

DESIGN OF A RF WIRELESS HEADPHONES

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This report is submitted in partial fulfillment of requirements for the award of Bachelor of Electronic Engineering (Industrial Electronics) with honours

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

**BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II**

Tajuk Projek :Design of A RF Wireless Headphone.....

Sesi Pengajian :2006/2007.....

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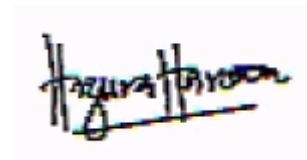
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DEDICATION

To my parents, family members and somebody special who encourage
and support was a great help in completing it

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Alhamdulillah, I finally able to complete the final year project and the thesis as well within the allocated time. First of all, I would like to take this opportunity to express my appreciation to some organizations and individuals who have kindly contributed to the successfully completion of my final year project in UTeM. With the cooperations and contributions from all parties, the objectives of the project; soft-skills, knowledge and experiences were gained accordingly. To begin with, I would like to convey my acknowledgement to UTeM PSM organization members especially my project supervisor, Pn Hazura Haroon for her cooperation and involvement from the beginning until the end of my project development. Her effort to ensure the successful and comfortability of students under her responsibility was simply undoubtful. Thanks for the invaluable advices given before, while and after completion of the project. Furthermore, I would like to extend my sincere acknowledgement to my parents and family members who have been very supportive throughout the project. Their understanding and support in term of moral and financial were entirely significance towards the project completion. Last but not list, my appreciation goes to my fellow colleagues in UTeM, especially for those who came from FKEKK. Their willingness to help, opinions and suggestions on some matters, advices and technical knowledge are simply precious while doing upon completion of my final year project.

ABSTRACT

The Wireless Headphones are an attempt to increase the audio listening pleasure of the users of this system, by eliminating the need for a wire or cord from the audio device to the listening device. The Wireless Headphones will be able to play music from any audio device such as a CD player or television (TV). There are many areas of application for this device. It can be used in military, academic, business, and home environments. The transmitter will transmit audio signals to the receiver up to a distance about 5m. The Wireless Headphones system will operate at Radio Frequency (RF) signals. Specifically, it will utilize Frequency Modulation (FM) techniques to transmit the audio signals. The system is designed to transmit and receive the audio signal about 88 till 108 MHz frequencies, which is a free band for those that are not licensed or commercial. The system will be powered using a 9Vdc battery.

ABSTRAK

Penciptaan *Headphones* tanpa wayar adalah untuk memperluaskan keperluan pengguna bagi pendengaran audio, dengan meniadakan bahan pengantara seperti wayar ataupun *cord* dari alat audio untuk alat pendengaran. *Headphones* tanpa wayar ini boleh digunakan dalam pelbagai peralatan yang berasaskan audio seperti pemain cakera padat, televisyen dan juga radio. Aplikasi alat ini sangat meluas, ianya dapat dilihat dalam sistem ketenteraan, pendidikan, bisnes, dan juga di dalam persekitaran rumah. Alat pemancar akan memancarkan isyarat audio kepada penerima dengan jarak maksimum 5m. Sistem *Headphones* tanpa wayar ini beroperasi pada isyarat frekuensi radio. Secara lebih jelasnya, ianya akan menggunakan teknik permodulatan frekuensi untuk memancarkan isyarat audio. Sistem ini direka pada isyarat audio dalam lingkungan frekuensi 88 hingga 108 Mhz. Alat ini menggunakan bateri 9Vdc sebagai bekalan kuasa.

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LIST OF ABBREVIATIONS

RF	-	Radio Frequency
FM	-	Frequency Modulation
Tx	-	Transmitter
Rx	-	Receiver
Hz	-	Hertz
Km	-	Kilometers
PM	-	Phase Modulation
ADC	-	Analog-to-Digital Converter
DAC	-	Digital-to-Analog
LED	-	Light Emitting Diode
EM	-	Emitter Modulation
PIC	-	Peripheral Interface Controller
UV	-	Ultra-violet
Ir	-	Infrared

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CHAPTER I

INTRODUCTION

The goal of this project is to bring wireless transmission to an activity that almost everyone enjoys: listening to music. The wireless headphone system is not a new invention in today's modern world. Wireless headphones take the electrical signal which creates the sound from the audio and convert it to radio waves. These signals are emitted by the headphone transmitter throughout the entire home (radio style). The headphones worn by the user receive and amplify the signal to produce sound from the small speakers in the earpieces of the headphones. Headphone speakers are worn very close to the ears because the actual volume level is much lower than the audio speaker that sends sound throughout the entire room. They also reduce noise. Rechargeable or replaceable batteries provide electricity to the headphones. The wireless headphone is an attempt to increase the audio-listening pleasure of the users of this system. This is done by eliminating the need for a wire or cord from the audio device to the listening device. It is known that people enjoy listening to the radio while they engage in other activities such as yard work or cleaning the house. The user simply connects the output of their compact disc player to the transmitter system. The music is broadcasted via IR LEDs and received by phototransistor, which outputs to a pair of headphones. There are many areas of application for this device. It can be used for military purposes, in education, business, and the home environment.

1.1 OBJECTIVES

The objectives of this project are:

- i) To learn about wireless communication.
- ii) To design a transmitter that is plugged into the line out and/or possible the headphone output of any audio device.
- iii) To improve the size, quality and range of wireless audio communication system.

1.2 PROBLEM STATEMENTS

Using wireless communication technology for home entertainment is very popular today. Normally, headphones are connected to a wire or core from the audio device to the listening device. So people cannot enjoy listening to the radio while engaging in other activities such as yard work. This project is designed to solve this problem.

1.3 SCOPE OF WORK

The scope of this project consist three major elements which are the FM transmitter, FM receiver and headphones. It currently uses a 9Vdc battery as a power source. Basically, there are two ways of generating FM waves: indirect generation and direct generation. The indirect generation method is used in the FM transmitter because indirect generation has an advantage of frequency stability. On the other hand, the direct generation has a major disadvantage, that is, when the carrier frequency tends to drift causing the need for additional circuitry for frequency stabilization. In this project, two IR LEDs are used for transmitter. A phototransistor receives light waves that are reflected from the surface by the emitting diode. The output of the receiver can be connected to any headphone or speaker

1.3.1 Transmitter

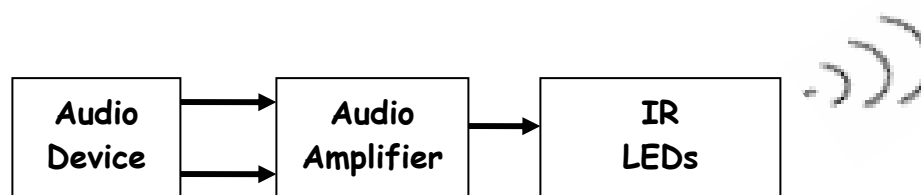


Figure 1.1: Block diagram of transmitter

The transmitter's block diagram is shown in Figure 1.1 which consists of an audio device, audio amplifier, and transmitter signal (IR LEDs). The transmitter is fed from an audio device, which supplies the audio signal that will be modulated and transmitted. The output signal of the audio device is already stereophonic, which means that the signal is separated into two channels, a left and a right channel. The audio signal is passed through an audio amplifier. Then, the signal will be transmitted by IR LEDs.

1.3.2 Receiver

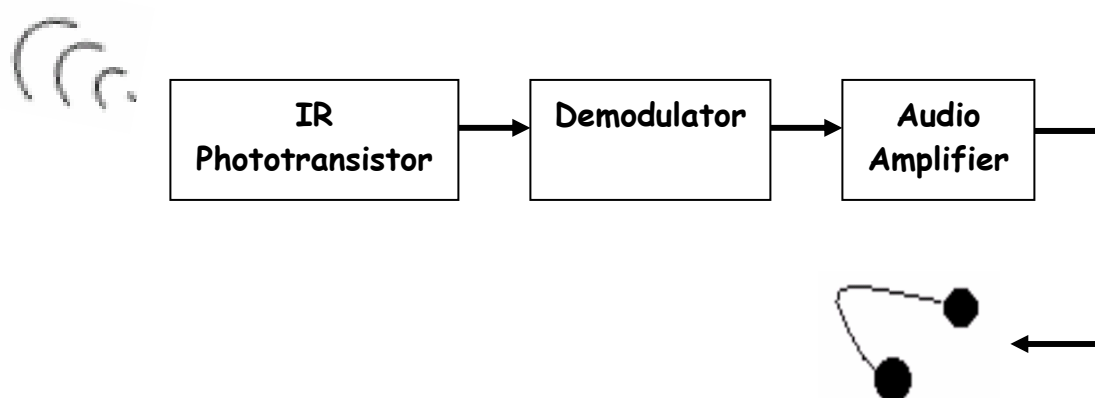


Figure 1.2: Block diagram of receiver

The receiver's block diagram that is shown in Figure 1.2 detects the transmitted signal and passes it to the headphones. The process requires the following: the signal is picked up at the transmitter's signal. Then the demodulator comes in next to recover the information and separates the message from carrier. It produces an output voltage that is

proportional to the instantaneous frequency of the input. The signal is passed through an audio amplifier and then the sound is heard through headphones.

1.3.4 Headphones

The output of the receiver can be connected to any headphone or speaker with 1/8 jack. In the project, two 8Ω 1W PC speakers were used.

1.3.5 Battery (GP's Supercell)

This 9V battery is the latest in rechargeable technology and is manufactured by Golden Peak Group. GP's Supercell primary batteries are built to provide an economical and reliable power source for general battery operated devices. The material to make a rechargeable Ni-MH is from chemistry and this battery is mercury-free.



Figure 1.4: GP's Supercell primary battery

1.4 PROJECT METHODOLOGY

For this project, there are some procedures and methods which will be used to produce a set of complete RF Wireless Headphones. The detailed explanation about the methodology used is discussed in Chapter III. The project workflow is described in Figure 1.4.

1.4.1 Project Workflow

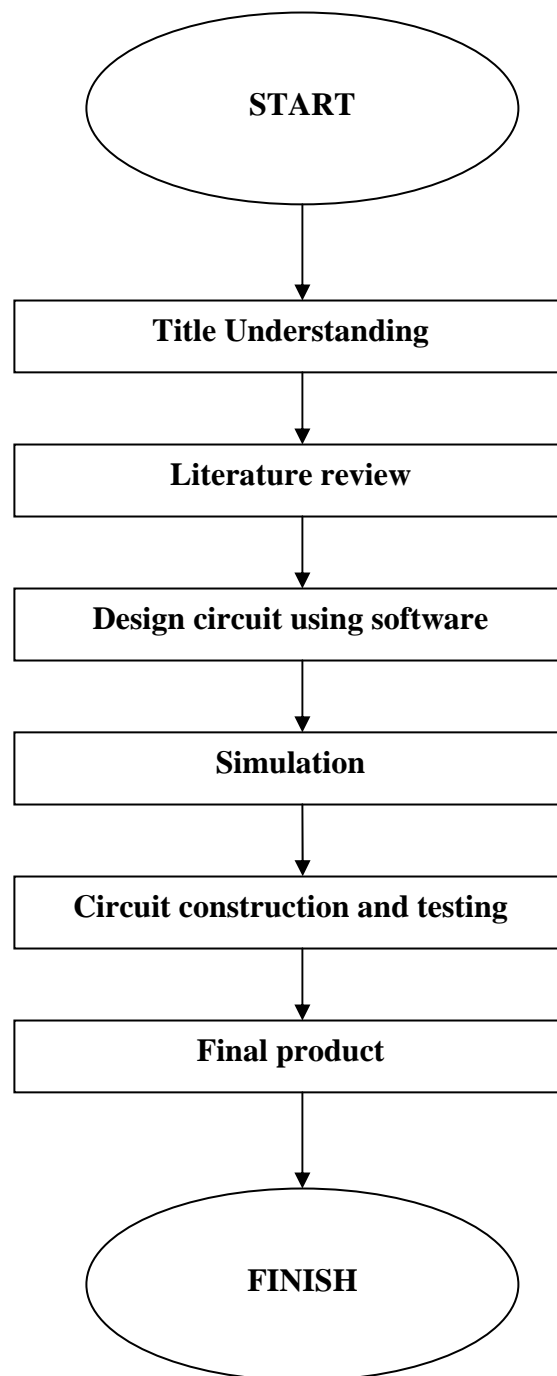


Figure 1.4: The project workflow

1.5 REPORT ORGANIZATION

This report is divided into several chapters. They are:

- i. Introduction
- ii. Literature Review
- iii. Project Methodology
- iv. Result and Discussion
- v. Conclusion and Suggestion

The first chapter is an introduction to the project title. The important overview or descriptions including the objectives and scopes of the project and problem statement have been comprised.

The second chapter is the literature review about the project title. In this literature review, it includes some research about wireless, theory of modulation, basic transmission, filters, phased-looked loops and many more.

The third section is about the project methodology. In this chapter, the methods and the project flow has been explained clearly. It also includes information on the research and experiments carried out during the project development.

The fourth chapter mainly focuses on the results and analysis done using the device and discussion. All testing and verification results are attached with the aid of figures, tables, and statistics related to the project. The discussion explains the results obtained as well as their analysis and the overall project.