

“I hereby acknowledge that the scope and quality of this report is qualified for the award of the Bachelor Degree of Electrical Engineering (Power System)”

Signature : \_\_\_\_\_

Name : RUHAIZAD BIN ISHAK

Date : 13 NOVEMBER 2008

SOLAR POWERED WARNING STREET LAMP

MOHD FITRI BIN MOHD SARIFF

This thesis is submitted as partial fulfillment of the requirement for the award of the  
Bachelor Degree Electrical Engineering (Power System)

Faculty of Electrical & Electronic Engineering  
Universiti Malaysia Pahang

NOVEMBER 2008

## DECLARATION

I declare that this thesis entitled “*Solar Powered Warning Street Lamp*” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

Author : MOHD FITRI BIN MOHD SARIFF

Date : NOVEMBER 2008

*Specially dedicated to  
My beloved parent*

## ACKNOWLEDGMENT

Alhamdulillah, the highest thank to God because with His Willingness I possible to complete the final year project. In preparing this thesis, I was in contact with many peoples, researchers, academicians, and practitioners. They have contributed towards my understanding and thoughts.

In particular, I wish to express my sincere appreciation to my main thesis supervisor, Mr. Ruhaizad Bin Ishak, for encouragement, guidance, critics and friendship. I am also very thankful to all lecturer and laboratory technician for sharing their valuables ideas and willing to spend their time for helping me. Without their continued support and interest, this thesis would not have been the same as presented here.

My fellow postgraduate students should also be recognized for their support. My sincere appreciation also extends to all my colleagues and others who have provided assistance at various occasions. Their views and tips are useful indeed. Unfortunately, it is not possible to list all of them in this limited space. I am grateful to all my family members.

**TABLE OF CONTENTS**

<b>CHAPTER</b>	<b>CONTENT</b>	<b>PAGE</b>
	<b>TITLE</b>	<b>i</b>
	<b>DECLARATION</b>	<b>ii</b>
	<b>DEDICATION</b>	<b>iii</b>
	<b>ACKNOWLEDGEMENT</b>	<b>iv</b>
	<b>ABSTRACT</b>	<b>v</b>
	<b>ABSTRAK</b>	<b>vi</b>
	<b>TABLE OF CONTENTS</b>	<b>vii</b>
	<b>LIST OF TABLE</b>	<b>xi</b>
	<b>LIST OF FIGURE</b>	<b>xii</b>
	<b>LIST OF ABBREVIATIONS</b>	<b>xiii</b>
	<b>LIST OF APPENDICES</b>	<b>xiv</b>

<b>1</b>	<b>INTRODUCTION</b>	
1.1	Background	1
1.2	Objectives	3
1.3	Scope of Project	3
<b>2</b>	<b>LITERATURE REVIEW</b>	
2.1	Definition of Warning Lamp	4
	2.1.1 Definitions of Each Part	5
2.2	Flash Light Requirement	6
2.3	Photovoltaic Cells History	7
2.4	Definition of Battery Charger	10
2.5	Types of Battery Chargers	10
	2.5.1 Simple Battery Charger	10
	2.5.2 Trickle Battery Charger	11
	2.5.3 Timer-based Battery Charger	11
	2.5.4 Intelligent Battery Charger	12
	2.5.5 Fast Battery Charger	13
2.6	Features of PIC16F877A	14

### **3 METHODOLOGY**

3.1	Overall System Design	16
	3.1.1 Introduction	16
3.2	Solar Panel	18
3.3	Charging Circuit	18
	3.3.1 Introduction	19
3.4	Circuit Operation	19
3.5	Battery	21
3.6	Voltage Regulator Circuit	22
3.7	Control Circuit	23
3.8	PIC16F877A Microcontroller	25
	3.8.1 Introduction	26
3.9	Programming PIC16F877A	27
3.10	PIC Basic Pro	28
	3.10.1 Compiler Overview	28
	3.10.2 PIC Programmer	30
3.11	Warning Lamp	32

### **4 RESULT AND ANALYSIS**

4.1	Three Mode of Warning Lamp	33
4.2	Power Usage	36
4.3	Output from Different Sources	37
4.4	Battery Estimation	37
4.5	Battery Charge Time	38
4.6	Graph Voltage versus Time	39
4.7	Problems and Solutions	40



<b>5</b>	<b>CONCLUSION AND RECOMMENDATIONS</b>	
5.1	Conclusion	41
5.2	Future Recommendation	42
5.3	Costing And Commercialization	43
	<b>REFERENCE</b>	45
	<b>APPENDIX A</b>	46
	<b>APPENDIX B</b>	56

**LIST OF TABLES**

<b>TABLE NO</b>	<b>TITLE</b>	<b>PAGE</b>
2.1	Features of PIC16F877A	14
3.1	Output from the lead acid battery	21
4.1	Power used by each LED	36
4.2	Output from solar panel	37
4.3	Output from charging circuit	37
4.4	Battery Charge Time	38
5.1	Cost of all components	43

## LIST OF FIGURES

FIGURE NO	TITLE	PAGE
2.1	Solar Powered Warning Street Lamp	6
2.2	Photovoltaic Cell	7
3.1	Flowchart of the system	17
3.2	Solar Panel	18
3.3	Charging Circuit	18
3.4	12V Lead acid battery	21
3.5	Voltage Regulator Circuit	22
3.6	Schematic of Controller Circuit	23
3.7	Controller Circuit	24
3.8	PIC16F877A Board	25
3.9	PIC16F877A	26
3.10	Coding to Controller Circuit by MicroCode Studio	29
3.11	Cytron Programmer	30
3.12	PIC Programming (Burn) Process	31
3.13	Light Emitting Diode (LED)	32
4.1	Portable Warning Street Lamp	33
4.2	Mode One, General Warning Lamp	34
4.3	Mode Two, Right Arrow Shape Warning Lamp	34
4.4	Mode Three, Left Arrow Shape Warning Lamp	35
4.5	The Charging Graph	39

**LIST OF ABBREVIATON**

DC	-	Direct Current
AC	-	Alternate Current
RAM	-	Random Access Memory
DIP	-	Dual Inline Package
PIC	-	Programmable Intelligent Computer
LED	-	Light Emitting Diode
MOSFET	-	Metal-Oxide Semiconductor Field-Effect Transistor

**LIST OF APPENDICES**

<b>APPENDIX</b>	<b>TITLE</b>	<b>PAGE</b>
A	Controller Coding	43
B	Data Sheet of PIC16F877A	52