A

Major Project Report

On

"VEHICLE TRACKING SYSTEM USING GPS AND GSM"

SUBMITTED TO:

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

2014-15

CERTIFICATE

This is to certify that this project report **"VEHICLE TRACKING SYSTEM USING GPS AND GSM"** entitled submitted by ***RAVI PRAKASH VIJAY, SAKSHI SHARMA, DEEPAK MALI, RAJESH SOLANKI*** is accepted in partial fulfillment of degree of Bachelor of Engineering in Electronics and Communication.

Project Guide	Head of Department	Principal
Dr. Dilip Sharma	Dr. Bhavana Jharia	

UJJAIN ENGINEERING COLLEGE, UJJAIN

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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RECOMMENDATION

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Internal Examiner External Examiner

ACKNOWLEDGEMENT

This is a project report on **"VEHICLE TRACKING SYSTEM USING GPS AND GSM"** we are very thankful to our project guide Prof. DILIP SHARMA, Department of Electronics and communication engineering, Ujjain engineering college, Ujjain for his invaluable guidance and assistance, without which the accomplishment of the task would have never been possible. We also thank him for giving his opportunity to explore into the real world and realize the interrelation.

We extend our most sincere thanks to Dr. BHAVANA JHARIA (HOD of Electronics & communication Engineering) for their cooperation during the project work and also we are thankful to all the professor and teacher for their support and cooperation.

It is our privilege to express our gratitude to Principal of Ujjain engineering college, Ujjain for providing me an excellent environment to complete my work successfully.

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ABSTRACT

Initially the GPS continuously takes input data from the satellite and stores the latitude and longitude values in AT89s52 microcontroller's buffer. If we have to track the vehicle, we need to send a message to GSM device, by which it gets activated. It also gets activated by detecting accident on the IR sensor, by detecting fire on the temperature sensor, by detecting theft connected to vehicle. Parallely deactivates GPS with the help of relay .Once GSM gets activated it takes the last received latitude and longitude positions values from the buffer and sends a message to the particular number or laptop which is predefined in the program. Once message has been sent to the predefined device the GSM gets deactivated and GPS gets activated.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION:-

Vehicle tracking system main aim is to give Security to all vehicles. Accident alert system main aim is to rescuing people in accidents. This is improved security systems for vehicles. The latest like GPS are highly useful now a days, this system enables the owner to observe and track his vehicle and find out vehicle movement and its past activities of vehicle.

This new technology, popularly called vehicle Tracking Systems which created many wonders in the security of the vehicle. This hardware is fitted on to the vehicle in such a manner that it is not visible to anyone who is inside or outside of the vehicle. Thus it is used as a covert unit which continuously or by any interrupt to the system, sends the location data to the monitoring unit.

When the vehicle is stolen, the location data from tracking system can be used to find the location and can be informed to police for further action. Some Vehicle tracking System can even detect unauthorized movements of the vehicle and then alert the owner. This gives an edge over other pieces of technology for the same purpose.

This accident alert system in it detects the accident and the location of the accident occurred and sends GPS coordinates to the specified mobile, computer etc. The fire detector circuit in it is used to detect fire in the vehicle, if the temperature inside the vehicle goes above a certain limit then a warning will be automatically send to the intende receiver. The infrared sensor which is additionally interfaced to the microcontroller is used to detect the obstacles and accidents, in any case if any mishap occurs then its warning will be directly send to the intended receiver.

When a request by user is sent to the number at the modem, the system automatically sends a return reply to that particular mobile indicating the position of the vehicle in

terms of latitude and longitude. A Program has been developed which is used to locate the exact position of the vehicle and also to navigated track of the moving vehicle on Google Map.

1.2 Proposed System :

The proposed system is used for positioning and navigating the vehicle with an accuracy of 10 m. The Exact location is indicated in the form of latitude and longitude along with the exact Navigated track on Google map.

The system tracks the location of particular vehicle and sends to users mobile in form of data and also to microcontroller. The arrived data, in the form of latitude and longitude is used to locate the Vehicle on the Google maps and also we can see the output on the LCD.

1.3 VEHICLE TRACKING FEATURES:

It is mainly benefit for the companies which are based on transport system. Since it can show the position of all vehicles in real time, so that they can create the expected data accordingly. These tracking system can store the whole data where the vehicle had gone, where did it stop, how much time it take at every stop and can create whole data analysis. It is also used in buses and trains, to estimate how far are they, how much time it takes for them to come to a particular stop. These systems are used to data capture, data storage, data analysis and finally data transfer. By adding additional sensors such as temperature sensor and infrared sensors the system can be enabled to detect fire , theft and obstacles.

1.4 USAGE OF TRACKING IN INDIA:

Tracking in India is mainly used by transport systems, taxi companies, traffic operators. Taxi operators use this to estimate how far the vehicle is from a particular area and send this information to call centers and they can inform general public about the distance of the taxi location and time it takes tom come to them. Another use is for traffic police if this system is located in every vehicle they can estimate the traffic by looking on the map and if any accident is detected then they can route the traffic in to another way. This is how tracking is useful because India is one of busy traffic countries and this system can control many of the traffic problems.

1.5 APPLICATIONS :

The project that has been introduced here can be used for variety of applicatons -

1. Car navigation

2. Fleet management/tracking

3. Palmtop, Laptop, PDA, and Handheld

4. Location Based Services enabled devices

CHAPTER 2

METHODOLOGY

2.1 WORKING :

The project consists of GPS receiver and GSM modem with a micro controller. The whole system is attached to the vehicle. In the other end (main vehicle station) one GSM mobile phone is attached to the computer with VB application. So the GPS system will send the longitudinal and altitude values corresponding to the position of vehicle to GSM Modem.

Imagine the bus has left Bangalore at 6 o clock in the morning. If the officer in charge for that vehicle wants to know where the vehicle is, he will come to the computer and click on the vehicle number on the VB program .The VB program will send an SMS to the vehicle number.

The SMS sent would come through the GSM service provider and then reach the vehicle, which is traveling, because the vehicle has a GSM device with sim card. This GSM modem will receive the SMS and send to the microcontroller in the vehicle. The microcontroller will receive this SMS and compare the password and the command. If every thing matches then it will perform the request required by the office.

A place name is assigned for each longitude & latitude. The GSM receiver in the vehicle office receives these data & gives to the PC through serial port. The VB program in the PC checks this data with its database & displays the details of the vehicle on the screen. The device is password controlled i.e. person who knows the device password only able to operate. In case of any mishaps such as fire , theft or obstacle ,th e device will automatically will send an alert to the registered number,i.e, the number that is feeded into the memory of microcontroller.

2.2 BLOCK DIAGRAM :

The block diagram of the vehicle tracking system is shown below. The block diagram shows the overall view of the system. The blocks that are connected here are Microcontroller, LCD display, GPS, GSM, Power supply, Infrared sensor, Fire detector.

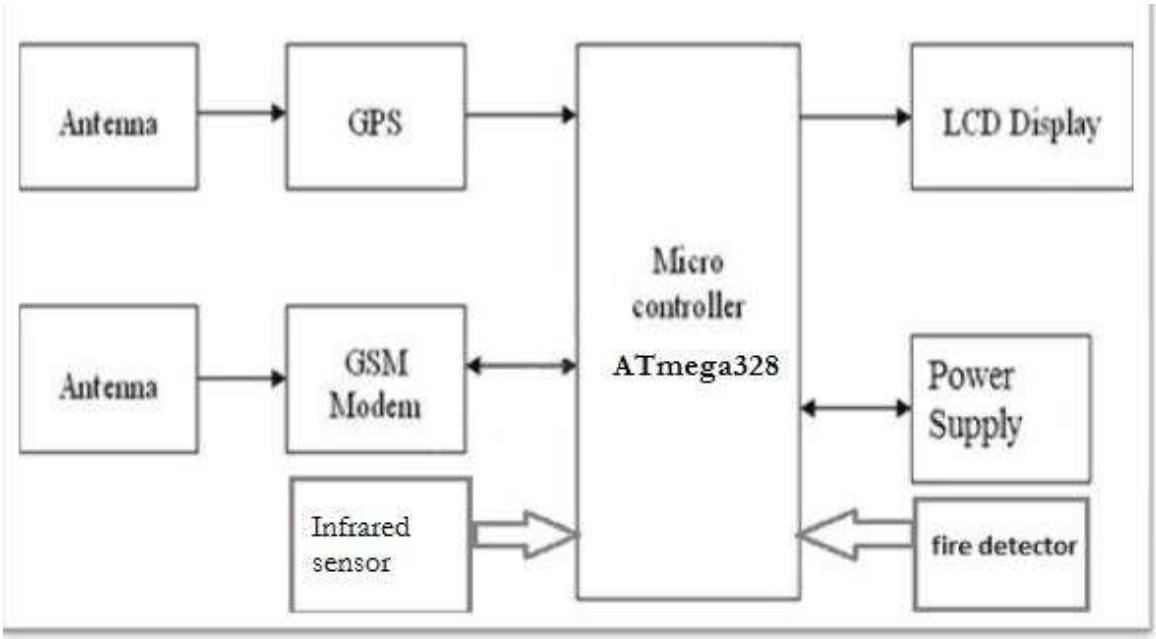


FIG : BLOCK DIAGRAM OF VEHICLE TRACKING SYSTEM USING GPS AND GSM

2.2.1 BLOCK DIAGRAM DESCRIPTION :

In this Project it is proposed to design an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM).

In this project 8052 microcontroller is used for interfacing to various hardware peripherals. The current design is an embedded application, which will continuously monitor a moving Vehicle and report the status of the Vehicle on demand.

For doing so an 8052 microcontroller is interfaced serially to a GSM Modem and GPS Receiver. A GSM modem is used to send the position (Latitude and Longitude) of the vehicle from a remote place. The GPS modem will continuously give the data i.e. the latitude and longitude indicating the position of the vehicle.

The GPS modem gives many parameters as the output, but only the NMEA data coming out is read and displayed on to the LCD. The same data is sent to the mobile at the other end from where the position of the vehicle is demanded. An EEPROM is used to store the data received by GPS receiver.

The hardware interfaces to microcontroller are LCD display, GSM modem and GPS Receiver. In order to interface GSM modem and GPS Receiver to the controller, a MUX is used.

The design uses RS-232 protocol for serial communication between the modems and the microcontroller. A serial driver IC is used for converting TTL voltage levels to RS-232 voltage levels.

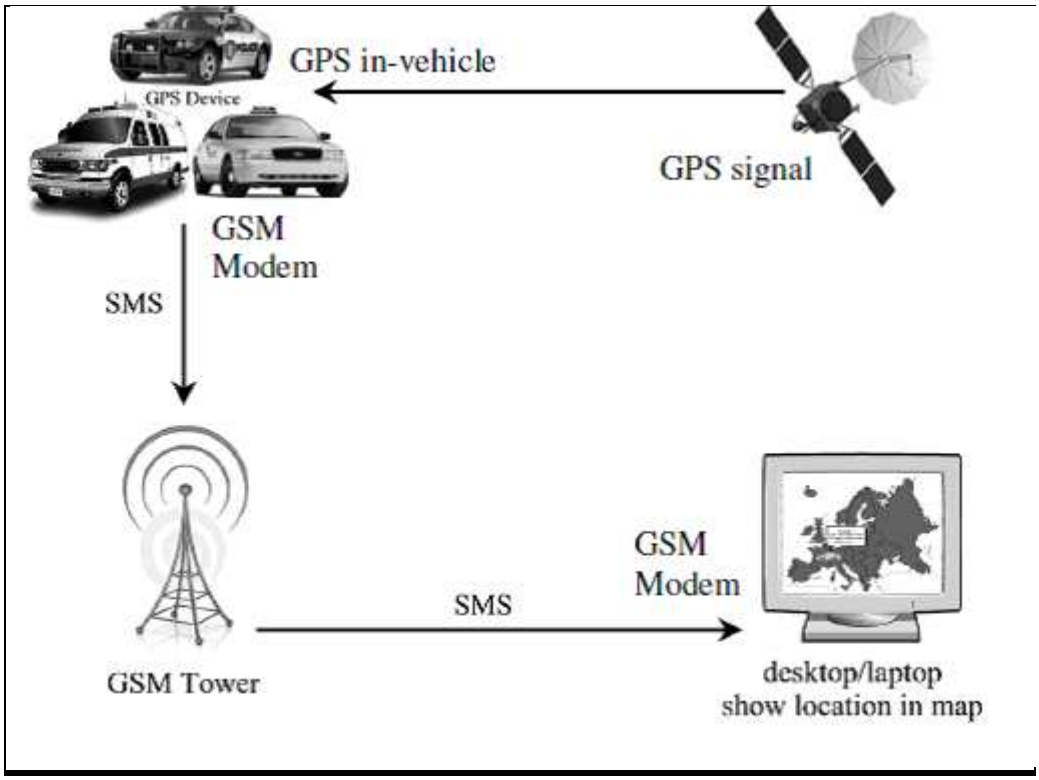
Different types or sensors such as infrared sensors and fire detector are used for detecting different types of problem encountered in the vehicle such as theft, accident, fire warning etc. In any of these cases messages will be automatically send to the intended receiver.

When a request by user is sent to the number at the modem, the system automatically sends a return reply to that particular mobile indicating the position of the vehicle in

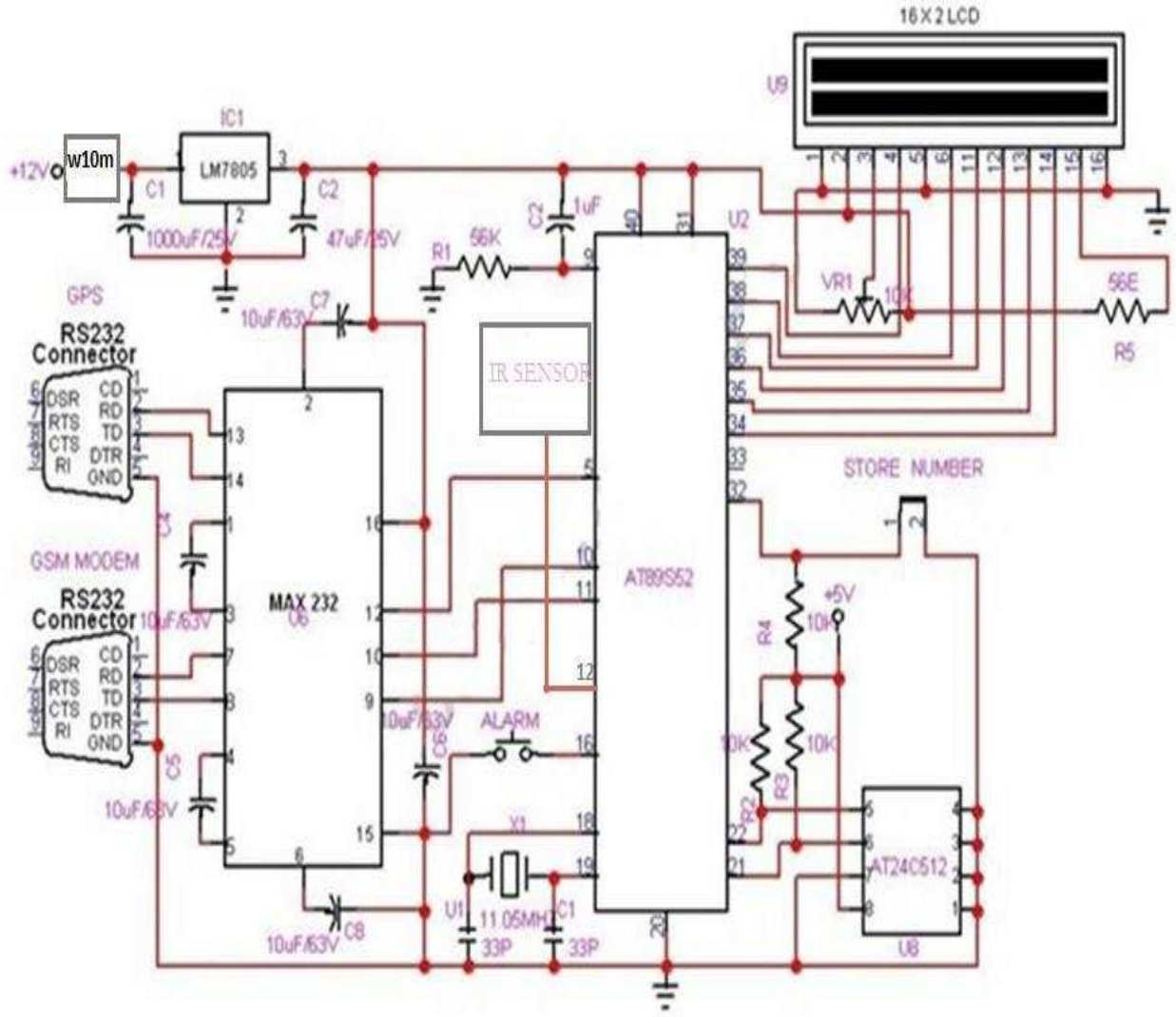
terms of latitude and longitude. A Program has been developed which is used to locate the exact position of the vehicle and also to navigated track of the moving vehicle on Google Map.

2.2.2 CONCEPT AND OVERVIEW:

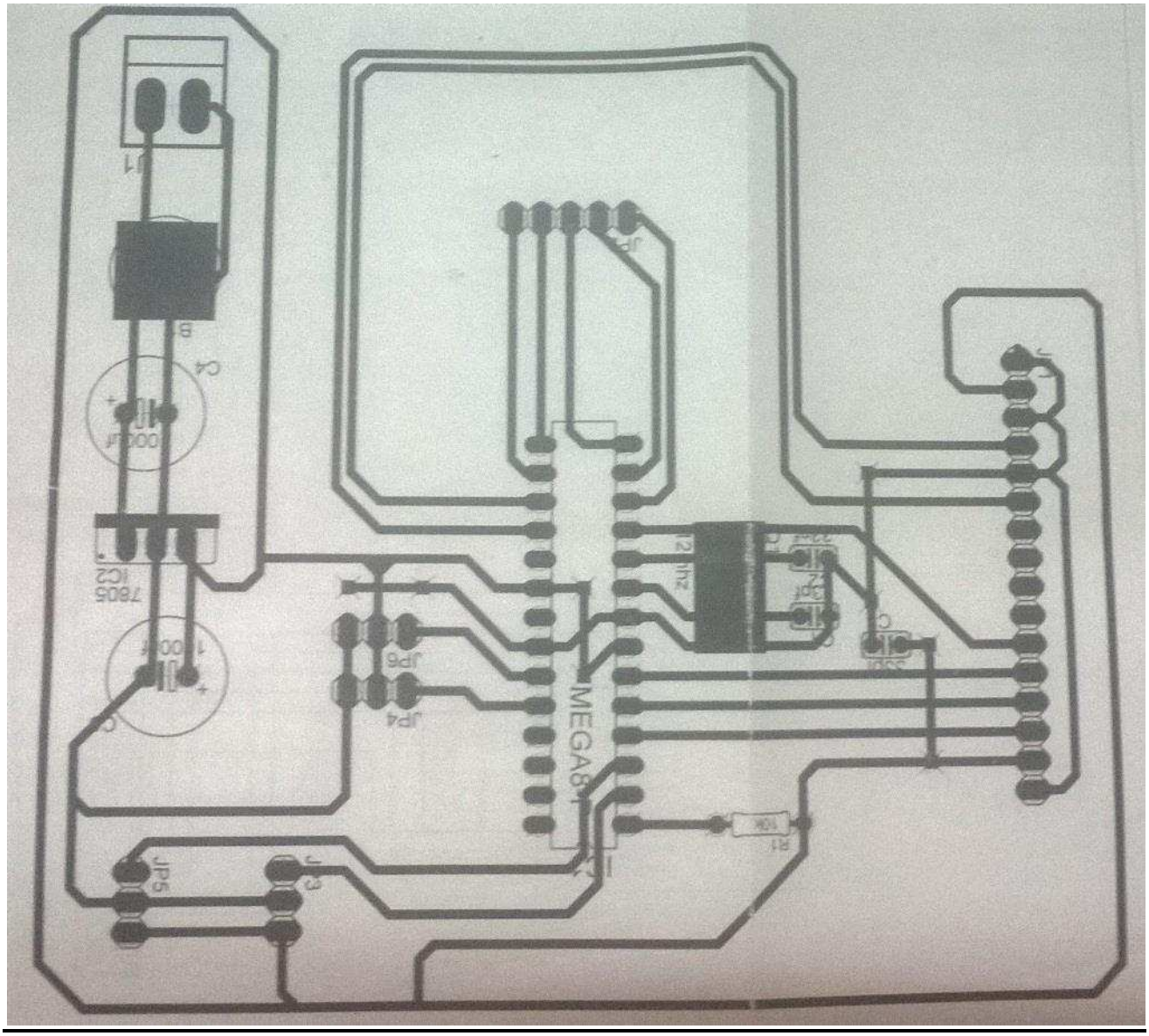
This vehicle tracking system takes input from GPS and send it through the GSM module to desired mobile/laptop using mobile communication. Vehicle Tracking System is one of the biggest technological advancements to track the activities of the vehicle. The security system uses Global Positioning System GPS, to find the location of the monitored or tracked vehicle and then uses satellite or radio systems to send to send the coordinates and the location data to the monitoring center. At monitoring center various software's are used to plot the Vehicle on a map. In this way the Vehicle owners are able to track their vehicle on a real-time basis. Due to real-time tracking facility, vehicle tracking systems are becoming increasingly popular among owners of expensive vehicles.


GPS in-vehicle
GPS Device
GPS signal
GSM
Modem
SMS
GSM
Modem
SMS
GSM Tower
desktop/laptop
show location in map

2.3 CIRCUIT DIAGRAM :



2.4 PCB LAYOUT :



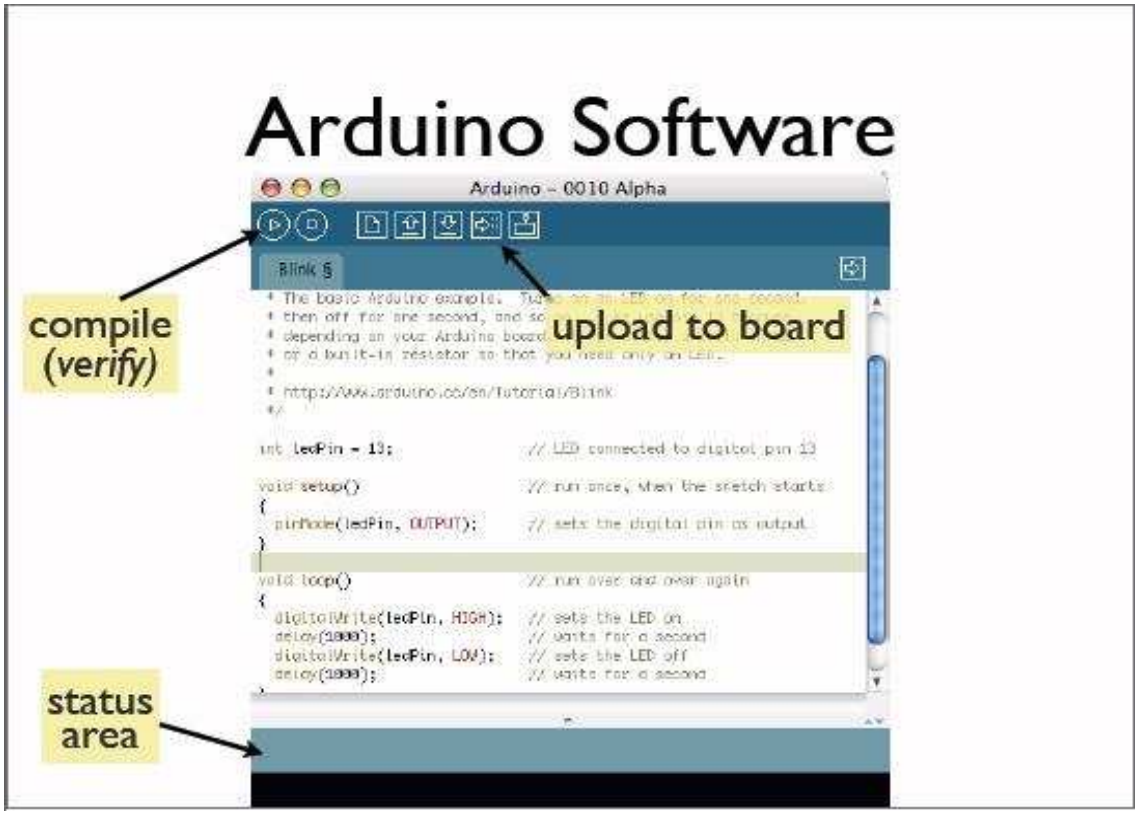
CHAPTER 3
PROCESS AND REQUIREMENTS

3.1 SOFTWARE REQUIREMENTS :

3.1.1 Arduino Compiler :

The Arduino IDE is a cross-platform application written in Java, and is derived from the IDE for the Processing programming language and the Wiring project. It is designed to introduce programming to artists and other newcomers unfamiliar with software development. It includes a code editor with features such as syntax highlighting, brace matching, and automatic indentation, and is also capable of compiling and uploading programs to the board with a single click. There is typically no need to edit make files or run programs on a command-line interface. Although building on command-line is possible if required with some third-party tools such a Ino.

The Arduino IDE comes with a C/C++ library called "Wiring" (from the project of the same name), which makes many common input/output operations much easier. Arduino programs are written in C/C++.



3.1.2 Eagle version 5.6.0 :

EAGLE (for: **E**asily **A**pplicable **G**raphical **L**ayout **E**ditor, German: **E**infach **a**nzuwendender **g**rafischer **L**ayout-**E**ditor) by CadSoft Computer is a flexible, expandable and scriptable EDA application with schematic capture editor, PCB layout editor, auto-router andCAM and BOM tools developed by CadSoft Computer GmbH, Germany, since 1988.

EAGLE is popular among smaller design houses and in academia for its favourable licensing terms and rich availability of component libraries on the web.

3.1.3 Google maps:

Google Maps is a desktop and mobile web mapping service application and technology provided by Google, offering satellite imagery, street maps, and Street View perspectives, as well as functions such as a route planner for traveling by foot, car, bicycle (beta test), or with public transportation. Also supported are maps embedded on third-party websites via the Google Maps API,[1] and a locator for urban businesses and other organizations in numerous countries around the world. Google Maps satellite images are not updated in real time; however, Google adds data to their Primary Database on a regular basis. Google Earth support states that most of the images are no more than 3 years old.


FIG : GOOGLE MAP ICON

3.2 COMPONENT DESCRIPTION :

For designing this hardware many types of devices are used to make it perfectly working. All the devices are purchased from different manufacturers. These components are soldered on a soldering board. The following list of hardware are required for this system.

- Power supply
- Microcontroller ATMEGA328
- GPS module
- GSM module
- Max232
- RS232
- LCD display
- LED
- Infrared sensor
- Fire detector

3.2.1 POWER SUPPLY:

It consists of step down transformer, bridge rectifier, capacitors and voltage regulator ICs. 230V AC is converted to 12V DC using transformer and bridge rectifier. This 12VDC is further reduced to 5V DC using voltage regulator IC.

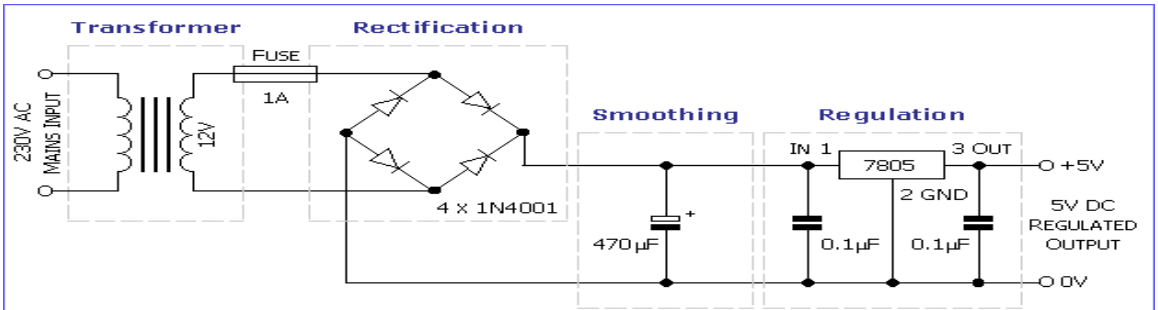


Figure 4: A simple 5V DC regulated power supply system

3.2.1.1 Resistors :

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current flow, and, at the same time, act to lower voltage levels within circuits.

In electronic circuits resistors are used to limit current flow, to adjust signal levels, bias active elements, terminate transmission lines among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators.

Fixed resistors have resistances that only change slightly with temperature, time or operating voltage.

Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits.

The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance will fall within a manufacturing tolerance.

FIG 1 : AXIAL LEAD RESISTOR

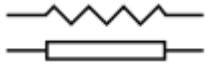


FIG 2: SCHEMATIC SYMBOL OF RESISTOR

Resistor is a circuit element having the function of introducing electrical resistance in to the circuit. There are three basic types of resistor.

(a) Fixed resistor

(b) Rheostat

(c) Potentiometer

A fix resistor is a two terminal device which electrical resistance is constant.

A rheostat is a resistor that can be changed in resistance value without opening the circuit to make adjustment.

A potentiometer is an adjustable resistor with three terminals, on at each end of the resistor element and thin movable along its length.

There are three basic types of resistors:

1. Carbon composite resistors
2. Wire wound resistors
3. Carbon-Film resistors.

In the circuit we use carbon composition resistors

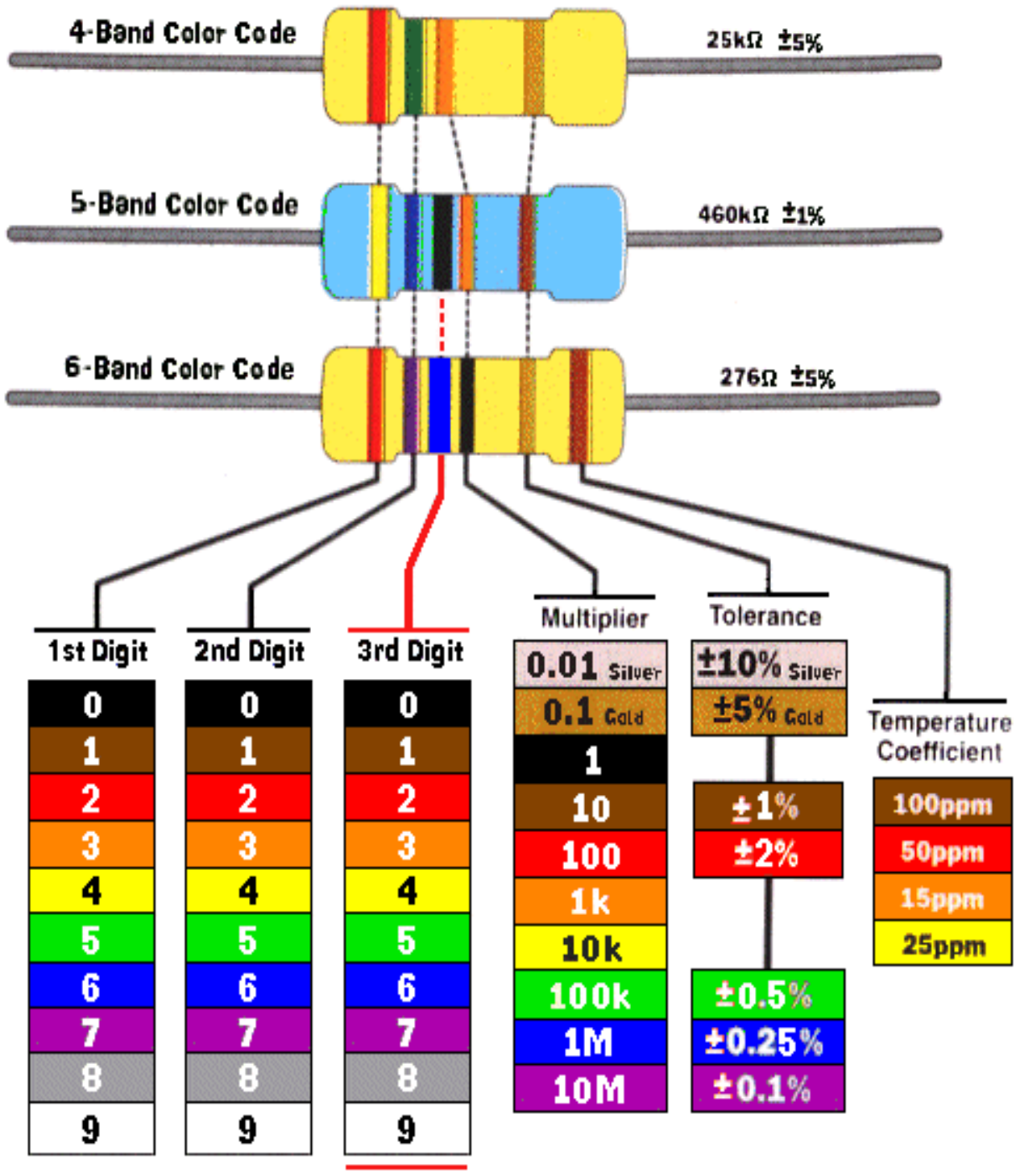


FIG : COLOUR CODING IN A RESISTOR

3.2.1.2 Capacitors :

A **capacitor** (originally known as a **condenser**) is a passive two-terminal electrical component used to store energy electrostaticallyin an electric field. The forms of practical capacitors vary widely, but all contain at least two electrical conductors (plates) separated by a dielectric (i.e. insulator). The conductors can be thin films, foils or sintered beads of metal or conductive electrolyte, etc. The nonconducting dielectric acts to increase the capacitor's charge capacity. A dielectric can be glass, ceramic, plastic film, air, vacuum, paper, mica, oxide layer etc. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike aresistor, an ideal capacitor does not dissipate energy. Instead, a capacitor stores energy in the form of an electrostatic field between its plates.

FIG : CAPACITORS

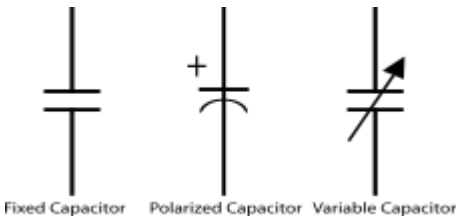


FIG : ELECTRONIC SYMBOL OF CAPACITOR

3.2.1.3 Transformers :

A **transformer** is an electrical device that transfers energy between two or more circuits through electromagnetic induction.

A varying current in the transformer's primary winding creates a varying magnetic flux in the core and a varying magnetic field impinging on the secondary winding. This varying magnetic field at the secondary induces a varying electromotive force (EMF) or voltage in the secondary winding. Making use of Faraday's Law in conjunction with high magnetic permeability core properties, transformers can thus be designed to efficiently change AC voltages from one voltage level to another within power networks.

Transformers range in size from RF transformers less than a cubic centimetre in volume to units interconnecting the power grid weighing hundreds of tons. A wide range of transformer designs is encountered in electronic and electric power applications. Since the invention in 1885 of the first constant potential transformer, transformers have become essential for the AC transmission, distribution, and utilization of electrical energy.

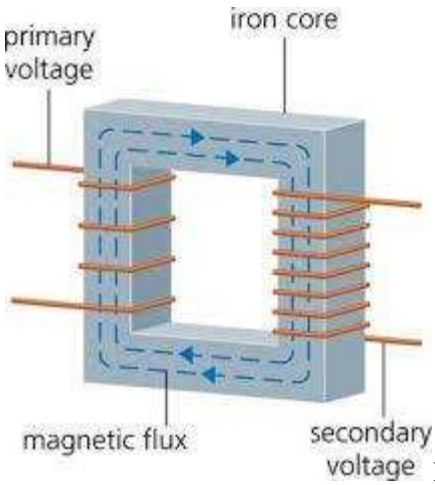


FIG : TRANSFORMER

3.2.1.4 IC LM7805 :

7805 is a **voltage regulator** integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The **voltage regulator IC** maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7805 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels.

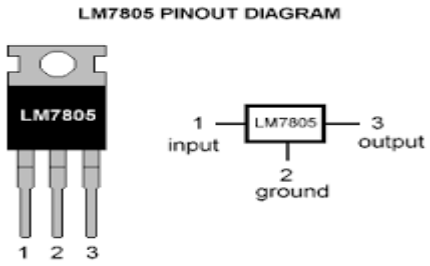


FIG : 7805 PIN DIAGRAM

3.2.1.5 W10M Bridge Rectifier

A **bridge rectifier** is an arrangement of four or more diodes in a **bridge** circuit configuration which provides the same output polarity for either input polarity. It is used for converting an alternating current (AC) input into a direct current (DC) output.

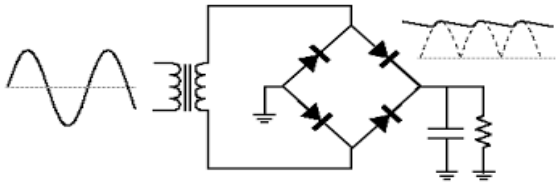


FIG : CIRCUIT DIAGRAM OF BRIDGE RECTIFIER

3.2.2 MICROCONTROLLER ATMEGA328 :

The Atmel AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

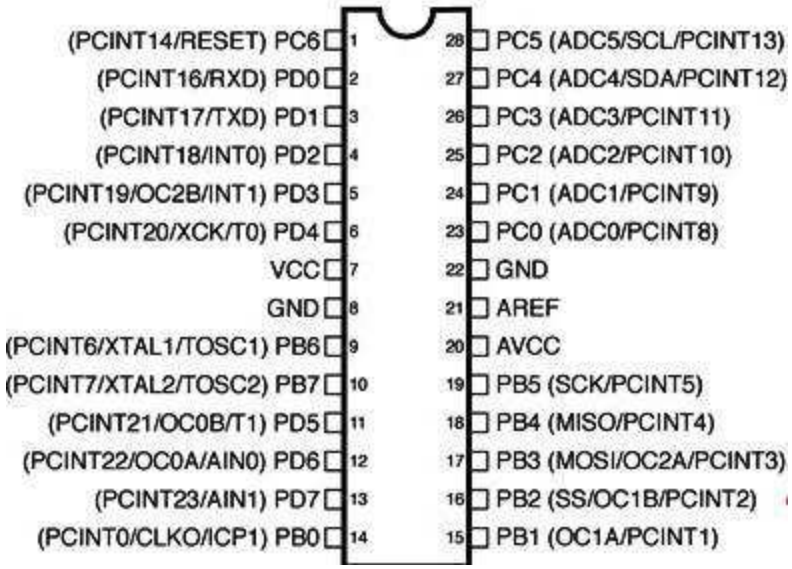


FIG : PIN DIAGRAM OF ATMEGA328 MICROCONTROLLER IC

The Atmega168 provides the following features: 16 Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 512 bytes of EEPROM, 1 Kbyte of SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible Timer/Counters with compare modes, internal and external interrupts, a serial programmable USART, a byte oriented Two wire Serial Interface, a 6-channel ADC (eight channels in TQFP and QFN/MLF packages) with 10-bit accuracy, a programmable Watchdog Timer with Internal Oscillator, an SPI serial port, and five software selectable power saving modes. The Idle mode stops the CPU

while allowing the SRAM; Timer/Counters, SPI port, and interrupt system to continue function

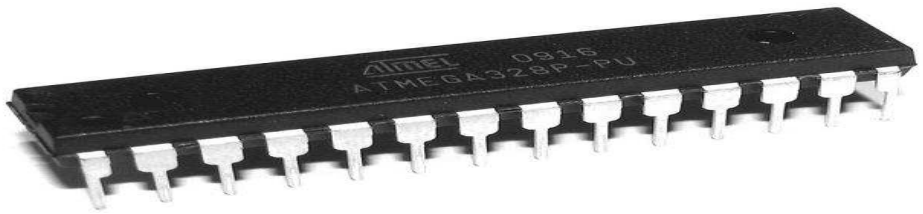


FIG : ATMEGA328

The Power down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next Interrupt or Hardware Reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC, to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator Oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low-power consumption.

3.3.3 GSM MODULE :

A **GSM modem** is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone.

When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

FIG : GSM MODULE

GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities.

For the purpose of this document, the term GSM modem is used as a generic term to refer to any modem that supports one or more of the protocols in the GSM evolutionary family, including the 2.5G technologies GPRS and EDGE, as well as the 3G technologies WCDMA, UMTS, HSDPA and HSUPA.

3.3.4 GPS MODULE :

A **GPS navigation device** is a device that accurately calculates geographical location by receiving information from GPS satellites. Initially it was used

by the United States military, but now most receivers are in automobiles and smartphones.

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of a minimum of 24, but currently 30, satellites placed into orbit by the U.S. Department of Defense. Military action was the original intent for GPS, but in the 1980s, the U.S. government decided to allow the GPS program to be used by civilians. The satellite data is free and works anywhere in the world.

GPS devices may have capabilities such as:

- maps, including streets maps, displayed in human readable format via text or in a graphical format,
- turn-by-turn navigation directions to a human in charge of a vehicle or vessel via text or speech,
- directions fed directly to an autonomous vehicle such as a robotic probe,
- traffic congestion maps (depicting either historical or real time data) and suggested alternative directions,
- information on nearby amenities such as restaurants, fueling stations, and tourist attractions.

FIG : GPS MODULE

3.3.5 MAX232 :

The **MAX232** is an IC, first created in 1987 by Maxim Integrated Products, that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.

The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip charge pumps and external capacitors. This makes it useful for implementing RS-232 in devices that otherwise do not need any voltages outside the 0 V to + 5 V range, as power supply design does not need to be made more complicated just for driving the RS-232 in this case.

The receivers reduce RS-232 inputs (which may be as high as ± 25 V), to standard 5 V TTL levels. These receivers have a typical threshold of 1.3 V, and a typical hysteresis of 0.5 V.

FIG : MAX232 IC

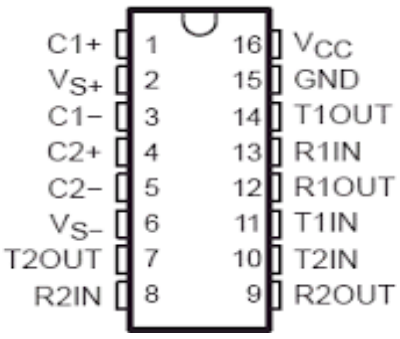


FIG : PIN DIAGRAM OF MAX232 IC

3.3.6 RS232 :

In telecommunications systems used today **RS-232** is a standard for serial communication transmission of data. It formally defines the signals connecting between a *DTE* (*data_terminal_equipment*) such as a computer terminal, and a *DCE* (*data circuit-terminating equipment*, originally defined as *data communication equipment*), such as a modem.

The RS-232 standard is commonly used in computer serial ports. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pinout of connectors. The current version of the standard is *TIA-232-F Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange*, issued in 1997.

An RS-232 serial port was once a standard feature of a personal computer, used for connections to modems, printers, mice, data storage, uninterruptible power supplies, and other peripheral devices. However, RS-232 is hampered by low transmission speed, large voltage swing, and large standard connectors.

In modern personal computers, USB has displaced RS-232 from most of its peripheral interface roles. Many computers do not come equipped with RS-232 ports and must use either an external USB-to-RS-232 converter or an internal expansion card with one or more serial ports to connect to RS-232 peripherals. Nevertheless, RS-232 devices are still used, especially in industrial machines, networking equipment and scientific instruments.

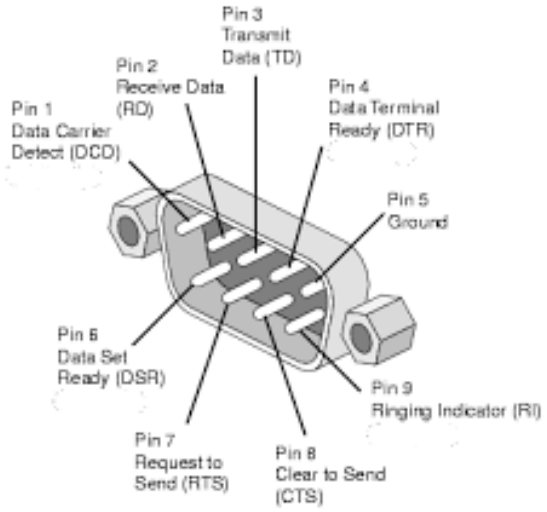


FIG : PIN DIAGRAM OF RS232 CONNECTOR

3.3.7 LCD :

A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly.

LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and signage. They are common in consumer devices such as DVD players, gaming devices, clocks, watches, calculators, and telephones, and have replaced cathode ray tube (CRT) displays in most applications.The LCD screen is more energy efficient and can be disposed of more safely than a CRT. Its low electrical power consumption enables it to be used in battery-powered electronic equipment.

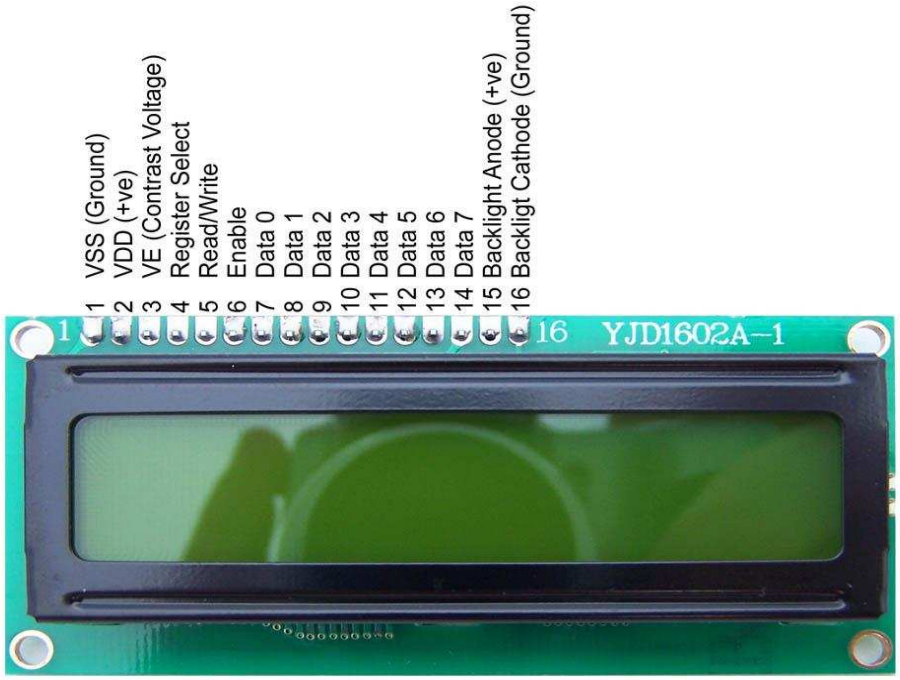


FIG : 16 BY 2 LCD & ITS PIN DESCRIPTION

3.3.8 LED :

A **light-emitting diode** (**LED**) is a two-lead semiconductor light source. It is a pn-junction diode, which emits light when activated.]When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes 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 band gap of the semiconductor.

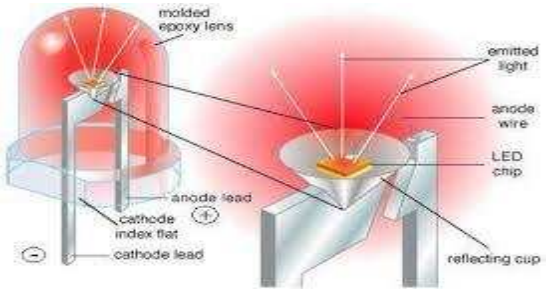


FIG :ILLUSTRATION OF LIGHT EMITTED BY LED

3.3.9 INFRARED SENSOR :

An **infrared sensor** is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting **infrared** radiation. **Infrared sensors** are also capable of measuring the heat being emitted by an object and detecting motion.

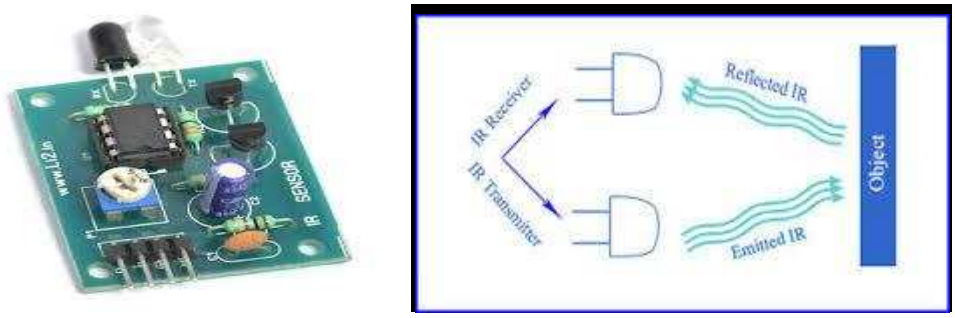


FIG : INFRARED SENSOR & HOW IT WORKS

3.3.10 FIRE DETECTOR :

A **heat detector** is a fire alarm device designed to respond when the converted thermal energy of a fire increases the temperature of a heat sensitive element. The thermal mass and conductivity of the element regulate the rate flow of heat into the element. All heat detectors have this thermal lag. Heat detectors have two main classifications of operation, "rate-of-rise" and "fixed temperature.

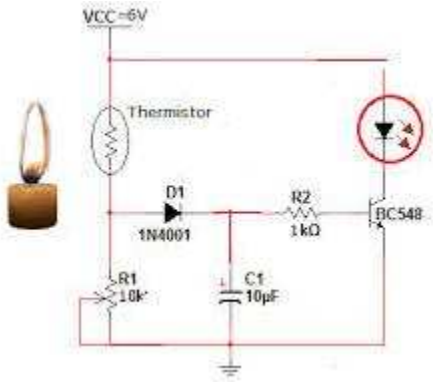


FIG : WORKING DESCRIPTION OF FIRE DETECTOR

3.3. PCB CONSTRUCTION :

PCB Layout

No device can work if its connections are not according to specification, and if the proper resistance, capacitance, inductance etc. are not connected to the place where required. Thus a PCB designer has to first think of the very possible combination of voltages that are required by the circuit and make them available at points where they are needed with the minimum use of jumpers and keeping the circuit size compact and yet effective.

The layout of PCB has to incorporate all the information on the board before one can go on the artwork preparation. This means that a concept, which clearly defines all the details of the circuitry and partly of final equipment, is a prerequisite before the actual layout can start.

For PCB layout, the following points ought to be considered carefully

1. Record size of components used.
2. Overall area covered is normally kept rectangular or square.
3. V_{cc} and ground lines should be provided at the sides to facilitate external connection.
4. Input and output terminals may be placed giving through to external connection.
5. Make a rough sketch placing components and interconnect components with jumpers.
6. Do not place components pointing in differed direction unless needed. Make them parallel to the either side of the board.
7. Make the neat final scaled sketch on the inch graph sheet.

8. Lines mounted are of uniform width.

9. Invest the layout to confirm that all the components are connected properly and given sufficient place in the layout.

Note: While following the above rule, a design must be chosen to minimize the total circuit area used.

Tracing

After the circuit layout has been prepared on the tracing paper, inverting the tracing paper onto the PCB so that the side that had been traced faces the PCB copper coating. Then trace the layout onto the PCB placing a carbon paper in between the two.

Painting

Paint must be uniformly applied. Use 0 number painting brushes for painting PCB layout.

Etching

In all PCBs, etching is the most important step. The final copper pattern is formed by selective removal of all unwanted copper which is not protected by an etch resist. Amongst the Enchants, FeCl3 (Ferric Chloride) is commonly used for small PCBs where etching is only out carried out occasionally for a small number of boards.

For etching, the solution is made, wherein sample and standard solution are in 2*1 dilutions. In order to increases the copper dissolution capacity and to bring the etching time slightly down, HCL is added. Etching temperature should be in the ranges of 20°C to 45°C. FeCl3 is an enchant used in small-scale PCB production. In high volume production FeCl3 is of

not much importance because it cannot be regenerated and it attacks the common metal etch resist.

PROCEDURE

To etch 1 kg of copper, 5.1 kg of Ferric Chloride is consumed. In order to increase the copper dissolving capacity and to bring the etching time slightly down, often HCL is added. HCL acts simultaneously against excessive sludge formation.

After etching is over the Ferric Chloride contained surface should be first cleaned by spraying water, which is not enough. Then we dip it in a 5% (by volume) in the solution of oxalic acid to remove iron and copper salts and final water rinsed vigorously. Then we rinse it by using petrol so that the paint comes out and copper remains intact where the paint was applied. The copper acts as conduction path for flow of signals.

The high corrosive nature of Ferric chloride leads to short etching time and avoid under etching.

Chemistry

Due to hydrolysis reaction, free acid is formed which reacts with copper.

$$FeCl_3+3H_2O = Fe(OH)_3+3HCl$$

The copper is oxidized by Ferric ion forming cuprous chloride.

Drilling

Drilling of holes for mounting components is important mechanical operation in PCB production process. The importance of hole drilling into

PCB's has further gone up with electronic components miniaturization. After rinsing drilling is done using bit as per the circuit provided. The diameters of holes generally accepted are as follows.

1. D = 0.8 mm
2. D =1.1 mm
3. D = 1.5 mm
4. D = 3.2 mm

Where,

D = Hole diameter.

Component Mounting

1. Before mounting any components, examine the PCB carefully for any cracks, beaks or other defects in conduction paths.

2. The leads of components like resistors and capacitors should be fully inserted into the mounting holes taking care to mount the components so that any information written on the components is clearly visible.

3. Carefully cut the leads of components so that about 3 mm of the end extended beyond the wiring side of the PCB. The ends of the leas are bent at right angles to make a firm contact with the surface where it is to be soldered.

4. In case of semiconductor devices like transistors and diodes, the length of the leads extending above the component side of the PCB should be about 1 cm. if transistor leads are too short we use a base. Metal cap should touch if they are not at ground potential. The right terminals should be at right places.

5. Certain components like transformers, potentiometers and variable capacitors, which are meant for use with PCB, are provided with pin type terminals that can be simply inserted into the hole in the PCB and soldered.

6. Use IC base for IC.

Soldering

PCB soldering required proper soldering technique, as explained below:

1. A light duty soldering iron of 25W or 30 W rating should be used to prevent damage to the printed circuit wiring due to excessive heating. The tip of soldering iron should not have an oxide coating. Clean it using sand paper.

2. Do not use excess solder to avoid solder flouring to adjacent conducing paths forming bridges, which cause short circuits.

3. Clean the surface of traces before you start soldering. It is advisable to use flux.

Layout of desired circuit diagram and preparation is first and most important operation in any printed circuit board manufacturing process. First of all layout of component side is to be made in accordance with available components dimensions. The following points are to be observed while forming the layout of P.C.B:

1. Between two components, sufficient space should be maintained.

2. High wattage/max, dissipated components should be mounted at a sufficient distance from semiconductors and electrolytic capacitors.

3. the most important point is that the components layout is making proper compression with copper side circuit layout.

Printed circuit board (P.C.B's) is used to avoid most or all the disadvantages of conventional bread board. These also avoid the use to thin wired for connecting (the components they are small in size and efficient in performance) the two most popular boards are widely used for general purpose application where the cost is to be low and the layout is simple

CHAPTER 4

CODING

Coding is as follows.....

```
int8_t answer;
int onModulePin= 2;
char aux_string[30];
int flag = 0;
char number [20];
char realnumber[9];
char mynumber[9];
int a=0;
int b=0;
int c=0;
//Your phone number
char phone_number[]="9977514948";

char data[100];
int data_size;

char aux_str[30];
char aux;
int x = 0;
char N_S,W_E;

char url[] = "pruebas.libelium.com";
char frame[200];

char latitude[15];
char longitude[15];
char altitude[6];
char date[16];
char time[7];
char satellites[3];
char speedOTG[10];
char course[10];
```

```
void setup(){
    mynumber[0]='9';
    mynumber[1]='9';
    mynumber[2]='7';
    mynumber[3]='7';
    mynumber[4]='5';
    mynumber[5]='1';
    mynumber[6]='4';
    mynumber[7]='9';
    mynumber[8]='4';
    mynumber[9]='8';


    pinMode(onModulePin, OUTPUT);
    Serial.begin(115200);

    power_on();
    power_onGPS();
    power_onSMS();

    delay(5000);

    sendATcommand("AT+CPIN=****", "OK", 2000);

    delay(3000);

    while( (sendATcommand("AT+CREG?", "+CREG: 0,1", 1000)
|| sendATcommand("AT+CREG?", "+CREG: 0,5", 1000)) == 0 );

    sendATcommand("AT+CLIP=1", "OK", 1000);

    while ( start_GPS() == 0);

    while (sendATcommand("AT+CREG?", "+CREG: 0,1", 2000) ==
0);
```

```
    // sets APN , user name and password
    sendATcommand("AT+SAPBR=3,1,\"Contype\",\"GPRS\"",
"OK", 2000);
    sendATcommand("AT+SAPBR=3,1,\"APN\",\"*******\"", "OK",
2000);
    sendATcommand("AT+SAPBR=3,1,\"USER\",\"*******\"",
"OK", 2000);
    sendATcommand("AT+SAPBR=3,1,\"PWD\",\"*******\"", "OK",
2000);

    // gets the GPRS bearer
    while (sendATcommand("AT+SAPBR=1,1", "OK", 20000) == 0)
    {
        delay(5000);
    }

    delay(1000);
    while(Serial.available() != 0)
    {
      Serial.read();
    }
}
void loop(){

    answer = sendATcommand("", "+CLIP", 1000);
    //Detect incomming call
    if (answer == 1)
    {
        Serial.println("Incoming call");

          if ( flag == 0){

              for (int i=0; i<19; i++){
                // read the incoming byte:
```

```
                while (Serial.available() == 0)
                {
                  delay (50);
                }
                //Stores phone number
                number[i] = Serial.read();

              }
              Serial.flush();
              flag = 1;
            }
            //Stores phone calling number
            for (int i=0; i<=14; i++){
              if(number[i]== '"'){
                i++;
                realnumber[0]=number[i];
                i++;
                realnumber[1]=number[i];
                i++;
                realnumber[2]=number[i];
                i++;
                realnumber[3]=number[i];
                i++;
                realnumber[4]=number[i];
                i++;
                realnumber[5]=number[i];
                i++;
                realnumber[6]=number[i];
                i++;
                realnumber[7]=number[i];
                i++;
                realnumber[8]=number[i];
                break;
              }
    }
```

```
    //Check phone number
    for (int i=0;i<9;i++){
      if (realnumber[i] == mynumber[i]){
          a++;
          if( a==9){
             Serial.println("Correct number");
             sendATcommand("ATH", "OK", 1000);
               if(b==1){
                 b=0;
               }else{
                 b=1;
                 c=1;
                   }
                 break;
               }
             }else{
               Serial.println("Wrong number");
               break;
             }
           }
     a=0;
     answer=0;
     flag = 0;
}
//Send SMS once and position to HTTP
if (b==1){
     get_GPS();
     send_HTTP();
     delay(500);
    if (c==1){
      sendSMS();
      delay(100);
      c=0;
      }
     }
```

```
}

void power_on(){

    uint8_t answer=0;

    digitalWrite(onModulePin,HIGH);
    delay(3000);
    digitalWrite(onModulePin,LOW);

    while(answer == 0){      // Send AT every two seconds
and wait for the answer
        answer = sendATcommand("AT", "OK", 2000);
    }
}

int8_t sendATcommand(char* ATcommand, char*
expected_answer, unsigned int timeout){

    uint8_t x=0,  answer=0;
    char response[100];
    unsigned long previous;

    memset(response, '\0', 100);     // Initialice the
string

    delay(100);

    while( Serial.available() > 0) Serial.read();     //
Clean the input buffer

    if (ATcommand[0] != '\0')
    {
        Serial.println(ATcommand);     // Send the AT
command
```

```
    }

    x = 0;
    previous = millis();

    // this loop waits for the answer
    do{
        if(Serial.available() != 0){    // if there are
data in the UART input buffer, reads it and checks for the
asnwer
            response[x] = Serial.read();
            //Serial.print(response[x]);
            x++;
            if (strstr(response, expected_answer) != NULL)
// check if the desired answer (OK) is in the response of
the module
            {
                answer = 1;
            }
        }
    }while((answer == 0) && ((millis() - previous) <
timeout));    // Waits for the asnwer with time out

    return answer;
}

void power_onGPS(){

    uint8_t answer=0;

    // checks if the module is started
    answer = sendATcommand("AT", "OK", 2000);
    if (answer == 0)
    {
        // power on pulse
```

```
        digitalWrite(onModulePin,HIGH);
        delay(3000);
        digitalWrite(onModulePin,LOW);

        // waits for an answer from the module
        while(answer == 0){
            // Send AT every two seconds and wait for the
answer
            answer = sendATcommand("AT", "OK", 2000);
        }
    }

}

int8_t start_GPS(){

    unsigned long previous;

    previous = millis();
    // starts the GPS
    sendATcommand("AT+CGPSPWR=1", "OK", 2000);
    sendATcommand("AT+CGPSRST=0", "OK", 2000);

    // waits for fix GPS
    while(( (sendATcommand("AT+CGPSSTATUS?", "2D Fix",
5000) ||
        sendATcommand("AT+CGPSSTATUS?", "3D Fix", 5000)) ==
0 ) &&
        ((millis() - previous) < 90000));

    if ((millis() - previous) < 90000)
    {
        return 1;
    }
    else
```

```
    {
        return 0;
    }
}

int8_t get_GPS(){

    int8_t counter, answer;
    long previous;

    // First get the NMEA string
    // Clean the input buffer
    while( Serial.available() > 0) Serial.read();
    // request Basic string
    sendATcommand("AT+CGPSINF=0", "AT+CGPSINF=0\r\n\r\n",
2000);

    counter = 0;
    answer = 0;
    memset(frame, '\0', 100);     // Initialize the string
    previous = millis();
    // this loop waits for the NMEA string
    do{

        if(Serial.available() != 0){
            frame[counter] = Serial.read();
            counter++;
            // check if the desired answer is in the
response of the module
            if (strstr(frame, "OK") != NULL)
            {
                answer = 1;
            }
        }
        // Waits for the asnwer with time out
```

```
    }
    while((answer == 0) && ((millis() - previous) < 2000));

    frame[counter-3] = '\0';

    // Parses the string
    strtok(frame, ",");
    strcpy(longitude,strtok(NULL, ",")); // Gets longitude
    strcpy(latitude,strtok(NULL, ",")); // Gets latitude
    strcpy(altitude,strtok(NULL, ".")); // Gets altitude
    strtok(NULL, ",");
    strcpy(date,strtok(NULL, ".")); // Gets date
    strtok(NULL, ",");
    strtok(NULL, ",");
    strcpy(satellites,strtok(NULL, ",")); // Gets
satellites
    strcpy(speedOTG,strtok(NULL, ",")); // Gets speed over
ground. Unit is knots.
    strcpy(course,strtok(NULL, "\r")); // Gets course

    convert2Degrees(latitude);
    convert2Degrees(longitude);

    return answer;
}

/* convert2Degrees ( input ) - performs the conversion from
input
 * parameters in  DD°MM.mmm’ notation to DD.dddddd°
notation.
 *
 * Sign '+' is set for positive latitudes/longitudes
(North, East)
 * Sign '-' is set for negative latitudes/longitudes
(South, West)
```

```
 *
 */
int8_t convert2Degrees(char* input){

    float deg;
    float minutes;
    boolean neg = false;

    //auxiliar variable
    char aux[10];

    if (input[0] == '-')
    {
        neg = true;
        strcpy(aux, strtok(input+1, "."));

    }
    else
    {
        strcpy(aux, strtok(input, "."));
    }

    // convert string to integer and add it to final float
variable
    deg = atof(aux);

    strcpy(aux, strtok(NULL, '\0'));
    minutes=atof(aux);
    minutes/=1000000;
    if (deg < 100)
    {
        minutes += deg;
        deg = 0;
    }
    else
```

```
    {
        minutes += int(deg) % 100;
        deg = int(deg) / 100;
    }

    // add minutes to degrees
    deg=deg+minutes/60;

    if (neg == true)
    {
        deg*=-1.0;
    }

    neg = false;

    if( deg < 0 ){
        neg = true;
        deg*=-1;
    }

    float numberFloat=deg;
    int intPart[10];
    int digit;
    long newNumber=(long)numberFloat;
    int size=0;

    while(1){
        size=size+1;
        digit=newNumber%10;
        newNumber=newNumber/10;
        intPart[size-1]=digit;
        if (newNumber==0){
            break;
        }
    }
```

```
    int index=0;
    if( neg ){
        index++;
        input[0]='-';
    }
    for (int i=size-1; i >= 0; i--)
    {
        input[index]=intPart[i]+'0';
        index++;
    }

    input[index]='.';
    index++;

    numberFloat=(numberFloat-(int)numberFloat);
    for (int i=1; i<=6 ; i++)
    {
        numberFloat=numberFloat*10;
        digit= (long)numberFloat;
        numberFloat=numberFloat-digit;
        input[index]=char(digit)+48;
        index++;
    }
    input[index]='\0';

}

void send_HTTP(){

    uint8_t answer=0;
    // Initializes HTTP service
    answer = sendATcommand("AT+HTTPINIT", "OK", 10000);
    if (answer == 1)
    {
```

```
        // Sets CID parameter
        answer = sendATcommand("AT+HTTPPARA=\"CID\",1",
"OK", 5000);
        if (answer == 1)
        {
            // Sets url
            sprintf(aux_str,
"AT+HTTPPARA=\"URL\",\"http://%s/demo_sim908.php?", url);
            Serial.print(aux_str);
            sprintf(frame,
"visor=false&latitude=%s&longitude=%s&altitude=%s&time=%s&s
atellites=%s&speedOTG=%s&course=%s",
            latitude, longitude, altitude, date,
satellites, speedOTG, course);
            Serial.print(frame);
            answer = sendATcommand("\"", "OK", 5000);
            if (answer == 1)
            {
                // Starts GET action
                answer = sendATcommand("AT+HTTPACTION=0",
"+HTTPACTION:0,200", 30000);
                if (answer == 1)
                {

                    Serial.println(F("Done!"));
                }
                else
                {
                    Serial.println(F("Error getting url"));
                }

            }
            else
            {
                Serial.println(F("Error setting the url"));
```

```
            }
        }
        else
        {
            Serial.println(F("Error setting the CID"));
        }
    }
    else
    {
        Serial.println(F("Error initializating"));
    }

    sendATcommand("AT+HTTPTERM", "OK", 5000);

}

void power_onSMS(){

    uint8_t answer=0;

    // checks if the module is started
    answer = sendATcommand("AT", "OK", 2000);
    if (answer == 0)
    {
        // power on pulse
        digitalWrite(onModulePin,HIGH);
        delay(3000);
        digitalWrite(onModulePin,LOW);

        // waits for an answer from the module
        while(answer == 0){      // Send AT every two
seconds and wait for the answer
            answer = sendATcommand("AT", "OK", 2000);
        }
    }
```

```
}

void sendSMS(){
  sendATcommand("AT+CPIN=****", "OK", 2000);

    delay(3000);

    Serial.println("Connecting to the network...");

    while( (sendATcommand("AT+CREG?", "+CREG: 0,1", 500) ||
            sendATcommand("AT+CREG?", "+CREG: 0,5", 500))
== 0 );

    Serial.print("Setting SMS mode...");
    sendATcommand("AT+CMGF=1", "OK", 1000);    // sets the
SMS mode to text
    Serial.println("Sending SMS");

    sprintf(aux_string,"AT+CMGS=\"%s\"", phone_number);
    answer = sendATcommand(aux_string, ">", 2000);    //
send the SMS number
    if (answer == 1)
    {
        Serial.print("Theft Alert:");
        Serial.print("Latitude: ");
              int i = 0;
              while(latitude[i]!=0){
              Serial.print(latitude[i]);
              i++;
              }
              Serial.print(" / Longitude: ");
              i = 0;
              while(longitude[i]!=0){
              Serial.print(longitude[i]);
```

```
                i++;
                }
        Serial.write(0x1A);
        answer = sendATcommand("", "OK", 20000);
        if (answer == 1)
        {
            Serial.print("Sent ");
        }
        else
        {
            Serial.print("error ");
        }
    }
    else
    {
        Serial.print("error ");
        Serial.println(answer, DEC);
    }

}
```

CHAPTER 5

ADVANTAGES & FUTURE SCOPE

5.1 ADVANTAGES :

Commercial fleet operators are by far the largest users of vehicle tracking systems. These systems are used for operational functions such as routing, security, dispatch and collecting on-board information.

These are also used for fire detector in large vehicles like train, bus etc. because the vehicle like train contains large number of people and the sending alert of fire accident can save many lives.

The applications for this project are in military, navigation, automobiles, aircrafts, fleet management, remote monitoring, remote control, security systems, tele services, etc.

- Fleet monitoring
- Vehicle scheduling
- Route monitoring
- Driver monitoring
- Accident analysis
- Geo-fencing geo-coding

These are just a few advantages of the project that has been introduced in this report . We can interface more number of sensors in order to serve multiple purposes. The microcontroller that has been used in this project have inbuit ADCs and hence the controller is capable of accepting analog inputs, which is the biggest advantage. Since all real world signals are analog in nature, by incorporating different sensors required purpose can be served.

5.2 FUTURE SCOPE :

- We can use the EEPROM to store the previous Navigating positions up to 256 locations and we can navigate up to N number of locations by increasing its memory.

- We can reduce the size of the kit by using GPS+GSM on the same module.

- We can increase the accuracy up to 3m by increasing the cost of the GPS receivers.

- We can use our kit for detection of bomb by connecting to the bomb detector.

- With the help of high sensitivity vibration sensors we can detect the accident. whenever vehicle unexpectedly had an accident on the road with help of vibration sensor we can detect the accident and we can send the location to the owner, hospital and police.

- We can use our kit to assist the traffic. By keeping the kits in the entire vehicles and byknowing the locations of all the vehicles.

- If anybody steals our car we can easily find our car around the globe. By keeping vehicle positioning vehicle on the vehicle.

CHAPTER 6

RESULT & CONCLUSION

6.1 RESULT :

Whenever accident or theft of the vehicle is occurred then the device sends message to given mobile device.

Message for theft :

“Theft alert

latitude: 2400.0090, N

longitude: 12100.0000, E

time: 12:00”

Message for accident :

“Accident alert

latitude: 2400.0090, N

longitude: 12100.0000, E

time: 12:00”

This system shows the location of vehicle on the lcd connected to it also just to make sure the working condition of the microcontroller.

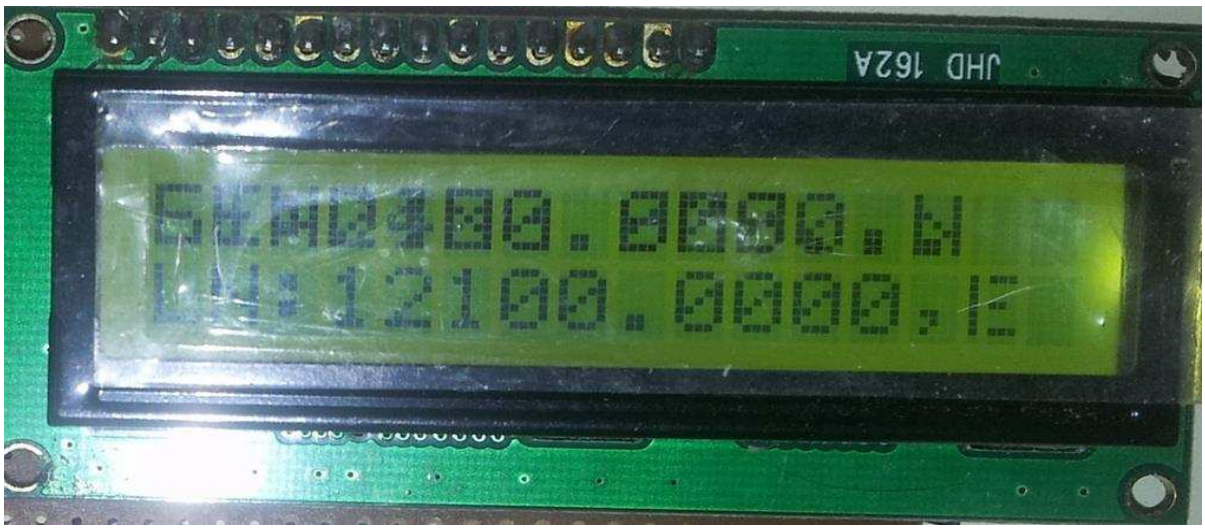


FIG : LCD SHOWING THE POSITION OF VEHICLE

6.2 CONCLUSION :

Vehicle tracking system makes better fleet management and which in turn brings large profits. Better scheduling or route planning can enable you handle larger jobs loads within a particular time. Vehicle tracking both in case of personal as well as business purpose improves safety and security, communication medium, performance monitoring and increases productivity. So in the coming year, it is going to play a major role in our day-to-day living.

Main motto of the project is to incorporate different types of sensors so that they help in decrease the chances of losing life in such accident which we can't stop from occurring. Whenever accident is alerted the paramedics are reached to the particular location to increase the chances of life. This device invention is much more useful for the accidents occurred in deserted places and midnights. This vehicle tracking and accident alert feature plays much more important role in day to day life in future.

CHAPTER 7

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7.1 REFERENCES :

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CHAPTER 8

PHOTO GALLERY

8.1 PHOTO GALLERY :


GPS Based Vehicl
Tracking System


GPS Based Vehicl
Tracking System


Text message
From
Latitude(N): 2650.2424
Longitude(E): 07547.3474


Lat(N)2650.24241
Lon(E)07547.3474
3.3V
5V
GND
GND
5V
BRIGHTNESS
aha!
ahaaadaets.in

THANK YOU