

# DESIGN AND DEVELOPMENT OF RFID ELEVATOR

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This report is submitted in partial fulfilment of requirement for the award of  
Bachelor Degree Of Electronics Engineering ( Telecommunication Electronics)  
With Honours

Faculty of Electronic and Computer Engineering  
Universiti Teknikal Malaysia Melaka

JUNE 2013

BORANG PENGESAHAN STATUS LAPORAN

**PROJEK SARJANA MUDA II**

**Tajuk Projek** : DESIGN AND DEVELOPMENT OF RFID ELEVATOR

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For my beloved father and mother.

## ACKNOWLEDGEMENT

Thanks to Allah S.W.T. for giving me a good health throughout the entire project. I can manage to complete this project with a group of knowledgeable people, researchers, academicians and practitioners. They have contributed a lot towards my understanding and thoughts. I would like to express my sincere appreciation to my supervisor, Mr Mohamad Harris Bin Misran for his supervision and guidance. His help and support throughout this project is greatly appreciated.

Besides, my sincere appreciation also goes on to my beloved parents and siblings because of their full support, encouragement, inspiration and pray for my success. I also would like to take this opportunity to show my appreciations to all my friends who sharing knowledge and give full support in completing my project.

## ABSTRAK

Projek ini dibina dengan tujuan untuk mengaplikasikan sistem RFID ini kepada lif. Objektif utama untuk membina projek ini adalah untuk membina sistem keselamatan pada aplikasi RFID. Terdapat dua bahagian yang akan dibincangkan dalam projek ini iaitu kajian dan carian maklumat mengenai RFID dan integrasi PIC16F877A kepada pembaca RFID untuk mengawal Paparan Kristal Cecair (LCD), diod pemancar cahaya (LED), buzzer dan juga geganti. Ketika ini, sistem keselamatan yang perada di pasaran tidak dilaksanakan untuk mengawal lif. Pencuri yang memecah masuk rumah akan menyebabkan kerugian dan kerosakan kepada harta benda. Projek ini juga sangat sesuai dilaksanakan di hospital. Orang awam, pesakit dan kakitangan hospital berkongsi lif untuk ke tingkat yang dikehendaki untuk melawat dan merawat pesakit. Keadaan ini boleh menyebabkan kesesakan pada waktu kecemasan. Dengan mengaplikasikan system ini, ia boleh menghadkan aliran semasa kecemasan dan waktu puncak. Sistem RFID terdiri daripada tiga bahagian, antena, transceiver dan transponder. Antena menggunakan gelombang frekuensi radio untuk menghantar isyarat yang akan mengaktifkan transponder. Tag akan menghantar kembali data dengan antena apabila transponder diaktifkan. Setiap tag mempunyai nombor siri unik yang mengenal pasti pengguna tag masing-masing. RFID tag boleh dibaca dari beberapa sentimeter sehingga beberapa meter bergantung kepada jenis frekuensi radio. Sistem RFID akan diintegrasikan dengan pengawal mikro dan hasilnya akan dipamerkan di paparan LCD.

## ABSTRACT

This project is about designing a Radio Frequency Identification (RFID) Elevator. The objective of this project is to develop a security and safety system based on the RFID application. There are two parts that will be covered in this project which are research about RFID and development of PIC16F877A and RFID reader to control Liquid Crystal Display (LCD), Light Emitting Diode (LED), buzzer and relay. Today, the security system for building provided in the market does not implement to elevator controller. In addition, we often heard about theft break into a house that will cause a lot of losses and damage to the owner properties. This project can increase the security in the building and can create greater control over residential and administrative facilities. This project is very suitable to be implemented in the hospital. Public, patients, staff of the hospital are sharing the same elevator to the desired level to visit and cure patient. This condition can cause traffic congestion during emergency time. Using this system, it can limit the undesirable transient traffic flow during emergency and peak time by allow the authorized user to use the elevator. This RFID system consists of three parts, an antenna, transceiver and transponder. The antenna use the radio frequency waves to transmit the signal that will activate the transponder. The tag will transmit back data to the antenna when the transponder is activated. Each tag have unique serial number that identifies the respective tag user. RFID tag can be read from several centimetres until several meters which depend to the type of radio frequency. The RFID system will integrate with the microcontroller and the result will be displayed at the LCD display.



## CONTENT

<b>CHAPTER</b>	<b>TITLE</b>	<b>PAGES</b>
	<b>PROJECT TITLE</b>	i
	<b>REPORT STATUS VERIFICATION FORM</b>	ii
	<b>STUDENT'S DECLARATION</b>	iii
	<b>SUPERVISOR'S DECLARATION</b>	iv
	<b>ACKNOWLEDGEMENT</b>	vi
	<b>ABSTRAK</b>	vii
	<b>ABSTRACT</b>	viii
	<b>CONTENTS</b>	ix
	<b>LIST OF FIGURES</b>	xiii
	<b>LIST OF TABLES</b>	xv
	<b>LIST OF ABBREVIATIONS</b>	xvi
	<b>LIST OF APPENDIX</b>	xvii
<b>I</b>	<b>INTRODUCTION</b>	
	1.1 Project Background	1
	1.2 Objective of Project	2
	1.3 Problem Statement	2
	1.4 Scope of Project	3
	1.5 Thesis Outline	4

## II LITERATURE REVIEW

2.1	Introduction	5
2.2	History of RFID	5
2.3	The Basic of RFID	6
2.4	RFID Reader	7
2.5	RFID Tag	8
2.6	Antenna	11
2.7	RFID Operating Principles	13
2.8	RFID Frequency Bands	14
2.9	RFID Application	15
2.10	Advantages of RFID	15
2.11	Disadvantages of RFID	16
2.12	Microchip PIC16F877A Microcontroller	16
2.13	Liquid Crystal Display (LCD)	19
2.14	Voltage Regulator (LM7805)	21
2.15	Relay	21
2.16	Weigand RFID Reader	23
2.17	RFID Card	25

## III METHODOLOGY

3.1	Introduction	26
3.2	The RFID Elevator System Operation	27
3.2.1	Project Methodology Flow Chart	27
3.2.2	Project Methodology	28
3.2.3	Block Diagram of The Project	28
3.2.4	RFID Elevator Flow Chart	29
3.3	RFID Elevator System Design	30
3.3.1	Specification	31
3.3.2	Voltage Regulator Circuit	31

3.3.3	Interface RFID Reader with PIC16F877A	32
3.3.4	Interface 16 X 2 LCD	33
3.3.5	Interface PIC16F877A with Relay	35
3.3.6	Reset Circuit	36
3.3.7	LED as Output for PIC Microcontroller	36
3.4	Setup the RFID Reader	36
3.5	Programming	37
3.5.1	MPLAB IDE v8.30	37
3.5.1.1	Project Wizard	38
3.5.1.2	Select Devices	38
3.5.1.3	Language ToolSuite	39
3.5.1.4	Create the Project	40
3.5.1.5	Add Files	41
3.5.1.6	Create the Programming Code	42
3.6	Printed Circuit Board (PCB) Design	43
3.6.1	Etching Process	43
3.6.2	Drilling Process	45
3.6.3	Soldering Process	46

## **IV RESULT AND DISCUSSION**

4.1	Introduction	47
4.2	Project Circuit with Protel SE99	47
4.3	Layout Design	48
4.4	Project Development	50
4.4.1	Hardware Development	50
4.4.2	Software Development	51
4.5	Project Prototype	52
4.6	Result	53

4.7	Discussion	56
-----	------------	----

**V CONCLUSION**

5.1	Conclusion	57
5.2	Recommendation	58

<b>REFERENCES</b>	<b>59</b>
-------------------	-----------

<b>APPENDIX A</b>	<b>61</b>
-------------------	-----------

<b>APPENDIX B</b>	<b>62</b>
-------------------	-----------

<b>APPENDIX C</b>	<b>67</b>
-------------------	-----------

<b>APPENDIX D</b>	<b>77</b>
-------------------	-----------

## LIST OF FIGURES

NO	TITLE	PAGES
1.1	Elevator Panel Buttons	1
2.1	Block diagram of RFID reader	7
2.2	Block diagram of the RF section of an RFID reader	7
2.3	RFID tag with the microchip and antenna	9
2.4	RFID passive tags	10
2.5	Some Typical Passive RFID Tag with Antenna	12
2.6	RFID Operating Principles	13
2.7	Pin diagram of PIC16F877A	17
2.8	PIC16F877A pin layout descriptions	18
2.9	LCD display 16X2 pin diagram	20
2.10	Voltage Regulator	21
2.11	Relay Components	22
2.12	Energized Relay (ON)	22
2.13	De-Energized Relay (OFF)	23
2.14	Weigand RFID Reader	23
2.15	12 byte ID packet data	24
2.16	RFID Tag	25
3.1	Project Methodology Flow Chart	27
3.2	RFID Elevator Block Diagram	28
3.3	RFID Elevator Flow Chart	29
3.4	RFID Elevator System Design	30
3.5	Relay Circuit Design	31
3.6	Circuit of Power Supply	31
3.7	RFID Reader	32

3.8	Connection LCD Display to PIC16F877A pins	34
3.9	Relay Circuit	35
3.10	Connection Relay to PIC16F877A pins	35
3.11	Setup the RFID Reader with PC	36
3.12	MPLAB IDE software logo	38
3.13	Devices Selection	39
3.14	Selecting Toolsuite	40
3.15	Summary of Project Wizard	41
3.16	Adding the Program Code	42
3.17	Debug the Program Code	42
3.18	Positif and Negatif PCB Board	43
3.19	Laminating Machine	44
3.20	Etching Process	44
3.21	Dry Machine	45
3.22	Drill Machine	45
3.23	Intermetallic Bond Structure	46
4.1	Project Circuit	48
4.2	Circuit Route	49
4.3	Component position at the PCB	49
4.4	Soldering at the PCB board	50
4.5	PCB Board after soldering	50
4.6	Writing the coding	51
4.7	The coding	51
4.8	Project Prototype	52
4.9	RFID Tags	52

**LIST OF TABLES**

<b>NO</b>	<b>TITLE</b>	<b>PAGES</b>
2.1	Active vs. Passive RFID tag	10
2.2	LCD display 16X2 pin description	20
3.1	RFID Reader Pin Description	33
3.2	LCD display 16X2 Pin Connection	34
4.1	Result for first card	53
4.2	Result for second card	54
4.3	Result for third card	55

## LIST OF ABBREVIATION

AC	-	Alternating Current
DC	-	Direct Current
HF	-	High Frequency
ID	-	Identification
kHz	-	Kilohertz
LCD	-	Liquid Crystal Display
LED	-	Light Emitting Diode
LF	-	Low Frequency
LNA	-	Low Noise Amplifier
MW	-	Microwave
NC	-	Normally Close
NO	-	Normally Open
PC	-	Personal Computer
PCB	-	Printed Circuit Board
PIC	-	Programmable Interface Controller
PSM	-	Projek Sarjana Muda
RF	-	Radio frequency
RFID	-	Radio-Frequency Identification
UHF	-	Ultra High Frequency
VHF	-	Very High Frequency
AC	-	Alternating Current
DC	-	Direct Current



**LIST OF APPENDIX**

<b>NO</b>	<b>TITLE</b>	<b>PAGES</b>
A	RFID Reader Datasheet	61
B	RFID Read Protocol	62
C	Source Code	67
D	Gantt Chart	77

# CHAPTER 1

## INTRODUCTION

### 1.1 Project Background

Elevator is a public place that allows people reach the different floors of the property. Elevator controller allows user to arrive at the destination floor. Elevators can be found in many residential and business buildings. They are used not only to transport people but also heavy object which would in other cases be difficult to transport. This project is designed to be implemented to panel buttons of an elevator as a security purposes.



Figure 1.1 : Elevator panel buttons

The RFID elevator consists of two major components which are a reader and a tag. The reader and tag will communicate using RFID technology. Authorized user can scan the tag at the reader. If a tag is valid, the reader will send a signal to instruct the relay in be close circuit. Then, the user can push any button required and the LCD display will show the level. The second condition is when the authorized user scan their card to reader, LCD display and push button will automatically display the user level information and level required.

The advantages of using RFID in this project is by using the system, users are safe inside the elevator and also provide security to the house.

### **1.1 Objective Of Project**

The objectives of this project are to apply the application of RFID in elevator for security purposes. This project is design basically to construct a security system for users. The development of this system can ensure users to feel safe inside the elevator.

The second objective is to describe the characteristic of RFID technology. The RFID technology allows automatic identification of information contained in the tag by using radio waves. The RFID technology is characterized by the deployment of three components which are microchip, antenna and reader. The tag is placed on the object to be identified.

Besides that, the objective is to develop a four level passenger elevator using RFID and PIC. By implement this project to all building, it can helps to increase safety to users and also can decrease the properties crime.

### **1.2 Problem Statement**

Nowadays, safety and security is very important. This project can increase security in the buildings. Users can move securely in the elevator without worrying

any stranger people with them. Public users often have an insecure feeling whenever a stranger is occupying the same elevator as the users.

Today we often heard about theft entering the house that will cause a lot of losses and damage to the owner properties. This project will reduce the building risk of theft and damage to the facility. It is essential for user to create greater control over residential and administrative facilities. Furthermore, the use of security guard also can be reduced by implementing this project to the elevator system.

This project also can limit the undesirable transient traffic flow during emergency and peak time as the example at the hospital. Public, patients, staff of the hospital are sharing the same elevator to the desired level to visit and cure patient. This condition can cause traffic congestion during emergency time. Public also share the same elevator with patient along with bed and all the required equipment. Thus, this creates an uncomfortable situation to the patient. To overcome this problem, all the hospital staff must have valid ID tag which can allows them only entering the specific elevator.

This project also can be implemented at university elevator to block the students from using elevator which are privilege given to the lecturers. The solution to all above problem can be solved by using the RFID which is implements to the elevator. RFID system helps users to feel secure as well as to limit the traffic flow in critical time.

### **1.3 Scope of project**

The main goal of this project is to design a elevator controller using Radio Frequency Identification (RFID). There are two scopes that will be cover in this project. The scope of work is divided into two separate part which are software part and hardware part.

The first part is the software part. In the software part it has two another part for RFID and Microcontroller. The hyperterminal in the Personal Computer (PC) is use to ensure that the RFID tag is working with the reader. Using hyperterminal in

the PC can also determine the unique number at the tag and can compare with number at the tag. For microcontroller part, the circuit is design using Protel SE 99. The PIC program is written C language because it gives maximum control and efficiency to programmer. For this project, MPLAB IDE V8.3 is used to convert the C code into hexadecimal code file. The IC Programmer software then used to transfer the hex file to the PIC.

The second part for scope of work is the hardware. Weigand RFID reader is use in this project. RFID tag which look like card with unique number also being use. The main component of the circuit are the PIC16F877A to control the operation, 16X2 LCD display is to display the output of the project, LED is to indicate the level and also push button for relay circuit.

#### **1.4 Thesis Outline**

This thesis is a document that delivers the ideas and concept which applied in this project. Chapter one contain the introduction of Design and Development of RFID Elevator. The introduction consists of project background, objectives, problem statement, scope of project and thesis outline.

Chapter two is the literature review. In order to execute this project, the references are from the previous project, journals, articles, books, magazines, datasheets and internet.

Meanwhile, chapter three describe the methodology of the project. It discusses the flow of this project started and the function. Block diagram contain of the started project process until project achieved was explained in details.

Chapter four consist of actual result and discussion. This chapter shows the result that had been obtained and achieved in this project.

Lastly, chapter five is the project conclusion and recommendation. This chapter concludes the entire project and some suggestion for project future plan.

## **CHAPTER II**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

Literature review is a process to find, search, collect, analyze and concluded all information about the project. The information will use to overcome the current problems. The literature reviews are focuses on the various theory and basic knowledge used in the project. The sources of the information are able to grab from books, magazine, articles, web pages or testing result.

#### **2.2 History of RFID**

The introduction of radio frequency identification technology can be traced at World War II. In 1935, Scottish physicist Sir Robert Alexander Watson-Watt warning the approaching planes while they were miles away. They facing problem to identify which planes belonged to the enemy and which were a country's own pilots returning from a mission.

Radio Frequency Identification (RFID) research and discovery began in early 1970s. RFID is basically used to transmit and receive information without wires. RFID readers and tags communicate through a distance using radio frequency. The advantages of RFID system is its cheap price, size, memory capacity and their capability.

On January 1973, Mario W. Cardullo received the first U.S. patent for an active RFID tag with rewritable memory. Charles Walton, a California entrepreneur, also received a patent for a passive transponder used to unlock a door without a key at the same year of Mario W. Cardullo. A tag card with an embedded transponder communicated a signal to a reader near the door. The reader unlocked the door when the reader detected a valid identity number stored within the RFID tag.

Some companies developed 125 kHz low frequency system consist of smaller transponders. A transponder was injected under the cows' skin to identify the location of the missing cow. This low frequency transponders were also put in cards tag to control the access to buildings.

Then, companies moved up to high frequency (13.56 MHz) which offered greater range and faster data transfer rates. Companies in Europe start using it to track reusable containers and other assets. Today, 13.56 MHz RFID systems are used for access control, payment systems (Mobile Speedpass) and contactless smart cards.

### **2.3 The Basic of RFID**

RFID represent the way to identifying objects using radio waves. RFID concept that being applied in this project basically consists of four main parts which are reader, tag, controller and software. The main characteristic of a RFID are[1] :

- 1) The large storage capacity
- 2) Information can be read by a reader from few centimetres to about 200 meters

- 3) RFID does not require any contact or particular vision field to operate
- 4) RFID can operates in any environment
- 5) Easy to use and suitable for automatic processing

## 2.4 RFID Reader

The device that used for capture and transfer information is a reader. It is able to read data from a transponder. RFID reader will transmit the energy field that wakes up the tag and power up the chip to enable the transmission of the data. RFID reader has three main parts. These three main part are[2]:

- 1) Digital/control section
- 2) RF section
- 3) Antenna

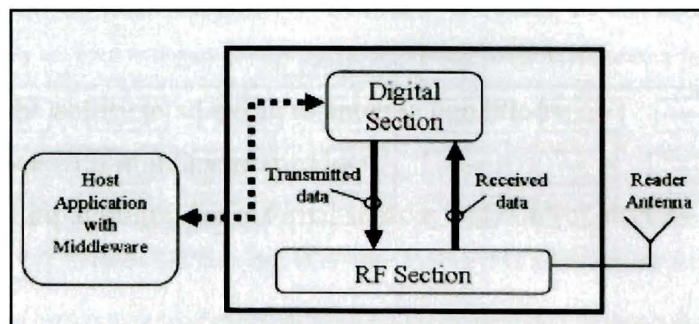


Figure 2.1 : Block diagram of RFID reader

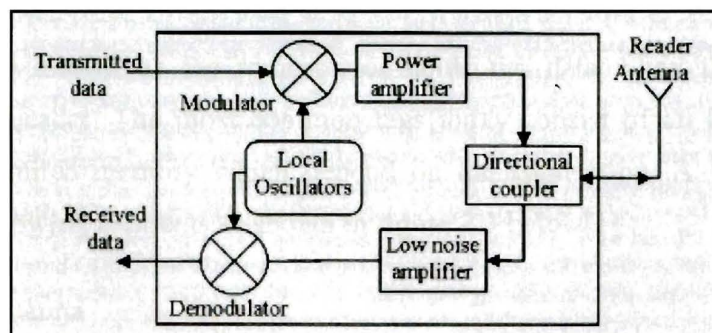


Figure 2.2: Block diagram of the RF section of an RFID reader