



# OTP CIRCUIT BREAKER FOR LINE MAN SAFETY AND MAINTAINANCE

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## Abstract

The electric line man safety system makes use of a new concept of one-time password (OTP). It is found that fatal electrical accidents to the line man are increasing during the electric line repair due to the lack of communication and co-ordination between the maintenance staff and the electric substation staff. Hence to avoid this we are implementing a password based circuit breaker. When the user put a request the system generates passwords and a relay switches to turn ON or OFF the circuit breaker. OTP plays a major role in this system. The one time passwords mean the generated passwords are different at each time. These passwords provide total control to the system to turn on or off the supply to each line. The maintenance staff e.g. line man has the control to turn ON/OFF the line, because the line man has to put a request to the system to its working. If there is a problem in any particular section of the supply line, then staff wants to turn off that line and repair it

**Keywords:** OTP, GSM, Circuit breaker; Password, Wireless communication

## I. INTRODUCTION

Security is the prime concern in our day to day life. Everyone needs to be secure as much as possible. The electric line man safety system is designed to control a circuit breaker by using a password for the safety of electric man. Nowadays, electrical accidents to the line man are increasing, while repairing the electrical lines due to the lack of communication between the electrical substation and maintenance staff. This project gives a solution to this problem to ensure line man safety. In this proposed system the control (ON/OFF) of the electrical lines lies with

line man. This project is arranged in such a way that maintenance staff or line man has to enter the OTP to ON/OFF the electrical line. Now if there is any fault in electrical line then line man will switch off the power supply to the line by entering OTP and comfortably repair the electrical line, and after coming to the substation line man switch on the supply to the particular line by entering the OTP. This system is fully controlled by a Advance microcontroller from the ARM7 family architecture. A keypad is interfaced to the microcontroller to enter the OTP. The entered OTP is compared with the OTP stored in the ROM of the microcontroller. If the OTP entered is correct, then only the line can be turned on/off. The activation/deactivation of the circuit breaker is indicated by a lamp that turns on or off. The password based circuit breaker can also be implemented in automatic door locking system for providing high security. And also can be implemented to control electronic appliances to save the power.

## II. Block Diagram

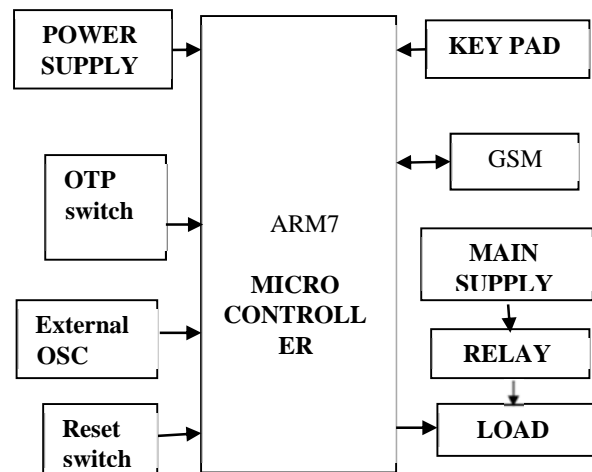


Fig.1 Basic Block Diagram

The basic block diagram of the system is shown in the above figure.2. OTP generation and OTP verification are the major steps that are performed by this system. Depending on the request from the user the system generates OTP and it will send to the user's phone. After enter this password using the keypad, it will have compared with the generated password (which is stored in the ROM). If the passwords are same, the supply to the line will be made off. Similarly using another password, the power to that line will be turned on. If the passwords are not matched up to or more than three times an alarm will be generate.

**A. ARM**

The ARM is a 32-bit reduced instruction set computer (RISC).It was known as the Advanced RISC Machine, and before that as the Acorn RISC Machine. ARM processors made them suitable for low power applications. This has made them dominant in the mobile and embedded electronics market as relatively low cost. The ARM7TDMI (ARM7 +Thumb +Debug+ Multiplier+ICE) processor is a 32-bit RISC CPU designed by ARM. The most widely used ARM7 designs, implement the ARMv4T architecture, but some implement ARMv3.The processor supports both 32-bit and 16-bit instructions via the ARM and Thumb instruction sets.

**B. LCD Display**

For ease of interaction with the user, this system uses an electronic display module. Here a 16x2 LCD is used. This means in 2 lines it is possible to display 16 characters per line. A 5x8 pixel matrix is used for display one character. Two registers are associated with an LCD, such as data and command. These modules are preferred since it is easily programmable. For providing visual assistance to the lineman this module is unavoidable. .

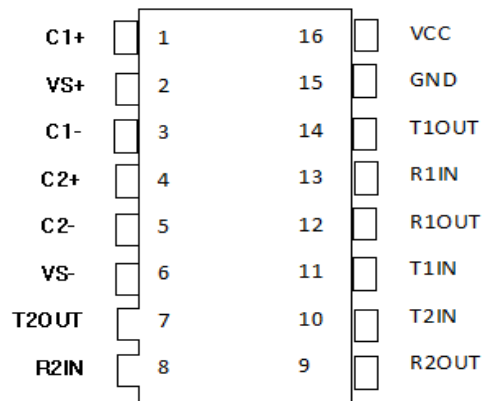
**C. GSM MODEM**

The Global System for Mobile Communication replaced the first generation analog cellular network. Here it is used for sending SMS to the user of the system that is the lineman. It is a dedicated modem device that accepts a SIM card and operates like a mobile phone. When it is used along with the computer, it is possible to communicate over the mobile network. Using

serial communication, the generated passwords are sent to the mobile phone of the user. Through the use of AT – attention commands the GSM modem can be controlled. It consists of an antenna.

**D. MAX 232**

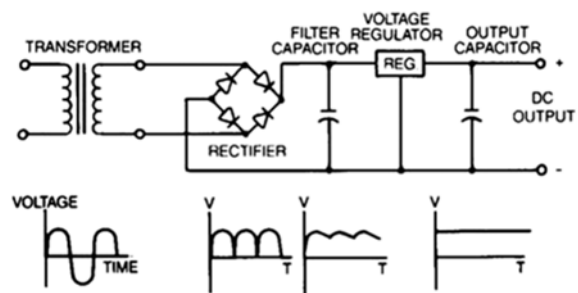
For long distance communication parallel data communication is faster. But for this there may be more channels are necessary. Therefore, the cost of the communication system also increases. So here prefer the UART serial communication. Here the baud rate used for data transmission is 9600. The MAX 232 converts the signals from RS 232 serial port to signals suitable for use in TTL compatible digital logic circuits. It provides a connection between a serial port device to a serial port that uses RS 232 standard.



**Fig.6 MAX 232**

**E. Power Supply Section**

For the working of the system a power supply is needed. The micro controller needs only 5-volt DC for its working. Therefore, the incoming AC will be rectified filtered and regulated by 7805 IC.



**Fig.7 Power supply with waveforms**

### F. Relay

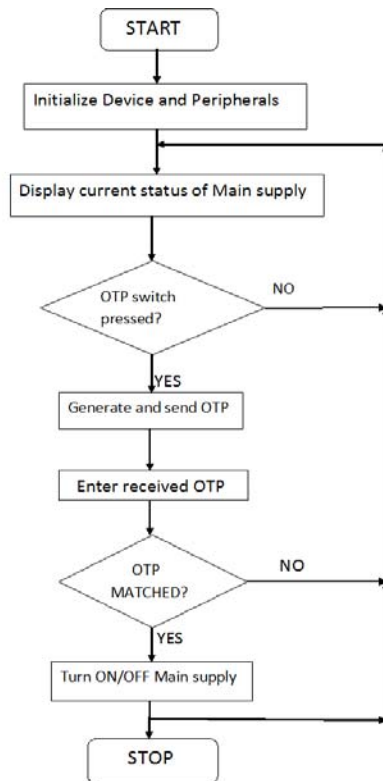
A relay is an electromechanical switch, which perform ON and OFF operations without any human interaction. Here uses a 12V DC SPDT relay. Relay uses an Electromagnet to move swing terminal between two contacts (NO and NC). It is normally open and closes when the OTPS are the same.

### G. Push buttons

Here it is used for entering the password. A push buttons are used for the entering the password. We can use 4\*4 matrix keyboard also for entering the password.

### III. Flowchart

The flowchart drawn below shows the general idea about the execution of OTP based circuit breaker program.



### IV. Working of project

The main objective of this project is to save life of line-man by making such a protective system controlled through OTP. In this proposed system if there is any fault in line. Before inspection of line the lineman need to turn OFF the main supply to avoid the electrical shock during inspection. In order to turn OFF main supply line man need to press OTP switch which generates the new password and sent to register

mobile number of the lineman received OTP need to Enter through keypad in order to turn OFF the main supply. The password due to which main line is switched OFF after that he works on online solution. After the repairing of the electrical line to switch ON the Main supply once again OTP switch is need to press which generates the new password and sent to register mobile number of the lineman. Once again Received OTP need to enter through keypad to switch ON the electrical line i.e. Main power supply.

### V. Result

Normally the supply to the line is always on and it is indicated by using a lamp which is always on. The LCD display provided along with the system gives visual assistance of “LINE MAN SAFETY SYSTEM WITH OTP GENERATION” for easy operation of the system. For that first put a request to the system. The LCD display gives an indication of “SYSTEM READY” if is ready to work. Then put a request by pressing a switch. This gives an indication to the system to turn off the supply to the line. Then the system generates a 4-bit length onetime password. And also gives an indication of “OTP GENERATED”. Then it will be send to phone (the number of which is stored in the program) gives an indication of “OTP SEND” and “ENTER OTP”. After enter it using the keypad, it will be compared with the generated password (which is stored in the ROM). If the passwords are matched, then the LCD displays “OTP MATCHED” and turn off the supply to the line i.e., the lamp will be turned off.

### VI. Conclusion

The electric line man safety system is designed to control a circuit breaker with help of a password only. OTP generation and OTP verification are the major tasks involved in this system. OTP generation 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.

### VII. FUTURE APPLICATIONS

Using wireless communication this system can be operated from other areas besides the substation such as on the transformer. The SCADA is a system used in the

communication channels to help easy troubleshoot to locate the fault location directly and the line man can easily rectify it.

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