



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**HOME SECURITY WITH GAS AND FIRE DETECTOR**

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Industrial Electronics) (Hons.)

by

**SITI FATIMAH BINTI MOHD AMIN**

**B071210223**

**910129-10-5536**

FACULTY OF ENGINEERING TECHNOLOGY  
2015

**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

TAJUK: **HOME SECURITY WITH GAS AND FIRE DETECTOR**

SESI PENGAJIAN: **2015/16 Semester 1**

Saya **SITI FATIMAH BINTI MOHD AMIN**

mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **\*\*Sila tandakan (✓)**

SULIT

(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

TERHAD

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972)

TIDAK TERHAD

Disahkan oleh:

(TANDATANGAN PENULIS)

(TANDATANGAN PENYELIA)

Alamat Tetap:

154 Jalan Parit Omar

Cop Rasmi:

\_\_\_\_\_

Kg. Bukit Kuching

\_\_\_\_\_

45800 Jeram, Selangor

\*\* Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

## FAKULTI TEKNOLOGI KEJURUTERAAN

Tel : +606 234 6623 | Faks : +606 23406526

Rujukan Kami (Our Ref) :

Rujukan Tuan (Your Ref) :

28 JAN 2016

Pustakawan  
Perpustakaan UTeM  
Universiti Teknikal Malaysia Melaka  
Hang Tuah Jaya,  
76100 Durian Tunggal,  
Melaka.

Tuan/Puan,

### **PENKELASAN LAPORAN PSM SEBAGAI SULIT/TERHAD LAPORAN PROJEK SARJANA MUDA TEKNOLOGI KEJURUTERAAN PEMBUATAN (ELEKTRONIK INDUSTRI) : SITI FATIMAH BINTI MOHD AMIN**

Sukacita dimaklumkan bahawa Laporan PSM yang tersebut di atas bertajuk **“Home Security with Gas and Fire Detector”** mohon dikelaskan sebagai \*SULIT / TERHAD untuk tempoh LIMA (5) tahun dari tarikh surat ini.

2. Hal ini adalah kerana IANYA MERUPAKAN PROJEK YANG DITAJA OLEH SYARIKAT LUAR DAN HASIL KAJIANNYA ADALAH SULIT.

Sekian dimaklumkan. Terima kasih.

Yang benar,

\_\_\_\_\_  
Tandatangan dan Cop Penyelia

\* Potong yang tidak berkenaan

**NOTA:** BORANG INI HANYA DIISI JIKA DIKLASIFIKASIKAN SEBAGAI SULIT DAN TERHAD. JIKA LAPORAN DIKELASKAN SEBAGAI TIDAK TERHAD, MAKA BORANG INI TIDAK PERLU DISERTAKAN DALAM LAPORAN PSM.

## DECLARATION

I hereby, declared this report entitled “Home Security with Gas and Fire Detector” is the results of my own research except as cited in references.

**Signature** :.....

**Name** : .....

**Date** : .....

## **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 Technology (Industrial Electronics) (Hons.). The member of the supervisory is as follow:

.....

(Project Supervisor)

## **ABSTRACT**

Nowadays, so many alarm system and security systems are emerging in our markets using high-tech techniques, but in this design use implementing a home automation and security systems using GSM, GSM is one of the latest mobile technology using smart MODEM which can easily interfaced to embedded microcontrollers. Now everything is going to be automated using this technology, using this technology can access the devices remotely. The common problem is always happened in the house are the incident such as Gas Leak, Fire and Intruders. In any, of the above three cases any one met while user are out of their home than the device sends SMS to user's phone. When gas leak it detected by gas sensor, for fire detected by flame sensor and intruders detected by PIR sensor. I produce this project "Smart Home Plan". This project is aimed at developing the security. This project uses three circuits, namely, PIC16F877A, MAX 232 and power supply.

## **ABSTRAK**

Pada masa kini, banyak sistem penggera dan keselamatan sistem yang baru muncul dalam pasaran kita menggunakan teknik berteknologi tinggi, tetapi dalam reka bentuk ini, saya melaksanakan automasi rumah dan sistem keselamatan menggunakan GSM, GSM adalah salah satu teknologi mudah alih terkini dengan menggunakan MODEM pintar yang boleh dengan mudah saling berkait bagi pengawal mikro terbenam. Kini semuanya akan automatik menggunakan teknologi ini, menggunakan teknologi ini kita boleh mengakses peranti dari jauh. Masalah biasa yang selalu berlaku di dalam rumah adalah kejadian seperti gas bocor, kebakaran dan penceroboh. Dalam mana-mana, satu daripada tiga kes di atas mana-mana satu bertemu ketika pengguna berada di luar rumah mereka, daripada peranti menghantar SMS ke telefon pengguna. Apabila gas bocor itu dikesan oleh sensor gas, kebakaran dikesan oleh sensor api dan penceroboh dikesan oleh sensor PIR. Saya menghasilkan projek “Pelan Pintar Rumah”. Projek ini bertujuan untuk membangunkan keselamatan. Projek ini menggunakan tiga litar iaitu PIC16F877A, MAX 232 dan kuasa bekalan.

## **DEDICATIONS**

Firstly, thanked to Allah for let me to finish this proposal. I thanked to my beloved parents and friend for help and give a support and idea to do this project. This dedication also give to my supervisor Mr Tengku Mohd Faisal Bin Tengku Wook for guide from the first draft until presentation first in this subject.



## **ACKNOWLEDGMENTS**

Firstly, we thanked to Allah for let us to finish our final project. We thanked to our parents and friend for help and give a support and idea to us to do this project. This appreciation also we give to our supervisor Mr. Tengku Mohd Faisal Bin Tengku Wook for giving the guidance and support by sharing his expertise and knowledge also some new idea in my project. I am very thankful for his advices and guidance until the successfulness of the project. Lastly, not forget thanked to all those time, concern and supports were given by my parents and friends during the process of completing this report. I am thankful to everyone who always inspires me directly and indirectly during the milestone of completing my final project.

# TABLE OF CONTENTS

DECLARATION .....	v
APPROVAL.....	vi
ABSTRACT.....	vii
ABSTRAK .....	viii
DEDICATIONS.....	ix
ACKNOWLEDGMENTS .....	x
TABLE OF CONTENTS.....	xi
LIST OF FIGURES .....	xiv
LIST OF TABLE .....	xvi
LIST OF SYMBOLS AND ABBREVIATIONS .....	xviii
CHAPTER 1 : INTRODUCTION.....	1
1.0 Introduction to Project.....	1
1.1 Background .....	2
1.2 Problem Statement .....	2
1.3 Objectives.....	3
1.4 Scope .....	4
1.5 Conclusion.....	4
CHAPTER 2 : LITERATURE REVIEW .....	5
2.0 Introduction .....	5
2.1 Related Theory .....	6

2.2	Literature Theory.....	7
2.3	Software Design Info.....	8
2.4	Basic System Interfacing.....	10
2.5	How to Program PIC Microcontroller.....	11
2.6	Data Sheet of the Components .....	13
2.6.1	The MAX232 & MAX232A.....	13
2.6.2	Alternatives .....	16
2.6.2.1	Data Cables .....	16
2.6.3	Comparison Wireless Transmission Media.....	19
2.6.4	LM35 Sensor Datasheet and Circuit Schematic Overview.....	19
2.6.5	Push Technology.....	21
2.6.6	General Use.....	21
2.6.6.1	AT Command Supporting GSM Mobile Phone.....	22
2.6.6.2	AT Command Set .....	24
2.6.7	Smoke Detector .....	24
2.7	Conclusion.....	26
CHAPTER 3 : METHODOLOGY .....		27
3.0	System Operation Flow Diagram .....	27
3.0.1.1	Explanation of the Block Diagram .....	27
3.1	Block Diagram .....	28
3.1.1	Description .....	28
3.2	System Flow Chart.....	30
3.3	Conclusion.....	30

CHAPTER 4 : RESULT & DISCUSSION.....	31
4.0    Software Development .....	31
4.1    Hyper Terminal .....	31
4.1.1.1    Testing GSM Modem with Hyper Terminal.....	33
4.1.1.2    Testing Virtual Basic with Program and GSM Modem .....	31
4.1.1.3    Testing the Basic Program with the Circuit.....	43
4.1.1.3.1    Programming Testing.....	43
4.1.1.4    Testing and Result the Full Programming.....	44
4.2    Result.....	46
4.3    Discussion .....	46
4.4    Conclusion.....	47
CHAPTER 5 : CONCLUSION & FUTURE WORK.....	48
5.0    Conclusion.....	48
5.1    Future Work .....	49
APPENDIX A .....	51
REFERENCES.....	75

## LIST OF FIGURES

Figure 2.1: Differences between the project .....	6
Figure 2.2: Design of the PIC Microcontroller .....	7
Figure 2.3: Flowchart of the Basic Concept for Interfacing between GSM and PIC .....	10
Figure 2.4: How to detect PIC.....	11
Figure 2.5: How to Select Baseline Flash Device.....	11
Figure 2.6: How to Import Hex File.....	12
Figure 2.7: Programming Successful Status.....	12
Figure 2.8: Programming Error Status .....	13
Figure 2.9: A MAX232 Integrated Circuit.....	13
Figure 2.10: MAX232(A) DIP Package Pin Layout.....	15
Figure 2.11: Model of GSM 2000.....	17
Figure 2.12: LM35 Sensor .....	20
Figure 2.13: LM35 Sensor Pin Outs and Packaging.....	21
Figure 2.14: Diagram Optical Smoke Detector.....	25
Figure 3.1: System Operation Flow Diagram .....	27
Figure 3.2: System Block Diagram.....	28
Figure 3.3: System Flowchart .....	30
Figure 4.1: ‘AT Command’.....	31
Figure 4.2: Software Testing.....	32
Figure 4.3: Sim Card put inside the GSM Modem .....	33
Figure 4.4: Connect the GSM Modem to the Laptop.....	33
Figure 4.5: Setting the Port of GSM Modem.....	33
Figure 4.6: Setting the Baud Rate of GSM Modem.....	34
Figure 4.7: Hyper Terminal and AT Command.....	34
Figure 4.8: PIC 16F877A.....	36
Figure 4.9: Crystal 20MHz .....	36
Figure 4.10: Capacitor.....	37
Figure 4.11: Max 232.....	37
Figure 4.12: Design of the PIC16F877A Microcontroller Circuit.....	38
Figure 4.13: Design of the MAX232 Interface Circuit.....	38
Figure 4.14: Design of the Power Supply Circuit.....	39
Figure 4.15: Data Transmission .....	41
Figure 4.16: Data Receiver .....	41
Figure 4.17: Flame Sensor Signal.....	42
Figure 4.18: Signal Detect from Sensor.....	42

Figure 4.19: Feedback from Phone .....	43
Figure 4.20: Build Project File .....	43
Figure 4.21: Build Failed because the Error in Command.....	44
Figure 4.22: Build Successful .....	44
Figure 4.23: GSM Modem with Full Hardware Circuit.....	45
Figure 4.24: Data Flow Path in Hardware Testing .....	45
Figure 4.25: Data Flow Path in Software Testing.....	45
Figure 4.26: The Mobile Phone Receive the SMS when GSM Connected .....	46
Figure 4.27: The Mobile Phone Receive SMS when a Motion Detected .....	46
Figure 4.28: The Mobile Phone Receive the SMS when Gas Detected.....	46
Figure 4.29: The Mobile Phone Receive the SMS when Fire Detected .....	46

## LIST OF TABLE

Table 2.1: Differences Between Programmer Language .....	8
Table 2.2: Features of pin MAX232 .....	15
Table 2.3: MAX232(A) External Capacitor .....	16
Table 2.4: Comparison between GSM, Bluetooth and Wi - Fi.....	19
Table 2.5: Description of AT Command.....	24
Table 4.1: AT Command and Explanation .....	35
Table 4.2: SMS Command .....	47
Table 4.3: SMS Feedback .....	47
Table 4.4: Summary of Objectives .....	48

## **LIST OF SYMBOLS AND ABBREVIATIONS**

PIC	=	Programmable Integrated Circuit
GSM	=	Global System for Mobile Communications
SMS	=	Short Message Service
DSM	=	Defect Shape Matching



# CHAPTER 1

## INTRODUCTION

### 1.0 Introduction to Project

“Home Security with Gas and Fire Detector” implements the emerging applications of the GSM technology. Using GSM networks, a control system has been proposed that will act as an embedded system which can monitor and control appliances and other devices locally using built-in input and output peripherals. Remotely the system allows the user to effectively monitor and control the house/office appliances and equipment via the mobile phone set by sending commands in the form of SMS messages and receiving the appliances status.

The main concept behind the project is receiving the sent SMS and processing it further as required to perform several operations. The type of the operation to be performed depends on the nature of the SMS sent. The principle in which the project is based is fairly simple. First, the sent SMS is stored and polled from the receiver mobile station and then the required control signal is generated and sent to the intermediate hardware that have designed according to the command received in form of the sent message. I have selected a particular Nokia mobile set for this project. The messages are sent from the mobile set that contain commands in written form which are then processed accordingly to perform the required task. A microcontroller based system has been proposed for this project.

There are several terminologies that are used extensively throughout this project report GSM (Global System for Mobile Communications): It is a cellular communication standard. SMS (Short Message Service): It is a service available on most digital mobile phones that permit the sending of short messages (also known as text messaging service).

## **1.1 Background**

The new age of technology has redefined communication. Most people nowadays have access to mobile phones and thus the world indeed has become a global village. At any given moment, any particular individual can be contacted with the mobile phone. But the application of mobile phone cannot just be restricted to sending SMS or starting conversations. New innovations and ideas can be generated from it that can further enhance its capabilities. Technologies such as Infra-red, Bluetooth, etc. which has developed in recent years goes to show the very fact that improvements are in fact possible and these improvements have eased our life and the way we live.

Remote management of several home and office appliances is a subject of growing interest and in recent years we have seen many systems providing such controls. These days, apart from supporting voice calls a mobile phone can be used to send text messages as well as multimedia messages (that may contain pictures, graphics, animations, etc.). Sending written text messages is very popular among mobile phone users. Instant messaging, as it is also known, allows quick transmission of short messages that allow an individual to share ideas, opinions and other relevant information. We have used the very concept to design a system that acts a platform to receive messages which in fact are commands sent to control different appliances and devices connected to the platform. We have designed a control system which is based on the GSM technology that effectively allows control from a remote area to the desired location. The application of suggested system is immense in the ever changing technological world. It allows a greater degree of freedom to an individual whether it is controlling the household appliances or office equipment. The need to be physically present in order to control appliances of a certain location is eliminated with the use of the system.

## **1.2 Problem Statement**

Technology has advanced so much in the last decade or two that it has made life more efficient and comfortable. The comfort of being able to take control of devices from one particular location has become imperative as it saves a lot of time

and effort. Therefore there arises a need to do so in a systematic manner which I have tried to implement with this system. The system I have proposed is an extended approach to automating a control system. With the advancement and breakthroughs in technology over the years, the lives of people have become more complicated and thus they have become busier than before. With the adoption of this system, can gain control over certain things that required constant attention. The application of the system comes in handy when people who forget to do simple things such as turn ON or OFF devices at their home or in their office, they can now do so without their presence by the transmission of a simple text message from their mobile phone. This development, I believe, will ultimately save a lot of time especially when people don't have to come back for simple things such as to turn ON/OFF switches at their home or at their office once they set out for their respective work.

The objective of this project is to develop a device that allows for a user to remotely control and monitor multiple home/office appliances using a cellular phone. This system will be a powerful and flexible tool that will offer this service at any time, and from anywhere with the constraints of the technologies being applied. Possible target appliances include (but are not limited to) climate control system, security systems, lights; anything with an electrical interface. The proposed approach for designing this system is to implement a microcontroller-based control module that receives its instructions and command from a cellular phone over the GSM network. The microcontroller then will carry out the issued commands and then communicate the status of a given appliance or device back to the cellular phone.

### **1.3 Objectives**

- To detect the gas and fire.
- To detect intruders.
- To build a system that rely on mobile phone system.

## **1.4 Scope**

Nowadays, this project can be used for main systems at the house. It also can be used in the office, private room and etc. To show this technology to the user so their will get the advantages. Other than that, this project is produce to show the modernization of the country is comparable to other countries.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

Literature review and research is done prior to undertaking the project. This will critically provide as much information as needed on the current technologies available in the market. Besides, a proper methodology is also can be planned in reference to the other research's counter parts performed on the related topics.

This chapter presents background information of the project that have been studied, observed and analysed. For this project, a study on the GSM communication is being done in order to find the suitable way to develop for the purpose of the projects. Besides that, a study on developing the circuit of the microcontroller and gas sensor has been also studied in looking for the best result. On the other hand, a study on the software such as programming is not left behind in order to achieve the purpose of the project.

## 2.1 Related Theory


<b>Smart Home Plan</b>	<b>Inform Gas Leak &amp; Fire Detector</b>
<ul style="list-style-type: none"><li>• To detect the gas and fire.</li><li>• To detect intruders.</li><li>• To build a system that rely on mobile phone system.</li></ul>	<ul style="list-style-type: none"><li>• Report the incident using the SMS service to the keeper laboratory.</li><li>• Increase the security features of the existing laboratory by adding a gas detector circuit.</li><li>• Displaying the temperature of the gas content in the environment using LCD display.</li></ul>
	

Figure 2.1: Differences between the Projects.

## 2.2 Literature Theory

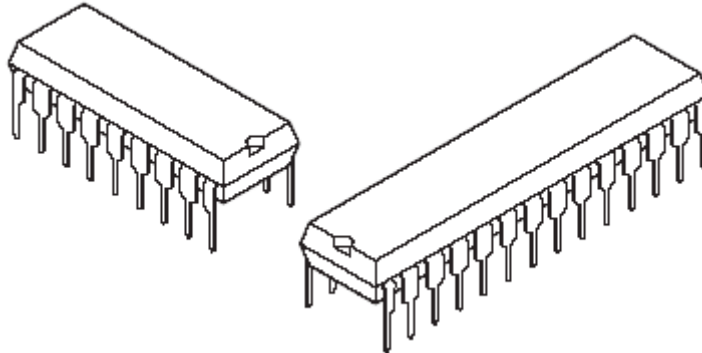


Figure 2.2: Design of the PIC Microcontroller.

A microcontroller is a single integrated circuit (IC) which is small enough but containing all the integrated circuits such as CPU, EPROM program memory, RAM memory and an Input / Output interfaces. All of these functions are included within one single package, making them cost effective and easy to use. PIC Microcontroller is a programmable microcontroller ICs manufactured by MICROCHIP.

### 2.2.1 Programming language:

High Level language:

- C language, C++
- Basic, QBasic

Low Level Language:

- Assembly

Software tools to write program:

- MPLAB IDE (can be download from microchip website)

Burning Software

- PICkit2 software

## 2.3 Software Design Info

- a) MPLAB software – can be download from [www.microchip.com](http://www.microchip.com)
- Use to write microcontroller coding
- b) Programming language
- Assembly
    - Also known as low level language
    - The Instruction code comprise of a short form of words (e.g. move – mov )
  - High Level Language
    - Just like human language
    - Easy to understand by non-technical person

Why use assembly language for this project?

Table 2.1: Differences between Programmer Languages.

<b>Assembly</b>	<b>Others (High Level Language)</b>
Built in assembler in MPLAB software	Proof working compiler – need to buy (too expensive)
MPLAB can be download without any prices	Using freeware compiler – Limited function and need to confirm the functionality
Documentation to refer – Only Datasheet	Limited references and sample code to study
So many references – Note, Sample, Instruction code details, datasheet and etc.	Need to study the compiler documentation.
Reduce development time	Increase development time