GSM BASED ALCOHOL DETECTION SYSTEM WITH VEHICLE CONTROL

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

Bachelor Of Technology

in

Electronics and Communication Engineering

Under the Supervision of

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(MAY-2015)

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CERTIFICATE

This is to Certify that Project Report entitled "GSM BASED ALCOHOL DETECTION SYSTEM WITH VEHICLE CONTROL", submitted by Amulya Chauhan(111103), Karan Bir Singh(111110) and Abhishek Singh(111111) in partial fulfillment for the award of degree of Bachelor of Technology in Electronics and Communication Engineering to Jaypee University of Information Technology, Waknaghat, Solan has been carried out under my supervision. This work has not been submitted partially or fully to any other University or Institute for the award of this or any other degree or diploma.

Date:

Supervisor's Name- Mr. Pardeep Garg

Designation- Assistant Professor

Signature:

ACKNOWLEDGEMENT

We owe a great many thanks to a great many people who have helped and supported us during this project. Our deepest thanks to ***Mr. Pardeep Garg***, our project guide for his exemplary guidance, monitoring and constant encouragement throughout the course of this project work. He has taken great pains to go through the project and make necessary corrections as and whenever needed. We are also grateful to ***Mr. Mohan*** **(ECE Project lab**) for his practical help and guidance. We would also like to thank all the faculty members of ECE department without whom the progress of this project would have been a distant reality. We also extend our heartfelt thanks to our family and well wishers.

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ABSTRACT

The aim of our project is a method for providing an automotive safety system for vehicles. The alcohol sensing device is attached to a vehicle ignition system and keeps the vehicle from starting if the driver is drunk. The present disclosure is generally related to automotive safety and more particularly, is related to a system and method for improving automotive safety by sensing drugs and alcohol on a prospective driver.

Embodiments of the present disclosure provide a system for improving automobile safety, comprising an alcohol detection sensor for detecting the presence of excess alcohol beyond the permissible limit in a potential driver, a time delay switch communicatively coupled to the alcohol sensor, where in a delay signal is activated when the sensor detects the excess alcohol consumption beyond the limit, an interface for electrically coupling the time delay switch of an automotive ignition system, where in the automotive ignition system is disabled while the delay signal is activated and a reset switch, deactivates the delay signal such that the automotive ignition system is not disabled.

Further, one of ordinary skill in the art knows or will know that although the systems and methods herein are presented in the context of an automotive environment, these concepts are applicable to the operation of any vehicle or device, which if used by an impaired operator, could result in serious bodily injury or death to the user or others. In this project GSM technology is implied if the driver consumes alcohol, the alcohol sensor unit senses that given information and sends the output to the microcontroller which takes an immediate action to control the ignition switch to reach an off state and send a text message to the family members of driver or owner. With the help of such a system, it's easy to suspect and protect the driver from accidents.

LIST OF FIGURES

Chapter 1: INTRODUCTION

A GSM Based Alcohol Detection System with Vehicular Controlling is a device that is used in a vehicle to detect the illegitimate alcohol consumption by the driver , succeeding which it will not allow the car to start and will use the G.S.M technology to inform the guardian of the driver. Drunk driving is a big problem in every part of the nation. In 2009 alone, over 10,000 traffic fatalities linked directly to drivers having blood alcohol levels above the legal limit. Many accidents happen due to the carelessness on the part of driver. Many drivers drink and drive which is a criminal offence .Such drivers are a menace to society and should be apprehended quickly. Though the country has laws to check drunken driving but its effective implementation is still to be worked upon and in some cases even questionable. For such purpose we are designing a system which will assist the traffic police officers to determine whether he/she is fit to drive or not. This system is basically a Embedded System which is combination of both software and hardware which can perform some specific functions using Microcontroller AVR-ATMEGA 8. The Alcohol sensor on detecting the alcohol concentration will give the analog resistive output to the microcontroller then further alcohol detection message will be displayed on LCD. Thus car will be stopped on detecting alcohol concentration and related information will go to nearby location through GSM.

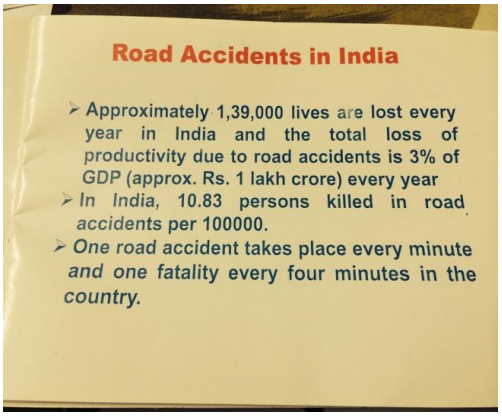
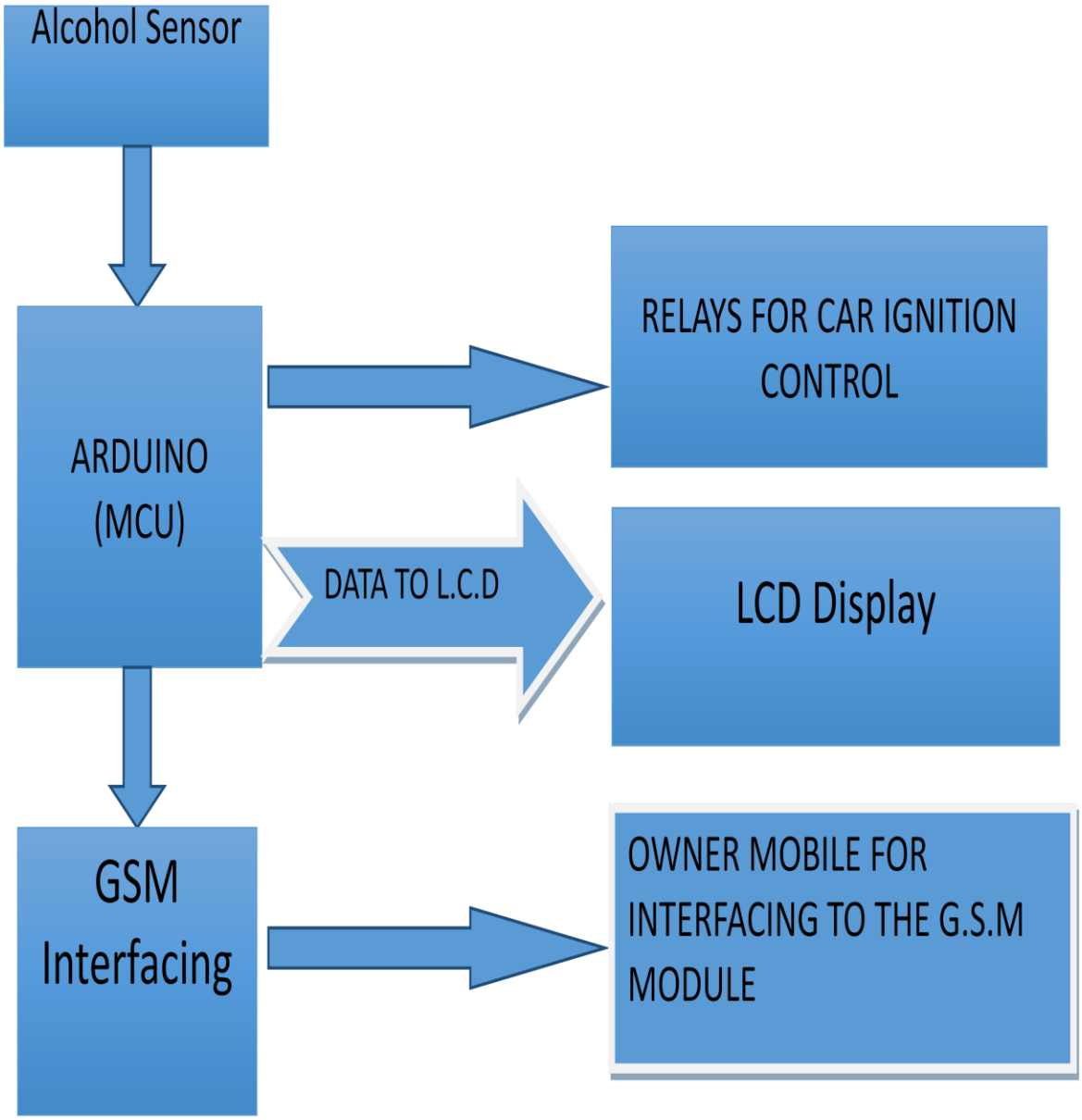


Figure 1:Document of Chandigarh Police[1]

Block Diagram:



Chapter 2: EMBEDDED SYSTEM

2.1 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.

Properties typical of embedded computers when compared with general-purpose ones are e.g. low power consumption, small size, rugged operating ranges and low per-unit cost. This comes at the price of limited processing resources, which make them significantly more difficult to program and to interface with. However, by building intelligence mechanisms on the top of the hardware, taking advantage of possible existing sensors and the existence of a network of embedded units, one can both optimally manage available resources at the unit and network levels as well as provide augmented functionalities, well beyond those available.

Modern embedded systems are often based on microcontroller (i.e. CPUs with integrated memory or peripheral interfaces) but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also still common, especially in more complex systems. In either case, the processor(s) used may be types ranging from general purpose to those specialized in certain class of computations, or even custom designed for the application at hand.

2.2 Characteristics

Embedded systems are designed to do some specific task, rather than be a general-purpose computer for multiple tasks. Some also have real-time performance constraints that must be met, for reasons such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs.

Embedded systems are not always standalone devices. Many embedded systems consist of small, computerized parts within a larger device that serves a more general purpose. For example, the Gibson Robot Guitar features an embedded system for tuning the strings, but the overall purpose of the Robot Guitar is, of course, to play music. Similarly, an embedded system in an automobile provides a specific function as a subsystem of the car itself.

The program instructions written for embedded systems are referred to as firmware, and are stored in read-only memory or Flash memory chips. They run with limited computer hardware resources: little memory, small or non-existent keyboard or screen.

Figure 2:An example of an Embedded System[2]

CHAPTER 3: MICROCONTROLLER

3.1 Introduction

A MCU is a small computer on a single integrated circuit containing a processor core, memory, and programmable input or output peripherals. It is used in automatically controlled products and devices such as, automobile engine control systems, medical devices, remote controls, office machines, appliances, power tools and other embedded systems.

3.2 ATMEGA8

ATMEGA8 is a low-power Atmel 8-bit AVR RISC-based microcontroller that combines 8KB of programmable flash memory, 1KB of SRAM, 512K EEPROM, and a 6 or 8 channel 10-bit A/D converter. The device supports throughput of 16 MIPS at 16 MHz and operates between 2.7-5.5 volts.

Figure 3:Atmega 8 Image[3]

3.2 Pin Diagram:

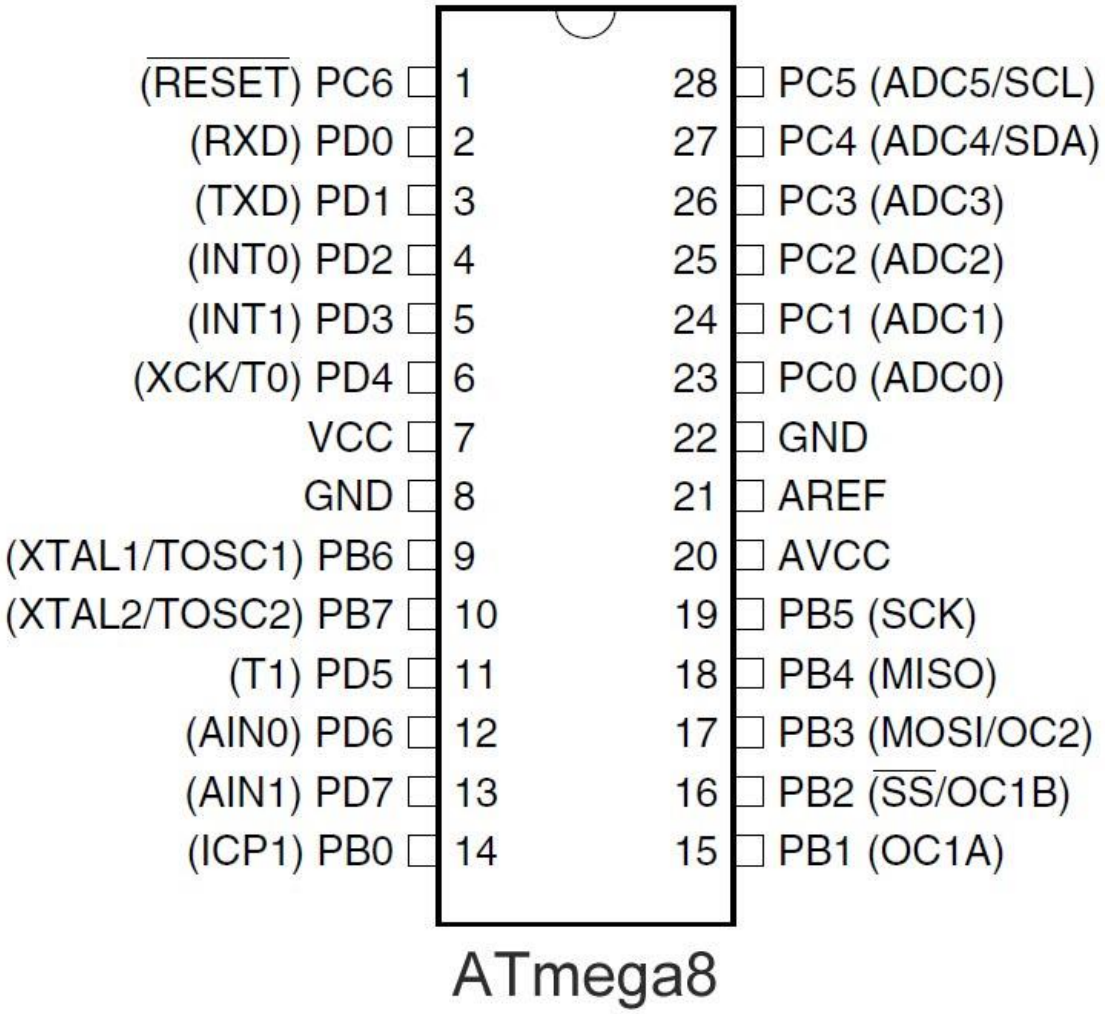


Figure 4:Pinout of Atmega 8[4]

3.3Features:

• High-performance, Low-power Atmel®AVR® 8-bit Microcontroller

• Advanced RISC Architecture

– 130 Powerful Instructions

– Most Single-clock Cycle Execution

– 32 × 8 General Purpose Working Registers

– Fully Static Operation

– Up to 16MIPS Throughput at 16MHz

– On-chip 2-cycle Multiplier

• High Endurance Non-volatile Memory segments
  – 8Kbytes of In-System Self-programmable Flash program memory
  – 512Bytes EEPROM
  – 1Kbyte Internal SRAM
  – Write/Erase Cycles: 10,000 Flash/100,000 EEPROM
  – Programming Lock for Software Security
• Peripheral Features
  – Two 8-bit Timer/Counters with Separate Prescaler, one Compare Mode
  – One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
  – Real Time Counter with Separate Oscillator
  – Three PWM Channels
  – Byte-oriented Two-wire Serial Interface
  – Programmable Serial USART
  – Master/Slave SPI Serial Interface
  – Programmable Watchdog Timer with Separate On-chip Oscillator
  – On-chip Analog Comparator
• Special Microcontroller Features
  – Power-on Reset and Programmable Brown-out Detection
  – Internal Calibrated RC Oscillator
  – External and Internal Interrupt Sources
  – Five Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, and Standby
• I/O and Packages
  – 23 Programmable I/O Lines
  – 28-lead PDIP, 32-lead TQFP, and 32-pad QFN/MLF
• Operating Voltages
  – 2.7V - 5.5V (ATmega8L)
  – 4.5V - 5.5V (ATmega8)

• Speed Grades

– 0 - 8MHz (ATmega8L)

– 0 - 16MHz (ATmega8)

• Power Consumption at 4Mhz, 3V, 25°C

– Active: 3.6mA

– Idle Mode: 1.0mA

– Power-down Mode: 0.5µA

3.4 Pin Description of ATMEGA8:

Memory: It has **8 Kb** of Flash program memory (10,000 Write/Erase cycles durability), **512 Bytes** of EEPROM (100,000 Write/Erase Cycles). **1Kbyte** Internal SRAM

I/O Ports: 23 I/ line can be obtained from three ports; namely Port B, Port C and Port D.

Interrupts: Two External Interrupt source, located at port D. 19 different interrupt vectors supporting 19 events generated by internal peripherals.

Timer/Counter: Three Internal Timers are available, two 8 bit, one 16 bit, offering various operating modes and supporting internal or external clocking.

SPI (Serial Peripheral interface): ATmega8 holds three communication devices integrated. One of them is Serial Peripheral Interface. Four pins are assigned to Atmega8 to implement this scheme of communication.

USART: One of the most powerful communication solutions is **USART** and ATmega8 supports both synchronous and asynchronous data transfer schemes. It has three pins assigned for that. In many projects, this module is extensively used for PC-Micro controller communication.

TWI (Two Wire Interface): Another communication device that is present in ATmega8 is Two Wire Interface. It allows designers to set up a commutation between two devices using just two wires along with a common ground connection, As the TWI output is made by means of open collector outputs, thus external pull up resistors are required to make the circuit.

Analog Comparator: A comparator module is integrated in the IC that provides comparison facility between two voltages connected to the two inputs of the Analog comparator via External pins attached to the micro controller.

Analog to Digital Converter: Inbuilt analog to digital converter can convert an analog input signal into digital data of 10bit resolution. For most of the low end application, this much resolution is enough.

3.5 Crystal Oscillator

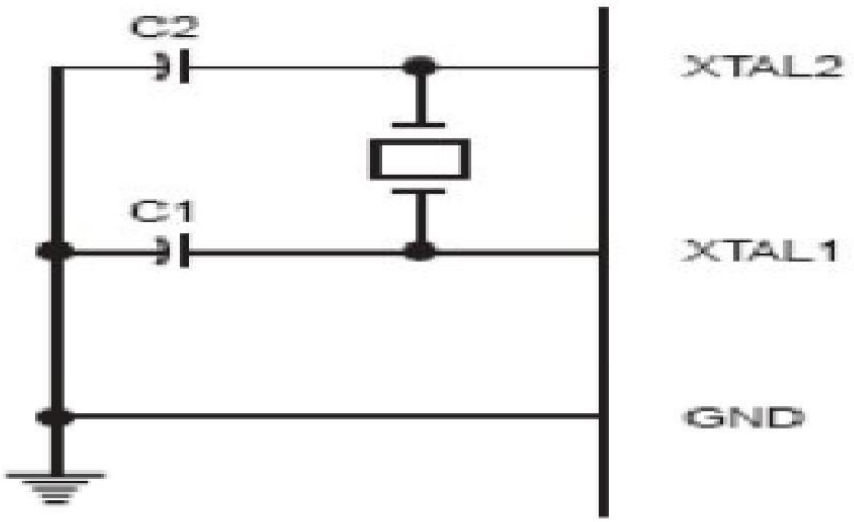


Figure 5: Schematic Diagram of Crystal Oscillator[5]

Introduction:

A **crystal oscillator** is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency .This frequency is commonly used to keep track of time , to provide a stable clock signals for digital integrated signals, and to stabilize frequencies for radio transmitters and receivers.

Construction :

XTAL1 and XTAL2 are the input and output, respectively, of an inverting amplifier which can be configured for use as an on-chip oscillator, as shown in Figure. Either a quartz crystal or ceramic resonator may be used. To drive the device from an external clock source, XTAL2 should be left unconnected while XTAL1 is driven as shown in Figure.

Features:

It must be noted that there are various speeds of the ATMEGA family. Speed refers to the maximum oscillator frequency connected to the XTAL. For example, a 12 MHz chip must be connected to a crystal with 12 MHz frequency or less. Likewise, a 20 MHz microcontroller requires a crystal frequency of no more than 20 MHZ. When the ATMEGA 8 is connected to a crystal oscillator and is powered up, we can observe the frequency on the XTAL2 pin using oscilloscope.

CHAPTER 4: SENSORS

4.1 Introduction

A sensor is a transducer whose purpose is to sense (that is, to detect) some characteristic of its environments. It detects events or changes in quantities and provides a corresponding output, generally as an electrical or optical signal; for example A sensor's sensitivity indicates how much the sensor's output changes when the input quantity being measured changes. For instance, if the mercury in a thermometer moves 1 cm when the temperature changes by 1 °C, the sensitivity is 1 cm/°C (it is basically the slope Dy/Dx assuming a linear characteristic).

4.2 Description

Alcohol sensor MQ-3, a semiconductor sensor for Alcohol detection has very good sensitivity and faster response to alcohol suitable for detecting alcohol concentration in breath like a common breathalyzer (portable alcohol detection). Provides an analog resistive output based on alcohol concentration. The drive circuit has one resistor. The resistance of the sensor reduces when alcohol concentration increases. The sensor gives output as per the condition of the breath through the logic circuit which is sent to the microprocessor. The Mq-3 sensor has good resistance to disturb of gasoline, smoke and vapor.

Figure 6: Alcohol Sensor MQ-3[6]

4.3 Specifications

-Power supply-5V

-Interface type-Analog

-Pin Definition- (1) Output, (2) GND, (3) VCC

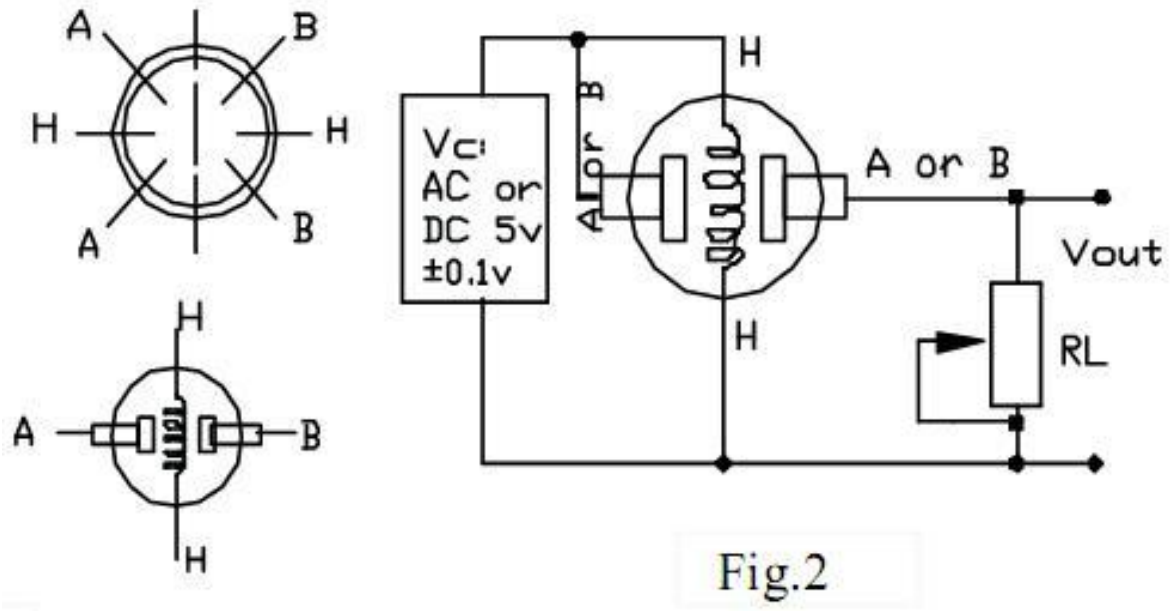


Figure 7 Schematic Diagram of MQ-3[6]

4.3 Working of MQ-3

Figure 8: MQ-3 Working[7]

When the user exhales into a breath analyzer, any ethanol present in their breath is oxidized to acetic acid at the anode:

$CH3CH2OH(g) + H2O(l) \rightarrow CH3CO2H(l) + 4H+(aq) + 4e-$

At the cathode, atmospheric oxygen is reduced:

$O2(g) + 4H+(aq) + 4e- \rightarrow 2H2O(l)$

The overall reaction is the oxidation of ethanol to acetic acid and water.

$CH3CH2OH(l) + O2(g) \rightarrow CH3COOH(l) + H2O(l)$

The electrical current produced by this reaction is measured by a microprocessor, and displayed as an approximation of overall blood alcohol content (BAC) by the Alcohol sensor

Chapter 5: GSM Module

5.1 Introduction

GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band. Mobile services based on GSM technology were first launched in Finland in 1991. Today, more than 690 mobile networks provide GSM services across 213 countries and GSM represents 82.4% of all global mobile connections. According to GSM World, there are now more than 2 billion GSM mobile phone users worldwide. GSM World references China as "the largest single GSM market, with more than 370 million users, followed by Russia with 145 million, India with 83 million and the USA with 78 million users.

5.2 Description

SIM900A is a dual band GSM modem being able to operate only in 900, 1800 MHz bands. SIM900A modem operates from 3.2V to 4.8V supply range.

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily.

The modem can either be connected to PC serial port directly or to any microcontroller through MAX232. It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet

and do many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logging.

This GSM modem is a highly flexible plug and play quad band **SIM900A** GSM modem for direct and easy integration to RS232 applications. Supports features like Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack.

Featuring an industry-standard interface, the SIM900a delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x3 mm, SIM900a can fit almost all the space requirements in your M2M applications, especially for slim and compact demands of design.

5.3 Features and Specifications of SIM900a

Features of SIM900a

- High Quality Product (Not hobby grade)
- Dual-Band GSM/GPRS 900/ 1800 MHz
- RS232 interface for direct communication with computer or MCU kit
- Configurable baud rate
- Wire Antenna (SMA connector with GSM Antenna Optional)
- SIM Card holder.
- Built in Network Status LED
- Inbuilt Powerful TCP/IP protocol stack for internet data transfer over GPRS.
- Normal operation temperature: -20 °C to +55 °C
- Input Voltage: 12V DC

Interfaces

- Interface to external SIM 3V/ 1.8V
- Analog audio interface
- RTC backup
- SPI interface
- Two Serial interfaces
- Antenna pad
- I2C
- GPIO
- PWM
- ADC

Specifications for Data

- GPRS class 10: Max. 85.6 kbps (downlink)
- PBCCH support
- Coding schemes CS 1, 2, 3, 4
- CSD up to 14.4 kbps
- USSD
- Non transparent mode
- PPP-stack

Sim 900a board features

- Input Voltage: 5V
- Current: 1.5amps
- On Board Power LED
- On Board Network LED
- RS232 Serial Control (TX and RX)
- Modem Reset PIN OUT
- Default Baud Rate: 9600. Data bits: 8, Parity: None, Stop Bit: 1

Board Specifications

- Board Dimensions: 45 x 35 mm
- Meterial: FR4
- Board Thickness: 1.6mm

Figure 9 :Sim 900A

5.4 Network LED

The Network LED indicates the various status of GSM module eg. Power on, Network registration & GPRS connectivity. When the modem is powered up, this NETWORK LED will blink every second. After the Modem registers in the network (takes between 10-60 seconds), this LED will blink in step of 3 seconds at slow rate. At this stage you can start using Modem for your application, showing that modem is registered with the network.

Chapter 6: POWER SUPPLY

6.1 Regulated Power Supply:

Power supplies are designed to convert high voltage AC mains to a suitable low voltage supply for electronic circuits and other devices. A power supply can be broken down into a series of blocks, each of which performs a particular function.

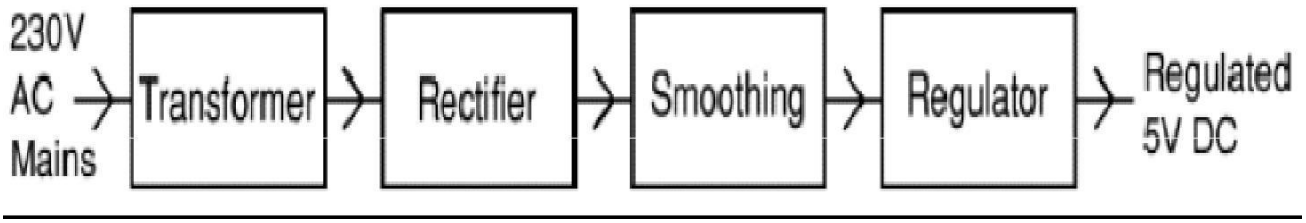


Figure 10: Block Diagram of Power Supply

Each of the blocks has its own function as described below:

1. Transformer – steps down high voltage AC mains to low voltage AC.

2. Rectifier – converts AC to DC, but the DC output is varying.

3. Smoothing – smoothes the DC from varying greatly to a small ripple.

4. Regulator – eliminates ripple by setting DC output to a fixed voltage

6.2 Bridge Rectifier: A bridge rectifier is an arrangement of four or more diodes in a bridge circuit configuration which provides the same output polarity for either input polarity. It is used for converting an alternating current (AC) input into a direct current (DC) output. A bridge rectifier provides full-wave rectification from a two-wire AC input, therefore resulting in lower weight and cost when compared to a rectifier with a 3-wire input from a transformer with a center-tapped secondary winding.

Generation of varying and smooth DC

The varying DC is generated using a transformer and a rectifier and in order to generate a smooth DC a smoothening capacitor is added to the circuit as shown below.

Transformer + Rectifier + Smoothing + Regulator

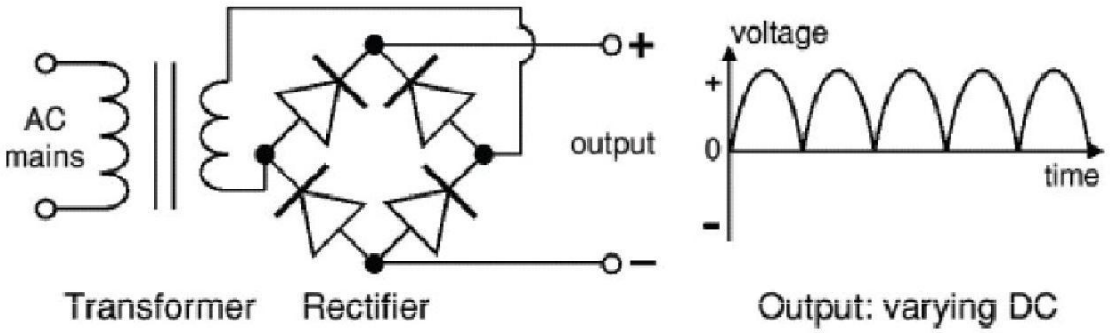
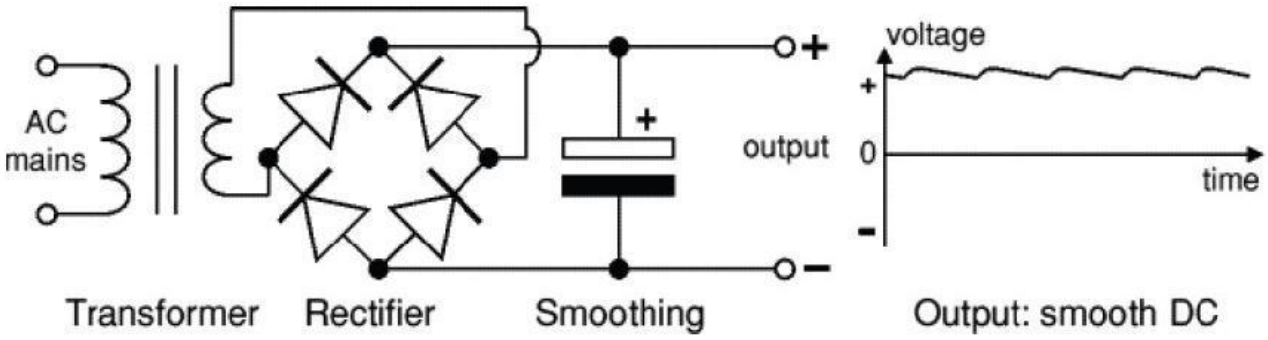


Figure 11: Bridge Rectifier Schematic Diagram

Generation of varying DC



Generation of smooth DC

The low voltage AC **output** is suitable for lamps, heaters and special AC motors. It is not suitable for electronic circuits unless they include a rectifier and a smoothing capacitor.

The varying DC output is suitable for lamps, heaters and standard motors. It is not suitable for electronic circuits unless they include a smoothing capacitor.

The smooth DC output has a small ripple. It is suitable for most electronic circuits.

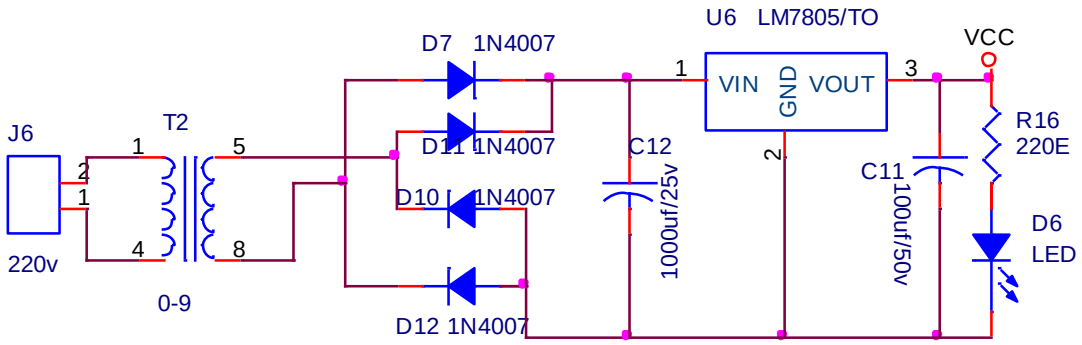


Figure 12: Circuit Diagram in Orcad

6.3 Transformer

A transformer is an electrical device that transfers energy between two or more circuits through electromagnetic induction**.** A varying current in the transformer's primary winding creates a varying magnetic flux in the core and a varying magnetic field impinging on the secondary winding. This varying magnetic field at the secondary induces a varying electromotive force (EMF) or voltage in the secondary winding. Making use of Faraday's law in conjunction with high magnetic permeability core properties, transformers can thus be designed to efficiently change AC voltages from one voltage level to another within power networks.

6.3.1 Types of transformer

- **Step Up Transformer & Step Down Transformer** - Generally used for stepping up and down the voltage level of power in transmission and distribution power network.
- **Three Phase Transformer & Single Phase Transformer -** Former is generally used in three phase power system as it is cost effective than later but when size matters, it is preferable to use bank of three single phase transformer as it is easier to transport three single phase unit separately than one single three phase unit.

6.3.2 Why are we using Step Down Transformer?

Here were using step down transformer as we have to convert 230v to 20v. The transformer converts high-voltage, low-current power into low-voltage, high-current power. The larger-gauge wire used in the secondary winding is necessary due to the increase in current. The primary winding, which doesn't have to conduct as much current, may be made of smaller-gauge wire.

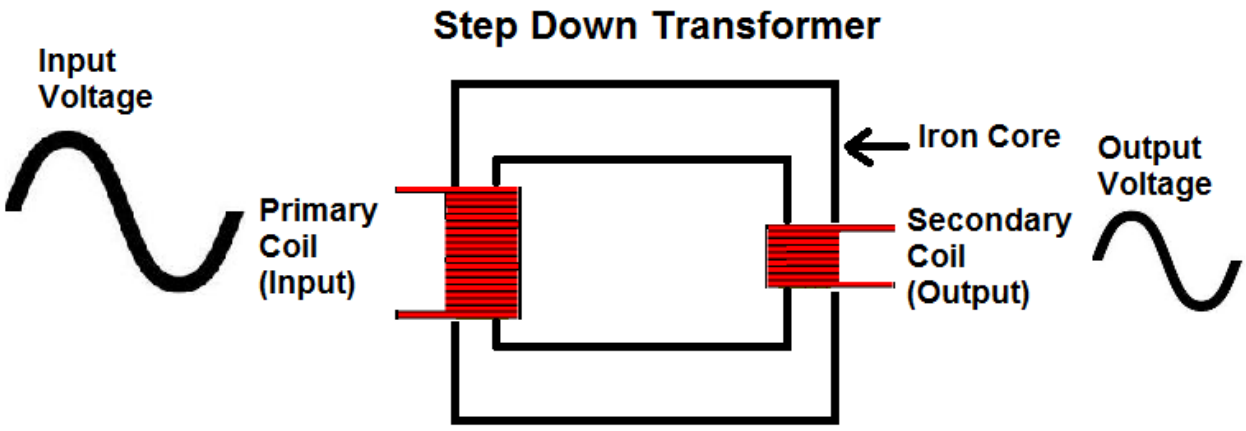


Figure 13: Step Down Transformer[8]

6.4 Voltage Regulator LM7805

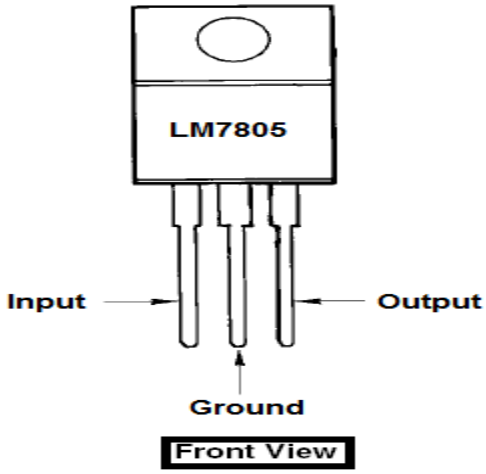


Figure 14: LM 7805 Description[9]

6.4.1 Introduction

A voltage regulator is designed to automatically maintain constant voltage level. A voltage regulator may be a simple "feed forward" design or may include negative feedback control loops. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages.

Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant. In an electric power distribution system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line.

A simple voltage regulator can be made from a resistor in series with a diode (or series of diodes). Due to the logarithmic shape of diode V-I curves, the voltage across the diode changes only slightly due to changes in current drawn or changes in the input. When precise voltage control and efficiency are not important, this design may work fine.

The most common part numbers start with the numbers 78 or 79 and finish with two digits indicating the output voltage. The number 78 represents positive voltage and 79 negative one. The 78XX series of voltage regulators are designed for positive input. And the 79XX series is designed for negative input.

6.4.2 Need

A LM7805 Voltage Regulator is a voltage regulator that outputs +5 volts. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The **voltage regulator IC** maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels. We're using lm 7805 because our requirement for the working of all the components is around (3.5v-5v).

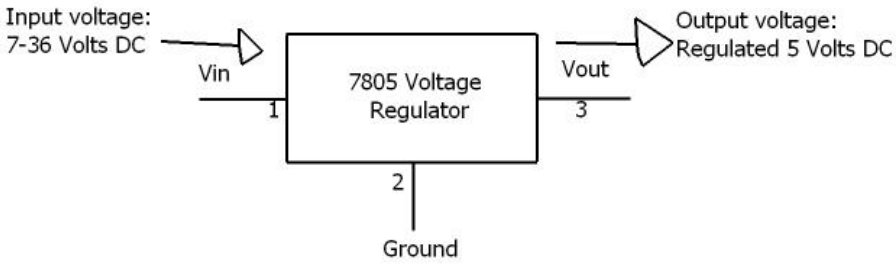


Figure 15: Connection of LM 7805

6.5 Electric Fuse

Figure 16: Electric Fuse

6.5.1Description:

This fast-acting, 5x20mm glass fuse is rated 0.5-amp 250V to protect equipment and consumer electronics from short circuits and power surges. It meets the circuit-protection requirements of most household electronic equipments.

Features:

- Fast-acting glass fuse
- Rated 0.5-amp 250V
- Protects electronics from short circuits and power surges

6.6 ULN 2803 (Darlington Transistor Arrays)

6.6.1Description:

The ULN2803 device is a high-voltage, high-current Darlington transistor array. The device consists of eight NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of each Darlington pair is 500 mA. The Darlington pairs may be connected in parallel for higher current capability.

6.6.2Features:

• 500-mA(max) Rated Collector Current (single output)

• High-Voltage Outputs: 50 V(min)

• Output Clamp Diodes

• Inputs Compatible With Various Types of Logic

• Compatible with ULN2800A Series

6.6.3Pinout:

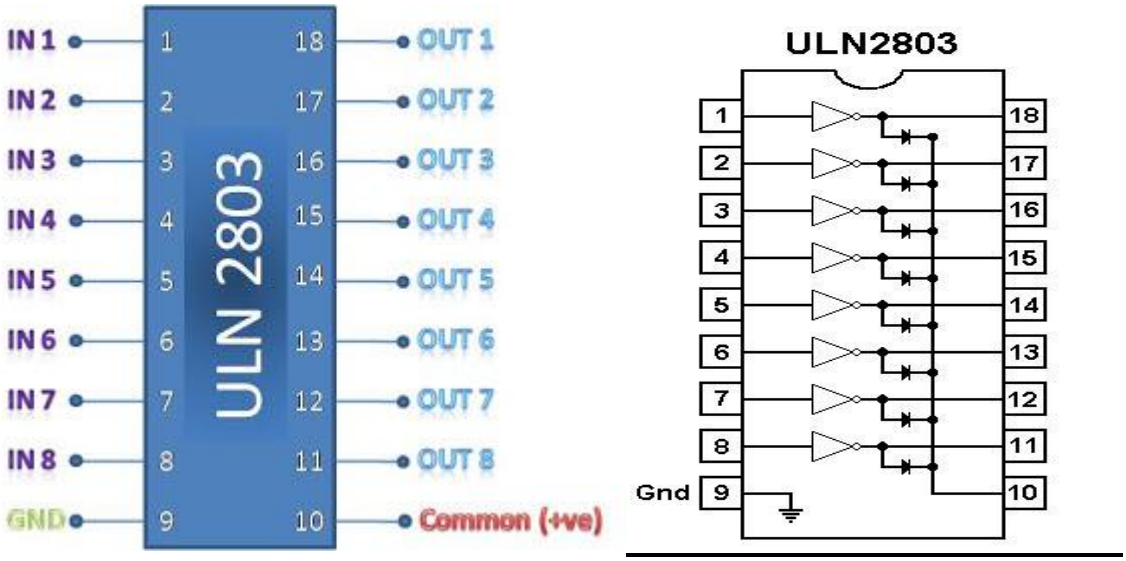


Figure 17: Pinout Diagram of ULN 2803[10]

6.6.4 Working:

The ULN 2803 IC consists of eight NPN Darlington connected transistors (often called a Darlington pair). Darlington pair consists of two bipolar transistors such that the current amplified by the first is amplified further by the second to get a high current gain β or h_{FE}. The figure shown below is one of the eight Darlington pairs of ULN 2803 IC.

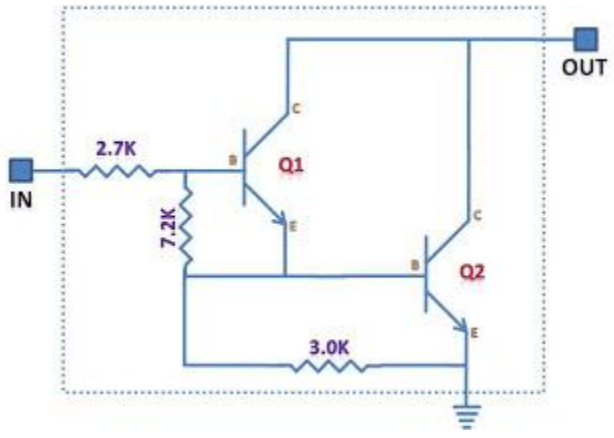


Figure 18: Circuit Diagram of ULN 2803

Case 1: When IN is 0 volts.

Q1 and Q2 both will not conduct as there is no base current provided to them. Thus, nothing will appear at the output (OUT).

Case 2: When IN is 5 volts.

Input current will increase and both transistors Q1 and Q2 will begin to conduct. Now, input current of Q2 is combination of input current and emitter current of Q1, so Q2 will conduct more than Q1 resulting in higher current gain which is very much required to meet the higher current requirements of devices like motors, relays etc. Output current flows through Q2 providing a path (sink) to ground for the external circuit that the output is applied to. Thus, when a 5V input is applied to any of the input pins (1 to 8), output voltage at corresponding output pin (11 to 18) drops down to zero providing GND for the external circuit. Thus, the external circuit gets grounded at one end while it is provided $+V_{cc}$ at its other end. So, the circuit gets completed and starts operating.

6.6.5 Applications:

- Relay Drivers
- Hammer Drivers
- Lamp Drivers
- Display Drivers (LED and Gas Discharge)
- Line Drivers
- Logic Buffers

Chapter 7: RELAYS

7.1 Introduction

A relay is an electrically operated switch. The relay contacts can be made to operate in the pre-arranged fashion. For instance, normally open contacts close and normally closed contacts open. In electromagnetic relays, the contacts however complex they might be, they have only two position i.e. OPEN and CLOSED, whereas in case of electromagnetic switches, the contacts can have multiple positions.

Figure 19: SPDT Relay[11]

7.2 Need for the Use of Relay:

The reason behind using relay for switching loads is to provide complete electrical isolation. This means that there is no electrical connection between the driving circuit and the driven circuits. The driving circuit may be low voltage operated low power circuits that control several kilowatts of power. In our circuit where a high fan could be switched on or off depending upon the conditions which are software defined.

Since the relay circuit operated on a low voltage, the controlling circuit is quite safe. In an electromagnetic relay the armature is pulled by a magnetic force only. There is no electrical connection between the coil of a relay and the switching contacts of the relay. If there are more than one contact

they all are electrically isolated from each other by mounting them on insulating plates and washers. Hence they can be wired to control different circuits independently.

7.3 SPDT (Single Pole Double Throw)

A common terminal connects to either of two others. Including two for the coil, such a relay has five terminals in total.

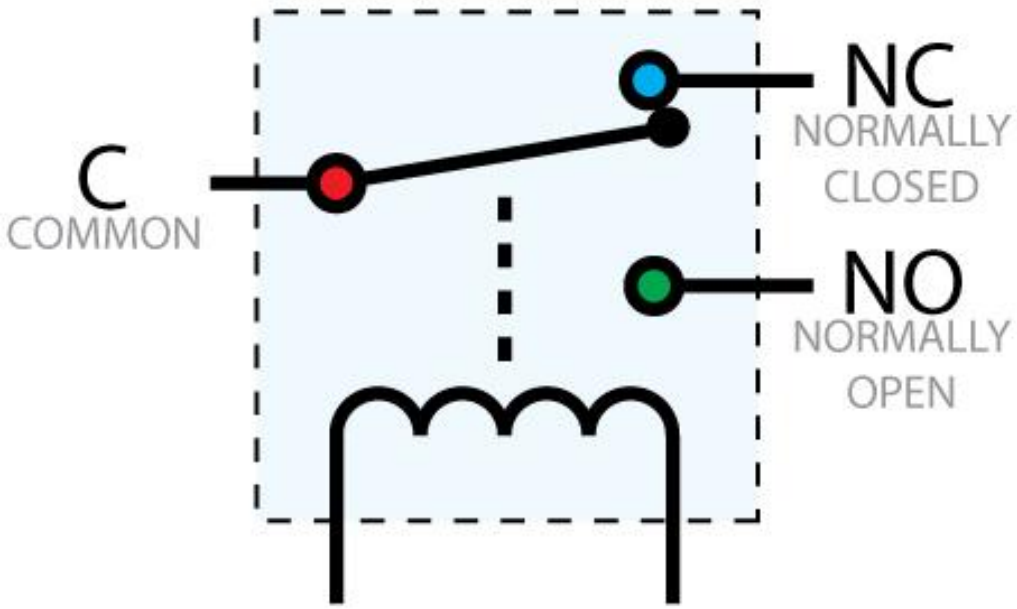


Figure 20: Circuit Diagram of Relay

Chapter 8: Hitachi HD44780 LCD

8.1 Introduction

The Hitachi HD44780 LCD controller is a commonly used alphanumeric dot matrix liquid crystal display(LCD) controller developed by Hitachi. The control interface and protocol is a de-facto standard for this type of display. The character set of the controller includes ASCII characters, Japanese Kana characters, and some symbols in two 28 character lines. Using an extension driver, the device can display up to 80 characters.

8.2 Architecture

The Hitachi HD44780 LCD controller is limited to monochrome text displays and is often used in copiers, fax machines, laser printers, industrial test equipment, networking equipment, such as routers and storage devices.

Compatible LCD screens are manufactured in several standard configurations. Common sizes are one row of eight characters (8x1), and 16×2, 20×2 and 20×4 formats. Larger custom sizes are made with 32, 40 and 80 characters and with 1, 2, 4 or 8 lines. The most commonly manufactured larger configuration is 40x4.characters, which requires two individually addressable HD44780 controllers with expansion chips as a single HD44780 chip can only address up to 80 characters. A common smaller size is 16×2, and this size is readily available as surplus stock for hobbyist and prototyping work.The nominal operating voltage for LED backlights is 5V at full brightness, with dimming at lower voltages dependent on the details such as LED color. Non-LED backlights often require higher voltages.

The HD44780 interface supports two modes of operation, 8-bit and 4-bit. Using the 4-bit mode is more complex, but reduces the number of active connections needed. The operation mode must always be set using the Function Set command, it is not defined at power-up whether the chip is in 8-bit or 4-bit mode. For this reason, in 4-bit mode a command is sent in two operations. To enable 4-bit mode the Function Set command must be sent three times.

8.3 Picture of LCD HD44780

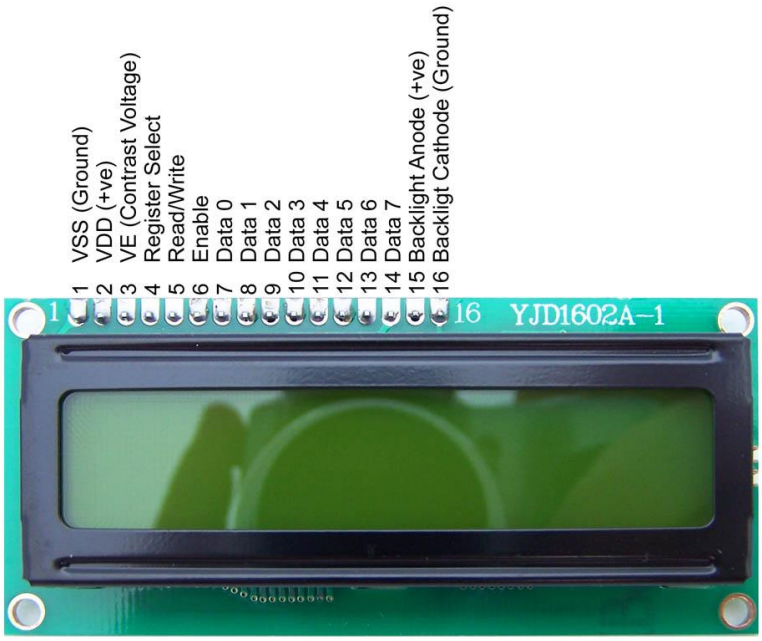


Figure 21: LCD HD 44780[12]

8.4 LCD pin description

The LCD discuss in this section has the most common connector used for the Hitachi 44780 based LCD is 14 pins in a row and modes of operation and how to program and interface with microcontroller is describes in this section.

The voltage VCC and VSS provided by +5V and ground respectively while VEE is used for controlling LCD contrast. Variable voltage between Ground and Vcc is used to specify the contrast (or "darkness") of the characters on the LCD screen.

The pins of the LCD are as follows:

RS (register select)

There are two important registers inside the LCD. The RS pin is used for their selection as follows. If RS=0, the instruction command code register is selected, then allowing to user to send a command such as clear display, cursor at home etc. If RS=1, the data register is selected,

allowing the user to send data to be displayed on the LCD.

R/W (read/write)

The R/W (read/write) input allowing the user to write information from it. R/W=1, when it read and R/W=0, when it writing.

EN (enable)

The enable pin is used by the LCD to latch information presented to its data pins. When data is supplied to data pins, a high power, a high-to-low pulse must be applied to this pin in order to for the LCD to latch in the data presented at the data pins.

D0-D7 (data lines)

The 8-bit data pins, D0-D7, are used to send information to the LCD or read the contents of the LCD's internal registers. To displays the letters and numbers, we send ASCII codes for the letters A-Z, a-z, and numbers 0-9 to these pins while making RS =1. There are also command codes that can be sent to clear the display or force the cursor to the home position or blink the cursor. We also use RS =0 to check the busy flag bit to see if the LCD is ready to receive the information. The busy flag is D7 and can be read when R/W =1 and RS =0, as follows: if R/W =1 and RS =0, when D7 =1(busy flag =1), the LCD is busy taking care of internal operations and will not accept any information. When D7 =0, the LCD is ready to receive new information.

8.5 Pin Diagram of LCD

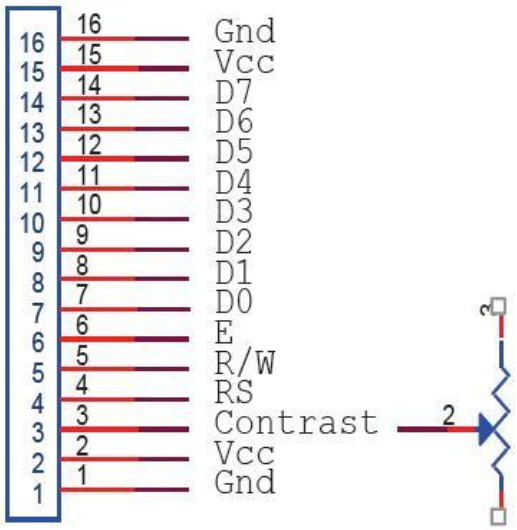


Figure 22: Pinout Diagram of LCD HD 44780[12]

8.6 Interfacing of micro controller with LCD display

In most applications, the "R/W" line is grounded. This simplifies the application because when data is read back, the microcontroller I/O pins have to be alternated between input and output modes. In this case, "R/W" to ground and just wait the maximum amount of time for each instruction (4.1ms for clearing the display or moving the cursor/display to the "home position", 160µs for all other commands) and also the application software is simpler, it also frees up a microcontroller pin for other uses. Different LCD execute instructions at different rates and to avoid problems later on (such as if the LCD is changed to a slower unit). Before sending commands or data to the LCD module, the Module must be initialized. Once the initialization is complete, the LCD can be written to with data or instructions as required. Each character to display is written like the control bytes, except that the "RS" line is set.

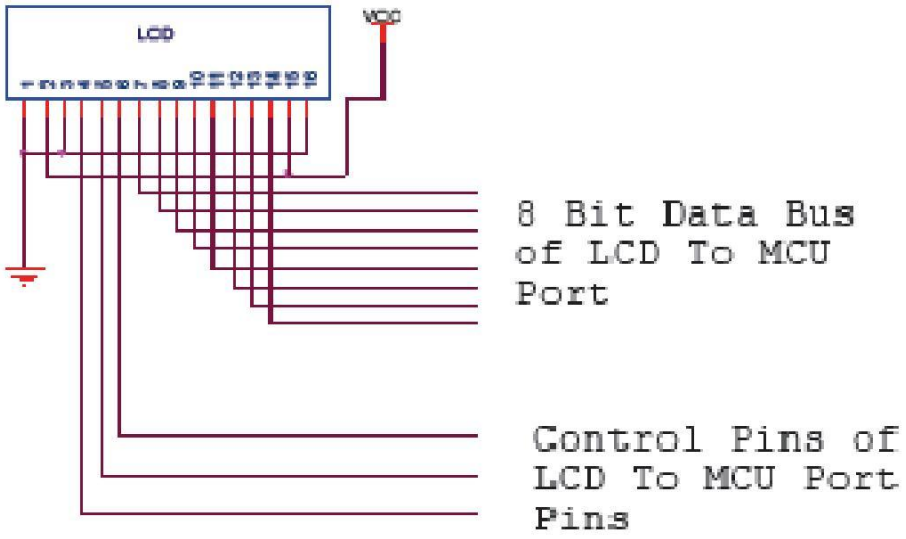


Figure 23: LCD Interfacing[12]

Chapter 9: Softwares Used for the Implementation of the Project

9.1Arduino Development Environment

The Arduino development environment contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions, and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

- Arduino development environment
- setup(): a function run once at the start of a program that can initialize settings
- loop(): a function called repeatedly until the board powers off

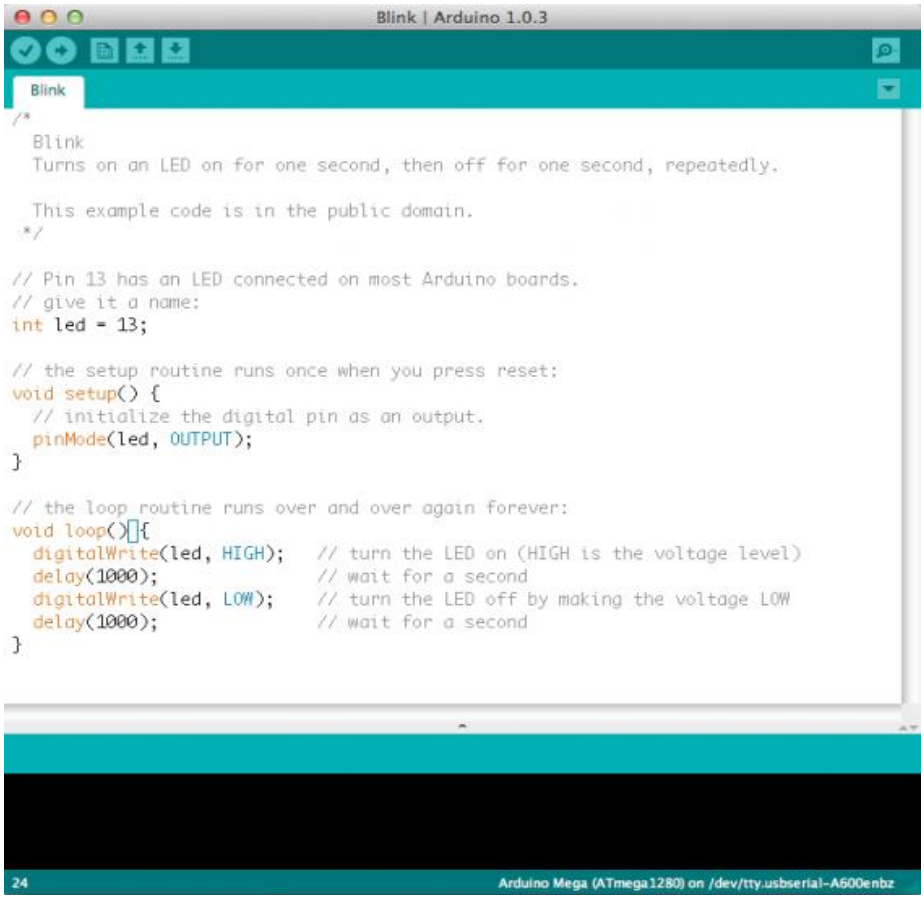


Figure 24: Arduino IDE Snapshot

9.2 Designing on Arduino Internal Development Environment

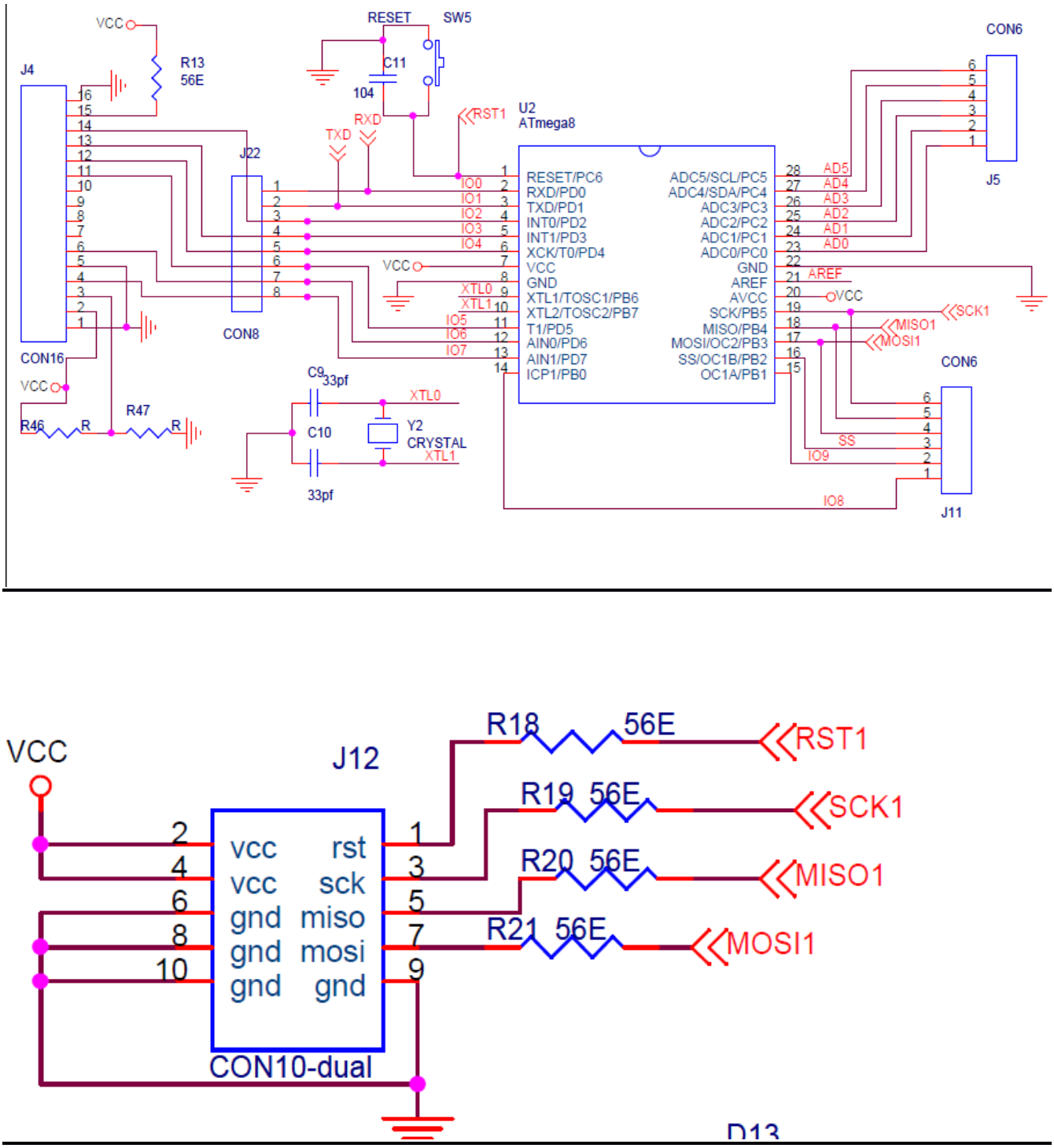


Figure 24.1: Snapshots of Designing on Orcad

Source Code:

```
/* Alcohol detector

pin 13 -> relay

pin 12 -> buzzer

alcohol detector -> A0

*/

#include <LiquidCrystal.h>

#define relay_1_pin 13

#define buzzer_pin 12

// #define mild_alcohol_threshold 400

#define extreme_alcohol_threshold 950

unsigned int alcohol_read;

LiquidCrystal lcd(7, 6, 5, 4, 3, 2);

void setup()

{

  pinMode(buzzer_pin, OUTPUT);

  pinMode(relay_1_pin, OUTPUT);

  lcd.begin(16,2);

  lcd.setCursor(0,0);

  lcd.print("Alcohol Detector");

  delay(4000);

  lcd.clear();
```

```
}
void loop()
{
  alcohol_read = analogRead(A0);  // read sensor value
  lcd.setCursor(0, 0);
  lcd.print("Alcohol");
  lcd.setCursor(11, 0);
  lcd.print(alcohol_read);  // display sensor value
  // lcd.print("     ");  // print blank space
  if(alcohol_read > extreme_alcohol_threshold)
  {
    lcd.setCursor(5, 1);
    lcd.print("Level HIGH");
    digitalWrite(relay_1_pin, HIGH);
    digitalWrite(buzzer_pin, HIGH);
  }
  else
  {
    digitalWrite(buzzer_pin, LOW);
    //lcd.setCursor(5, 1);
    //lcd.print("           ");
    digitalWrite(relay_1_pin, LOW);
```

```
  }
  delay(250);
  lcd.clear();
}
```

Future Scope

- We can implement GPS technology. With the help of which we will be able to send the location of the vehicle in case the alcohol level is beyond the maximum extreme level.
- We can implement voice feedback mechanism and additionally we can monitor the driver with the help of a camera.

Challenges

- The person sitting next to the driver can blow the air in the sensor.
- One disadvantage is when you inhale air and then exhale it on the device , it doesn't show the correct reading.
- Cannot detect if breath sample was alveolar (deep lung air). As a result it may produce a falsely high reading if a subject recently drank and still has alcohol in his mouth (highly unlikely as mouth alcohol evaporates very quickly**)**

Conclusion

Automatic accident detection and reporting system is designed in this project. When accident occurs, it is sensed by Alcohol Sensor. Short message if alcohol level is beyond extreme level is sent via GSM network.

It provides more than 70% safety for four wheelers. It is the fact that implementation of system will increase cost of vehicle but it is better to have some percent safety rather than having no percent of safety.

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