

DESIGN AND IMPLEMENTATION OF WIRELESS COMMUNICATION SYSTEM FROM VEHICLE TO TOLL USING LIFI

*Dissertation submitted in partial fulfillment of the requirement for the
degree of*

BACHELOR OF TECHNOLOGY IN ELECTRONICS AND COMMUNICATION ENGINEERING

By

**AKHIL SOOD (131006)
NIKHIL ARORA (131007)
GULSHAN THAKUR (131032)**

UNDER THE GUIDANCE OF

MR. ALOK KUMAR



JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY WAKNAGHAT

MAY 2017

TABLE OF CONTENTS

| | Page Number |
|---|------------------------|
| DECLARATION BY THE SCHOLAR | v |
| SUPERVISOR CERTIFICATE | vi |
| LIST OF ACRONYMS AND ABBREVIATIONS | vii |
| LIST OF FIGURES | viii |
| ABSTRACT | ix |
| | |
| CHAPTER-1 | |
| INTRODUCTION | 1 |
| 1.1 PROJECT OVERVIEW | 1 |
| 1.2 UPCOMING CHAPTERS OVERVIEW | 2 |
| CHAPTER-2 | 3 |
| DESIGN OVERVIEW | 3 |
| 2.1 INTRODUCTION | 3 |
| 2.1.1 TRANSMITTER BLOCK DIAGRAM. | 3 |
| 2.1.2 RECIEVER BLOCK DIAGRAM | 4 |
| 2.2 COMPONENTS REQUIREMENT | 6 |
| 2.3 SOFTWARE REQUIREMENT | 6 |

| | |
|--|-----------|
| CHAPTER-3 | 7 |
| HARDWARE DESCRIPTION | |
| 3.1 ARDUINO UNO | 7 |
| 3.1.1 INTRODUCTION | 7 |
| 3.1.2 DIAGRAM | 7 |
| 3.1.3 SPECIFICATION | 8 |
| 3.1.4 DESCRIPTION | 8 |
| 3.1.5 PIN DIAGRAM | 9 |
| 3.1.6 ADVANTAGES OF ARDUINO | 12 |
| 3.2 LCD DISPLAY | 13 |
| 3.2.1 INTRODUCTION | 13 |
| 3.2.2 DIAGRAM | 13 |
| 3.2.3 PIN DESCRIPTION | 14 |
| 3.3 LCD INTERFACING WITH ARDUINO UNO | 15 |
| 3.3.1 CIRCUIT DESCRIPTION | 16 |
| CHAPTER-4 | 17 |
| SOFTWARE DESCRIPTION AND SIMULATION | 17 |
| 4.1 PROTEUS | |
| 4.1.1 INTRODUCTION | 17 |
| 4.1.2 FEATURES | 18 |
| 4.1.3 TOOLS DISCRPTION | 19 |
| 4.2 SIMULATION RESULT | |
| 4.2.1 TRANSMITTER SIMULATION | 20 |
| 4.2.2 LED DRIVER SIMULATION | 22 |
| 4.2.3 TRANSIMPEDANCE AMPLIFIER SIMULATION | 23 |
| 4.2.4 RECIEVER SIMULATION | 24 |

| | |
|---------------------------|-----------|
| 4.3 ARDUINO IDE | |
| 4.3.1 INTRODUCTION | 25 |
| CHAPTER-5 | 26 |
| IMPLEMENTATION | 26 |
| CHAPTER-6 | |
| CONCLUSION | |
| 28 | |
| APPENDIX-A | 29 |
| CODE | 29 |
| APPENDIX-B | 35 |
| REFERENCES | |

DECLARATION BY THE SCHOLAR

We hereby declare that the work reported in the B-Tech thesis entitled “**Design and implementation of wireless communication system from vehicle to toll using LIFI** ” submitted at **Jaypee University of Information Technology,Waknaghat India**, is an authentic record of our work carried out under the supervision of **Mr Alok Kumar**. We have not submitted this work elsewhere for any other degree or diploma.

AKHIL SOOD (131006)

NIKHIL ARORA (131007)

GULSHAN THAKUR (131032)

Department of Electronics and Communication Engineering

Jaypee University of Information Technology, Waknaghat , India

May,2017

SUPERVISOR CERTIFICATE

This is to certify that the work reported in the B-Tech. thesis entitled **“DESIGN AND IMPLEMENTATION OF WIRELESS COMMUNICATION SYSTEM FROM VEHICLE TO TOLL USING LIFI”**, submitted by **AKHIL SOOD(131006), NIKHIL ARORA(13007) AND GULSHAN THAKUR(131032)** at **Jayvee University of Information Technology, Wagnaghat , India**, is a bonafide record of their original work carried out under my supervision. This work has not been submitted elsewhere for any other degree or diploma.

Mr. ALOK KUMAR

ASSISTANT PROFESSOR (DEPARTMENT OF ECE)

MAY, 2017

LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|--------|--|
| ASCII | American Standard Code For Information Interchange |
| AC | Alternating Current |
| DC | Direct Current. |
| EEPROM | Electrically erasable programmable read only memory. |
| IC | Integrated Circuit. |
| ICSP | In Circuit Serial Programmer |
| IDE | Integrated Development Enviornment. |
| KCL | Kirchoff Current Law. |
| LCD | Liquid Crystal Display |
| LED | Light Emitting Diode. |
| LIFI | Light Fiedility. |
| OP-AMP | Operational Amplifier |
| PCB | Printed Circuit Board |
| PWM | Pulse Width Modulation |
| RF | Radio Frequency. |
| SRAM | Static Random Access Memory |
| UART | Universal Asynchronous Reciever Transmitter. |
| USB | Universal Serial Bus. |
| WIFI. | Wireless Fidelity. |

LIST OF FIGURES

| Figure Number | Caption | Page No. |
|---------------|------------------------------------|----------|
| 2.1 | Transmitter diagram. | 3 |
| 2.2 | Reciever diagram. | 4 |
| 2.3 | Op-amp circuit. | 5 |
| 2.4 | LM358 pinout. | 6 |
| 3.1 | Arduino diagram. | 7 |
| 3.2 | Arduino specification | 8 |
| 3.3 | Pin configuration of atmega 328. | 9 |
| 3.4 | LCD diagram. | 13 |
| 3.5 | LCD pin description | 14 |
| 3.6 | Interfacing arduino with LCD. | 16 |
| 4.1 | Arduino first page. | 18 |
| 4.2 | Simulation of transmitter. | 20 |
| 4.3 | Configuration of square pulse. | 21 |
| 4.4 | Output of transmitter. | 21 |
| 4.5 | Simulation of Led driver circuit. | 22 |
| 4.6 | Output of driver circuit. | 22 |
| 4.7 | Simulation of amplifier circuit. | 23 |
| 4.8 | Output of amplifier circuit. | 23 |
| 4.9 | Simulation of receiver circuit. | 24 |
| 4.10 | Output of receiver circuit. | 25 |
| 4.11 | Arduino IDE first page. | 26 |
| 5.1 | Design on isis professional | 27 |
| 5.2 | Transmission and receiving of data | 27 |

ABSTRACT

Communication is an important aspect of our life. It is merely difficult to find any sphere of life where importance of communication can be ignored. In today's world wireless communication is affecting every part of our life. It got a large number of applications. Wireless communication at toll plaza is one of them. It can be done using RFID, GPS and Wi-Fi.[1].but in all these methods the vehicle need to stop at toll plaza which increases the consumption of fuel and cost. So we are providing a solution to remove this problem using LIFI. It will reduce fuel consumption and help in making an eco-friendly environment.[2-4]

CHAPTER 1

INTRODUCTION

1.1) Project Overview

The concept of communication was given about 500,000 years ago. At that time cave paintings, rock arts were used for communication. The advancement in technologies resulted in the invention of new form of communication system which help in increasing the distance of communication and decreasing time.

These advancements resulted in invention of wireless technology. In today's time it has become the integral part of our life. Wi-Fi is one of those. Undoubtedly Wi-Fi is very eminent technology that has large applications in both our personal and professional life. One of its application is for wireless communication between vehicle and toll at toll booth. But due to its tremendous use RF bands are getting scarce and also they are restricted at airplanes and hospitals. Some of the issues related with Wi-Fi are its Capacity, Efficiency, Availability and Security. Also at toll booth we require eco-friendly environment and a situation where there is no need for a vehicle to stop at toll booth. These issues led to development of a new concept called LIFI for short range communication, which can be used at toll booth.[1].

LIFI means Light fidelity. It basically refers to transferring information through light. Its key components are vehicle, led, microcontroller, amplifier, photodiode.[1-3]

1.2) UPCOMING CHAPTERS OVERVIEW

Chapter-2 gives the details of system design. It includes description of basic components of Li-Fi, components requirement, software requirements. Chapter-3 gives the detailed description of hardware including arduino-uno, Lcd ,its interfacing with arduino. Chapter-4 gives the detailed description of software and discussed in detail the simulation results. Chapter-5 gives the actual implementation of our whole idea and discuss its results. Chapter-6 includes conclusion of the project. Appendix-A contain sender and receiver code along with its explanation and Appendix-B contains all the references which are used.

CHAPTER-2

DESIGN OVERVIEW

2.1) INTRODUCTION

The traffic congestion is increasing day by day. Most of the people find it difficult to be a part of long queue at toll for toll payment. This causes waste of petrol and diesel in large amount which are going to extinct in coming years. This project provides a great solution to all these problems. LIFI is emerging technology in the trend. Each and every vehicle is having LIFI transmitter placed under vehicle bonnet and it stores the encoded data like vehicle number. The LIFI receiver is present in middle of road at toll. The transmitter will send vehicle number to receiver and based on type of vehicle the user is charged toll tax accordingly through a wallet linked with vehicle number. This technology helps to create an eco friendly environment.

2.1.1) TRANSMITTER BLOCK DIAGRAM

In this figure we are defining the transmitter part. It consists of three main components Vehicle, Microcontroller and Led.



FIGURE 2.1 Transmitter Block

1) Vehicle:-

There will be a LED fitted under vehicle bonnet and receiver will be somewhere in the middle of road at toll. This is done to decrease the distance between transmitter and receiver and to prevent LED light from getting interfered with sunlight.

2) Microcontroller:-It is used so that it will change the pattern of LED illumination according to the digit which is sent. Here in our case we are using Arduino- uno.

3) Led:-

Led refers to light emitting diode. It is a p-n junction diode which emits light when activated. When a certain voltage is applied to LED then energy get released due to the combination of electron and holes in the form of photons. The color of the light depends on the band gap of the semiconductor used to make LED. This effect is called electroluminescence.

2.1.2) RECIEVER BLOCK DIAGRAM

In this figure we are defining the receiver part. Its key components are photodiode, Amplifier, Microcontroller and LCD.

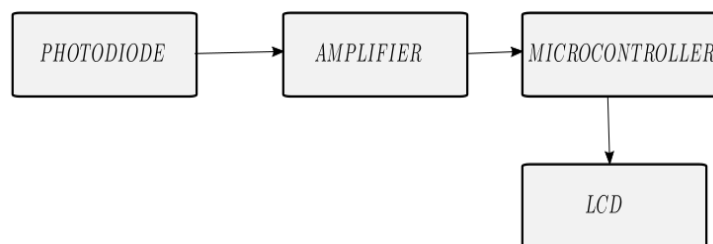


FIGURE 2.2 Receiver Block

1) Photodiode:-

Photodiode is a device that converts light into current. The current is produced due to the breakage of bonds between electrons and holes when photons are absorbed by it. Small amount of current also flows through photodiode when no light falls on it which is called dark current. In this project it is used as a receiver.

2) Amplifier:-

The amplifier used here is a trans-impedance amplifier which is used to convert the output current from photodiode into the corresponding voltage. We are using LM358 for our purpose.

LM358

It is an IC designed by texas instruments.It got 8 pins and we can give two signals simultaneously for amplification.It basically contains two op-amps.

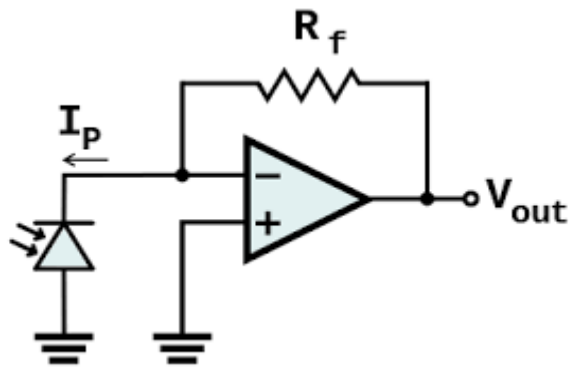


FIGURE 2.3 Op-amp circuit

From the figure it is clear that by applying KCL at the junction

$$V_{out} = -I_P * R_F.$$

Which makes it clear that the output voltage depends on the input current from the photodiode.[3]

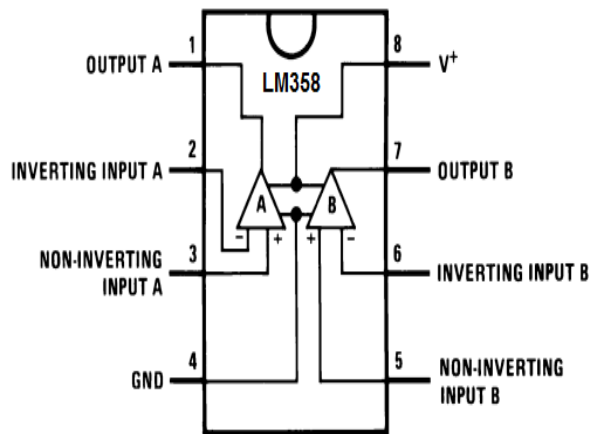


FIGURE 2.4:LM358 internal configuration

3) Lcd:-

It stands for Liquid crystal Display. It can be found in different configurations like 16*2,10*2,16*4 and many more. The first component tells us about the number of characters that can be written in one row and the second component tells us about the number of rows.

2.2) Components Requirement

1)Two Arduino uno,LM358.,IR Led, Photodiode, Capacitor., Resistor(220 ohm), Potentiometer(10k), LCD(16*2). Breadboard.

2.3) Software Requirements

- 1) Proteus.
- 2) Arduino IDE.

CHAPTER-3

HARDWARE DISCRPTION

3.1 ARDUINO UNO

3.1.1) INTRODUCTION: - Arduino is an open source, computer hardware .The Arduino board use IC ATmega328. Arduino has 14 digital pins an6 analog pins. Out of 14 digital pins 6 can be used as PWM pins. Arduino has 16 MHz crystal oscillator. For power option it has USB connection, power jack. Arduino uno comes with ICSP header and reset button. To upload new code, we have just have to reset it. It is easily connected with computer, we just need to connect USB cable with computer.

3.1.2) DIAGRAM :-

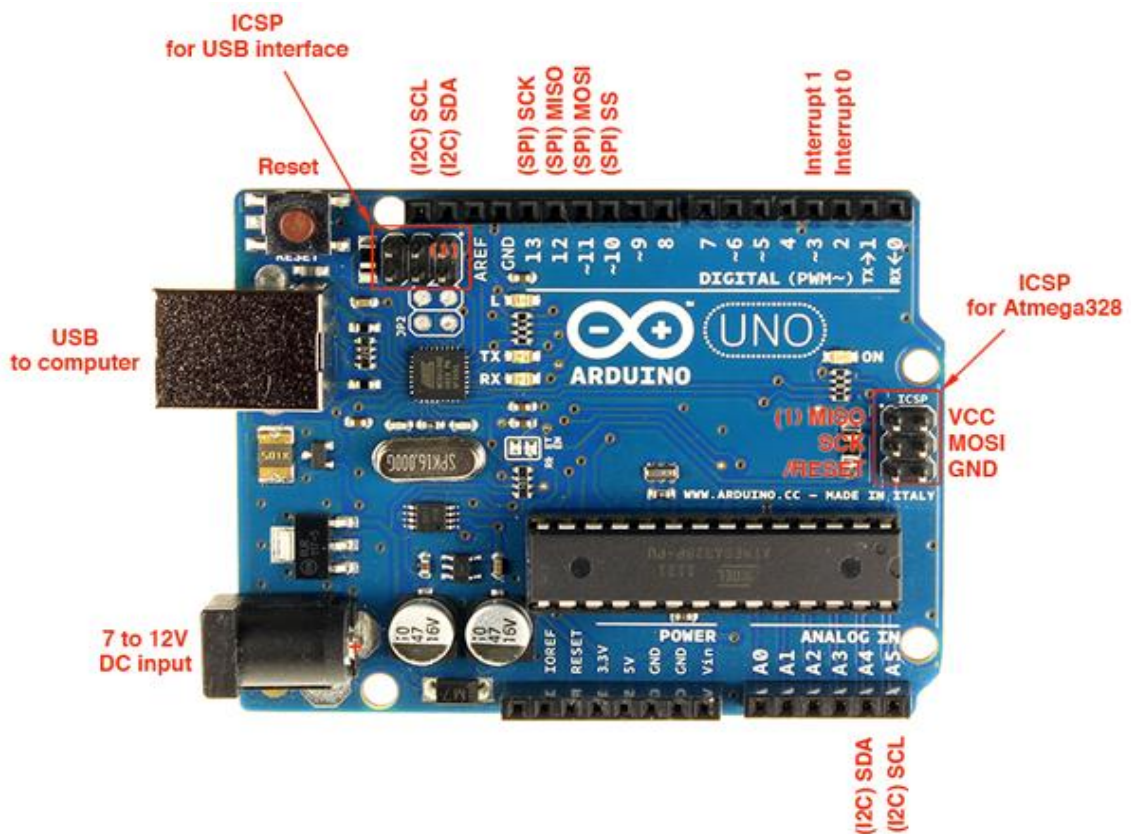


Figure:-3.1 Arduino Diagram

3.1.3) SPECIFICATION :-

| | |
|-----------------------------|-------------------------------------|
| Microcontroller | ATmega 328P |
| Operating Voltage | 5 Volt |
| Input Voltage (recommended) | 7 to 12 Volt |
| Input Voltage (limit) | 6 to 20 Volt |
| Digital I/O Pins | 14 |
| PWM Pins | 6 |
| Analog Input Pins | 6 |
| DC current for I/O pins | 20 mA |
| DC current for 3.3V pins | 50 mA |
| Flash Memory | 32Kb 0.5Kb is used by bootloader |
| SRAM | 2Kb (ATmega328P) |
| EEPROM | 1Kb (ATmega328P) |
| Clock Speed | 16 Mhz |
| LED_BUILTIN | 13 |
| Length | 68.6 mm |
| Width | 53.4 mm |
| Weight | 25 g |

Figure 3.2 Specification of Arduino

3.1.4) DISCRPTION:-

1) Power: - Arduino can be powered by two ways, first is USB connection and second is via external power.

For external power we use battery and connect AC to DC power source via pin to power connector. Or simply connect USB cable from Arduino to computer.

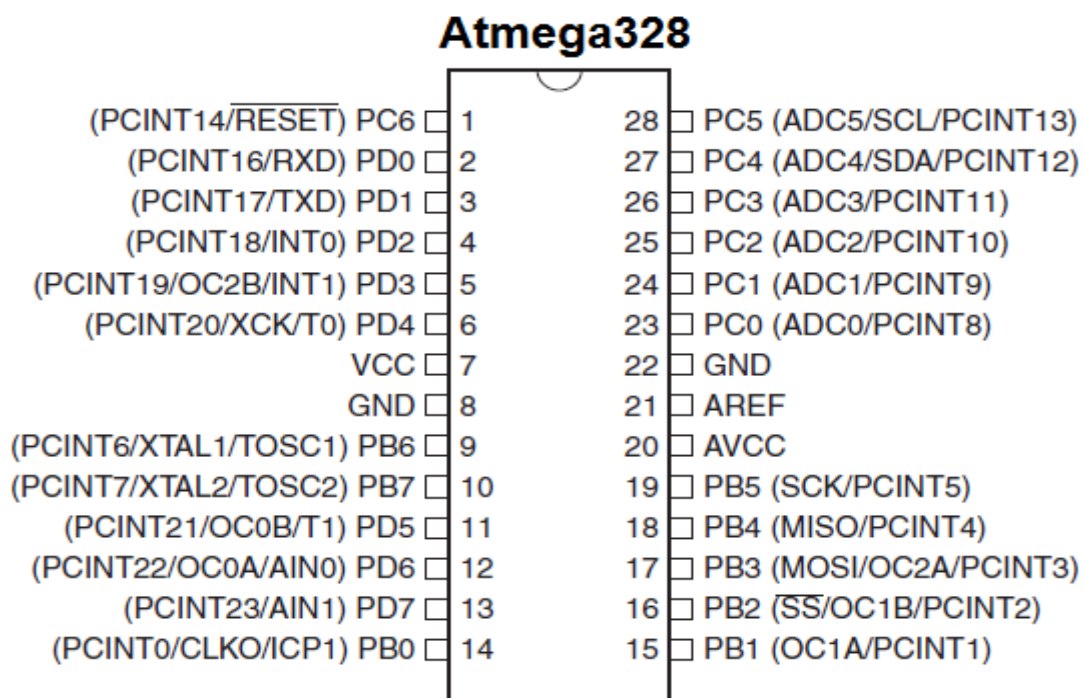
On external supply Arduino operates on supply range between 6 to 20 volts. If input supplied voltage to Arduino is less than 6 V than the voltage from 5V pin of Arduino may be less than 5V. And if input supplied voltage is greater than 12 volts than the voltage regulator may heat or damage the board. So for stable operation input supply should be in range of 6-12 volts.

Power pins :-

- V(input) :- This pin used when we uses external supply for Arduino. We can supply external voltage through this pin.
- 5 Volt :- This is regulated power supply from Arduino. This is used by the microcontroller and other components on board. This 5 volt supply came from Vinput which is regulated by on-board regulator or supplied by USB cable through computer.
- 3.3 Volt :- This supply is also generated by on-board regulator. For this supply maximum current drawn should be around 50 mA.
- Ground:- Ground pin on board are used for ground purpose.

2) **Memory :-** The Arduino has 32Kb of flash memory. This memory is used to store the code. Out of this 32 Kb 0.5Kb is used by the bootloader. Additionally it has SRAM (size of 2Kb) and EEPROM (size of 1Kb). EEPROM can be read and write by the help of EEPROM library.

3.1.5) Pin Diagram:-



Fig

ure 3.3 Pin Diagram Of Atmega328

3) Input And Output :- All the 14 digital pins on the Arduino Uno board can be used as an input or output. To use these pins for input and output purpose we use different functions as per our need. Some major functions on software are pin Mode(), digital Write(), digital Read(). These all pins operate at 5V. For stable operation the maximum current drawn should be 40 mA. For safety of these pins Arduino has inbuilt internal pull up resistor and has a range between 20-50 ohms. In addition, some of these pins have specialized functions:-

- **Serial :-** For serial communication we use digital pin 0 as a receiver and digital pin 1 as a transmitter. For serial transmission of data we have to connect these pins to corresponding pins of the ATmega8U2 USB to TTL serial chip.
- **External Interrupts :-** Pin 2 and Pin 3 are used for serial interrupts. These pins are triggered during a low value, a rising edge, or a change in value.
- **PWM pins :-** digital pins 3,5,6,9,10,11 are used for pulse width modulation, Provide 8-bit PWM output with the help of analog Write() function.
- **SPI :-** Pin 10 (SS), Pin 11 (MOSI), Pin 12 (MISO), Pin 13 (SCK) are used for SPI communication which is provided by the underlying hardware.
- **LED 13 :-** This is built-in LED on board. This is connected to digital pin 13. When pin value is high, the LED turns On. When pin value is LOW, the LED turns OFF.

The board also has 6 analog input pins. All pins have 10 bit resolution means each pin can provide 1024 different values. By default these values are measured between 0 to 5V. but we can also change the range of it by using AREF pin on board or via analog Reference() function.

Some of analog pins are used for different purposes :-

- **I2C communication:-** Pin 4 (SDA) and 5 (SCL) support I2C (TWI) communication using the Wire library.
- **AREF :-** This is used as reference voltage for the analog inputs. And it is used with analog Reference() function.

- **Reset :-** This is used to reset the microcontroller. Bring this line LOW to reset the microcontroller.

4) Communication :- The Arduino Uno can be easily connected to computer or with another controller. There are many methods for its communication. The ATmega328 IC provides UART TTL serial communication to communicate with other computers and controllers. For serial communication we use digital pins 0 for receiver (RX) and digital pin 1 for transmitter (TX) and there is no need for external driver for this communication.

The Arduino software has serial monitor through which we can send textual data from computer to Arduino. The data is received and transmitted by digital pins 0 and 1. And the receiver and transmitter LEDs will be continuously blinking during data transmission.

For serial communication on digital pins of Arduino we use special library i.e Serial library

The ATmega328 IC on Arduino also supports I2C (TWI) and SPI communication techniques for serial communication. For I2C bus serial communication Arduino software provides a Wire library to simplify the operation.

5) Programming :- The Arduino Uno is easy to program. It is programmed with software Arduino IDE.

The IC used in Arduino is ATmega328 which comes with preburned bootloader. So every time we can upload new code without use of external hardware programmer. It uses the STK500 protocol for communication.

We can also program our controller with the help and program the microcontroller with the help of ICSP (In-Circuit Serial Programming) header.

6) USB Overcurrent Protection :- The Arduino Uno has a resettable poly fuse which protects it from short circuit and over current. Now a days most computers and

controller provides internal protection for safety, But this poly fuse provides an extra layer of protection over short circuit and over current. If current on board is greater than 500mA than poly fuse break the connection till the short circuit is removed or over current get lowered below 500mA.

3.1.6) ADVANTAGES OF ARDUINO:-

1) Ready to use structure :-

The main advantage of Arduino is due to its ready to use structure. Because Arduino comes in full package. It has its own voltage regulator, burner, oscillator, serial communication interface, LED and pin header for connection. So we don't need to worry about external hardware like boot loader, voltage regulator etc.

2) Effortless functions :-

In Arduino software many functions are easy to use. And one more important advantage of Arduino is that it has automatic unit conversion capability which makes it more usable in daily life projects. So during the debugging we are free from unit conversions, So we don't have to worry about it.

3) Large Community :-

On internet we can easily get many forums and projects on Arduino. Many professionals, engineers etc are using Arduino for their major projects. Because it is so widely used that we can get everything on Arduino from internet. Also its software operations are very easy to use.

3.2) LCD DISPLAY (16×2) :-

3.2.1) INTRODUCTION :- LCD (Liquid Crystal Display) screen is an electronic display. A 16×2 LCD display is commonly used in various devices and circuits. LCDs are much better than its all competitors like seven segment LEDs etc. The advantage of LCDs are that they are more economical and they are easy to programme. And they are also able to display special characters which are not possible in seven segments. A 16x2 LCD means that we can display 16 characters in horizontally and we can have maximum 2 rows. In 16×2 LCDs each character is displayed in matrix form (5×7 pixel). LCDs have two type of registers command and data

The command registers are used to stores the command instructions. These instructions are given to the LCD for its initialization. A command instructions are for following tasks such as clearing screen, setting cursor position, controlling display etc.. The data register are used to stores the data. Which has to be shown on the LCD. The data of a characters to be displayed is in the form of ASCII value.

3.2.2) DIAGRAM :-

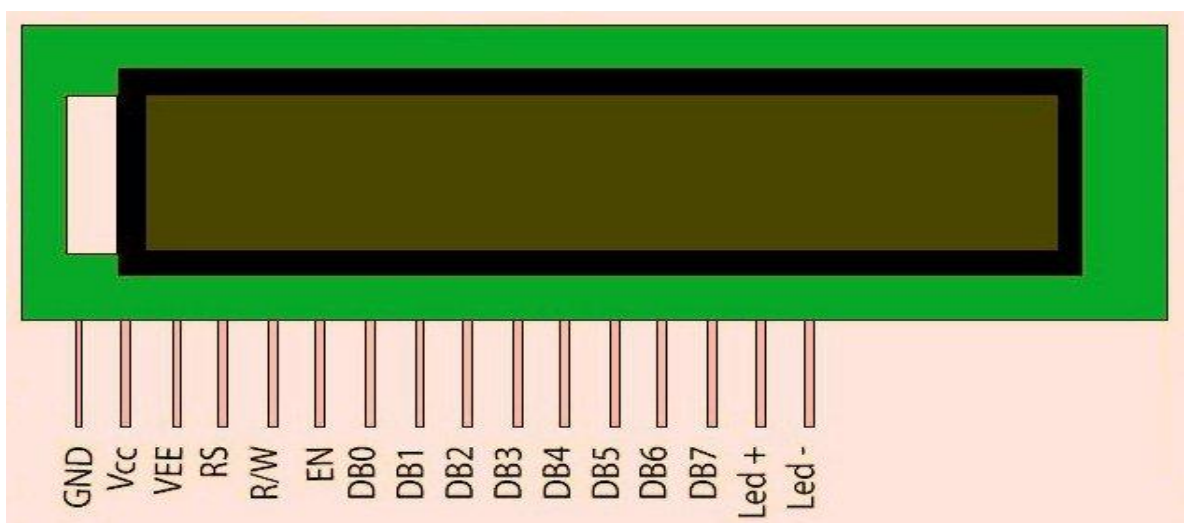


Figure 3.4 Lcd Diagram

3.2.3) Pin Description:-

| Pin No | Function | Name |
|--------|--|-----------------|
| 1 | Ground (0V) | Ground |
| 2 | Supply voltage 5V (4.7V – 5.3V) | V _{CC} |
| 3 | Contrast adjustment; through a variable resistor | V _{EE} |
| 4 | Selects command register when low; and data register when high | Register Select |
| 5 | Low to write to the register; High to read from the register | Read/write |
| 6 | Sends data to data pins when a high to low pulse is given | Enable |
| 7 | 8-bit data pins | DB0 |
| 8 | | DB1 |
| 9 | | DB2 |
| 10 | | DB3 |
| 11 | | DB4 |
| 12 | | DB5 |
| 13 | | DB6 |
| 14 | | DB7 |
| 15 | Backlight V _{CC} (5V) | Led+ |
| 16 | Backlight Ground (0V) | Led- |

Figure 3.5 Lcd Pin Description

3.3) LCD INTERFACING WITH ARDUINO UNO:-

In arduino-uno LCD has a library(Liquid Crystal Library) allows us to control the display with the help its functions example display(), no display() etc.

3.3.1) CIRCUIT DISCRPTION :- This circuit diagram shows how connect LCD with Arduino Uno.

1) Components required :-

- Arduino Uno board
- 16×2 LCD display
- Pin headers for LCD connection
- Potentiometer (10k ohm)
- Resistor (220 ohm)
- Connecting Wires
- Breadboard

2) Connections :- First of all we connect pin header to LCD pins. After that we connect LCD pins with Arduino as :-

- Connect RS pin of LCD to digital pin 12 of Arduino
- Connect Enable pin of LCD to digital pin 11 of Arduino
- Connect D4 pin of LCD to digital pin 5 of Arduino
- Connect D5 pin of LCD to digital pin 4 of Arduino
- Connect D6 pin of LCD to digital pin 3 of Arduino
- Connect D7 pin of LCD to digital pin 2 of Arduino

And connect pins of 10K ohm potentiometer to +5Volt supply and 2nd pin to GND, And connect its third pin to pin 3 of LCD. And connect 560 ohm resistor with 5V. This

is done to Power the backlight of LCD display. This resistor is connected to pin 15 of LCD.

3) Diagram :-

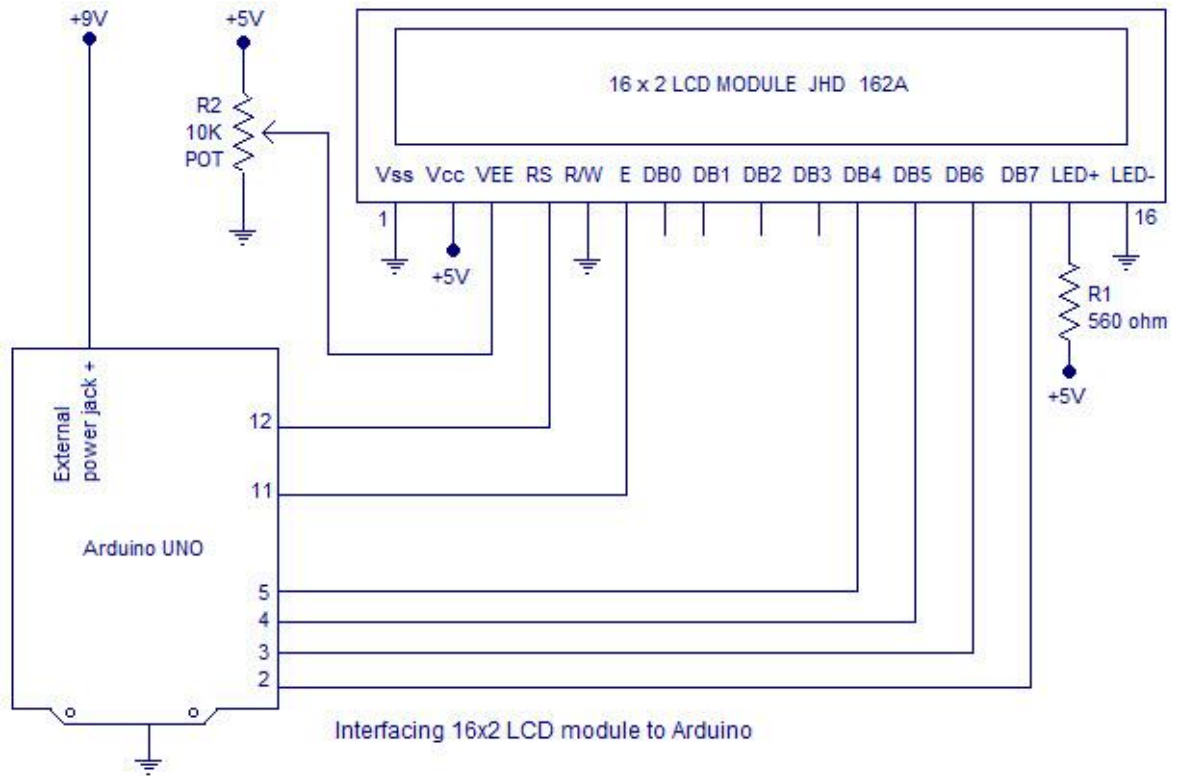


Figure 3.6 Lcd Interfacing With Arduino

Chapter-4

SOFTWARE DESCRIPTION AND SIMULATION

Software used are:-

- 1) Proteus. (Version 7.7)
- 2) Arduino IDE.

4.1) Proteus

4.1.1) Introduction

Proteus is a software used for simulation. We can simulate any practical electronic scenario in proteus. It is similar to P-spice but the only difference is that it can also simulate microcontrollers and allow us to burn code in microcontrollers and simulate it.

About proteus:-

It is a software suite that supports schematic simulation as well as PCB designing

- ISIS:- It is the software that is used to draw schematics and simulate the circuits in real time. It allows human access during run time, hence provide real time simulation.
- ARES:-It is used for PCB designing. It allows us to view output in 3D view of the designed PCB along with components.
- The designer can also develop 2D images for the product

4.1.2) Proteus features:-

- ISIS has large range of components in its library.

- It has signal generators, measurement and analysis tools like voltmeter, ammeter, oscilloscope etc
- It contains many other features like probes, switches etc.
- Other components like resistor, inductor ,capacitor, potentiometer, voltmeter, ammeter etc. is also present in it.
- In ARES we can have PCB designing up to fourteen(14) layers.
- It gives both options as routing that is auto routing and manual routing.

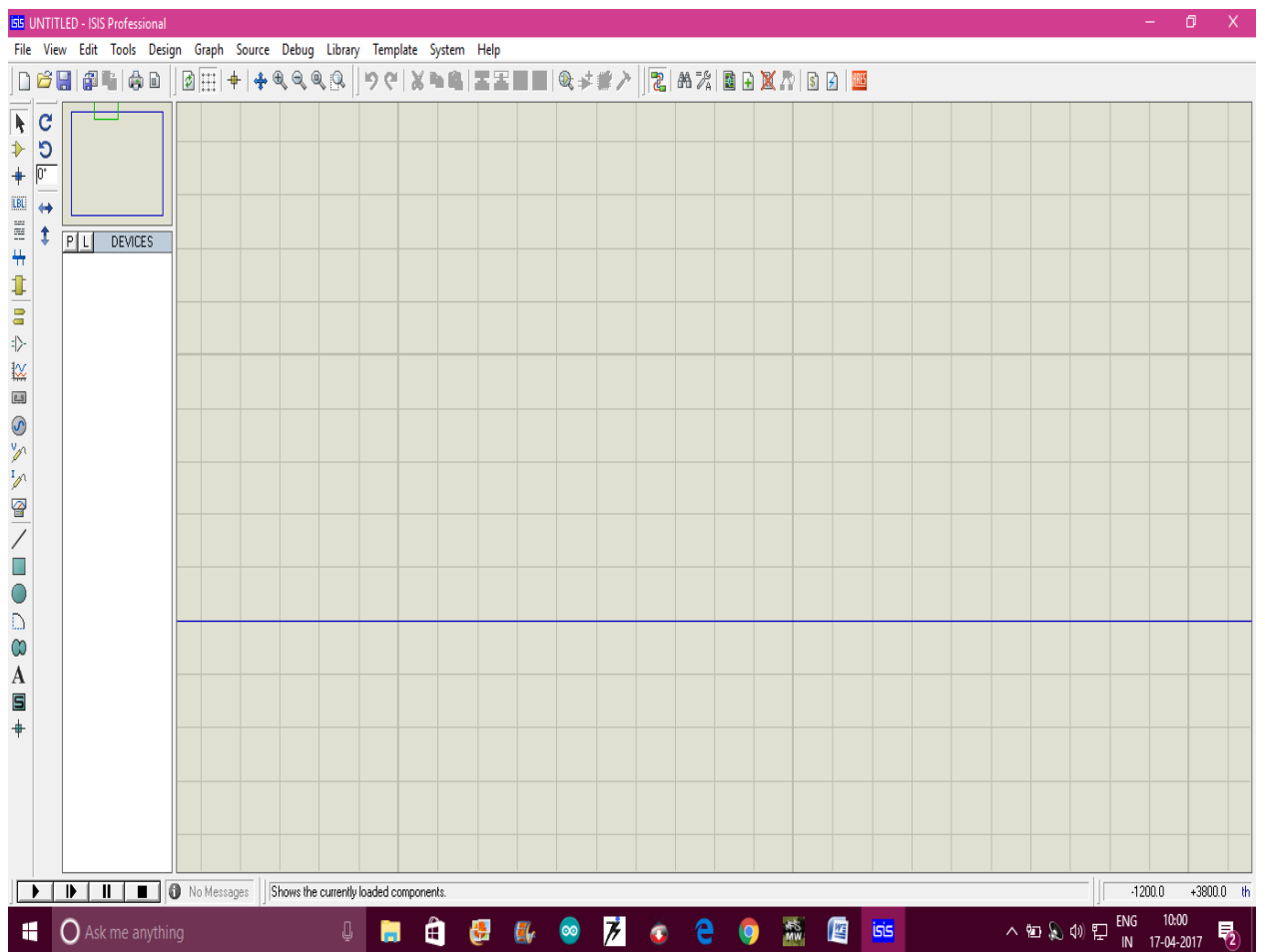


Figure 4.1 Proteus first page

4.1.3) Tools description:-

1) Selection mode:-

The first button on the top is selection mode. It is used to select any component.

2) Component mode:-

This second button is used to select components from the list.

3) Junction dot mode :-This is used where two wires are in contact with each other .It is used to differentiate it from the scenario when they are just crossing each other.

4)Wire label mode:-

Used to label the wire.

5)Text script mode

6) Sub circuit mode:-

This to used for circuit inside a circuit.

7) Device pins mode:-

This is used for the description of pins of a device. It is used when description of any device having pins is required.

8) Generator mode:-

It is used to generate signals like sin, dc ,pulse , audio signals etc.

9) Probe mode:-

This contains two types of mode current probe and voltage probe mode.

Current mode:- This probe is used to find current in any part of circuit.

Voltage mode:- This probe is used to find voltage in any part of circuit.

10) Virtual Instruments mode:-

This mode is helpful for having virtual instruments in the circuit like ammeter, voltmeter, oscilloscope, signal generator etc.

11) Auto router

This is used for auto routing while designing schematic for PCB designing.

4.2) Simulation results:-

We have simulated the circuits on proteus as shown:.....

4.2.1) Transmitter:-

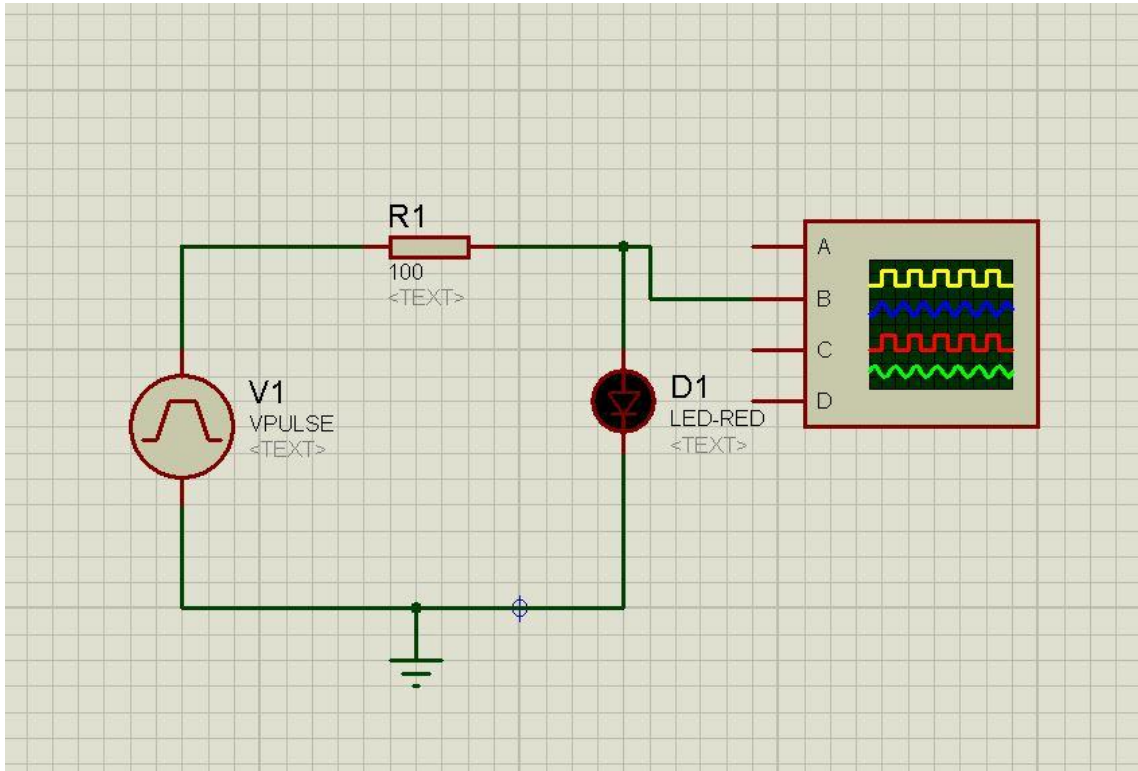


Figure 4.2 Transmitter diagram on proteus

The input square pulse is given to led and oscilloscope is used to see the output as shown in fig.4.2.

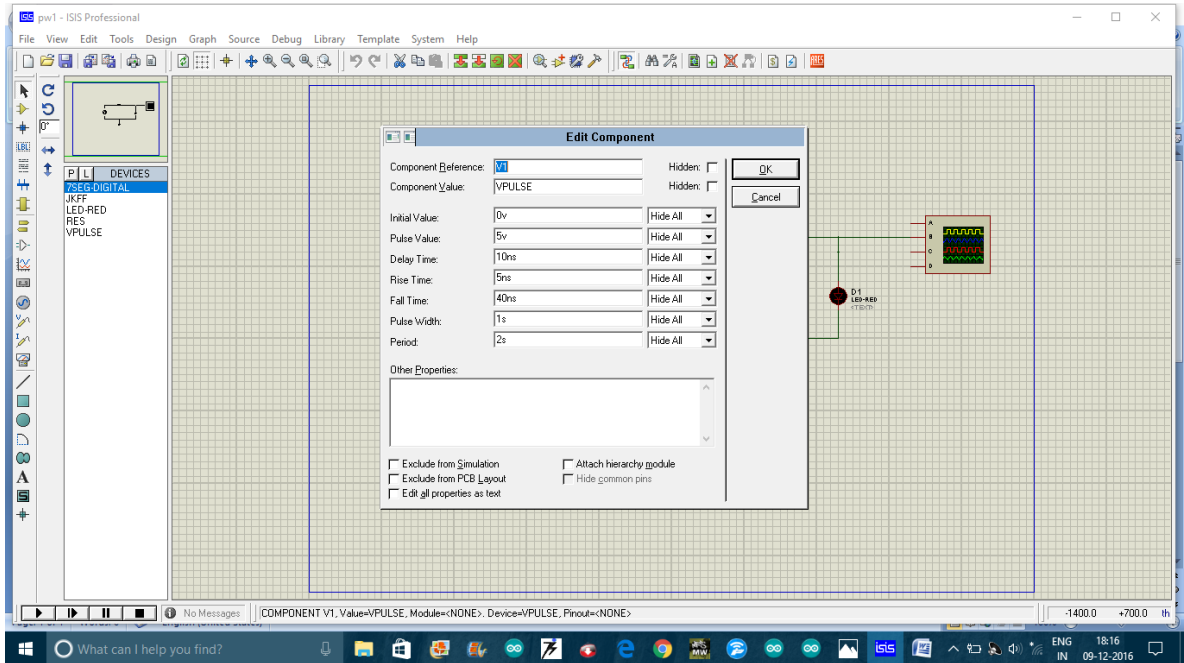


Figure 4.3 Square pulse configuration

The configuration of square pulse is done like duty cycle , rise time ,fall time etc.as shown in figure 4.3.

Output

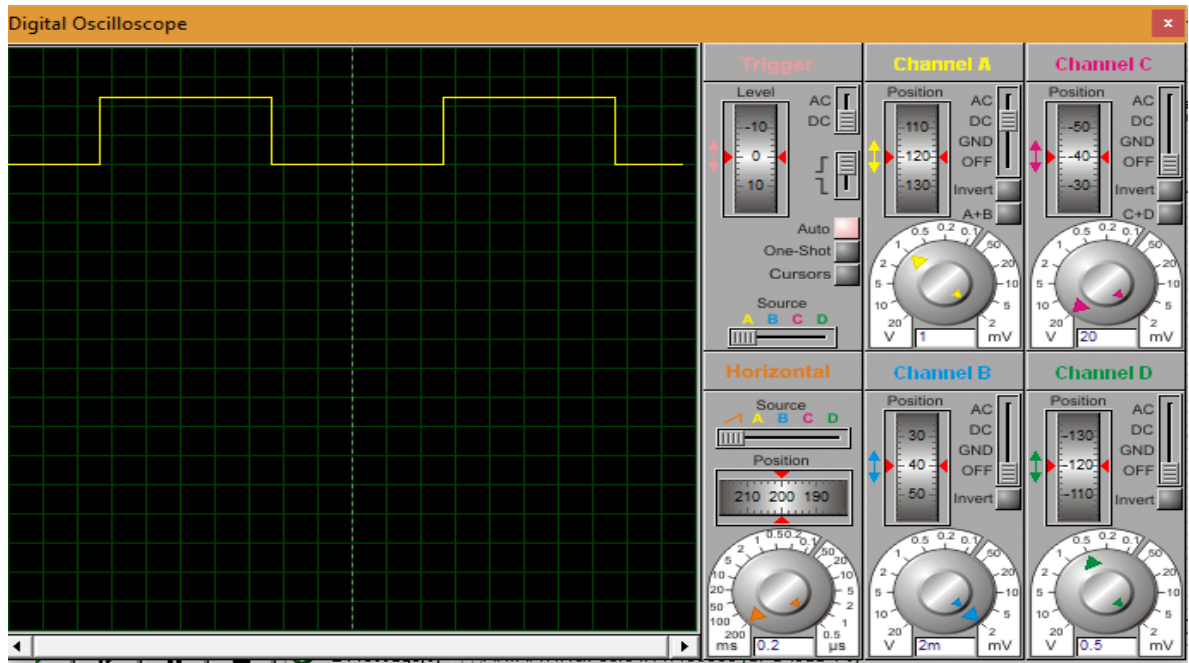


Figure 4.4 Output of transmitter

From the output it is clear that the led blink according to the input signal given to it.

4.2.2) Led Driver Circuit

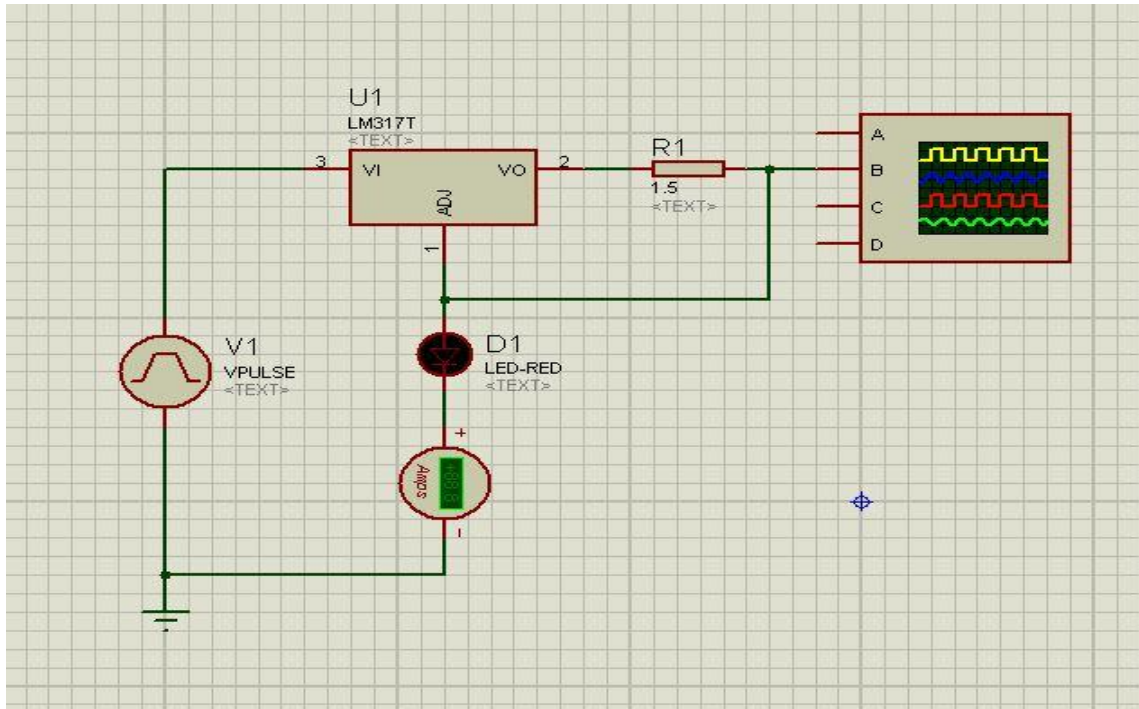


Figure 4.5 Led driver circuit simulation

The driver circuit helps to provide proper operating conditions for the led. The IC LM317T can be used as an Led driver as shown in fig.4.5.

Output

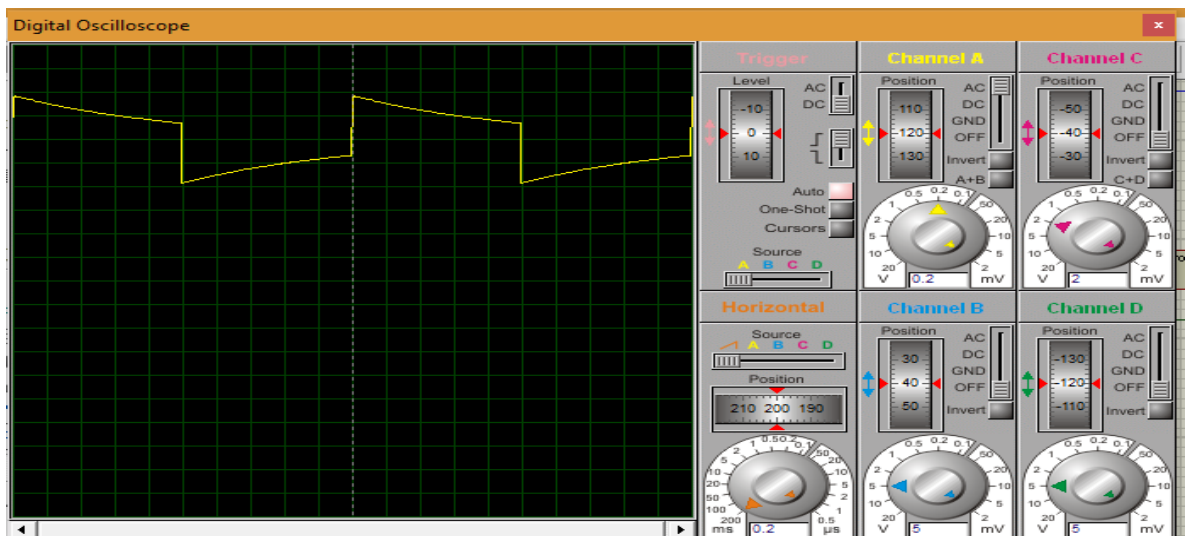


Figure 4.6 Output of driver circuit

From the output as shown above the '1' and '0' can be easily determined.

4.2.3) Trans- impedance Amplifier

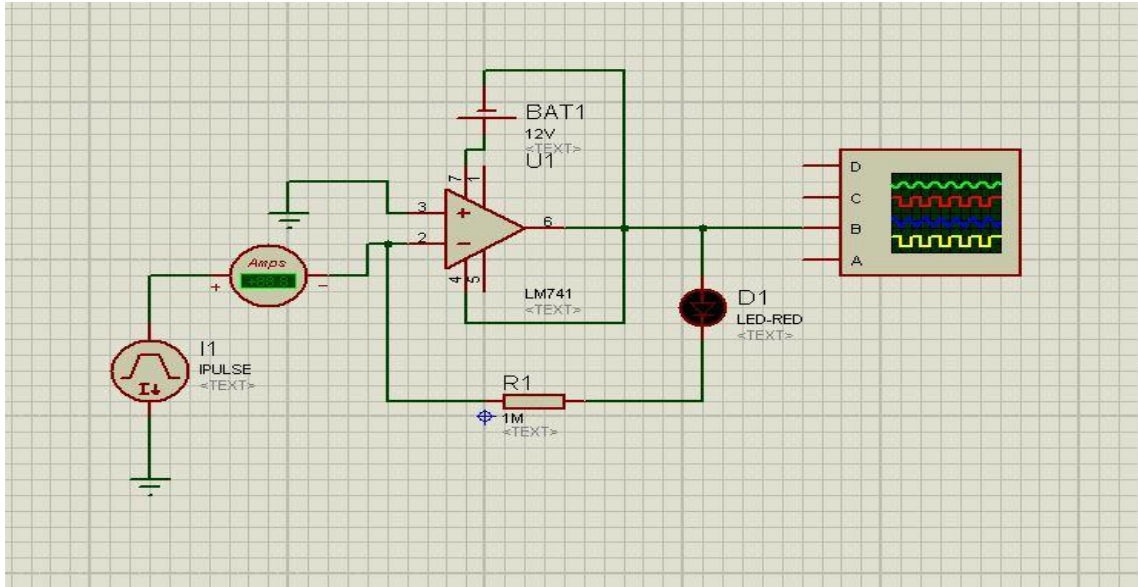


Figure 4.7 Simulation of amplifier

The trans- impedance amplifier is used to amplify the weak output current from photodiode .In this simulation it is assumed that the signal will reach at photodiode. So a constant current source is used as input.

Output

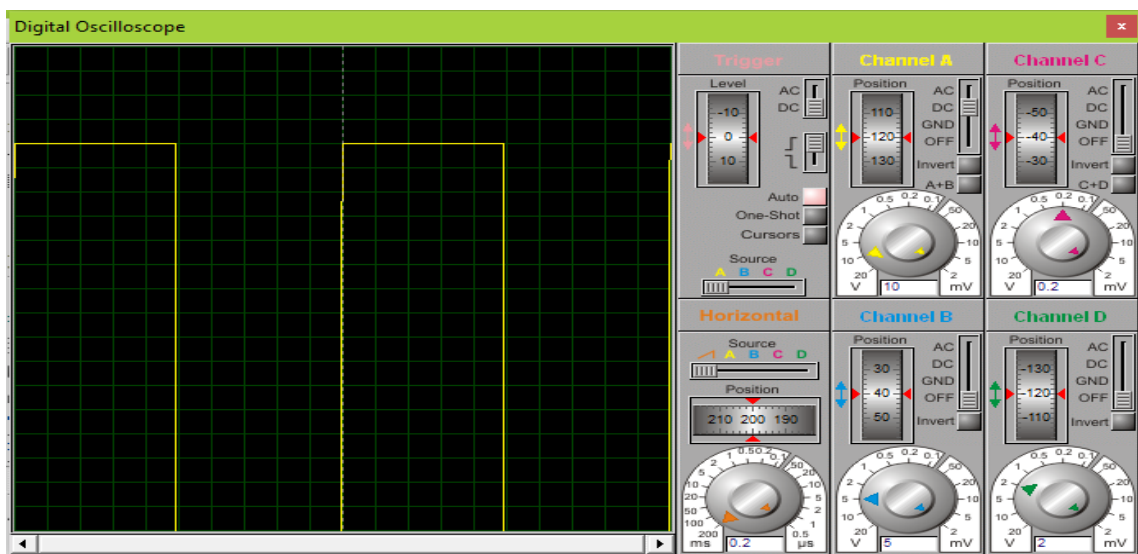


Figure 4.8 Output of amplifier

It is clear from the fig.4.8 that the photodiode output got amplified.

4.2.4) Receiver Circuit

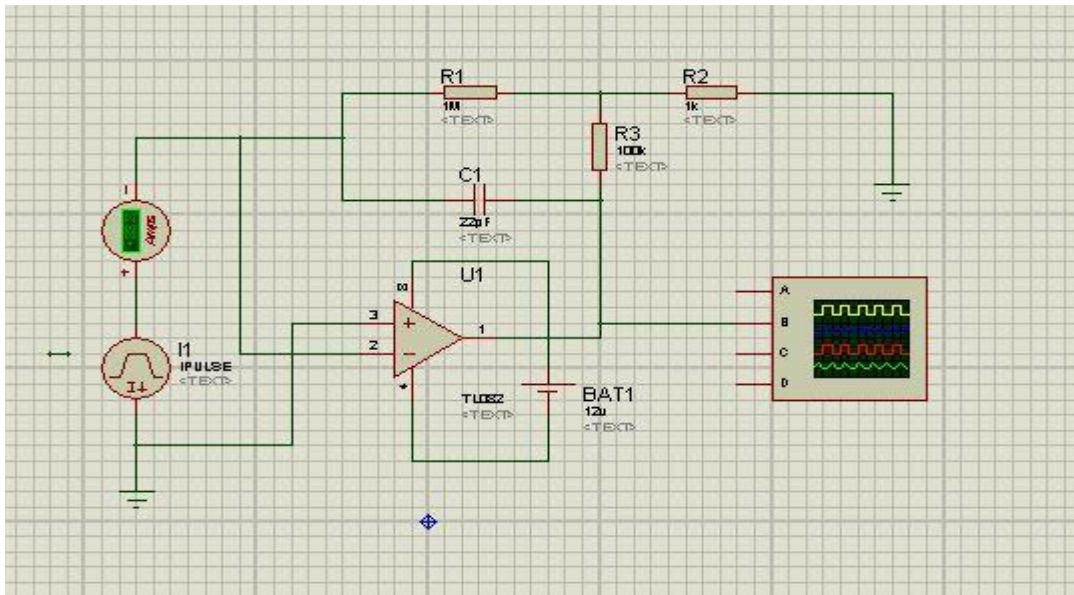


Figure 4.9 Simulation of receiver

The simulation of whole receiver is done as shown in fig.4.9

Output

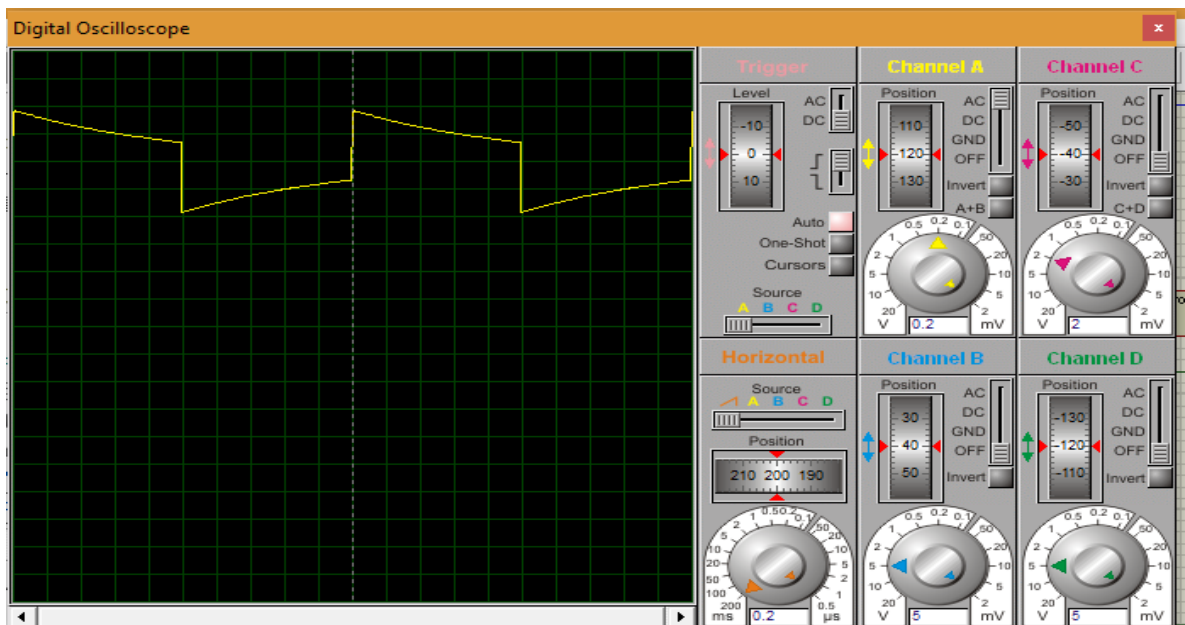


Figure 4.10 Output of receiver

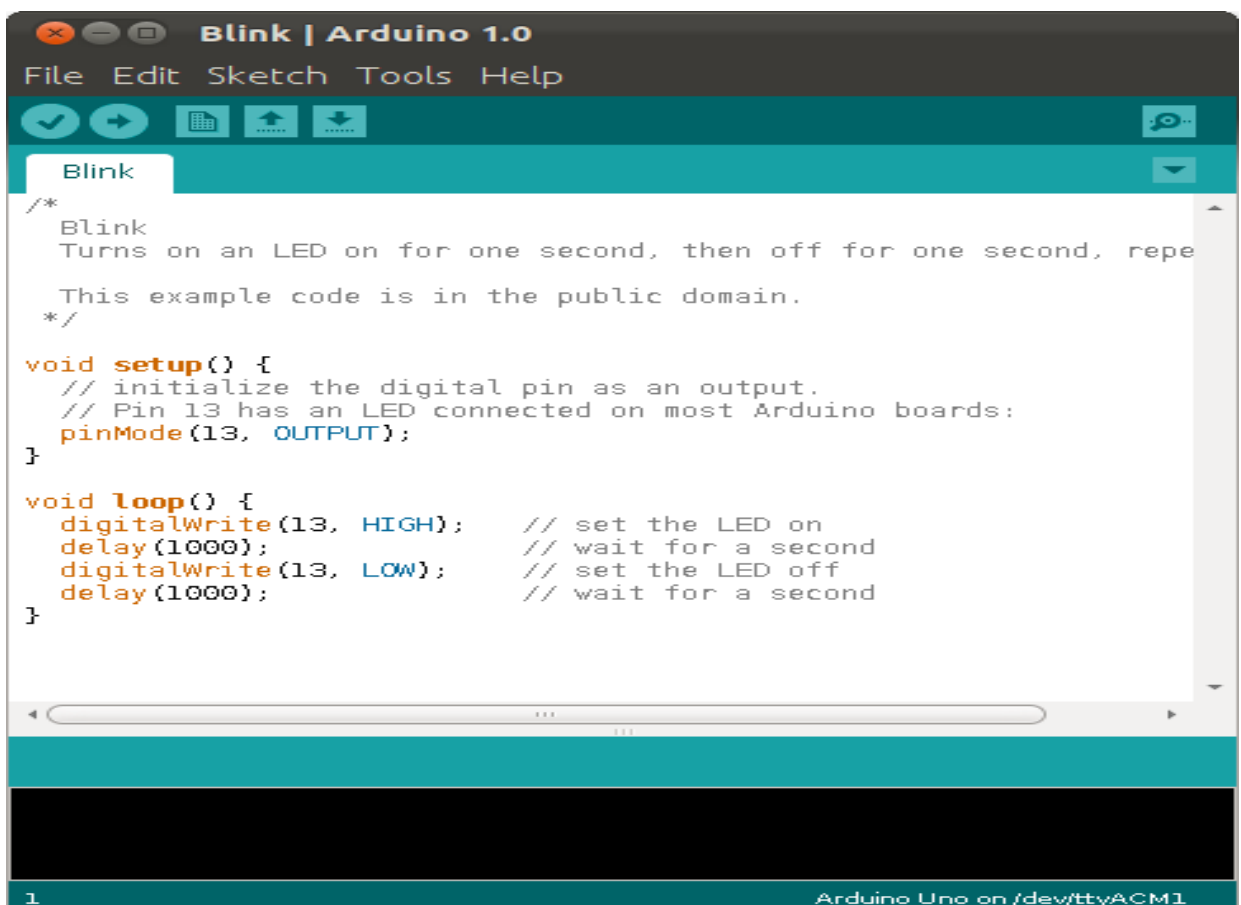
The output shows that the signal is received at receiver.

4.2) Arduino IDE:-

4.2.1) Introduction

Arduino IDE is a platform where we can code that will allow us to make the arduino behave in the way we want it to behave. It is an Integrated Development Environment created specially for arduino board. We can use embedded C to code in this. It is similar to C but the only difference is in the syntax. It is an open source software that makes it easy to write and upload code on board. It can run on windows, mac, linux. the programming language used to write it is java. It has code editor that has many features like searching, brace matching, automatic indenting etc. It also contains a message box, a text console, a toolbar with buttons for common functions[7].

A program written in this IDE is called sketch. They are saved with .ino extension.

The image shows a screenshot of the Arduino IDE interface. The window title is "Blink | Arduino 1.0". The menu bar includes "File", "Edit", "Sketch", "Tools", and "Help". Below the menu bar is a toolbar with icons for saving, running, and other functions. The main editor area displays the code for a "Blink" sketch. The code includes a comment block, a setup function that initializes pin 13 as an output, and a loop function that toggles the LED on and off with 1000ms delays. The status bar at the bottom indicates "1" and "Arduino Uno on /dev/ttyACM1".

```
/*
 * Blink
 * Turns on an LED on for one second, then off for one second, repeatedly.
 * This example code is in the public domain.
 */

void setup() {
  // initialize the digital pin as an output.
  // Pin 13 has an LED connected on most Arduino boards:
  pinMode(13, OUTPUT);
}

void loop() {
  digitalWrite(13, HIGH); // set the LED on
  delay(1000);           // wait for a second
  digitalWrite(13, LOW); // set the LED off
  delay(1000);          // wait for a second
}
```

Figure 4.11 Arduino IDE First Page

CHAPTER-5

IMPLEMENTATION

5.1) IMPLEMENTATION

After verification of simulation results the actual implementation is done. The input signal number is given with the help of arduino terminal and output is shown on LCD.as shown below:-

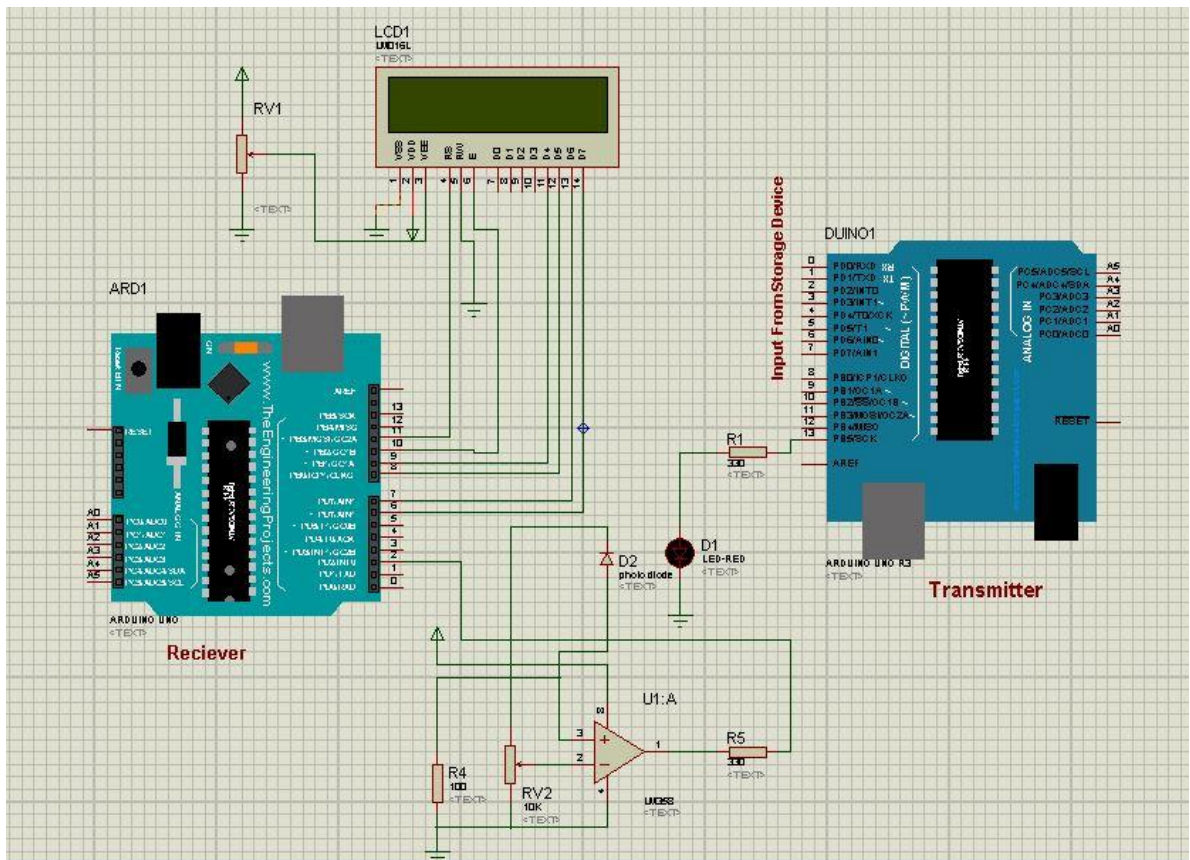


Fig 5.1 Design On ISIS Professional

The overall design of the whole system is done on the proteus. Firstly .the data is sent to the microcontroller which is further send to the led and received by photodiode and displayed on LCD.

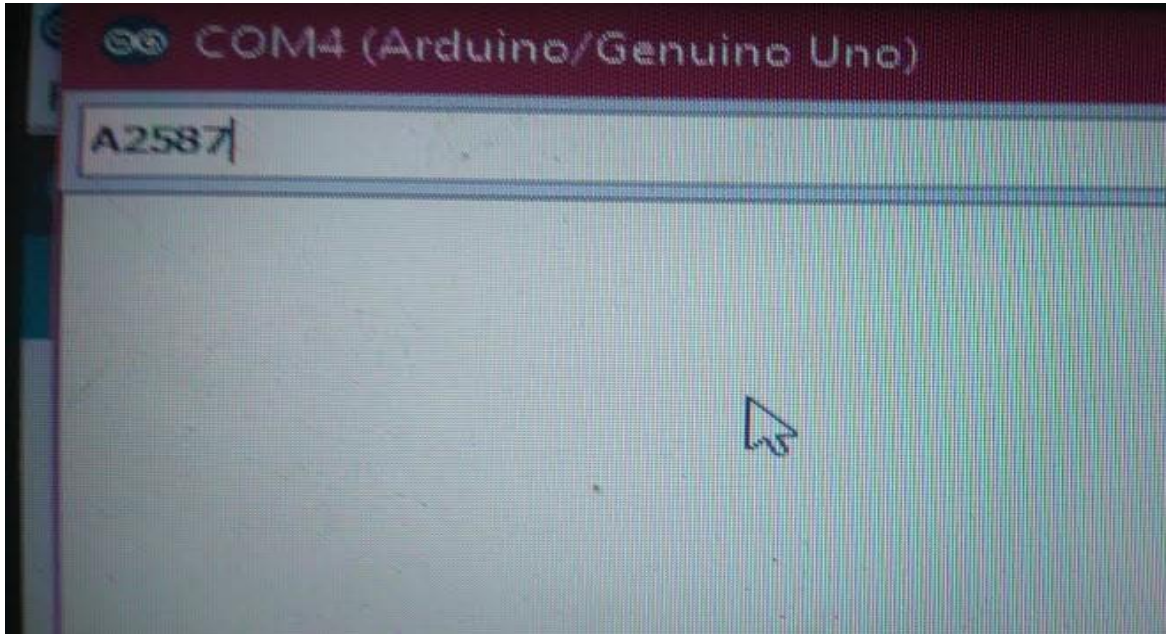


Fig 5.2 Transmission From Serial Monitor

The data is sent through the serial monitor. It can be alphabet or any number.

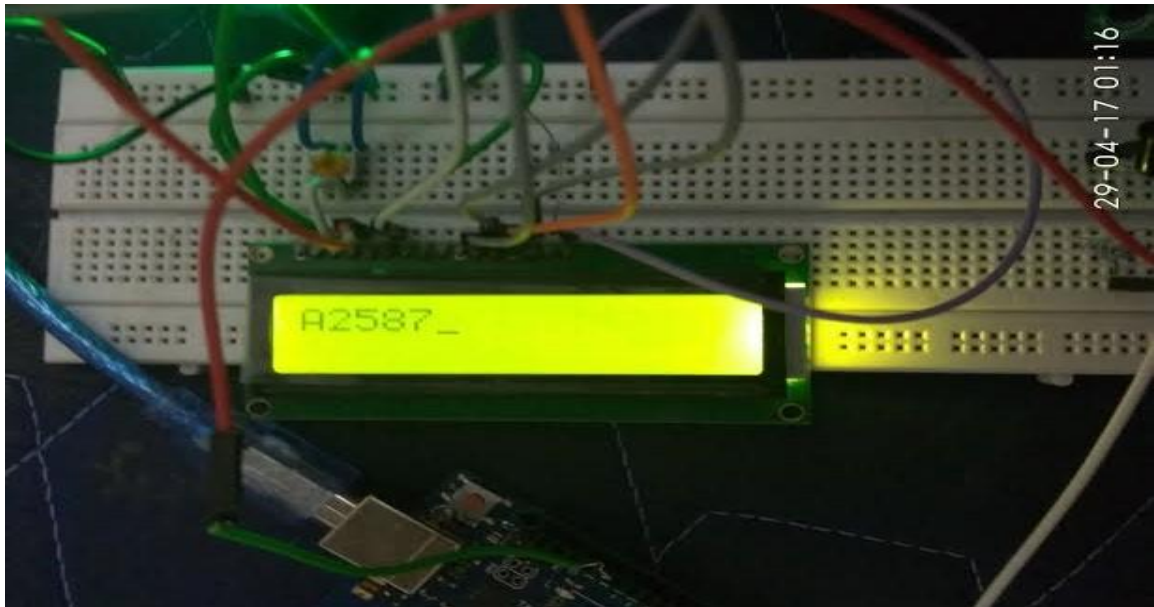


Fig 5.3 Data Received On LCD

The data send from the serial monitor is received by the LCD.

CHAPTER-6

CONCLUSION

The vehicle number which is sent by the vehicle is received successfully at the receiver or toll side. The range of communication can be easily increased by using a cluster of led at the sender side. The system will be very helpful for toll collection and will help to reduce the consumption of fuel.

APPENDIX-A

CODE

1) SENDER CODE

```
void setup()

{

  Serial.begin(9600);

  pinMode(13,OUTPUT);

}

void loop() {

if(Serial.available(>0)

{s_num =Serial.read();}

if(s_num=='0'){

  digitalWrite(13,HIGH);

  delay(100); //the specified time for 0

  digitalWrite(13,LOW);

  delay(100);}

if(s_num=='1'){

  digitalWrite(13,HIGH);

  delay(200);

  digitalWrite(13,LOW);

  delay(200);}

if(s_num=='2'){
```



```
digitalWrite(13,HIGH);

delay(300);

digitalWrite(13,LOW);

delay(300);}

char s_num; if(s_num=='3'){

digitalWrite(13,HIGH);

delay(400);

digitalWrite(13,LOW);

delay(400);}

if(s_num=='4'){

digitalWrite(3,HIGH);

delay(500);

digitalWrite(13,LOW);

delay(500);}

if(s_num=='5'){

digitalWrite(13,HIGH);

delay(600);

digitalWrite(13,LOW);

delay(600);}

if(s_num=='6'){

digitalWrite(13,HIGH);

delay(700);
```

```
digitalWrite(13,LOW);

delay(700);}

if(s_num=='7'){

digitalWrite(13,HIGH);

delay(800);

digitalWrite(13,LOW);

delay(800);}

if(s_num=='8'){

digitalWrite(13,HIGH);

delay(900);

digitalWrite(13,LOW);

delay(900);}

if(s_num=='9'){

digitalWrite(13,HIGH);

delay(1000);

digitalWrite(13,LOW);

delay(1000);}

digitalWrite(13,LOW);

s_num=10;

}
```


1) Explanation:-

In the sender code we are first sending any data through computer terminal and based on the digit sent we are making the led to glow accordingly. For example: If the digit sent is 0 led will glow for a very short time and the time duration increases accordingly. The main functions used are pin Mode(),Serial.begin(), Serial.available(), Serial.read(),Digital read(),Digital write(),delay().

2) Reciever code:

```
#include<LiquidCrystal.h>

LiquidCrystal lcd(7,6,8,9,10,11);

unsigned long c_t=0;

unsigned long s_t=0;

unsigned int t0;

unsigned int long t=0;

void setup() {

lcd.begin(16,2);

lcd.cursor();

pinMode(2,INPUT);

Serial.begin(9600);

}

void loop()

{

t=pulseIn(2,HIGH,2000000)/1000;

t=t-t%100;

Serial.println(t);//for test with serial monitor
```

```

Serial.println(t%100);

if(t>1)

{

t=t+100;

}

if(t==100){Serial.println("0");lcd.print("0");}

if(t==200){Serial.println("1");lcd.print("1");}

if(t==300){Serial.println("2");lcd.print("2");}

if(t==400){Serial.println("3");lcd.print("3");}

if(t==500){Serial.println("4");lcd.print("4");}

if(t==600){Serial.println("5");lcd.print("5");}

if(t==700){Serial.println("6");lcd.print("6");}

if(t==800){Serial.println("7");lcd.print("7");}

if(t==900){Serial.println("8");lcd.print("8");}

if(t==1000){Serial.println("9");lcd.print("9");}

}

```

1) Explanation:-

In this code we are receiving the digit send by the sender to detect this we are measuring the width of the square pulse that we are receiving and based on that we find for how much time we are receiving the signal and the sending led is on and find the corresponding digit. Some main functions used are Liquid Crystal lcd(),lcdprint.

APPENDIX-B

REFERENCES

- [1] S.Nandhini , P.Premkumar “Automatic Toll Gate System Using Advanced RFID and GSM Technology” International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, nov. 2014, Vol. 3, Issue 11, pp. 701-703.
- [2] Shaista Tarannum,“Data transmission Through Smart Illumination Via Visible Light Communication Technology”International Journal of Technical Research and Applications(IJTRA), mar.-apr. 2016, Volume 4, Issue 2, pp. 136-141.
- [3] Sagotra Rajan, Aggarwal Reena,“Visible light communication” International Journal of Computer Trends and Technology (IJCTT) , apr. 2013, Volume 4 Issue 4,
- [4] Zubin Thomas, Nikhil kumar, Dr. Jyothi Preshiya, “Automatic billing system using LIFI” International Conference on Communication and Signal Processing(ICCSP), Melmaruvathur, India, apr.2016 ,pp.2216-2219.
- [5] Noof Al Abdul Salam, Raya Al Hajri, Zahra Ali Abri, “Design and implementation of a vehicle to vehicle communication system using Li-Fi technology.” Information and Communication Technology Research (ICTRC), Abu Dhabi, United Arab Emirates, may 2015,pp. 136 -139.
- [6] P. Kuppusamy, S. Muthuraj, S. Gopinath, “Survey and Challenges of Li-Fi with Comparison of Wi-Fi” International Conference on Wireless Communications, Signal Processing and Networking (WISPNET), Chennai, India, mar.2016
- [7]ShilpaMahajan“MicrocontrollerBasedAutomaticTollCollectionSystem”,International Journal of Information and Computation Technology(IJCTT),apr.2013.Volume3, Number 8, pp. 793-800.
- [8] Galande S.D.,Oswal S.J.,Gidde V.A.,Ranaware N.S.,Bandgar S.B. “Automated Toll Cash Collection System for Road Transportation”International Journal of Computer Science and Mobile Computing, feb. 2015 ,Vol. 4, Issue. 2, pp.216 – 224.

Submission Info

| | |
|------------------|-----------------------------|
| SUBMISSION ID | 806356337 |
| SUBMISSION DATE | 28-Apr-2017 13:11 |
| SUBMISSION COUNT | 1 |
| FILE NAME | Project_Reprot_Akhil_Nik... |
| FILE SIZE | 2.34M |
| CHARACTER COUNT | 24175 |
| WORD COUNT | 4889 |
| PAGE COUNT | 44 |
| ORIGINALITY | |
| OVERALL | 16% |
| INTERNET | 15% |
| PUBLICATIONS | 1% |
| STUDENT PAPERS | 11% |
| GRADEMARK | |
| LAST GRADED | N/A |
| COMMENTS | 0 |
| QUICKMARKS | |


LIBRARIAN
LEARNING RESOURCE CENTER
Jaypee University of Information Technology
Wazirpur, Distt. Solan (Himachal Pradesh)
Pin Code: 173234

