

# Operation of Circuit Breaker with the help of Password

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**Abstract**— A circuit breaker is an electrical switch use to protect an electrical circuit from damage caused by faults. Its basic function is to detect a fault condition and protect from it. Fuse operates once after that it must be replaced but a circuit breaker can be reset to resume normal condition. During the manual operation, we see inoperable electrical accidents to the line man are rises during maintenance due to improper communication between the maintenance staff and the substation staff.

In order to prevent such accidents, password based circuit breaker is design so that only authentic person can operate it with a password. There is also a facility of changing the password. The system is fully controlled by the microcontroller. The password is saved in an EEPROM, interfaced to the microcontroller and the password can be changed any time. A keypad is used to submit the password and a relay to operate circuit breaker, which is indicated by a bulb. Any wrong attempt to open the circuit breaker by entering the wrong password an alert will be shown in the LCD.

**Keywords**—Capacitors, Diodes, EEPROM, Microcontroller, Rectifier, Relay, Relay Driver ,Resistors, Transistors, Voltage Regulator.

## I. INTRODUCTION

Fault is defined as abnormal condition that occurs in the system. These abnormal conditions may be due to short circuit, current leakage, ground short, over current and over voltage. Power system protection is the most important part in the industrial and domestic electrical system to prevent undesirable condition. These papers present the control a circuit breaker with the help of a password for the safety of line man. Electrical accidents to maintenance staff are on the rise during line repair due to improper communication between the maintenance staff and substation. This system gives a solution that ensures safety of line man. The control of power supply in the line will be maintained by the line man because this system has an arrangement that a

password is needed to perform the circuit breaker .This system is controlled by a microcontroller. A keypad is interfaced to the microcontroller to submit the password. The operation time password is compared with the previously stored in the microcontroller. If the entered password is correct, then only circuit breaker will operate. The operation of the circuit breaker is indicated by a bulb.

## II. DESCRIPTION

### 2.1 Capacitor

A capacitor is a passive component having of a pair of conductors separated by a dielectric. When a potential difference occurs across the conductors, a electric field develops in the dielectric medium that store energy and produces a mechanical force between the conductors. The capacitance is highest when there is a narrow separation between conductors. A capacitor is a device which store electric charge in the form of:  $Q = CV$ .

### 2.2 Resistor

Resistor is a two terminal electronic component which oppose current by introduce a voltage drop between its terminals in proportion to the current, according to Ohm's law:  $V = IR$

Resistors are used as part of electrical and electronic system. They are extremely common component which place in most electronic equipment.

### 2.3 Transformer

Transformer is a static electrical device that transfers power by mutual induction between its windings (primary and secondary). A varying current in its primary winding produce a varying magnetic flux in the transformer's core and thus a varying magnetic flux through the secondary side winding. This varying magnetic flux induces a varying electromotive force (e.m.f.) or voltage in the secondary winding. Transformers can be used to vary the relative voltage of circuits or isolate them. The transfer of energy from one circuit to another circuit takes place without a change in frequency.

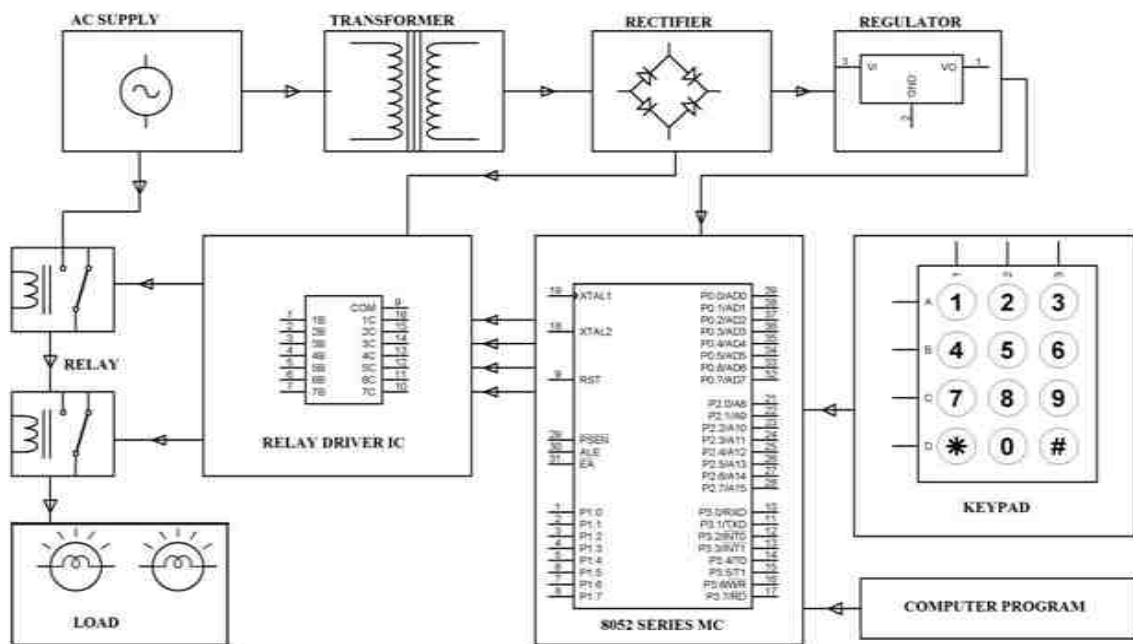


Fig. 1: Block Diagram of Operation of Circuit Breaker with the help of Password

#### 2.4 Voltage Regulator

A voltage regulator produces a fixed output voltage of a preset magnitude that remains constant regardless of changes to its input voltage or load variations. There are two types of voltage regulators: linear and switching.

A linear regulator uses an active (BJT or MOSFET) pass device (series or shunt) controlled by a high gain differential amplifier. It compares with the output voltage with a precise reference voltage and adjusts the pass device to maintain a constant output voltage.

A switching regulator converts the dc input voltage to a switched voltage applied to a power MOSFET or BJT switch. Filtered power switch output voltage is fed back to the circuit that controls the power switch so that the output voltage remains constant regardless of input voltage or load changes. The 78xx (sometimes L78xx, LM78xx, MC78xx) is most common voltage regulator.

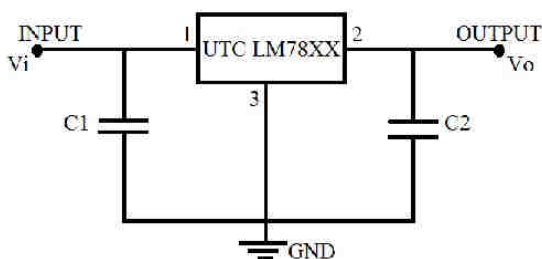


Fig.2: Voltage Regulator

#### 2.5 Diode

A diode is a two terminal electronic component that conduct in only single direction, it has very low resistance to the flow of current in single direction and high (ideally infinite) resistance in the other. Today most diodes are made by silicon but other semiconductors such as selenium or germanium are sometimes used. Diodes are most common component used to convert AC into DC these are used as half wave or full wave rectifier. A bridge rectifier provides full wave rectification by a two-wire AC input, resulting in lower cost and weight as compared to a rectifier with a three-wire input by a transformer with a center tapped secondary winding.

#### 2.6 Relay

Relay is an electrically operated switch or circuit. Relay is used where it is necessary to control a circuit by a small power signal or several circuits must be controlled with one signal. A type of relay that can handle the high power needed to directly control an electric motor or other loads is called a contractor. Solid-state relays control power circuit using static parts, instead using a semiconductor device to perform switching. Relay with operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload faults, in recent electric power systems these functions are control by digital instruments still called "protective relays".

#### 2.7 Micro Controller

A microcontroller is an integrated circuit consisting of a core processor, memory and programmable input/output peripherals. Program memory in the form of Ferro-electric RAM, flash or OTP ROM is also often included on chip, as well as a typically less amount of RAM. Microcontrollers are designed for embedded applications but microprocessors used in personal computers or other general purpose applications.

#### 2.8 Relay Driver IC

A Relay driver IC is an electromagnetic device that will be used whenever we want to use a low voltage circuit to switch a light bulb ON/OFF which is connected to 220V mains power supply. The required current to operate the relay coil is more than can be supplied by other various integrated circuits like Op- Amp, etc. Relays have distinct properties and are replaced with solid state switches that are more effective than solid state devices. High current capacities, ability to stand ESD and drive circuit isolation are the distinct properties of Relays.

### III. PRINCIPLE

The important component in this system is 8051 microcontroller. In this paper keypad is used for entering the password. The password which is submitted is compared with the predefined password. If password is correct then the relative electrical line is either turned ON or OFF. In this paper a different password is provided to each line. Activation and deactivation of the line is indicated by the bulb.

### IV. WORKING AND OPERATION

The system uses standard power supply consisting of a step down transformer from 230V to 12V. Two diodes forming a center tap rectifier that convert ac to pulsating dc which is then filtered by an electrolytic capacitor up to the range of 1000 $\mu$ F. The filtered dc is unregulated so IC LM7805 is used to get 5V constant or regulated DC.

The dc voltage at the input of the regulator changes from about 8V to 15V because of A.C voltage variation in between 160V to 270V the regulator output will remain constant at 5V.

The constant 5V DC is again filtered by a small electrolytic capacitor of 10 $\mu$ F for limit the noise produced in the circuit. One LED is connected of this 5V supply in series with a resistor of 330 $\Omega$  to the negative voltage to indicate 5V power supply availability. The unregulated 12V supply is used for other applications.

For the operation of circuit through a password, program is written in keil compiler and created into a .hex file that is again burnt onto the controller with the help of flash magic.

When connecting the connections, it should be made sure that there is no common connection between AC and DC supplies.

5V power supply circuit is to be used to provide regulated 5V DC to the Microcontroller. Now both the AC and DC supplies are switched on. Relay output pins gets 230V, so they should not be touched. Enter the password with the help of 4\*4 keypad, we can see digit in the LCD. If the password is correct then the circuit breaker changes its states (either on or off). If the password is wrong then it shows "password incorrect" and circuit breaker state not change.

Since this is a user changeable, to change the password type 'xxxx'. It will display 'enter new password'. Here the "xxxx" is the master code. For changing the password, this master code is to be entered. Then after entering the master code, LCD displays, 'new password'. Now any password of will can be entered. After that it displays 'confirm password' i.e., the new entered password is going to be stored and the person can change the status of circuit breaker only by this new password.

### V. RESULT AND DISCUSSION

This circuit provides a solution which can ensure the safety of the maintenance staff or line man. The control to turn ON/OFF the line, lies with only the line man. This system has an arrangement such that a password is needed to operate the circuit breaker. Line man can turn off the supply and comfortably repair it, and return to the substation then turn on the line by entering the correct password. It gives also the provision of changing the password.

### VI. CONCLUSIONS

This proposed system is work on single given known password. This system provides a new approach to secure the life of lineman. In this system also provision for changing the password. No other person can on the circuit breaker once the changed password is given into the system other than the person who had changed it. It gives no scope of password stealing

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