

# **WIRELESS SMOKE DETECTOR WITH ALARM SYSTEM**

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**This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electronic Engineering (Computer Engineering) With Honours.**

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 SYSTEM**

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To my beloved parents, family, fellow friends and supervisor, thanks for all supports in successfully producing this projects.

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## ABSTRACT

Smoke detectors save hundreds of lives and prevent severe property damage every year. A more efficient warning system, along with a more effective detection system could provide an even safer environment. This project has resulted in the successful implementation of a Wireless Smoke Detector with Alarm System. The alarm incorporates wireless communications, multiple detection methods, constant regulated power, lighting and a remote control. These features are interfaced through the use of a microprocessor. The Wireless Smoke Detector with Alarm System has the potential to detect different fire hazards and then spread the warning through a wireless system, turning on lights and alarms. If the warning turns out to be false, then the remote can be used to turn off the alarms and lights. The wireless network also has the capability of detecting a non-operational alarm. With this in mind and through the use of a constant power source the risk of having a faulty alarm is dramatically reduced. Hence, the Wireless Smoke Detector with Alarm System is a safe and convenient device that is marketable at a reasonable price for a large market. The concept of this product has several possibilities for future extensions and upgrades.

## ABSTRAK

Setiap tahun pengesanan asap menyelamatkan beratus-ratus nyawa dan menghalang kerosak harta yang teruk. Dengan sistem amaran lebih efisien, bersama dengan satu sistem pengesanan yang lebih berkesan, ia dapat menyediakan satu persekitaran yang lebih teratur. Dalam pelaksanaan yang berjaya untuk projek ini, satu sistem yang dipanggil “Wireless Smoke Detector with Alarm System” dicipta. Penggera ini menghubungkan satu komunikasi secara wayarles iaitu kaedah pengesanan berbentuk bilangan, kuasa pengatur yang malar, lampu dan alat kawalan jauh. Ciri-ciri ini menghubungkan melalui penggunaan mikropemproses. ” Wireless Smoke Detector With Alarm System” mempunyai potensi untuk mengesan kebakaran berbahaya yang berbeza dan amaran tersebut disebarkan melalui sistem wayarles, dan terus menghidupkan lampu dan penggera. Jika amaran tersebut adalah palsu, ”Remote Control” boleh mematikan sistem penggeran dan lampu tersebut. Rangkaian wayarles ini juga mempunyai keupayaan mengesan operasi penggera yang tidak berfungsi. Dengan memikirkan penggunaan sumber kuasa malar yang berisiko yang dimiliki pada satu sistem penggera yang rosak dapat dikurangkan secara mendadak. Oleh itu, “Wireless Smoke Detector With Alarm System” adalah satu peranti yang selamat dan mudah untuk dipasarkan dalam pasaran yang besar dengan harga yang berpatutuan. Konsep produk ini mempunyai beberapa kemungkinan boleh ditingkatkan dan diperluaskan pada masa hadapan.



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**LIST OF ABBREVIATION**

AM	-	Amplitude Modulation
BB	-	Base Band
BER	-	Bit Error Rate
DC	-	Direct Current
FM	-	Frequency Modulation
GPS	-	Global Positioning System
IF	-	Intermediate Frequency
LO	-	Low Oscillator
PA	-	Power Amplifier
PCS	-	Personal Communication Services
PIC	-	Programmable Integrated Circuit
PLL	-	Phase-locked Loop
POR	-	Power on Reset
PWRT	-	Power up Timer
RF	-	Radio Frequency

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## **CHAPTER I**

### **INTRODUCTION**

#### **1.1 Project Overview**

Fires destroy lives and property. Often the effects of the fire could have been dramatically reduced if a reliable and effective fire detection and warning system had been present. Hence a smoke alarm that incorporates features such as wireless communications, multiple detection methods, and constant power will increase the effectiveness of the device. To create better usability, lighting and operation via remote will also be included in the design. The combination of a wireless communication system and a standard smoke alarm create significant benefits. The alarms in the area can form a network which can rapidly spread a fire warning or detect a faulty cell. Smoke and heat are the primary causes of injury and damage during a fire. By using two different detection methods, the hazards of a fire are more likely to be discovered. In many households, smoke alarms are without power simply because the battery power supply has not replaced. By powering the device from main power, the risk of having an alarm without power is dramatically reduced.

Fire alarms are widely used and have become a standard household safety device in many countries. There are various different types of fire alarms and each of them has

their own pros and cons. In order for the fire alarms to work efficiently, their placement becomes very important. While this is good, it still left with a potential problem. In a big house or building, when one of the alarm is ringing, it may not be able to give sufficient sound to warn distant people immediately. Consequently, users might not be notified early enough and thus exposing them to danger.

This project will use PIC16F877A and smoke detector to detect smoke and sound a buzzer when smoke detected. Circuit schematic and PIC source code will be provided. Smoke detector is one of the common devices in a house security system. This project will demonstrate how microcontroller will read the smoke detector and react when the smoke detector detect smoke.

The Smoke Detector is a device that sense smoke and beep loudly when it detect smoke. It sends its status via RF transmitter when smoke is detected to RF receiver. The alarm sounds an alarm as soon as smoke is detected, regardless of whether or not the system is armed. It also sends a wireless alarm signal to the security control panel, where alarm monitoring staff can quickly send fire personnel to your address. The alarm signal will be repeated every 10 seconds there after as long as smoke is still present, and a restore report will be sent when the smoke detection chamber clears.

Because each smoke detector is assigned with a unique code at the factory, it is able to use more than one in your home without coding switches. The smoke detectors, which come with mounting screws and anchors, are powered by two 9-volt alkaline batteries (included), which can power the unit for up to two years. If the battery voltage drops below normal, a low-battery report will be displayed on the LED.

## 1.2 Objectives of Project

The main objectives of conducting this project included:

1. To develop both hardware and software tools to improve the safety, efficiency and effectiveness of firefighting.
2. To provide a convenient means by which a person with a hearing impairment can detect smoke in a household.

## 1.3 Problem Statement

To detect smoke and sound a buzzer when smoke detected. These extra steps will help people be better prepared in the event of an actual emergency. To take safeguards in home to prevent fires and eliminate potential risks. Many people who live alone, or who are alone for long periods, choose to have an alarm system so that they can summon assistance should they require it. Personal alarms, also sometimes called anti-mugging devices, can be used by a disabled person to attract the attention of someone who is nearby, example within earshot.

## 1.4 Scope of Project

Smoke detector is a wireless device where it uses a 9V battery to operate and send the signal via RF transmitter and a remote control encoder inside the smoke detector. The interface between PIC16F877A and Smoke detector will involve a RF receiver to receive data from Smoke detector and a remote control decoder PT2272 to decode the received data.

## **CHAPTER II**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

A smoke detector is a device that detects smoke and issues an alarm. Smoke detectors alert people within hearing range; some also interface with a security system or notify emergency services.

A household smoke detector will typically be mounted in a disk-shaped plastic enclosure about 150 millimeters (5.9 in) in diameter and 25 millimeters (0.98 in) thick, but the shape can vary by manufacturer. Most smoke detectors work either by optical detection (photoelectric) or by physical process (ionization), but some of them use both detection methods to increase sensitivity to smoke. Smoke detectors are usually powered by battery and some are connected directly to main power and often have a battery as a backup power supply backup in case the main power fails.

The smoke detector is one of three items of fire safety apparatus which are both recommended for homes and can be self-installed by the consumer. Other are fire extinguisher, and is a fire blanket.

## **2.2 Current Study of Wireless System**

Fire is one of the most common household accidents, and one that results in thousands of death across the world every year. There are many things that can do to avoid a house fire, but the most important is to have a working smoke alarms in home. Good news is that there are many types of smoke alarms that can be chosen. There are a few different types of smoke detector out there that can choose. And there are two comparison options wireless smoke detector and wired smoke detector.

### **2.2.1 Comparison of wireless with wired smoke detection and wireless smoke detector with alarm systems**

1. No wiring and conducting works on radio waves. Lot of concealed wiring is required in case of wired system.
2. Each detector works as a independently unit. So in case of non working of particular detector it does not have any effect on the system. But in case of Wired System Complete zone / system becomes effected due to damaging of wire or failure of connection
3. Can be installed in running office complex or factory.
4. Complete flexibility. Any time there is a requirement for any modernization of the building. Any detector panel can be shifted as per requirements.
5. Very competitive prices of wireless panel. Wired panel with equal nos. of zones cost five times more than the wireless panel.
6. Easy testing while every time it is practically not possible to test the system by generating smoke. A test button is available with each wireless smoke detectors and just pressing the button is sufficient for working of detector, panel and emitter.

## 2.3 Radio Frequency

Radio frequency (RF) is commonly used in communication systems. Radio frequency is a **frequency** or rate of **oscillation** within the range of about 3 **kHz** to 300 **GHz**. This range corresponds to frequency of **alternating current electrical signals** used to produce and detect **radio waves**. Since most of this range is beyond the vibration rate that most mechanical systems can respond to, RF usually refers to oscillations in **electrical circuits** or **electromagnetic radiation**.

### 2.3.1 RF Transmitter

Radio frequency (RF) is widely used in radio frequency communications systems. With the increasing availability of efficient, low cost electronic modules, mobile communication systems are becoming more and more widespread. Wireless communications systems, including cellular phones, paging devices, personal communication services (PCS) systems, and wireless data networks, have become ubiquitous in society.

A mobile terminal apparatus used in the cellular radio communications system receives a radio frequency signal transmitted from a base station, by an antenna, inputs the signal to a receiving radio-frequency unit via an antenna duplexer, high frequency amplifies the signal, removes unnecessary waves outside the receiving band from the signal, converts the signal to an intermediate frequency signal, demodulates the intermediate frequency signal by a demodulator, and converts the signal into a baseband signal.

Generally, a radio transmitter and receiver is used for performing a radio transmission and receiving operation, whereby a high frequency signal outputted from a modulator is transmitted to an antenna of the radio transmitter and is transmitted there from to a remote radio transmitter and receiver, or the thusly transmitted signal is

received through another antenna. The transmitting base band signal is subjected to a predetermined signal process, input to a modulator, which modulates a carrier wave signal. The modulated carrier wave signal is converted into a radio frequency by a transmitting radio-frequency circuit and amplified to a predetermined transmitting power, and transmitted to the base station from the antenna via the duplexer.

Communication systems are known to support wireless and wire lined communications between wireless and/or wire lined communication devices. Such communication systems range from national and/or international cellular telephone systems to the Internet to point-to-point in-home wireless networks. Depending on the type of wireless communication system, a wireless communication device, such as a cellular telephone, two-way radio, personal digital assistant (PDA), personal computer (PC), laptop computer, home entertainment equipment that communicates directly or indirectly with other wireless communication devices.

For direct communications, the participating wireless communication devices tune their receivers and transmitters to the same channel or channels. For indirect wireless communications, each wireless communication device communicates directly with an associated base station and/or an associated access point via an assigned channel. Compact radio frequency (RF) transmitters are widely employed to transmit radiating signals for use in connection with remote signal communication systems.

In cellular systems, a plurality of base stations is distributed across the service area. Each base station services wireless communications within a respective cell. Both base stations and subscriber units include radio frequency transmitters and RF receivers, together they're called "RF transceivers." RF transceivers service the wireless links between the base stations and subscriber units. Transceivers are used in wireless communications to transmit and receive electromagnetic waves in free space. RF receivers generally either convert an input RF signal to an intermediate frequency, or directly mix an input signal to a direct current (DC) signal. The transmitter includes a