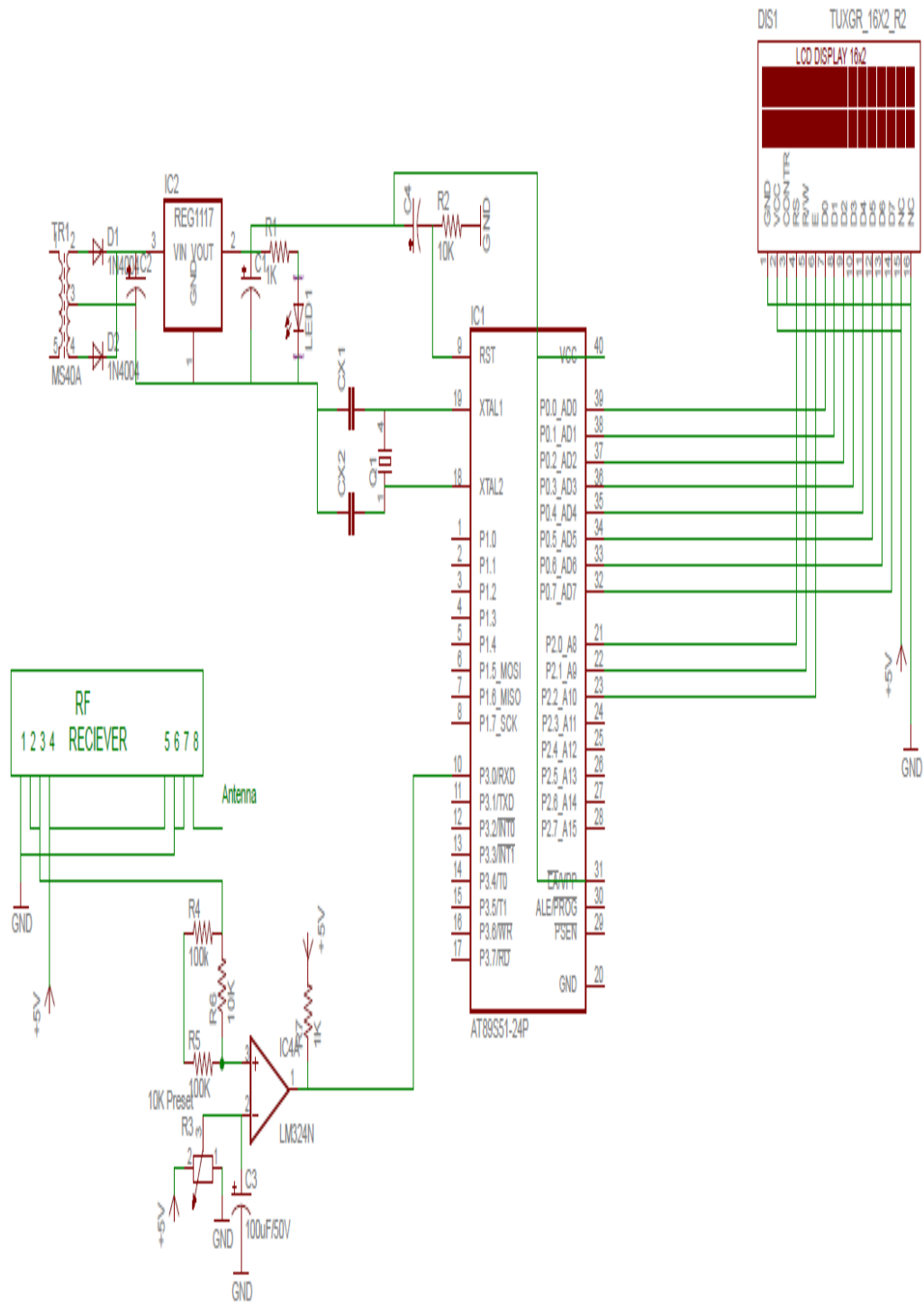


Fig:-12 RF Receiver

CONCLUSION & RESULT

We have successfully made RF Based Hotel Intimation System using AT89S52 microcontroller. In this project we have used center tap transformer to control the power supply then it will pass through two diode for full wave rectification then it will pass through voltage regulator to microcontroller and our microcontroller will be connected to switches and RF transmitter with antenna whereas at receiver side our processor will be connected to LCD and amplifier circuit with RF receiver. By pressing the switches on the transmitter side we can decide the menu order and it will be displayed on the LCD at the receiver side. The communication between transmitter and receiver is wireless through an antenna using RF transmitter & receiver. The application of this project is that it can be used in hotels as a menu and ordering system. The customer can directly order by pressing the switch on the transmitter side whatever he wants to order and at the receiver side his order will b displayed.

We have successfully implemented Wireless Sensor Network Based RF Hotel Intimation System.

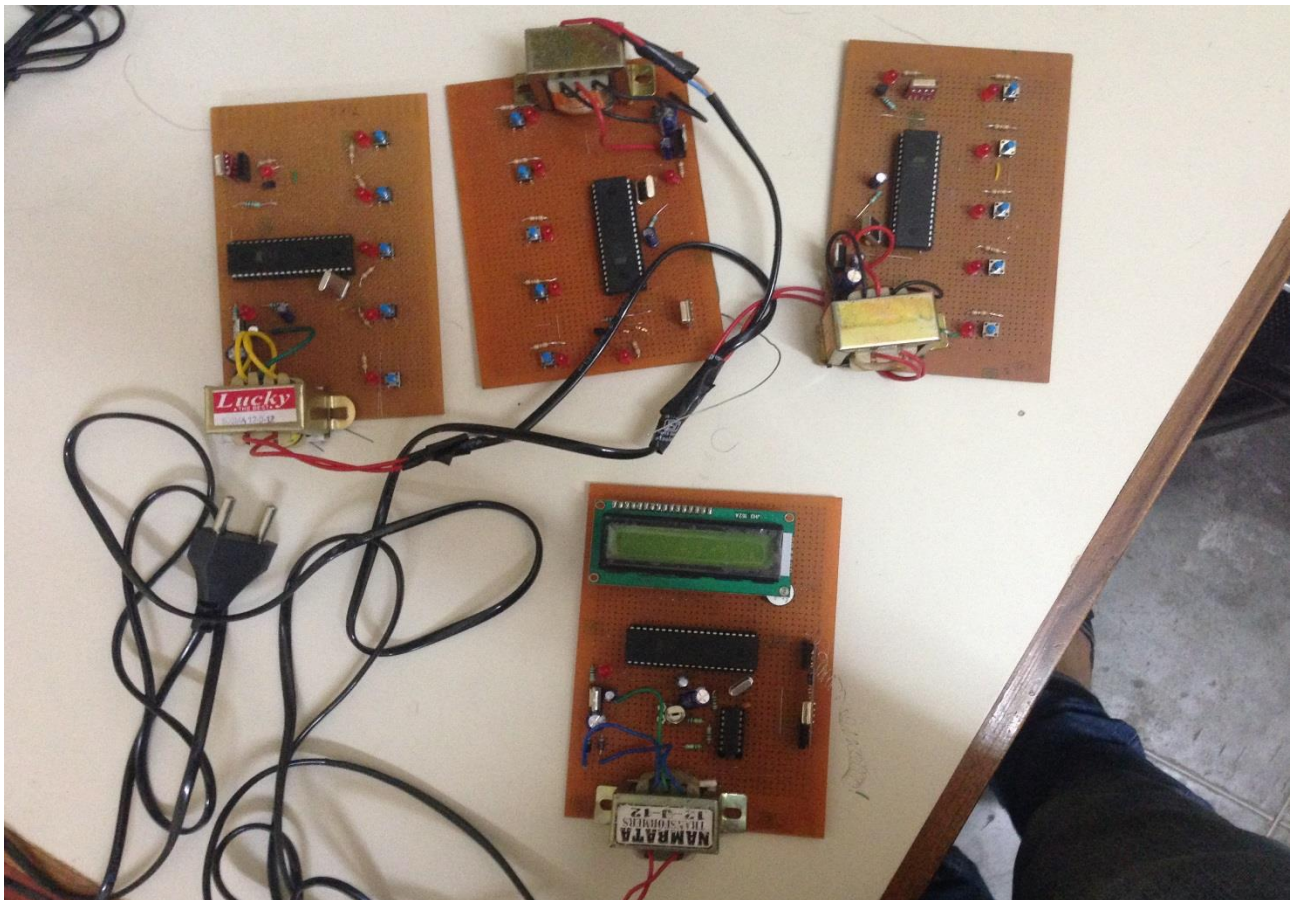


Fig:-13 Hotel Intimation System

REFERENCES

The sites which were used while doing this project:

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