DESIGN AND DEVELOPMENT OF REMOTE CONTROL FOR DISTRIBUTION BOARD USING GSM MODEM

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Using GSM Modem

Sesi Pengajian   : | 1 | 3 | / | 1 | 4 |

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DEDICATION

I am dedicated this to my beloved parents, Md Ahir Bin Hashim and Khalijah Binti Othman who always supported me. To my supervisor, lecturers and fellow friends for all their helps and supports.

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Assalamualaikum w.b.t. Very grateful to Allah S.W.T because of Allah's endowment, I can execute this report at the right time. I would like to take this opportunity to express my thankful to all those who have guided and supported me during my Final Year Project.

First of all, I would like to thank Allah S.W.T for this opportunity, and to my parents and siblings for their love and support. Next I would like to thank Mr Haziezol Hemli bin Mohd Yusof as my supervisor and all lectures with respect to their guidance, direction, assistance and support.

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ABSTRAK

Projek ini adalah untuk mereka bentuk dan membangunkan sistem kawalan jauh untuk papan agihan sistem bekalan elektrik di rumah yang dapat dikawal oleh telefon bimbit melalui system pesanan ringkas (SMS). Sistem ini membolehkan pengguna mengawal keadaan pemutus litar kecil (MCB) sama ada untuk mengaktifkannya kembali selepas terputus sambungan akibat daripada lebihan arus elektrik. Untuk mengaktifkan sistem itu, ia memerlukan satu SMS tidak kira dari jarak dekat mahupun jauh. Ini bermakna pengguna boleh menghidupkan secara automatik pemutus litar ini tidak kira di mana mereka berada. Sebagai contoh, apabila sistem dihidupkan, satu mesej "GSM Diaktifkan" akan dihantar melalui GSM ke telefon bimbit pengguna, dan apabila sistem telah tersandung, mesej mudah "MCB1/MCB2 tersandung" akan dihantar kepada pemilik. Oleh itu, pengguna akan berasa lebih yakin, selamat dan selesa dengan sistem ini setiap kali mereka perlu meninggalkan rumah mereka walaupun dalam tempoh yang lama. Sistem ini juga akan dipasang dengan Sistem Global untuk Komunikasi Mudah Alih (GSM) yang akan menghantar mesej amaran kepada pengguna jika berlaku lebihan arus eletrik pada pemutus litar kecil (MCB) yang membolehkan pengguna untuk mengambil apa-apa tindakan selanjutnya.

ABSTRACT

This project is to design and develop a remote control system for distribution board for home use controlled by a mobile phone via short message service (SMS). This system allows the consumer to automatically turn on back the miniature circuit breaker (MCB) after tripped due to the overload current. In order to activate the system, it requires a simple SMS from just a distance away. It means that the consumer can automatically ON this circuit breaker no matter where they are located. For an example, when the system is ON, a simple message "GSM Activated" will be sent by GSM to the consumer mobile phone and when the system has been tripped, simple messages "MCB1/MCB2 Tripped" also will be sent to the consumer mobile phone. Hence, the consumer will be feel more confident, secure and comfortable with this system every time they have to leave their house even for a couple of days. This system is also will be installed with Global System for Mobile Communication (GSM) that will send a warning message to the user if the trip is detected enabling the user to take any further actions.

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LIST OF ABBREVIATIONS

AC = Alternating current

DB = Distribution board

DC = Direct current

GSM = Global system for mobile communications

LED = Light-emitting diode

PIC = Peripheral interface controller

SMS = Short message service

SIM = Subscriber identity module

V = Voltage

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CHAPTER I

INTRODUCTION

This chapter will discuss about the overview process that involved for Design and Development of Remote Control System for Distribution Board using GSM Modem. Moreover, the content in this chapter also introduced about specific objectives, problem statements, scope of work and methodology of this project. At the end of the chapter, the report structure will be listed.

1.1   Project Summary

Distribution board is a box that contains the fuses, circuit breakers, and ground leakage protection units used to distribute electrical power to numerous circuits points. Currently if the distribution board suddenly tripped due to overload current, consumer need to manually turn on back the distribution board switch. However, consumers are not always at home and there are some important electrical appliances that need twenty-four hours electrical power such as the refrigerator, alarm and ventilation system.

Therefore this project is proposed by using GSM Module since the GSM signal covers longer distance and reliable. The development of proposed project consists of designing a voltage regulator circuit, MAX232 circuit and relay circuit. There is a unidirectional communication applied in the transmitting the signal between MAX232 circuit and GSM modem. At the end of the project, a reliable and robust distribution board using GSM module is expect to be developed.

1.2   Problem Statement

Nowadays every home has one distribution box in order to distribute current to all home appliances. But the problem is when trip happened especially due to the overload current, the consumer needs to manually turn on back the switch. It is difficult for consumer if they are away from home. However the consumer can overcome it by using the remote control system for distribution board with wireless switch control using GSM at their home. The circuit breaker switch can be turn on wirelessly after tripped by sending a message to the GSM system.

The system offers more protection and easy to be used by customers. During the tripped due to overload current, they always turn on back the distribution board by using their hand. From that, we can see if there is any leakage current happened, the customer might be hurt because of electric shocked. Hence, by using this system, the overload current will be detected and a message will be sent to the customer's mobile phone. Then the customer will send a coded message to the system to reopen the distribution board. This system can ensure their safety and prevent the distribution board from damaged or burned because of the overflow current. However this system only works on the area that has mobile coverage since it is using GSM module.

1.3 Objectives

The objectives of the project are:

1. To design a remote control system for distribution board by using Programmable Integrated Circuit (PIC) and relay.
2. To develop a wireless monitoring system by using Global System for Mobile Communication (GSM) modem.
3. To analyze the performance of the developed remote control system for distribution board.

1.4 Scope of Work

The scopes of work are:

- Design and development of the remote control system for distribution board for home use with long and reliable distance covered.
- The GSM modem support 900/1800/1900 MHz Tri band.
- Interfacing the microcontroller and GSM modem using MAX232.
- Voltage supply is 240 VAC for the socket outlet, 12 VDC for the relay circuit, 5 VDC for the PIC 16F877 and MAX232 circuit.

1.5 Methodology

Methodology discusses about the processes and methods that were used to complete the project. All the necessary steps have been taking into consideration before starting the project. First of all, it started with a process of searching and gathering all the information that can be used for the project by referring to the articles, journals, websites, datasheets and electronic books. After that, try to understand it before proceed to the other step. The next step is designing the circuits that will be used in the project. When all the circuits had been designed, then the laboratory works will take place. All

the hardware part need to do in the laboratory works which involved in the fabrication of the circuit board. The software part also can be done in the laboratory work by using the suitable software program. For the software program, it takes a lot of work to write the command that will run the project smoothly. The steps of writing the command might be repeated until it works for the project. After the project completely done, it will be tested in order to make sure the system is working as required. Finally, the outputs are discussed and analyzed to check the function and effectiveness of the system.

1.6   Report Structure

This final year report will discusses overall development of the remote control system for distribution board. The report is divided into five chapters which cover all the matters that should be discussed in the developing of this project.

In Chapter one, it is about the introduction to this project. It is also including the project summary, problem statement, objectives to achieve from this project, scope of work, and lastly methodology of the project.

Chapter two will cover the literature review that has been done. It is about the study on the components that had been used, the theory of the project and the case studies of the previous projects. Besides that, the literature review also covered about article, book, or research that related to this project.

Chapter three discusses about the project methodology. It consists of the processes and methods that have been used in order to complete the project. A flow chart is built to show the processes of the project in detail. Then a Gantt chart also provided in this chapter to show the process flow of the project.

Chapter four is about the results and discussions of the project. Besides that, the performance and analysis of the result obtained is also included in this chapter.

Last but not least, chapter five is the final chapter in this final year report. It is about the findings and conclusion of the project. In addition, some recommendations are proposed for the improvement of the future project.

CHAPTER II

LITERATURE REVIEW

This chapter will discuss about all the sources or articles that are related to the project. It consists of the products that have been exposed in the market nowadays. Besides that, this chapter is also will explain about the components and programming language that is used in the development of the project.

2.1   Introduction to Distribution Board

According to Nirman Bhavan in his book titled 'Electrical & Electronics Division', a distribution board refers to an equipment which consists of bus bars, and possible switches, fuse links, and automatic protective equipment, bypass equipment, for connecting, controlling and protecting a number of branch circuits fed from one main circuit of a wiring installation in a building or premises for easy and safe handling of incoming power supply. These are also used to protect the electrical distribution system in turn, connected electrical equipment from being damaged due to various faults like short circuit, over load, earth leakage and so on.

The Conductor system by means of which electrical energy is conveyed from bulk power source or sources to the consumers is known as distribution system, which may be divided into two systems known as high voltage (primary) distribution and low voltage (secondary) distribution. From the generating stations the Electrical Power is usually transmitted to various Sub- stations, through extra high tension transmission lines at voltages from 33 to 220 kV and at these Sub-stations this voltage is stepped down to 11 or 6.6 or 3.3 kV and power at this voltage is conveyed to different sub-stations for distribution and to the bulk supply consumer. Similarly at distribution Sub-stations the voltage is stepped down to 400 volts. From these sub-stations various low voltages distributed and radiated out to feed the consumer. This system of distribution of power is known as low voltage or secondary distribution system [1].

2.2   Voltage Regulator

A voltage regulator is an electrical or electronic device that sustains the voltage of a power source within acceptable limits. According to the National Semiconductor company, LM7805 is used to regulate voltage in the system and output 5 VDC (max output current: 1000 mA) [5]. The voltage regulator is needed to keep voltages within recommended range that can be accepted by the electrical equipment using that voltage. Low voltage, on the contrary, might not provide enough power for the components to function. Voltage regulator ICs are available with fixed voltage (typically 5 V, 12 V and 15 V) or variable output voltages. For ICs within the 78xx family, the xx is replaced with two digits, indicating the output voltage of the regulator. As example the 7805 has a 5 volt output, while the 7812 produces 12 volt output.