

POWER SUPPLY TRAINER

SANDRA GRIPES ANAK LITAI

SITI KHAIRINA BT ZOHARI

MIMI ARDANI BT ZULKAFLI

**DIPLOMA KEJURUTERAAN ELEKTRONIK (KOMUNIKASI)
POLITEKNIK SEBERANG PERAI**

DISEMBER 2014

POWER SUPPLY TRAINER

Oleh

SANDRA GRIPES ANAK LITAI

SITI KHAIRINA BT ZOHARI

MIMI ARDANI BT ZULKAFLI

**Penghantaran Laporan Ini Adalah Untuk Memenuhi Keperluan Untuk
Penganugerahan Diploma Kejuruteraan Elektronik (Komunikasi) di Jabatan
Kejuruteraan Elektrik Politeknik Seberang Perai**

Disember 2014

ABSTRACT

Electronics circuit required DC power supply to operate. The most commonly used circuit to convert AC voltage to DC voltage is the rectifier circuit. There are two types of rectifier such as the half-wave rectifier and full-wave rectifier. The difference between full wave and half wave rectification is that a full-wave rectifier allows unidirectional current to the load during the entire input cycle and the half-wave rectifier allows this only during one-half of cycle. A full-wave rectifier produces ripple voltage during both positive and negative input cycle. The bridge rectifier is available in special packages containing the four diode required. Bridge rectifiers are rated by their maximum current and maximum reverse voltage. Output rectifier circuit is a pulsed dc voltage. To get more output dc voltage linear filter required. Circuit filter is needed to reduce or remove all voltage ripple. Filter circuit is commonly used filters using capacitors and resistors. Good power supply must have a voltage regulator, which is a function of the voltage regulator to generate a stable dc voltage despite changes in output load or input voltage. Without a voltage regulator, the output voltage will change when the input supply or the load resistance changes.

ABSTRAK

Kebanyakan litar elektronik memerlukan DC bekalan kuasa untuk beroperasi. Litar yang paling biasa digunakan untuk menukar voltan AC ke DC voltan litar penerus. Terdapat dua jenis penerus seperti penerus setengah gelombang dan penerus penuh gelombang. Perbezaan antara gelombang penuh dan separuh pembetulan gelombang ialah satu penerus penuh gelombang membolehkan arus satu arah kepada beban semasa kitaran input keseluruhan dan penerus setengah gelombang membolehkan ini dalam hanya setengah daripada kitaran. A penerus penuh gelombang menghasilkan voltan riak semasa kitaran input positif dan negatif. Penerus jambatan boleh didapati dalam pakej khas yang mengandungi empat diod diperlukan. Penerus jambatan undian oleh maksimum voltan terbalik semasa dan maksimum. Keluaran litar penerus adalah voltan dc . Untuk mendapatkan voltan dc keluaran yang lebih linar, penapis diperlukan. Litar penapis diperlukan untuk mengurangkan atau membuang semua voltan riak. Litar penapis yang biasa digunakan ialah penapis menggunakan kapasitor dan resistor. Bekalan kuasa yang baik mesti mempunyai pengatur voltan, dimana fungsi pengatur voltan ini adalah untuk menghasilkan voltan dc yang stabil walaupun berlaku perubahan beban keluaran atau voltan masukan. Tanpa pengatur voltan, keluaran voltan akan berubah apabila bekalan masukan atau rintangan beban berubah.

DEDICATION

Selamat sejahtera,

First of all we would like praise to God because with His help we can complete this Final Project Report and can be send right on time.

We thank Mr Shaiful Hanif bin Mat Din willing to be our supervisor during this final project. Mr Shaiful Hanif bin Mat Din has give us a lot of inspirations and guiding mentor to us to complete the project. Support, motivation and guidance provided by our supervisors we will use the best possible future in the future. Not forgetting both our parents are because there give us motivation to continue and then complete this project and never give up on us.

Finally, thanks to our partnership because have committed a continuing and very helpful guidance during the final project. Without hardworking and ongoing commitment we may not be able to perform the tasks to complete the project by the end of this perfect.

Thank you

APPRECIATION

Alhamdulillah praise to Allah The Almighty that we can prepare our final project report. We can prepare a final project report as a guide lines laid down by the administration in the Department of Electrical Engineering to meet the requirements for the Diploma in Electronic Engineering (Communication). In this final project, we have gained much useful experience and add this knowledge as a result of tutoring lecturer's from the Department of Electrical Engineering, especially from our own supervisors.

Sincere appreciation goes to Mr. Shaiful Hanif bin Mat Din as our supervisor has given encouragement, support and guidance in completing project and this final report. Then do not forget to thank all those involved directly or indirectly in providing the information and support provided in the final project.

In addition, the appreciation also goes to my fellow friends for the support and guidance to us in developing this project.

Thank You

CONTENTS

	PAGE
ABSTRACT	ii
ABSTRAK	iii
DEDICATIONN	iv
APPRECIATION	v
TABLES	vi
FIGURES	vii
CHAPTER	
1 INTRODUCTION (1)	
1.1 Background History	1
1.2 Problem Statement	2
1.3 Objective of Project	2
1.4 Scope and Limitation of Project	3
1.5 Circuit Section	3
1.6 Hardware Section	4
1.7 Project Overview	4
1.8 Structure Report	5
2 LITERATURE REVIEW	7
2.1 Introduction	7
2.2 Overview of Power Supply Trainer	8
2.2.1 Transformer	9

2.2.2	Half Wave Rectifier	10
2.2.3	Bridge Rectifier	11
2.2.4	RC Capasitor Input Filter	12
2.2.5	Voltage Regulator	13
2.3	Overview of Each Components	14
2.3.1	Transformer	14
2.3.2	Resistor	14
2.3.3	Toggle Switch	14
2.3.4	Diode	15
2.3.5	LED	16
2.3.6	Variable Resistor	16
2.3.7	Capasitor	17
2.3.8	IC LM317	17
2.3.9	IC LM78XX	18
3	METHODOLOGY	19
3.1	Introduction	19
3.1.1	Methodology	20
3.1.2	Method of Project	21
3.1.3	Method of Power Supply Trainer	21
3.1.4	Review and Research	22
3.1.5	Circuit Design	22
3.1.6	Analysis	22
3.1.7	Software Development	22
3.1.8	Circuit Simulation	23
3.1.9	Hardware Deveploment	23

3.1.10 Experiment	23
3.1.11 Construction last system	23
3.1.12 Carry out test on circuit	23
3.1.13 Provision of project report	24
3.1.14 Project presentation	24
3.2 Early result and draw	24
3.3 Working process	25
3.3.1 Circuit drawing sketching process	25
3.4 Choosing suitable devices and mate	26
3.5 Process for etching	26
3.5.1 Ultra Violet	26
3.5.2 Develop	27
3.5.3 Etching	27
3.5.4 Drilling Hole	28
3.5.5 Soldering	28
3.6 Gantt Chart	29
4 ANALYSIS PROJECT AND FINDING	30
4.1 Introduction	31
4.1.1 Schematic Design	31
4.1.2 Circuit Design	32
4.2 Problems and Troubleshoot of the project	33
4.3 Result of the study	34
4.4 Contribution of project	35

5	CONCLUSION AND SUGGESTION	36
5.1	Conclusion	36
5.2	Advantages and Disadvantages	38
5.2.1	Advantages	38
5.2.2	Disadvantages	39
5.3	Suggestion	39
5.4	Overall conclusion	40
6	REFERENCE	41

APPENDIX	L-1
-----------------	------------

LIST OF TABLES

Tables	Pages
1.1 Problems and troubleshoot	34

LIST OF FIGURES

FIGURES	PAGES
1.1 Diagram of transformer	9
1.2 Symbol of transformer	10
1.3 Schematic of half wave rectifier	11
1.4 Schematic of bridge rectifier	11
1.5 Figure of capasitor	12
1.6 Circuit of capasitor	12
1.7 Complete of voltage regulator	13
1.8 Diagram of full cicuit	25
1.9 Ultra violet	26
1.10 Develop	27
1.11 Etching	27
1.12 Drilling	28
1.13 Input circuit	31
1.14 Output circuit	32

CHAPTER 1

INTRODUCTION

1.1 Background History

A power supply is an electronic device that supplies electric energy to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another and, as a result, power supplies are sometimes referred to as electric power converters. We were doing power supply trainer project is to help students in their learning system. It helps student easy to understand power supply topic. Power supply have five block diagram which is transformer, rectifier, filter, voltage regulator and voltage divider. Each block will display a different waveform. They also will display a different wave according to value that we will use. If we use power supply trainer, it will be easy to understand and get the right waveform. It save our time. We also can separate each block to get a better explanation and beside, power supply tainer can supply high volt than battery while it use small cost. A fixed power supply, we cannot change the value but with power supply tainer, we change the value according to test or lab we were doing.

1.2. Problem Statement

- a) Fixed power supply cannot be change their input value. By doing power supply trainer, we can change their input value according to test or lab that we were doing.
- b) When student are using power supply that have been prepared by polytechnic, student normally cannot understand the correct operational of power supply. So by doing this trainer we will design it for student to understand more better.

1.3. Objective of Project

- a) This project was produce as a teaching aid for students.
- b) To facilitate the users and minimize cost and also reduce time. There are some objective to be achieved by us after our project which ic DC Power Supply is conducted trainer.
- c) Student were able to understand the operational of power supply.
- d) To help student able to understand the function of each part or block that power supply have.

1.4. Scope and Limitation of project

- a) This project are specially used in semester 1 until 3 in electric course.
Therefore, this trainer would be the best medium for the students to learn about many basic of power supply before the lab session.
- b) In this project, we used halfwave and bridge for rectifier session. In halfwave rectifier, we used one diode while for fullwave rectifier, we used solid bridge.
- c) Range of the output were 5v, 9v, and 12v. This is because the input was 12v.
- d) This trainer can be used by semester 3 students.

1.5. Circuit Section

The circuit designed are divided into two parts. There are inputs part and outputs part. At the inputs part, the toggle switches will be used as control the input, while output part are from combination of oscilloscope and multimeter.

1.6. Hardware section

1.6.1. This project will use following main hardware :

- Switch
- LED
- Resistor
- Diode
- Transformer
- Capasitor
- IC
- Terminal block
- Variable resistor

1.7. Project Overview

Power supply is a basic electronic equipment that we always used. In education, we need to know how it operate and what the output that we will get. So, we build power supply trainer to make other people easy to understand how it operating. Power supply have five block diagram. Each diagram will show a different waveform. So, with this power supply trainer, we can see its waveform in only one equipment. We do not need to install the component one by one on bread board and then test the circuit. With this trainer we can test all the block diagram in one go. We just need to on and off the switch.

1.8. Structure Report

The project report is done basically to document the concept, activities and outcome of the project that is relevant to the project progress. The report consists of six main chapters. Chapter one gives the introduction and overview of the project. It is discussed about the objectives, scopes of project and also the problem statement.

Chapter two will cover the literature review that consists of the background of the project. It also describes about overview of Power Supply Trainer and introduction to the electronic components that have been used in this project. In this chapter, we will describe more on the components specification.

The next chapter is chapter three we will cover the project methodology where the simulation parts are discussed. In this chapter, the simulation method and the simulation needs.

In chapter four, the design and the implementation of the simulation of the project will be covered. In this chapter, the simulation project will be shown to describe the project.

Chapter five is covering the simulation results of the whole project. The result is based on the troubleshooting session that held two weeks before the presentation of the project to the panel.

Lastly, chapter six is the conclusion and summary about achievement of the objective, knowledge that gained from the project and also some recommendation for the further study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, we were research about some components that involved in this project. It is about the function and operation for each component. This chapter contains a review of the literature related to the project and help to understand more about the projects to be implemented. The project was designed and builds Power Supply Trainer will be reviewed, analysed and understood. As students of polytechnics and computer electronics background, we were given exposure on electronic components, wiring, installation, programming, circuit analysis and more. We produce a project that is very helpful to a diploma students in the future to learn about relay in applications related to the project theme, and it was given the title as "Power Supply Trainer".

2.2 Overview of Power Supply Trainer

Regulated power supply is an electronic circuit that is designed to provide a constant DC voltage of predetermined value across load terminals irrespective of AC mains fluctuations or load variations. A regulated power supply essentially consist of an ordinary power supply and a voltage regulating device. The output from an ordinary power supply is fed to the voltage regulating device that provides the final output. The output voltage remains constant irrespective of variations in the AC input voltage or variations in output (or load) current.

The ac voltage, typically 230 Vrms is connected to a transformer which transforms that ac voltage to the level for the desired dc output. A bridge rectifier then provides a full-wave rectified voltage that is initially filtered by a Π (or C-L-C) filter to produce a dc voltage. The resulting dc voltage usually has some ripple or ac voltage variation. A regulating circuit use this dc input to provide a dc voltage that not only has much less ripple voltage but also remains constant even if the input dc voltage varies somewhat or the load connected to the output dc voltage changes. The regulated dc supply is available across a voltage divider.

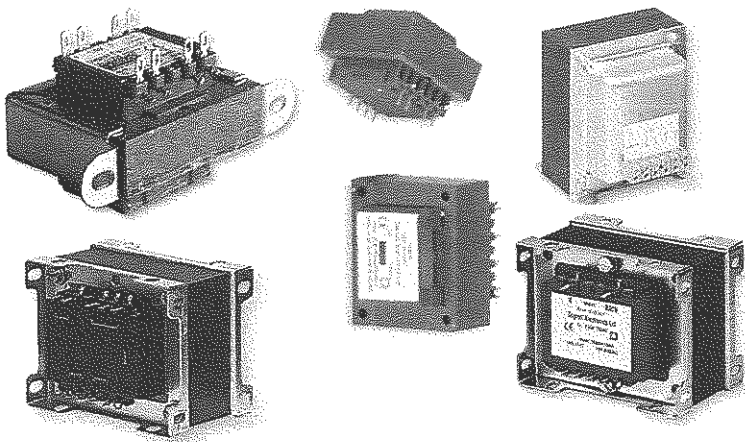
Often more than one dc voltage is required for the operation of electronic circuits. A single power supply can provide as many as voltages as are required by using a voltage (or potential) divider. A potential divider is a single tapped resistor connected across the output terminals of the supply. The tapped resistor may consist of two or three resistors connected in series across the supply.

2.2.1 Transformer

A transformer is an electrical device that transfers energy between two or more circuits through electromagnetic induction.

A varying current in the transformer's primary winding creates a varying magnetic flux in the core and a varying magnetic field impinging on the secondary winding. This varying magnetic field at the secondary induces a varying electromotive force (EMF) or voltage in the secondary winding. Making use of Faraday's Law in conjunction with high magnetic permeability core properties, transformers can thus be designed to efficiently change AC voltages from one voltage level to another within power networks.

Transformers range in size from RF transformers less than a cubic centimetre in volume to units interconnecting the power grid weighing hundreds of tons. A wide range of transformer designs is encountered in electronic and electric power applications. Since the invention in 1885 of the first constant potential transformer, transformers have become essential for the AC transmission, distribution, and utilization of electrical energy.



1.1 Diagram of transformer

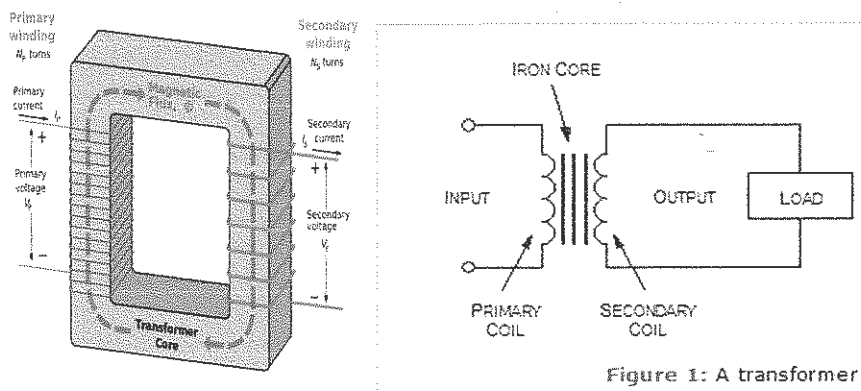


Figure 1: A transformer

1.2 Symbol of transformer

2.2.2 Half wave rectifier

A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction. The process is known as rectification. Physically, rectifiers take a number of forms, including vacuum tube diodes, mercury-arc valves, copper and selenium oxide rectifiers, semiconductor diodes, silicon-controlled rectifiers and other silicon-based semiconductor switches. Historically, even synchronous electromechanical switches and motors have been used.

Rectifiers have many uses, but are often found serving as components of DC power supplies and high-voltage direct current power transmission systems. Rectification may serve in roles other than to generate direct current for use as a source of power.

Because of the alternating nature of the input AC sine wave, the process of rectification alone produces a DC current that, though unidirectional, consists of pulses of current.