TELEMATIC UNIT FOR FUEL

MONITORING USING GPRS MODULE

A PROJECT REPORT

Submitted by

DHIVYASRI. G

Register No: 13MCO08

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(An autonomous institution affiliated to Anna University, Chennai)

COIMBATORE - 641 049

ANNA UNIVERSITY: CHENNAI 600 025

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BONAFIDE CERTIFICATE

Certified that this project report titled **"TELEMATIC UNIT FOR FUEL MONITORING USING GPRS MODULE"** is the bonafide work of **DHIVYASRI. G [Reg. No. 13MCO08]** who carried out the research under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other project or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

SIGNATURE

Dr.RAJESWARI MARIAPPAN

PROJECT GUIDE

Department of ECE

Kumaraguru College of Technology

Coimbatore-641 049

SIGNATURE

Dr. RAJESWARI MARIAPPAN

HEAD OF THE DEPARTMENT

Department of ECE

Kumaraguru College of Technology

Coimbatore-641 049

The Candidate with university **Register No. 13MCO08** was examined by us in the project viva –voice examination held on..............................

Internal Examiner

External Examiner

ACKNOWLEDGMENT

First, I would like to express my praise and gratitude to the Lord, who has showered his grace and blessings enabling me to complete this project in an excellent manner.

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TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms G Dhivyasri M.E (CS) student from Kumaraguru College of
Technology-Coimbatore undergone her internship in Pricol Limited

Department	Product Development Engineering
Guide	Mr Suresh Govindagatta
Period	10.07.14 to 31.01.15
Project	Telematic Unit for Fuel Monitoring Using GPRS Module
Performance	Good

We wish her all success in future endeavours.

For Pricol Limited,

9/2/15

K.Sampathkumar

Manager – HR

ISO 14001
OHSAS 18001
BUREAU VERITAS
Certification

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BUREAU VERITAS
Certification

ABSTRACT

Telematics is an eminent technology which merges telecommunications and informatics. This blending of computers and wireless telecommunications technologies is done ostensibly with the goal of efficiently conveying information over vast networks to handle vehicle information's.

The entire system consists of TeCU Telematics Control Unit, server and webpage application to monitor and to sense ample information's received from vehicle over the air. Telematics Control Unit (TeCU) has to be designed and developed, which could be used in real time and off time monitoring, tracking and reporting system.

TeCU is mounted in the vehicles and it's implemented with GSM/GPRS for tracking to communicate with backend server. The user can create a webpage application and monitor the vehicle update information's and mappings with fine precision. Thus, system provides adequate information to fleet operator regarding route/direction taken by driver, stoppages, vehicle location, speed of the vehicle, engine speed, idle mode, AC ON or OFF, vehicles unit information's, RPM, high acceleration, sudden braking, date, time, etc. All these vehicle information's from TeCU could be updated to the Server; this is possible through GPRS communication. Thus server dispatch's all information's completely to end user webpage. This system could be extensively used in commercial vehicles and in constant equipments.

In this project fuel indicative sensor and TeCU are interfaced, and then fuel status of vehicle is monitored predominantly on the webpage. Then hardware and software implementations will also be done to administrate the system. This core endeavor of the project is to identify fuel theft, tank failure and manage the fuel pilfering along with some additional features. Then a new entity is proposed to monitor the fuel capacity of vehicles during the refills at bunks which would help to ensure the fuel level present in tanks precisely.

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LIST OF ABBREVIATIONS

TeCU	Telematic Unit
SOP	Start of Protocol
GPIO	General Purpose Input Output
MCU	Micro Controller Unit
SPI	Serial Peripheral Interface
GPRS	General Packet Radio Server
UART	Universal Asynchronous Receiver Transmitter
FIFO	First In First Out
PWM	Pulse Width Modulation
ROM	Read Only Memory
RAM	Random Access Memory
PPAP	Part Production Approval Process
OTA	Over The Air
GSM	Global System for Mobile Communication

CHAPTER 1

INTRODUCTION

1.1 TELEMATICS

Telematics is the blending of computers and wireless telecommunications technologies, with the goal of efficiently conveying information over vast networks to improve a host of business functions or government-related public services. Telematics is an interdisciplinary field encompassing telecommunications, vehicular technologies, road transportation, road safety, electrical engineering (sensors, instrumentation, wireless communications, etc.), computer science (multimedia, Internet, etc.). Hence the application of telematics is with any of the following:

- The technology of sending, receiving and storing information via telecommunication devices in conjunction with affecting control on remote objects.
- The integrated use of telecommunications and informatics, for application in vehicles and with control of vehicles on the move.
- Telematics includes but is not limited to Global Positioning System technology integrated with computers and mobile communications technology in automotive navigation systems.
- Most narrowly, the term has evolved to refer to the use of such systems within road vehicles, in which case the term vehicle telematics may be used.

    In contrast telemetry is the transmission of measurements from the location of origin to the location of computing and consumption, especially without affecting control on the remote objects.

    Telematics is obtained from the Greek "**Tele**"- Far away, especially in relation to the process of producing or recording "**Matos**"- A derivative of the Greek machinery, or contrivance, usually taken in this context of automation, to mean 'of its own accord'. As the term "telematics" describes the process of long-distance transmission of computer-based information.

1.2 VEHICLE TELEMATICS

The convergence of telecommunications and information processing, the term later evolved to refer to automation in automobiles, such as the invention of the emergency warning system for vehicles. The science of **Tele**communications and Infor**matics** applied in

wireless technologies and computational systems. More universally applicable technology as a superset of M2M (Machine to Machine) connectivity, and as part of an "intelligent network of connected things", the term is typically associated with the vehicle market.

Fig 1.1 TELEMATIC SYSTEM ENABLING MODE

Telematics enables you to get information about the location, movement, and state of your vehicle. It also enables your vehicle to communicate wirelessly, which opens up a wide range of services. You can discover useful information about that vehicle, such as:

- When the vehicle was last started and shut down
- Where it is at any point in time and When it is sitting idling
- What speed its being driven at

It looks for many different signs of bad behavior like: Sharp turns, Tailgating, Sudden stops, Speeding. Telematics is enabling it's users to take advantage of a wide range of useful features.

1.3 HOW TELEMATIC SYSTEM WORKS

The telematics system starts with your vehicle which communicates with a third party off site somewhere via a satellite signal. Then at this third party location the data your vehicle sends is collected, stored, and analyzed by whatever software your manufacturer is using. This data can even be used to adjust your vehicle based on your driving behavior. For example if any driver have a habit of hitting the breaks hard, then your car can electronically adjust itself to be better suited for hard breaking. It can also look at how you handle curves and dynamically adjust itself to better handle the way you move around the road.

Perhaps even more amazing is that telematics can let you use a camera inside your vehicle and take a recording of your driver. In the event of a theft or accident, this can be powerful evidence to shift the case in your choice.

1.4 MAJOR COMPONENTS OF TELEMATICS

Telematics is based upon two key components:

- Tracking
- Tracing

Tracking

Tracking is all about collecting data on your car. From the braking to the temperature outside, it's getting data about car to a third party database where it can be analyzed.

Tracing

Tracing is putting together the links in this data and gaining new insights from it.

For example there may be "black spots" on the road where an unusual amount of people have accidents. In these areas your sat-nav can automatically warn you to drive extra carefully, even though the signs may not indicate the need to do so.

1.5 TECHNOLOGY THAT MAKES UP TELEMATICS

The possibilities offered by telematics are truly exciting. No one quite knows what will be available in the future, but we do know what is in progress right now, and what is already available. Through telematics you can gain greater convenience and safety in car. Imagine a world where instead of taking your iPod with you, you just sync your vehicle with your on-line music database. Well that's exactly what is possible now, no more worrying about forgetting a song, or not bringing your favorites mp3 player. Instead you can just sync to your wireless cloud and play as much of your personal favorites as you like. Better still, if there is a new hit you hear on the radio, you can instruct your car to download it for you through voice activated commands. Perhaps you have a favorites app you enjoy for your tablet computer. Well you can also take advantage of it in your car. You won't even need to touch the screen, controlling it with your voice instead. While waiting in rush hour traffic you can compose emails without ever lifting a finger, or order a pizza on-line and have it waiting for you at your house as you arrive. You can chill out and watch movies or call your friends on Skype.

Telematics is ultimately several different pieces of hardware that merges telecommunications and informatics for your vehicle through this marriage of hardware there is a plethora of exciting benefits available to drivers now and in the future. Telematics solutions have provided basic track and trace functionality successfully world over. But real multi-fold return on investment can be realized when tough to crack logistics issues are solved with the help of a rich software suite that leverages the available "geo" and allied information.

Sensel has constantly endeavored to understand the unique problems challenges in logistics of the specific business vertical and customize/leverage appropriate solutions and constantly increasing the breadth and depth of fleet-SMART.

- Frozen Good Carriage
- Long Distance Buses
- Infrastructure
- Tourism/Transport
- Factory/Industry

Frozen Good Carriage

Milk and several other goods are today transported in vehicles with a refrigerated stored. Close monitoring of the temperature in the frozen sections is very important and essential for the transport vendor as well as the end customer transporting the goods. Telematic attains solution were Sensel has deployed its temperature sensor accessory coupled with the VTX for continuous real-time monitoring and alerts to the user when temperature rises above user defined values.

Fig 1.2 REFRIGERATED GOODS

Long Distance Buses

It's obviously a difficult task to pick up the passengers over a long distance were telematic provides a solution by sending SMS alerts to the passengers mobiles. An important customer friendly feature necessary in this segment is SMS alerts passenger waiting at each pickup point on estimated time of arrival and other bus details. Sensel has tied up with a value added reseller to provide this service to customers. Also custom dashboards are available to monitor the timeliness and other operational parameters.

Fig 1.3 LONG DISTANCE BUS MONITORING

Infrastructure

During the construction of large buildings large vehicles features needed to be monitored, such that to point locations and for fuel consumptions. Role of telematic has obtained a better solution.

Besides the usual vehicles also deployed are vehicles such as tippers, JCB earth movers, digging rigs, generators all of which need be monitored for usage, location and fuel consumption. Sensel has significant customer base in this segments where alerts and reports were customized and integrated to fleet-SMART suite to ensure a superior multi-fold return on investment for the customer.

Tourism / Transport

Basic track and trace issue fuel pilferage is a major problem faced by this sector. Sensel's fuel monitoring solution provides best in class fuel reports indicating the fuel filled as well as the mileage. Any many parts of the country the owners are worried of theft of the vehicle and feel the need for remote immobilization of the vehicles in emergency situations. While integrating the immobilizer we make sure from a safety is kept in mind and accordingly

remote immobilizing will not affect the vehicle in motion but take effect only once the vehicle halts

Factory/Industry

For most factories tracking JIT is critical. The demand is to geo-code all the destination points and closely tracks IN/OUT and waiting times at each delivery point.

Fig 1.4 JIT TRACKING

At some customer sites the First In First Out view in fleet-SMART based on the GPS IN time has not only help mitigate unnecessary disputes between the truck drivers, but has also help improve the waiting times and increased the transport efficiency. Thus telematics play a role.

1.6 PRACTICAL APPLICATIONS OF VEHICLE TELEMATICS

Vehicle Tracking

Vehicle tracking is monitoring the location, movements, status and behavior of a vehicle or fleet of vehicles. This is achieved through a combination of a GPS(GNSS) receiver and an electronic device (usually comprising a GSM GPRS modem or SMS sender) installed in each vehicle, communicating with the user (dispatching, emergency or co-coordinating unit) and PC- or web-based software.

Container Tracking

Freight containers can be tracked by GPS using a similar approach to that used for trailer tracking i.e. a battery-powered GPS device communicating its position via mobile phone or satellite communications. Benefits of this approach include increased security and

the possibility to reschedule the container transport movements based on accurate information about its location.

Fleet Management

Fleet management is the management of a company's fleet. Fleet management includes the management of ships and or motor vehicles such as cars, vans and trucks. Fleet (vehicle) Management can include a range of Fleet Management functions, such as vehicle financing, vehicle maintenance, vehicle telematics (tracking and diagnostics), driver management, fuel management, health & safety management and dynamic vehicle scheduling.

Mobile Data

Mobile data is the use of wireless data communications using radio waves to send and receive real time computer data to, from and between devices used by field based personnel. These devices can be fitted solely for use while in the vehicle (Fixed Data Terminal) or for use in and out of the vehicle (Mobile Data Terminal). During the early 2000, manufacturers of mobile data terminals/AVL devices, moved to try cellular data communication in order to offer cheaper ways to transmit telematics information and wider range based on the country full coverage of cellular providers. Ever since then, thanks to the cellular providers that offered low GPRS (2.5G) and later UMTS (3G) rates, mobile data is almost totally offered to telematics customers by cellular communication.

Wireless Vehicle Safety Communications

Wireless vehicle safety communications telematics aid in car safety and road safety. It is an electronic sub-system in a car or other vehicle for the purpose of exchanging safety information, about such things as road hazards and the locations and speeds of vehicles, over short range radio links. This may involve temporary ad hoc wireless local area networks. Wireless units will be installed in vehicles and probably also in fixed locations such as near traffic signals and emergency call boxes along the road. Sensors in the cars and at the fixed locations, as well as possible connections to wider networks, will provide the information, which will be displayed to the drivers in some way.

Emergency Warning System for Vehicles

Telematics technologies are self-orientating open network architecture structures. Emergency warning systems for vehicles telematics are developed particularly for vehicle-to-

vehicle, infrastructure-to-vehicle, and vehicle-to-infrastructure real-time Dedicated Short Range Communication (DSRC) systems.

Intelligent Vehicle Technologies

Intelligent vehicle technologies commonly apply to car safety systems and self-contained autonomous electromechanical sensors generating warnings that can be transmitted within a specified targeted area of interest, say within 100 meters of the emergency warning system for vehicles transceiver. In ground applications, intelligent vehicle technologies are utilized for safety and commercial communications between vehicles or between a vehicle and a sensor along the road

1.7 ADVANTAGES AND DISADVANTAGES OF TELEMATICS

Telematics is a branch of IT that deals with transmission of computerized information over long distances. In the case of UPS's telematics their project focuses on the social, environmental and financial aspects that are otherwise known as the triple bottom line. Some of the social benefits include safer driving habits, self correction encouraged by telematic reports and truck reliability. In terms of environmental friendliness telematics help find opportunities to reduce mileage, consumption of fuel and replacement parts. Financial advantages of the telematics systems also result from the social and environmental advantages. For example, reduced fuel consumption and route efficiency have greatly cut costs in that department. They have also reaped the benefits from keeping their energy consumption and costs consistent. Their decision to move from scheduled maintenance to maintenance that was based on the condition of the vehicles has also had a great financial impact.

Though the advantages of using telematics have caused great improvement in the company's triple bottom line, there have also been many setbacks. These challenges include organizational challenges such as high cost to upkeep the sustainability goals and maintain their profit margin as costs increase. Social challenges would be the treatment and discipline of employees. In terms of technological challenges, I think UPS will find problems with implementation as they continue to grow the sustainability aspect of their organization. Nevertheless, I think the move towards telematics is a positive one and that the challenges they face can and will be tackled if they are able to focus on the important issues and how they can be fixed.

Safer drivers rewarded

Arguably the greatest advantage is that it makes the insurance premiums fairer. With drivers insurance premiums are charged according to their actual driving behaviour rather than the demographic group that they belong to. This means that a young, male driver whose auto insurance premiums would in the past be very high, can reduce these costs if he is a safe driver. At the same time an older, female driver who drives frequently and dangerously will not be able to "free-ride" the system simply on the basis of the demographic group she is in.

Better for society

It is estimated that in the UK, five people die on the roads each day. The majority of these deaths would be preventable through safer driving. When you add in the estimated 18 billion pounds a year in economic costs attributed to road accidents you can see that anything that would encourage people to drive more safely would be of great benefit to society. With black box insurance drivers have a financial incentive to drive safely at all times. Because they are constantly being monitored their driving will improve and this will decrease road accidents.

Prevents theft

Monitoring technology also helps to prevent theft and enables the tracking of automobiles. With GPS technology it is possible for insurance companies to determine the current location of a stolen automobile. It is even possible to remotely disengage the ignition to make the car immobile. This acts as a deterrent to stealing cars with black box technology, as well as making it easier to locate cars that have been stolen. In turn this reduces auto theft insurance premiums because of reduced claims.

Helps with claims management

The black box in the car includes a huge amount of information, which can be very useful in the case of a car accident. For example it can show whether the driver was speeding or driving dangerously prior to the accident. This can increase the speed and accuracy with which car insurance claims are managed.

More profitable for insurance companies

Black box insurance is also more profitable for the insurance companies. With black box insurance they are charging premiums which more accurately reflect the probability that they will be claimed. This means that they can charge higher premiums to drivers which

actually pose a higher risk of an accident. Also because they can reward drivers who are safer with lower premiums, they can attract more of these customers and thus increase market share and overall revenues.

DISADVANTAGES

Cost

Automotive telematics add a lot of value to your car, but they're also very expensive. GPS systems, cell phone integration and automated texting need to be purchased in their base form, and then installed into your car by experienced techs. Even if you have the ability to install the systems yourself, automotive telematics can still get very expensive as you add more and more of them into your car for a more complete and convenient driving experience.

Tracking

One disadvantage of automotive telematics is that they make your car easier to track. This is something of a double edged sword though. In the event that your car is stolen, you'd want it to be easier to find, especially if you could just track where it is via the GPS chip that you have inside it. However, it also means that you're giving up a lot of privacy by making yourself track able. It's a consideration that you should think about, since it can be a major pressure on your privacy.

Dangerous drivers may opt out

At the moment the installation of black box monitoring technology is voluntary. This can cause a problem however in that good drivers will receive the benefits of lowered premiums but bad drivers may not be penalized to the same degree. For good drivers there is a financial incentive to have their behaviour monitored and so they are likely to opt into a black box insurance system.

However for bad drivers that may be part of a low premium demographic, there is an incentive not to have the technology used. Insurance companies need to be able to match their lowered premiums for the good drivers by similarly increasing the premiums for the bad drivers. If they only lower their premiums, then overall running a black box system will be more expensive for insurance companies.

Technology and monitoring costs may outweigh potential revenues

The installation and monitoring of black boxes has a cost. If this cost exceeds the potential savings and increased revenue that results from that technology, then it may not be in the best interests of insurance companies to have the monitoring devices installed. This is particularly true if the scenario mentioned above occurs, where bad drivers choose not to use the system and are consequently not accurately penalized.

CHAPTER 2

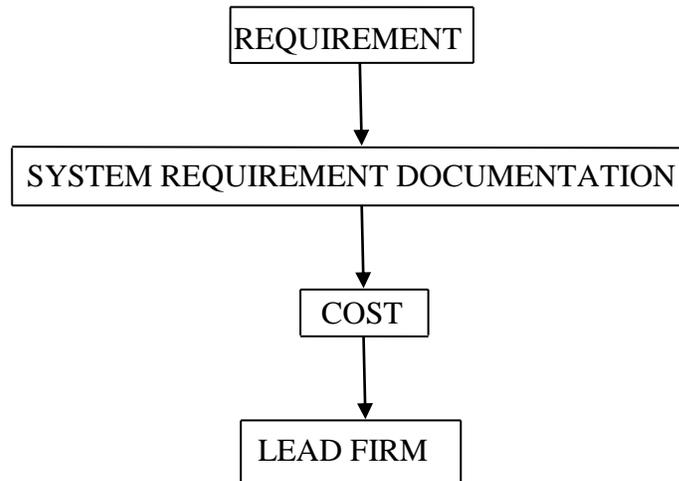# LITERATURE SURVEY

2.1 OUTLINE OF PRODUCT DEVELOPMENT

```
┌─────────────────┐
│   REQUIREMENT   │
└─────────────────┘
         │
         ▼
┌──────────────────────────────────────┐
│  SYSTEM REQUIREMENT DOCUMENTATION    │
└──────────────────────────────────────┘
         │
         ▼
      ┌────────┐
      │  COST  │
      └────────┘
         │
         ▼
   ┌──────────────┐
   │  LEAD FIRM   │
   └──────────────┘
```

Fig 2.1 FLOW DIAGRAM OF PRODUCT DEVELOPMENT

2.2 HARDWARE DEVELOPMENT PROCEDURE

- ➢ SRS
- ➢ SCHEMATIC OF THE PRODUCT
- ➢ DU- VERIFICATION
- ➢ PCB LAYOUT
- ➢ PCB FABRICATION
- ➢ INITIAL PROTOTYPE
- ➢ DESIGN VERIFICATION REPORT
- ➢ SOFTWARE SUPPORT
- ➢ PRODUCT RELIABILITY
- ➢ CUSTOMER TRIAL
- ➢ BENCH TEST VERIFICATION
- ➢ VEHICLE LEVEL TESTING
- ➢ APPROPRIATE ENGINEER SYNTHESIS
- ➢ PRODUCTION SUPPORT & RELEASE

The telematic product should also satisfy the ISO standardization and automotive standards which has been specified.

2.3 STUDY OF AUTOMOTIVE FUEL SENSORS

The main types of fuel level indicative sensors are:

- Wire wound
- Thick Film Resistor
- Tubular with wire resistance
- Tubular with Reed Switch
- Capacitance

2.4 TYPES OF FUEL LEVEL SENSORS

Fig 2.2 DIFFERENT TYPES OF FUEL LEVEL SENSORS

BENEFITS

- No power supply required.
- Contacts hermetically sealed.
- Most economic non touch switching solutions
- Various methods of actuation principles
- Magnetic and electric pole independent
- Various sensitivity ranges available

APPLICATIONS
- Four Wheelers
- Two Wheelers

2.5 FUEL LEVEL SENSOR – USING REED SWITCH

A Fuel level sensor incorporates a reed switch in a stem. An external float with a magnetic inside passes and actuates the reed switch depending on the liquid level.

2.5.1 REED SWITCH

It is a small electro mechanical device having two ferromagnetic reed blades sealed in a glass envelope. When a magnetic field is brought near to this, reeds will close creating the switching functions.
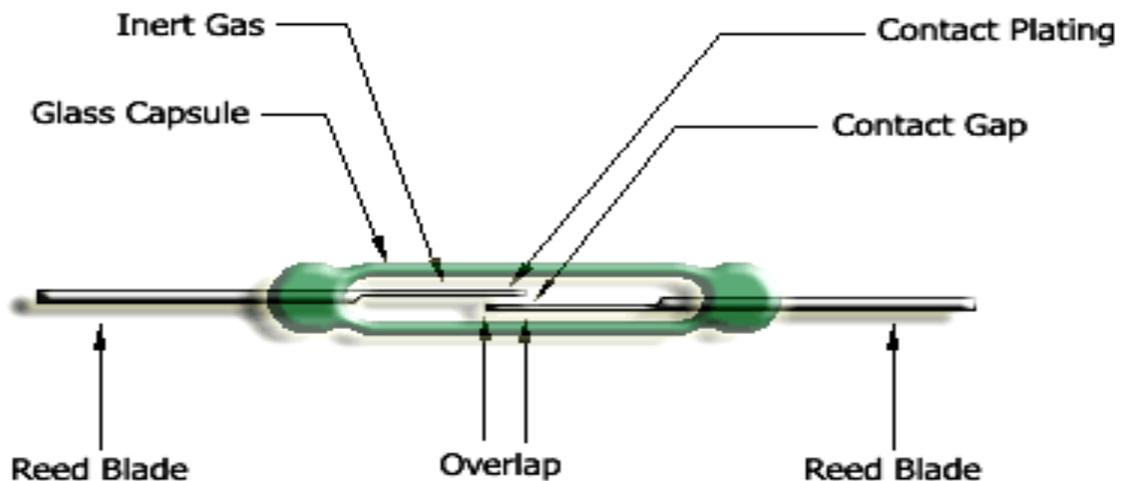

Fig 2.3 REED SWITCH

2.5.2 WORKING OF REED SWITCH:

A reed switch consists of a pair of ferromagnetic reeds, hermetically sealed in a glass tube. Their free ends overlap at a very small distance. A magnetic field (from an electromagnet or a permanent magnet) will cause the reeds to come together, thus completing an electrical circuit. The stiffness of the reeds causes them to separate, and open the circuit, when the magnetic field ceases. One important quality of the switch is its sensitivity, the amount of magnetic necessary to actuate it. Sensitivity is measured in units of Ampere-turns, corresponding to the current in a coil multiplied by the number of turns. Typical pull-in sensitivities for commercial devices are in the 10 to 60 AT range. The lower the AT, the more sensitive the reed switches.
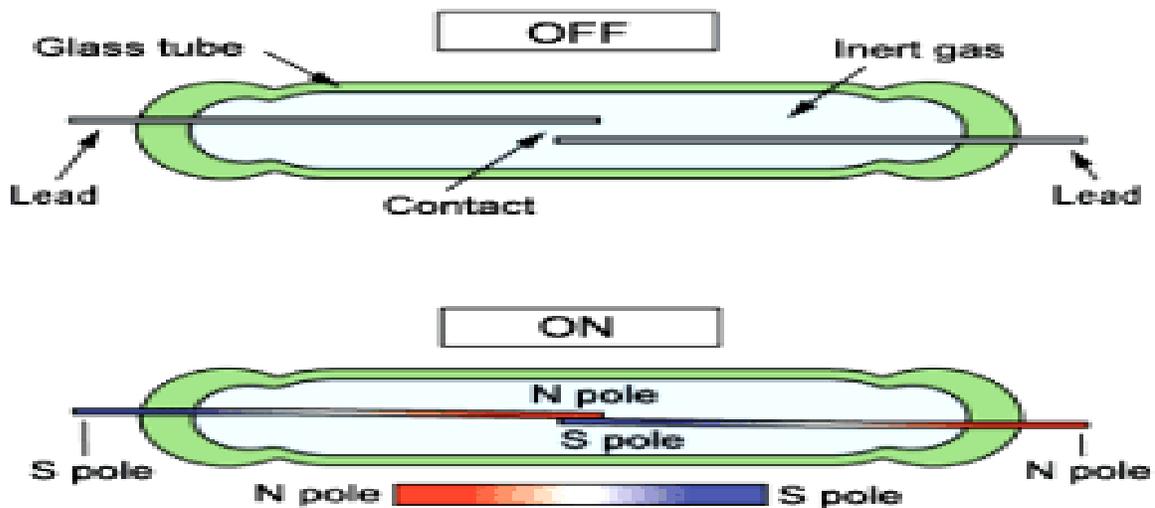
Fig 2.4 WORKING MECHANISM OF REED SWITCH

2.6 GSM/GPRS MODULE

The smallest GSM/GPRS surface mounted module is a dual band 900/1800 GSM/GPRS device with LCC castellation package with extremely low power consumption, extended temperature range and compact profile.

The low profile and small size of SMT package combined with low power consumption enables the design of very compact application with increased autonomy. Since connectors are eliminated, the solution cost is significantly reduced than compared to conventional mounting.

Dual module with LCC castellation package technology, are surface mount package devices, which uses metalized pads on sides of packages. The kind of packaging is ideally suited for uncomplicated and low cost application based on four layers PCB. Moreover with the option for manual solder and removal it can serve niche application with low volume production.

Additional features such as integrated TCP/IP protocol stack, serial multiplication and remote AT command extend the functionality. It's possible to run the customer's application inside the module by means a python script interpreter, thus making its smallest, complete SMT platform for m2m solution. All telit module will support the over the air firmware by means premium FOTA management.
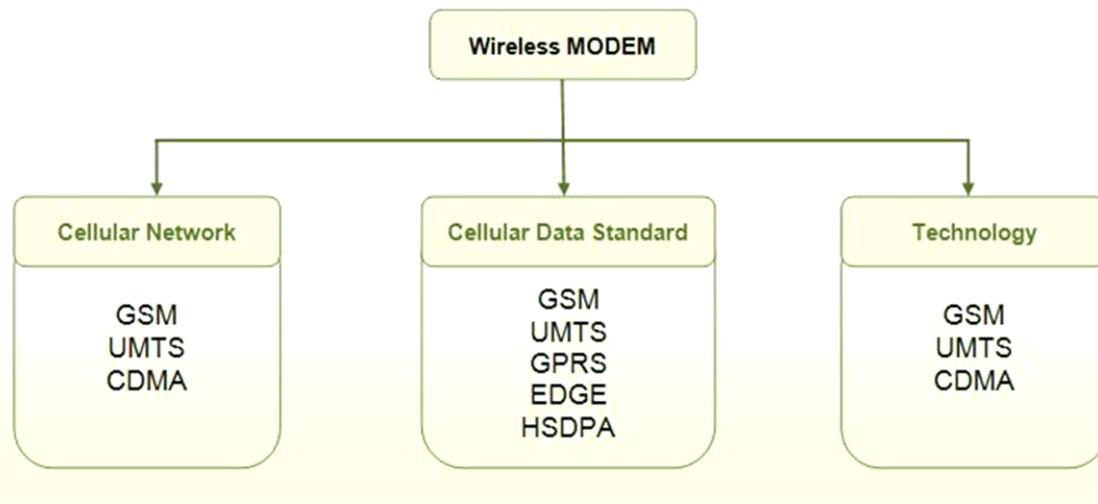
Fig 2.5 GSM/GPRS NETWORK BLOCK

2.7 SERVER

A server is a running instance of an application capable of accepting requests from the client and giving responses accordingly. Servers can run on any computer including dedicated computers, which individually are also often referred to as "the server". The advantage of running servers on a dedicated computer is security. Servers operate within a client-server architecture. Servers are computer programs running to serve the requests of other programs, the clients. It facilitates the clients to share data, information or any hardware and software resources. Servers often provide essential services across a network, either to private users inside a large organization or to public users via the Internet. Typical computing servers are database server, file server, mail server, print server, web server, gaming server, and application server.

Server-oriented operating systems tend to have certain features that make them more suitable for the server environment, such as

- GUI not available or optional
- Ability to reconfigure and update both hardware and software to some extent without restart
- Advanced backup facilities to permit regular and frequent online backups of critical data
- Transparent data transfer between different volumes or devices
- Flexible and advanced networking capabilities

- Automation capabilities such as daemons in UNIX and services in Windows
- Tight system security, with advanced user, resource, data, and memory protection.

2.8 STATIC WEBPAGE

A static web page known as flat page/stationary page is a web page that is delivered to the user exactly as stored, in contrast to dynamic web pages which are generated by a web application.

Consequently a static web page displays the same information for all users, from all contexts, subject to modern capabilities of a web server to negotiate content-type or language of the document where such versions are available and the server is configured to do so.

Static web pages are often HTML documents stored as files in the file system and made available by the web server over HTTP (nevertheless URLs ending with ".html" are not always static). However, loose interpretations of the term could include web pages stored in a database, and could even include pages formatted using a template and served through an application server, as long as the page served is unchanging and presented essentially as stored.

Static web pages are suitable for the contents that never or rarely need to be updated. However, maintaining large numbers of static pages as files can be impractical without automated tools. Any personalization or interactivity has to run client-side, which is restricting.

Advantages of static website:

- Quick to develop
- Cheap to develop
- Cheap to host

Disadvantages of static website:

- Requires web development expertise to update site
- Site not as useful for the user
- Content can get stagnant

2.9 LITERATURE SURVEY

Survey on various papers provides the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular telematics and GSM technology.

Pankaj Verma, J.S Bhatia (2013) describes ***"Design and Development of GPS-GSM based Tracking System with Google map based Monitoring"*** examines that one of the applications is tracking your vehicle and keeps regular monitoring on them. This tracking system can inform you the location and route travelled by vehicle, and that information can be observed from any other remote location. It also includes the web application that provides you exact location of target. This system enables us to track target in any weather conditions. This system uses GPS and GSM technologies. The paper includes the hardware part which comprises of GPS, GSM, Atmega microcontroller MAX 232, 16x2 LCD and software part is used for interfacing all the required modules and a web application is also developed at the client side. Main objective is to design a system that can be easily installed and to provide platform for further enhancement.

Pietro Manzoni, Richard D. Gitlin, C. K. Toh, Tao Zhang, and Sadao Obana (2013) described ***"Special Issue on Telematics Communications and Vehicular Networking"*** examines the critical issues involved with telematics such as vehicular network infrastructure, vehicular network communication protocols, and vehicular services and applications. A new era of vehicular technology that includes vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications is approaching. During recent Intelligent Transportation Systems (ITS) development, transportation telematics techniques have exhibited much progress, e.g., interaction between automobiles and the infrastructure for delivering services such as roadside assistance, automatic crash notification, concierge assistance and vehicle condition reports. This special issue aims to cover a widening range of research topics, related to vehicular networking applications, services, and systems. One issue central to V2V and V2I is mobility. Mobility affects virtually all layers of the wireless architecture, from radio to applications. It is a major challenge to the designer and it must be reckoned with, whether it contrasts performance, or it enhances it (as with "data mules" in Delay Tolerant Networks for example). In this special issue, we recognize the synergies between telematics communications and

vehicular networking and have thus solicited papers that specifically focus on the various facts of these intersecting research areas. Our effort has been rewarded: out of over 40 submissions, we have selected 10 excellent papers that capture the current situation in this area. For the readers' convenience, the papers have been organized in four categories: (a) Performance Evaluation; (b) Security and Privacy; (c) Services, and; (d) Mobility Management.

Won-Kee Hong, Tae-Hwan Kim, and Cheong-Ghil Kim (2013) described *"Internet-Based Human-Vehicle Interface for Ubiquitous Telematics"*. In the ubiquitous computing environment, a ubiquitous vehicle will be a communication node in the vehicular network as well as the means of ground transportation. It will make humans and vehicles seamlessly and remotely connected. Especially, one of the prominent services in the ubiquitous vehicle is the vehicle tele operation. However, mutual-collaboration with the in-vehicle communication network, the vehicle-to-vehicle communication network and the vehicle-to-roadside communication network is required to provide vehicle tele operation services. In this paper, an Internet-based human-vehicle interfaces and a network architecture is presented to provide remote vehicle control and diagnosis services.

Hu Jian-Ming; Li Jie; Li Guang-Hui (2012) describes *"An automobile anti-theft system using GSM and GPS module"*. The system is developed using high speed mixed type single-chip C8051F120 and stolen automobile is detected by the use of vibration sensor. The system remains in contact with automobile owner through the GSM module, for the safety and reliability of automobile.

Fleischer, P.B.; Nelson (2012) describes *"Development and deployment of GPS (Global Positioning System)/GSM (Global System for Mobile Communications) based Vehicle Tracking and Alert System"* This system allows inter-city transport companies to track their vehicles in real-time and provides security from armed robbery and accident occurrences.

Nasir M.A.M., Mansor, W (2011) describes **"GSM based motorcycle security system"** In this paper a motorcycle security system to prevent thieves from stealing the motorcycle. The system used microcontroller and was designed based on Global System for Mobile Communications. The system can be installed in a motorcycle at hidden place. The action of pressing the paddle or activating the engine without a key will cause a signal to be sent to

microcontroller. The microcontroller will detect the status of a limit switch that is connected to it and send a message to the owner via a mobile phone and stop the engine immediately by disconnecting the power supply. The system will operate in normal condition again after the owner disables it. The proposed system is simpler and more efficient than conventional security system.

Le-Tien, T.; Vu Phung (2010) describes **"Routing and Tracking System for Mobile Vehicles in Large Area, Electronic Design, Test and Application"** The practical model for routing and tracking with mobile vehicle in a large area outdoor environment. The system includes the Compass sensor-YAS529 of Yamaha Company and Accelerator sensor-KXSC72050 of Koinix Company to acquire moving direction of a vehicle. The system will acquire positions of the vehicle via GPS receiver and then sends the data to supervised centre by the SMS (Short Message Services) or GPRS (General Package Radio Service) service. The supervised centre comprises of a development kit that supports GSM techniques-WMP100 of the Wavecom Company. Finally, the position of the mobile vehicle will be displayed on Google Map.

El-Medany, W.; Al-Omary (2010) describes **"A Cost Effective Real-Time Tracking System Prototype Using Integrated GPS/GPRS Module",** that provides accurate localizations of the tracked vehicle with low cost. GM862 cellular quad band module is used for implementation. A monitoring server and a graphical user interface on a website is also developed using Microsoft SQL Server 2003 and ASP.net to view the proper location of a vehicle on a specific map. The paper also provides information regarding the vehicle status such as speed, mileage.

Suqun Cao (2009) describes **"GSM Modem-Based Mobile Auxiliary Learning System"** With the development of mobile communication technologies and the popularity of relating devices, mobile learning (M-learning) system has been used more and more widely. But most of existing M-learning systems have built on mobile platforms whose interfaces don't open to

general education institutions. This limits M-learning application. In view of this, a novel mobile auxiliary learning system, called GSM modem-based mobile auxiliary learning system (GM-MAL) is proposed, which has advantages of low cost, user-friendly and convenience for secondary development. System design of GM-MAL including hardware structure, software function and working procedures has discussed in detail. From the analysis of At commands, PDU encoding and decoding, serial programming, the technical method how to realize GM-MAL are given. Practice has proved that GM-MAL can not only strengthen the contact of teaching and learning, but also promote students learning and improve the teaching effect.

CHAPTER 3

PROPOSED WORK

3.1 SCOPE OF THE PROJECT

This serves as the purpose of stating the overall functionality and hardware requirement of the fuel level to be interfaced to the telematics unit and then entire features to be implemented in vehicles. Through GSM/GPRS module information is given to the server then entire result is given to the user webpage.
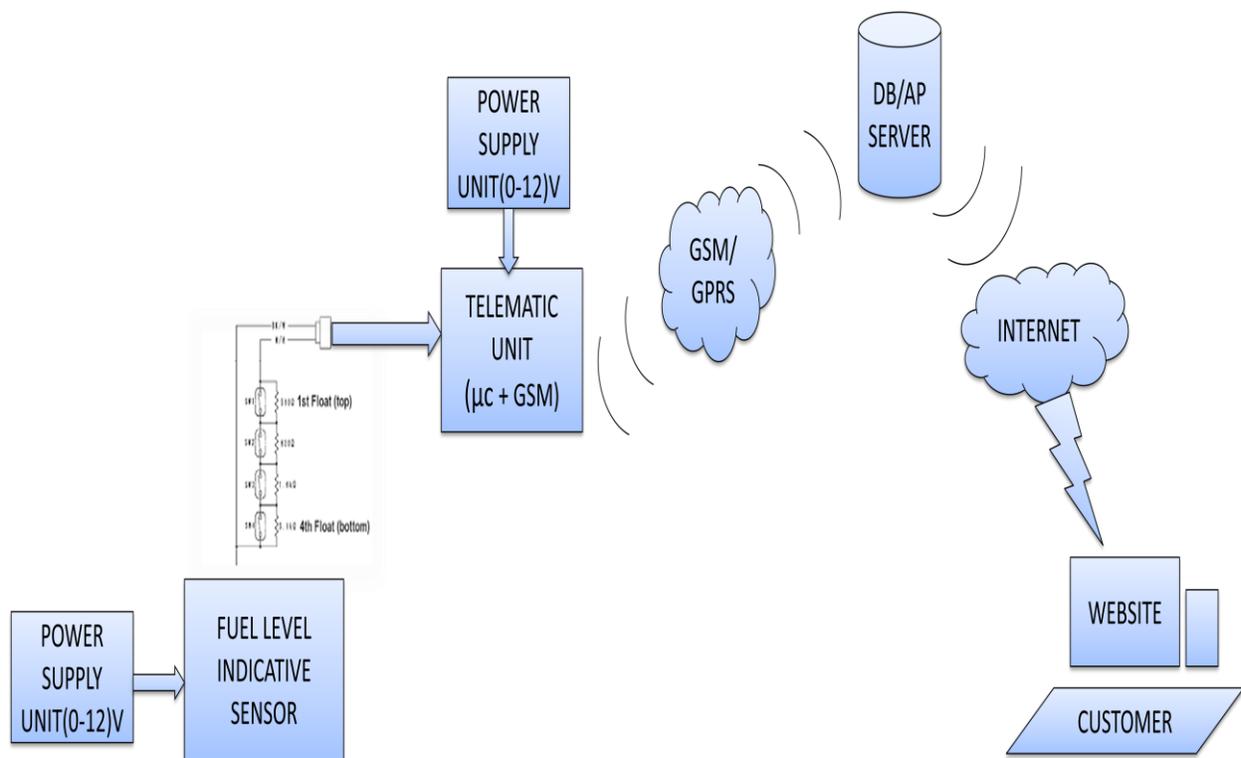

Fig 3.1 GENERAL ARCHITECTURE

3.2 POWER SUPPLY UNIT

A power supply is an electronic device that supplies electric energy to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another and, as a result, power supplies are sometimes referred to as electric power converters. Some power supplies are discrete, stand-alone devices, whereas others are built into larger devices along with their loads.

Initially, 12 volt power supply unit has been developed, and connected to the vehicles fuel level sensor. The schematic of power supply unit is as follows,
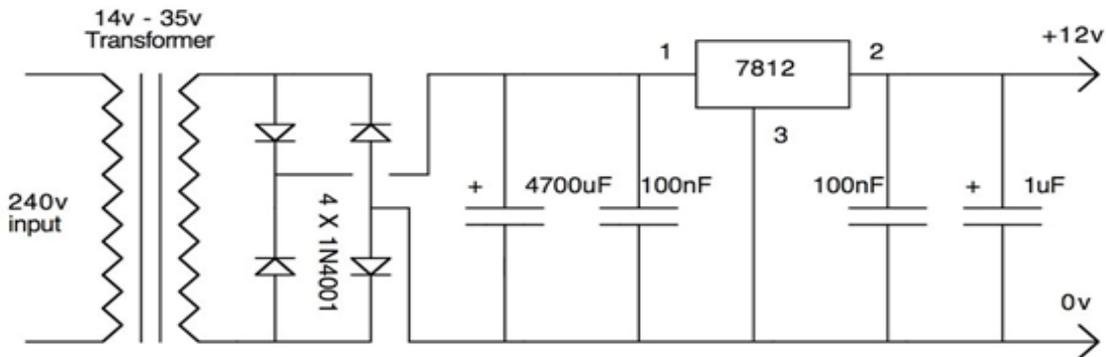

Fig 3.2 CIRCUIT DIAGRAM OF 12V POWER SUPPLY

Now, the power supply unit could be interfaced with fuel level sensor and its relevant level changes in the tank could be measured.

3.3 FUEL LEVEL INDICATIVE SENSOR

Fuel level sensor chosen in this project is resistive type were it contains series of reed switches are connected to indicate the liquid level in resistance range. Resistive fuel level indicative sensors are similar to magnetic float level sensors in that a permanent magnet sealed inside a float moves up and down a stem in which closely spaced switches and resistors are sealed. When the switches are closed, the resistance is summed and converted to current or voltage signals that are proportional to the level of the liquid. The choice of float and stem materials depends on the liquid in terms of chemical compatibility as well as specific gravity and other factors that affect buoyancy.

Fig 3.3 RESISTANCE TYPE FUEL SENSOR

Fuel level sensor is widely used for trucks and construction machinery. This structure can achieve the precise measuring in shaky condition. With the electromagnetic induction principle, it can output signal stably and continuously. The sensor also has the characteristics of long using life, anti-vibration and anti-corrosion.
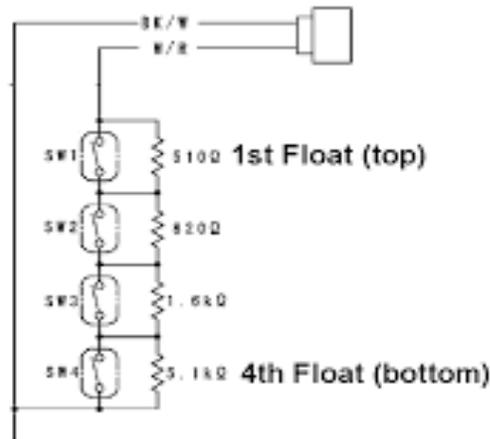

Fig 3.4 CIRCUIT DIAGRAM OF FUEL SENSOR

Observation of fuel level sensor output from a passenger car

Fuel capacity	Ohms Ω	Tolerance
Empty low (3lit)	10	±3
Empty high(6lit)-Reserve	30	±3
¼ position tank(10lit)	60	±6
½ position tank(20lit)	100	±6
¾ position tank(30lit)	140	±8
Full tank(38lit)	190	±8

Table 3.1 FUEL LEVEL SENSOR OUTPUT

Now, this resistance values need to be calibrated between the ranges of (0-5) volt, in order to feed into TeCU controller. Thus calibration is done using potential divider calculation. Initially worst case range has been fixed using trial and error method and then voltage

Calculations are preceded for all the above assigned resistances of the fuel capacity. Changing the value of the variable resistor R-2 changes the output voltage V-OUT
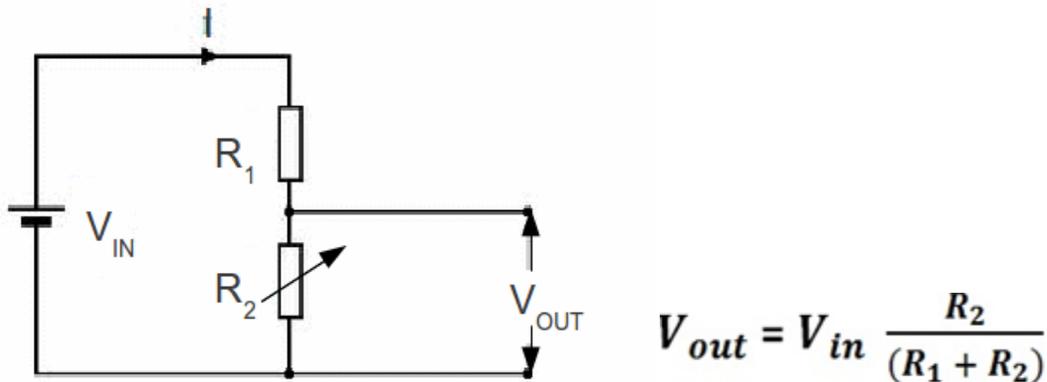

$$V_{out} = V_{in} \frac{R_2}{(R_1 + R_2)}$$

Fig 3.5 POTENTIAL DIVIDER CIRCUIT AND FORMULA

Calibrated output readings

V_{in}(volt)	R1(ohms)	R2(ohms)	Verified V_{out}(volt)
12	300	10	0.387
12	300	30	1.091
12	300	60	2
12	300	100	3
12	300	140	3.818
12	300	190	4.653

Table 3.2 CALIBRATED OUTPUT READING

3.4 TELEMATICS CONTROL UNIT

Hardware unit to be installed in the vehicle for should operate for both 12V and 24V system, shall continue to operate during cranking voltage of 6.0V complaint with IP67 standard, sleep current should not exceed 4mA. The TeCU functionality should not get affected by any of mechanical or environmental aspect of the vehicle and should not cause any kind of electrical interference to any other electrical/electronic components in the vehicles

TeCU should have the capability of capturing the following inputs

S.No	Signal type	No. of signal to be captured
1	Digital-active High	6
2	Digital-active low	6
3	Analog signal	3
4	PWM signal	1

Table 3.3 TeCU SIGNAL INPUTS

The TeCU circuitry used for tapping active low digital signal should not cause any leakage current to flow in the shared circuitry in the vehicles. All the analog signals are shared only. It should have a quad band GSM modem which can do the functions: Send GPRS data packet to a valid, Receive incoming GPRS data packet URL address, Receive incoming SMS, should have internal antenna for its GSM functionality

The TeCU should be equipped with LED to show status of the GSM signal. Also there should be another LED which shows status of the TeCU. When the vehicle is in ignition ON condition, the TeCU should send data packet on the server periodically which should contain the location information of the vehicle at the moment. This data packet will be termed as tracking data here onwards. Periodicity for tracking the data is mentioned in the table. These parameters are configurable parameter and configured over the air by sending GPRS data packet or SMS from server to TeCU

The TeCU should detect the alert conditions occurring in the vehicle is given below

Alerts	Signal types
Water in fuels	Active high digital
Ac ON	Active high digital
Lift axle position	Active high digital
Twin axle usage	Active high digital
Battery not charging	Active low digital
E call	Active low digital
Air filter clog	Active low digital
PTO switch	Active low digital

Tipper body clog	Active low digital
Low oil pressure	Active low digital
Low fuel level	Analog signal
High engine temperature	Analog signal
Low brake air pressure	Analog signal
High engine RPM	PWM signal
Excessive idling	Based on engine RPM and time
Fuel theft	Based on fuel level value and time

Table 3.4 TeCU ALERT CONDITION

The TeCU should send data packet to the server whenever it detects an alert, informing the same. These data packet will be termed as alert data packets will be termed as alert data packet here onwards. These parameters to be considered for detecting the alerts should be configurable parameter which can be configured over the air by sending GPRS data packet or SMS from the server to TeCU. In case of no GSM/GPRS signal availability the TeCU should store the periodic tracking data in a separate memory as a stack. This memory is termed as Backlog memory. The Backlog memory should be sized in such a way that it can store 18hrs of tracking data

During the condition mentioned, if an alert is also occurring in the vehicle, then the corresponding alert data packet also has to be stored in the backlog memory with the tracking data. All data packets stored in the backlog memory is termed as backlog data. Whenever the TeCU detects the availability of GSM/GPRS signal after the occurrence of the backlog conditions, the TeCU should send the backlog data in FIFO manner. At the same time TeCU should store the live tracking data in the backlog memory

Three particular live alerts will have more priority when the TeCU is engaged in sending Backlog data, TeCU will stop sending it and will send these alert data packets to the server, and then it will resume sending of backlog data. While the TeCU is engaged in the emptying of backlog memory by sending the backlog data, if an alert occurs other than the 3 alerts, it will also be stored in the backlog memory with the live tracking data. The periodicity of sending the backlog data should be less than that of sending live tracking data packet. This time period will be configurable parameter which can be configured over the air by sending GPRS data packet or SMS from the server to TeCU. Even if the vehicle is in ignition OFF state, the TeCU should send backlog data to server if there is any data present in backlog

memory. Once the TeCU empties the backlog memory it will continue to send the live tracking and alert data packets to the server

In any circumstances, if the backlog memory gets fully filled, then the TeCU should delete the oldest data packets in the backlog memory if it has to store new live data packets, once the backlog memory is full, then the backlog has to be cleared in first in first out manner (FIFO) and it should be done only if a new data packet is created to be stored. The TeCU has to send data packet containing the location and time details of its current position for every particular period of time when the vehicle is in ignition OFF state. This data packet will be known as beacon signal data. This time period value should also be a configurable parameter which can be configured over the air by sending GPRS data packet or SMS from server to TeCU
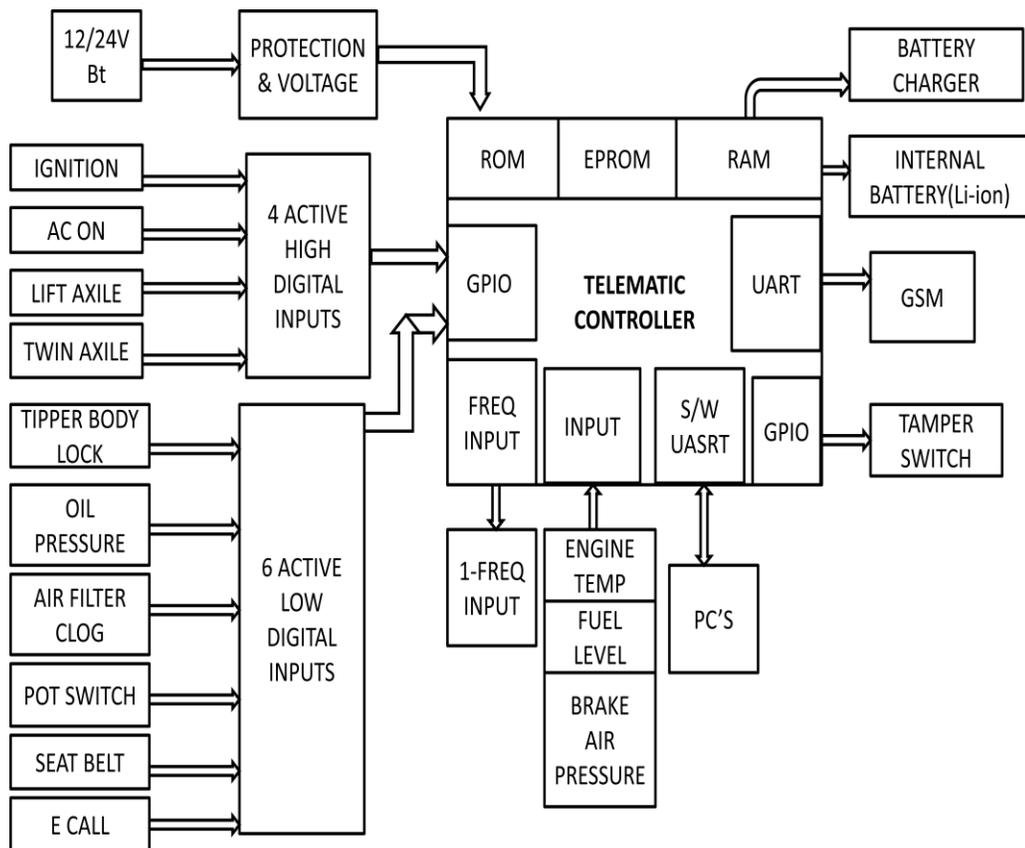
Fig 3.6 BLOCK OF TeCU

3.5 INTERFACING TeCU WITH GSM/GPRS MODULE

GSM/GPRS module is used to establish communication between a computer and a GSM-GPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc) for computer. The MODEM is the soul of such modules.

Fig 3.7 GSM/GPRS MODULE, MODEM

Wireless MODEMs

Wireless MODEMs are the MODEM devices that generate, transmit or decode data from a cellular network, for establishing communication between the cellular network and the computer. These are manufactured for specific cellular network (GSM/UMTS/CDMA) or specific cellular data standard (GSM/UMTS/GPRS/EDGE/HSDPA) or technology (GPS/SIM). Wireless MODEMs like other MODEM devices use serial communication to interface with and need Hayes compatible AT commands for communication with the computer.GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network.

A GSM/GPRS MODEM can perform the following operations:

1.   Receive, send or delete SMS messages in a SIM.

2.   Read, add, search entries of the SIM.

Some AT commands that supports GPRS support

Command	Description
AT+CGATT	Attach and from GPRS service
AT+CGDCONT	Define PDP content
AT+CGQMIN	Quality of service profile (minimum acceptable)
AT+CGQREQ	Quality of service profile (requested)
AT+CGACT	PDP context activated or deactivated
AT+CGDATA	Enter data state
AT+CGPADDR	Show PDP address
AT+CGCLASS	GPRS mobile station class
AT+CGEREP	Control unsolicited GPRS event reporting
AT+CGREG	Network registration status
AT+CGSMS	Select service for SMS messages

Table 3.5 AT COMMANDS

3.6 WEB APPLICATION

In this project, database and application server could be used to receive data from the TeCU and to provide web hosting. Data from the vehicle is through SMS or GPRS; it's collected in database server which is having static IP. In web application server domain name is kept and accessed with webpage login.
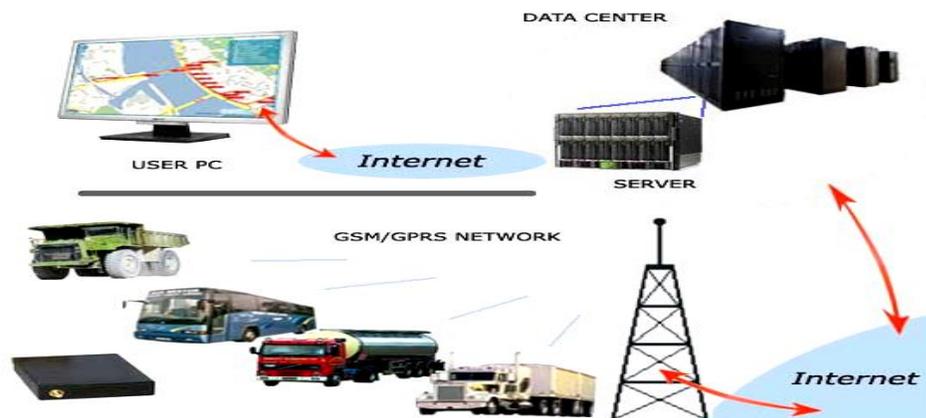
Fig 3.8 GENERAL SERVER MECHANISM ALONG WITH TeCU

In a network environment the following types of servers are used.

- Application server, a server dedicated to running certain software applications
- Database server, provides database services to other computer programs or computers Name server or DNS
- Web server, a server that HTTP clients connect to in order to send commands and receive responses along with data contents

The web application represents the complete output of the system. In this system two applications are developed that are linked to each other. First one is used to get the initial position of the vehicle with its fuel level along with some added features and as system will receive the different co-ordinates (longitude and latitude) switching to the next one will be done to get the signal strength. Then fuel level could be observer graphically from the webpage. The application will run on WAMP server and will run only if the internet is in use. WAMP server homepage is shown in diagram.
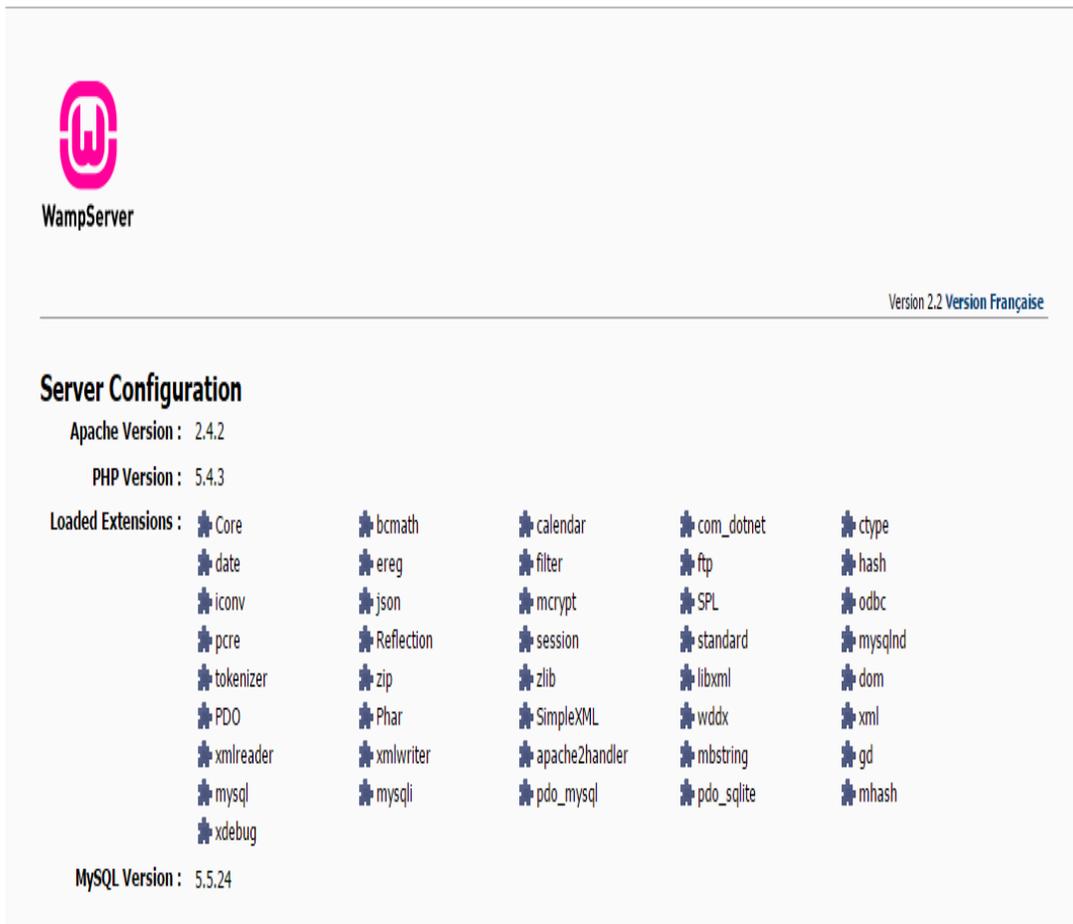
Fig 3.9 WAMP SERVER HOMEPAGE

3.7 DIRECT FUEL LEVEL MONITORING ENTITY

The main scope of this entity is to monitor the fuel level of any vehicles during the refills at bunks. Thus if any vehicles has to be refilled, already the level of fuel left in the tank could be at any levels. Thus it could be varied from empty (reserved) till full tank case. By using this compact entity user can check the fuel filled at the time of each refills.
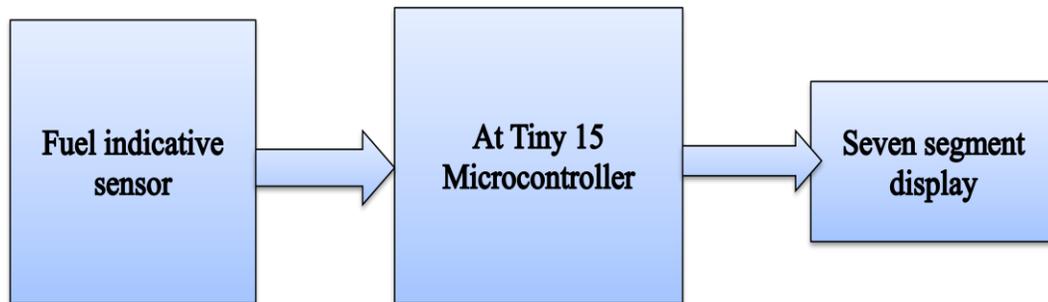

Fig 3.10 BLOCK OF DIRECT FUEL LEVEL MONITORING ENTITY

Initially the fuel in tank could be at any level, the fuel level indicative sensor is kept inside the fuel tank of any vehicles like 2 wheeler, 3 wheeler, 4wheeler, commercial vehicles, and heavy vehicles. The observed reading from fuel indicative sensor is given to At Tiny 15 controller. The controller is interfaced with 7447 BCD to seven segment decoder drives and to 74LS174 positive edge triggered flip flops with clear. Then it's connected to seven segment display to read the value of count. Determining the count value and then with that of interpolation table relevant fuel level present in vehicles fuel tank could be measured. The calibration table to monitor the fuel level directly,

Fuel capacity	Ohms Ω	Voltage	Count (Observed)	Liters
Empty low	10	0.387	82	3
Empty high-Reserve	30	1.091	205	6
¼ position tank	60	2	409	10
½ position tank	100	3	614	20
¾ position tank	140	3.818	777	30
Full tank	190	4.653	941	38

TABLE 3.6 DIRECT FUEL LEVEL MONITORING

3.8 FEATURES OF AT TINY 15 MICRO CONTROLLERS

• High-performance, Low-power 8-bit Microcontroller

• Advanced RISC Architecture

    – 90 Powerful Instructions – Most Single Clock Cycle Execution

    – 32 x 8 General Purpose Working Registers

    – Fully Static Operation

• Non-volatile Program and Data Memories

    – 1K Byte In-System Programmable Flash Program Memory

Endurance: 1,000 Write/Erase Cycles

    – 64 Bytes EEPROM

Endurance: 100,000 Write/Erase Cycles

    – Programming Lock for Flash Program Data Security

• Peripheral Features

    – Interrupt and Wake-up on Pin Change

    – Two 8-bit Timer/Counters with Separate Prescalers

    – One 150 kHz, 8-bit High-speed PWM Output

    – 4-channel 10-bit ADC

One Differential Voltage Input with Optional Gain of 20x

    – On-chip Analog Comparator

    – Programmable Watchdog Timer with On-chip Oscillator

• Special Microcontroller Features

    – In-System Programmable via SPI Port

    – Enhanced Power-on Reset Circuit

    – Programmable Brown-out Detection Circuit

    – Internal, Calibrated 1.6 MHz Tuneable Oscillator

    – Internal 25.6 MHz Clock Generator for Timer/Counter

    – External and Internal Interrupt Sources

    – Low-power Idle and Power-down Modes

• Power Consumption at 1.6 MHz, 3V, 25°C

    – Active: 3.0 mA

    – Idle Mode: 1.0 mA

    – Power-down: < 1 μA

• I/O and Packages

    − 8-lead PDIP and 8-lead SOIC: 6 Programmable I/O Lines

• Operating Voltages

– 2.7V - 5.5V

• Internal 1.6 MHz System Clock

3.9 SEVEN SEGMENT DISPLAY

A seven-segment display (SSD), or seven-segment indicator, is a form of electronic display device for displaying decimal numerals that is an alternative to the more complex dot matrix displays. To operate any particular segment of any digit, the controlling integrated circuit would turn on the cathode driver for the selected digit, and the anode drivers for the desired segments; then after a short blanking interval the next digit would be selected and new segments lit, in a sequential fashion. In this manner an eight digit display with seven segments and a decimal point would require only 8 cathode drivers and 8 anode drivers, instead of sixty-four drivers and IC pins. The four digits LED display seven segment is connected with 7447 and 74LS174. Then its relevant count values are displayed as outputs.
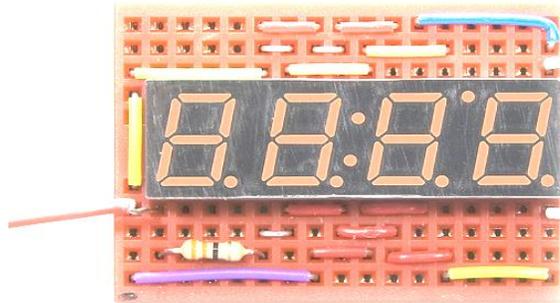
Fig 3.11 FOUR DIGIT SEVEN SEGMENT DISPLAY

CHAPTER 4
HARDWARE AND SOFTWARE DESCRIPTION

4.1 HARDWARE DESIGN

In this we are using a 40 pin ATmega16 microcontroller. It has four input–output ports. ATmega16 microcontroller is the heart of the project that is used for interfacing. Two pins are VCC pins and other two pins are at ground. Pin 9 is reset pin. A crystal oscillator of 12 MHz is connected to the microcontroller. RS-232 protocol is used as serial communication between the microcontroller and GSM modem. A serial driver MAX232, 16 pin IC is used for converting RS-232 voltage levels into TTL voltage levels. There are four electrolytic capacitors which are used with MAX232. A 5V battery is used to power the circuit. The microcontroller and MAX232 are powered by 5V. LED indicates the presence of signal.

To determine the fuel level directly we are using AT Tiny15 microcontroller. This interfaced with 7447and 74LC174, then connected to 4 digit seven segment display to monitor its output count value.

4.2 SOFTWARE PROGRAM

The software programming is done in 'C' language. Then coding is compiled using Keil μvision4 IDE, after generating the hex file. The simulation is done by PROTEUS software. Data (co-ordinates) received from sensor is defined in the software. The device number of the TeCU should be included in the software programming in order to receive the location values from the SIM card which we are using in GSM modem.

4.3 PROTEUS DESIGN SUITE 8 SOFTWARE

The Proteus Design Suite is wholly unique in offering the ability to co-simulate both high and low-level micro-controller code in the context of a mixed-mode SPICE circuit simulation. With this Virtual System Modelling facility, you can transform your product design cycle, reaping huge rewards in terms of reduced time to market and lower costs of development.

Proteus Virtual System Modelling (VSM) combines mixed mode SPICE circuit simulation, animated components and microprocessor models to facilitate co-simulation of complete microcontroller based designs. For the first time ever, it is possible to develop and test such designs before a physical prototype is constructed.

ISIS Schematic Capture

ISIS lies at the heart of the Proteus system, and is far more than just another schematics package. It combines a powerful design environment with the ability to define most aspects of the drawing appearance. Whether your requirement is the rapid entry of complex designs for simulation and PCB layout, or the creation of attractive schematics for publication, ISIS is the tool for the job.

ARES PCB Layout Software

ARES is the PCB editing software that is included in the Proteus Design Suite. It is fully compatible with ISIS Schematic Capture.

Hierarchical Design

As well as supporting normal multi-sheet designs (equivalent to a circuit spread over several pieces of paper), Proteus capture fully supports hierarchy within a design. In other words, a particular component can be defined as a module which is then represented by a further circuit diagram. The hierarchy can be nested to an arbitrary number of levels and modules can be drawn either as standard components or a special sub-circuit blocks on which the interface ports can be placed and removed on the fly. The professional system including net list based PCB design with auto-placement, auto-routing and graph based simulation.

CHAPTER 5

SIMULATION RESULT

5.1 INTRODUCTION

In this chapter, we present the simulation results that we have obtained for our proposed method. The simulation was carried out using the Proteus design suite 8 professional software.

5.2 RESULT ANALYSIS

Proteus design suite 8 professional software is used to verify the simulation result. The fuel level indicative sensor is interfaced to the pretended TeCU controller and its output results are verified. Thus (0-5) V is given to the ADC 0808- analog to digital controller and then it is connected to the ATMEGA16 controller (instead of original TeCU controller) along with some basic connections. Thus its resultant outputs are being verified.
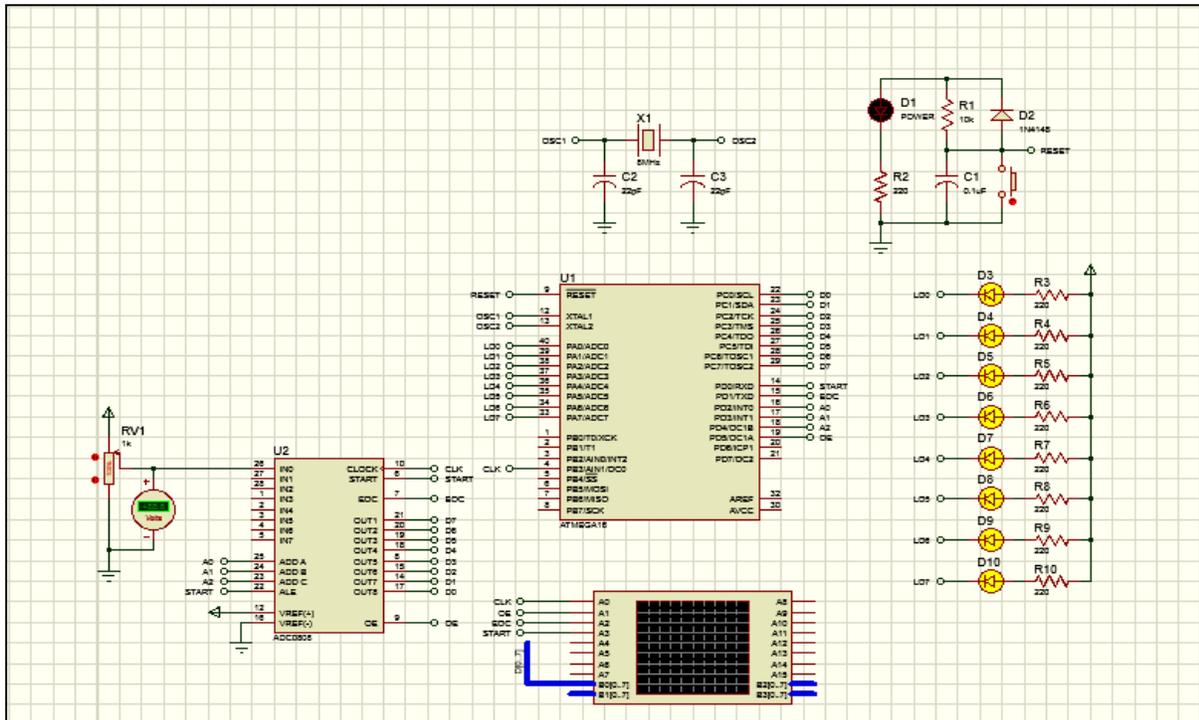
Fig 5.1 FUEL LEVEL- TANK IS FULL

When the fuel tank capacity is full all the reed switches will be closed and then the resultant signal is represented.
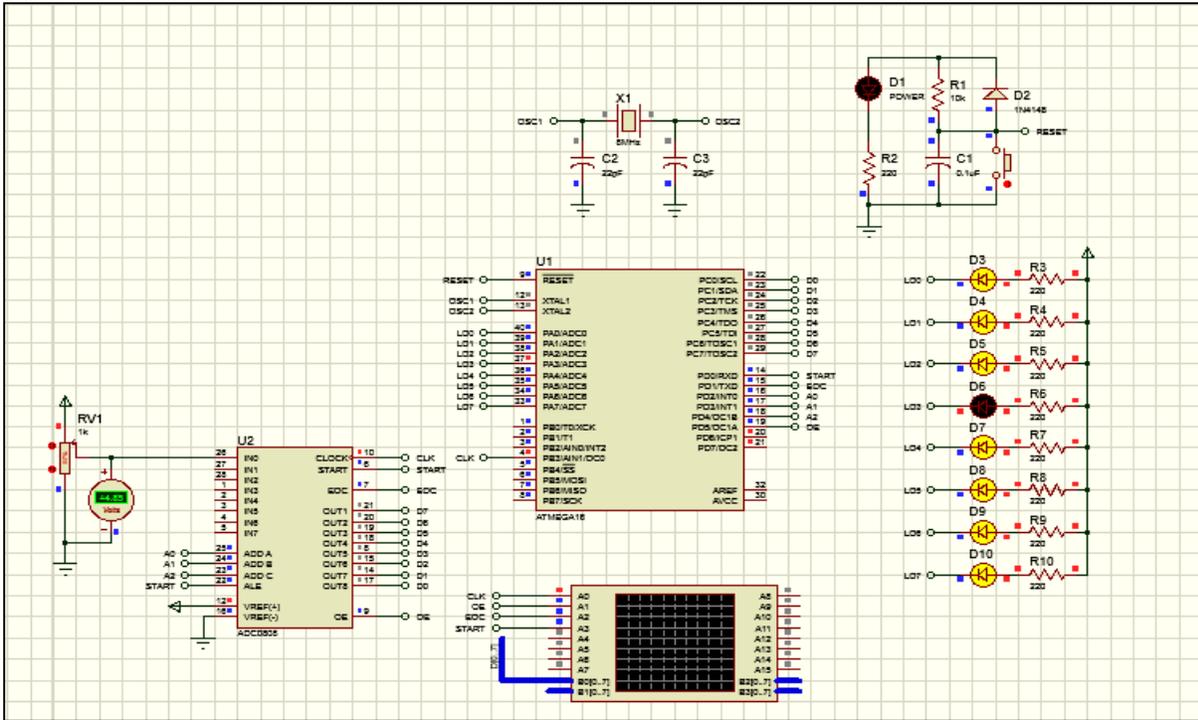
Fig 5.2 FUEL LEVEL- TANK ¾

When fuel level gets reduced the reed switches get opened relevantly the output signals are obtained.
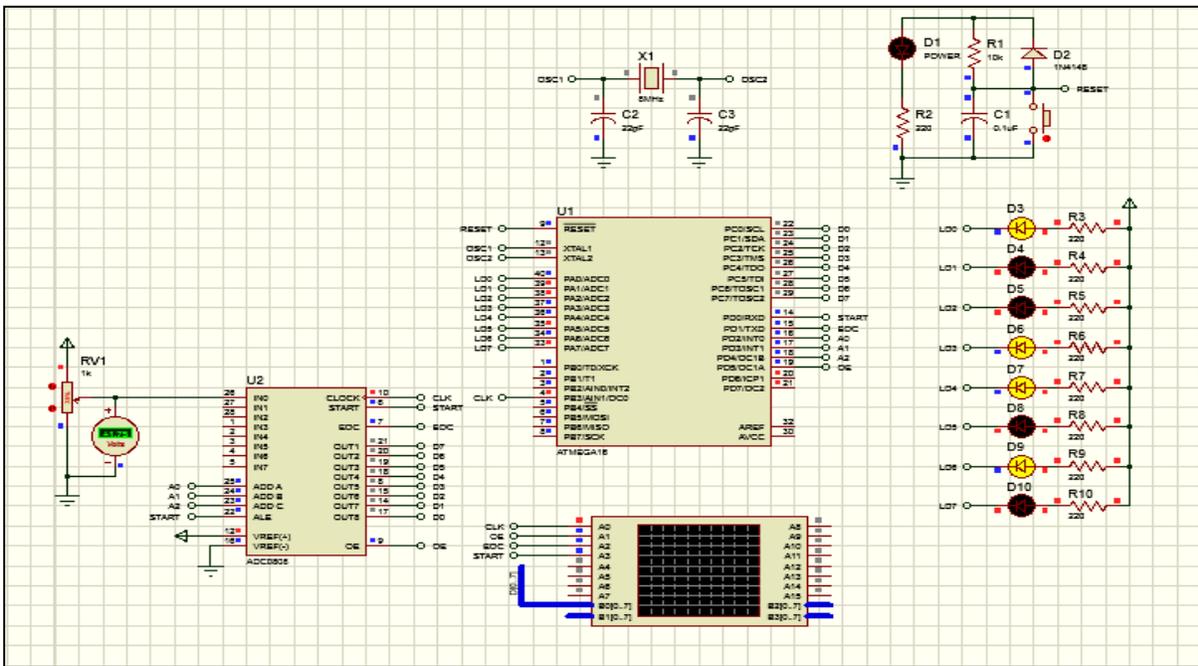
Fig 5.3 FUEL LEVEL- TANK ½

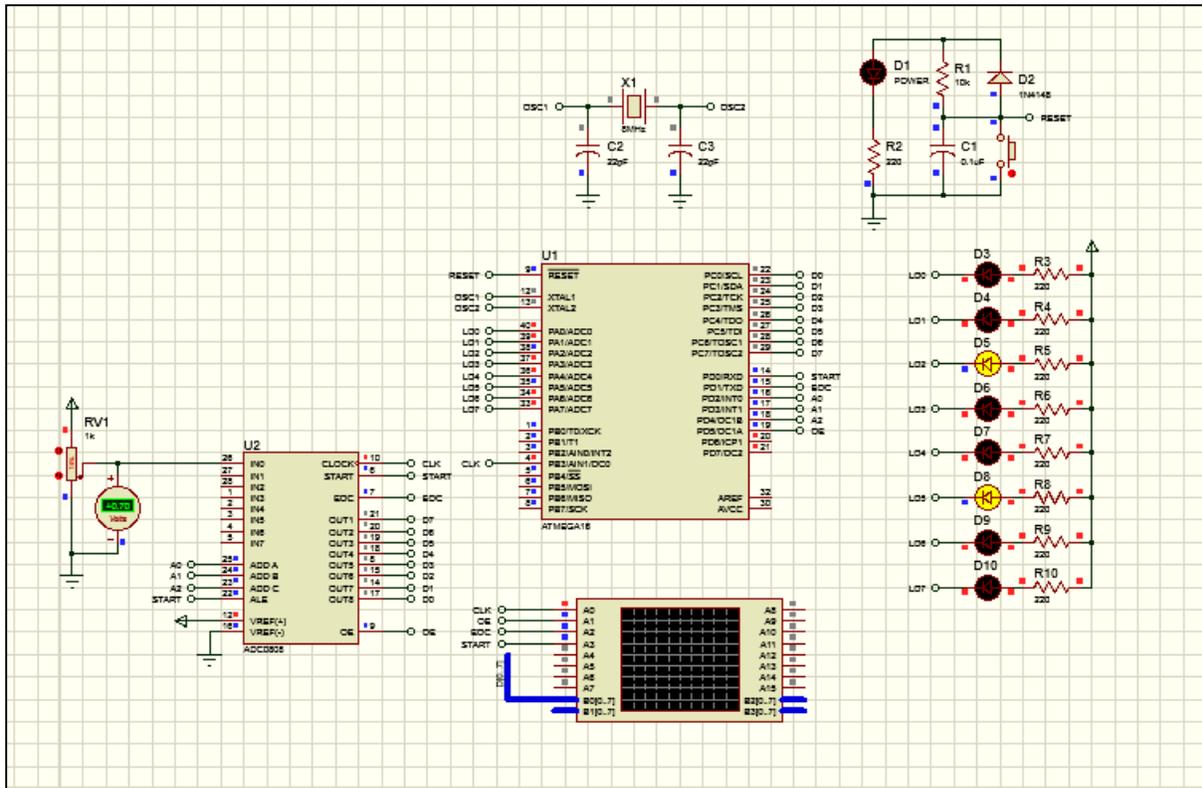When the fuel capacity is half in the tank according the led glows and indicates the signal outputs.

Fig 5.4 FUEL LEVEL- TANK MINIMUM (RESERVED)

Minimum or empty level of the tank could be ensured from few led glow. Thus figures listed mainly describes that the variation in fuel capacity is interfaced with the controller.

5.3 WEBPAGE OUTPUT DESCRIPTION

The data from TeCU are forwarded to server through GPRS. Then from server entire information about the vehicle is given to webpage. The webpage is designed in such a way that it could display the information of vehicle along with fuel consumption which is expressed graphically.

In this project five devices information are stored in the database server, then application server is designed to observe the vehicle information. Thus graphical user interface utilized is PHP 5.4.3.

The graph is plotted between fuel level (liters) verses Mileage (Km), Stating that whenever the fuel consumption tend to be high without a large variation in mileage it's considered as fuel theft. If the fuel drops levels are continuously high even after the refills it's identified as fuel tank damage.

In graph,

- The rise in fuel value describes the refills

- The drop in fuel value is identified as fuel theft

- The large amount of drop in fuel drop is considered as fuel tank failure

The following figure describes the information obtained from device no: 126001. Thus it's clearly visible that it displays information of Ignition, Ac, Lift axile, Twin axile, Tipper body lock, Oil pressure, Air filter clog, POT switch, Seat belt, Ecall.

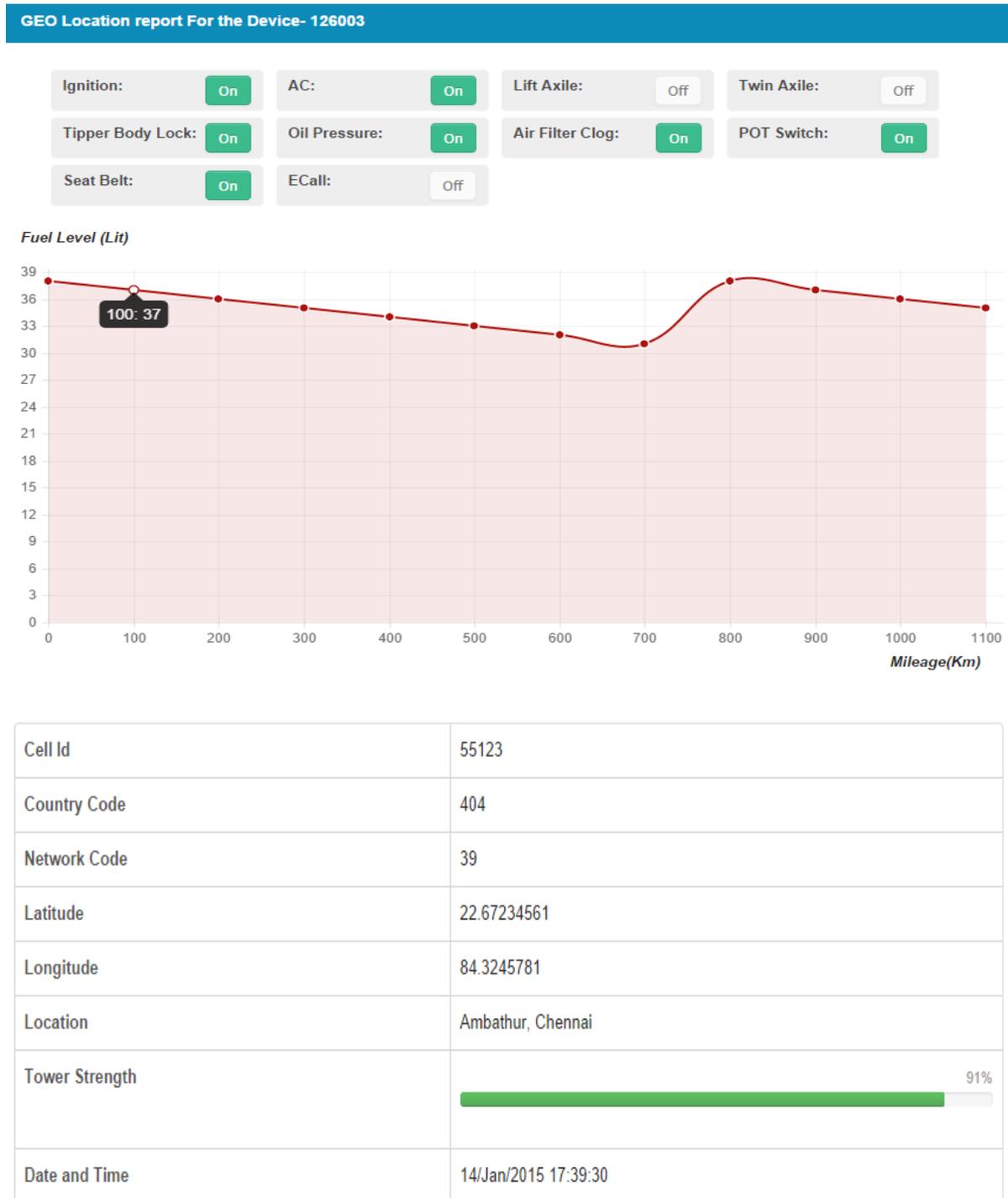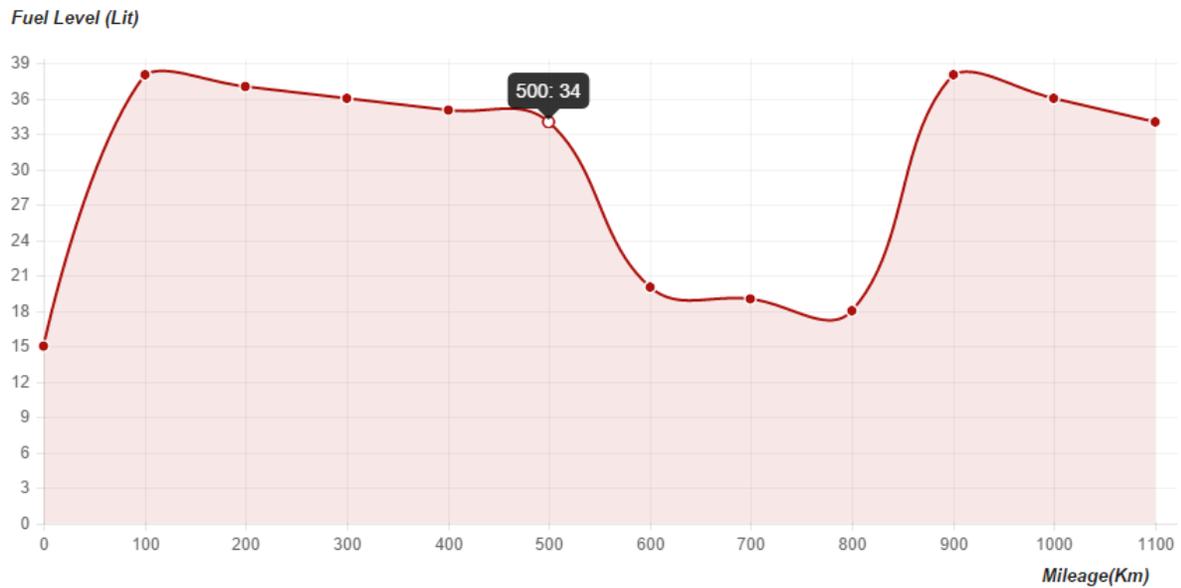| Cell Id	21368
Country Code	404
Network Code	29
Latitude	33.67129864
Longitude	91.6718923
Location	Ganapathy, Coimbatore
Tower Strength	92%
Date and Time	14/Jan/2015 17:23:15

Fig 5.5 OUTPUT FOR DEVICE 126001

The following figure describes the information obtained from device no: 126002, along with its displays information like Ignition, Ac, Lift axle, Twin axle, Tipper body lock, Oil pressure, Air filter clog, POT switch, Seat belt, Ecall.

GEO Location report For the Device- 126002		

Ignition:	On	AC:	On	Lift Axile:	Off	Twin Axile:	Off
Tipper Body Lock:	On	Oil Pressure:	On	Air Filter Clog:	On	POT Switch:	On
Seat Belt:	On	ECall:	Off				

Cell Id	31178
Country Code	404
Network Code	58
Latitude	19.67329647
Longitude	77.4538911
Location	Saranvanampatti, Coimbatore
Tower Strength	71%
Date and Time	14/Jan/2015 17:35:52

Fig 5.6 OUTPUT FOR DEVICE 126002

The following figure describes the information obtained from device no: 126003, along with its displays information Ignition, Ac, Lift axile, Twin axile, Tipper body lock, Oil pressure, Air filter clog, POT switch, Seat belt, Ecall.

Fig 5.7 OUTPUT FOR DEVICE 126003

The following figure describes the information obtained from device no:126004, along with its displays information Ignition, Ac, Lift axile, Twin axile, Tipper body lock, Oil pressure, Air filter clog, POT switch, Seat belt, Ecall.

GEO Location report For the Device- 126004		
Ignition: **On**	AC: **On**	Lift Axile: Off	Twin Axile: Off
Tipper Body Lock: **On**	Oil Pressure: **On**	Air Filter Clog: **On**	POT Switch: **On**
Seat Belt: **On**	ECall: Off		

Cell Id	39065
Country Code	404
Network Code	55
Latitude	31.74562915
Longitude	96.8466734
Location	Kothigiri, Ooty
Tower Strength	19%
Date and Time	14/Jan/2015 17:41:59

Fig 5.8 OUTPUT FOR DEVICE 126004

The following figure describes the information obtained from device no:126005, along with its displays information Ignition, Ac, Lift axile, Twin axile, Tipper body lock, Oil pressure, Air filter clog, POT switch, Seat belt, Ecall.

Fig 5.9 OUTPUT FOR DEVICE 126005

5.4 DIRECT FUEL LEVEL MONITORING SIMULATION RESULT

Simulation is the imitation of the operation of a real-world process or system over time. A computer simulation is an attempt to model a real-life or hypothetical situation on a computer so that it can be studied to see how the system works. By changing variables in the simulation, predictions may be made about the behavior of the system.

In this we have designed a system which is used to fetch the fuel capacity of the vehicle and displays its current level especially to check its exact presences before and after the refills in the bunks. Thus output are traced as count values, from this count value by using interpolation table we can determine the fuel capacity in digit values using seven segment displays or LCD monitors.

The following figures from 5.10- 5.15 describes, whenever there is changes in fuel level indicative sensor value of the count is also changed considerably.
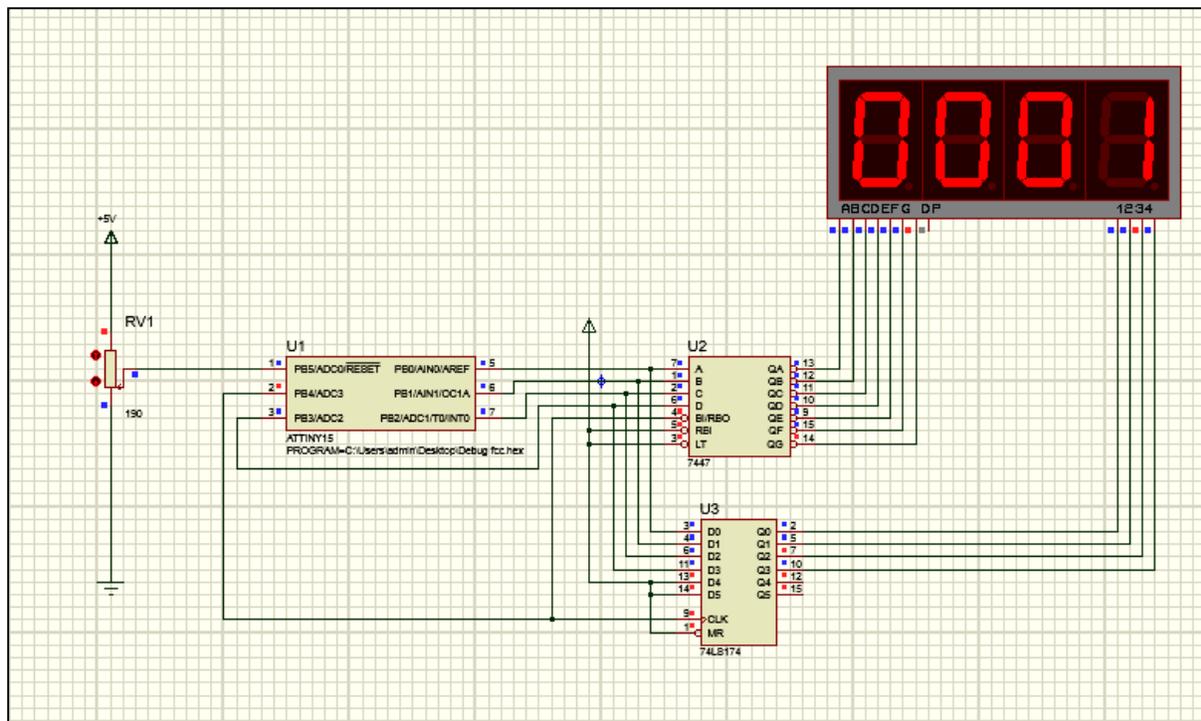

Fig 5.10 FUEL LEVEL (EMPTY)

When the observer count value is 0001 the fuel level in the tank is completely empty. It's justified from the table 3.7 that the fuel capacity in tank is below 3 liters.
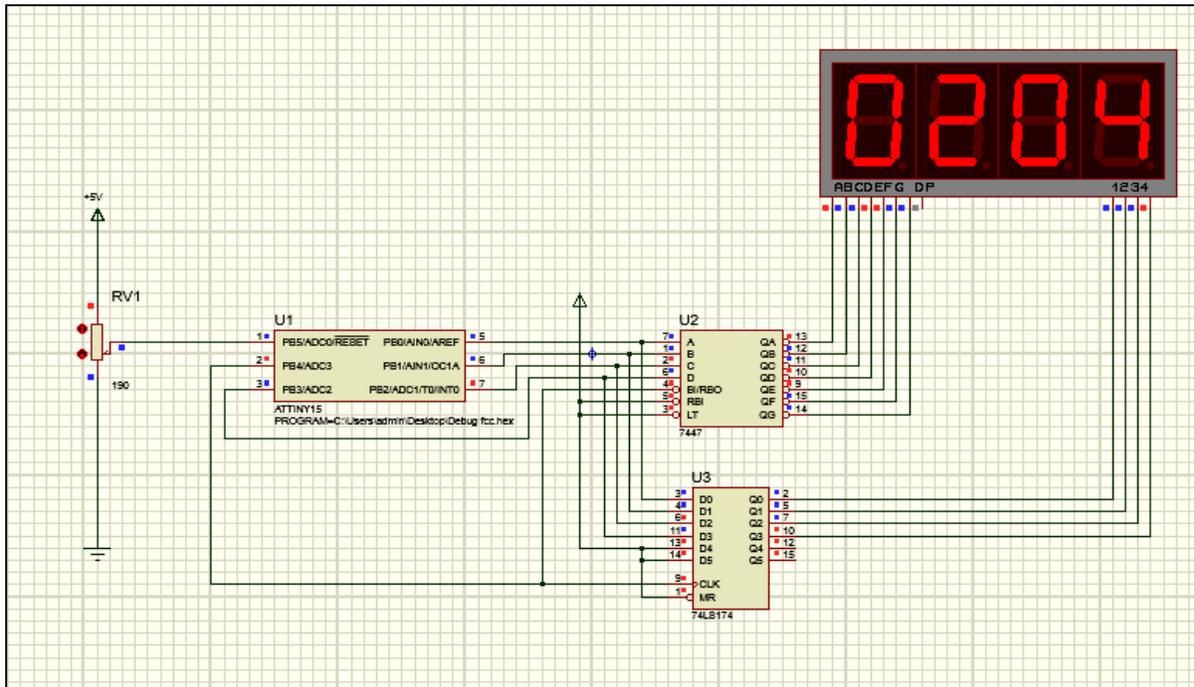
Fig 5.11 FUEL LEVEL (AT RESERVED)

When the observer count value is 0204 the fuel level in the tank is at reserved level. It's justified from the table 3.7 that the fuel capacity in tank is around 6 liters.
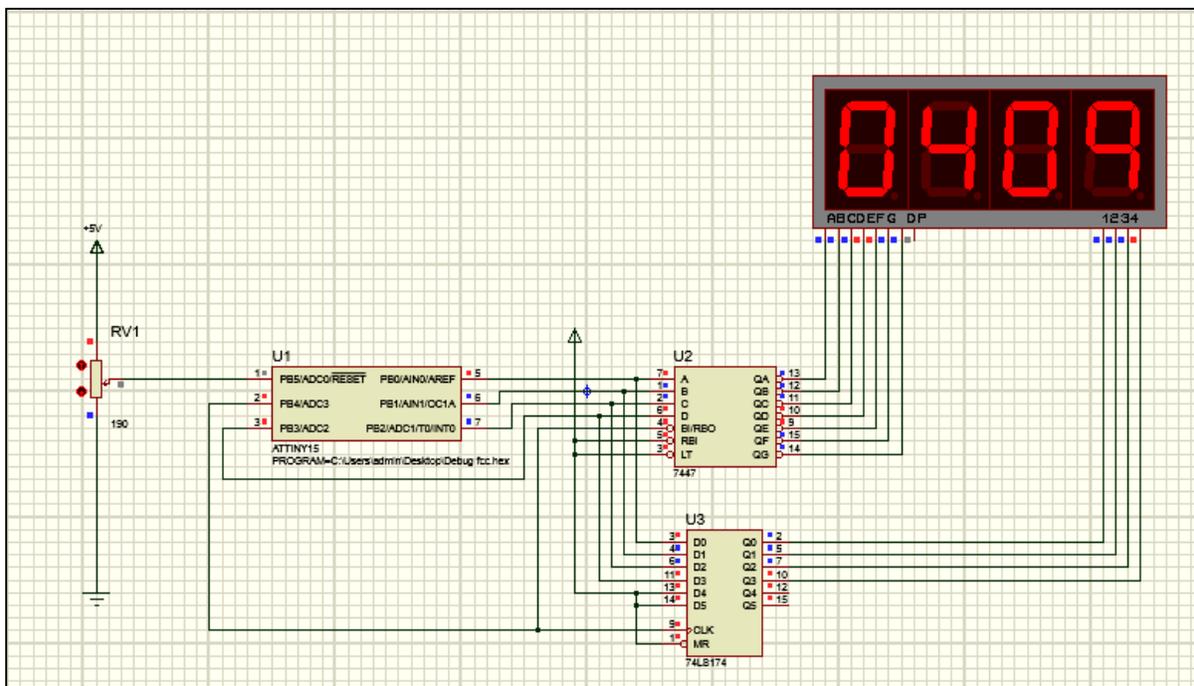

Fig 5.12 FUEL LEVEL- TANK ¼

When the observer count value is 0409 the fuel level in the tank is at ¼th level. It's justified from the table 3.7 that the fuel capacity in tank is around 10 liters.
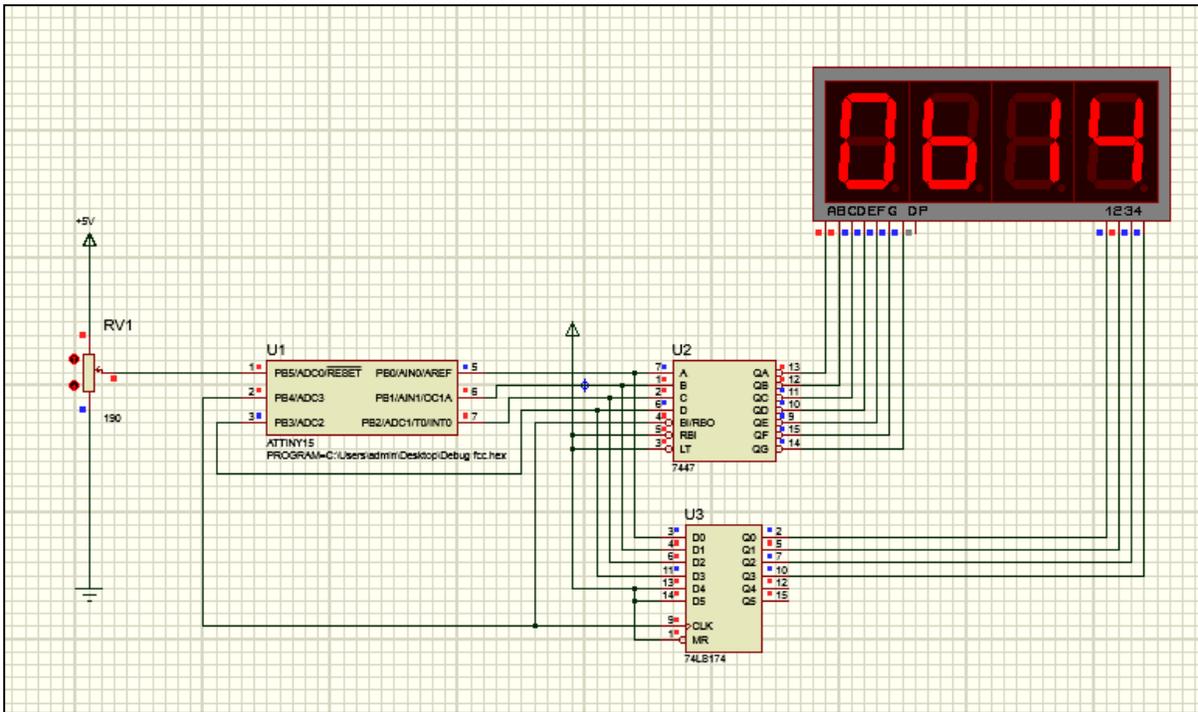
Fig 5.13 FUEL LEVEL- TANK ½

When the observer count value is 0619 the fuel level in the tank is at ½ th level. It's justified from the table 3.7 that the fuel capacity in tank is around 20 liters.

Fig 5.14 FUEL LEVEL- TANK ¾

When the observer count value is 0716 the fuel level in the tank is at ¾ th level. It's justified from the table 3.7 that the fuel capacity in tank is around 30 liters.
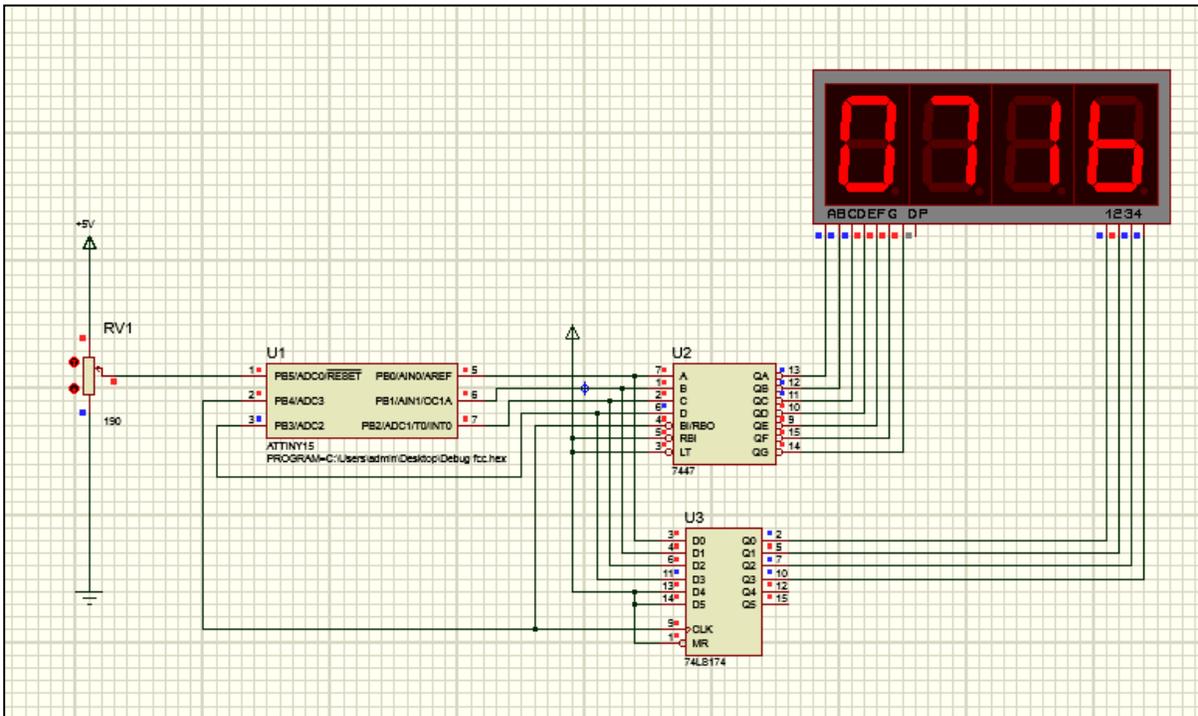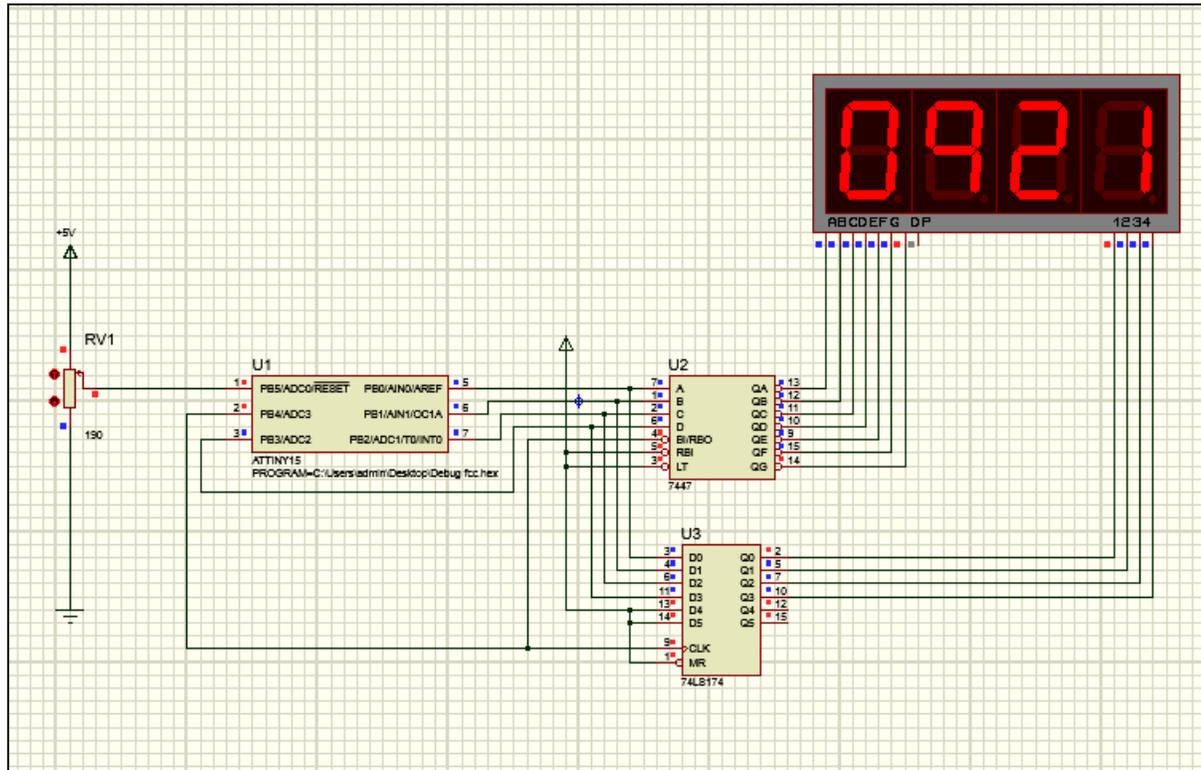

Fig 5.15 FUEL LEVEL- TANK FULL

When the observer count value is 0921 the fuel level in the tank is at full level. It's justified from the table 3.7 that the fuel capacity in tank is around 38 liters.

CHAPTER 6

CONCLUSION AND FUTURE ENHANCEMENT

In this project, fuel sensors input has been fed into controller and its output response is analyzed. This process is done by using Proteus design suite 8 professional software. Thus results is observed that, whenever the resistance value is altered in the reed switch of the fuel level indicative sensor which is kept inside the fuel tank of the vehicle, its relevant voltage is indicated through calibration, accordingly output varies in the TeCU. The data from TeCU is forwarded to server using GSM/GPRS. Then webpage is developed to monitor the fuel level of various devices and analyze if any fuel theft and failure in tanks instantly.

In direct fuel level monitoring entity case users themselves can ensure fuel capacity of their vehicles which helps to observe the fuel level especially before and after refills at bunks.

6.1 FUTURE ENHANCEMENT

The current output information about fuel theft and tank failure is obtained from webpage. In future direct fuel monitoring entity could also be included into TeCU, so that both the application could be achieved using a single entity and its relevant outputs can be verified on webpage.

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