

PUBLIC ADDRESS SYSTEM

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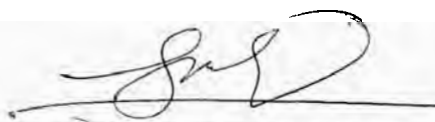
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*To him that our memory would never vanish;
Your thought and wisdom are always remembered.*

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ABSTRACT

A public address system or also known as "PA" system is an electronic amplification system with the simplest combination of microphone, a modestly-powered mixer-amplifier and one or more loudspeakers that are used to reinforce a given sound. This project was proposed design a simple public address system that consists of a suitable microphone, a preamplifier together with its suitable amplifier and also loudspeakers. Study shows that, a class AB amplifier is the most efficient and higher power output class of amplifier and this criteria is been taken account into this project where the amplifier is from this class. In order to prove its effectiveness and capabilities, tests are run to identify the frequency response, linearity and gain.

ABSTRAK

Sistem pembesar suara atau lebih dikenali sebagai sistem PA ialah sistem penguat elektronik yang ringkas terdiri daripada gabungan mikrofon, sistem penguat suara dan juga speaker yang digunakan untuk meyalurkan bunyi yang terhasil daripada mikrofon. Projek ini dijalankan untuk merekabentuk sistem penguat suara ringkas yang terdiri daripada mikrofon, pra penguat dan juga pembesar suara. Kajian menunjukkan bahawa kelas penguat AB adalah yang paling terkenal dengan keefisienan and kuasa keluaran yang besar dan kriteria ini diambil kira untuk projek ini yang mana projek ini menggunakan penguat daripada kelas tersebut. Dalam membuktikan keefektifan dan kemampuan sistem penguat tersebut, ujian dijalankan untuk mengenalpasti tindakbalas frekuensi, kesamaan dan gandaan sistem tersebut.

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LIST OF ABBREVIATIONS

PA	-	Public Address
DC	-	Direct Current
AC	-	Alternate Current
AMP	-	Amplifier
MIC	-	Microphone
RMS	-	Root Mean Square
THD	-	Total Harmonic Distortion
IMD	-	Intermodulation Distortion
PCB	-	Printed Circuit Board
PSU	-	Power Supply Unit
IC	-	Integrated Circuit
SNR	-	Signal to Noise Ratio
AUX	-	Auxiliary
dB	-	Decibels
Mm	-	Millimeters
Kg	-	Kilogram

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 rural areas where it is hard to find a device for making important announcements or speeches so that everyone can listen precisely to what the speaker is talking about. Besides that, this simple project can also be use by lecturers in lecture hall. Many of them are tired of speaking aloud and as a solution, microphone and speakers works just fine for them.

1.3 Objectives

The objective of this project is to study, design and develop an amplifier that can be used in a small environment. It is also must be simple and can be carried around easily by its user. Using self battery and outlet power supply, this project should be a little bit bulky in size.

1.4 Operating Environment

Work that constrains this amplifier system is:

- Developing an amplifier that is powerful enough to be use in a small environment.
- Designing a preamp suitable for use with a microphone and loudspeakers.

1.5 Project Assumption

This project main objective is its ease of use by users. But since it is still in a prototype mode, weight is less considered and taken into account. But then, the project should have its own power so that it will not rely on outlet power supply.

After designing all sub circuits, the PCB of each sub circuit is constructed. The project ends up with the combination of all sub circuits and troubleshooting should there be any problem.

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 and the assumptions of this project.

Chapter 2 will discuss the many types of devices and components that can be used to construct amplifier, preamp and mixer. 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 design and construction that were been used to complete this project. The steps that were taken during literature review, decisions on the outer looks of the amplifier.

Chapter 4 will discuss the measurement and testing procedure. From the final selections of amplifier class, its circuit designs on preamplifier will be discussed. The entire necessary test is been done in this chapter.

Chapter 5 will discuss about the analysis and findings from the project whether the project is successful or not. And also the recommendation for the next upgrade for this project.

CHAPTER II

LITERATURE REVIEW

2.1 PA System

The power amplifier system is actually an integration of several audio projects to make a bigger project. It is must for it to follow the arrangement in order for the system to be functional. The flow for the complete system are

1. Power supply
2. Microphone
3. Pre amplifier
4. Tone Controls
5. Power Amplifier
6. Speakers

Between the microphone and power supply and also between power amplifier and power supply, there are input and output socket respectively. This input socket and cables will act as a messenger to the whole system.

2.2 Power Supply

2.2.1 Introduction

Power supply in general should supplies electrical or other types of energy to an output load. It is also known as power supply unit (PSU).

2.2.2 Types of Power Supply

In general, there are three types of power supply that can be used to power an audio amplifier system. They are unregulated power supply, linear regulated power supply and the switchmode power supply. Power amplifiers can use any type of power supply with its corresponding advantages and disadvantages.

2.2.2.1 Unregulated Power Supply

This is the simplest power supply consisting of only transformers, rectifier, smoothing capacitors and fuse for over current protection.

Advantages:

- Simple design.
- Low cost.
- Can provide high power in transient pack.

Disadvantages:

- Poor load and line regulation.
- Sufficient ripple on the DC output.
- Poor protection against malfunction.

2.2.2.2 Linear Regulated Power Supply

The output voltage of this power supply is regulated against the change of load and input voltage. The output voltage is fixed at a desired level for a given range of load and input voltage.

Advantages:

- Good load and line regulation.
- Minimum level of output ripples noise.
- Protection of the circuit can be incorporated easily.

Disadvantages:

- Great heat dissipation and require proper heatsinking.
- Higher cost as compared to the unregulated type.
- High power consumption.

2.2.2.3 Switchmode Power Supply

The DC output of switchmode power supply is regulated, same as that of linear regulated power supply. However, it uses transistor-switching principle in converting input voltages to desired DC output.

Advantages:

- Space saver due to small size.
- High power efficiency.
- Higher output current capability.

Disadvantages:

- Higher ripple on output as compared to linear regulated type.
- Complexity of design.
- Higher cost.

2.2.3 Power Supply for Power Amplifiers

A simple unregulated power supply is chosen because it can deliver higher power on transient peak, which is just what is required in most audio power amplifiers system.

During power rectification, radio frequency interference is generated by the bridge rectifier. This happens when the bridge diode turned off; the charge carriers are swept rapidly from the p-n junction and the current flow stops with a sudden jolt that generates harmonics well into the radio frequency bands.

2.2.4 Transformers

Power amplifiers are usually designed to work from a positive and negative supply. One big advantage of this is that the output will be zero volts DC with respect to ground, and thus no large DC coupling capacitors are required. Few extra components are required to provide both supplies, however a mains transformer with a centre tapped output is required. A transformer may be specified as 50V centre tapped, or 25V-0-25V. The output current may be given for both series and parallel connection of the output windings. If it is using both windings as separate positive and negative supplies, then the lower current figure applies.

Transformers are often specified as the VA rating, this is the output volts multiplied by the output current. If the transformer was rated as 100VA, then it's output would be 50V at 2A for the series connection. This will also give two 25V supplies, at 2A each. The AC output then needs to be rectified and filtered to provide the necessary DC supply needed for the amplifier. Because the capacitors charge to the peak voltage of the rectified sine wave, this is approximately 1.4 times the specified AC RMS value.

2.2.4.1 Safety Precautions

When dealing with mains transformers, one needs to be careful of safety requirements. This will usually mean providing a suitable earth to any metal case, providing a suitable fuse and switch to the transformer primary windings, and making sure all wires and connections are properly insulated. Fuse for the transformers must be large enough to allow for surge currents when the amplifier is first switched on, however it should be small enough to provide some overload protection in the event of circuit failure. All diodes can handle both the peak voltages and peak currents expected, not just the normal values. Similarly the capacitors must have a rating higher than the peak no load DC voltage expected. A suitable safety margin is prudent in both cases.

2.2.5 Portable Power Supply

In order to make the system portable, portable power supply is a compulsory where it can function anywhere without depending on the normal AC outlet. There are numerous types of rechargeable batteries available in the market but in this case, the lead acid batteries have the highest score where its ability to produce constant output power and minimum time for charging.

2.2.5.1 Lead Acid Battery

Invented in 18's, this battery is the oldest type of rechargeable battery. Despite having the energy to weight ratio, it has the ability to supply high surge current with a constant value. It is also known as the free maintenance and low cost value.