



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF AUTOMATIC TRIP MONITORING
SYSTEM IN DISTRIBUTION BOX USING GLOBAL SYSTEM
FOR MOBILE COMMUNICATION (GSM)**

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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FACULTY OF ENGINEERING TECHNOLOGY

2017

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: DEVELOPMENT OF AUTOMATIC TRIP MONITORING SYSTEM IN DISTRIBUTION BOX USING GLOBAL SYSTEM FOR MOBILE COMMUNICATION (GSM)

SESI PENGAJIAN: **2017/18 Semester 2**

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Power) with Honours. The member of the supervisory is as follow:

.....
(Encik Shahrudin Bin Zakaria)

ABSTRAK

Sistem Global untuk Komunikasi Mudah Alih (GSM) adalah teknologi yang paling digunakan dalam sejarah. Sistem ini adalah sistem telefoni mudah alih digital yang digunakan secara meluas di dunia. Dalam projek ini, penggunaan GSM ke arah litar elektrik perjalanan pemutus dalam kotak pengagihan digunakan. Apabila litar pintas yang berlaku kepada suis ELCB yang disebabkan oleh kebocoran elektrik atau kilat, pengguna perlu menghidupkan semula supaya kuasa elektrik boleh terus dibekalkan ke rumah mereka. Oleh itu, aplikasi ini akan membantu untuk menyelesaikan masalah tersebut dengan menggunakan mekanisma dalam kotak pengagihan untuk memantau dan mengawal pemutus litar. Aplikasi ini akan melibatkan sistem GSM dengan telefon bimbit untuk berinteraksi dengan pengawal mikro yang memantau kondisi pemutus litar. Kelebihan aplikasi ini adalah pengguna hanya boleh menaip teks ringkas dalam telefon mudah alih mereka setiap kali mereka menerima mesej memaklumkan keadaan ELCB mereka adalah 'OFF'. Aplikasi ini juga membantu untuk memantau peralatan elektrik di dalam rumah seperti mengelakkan makanan di dalam peti sejuk daripada rosak. Aplikasi ini juga akan membantu pengguna untuk memantau rumah mereka walaupun tidak ada orang di dalam rumah untuk memeriksa keadaan peralatan perkakas rumah mereka.

ABSTRACT

Global System for Mobile Communication (GSM) is the most used technology in history. This system is a digital mobile telephony system that is widely used in the world. In this project, the application of GSM towards electrical circuit breaker trip in the distribution box is used. When a trip occurs to the ELCB switch that was caused by electric leakage or lightning, the user must turn it on so that the electric power can continue supply their house. Therefore, this application will help to solve that by using a simple mechanism in the distribution box to monitor and control the circuit breaker. This application will involve a GSM system with mobile phone to interact with the microcontroller that monitors the condition of the tripping. The advantage of this application is that the user can simply type short text in their mobile phone whenever they receive message informing their ELCB condition was 'OFF'. This application also saves the electrical equipment in house such as prevent the food in refrigerator from being spoiled. The application will help the user to monitor their house although there are no people in the house to check the condition of the electrical equipment.

DEDICATION

To my beloved mother, Jamaliah Binti Dahalan. To my late father Ismail Bin Pandak Zainal, here is a present for both of you after all your love that given to me for me to be a good son. I miss and love you both.

ACKNOWLEDGEMENT

I would like to thank to my supervisor, Encik Shahrudin Bin Zakaria for the guidance, encouragement, and inspiration to me in making this wonderful project. You have given to me all your attention and dedication toward me for completing this work. Not to forget my beloved family, classmates, housemates who always stay and supported with me no matter what happen.

TABLE OF CONTENT

Abstrak	vi
Abstract	vii
Dedication	viii
Acknowledgement	ix
Table of Content	x
List of Tables	xi
List of Figures	xii
List Abbreviations, Symbols and Nomenclatures	xiii
CHAPTER 1: INTRODUCTION	1
1.0 Background	2
1.1 Problem Statement	2
1.2 Objective	3
1.3 Work Scope	3
CHAPTER 2: LITERATURE REVIEW	4
2.0 Introduction	4
2.1 Residential Electrical System	4
2.1.1 Single Phase System	5
2.1.2 Consumer Distribution Box	6
2.1.3 Location Suitable for Distribution Box	7
2.2 Component in Consumer Unit Distribution Box	8
2.2.1 Main Switch	8
2.2.2 Earth Leakage Circuit Breaker	8
2.2.3 Miniature Circuit Breaker	10
2.3 Global System for Mobile Communication (GSM).	11
2.3.1 Short Messaging Service (SMS)	12
2.4 Microcontroller	14
2.4.1 Arduino	16

CHAPTER 3: METHODOLOGY	18
3.0 Introduction	18
3.1 Project Flow Analysis	18
3.1.1 Flow Chart	19
3.2 Software Part	20
3.2.1 Programming Arduino	20
3.2.2 Interfacing GSM Module with Arduino	20
3.2.3 Using GSM Mobile Phone to Relay	22
3.2.4 Using Servo Motor to Pull the ELCB Switch	23
CHAPTER 4: RESULT & DISCUSSION	24
4.0 Introduction	24
4.1 Connecting the Arduino	25
4.2 Setting the Arduino Uno	26
4.3 Upload coding in Arduino	29
4.4 GSM Sim900a	30
4.5 Circuit Operation	31
4.5.1 Circuit Design	32
4.5.2 Arduino Uno as The Microcontroller	32
4.5.3 Arduino IDE Programming	33
4.6 Circuit Breaker Connection	39
4.7 Results	40
4.8 Results Model	41
4.9 Discussion	42
CHAPTER 5: CONCLUSION & RECOMMENDATIONS	43
5.0 Introduction	43
5.1 Conclusion	44
5.2 Future Works	44
REFERENCES	46

LIST OF TABLES

2.2.2 ELCB Specification

9

LIST OF FIGURES

2.1.1	Typical Electricity Supply	5
2.1.2	Consumer Box	6
2.2.2	Electrical Leakage Circuit Breaker (ELCB)	9
2.2.3	Miniature Circuit Breaker (MCB)	10
2.3.1	Mobile Phone	13
2.3.1	Short Message Service (SMS) architecture	14
2.4	Microcontroller Configuration	15
3.1.1	Methodology Flow Chart	19
3.2.2	Sim900a Board Shield	20
3.2.2	Sim900a Interfacing to Arduino Module	21
3.2.3	Relay	22
3.2.3	Relay Connection	23
3.2.4	Connection Servo Motor to Arduino	23
4.1	Side view of Arduino Uno	25
4.1	Arduino Uno powered up by connecting it with laptop	26
4.2	Device Manager Window	26
4.2	Setting the Arduino	27
4.2	Checking the port connection	28
4.3	Upload coding in Arduino	29
4.4	Pin Connection	30
4.4	GSM Sim900a	31
4.5.1	Proteus Simulation	32
4.6	Circuit Breaker Connection	39
4.7	Results	40
4.8	Results Model	41

LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

GSM	-	Global System for Mobile Communication
ELCB	-	Electric Leakage Circuit Breaker
MCB	-	Miniature Circuit Breaker
MCCB	-	Moulded Case Circuit Breaker
SMS	-	Short Message Services
UMTS	-	Universal Mobile Telecommunications Service
RCD	-	Residual Current Device

CHAPTER 1

INTRODUCTION

1.0 Background

The automatic trip monitoring system using GSM is an advanced and creative invention especially for local user. This project of plan and development of electrical protection device will directly give info and status of the circuit breaker module in the distribution box every time tripping occurs. The function of ELCB (Electrical Leakage Circuit Breaker) act as protection device when electrical leakage occurs. The trip usually triggered by lightning, leakage currents, overload and short circuits. But to switch it on again, the procedure is done manually and consume time. So, in order to solve this problem, a GSM (Global System for Mobile communication) is joined with the electrical component in the distribution box to straight control the switching process automatically.

The user can acquire the status and state of the electrical devices in their distribution box using GSM system. On every occasion a tripping occurs, a SMS (Short Message Services) will be send straight to the user to notify them. The system also will inform whether it is safe to switch on the ELCB switch. The user then will choose to switch on the ELCB or not depending on the safety precaution. By using GSM based integrated to this hardware components, the user can control their electrical device at any place as long as the GSM is working.

1.1 Problem Statement

The problem to this plan is that the regular ELCB switch cannot be switch 'ON' automatically. The users will never tell the status of circuit breaker in their household and this has been a most important problem that publics are facing. Folks tend to get busier in their day-to-day life and never know if their ELCB is trip. There are many difficulties that people will get when their power was trip off. For example, the food and beverages inside the fridge will spoiled, fishes in the aquarium will be in risk when the pump was not functioning, CCTV surveillance was interrupted and the possessor cannot monitor their household and the programmed TV program is stopped due to power outage. In order to grip this problem, a new system monitoring device need to be formed.

1.2 Objective

1. To develop an automatic control system for the protection device of circuit breaker in distribution box.
2. To monitor the condition and status of the circuit breaker in distribution box.
3. To use GSM as a medium to receive message and control the circuit breaker.

1.3 Work Scope

The scope of my plan is vast. The combination of GSM towards many electrical devices has become the distinctive and significant to nearly all persons in this world. By applying this system, it can increase the efficiency and save time to many industrial or domestic operator. Beside that this project also can target those people who lives in the country or remote area that can improve their productivity.

- This project used the relay to detect circuit breaker at distribution box
- This project used GSM as a modem to communicate the user to the ELCB.
- This project used microcontroller as part of the process in delivering message to user.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter contains research and material on the project to several important concepts of monitoring a distribution box using Global System for Mobile Communication (GSM). There are several parts that need to be study in developing this project. This chapter will review about the residential electrical system, component in a standard consumer's distribution box, faults, Global System for Mobile Communication (GSM) and Microcontroller.

2.1 Residential Electrical System

An electric force framework is an organize for electrical components that make electrical force starting with any sources about force (such Likewise coal, water, atomic vitality furthermore oil) which then transmitted furthermore dispense the energy with close-by homes Furthermore commercial enterprises. In electrical wiring system, there are divided into two types of system. These are one phase system that normally in residential area and three phase system that for industrial and commercial area. But in this project, a study for single phase system is conducted for reviewing the project.

2.1.1 Single Phase System

Single stage electric force alludes all the of the conveyance about electric framework utilizing an arrangement Previously, which every last one of voltage of the supply varies as one. There are standard frequencies with 50 or 60 Hz.

A single-phase load might a chance to be powered from a three-phase dissemination framework or connection between neutral and phase. (120V or 220V). On higher voltage system (kilovolt), a single-phase transformer is used to supply a low voltage system. Single phase power supply is used especially in country zone, were the cost of equipment of a three-phase distribution network is high. Typically, a third conductor is called a ground use for safety, and ordinarily only carries significant current when there is a current fault.

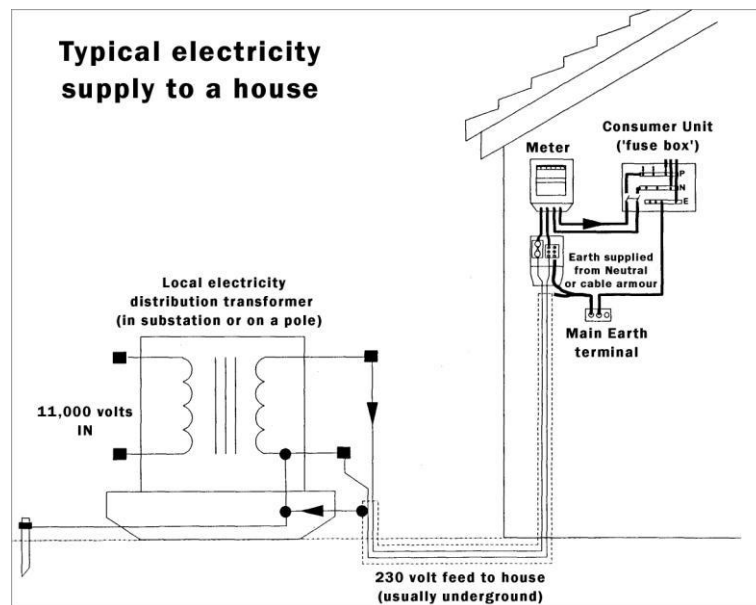


Figure 1: Typical Electricity Supply

In spite of the fact that the single-phase framework need security (earth conductor), yet this framework can't superbly watchman the electrical circuit, electrical mechanical assembly and additionally human an aggregation from the high voltage. So, those circuit board is necessary will make additional security. A single-phase

system is suitable if you do not have high request for electricity (you do not plan air conditioning for the whole house, many water heaters, etc.). If you have high request but still use a single-phase system, then you may agonize from frequent power trips and fuse blown.

2.1.2 Consumer Distribution Box

A conveyance board (otherwise called board, breaker board, or electric board) is a part of a power supply framework that parts an electrical power nourish into auxiliary circuits, while giving a defensive wire or electrical switch for each circuit in a typical walled in area. Ordinarily, a primary switch, and in late sheets, at least one leftover current gadgets (RCD) or remaining current breakers with overcurrent insurance (RCBO), are likewise consolidated.



Figure 2: Consumer Box

The purchaser unit is the "breaker box" which goes between the power meter and all the electrical circuits in the house. Present day units don't contain wires, however smaller than expected mechanical circuit breakers (MCBs) which have supplanted them. They regularly likewise contain an additional defensive gadget called a leftover current gadget RCD, which replaces the isolator switch. Present day buyer units can

likewise contain different gadgets, for example, time switches and entryway chime transformers. The frequently utilized as a part of buyer unit are plastic write that give no electric field protecting. There is a metal shopper write fenced in area that give more security to the client. The metal kind fenced in area likewise is another direction requiring buyer units and comparative switchgear congregations in local premises to have a non-ignitable walled in area.

2.1.3 Location Suitable for Distribution Box

While picking where to put the buyer unit, thought should be given to how the client unit will be recovered. Client unit settings are well known for being in the most extreme ungainly of spots. It is imperative that it is anything but difficult to achieve the shopper unit and there is adequate space around the buyer unit to work switches and defensive gadgets, for example, RCDs. It should likewise be effectively open for a circuit tester to get to the customer unit to empower them to complete examinations and support which may require the electrical expert to get to all associations with the purchaser unit. Space is hence fundamental! Unsatisfactory buyer unit areas incorporate walled in areas, compartments or other kept spaces.

Shopper unit switches and defensive gadgets inside a purchaser unit should be effortlessly open to the householder. Access which would require the utilization of a step or comparative achieving stage would not be appropriate. Thought should be given to the necessities of the householder especially in the event that they are debilitated, elderly or decrepit. In these cases, access to switches and defensive gadgets ought to consent to BS 8300 – Design of structures and their ways to deal with address the issues of debilitated individuals.

2.2 Component in Consumer Unit Distribution Box

In a standard and consumer unit type of distribution box there are consist of Main Switch, Circuit Breaker and/or Fuses, Residual Current Devices, Residual current Circuit Breaker with Overcurrent Protection and conductor terminal for phase, neutral and earth.

2.2.1 Main Switch

The main function of the fuse is to burn out if there is sudden increase in current. An increase in current is cause by several different things or situations. A short in the electrical wiring system, defective appliance, and lightning strikes are some examples of things that can trigger an increase in current. High current would cause the wires to heat up and eventually the insulators will burn. This is the cause of fires blamed on faulty electrical wirings. This is why fuses (or circuit breakers) are important. They cut the flow of electricity when there is a tremendous increase in current flowing through the system.

2.2.2 Earth Leakage Circuit Breakers

The ELCB is the Earth Leakage Circuit Breaker which is utilized to isolate the earth spillage. The ELCB takes a shot at the current balance principle. There are two sorts of ELCB's are advertised. They are single stage 2-shaft earth spillage electrical switch and three stage 4-post earth spillage electrical switch. The blame current over-burdens and short-circuits can be recognized by circuit breakers like MCB's MCCB's and Fuses and so on. In any case, Circuit breakers don't distinguish spillage streams, which are unsafe for people and domesticated animals and if not recognized can prompt fire risks. We require a determination that distinguishes such spillages streams and isolates the circuits from the power supply. Here comes the appropriate response as RCCB (Residual Current Circuit Breaker) otherwise called ELCB (Earth Leakage

Circuit Breaker) which gives insurance against immediate and roundabout contact of staff or domesticated animals and against likely flames. The earth spillage is identified by the ELCB, when the electrical switch outings and separate the power supply. [1]



Figure 3: Earth Leakage Circuit Breaker (ELCB)

SPECIFICATIONS

Rated Voltage(V)	Pole No	Rated current (A)	Leakage action current(mA)	Leakage dead current(mA)	Leakage action time(s)
220V	1P	1~10	30	15	<0.1
		15~32			
380V	2,3,4P	40~60	100	50	

Figure 4: ELCB Specification

The Earthing or Grounding is the protection provided to each and every electrical system. Earthing is the most important attention in protecting the electrical system from internal causes and external causes. The internal causes like switching surges, overflow current and voltage, fault current, etc. and the external causes such as lightning. [1]

2.2.3 Miniature Circuit Breaker (MCB)

An electrical switch is a mechanically worked electrical change expected to shield an electrical circuit from harm caused by overabundance current, regularly coming about because of an over-burden or short out. Its essential capacity is to intrude on current stream after a blame is recognized. Not at all like a wire, which works once and after that must be supplanted, an electrical switch can be reset (either physically or consequently) to continue ordinary operation. Circuit breakers are made in shifting sizes, from little gadgets that secure low-current circuits or individual family machine, up to huge switchgear intended to ensure high voltage circuits bolstering a whole city. The nonexclusive capacity of an electrical switch, RCD or a circuit, as programmed methods for expelling power from a defective framework is regularly abridged to ADS (Automatic Disconnection of Supply).

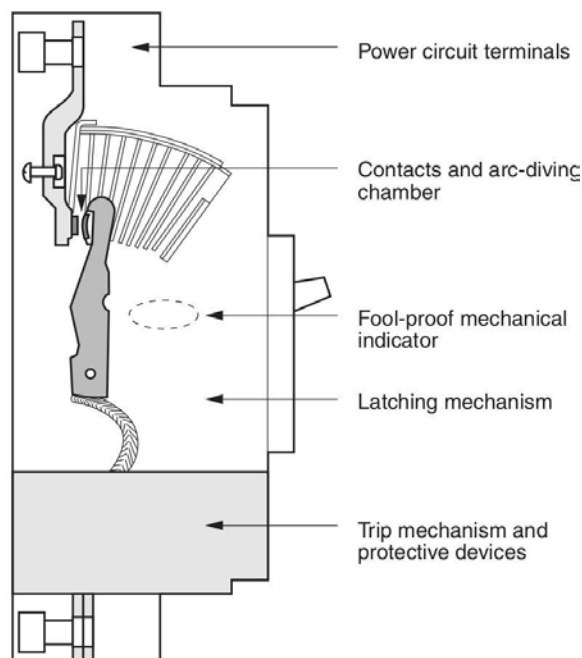


Figure 5: Miniature Circuit Breaker (MCB)

Down shows schematically the key parts of a low voltage circuit breaker and its four essential functions [15]:

- circuit-breaking components, comprising the fixed and moving contacts and the arc-dividing chamber,
- latching mechanism which becomes unlatched by the tripping device on detection of abnormal current conditions, this mechanism is also linked to the operation handle of the breaker,
- trip-mechanism actuating device:
 - either: a thermal-magnetic device, in which a thermally-operated bi-metal strip detects an overload condition, while an electromagnetic striker pin operates at current levels reached in short-circuit conditions, or
 - an electronic relay operated from current transformers, one of which is installed on each phase,
 - space allocated to the several types of terminal currently used for the main power circuit conductors.

2.3 Global System for Mobile Communication (GSM).

The most vital part in the plan of developing the automatic monitoring system is the use of Global System for Mobile Communication system into the hardware module. With the implementation of this technology into the out-of-date switch box, the objective of this project is achieved so that to increase efficiency in day-to-day life. The usage of GSM also has been one of the most significant interest among newer generation that rely on technology.

Since GSM is the world's biggest framework for portable correspondence today and establish the framework for the future UMTS, it is vital to perceive the need to contemplate the techniques and devices for measurable examination of the GSM framework. [8]

With GSM, frameworks for versatile correspondence achieved an all-inclusive scale. In the western world, it appears everybody has their own cell phone, and GSM has