

QA76.5 .N87 2010.



0000077491

A microcontroller based on prayer time display / Nur Isa
Md Amin Teng.

A MICROCONTROLLER BASED ON PRAYER TIME DISPLAY

NUR ISA BIN MD AMIN TENG

Bachelor of Mechatronics Engineering

2010

ACKNOWLEDGMENT

After so many months of hard works in completing this FYP1 (Final Year Project 1), It finally comes to a day of expressing my gratitude to anyone who contribute the most in the completing the FYP 1 project. I would like to extend m highest appreciation and gratitude to:

First and foremost, Mr Ahmad Idil bin Abd Rahman, as my FYP supervisor, who has inspired me and guided us in achievement of this Project Report.

He inspired me greatly to work in this project. His willingness to motivate me contributed tremendously to my project. I also would ike to thank him for willingness to showing me some example that related to the topic of my project.

Finally, an honorable mention gifted to my family members and friends for their understanding, willingness and supports on completing the project.

“I hereby declared that I have read through this report and found that it has comply the partial fulfillment for awarding the Degree of Bachelor of Electrical Engineering (Mechatronics)”

Signature

: 

Supervisor's Name : En Ahmad Idil Bin Abd Rahman

Date : 26 April 2010

MICROCONTROLLER BASED PRAYER TIME DISPLAY

NUR ISA BIN MD.AMIN TENG


**A report is submitted in partial of fulfillment of the requirements for the degree of
Bachelor in Electrical Engineering (Mechatronic)**

Faculty of Electrical Engineering

UNIVERSITY TEKNIKAL MALAYSIA MELAKA

2010

I declared that this report entitle “a microcontroller based prayer time display” is the result of my own research except as cited in the references. The report has not been accept for any degree and is not concurrently submitted in candidature of other degree.

Signature : 
Name : Nur Isa Bin Md amin Teng
Date : 26 April 2010

Dedicated to my beloved father, my siblings

And all my friends,

For their love and sacrifice

ABSTRACT

A microcontroller based prayer time display is able to display various areas of prayer time as long as the longitude and latitude are given and able to customize it to alert us to the prayer time for the given areas. A majority people rely upon the sound of an alarm clock to signal the start of their day, while some claim that to awaken at a certain time without assistance from an alarm. It is same goes to prayer time, since for Muslim “solat” is pillar so it is compulsory to pray five times a day. Surprisingly, not most of us have the ability to pray on time. The project consists of two parts, hardware development and the software development. Implementation and works of this project are summarized into the flow chart in this report. A micro controller based prayer time display has a unique operating system which is combine a simple prayer time clock operation with Infrared time remote control which is controlled by HT12E and HT12D Holtek IC and PIC 16F877A. A microcontroller based prayer time display is developed to give owner the power to pray in time and setting the prayer time according to areas and region where the owner live. The achievement of this project can be divided into three major parts. Firstly, the microcontroller based prayer time display is able to control the clock prayer time by display the accurate prayer time based on world Muslim League Method. Secondly, the microcontroller based prayer time display is able to equip with the time remote control and automatic time update. Last but not lease, the project product is affordable by all level of society especially student as a target user.

ABSTRAK

Alat mikropengawal berdasarkan paparan waktu solat mempunyai kemampuan memaparkan waktu solat berdasarkan kawasan tertentu jika latitude dan longitude sesuatu kawasan diberi dan ia mampu disesuaikan dengan waktu solat sesuatu kawasan tersebut. Kebanyakan kita hanya mampu bergantung kepada jam loceng untuk memulakan harian awal pagi mereka akan tetapi ada segelintir daripada mereka mengatakan bahawa mereka mampu memulakan harian pagi mereka tanpa bantuan bunyi jam loceng. Sebagai seorang umat islam, solat lima waktu adalah menjadi kewajipan kepada setiap mukallaf dan solat merupakan tiang agama. Namun begitu, kebanyakan diantara kita tidak mampu untuk solat pada awal waktu. Projek ini terbahagi kepada dua fasa pembangunan iaitu fasa perisian dan fasa perkakasan. Perlaksanaan dan kerja-kerja pembangunan project akan diterangkan lebih mendalam berdasarkan carta alir dalam kertas kerja ini. Alat mikropengawal berdasarkan paparan waktu solat mempunyai system operasi yang unik dimana ia digabungkan dengan alat pengawal kawalan jauh yang dikawal sepenuhnya oleh mikropengawal PIC 16F877A dan HT12E dan HT12D. Alat ini juga direka untuk memudahkan membantu para pengguna yang kurang peka akan waktu solat ketika berada disesuatu kawasan tertentu. Kejayaan projek ini terbahagi kepada tiga fasa iaitu fasa pertama ialah kemampuan alat ini untuk memaparkan waktu solat dengan tepat berdasarkan cara kiraan "World Muslim League". Kedua ialah, keberkesanan untuk alat ini bergabung dengan alat infrared berkawalan jauh dan kemampuan untuk mengemas kini waktu solat berdasarkan sesuatu kawasan secara automatik. Akhirnya, rekaan produk ini mampu dimiliki semua golongan masyarakat terutamanya pelajar sebab pengguna sasaran.

TABLE OF CONTENT

CHAPTER	TITLE	PAGE
	TITLE	
	STUDENT DECLARATION	
	DEDICATION	
	ACKNOWLEDGEMENT	
	ABSTRACT	
	ABSTRAK	
	TABLE OF CONTENTS	
	LIST OF FIGURES	
	LIST OF SYMBOLS AND ABBREVIATIONS	
	LIST OF APPENDICES	
1	INTRODUCTION	
	1.1 Background	1
	1.2 Problem Statement	2
	1.3 Objective of Project	3

1.4 Scope of Project	3
1.5 Outline of Progress Report	4
2 LITERITURE REVIEW	
2.1 Introduction	
2.2 Prayer time Interpretation of Astronomy View	5
2.2.1 The relation of “solat time” and “region”	6
2.3 General calculation of Prayer Time Related to Movement of The Sun	7
2.3.1 Zuhor	8
2.3.2 Asar	9
2.3.3 Magrib	11
2.3.4 isya’	13
2.3.5 Subuh	14
2.4 Real time clock (RTC) implementation	15
2.4.1 Real Time Clock feature	15
2.5 Remote Control implementation	16
2.5.1 RF module	17
2.6 RS 232 (Recommended Standard 232)	18
2.7 Product Comparison	20
2.7.1 Prayer clock comparison	21
2.7.2 Remote Control Comparison	22

2.7.3 Microprocessor & Microcontroller comparison	23
2.8 Hardware Specification	24
2.8.1 PIC 16F877a (Microchip Microcontroller)	24
2.8.2 HT12E (Holtek Encoder)	26
2.8.3 HT12D (Holtek Decoder)	27
2.8.4 MAX 232	28
2.8.5 Dallas 1307	29
2.9 Software Specification	30
2.9.1 Solidworks 2007	30
2.9.2 Proteus v7.3 Professional	32
2.9.3 MicroC, mikroelektronika C Compiler	33
2.9.4 Visual Basic 6.0 (VB.net)	34

3 METHODOLOGY

3.1 Introduction	35
3.2 Project Construction Flow Chart	36
3.3 Hardware Development	37
3.3.1 Digital Clock Circuit	37
3.3.2 Digital Clock Schematic	38
3.3.3 PCB Layout for Main Circuit	39
3.3.4 RS 232 Communication	40

3.3.4.1 RS 232 Cables and Converter	41
3.3.5 Dallas 1307(Real Time Display)	42
3.3.6 Radio Frequency Remote Controller (HT12E & HT12D)	43
3.3.6.1 RF transmitter Circuit Equip with HT12E	44
3.3.6.2 RF transmitter Circuit Equip with HT12D	45
3.4 Software Development	
3.4.1 Software Coding in C language for MicroC	46
3.4.2 VB.net Coding	52
3.5 Simulation Using VB.net	53
3.6 Simulation Using Proteus V7.4	54
4 RESULT AND ANALYSIS	
4.1 Introduction	55
4.2 Result	55
4.2.1 Hardware Result	56
4.2.2 Software Result	57
4.3 Result Analysis	58
4.3.1 Objective	58
4.3.2 Hypothesis	58
4.3.3 Procedure	58
4.3.4 Result	59

4.3.5 Discussion	59
4.3.6 Conclusion	61

5 CONCLUSION

5.1 Introduction	62
5.2 Discussion Of the Project	63
5.3 Suggestion	63
5.4 Conclusion	64

REFERENCES

APPENDIX A

APPENDIX B

APPENDIX C

LIST OF TABLES

TABLE NO	TITLE	PAGE
2.1	Organization & Region Table	6
2.14	Prayer Time Comparison	21
2.15	Remote Control Comparison	22
2.16	Microprocessor VS Microcontroller	23
2.18	PIC 16F877a Specification	24
2.21	HT12E Specification	26
2.23	HT12D Specification	27
2.25	MAX 232 Specification	28
2.27	DS1307 Specification	29
4.3	Analysis	59

LIST OF FIGURES

NO	TITLE	PAGE
1.1	System Block Diagram	3
2.1	Prayer Time	7
2.2	Zohor	8
2.3	asar (A)	9
2.4	asar (B)	10
2.5	Magrib	11
2.6	Isya'	13
2.7	Subuh	14
2.8	Real Time Clock Using DS1307	16
2.9	The RF Transmitting Module (x315MHZ)	17
2.10	The RF Receiving Module (CZS-3A)	17
2.11	The Encoding/Decoding Circuit Using HT12E and HT12D	18
2.12	RS 232 Communication	19
2.13	RS 232 Cable Pins	20

2.17	PIC 16F877a	24
2.19	PIC 16F877a Pins	25
2.20	HT12E	26
2.22	HT12D	27
2.24	MAX 232	28
2.26	DS1307	29
2.28	Solidworks 2007	30
2.29	Solidworks Schematics	31
2.30	Proteus V7.3 Professional	32
2.31	Proteus Schematics	32
2.32	MicroC	33
2.33	MicroC schematic	33
2.34	Visual Basic v6.0	34
3.1	Project Flow Chart	36
3.2	Digital Clock (A)	37
3.3	Digital Clock (B)	38
3.4	Digital Clock Simulation	38
3.5	PCB Layout	39
3.6	RS 232 Hardware Configuration	40
3.7	RS 232 Cable	41
3.8	RS 232 Converter Cable	42

3.9	DS1307 (REAL TIME DISPLAY)	42
4.0	HT12E & HT12D	43
4.1	Transmitter Circuit including HT12E	44
4.2	Receiver Circuit Including HT12D	45
4.3	Software Flow Chart	46
4.4	VB.net Communication Via RS 232	53
4.5	Full Circuit Simulation	54
4.6	Full Hardware intergrated (Main board & remote control)	56
4.7	Software Simulation	57
4.8	Antenna Construction	60
4.9	RF amplifier Kit	61

LIST OF SYMSBOLS AND ABREVAITION

LCD	Liquid Crystal Display
CPU	Central Processing Unit
GDN	Ground
I/O	Input/Output
XTAL	Crystal
IC	integrated Circuit
HW	Hardware
COM	Common
PC	Computer

LIST OF APPENDICES

NO	TITLE
A	Gantt Chart for Final Year Project 1
B	PowerPoint Slide Presentation for FYP 1&2
C	Datasheet of PIC 16F877A
D	Datasheet of HT12E
E	Datasheet of HT12D
F	Datasheet of DS1307
G	Datasheet of MAX232

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

A clock is an instrument that able to indicates, measure, keeps and display time. The word *clock* is born from the words “*clagan*” and “*clocca*” meaning “bell”, but in general usage today a “clock” refers to any device for measuring and display time.

Nowadays Clocks are in homes, office and many other places, smaller ones called watches are carried on wrist while the larger ones are in public places like a watch tower. A small clock is often shown in a corner of computer displays, Mobile phones and many mp3 players.

The purpose of a clock is not always to display the time. It may also be used to control a device according time, example an alarm clock and prayer time clock. A majority of people rely upon the sound of an alarm clock to signal the start of their day, while some claim to awaken at a certain time without assistance from an alarm. Its same goes to the prayer time. For a Muslim, it is compulsory to pray five times a day. Some of them might need a clock to signal them to start their prayer time and surprisingly, not most of us have the ability to have pray on time.

Nowadays with the advance technology, it is possible to create a microcontroller based on prayer time that is able to display various areas of prayer times as long as the longitude and latitude are given and able to customize it to alert us to the prayer times for the given areas.

The microcontroller based prayer time display system consists of two elements to be considered:

- i. Hardware development
- ii. Software development

The achievement of the project can be divided into two parts:

- i. Ability to display accurate prayer time for Zohor, Asar, Magrib, Isya and Subuh
- ii. Ability to remote clock setting using infrared Time Remote Control

1.2 PROBLEM STATEMENT

Most of the available product are expensive and cannot be affordable for lower level society. Even though there are low cost product available but still low quality and poor performance. The is a major problem is purchasing the prayer time clock which refer to imported clock from Arabic, and other region is that the accuracy of displaying the correct prayer time since different region has different prayer time calculation method. Most of the product in the market rarely equip with friendly user function when comes to setting the clock.

There are three problem statements to be considered. Firstly, the market available clock are rarely equip with Time Remote Control and the prices of the Prayer Time clock are expensive and cannot be afford by low level society. Finally normally the available prayer clock in the market didn't state whether its follow the standard of Muslim World League method.

Hence, with this project we are giving an opportunity for low level society for having prayer time clock for alert them about the important to pray on time. The product Is using a good quality component to operate and equip with user friendly option.;

1.3 OBJECTIVE OF PROJECT

There are 3 objective of project to be considered:

1. To develop an automatic clock that able to display an accurate prayer time based on *Muslim World League method*.
2. To develop an automatic prayer time display with *Time remote Control & automatic prayer time update*.
3. To design and build up a *lower cost* of a prayer time clock, so that it can make it *affordable for all level of society* as student be the target user.

1.4 SCOPE OF PROJECTS

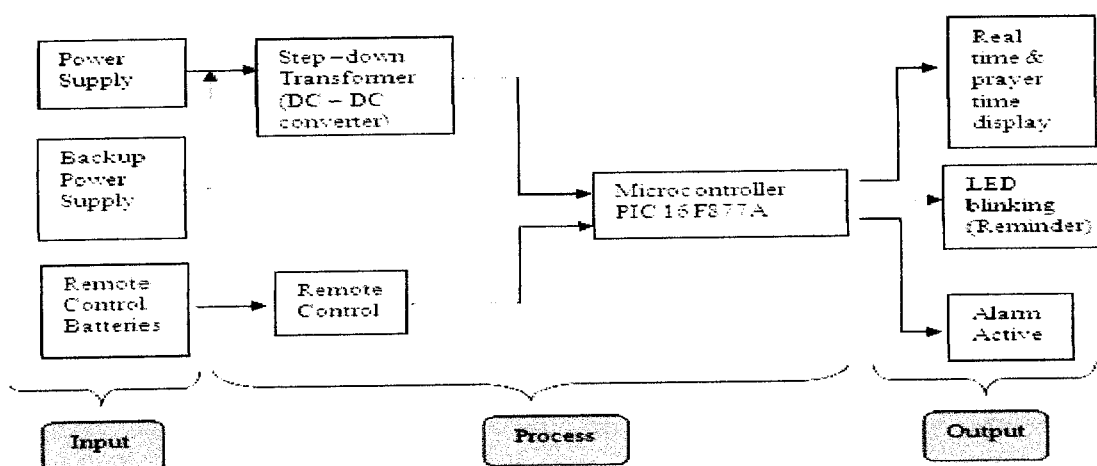


FIGURE 1.1: SYSTEM BLOCK DIAGRAM

Refer from the figure above, this project consists of two parts which is the first part is about the development of microcontroller based prayer time display while the another part is all about the development of Time Remote control device.

In the first parts, it will focus on inventing a Clock Core system consists of a PIC (Programmable Integrated Circuit) that acts as system microcontroller. The PIC 16F877A is being chooses for most suitable PIC to do the job. The supply 12V DC current will need to get through a DC – DC converter process before directly supply to system core. The backup power supply will be taking over as the main supply when the first main power supply of the system is down. The backup power supply consists of batteries with 12V.

As we move to second parts, it all about the construction of Time Remote Control which is using infrared signal to communicate with the PIC. The power supply will be 3V and the infrared signal that transmits from remote control will be receive to the receiver located in the microcontroller board system.

Finally, the output of the project is that the system is able to display the real time & prayer time accurately and the alarm and LED able to function properly.

1.5: PROJECT OUTLINE

This progress report consists of five chapters. The first chapter of progress report discussing on the background, problem statement, objective and scope of the project. The second chapter consists more on literature review that has been done. It discusses about the theory on component of software and hardware such as a comparison between microcontroller and microprocessor used in this project. Others, it will also include the type of hardware and software specification that will be used in the project. Chapter three will be explained about the methodology of this project. It consists of two major parts; there are software development and

hardware development. Next, chapter four will be present about the preliminary expected result that has been done. Finally, chapter five will be discusses about the discussion and suggestion for this project. In the discussion part, it will explained the problem occur when doing the project. In this chapter also, there will be a conclusion included, it will summarize the research and development of this project.