

# **HOME EQUIPMENT CONTROL BY USING HOME PHONE SIGNAL**

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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**

**Faculty of Electronic and Computer Engineering  
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**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**  
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

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**Tajuk Projek** : HOME EQUIPMENT CONTROL BY USING HOME PHONE SIGNAL

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Special dedication to my love husband and daughters, my loving parents and siblings, also my kind hearted supervisor Mr. Ahmad Sadhiqin Bin Mohd Isira.

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## ABSTRACT

This project is to control ON and OFF home equipments using Dual Tone Multi Frequency (DTMF) signal. This device will enable the users to control the appliances by using the telephone from anywhere. A part from that, the user can switch on any equipment or appliances in advance before coming home as a safety precaution. This equipment is enabled to trigger the alarm and informs the owner via automatic phone ringing. In order to activate this device, all the user need to do is to call home and insert the password after twelve ringing tones. The user will be allowed to control the home appliances upon correct combination of password key in.

## **ABSTRAK**

Projek ini adalah untuk mengawal buka dan tutup peralatan rumah dengan menggunakan nada ganda multi frekuensi isyarat (DTMF). Alat ini akan membolehkan pengguna untuk mengawal peralatan dengan menggunakan telefon dari mana sahaja. Sehubungan daripada itu, pengguna boleh mengaktifkan peralatan ini sebelum pulang sebagai tindakan pencegahan keselamatan. Alatan ini dapat mengaktifkan penggera dan menginformasikan pemilik secara automatik melalui deringan telefon. Untuk mengaktifkan peranti ini, pengguna hanya perlu menelefon ke rumah dan memasukkan kata kunci selepas dua belas nada deringan. Pengguna akan dibenarkan untuk mengendalikan peralatan rumah dengan memasukkan kombinasi kata kunci yang betul



## CONTENT

<b>CHAPTER</b>	<b>CONTENT</b>	<b>PAGE</b>
	<b>PROJECT TITLE</b>	<b>i</b>
	<b>REPORT STATUS VERIFICATION FORM</b>	<b>ii</b>
	<b>STUDENT’S DECLARATION</b>	<b>iii</b>
	<b>SUPERVISOR’S DECLARATION</b>	<b>iv</b>
	<b>DEDICATION</b>	<b>v</b>
	<b>ACKNOWLEDGEMENT</b>	<b>vi</b>
	<b>ABSTRACT</b>	<b>vii</b>
	<b>ABSTRAK</b>	<b>viii</b>
	<b>CONTENTS</b>	<b>ix</b>
	<b>LIST OF TABLES</b>	<b>xiii</b>
	<b>LIST OF FIGURES</b>	<b>xiv</b>
	<b>LIST OF SYMBOLS AND ABBREVIATIONS</b>	<b>xvi</b>
	<b>LIST OF APPENDICES</b>	<b>xvii</b>
<b>I</b>	<b>INTRODUCTION</b>	
	1.1 Introduction of Project	1
	1.1.1 Overall System	2
	1.2 Objective	4
	1.3 Problem Statement	5
	1.4 Scope	5
	1.6 Methodology	8
	1.6.1 Flow chart of The Method	9

## II LITERATURE VIEW

2.1	Introduction	10
2.2	Dual Tone Multiple Frequency( DTMF)	11
	2.2.1 Introduction of DTMF	11
	2.2.2 Specification	12
	2.2.3 Component Description	13
	2.2.4 Implementation	16
2.3	Microprocessor	17
	2.3.1 Component Description	17
	2.3.2 Implementation	18
2.4	LED Display	19
	2.4.1 Component Description	19
	2.4.2 Implementation	19
2.5	Power Supply	20
	2.5.1 Component Description	20
	2.5.2 Implementation	21
2.6	Relay	22
	2.6.1 Component Description	22
	2.6.2 Implementation	22
2.7	ULN2003	22
	2.7.1 Component Description	22
	2.7.2 Implementation	23
2.8	ATS 138	23
	2.8.1 Component Description	23
	2.8.2 Implementation	23
2.9	H11AA4	24
	2.9.1 Component Description	24
	2.9.2 Implementation	24
2.10	MPLAB	25
	2.10.1 Component Description	25
	2.10.2 Implementation	25

2.11	Comparing other Project with This Project	27
<b>III</b>	<b>CIRCUIT DESIGN</b>	
3.1	Etching Process	30
3.2	Prepare The PCB for Use and Drill The PCB	33
3.3	The Subsystem and The Function	34
3.4	Schematic for The Project	36
3.5	User Interface Specification	39
<b>IV</b>	<b>SOFTWARE DESIGN</b>	
4.1	Flow Chart of Software Design	42
4.2	Programming	47
<b>V</b>	<b>EXPERIMENT AND RESULT</b>	
5.1	Experiment for DTMF Circuit	49
5.2	Result of Experiment for DTMF	50
5.3	Experiment for Microcontroller	51
<b>VI</b>	5.4 Expected Result	53
	5.5 Actual Result	55
	5.5.1 Password Setting	55
	5.5.2 Telephone Interface	55
	5.5.3 Device Status Checking	55
	5.5.4 Device Switching Unit ( Relay Output)	55
	5.6 Software Result	56
<b>VII</b>	<b>DISCUSSION</b>	
6.1	Discussion	58

<b>VII</b>	<b>CONCLUSION AND RECOMMENDATION</b>	
7.1	Conclusion	61
7.2	Recommendation	62
	<b>REFERENCES</b>	64
	<b>APPENDIX A</b>	65
	<b>APPENDIX B</b>	72

**LIST OF TABLE**

<b>NO</b>	<b>TITLE</b>	<b>PAGE</b>
2.2.1	The frequencies associated with various keys on the keypad	12
2.2.3(a)	Functional Decode ( 0 = Logic low, 1 = Logic high)	14
2.2.3(b)	CM8880 pin Table	14
2.5.2	Voltage Requirement of Each Component	21
3.5	Description of The Main Menu	40
5.2	Result	50
5.4	Expected Result	54

## LIST OF FIGURE

<b>NO</b>	<b>TITLE</b>	<b>PAGE</b>
1.1(a)	Collaboration Diagram of Home Phone Signal (HomePS)	2
1.1(b)	Overview this project	4
1.6.1	Flow chart of The Method	9
2.2.3	CM8880-PI Single End Input Connection	16
2.3.1	Pin Diagram of PIC 168F73 Microprocessor	18
2.3.2	Basic Microcontroller Implementation Diagram	19
2.4.1	LED Diagram	19
2.4.2	Block Diagram of LED	20
2.5.1	L7805CV	21
2.6	Relay	22
2.9(a)	Schematic of H11AA4	24
2.9(b)	Standard Thru Hole	24
2.10.2(a)	Design Phase	26
2.10.2(b)	MPLAB Programming	26
3.1(a)	Tape cover of the PCB is Removed	31
3.1(b)	PCB Board is put Under the UV light	31
3.1(c)	PCB in developing process	31
3.1(d)	PCB Circuit before come out from MEGA	32
3.1(e)	PCB Circuit after come out from MEGA	33
3.2	Drilled PCB	34

3.3	Subsystem	35
3.4(a)	Schematic of DTMF Communication Circuit	36
3.4(b)	Schematic of Central Control Unit	36
3.4(c)	The PCB of circuit HomePS	36
3.4(d)	The Layout of circuit HomePS	37
3.4(e)	Central control Unit	39
3.4(g)	Owner Appliance Unit Circuit	39
3.5	User Interface Flow Chart	41
4.1(a)	General Step of Programming	43
4.1(b)	Detail on Step of Programming	44
5.1	Circuit Experiment	49
5.2	DTMF Result	50
5.3(a)	PIC Burner	51
5.3(b)	Test port for PIC controller	53
5.5	The complete connection of the HomePS	55
5.6(a)	Debugging Program	56
5.6(b)	Build Successful	56

## LIST OF SYMBOLS AND ABBREVIATIONS

ADC	-	Analog to Digital Converter
DC	-	Direct Current
CCU	-	Central Control Unit
OAU	-	Owner Appliance Unit
DC	-	DTMF Circuit
HomePS	-	Home Phone Signal
EEPROM	-	Electrical Erasable Programmable Read Only Memory
MOSFET	-	Metal Oxide Semiconductor Field Effect Transistor
RAM	-	Random Access Memory
PIC	-	Programmable Interrupted Controller
DC	-	Direct Current
PCB	-	Printed Circuit Board CG
I/O	-	Input/ Output
CPU	-	Central Processing Unit
LED	-	Light Emitting Diode
PCB	-	Print Circuit Board
f(t)	-	Total Frequency
fa&fb	-	Audio Frequencies



**LIST OF APPENDICES**

<b>NO</b>	<b>TITLE</b>	<b>PAGE</b>
A	CM8880	65
B.	CODING FOR THIS PROJECT	72

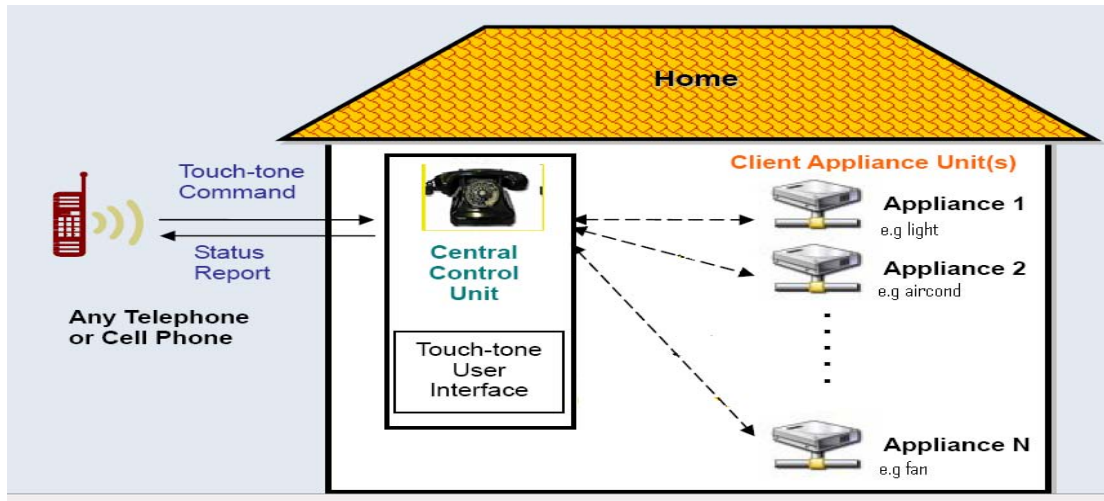
## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction of Project.**

This project is to control ON and OFF home equipments using Dual Tone Multi Frequency (DTMF) signal. This device will enable the users to control the appliances by using the telephone from anywhere. Here, this project using a home phone as a local phone and another phone, either landline or mobile phone as a remote phone. A part from that, the user can switch on any equipment or appliances in advance before coming home as a safety precaution. This equipment is enabled to trigger the alarm and informs the owner via automatic phone ringing. In order to activate this device, all the user need to do is to call home and insert the password after twelve ringing tones. The user will be allowed to control the home appliances upon correct combination of password key in. This application will use a mobile phone user who will be able to monitor and control electronics appliances at home whether they are in 'ON' state or 'OFF' state. This project combines two circuits with a main control system. They are DTMF circuit and controller circuit (central control unit). Here, the DTMF can be configured to send or receive touch tones used in many phone as a communication system. While, the controller react as control the system. The controller will be programmed to execute the

function of this system by using PIC microcontroller. The system collaboration diagram in Figure 1.1(a) and Figure 1.1(b) Overview of this project illustrates how each subsystem in Home Equipment Control Using Home Phone Signal (HomePS) interacts with one another.



**Figure 1.1(a): Collaboration Diagram of Home Phone Signal (HomePS)**

### 1.1.1 Overall System

The HomePS consists of several functional components as outlined in Figure 1.1(a). My design includes one central control unit circuit, DTMF circuit and four client appliance units.

#### i. Central Control Unit(CCU)

The central control unit is plugged into a household phone jack. It receives and processes an incoming touch-tone command sent by a user's phone call. The phone command determines the home facility or appliance to be controlled. The control station will then call the corresponding transponder to operate the device via DTMF communication. In this situation that an abrupt change in appliance status occurs, the central control unit can inform the user by dialing out to a user preset phone number.

**ii. DTMF Unit (DC)**

The function of this circuit is to convert the line telephone to the binary data using IC CM8880. The DTMF communication unit is responsible for calling the designated client appliance unit, which in turn is responsible for actually operating the designated appliances.

**iii. Client Appliance Unit (CAU)**

The Client Appliance Unit is connected to the home facility or appliance that a user would like to control. Once it receives a command from the central control unit via DTMF communication, it performs the assigned operation on the appliance to switch on/off, check status and others. The Client Appliance Unit can also report back to the central control unit the status of the appliance currently connected to it.

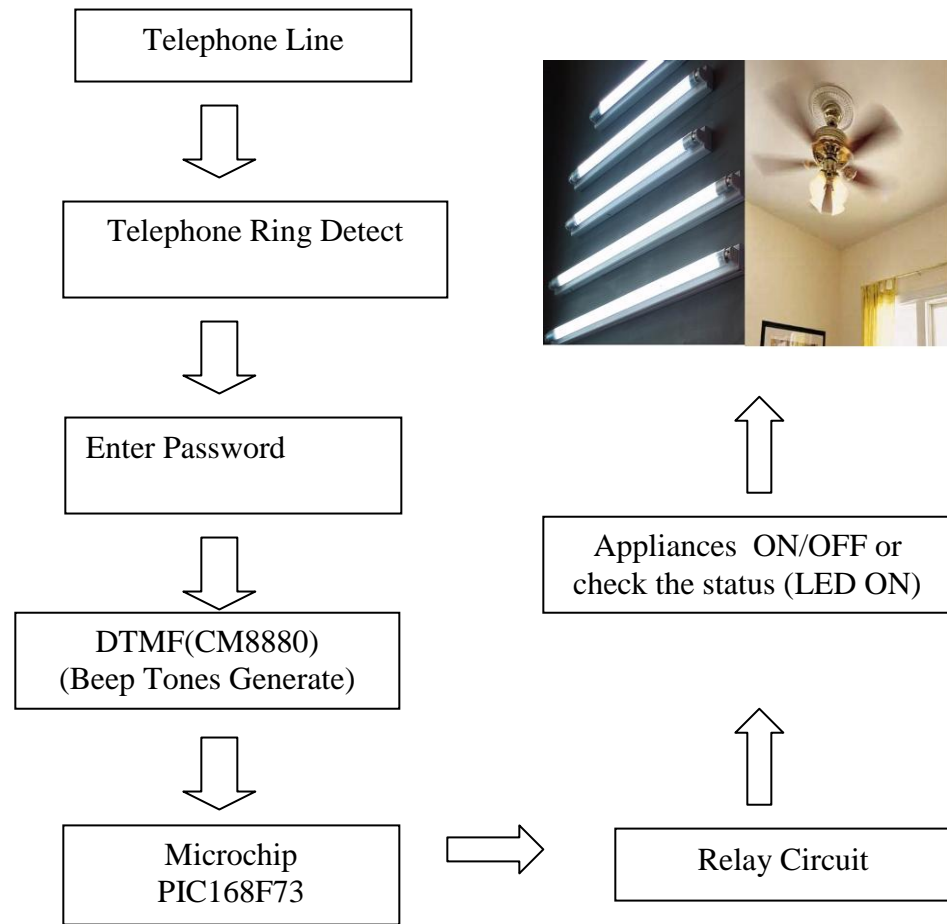


Figure 1.1(b): Overview of this project

## 1.2 Objectives

The project is aimed to achieve this objectives:

- i) To build the main hardware system that can convert the line phone by using DTMF signal to binary signal.
- ii) To design Home Appliance Control System over line phone with any telephone device.
- iii) To understand the architecture and programming of the PIC.
- iv) To learn troubleshooting and analyzing.

### **1.3 Problem Statement**

- i) If someone forgets or not sure whether the home appliances one turn ON or OFF, they can monitor the appliances using the phone.
- ii) This project is to design and develop a system which will help users to makes protective because this device can trigger the alarm and informs the owner via automatic phone ringing.
- iii) This system is suitable for all homes. It is because the system has a simple function and do not use a lot of circuits and less cost. It also saves electricity because this device will enable the users to control the appliances by using the telephone from anywhere.

### **1.4 Scope**

The scopes that are to be concentrating in this project are:

- i) Home appliances control using DTMF signal to be operated using the local phone and mobile phone as the remote phone.
- ii) This system manipulates Dual Tone Multi Frequency (DTMF) and PIC technology.
- iii) Four relays will be used as switching devices.
- iv) The tools that will be used is :
  - ◆ MPLAB IDLE.
  - ◆ Microcontroller board.
  - ◆ Interface board.

## 1.5 Report Structure

This report contains of seven chapters that explain detail about this project. The first chapter is introduction of the project. This chapter contain of project introduction, project objectives, project scope, problem statement and research methodology.

The second chapter is literature discuss the theory of the components and implementation that is used in the project. This chapter also discuss the comparing with others project. So, it is very important to understand the concepts involve and how this system works.

The third and fourth chapter is Project Methodology. This chapter will figure out a few tests that have been conducted. This is to make sure the components and other devices involves are in good condition function. The testing procedures, devices and method used to generate the expected results will include in this chapter. This chapter also contains of the process design program that was describe in the flowchart. A lot of term and variable needs to determine for declaration in program. The term of input and output must be identifying in order to build the program.

The fifth and sixth chapter is about result and discussion were be explain about the any result from this project and discuss about design process, expected/actual result and some new idea. Lastly chapter seventh is conclusion and recommendation. This chapter also contain of suggestion to improve this project for future works. The overall conclusion of this project showed.

## 1.6 Methodology

Firstly, this project starts by searching for literature reviews from books and journals as a readability sources. Then the suitable circuits were identified. The circuits are The Central Control Unit (CCU), DTMF communication (DC) and Owner Appliance Unit (OAU). The CCU will be connected to the household phone line and will receive and process a touch-tone command sent by an owner's phone home. While for DC circuit is to convert the line telephone to the binary data using IC CM8880. The next circuit is OAU which is control the home devices when press some key in the phone.

Secondly, the next activities are circuit design and programming. Circuit will be design by using PROTEL, PROTEUS and MULTISIM software. Beside this, frame work for programming need to draw to help the programmer clearly to start their work.

The next stage would be simulation for the circuit. Labs experiments are the way to verify the overall designed are operation. Beside that, MPLAB software will be used as compiler in programming. MPLAB Integrated Development Environment (IDE) is a free, integrated toolset for the development of embedded applications employing Microchip's PIC<sup>®</sup> and dsPIC<sup>®</sup> microcontrollers. MPLAB IDE runs as a 32-bit application on MS Windows<sup>®</sup>, is easy to use and includes a host of free software components for fast application development and super-charged debugging. MPLAB IDE also serves as a single, unified graphical user interface for additional Microchip and third party software and hardware development tools. Moving between tools is a snap, and upgrading from the free software simulator to hardware debug and programming tools is done in a flash because MPLAB IDE has the same user interface for all tools.<sup>1</sup>

The big part of the project is programming. I need to learn how to implement C programming as a compiler in MPLAB. A part from that, the syntax also needs to identify to make the synchronizations between software and hardware.

---

<sup>1</sup>[http://www.microchip.com/stellent/idcplg?IdcService=SS\\_GET\\_PAGE&nodeId=1406&dDocName=en019469&part=SW007002](http://www.microchip.com/stellent/idcplg?IdcService=SS_GET_PAGE&nodeId=1406&dDocName=en019469&part=SW007002)