POWER SUPPLY EXPERIMENTAL UNIT

Project Report Submitted by

PALIS MICHAEL SOTERIOU

to the Department of Electrical Engineering of the Higher Technical Institute Nicosia, Cyprus in partial fulfillment of the requirements for the diploma of

TECHNICIAN ENGINEER

in

ELECTRICAL ENGINEERING

Project Supervisor: S. Spyrou Lecturer in Electrical Engineering. Type of Project : Individual

JUNE 1990

HIGHER TECHNICAL

INSTITUTE

PROJECT NO

1635

ABSTRACT

This textbook deals with the design, construction and testing of power supply units suitable for experimental work in the laboratories.

The power supply modules constructed, demonstrate the principles of operation of power supplies, ranging from simple half wave rectified unregulated to a highly regulated switching power supply.

Detailed description of the theory and the construction of each module, together with experimental procedures is included in the textbook.

All modules were constructed on printed circuit boards and tested.

Also module panels on which full circuit information is shown were constructed. Each module is fitted with standard banana plugs for external connections and module inter-connection.

Test points are provided on each module so as to enable the user to understand better the operation of the different kinds of power supply.

II

CONTENTS

PAGE

ACKNOWLEI	DGEMENTS	I
ABSTRACT		II
INTRODUCT	FION	III
CHAPTER [·]	1 UNREGULATED POWER SUPPLY	
1.1	General considerations	1
1.2	Half wave rectifier	2
1.3	Full wave rectifier	4
1.4	Rectifier filters	8
1.5	Unregulated power supply module	12
1.6	Design Calculations	12
1.7	Testing	14
1.8		18
CHAPTER 2	ZENER REGULATOR	
2.1	Zener as a voltage reference	21
2.2	Zener voltage regulators	22
2.3	Zener regulator module	24
2.4	Design calculations	24
2.5	Testing	26
2.6	Experiment No 2	30
CHAPTER 3	<u>SERIES REGULATOR</u>	
	Regulating action	32
3.2	Protection circuits	32
3.3	External pass transistor	35
3.4	Series Regulated Power Supply module	36
3.5	Design calculations	40
3.6	Testing	42
3.7	Experiment No 3	46
		40
CHAPTER 4	<u>723 IC Regulator</u>	
4.1	723 IC Regulator	50
4.2	723 IC Regulator module	53
4.3	Testing	57

4.4 Experiment No 4

CHAPTER 5	SWITCHING REGULATOR	
5.1	Basic switching Regulator	64
5.2	Step down configuration	66
5.3	Step up configuration	68
5.4	Voltage inverter configuration	70
5.5	78540 Switching Regulator	71
5.6	Switching regulator module	72
5.7	Testing	77
5.8	Experiment No 5	79

CHAPTER 6 CONSTRUCTION

6.1	Power supply experimental modules	82
6.2	Printed circuit Boards (PcBs)	82
6.3	Component list	93

APPENDICES