UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF LABORATORY PIC MICROCONTROLLER TRAINER

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree in Electrical Engineering Technology (Industrial Power) (Hons.)

by

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DECLARATION

I hereby, declared this report entitled "Development of Laboratory PIC Microcontroller Trainer" is the results of my own research except as cited in references.

Signature : …….

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Date : 22 DISEMBER 2014

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the Bachelor's Degree in Electrical Engineering Technology (Industrial Power) (Hons.). The member of the supervisory is as follow:

……

En. Khalil Azha B. Mohd Annuar

ABSTRAK

Projek ini dinamakan “Development Of Laboratory PIC Microcontroller Trainer” kerana projek ini akan digunakan untuk menggantikan kit latihan yang sedang digunakan bagi proses mengajar yang menggunakan cip PIC. Kit latihan yang digunakan sekarang adalah agak ketinggalan dari segi reka bentuk dan kegunaan. Ia mengehadkan penggunaan peranti keluaran dimana ia perlu digabungkan dengan litar atau kit latihan yang berasingan untuk beroperasi. Dengan adanya projek ini, kit latihan yang lama akan digantikan kepada kit latihan yang baru yang mana ia lebih ringkas, serba guna dan menggunakan kit latihan tambahan secara berasingan serta ketahanannya lebih lasak dari kit latihan yang sedia ada. Bagi memastikan ketahanan kit latihan, satu bekas yang menggunakan bahan yang tahan lasak akan digunakan sebagai pelindung. Kit latihan yang dihasilkan ini mempunyai pelbagai jenis masukan dan keluaran. Contoh keluaran yang disediakan adalah seperti LED, LCD, 7-Segmet, Buzer dan Dot Matrix. Sebuah kotak yang digunakan direka khas bagi menggayakan dan memberi perlindungan yang maksima terhadap litar yang terdapat dalam kit tersebut.

ABSTRACT

This project called "Development of Laboratory PIC Microcontroller Trainer" will be used to replace the trainer that is being used for teaching the PIC microchip. Trainer currently in use is a bit behind in terms of design and usability. It restricts the use of the output device where it needs to be combined with circuit training or a separate kit to operate. With this project, the old trainer will be transferred to the new trainer which is simpler, versatile and use additional trainer separately and more rugged durability of existing trainer. To ensure the durability of the trainer, a container that uses durable materials will be used as a shield. This trainer has produced a wide variety of input and output. Sample output is provided as LED, LCD, 7 Segment, Buzzer and Dot Matrix. A simple box used specially designed for styling and provide maximum protection for circuits contained in the trainer.

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DEDICATION

To my beloved parents

ACKNOWLEDGEMENT

I would like to express my greatest gratitude to ALLAH S.W.T for the blessing and strength given to me to complete this final year project. With HIS blessing, I am able to complete the project and this report.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

PCB	-	Printed Circuit Board
LED	-	Light Emitting Diode
LCD	-	Liquid Crystal Display
PWI	-	Power Inspect
PIC	-	Programmable Interface Controllers
ICSP	-	In Circuit Serial Programming
TX	-	Transmitter
RX	-	Receiver
USB	-	Universal Serial Bus
IC	-	Integrated Circuit
MHZ	-	Megahertz
VSS	-	Voltages at Various Common Power Supply
GND	-	Grounding
MCLR	-	Master Clear
Ω	-	Ohm

CHAPTER 1
INTRODUCTION

1.0 Introduction

The "Development of Laboratory PIC microcontroller Trainer" is designed and develops to accommodate the needs of educational process due to progressing towards teaching and learning process environments. This project using PIC16F877A (programmable Integrated Circuit)" as a main device which is to run the program constructed by users. This project used to run the various function. This chapter will briefly discuss the general background of this project, its problem statements, objectives, scope and the thesis outline.

1.1 Background

Development of Laboratory PIC microcontroller Trainer using PIC16F877A (Programmable Integrated Circuit) as a main device which is to run the program constructed by users. This project used to run the various function. The main objective for this project is used to provide a simple, versatile and study training kit. With this training kit, the process of learning PIC can be achieved more quickly and easily. This trainer provided various actuator device acts as output such as LED, LCD, 7 Segment and Buzzer. Keypad, switch and sensors might be used as an input device. The most interesting for this project is this trainer can be use at any time, any

place and no external sources needed. It‟s would make an easy to bought it anywhere. Simple and easy for the objectives are achieved.

1.2 Problem Statement

Nowadays, the Embedded System subject is the most common subject that taught in most universities. Student difficult to study the microcontroller subject because it‟s commonly only has the trainer in the laboratory. Furthermore, the PIC trainer that already done currently is not fully completed the desired of people. It is because there are commonly can be use in the laboratory and can‟t bring anywhere. And also the trainer is not completed multifunction because there some function could not be in the trainer. Need to use external sources is one of the main problem for studying this embedded system design.

1.3 Objectives of Research

There are several objectives in this development of PIC trainer such as:

- To design basic circuit based PIC microcontroller Trainer.
- To develop PCB board of PIC microcontroller
- To analyze performance of hardware
- To provide manual user of the trainer

1.4 Scope of Research

This project involves with study of the PIC16F877A microcontroller based PIC microcontroller training kit. PIC16F877A is a common microcontroller used currently. The main function of microcontroller is to save and run the program. This project is divided into two parts, the first part is USB programming circuit and the

second one is the running circuit purposed to run the program. For this trainer, its develop by two type of power supply which are the USB cable that connected to computer and the other way is only use the power supply. But, the recommendation for this new trainer, it is easy to apply this trainer if it‟s just use the external source such as battery 12V or maybe 9V. The scope of this project is to use PIC as an interface. The PIC is electronic and digital device that widely used in industry today due to its can be used as both an input and output by referring the datasheet. The PIC is might be used in this project is PIC16F877A which has 40-pin, where 33 pins can be used as input or output. Furthermore, this project will be providing a few devices as an output such as Dot Matrix, 7 Segment, LED and the LCD display.

1.5 Thesis outline

Chapter 1:

The general information of this project is provided in this part such as background project, objectives of project, problem statement and scope of project.

Chapter 2:

Journal and some references are explained in this part. There are might be in comparison explanation or some information that‟s used in this project. There are too many comparison had done in this part. Furthermore, some discussion also made in this part after do the comparison.

Chapter 3:

In order to achieve the objective, several methodologies have been proposed. Literature review is done by gathering information about this project from journal, article, books and papers in order to get knowledge. In the beginning, literature review including understanding about the project. Next is modelling the circuit and

simulate the circuit by using Proteus software then the development of hardware. Follow by implementation and integration phase where is to test the project and analyze the results. Finally, the report has been prepared.

Chapter 4:

Software and Development of Hardware are discussed on this chapter. The procedures and each process of development included in this chapter.

Chapter 5:

The results of software and hardware development are discussed on this chapter. All the issues and the discussion also explained in this chapter.

Chapter 6:

Chapter 6 is the last chapter of this report contains an overall conclusion of the project. The future recommendation and works of project are also mentioned and described on this chapter.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

Literature review is done by gathering information about this project from journal, article, and books. Literature review is necessary before initiate the project and literature researches regarding the project are important in understanding the concept of the overall project. This chapter discusses about PIC microcontroller types, MikroC programmer software and Proteus Simulation Software.

2.1 Previous Project Study

Some case study and review of previous researches is performed to gain more information and understanding on development of laboratory PIC microcontroller trainer. Previous study shown there are many projects based on PIC microcontroller trainer.

Table 2.1 : Case Study

Title	Sources	Description	Authors
Introduction to a Microcontroller Training		This paper explained the use of a low-cost PIC Microcontroller	1. Richard L. Jones

Platform for Distance Education	2012 ASEE PSW Conference	Training Platform that was a product of an NSF supported project to successfully create an active/synchronous distance learning/teaching environment. This system is sufficiently flexible to be useful from the most basic PIC microcontroller programming to some fairly complex research Project based implementations.	2. Steve C. Hsiung 3. Reza Raeisi
Design and implementation of microcontroller trainer as interactive media to enhance learning process	article	This project designs a microcontroller trainer without computer as its operating system. -As a result, it can be used with less overhead project efforts because it does not need computer which is dissimilar to previous system.	1.Yoyo Somantri 2.Enjang A.Juanda 3.Erik Haritman

Implementation of user interface for Microprocessor trainer	International Journal of Information Technology Convergence and Services	- This paper purposed to design and build the microcontroller-based user interface system and to study input, computation, and output for microprocessor trainer. - This paper also explained how to do high quality research in the area of file systems, as well as develop a good implementation on at least one computer system.	Tin Mar Kyi

2.2 Source of Journal

Some research had done during this project. There are divided by any categories. The explanations of each sources as description below.

2.2.1 Main Reference (hardware)

Paper Citation: Tin Mar Kyi (2011) "International Journal of Information Technology Convergence and Services (IJITCS)", "Implementation of User Interface For Microprocessor Trainer", Volume (1, No. 4) (August).

This paper purposed to design and construct the microcontroller-based user interface system and to study input, computation, and output for microprocessor trainer. The aims of this paper are to do high quality research in the area of file systems, as well