

DESIGN AND CONSTRUCTION OF DIGITAL ENERGY METER

This report submitted in partial fulfillment of the requirement for the Award of degree of
Bachelor of Science in Electrical and Electronics Engineering

Submitted By

Md. Abdul Kader

ID: 151-33-2365

A B M Khyrul Islam

ID: 151-33-2363

Supervise By

Dr. Md. Rezwanul Ahsan

Assistant Professor

Department of Electrical and Electronic Engineering

Faculty of Engineering



Department of Electrical and Electronics Engineering

Faculty of Engineering

DAFFODIL INTERNATIONAL UNIVERSITY

December 2018

©Daffodil International University

CERTIFICATION

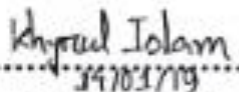
This certify that this project entitled "DIGITAL ENERGY METER "is done by the following student under my direction supervision and this work has been carried by the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering .The presentation of the work was held on 2019.

Signature of the candidates


.....

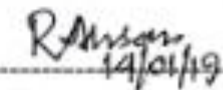
Md. Abdul Kader

ID: 151-33-2365


.....

A B M Khyrul Islam

ID: 151-33-2363


.....

Dr. Md. Rezwanul Ahsan

Assistant Professor

Department of Electrical and Electronic Engineering

Faculty of Engineering

Daffodil International University.

Dedicated
To
Our Parents & Teachers

CONTENTS

LIST OF FIGURES		vii
LIST OF ABBREVIATIONS		viii
ACKNOWLEDGEMENT		ix
ABSTRACT		x
CHAPTER 1 INTRODUCTION		11-12
1.1	Introduction	11
1.2	Objective	11
1.3	Problem Statement	12
1.4	Research Methodology	12
CHAPTER 2 LITERATURE AND REVIEW		13
2.1	Introduction	13
2.2	Electro Mechanical Meter	13
CHAPTER 3 OVERVIEW OF THE PROJECT		14-18
3.1	Introduction	14
3.2	Evolution of Electricity Meter from the past	14
3.3	Smart Grid	14
3.4	Traditional Electricity Meter	15
3.5	Some of the limitation faced by the traditional electricity meter	16
3.6	Various electricity meters	16
3.7	Smart meter	18
3.8	Power consumption	18
CHAPTER-4 HARDWARE COMPONENT		19-39
4.1	Hardware Component	19
4.2	Power Supply	20
4.3	Voltage regulator	20

4.4	Resistor	21
4.4.1	Variable Resistor	21
4.4.2	Tips for reading resistor color code	22
4.4.3	Resistor color code chard	22
4.4.4	4-Band Resistor	24
4.4.5	5-Band Resistor	24
4.5	Capacitor	25
4.6	Diode	26
4.7	LED	26
4.7.1	Types of LED	27
4.8	Step down transformer	28
4.8.1	Construction of Transformer	29
4.8.2	Transformer Efficiency	30
4.8.3	Current Transformer	30
4.8.4	Potential Transformer	32
4.8.4(a)	Construction of Potential Transformer	32
4.8.4(b)	Connection of Potential Transformer	32
4.8.4(c)	Types of Potential Transformer	33
4.8.4(d)	Application of Potential Transformer	33
4.5	Low voltage Arduino amplifier	34
4.5.1	Dual OPM Application	34
4.6	ARDUINO(NANO)ATMEGA328	35
4.6.1	ARDUINO(NANO)ATMEGA328 Pin diagram	35
4.7	LCD	36
4.8	Circuit Diagram	37
4.9	Block Diagram	38
4.10	Cost Estimate	39
CHAPTER 5	DSIGN AND IMPLEMENTATION	40-41

CHAPTER 6	RESULT AND DISCUSSION	42
6.1	Result	42
6.2	Discussion	42
6.3	Summary	42
CHAPTER 7	CONCLUSIONS	43
7.1	Conclusion	43
7.2	Limitations of the Work	43
7.3	Future Scopes	43
Reference		44
Appendix A		45-49

LIST OF FIGURES

Fig 3.4	Traditional Energy Meter	7
Fig 3.7	Smart Energy Meter	9
Fig 4.2	AC to DC Converter Power Supply	11
Fig 4.3	Pin diagram of IC 7805	12
Fig 4.4	Resistor	13
Fig 4.4.1	Variable Resistor	13
Fig 4.4.3	Color Code of the Resistor	15
Fig 4.4.4	Four Band Resistor Color Code	16
Fig 4.4.5	Five Band Resistor Color Code	16
Fig 4.5(a)	Electrolytic Capacitor	17
Fig 4.5(b)	Ceramic Capacitor	18
Fig 4.6	Diode	19
Fig 4.7 (a)	LDE Function	20
Fig 4.7 (b)	LED	21
Fig 4.8.1	Construction &Symbol of Single phase Transformer	22
Fig 4.8.3(a)	Typical Current Transformer	24
Fig 4.8.3(b)	Current Transformer Symbol	25
Fig 4.8.3(c)	Current Transformer Primary Turns Ratio	27
Fig 4.8.4(b)	Potential Transformer	28
Fig 4.8.4(c)	Capacitor Potential Transformer Circuit Diagram	29
Fig 4.5	Dual OPM Pin Diagram	30
Fig 4.6	ARDUINO	31
Fig 4.6.2	ARDUINO (NANO) Pic	32
Fig 4.7	LCD Display	33
Fig 4.8	Circuit Diagram of Digital Energy Meter	34
Fig 4.9	Block Diagram of Digital Energy Meter	35

List of Abbreviations

DC	Direct current
AC	Alternating Current
LED	Light emitting Diode
LCD	Liquid Crystal Display
KWH	Kilo Watt Hour
nF	Nano Farad
pF	Pico Farad
mF	Micro Farad

ACKNOWLEDGEMENT

First of all, we give thanks to allah. It is a great intention for authors to express their unfettered gratification, sincere appreciation and a great honor to our respective supervisor Dr. Md. Rezwanul Ahsan, Department of Electrical & Electronic Engineering, Daffodil International University, for his constructive suggestion, scholastic guidance, constant inspiration, valuable advices and kind cooperation for the successful completion of work on **“Design and construction of Digital Energy Meter ”**. This could not be possible without his help. Space does not allow us to mention each person by name, but we are deeply grateful to everyone associated with this project and thesis. We also wish to complement all our respective concern teachers & staffs of our department of their direct and indirect assistance at different times.

ABSTRACT

This paper produces the design and building a system that gives a solution to the measurement of energy and helps the local customers to save the power in an efficient manner. Also, in this paper have been introduced the design, realization, and testing a wire monitoring system for measuring the energy consumption of electrical devices in the consumer's homes..The system consists of power consumption monitoring systems (Digital energy meter) at customer homes and a control system for remotely reporting and handling the smart meter readings at the power distribution station .The server shows the readings from these meters system by means of a client visual interface continuously. An arduino kit with voltage , current ,watt ,unites and unites cost are used in the meter for measuring the power .The client does not need to exert oneself to note their power use so as to control their behavior to decrease their energy usage and costs.

Chapter-1

Introduction

1.1 Introduction.

The amount of electrical energy Meter is a device that measures consumed by a residence business an electrical power device. They are typically calibrated in billing units and the most common one is the kilowatt hour.

1.2 Objectives

The overarching objective of this report is to provide indications of how To tariff structures might impact on groups of interest in the community. To achieve this we have designed a methodology to understand and describe:

- The factors that help identify households that may be vulnerable to changes in electricity costs
- What the current pattern of electricity usage by each group might be through the year
- Advantage and disadvantage of the the tariff structures change
- We can see the unit ,unit cost and voltages of the meter
- Power factor shown the meter clearly shows

1.3 Problem Statement.

Main function of the induction type motor or energy meter is on two function

- i. rotate at a speed proportional to the power.mechanism of rotation of an aluminum disc witch is made to
- ii. mechanism of counting and display the amount of energy has been transferred

Hence ,this system has moving characteristic ,accuracy would be less

1.4 Research Methodology.

proprietary demographic data to develop electricity usage profiles for groups of interest in the community In essence, the analytical approach vulnerable customers in particular. These electricity usage profiles were then applied to taken was to gather metering and billing data from DBs and RBs and combine it with Deloitte's,

- tariff structures typically applied in the current environment; and to produce base case and estimated scenario electricity bills for each group.

Chapter-2

Literature Reviews

2.1 Introduction.

Energy meter are very important our modern life . . First, a meter records the amount of electricity consumed by the consumer. After that a person catch image of Four steps are involved, in on-going typical metering system meter for each user, then consumer n bill distribution. Meter reading collection is most difficult persuasive. To record reading of it is given to the computer system to house so; the worker needs to revisit the houses. Also this method is very old, it gives opportunity for improvement calculate the charges for each meter a worker visits each house regularly. Many meters are inside the.

2.2 Electromechanical meters.

Electromechanical meters are extremely unreliable. Anything that expands the delay that the episode roller can bring about a meter to run heavily, resulting in reduced bills. Worn gears, consumption, humidity, dust, or affected by an accidental drop to floor It can cause obstruction of work and result in an electromechanical meter that does not catch the full advantage of the reason for its manufacture.

Chapter-3

Theoretical Model

3.1 Introduction

The usages of these made to encounter the problem occurred by the traditional energy meter .In the early phase of household meters delivery of electricity is completely depend on traditional energy meter. consumption and measuring has been slowly declining with the advance in technology ads rapid changes has been technology , of electricity .in individual households.

3.2 Evolution of Electricity Meters from the Past.

The electricity meter is measure the electricity and show the init and power factor ,voltage and current,the history of the electricity meter in early 1870 s in to only confined telegraph and arc lam in electricity. is available in our society to specification affluent society.With the invention of the electricity balpe by Thomas elva edision,

3.3 Smart Grid.

Modern development in electricity meter is known is smart grid.Recent electrical grids are becoming weak with respect to the electrical load variation of appliances inside the home. The higher the population, the more load on the grid. Improving the efficiency of grid by remotely controlling and increasing reliability, measuring the consumptions in a communication that is supported by delivering data (real time) to consumers, supplier and vice versa is termed as Smart Grid .

3.4 Traditional Electricity Meters.

Traditional meters are used since the late 19th century. The electrical devices that can detect and display energy in the form of readings are termed as electricity meter. A single phase two wire are shown figure below.



Figure 3.4: Traditional Electricity meter

3.5 Traditional meter are some limitation faced below.

- Monthly electrical bills unreliable in nature as consumer .
- The electrical meter process of measurement is supported by a specific mechanical structure and hence they are called as electromechanical meters.
- a great number of inspectors have to be employed. In order to perform meter readings,
- Time consuming and payment is expensive .

3.6 Various electricity meters.

Table-1

Different Types	Outline
Electrolytic Meter	The whole current passes through the electrolyte. The major drawback is mechanical considerations and adoption by limited localities.
Commutator Meter	Brush-shifting device is used to vary the current load and commutator's of small diameter facilitates in insulation attention. The major drawbacks are inadequate load characteristics, maintenance cost and lack of proper insulation.
Mercury Motor Meter	There is a satisfactory performance with the introduction of this meter. The adoption of rotor made a prominent role in supplying the calibration. The momentary short circuit is reduced or even prevented.
D.C Watt Hour Meter	This meter model is developed for heavy current circuits where the temperature coefficient is high. For indication of demand purposes a separate time switch is used. Also, it is a clock-type meter in which voltage variations is less with the reduced shunt loss.
Single Phase Induction Meter	Magnetic conditions are better improved to control the energy consumption and a considerable improvement in performance is also done. Meter inspection is easily assessed as the construction of this model has accessibility of simplifying assembly.
Poly-Phase Watt Hour Meter	Lagging power factors in the meter reflects the characteristics of the current transformer. Attempts for improving high degree of accuracy have been built to avoid troublesome corrections. Interaction effects, calibration and increase in the effects of shunt loss are the greatest drawback of this model.

3.7 Smart Meter.

The smart energy meter are commonly name is digital energy meter,show the digital letter , are the latest in energy metering technology. Similar to interval meters, they record electricity usage in 30 minute intervals allowing different rates to be charged at different times of day.



Figure 3.7: Smart Energy Meter

3.8Energy consumption.

The amount of total power consume in individual household is referred as electrical power .the consumption of electricity power important supply

Chapter -4

Hardware Development

4.1 Hardware Component.

- LCD DISPLAY
- CAPACITORS
- SOME RESISTOR
- DIODE
- STEP DOWN TRANSFORMER
- CURRENT TRANSFORMER
- POTENTIAL TRANSFORMER
- OPM
- ARDUIONO
- INDUCTOR 220UH
- CONNECTOR
- AC POWER SUPPLY
- HOLDER
- LIGHT
- SOME WIRES
- PCB BOARD
- SWITCH

4.2 Power Supply.

Power supply is the reference to a source of electrical energy. A device or a system that Supply electrical or other types of energy to an output load is called is power.

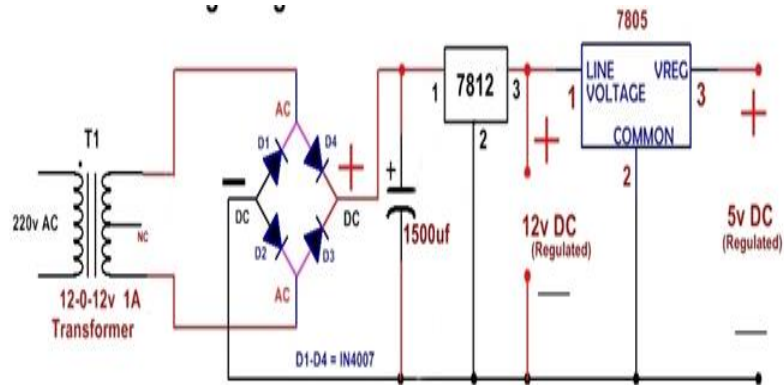


Fig.4.2:AC to DC Converter Power Supply

4.3 Voltage Regulator.

Usually, we start with an unregulated power supply ranging from 9volt to 12volt DC.To make a 5volt power supply, IC 7805 voltage regulator as shown in figure has been used

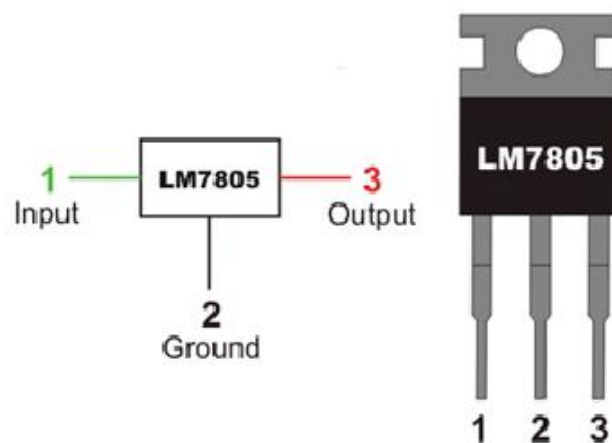


Fig. 4.3: Pin Diagram of IC 7805

4.4 Resistor.

electrical resistance as a circuit element. In a passive two-terminal electrical component that implements the voltages, bias active elements, and terminate electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide a resistor in transmission lines, among other uses.



Fig. 4.4:Resistors

4.4.1 Variable Resistor.



Fig. 3.4.1:variable resistorr

By changing resistor.. When resistance increases in a variable resistor, the amount of current that is allowed to flow in a circuit decreases. Two basic components make up variable resistors. The resistive material is the first component and is called the element.

The second component, called the wiper or brush, is used to set the resistance, and is often controlled with a knob or sliding switch.

Variable Resistors can be found in:

- Audio control
- Television
- Motion control
- Transducers
- Computation
- Home Electrical Appliances
- Oscillators

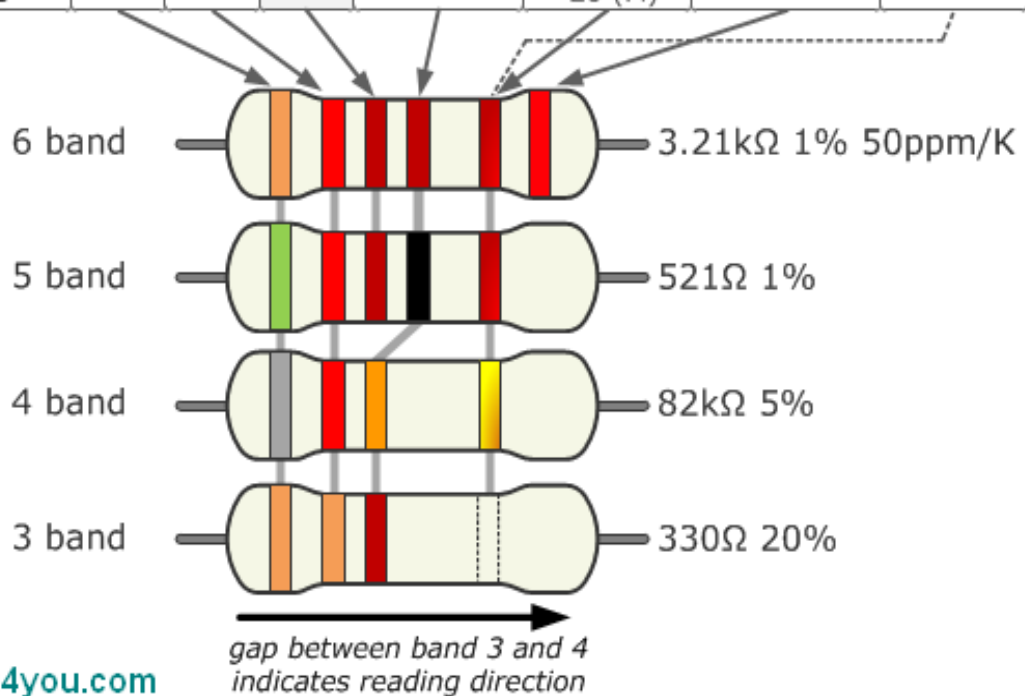
4.4.2 Tips for Reading Resistor Code.

In the sections below examples are given for different numbers of bands, but first some tips are given to read the color code:

4.4.3 Resistor Color Code Chart.

Below the resistance color code chart to determine and tolerance .table shown are below.

Color	Significant figures			Multiply	Tolerance (%)	Temp. Coeff. (ppm/K)	Fail Rate (%)
black	0	0	0	x 1		250 (U)	
brown	1	1	1	x 10	1 (F)	100 (S)	1
red	2	2	2	x 100	2 (G)	50 (R)	0.1
orange	3	3	3	x 1K		15 (P)	0.01
yellow	4	4	4	x 10K		25 (Q)	0.001
green	5	5	5	x 100K	0.5 (D)	20 (Z)	
blue	6	6	6	x 1M	0.25 (C)	10 (Z)	
violet	7	7	7	x 10M	0.1 (B)	5 (M)	
grey	8	8	8	x 100M	0.05 (A)	1(K)	
white	9	9	9	x 1G			
gold			3th digit only for 5 and 6 bands	x 0.1	5 (J)		
silver				x 0.01	10 (K)		
none					20 (M)		



circuits4you.com

Fig.4.4.3:Color Code Chart of Resistor

4.4.4 4-Band Resistor.

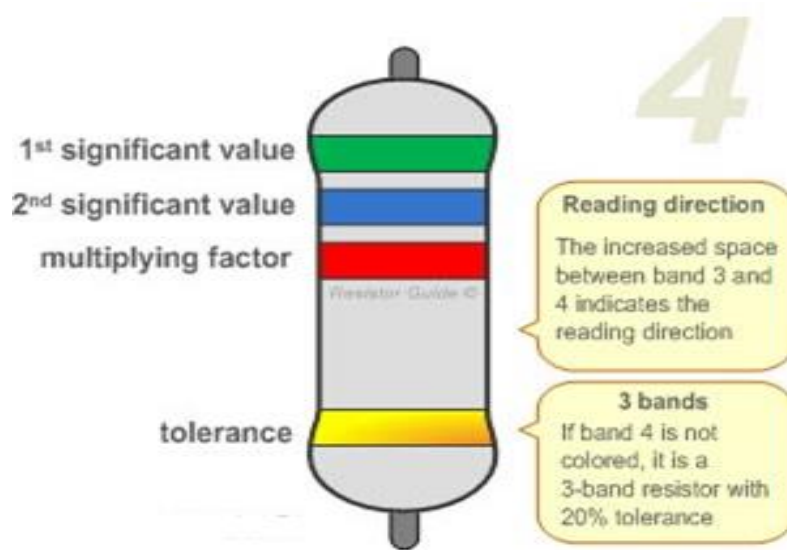


Fig. 4.4.4: four band Resistor Color Code

4.4.5 5-Band Resistor.

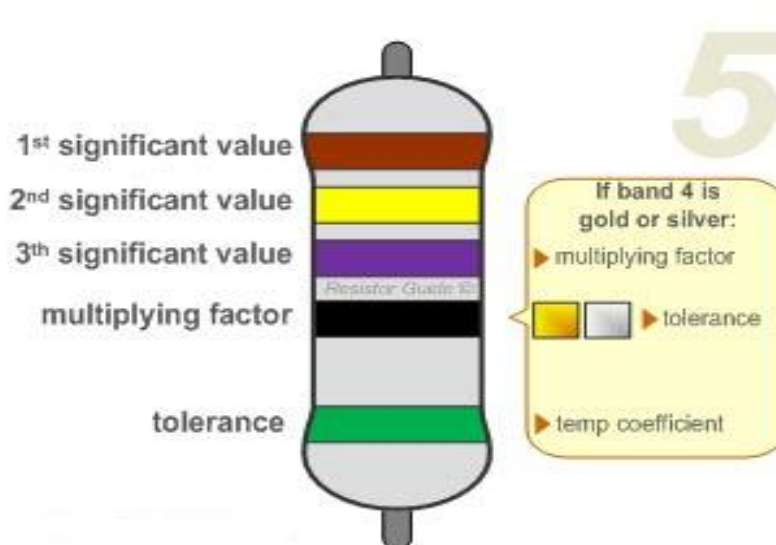


Fig. 4.4.6: 5-Band Resistor Color Code

4.5 Capacitor.

A capacitor is a passive electronic component that stores energy in the form of an electrostatic field. In its simplest form, a capacitor consists of two conducting plates separated by an insulating material called the dielectric.



Fig. 4.5(a): Electrolytic Capacitor

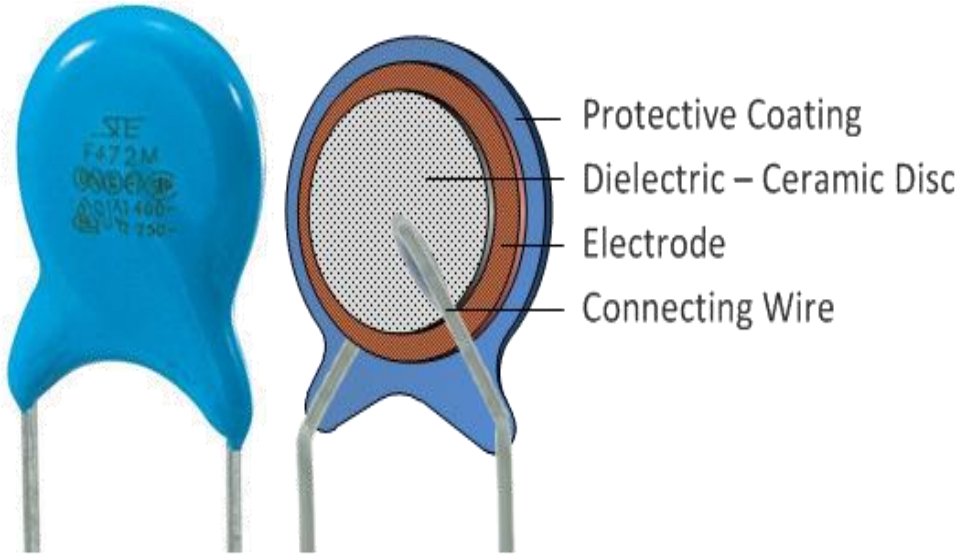


Fig. 4.5(b): Ceramic Capacitor

4.6 Diode.

The diode are variety current only convert in on way current .this diode are two part anode and cathode. with a pure elemental gas at low pressure. Diodes can be used as rectifiers, signal limiters, voltage regulators, switches, signal modulators, signal mixers, signal demodulators, and oscillators.

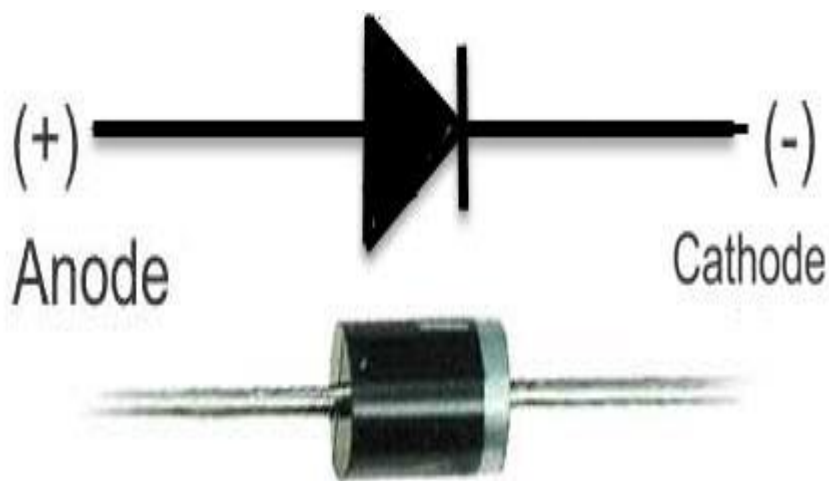


Fig. 4.6:Diode

4.7 Light Emitting Diode(LED).

The LED means light emitting diode device that emits visible light when an electric current passes through it.

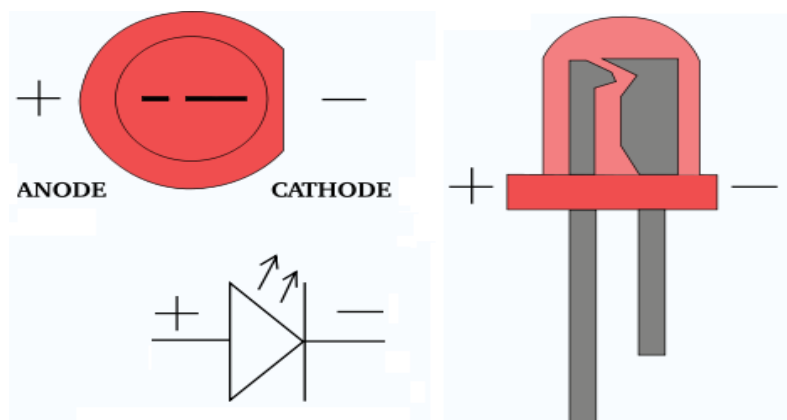


Fig.4.7(a):LED Function

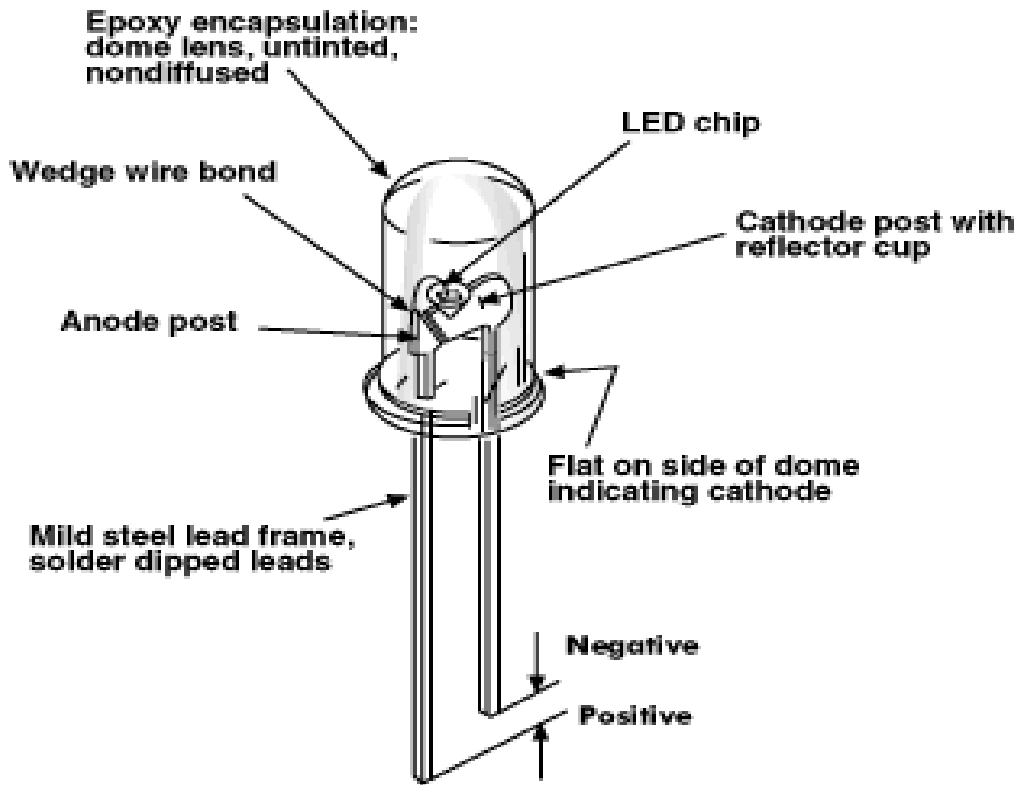


Fig. 4.7.(b):Light Emitting Diode

4.7.1 kinds of LED

Some type are define are below.

- Gallium Arsenide (GaAs) – infra-red.
- Gallium Arsenide Phosphide (GaAsP) – red to infra-red, orange
- Aluminum Gallium Arsenide Phosphide (AlGaAsP) – high-brightness red, orange-red, orange, and yellow

4.8 Step down Transformer.

Transformers are electrical devices consisting of two or more coils of wire used to transfer electrical energy by means of a changing magnetic field

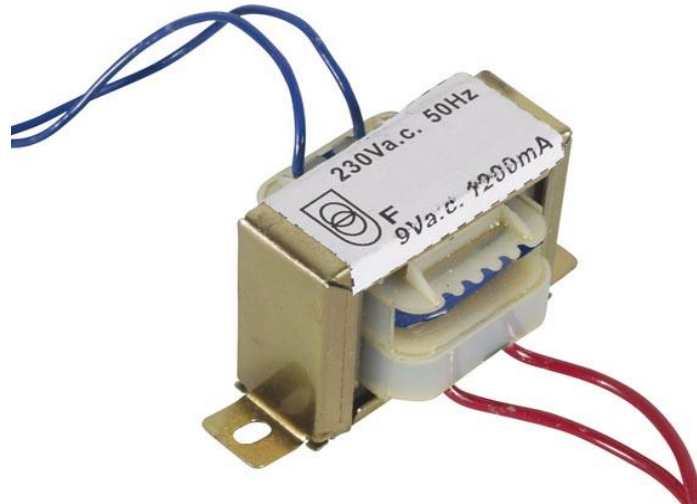


Fig.4.8:Step Down Transformer

4.8.1 Construction of Transformer (Single Phase)

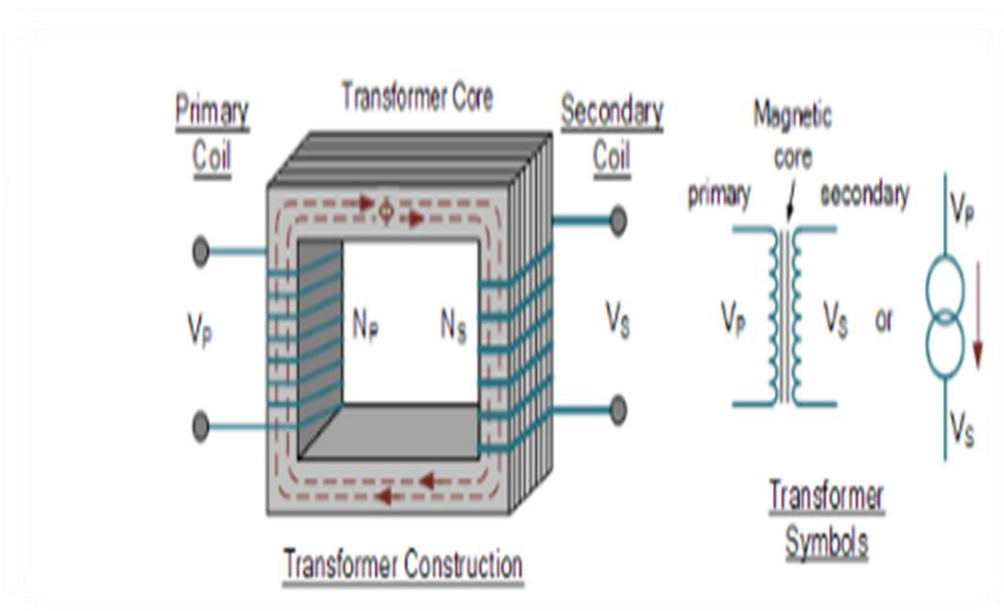


Fig. 4.8.1: Construction and Symbol of Single Phase Transformer

In the above figure, we see a single phase Transformer's construction and symbol

Where:

V_P - the Primary Voltage

V_S - the Secondary Voltage

N_P - the Number of Primary Windings

N_S - the Number of Secondary Windings

Φ (phi) - the Flux Linkage

4.8.2 Efficiency of Transformer.

$$\begin{aligned}\text{efficiency, } \eta &= \frac{\text{Output Power}}{\text{Input Power}} \times 100\% \\ &= \frac{\text{Input Power} - \text{Losses}}{\text{Input Power}} \times 100\% \\ &= 1 - \frac{\text{Losses}}{\text{Input Power}} \times 100\%\end{aligned}$$

Normally when the dealing with the transformer the primary watts are called voltage or VA varsities them from the secondary watts ,the efficiency equations above can be modified to

$$\text{Efficiency, } \eta = \frac{\text{Secondary Watts (Output)}}{\text{Primary VA (Input)}}$$

4.8.3 current transformer.



Fig.4.8.3(a):Typical Current Transformer

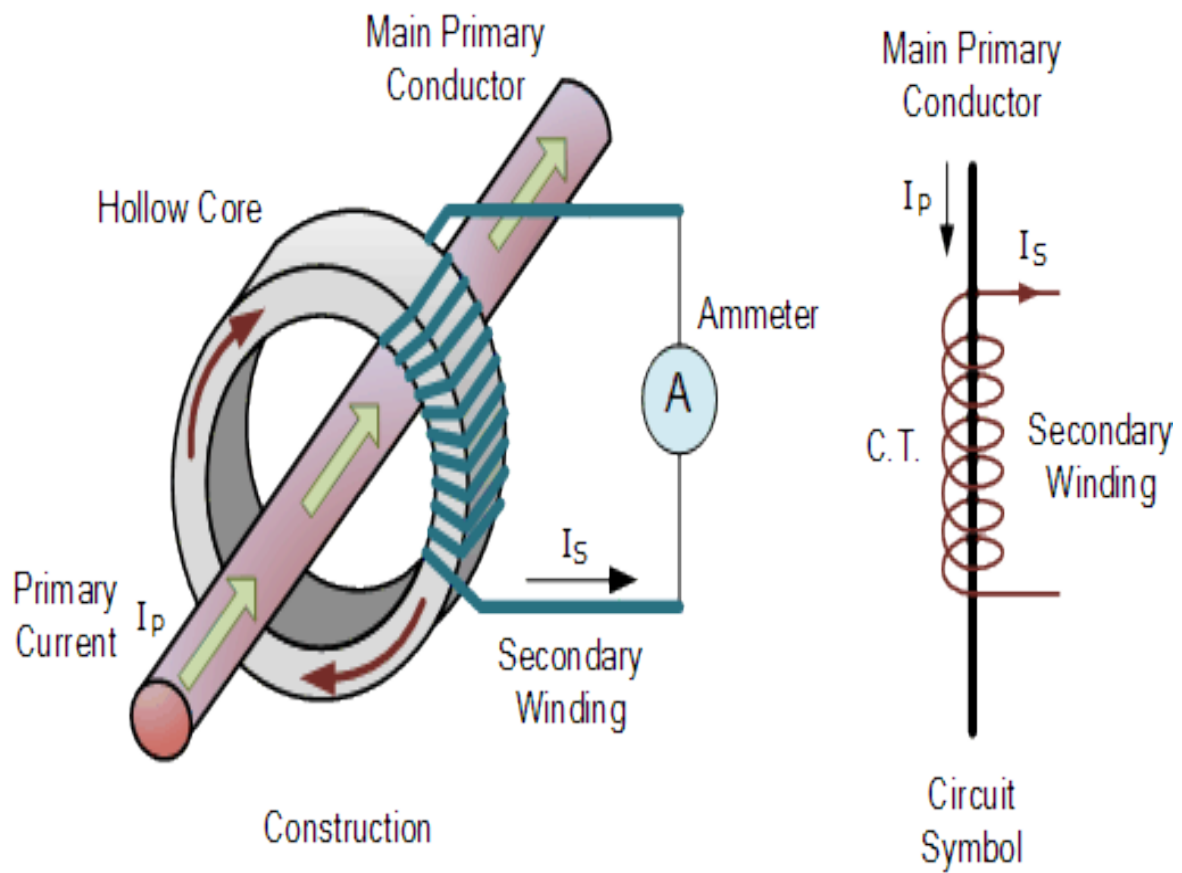


Fig.4.8.3(b):symbol of current transformer

secondary current, $I_S = I_P \left(\frac{N_P}{N_S} \right)$

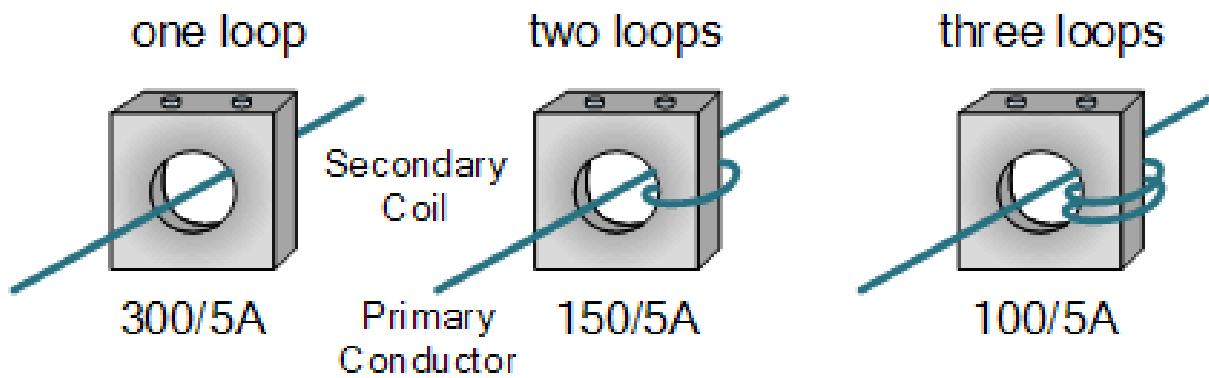


Fig.4.8.3(c):Current Transformer Primary Turns Ratio

4.8.4 Potential Transformer (PT).

Define the potential transformer we can define as an instrument transformer used for the transformer of voltage from a high value

4.8.4 (a) Connection of Potential Transformer.

The potential transformer is connected in parallel with the circuit. The primary windings of the potential transformer are directly connected to the power circuit whose voltage is to be measured.

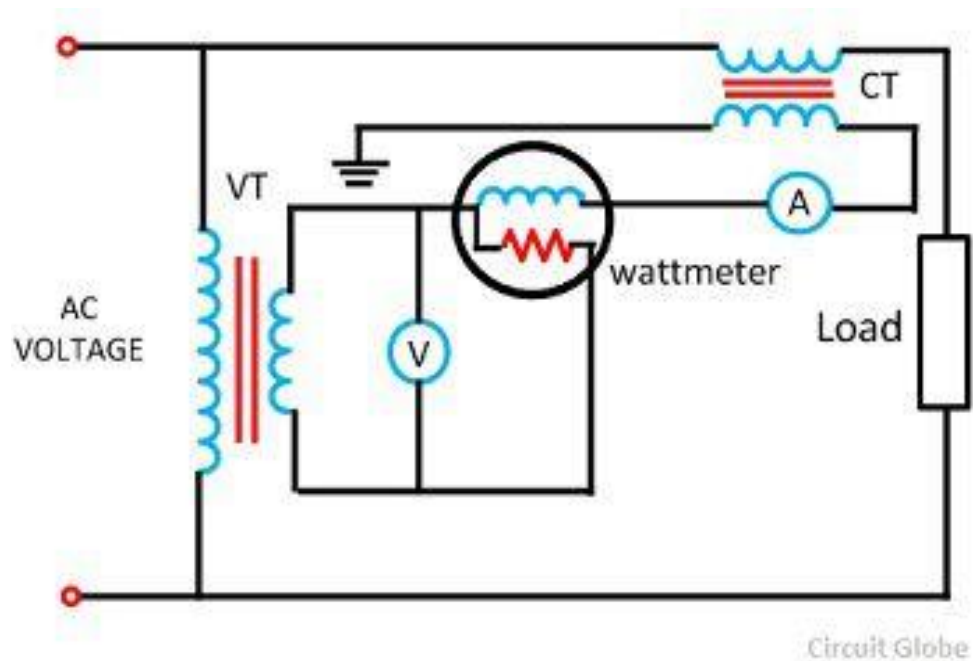


Fig.4.8.4(b) :Potential Transformer

4.8.4 (c) Kinds of potential transformer

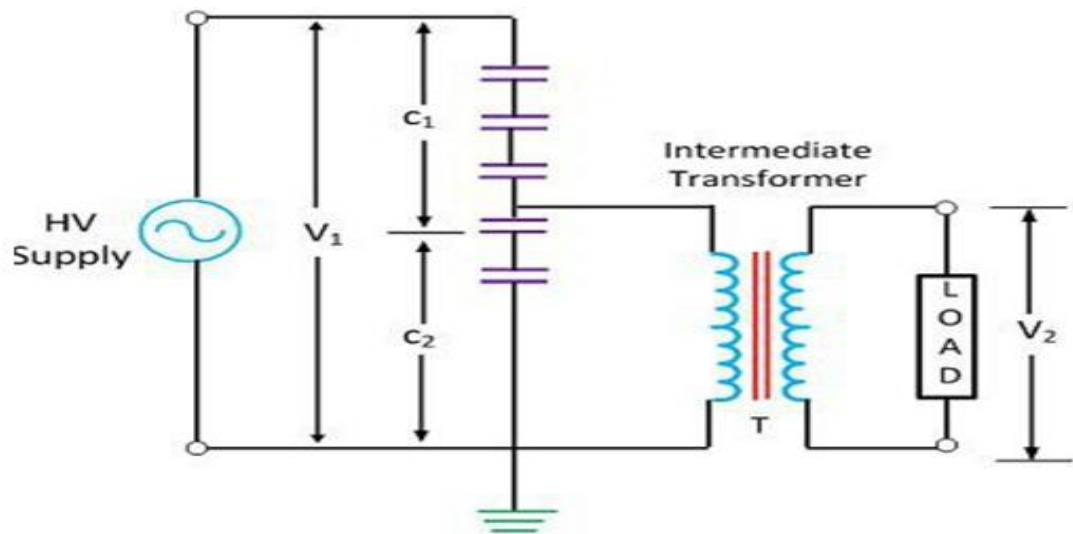


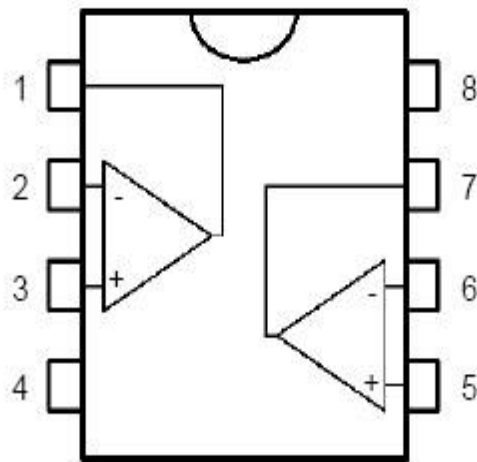
Fig 4.8.4(c):Capacitor Potential Transformer Circuit Diagram

4.8.4 (d) use sector of Potential Transformer.

- i. It is used for a metering purpose.
- ii For the protection of the feeders.
- iii For protecting the impedance of the generators.
- iv For synchronising the generators and feeders.

The potential transformers are used in the protecting relaying scheme because the potential coils of the protective device are not directly connected to the system in case of the high voltage. Therefore, it is necessary to step down the voltage and also to insulate the protective equipment from the primary circuit.

4.5 LVAP Amplifier(Dual OPM).



1 - Output 1	5 - Non-inverting input 2
2 - Inverting input 1	6 - Inverting input 2
3 - Non-inverting input 1	7 - Output 2
4 - V_{CC}^-	8 - V_{CC}^+

Fig.4.5: Dual OPM Pin Diagram

4.5.1 Dual OPM Application.

- AM-FM Radio Amplifiers
- Portable Tape Player Amplifiers
- Intercoms
- TV Sound Systems Line Drivers
- Ultrasonic Drivers
- Small Servo Drivers
- Power Converters

4.6 Arduino (NANO)

The Arduino NANO R3 is the best version after the desimiliune of the electronic device .this device is the best of microcontroller and it varias type of the device.

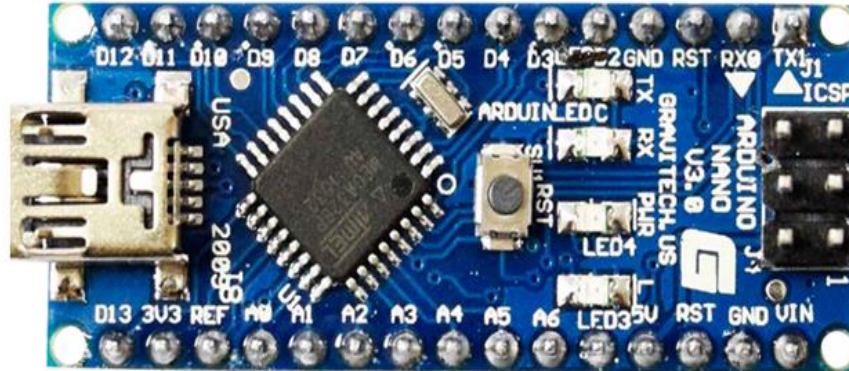


Fig: 4.6:Arduino (NANO)

4.6.1 Arduino (NANO) ATMEGA328 Operation.

Microcontroller	Atmega 8
Controlling voltage	Five volt
I/V	7V to 12 V
I/P L	6V to 12v
Digital I/O Pins	14 (of which 6 provide PWM output
Analog Input Pins	6
DC I/O Pin	40mA
DC .3V Pin	50mA
Flash memory	32 KB (ATmega328) of which 0.5 KB used by boot
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)

4.6.2 Pin Diagram of Arduino (NANO) ATMEGA328

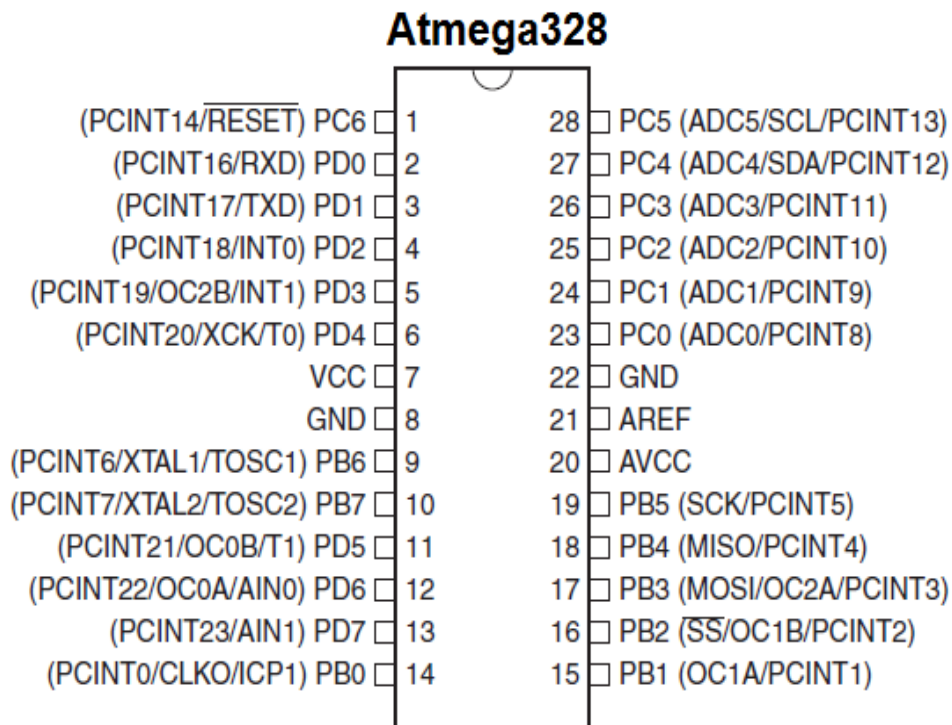


Fig.4.6.2:Pin Diagram of ATMAGA328

4.7Liquied crystal Display.

We use 16*2 line display .one line total 16 character show the display.

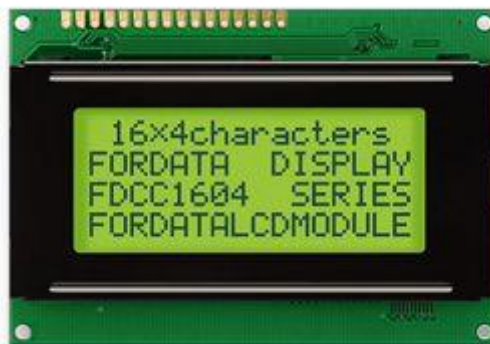


Fig.3.12:LCD Display

4.8 Circuit Diagram.

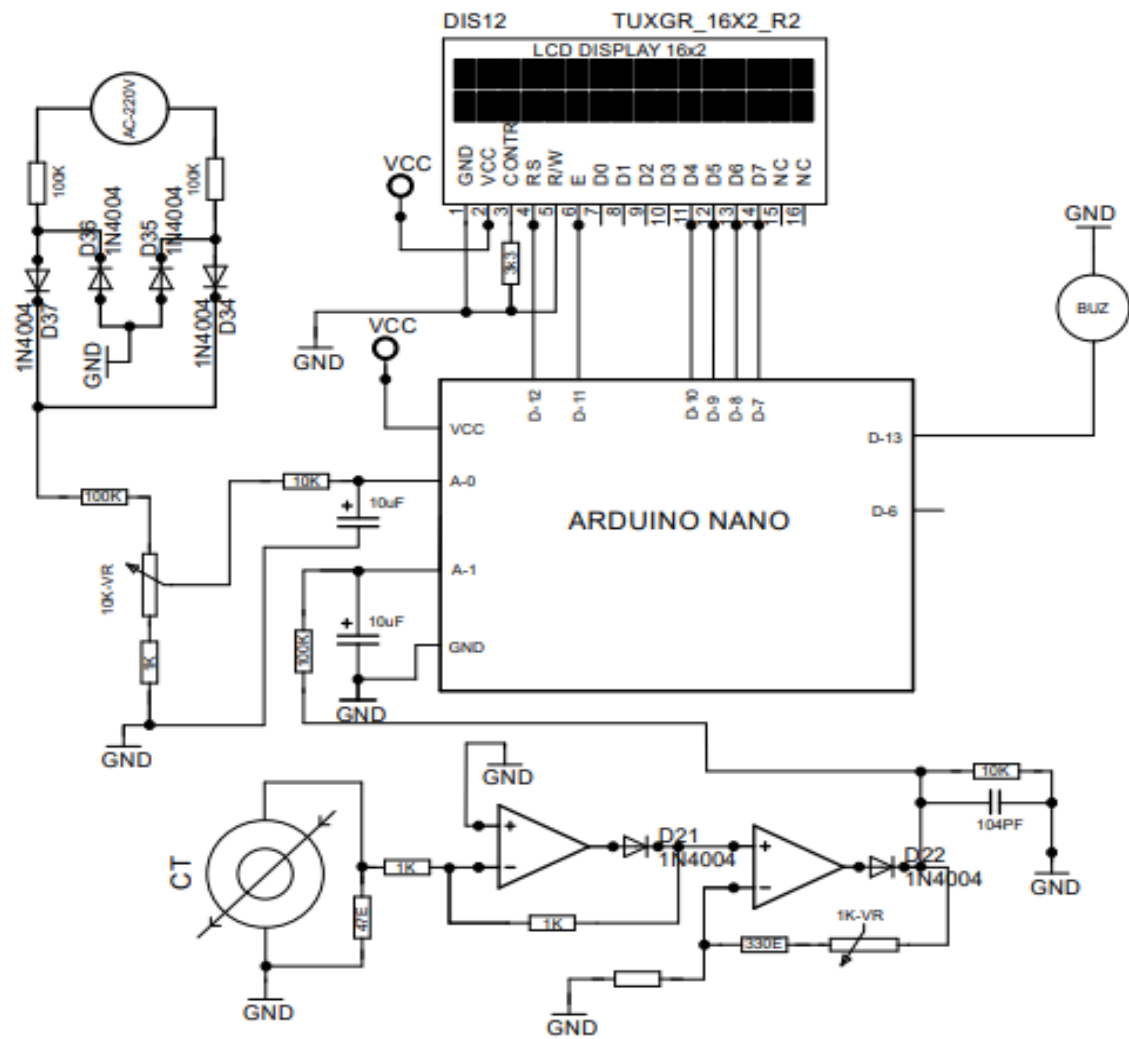


Fig 4.8 : Circuit Diagram of Home Energy Meter

4.9 Block Diagram.

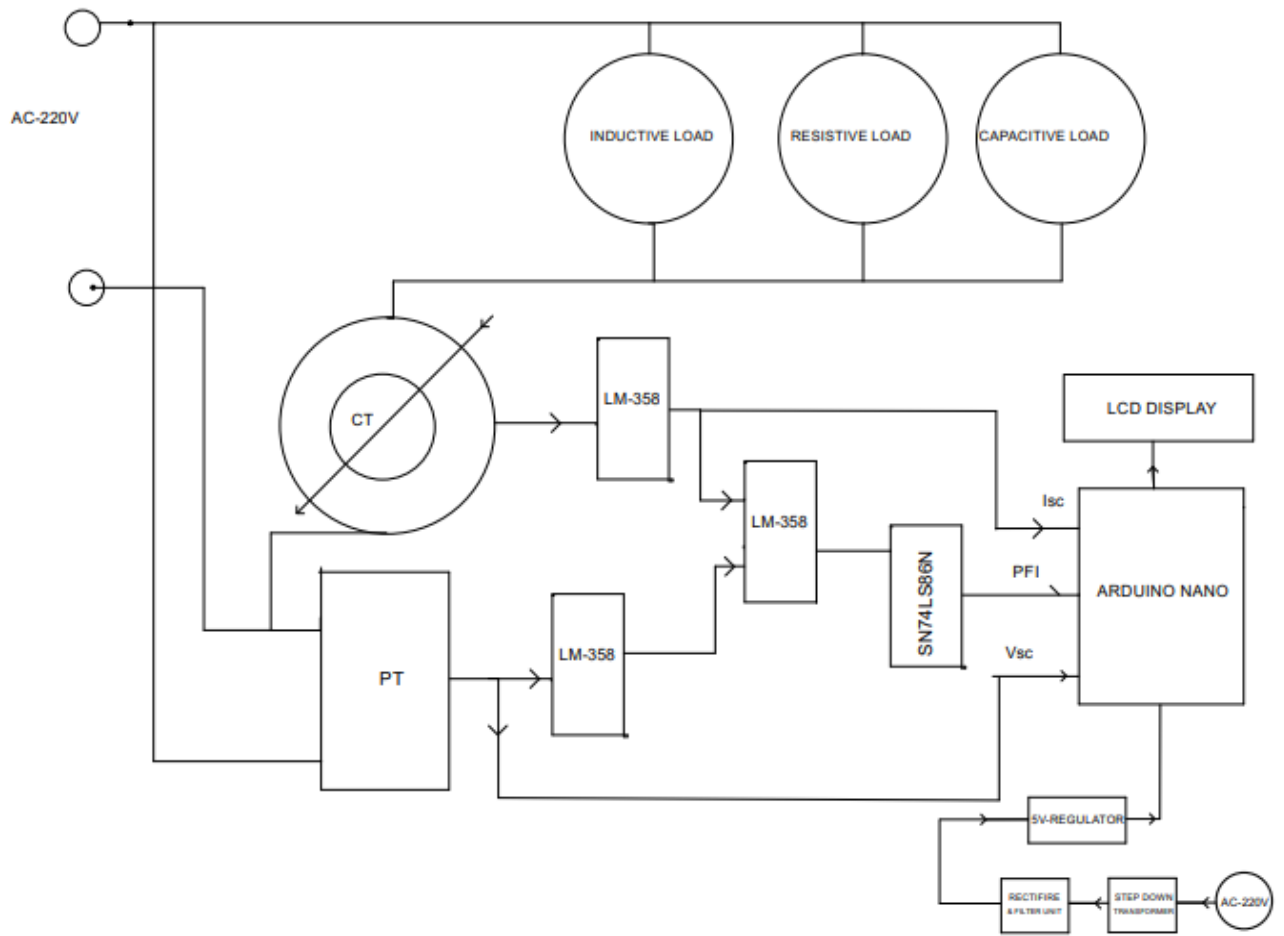


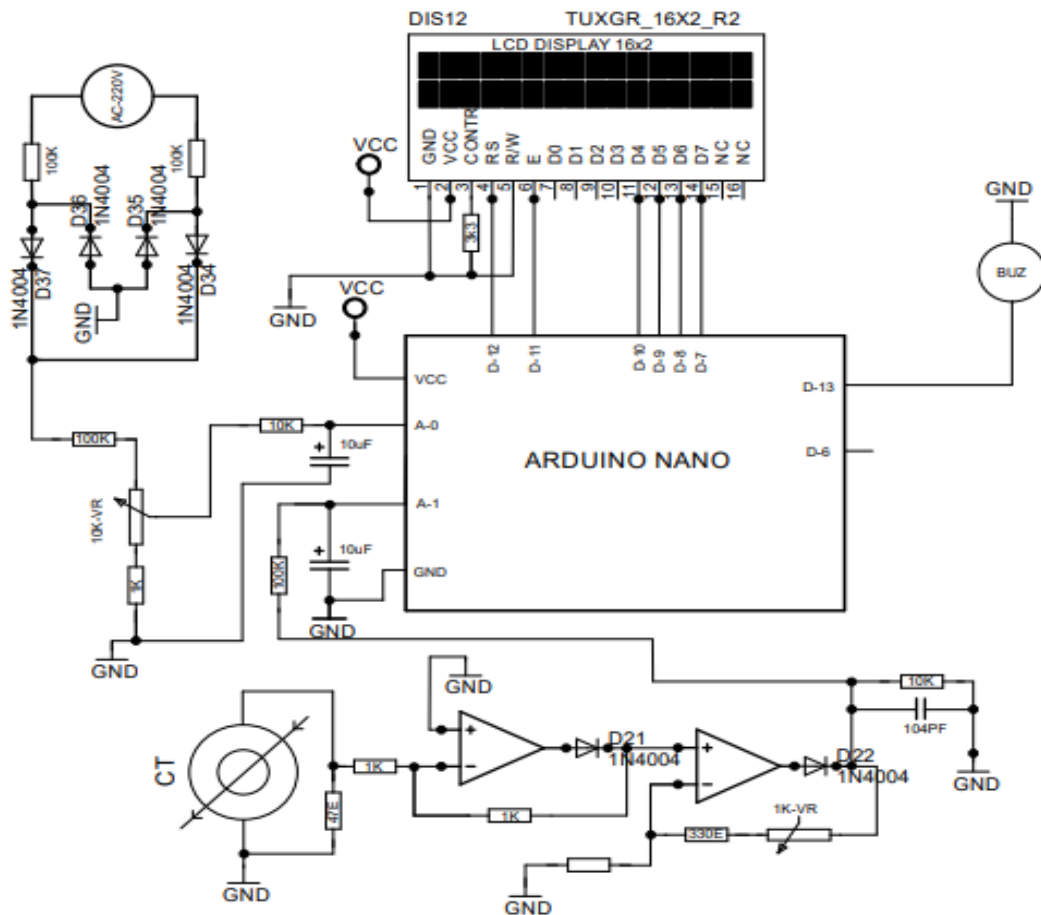
Fig. 4.9: Home Energy Meter

4.10 Cost Estimate.

Component Name	Quantity	Cost
Buzzer	1	50 Taka
LCD	1	50 Taka
Capacitor	4	36 Taka
Resistor	8	30 Taka
Diode	5	30 Taka
CT	1	50 Taka
PT	1	150 Taka
Step down Transformer	1	150 Taka
Dual OPM	1	80 Taka
Arduino	1	250 Taka
Light	2	56Taka
Push Switch	3	45 Taka
Holder	2	40 Taka
Fan	1	30 Taka
PCB Board	1	80 Taka
Some wire	-----	25 Taka
LED	2	5 Taka
	Total	1157 Taka

CHAPTER 5

DESIGN AND IMPLEMENTATION



Firstly supplied A.C voltage about up to 240 voltage in addition to add the step down transformer from declining voltage for which is low as ardiuono does not move on ac as well as converted to dc using a rectifier directly connected to the supply of the ardiuono .limited voltage absorbed for ardiuono ,used regulator device witch well gather enough voltage for all any high circumstances

To the CT which is also shown current .both of the GEND line's connections are together to the earth PT and CT described earlier why we have used .usually shown three loads as like capacitive ,inductive loads. of all the evolution well watch from the LCD display in which

usually added to the arduino that's model varied arduino nano328 in monitoring according to show as much as get to line with four ingredient namely V,P,TU,U(per second) also we have used capacitor to get pure manner and used resistance to have internal several situation handled. to obtain more performance ,can see the code which is attached this paper that's of the briefly narrated the working principle to can be played whole the energy meter

CHAPTER 6

SUMMERY AND DISCUSSION

6.1 Discussion.

An electricity energy meter is a device that measures the amount of electric energy consumed by a residence, a business, or an electrically powered device. Electric utilities use electric meters installed at customers' premises for billing purposes. They are typically calibrated in billing units, the most common one being the kilowatt hour (kWh). They are usually read once each billing period.

6.2 Summery.

This Smart energy meter is exceptional because shown the Voltage, Total Unite per day, Unite per day per second, Watt and Current for the AC supply.

CHAPTER 7

CONCLUSIONS

7.1 Conclusion.

In this project, we develop a general purpose of electronic circuit design that can Show the LCD display Voltage, Total Unite per day ,Unite per day per second ,Watt and Current for the AC supply. The project is successfully developed and met the stated objectives.

7.2 Limitations of the Work.

The working procedure of this project is very easy but we are facing some limitation for doing this project. Such as coding problem, program writing, connecting to PCB board, commend following etc

7.3 Future Scopes.

- i. To convert Analog Energy Meter to Digital Energy Meter
- ii. Prepaid System Energy Meter
- iii. Energy meter Monitoring by GSM System

References

- [1] www.researchgate.net
- [2] www.heyuanintel.com
- [3] www.diva-portal.org
- [4] www.radianresearch.com
- [5] www.academia.edu
- [6] www.engpaper.net
- [7] technav.ieee.org/tag
- [8] gsdl.easternuni.edu.bd
- [9] www.informationvine.com

APPENDIX A

```
#include<LiquidCrystal.h>
#include <EEPROM.h>
LiquidCrystal lcd(12,11,7,6,5,4);
#define BUZ 13
float I ,PW=00.0;
float PF=0.86;
float UNIT = 00.0,UNITT = 00.0,UNITD = 00.0;
int ACV=0,SEC,MIN,HR,DAY,PDAY;
int temp=0,i=0,cnt,BALANCE=20,MSGF;
char str[20];
void setup()
{
  lcd.begin(16,2);
  pinMode(A0,INPUT);
  pinMode(A1,INPUT);
  pinMode(A2,INPUT);
  pinMode(A3,INPUT);
  pinMode(A4,INPUT);
  pinMode(BUZ, OUTPUT);
  lcd.setCursor(0,0);
  lcd.print(" AC VOLT-AMPERE ");
  lcd.setCursor(0,1);
  lcd.print(" ENERGY METER  ");
  digitalWrite(BUZ, LOW);
  delay(1000);
  /*
  lcd.setCursor(0,0);
```

```
lcd.print(" SUBMITTED BY:  ");
lcd.setCursor(0,1);
lcd.print("          ");
delay(2000);
```

```
lcd.setCursor(0,0);
lcd.print(" ABDUL KADER ");
lcd.setCursor(0,1);
lcd.print("KHYRUL ISLAM ");
delay(3000);
```

```
*/
```

```
digitalWrite(BUZ, LOW);
delay(60);
digital write (BUZ, HIGH);
delay(60);
digital write (BUZ, LOW);
delay(60);
digital write (BUZ, HIGH);
delay(60);
digital write (BUZ, LOW);
delay(500);
lcd.print("Circuit Digest ");
delay(500);
lcd.setCursor(0,1);
```

```
lcd.print("System Ready... ");
UNITD = EEPROM.read(0);
UNITT = EEPROM.read(8);
delay(500);
lcd.clear();
```

```

}
/////////////////////////////////////////////////////////////////
/////////////////////////////////////////////////////////////////
void loop()
  ///////////////////////////////////////////////////////////////////
  cnt++;delay(4);
  if(cnt > 225)
  {
    DISPLAY1();
    ACV = analogRead(A0);
    delay(1);
    int adc1 = analogRead(A1);
    delay(1);
    I = (adc1 * 5.0) / 255;
    PW = ACV * I*PF;/ Power Factor Constant Value 0.86
    SEC++;
    UNIT = ((PW*3600)/1000);
    UNIT = ( UNIT / 3600 );/Showing Unit Per Day Per Second
    UNITD = (UNITD + UNIT );
    EEPROM.write(0, UNITD);
    if(SEC > 59)
    {
SEC=0;MIN++;
      UNITT = ( UNITT + UNITD );
      UNITD=0;
      EEPROM.write(8, UNITT);
    }
    if(MIN > 59)
    {MIN=0;HR++;}

```

```

if(HR > 24)
{
    HR=0;DAY++;
    //UNITT = ( UNITT + UNITD );
    //UNITD=0;
    //EEPROM.write(0, UNITT);
}
cnt=0;
}
//////////
}
////////////////////////////////////
////////////////////////////////////
void DISPLAY1()
{
    lcd.setCursor(0, 0);
    lcd.print("AC:");
    lcd.print(ACV);
    lcd.print("V ");
    lcd.setCursor(9, 0);
    lcd.print("P:");
    lcd.print(PW);
    lcd.print("W");
    //lcd.setCursor(0, 1);
    //lcd.print("I:");
    //lcd.print(I);
    //lcd.print("A ");
    lcd.setCursor(0, 1);
    lcd.print("UT:");
    lcd.print(UNITT);
}

```



```
lcd.print(" ");

//lcd.setCursor(9, 1);
//lcd.print("P:");
//lcd.print(PW);
//lcd.print(" W ");
lcd.setCursor(9, 1);
lcd.print("U:");
lcd.print(UNITD);
}

/////////////////////////////////////////////////////////////////
/////////////////////////////////////////////////////////////////
```