ADVANCED PUBLIC ADDRESS SYSTEM

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This Report Is Submitted In Partial Fulfillment of Requirements for the Degree Of
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UNIVERSTI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : ADVANCED PUBLIC ADDRESS SYSTEM

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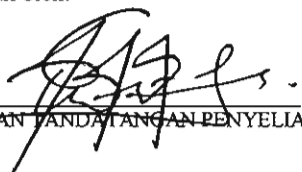
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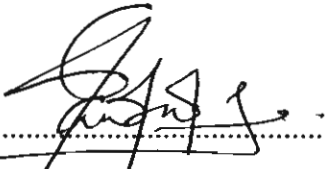
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To

Mom and Dad

Your prayers keep me moving forward

Teachers

Fill my heart with the truth and knowledge

Beloved friends

Make my world happens

Every Muslims

May Allah bless you all here and hereafter

-Al-fatihah-

ACKNOWLEDGEMENT

In the name of Allah, The Most Beneficent and Merciful. Peace be upon the Messenger of Allah, Prophet Muhammad s.a.w, his companions (r.a) and followers until the end of day. Thanks to Allah, with His blessing, this final project is successfully delivered. First of all, I want to thanks my beloved mom and dad, whom keep prays for me, gives me freedom and show understanding to me as a student because their loves keep me moving forward. Secondly, I want to thanks my supervisor for this final project, Mr Hazli Rafis Bin Abdul Rahim whom shares knowledge and idea so that I will keep on the right track which leads to this project successful. Lastly, I also want to thanks all my friends who lend me a hand throughout this project.

Wassalam

ABSTRACT

This project was proposed to solve the problems in classroom in University Technical Malaysia Malacca that doesn't have any speech equipment to help lecturer to give lectures. My advanced public address system will help to solve this problem. Besides that this project also has an easy setting and does not need a lot of set up. The system will be installed in the personal computer casing at the front of the classroom. We also know that when a speech is not loud, student especially at the back will not hear the speech. As for that, student will lose their concentration. This public address project surely can help to overcome it. This project will include a volume controller and the microphone will be using the wireless microphone to give the user a freedom to move. For the amplifier section, a class AB amplifier since it is known efficiency and higher power output.

ABSTRAK

Projek ini dicadangkan untuk menyelesaikan masalah di kelas di Universiti Teknikal Malaysia Melaka yang tidak mempunyai peralatan pidato untuk membantu pensyarah untuk memberikan kuliah. sistem alamat awam maju saya akan membantu untuk menyelesaikan masalah ini. Selain itu projek ini juga mempunyai tatacara yang mudah dan tidak perlu banyak ditetapkan. Sistem ini akan dipasang di komputer peribadi casing di bahagian depan kelas. Kita juga tahu bahawa ketika pidato tidak keras, mahasiswa khususnya di bahagian belakang tidak akan mendengar pidato tersebut. Sementara itu, pelajar akan kehilangan konsentrasi mereka. Projek ini alamat awam benar-benar dapat membantu mengatasinya. Projek ini akan memasukkan kontroler kelantangan dan mikrofon akan menggunakan mikrofon wireless untuk memberikan pengguna kebebasan untuk bergerak. Untuk bahagian penguat, penguat kelas AB kerana diketahui kecekapan dan output kuasa yang lebih tinggi.

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LIST OF ABBREVIATION

AC	-	Alternate current
DC	-	Direct Current
SLA	-	sealed lead acid
UTeM	-	Universiti Teknikal Malaysia Melaka
PCB	-	Printed Circuit Board
IC	-	Integrated Circuit
PC	-	Personal Computer
PA	-	Public Address
PSU	-	Power Supply Unit

LIST OF APPENDIX

CHAPTER I

PROJECT INTRODUCTION

1.1   Introduction

In general, the purpose of an amplifier is to take an input signal and make it stronger. Amplifiers find application in all kinds of electronic devices designed to perform numbers of functions. There are many different types of amplifiers, each with a specific purpose. This project is specified on audio amplifier. Audio power amplifiers are those amplifiers which are designed to drive loudspeakers.

1.2   Problem Statement

This project is to overcome problems that usually occur in classroom. In the classroom do not have a PA (Public Address) system to help lecturer making a clear speech and announcement. Secondly, to find small and easy PA system in UTEM is not easy. Thirdly, large PA system have a lot of setting and need time to configure it. The fourth problem is large PA system use a lot of space in the classroom. Besides that noisy situation may cause the speech of lecturer cannot be heard. Student at the back always lost concentration when they don't hear the lecturer speech.

1.3   Objectives

The objective of this project is to study, design and develop an amplifier. Firstly is to design and make a simple amplifier that can be used in classroom. Secondly is to integrate the PA system into the PC (Personal Computer) Casing. Thirdly is to design the amplifier that use power from the PC power supply and have a backup power source. Fourthly is to built wireless microphone and connect it to the PA system circuit. Fifthly is to determine the right spot in the PC casing for the PA system circuit. Lastly is to design useful audio equipment that easy to use.

1.4   Scope of Project

To achieve the objective of the project, there are few scope to be done. Besides that the scope will be a guide in making the project. In addition the scope of work will be used as guidance so that the system will not conflict with the objectives of the project. The following list is the scope of work for this project to design a power amplifier, designing a suitable pre-amp, design cordless microphone, select suitable loudspeaker, and a rechargeable power supply.

1.5 Gantt Chart

Table 1.0: Gantt Chart

PROJECT PLANNING

List the main activities for the project. Specify the time period required for each activity.

Activity	2009 July				August				September				October				November				December				2010 January				February				March				April			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	1	2	3	4	5	6	7	8	9	10	11	12	13	1	8	16	17
Select title of project, objective and project scope		■																																						
Objective analysis					■			■																																
Project Planning									■	■																														
Project Development														■											■	■	■			■										
Information analysis and recommendations																											■			■										
Test and identify problems of project																														■										
Discussion and Conclusion																																■	■							
Tesis		■			■								■																							■				

Labels across timeline:
- July–August: **PSM SEMINAR**, **Mid term holiday**
- October: **PSM PRESENTATION**
- November: **FINAL EXAM**
- December: **SEMESTER BREAK**
- January–February: **Mid SEMESTER BREAK**
- March: **Draft Repot**
- April: **Inotek**, **PSM 2 Presentaion**, **Final Exam**

2009 — 2010

Gantt chart for the two subjects is show in Table 1.0. This Gantt chart has 8 activities that is divided in two parts. This project takes about 9 month that is two semester to complete all of the activities. It is started on July 2009. In this stage the title of the project is being determined. The objective and the scope also are determine in this period. On 3rd July and 6th August is the process where the objective being analyze.

In September this process still running and also included the project planning period. Starting the end of September and in the October 2009 the project development have been started. End of the October is the PSM 1 presentaion and on November the final exam of student in UTeM. On December the semester break is start. Starting in January 2010 the stage of project development, information analysis and recommendation running on the same time. It finish on February when the semester break started.

The project is including the etching process, drilling and soldering the circuit. After semester break is end, the project development still running to complete all the unfinished element. Discussion and conclusion have been take it and process to making a draft report started and submit it at the supervisor. On 8th April the PSM 2 exhibition was start and project was been present. The thesis construction running on each month directly until the end of submitting report date.

1.5   Operating Environment

Work that constrains this amplifier system is developing an amplifier and a preamp suitable for use with a cordless microphone and loudspeakers. Designing a suitable volume control for the public address system and designing a suitable rechargeable power supply.

1.6   Report Structure

Chapter 1 will discuss the term amplifier and its diversity. This chapter will discuss the objectives of this project, the methods and steps used to complete this project also the assumptions of this project.

Chapter 2 will discuss the many types of devices and components that can be used to construct amplifier, preamp, cordless microphone and power supply. The literature review is very important in determining the best components. This chapter will explain about the devices and components that have been proposed to be used in this project

Chapter 3 will discuss the methodology that were been used to complete this project. The steps that were taken during literature review, decisions on the outer looks of the porTable amplifier. The circuit layout is also discussed.

Chapter 4 will discuss the hardware development. From the final selections of amplifier class, its circuit designs on preamplifier will be discussed. The power consumption saving circuit is also discussed in this very chapter.

Chapter 5 will discuss about the analysis and findings from the project. This section will determine the project successful or not.

CHAPTER II

LITERATURE REVIEW

2.1   Introduction to Amplifier

The purpose of a power amplifier, in very simple terms, is to take a signal from a source device and make it suitable for driving a loudspeaker. Ideally, the only thing different between the input signal and the output signal is the strength of the signal itself. In this real world, there are no such things as ideal power amplifier. But many do a very good job if they are operated within their advertised power ratings. The output signals of all amplifiers contain additional and unwanted components that are not present in the input signal; these additional characteristics may be combined together and are generally known as distortion. Amplifiers also generate a certain amount of unwanted noise.

Power amplifier ability is measures by its power rating. The unit that is used is watts. The power rating of an amplifier may be stated for various load impedances; the units for load impedance are ohms. The main characteristics of an amplifier are linearity, efficiency, output power, and signal gain. In general, there is a tradeoff between these characteristics. An amplifier is said to be linear if it preserves the details of the signal waveform, referring to the equation:

$$Vo(t) = A.Vi(t) \qquad (2.0)$$

Where, *Vi* and *Vo* are the input and output signals respectively, and *A* is a constant gain representing the amplifier gain.

The amplifier's efficiency is a measure of its ability to convert the dc power of the supply into the signal power delivered to the load. The definition of the efficiency can be represented in an equation 2.1 below:

$$n = \frac{\text{Signal power delivered to load}}{\text{DC power supplied yo output circuit}} \qquad (2.1)$$

For an ideal amplifier, the efficiency is one. Thus, the power delivered to the load is equal to the power taken from the DC supply. In this case, no power would be consumed in the amplifier. But in reality, there is no such thing as ideal amplifier. Most of the power given to amplify the signal is dissipate as heat. Thus, amplifier needs heat sink to withstand higher temperature cause by this nature.

The gain of the amplifier (*G*) is equal to the magnitude of the output signal (*Xo*) over the magnitude of the input signal (*Xi*) as shown in the equation 2.2:

$$G = \frac{Xo}{X1} \qquad (2.2)$$

G can be voltage, current, or power gain depending on the application.

The output power level plays an important role in evaluating the power amplifier. The power output capability factor, PMAX can be derived from equation 2.3 :

$$Pmax = \frac{\text{The Maximum Output Power}}{\text{The Peak Drain Voltage x The Peak Drain Current}} \qquad (2.3)$$

2.1.1 Amplifier Classes

Amplifiers can be specified according to their input and output properties [1]. There are many classes used for audio amps. The class of an amplifier refers to the design of the circuitry within the amplifier. These classes range from entirely linear with low efficiency to entirely non-linear with high efficiency. The following is brief description of some of the more common amplifier classes:

2.1.1.1 Class A Amplifier

Class A amplifiers have very low distortion; however they are very inefficient and are rarely used for high power designs. The distortion is low because the transistors in the amp are biased such that they are half "on" when the amp is idling. As a result of being half on at idle, a lot of power is dissipated in the devices even when the amp has no input. Class A amps are often used for signal level circuits where power requirements are small because they maintain low distortion. High end Class A audio amplifiers are sometimes used by the most discriminating audiophiles. Distortion for class A amps increases as the signal approaches clipping, as the signal is reaching the limits of voltage swing for the circuit. Some class A amps have speakers connected via capacitive coupling. The disadvantages of Class A amplifier is higher dc power loss at its output. It's also have poor efficiency and poor impedance matching. Result of the waveform for the Class A is shown in Figure 1.1 and in Figure 1.2.