



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DESIGN CHILDREN ALERT SYSTEM USING RADIO  
FREQUENCY FM TECHNIQUES**

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

by

**NUR FATIN HUSNA BINTI SHARUDIN**

**B071110176**

**910616085528**

FACULTY OF ENGINEERING TECHNOLOGY

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## **APPROVAL**

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Electronic Technology (Telecommunication) (Hons.). The member of the supervisory is as follow:

.....

(Mr. Abdul Halim Bin Dahalan)

## ABSTRAK

Projek ini membincangkan mengenai reka bentuk sistem amaran bagi kanak-kanak dengan menggunakan teknik Frekuensi Radio ( RF) Pemodulatan Frekuensi (FM). Kehilangan kanak-kanak berleluasa dan sering kali berlaku oleh kerana ibu bapa mereka tidak berwaspada dan hilangan pandangan terhadap anak-anak mereka terutamanya di kawasan awam. Objektif utama sistem amaran ini adalah untuk memastikan ibu bapa berwaspada dengan anak-anak mereka daripada hilang yang berkeliaran dengan jarak had. Dalam sistem amaran ini, pemancar akan dibawa oleh kanak-kanak manakala bahagian penerima berada pada ibu bapa. Pemancar terus menghantar isyarat kepada penerima. Penerima ini akan mengeluarkan bunyi bip dalam beberapa saat semasa penghantaran isyarat dari pemancar ke penerima . Apabila kanak-kanak mencapai had jarak yang ditetapkan , isyarat akan berhenti menghantar dan tiada lagi kedengaran bunyi bip oleh ibu bapa mereka. Bunyi berulang-ulang yang didengar oleh ibu bapa mereka dan tiba-tiba tidak ada lagi kedengaran bunyi tersebut akan memberi isyarat serta memberitahu kepada ibu bapa mereka bahawa anak-anak mereka telah mencapai had jarak selamat. Projek ini terdiri daripada reka bentuk perkakasan yang peranti mudah. Perisian telah digunakan untuk memperbaiki litar sebelum memasang siap di papan litar bercetak(PCB) dilakukan untuk mendapatkan hasil yang diharapkan. Litar pemancar telah direka untuk menghantar isyarat FM manakala radio FM dalam telefon pintar telah digunakan sebagai penerima. Sistem amaran kanak-kanak akan membantu ibu bapa berwaspada apabila anak mereka merayau bersendirian dan mereka tidak akan terlambat menyedari bahawa anak-anak mereka telah hilang. Oleh itu, sistem amaran ini dapat mengurangkan kes kanak-kanak hilang.

## **ABSTRACT**

This project converses about the design of children alert system by using Radio Frequency (RF) Frequency Modulation (FM) techniques. Children missing become pervasive and happen frequently as their parent not alert and lost sight of their children especially at public area. The main objective of this alert system is to ensure parents alert with their children that wandering from missing with limitation distance. In this alert system, the transmitter will attach to the children while the receiver part is carried out by the parents. Transmitter continuously transmits the signal to the receiver. The receiver emitted a beep sound in a few seconds during the transmission of signal from transmitter to receiver. Once the children reach the distance limitation, the signal will stop transmitting and no more sound can be heard by their parents. Repeated sound that heard by their parents and suddenly there is no more sound heard will alert their parents and notify that their children have been reached the safe distance limit. This project consist of hardware design which a simple device. Software was used to improve the circuit before fabricating on printed circuit board is done to get the expected result. The transmitter circuits were developed to transmit FM signal while the radio FM in Smartphone was used as a receiver. This child alert system will help parent alert when their child wanders alone and they will not too late to realize that their children are missing. Thus, this alert system will reduce the child missing case.

## **DEDICATION**

This thesis dedicated with deepest love to my beloved parents for their devoted caring, lecturer and my friends for understanding and supporting me all the way.

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Alhamdulillah, His Willingness has made it possible for me to complete this Bachelor Degree Project in time. First of all, in this opportunity I would to express my greatest appreciation to my supervisor, Mr. Abdul Halim bin Dahalan for his contributions, invaluable advice and guiding in this project that motivate me in order to complete my project and gave me a lot of precious help and guidance when I met with some obstacles along the project with fully patience. Also, he provides me with the helpful information and details regarding my project so that I manage to complete this project. Not forget, thanks for the contribution from Universiti Teknikal Malaysia Melaka on their facilities and equipment. In addition, with the useful guidance from technician in laboratory, I manage to carry out my project with fully concentration. Last but not least, greatest credit goes to my beloved family and Mohammad Hafiz for their love, fully support and consideration that can spent more time with them along my project. Their encouragement just as an invisible spiritual pillar and makes me be strong when I encounter with any obstacle. I also would like to thanks all my friends and not to be forget my lecturer who have offered positive feedback and suggestions for improvement in my project. Their opinion and suggestion are very useful and will be a guideline for me.



# TABLE OF CONTENT

Abstrak	i
Abstract	ii
Dedication	iii
Acknowledgement	iv
Table of Content	v
List of Tables	viii
List of Figures	ix
List Abbreviations, Symbols and Nomenclatures	xi
<b>CHAPTER 1: INTRODUCTION</b>	<b>1</b>
1.1 Background Project	1
1.2 Problem statement	2
1.3 Project Objective	3
1.4 Work scope	3
1.5 Report overview	4
<b>CHAPTER 2: LITERATURE REVIEW</b>	<b>5</b>
2.1 Introduction	5
2.2 Radio Frequency	5
2.2.1 RF system work	6
2.3 Transmitter	7
2.4 Receiver	7
2.5 Radio Transmission Loss	8
2.6 Electromagnetic Spectrum	9
2.6.1 Wavelength and Frequency	10
2.6.2 RF Spectrum / Radio Waves	12
2.7 Transmission Modes	13
2.7.1 Simplex	14
2.7.2 Half Duplex	14
2.7.3 Full Duplex	15

2.8	Modulation	16
2.8.1	Function of Carrier wave	17
2.8.2	Need for Modulation	17
2.8.3	Types of Modulation	18
2.9	Frequency Modulation	19
2.9.1	FM Performance	20
2.9.1.1	Bandwidth	20
2.9.1.2	Efficiency	21
2.9.1.3	Noise	22
2.9.2	FM features in Modulation Spectrum	22
2.9.3	Advantages of FM than AM	22
2.9.4	Frequency Modulation signal	23
2.10	Components	24
2.10.1	Trimmer capacitor	25
2.10.2	Electret Condenser Microphones	25
2.10.3	Potentiometer	27
2.10.4	Configuration of 555 Timers	28
2.10.4.1	Pin Description of 555 Timers	29
2.10.4.2	Functional Parts of 555 Timer IC	30
2.10.4.3	Modes of 555 Timer	30
<b>CHAPTER 3: METHODOLOGY</b>		<b>32</b>
3.1	Introduction	32
3.2	Project Planning	32
3.3	Literature review	34
3.4	Data collection	34
3.5	Design circuit	35
3.6	Simulation and analyse	38
3.7	Fabrication on Printed Circuit Board (PCB)	40
3.8	Hardware Testing	43
3.9	Project Flowchart	44
3.10	Documentation and report writing	45

<b>CHAPTER 4: RESULT &amp; DISCUSSION</b>	<b>46</b>
4.1 Introduction	46
4.2 Expected Result	46
4.3 Preliminary Result	47
4.4 RF Transmitter	48
4.5 RF Receiver	56
<b>CHAPTER 5: CONCLUSION &amp; FUTURE WORK</b>	<b>57</b>
5.1 Conclusion	57
5.2 Limitation	58
5.3 Future work	59
<b>REFERENCES</b>	<b>60</b>
<b>APPENDICES</b>	
A List of frequency FM that used in Ayer Keroh, Melaka	
B NE SE 555 Timer Datasheet	
C Schematic of FM Transmitter	
D PCB Layout FM Transmitter	
E PCB Top silk FM Transmitter	
F PCB Bottom copper FM Transmitter	

## LIST OF TABLES

1.1	Statistic children missing 2012	2
1.2	Statistic children missing 2013	2
1.3	Statistic children missing 2014 (JAN-FEB)	3
2.1	Range of Frequency Spectrum	13
2.2	The parameters of a frequency modulated signal	19
2.3	Material for potentiometer	28
3.1	Gantt Chart PSM I and PSM II	33
4.1	List frequency of FM that used at Ayer Keroh, Melaka	50
4.2	Observation of tone signal square wave when potentiometer resistance difference	51
4.3	Square wave signal which output from FM Transmitter	52
4.4	Voltage at battery and time taken for range 5m	54
4.5	Voltage at battery and time taken for range 17m	55

## LIST OF FIGURES

2.1	Block diagram of Transmitter	7
2.2	Block diagram of Receiver	8
2.3	Electromagnetic Spectrum	10
2.4	Wavelength	11
2.5	Data Transmission Mode	15
2.6	Relationship between modulation index and bandwidth	21
2.7	Frequency Modulation signal	24
2.8	Variable capacitor	25
2.9	Electret Condenser Microphone	25
2.10	Two terminal of Electret Condenser Microphone	26
2.11	Three terminal of Electret Condenser Microphone	26
2.12	Potentiometer	27
2.13	555 Timer Block Diagram	29
2.14	Internal arrangement of 555 Timer	30
3.1	Basic FM Transmitter Circuit	35
3.2	Tuning the frequency	36
3.3	Tone Generator circuit	36
3.4	Tone Generator circuit with potentiometer	37
3.5	Tone Generator circuit without potentiometer	38
3.6	Proteus Software	38
3.7	Schematic RF Transmitter built in Proteus software	39
3.8	Analyse circuit	40
3.9	Using UV insulator machine	41
3.10	Ferric chloride was used to remove copper	41
3.11	PCB Layout	42
3.12	Drilling process	42
3.13	Soldering process	43
3.14	Hardware testing	43

3.15	Project flowchart	44
3.16	Methodology flowchart	45
4.1	Prototype of project	47
4.2	Frequency between FM Transmitter and receiver	47
4.3	FM Transmitter	48
4.4	Waveform of tone generator circuit using VCC=5V	49
4.5	Waveform of tone generator circuit using VCC=9	49
4.6	Graph of voltage versus time for range 5m	54
4.7	Graph of voltage versus time for range 17m	55
4.8	Receiver devices	56

# LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

AC	-	Alternating current
AM	-	Amplitude Modulation
BW	-	Bandwidth
c	-	Speed of light or velocity
c	-	Frequency of carrier
d	-	Distance
d	-	Peak deviation
dB	-	decibel
DSTFT	-	Discrete short-time Fourier Transform
EM	-	Electromagnetic
f	-	Frequency
f <sub>c</sub>	-	centre frequency
FEB	-	February
FM	-	Frequency Modulation
f <sub>m</sub>	-	Maximum modulating frequency
gt /gr	-	Power gain of transmitting (or receiving) antenna
GHz	-	Gigahertz
Hz	-	Hertz
IF	-	Intermediate frequency
JAN	-	January
kHz	-	kilohertz
Km	-	kilometre
m	-	Frequency of modulation
m	-	Meter
mm	-	millimetres
MHz	-	Megahertz
PCB	-	Printed circuit board
PM	-	Phase modulation

$P_r$	-	Received power
$P_t$	-	Radiated power
RF	-	Radio Frequency
TV	-	Television
$\lambda$	-	Wavelength
$\beta$	-	The modulation index



# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Radio frequency or usually known as RF is defined as the rate of oscillation that being measured in Hertz (Hz) between frequency ranges of 30 kHz to 300GHz. Radio Frequency is used to transmit signal and also receive a signal.

Nowadays, children missing happen frequently as their parent not alert and lost sight with their children. These situations usually occur when they are doing outdoor activities or in a public area. This project will presents the alert system on which it capable to avoid the children from lost by limit the safety distance between parent and child. For this project Radio Frequency FM techniques were used in which a small portable device as a medium between parent and children. This consists of a Radio Frequency transmitter and receiver. Both transmitter and receiver are small portable devices which to easier parent and their children bring it everywhere and anywhere.

The analogy that we can create for this project is the transmitter is present with the children while the receiver part is carried out by the parents. RF transmitter with the child will continuously transmit the RF signal to the RF receiver that carried by the parents. If the child walk and leave the parents until reach the distance limit, the RF signal will stop transmit to the receiver. During the RF signal is transmitting, it will emit a sound which functioning to alert parent that their children still in the

range of distance limitation until the sound is stop means that their children is out of range. These children alert system is particularly designed to avoid missing children and alert their parent from lose sight of their children.

## 1.2 Problem statement

As we know it is not easy to handle children especially when we are at public area which full with people and everywhere have interesting things which attract children to go near or get that thing. It is also difficult to parents or guardian consistence and always keeps an eye on their children all the times and eventually still will lose sight of children. This will tend to miss their children either their children still in the area of that place or maybe was being kidnapped. Other than that, parents also usually late realize their children are missing from them. These will take a long time to find back and maybe their children have been far away at the times they realize it. Table 1.1, 1.2 and 1.3 below shows the statistic of missing children from 2012 to 2014 (February).

Table 1.1: Statistic children missing in 2012

Age	Total missing	Was found	Still missing
Below 1 years	2	0	2
1-8 years	97	50	47
9-12 years	166	94	72

Table 1.2: Statistic children missing in 2013

Age	Total missing	Was found	Still missing
Below 1 years	8	2	6
1-8 years	93	39	54
9-12 years	139	81	58

Table 1.3: Statistic children missing in 2014 (JAN-FEB)

Age	Total missing	Was found	Still missing
Below 1 years	0	0	0
1-8 years	14	4	10
9-12 years	13	6	7

### 1.3 Project Objectives

- To develop children alert system that is in pair of portable devices.
- To ensure parents alert with their children from missing occur in limitation distance.
- To introduce an alert system that makes parents feels safer toward their child safety when they are at public area.

### 1.4 Work scope

In order to make a child alert system, firstly we have to design the system and do some research for the techniques that will be used. These will prevent from over budget as we know that the hardware to make this system will cost an expensive. The project work scope for this project will focus on Radio Frequency (RF) and Frequency Modulation (FM) The transmitter that will be used is an FM transmitter that has 555 timers which act as tone generator. There are three choices for receiver either by using FM receiver circuit, walkie- talkie or application of smartphone which is radio FM frequency to receive signals from FM transmitter. The transmission range is short which among 15m to 20m. The frequency that will be used for FM must be tuned to get the fix frequency. Frequency must be checked to make sure the frequency is not belonging to others station to avoid interference with the same frequency. The simulation will be done to the system by using Proteus

software before jump to fabricate. The result of simulation can be obtained and analyzed before move to last step which perform the system hardware.

## **1.5 Report overview**

Generally, this report of Bachelor Degree Project consists of five chapters. The chapter is including introduction, literature review, methodology, result and discussion and lastly conclusion. In Chapter I, it was overview of the project which more detailed on the background of the project, objective that should be achieve at the end of this project, problem statement that contribute to idea of this project and work scope of the project. Chapter II is literature review which explains about project concept and method that have been used in this project. The research and information was collect from different resources such as article, journal and reference book. For Chapter III, it discuss the methodology that taken throughout the project which to achieve the project objectives. In Chapter IV, all the results that get from simulation, data collection and analysis were discuss in detailed regarding the project. Lastly, Chapter V is the last chapter that conclude the project which including the project finding, analysis achievement and suggestion for future work.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

In this chapter, the method and theory will be described and discussed which related to this project. A few sources such as an articles, journal, newspaper and documentations were used to get knowledge regarding application and research work. The study and some research are very essential in order to get more understanding in Radio Frequency (RF) and Frequency Modulation (FM). Furthermore, the theory understanding is very important which lead to this project and the project would relate into research and available theory.

#### **2.2 Radio Frequency (RF)**

Radio frequency (RF) is defined as a rate of oscillation in the range extending of 3 kHz to 300GHz. RF usually more to electrical than mechanical oscillation. These radio frequencies are corresponding to the frequency of radio waves, and the alternating current which carry radio signals. Radio frequency applications usually used for communication, radar, satellites and so on. Theoretical work of Maxwell and experimental work of Hertz which a German Physicist was contribute to introduction of radio transmission. Nowadays, transmission of radio waves become established technology and currently provide for broadcasting as entertainment and

as well as domestic satellite antenna which the most recent development. (Ushie & Nwankwo, 2013)

In addition, radio frequency also refers to alternating current (AC) which having the characteristics such that an electromagnetic (EM) field is generated if RF current is input to antenna, which it suitable for broadcasting and communications. Electromagnetic field will propagates through space when there is current supplied to antenna.(Rouse, 2008)

Besides that, Radio Frequency (RF) has better transmission than other technique because it allow signal that pass through it transmit in long distance thus it suitable for long range applications. Next, RF transmission also is more strong and reliable than other transmission.

### **2.2.1 RF system work**

Basically, there is pair of transmitter and receiver to accomplish the transmission signal by Radio Frequency (RF). The transmitter will transmit the RF signal while receiver will receive the RF signal. There are many factors that affect during the transmission signal from transmitter to receiver. Selection of antenna one of the components that play important role in transmission signal which it will produces radio waves. Both receiver and transmitter have antenna. Furthermore, the distance between transmitter and receiver also one of the aspects that has to consider in transmit RF signal between transmitters and receiver. There will be some energy that radiated in direction other than the correct way which will make the radio waves loses some of its energy.

## 2.3 Transmitter

Transmitter in term of electronics and telecommunication is referring to devices that have an antenna which produces radio waves. Meanwhile, in radio communication system, to transmit information over a distance by using electromagnetic waves is known as transmitter. There is radio frequency alternating current which applied to antenna and correspond to carry a radio signal where the alternating current is generates by transmitter. The antenna will radiates radio waves when boost by the alternating current. Usually, transmitter is used for communication purpose which it limited to equipment that generates radio waves.(Mohan, 2013). Block diagram of Transmitter is shows in Figure 2.1 below.

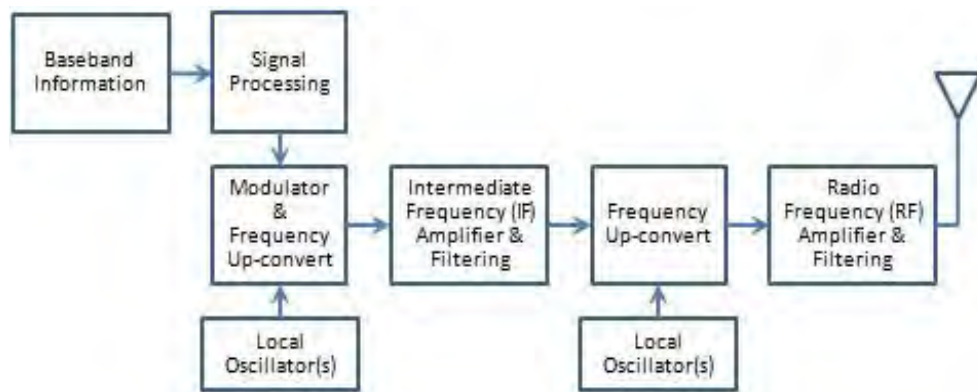


Figure 2.1: Block Diagram of Transmitter(Anon n.d.)

## 2.4 Receiver

There are wide variety applications of RF transmitter such as cellular telephone, satellite radio receiver, television receiver and so on. RF signal from transmitter will transmitted through air, free space and others medium and will be receive by the receiver. Superhetrodyne receiver is one of the common type receivers which will produce an output at a fixed intermediate frequency (IF). The IF signal then will filtered and converted down to baseband for next processing.(Mirkin, 2013) The basic form of receiver is shown in Figure 2.2 below.

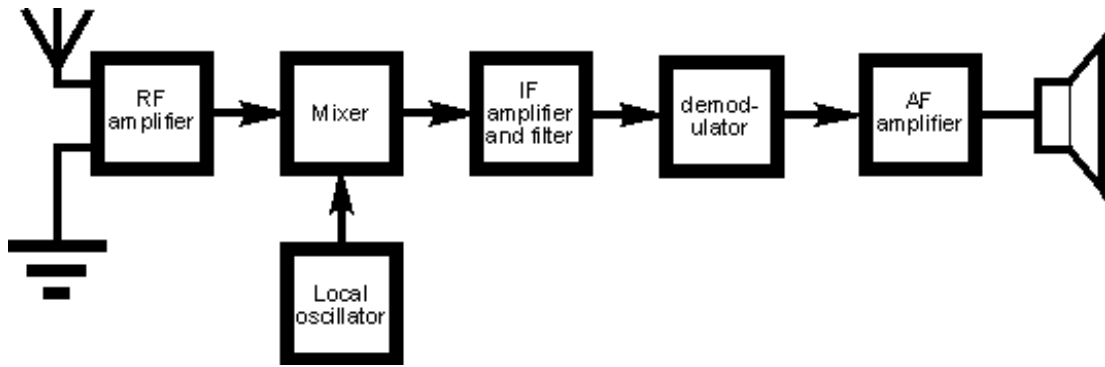


Figure 2.2: Block Diagram of Receiver(Mirkin 2013)

## 2.5 Radio Transmission loss

Refer to (Bullington Kenneth, 1956), radio transmission loss is a ratio of radiated power to received power. The power radiated from a transmitting antenna is ordinarily spread in a wide area. Thus, it makes the power available at most receiving antenna is only small fraction of the radiated power. The transmission loss between the transmitting and receiving antenna will contribute either the received signal will be useful or results in poor quality or poor reliability. This is because, every radio system have their maximum allowable transmission loss. By using inverse square law in optics, radio transmission loss can be estimate which expected in free space where there is free from any objects that will absorb or reflect radio energy. The free space loss is 22dB and increases by 6dB each time the distance is doubled which is for one wavelength separation between isotropic antennas. The power gain of an ideal isotropic antenna that radiates power uniformly in all direction is unity by definition. The free space transmission ratio at a distance,  $d$  is given by: