

# Switching Operation of Circuit Breakers Using Password

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## ABSTRACT

Nowadays electrical accidents to the lineman are increasing, due to the lack of communication between electrical substation and maintenance staff. Hence, to avoid this we are implementing password-based circuit breaker where the switches of the circuit breaker is operated using RFID and OTP.

**Keywords.** RFID, OTP

## I. INTRODUCTION

Security is the prime concern in our day-to-day life. Everyone needs to be secure as much as possible. Especially people working in electrical field need to work with a lot of care as a small carelessness may lead to a loss of life. The main reason for such hazard is the lack of communication and coordination between the maintenance staff and electric substation staff. Henceforth it is important to make provision so that no lineman loses his life during the work. In order to overcome the problem a system has to be designed such that the control to turn on or off the line will be maintained by the in charge person only[1].

This project deals with the problem in two ways, OTP method and RFID method. In addition, this idea appears as the most effective and reliable method to provide safety to line man.

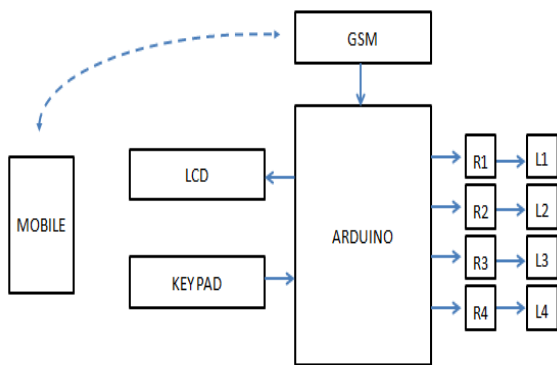
In OTP method the system has an arrangement where password is required to operate the circuit breaker (on/off) [2]. To repair a particular section of the electric supply line, the lineman wants to turn off the supply to that line. For this he first put a

request to the system. Then the system responds to him using the LCD display to enter the password. Then the system generates a password and it will be sent to the phone (the number of whose is stored in the program). The entered password is compared with the password generated. If the password entered is correct, only then the line can be turned ON/OFF. The password-based circuit breaker can also be implemented in automatic door locking system for providing high security. In RFID method, each person will be given with unique tags and these tags have to be scanned to operate the circuit breakers. The system is fully controlled by a Arduino Mega board. The advantage of using Arduino over Microcontroller is that it is more user friendly. Building codes for it is very easy. Codes built in Python, Embedded C, C++ can be used to run on it. The project makes use of Global System for Mobile Communication module, Radio Frequency Identification (RFID) module, 4-driver relay circuit, an LCD display and a matrix keypad. The GSM module is used in order to send the OTP to the respective phone number. RFID module consists of a reader and tags in it. Each tag will have a unique number; these tags will be scanned across the reader. The reader senses the card and verifies the tag

number. A 4-driver relay circuit is used and it is connected to four lamps in this project instead of circuit breakers. LCD is the medium through which the user can interact with the system. A matrix keypad is interfaced to the Arduino to enter the password.

## II. METHODS AND MATERIAL

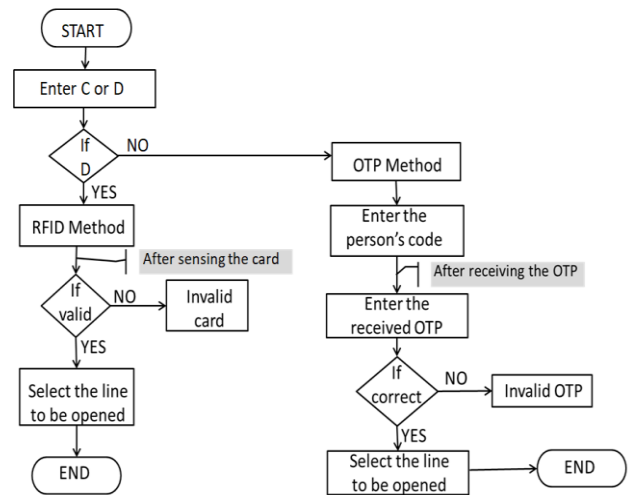
The methodology of this system is very simple. Here, the keypad and LCD are interfaced to take the input from the user and display the command, RFID is used to scan the tags. GSM enables sending of OTP to the person. 4-drive relay is connected at the output followed by four lamps.



**Figure 1.1.** Block diagram of password based circuit breaker.

The operation of this project can be analysed from the following flowchart. Initially the user has to choose either of the methods. ‘C’ is entered for

RFID method and ‘D’ is entered for OTP method. After the scanned tag or the entered OTP is verified to be correct then the person will be allowed to select the line to be operated. And later after the work is finished the person can turn on the line by pressing ‘C’ in the keypad.



**Figure 1.2.** Operational Flowchart

### A. Circuit Breaker

A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. Its basic function is to detect a fault condition and interrupt current flow. Unlike a fuse, which operates once and then must be replaced, a circuit breaker can be reset (either manually or automatically) to resume normal operation.

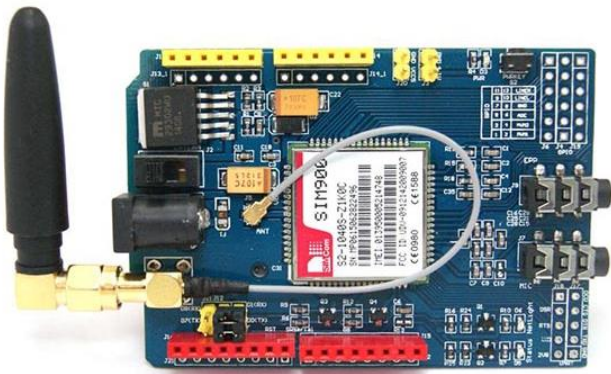
### B. Relay

A relay is usually an electromechanical device that is actuated by an electrical current. The current flowing in one circuit causes the opening or closing of another circuit. Relays are like remote control switches and are used in many applications because of their relative simplicity, long life, and proven high reliability. Relays are used in a wide variety of applications throughout industry, such as in telephone exchanges, digital computers and automation systems. Highly sophisticated relays are utilized to protect electric power systems against trouble and power blackouts as well as to regulate and control the generation and distribution of power.

### C. GSM Module

GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a

variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band.



**Figure 1.3.** Global System for Mobile Communication.

#### D. RFID

RFID stands for Radio Frequency Identification uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source (such as a battery) and may operate hundreds of meters from the RFID reader. Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method for Automatic Identification and Data Capture (AIDC).

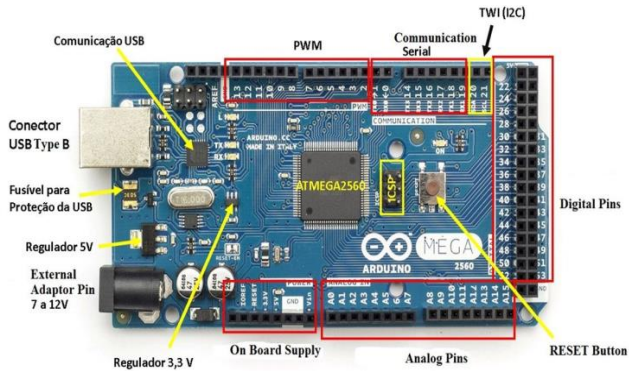
RFID tags are used in many industries, for example, an RFID tag attached to an automobile during production can be used to track its progress through the assembly line; RFID-tagged pharmaceuticals can be tracked through warehouses; and implanting RFID microchips in livestock and pets allows for positive identification of animals.



**Figure 1.4.** Radio Frequency Identification

#### E. Arduino Mega 2560

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to incredible amount of accessible knowledge that can be of great help to novices and experts alike. Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users.



**Figure 1.5.** Architecture of Arduino Mega 2560.

### III. RESULTS AND DISCUSSION

The electric lineman safety system is designed to control a circuit breaker with help of a password and RFID. OTP generation, OTP verification and scanning of the tags are the major tasks involved in this system. RFID is the main attraction of this project. It provides a new approach to the security of the lineman and completely eliminates the accidents to the lineman due to electric shock during the electric line repair. This system can also implement in many other public areas also.

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