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Solar Based Failure Boat Location Detecting System

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ABSTRACT: *These days almost all fisher mans are using motorized fuel boats for hunting the sea foods. In this regard they travel too long from the sea shore to capture big fishes, sometimes due to the lack of fuel or due to the engine failure, they stuck in the middle of sea water, they cannot comeback. Since mobile network is not existed in deep sea, it is very difficult to communicate with the concern persons & almost it is impossible to send the information. In such critical situation they need help of rescue team, therefore this system is designed which is quite useful for the fisherman's during emergencies. Each and every fisherman boat must be equipped with this low-cost solar powered boat location detector using GPS and RF communication system by which boat location data in the form of latitude & longitude values can be transmitted to the rescue team or coast guards. Since it is a prototype module, low range RF communication system is used there by the range is restricted to less than 50feet. But for real time applications, 400 MHz frequency range high power transmitter of 10Watts can be used which can able to send the information to an 80 km distant located receiver. If required, RF repeaters are also can be used to enhance the range. Since the availability of main power source is not possible in the moving boat, here free power source of solar energy is used to energize the system and for this purpose 10Watts solar panel is used. The output of the panel is used to charge the battery, for this purpose, 12V – 2Ah rechargeable battery is used by which the system can be energized during knight also. The main processor is designed with 89c52 microcontroller chip and the GPS interfaced with this processor can acquire the location data from corresponding satellites. This data will be displayed through an LCD and this same information will be transmitted through RF transmitter. Here with the help of a send key interfaced with controller and by activating this key, data will be transmitted. In the receiver, with the help of another 89c52 controller chip interfaced with LCD, boat location can be monitored. Whenever the receiver receives the location data, alarm will be energized for few seconds to alert the concern persons.*

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I. INTRODUCTION

Fishing in India is a major industry employing 14.5 million people. India ranks second in aquaculture and third in fisheries production. Fisheries contribute to 1.07% of the Total GDP (Gross Domestic Product) of India. According to the National Fisheries Development Board the Fisheries Industry generates export earnings of Rs 334.41 billion. Centrally sponsored schemes will increase exports by Rs 1 lakh crore in FY25. 65,000 fishermen have been trained under these schemes from 2017 to 2020. All it is possible because our country is having very lengthy coastal area, India has 7,516 kilometers (4,670 mi) of marine coastline, 3,827 fishing

villages and 1,914 traditional fish landing centers and therefore it is essential to safeguard our fishermen when they stuck in deep sea. In this regard, this project work is designed to rescue the fishermen along with their boat when their boat engine fails. The main purpose of this project work is to send failure boat location to the coast guards through wireless communication system because mobile communication system is not existed in deep sea.

The other important advantage of using this system is to safeguard the fisherman from the international water border crossing. In general, while hunting the fishes, the fisherman they are not aware of international borders and moves further in to other nation waters by which they will be caught. Though they are innocent, it will be treated as a severe offense in the view of other nation coast guards and often it happens in indo-Srilanka boarders near Tamil Nādu. To avoid such harassment, here this system is designed to track the boat through GPS. Presently the system is designed to obtain boat position data through GPS module, in this regard, the co-ordinate values in the form of latitude and longitude values obtained from the satellites will be displayed continuously. Presently the system doesn't contain warning system, if it is incorporated in the fisherman boat device which alerts the fisherman in advance when his boat reaches near to the international water boarder.

The system is designed with 89c52 microcontroller chip as main processor and other devices like GPS, RF communication system, LCD, etc are interfaced with this processor in data transmitting module, i.e. boat equipment. The purpose of GPS is to acquire the global position data of the boat such that whenever the boat engine fails, the sailor can activate emergency button by which the system sends warning signal along with boat location data through RF communication system. The information gathered from the GPS will be in the form of Latitude & Longitude values in North-East region and this data will be transmitted. When this data is entered in to the computer Google maps at data receiving end, boat location will be displayed.

Now coming to the main processing unit, it is constructed with 89c51/52 microcontroller chip, the microcontroller used in this project work is playing major roll. Microcontrollers are increasingly being used to implement communication systems. It is therefore important to understand Microcontroller based systems well. Today, microcontrollers have become an integral part of all instruments. Dedicated system that uses microcontrollers, have certainly improved the functional, operational and performance-based specifications. The architectural changes in instrumentation and control systems where and are due to the computing and communication capability of the Micro controller devices. Micro controller must be treated as a tool for computing and communication; Knowledge of microcontrollers is meaning full and very rewarding if it is applied to design a product that is useful in the industry or for the society in general. This is a subject, which has direct relevance to industrial product development and automation. In this project work, microcontroller is programmed to perform the function of encoding and decoding techniques, which is essential for any communication system.

Any Micro-controller, that functions according to the program written in it. Here the program is prepared in such a way, so that the system performs the function of sending GPS information to the remote monitoring station. The chip is programmed to display the boat location data and this same data can be transmitted through RF network.

The program is nothing but an instruction set, this is often prepared in binary code, & are referred as machine code, there by this software is called as machine language. Writing a program in such a code is a skilled and very tedious process. It is prone to errors because the program is just a series of 0's and 1's and the instructions are not easily comprehended from just looking at the pattern. An alternative is to use an easily comprehended form of shorthand code for the patterns 0's and 1's. Micro controller can read and it can store the information received from the external devices. Micro-controllers are dedicated to one task and run one specific program. The program is stored in ROM (read-only memory) and generally does not change. If there are any modifications in the function, or errors in the software, the existing program must be erased from the chip & again modified program must be loaded in the chip through chip burner. The detailed description of these controllers is explained in following chapters.

It is clear that the above functions cannot be performed without microcontrollers, therefore these devices are said to be heart of the instruments, now a days there is no such instrument that works without microcontroller. Hence micro-controllers are increasingly being used to design all sorts of communication systems, instruments, control systems, robots, etc. It is therefore important to understand micro-controller-based communication systems well.

Now coming to the RF communication system, Radio communication is the process of sending information from one place and receiving it in another place without using any connecting wires. It is also called as wireless communication system; the most important form of radio communication is radio broadcasting. In general Radio waves are produced by rapidly changing currents flowing through a conductor. These radio waves spread out in space like ripples produced on the surface of a pond when a stone is dropped in the water. When these fast-moving radio waves strike some other conductor placed in their path at a distant point, they produce in the second conductor weak currents of the same nature as the original current which produced these radio waves. Thus, a communication link will be established between two distant points.

Radio waves belong to a particular type of waves called electromagnetic waves, a form of energy resulting from a combination of electrical and magnetic effects of rapidly changing electric currents. Although not visible to the eye, radio waves travel with the velocity of light waves which is 1, 86,000 miles per second. In fact, both light waves and radio waves are electromagnetic waves. Sound also travels in the form of waves but sound waves are not electromagnetic waves. Compared to electromagnetic waves, sound waves travel at a much lower speed of 1100 feet per second. This is the reason why a flash of lighting is seen first and the sound of thunder follows a little later.

Basically, a communication system is of an analog or digital type, here digital type of communication system is implemented. In an analog communication system, the information-bearing signal is continuously varying in both amplitude and time, and it is used directly to modify some characteristic of a sinusoidal carrier wave, such as amplitude, phase, or frequency. In a digital communication system, on the other hand, the information-bearing signal is processed so that it can be represented by a sequence of discrete messages. In analog communication, frequency and wavelength represents a complete cycle of a radio wave. The number of such complete cycles performed by the radio wave in one second is called the frequency of the radio wave. The unit of frequency is hertz, which is one cycle per second. This unit is named after Henrich Hertz, who discovered radio waves. Radio waves generally possess a frequency of millions of hertz, thus represented by megahertz. The wavelength of a radio wave is the distance travelled by the wave during one complete cycle.

Any source of information, either it is digital or analog, frequencies by themselves cannot travel long distances, but when superimposed on the carrier frequency, they can cover the same distance as the carrier wave itself. A modulated wave is like an aero-plane carrying passengers who could not have reached their destination without the help of the aero-plane. For modulating a radio wave, the two important characteristics of the radio wave that can be varied are the amplitude and the frequency of the carrier wave. When the amplitude of the carrier is varied in accordance with the variation in the amplitude of the modulating signal (Audio frequency), the modulation is called amplitude modulation (AM). If, however, the frequency of the carrier is varied in accordance with the variation in the amplitude of the modulating signal, the modulation is called frequency modulation (FM).

The carrier generator in the transmitting module is designed to produce 433MHz approximately; the digital information produced by the microcontroller chip is super imposed over this carrier and transmitted as a modulated wave. In the receiving module, the received information will be de-modulated, decoded and displayed through an LCD interfaced with the controller chip.

II. OVERVIEW OF THE CIRCUIT

2.1 CIRCUIT ANALYSIS

Depending up on the program prepared for the 89C52 microcontroller chip in the data transmitting unit, I, e, boat equipment, the system performs multiple tasks of acquiring data from GPS module, displaying the data through LCD, Transmitting the data through RF transmitter, etc. similarly in second part, I, e in data receiving module, another 89c52 microcontroller chip is programmed to receive the data through RF receiver, decode the data and display the GPS data through LCD. Another important function of this device is to raise an alarm when emergency key is activated in the transmitter. Entire system equipped in the boat is designed to operate through solar energy because availability of main power source in the moving boat is not possible. For this purpose, 10Watts solar panel with suitable rechargeable battery is used to run the system effectively.

Since the main intention of the project work is to utilize free power source of solar energy in the boat, it can be utilized for some other purposes like lighting system, energizing the motor, etc., related to the boat. Our main motto is to transmit the boat engine failure information along with boat location data low power solar panel is used. If required high power solar panel can be used to operate entire boat mechanism. All most all fishing boats are equipped with diesel engines, economy point of view, it is not advisable and hence we recommend convert all boats as electric boats and utilize solar energy to gain more profits.

One best and dependable method is utilizing solar energy. As the availability of fossil fuel declines, there is need to find alternate energy sources, of the many sources, solar energy available in abundance and renewable is the ultimate source of all known forms of energy. It is clear, safe, and free, does not pollute the environment and thus will be an extremely viable alternative in the days to come. So, it is essential to learn about solar energy & hence the following is the brief description of this energy source.

One way to utilize the solar energy is to generate electricity directly from the sunlight by photovoltaic conversion. Since photovoltaic modules have now become extensively available in the country. Solar energy has long been regarded as an ideal energy source but for the fact that we knew little to tap or use it to our advantage. The advancement in science and technology brought out by mankind had led to developments like the photovoltaic cell. Solar panels comprise of a number of such P V Cells. The output of the Solar Panel is proportional to the intensity of incident radiation from the sun.

Photovoltaic systems and power plants have emerged as viable power sources for applications such as lighting, water pumping and telecommunications and are being increasingly used for meeting electrical energy

needs in remote villages, hamlets, hospitals and households. PV systems, when used on a large scale, can cut down the need for extending the distribution grids in rural areas and the resultant losses in transmission. Solar Photovoltaic (SPV) water pumping systems are technically proven and have potential of replacing diesel-pumping systems, commonly used in un-electrified locations for lifting water from shallow depths. The pumps can also bring the benefits of irrigation and drinking water supply in backward areas not served by the existing grid and where supplying diesel is a problem. It is clear that there is a vast potential for the use of solar photovoltaic technology in India.

The Ministry of Non-Conventional Energy Sources (MNES) is responsible for the overall planning, program formulation and overseeing the implementation of various activities relating to renewable energy technologies. Recognizing the importance of PV technology in the Indian context, the Ministry has been implementing a comprehensive program covering R&D, demonstration & utilization, commercialization, industrial development and awareness promotion for more than two decades.

During the past 25 years, significant efforts have gone into the development, evaluation and introduction of a large number of applications. Several PV systems and products are now commercially available, and are also economically viable in comparison to fossil fuel-based systems in certain situations. The country today has among the world's largest programs for deployment of decentralized PV systems. A summary of the status of PV development and use in India is given in the succeeding sections.

The relatively simple technology called photovoltaic (PV) converts sunlight directly into electricity. We can easily understand and use this astonishing process. PV already provides total electrical power for hundreds of thousands of dwellings (large and small) around the globe. You too, can get your electricity from the world's largest energy source.

Solar energy is increasingly used these days for wide variety of applications, in this regard this project work is considered, which is aimed to design a low-cost solar powered system. As this project work mainly exposes about solar energy, it is essential to learn about solar radiation & photovoltaic (PV) systems. The detailed description about PV cells & solar energy is provided in separate chapter.

Solar energy, with its virtually infinite potential and free availability, represents a non-polluting and endless or inexhaustible energy source which can be developed to meet the energy needs of mankind in a major way. The high cost, fast depleting fossil fuels and the public concern about the eco-friendly power generation of power have led to a surge of interest in the utilization of solar energy. To evaluate the energy potential at particular place, detailed information on its availability is essential. These include data on solar intensity, spectrum, incident angle and cloudiness as a function of time.

The utilization of solar energy is increasing day by day, because the cost of solar panels is reducing slowly. In 2005 the cost of solar panel was Rs: 200/- per watt, but today the same panel is available for Rs: 60/- per watt, this cost may further reduce in feature, because more manufacturers are entering in to this field. But even today, unfortunately, energy provided by solar panels is more expensive than using conventional energy sources, so it is important to increase the production & reduce the panel cost. One main drawback is efficiency; the output of the panel is very poor when compared with input, so it is important to increase the efficiency of the PV cells. There are two ways to enhance the utility, one is by developing cheaper and more efficient solar panels and the other method is by improving the efficiency of the system by optimizing the operating conditions. Another important factor is long life of the panel.

As the initial expenditure is more, a long lifetime is expected to recover the cost of the system both in financial and energy expenditure. Presently the panel manufacturers are offering 15 years life to their panels; few of them are claiming that their panels can work up to 20 years. So, validation of the panel is important by comparison of different technologies. Panels must be tested perfectly before they install, for this reason proper testing equipment & methods are essential for various reasons. One main reason is to measure the working power at different conditions. The solar panel testing should be done close to the operating conditions. The measurement system can be designed to determine the electrical parameters of a PV cell.

2.2 BLOCK DIAGRAM

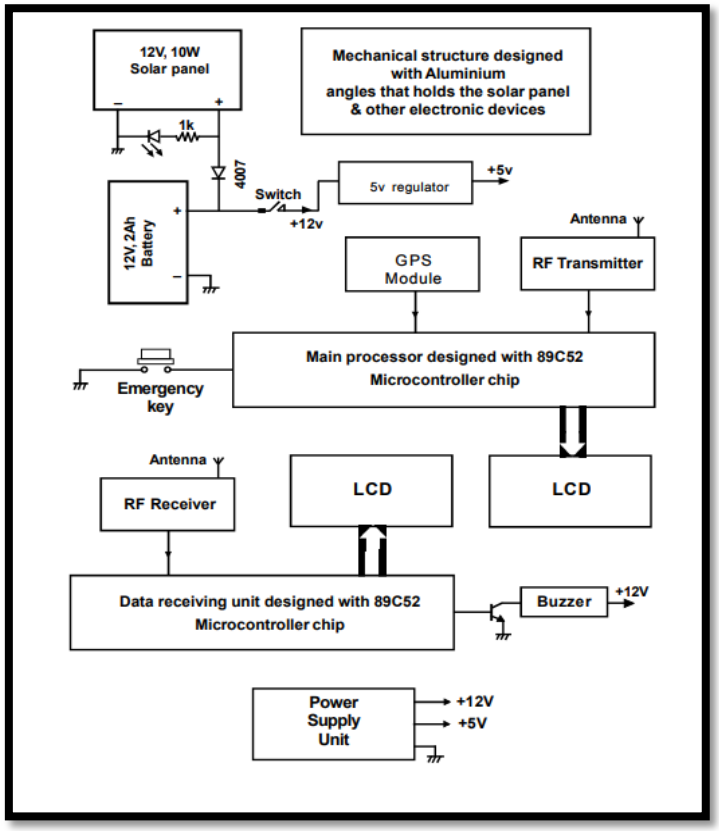

Fig 1.1 Block diagram of the project

2.3 CIRCUIT DIAGRAM

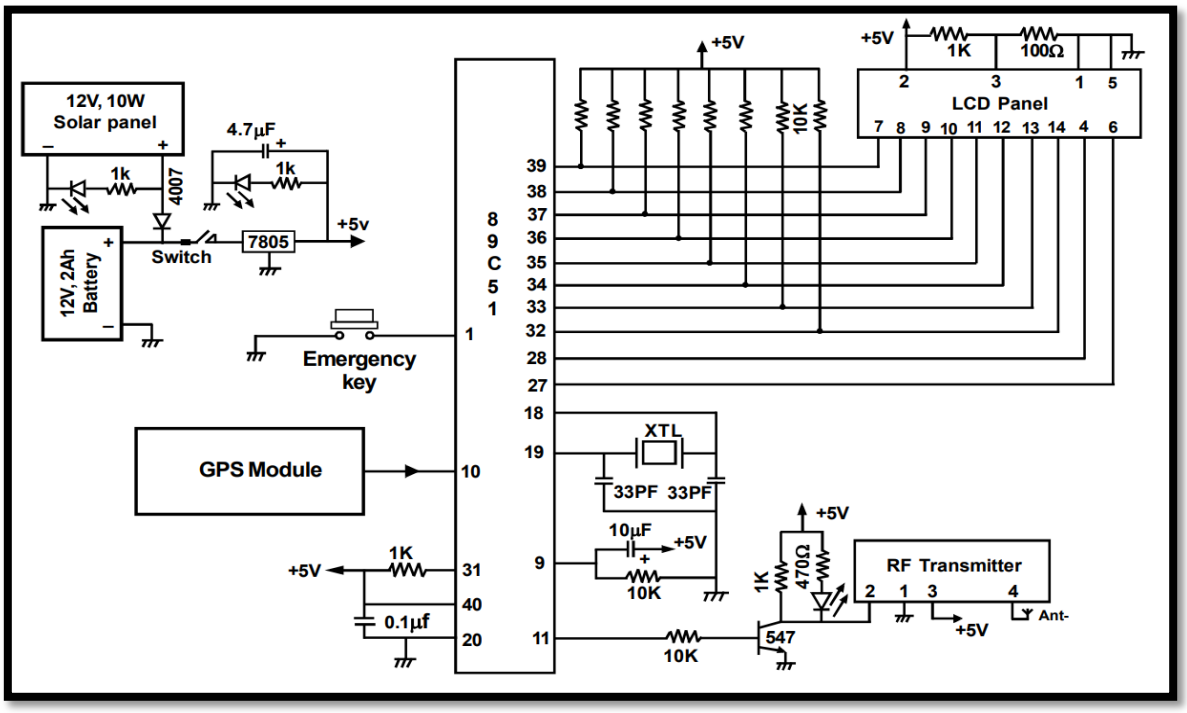

Fig 1.2 Circuit diagram on the transmitter side

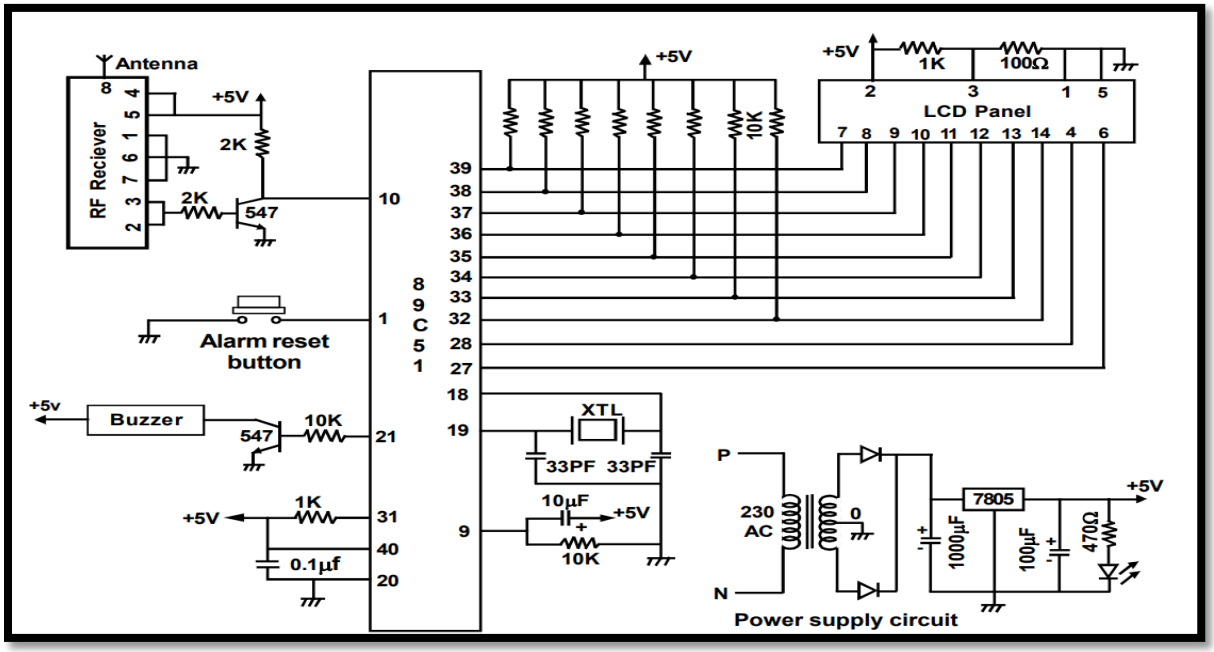

Fig 1.3 Circuit diagram on the receiver side

III. DISCUSSION ABOUT COMPONENTS AND A FEW CONCEPTS

3.1 Description about GPS

The **Global Positioning System** (**GPS**) is a space-based global navigation satellite system that provides reliable location and time information in all weather and at all times and anywhere on or near the Earth when and where there is an unobstructed line of sight to four or more GPS satellites. It is maintained by the United States government and is freely accessible by anyone with a GPS receiver.GPS was created and realized by the U.S. Department of Defense (DOD) and was originally run with 24 satellites. It was established in 1973 to overcome the limitations of previous navigation systems.GPS consists of three parts: the space segment, the control segment, and the user segment. The U.S. Air Force develops, maintains, and operates the space and control segments. GPS satellites broadcast signals from space, which each GPS receiver uses to calculate its three-dimensional location (latitude, longitude, and altitude) plus the current time.

The space segment is composed of 24 to 32 satellites in medium Earth orbit and also includes the boosters required to launch them into orbit. The control segment is composed of a master control station, an alternate master control station, and a host of dedicated and shared ground antennas and monitor stations. The user segment is composed of hundreds of thousands of U.S. and allied military users of the secure GPS Precise Positioning Service, and tens of millions of civil, commercial, and scientific users of the Standard Positioning Service (see GPS navigation devices).

A GPS tracking unit is a device that uses the Global Positioning System to determine the precise location of a vehicle, person, or other asset to which it is attached and to record the position of the asset at regular intervals. The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location data base, or internet-connected computer, using a cellular (GPRS), radio, or satellite modem embedded in the unit. This allows the asset's location to be displayed against a map backdrop either in real-time or when analysing the track later, using customized software.A GPS tracking system uses the GNSS (Global Navigation Satellite System) network. This network incorporates a range of satellites that use microwave signals, which are transmitted to GPS devices to give information on location, vehicle speed, time and direction. So, a GPS tracking system can potentially give both real-time and historic navigation data on any kind of journey.

A GPS tracking system can work in various ways. From a commercial perspective, GPS devices are generally used to record the position of vehicles as they make their journeys. Some systems will store the data within the GPS tracking system itself (known as passive tracking) and some send the information to a centralized database or system via a modem within the GPS system unit on a regular basis (known as active tracking).

- A PASSIVE GPS TRACKING SYSTEM will monitor location and will store its data on journeys based on certain types of events. So, for example, this kind of GPS system may log data such as turning the ignition on or off or opening and closing doors. The data stored on this kind of GPS tracking system is usually stored in internal memory or on a memory card which can then be downloaded to a computer at a later date for

analysis. In some cases the data can be sent automatically for wireless download at predetermined points/times or can be requested at specific points during the journey.

- AN ACTIVE GPS TRACKING SYSTEM is also known as a real-time system as this method automatically sends the information on the GPS system to a central computer or system in real-time as it happens. This kind of system is usually a better option for commercial purposes such as fleet tracking and individual vehicle tracking as it allows the company to know exactly where their vehicles are, whether they are on time and whether they are where they are supposed to be during a journey. This is also a useful way of monitoring the behaviour of employees as they carry out their work and of streamlining internal processes and procedures for delivery fleets.

3.1.1 What is GPS (Global Positioning System)

The Global Positioning System (GPS) is actually a constellation of 27 Earth-orbiting satellites (24 in operation and three extras in case one fails). The U.S. military developed and implemented this satellite network as a military navigation system, but soon opened it up to everybody else.

Each of these 3,000- to 4,000-pound solar-powered satellites circles the globe at about 12,000 miles (19,300 km), making two complete rotations every day. The orbits are arranged so that at anytime, anywhere on Earth, there are at least four satellites "visible" in the sky.

A GPS receiver's job is to locate four or more of these satellites, figure out the distance to each, and use this information to deduce its own location. This operation is based on a simple mathematical principle called trilateration.

GPS consists of 24 satellites of which at least 5 can be seen from any point on the globe.

In order to make the simple calculation of the location, then, the GPS receiver has to know two things:

1) The location of at least three satellites above you
2) The distance between you and each of those satellites

The GPS receiver figures both of these things out by analyzing high-frequency, low-power radio signals from the GPS satellites. Better units have multiple receivers, so they can pick up signals from several satellites simultaneously.

You can use maps stored in the receiver's memory, connect the receiver to a computer that can hold more detailed maps in its memory, or simply buy a detailed map of your area and find your way using the receiver's latitude and longitude readouts. Some receivers let you download detailed maps into memory or supply detailed maps with plug-in map cartridges.

A standard GPS receiver will not only place you on a map at any particular location, but will also trace your path across a map as you move. If you leave your receiver on, it can stay in constant communication with GPS satellites to see how your location is changing. With this information and its built-in clock, the receiver can give you several pieces of valuable information:

- How far you've travelled (odometer)
- How long you've been traveling
- Your current speed (speedometer)
- Your average speed
- A "bread crumb" trail showing you exactly where you have travelled on the map

- The estimated time of arrival at your destination if you maintain your current speed

3.1.2 TYPES OF GPS TRACKING SYSTEM

Three Types of GPS Tracking Units are there.

There are currently three categories of GPS tracking units. The categories are split into how GPS data is logged and retrieved.

❖ Data Loggers

Data loggers are usually the most basic type of GPS tracking; a GPS data logger simply logs the position of the object at regular intervals and retains it in an internal memory. Usually, GPS loggers have flash memory on board to record data that is logged. The flash memory can then be transferred and accessed using USB or accessed on the device itself. Usually, data loggers are devices used for sports and hobby activities. They might include devices that help log location for hikers, bikers and joggers.

❖ Data Pushers

Data Pushers are GPS tracking units that are mainly used for security purposes. A data pusher GPS tracking unit sends data from the device to a central database at regular intervals, updating location, direction, speed and distance.

Data pushers are common in fleet control to manage trucks and other vehicles. For instance, delivery vehicles can be located instantly and their progress can be tracked. Other uses include the ability to track valuable assets. If valuable goods are being transported or even if they reside in a specific location, they can constantly be monitored to avoid theft.

Data pushers are also common for espionage type tasks. It is extremely easy to watch the movements of an individual or valuable asset. This particular use of GPS tracking has become an important issue in the field of GPS tracking, because of its potential for abuse.

❖ Data Pullers

The last category of GPS tracking units is the data pusher units. These types of units push data or send data when the unit reach a specific location or at specific intervals. These GPS units are usually always on and constantly monitoring their location. Most, if not all data puller unit also allow data pushing (the ability to query a location and other data from a GPS tracking unit).

3.1.3 FEATURES OF THE GPS TRACKING SYSTEM

Generally, all of the GPS Tracking System has some of the common features that are listed below: -

- GSM/Gprs Module - It is used to send the location to the user online. In some case, if the user wants the location through the internet, then this module is very useful. By the help of the GSM/GPRS module, we can send data real time. It can be seen on the internet enabled any device as a PC, mobile phone, PDA etc.
- Track Playback - Animates your driver's daily driven route so that you can follow every move. The track animation line is colour coded to indicate the speed your driver was traveling during his route.
- Idle Time Report - Gives you an accurate report detailing when your driver was stopped and has left the engine running on the vehicle. This report was designed with input from our existing customers who were concerned about high fuel bills.
- Track Detail - Provides you with a split screen view when reviewing your driver's route. Stop and transit times, as well as speed information, are displayed in the bottom pane. You can easily toggle between stops by clicking the stop number on the track detail pane.
- As the zoom increases, so does map detail. Street names are listed as well as geographic markers (schools, airports, creeks, railways, parks, etc.). At th street level, we can clearly see stops marked by a red stop sign. Clicking on these stops pops up a summary of the stop: stop number, time, location, and duration. This makes it a breeze to determine where and when your employees were at certain locations.
- Speed Bar - Your driver’s route is colour coded when it is displayed on the map. The colors represent a 10 MPH or 5 MPH speed range. This allows you to see how fast your driver was driving in a specific area.
- In the figure 2, we have an example of a zoom in progress, also notice the speed bar and the colour coded route. Determining employee speeds is extremely easy to accomplish.
- Mileage By State - Breaks down mileage by state boundaries to assist with DOT reporting.
- Group Reporting - Allows you to set vehicles up into groups for faster and easier reporting.
- Geo Fencing – It allows us to limit some region of area and if your vehicle go beyond the boundary of that region then urgent message will be sent by the system to the manager to control the driver. So that the time and money can be saves by this system.
- Ignition ON/OFF detection – The system can save the information about the engine that it is in working condition or stop by ignition ON/OFF detection so that the manager can know for how many times the driver stopped the fleet and for how many times. So much time can be saved.
- SMS / GPRS Communication - The location about the fleet or the person can be sent by SMS or email by this facility.

- On-Line and Off-Line tracking – Every user has different requirement and as per the requirement the data can be viewed real-time or it can be saved in the unit and when the vehicle reach to its manager, manager can download data and see the route of the vehicle and every other detail that can be seen by the real-time.
- Buzzer for alerting the driver – Some system uses the buzzer system to alert the driver that he is going out of the boundary or the speed is very high, or anything that is restricted. So that the driver is able to know that he is going wrong.
- Monitoring digital events – If you need to know when a piece of machinery was turned on/Off or when a door was Open/Shut, this system will provide you with best options.
- Reports – start stop report, standard report, pto sensor report, aggressive driving report, excessive idling report, vehicle mileage report etc reports can be generated by the system to help understand the driver's behaviour and to improve it.

3.1.4 DIFFERENCE BETWEEN TRACKING AND NAVIGATION

A GPS navigation device is any device that receives Global Positioning System (GPS) signals for the purpose of determining the present location. These devices are used in military, commercial aviation, and consumer product applications. Navigation system is said to guide the person to find his/her route. The GPS navigation device is used to know the exact location of their own that has that device and there is no need to send the information to the other computer or some other person. The device also has an extremely detailed map data and navigation software inside it allowing the user to search for a destination address and point of interest, and then get graphical map instructions supported by voice prompts.

While the GPS tracking system is used for the purpose of tracking the person or vehicle or any other asset and send this information to some authority to know about their assets. The GPS tracking system may or may not have a detailed map data and navigation software inside it allowing the user to search for a destination address and point of interest.

3.1.5 DIFFERENCE BETWEEN PERSONAL AND VEHICLE TRACKING SYSTEM

Personal tracking devices are compact handy device like mobile phone with integrated GPS & GPRS technology and Vehicle Tracking devices are black box type secure devices with ability to work with sensors.

VEHICLE TRACKING SYSTEM is aimed for man who owns a four-wheeler and will gain the benefits of real-time location and speed along with the land mark. He can check the details any time through Internet or mobile SMS. He can put a Geo Fence to the vehicle, with which he can put fencing of 200 mts, 500 meters, 1 km etc. The moment the vehicle goes out of this geo fence area he will get an alert on his mobile phone which will help him to understand whether his vehicle is towed away from his residence and if it has been stolen. He can immobilise/stop the vehicle by sending SMS and the ignition, fuel and power will be immediately off. After immobilisation his vehicle will not move a single inch. He can inform police and recover his vehicle. He can also take the Over speed alert by putting a cap on the speed as 60 km per hour, the moment driver over speeds he will get a alert in form of SMS. This will be useful for large fleet owners to cut their cost by tracking the movement of the drivers. In case a driver is in a problem, he can press the panic button which will send the alert to the owner that the driver is in a problem/emergency. It will be useful for banks which carry large amount of cash.

PERSONAL TRACKING SYSTEM: Parents can put the device in the school bag of the kids and can know where the kid is at any point of time. Kids can press a panic button of the device in case of any problems and phone call will be connected to the parent's mobile and keep on dialling till he picks up the phone. It's useful for corporates for tracking their sales staff. It's useful for military persons as the commander will know the location of his personnel any time when he is at battle field or patrolling, it is also useful for police force to track their staff and officers anytime they want. Application includes: Valuable property, medical facility, electric facility, Petro facility, Special professional personnel, such as policemen, soldiers, prison administrators, security guard, etc. and disadvantaged groups, such as elders, kids, patients, etc., also for outdoor-sports groups, such as go-abroad, traveling and exploring, etc.

3.1.6 APPLICATION OF THE GPS TRACKING SYSTEM

- ❖ Fleet control. For example, a delivery or taxi company may put such a tracker in every of its vehicles, thus allowing the staff to know if a vehicle is on time or late, or is doing its assigned route. The same applies for armoured trucks transporting valuable goods, as it allows to pinpoint the exact site of a possible robbery.
- ❖ Stolen vehicle searching. Owners of expensive cars can put a tracker in it, and "activate" them in case of theft. "Activate" means that a command is issued to the tracker, via SMS or otherwise, and it will start acting as a fleet control device, allowing the user to know where the thieves are.
- ❖ Animal control. When put on a wildlife animal (e.g., in a collar), it allows scientists to study its activities and migration patterns. Vaginal implant transmitters are used to mark the location where pregnant

females give birth.[1] Animal tracking collars may also be put on domestic animals, to locate them in case they get lost.

❖ Race control. In some sports, such as gliding, participants are required to have a tracker with them. This allows, among other applications, for race officials to know if the participants are cheating, taking unexpected shortcuts or how far apart they are. This use has been featured in the movie "Rat Race", where some millionaires see the position of the racers in a wall map.

❖ Espionage/surveillance. When put on a person, or on his personal vehicle, it allows the person monitoring the tracking to know his/her habits. This application is used by private investigators, and also by some parents to track their children.

❖ Internet Fun. Some Web 2.0 pioneers have created their own personal web pages that show their position constantly, and in real-time, on a map within their website. These usually use data push from a GPS enabled cell phone.

❖ Sport. Sport enthusiast carry it while practising an outdoors sport, e.g. jogging or backpacking. When they return home, they download the data to a computer, to calculate the length and duration of the trip, or to over impose their paths over a map with the aid of GIS software.

Case study: -

▪ 108 emergency ambulance service: - In India, many of the states have launched the Emergency Management and Research Institute's (EMRI) 108 emergency ambulance service in the state. Gujarat, Tamil Nādu, Goa, Karnataka, Andhra Pradesh, Uttarakhand, Chennai, Rajasthan and Assam are some of them states which provide the 108 Emergency service. The ambulances would also be equipped with GIS and GPS systems, which would help locate the geographical position of emergency scene and help the nearest ambulance reach the site in the shortest possible time.

The case before the GPS system was not equipped with the ambulances was very different. The manager of the ambulances could not decide which of ambulances to send at the accident site. It might be possible that the manager can order the ambulance to reach at the accident site which is not very near to the site. And there might be a free ambulance near to the accident site. So, the manager's decision was wrong. And it is not tolerable. So, they have decided to equip GPS receiver with the ambulances so that the manager can get the location of every ambulance and decide which is nearer to the site. So, this is the most advantageous and can save life of thousands

▪ 911 service through IP or VOIP: - There are many systems for providing 911 services to cellular phones. But these systems are not designed to work in Internet Protocol ("IP") or voice over IP ("VoIP") systems. These systems do not have any way to match a location or address to an IP address because an IP address does not have a physical address or telephone number associated with it. Accordingly, there is a need for an IP based 911.

The present invention provides software applications that communicate with Global Positioning Systems ("GPS") hardware embedded in Internet Protocol ("IP") enabled equipment such that when the equipment is used to access emergency services by entering 911 or pressing an emergency activation button, the software provides the means to determine the location of the calling equipment to the respective emergency service centre appropriate to the location of the emergency. More specifically, the software monitors the voice over IP ("VoIP") software installed on the IP enabled equipment. When 911 is entered, the software acquires the vertical and horizontal coordinates ("V&H") from the GPS hardware, overrides the installed VoIP software to send a Session Initiation Protocol ("SIP") request to an address server which is also monitoring the Internet for these specific sessions. The address server accepts the SIP from the originating hardware, receives the V&H and accesses a database that cross references emergency services direct dial numbers with the V&H. The address server passes the voice call and the available direct dial numbers to a call centre that handles emergency voice interface with the person who entered 911 at the originating equipment. The call centre operator chooses which emergency service to dial after speaking with the person who has the emergency, or defaults to the fire rescue number.

The present invention is applicable to both wireline and IP telephony systems, such as laptop computers, PDAs, etc. The present invention does not rely on a set IP address, so that it will work on virtual networks and with transactional IP addresses. GPS coordinates are cross referenced to the closest physical emergency services. For example, the system may provide four or more numbers to the operator (police, fire, poison control, emergency medical services, rescue, etc.). The operator selects the appropriate number and routes the call via the Public Switched Telephone Network ("PSTN") or directly to the IP address. Note that this invention does not require fixed equipment and is primarily designed for stationary or portable voice or IP enabled devices rather than mobile phones. The present invention completes the IP telephony service.

The present invention provides a method for initiating an emergency IP request using an IP enabled device having GPS capability. The method includes monitoring the IP enabled device for one or more

emergency criteria, and obtaining global positioning data using the GPS capability and sending the emergency IP request whenever the one or more emergency criteria are satisfied.

- GPS at Disneyland: - The Rino GPS units have all the features of a high-end FRS / GMRS radio so you can talk to each other walkie-talkie style. At first, we were worried that with hundreds of people in the park, we would have a hard time finding a free channel. However, the Rino GPS units have 22 channels and 38 squelch codes for a whopping 836 different combinations. We picked a one combination and only once heard another person on our radio during the entire five days we were in the parks. The Rino GPS units are also waterproof, which is a feature that I have yet to see on another FRS radio. You will appreciate not worrying about water when you are on a wet ride like Grizzly River Rapids, or when it starts to rain. They also have a backlight for using at night.

Of course, the Rinos also have a built in GPS receiver that can accept downloaded maps. With the Stone Maps "Park Hopper" Disneyland and California Adventure GPS map, we could see exactly where we were as we walked around the parks. The screen is in full colour, the resolution is very high, and the images are crisp.

The most amazing feature of the Rino GPS units is the ability to not only see where you are, but also the location of others in your party. Garmin calls this "location polling" and here is how it works. You first set all the radios to the same channel and squelch code at the beginning of the day. Next, you broadcast on Radio 1 by pushing the talk button. All the other radios see that a Rino is broadcasting and each of the other radios ask if you want to add Radio 1 to your list of contacts. You do the same on Radio 2 and so on. Once all the radios are in each list of contacts, then any of the radios can "ping" any other radio and ask it where it is by pushing the page button. You can even give each radio a name and a unique icon. When you look at your map, you can see the name and icon displaying the last known location of that particular radio.

3.2 Description about solar panel

Solar photovoltaic systems use solar energy to produce electricity. The term **photovoltaic** is composed of "photo", the Greek root for "light", and "volt", a common measurement of electricity named after Alessandro Volta, a scientist renowned for his research on electricity. Together, these terms literally mean "light electricity". Photovoltaic technology can be referred to in short as **photovoltaics** or **PV**. Photovoltaic technology relies on the electrical properties of certain materials known as **semiconductors**. When hit by sunlight, a semiconductor material responds by creating an electrical charge which can then be transferred to anything that uses electricity. These semiconductors are produced in the form of **cells**, which can then be assembled in groups in a **panel**. There are many different types of panels available, and each has its particular advantages. Individual panels are often used to charge batteries that power small or remote electric equipment. Depending on the amount of electricity needed, these panels can then be connected in an **array** to provide larger amounts of electricity to a building or other large user of electricity.

Photovoltaic cells and panels can be manufactured and installed at almost any scale, and as a result are used to power a broad variety of applications. At its smallest, photovoltaic technology powers calculators, laptop computers and other appliances that run on batteries. At its largest, it powers homes, offices and other buildings that use large amounts of electricity, and can be connected to utilities to increase the diversity of our collective electricity supply.

In connecting a photovoltaic system to an end use, several additional structures and technologies are needed. While photovoltaics can be mounted on roofs, it is important to consider the angle at which they face the sun. To transfer electricity to its end use, photovoltaics are connected through intermediary technologies that condition and modify the electricity they produce. These considerations are known as **balance of system** components, as they maximize the system's efficiency and allow higher amounts of electricity to reach its end use.

There are many benefits to using photovoltaics as an electricity source, most notably their environmental benefits. As one of the cleanest electricity-generating technologies available, photovoltaics holds much promise for reducing environmental impacts from energy production. At the same time, several barriers exist for widespread use of this technology, the largest of which is its current cost. In spite of its barriers, photovoltaics is becoming more widely used each year, and many examples exist throughout the world. To find out much more about solar photovoltaics, go through the following sections of this introduction:

The Sun

The sun is a blazing globe of hot gases fueled by nuclear fusion - where small atoms are squeezed together at great pressure to make heavier atoms with the release of massive amounts of energy. The energy from the sun is radiated out in all directions as light. Much of the energy striking the earth is reflected back into space by the atmosphere.

Photovoltaic Cells

Photovoltaic cells, which convert light directly into electricity, have become commonplace on devices such as calculators and watches. There are a number of technologies in development with the aim of making PV more economic for electrical power generation. All use semiconductor materials like those used in silicon chips.

The heart of a PV cell is the interface between two different types of semiconductors. When a light photon hits a silicon atom in this region, it throws out an electron. The electron can travel through the n-type semiconductor to metal contacts on the surface. The hole left by the absence of the electron travels in the opposite direction. Once at the metal contact the electron flows through an electrical circuit back to meet up with a hole at the other contact.

As it flows through the external circuit, the electron does useful work, like charging a battery, or operating an electrical appliance. Photovoltaic systems have been reducing in cost, and increasing in efficiency in recent years. The most efficient commercially available systems can convert up to 16% of the light energy that strikes them into electrical energy.

Solar energy is harnessed using photovoltaic cells. Groups of photovoltaic cells are known as solar modules. There are a range of products using single crystal solar cells producing 30 to 165 watts of power. The modules can be adapted to off-grid or on-grid power generation needs. The modules offer a 20- to 25-year warranty. The modules based on crystalline silicon are one of the most efficient available on a commercial basis. The modules are formed by a series of cells wired together and are available in complete packages for residential, commercial, and industrial purposes. Solar energy panels can use the sun's energy to heat water for sanitary use at home or for pools and hot tubs. PV panels, on the other hand, convert light into electricity. Most commonly, these panels are placed on the roof. The power generated by PV panels is transmitted to a battery for storage. Household power needs are drawn from this storage.

The solar cell used on most satellites and space travel vehicles is based on the same chemical and physical principles as a hand-held radio or calculator. A device called a transistor operates very similarly to a solar cell. How does the piece of silicon convert the sun's rays into electricity? Physics answers this question and explains the actions of the electrons Solar Physics page should be visited for concentrated related physics information.

In order to assess the strengths and weaknesses of an alternative energy form, the history including its invention and implementation must be examined. No one in modern civilization has been credited with a patent or copyright for using the sun as a source of heat. A patent for this technology would be useless because it is freely available all over the galaxy. What events in recent years changed the way solar power is used? Due floating debris in space, the solar cells of the Hubble Telescope were bent and had to be fixed. Solar power works well in places of abundant sunlight, but areas of low solar activity can also benefit from utilizing the power of the sun. In order to evaluate the affordability and ease of use of solar power, geography must be considered. Geography covers weather, altitude and location on the earth.

Photovoltaic cells work by transforming the photon energy in solar radiation directly into electrical energy without an intermediate mechanical or thermal process. A photovoltaic cell consists of layers of semiconductor materials in contact with each other and fitted with metallic contacts to transfer the released electrons to the external load. Most commercial photovoltaic cells now available are manufactured from crystalline silicon, which is doped to provide the required semiconductor qualities. This is then fitted with the metallic contacts and encapsulated for protection. PV cells operate on the principle that electricity will flow between two different semiconductors when they are put in contact with each other and exposed to light. By linking a number of these cells together a flow of electricity can be achieved.

Since 1988 world-wide production of photovoltaic modules has increased at a rate of up to 40% per year. Today, it is used for a wide range of applications, including stand-alone systems, grid-linked systems and building integrated systems. Major national and international investments in research, development, demonstration and dissemination have resulted in important technical improvements and a drop in the price of PV cells by a factor of more than 20 over the last two decades. This has opened up opportunities for cost-effective uses and both commercial and donor-supported applications are resulting in continued major growth in the global markets.

It is used for a variety of off-grid applications in developing countries where PV technology is considered as a promising alternative to the slow arrival of grid electricity, particularly as its cost is expected to decrease. Its reliability, very low operational and maintenance costs, and its modularity which provides for easy expansion, make it very advantageous in many rural settings.

- Overview of the technology

Sunlight is composed of photons containing energy which correspond to the different wavelengths of the solar spectrum. When photons strike a PV cell, their energy is transferred to an electron in the semiconductor material of the cell. With this extra energy, the electron is then able to escape from its normal position in the atom creating a "hole", which will become part of a current in an electrical circuit.

A diode is formed when two layers of semiconductor materials are doped so that one will conduct negative carriers and the other positive carriers. When photons fall on these layers, they transfer energy and momentum to charge carriers, which increase their potential energy by an amount depending on the diode's material properties. Because of their electrical properties, PV modules produce direct current (DC) rather than alternating current (AC). In the simplest PV systems, DC current is used immediately in applications but where AC is required; an inverter is added to the system to convert DC into AC.

The efficiency of the photovoltaic conversion process would be about 85% if each photon could transfer all its energy into that of charge carriers. However, this is normally not the case as any transfer of energy from photon to charge carrier can only be of the amount given by the band-gap of the semiconductor material. Photons with energies below the energy band-gap of the material are lost from the photovoltaic effect and converted into heat. In addition, photons with energies above the band-gap transfer no more than the band-gap energy, and any excess energy is lost. In today's cells, both of these effects individually limit the theoretical efficiency to 50%. Currently, practical maximum efficiencies are in the range of 15-20%. Ideally, PV cells would consist of material layers with different band-gaps, for each photon to be absorbed exactly where its energy matches the band-gap energy.

The output from a PV module depends on the amount of incident light and other factors such as temperature and the cleanliness of the cell surface. Modules are rated in terms of their peak output (Peak Watts, or Wp), which is the maximum power that they will produce given calibrated solar input and operating conditions. However, PV cells can produce useful quantities of power in less-than-ideal solar conditions.

3.3 DESCRIPTION ABOUT 89C51 MICROCONTROLLER CHIP

The situation we find ourselves today in the field of microcontrollers had its beginnings in the development of technology of integrated circuits. This development has enabled us to store hundreds of thousands of transistors into one chip. That was a precondition for the manufacture of microprocessors. The first computers were made by adding external peripherals such as memory, input/output lines, timers and others to it. Further increasing of package density resulted in creating an integrated circuit, which contained both processor and peripherals. That is how the first chip containing a microcomputer later known as a microcontroller has developed.

In the year 1969, a team of Japanese engineers from BUSICOM came to the USA with a request that a few integrated circuits for calculators were to be designed according to their projects. The request was sent to INTEL and Marciano Hoff was in charge of the project there. Having experience working with a computer, the PDP8, he came up with an idea to suggest fundamentally different solutions instead of the suggested design. This solution presumed that the operation of integrated circuit was to be determined by the program stored in the circuit itself. It meant that configuration would be simpler, but it would require far more memory than the project proposed by Japanese engineers. After a while, even though the Japanese engineers were trying to find an easier solution, Marciano's idea won and the first microprocessor was born. A major help with turning an idea into a ready-to-use product was Federico Fagin. Nine months after hiring him, Intel succeeded in developing such a product from its original concept. In 1971 Intel obtained the right to sell this integrated circuit. Before that Intel bought the license from BUSICOM, which had no idea what a treasure, it had. During that year, a microprocessor called the 4004 appeared on the market. That was the first 4-bit microprocessor with the speed of 6000 operations per second. Not long after that, an American company CTC requested from Intel and Texas Instruments to manufacture an 8-bit microprocessor to be applied in terminals. Even though CTC gave up this project, Intel and Texas Instruments kept working on the microprocessor and in April 1972 the first 8-bit microprocessor called the 8008 appeared on the market. It was able to address 16Kb of memory, had 45 instructions and the speed of 300 000 operations per second. That microprocessor was the predecessor of all today's microprocessors. Intel kept on developing it and in April 1974 it launched an 8-bit processor called the 8080. It was able to address 64Kb of memory, had 75 instructions and initial price was $360.

Another American company called Motorola quickly realized what was going on, so they launched 8-bit microprocessor 6800. Their chief constructor was Chuck Peddle. Apart from the processor itself, Motorola was the first company that also manufactured other peripherals such as the 6820 and 6850. At that time many companies recognized the greater importance of microprocessors and began their own development. Chuck Peddle left Motorola to join MOS Technology and kept working intensively on developing microprocessors.

At the WESCON exhibition in the USA in 1975, a crucial event in the history of the microprocessors took place. MOS Technology announced that it was selling processors 6501 and 6502 at $25 each, that interested customers could purchase immediately. It was such a sensation that many thought it was a kind of fraud, considering that competing companies were selling the 8080 and 6800 at $179 each. On the first day of the exhibit, in response to the competitor, both Motorola and Intel cut the prices of their microprocessors to $69.95. Motorola accused MOS Technology and Chuck Peddle of plagiarizing the protected 6800. Because of that, MOS Technology gave up further manufacture of the 6501, but kept manufacturing the 6502. It was the 8-bit microprocessor with 56 instructions and ability to directly address 64Kb of memory. Due to low price, 6502

became very popular so it was installed into computers such as KIM-1, Apple I, Apple II, Atari, Commodore, Acorn, Oric, Galeb, Orao, Ultra and many others. Soon several companies began manufacturing the 6502 (Rockwell, Sznertek, GTE, NCR, Ricoh, Commodore took over MOS Technology). In the year of its prosperity 1982, this processor was being sold at a rate of 15 million processors per year!

Other companies did not want to give up either. Frederico Faggin left Intel and started his own company Zilog Inc. In 1976 Zilog announced the Z80. When designing this microprocessor Faggin made a crucial decision. The 8080 had already been developed and he realized that many would remain loyal to that processor because of the great expenditures which rewriting of all the programs would result in. Accordingly, he decided that a new processor had to be compatible with the 8080, i.e., it had to be able to perform all the programs written for the 8080. Apart from that, many other features have been added so that the Z80 was the most powerful microprocessor at that time. It was able to directly address 64Kb of memory, had 176 instructions, a large number of registers, a built-in option for refreshing dynamic RAM memory, a single power supply, greater operating speed etc. The Z80 was a great success and everybody replaced the 8080 by the Z80. Certainly, the Z80 was commercially the most successful 8-bit microprocessor at that time. Besides Zilog, other new manufacturers such as Mostek, NEC, SHARP and SGS appeared soon. The Z80 was the heart of many computers such as: Spectrum, Partner, TRS703, Z-3 and Galaxy.

In 1976 Intel came up with an upgraded version of the 8-bit microprocessor called the 8085. However, the Z80 was so much better that Intel lost the battle. Even though a few more microprocessors appeared later on the market (6809, 2650, SC/MP etc.), the die had already been cast. There were no such great improvements which could make manufacturers to change their mind, so the 6502 and Z80 along with the 6800 remained chief representatives of the 8-bit microprocessors of that time.

3.3.1 MICROCONTROLLER VERSUS MICROPROCESSOR

A microcontroller differs from a microprocessor in many ways. The first and most important difference is its functionality. In order that the microprocessor may be used, other components such as memory must be added to it. Even though the microprocessors are considered to be powerful computing machines, their weak point is that they are not adjusted to communicating to peripheral equipment.

Simply, In order to communicate with peripheral environment, the microprocessor must use specialized circuits added as external chips. In short microprocessors are the pure heart of the computers. This is how it was in the beginning and remains the same today. On the other hand, the microcontroller is designed to be all of that in one. No other specialized external components are needed for its application because all necessary circuits which otherwise belong to peripherals are already built into it. It saves the time and space needed to design a device.

A Micro controller consists of a powerful CPU tightly coupled with memory, various I/O interfaces such as serial port, parallel port timer or counter, interrupt controller, data acquisition interfaces-Analog to Digital converter, Digital to Analog converter, integrated on to a single silicon chip. If a system is developed with a microprocessor, the designer has to go for external memory such as RAM, ROM, EPROM and peripherals. But controller is provided all these facilities on a single chip. Development of a Micro controller reduces PCB size and cost of design.

One of the major differences between a Microprocessor and a Micro controller is that a controller often deals with bits not bytes as in the real-world application. Intel has introduced a family of Micro controllers called the MCS-51.

3.3.2 THE MAJOR FEATURES:

- Compatible with MCS-51 products
- 4k Bytes of in-system Reprogrammable flash memory
- Fully static operation: 0HZ to 24MHZ
- Three level programmable clock
- 128 * 8 –bit timer/counters
- Six interrupt sources
- Programmable serial channel
- Low power idle power-down modes

3.3.3 Why AT 89C51?

The system requirements and control specifications clearly rule out the use of 16-, 32- or 64-bit micro controllers or microprocessors. Systems using these may be earlier to implement due to large number of internal features. They are also faster and more reliable but, the above application is satisfactorily served by 8-bit micro controller. Using an inexpensive 8-bit Microcontroller will doom the 32-bit product failure in any competitive market place.

Coming to the question of why to use AT89C51 of all the 8-bit microcontroller available in the market the main answer would be because it has 4 Kb on chip flash memory which is just sufficient for our application. The on-chip Flash ROM allows the program memory to be reprogrammed in system or by conventional non-volatile memory Programmer. Moreover, ATMEL is the leader in flash technology in today's market place and hence using AT 89C51 is the optimal solution.

3.3.4 AT89C51 MICROCONTROLLER ARCHITECTURE

The 89C51 architecture consists of these specific features:

- Eight –bit CPU with registers A (the accumulator) and B
- Sixteen-bit program counter (PC) and data pointer (DPTR)
- Eight- bit stack pointer (PSW)
- Eight-bit stack pointer (Sp)
- Internal ROM or EPROM (8751) of 0(8031) to 4K (89C51)
- Internal RAM of 128 bytes:

1. Four register banks, each containing eight registers
2. Sixteen bytes, which may be addressed at the bit level
3. Eighty bytes of general- purpose data memory

- Thirty –two input/output pins arranged as four 8-bit ports: p0-p3
- Two 16-bit timer/counters: T0 and T1
- Full duplex serial data receiver/transmitter: SBUF
- Control registers: TCON, TMOD, SCON, PCON, IP, and IE
- Two external and three internal interrupts sources.
- Oscillator and clock circuits.

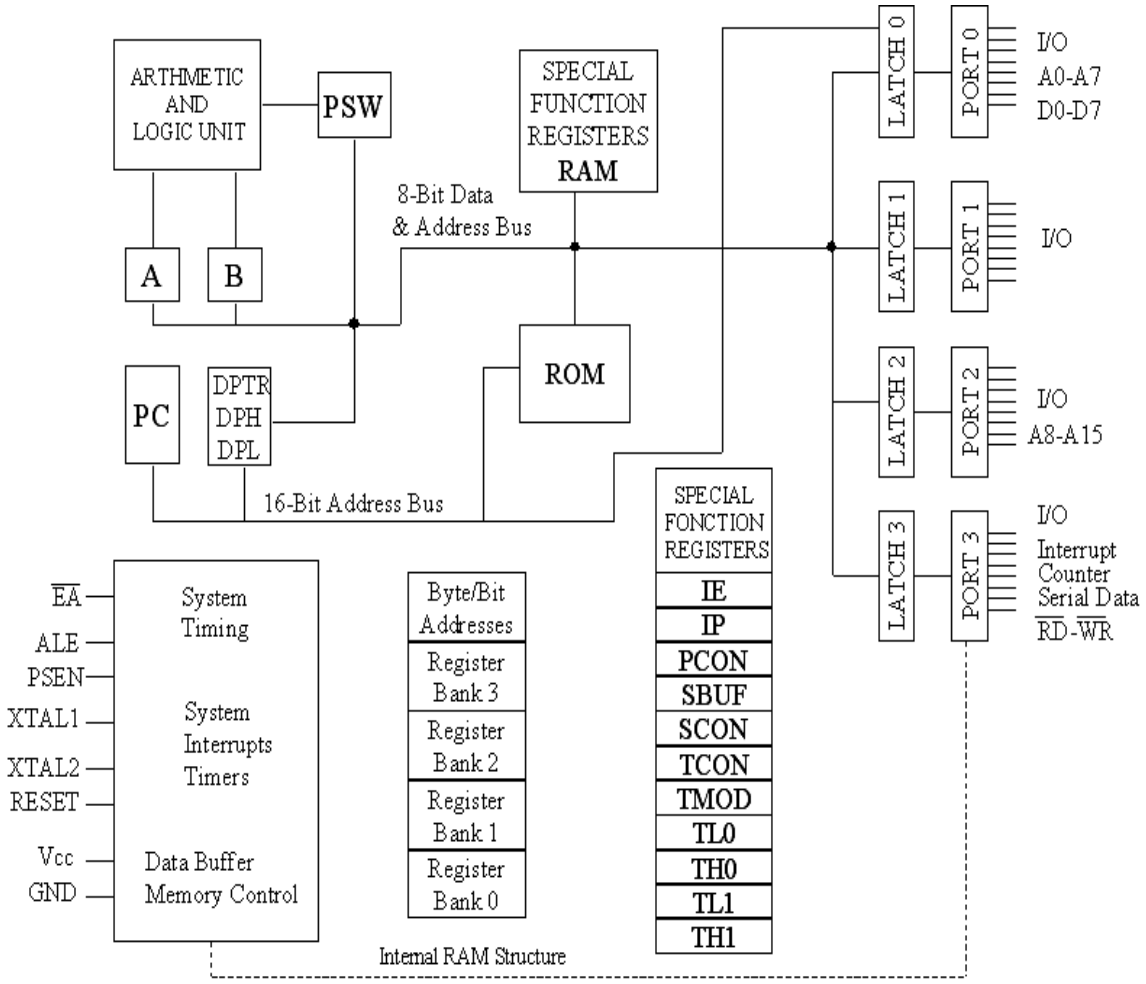

Fig 1.4 Functional block diagram of microcontroller

3.3.5 THE 89C51 OSCILLATOR AND CLOCK:

The heart of the 89C51 circuitry that generates the clock pulses by which all the internal all internal operations are synchronized. Pins XTAL1 and XTAL2 is provided for connecting a resonant network to form an oscillator. Typically, a quartz crystal and capacitors are employed. The crystal frequency is the basic internal clock frequency of the microcontroller. The manufacturers make 89C51 designs that run at specific minimum and maximum frequencies typically 1 to 16 MHz

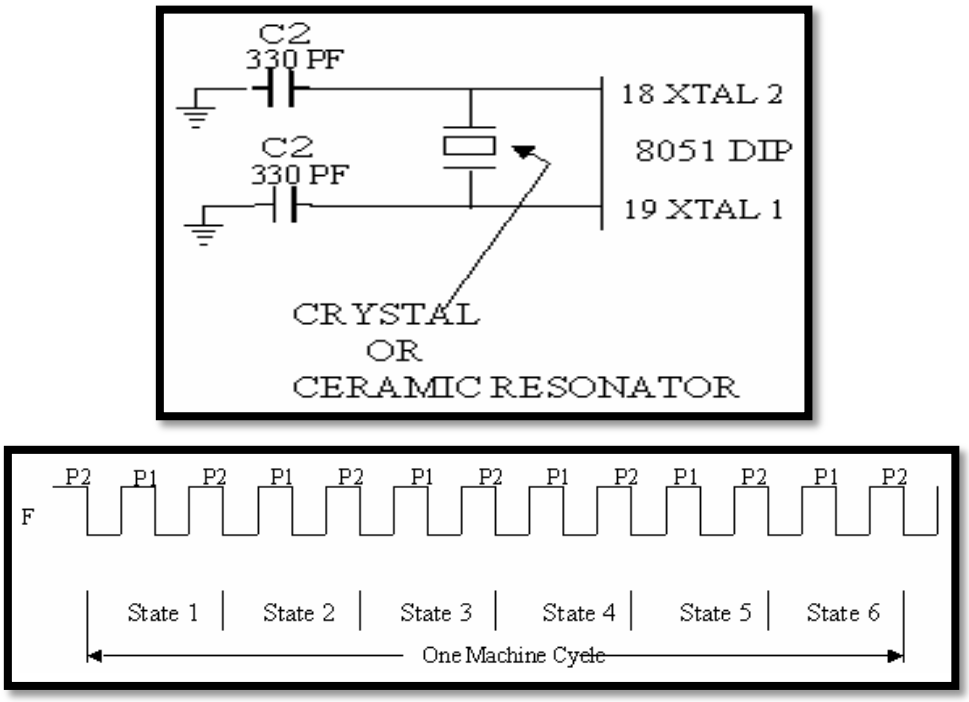

fig 1.5 Oscillator and timing circuit

3.3.6 TYPES OF MEMORY:

The 89C51 have three general types of memory. They are on-chip memory, external Code memory and external Ram. On-Chip memory refers to physically existing memory on the micro controller itself. External code memory is the code memory that resides off chip. This is often in the form of an external EPROM. External RAM is the Ram that resides off chip. This often is in the form of standard static RAM or flash RAM.

a) Code memory

Code memory is the memory that holds the actual 89C51 programs that is to be run. This memory is limited to 64K. Code memory may be found on-chip or off-chip. It is possible to have 4K of code memory on-chip and 60K off chip memory simultaneously. If only off-chip memory is available then there can be 64K of off chip ROM. This is controlled by pin provided as EA

b) Internal RAM

The 89C51 have a bank of 128 of internal RAM. The internal RAM is found on-chip. So, it is the fastest Ram available. And also, it is most flexible in terms of reading and writing. Internal Ram is volatile, so when 89C51 is reset, this memory is cleared. 128 bytes of internal memory are subdivided. The first 32 bytes are divided into 4 register banks. Each bank contains 8 registers. Internal RAM also contains 128 bits, which are addressed from 20h to 2Fh. These bits are bit addressed i.e.; each individual bit of a byte can be addressed by the user. They are numbered 00h to 7Fh. The user may make use of these variables with commands such as SETB and CLR.

FLASH MEMORY:

Flash memory (sometimes called "flash RAM") is a type of constantly-powered non-volatile that can be erased and reprogrammed in units of memory called *blocks*. It is a variation of electrically erasable programmable read-only memory (EEPROM) which, unlike flash memory, is erased and rewritten at the byte level, which is slower than flash memory updating. Flash memory is often used to hold control code such as the basic input/output system (BIOS) in a personal computer. When BIOS needs to be changed (rewritten), the flash memory can be written to in block (rather than byte) sizes, making it easy to update. On the other hand, flash memory is not useful as random-access memory (RAM) because RAM needs to be addressable at the byte (not the block) level.

Flash memory gets its name because the microchip is organized so that a section of memory cells is erased in a single action or "flash." The erasure is caused by Fowler-Northeim tunnelling in which electrons pierce through a thin dielectric material to remove an electronic charge from a *floating gate* associated with each memory cell. Intel offers a form of flash memory that holds two bits (rather than one) in each memory cell, thus doubling the capacity of memory without a corresponding increase in price.

Flash memory is used in digital cellular phones, digital cameras, LAN switches, PC Cards for notebook computers, digital set-up boxes, embedded controllers, and other devices.

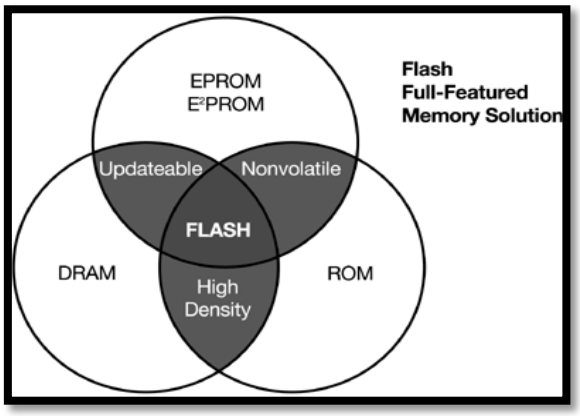

fig 1.6 Types of Memory

Table 1 Table of various memories and their features

Memory Type	Features
FLASH	Low-cost, high-density, high-speed architecture; low power; high reliability
ROM Read-Only Memory	Mature, high-density, reliable, low cost; time-consuming mask required, suitable for high production with stable code
SRAM Static Random-Access Memory	Highest speed, high-power, low-density memory; limited density drives up cost
EPROM Electrically Programmable Read-Only Memory	High-density memory; must be exposed to ultraviolet light for erasure
EEPROMorE²PROM Electrically Erasable Programmable Read-Only Memory	Electrically byte-erasable; lower reliability, higher cost, lowest density
DRAM Dynamic Random Access Memory	High-density, low-cost, high-speed, high-power

3.3.7 DETAILED PIN DESCRIPTION OF AT89C51:

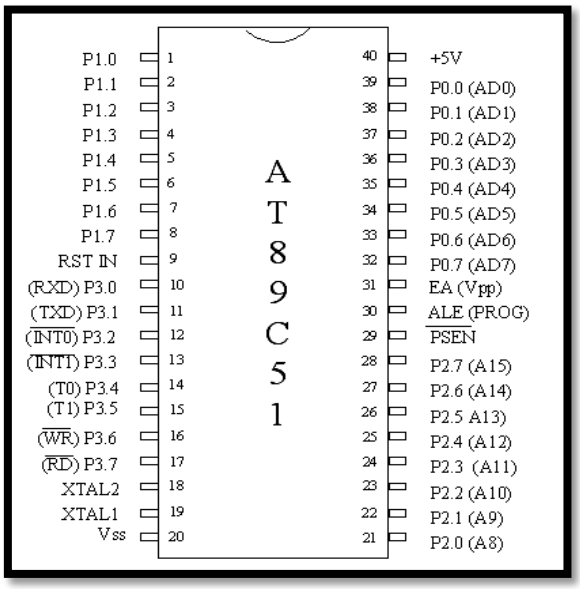

Fig 1.7 Pin diagram of AT89C51

VCC: Supply voltage.
GND: Ground.
Port 0: Port 0 is an 8-bit open-drain bi-directional I/O port. As an output port, each pin can sink eight TTL inputs. When 1sare written to port 0 pins, the pins can be used as high impedance inputs. Port 0 may 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 bi-directional 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. Port 1 also receives the low-order address bytes during Flash programming and verification.
Port 2: Port 2 is an 8-bit bi-directional 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 memories that use 16-bit addresses (MOVX @DPTR). In this application, it uses strong internal pull-ups when emitting 1s. During accesses to external data memories 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 bi-directional 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 also serves the functions of various special features of the AT89C51 as listed below:
Port 3 also receives some control signals for Flash programming and verification.

Table 2. Port 3 pins and their alternate functions

Port Pin	Alternate Functions
P3.0	RXD (serial input port)
P3.1	TXD (serial output port)
P3.2	$\overline{\text{INT0}}$ (external interrupt 0)
P3.3	$\overline{\text{INT1}}$ (external interrupt 1)
P3.4	T0 (timer 0 external input)
P3.5	T1 (timer 1 external input)
P3.6	$\overline{\text{WR}}$ (external data memory write strobe)
P3.7	$\overline{\text{RD}}$ (external data memory read strobe)

RST:
Reset input. A high on this pin for two machine cycles while the oscillator is running resets the device.
ALE/PROG:
Address Latch Enable 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 1/6the 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 is the read strobe to external program memory. When the AT89C51 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, for parts that require 12-volt VPP.

XTAL1:

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

XTAL2:

Output from the inverting oscillator amplifier.

Oscillator Characteristics:

XTAL1 and XTAL2 are the input and output, respectively, of an inverting amplifier which can be configured for use as an on-chip oscillator, as shown in Figs 6.2.3. Either a quartz crystal or ceramic resonator may be used. To drive the device from an external clock source, XTAL2 should be left unconnected while XTAL1 is driven as shown in Figure 6.2.4. There are no requirements on the duty cycle of the external clock signal, since the input to the internal clocking circuitry is through a divide-by-two flip-flop, but minimum and maximum voltage high and low time specifications must be observed.

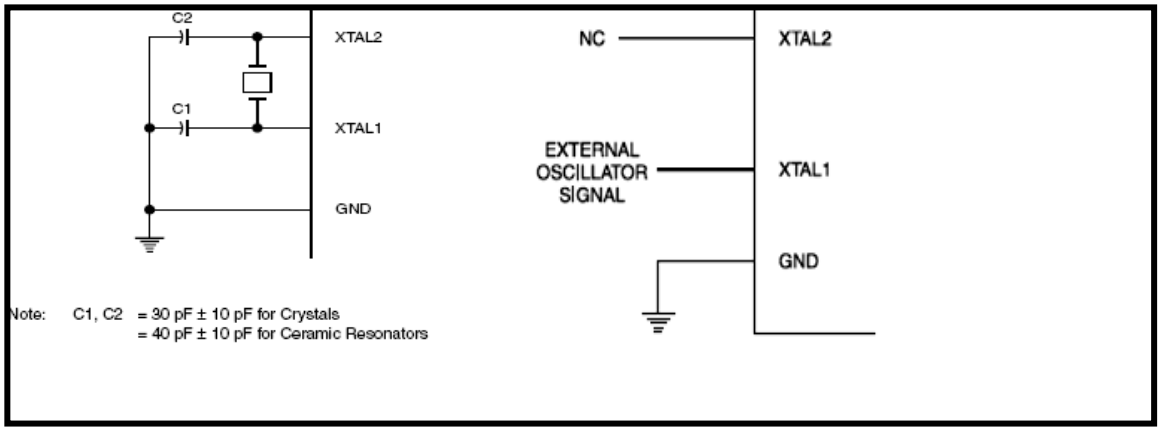

fig 1.8a Oscillator Connections
1.8b External Clock drive configurations

3.4 DESCRIPTION ABOUT RF COMMUNICATION SYSTEM

Radio Frequency (RF) and wireless have been around for over a century with Alexander Popov and Sir Oliver Lodge laying the groundwork for Guglielmo Marconi's wireless radio developments in the early 20th century. In December 1901, Marconi performed his most prominent experiment, where he successfully transmitted Morse code from Cornwall, England, to St John's, Canada.

3.4.1 GENERAL PHYSICS OF RADIO SIGNALS

RF communication works by creating electromagnetic waves at a source and being able to pick up those electromagnetic waves at a particular destination. These electromagnetic waves travel through the air at near the speed of light. The wavelength of an electromagnetic signal is inversely proportional to the frequency; the higher the frequency, the shorter the wavelength.

Frequency is measured in Hertz (cycles per second) and radio frequencies are measured in kilohertz (kHz or thousands of cycles per second), megahertz (MHz or millions of cycles per second) and gigahertz (GHz or billions of cycles per second). Higher frequencies result in shorter wavelengths. The wavelength for a 900 MHz device is longer than that of a 2.4 GHz device.

In general, signals with longer wavelengths travel a greater distance and penetrate through, and around objects better than signals with shorter wavelengths.

3.4.2 WHAT IS RF?

RF itself has become synonymous with wireless and high frequency signals, describing anything from AM radio between 535 kHz and 1605 kHz to computer local area networks (LANs) at 2.4 GHz. However, RF has traditionally defined frequencies from a few kHz to roughly 1 GHz. If one considers microwave frequencies as RF, this range extends to 300 GHz.

Radio frequency (**RF**) is a frequency, or rate of oscillation, of electromagnetic radiation within the range of about 3 Hz to 300 GHz. This range corresponds to the frequency of alternating current electrical signals used to produce and detect radio waves. Since most of this range is beyond the vibration rate that most mechanical

systems can respond to, RF usually refers to oscillations in electrical circuits. The following tables outline the various nomenclatures for the frequency bands.

Table 3 Frequency Band Designations:

Name	Symbol	Frequency	Wavelength	Applications
Extremely low frequency	ELF	3–30 Hz	100–10 Mm	Directly audible when converted to sound (above ~20 Hz), communication with submarines
Super low frequency	SLF	30–300 Hz	10–1 Mm	Directly audible when converted to sound, AC power grids (50–60 Hz)
Ultralow frequency	ULF	300–3000 Hz	1000–100 km	Directly audible when converted to sound, communication within mines
Very low frequency	VLF	3–30 kHz	100–10 km	Directly audible when converted to sound (below ~20 kHz; or *ultrasound* otherwise)
Low frequency	LF	30–300 kHz	10–1 km	AM broadcasting, navigational beacons, and amateur radio.
Medium frequency	MF	300–3000 kHz	1000–100 m	Navigational beacons, AM broadcasting, amateur radio, maritime and aviation communication
High frequency	HF	3–30 MHz	100–10 m	Short wave, amateur radio, citizens' band radio, sky wave propagation.
Very high frequency	VHF	30–300 MHz	10–1 m	FM broadcasting, amateur radio, broadcast television, aviation, GPR, MRI.
Ultra-high frequency	UHF	300–3000 MHz	100–10 cm	Broadcast television, amateur radio, mobile telephones, cordless telephones, wireless networking, remote keyless entry for automobiles, microwave ovens, GPR
Super high frequency	SHF	3–30 GHz	10–1 cm	Wireless networking, satellite links, amateur radio, microwave links, satellite television, door openers
Extremely high frequency	EHF	30–300 GHz	10–1 mm	Microwave data links, radio astronomy, amateur radio, remote sensing, advanced weapons systems, advanced security scanning

The above Table shows a relationship between frequency (f) and wavelength (λ). A wave or sinusoid can be completely described by either its frequency or its wavelength. They are inversely proportional to each other and related to the speed of light through a particular medium. The relationship in a vacuum is shown in the following equation:

$$C = f \bullet \lambda$$

Where *c* is the speed of light. As frequency increases, wavelength decreases. For reference, a 1 GHz wave has a wavelength of roughly 1 foot, and a 100 MHz wave has a wavelength of roughly 10 feet.

f (GHz)	Letter Band Designation
1–2	L band
2–4	S band
4–8	C band
8–12.4	X band
12.4–18	Ku band
18–26.5	K band
26.5–40	Ka band

Fig 1.9 Band designations according to frequency ranges

RF measurement methodology can generally be divided into three major categories: spectral analysis, vector analysis, and network analysis. Spectrum analysers, which provide basic measurement capabilities, are the most popular type of RF instrument in many general-purpose applications. Specifically, using a spectrum analyser you can view power-vs. -Frequency information, and can sometimes demodulate analog formats, such as amplitude modulation (AM), frequency modulation (FM), and phase modulation (PM). Vector instruments include vector or real-time signal analysers and generators. These instruments analyse and generate broadband waveforms, and capture time, frequency, phase, and power information from signals of interest. These instruments are much more powerful than spectrum analysers and offer excellent modulation control and signal analysis. Network analysers, on the other hand, are typically used for making S-parameter measurements and other characterization measurements on RF or high-frequency components. Network analysers are instruments that correlate both the generation and analysis on multiple channels but at a much higher price than spectrum analysers and vector signal generators/analysers.

Why Operate at Higher Frequencies?

From the frequency spectrum we notice that it is quite fragmented and dense. This encompasses one of the reasons that we are constantly pushing applications into higher and higher frequencies. However, some of the other reasons accounting for this push into higher frequencies include efficiency in propagation, immunity to some forms of noise and impairments as well as the size of the antenna required. The antenna size is typically related to the wavelength of the signal and in practice is usually ¼ wavelength.

This leads to a very interesting question. Typically, data is structured and easily represented at low frequencies; how can we represent it or physically translate it to these higher RF frequencies? For example, the human audible range is from 20 Hz to 20 kHz. According to the Nyquist theorem, we can completely represent the human audible range by sampling at 40 kHz or, more precisely, at 44.1 kHz (this is where stereo audio is sampled). Cell phones, however, operate at around 850 MHz

How this happens is much of the study of RF and high-frequency measurements occurs in the frequency domain. There is a duality between the time-domain functions and those same functions represented in the frequency-domain. In frequency shifting the human audible range to transmit through cellular frequencies. The most common way to frequency shift is called mixing, which is equivalent to multiplying your signal by a sinusoidal signal.

3.4.3 WORKING OF RF COMMUNICATION SYSTEM

Imagine an RF transmitter wiggling an electron in one location. This wiggling electron causes a ripple effect, somewhat a kind of dropping a pebble in a pond. The effect is an electromagnetic (EM) wave that travels out from the initial location resulting in electrons wiggling in remote locations. An RF receiver can detect this remote electron wiggling.

The RF communication system then utilizes this phenomenon by wiggling electrons in a specific pattern to represent information. The receiver can make this same information available at a remote location; communicating with no wires.

In most wireless systems, a designer has two overriding constraints: it must operate over a certain distance (range) and transfer a certain amount of information within a time frame (data rate). Then the economics of the system must work out (price) along with acquiring government agency approvals (regulations and licensing).

RANGE

In order to accurately compute range – it is essential to understand a few terms: **dB – Decibels.** Decibels are logarithmic units that are often used to represent RF power. To convert from watts to dB: Power in dB = 10* (log x) where x is the power in watts. Another unit of measure that is encountered often is dBm (dB mill watts). The conversion formula for it is Power in dBm = 10* (log x) where x is the power in mill watts.

Line-of-site (LOS)

Line-of-site when speaking of RF means more than just being able to see the receiving antenna from the transmitting antenna. In, order to have true line-of-site no objects (including trees, houses or the ground) can be in the Fresnel zone. The Fresnel zone is the area around the visual line-of-sight that radio waves spread out into after they leave the antenna. This area must be clear or else signal strength will weaken. There are essentially two parameters to look at when trying to determine range.

1) Transmit Power

Transmit power refers to the amount of RF power that comes out of the antenna port of the radio. Transmit power is usually measured in Watts, mill watts or dBm.

2) Receiver sensitivity

Receiver sensitivity refers to the minimum level signal the radio can demodulate. It is convenient to use an example with sound waves; Transmit power is how loud someone is yelling and receive sensitivity would be how soft a voice someone can hear. Transmit power and receive sensitivity together constitute what is known as

"link budget". The link budget is the total amount of signal attenuation you can have between the transmitter and receiver and still have communication occur.

Example:

Maxstream 9XStream TX Power: 20dBm
Maxstream 9XStream RX Sensitivity: -110dBm
Total Link budget: 130dBm.

For line-of-site situations, a mathematical formula can be used to figure out the approximate range for a given link budget. For non-line-of-site applications range calculations are more complex because of the various ways the signal can be attenuated.

RF communications and data rate

Data rates are usually dictated by the system - how much data must be transferred and how often does the transfer need to take place. Lower data rates, allow the radio module to have better receive sensitivity and thus more range. In the XStream modules the 9600-baud module has 3dB more sensitivity than the 19200-baud module. This means about 30% more distance in line-of-sight conditions. Higher data rates allow the communication to take place in less time, potentially using less power to transmit.

Radio communication

In order to receive radio signals, for instance from AM/FM radio stations, a radio antenna must be used. However, since the antenna will pick up thousands of sine waves at a time, a radio tuner is necessary as well to tune in to 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). The resonator is configured to resonate at a particular frequency (or frequency band), thus amplifying sine waves at that radio frequency, while ignoring other sine waves. Usually, either the inductor or the capacitor of the resonator is adjustable, allowing the user to change the frequency it resonates at.

Special properties of RF electrical signals

Electrical currents that oscillate at RF have special properties not shared by direct current signals. One such property is the ease with which they can ionize air to create a conductive path through air. 'High frequency' units used in electric arc welding, although strictly speaking these machines do not typically employ frequencies within the HF band, exploit this property. Another special property is an electromagnetic force that drives the RF current to the surface of conductors, known as the skin effect. Another property is the ability to appear to flow through paths that contain insulating material, like the dielectric insulator of a capacitor. The degree of effect of these properties depends on the frequency of the signals.

3.5 DESCRIPTION ABOUT LCD INTERFACING

LCD Displays are dominating LED displays, because these displays can display alphabets, numbers and some kind of special symbols, whereas LED's (seven segment display) can display only numbers. These LCD displays are very useful for displaying user information and communication. LCD displays are available in various formats. Most common are 2 x 16, is that two lines with 16 alphanumeric characters. Other formats are 3x16, 2x40, 3x40 etc.;

In recent years LCD is finding widespread use replacing LED's, because of the ability to display numbers, characters, and graphics. Another advantage is, because of its compactness and ease of programming for characters and graphics, more information in the form of text message or graphics can be displayed. Generally, the LCD modules have an 8-bit interface, besides the 8-bit data bus; the interface has a few other control lines. The 8-bit data bus is connected to port '0' and the control lines are connected to port '2'. The default data transfer between the LCD module and an external device is 8-bits, however it is possible to communicate with the LCD module using only four of the 8-data lines. The R/W line is connected to ground and hence the processor cannot read any status information from the LCD module, but can only write data to the LCD.

The LCD panel used in this project work is having 14 pins. The function of each pin description with table is provided in the next page:

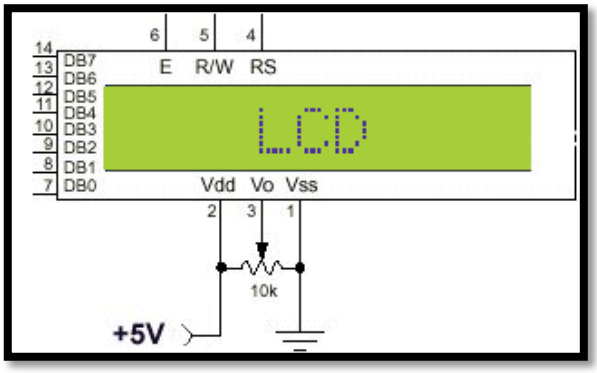

Fig 2.0 Depiction of an LCD

Table 4. LCD Pin description

Pin No.	Name	Description
Pin no. 1	**VSS**	Power supply (GND)
Pin no. 2	**VCC**	Power supply (+5V)
Pin no. 3	**VEE**	Contrast adjusts
Pin no. 4	**RS**	Instructioninput Data input
Pin no. 5	**R/W**	Write toLCD module Read from LCD module
Pin no. 6	**EN**	Enable signal
Pin no. 7	**D0**	Data bus line 0 (LSB)
Pin no. 8	**D1**	Data bus line 1
Pin no. 9	**D2**	Data bus line 2
Pin no. 10	**D3**	Data bus line 3
Pin no. 11	**D4**	Data bus line 4
Pin no. 12	**D5**	Data bus line 5
Pin no. 13	**D6**	Data bus line 6
Pin no. 14	**D7**	Data bus line 7 (MSB)

Vcc, Vss, and VEE: While Vcc and Vss provide +5V and ground, respectively; VEE is used for controlling LCD contrast.

RS - register select: There are two very 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, allowing the 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: R/W input allows the user to write information to the LCD or read information from it. R/W = 1 when reading; R/W =0 when writing.

E - 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 to low pulse must be applied to this pin in order for the LCD to latch in the data present at the data pins. This pulse must be a minimum of 450 ns wide.

D0 – D7: 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 display 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 instructions command codes that can be sent to the LCD to clear the display or force the cursor to the home position or blink the cursor. Table below lists the instruction command codes.

IV. POWER SOURCE DESCRIPTION

The project work designed here utilizes free power source of solar energy, it doesn't require main power source. Solar power is the conversion of renewable energy from sunlight into electricity, either directly using photovoltaics (PV), indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and solar tracking systems to focus a large area of sunlight into a small beam.

Since it is a prototype module, above said lenses or tracking system is not utilized here, simple solar panel of 0.6amps current output panel is used which is enough to run the entire system.

One major drawback of the solar power source is that it is not continuous, availability is depending up on the season, time and climatic conditions. So, whenever the panel gets incident solar radiation, it must be stored in to a rechargeable battery. If a higher rating panels and batteries are used depending up on power consumption of the system, stored energy can be utilized throughout the year without any interruption and irrespective of availability solar energy. The system designed here is a small version of farm land serving device which consumes less power so that lower rating panel & battery is used for demo purpose. As long as the solar energy is available, the battery will be charged and stored energy is used when required. If the Sun is bright, the panel used here can deliver a maximum output current of 600ma at around 12V.

4.1 BATTERY

This device can be called as chemical voltage source; a chemical voltage source is one of the most important sources of electrical energy. It is a self-contained voltage source and does not need any outside energy. When the battery is discharged it is supposed to be charged with suitable power source either from solar panel or from mains supply, i.e., single phase conventional energy source. The electrical energy supplied by a chemical source of voltage is produced by chemical action within the source itself. Chemical voltage sources normally exist in the form of batteries and cells of various types. These batteries are extensively used for mobile applications.

Whenever the system is energized, the required power to drive the system is generated from the battery. Here 2Ah (Ampere Hour) current rating battery is used for long back-up time, means when average power is considered the battery can withstand up to two hours. This is a maintenance free battery built in with a group of cells combined together to increase the voltage and current to the required level. A cell or battery is classified as a 'primary' or 'secondary' depending up on the manner in which the chemical energy is converted in to electrical energy. The primary cell cannot be re-charged, it is a type use and through concept battery. A secondary cell must be charged with electrical energy first to enable it to convert the chemical energy into electrical energy. Because of its action of storing energy supplied to it, a battery consisting of secondary cells is often called a storage battery. Here in this project work this kind of re-chargeable storage battery is used. As it is a prototype module, the battery used here can withstand for one hour, but for real applications heavy duty battery can be used for long back-up.

As the system operates at 12V DC, here 12V DC lead acid re-chargeable battery is used and it is accommodated over the kit structure. As the overall system consumes nearly 0.8Amp continuous current from the battery & to calculate the backup time, first we must calculate the overall power consumption, it is assumed as 0.8A, therefore back-up time = battery rating / consumption, i.e., 2/0.8 = 2.5 hours approximately. In general, the average power of battery is considered as 20% less than the rating. According to this equation back up time is depending up on the power consumption & average power of the battery, there by back-up time can be defined as less than 2 hours. Batteries are maintenance free sealed lead acid rechargeable batteries. The batteries are having excellent economy stability and superior output. Various characteristics have been improved such as leak proof, overcharging and over discharging. This compact & powerful sealed lead-acid battery with higher performance can be used as a power source for portable instruments and also for power backup use. Batteries are now being used in a wide range of applications.

4.2 CHARGING METHOD

These Batteries are maintenance free. There is no need to add water. Battery performance and service life are greatly affected by the charging method. There are various different charging methods: constant voltage charging, constant current charging, tapered current charging and some combination systems. Batteries can be charged by any of those methods. However, constant voltage charging combined with limited current is recommended for obtaining maximum capacity and service life together with acceptable recharge times and economy. Here the battery is charged with constant voltage source.

4.3 SOLAR ENERGY

In today's climate of growing energy needs and increasing environmental concern, alternatives to the use of non-renewable and polluting fossil fuels have to be investigated. One such alternative is solar energy. Solar energy is quite simply the energy produced directly by the sun and collected where required. The sun creates its energy through a thermonuclear process that converts about 650,000,000 tons of hydrogen to helium every second. The process creates heat and electromagnetic radiation. The heat remains in the sun and is instrumental in maintaining the thermonuclear reaction. The electromagnetic radiation (including visible light, infra-red light, and ultra-violet radiation) streams out into space in all directions.

Due to the nature of solar energy, two components are required to have a functional solar energy generator. These two components are a collector and a storage unit. The collector simply collects the radiation

that falls on it and converts a fraction of it to other forms of energy (either electricity and heat or heat alone). The storage unit is required because of the non-constant nature of solar energy; at certain times only a very small amount of radiation will be received. At night or during heavy cloud cover, for example, the amount of energy produced by the collector will be quite small. The storage unit can hold the excess energy produced during the periods of maximum productivity, and release it when the productivity drops. In practice, a backup power supply is usually added, too, for the situations when the amount of energy required is greater than both what is being produced and what is stored in the container.

V. HARDWARE DETAILS

To prove any project work practically for the demonstration purpose, construction of described model is essential. For this purpose, suitable hardware in the form of electronic & electrical components are essential to perform the given task. When these components are integrated together or working together, better results can be obtained from the project work. Since it is a practical oriented project work, the content presented in the abstract must be proven practically. In this regard required active hardware like IC's and other special components must be gathered and their details must be described in this chapter to fulfil the concept of perfect project report.

Electronic hardware is Hardware, in the context of technology, refers to the physical elements that make up electronic system or electro-mechanical system, and everything else involved that is physically touchable. When an embedded system is considered, that contains a processing unit (Often microcontroller chips are preferred to build a processing unit) Sensors, control circuits that includes the motors, relays, switching devices (like power Mosfets, transistors, etc). Hardware works hand-in-hand with firmware and software to make a system function. Software is a collection of code installed into the microcontroller chip. Often LCD displays are used to monitor the system performance or results.

When computer is considered as example, Hardware is only one part of a computer system, but there is also firmware, which is embedded into the hardware and directly controls it. There is also software, which runs on top of the hardware and makes use of the firmware to interface with the hardware. Hardware is a surrounding term that refers to all the physical parts that make up a computer. The internal hardware devices that make up the computer and ensure that it is functional are called components, while external hardware devices that are not essential to a computer's functions are called peripherals.

The following are the active components used in this project work.

1 – 89C52
2 – LCD
3 – Voltage regulator
4 – GPS module
5 – Buzzer

VI. CONCLUSION

The main objective of this project work to help the fishermen when their boat stuck in the deep-sea water. Means if the boat is failed or boat engine fails, then it is very difficult to move the boat manually, because these days fishermen's drive their boats in too deep sea for hunting the sea food. If the boat engine fails, it is very difficult to send information to the coast guards or see shore persons for seeking help because mobile communication network is not existed over sea water. Indian navy sailor's uses satellite phones but they are not available for common fishermen. In this regard, in this project work, RF communication system is used for sending the information. Since it is a prototype module, low power transmitter is used, but for real time applications 10Waats power transmitter can be used by which the signal can be transmitted up to the range of 80Km's.

The same system also can be used to identify the international water boundaries. It is essential to keep in mind that our fishermen's do not navigate beyond other country's border. With little modifications in the system, it also can be called as boarder alert cum boat tracking system. In this regard, the system deals with tracking the location of the boat using GPS and to trigger an alarm which consists of a Piezo-buzzer, when the border is approached. When the boat reaches near to the boarder, the location of the boat will be transmitted to the coast guards and family members through a wireless communication system. This feature will be added in our future work.

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