

DIGITAL PERSONAL COMPUTER OSCILLOSCOPE

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This report is submitted in partial fulfillment of requirement for the award of Bachelor of Electronic Engineering (Computer Engineering) with honours

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To Beloved Father, Mother and members of Family....

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ABSTRACT

This project is aim to design and assemble the complete model of Digital Personal Computer (PC) Oscilloscope. Digital Personal Computer Oscilloscope is a new version of oscilloscope is emerging that consists of an external analog-to-digital converter which is connected to a PC are provides a display, control interface, disc storage, networking and power supply. The main objective for this project is to use Visual Basic as a heart of the operating system. This software will integrate software and hardware part, and finally design and assemble a model of Digital Personal Computer Oscilloscope. This project is attempts to achieve the same functionality as a Cathode Ray Tube (CRT) oscilloscope by using a data acquisition card (DAQ) which transfers the data to the PC via Universal Serial Bus Technology (USB). The most important part of this project is on screen graphics which is display the signal. The data will be directed to the screen of PC and will display the waveform that represents the signals.

ABSTRAK

Projek ini bertujuan untuk merekabentuk dan memasang satu model lengkap Digital Osiloskop Komputer Peribadi. Digital Osiloskop Komputer Peribadi adalah satu versi osiloskop yang baru yang mengandungi perkakasan luaran yang menukarkan analog kepada digital yang disambung ke komputer peribadi yang menyediakan paparan, kawalan paparan, simpanan dalam cakera, sistem rangkaian dan kuasa elektrik. Objektif utama projek ini ialah untuk membangunkan sistem dengan menggunakan Visual Basic. Perisian ini akan menghubungkan antara bahagian perisian dan perkakasan, dan akhir sekali ialah untuk merekabentuk dan memasang satu model Digital Osiloskop Komputer Peribadi. Projek ini cuba untuk mencapai fungsi yang sama seperti Osiloskop Sinar Tiub Katod (CRT), dengan menggunakan kad perolehan data (DAQ) yang dapat memindahkan data ke komputer peribadi melalui teknologi Bus Selari Universal (USB). Bahagian yang paling penting dalam projek ini adalah paparan grafik isyarat di skrin. Data akan diarahkan terus ke skrin komputer dan akan menghasilkan satu gelombang yang mewakili isyarat tersebut.

CONTENTS

CHAPTER	TITLE	PAGE
	PROJECT TITLE	i
	STATUS CONFIRMATION FORM	ii
	DECLARATION	iii
	DEDICATION	iv
	ACKNOWLEDGEMENT	vi
	ABSTRACT	vii
	ABSTRAK	vii
	CONTENTS	ix
	LIST OF TABLES	xiii
	LIST OF FIGURES	xiv
	LIST OF ABBREVIATIONS	xvi
I	INTRODUCTION	
	1.1 CHAPTER OVERVIEW	1
	1.2 BACKGROUND OF PROJECT	2
	1.3 OBJECTIVES	2
	1.4 PROBLEM STATEMENT	3
	1.5 SCOPE OF PROJECT	3
	1.6 METHODOLOGY	4
	1.7 THESIS ORGANIZATION	5

II LITERATURE REVIEW

1.8	CHAPTER OVERVIEW	7
1.9	OSCILLOSCOPE	8
2.2.1	Introduction	8
2.2.2	Function of Oscilloscope	10
2.2.3	Analog and Digital Oscilloscope	12
2.2.4	The Operation of Oscilloscope	14
2.2.4.1	Analog Oscilloscope	14
2.2.4.2	Digital Oscilloscope	15
2.2.5	Oscilloscope Terminology	16
1.10	DIGITAL PC OSCILLOSCOPE	18
1.11	DATA ACQUISITION (DAQ)	20
2.4.1	Introduction	20
2.4.2	Operation of DAQ	21
2.4.3	NI USB-6008 DAQ Card	23
2.5	MICROSOFT VISUAL BASIC	25
2.6	LITERATURE REVIEW FOR THE PAST PROJECT	26

III METHODOLOGY

3.1	CHAPTER OVERVIEW	29
3.2	INTRODUCTION	30
3.3	HARDWARE	32
3.3.1	Data Acquisition Card (DAQ Card)	32
3.3.2	Advantages of Using NI USB-6008	32
3.3.3	Setting up NI USB-6008	33
3.3.4	Analog Input Circuitry	36
3.3.5	Connection of NI USB-6008	37

3.3.6	The Operation of NI USB-6008	38
3.4	SOFTWARE	39
3.4.1	Measurement and Automation Explorer	39
3.4.2	Microsoft Visual Basic 6	40
3.4.2.1	Analyze the Problem	41
3.4.2.2	Design the Program	41
3.4.2.3	Code the Program	43
3.4.2.4	Test and Debug the Program	43
3.4.2.5	Formalize the Solution	43
3.4.2.6	Maintain the Program	44

IV RESULTS AND DISCUSSION

4.1	CHAPTER OVERVIEW	45
4.2	INTRODUCTION	46
4.3	GRAPHICAL USER INTERFACE (GUI)	47
4.3.1	Menu GUI	47
4.3.2	GUI of Oscilloscope	48
4.3.3	GUI of 'Multiple Reading of Voltage'	50
4.3.4	GUI of 'One Sample of Voltage'	51
4.4	OSCILLOSCOPE	52
4.4.1	Results When No Input	52
4.4.1.1	Various Type of Waveform	52
4.4.1.2	Scope Timebase	55
4.4.2	Result When Have Input	59
4.4.2.1	Applying Frequency Signal	60
4.4.2.2	Applying DC Voltage	64
4.4.2.3	Change the Timebase Knob	66
4.4.2.4	Save and Clear Data in Excel	67
4.4.2.5	Apply Frequency to see Spectrum	68

4.5	MULTIPLE READING OF VOLTAGE	69
4.6	ONE SAMPLE OF VOLTAGE	70
4.7	BUILD A SETUP APPLICATION PROGRAM	71
V	CONCLUSION AND SUGGESTION	
5.1	CONCLUSION	72
5.2	SUGGESTION	73
	REFERENCES	74
	APPENDIX	

LIST OF TABLES

NO	TITLE	PAGE
3.1	Analog Terminal Assignments	34
3.2	Digital Terminal Assignments	35

LIST OF FIGURES

NO	TITLE	PAGE
2.1	X, Y, and Z Components of Displayed Waveform	8
2.2	Analog Oscilloscope	9
2.3	Digital Oscilloscope	10
2.4	Real Pictures of Oscilloscope	10
2.5	Scientific Data Gathered by an Oscilloscope	11
2.6	Digital an Analog Oscilloscopes Display Waveforms	12
2.7	Analog Oscilloscope Block Diagram	14
2.8	Digital Oscilloscope Block Diagram	16
2.9	Sine and Damped Sine Waves	17
2.10	Square and Rectangular Waves	17
2.11	Sawtooth and Triangle Waves	17
2.12	Step, Pulse, and Pulse Train Shapes	18
2.13	Picture of Digital PC Oscilloscope	19
2.14	NI USB-6008 DAQ Card	24
2.15	Percent of Industry-standard Development Software	25
2.16	Project 1 System Diagram	27
2.17	Project 2 System Diagram	28
3.1	Flowchart of Work	31
3.2	Hardware Setup Procedures	33
3.3	How to Set Up DAQ Card	34
3.4	Analog Input Circuitry	36

3.5	Connection of NI USB-6008 DAQ Card	37
3.6	Device Block Diagram	38
3.7	Measurement and Automation Explorer	39
3.8	Program Flowchart	42
4.1	Menu's GUI	48
4.2	Oscilloscope's GUI	49
4.3	GUI for Multiple Reading of Voltages	50
4.4	GUI for One Sample of Voltage	51
4.5	Picture of Sine Wave	54
4.6	Picture of Square Wave	54
4.7	Picture of Rectangular Wave	55
4.8	Pictures of Various Time Base of Sine Wave	57
4.9	Pictures of Various Time Base of Square Wave	58
4.10	Pictures of Various Time Base of Triangle Wave	58
4.11	Pictures of Various Frequencies in Sine Wave	61
4.12	Pictures of Various Frequencies in Triangle Wave	62
4.13	Pictures of Various Frequencies in Square Wave	63
4.14	DC Supply Voltage for Result 1	65
4.15	DC Supply Voltage for Result 2	65
4.16	Pictures of Change the Timebase Knob	66
4.17	Picture of Data in Excel	67
4.18	Picture of Example for Spectrum Analyzer	68
4.19	Picture of 'Multiple Reading of Voltage' program	69
4.20	Picture of 'One Sample of Voltage' program	70

LIST OF ABBREVIATIONS

PC	-	Personal Computer
I/O	-	Input/Output
VB	-	Visual Basic
GUI	-	Graphical User Interface
CRT	-	Cathode Ray Tube
DAQ	-	Data Acquisition
USB	-	Universal Serial Bus
DC	-	Direct Current
AC	-	Alternating Current
Hz	-	Hertz
ADC	-	Analog-to-Digital Converter
DAC	-	Digital-to-Analog Converter
DIO	-	Digital Input/Output
GPIO	-	General Purpose Interface Bus
SE	-	Single Ended
RAM	-	Random
CPU	-	Central Processing Unit
TTL	-	Transistor Transistor Logic
DAO	-	Data Access Objects
RDO	-	Remote Data Objects
ADO	-	ActiveX Data Objects
PDLC	-	Program Development Life Cycle
BASIC	-	Beginner's All-Purpose Symbolic Instruction Code
GND	-	Ground

RSE	-	Reference Single Ended
FIFO	-	First-In-First Out
MUX	-	Multiplexer
PGA	-	Programmable-gain Amplifier
AI	-	Analog Input
AO	-	Analog Output
VDC	-	Voltage Direct Current
V	-	Volts
PSM	-	Projek Sarjana Muda

LIST OF APPENDIX

NO	TITLE	PAGE
A	Source Code	75

CHAPTER I

INTRODUCTION

1.1 CHAPTER OVERVIEW

This first chapter will explain more about the introduction of project. Firstly, the project introduction will explain a simple description about the project that has been implemented. It will show the project's importance and several about the research that have been implemented. Then, this chapter will expound about the objectives of the project and the problem statement of the project also will be described briefly. Next, the scope of work will be described simply and any assumptions that have been made in this project will be explained. Project's methodology also will be shown in this chapter but the briefly explanation of this topic only will be describe in other chapter. Finally, this report will be end by showing the overall thesis structure including the summary from each chapter.

1.2 BACKGROUND OF PROJECT

The aim of this project is to design and assemble the complete model of Digital Personal Computer (PC) Oscilloscope. This digital oscilloscope can monitor the output from PC. This project contains several stages of operation. Firstly is how to find the suitable interface part. The other stages are involved in computer such as I/O card interface and Visual Basic programming which displayed the data. This project will produce a complete working model that is user friendly and accurate value. The final demonstration will include the external hardware control system connected through a port to the computer by I/O card. The heart of the system will be an executable program that is programmed by Visual Basic. The most important part will be the on screen graphics display of the signal. The data will be directed to the screen of the PC and will reproduce a wave form that represents the signals. The importance of this project is to create an easy technology compare to existing oscilloscope technology. This Digital PC Oscilloscope is low cost and also portable especially when the user uses a laptop PC.

1.3 OBJECTIVES

In this project there are three objectives. Below is the list of this project's objectives;

- i) To design the system (GUI) by using Visual Basic
- ii) To integrate between software (VB) and hardware to make a complete working process of Digital Personal Computer Oscilloscope.
- iii) To design and assemble the complete model of Digital Personal Computer Oscilloscope.

Visual Basic is used in design the graphical user interface (GUI) because it encompasses a set of tools and technologies that are used by more than three million developers worldwide to create computer software components and applications. Then, the

suitable interface part to communicate between PC and external hardware must be obtained. The suitability of the hardware is depends to the cost, portability and user friendly. Integrate the hardware and software part one of crucial process and try to solve this most complicated step or work of project.

1.4 PROBLEM STATEMENT

Oscilloscopes are one of the most widely used electronic instruments because they provide easily understood displays of electrical waveforms and are capable of making measurements over an extremely wide range of voltage and time. Oscilloscopes traditionally are hardware based using a CRT (Cathode Ray Tube) designed to display voltage variations (periodic or otherwise). This traditional oscilloscope has it own weakness and problem compare to Digital PC oscilloscope. Firstly, the cost of CRT oscilloscope is high if we compare to Digital PC oscilloscope. If CRT oscilloscope wants to use PC's networking and disc storage functions, it must used extra cost when added to a self-contained oscilloscope. Otherwise, the procedure to export the data to standard PC software such as spreadsheets and word processors are difficult. The CRT oscilloscope is not ability to control the instrument by running a custom program on the PC. Finally, the weakness of the recent oscilloscope is not portability. The size of the recent oscilloscope is big and heavy. Digital PC oscilloscope is design to solve or decrease the weakness and problem above. Digital PC Oscilloscope is a new type of oscilloscope is emerging that consists of an external analog-to-digital converter connected to a PC that provides the display, control interface, disc storage, networking and often the electrical power.

1.5 SCOPE OF PROJECT

This project is attempts to achieve the same functionality as a traditional oscilloscope, using a data acquisition card (DAQ) which transfers the data to the PC

(possibly via USB). The Visual Basic program application will then display the waveform as it would appear on a traditional CRT oscilloscope. Actually, the purpose of this project is to apply what student had learned in the previous semesters and also to get new useful knowledge.

For hardware part, this project is more about how to inter-relate computer technology with external hardware design. DAQ Card is use as an interface between input and output. For software part, the design of the interface part on PC's monitor (GUI) is develop by using Visual Basic and then programmed by programming language. Besides that, the writing of the Visual Basic programming language must follow to the specification of the hardware part. Finally, the integration of the hardware and software part will be implementing so that it will produce a complete model of Digital PC Oscilloscope. The data will be directed to the monitor of the PC and will reproduce a wave form that represents the signal.

1.6 METHODOLOGY

Methodology for this project is divided into three parts as listed below;

- i) Hardware part
- ii) Software part
- iii) Integrate the hardware and software part

For hardware part, first method is making some researches to find suitable hardware. The researches about the information and data of hardware will be used and make sure that hardware is suitable based on specification of project, available on market and also low cost. After choose the right hardware or equipment, scope more detail about the chosen hardware and understanding hardware specification. Finally is to design and assemble that hardware.

For software part, firstly concentrate on literature review which study of the journals, application notes, data and books that related to this project will be done. Besides, learning more detail about Visual Basic programming will make the implementation of this project become easy. Finally, the design of the interface part is develop by using Visual Basic and programmed by programming language.

In final stages, the software and hardware part will be integrated to become a complete model of Digital Personal Computer Oscilloscope. Then, the debugging process will be implemented to check either it function properly or not.

1.7 THESIS ORGANIZATION

This thesis report provides all explanations and detail information about this project. The material is divided into six chapters as follows.

Chapter 1 provides an overview or introduction of this project. All the simple description of my project is shown under this chapter. This chapter also expound about project's objectives, problem statement, scope of work and methodology.

Chapter 2 is literature review which the discussion about the background study that relevance to the project. There are many others project, journal and thesis that have been taken as a comparison and reference. From this process, the weakness from other project can be reduced and the other project mistake can been avoided. This chapter will discuss the study and all information that are related to this project.

Chapter 3 will explain the specifically about the methods or procedures that have done to make this project success. The success of this project can be determined when the project objectives archived.

Chapter 4 will show the results obtained on this project including the finding and the analysis of the data. On this chapter, the discussion of all the result will be explained.

Finally, all the chapter will be conclude in chapter 5. Then, suggestions are given to improve this project in future.