SUPERVISOR APPROVAL

"I admit that I have read this literature work through my observation which has fulfilled the scope and quality in order to be qualified for the conferment of Bachelor Degree in Electronic Engineering (Computer Engineering)."

Signature : .....

Supervisor's Name : Mr. Sani Irwan Bin Md Salim

Date : 5/5/06

REAL TIME CLOCK DISPLAY USING PROGRAMMING LANGUAGE APPROACH

NOOR AZIANA BINTI ABU TAIB

This Report Is Submitted In Partial Fulfillment of Requirements for the Bachelor Degree of Electronic Engineering (Computer Engineering)

Fakulti Kejuruteraan Elektronik & Kejuruteraan Komputer
Kolej Universiti Teknikal Kebangsaan Malaysia

MAY 2006

ADMITATION

"I admit that this is done by my self except the discussion and extracts taken from other sources that I explained each in detail."

Signature : .....

Author's Name : Noor Aziana Binti Abu Taib

Date : 3/5/06

This thesis specially dedicated to my beloved father and mother

APPRECIATION

First of all I would like to praise to Allah with His Merciful giving to me in order to accomplish my report's project.

Secondly, I would like to express my sincere thanks to my supervisor, Mr. Sani Irwan Md Salim by giving his guidance, support and helps to me. He is very dedicated supervisor by doing his supervision on my project.

Furthermore, thank to all lectures and technicians of Faculty of Electronic and Computer Engineering which are involved directly or indirectly in achieving the objectives of my project.

Besides that, a special dedication to my beloved parents; En. Abu Taib Ismail and Pn. Zubaidah Othman and family that give a full support, pray and their invocation for achieving the successful of my project. Not to forget to my lovely fiancée; Raihan Ahmad who contributes brilliant ideas to me during the project.

Last but not least to my colleagues; Maizan Sulaiman, Baizura Baharin, Hasealah Ishak and Hartini Saad by their encouragement while facing the difficulty moment in order to accomplish the project. Thank you in advanced.

ABSTRAK

Projek ini adalah mengenai Paparan Waktu Masa Nyata. Projek ini juga merupakan aplikasi dan rekaan satu litar untuk sebuah model waktu secara digital dengan menggunakan Paparan *LED Dot Matrik* yang mana dengan menggunakan *PIC16F877* sebagai pengawal mikro dan *DS1307* cip masa nyata (RTC). Dengan menggunakan pengawal mikro ini, masukan (input) akan diterima melalui suis dan keluaran (ouput) bagi masa terkini akan dipaprkan. Seterusnya, jam atau waktu ini akan beroperasi samada dalam format 12 atau 24 jam dengan tandaan AM/PM. Terdapat kekurangan pada program biasa jika dibandingkn dengan cip masa nyata di mana langkah program untuk format 12/24 jam bersama tandaan AM/PM perlu dihasilkan. Tetapi dengan menggunakan cip masa nyata, langkah tersebut boleh diabaikan. Tambahn pula, cip tersebut menggunakan kiraan frekuensi kristal untuk membentuk satu pengira masa dan mengelakkan masalah perkiraan masa. Bahaa pengaturcaraan yang digunakan di dalam projek ini adalah bahasa himpunan.

ABSTRACT

This project is about Real-Time Clock Display. This project is on how to implement a program and design a circuit for a digital clock model with LED Dot Matrix Display by using a PIC16F877 microcontroller and a DS1307 Real Time Chip (RTC). By using microcontroller, the input would be received from switches and display output of the current time. Then, the clock operates in 12 or 24 hour format with AM/PM indicator. The limitation of normal program compared to Real Time chip is the programming step for 12 or 24 hours format with AM/PM indicator must be created. Instead of RTC, this step could be skipped. Furthermore, RTC use crystal frequency count for setting time counter and avoid count time problem. The programming that will be used as a core of this project is assembly language.

TABLE OF CONTENTS

II LITERATURE REVIEW

III PROJECT METHODOLOGY

LIST OF TABLES

PAGES

LIST OF FIGURES

PAGES

ABBREVIATION

PIC	Peripheral Interface Controller
LED	Light Emitter Diode
MCLR	Master Clock Reset
RTC	Real Time Chip
ROM	read Only Memory
PIC	Peripheral Interface Controller
EEPROM	Electrically Erasable Programmable Read Only Memory
SRAM	Static Random Access Memory
RAM	Random Access Memory
RST	Reset
CPU	Central Processing Unit
MCU	Microcontroller Unit
BCD	Binary Coded Decimal
LSI	Large-scale Integration
VLSI	Very Large-scale Integration
DIP	Dual Inline Package
SSOP	Short for Shrink Small Outline Package
SOIC	Small-Outline Integrated Circuit
TQFP	Thin Quad Flat Pack
PLCC	Plastic Leaded Chip Carrier
MIPS	Million Instruction Per Second
CPLD	Complex Programmable Logic Device
SPI	Synchronous serial port
USART	Universal synchronous asynchronous receive transmitter
PWM	pulse Width Modulation
NV	Non Volatile

UL	Underwriters Laboratory
GPIO	General Purpose Input Output
ASCII	American Standard Code for Information Interchange
AM	Ante Meridiem
PM	Post Meridiem
LCD	Liquid Crystal Display
VSM	Virtual System Modeling
MHz	mega Hertz
Hz	Hertz
TTL,	Transistor-Transistor Logic
CMOS	Complementary Metal Oxide Semiconductor
PCB	Printed Circuit Board
ADI	ASCII Data Import
SCL	Serial Clock
SDA	Serial Data
I^2C	Inter-Integrated Circuit
R/W	Read/Write
I/O	Input/Output
TC	Terminal count
CE	Clock Enable

LIST OF APPENDICES

PAGES

CHAPTER I

INTRODUCTION

1.0 Introduction

In this chapter, it will discuss about the introduction of the project, objectives of the project and report organization.

1.1 Introduction of Project

This project is a Real-Time Clock Display. This project is about on how to implement a program and design a circuit for a digital clock model with 10 of LED Dot Matrix Display by using a PIC16F877 microcontroller and a DS1307 Real Time Chip (RTC). By using microcontroller as the main circuitry, the input would be received from switches and display output of the current time. Then, the clock operates in 12 or 24 hour format with AM/PM indicator.

DS1307 chip stores the current date and time in registers in seconds, minutes and hours, days, months and years. The interface allows the PIC16F877 to read the time keeping registers. The time will be displayed through ten of LED Dot Matrix displays. Besides that, the programming step for 12/24 hours with AM/PM indicator and create the program for calendar and time can be skipped.

The programming that used as a core of this project is assembly language which is PIC. The programming design of real time clock is implementing using MPLAB-IDE as the project development tool. The source code is burned in Flash ROM inside the PIC using IC PROG JDM.

LED Dot Matrix programming is utilized as the display. Programming scanning through row driver and column driver is needed to transfer the output data to their exact coordinates.

1.2 Objectives of Project

i) Designing and constructing the LED Dot Matrix circuit.
ii) Utilizing PIC16F877 with assembly programming as its core
iii) Applying RTC chip to the LED Dot Matrix circuit

1.3 Scope of Project

i) Display hours, minutes and seconds in 12-hour format in ten of 5 X 7 LED Matrix.

ii) The Programming that be chosen is assembly language.

iii) RTC chip DS1307 and EEPROM will be used for data and character storage.

1.4 Report Description

This thesis is divided into several chapters which are:

i) Introduction

ii) Literature Review

iii) Project Methodology

iv) Hardware Description

v) Result and Analysis

vi) Discussion and Recommendation

vii) Conclusion

For the first chapter, it covered some briefly explanation of the project such as the introduction and the objectives of project.

Second chapter is about literature review instead of the previous project of real time clock display. Furthermore, it would discuss about improvement that is made for this project.

Third chapter is concerning project methodology. In this chapter, it would cover the methods which are divided to two section hardware and software that are used and flow chart that involved for this project.

Fourth chapter is concerning description of hardware that is developed in this project. In this chapter, thorough explanation would involve microcontroller and real time chip.

Fifth chapter covered about the analyzing the result. In this chapter, program development is analyzed to observe the performance of each line codes whether it is more or less efficient than the current time.

Sixth chapter regarded about the discussion and recommendation for the future improvement. In this section, it would discuss the problem that aroused during the project implementation and the actions to overcome the problem occurred.

For the last chapter, conclusion of the project would be discussed. In this chapter, the conclusion is made regarding to the achievement and knowledge obtained in order to accomplish the project.

CHAPTER II

LITERATURE REVIEW

2.0 Introduction

In this chapter will discuss about the previous projects regarding to the real time clock display. The important of this study is to get in practice the concept in implementing the real time clock display. Besides, how the project would relate into research and available theory. From this evaluation, some improvement has been done.

2.1 Review of Previous Studies

2.1.1 Real-Time Clock

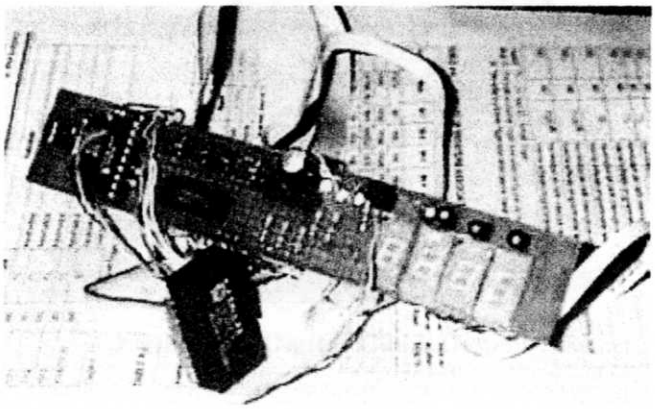

Figure 2.0: Real-Time Clock

This real time clock was developed by Savel. It used PIC16F84 (16C84) CPU as the controller and display. Dallas DS12887A was used for clock. Actually this clock was to test prototype for more complicated clock design. Besides that, it purposely was build up for testing the programs on PIC microcontroller. Furthermore, there are two buttons one to increase and another to decrease RTC memory address.

2.1.2 Digital Clock Display

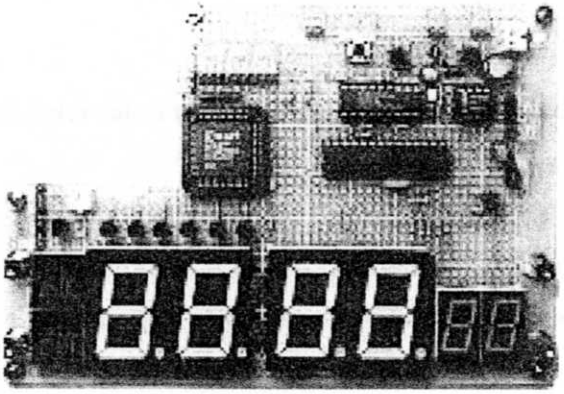

Figure 2.1: Digital Clock Display

This digital clock display was build up by Seiichi Inoue. The project implemented PICF873 as CPU controller. For this project, its output was displayed via 7 segments LED for time and minute and other LEDs segment for AM/PM indicator. Feature of the clock is realized by the software which was programmed in PIC via peripheral circuit for Digital clock instead of RTC chip. Actually, by using normal program, the probability that occurrence of count time problem might be existed compared to the usage of RTC chip.

2.1.2.1 Illustration Problem Based on Digital Clock Project

2.1.2.1.1 Clock was slow

It had been delayed compared with the correct clock when measuring count time of 1 second. There was a mistake in the processing which made time of one second as a result of the investigation. One second was made by counting 20 milliseconds 50 times. At beginning, if being equal to or less than 50, it was doing