A PROJECT REPORT
ON

BLUETOOTH BASED SUBSTATION MONITORING SYSTEM

Submitted in partial fulfillment of requirements
For the award of the degree of
DIPLOMA
In
ELECTRICAL AND ELECTRONICS ENGINEERING
STATE BOARD OF TECHNICAL EDUCATION AND TRAINING

M.BALA KRISHNA	**(19233-EE-213)**
P.RAMU	**(19233-EE-214)**
V.HARILAL	**(19233-EE-215)**
P.SHIVA SHENKARA VARA PRASAD **M.RISHIKSAI**	**(19233-EE-216)**
M.RISHIKSAI	**(19233-EE-218)**

Degree

DIPLOMA

In

ELECTRICAL AND ELECTRONICS ENGINEERING

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING

By
Under the Esteemed guidance of

MOHAMMED MASOOD

Assistant professor Department of EEE

ESTD:2001
Department of Electrical and Electronics Engineering

ACKNOWLEDGEMENT

We would like to thank our training guide **Mr.MOHAMMED MASOOD sir** , for his inspiration and guidance throughout my training. The interest she showed in our training was admirable and motivation.

I express thank to **Head of the Department**, EEE **DR.M.RAJENDAR REDDY** for his administration on preparing this description

We also thank our principal **DR.S.RAVINDER REDDY**, Mahaveer institute of science and technology for his kind encouragement and support.

I express my profound gratitude to our charman, **S.SUDARSHAN REDDY**, of Mahaveer Institutes of Science and Technology, polytechnic, Bandlaguda, Hyderabad.

MAHAVEER INSTITUTE OF SCIENCE AND TECHNOLOGY

BANDLAGUDA, HYDERABD – 500005

2019-2022

Department of Electrical and Electronics Engineering

ESTD : 2001

CERTIFIACATE

This is M.BALAKRISHNA, P.RAMU, D.HARILAL, P.SHIVASHENKARA VARAPRASAD, M.RISHIKSAI bearing pin number 19233-EE-213,214,215,216,218 respectively, completed project of " BLUETOOTH BASED SUBSTATION MONITORING SYSTEM "in partial fulfillment for ward of diploma in "ELECTRICAL AND ELECTRONICS ENGINEERING" to the state board of technical education and training is a record of bonafide work carried by her/him.

INTERNAL GUIDE **HEAD OF DEPARTMENT**

EXTERNAL EXAMINER **PRINCIPAL**

DECLARATION

I hereby declare that the report entitled " BLUETOOTH BASED SUBSTATION MONITORING SYSTEM " **being submitted to SBTET in partial fulfilment for the requirement for the award of degree of diploma in electrical and electronics engineering done by me and has not been submitted elsewhere for award of any degree.**

CONTENT LIST :

S. NO	CHAPTER NAME	PAG NO
1.	SUBSTATION MONITORING SYSTEM	6
2.	INTRODUCTION	7-8
3.	HARDWARE COMPONENTS	8-19
4.	SOFTWARE REQUIREMENT	20-21
5.	CIRCUIT OPERATION	21-22
6.	RESULT	27-28
8.	CONCLUSION	28
9.	FUTURE SCOPE	29

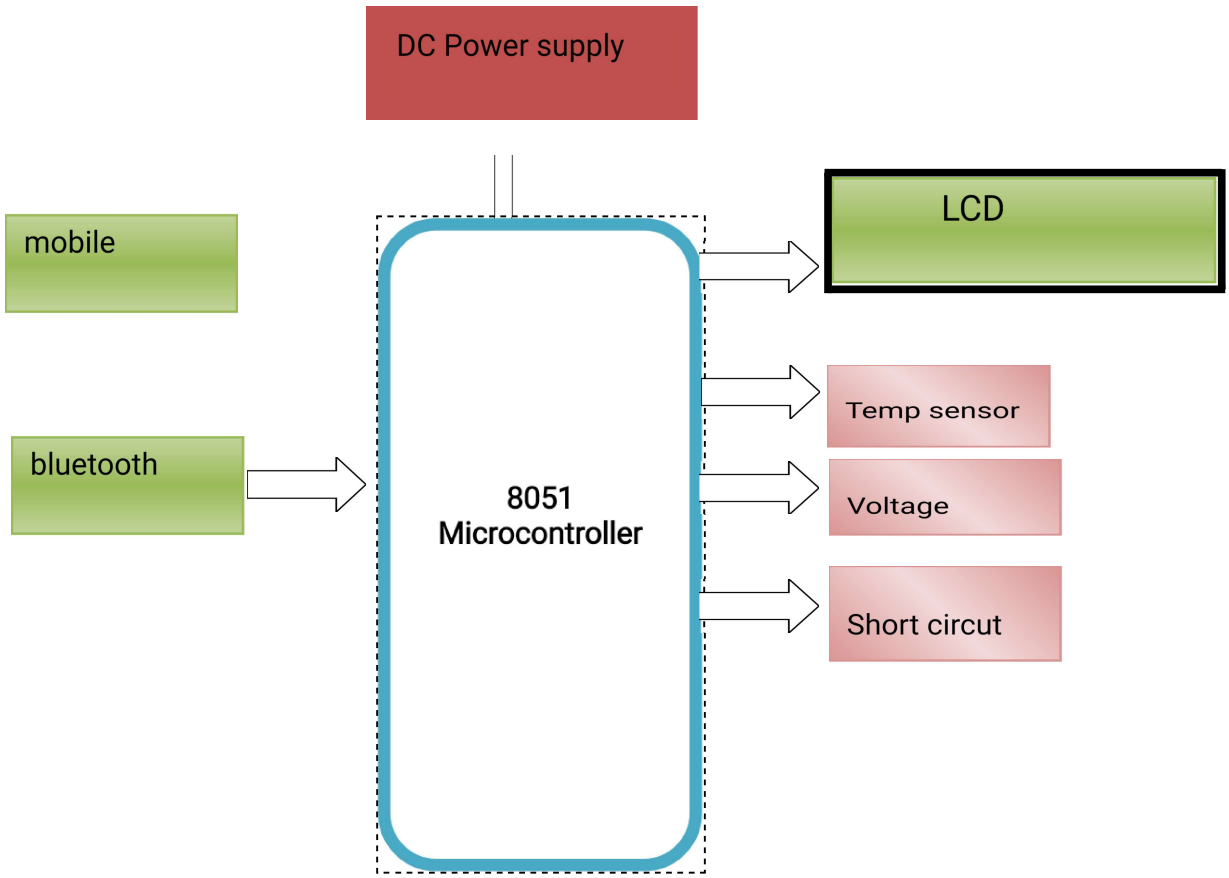
CHAPTER-1

BLUETOOTH BASED SUBSTATION MONITORING SYSTEM

ABSTRACT:

Bluetooth technology can replace wired cable connection with the wireless interface in the short distance, Prevent from complicated line in industry and the inconvenient from resist electromagnetism and radio interference that need physics protects and electromagnetisim shielding. The bluetooth chip is small in size, low power dissipation, it is convenient to establish network, it hasn't special communication visual angle and direction required. Put bluetooth technology into the transformer substation, can simplify transformer substation construction, Improve the comprehensive intelligence degree of the transformer substation and the flexibility of the, operate mode.

BLOCK DIAGRAM:



CHAPTER-2

INTRODUCTION OF BLUETOOTH BASED SUBSTATION MONITORING SYSTEM:

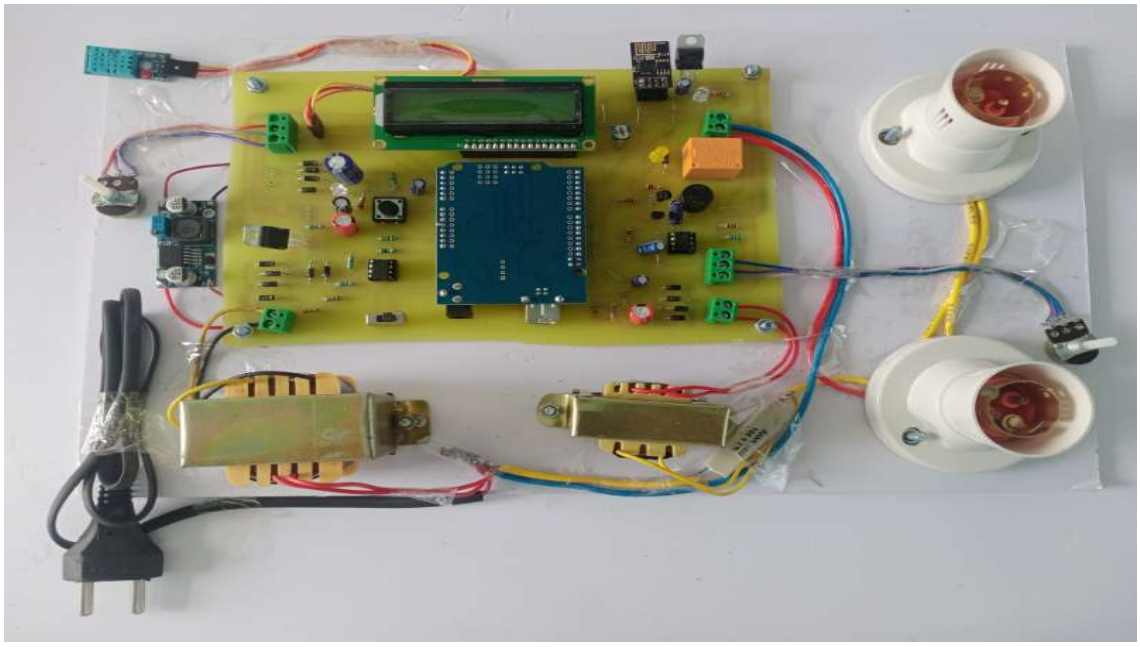


Figure- 01

The electrical substation is an important part of an electrical system. with the advent of deregulation of the power industry, the importance of substation automation has further increased to become a necessity for the next generation modern power grid. Substation automation is also of great interest as an emerging issue to the researchers and scientists all over the globe because of proper operation, maintenance and load flow analysis purposes of the modern power industry.
The information about the existing conditions of different equipments in a substation provides a clear picture of the state of its components. Further, the information about the direction of flow of electricity will help the electricity utility provider to have a better control over that substation [1]. Although it is possible to monitor the status of the equipments in a substation manually, human error and system response speed become the crucial factors in building up a successful monitoring system. To reduce these limitations and with the improvement in communication and computer technology, the condition based maintenance of substation is becoming possible through online measuring instruments. Thus the measured information regarding the operational voltage level, magnitude of current flow and the direction of power flow at different nodes of bus bars, supply frequency, etc. is needed to be transmitted and stored to a central location in order to have their remote monitoring and analysis. Moreover, trend analysis is performed with the above stored data for better planning and expansion of the substation. The load flow analysis helps in realizing the

healthiness of the nodes and any faulty node, if occurs, can be isolated from the circuit in order to maintain uninterrupted supply at the healthy zone

CHAPTER-3

Hardware Requirements:

- Microcontroller,
- Power supply
- Step-down Transformer
- LCD(LIQUID CRISTAL DISPLAY)
- Rectifier unit
- Input Filter
- Voltage Regulator
- Contrast control
- Potentiometer
- 3202-B IC

3.1.1. POWER SUPPLY:

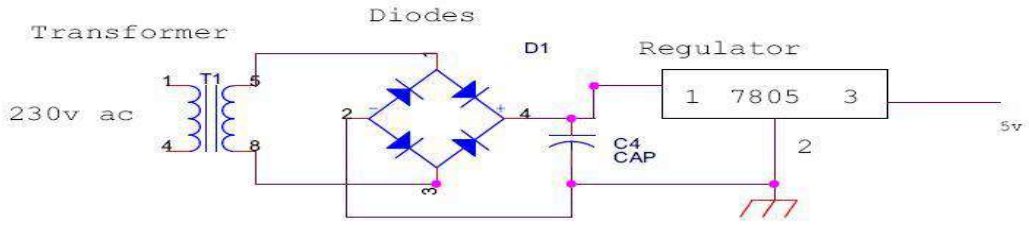


Figure- 03

Power provides unit consists of following units:

i) Step down Transformer (Electrical device).

ii) Rectifier unit

iii) Input filter

iv) Regulator unit

v) Output filter

3.1.1 Step-down Transformer (Electrical device):

The Step down electrical device is employed to step down the most provide voltage from 230V AC to lower price. This 230 AC voltage cannot be used directly, so it's stepped down. The electrical device consists of primary and secondary coils. to scale back or step down the voltage, the electrical device is meant to contain less variety of turns in its secondary core. The output from the secondary winding is additionally AC undulation. so the conversion from AC to DC is important. This conversion is achieved by mistreatment the Rectifier Circuit/Unit.

Step down transformers will step down incoming voltage that permits you to possess the proper voltage input for your electrical wants. For instance, if our instrumentality has been given for input voltage of twelve volts, and therefore the main power provide is 230 volts, we are going to want a step down electrical device that decreases the incoming electrical Voltage to be compatible together with your twelve volt instrumentality.

3.1.2. Voltage Regulator

The regulator is a single chip that regulates the ripple free rectified voltage to give a constant output voltage. Since the circuit needs a supply voltage of 12V and 5V, a 12V and 5V regulators were used. The percentage regulation or simply regulator of a power supply is given by: The voltage regulator provides the regulated output. There are many voltage regulator ICs available in the market. For 5V dc output we are using LM7805 and for 12V dc power supply we are using LM7812.

3.1.3. Capacitor:

Capacitor or electric condenser is a device for storing an electric charge. The simplest form of capacitor consists of two metal plates separated by a non-touching layer called the dielectric. When one plate is charged with electricity from a direct current or electrostatic source, the other plate have induced in it a charge of the opposite sign; that is, positive if the original charge is negative and negative if the original charge is Positive. The electrical size of the capacitor is its cap Acutance. Capacitors are limited in the amount of electric charge they

can absorb; they can conduct direct current for only instances but function well as conductors in alternating current circuits. Fixed capacity and variable capacity capacitors are used in conjunction with coils as resonant circuits in radios and other electronic equipment. Capacitors are produced in a wide variety of forms. Air, Mica, Ceramics, Paper, Oil, and Vacuums are used as dielectrics depending on the purpose for which the device is intended

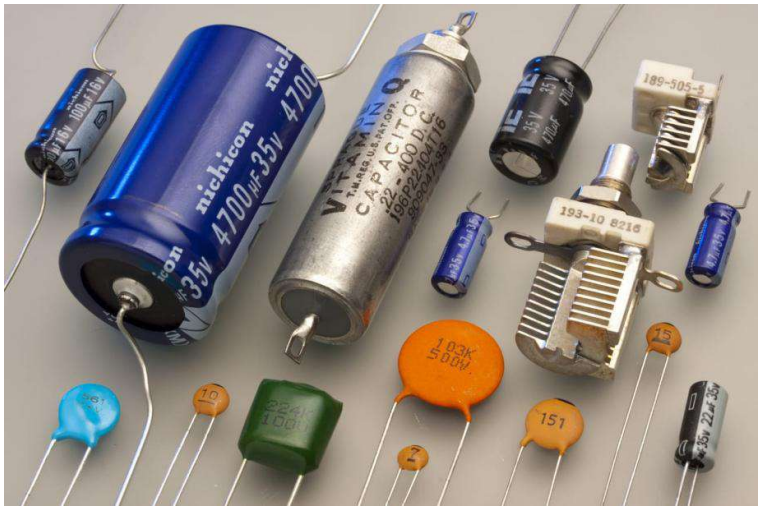


Figure - 04

3.1.4. Resistors:

Resistor is a component that resists the flow of direct or alternating electric circuit. Resistors can limit or divide the current, reduce the voltage, protect an electric circuit, or provide large amounts of heat or light. An electric current is the movement of charged particles called electrons from one region to another. Resistors are usually placed in electric circuits. Physicists explain the flow of current through a material, such as a resistor, by comparing it to water flowing through a pipe. Resistors are designed to have a specific value of resistance. Resistors used in electric circuits are cylindrical. They are often color coded by three or four color bands that indicate the specific value of resistance. Resistors obey ohm's law, which states that the current density is directly proportional to the electric field when the temperature is constant.

Figure- 05

3.1.5 Rectifier Unit:

The Rectifier circuit is employed to convert the AC voltage into its corresponding DC voltage. The foremost vital and easy device employed in Rectifier circuit is that the diode. The straightforward operate of the diode is to conduct once forward biased and to not conduct in reverse bias. Currently we have a tendency to ar mistreatment 3 sorts of rectifiers. They are

1. Half-wave rectifier
2. Full-wave rectifier
3. Bridge rectifier

Half-wave rectifier:

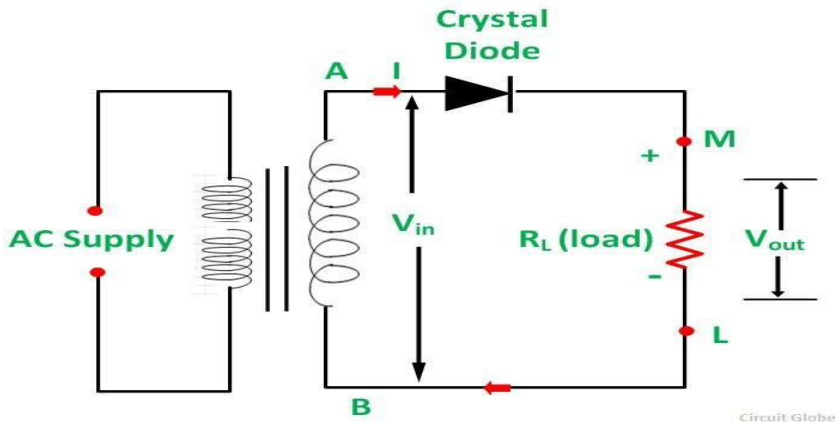


Figure: 06

In full wave rectification, either the positive or negative half the AC wave is passed, whereas the opposite full wave rectification is blocked. As a result of just one half the input undulation reaches the output, it's terribly inefficient if used for power transfer. Half-wave rectification is achieved with one diode in a very one section provide, or with 3 diodes in a very three-phase provide.

Full-wave rectifier:

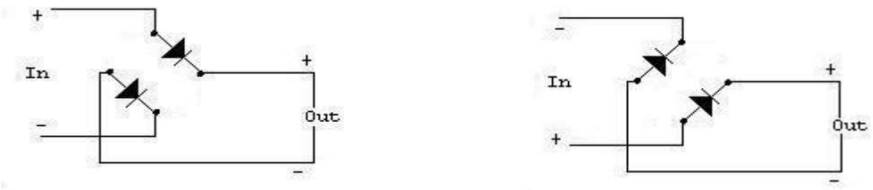


Figure: 07: Full Wave Rectifier

A rectifier converts the complete of the input undulation to at least one of constant polarity (positive or negative) at its output. Full-wave rectification converts each polarities of the input undulation to DC (direct current), and is a lot of economical. However, in a very circuit with a non-center broach electrical device, four diodes ar needed rather than the one required for half-wave rectification. A rectifier uses a diode bridge, made from four diodes.as shown in the figer.

Bridge rectifier:

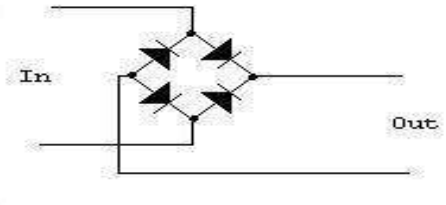


Figure: 08: Bridge Rectifier with diodes back to back connection

A bridge rectifier makes use of 4 diodes in an exceedingly bridge arrangement to realize full-wave rectification. This can be a wide used configuration, each with individual diodes wired as shown and with single element bridges wherever the diode bridge is wired internally.

3.1.6. VOLTAGE SENSOR:

Figure- 09

Voltage sensors are **wireless tools that can be attached to any number of assets, machinery or equipment**. They provide 24/7 monitoring, constantly watching for voltage data that could indicate

3.1.7.REGOLATOR UNIT:

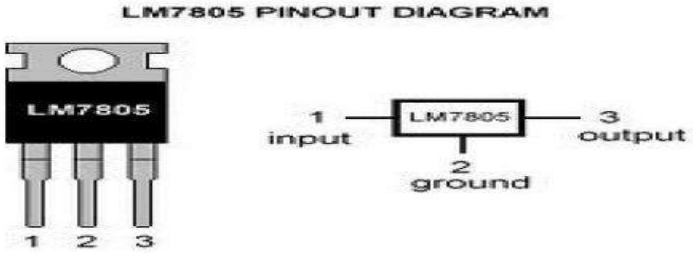


Figure:10: 7805 Regulator along with pin diagram

Regulator regulates the output voltage to be continually constant. The output voltage is maintained regardless of the fluctuations within the input AC voltage. As and so the AC voltage changes, the DC voltage conjointly changes. So to avoid this Regulators square measure used. Conjointly once the interior resistance of the facility provide is larger than thirty ohms, the output gets affected. So this may be with success reduced here. The regulators square measure chiefly classified for low voltage and for top voltage. Additional they'll even be classified as:

i) Positive

regulator 1) Input pin/

First pin

2) Ground pin /Middle pin

3) Output pin/last or 3rd pin

It regulates the positive voltage.

ii) Negative regulator

1) Ground pin /first pin

2) Input pin/ middle pin

3) Output pin/last pin

It regulates the negative voltage.

3.1.8. Liquid crystal display:

In 1968, RCA Laboratories developed the first liquid crystal display (LCD). Since then, LCD's have been implemented on almost all types of digital devices, from watches to computer to projection tvs .LCD's operate as a light "valve", blocking light or allowing it to pass through. An image in an LCD is formed by applying an electric field to alter the chemical properties of each LCC (Liquid Crystal Cell) in the display in order to change a pixel's light absorption properties. The alphanumeric 16character X 2line LCD requires 8data lines and also 3 control

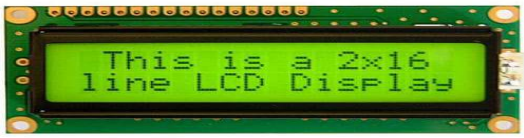


Figure- 11

Signals and they are interfaced to 3664.By using 2 ports, port 0&3 data pins are connected to LCD as data bus. Port0 can be basically used as I/O port i.e. It can be programmed as an input or as an output port. That means if it is programmed as output port, suppose if it is required to read data from LCD immediately it is not possible. Before reading the data it is required to make the port as an input port. Data reading from LCD gives an erroneous reading & should not be implemented. Because of this port5 is made as input / output port depending on the situation. The control signals are 11 connected to port 3 pins. They are EN bar & RS bar, RW bar. At different instance such as data write / command write / data read etc. Various signals are to be provided as indicated by the by the LCD manufacturers. To interface the LCD, to the Micro controller it require an 8 bit and also three control signals differentiate the data from the control words send to the LCD. The Micro controller has to send the necessary control words followed by the data to be displayed. Depending on the operation to be performed the control words are selected and passes to the LCD. The data to be displayed on the LCD is to be sent in the ASCII format. Thus all the character to be displayed are converted into ASCII form and then sent to the LCD along with different control words. The control word differentiated the various operations and is executed. It is also possible to read the LCD data if required. The control signals to the LCD are also provided by the Micro controller. This is also done through pins 3,5, 3,6&3,7.Through program necessary control signals are passed to the LCD by using the bits of the port. The remaining can be used for some other purpose if there is a need. The software controls the necessary ports and performs the task it is designed for. The software and associated hardware perform the LCD interface.

Pin Definition of LCD

PIN	SYMBOL	FUNCTION
1	Vss	Power Supply(GND)
2	Vdd	Power Supply(+5V)
3	V0	Contrast Adjust
4	RS	Instruction/Data Register Select
5	R/W	Data Bus Line
6	E	Enable Signal
7-14	DB0-DB7	Data Bus Line
15	A	Power Supply for LED B/L(+)
16	K	Power Supply for LED B/L(-)

Table – 01

A liquid crystal is a material (normally organic for lcds) that will flow like a liquid but whose molecular structure has some properties normally associated with solids. The Liquid Crystal Display (LCD) is a low power device. The power requirement is typically in the order of microwatts for the LCD. However, an LCD requires an external or internal light source. It is limited to a temperature range of about 0C to 60C and lifetime is an area of concern, because lcds can chemically degrade. There are two major types of LCD s which are: 1) Dynamic-scattering LCD s 2) Field-effect LCD s Interfacing LCD to the PIC Microcontroller: This is the first interfacing example for the parallel port. We will star with something simple. This example does not use the Bi-directional feature found on newer ports, thus it should work with most, if no all Parallel Ports. It however does not show the use of the status port as an input. So what are we interfacing? A 16 Character, 2 Line LCD Module to the Parallel Port. These LCD Modules are very common these days, and are quite simple to work with, as all the logic required running them is on board. Features

- ✓ Interface with either 4-bit or 8-bit microprocessor.
- ✓ Display data RAM.
- ✓ Character generator ROM.
- ✓ 160 different 5 X 7 dot-matrix character patterns.

- ✓ Character generator RAM
- ✓ 8 different user programmed 5 X 7 dot-matrix patterns.
- ✓ Display data RAM and character generator RAM may be
- ✓ Accessed by the microprocessor.
- ✓ Numerous instructions
- ✓ Clear Display, Cursor Home, Display ON/OFF, Cursor
- ✓ ON/OFF, Blink Character, Cursor Shift, Display Shift.
- ✓ Built-in reset circuit is triggered at power ON

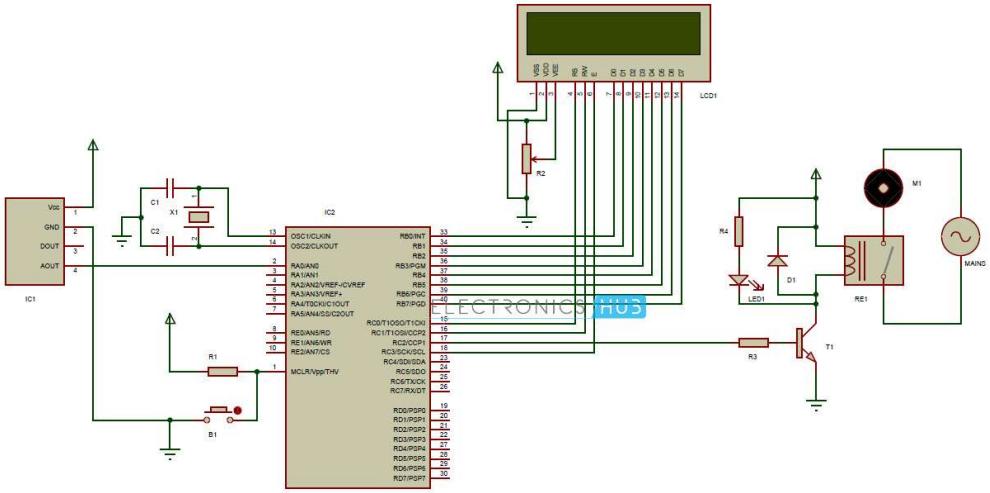


Figure-12

3.1.9. AT89S52 Microcontroller :

The PIC microcontroller AT89S52 is one of the most renowned microcontrollers in the industry. This controller is very convenient to use, the coding or programming of this controller is also easier. One of the main advantages is that it can be write-erase as many times as possible because it use FLASH memory technology. It has a total number of 40 pins and there are 33 pins for input and output. AT89S52 is used in many pic microcontroller projects. AT89S52 also have

many application in digital electronics circuits. The 40 pins make it easier to use the peripherals as the functions are spread out over the pins. This makes it easier to decide what external devices to attach without worrying too much if there are enough pins to do the job. 14 One of the main advantages is that each pin is only shared between two or three functions so it's easier to decide what the pin function (other devices have up to 5 functions for a pin). A slight disadvantage of the device is that it has no internal oscillator so you will need an external crystal or other clock source. However the internal oscillator is only 1% accurate and adding a crystal (max 20mhz crystal - for 5mhz internal instruction cycle) and two 15pf capacitors is not a great chore - the accuracy will be 100ppm depending on the crystal use

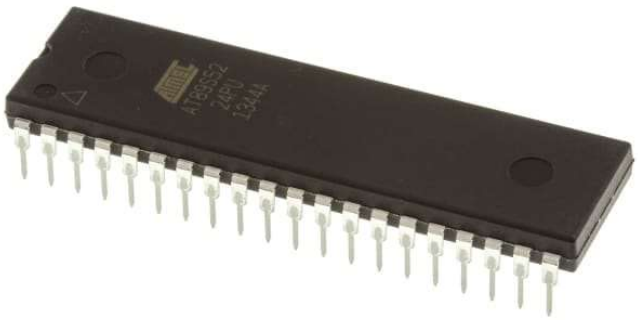


Figure-13

AT89S52 a finds its applications in a huge number of devices. It is used in remote sensors, security and safety devices, home automation and in many industrial instruments. An EEPROM is also featured in it which makes it possible to store some of the information permanently like transmitter codes and receiver frequencies and some other related data. The cost of this controller is low and its handling is also easy. It's flexible and can be used in areas where microcontrollers have never been used before as in coprocessor applications and timer functions etc.

PIN CONFIGURATION AND DESCRIPTION OF AT89S52 :

It has been mentioned before, there are 40 pins of this microcontroller IC. It consists of two 8 bit and one 16 bit timer. Capture and compare modules, serial ports, parallel ports and five input/output ports are also present in it. PIN 1: MCLR

The first pin is the master clear pin of this IC. It resets the microcontroller and is active low, meaning that it should constantly be given a voltage of 5V and if 0 V are given then the controller 15 is reset. Resetting the controller will bring it back to the first line of the program that has been burned into the IC.

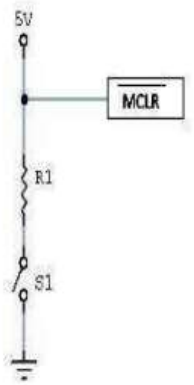


Figure-14

A push button and a resistor is connected to the pin. The pin is already being supplied by constant 5V. When we want to reset the IC we just have to push the button which will bring the MCLR pin to 0 potential thereby resetting the controller.

PIN 2: RA0/AN0

PORTA consists of 6 pins, from pin 2 to pin 7, all of these are bidirectional input/output pins. Pin 2 is the first pin of this port. This pin can also be used as an analog pin AN0. It is built in analog to digital converter.

PIN 3: RA1/AN1 This can be the analog input 1.

PIN 4: RA2/AN2/VrefIt can also act as the analog input2. Or negative analog reference voltage can be given to it.

PIN 5: RA3/AN3/Vref+ It can act as the analog input 3. Or can act as the analog positive reference voltage.

PIN 6: RA0/T0CKI To timer0 this pin can act as the clock input pin, the type of output is open drain.

PIN 7: RA5/SS/AN4 This can be the analog input 4. There is synchronous serial port in the controller also and this pin can be used as the slave select for that port. 16

PIN 8: RE0/RD/AN5 PORTE starts from pin 8 to pin 10 and this is also a bidirectional input output port. It can be the analog input 5 or for parallel slave port it can act as a 'read control' pin which will be active low.

PIN 9: RE1/WR/AN6 It can be the analog input 6. And for the parallel slave port it can act as the 'write control' which will be active low.

PIN 10: RE2/CS/A7 It can be the analog input 7, or for the parallel slave port it can act as the 'control select' which will also be active low just like read and write control pins.

PIN 11 and 32: VDD These two pins are the positive supply for the input/output and logic pins. Both of them should be connected to 5V.

PIN 12 and 31: VSS These pins are the ground reference for input/output and logic pins. They should be connected to 0 potential. PIN 13: OSC1/CLKIN This is the oscillator input or the external clock input pin. PIN 14: OSC2/CLKOUT This is the oscillator output pin. A crystal resonator is connected between

PIN 13 and 14 to provide external clock to the microcontroller. ¼ of the frequency of OSC1 is outputted by OSC2 in case of RC mode. This indicates the instruction cycle rate.

PIN 15: RC0/T1OCO/T1CKI PORTC consists of 8 pins. It is also a bidirectional input output port. Of them, pin 15 is the first. It can be the clock input of timer 1 or the oscillator output of timer 2.

PIN 16: RC1/T1OSI/CCP2 It can be the oscillator input of timer 1 or the capture 2 input/compare 2 output/ PWM 2 output.

PIN 17: RC2/CCP1 It can be the capture 1 input/ compare 1 output/ PWM 1 output.

PIN 18: RC3/SCK/SCL It can be the output for SPI or I2C modes and can be the input/output for synchronous serial clock.

PIN 23: RC4/SDI/SDA It can be the SPI data in pin. Or in I2C mode it can be data input/output pin. 17 PIN 24: RC5/SDO It can be the data out of SPI in the SPI mode.

PIN 25: RC6/TX/CK It can be the synchronous clock or USART Asynchronous transmit pin. PIN 26: RC7/RX/DT It can be the synchronous data pin or the USART receive pin.

PIN 19, 20,21,22,27,28,29,30: All of these pins belong to PORTD which is again a bidirectional input and output port. When the microprocessor bus is to be interfaced, it can act as the parallel slave port.

PIN 33-40: PORT B All these pins belong to PORTB. Out of which RB0 can be used as the external interrupt pin and RB6 and RB7 can be used as in-circuit debugger pins.

Circuit Diagram:

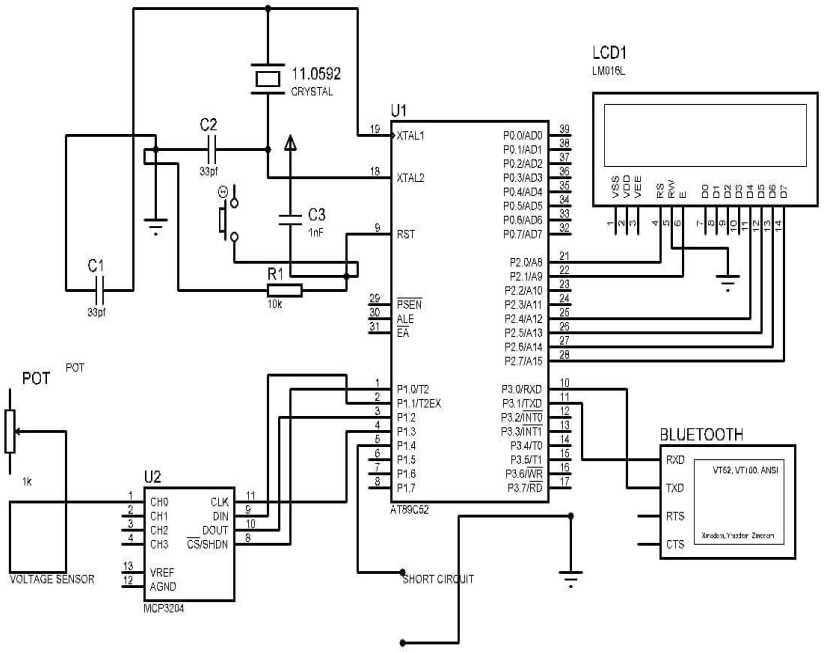


Figure- 15

CHAPTER-4

Software Requirements

Following software used in our project

· Proteus 8.6 Professional

· Pic c compiler Proteus 8.6 Professional

· It is a software suite containing schematic, simulation as well as PCB designing.

· Proteus has wide range of components in its library. It has sources, signal generators, measurement and analysis tools like oscilloscope, voltmeter, ammeter etc., probes for real time monitoring of the parameters of the circuit, switches, displays, loads like motors and lamps, discrete components like resistors, capacitors, inductors, transformers, digital analog Integrated circuits, semi-conductor switches, relays, microcontrollers, processors.

Figure- 18

CHAPTER-5

Circuit operation:

The distance between the generators and load may be regarding hundreds of miles hence the amount of enormous power exchange over long distances has turned out as a result of the lack of quality of the electric power. During the earlier development stages, the issues on quality of power were not frequently reported. Demanding the quality of power being delivered to the user side has raised the alarm due to the increase in demand for electricity in the customer side. A massive amount of energy is lost during the transportation of the general power which prompts the decrease in the nature of intensity got at the substation.

Improve the quality of power with a different solution, it is necessary to be familiar with what sort of constraint has occurred. Additionally, if there is any inadequacy in the protection, monitoring, and control of a power system. The system might become unstable. Therefore it necessary a monitoring system that can automatically detect, monitor, and classify the existing constraints on electrical lines. Today power still experiences control blackouts and power outages because of the absence of mechanized examination and poor deceivability of the utility over the grid.WSN will give the service provide the needed view by collecting information from the different sub-systems of the grid. A sensor node will decide information or to slightly delay this notification whether to notify the sink about this information immediately. PB COOP operation.1) The evaluation of sense data: we define three priority levels {0, 1, and 2}) The determination of a correspondence strategy: need 0-no further activity is performed, need 2-esteem is sent to the sink since it is considered as earnest and a warning should be straightforwardly sent, need 1-we consider that esteem ought to be accounted for in light of the fact that it might motion as blame or an issue that is less pressing than need 2 information.

PR0JECT SOURCE CODE :

```
#include<reg51.h>
#include "UART_SUPPORT.H"
#define lcd_data P2

sbit lcd_rs = P2^0;
sbit lcd_en = P2^1;

sbit cs=P1^0;              //ADC temp
sbit din=P1^1;
sbit dout=P1^2;
sbit clk=P1^3;

sbit sc = P1^4; //Load pin
sbit buzzer = P3^7; //Buzzer pin
```

```
unsigned int tempV, temp,temp1;
float val;

//current
/*int mv_per_amp = 100; // use 100 for 20A Module and 66 for 30A Module
int raw_value= 0;
int acs_offset = 2500;
double voltage = 0;
double amps = 0;*/



void delay(unsigned int t)
 {
  unsigned int i,j;
  for(i=0;i<t;i++)
  for(j=0;j<1275;j++);
  }

void lcdcmd(unsigned char value)                    // LCD COMMAND
  {

                    lcd_data=value&(0xf0); //send msb 4 bits
                    lcd_rs=0;           //select command register
                    lcd_en=1;           //enable the lcd to execute command
                    delay(3);
                    lcd_en=0;
                    lcd_data=((value<<4)&(0xf0)); //send lsb 4 bits
                    lcd_rs=0;          //select command register
                    lcd_en=1;          //enable the lcd to execute command
                    delay(3);
                    lcd_en=0;
  }

void lcd_init(void)
{
 lcdcmd(0x02);
 lcdcmd(0x02);
 lcdcmd(0x28);  //intialise the lcd in 4 bit mode*/
 lcdcmd(0x28);  //intialise the lcd in 4 bit mode*/

 lcdcmd(0x0e); //cursor blinking
 lcdcmd(0x06); //move the cursor to right side
 lcdcmd(0x01); //clear the lcd

}

void lcddata(unsigned char value)
```

```
 {
                lcd_data=value&(0xf0); //send msb 4 bits
                lcd_rs=1;          //select data register
                lcd_en=1;          //enable the lcd to execute data
                delay(3);
                lcd_en=0;
                lcd_data=((value<<4)&(0xf0)); //send lsb 4 bits
                lcd_rs=1;          //select data register
                lcd_en=1;          //enable the lcd to execute data
                delay(3);
                lcd_en=0;
                delay(3);
 }

void msgdisplay(unsigned char b[]) // send string to lcd
 {
unsigned char s,count1=0;
for(s=0;b[s]!='\0';s++)
 {
  count1++;
  if(s==16)
   lcdcmd(0xc0);
   if(s==32)
   {
   lcdcmd(1);
   count1=0;
   }
  lcddata(b[s]);
 }
}

void clock()
{
        clk=0;  delay(1);
        clk=1;  delay(1);
}

void powerup(unsigned char sel)
{
din=0;
clock();clock();clock();clock();clock();

din=1;
clock();//start bit

din=1;
clock();//mode select bit

if(sel==1)
        {       din=1;}
```

```
else
{din=0;}

clock();

clock();
clock();
}


unsigned int read_mcp3202()
{
unsigned char ii=0;
unsigned int read_i;

clk=0;  delay(1);
clk=1;//for null charecter
read_i=0;
delay(1);
for(ii=0;ii<12;ii++)
        {
                clk=0;  delay(1);
                if(dout==1){read_i++;}
                read_i=read_i<<1;
                clk=1;  delay(1);
        }
return read_i;
}
void Voltage_Ch0()
{
        delay(100);
        cs=1; delay(10);
  cs=0; delay(10);
        powerup(0);
  tempV = (read_mcp3202()) ;
        tempV /= 8;
        val = (tempV*0.02);
        val = (val/0.2);
        val /= 4.8;

                if((val>=3.0) && (val<10.0))
                {
                        lcddata(' ');
                temp=(val*1000);
                temp1=(((temp)/1000)+48);
                lcddata(temp1);

                        lcddata('.');

                temp1=(((temp/100)%10)+48);
```

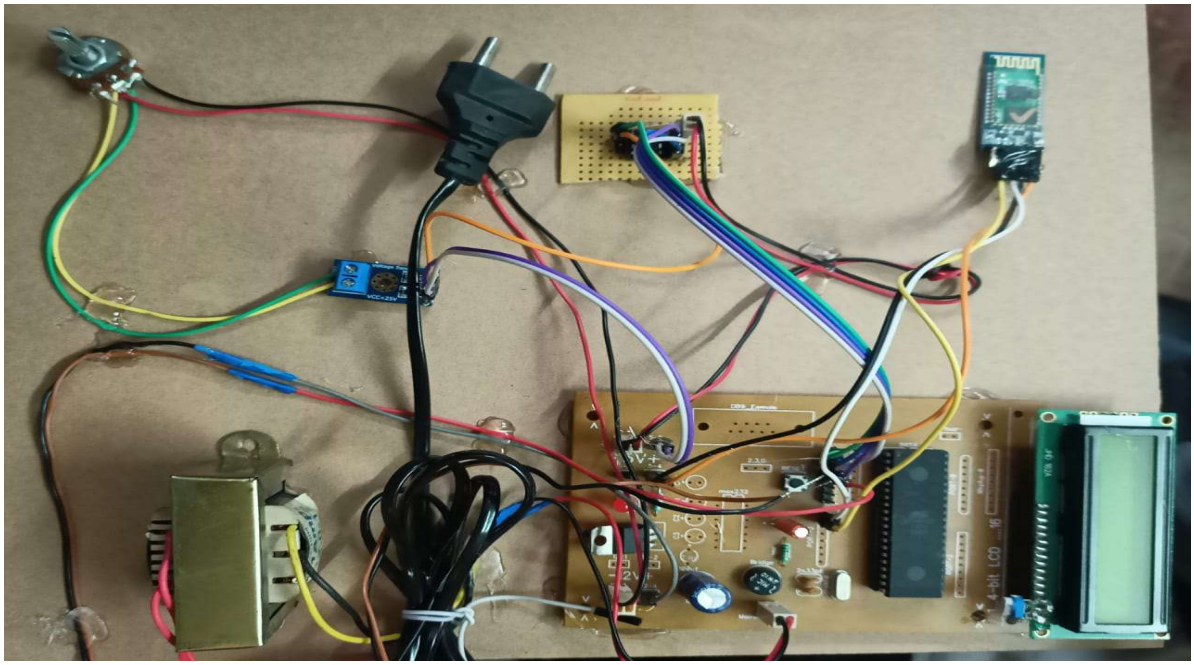
```
                lcddata(temp1);
                        lcdcmd(0xc0);msgdisplay("NORMAL  VOLTAGE      ");
                        buzzer=1;

                }

                else if((val>=10.0) && (val<100.0))
                {
                        temp=val*100;
                temp1=((temp/1000)+48);
                lcddata(temp1);

                        temp1=(((temp/100)%10)+48);
                lcddata(temp1);

                        lcddata('.');

                        temp1=(((temp/10)%10)+48);
                lcddata(temp1);
                        lcdcmd(0xc0);msgdisplay(" OVER  VOLTAGE      ");
                        uart_string("OVER VOLTAGE\r\n");
                        buzzer=0;

                        delay(5);
                }

                else
                {
                        lcddata(' ');
                        msgdisplay("0.0");
                        uart_string("LOW VOLTAGE\r\n");
                        lcdcmd(0xc0);msgdisplay(" LOW   VOLTAGE       ");
                        //buzzer=0;

                }
                delay(50);
}

void main()
{
        buzzer=1;
  lcd_init();
        uart_init();
        lcdcmd(0x80);
  msgdisplay(" OVER VOLTAGE   ");
        lcdcmd(0xC0);
  msgdisplay("PROTECTION SYSTEM  ");
        delay(300);
        uart_init();
        lcdcmd(0x01);
```

```
        lcdcmd(0x80);
 msgdisplay("V:");
 while(1)
  {
                lcdcmd(0x82);Voltage_Ch0();
   if(sc==0)
                {
                        uart_string("SHORT CIRCUIT\r\n");
                }
  }
}
```

CHAPTER-6

Results:

Snapshots The kit consists of hardware of BLUETOOTH BASED SUBSTATION MONITORING SYSTEM. The system gives signal to Bluetooth module which will be sent as a message for the operator by it is also displayed on the LCD screen



8.1.Advantages:

- ✓ Helpful for Fault Management

- ✓ Reduced hazards
- ✓ Real time monitoring
- ✓ Remote Access
- ✓ Periodical collection of data
- ✓ Error free data
- ✓ Personalised alert over fault
- ✓ Reduces cost of monitoring

8.2. Applications:

- ❖ To provide operative and relevant data necessary for the proper integration of transformer substations into the local and central network;
- ❖ To provide useful information necessary for the maintenance optimization in transformer substation equipment;
- ❖ To improve the safe operation of all equipment;
- ❖ To extend the lifespan of the dedicated equipment and increase the safety of electric power transmission with consequences for end-users.

CHAPTER-8

Conclusion :

Monitoring means acquiring significant parameters from the assets of interest. The acquired data is feasible to be used for analyses and diagnose the condition of the assets which is of great use for maintenance scheduling, failure management and controlling system and this method minimizes time contact between human and high voltage device. As it is known, most substation devices have high voltage and generate electromagnetic that can harm human health. This proposed system is specially designed for monitoring the condition of substation transformers which are deployed at dispersed locations There are many parameters to be quantified and monitored periodically It is quite costly and difficult to monitor the parameters by appointing a person at all locations and furthermore the data would also be error prone if the monitoring is manual. The greatest issue is to have all the transformers data at a single sink when the data is collected manually. Through our proposed system all the problems discussed above can be reduced to some great extent.

CHAPTER-9

9.1. Future scope:

Addition of GSM Module:

By incorporating the GSM module, we will be able to send Personalised SMS to the authorities so that they can remain be updated about the plant while outside. And the microcontroller is programmed in such a way that a particular format of SMS is send which can be used as a input for the microcontroller for required operation.

Addition of Wireless Camera:

We can install wireless cameras in the premises of substation switchyard; through we shall be able to visually monitor the substation in a better way. This particular would be really helpful for monitoring of transformers as we know most of the time they are deployed in the dispersed locations.

Development of GUI:

The window display is developed using Graphical User Interface (GUI). The devices and their parameters such as frequency, voltage, load impedance, reluctance, oil level, temperature, cooling condition and power can be monitored integratedly in a displayer. This method helps the operator monitoring in real time the condition of each device easily. Furthermore, in the case of any failure, the operator will be acknowledged immediately that a specific device is experiencing some difficulty or failure. The blackout condition can be prevented and continuity power supply will be guaranteed.

Coolant Management System:

We can add a coolant management system along with the temperature sensor module; which will be very helpful for the managing cooling flow and temperature management. It can be designed in such a way when the temperature of a module or a particular equipment will exceed a predefined limit the coolant flow will be rapid and continuous, and when temperature is well within range then the coolant flow will be slow and periodic.

-