SMS CONTROLLER

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This report is submitted in partial fulfillment or requirement for the award of Bachelor of Electronic Engineering (Industrial Electronic) with honors

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DECLARATION

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DEDICATION

Specials dedicated to my loving mom Mrs. Baayah binti Saidin, my father Mr. Ismail bin Ali, my brother Mr. Hardy Ismail, all my siblings, my kind hearted supervisor Prof. Abdul Hamid Hamidon and my dearest friends.

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I have completed my thesis which is a partial fulfillment of requirements for the degree of Bachelor in Electronic Engineering (Industrial Electronic).

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ABSTRAK

This project is to design a circuit that will allow us to remotely control appliances by sending plain text messages such 'pump on', 'BUKA', 'TUTUP', and 'reset' or 'blast horn' through a mobile phone. This project is developed to complete our daily needs where we can switch ON or OFF domestic appliance from a great distance using the convenience of Short Message Service (SMS). People also can receive SMS when appliance in condition ON or OFF. This project involves network mobile phone and channeling it to the relevant appliances through a GSM Mobile Phone. The GSM Mobile Phone is connected via relays to operate the relevant appliance. The appliance must be connected at all time to the power supply in order to function. All these control instructions can be pre-programmed into a controller which forms the heart of the SMS Controller circuit.

ABSTRAK

Projek ini bertujuan untuk merekabentuk sebuah litar yang boleh membenarkan kita untuk mengawal perkakasan di rumah atau di pejabat hanya dengan menggunakan telefon bimbit melalui sistem penghantar ringkas dengan menggunakan kata isyarat seperti 'pump on', 'BUKA', dan 'TUTUP'. Objektif projek ini dibangunkan adalah untuk memenuhi keperluan semasa dimana kita akan dapat menghidupkan atau mematikan peralatan domestic dari jarak jauh dengan hanya menghantar Sistem Penghantar Ringkas (SMS). Projek ini melibatkan pentafsiran isyarat rangkaian talian telefon dan kemudiannya disalurkan kepada perkakasan yang berkaitan melalui *GSM Mobile Phone. GSM Mobile Phone* kemudianya disambung kepada beberapa geganti untuk menjalankan perkakasan yang berkaitan. Perkakasan tersebut pula haruslah disambungkan secara terus kepada bekalan kuasa supaya apabila litar projek ini beroperasi, ia dapat diselaraskan secara automatik. Kesemua arahan kawalan ini boleh di program di litar kawalan yang sama. Projek ini berjaya dibangunkan dengan hanya satu satu sahaja perkakasan boleh dihidupkan. Isyarat keluaran data akan dipaparkan pada skrin telefon bimbit.

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LIST OF ABBREVIATION

IC	Integrated Circuit
PIC	Peripheral Integrated Controller
GSM	Global System for Mobile Communications
SMS	Short Messages System
LED	Light Emitting Diode
ID	Identify
I/O	Input / Output
GND	Ground
TX	Transmit
RX	Receive
V	Voltage
PCB	Printed Circuit Board
AC	Alternating Current
DC	Direct Current
VLR	Visitor Location Register
BSS	Base Switching Station
BTS	Base Transceiver Station
BSC	Base Switching Centre
GPRS	Global Radio Station

CHAPTER 1

PROJECT OVERVIEW

People tend to be careless because they are too busy with their work. When they go to work or go on a vacation, for example, they forget to switch off one of the house lamp. If they have to turn back, just to switch off the lamp, they will waste their time. A solution must be obtained to overcome this problem.

1.1 Introduction of the Project

This project involves the remote control of electrical and electronics appliance via Short Messages Systems (SMS). For this project, a mobile phone is the media for distance control of every home appliances, office, industry and rebooting a server or locating a car in a car park.

Two types of SMS message are used in the system. First is the outgoing message from the system to the home owner mobile and the other is incoming SMS message from the homeowner's mobile to the system. The incoming SMS message is sent to GSM Mobile Phone module via the GMS public network as a text message with maximum message length of 160 characters. SMS messages travel over the mobile networks low speed control channel and it is shown that SMS is a fast and

convenient way of communicating. Figure 1.1 and figure 1.2 below will show how the system will operate.

Figure 1.1 shows how a mobile phone is used to turn ON or OFF appliances.
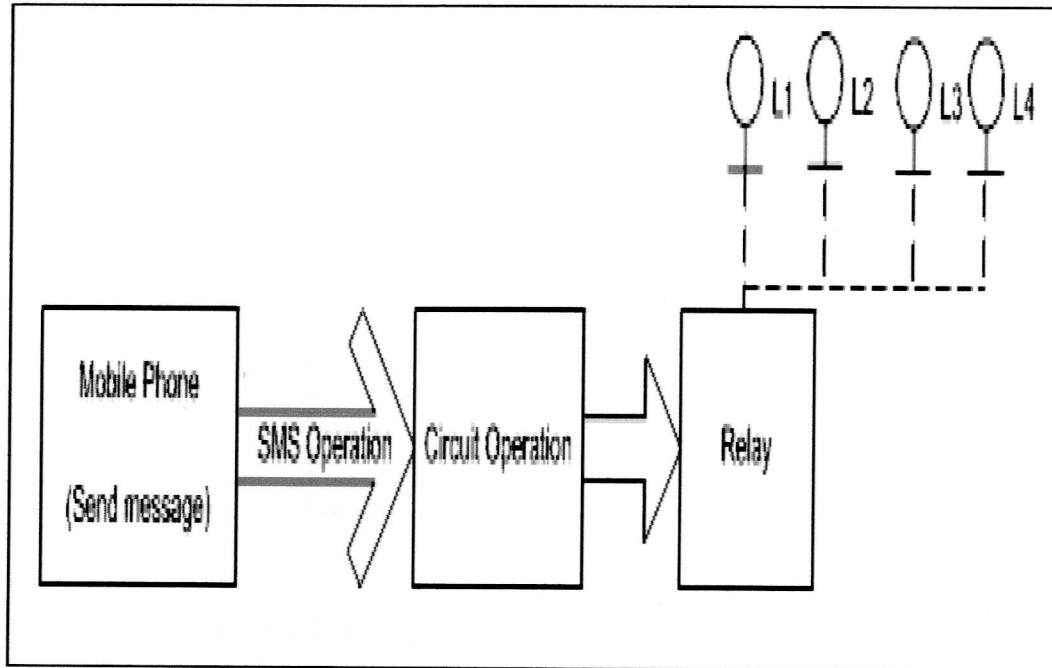
Figure 1.1: Turning on of appliance

The process for turning OFF an appliance is as follows:

Lamp 1, Lamp 2, Lamp 3 and Lamp 4 indicates the appliances

1. Lamp1, lamp 2, lamp 3 and lamp 4 is in condition ON.

2. To switch OFF the lamp, set the user mobile phone.

3. Open the message setting on user mobile phone; enter number 1 to OFF L1, enter number 2 to OFF L2, enter number 3 to OFF L3 and enter number 4 to OFF L4.

4. The SMS operation from user will be sent to mobile phone server and then to the circuit by using GPRS.

5. Finally from the circuit, relay will take action to switch OFF the lamp.

Figure 1.2 shows how mobile phone receive message from appliance.
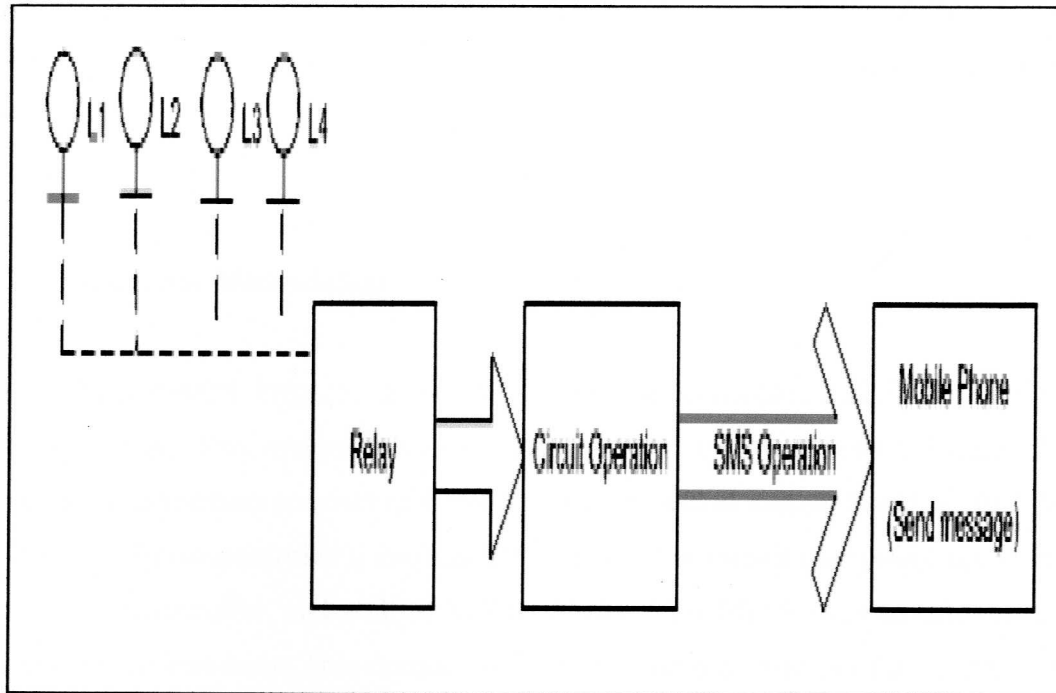
Figure 1.2: Example to receive signal from appliance

The process for receiving message from appliance is as below:

1. Firstly ON the Lamp 1, lamp 2, lamp 3 and lamp 4.

2. Then, from this situation, the relay will take action to connect with circuit.

3. The SMS operation will be sent to user mobile phone by using GPRS to inform user that L1, L2, L3 and L4 in condition ON.

(This example just to inform user either L1, L2, L3 or L4 in condition ON or OFF).

1.2   Scope of Project

The scope of this project is to understand how the SMS system works. Secondly is how to use the SMS system to remotely turn ON and turn OFF appliances. The user can also be informed through the SMS system whether an appliance is ON or OFF. Lastly the project is to search and construct the circuit that will enable the SMS to be used.

1.3   Expected Result

At the end of this project an overall system of the mobile phone will be understood. This allows the SMS to determine a specific path to the goal spot. The SMS Controller is expected to be a medium as a stand alone to monitor and control home appliance.

1.4   Research Methodology

This project employs a mobile phone, PIC (microcontroller) and a GSM Mobile Phone. The system has two parts namely: hardware and software. The hardware architecture consists of a stand alone embedded system based on PIC 16F 873A-1/SP (microcontroller), an-interface and a driver circuit to connect the device to the microcontroller, and a GSM Mobile Phone. This PIC is used to store several mobile phone numbers. This number will be programmed into the PIC and will be dialed the moment the PIC triggered. So it is important to learn how to store a mobile phone number in the PIC. It is also important to know how to trigger the PIC to call the stored mobile phone number when lamp is ON / OFF. To call the mobile phone numbers, this project uses GSM Mobile Phone and also important to know how to connect the circuit with a GSM Mobile Phone.

To achieve the project objective, the following steps are considered important:

1.   Review necessary circuits for the project.

2.   Understand the circuit operation.

3.   Understand the working operation of SMS and GSM Mobile Phone.

4.   Understand how receive and transmit operation is done.

5.   Understand why PIC is used in the project and not other method.

6.   Familiar with PIC programming.

7.   Construct the circuit.

8.   Construct the PIC programmed.

9.   Simulate and test the circuit.

10.   Complete the construction and packaging.

1.5   Report Structure

This thesis consist five chapters. The first chapter will focus on the brief introduction of the project carried. The important overview or description including the problem statement, project objectives and project scopes are well emphasized in this part. It also gives some overview of the project methodology.

The second chapter is development of SMS Controller. This includes, how the system woks by using GSM mobile phone or GSM Module as a controller. For example, in order to receive or transmit a SMS, GSM Mobile Phone will use. Therefore, brief information about GSM Mobile Phone also included in this chapter. It is important to understand the concept and how this system works. This chapter also gives information about the circuit and the main components used. The main component is the PIC (microcontroller).

The third chapter is Research Methodology. This chapter will decide from hardware (theory) and explanation about how the system works. Project methodology can be reuse as a guide line to someone who wants to make improvement to this project. This chapter explains the procedures that have used in order to complete this project. It is including the hardware development.

The fourth chapter is focused on construction and testing on how to build a few programmers. This chapter also include to purpose of the test, expected result and the procedures. This chapter will figure out a few tests that had been conducted in a several times and stages to successful rate of the project. The purpose of test, expected result, procedures, result, discussion, and conclusion for each test will be detailed out in this chapter. All testing and verification result are attached with the aid of figure and table.

The last chapter is a complimentary of the previous four chapters. It describes on the overall project, discussion on the result achieve. Future recommendation is the ideas of upgrade that can be made to this project to make it more reliable in the

future. All matters arise including the problems and unachieved objectives will be described clearly in this part.

CHAPTER II

DEVELOPMENT OF SMS CONTROLLER

2.1 SMS SYSTEM

The Short Message Service (SMS) allows text messages to be sent and received from mobile phone. The text can comprise words or numbers or an alphanumeric combination. SMS was created as part of the GSM Phase 1 standard. The first short message is believed to have been sent in December 1992 from a PC to a mobile phone on the Vodafone GSM network in the UK. Each short message is up to 160 characters in length when Latin alphabets are used and 70 characters in length when non-Latin alphabets such as Arabic and Chinese are used. There is no doubting the success of SMS.

SMS is essentially similar to paging, but SMS messages do not require the mobile phone to be active and within range, as they will be held for a number of days until the phone is active and within range. SMS messages are transmitted within the same cell or to anyone with roaming capability. They can also be sent to digital phones from a website equipped with a PC Link or from one digital phone to another.

The SMS is a store and forward service. In other words, short messages are not sent directly from sender to recipient, but via an SMS Center. Each mobile telephone network that supports SMS has one or more messaging centers to handle and manage the short messages. The SMS features confirmation of message delivery.

Instead the sender of the short message can receive a return message back notifying them whether the short message has been delivered or not. Short messages can be sent and received simultaneously with GSM (Global System for Mobile Communications) voice, data and fax calls.

This SMS supports national and international roaming. This means that when people send short messages to any other GSM mobile user around the world. With the PCS networks based on all the three technologies, GSM, CDMA and TDMA supporting SMS, SMS is more or less a universal mobile data service.

Note: The actual limit of size of SMS is 160 characters if Latin alphabets are used. If non-Latin alphabets like Chinese or Arabic are used, the limit is 70 characters.

2.1.1 How SMS work

Figure 2.1 shows a typical organization of network elements in a GSM network supporting SMS.
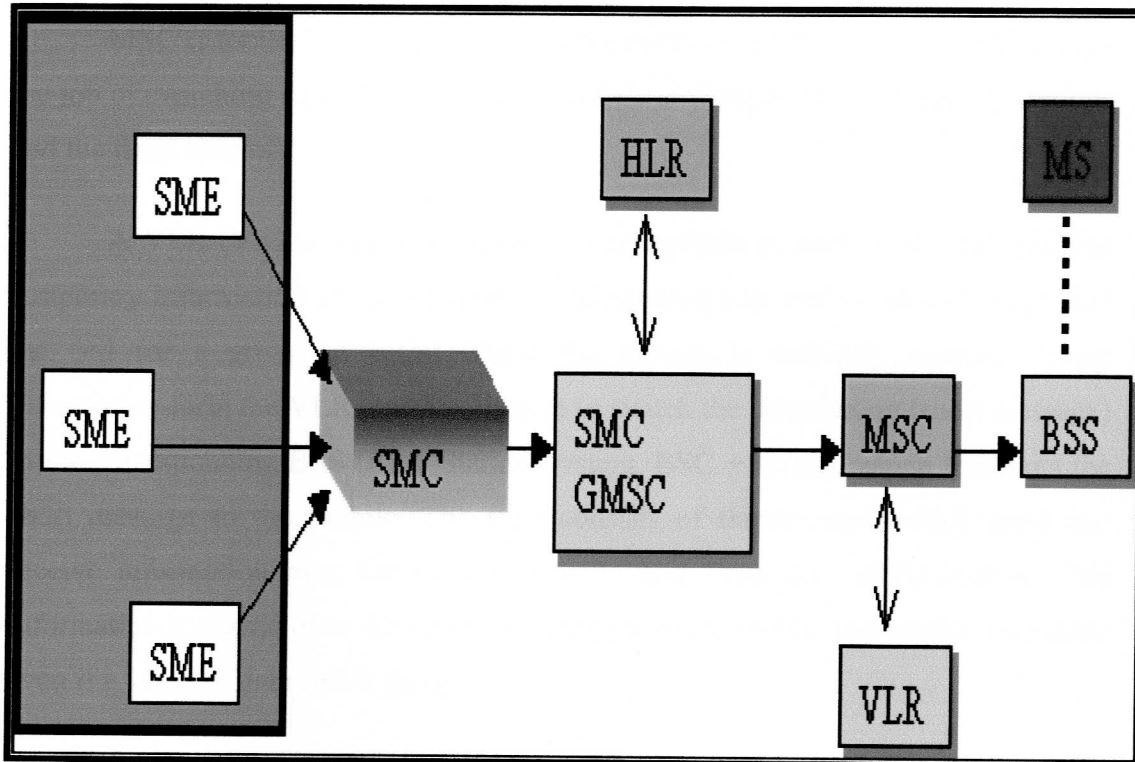

Figure 2.1: Network elements in a GSM

The SMC (Short Message Center) is the entity which does the job of store and forward of messages to and from the mobile station. The SME (Short Message Entity) which can be located in the fixed network or a mobile station receives and sends short messages. The availability of the SMS service over different mobile networks depends on roaming agreements of the networks, as well as on a mechanism to deliver the messages.

The SMS GWMS (SMS gateway MSC) is a gateway MSC that can also receive short messages. The gateway MSC is a mobile network's point of contact with other networks. On receiving the short message from the short message center, GMSC uses the SS7 network to interrogate the current position of the mobile station form the HLR, the home location register.

HLR is the main database in a mobile network. It holds information of the subscription profile of the mobile and also about the routing information for the subscriber, i.e. the area (covered by a MSC) where the mobile is currently situated. The GMSC is thus able to pass on the message to the correct MSC.

MSC (Mobile Switching Center) is the entity in a GSM network which does the job of switching connections between mobile stations or between mobile stations and the fixed network.

A VLR (Visitor Location Register) corresponds to each MSC and contains temporary information about the mobile, information like mobile identification and the cell (or a group of cells) where the mobile is currently situated. Using information form the VLR the MSC is able to switch the information (short message) to the corresponding BSS (Base Station System, BSC + BTSs), which transmits the short message to the mobile. The BSS consists of transceivers, which send and receive information over the air interface, to and from the mobile station. This information is passed over the signaling channels so the mobile can receive messages even if a voice or data call is going on.

Finally SMS, because of its very nature has unique advantages that other non voice services do not have. It provides a very convenient method of exchanging small bits of information between mobile users. The reasons for the enormous popularity of SMS have been the fact that this mechanism of sending and receiving messages not only saves time but costs less as well. In many situations one is relatively much more comfortable sending a message via SMS than talking over phone. With new information services and unique value added services being used by the operators the popularity of SMS is increasing further. SMS is also uniquely positioned as a very attractive advertisement medium. SMS should no longer be treated as a value added service in mobile networks. SMS is not only providing a useful mechanism for a host of innovative services over mobile networks but it acting as a point of entry for new data services like WAP in mobile networks.