UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AUTOMATIC ELCB INTEGRATED WITH MICROCONTROLLER AND GSM SYSTEM

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Power) with Honours.

By

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I hereby, declared this report entitled AUTOMATIC ELCB INTEGRATED WITH MICROCONTROLLER AND GSM SYSTEM is the results of my own research except as cited in references.

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APPROVAL

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ABSTRAK

Perlindungan sistem kuasa adalah sangat penting untuk menjaga keselematan manusia dan pelaratan elektrik di rumah ataupun bangunan. Pemutus litar bocor ke bumi (ELCB) merupakan sejenis alat keselamatan yang digunakan untuk mencegah renjatan pada sistem pendawaian elektrik dengan galangan bumi yang tinggi. Galangan bumi yang tinggi di dalam kebanyakan sistem pendawaian elektik disebabkan oleh keadaan tanah yang tidak lembab atau penggunaan rod bumi pada sistem pembumian 'TT'. Jika berlaku sebarang kebocoran pada sistem pembumian ia boleh mengakibatkan bahaya dan memberi risiko kepada manusia. Oleh itu, 'ELCB' perlulah selalu berada didalam keadaan yang baik untuk menjalankan tugas sebagai pelindung sistem kuasa. Projek ini direka untuk mencegah pengguna dari terkena renjatan elektrik dan untuk memudahkan pengguna untuk menghidupkan semula 'ELCB' apabila berlaku kebocoran arus ke bumi atau litar pintas. Arduino UNO akan digunakan dalam projek ini untuk mengawal ELCB secara automatik dengan memprogramkannya. Apabila litar pintas atau arus lebihan berlaku bekalan 'ELCB' akan terputus dan Arduino akan menghantar isyarat kepada sistem komunikasi bersifat terbuka (GSM) dan 'GSM' berfungsi untuk menghantar sistem pesanan ringkas (SMS) kepada pengguna. Selepas pengguna membalas SMS tersebut Arduino akan memproses dan menghantar arahan kepada motor arus terus untuk menarik semula suis pada ELCB tersebut.

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ABSTRACT

Protection of the power system plays an important role in the safety of electrical appliances and the user at residential or building. Earth leaked circuit breaker (ELCB) is a safety circuit breaker installed on high-earth electrical wiring systems to prevent electrical shock. Most electrical wiring has a high earth impedance due to the use of earth rods in the TT grounding system or dry soil conditions. This such of wiring is dangerous and exposed to risks in case of an electric current flowing due to leakage from live wires to ground wires. So ELCB should always be in good condition to carry out the task of protecting the power system. This project is developing to prevent users from being exposed to electricity and to simplify users to switch on the ELCB when the ELCB tripped due to leakage to ground or short circuit by sending SMS to the GSM. Arduino UNO will be used in this project to automatically control ELCB by programming it. When the short circuit or overcurrent occurred ELCB will trip and Arduino will send a signal to Global System for Mobile (GSM) and GSM will send the SMS to the user. After the user replies the SMS Arduino will process and send instructions to the motor to switch on the ELCB by pulling the trigger. This system provides convenient way for resident especially during nobody at home.

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DEDICATION

To my beloved parents, Mohd Ghazali Bin Din and Faridah Binti Saad.

Also, to my family members.

Appreciation for their supports and understanding.

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LIST OF SYMBOLS

A	-	Ampere
V	-	Volts

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LIST OF ABBREVIATIONS

ELCB	Earth Leakage Circuit Breaker
GSM	Global System for Mobile
RCD	Residual Circuit Breaker

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CHAPTER 1

INTRODUCTION

1.0 Introduction

The purpose of this chapter to explain the objectives, scope, problem statement, project background and expected results regarding this project.

1.1 Background

Nowadays, many accidents occur due to the short circuit in circuit breaker and this accident may cause the fire and can cause harmful people and appliances. Generally, we know that the accident was occurred due to the Earth Leakage Circuit Breaker (ELCB). Basically, the fault will occur at the residential area when they are not at home. Figure 1.0 shows the ELCB burning caused by the short circuit.

Figure 1.1: Burning ELCB caused by a short circuit

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According to this problem, the aim of this project is to design and develop a unit of Automatic Earth Leakage Circuit Breaker integrated with a microcontroller and Global System for Mobile communication (GSM) where the system can auto switch ELCB. The equipment that controls an ELCB is a mechanical switch and the function of this switch is limited which is it cannot distinguish fault accorded. As an example, if there is no resident in the house for a while and the ELCB in the resident is currently trip, some electrical appliances like refrigerator and water pump for aquarium will become malfunction. Thus, it will spoil the fresh vegetable and meat in the fridge meanwhile the fish in the aquarium may die because of lack of oxygen. This may seem unimportant, but if this problem can be solved it can make human life a bit easier. The focus of this project is to design and improving the ELCB to a new ELCB with a microcontroller. The new ELCB function does not limit to the auto switching(Mohd Anuar Bin Mohamed Ayub, 2013).

1.2 Statement of the purpose

The purpose of this project is to develop an Automatic Earth Leakage Circuit Breaker integrated with microcontroller ang GSM technology.

1.3 Problem Statement

Earth Leakage Circuit Breaker (ELCB) is a device used to protect the electrical equipment that had been used in residential, factories and etcetera. The purpose of this ELCB is to cut off the power when any overload current from earth leakage. It also prevents injury to humans and protects appliances from excessive current. The main problem is no user can turn on back the device when the trip is already solved or repaired.

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The device uses the mechanical switch that needs to activate manually. After the ELCB is being tripped it will remain off until the user pushes it back to the ON condition. This fault occurred temporarily in one millisecond. Hence, the ELCB does not work as an automatic device that can operate automatically(Mohd Anuar Bin Mohamed Ayub, 2013). The device eventually requires the human to turn on the switchback manually.

When tripping occurs and there is no one at home, it affects the electrical and electronic appliances that require continuous electrical supply. For example, if the security system can't function properly due to the temporary short circuit, consumers need to pay an extra charge to build a security system to ensure their home safe from any accidents or problems. The security breakdown due to temporary fault or trip of the ELCB.

Another situation is the refrigerator. The refrigerator usually used to store food and make food stay fresh for a longer period. However, without electricity, the refrigerator cannot protect the food from spoiling. For example, if the milk is left out in the refrigerator without electricity for too long it will spoil eventually and cannot be consumed.

To prevent this problem a suitable system should be developed and designed such that it can pull back or reset back the ELCB automatically by implementing an appropriate force. The backup power supply is extremely important in providing the necessary power in the event of normal supply failure in the related building. Under such circumstances, an interference power supply is essential(Mohd Anuar Bin Mohamed Ayub, 2013).

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