DESIGN AND CONSTRUCTION OF A BASIC UPS (UNINTERRUPTER POWER SUPPLY)

BY

PETER GIDEON IBRAHIM
N/EET/08/01315

DEPARTMENT OF ELECTRICAL/ELECTRONICS
ENGINEERING TECHNOLOGY
NUHU BAMALLI POLYTECHNIC, ZARIA

OCTOBER 2010

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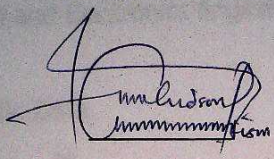
A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF ELECTRICAL/ELECTRONICS ENGINEERING

NUHU BAMALLI POLYTECHNIC ZARIA

OCTOBER, 2010

DECLARATION

I hereby declare this project is the sole result of my work under the guidance and supervision of Mr. Y.Y Dangana of the Department of Electronic Engineering Technology. Nuhu Bamalli polytechnic, Zaria and that I have neither copied some ones work.



1st Dec, 2010.

Peter Gideon Ibrahim **Sign** **Date**

CERTIFICATION

This is to certify that this titled "basic uninterrupted power supply (UPS)" by Peter Gideon Ibrahim meets the standard expected for the award of the National Diploma Certificate and has been prepared in accordance with the regulations governing the preparation and presentation with the of project at the department of Electrical and Electronics Engineering technology.

Nuhu bamalli Polytechnic Zaria.

MR. Y.Y DANGANA (Project Supervisor)	**Sign**	**Date** 07/12/10
MAHMOUD PANTI (Project Coordinator)	**Sign**	**Date**
MOHAMMEH A. GARBA (Head of Department)	**Sign**	**Date**

DEDICATION

This project is dedicated to our Almighty God the Omni – potent and to my parents: Deaconess and Mr. Peter for their encouragement, support and constant prayers for my success in my academy pursuit as well as to the staff of student to Electrical/Electronic Engineering of Nuhu Bamalli Polytechnic (Zaria).

(NBPZ)

ACKNOWLEDGEMENTS

I hereby centre my profound gratitude to Almighty god for sparing my life and for giving me the opportunity, ability and capability to reach this stage in my career and academic pursuit.

I owe a great deal of gratitude to my project supervisor Mr. Y.Y Dangana of the department of Electrical/Electronics Engineering Technology whose sacrifices his precious time and through his indefatigable effort carefully went through the manuscript which made it possible to product this pieces of work. My thanks also go to my industrial base supervisor in person pf Mallam Umar Garba.

I wish to register my profound gratitude to my Mum (Mrs. Adama Peter) and special gratitude to my Dad (Mr. Peter Ibrahim) for their great encouragement and support during the course of my studies and also to Mr. Daniel Ibrahim, Mr. Okohson Ezeja, Alpha Thomas, Mr. Joseph Atama, Mr. Iliya Ibrahim, and all of my course mates that put through when ever I am having any difficulties during my course of studies which I could not mentioned one by one. May Almighty God reward you abundantly in your needs, Amen.

It will be incomplete if I do not extent my gratitude to my school guidance in the person of mallam Aminu Abubakar of student's Dean office, Annex Campus and also my brother and sisters Linda Joseph (Sunshine), Rapture Peter, Florence Peter, and Theophilus, peter, Miracle Daniel and Ina Joseph and others to mentioned a few. I love you all.

How can I forget my uncle Mr. Alhaji Gajere and my good friends indeed: Eli Joseph, Monday Joseph, Chibike Zephaniah, Sintiki Zachariah and Dorcas Dogo, Saul Bayero, Yusuf Sabo and Akacha Ibrahim.

You are all God send. Thanks for the assistance you rendered throughout this period. My entire lecturers in the Department Electrical/Electronics Engineering Technology are not left out. I thank you for efforts towards my completion of this programme.

Finally, to of you not mentioned here I am indebted to you all Thanks.

TABLE OF CONTENT

CHAPTER ONE

1.1 INTRODUCTION

The circuit is a simple form of basic of UPS (uninterrupted power supply) which standby capacity to maintain the supply with no electrical supply depend on the load taken from the UPS and also the amphorae hour capacity of the battery by using 7A/H 12V battery and loaded from 6s regulated was 0.5amp and no load the unregulated supply then regulated would be maintain for 14 hours create A/h capacitor battery would provided a longer stand by time and vice versa.

1.2 AIMS AND OBJECTIVE OF THE PROJECT

The aims and the objective of this are as stated below:

i. To provide a design that is affordable compare to the important types of UPS

ii. Develop (design and construction) a portable, reliable and efficient basic UPS with ease in ease of power failure

iii. Select appropriate material (local material) suitable for the construction of the basic UPS

1.3 MOTIVATION

The uninterrupted power supply (UPS) circuit is very simple for among the UPS circuit. This circuit is a form of the commercial UPS at low price which at least 90% can be affordable. It can be adopted for the other regulate and volt by using too 12voltbatteries in series and 7815 regulator.

1.4 SCOPE AND LIMITATIONS

UPS – back up power when light goes of from the National grid for the operator of the computer to have time to save, and switch the set

CHAPTER TWO

LITERATURE REVIEW

2.1 LITERATURE REVIEW OF THE COMPONENT USED

Transformer: The transformer in its simplest form, consist of the two inductive coils which are electrical separated but magnetically linked through a part of low reduction. A charging current in one winding induce a charging in electromotive force e.m.f in that winding.

If one is connected to a source of alternating voltage, an alternating flux is set up in the laminating core, most of which is linked with the other coil in which it produced mutually induced e.m.f. If the second circuit energy is transected the first coil is called the seconding winding the second winding. The diagram is show below.

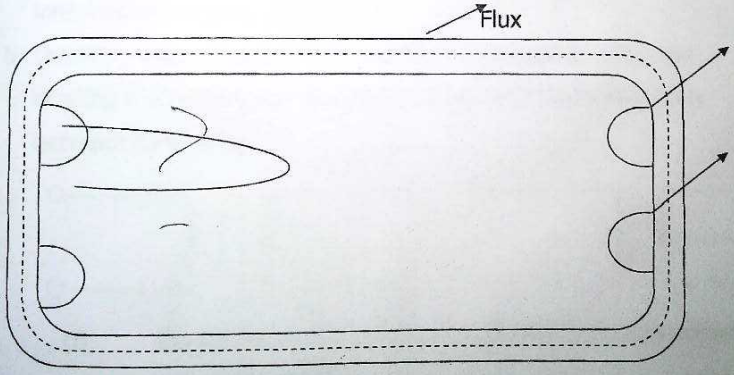


Figure 2.1 ideal transformers.

USES OF TRANSFORMER

1. To step down or step in up input AC voltage to lower or high voltage respectively
2. Is a transducer

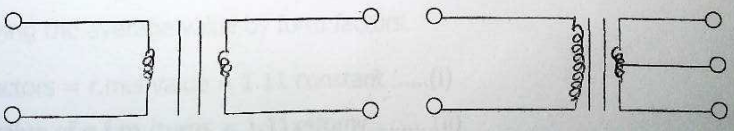
CLASSIFICATION OF TRANSFORMER

Transformers are classified according to the physical size, power rating winding, core types, and functions son on.

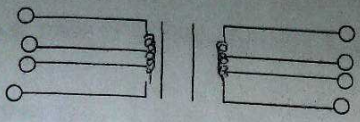
1. Winding: - The winding in transformer makes it possible for churching a magnetic field in the core which links the same or other winding and induced a churching e.m.f in that winding.

a. Auto – transformer:- This is a single wound transformer with intermediate tapping

b. Double – wound transformer:- as the name suggest, it has two winding the primary and secondary. It has electrically insulation between its winding.



(i) Double wound transformer (ii) Double wound transformer with centre tapped



iii. Double wound transformer with separate secondary and multi – tapped primary

2.3 E.M.F EQUATION OF A TRANSFORMER

Let N_1 = Number of turns in primary

N_2 = number of turns in secondary

Q_m = Maximum flue in core in wbe = BMXA

F = frequency of A.C input

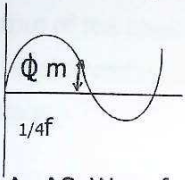


Fig. 2A An AC. Wave form

Flux increase from zero value to maximum value Qm in one quarter of cycle i. e ¼ of sec.

Average rate of change of flue = flux = Q_m

$1/4f = 4Q_m f$ volt

Now, rate of change of flux per turns means induces e.m.f is obtained by multiplying the average value by form factors.

Form factors = r.m.s value = 1.11 constant .....(i)

r. m.s value of e.f.m /turns = 1.11x4fqmv .....(ii)

Now r.m.s value of induces e.m.f. in the whole of primary Winding = induces e.m.f/turns x no of primary many turns

$E1 = 4.44\ fN_1\ Q_m = 4.4FN_1\ BMA$ ..... (iii)

Similarity, r.m.s. value of the induces e.m.f. in secondary winding

$E2 = 4.4FN_2 Qm = 4.44FN_2 BMA$ .... (iv)

In an ideal transformer on no load

$V_1 = E_1$ and $V_2 = E_2$ ..... (v)

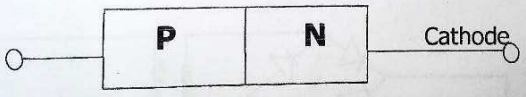
Where $V_2 = E_1$ is the terminal voltage.

RECTIFICATION

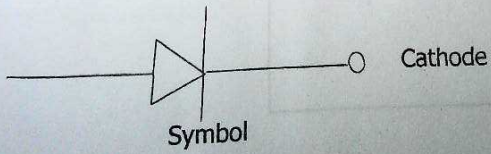
The output of the power – supply from transformer is declared t a section marked diode rectification is to convert the A.C voltage input to pulsating D.G voltage.

DIODE

The diode is a semi conductor device with large, the panel inside diode function as a rectifier because the will allow current to flow only one direction.



Structure

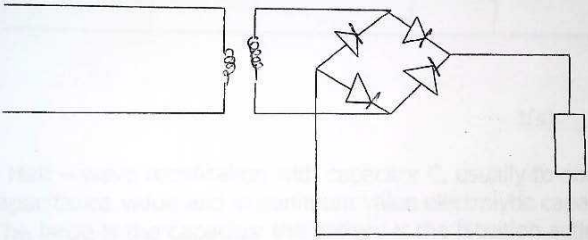


Symbol

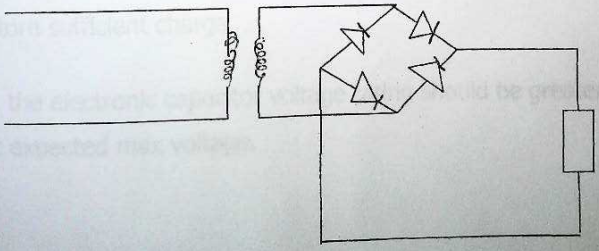
Full – wave bridge rectifier

The bridge circuit regulates with four diode instead of two but avoided the need for a centre tapped input transformer, the bridge rectifier may be four separate diode or molded into one assembly.

During the first half – cycle two of the diode conduct and two are blocked and in the alternative half – half cycle the first two are blocked while other two conduct as show in figure 2.3.0 below.



(a) During the first half – cycle D_2 and D_2 conduct



(b) During the second half –wave rectification.

(c) The capacity provide an output D.C that is smooth because the D.C is pulsating at 120 pulse/sec. there is also less ripple because the ripple are close together.

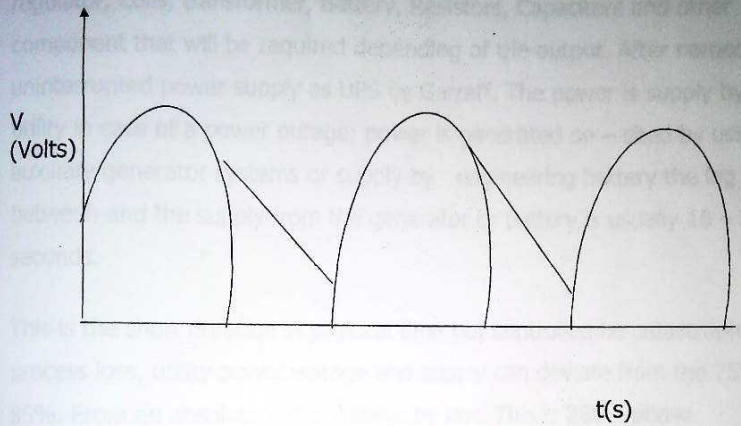


fig. 2.4 Half – wave rectification with capacitor C. usually to obtain fairly large capacitance value and in minimum value electrolytic capacitor is used. The large is the capacitor the battery is the filtration action.

The value of the capacitor is chose to be varying large in other.

O To prevent small reactance to be pulsating rectifier put

O To store sufficient charge.

Finally, the electronic capacitor voltage rating should be greater that the current expected max voltage.

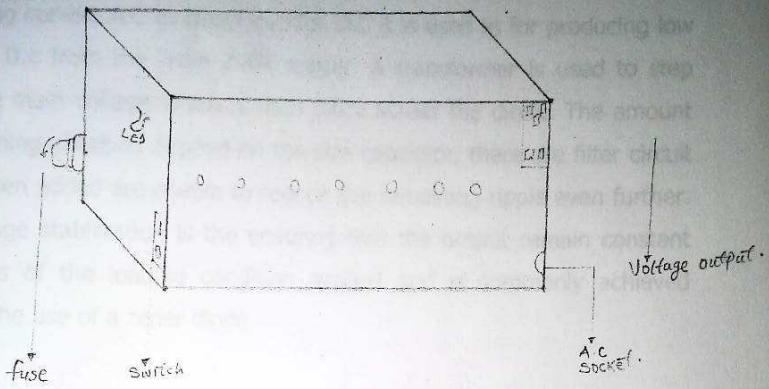
2.4 HISTORICAL BACKGROUD OF THE UPS

Towards the end of the 19thy century, scientist began to invent equipment that will be used when there is no electricity supply by Len Jones by using regulator, Coils, transformer, Battery, Resistors, Capacitors and other component that will be required depending of the output. After named as uninterrupted power supply as UPS by Garraff. The power is supply by the utility in case of a power outage; power is generated on – sited by using auxiliary generator systems or supply by engineering battery the lag time between and the supply from the generator or battery is usually 10 – 30 seconds.

This is the short duration in physical time but controlled be catastrophic in process loss, utility power voltage and supply can deviate from the 75% to 85%. From an absolute value voltage by law. This is 280 – phase

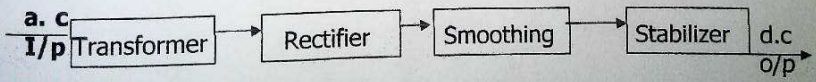
CHAPTER THREE

3.1 DESIGN



The project was design using plastic rubber. With the following measurement length 21cm and Breath 11.8cm.

3.2 BLOCK DIAGRAM (PRINCIPLE OF OPERATION)

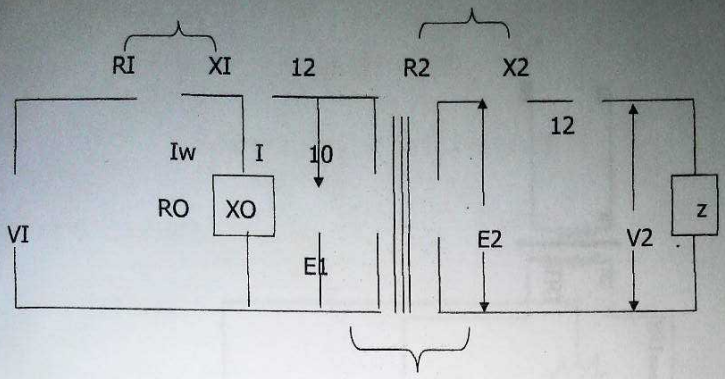


BLOCK DIAGRAMM OF UPS (UNINTERRUPTED POWER SUPPLY)

Principle of operation: the rectification unit is the process of converting alternating current A.C to direct current D.C it is used in for producing low – power D.c from the main 240V supply. A transformer is used to step down the main voltage which is then place across the diode. The amount of smoothing obtained depend on the size capacitor, there are filter circuit which when added are enable to reduce the remaining ripple even further. The voltage stabilization is the ensuring that the output remain constant regardless of the loading condition applied and is commonly achieved through the use of a zener diode

3.3 CALCULATION

The performance of a transformer can be calculated on the basic of its equivalent circuit which contains on the diagram below.



Ideal
Transformer

The no – load current I_o is simulated by pure inductance X_o taking the magnetizing component Iu and a non – inductive resistance Ro taking the working component Iw connected in parallel across the primary circuit.

The value of E_1 is obtained by subtracting vectorially I_1Z_1 from V_1. The value $X_o = E_1 / I_o$ and of $R_o = E_1 / I_w$. It is clear that E_1 and E_2 are related to each other by expression.

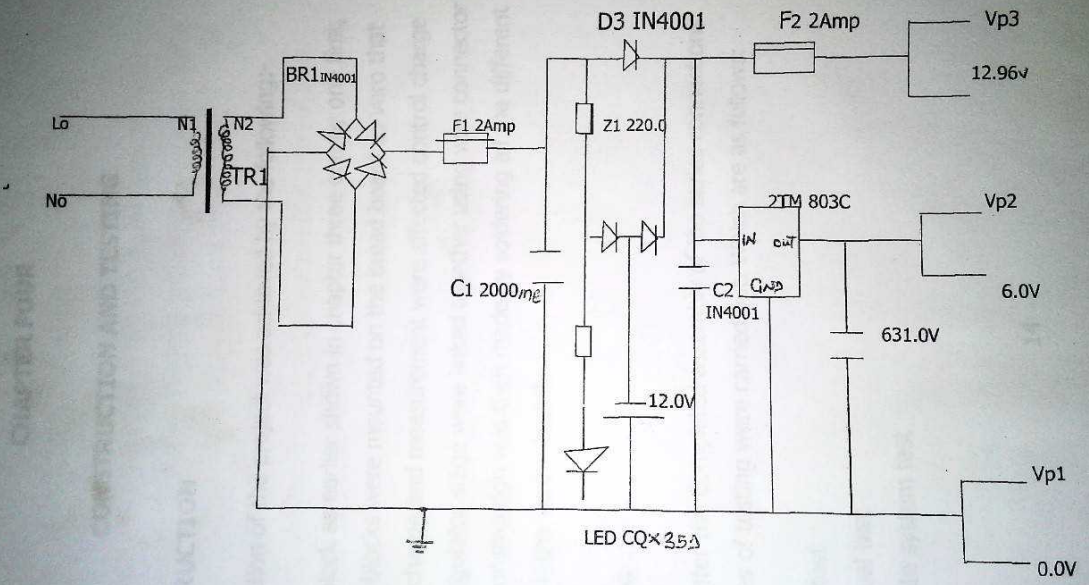
$$E_2 / E_1 = N_2 / N_1 = K$$

To make transformer calculation simpler, it is preferable to transfer voltage. Current and impendence either to the primary or to the secondary. In that case, we would have to work in one winding only which is more convenient. From transferring secondary impendence to primary K_2 is used.

$$R_2 = R_2/K_2,\ X_2 = X_2/K_2,\ Z_2 = Z_2/K_2$$

Where $E_2 = E_2 / K = E_1$ is the primary equivalent of the secondary induced voltage.

CIRCUIT DIAGRAM OF UNINTERRUPTED POWER SUPPY (UPS)



CHAPTER FOUR

CONSTRUCTION AND TESTING

4.1 CONSTRUCTION

The construction of the project was achieved by the following:-

The design block as earlier shown in chapter three one by one first, the different blocks were mounted on the bread board so vero that adjustment, charge and measurement were affected control charge circuit and regulator stage were linked together using wire connector paramount construction was then made by soldering all the different component on the vero – board.

4.2 TESTING

Before And after the Completed assembly of the series connections different types of testing were carried out. Which are as follows:

1. Wiring test
2. Individual test
3. Complete system test

Explanation of the several:- test carried out

1. Wiring test:- The wiring test of the circuit was done or vero – board short circuit and open circuit test were done using digital multi mater (DMM). The wiring was found satisfactory.
2. Individual Component Test:- Before making used of the component, they were subjected to various test confirm well being resistor and capacitor and their exact value were tested with mater.

The diode:- the diode were subjected to test to ascertain their form and reversed biased characteristics

CHAPTER FIVE

SUMMARY, CONCLUSION: - RECOMMENDATIONS

5.1 SUMMARY

After I have finished my construction came across a fault in my circuit with the resistor having lower value than that of the surrounding components when tested it did not work since there not short in the circuit. The resistor was soldiered and the circuit worked.

5.2 CONCLUSIONS

The design circuit of UPS (uninterrupted power supply) achieved with our design with regulated output voltage 6V and unregulated 12V as regulated in the circuit.

5.3 RECOMMENDATIONS

The following recommendation where made:

1. Follow-up studies on this project should be undertaking by other students but with modifications,
2. ~~the circuit worked~~

REFERENCE

A. Kingaini (2002): Electronics project for beginners" 4th Edition kwaslity offset printing press, Narains. New Delhi 11028, P.P 9 – 44, 123.

John Watson (1990): 'Mastering Electronics" 3rd Edition the Macmillian Press L. T. D Hound Mill, Basin Slake, Hampshire. P. P34, 17 -180.

Panthorowitz and Linfield Hill (1989): "The Art of electronics" 2nd Edition, Cambridge University Press P> P43 -197, 214.