FIRE AND GAS PREVENTION SYSTEM

A Report submitted in partial fulfillment of the requirements for the award of degree of

Bachelor of Technology

In

Electronics and Communication Engineering

Under the Supervision of:

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Finally, we would like to express my deep appreciation to our family and friends who have been a constant source of inspiration. we are internally grateful to them for always encouraging me wherever and whenever we needed them.

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CERTIFICATE

This is to certify that project work done on “FIRE AND GAS PREVENTION SYSTEM” submitted to Maharaja Surajmal Institute of Technology, Janakpuri Delhi by “Harsh Singh. Rohan Agarwal, Shubham Singhal, Mayank Gupta” in partial fulfilment of the requirement of the award of degree of Bachelors of Technology, is a bona fide work carried out by him/her under my supervision and guidance. This project work comprises of original work and has not been submitted anywhere else for any other degree to best of my knowledge.

Ms. Deepti Deshwal
(Project Supervisor)

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(HOD,ECE)

DECLARATION

We, student of B.Tech(Electronics and Communication Engineering) hereby declare that the project work done on "GAS LEAKAGE AND FIRE PREVENTION" submitted to Maharaja Surajmal Institute of Technology, Janakpuri Delhi in partial fulfillment of the requirement for the award of degree of Bachelors of Technology comprises of our original work and has not been submitted anywhere else for any other degree to the best of our knowledge.

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Abstract

Everyone knows, the demand of flammable gas is increasing day by day, but with this increasing demand the chances of blasting gas are also increasing day by day. Due to this blasting the heavy accidental conditions are occurred. These accidental conditions are cased to large damaged of life and property. This is happened in every country on annual basis. So, we must have to search the systems to overcome these accidental conditions. The flammable gas and fire accident prevention system is a system that could be used to warn the person about flammable gas leakage or fire combustion in any industrial or domestic area This system senses the flammable gas leakage or fire combustion without wasting any time and sends the fire or flammable gas leakage intimation message to the consumer mobile phone.

Chapter 1: Introduction to Embedded Systems

1.1 Introduction

An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today. There are more computers on this planet than there are people, and most of these computers are single-chip microcontrollers that are the brains of an embedded system. We interact with hundreds of tiny computers every day that are embedded into our houses, our cars, our bridges, our toys, and our work. As our world has become more complex, so have the capabilities of the microcontrollers embedded into our devices. Therefore, the world needs a trained workforce to develop and manage products based on embedded microcontrollers.

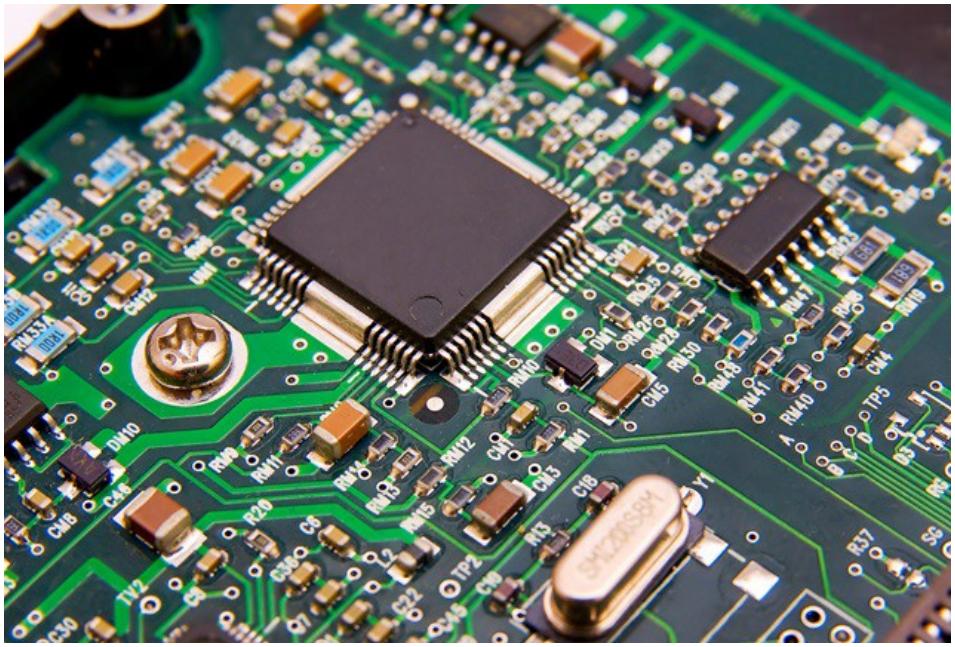

Fig 1.1 Example of microcontroller

Embedded Systems is simply the brain of the most of the electronics-based systems to access, process, and store and control the data. A combination of hardware and software which together form a component of a larger machine. Embedded systems are designed to do some specific task, rather than be a general-purpose computer for multiple tasks. Since

the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance.

1.2 Definition of Microcontroller

Microcontroller, as the name suggests, are small controllers. They are like single chip computers that are often embedded into other systems to function as processing/controlling unit. For example, the remote control you are using probably has microcontrollers inside that do decoding and other controlling functions. They are also used in automobiles, washing machines, microwave ovens, toys ... etc, where automation is needed.

The key features of microcontrollers include:

- High Integration of Functionality
- Microcontrollers sometimes are called single-chip computers because they have on-chip memory and I/O circuitry and other circuitries that enable them to function as small standalone computers without another supporting circuitry
- Field Programmability, Flexibility
- Microcontrollers often use EEPROM or EPROM as their storage device to allow field program ability so they are flexible to use. Once the program is tested to be correct then large quantities of microcontrollers can be programmed to be used in embedded systems.

Assembly language is often used in microcontrollers and since they usually follow RISC architecture, the instruction set is small. The development package of microcontrollers often includes an assembler, a simulator, a programmer to "burn" the chip and a demonstration board. Some packages include a high-level language compiler such as a Compiler and more sophisticated libraries.

Embedded systems contain two main elements:

- **Embedded system hardware**: As with any electronic system, an embedded system requires a hardware platform on which to run. The hardware will be based around a microprocessor or microcontroller. The embedded system hardware will also contain other elements including memory, input output (I/O) interfaces as well as the user interface, and the display.

- **Embedded system software**: The embedded system software is written to perform a particular function. It is typically written in a high-level format and then compiled down to provide code that can be lodged within a non-volatile memory within the hardware.

Examples of Embedded System:

- ATMs.
- Integrated system in aircraft and missile.
- Cellular telephones and telephonic switches.
- Computer network equipment, including routers timeservers and firewalls.

1.3 Block Diagram of an Embedded System

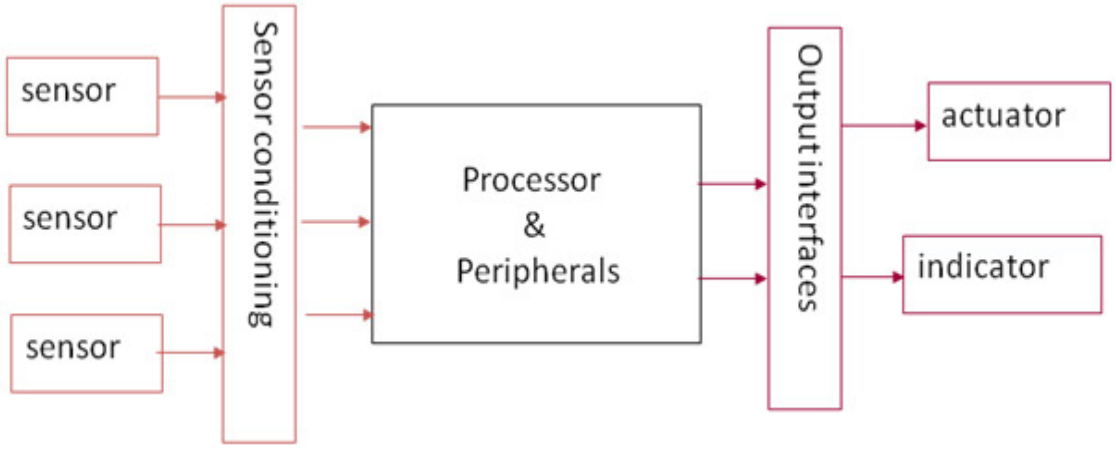

Fig. 1.2 Block Diagram of an Embedded System

Characteristics of Embedded Systems:

- Embedded systems are application specific & single functioned; the programs are executed repeatedly.
- Efficiency is of paramount importance for embedded systems. They are optimized for energy, code size, execution time, weight & dimensions, and cost.
- Embedded systems are typically designed to meet real time constraints; a real time system reacts to stimuli from the controlled object/ operator within the time interval dictated by the environment. For real time systems, right answers arriving too late (or even too early) are wrong.

- Embedded systems often interact (sense, manipulate & communicate) with external world through sensors and actuators and hence are typically reactive systems; a reactive system is in continual interaction with the environment and executes at a pace determined by that environment.
- They generally have minimal or no user interface.

1.4 Most Commonly Used Microcontrollers

There are many microcontrollers which are used in the present years but there are some microcontrollers which are very popular due to its characteristics and features which make them better than the others. Some of them are:

- **PIC:** The PIC Microcontroller is developed by Microchip. It is the most commonly used 8-bit microcontroller which has all the features which the modern microcontrollers normally have. For its low price, wide range of application, high quality and easy availability, it is an ideal solution in applications such as, the control of different processes in industry, machine control devices, measurement of different values etc.

- **AVR (Alf and Vegard's RISC)**: It is also the most commonly used microcontroller in the present situation. It is developed by Intel in the year 1996. It provides a tough competition to the PIC microcontroller due to its cheap price, easy availability, high quality and support of its AVR community.

- **8051 Microcontroller**: The Intel MCS-51 (commonly termed 8051) is an internally Von Neumann architecture with segregated memory, complex instruction set computer (CISC) instruction set, single chip microcontroller (μC) series developed by Intel in 1980 for use in embedded systems. Intel's original versions were popular in the 1980s and early 1990s and enhanced binary compatible derivatives remain popular today.

- **Arduino**: Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and

interactive objects that can sense and control objects in the physical and digital world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL),[1] permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself (DIY) kits.

1.5 Block diagram of a General Microcontroller

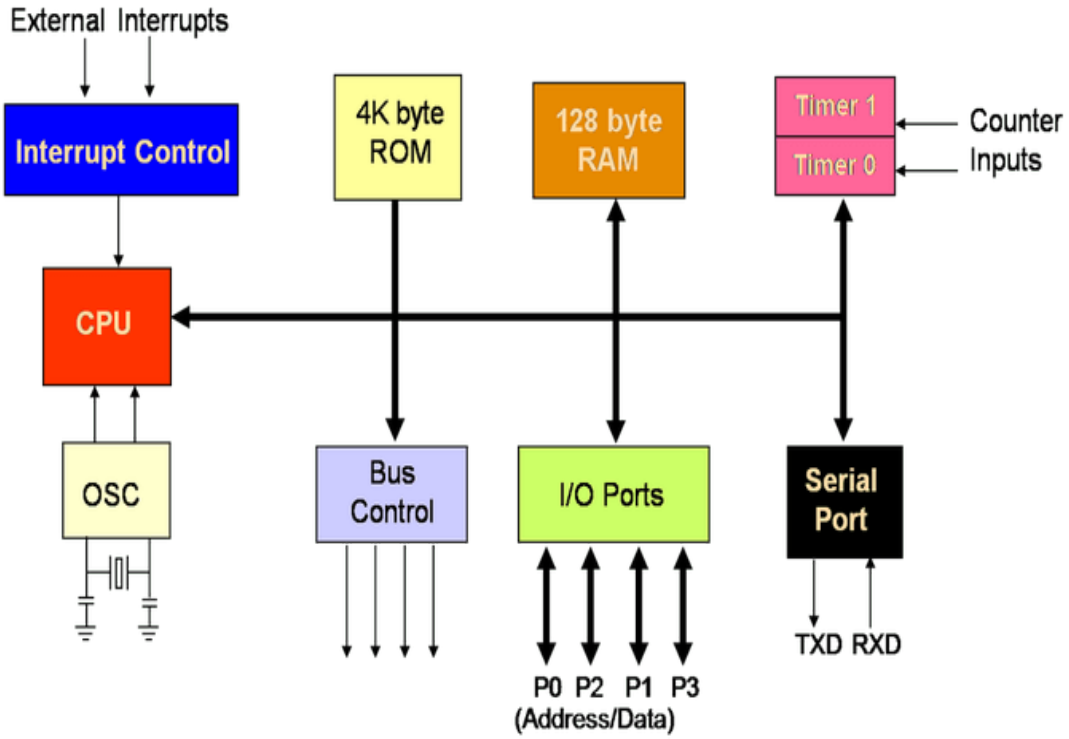

Fig 1.3 Block diagram of a general Microcontroller

Chapter 2: Microchip PIC Microcontroller

2.1 PIC Microcontroller

PIC microcontroller was developed in the year 1993 by microchip technology. The term PIC stands for Peripheral Interface Controller. Initially this was developed for supporting PDP computers to control its peripheral devices, and therefore, named as a peripheral interface device. These microcontrollers are very fast and easy to execute a program compared with other microcontrollers. PIC Microcontroller architecture is based on Harvard architecture. PIC microcontrollers are very popular due to their ease of programming, wide availability, easy to interfacing with other peripherals, low cost, large user base and serial programming capability (reprogramming with flash memory), etc.

We know that the microcontroller is an integrated chip which consists of CPU, RAM, ROM, timers, and counters, etc. In the same way, PIC microcontroller architecture consists of RAM, ROM, CPU, timers, counters and supports the protocols such as SPI, CAN, and UART for interfacing with other peripherals. At present PIC microcontrollers are extensively used for industrial purpose due to low power consumption, high performance ability and easy of availability of its supporting hardware and software tools like compilers, debuggers and simulators.

Fig 2.1 PIC Microcontroller

2.2 What is PIC Microcontroller

PIC microcontrollers are the world's smallest microcontrollers that can be programmed to carry out a huge range of tasks. These microcontrollers are found in many electronic devices such as alarm systems, embedded systems, etc. Various types of microcontrollers exist, even though the best is found in the GENIE range of

programmable microcontrollers. These microcontrollers are programmed and simulated by circuit-wizard software.

Every PIC microcontroller architecture consists of some registers and stack where registers function as Random Access Memory (RAM) and stack saves the return addresses. The main features of PIC microcontrollers are RAM, flash memory, Timers/Counters, EEPROM, I/O Ports, USART, CCP (Capture/Compare/PWM module), SSP, Comparator, ADC (analog to digital converter), PSP (parallel slave port), LCD and ICSP (in circuit serial programming) The 8-bit PIC microcontroller is classified into four types on the basis of internal architecture such as Base Line PIC, Mid-Range PIC, Enhanced Mid-Range PIC and PIC18.

2.3 Architecture of PIC Microcontroller

The PIC microcontroller architecture comprises of CPU, I/O ports, memory organization, A/D converter, timers/counters, interrupts, serial communication, oscillator and CCP module which are discussed in detailed below.

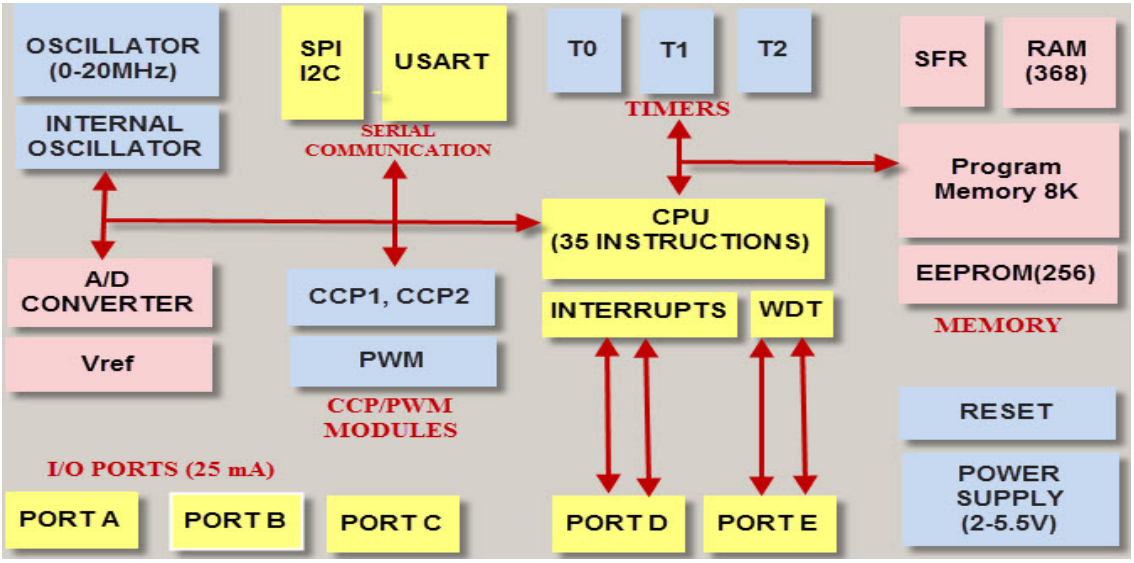

Fig 2.2 Architecture of PIC Microcontroller

- **CPU (Central Processing Unit)**
    - It is not different from other microcontrollers CPU and the PIC microcontroller CPU consists of the ALU, CU, MU and accumulator, etc. Arithmetic logic unit is mainly used for arithmetic operations and to take logical decisions. Memory is used for storing the instructions after processing. To control the internal and external peripherals, control unit is used which are connected to the CPU and the accumulator is used for storing the results and further process.
- **Memory Organization**
    - The memory module in the PIC microcontroller architecture consists of RAM (Random Access Memory), ROM (Read Only Memory) and STACK.
- **Random Access Memory (RAM)**
    - RAM is an unstable memory which is used to store the data temporarily in its registers. The RAM memory is classified into two banks, and each bank consists of so many registers. The RAM registers are classified into two types: Special Function Registers (SFR) and General-Purpose Registers (GPR).
    - **General Purpose Registers (GPR):** These registers are used for general purpose only as the name implies. For example, if we want to multiply two numbers by using the PIC microcontroller. Generally, we use registers for multiplying and storing the numbers in other registers. So, these registers don't have any special function, - CPU can easily access the data in the registers.
    - **Special Function Registers**: These registers are used for special purposes only as the name SFR implies. These registers will perform according to the functions assigned to them, and they cannot be used as normal registers. For example, if you cannot use the STATUS register for storing the data, these registers are used for showing the operation or status of the program. So, user cannot change the function of the SFR; the function is given by the retailer at the time of manufacturing.
- **Read Only Memory (ROM)**

- Read only memory is a stable memory which is used to store the data permanently. In PIC microcontroller architecture, the architecture ROM stores the instructions or program, according to the program the microcontroller acts. The ROM is also called as program memory, wherein the user will write the program for microcontroller and saves it permanently, and finally the program is executed by the CPU. The microcontroller's performance depends on the instruction, which is executed by the CPU.

- **Electrically Erasable Programmable Read Only Memory (EEPROM)**
  - In the normal ROM, we can write the program for only once we cannot use again the microcontroller for multiple times. But, in the EEPROM, we can program the ROM multiple times.
- **Flash Memory**
  - Flash memory is also programmable read only memory (PROM) in which we can read, write and erase the program thousands of times. Generally, the PIC microcontroller uses this type of ROM.
- **Stack**
  - When an interrupt occurs, first the PIC microcontroller has to execute the interrupt and the existing process address. Then that is being executed is stored in the stack. After completing the execution of the interrupt, the microcontroller calls the process with the help of address, which is stored in the stack and get executes the process.
- **I/O Ports**
  - In I/O Ports are the ports which are used to connect Input/ Output devices to the PIC microcontroller. The special features of I/O Ports are:
    - The series of PIC16 consists of five ports such as Port A, Port B, Port C, Port D & Port E.
    - Port A is a 16-bit port that can be used as input or output port based on the status of the TRISA (Tradoc Intelligence Support Activity) register.

- Port B is an 8- bit port that can be used as both input and output port.
- Port C is an 8-bit and the input of output operation is decided by the status of the TRISC register.
- Port D is an 8-bit port acts as a slave port for connection to the microprocessor BUS.
- Port E is a 3-bit port which serves the additional function of the control signals to the analog to digital converter.

- **Bus**
  - BUS is used to transfer and receive the data from one peripheral to another. It is classified into two types such as data bus and address.
  - **Data Bus:** It is used for only transfer or receives the data
  - **Address Bus:** Address bus is used to transmit the memory address from the peripherals to the CPU. I/O pins are used to interface the external peripherals; UART and USART both are serial communication protocols which are used for interfacing serial devices like GSM, GPS, Bluetooth, IR, etc.

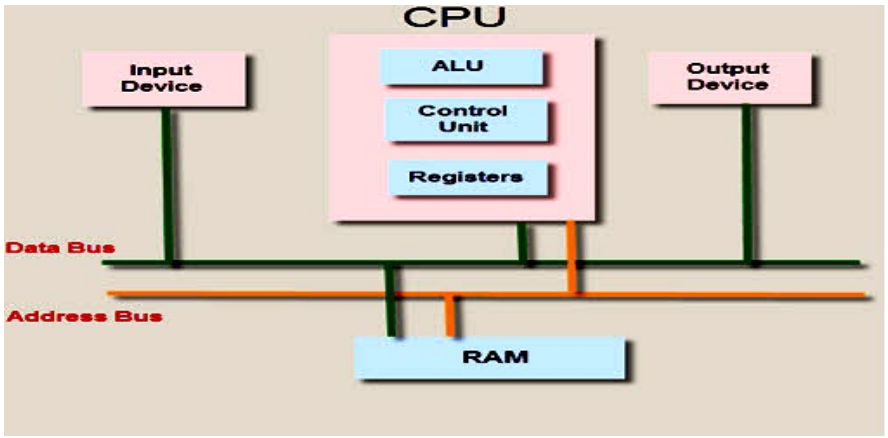

Fig 2.3 Microcontroller

- **A/D Converters**
  - The main intention of this analog to digital converter is to convert analog voltage values to digital voltage values. A/D module of PIC microcontroller consists of 5 inputs for 28 pin devices and 8 inputs for 40 pin devices. The operation of the analog to digital converter is controlled by ADCON0 and ADCON1 special registers. The upper bits

of the converter are stored in register ADRESH and lower bits of the converter are stored in register ADRESL. For this operation, it requires 5V of an analog reference voltage.

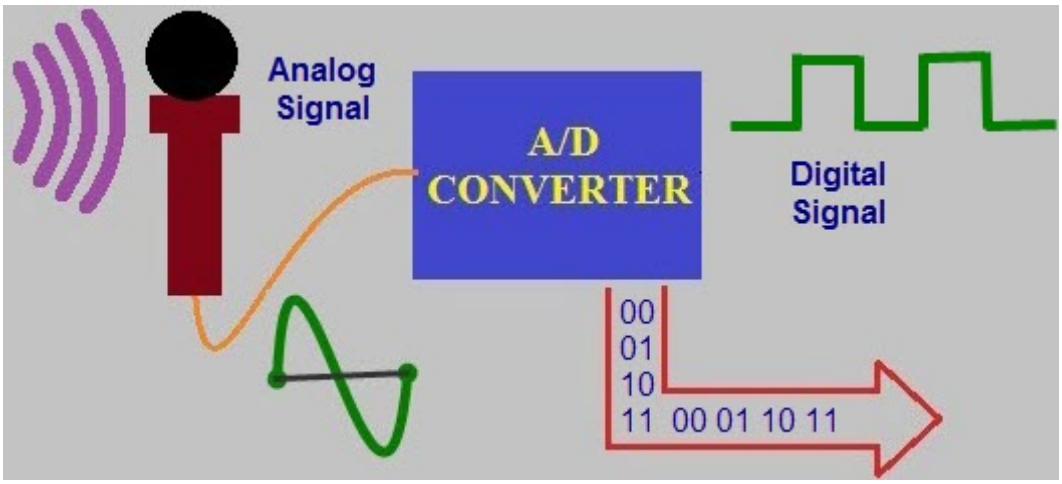

Fig 2.4 Analog to Digital Convertors

- **Timers and Counters**
  - PIC microcontroller has four timer/counters wherein the one 8-bit timer and the remaining timers have the choice to select 8 or 16-bit mode. Timers are used for generating accuracy actions, for example, creating specific time delays between two operations.
- **Interrupts**
  - PIC microcontroller consists of 20 internal interrupts and three external interrupt sources which are associated with different peripherals like ADC, USART, Timers, and so on.
- **Serial Communication**
  - **USART:** The name USART stands for Universal synchronous and Asynchronous Receiver and Transmitter which is a serial communication for two protocols. It is used for transmitting and receiving the data bit by bit over a single wire with respect to clock pulses. The PIC microcontroller has two pins TXD and RXD. These pins are used for transmitting and receiving the data serially.
  - **SPI Protocol:** The term SPI stands for Serial Peripheral Interface. This protocol is used to send data between PIC microcontroller and other

peripherals such as SD cards, sensors and shift registers. PIC microcontroller support three wire SPI communications between two devices on a common clock source. The data rate of SPI protocol is more than that of the USART.

- **I2C Protocol:** The term I2C stands for Inter Integrated Circuit, and it is a serial protocol which is used to connect low speed devices such as EEPROMS, microcontrollers, A/D converters, etc. PIC microcontroller support two wires Interface or I2C communication between two devices which can work as both Master and Slave device.

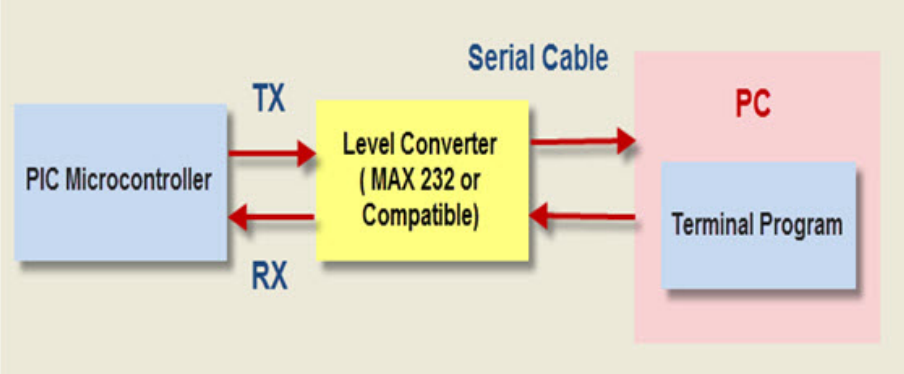

Fig 2.5 Serial Communication

- **Oscillators**
  - Oscillators are used for timing generation. PIC microcontroller consists of external oscillators like RC oscillators or crystal oscillators, where the crystal oscillator is connected between the two oscillator pins. The value of the capacitor is connected to every pin that decides the mode of the operation of the oscillator. The modes are crystal mode, high-speed mode and the low-power mode. In case of RC oscillators, the value of the resistor & capacitor determines the clock frequency and the range of clock frequency is 30 KHz to 4MHz.
- **CCP Module**
  - The name CCP module stands for capture/compare/PWM where it works in three modes such as capture mode, compare mode and PWM mode.

- **Capture Mode:** Capture mode captures the time of arrival of a signal, or in other words, when the CCP pin goes high, it captures the value of the Timer1.
- **Compare Mode:** Compare mode acts as an analog comparator. When the timer1 value reaches a certain reference value, then it generates an output.
- **PWM Mode:** PWM mode provides pulse width modulated output with a 10-bit resolution and programmable duty cycle.

- **PIC Microcontroller Applications**
  - The PIC microcontroller projects can be used in different applications, such as peripherals, audio accessories, video games, etc. For better understanding of this PIC microcontroller, the following project demonstrates PIC microcontroller's operations:
    - Bluetooth Home Automation Project
    - Arduino Coin Accepting Machine
    - Line following Robot using PID algorithm
- **Advantages of PIC Microcontroller**
  - PIC microcontrollers are consistent and faulty of PIC percentage is very less. The performance of the PIC microcontroller is very fast because of using RISC architecture.
  - When comparing to other microcontrollers, power consumption is very less and programming is also very easy.
  - Interfacing of an analog device is easy without any extra circuitry
- **Disadvantages of PIC microcontroller'**
  - The length of the program is high due to using RISC architecture (35 instructions)
  - One single accumulator is present and program memory is not accessible.

Chapter 3: Fire and Gas Prevention System

3.1 Fire and gas Prevention Project

We made FIRE AND GAS PREVENTION SYSTEM WITH GSM MODULE on PIC16F887. The main objective is to design a flammable gas and fire prevention system which detects the fire or gas leakage and directly sends the intimation message to the consumer's mobile phone.

3.2 Introduction

The flammable gas and fire accident prevention system is a system that could be used to warn the intimation about flammable gas leakage or fire combustion in any industrial or domestic area sat consumer mobile phone. Everyone knows, the demand of flammable gas is increasing day by day, but with this increasing demand the chances of blasting gas are also increasing day by day. Due to this blasting the heavy accidental conditions are occurred. These accidental conditions are cased to large damaged of life and property. This is happened in every country on annual basis. So, we must have to search the systems to overcome these accidental conditions. This system senses the flammable gas leakage or fire combustion without wasting any time and sends the fire or flammable gas leakage intimation message to the consumer mobile phone. This system also has the buzzer and led facility during any accidental condition.

3.3 Features

- It has 16*2 LCD display.
- It has sim900 GSM module that directly sends message to the phone.
- Flame sensor for detection of flames in the area.
- MQ-2 gas sensor for propane, butane, LPG, CNG high sensitivity, petroleum gas and has a decent sensitivity adjustment option.
- The system is powered by a 12V power supply.
- No external battery required.

3.4 Block Diagram

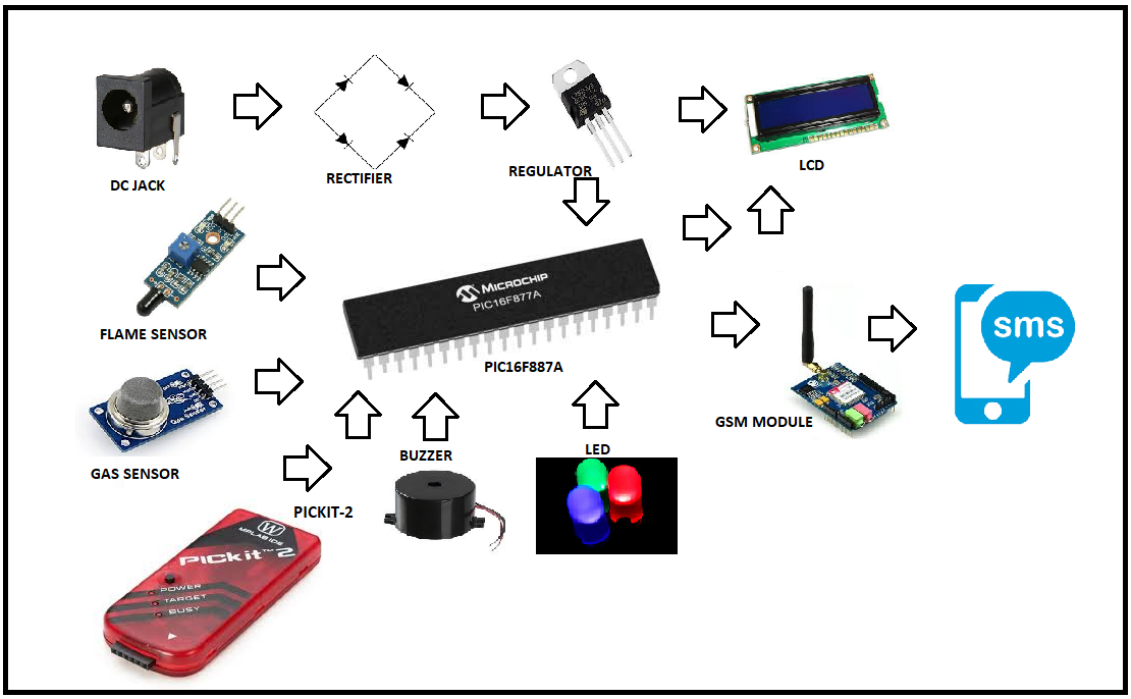

Fig 3.1 Block diagram of the project

The block diagram consists of many sections as follows

- DC JACK
- RECTIFIER
- REGULATOR
- LCD
- FLAME SENSOR
- GAS SENSOR
- PIC KIT-2
- PIC16F887A
- BUZZER
- LED
- LCD
- GSM900 MODULE

3.5 List of Components Used

- 7805
- BC547
- BUZZER
- CAPACITOR
- CRYSTAL OSSICALTOR
- CON SIL-2,3,5
- DC JACK
- DIODE
- LCD 16 PINS
- LED
- RESISTANCE
- POT HG
- PIC16F887
- SWITCH

3.6 Working of Devices

- **DC Jack**- A DC connector (or DC plug, for one common type of connector) is an electrical connector for supplying direct current (DC) power. Compared to domestic AC power plugs and sockets, DC connectors have many more standard types that are not interchangeable. The dimensions and arrangement of DC connectors can be chosen to prevent accidental interconnection of incompatible sources and loads. Types vary from small coaxial connectors used to power portable electronic devices from AC adapters, to connectors used for automotive accessories and for battery packs in portable equipment.

Fig 3.2 DC JACK

- **Bridge Rectifier**: It is a combination of four 1N4007 Diodes. A Bridge rectifier is an Alternating Current (AC) to Direct Current (DC) converter that rectifies mains AC input to DC output. Bridge Rectifiers are widely used in power supplies that provide necessary DC voltage for the electronic components or devices. They can be constructed with four or more diodes or any other controlled solid-state switch.

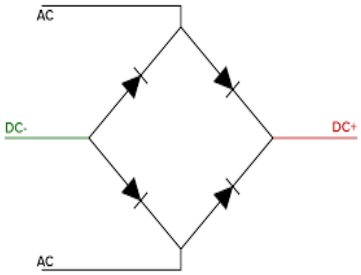

Fig 3.3 Bridge Rectifier

- **7805 voltage regulators:** The 7805-voltage regulator is used to convert high voltages into +5 voltage power supply it is very useful and it is a must as the PIC16F887 microcontroller used +5 voltage for operation and it is very necessary for the PIC16F887 as the dc adapter provided 12 volts and 5 volts are required for PIC16F887. Its Input voltage range =7v-35v, Current rating= 1A, Output voltage range=$V_{min=4.8V}$, $V_{max=5.2V}$,

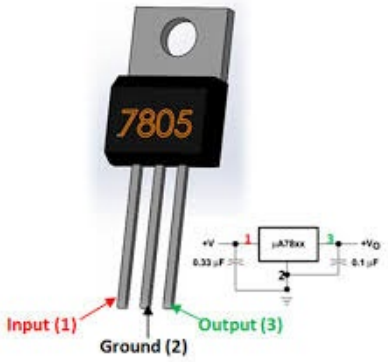

Fig 3.4 7805 Voltage Regulator

(THE ABOVE DEVICES ACT AS A POWER SUPPLY OF 5 VOLT FOR MICROCONTROLLER AND LCD AND THERE ARE TWO CAPACITORS OF 470µF AND 220µF THAT ARE ALSO USED FOR THE CONVERSION OF AC TO DC AND ALSO FOR THE REGULATION OF POWER SUPPLY.)

- **LCD (16*2)**-It's Operating Voltage is 4.7V to 5.3V and have Alphanumeric LCD display module, meaning can display alphabets and numbers. Consists of two rows and each row can print 16 characters. Each character is built by a 5✕8-pixel box. It can work on both 8-bit and 4-bit mode It can also display any custom generated characters and used here for displaying ALERT messages.

Fig 3.5 LCD (16*2)

- **PIC16F887 Microcontroller-**The microcontroller used in our project is PIC16F887. The PIC16F887 is one of the latest Microcontroller products from Microchip. It has all the features which the modern microcontrollers normally have. For its low price, wide range of application, high quality and easy availability, it is an ideal solution in applications such as, the control of different processes in industry, machine control devices, measurement of different values etc. Some of its main features are listed below:
    - RISC architecture
        - Only 35 instructions to learn
        - All single-cycle instructions except branches
    - Operating frequency 0-20 MHz
    - 35input/output pins: High current source/sink for direct LED drive
      Software and individually programmable *pull-up* resistor
      Interrupt-on-Change pin
    - 256 bytes EEPROM memory
        - Data can be written more than 1.000.000 times
    - 368 bytes RAM memory
    - A/D converter:
        - 14-channels
        - 10-bit resolution

- The CPU can recognize only 35 simple instructions (In order to program some other microcontrollers it is necessary to know more than 200 instructions by heart). The execution time is the same for all instructions except two and lasts 4 clock cycles (oscillator frequency is stabilized by a quartz crystal). The Jump and Branch instructions execution time is 2 clock cycles. It means that if the microcontroller's operating speed is 20MHz, execution time of each instruction will be 200nS, i.e. the program will be executed at the speed of 5 million instructions per second!
- **EEPROM Memory**: Similar to program memory, the contents of EEPROM is permanently saved, even the power goes off. However, unlike ROM, the contents of the EEPROM can be changed during operation of the microcontroller. That is why this memory (256 locations) is a perfect one for permanently saving results created and used during the operation.

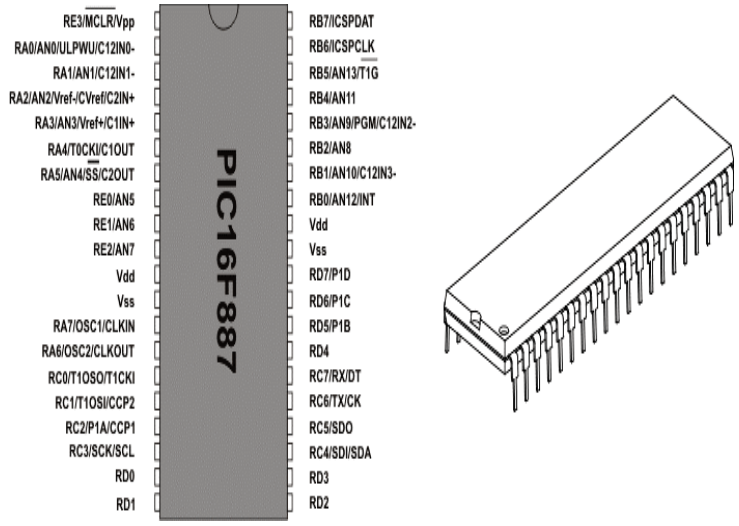

Fig 4.6 PIC16F887

- **FLAME SENSOR**-A flame sensor module consists of a flame sensor (IR receiver), resistor, capacitor, potentiometer, and comparator LM393 in an integrated circuit. It can detect infrared light with a wavelength ranging from 700nm to 1000nm.The far-infrared flame probe converts the light detected in the form of infrared light into current changes. Working voltage is between 3.3v and 5.2v DC, with a digital output to indicate the presence of a signal.

Fig 4.7 Flame Sensor

- **Gas Sensor:** MQ-2 Gas Sensor module is useful for gas leakage detection (home and industry). It is suitable for detecting H2, LPG, CH4, CO, Alcohol, Smoke or Propane. Due to its high sensitivity and fast response time, measurement can be taken as soon as possible. The sensitivity of the sensor can be adjusted by potentiometer. It has 4 pins VCC,GND,DO,AO and have input voltage-5V DC.

Fig 4.8 MQ-2 GAS SENSOR

- **PICKIT 2 PROGRAMMER**-The PICKIT 2 programmer is developed by the Microchip and it is used to burn the C code in the microcontroller so that it can perform various tasks. It is a 6 pin programmer in which the Pin configuration is as follows:
    - VPP/MLCR: It is connected to the Reset Button of the Microcontroller pin i.e. Pin No 1.
    - VDD: The VDD pin is connected to the Pin No. 11 of the Microcontroller and it provides +5 volts to te Microcontroller.
    - VSS: The VSS Pin of the PICKIT 2 is connected to the Pin No. 12 other Microcontroller to provide the Ground voltage to the Microcontroller.
    - ICSPDAT/PGD: The 4th Pin of the PICKIT 2 is connected to the RB7 Pin of the Microcontroller.

- ICSPCLK/PGC: The 5thPin of the PICKIT 2 is connected to the RB6 Pin of the Microcontroller.
- Auxiliary Pin: The Auxiliary Pin of the PICKIT 2 left unconnected

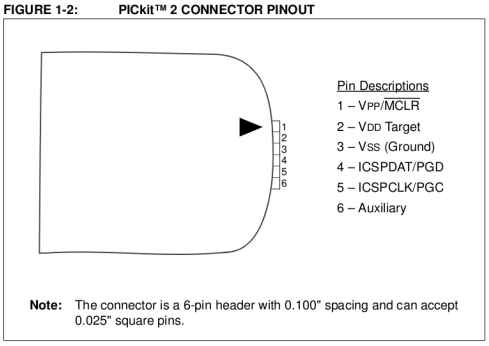

Fig 4.9 PICKIT-2

- **BUZZER**-Buzzers are used for making beeps, tones and alarms. They produces audible sounds due to oscillations. Here Piezo Buzzer is used at the time of ALERT.

Fig 4.10 BUZZER

- **LED**-LED stands for light emitting diode which is used here for emitting light. Here it is used as an indicator for ALERT messages along with buzzer and LCD.

Fig 4.11 LED

- SIM900 GSM MODULE-GPRS module is a breakout board and minimum system of SIM900 Quad-band/SIM900A Dual-band GSM/GPRS module. It can communicate with controllers via AT commands (GSM 07.07 ,07.05 and

SIMCOM enhanced AT Commands). This module supports software power on and reset. Features:

- Quad-Band 850/ 900/ 1800/ 1900 MHz
- Dual-Band 900/ 1900 MHz
- GPRS multi-slot class 10/8GPRS mobile station class B
- Compliant to GSM phase 2/2+Class 4 (2 W @850/ 900 MHz)
- Class 1 (1 W @ 1800/1900MHz)
- Control via AT commands (GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)
- Low power consumption: 1.5mA(sleep mode)
- Operation temperature: -40°C to +85 °C

Interface	Pin	Description
Rst	1	Reset the SIM900 module
P	2	Power switch pin of SIM900 module
Tx	3	UART data output
Rx	4	UART data in
DT	5	Debug UART data output
DR	6	Debug UART data input
-	7	GND
+	8	VCC

Table 3.1 PIN description of SIM900 GSM module

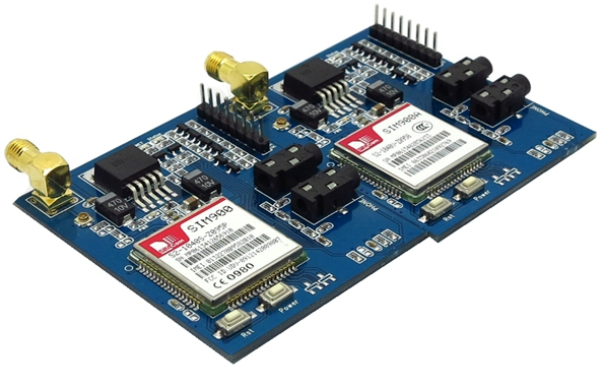

Fig 3.12 SIM 900 GSM MODULE

3.7 Circuit Diagram

The Circuit Diagram used in this program is displayed below and the details of the circuit diagram are given as follows.

- The LCD (16X2) is connected in the port B of the PIC16F887 microcontroller and it controlled with the help of a 10kΩ Pot to control and drive the IC.
- The PICKIT 2 programmer is connected to the five pins of the microcontroller.

- GAS and Flame sensor are connected at RA0 and RA1.
- GSM MODULE is connected at RC6 AND RC7 pins that are receiving and transmission pins of microcontroller.

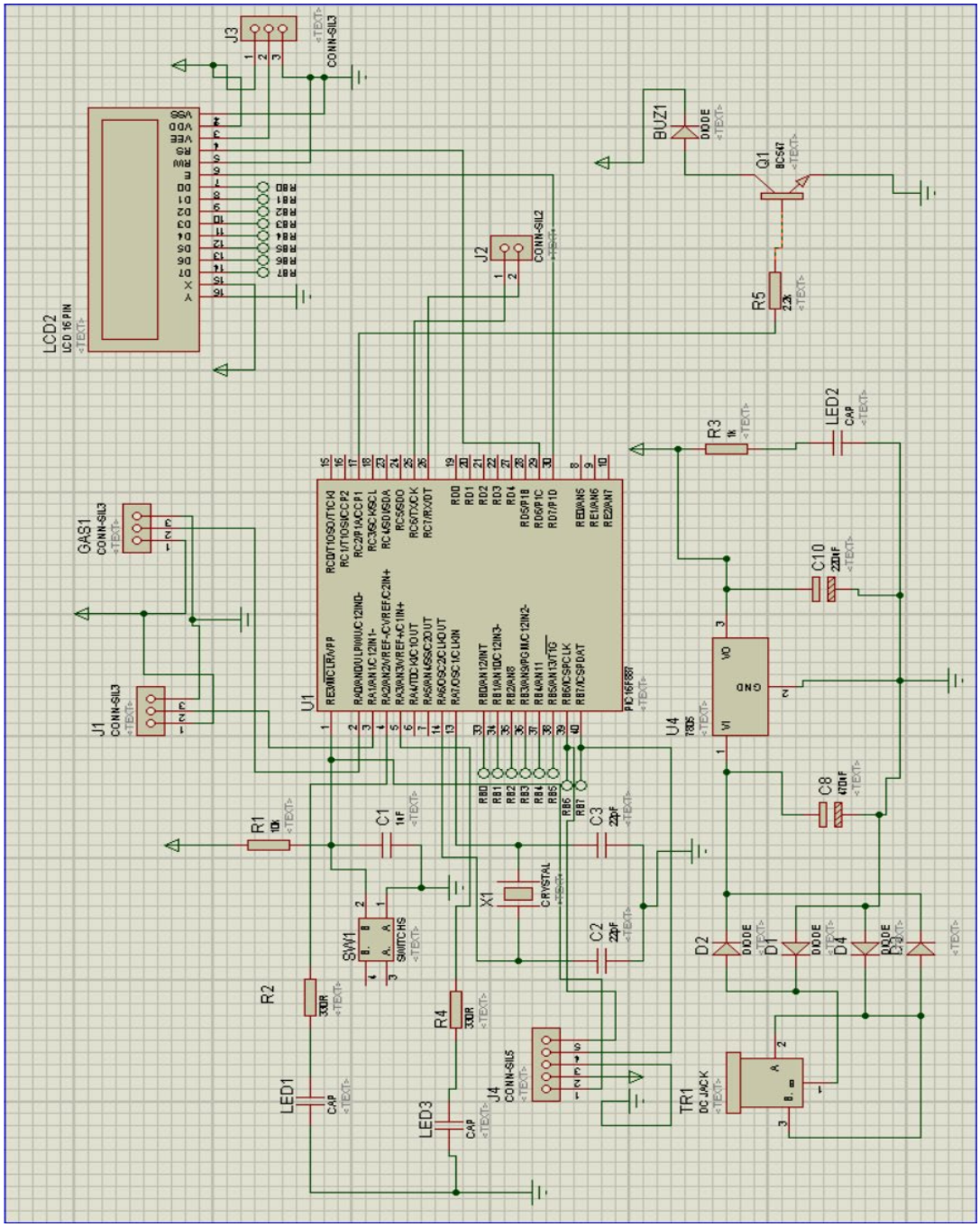

Fig 3.13 CIRCUIT DIAGRAM

3.8 Flow Chart

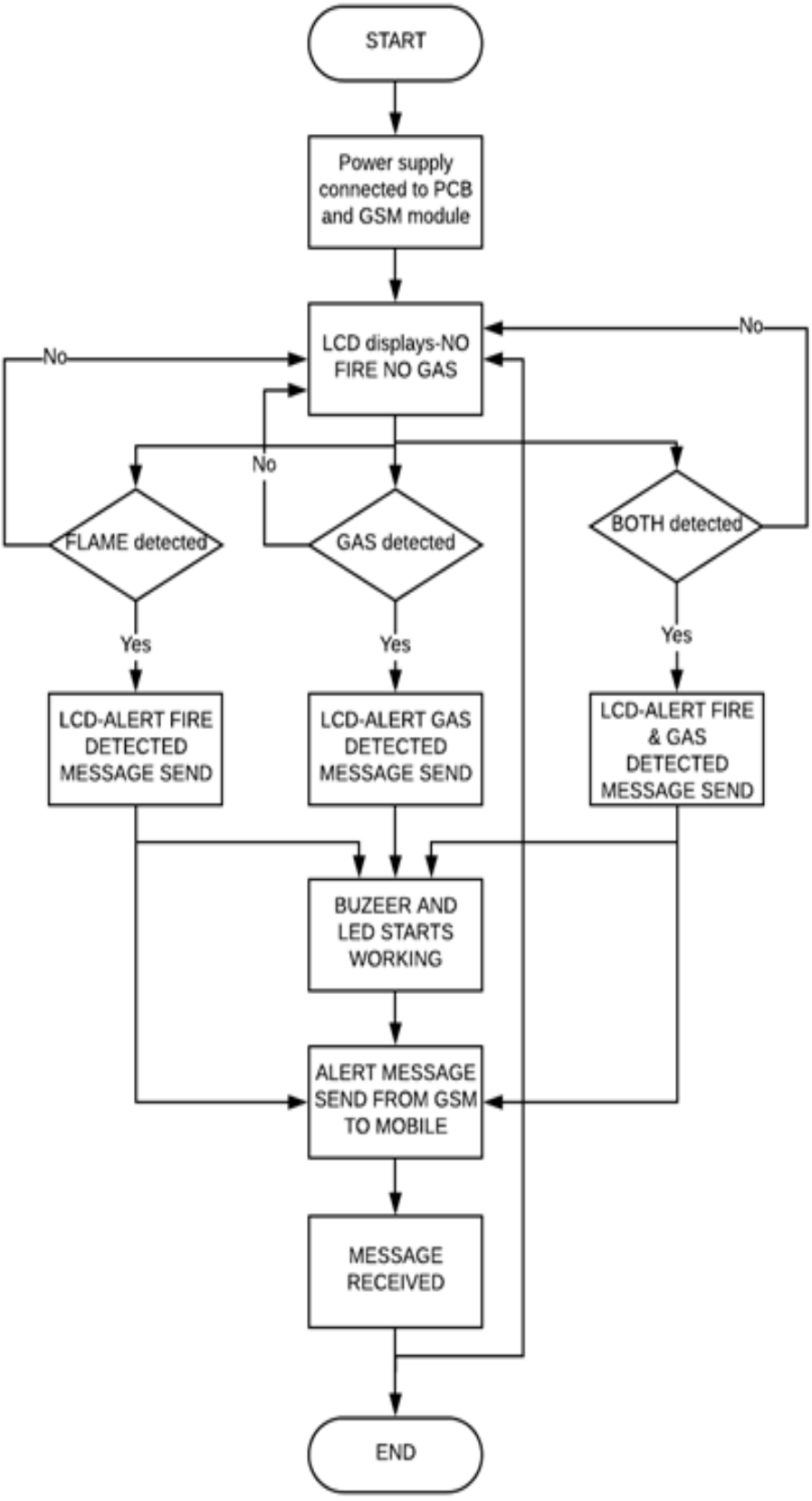

Fig 3.14 Flow Chart

3.9 Advantages of Using Fire and Gas Prevention System

The advantages of installing a fire alarm system are numerous. Having systems in your home that will help keep your family and guests safe when emergencies occur are essential. Fire alarm systems, often referred to as smoke alarms, are devices that detect the presence of smoke and heat in the atmosphere, allowing you and your family to get to safety. Here's a breakdown of why you should make sure that you have a functioning fire alarm system in your home right now.

- **Warning**

  Fire alarms provide audible alerts. This is an important feature because you may not always be in the same room or area where the fire starts. The alert will give you time to respond to the fire, by escaping to a safe place outside or addressing the flame with a fire extinguisher.

- **Monitoring**

  Even if you aren't home, remote monitoring will alert you to any fire emergencies at your residence. These connected systems will send alerts to your smartphone and fire emergency personnel that will respond to the emergency in a timely manner. In addition, these systems will also send emergency medical help for other issues that anyone at your home may be facing.

- **Optional Placement**

  Fire alarms are flexible appliances and can be installed in any specific area of your choice. If you follow the guidelines provided by the fire alarm manufacturer, you can place them in spaces that have fire hazards, like the kitchen. Be careful near spaces like bathrooms where steam from showers could falsely trigger the alarm. Be also sure to place them in areas where they can be easily heard, near bedrooms and family rooms.

3.10 Future Scope

The studies can be used in future to identify the main volatiles that are responsible for causing the sensor response variations. Using this knowledge gained from the analysis and studies one can customize the sensor array towards these main volatiles. In this way one can identify a volatile pattern, which correlates with a better odor discrimination

outcome with a lower cost detection risk. This development is very beneficial in biomedical applications in detecting different kinds of diseases because if it can correlate key volatiles (potential uremic toxins) to the volatile shift observed in various data records used in medical test. In this way one can precede the approach in the work having applications of low sensors in pathological diagnosis. Because it has been found in various literature that the electronic nose is able to distinguish between control blood and ―uremic‖ blood. In addition, the gas sensor series is not only able of discriminating perform after-dialysis blood however also it can follow the unpredictable shift happening during a single haemodialysis session. The e-nose can be used for equally dial sate side and blood-side monitoring of haemodialysis. In this way the work has marvellous scope in social welfare and minimizing expenses in costly pathological test in diagnosis of diseases.

If we consider such equipment are very useful at current as well as future as due to increasing advancement people are getting busy with their work and majorly stay out. Current gas pipeline system has greater chances to create huge destruction and people when stay far from home they generally tend to forget switching off pipeline off. This system will inform the user as soon as the leak of fire break out at their house or factory as this will send a text and so that human can work accordingly as fast as he can. We believe that the system is going to a basic part of every household and factory in coming time.

REFERENCES

1. "PICmicro Family Tree", PIC16F Seminar Presentation "Archived copy" (PDF). Archived from the original (PDF) on 2012-03-02. Retrieved 2011-08-02.
2. Myke Predko, Programming and Customizing the PIC Microcontroller, India, 2007, 120-158
3. Tarun Aggarwal, “How to Program a PIC Microcontroller to Build a Project”, https://www.elprocus.com/pic-microcontroller-programming-using-c-language/ , Oct 2007[14 Jan 2016]