

ELECTRIC LINEMAN PROTECTION USING KEYPAD AND GSM BASED CIRCUIT BREAKER

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ABSTRACT

Now a days we see fatal electrical accidents to the electric line man are increasing during the electric line repair due to the lack of communication and co-ordination between the maintenance staff .In order to avoid such accidents, the breaker can be so designed such that only authorized person can operate it with a password. The system is fully controlled by the 8 bit microcontroller of At mega family. The password is stored in an EEPROM, embedded in the microcontroller and can be entered through a keypad or a GSM module with a registered a mobile only. A relay is used to open or close circuit breaker, which is indicated by a lamp. Any wrong attempt to open the breaker (by entering the wrong password) will not be entertained.

KEYWORDS: circuit breaker, microcontroller, relay, GSM module.

I. INTRODUCTION

During the maintenance of the line in the distribution sector, present practice is to cut off the supply and carry the fuse along with the lineman but due to miscommunication between the lineman and other staff fatal accidents can take place. So to avoid this a keypad and GSM based module is installed on pole mounted substation. The mobile with which are going to send the request is saved on the microcontroller so only the registered mobile can send the request. In case of signal unavailability keypad can be used to enter the password.

III.COMPONENTS

3.1 RESISTORS

A resistor is a two-terminal electronic component designed to oppose an electric current by producing a voltage drop between its terminals in proportion to the current, that is, in accordance with Ohm's law:

$V = IR$. Resistors are used as part of electrical networks and electronic circuits. They are extremely common place in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire.

3.2 CAPACITOR

A capacitor or condenser is a passive electronic component consisting of a pair of conductors separated by a dielectric. When a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the plates. The effect is greatest between wide, flat, parallel, narrowly separated conductors.

3.3 DIODES

Diodes are used to convert AC into DC these are used as half wave rectifier or full wave rectifier. When used in its most common application, for conversion of an alternating current (AC) input into a direct current (DC) output, it is known as a bridge rectifier. A bridge rectifier provides full-wave rectification from a two-wire AC input, resulting in lower cost and weight as compared to a rectifier with a 3-wire input from a transformer with a center-tapped secondary winding

3.4 TRANSISTORS

A transistor is a semiconductor device used to amplify and switch electronic signals and electric power. It is composed of semiconductor material with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current through another pair of terminals. Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits. The transistor is the fundamental building block of modern electronic devices, and is ubiquitous in modern electronic systems.

3.5 VOLTAGE REGULATOR

7805 is a voltage regulator integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7805 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels.

3.6 RECTIFIER

A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), current that flows in only one direction, a process known as rectification.

3.7 MICROCONTROLLER

A microcontroller (sometimes abbreviated μC , uC or MUC) is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications. The ATmega328 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328 achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed.

3.7 EEPROM

EEPROM (also written E^2PROM and pronounced “e-e-prom”, “double-e prom”, “e-squared”, or simply “e-prom”) stands for Electrically Erasable Program able Read Only Memory and is a type of non-volatile memory used in computers and other electronic devices to store small amounts of data that must be saved when power is removed, e.g., calibration tables or device configuration. When larger amounts of static data are to be stored (such as in USB flash drives) a specific type of EEPROM such as flash memory is more economical than traditional EEPROM devices. EEPROMs are organized as arrays of floating-gate transistors.

3.8 TRANSFORMER

A transformer is an electrical device that transfers electrical energy between two or more circuits through electromagnetic induction. Electromagnetic induction produces an electromotive force across a conductor which is exposed to time varying magnetic fields. Commonly, transformers are used to increase or decrease the voltages of alternating current in electric power applications.

A varying current in the transformer's primary winding creates a varying magnetic flux in the transformer core and a varying magnetic field impinging on the transformer's secondary winding. This varying magnetic field at the secondary winding induces a varying electromotive force or voltage due to electromagnetic induction.

3.8 RELAY

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations

3.9 RELAY DRIVER

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

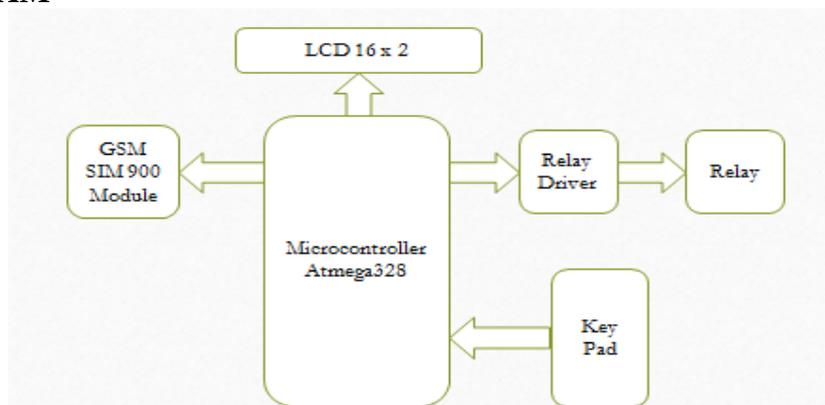
3.10 GSM MODULE

GSM/GPRS module is used to establish communication between a computer and a **GSM-GPRS system**. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc) for computer. It requires a **SIM (Subscriber Identity Module)** card just like mobile phones to activate communication with the network

3.11 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. 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.

IV. BLOCK DIAGRAM



V OPERATION

Connections are given as per the circuit diagram. While giving 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 controller. Now both the AC and DC supplies are switched on. Relay output pins gets 230V, so they should not be touched. In case of keypad mode LCD displays "enter password".

Enter the password with the help of keypad, you can see „*” for each digit. Now if the password is correct then the circuit breaker state changes.

While using the GSM mode password is entered through the mobile which is already registered on the microcontroller, so only respective mobile can send the request. So security is ensured. If the password matches with the stored one then the relay changes its state.

For closing the circuit one password is stored and for opening the circuit another password is available for both the keypad and GSM mode.

VI. RESULT AND DISCUSSIONS

This project can be used to ensure the safety of the maintenance staff e.g. line man. The line can be only turned off/on by the line man. This system provides an arrangement such that a password is required to operate the circuit breaker (ON/OFF). Line man can turn off the supply and comfortably repair it, and then turn on the line by entering the correct password. Since it has the provision of entering the password through registered mobile only authorized person can enter the password. In case of remote areas where signal is unavailable password can be entered through keypad.

VII. CONCLUSION

The implementation of this project gives an idea of security. Thus proposed system can be used to maintain one time password that cannot be stolen. The control over power supply is maintained continually. It can be used with SCADA system to automate the operation and enhance the security.

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