Global Journals LaTeX JournalKaleidoscope™
Artificial Intelligence formulated this projection for compatibility purposes from the original article published at Global Journals. However, this technology is currently in beta. *Therefore, kindly ignore odd layouts, missed formulae, text, tables, or figures.*

Power Factor Detection using Android Application via Bluetooth

Md. Asaduzzaman Nur[1], Md. Faysal Chowdhury[2], Sayeedul Mursalin[3], Mohammad Jubair Hossain[4] and Omor Ahmed Dhali[5]

[1] AIUB

Received: 3 February 2015 Accepted: 4 March 2015 Published: 15 March 2015

Abstract

In present days Technological advancement and its incorporation is becoming a significant role in human life. Now Electrical power is very precious but due to the addition of Inductive load the reactive power is increasing rapidly as a result the industrialization has been affecting the efficiency of the electric power system. To minimize the reactive power consumption the power factor detection system is became a serious issue. The developed module will be an ideal possibility in the upcoming future with minimal cost and flexibility. In this project we have used atmega16 microcontroller, LCD, current sensor, voltage sensor, Bluetooth Module and Android Application. The microcontroller is used to measure the phase voltage and current by using ADC as well as it detect the power factor by measuring the phase difference between voltage and current using delay. The current sensor is used to measure the current respectively voltage sensor for voltage. The LCD is used to show the measured data and the Bluetooth module is to send the data. The android application is used to show the data in smart phone which is specially developed for it. This is a part of smart grid. The ultimate objective of the project is to monitor the consumer end status continuously with minimum cost.

Index terms— microcontroller, transformer, LCD, bluetooth module, bridge rectifier, zero crossing detector, android application.

1 Power Factor Detection using Android Application via Bluetooth

Abstract-In present days Technological advancement and its incorporation is becoming a significant role in human life. Now Electrical power is very precious but due to the addition of Inductive load the reactive power is increasing rapidly as a result the industrialization has been affecting the efficiency of the electric power system. To minimize the reactive power consumption the power factor detection system is became a serious issue. The developed module will be an ideal possibility in the upcoming future with minimal cost and flexibility. In this project we have used atmega16 microcontroller, LCD, current sensor, voltage sensor, Bluetooth Module and Android Application. The microcontroller is used to measure the phase voltage and current by using ADC as well as it detect the power factor by measuring the phase difference between voltage and current using delay. The current sensor is used to measure the current respectively voltage sensor for voltage. The LCD is used to show the measured data and the Bluetooth module is to send the data. The android application is used to show the data in smart phone which is specially developed for it. This is a part of smart grid. The ultimate objective of the project is to monitor the consumer end status continuously with minimum cost. Keywords: microcontroller, transformer, LCD, bluetooth module, bridge rectifier, zero crossing detector, android application.

2 I. Introduction

ower factor is the ratio between the kW and the kVA drawn by an electrical load where the kW is the actual load power and the kVA is the apparent load power. Simply, it is a measure of how efficiently the load current is

being converted into useful work output and more particularly is a good indicator of the effect of the load current on the efficiency of the supply system. The value for the power factor can theoretically vary between 0/% and 100%, where a value of 100% also called unity power factor -delivers all of the power as active power. A value of 0% would mean all the power is supplied as reactive power; no motors would turn and no useful work could be accomplished. A high power factor is important. But if the power factor is low the Current will be increased, and this high current will cause to the following disadvantages.

Department, AIUB, Dhaka, Bangladesh. e-mails: faysalchowdhury05@gmail.com, sayeedul.mursalin@gmail.com, jubair_aiub@hotmail.com, ador1207@gmail.com

? Large Line Losses (Copper Losses) will occurs.

? Large kVA rating and Size of Electrical Equipment's will be required. This Project focuses on the design and implementation of power factor Detection using Atmega16 microcontroller chip, determine the power factor of the loaded power system, and generate proper action to calculate Capacitor. Also we would be using concepts of Bluetooth Module and Android Application.

3 II. Proposed System

4 III. Circuit Design Arrangement

In figure 1, the basic arrangement of the implemented project can be found.

Among the major components required to establish the project, few of them are the power transformers (step down), microcontroller ATMEGA 16 and Bluetooth module, Bridge rectifier, Zero crossing detector.

5 a) Transformer

Transformer is an electrical device which transfer energy from one circuit to another circuit without change its frequency but in different voltage level. In this project we have 230v to 12v step down transformer.

Step down transformers convert electrical voltage from one level usually down to a lower level. A step down transformer has less turns on the secondary coil that the primary coil. The induced voltage across the secondary coil is less the applied voltage across the primary coil or in other words the voltage is "stepped-down. Step down transformers are made from two or more coils of insulated wire wound around a core made of iron. When voltage is applied to one coil (frequently called the primary or input) it magnetizes the iron core, which induces a voltage in the other coil, (frequently called the secondary or output). The turn's ratio of the two sets of windings determines the amount of voltage transformation. A bridge rectifier is an arrangement of four or more diodes in a bridge circuit configuration which provides the same output polarity for either input polarity. It is used for converting an alternating current (AC) input into a direct current (DC) output. A simple rectifier circuit described in this project converts the input from AC source to DC voltage. Firstly, the step down transformer converts the AC mains supply of 230V to 12V AC. This 12V AC is applied to the bridge rectifier arrangement such that the alternate diodes conduct for each half cycle producing a pulsating DC voltage consisting of AC ripples. A capacitor connected across the output allows the AC signal to pass through it and blocks the DC signal, thus acting as a high pass filter. The output across the capacitor is a smooth DC signal [8].

6 IV. Simulation & Flow Chart

The initial stage, the circuits have been designed and simulated in PROTEUS. The circuit have been utilized to detect the power factor using Android application via Bluetooth module. The circuit diagram can be found in figure 8. As can be seen from the flow chart, the sequence of operation depicted clearly. The process runs continuously in accordance with obtained logic. Vrms and Irms are read by the Microcontroller using ADC ports. After the zero crossing of voltage and current Signals, which are converted to square-waves, are provided to Microcontroller. Power Factor is measured by the Microcontroller from manipulating of capture module for V and I signals. After measuring the Power factor then microcontroller calculate the real power, reactive power, apparent power and value of capacitor. All the measured value are transmitted via UART.

7 V. Hardware Implementation

In reference to figure 1, the transmitting and receiving side can be described as follows: a) Transmitting side Heart of the project is the microcontroller ATMEGA 16.For measuring the line Voltage in this project we have used a step down transformer (220/12V) to converting the line voltage from 220V to 12V. Then, a bridge rectifier has been used to converting the 12 V ac to 12 V dc; after that, voltage divider have been applied to converts the 12 V to 5 V because the microcontroller works at maximum 5 V after that we connect it into a microcontroller pins. For current here we used a Hall Effect current sensor and connect the sensor output to another microcontroller pin. From this two pin the microcontroller measures the line voltage and current through ADC. For measuring zero crossing of voltage and current here we used a current transformer and potential transformer and the output ZCD are connected with microcontroller pins and microcontroller measures the phase angle between voltage and current .the Bluetooth module power is given from external power source (4V battery). Bluetooth module communicates with atmeg16 through UART. RXD of Bluetooth module is connected with TXD of atmega16 and TXD of Bluetooth module is connected to RXD of atmega16.

8 b) Receiving side

In receiver Side an Android Phone is available which is connected with transmitting side via Bluetooth Module CI Android Apps [6]. The apps can communicate with Bluetooth Module HC-06. The password of the module is 1234. The communication protocol is UART and baud rate is 9600 [4].

In view of the descriptions above, the implemented hardware can be found in figure 10. In The view of a wide and short range of possibilities on the basis of Bluetooth based power factor Detection system, a few has been depicted below:

? Improvements to human-machine interface.

? Load controlling.

? Load status checking and fault detection.

? Capacitor Switching etc. Also this project work has not been tested on synchronous motor because of the requirement of considerable expense. It needs the further enhancement of the system. Finance is a critical issue for further enhancement.

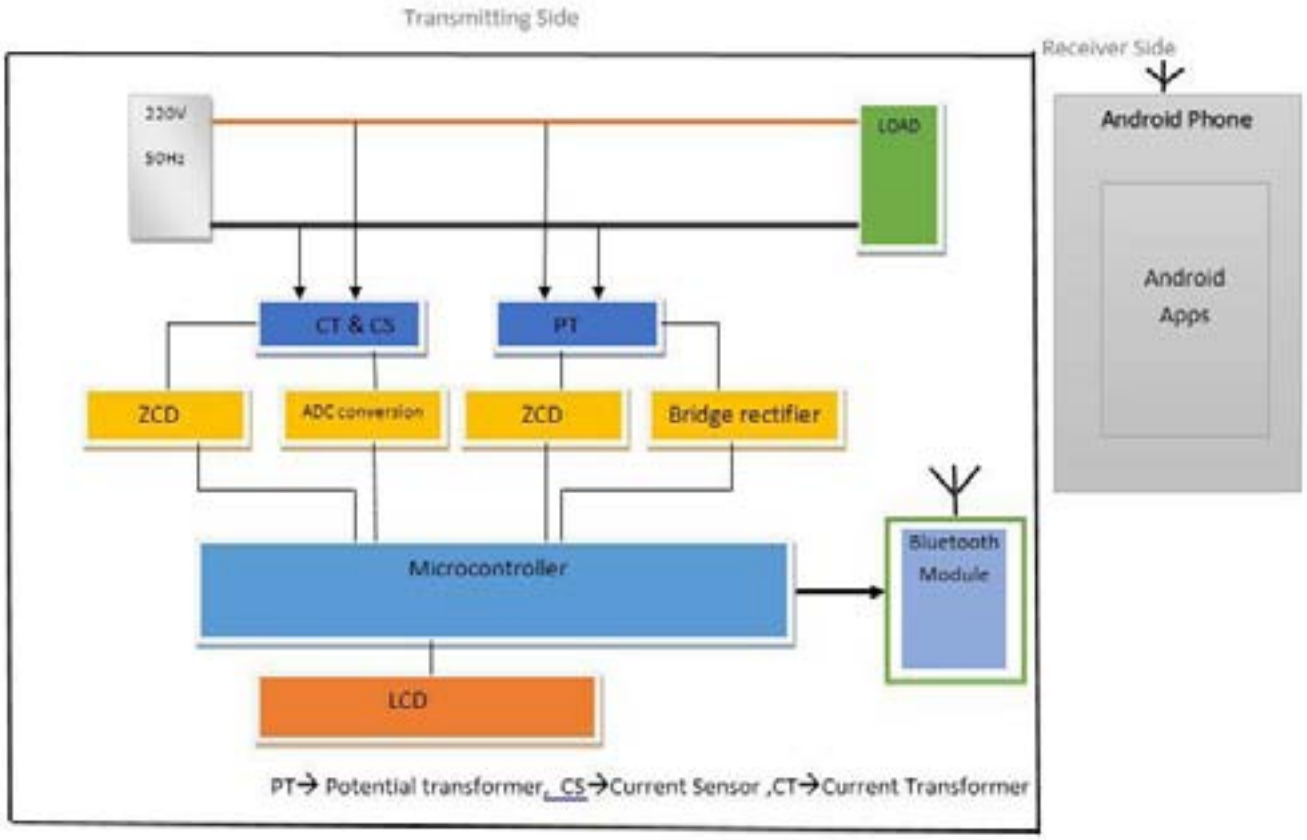
9 VII.

10 Conclusion

This Project has proposed the advanced method of the power factor Detection by using the Atmega16 and Android application via Bluetooth module which has the many advantages over the various conventional methods of the Power factor compensation. The microcontroller always monitor power factor, voltage and current and it always send the current status of the load via Bluetooth module. This project gives more reliable and user friendly power factor detection. Thus we have presented the Possible advanced method for the detection of the power factor. [1]

Figure 1:

[1] © 2015 Global Journals Inc. (US)

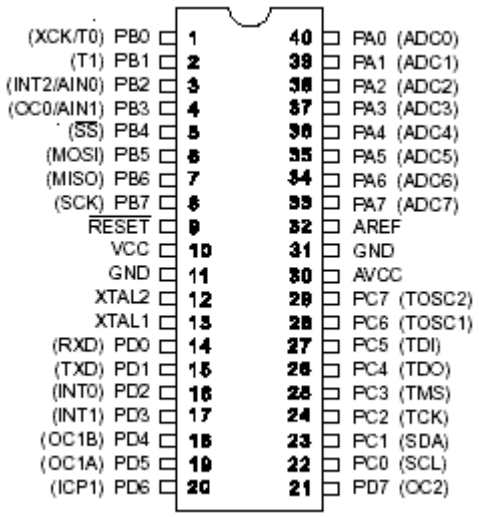


1

Figure 2: Figure 1 :

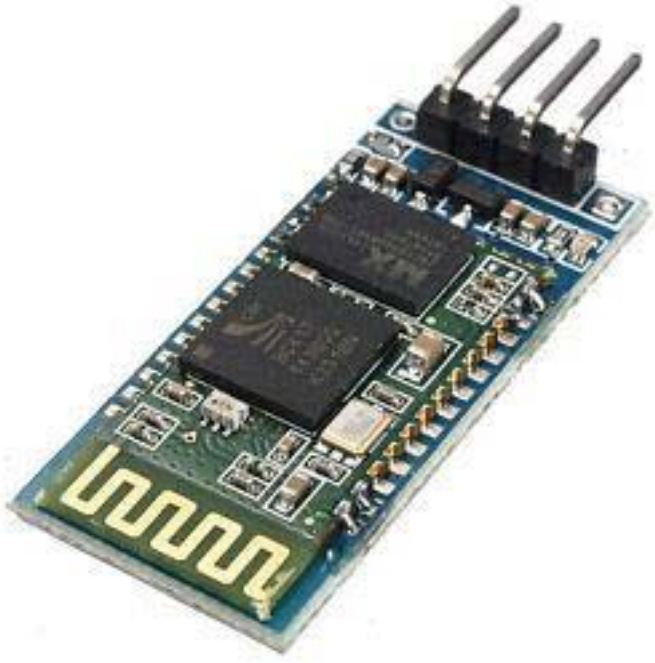
2

Figure 3: Figure 2 :



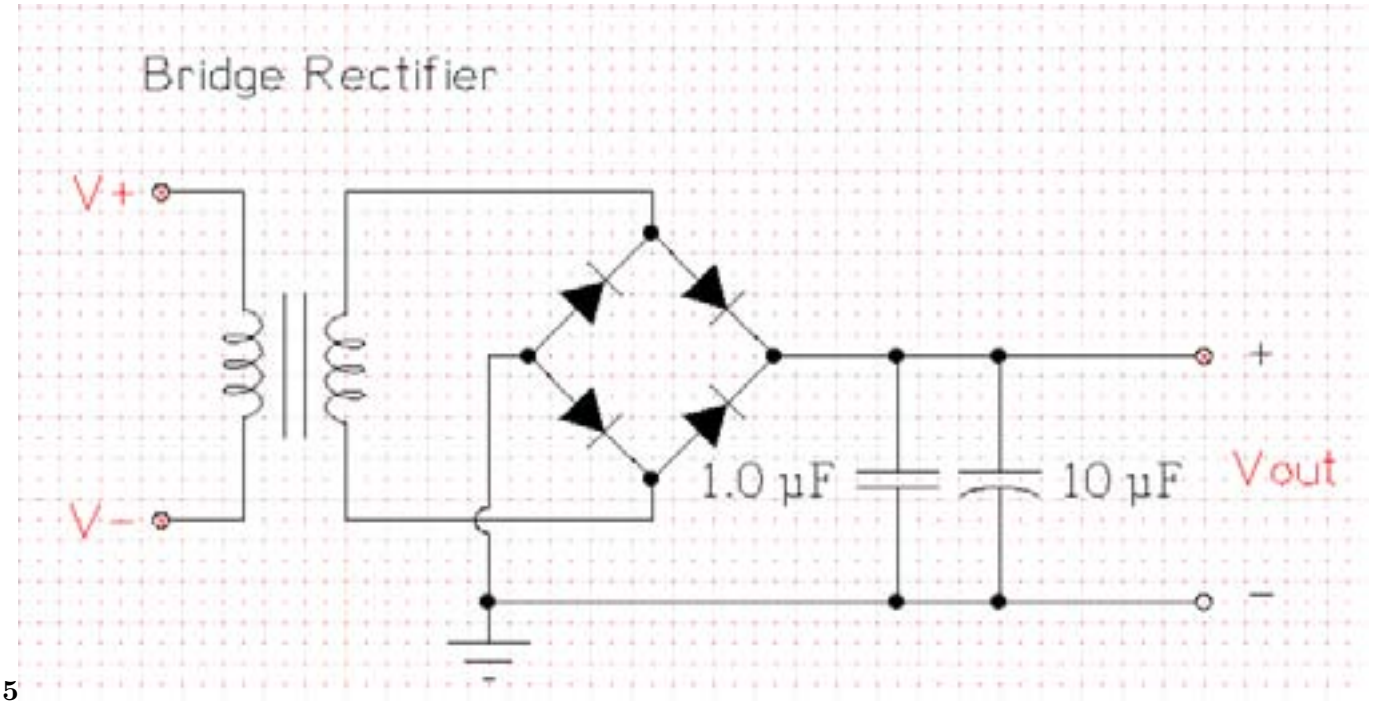
3

Figure 4: Figure 3 :



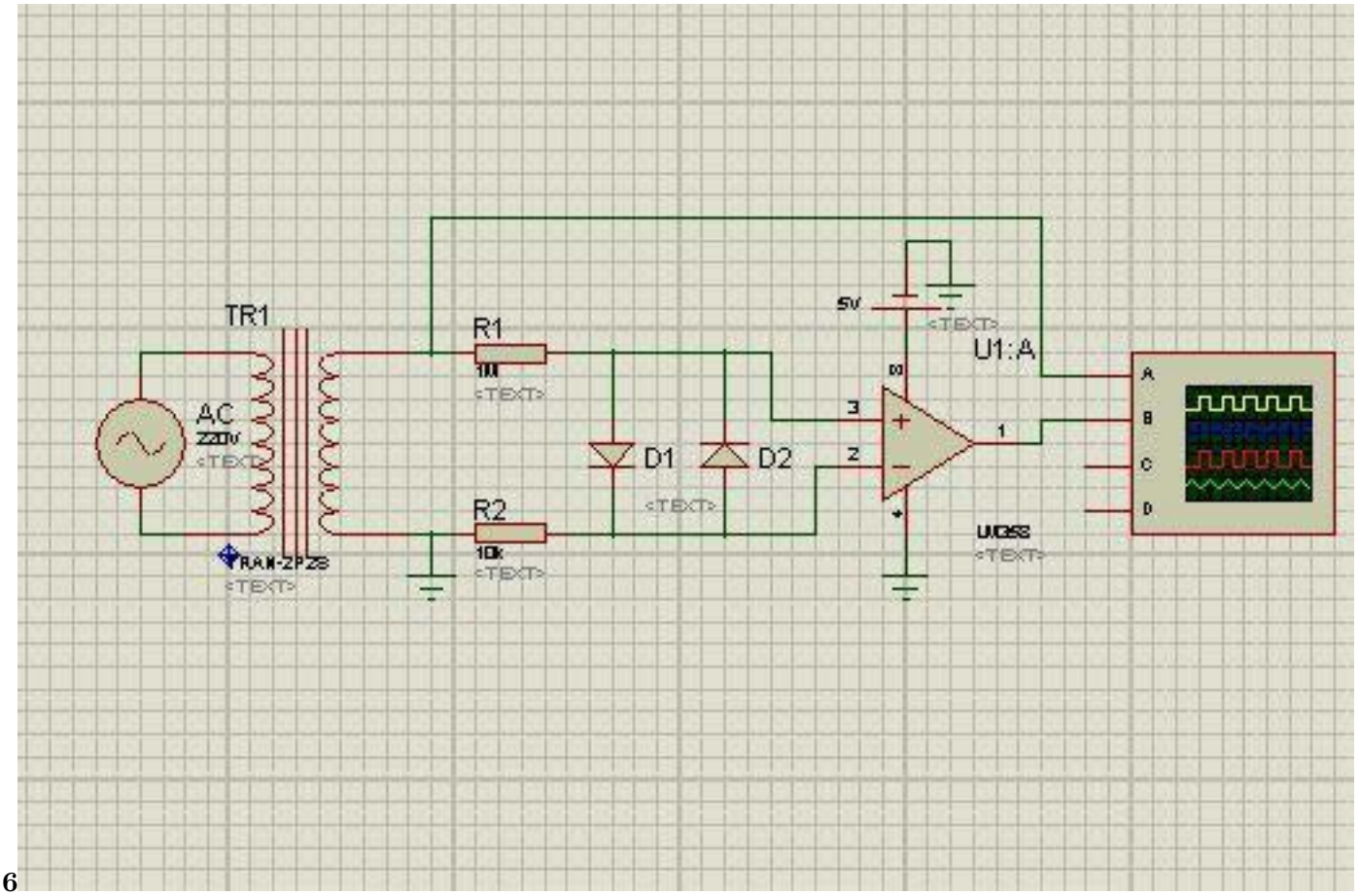
4

Figure 5: Figure 4 :



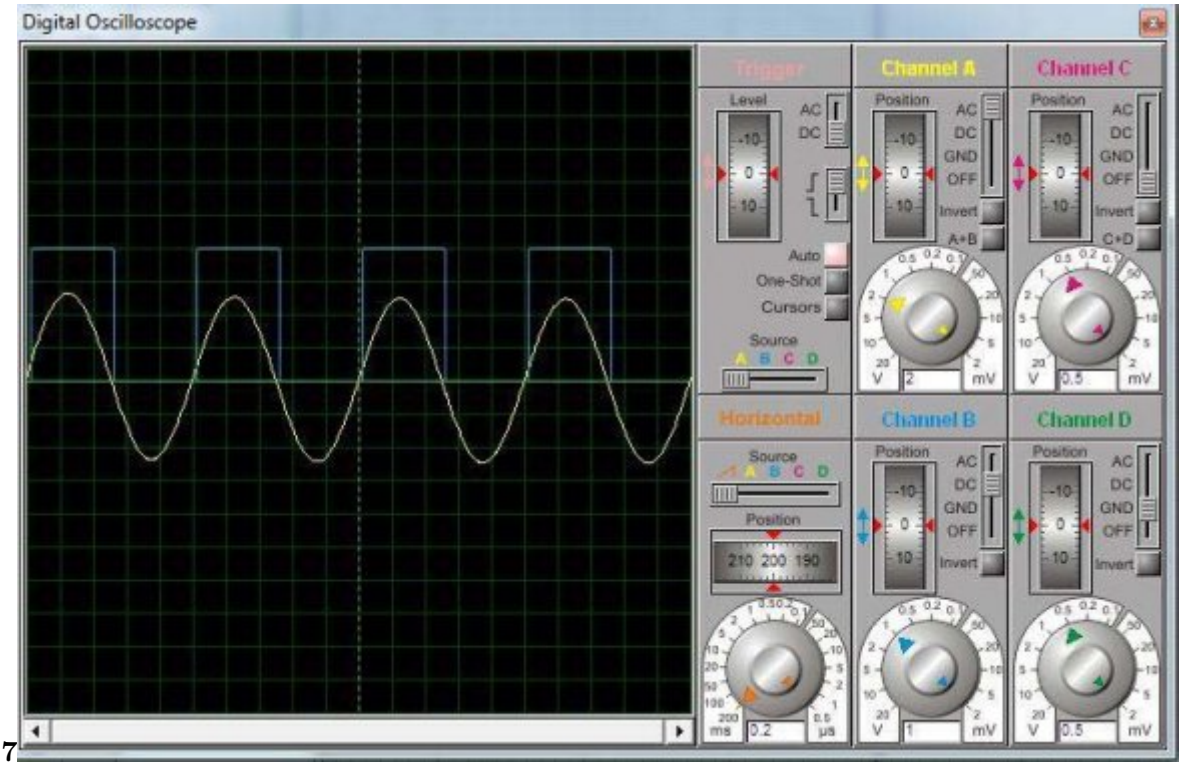
5

Figure 6: Figure 5 :



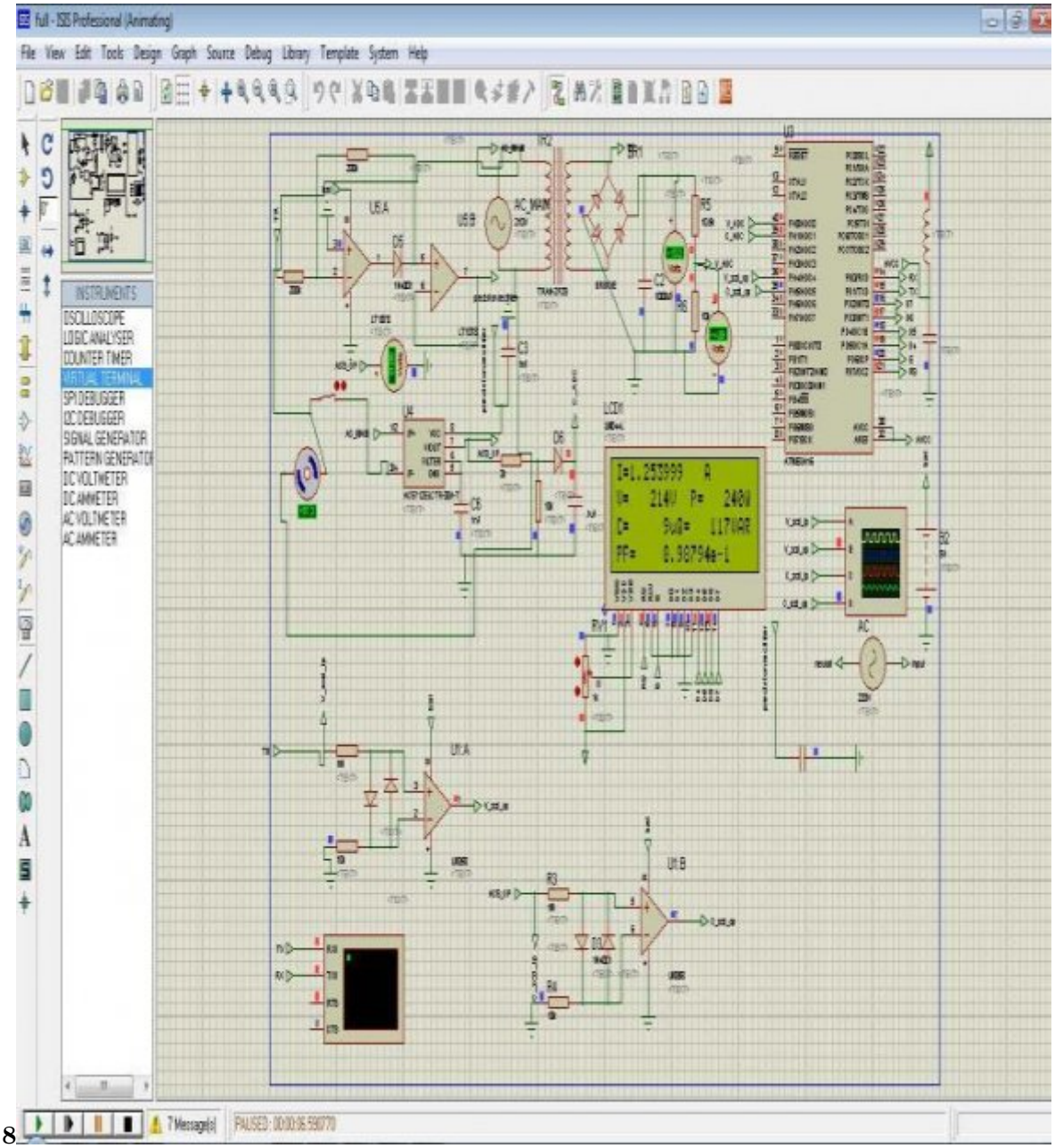
6

Figure 7: Figure 6 :



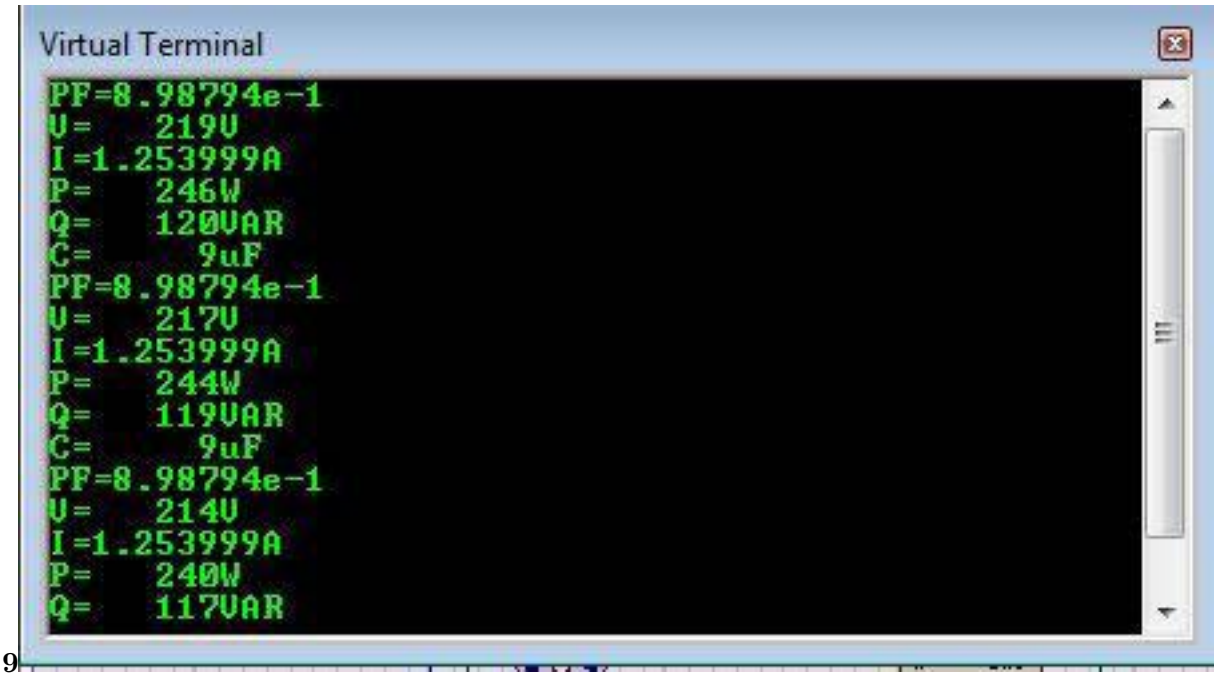
7

Figure 8: Figure 7 :



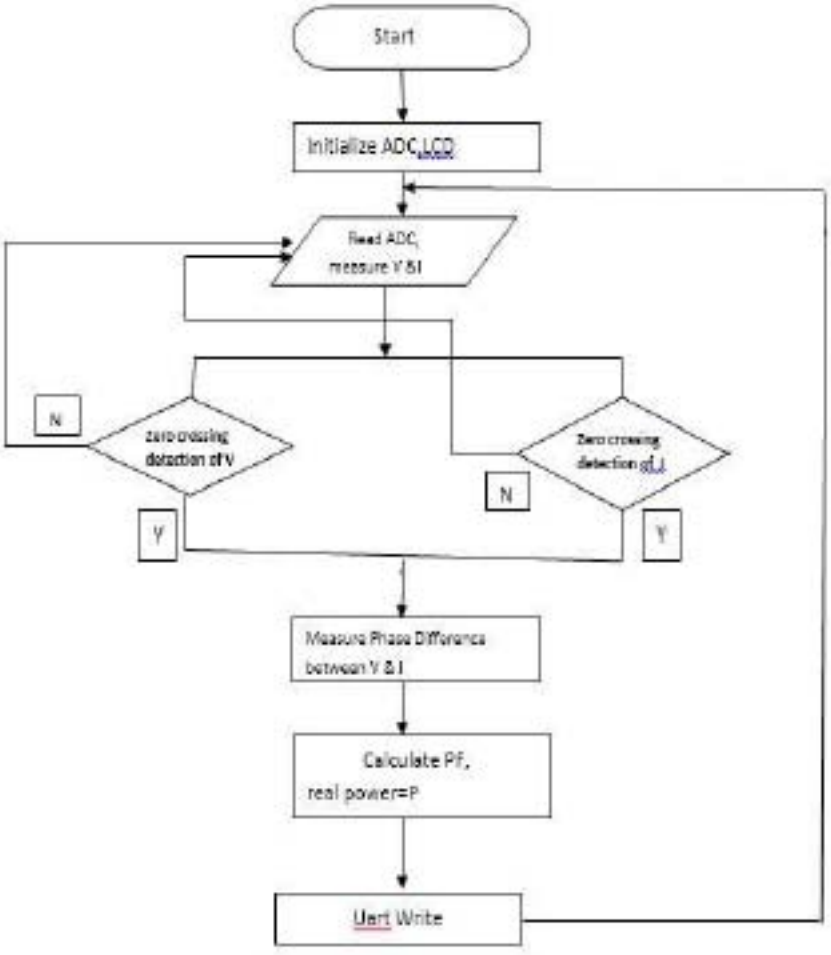
8

Figure 9: Figure 8 :



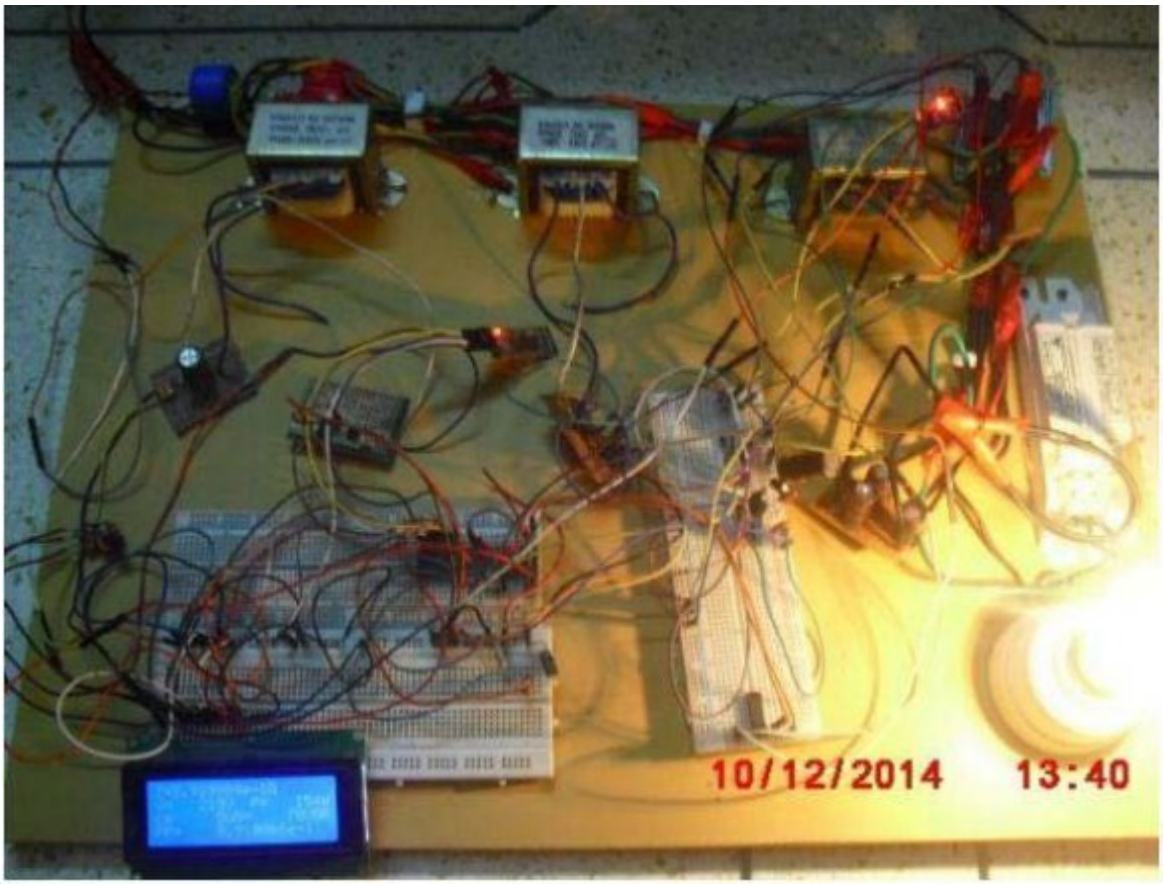
9

Figure 10: Figure 9 :



10

Figure 11: Figure 10 :



11

Figure 12: Figure 11 :

12

Figure 13: Figure 12 :

Figure 14: ?

[Datasheet Of] , Atmega16 Datasheet Of . http://www.atmel.com/images/7766s.pdf

[Datasheet of Bluetooth module HC-06] http://www.micro4you.com/files/ElecFreaks/Bluetooth%20HC-06.pdf *Datasheet of Bluetooth module HC-06*,

[Wadhwa ()] *Electrical Power Systems". New Age International (P) Ltd., Publishers: New Delhi*, C L Wadhwa . 2005. p. .

[Md Asaduzzaman Nur et al.] 'Fault Analysis and Electrical Protection of Distribution Transformers'. Mehdi Md Asaduzzaman Nur , M S Hasan Sourov , Muhit & Md Khaled Hossain . *E-Journal_GJRE_(F)* p. .

[Alexander and Sadiku ()] 'Fundamentals of Electric Circuit'. C K Alexander , M N O Sadiku . *United States of America* 2000. McGraw-Hill Companies, Inc.

[Google play store "Bluetooth module CI] *Google play store "Bluetooth module CI*,

[Thiyagarajan (2010)] 'Palanivel "AN EFFICIENT MONITORING OF SUBSTATIONSUSING MICROCONTROLLER BASED MONITORING SYSTEM'. & T G Thiyagarajan . *IJRRAS* July 2010. 4 (1) .

[Sonje and Soman (2013)] 'Power Factor Correction Using PIC Microcontroller'. Pranjali Sonje , Anagha Soman . *IJEIT* October 2013. 3 (4) .

[Grainger ()] *Power System Analysis. Tata McGraw-Hill*, John J Grainger . 2003. p. 380.

[Md Asaduzzaman Nur et al. ()] *Transmission Line Fault Detection Using Android Application via*, Md Asaduzzaman Nur , Md Golam Islam , Mostofa . 2014. (Moshiul Alam Chowdhury. Bluetooth" E-Journal_GJRE_(F)_Volume 14 Issue 8 Version 1.0 Year)