Password Based Circuit Breaker with GSM Module

Yash Pal Gautam
Electronics and Communication Engineering
IEC College of Engineering and Technology, Dr. A.P.J Abdul Kalam University
Yashpal.gautam94@gmail.com

Abstract: This project focuses on the safety of the lineman while working so they do not feel the sudden electric shock. As lineman has to deal with live wires very often, the chances of critical accidents are already very high. However, with the right amount of coordination among lineman and substation, a lot of these accidents can be avoided. The project aimed at providing the solution that ensures the safety of maintenance staff. Here, as soon as the lineman detect the fault in the electric line, an SMS will be sent to the substation staff, who would switch off the line and turn it on when the fault is being resolved, thus reducing the chances of accidents and saves the power as well. The proposed system is fully operated on a microcontroller.

Keywords: Microcontroller, LCD, GSM Module, Relay, Regulator.

1. INTRODUCTION

The project is based on Embedded Systems.In this project, Microcontroller is used which controls all the operations in regarding the password system. For this process, we require the component like microcontroller control circuitry, power supply like keypad. This keypad is used for entering a password for operating different load which is connected to the controller. This project gives a solution to this problem to ensure lineman safety. Its maintenance is a very low due to this it is very useful for the lineman. Nowadays there is a various product which is available in the market but they are very costly and also they are very time-consuming devices. Our device reduces the time which is required for the lineman for repairing. The parts which are required for our model is easily available in the market. The main concept of our project is to reduce the time of the lineman. The main part of our project is the GSM module which is required for sending an SMS.

2. HARDWARE REQUIRED

A. Review of the 8051 Pin Microcontroller

1). MICROCONTROLLER
The AT89C51from ATMEL is designed with static logic for operation down to zero frequency and supports two Software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port and interrupt system to continue functioning. The microcontroller can be described as a small computer which has an ALU, core, programmable peripherals, and ROM. They are a fundamental component of any embedded system designed today.

2). PSEN
Program store enable is absolutely read strobe to external program memory with an AT89C51 microcontroller. When the microcontroller is executing code from external memory, program store enable was activate twice each cycle, except that two program store enable activation are skipped during each access to external data memory.
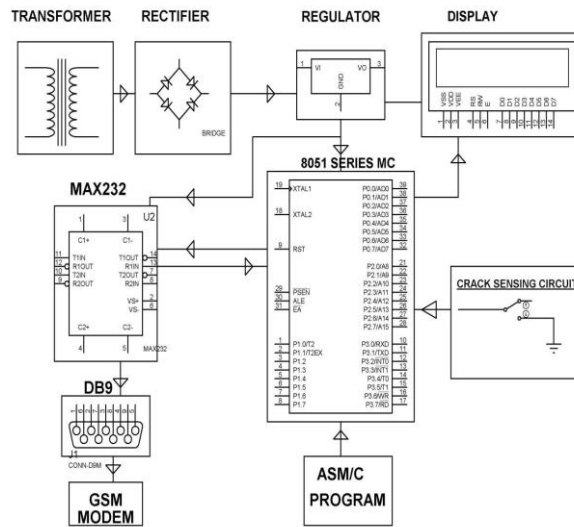
Fig. 1. Block Diagram of Password Based Circuit Breaker with GSM Module

2). EA / VPP
External Access Enable should be strapped to GND in order to enable the device to fetch code from external program memory locations starting at 0000H up to FFFFH. Note, however, that if lock bit 1 is programmed, EA will be internally latched on reset. External Access should be strapped to VCC for internal program executions. The pin also receives the 12-volt programming enable voltage (VPP) during Flash programming, for parts that require 12-volt VPP shown in figure 1.

3). RST
Reset input, a high on this pin for two machine cycles while the oscillator is running resets the device.

4). XTAL1
Input to the inverting oscillator amplifier and input to the internal clock operating the circuit.

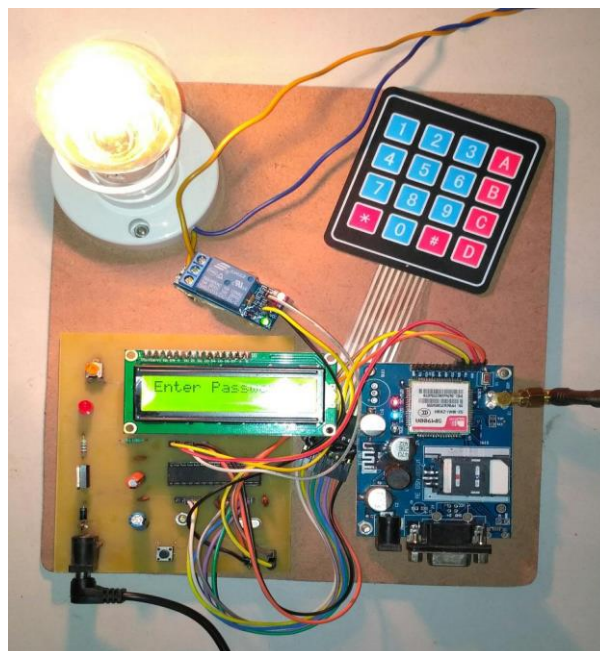*5). XTAL2*
The output from the inverting oscillator amplifier.

Fig. 2. Hardware Implementation

6). ALE / PROG
Address Latch Enable output pulse for latching the low byte of the address during accesses to external memory. These pins are also the program pulse input (PROG) during Flash programming. In normal operation, ALE is emitted at a constant rate 1 / 6 the oscillator frequency and may be used for external timing or clocking purposes. Note, however, that one ALE pulse is skipped during each access to external Data Memory. If desired, ALE operation can be disabled by setting bit 0 of SFR location 8EH.With the bit set,

ALE is active only during an MOVX or MOVC instruction. Otherwise, the pin is weakly pulled high. Setting the address Latch Enable to disable bit has no effect if the Microcontroller is in external execution mode.

B. *Max232*

The MAX 232 converts the signals from RS 232 serial port to signals suitable for use in TTL compatible digital logic circuits. It provides are a connection between serial port devices to a serial port that uses RS 232 a standard. 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.
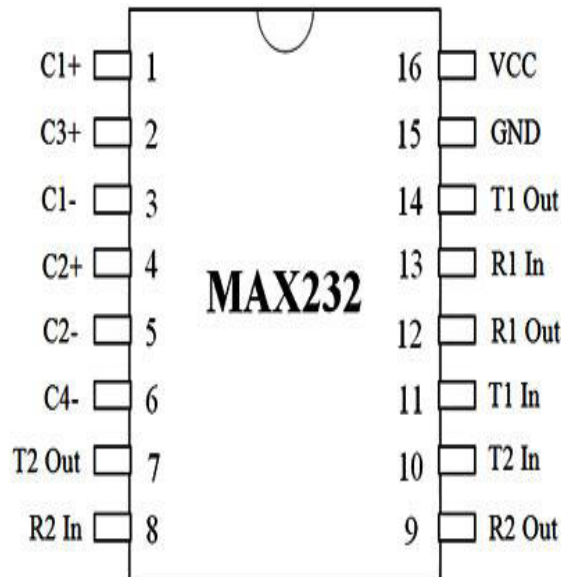

Fig.3. Pin configuration of MAX 32

C. *Power Supply*

A transformer is an electrical device that takes electricity of one voltage and changes it's another voltage. AC and DC voltage in power supply equipment are almost achieve by transformer's transformation and communication.

Basically, a transformer changes electricity from high to low voltage or low to a high voltage using two properties of electricity. For the working of the system a power supply needed. The microcontroller needs only 5 volt DC for its working. Therefore the incoming AC will be rectified filtered and regulated by 7805 IC.

D. *Relay*

A relay an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically. They are very usefully device and allow one circuit to switch another one while they are completed separated. A Relay driver IC is electromagnetic 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, the capability to stand ESD and drive circuit isolation are the unique properties of Relays. A Relay driver IC is an electromagnetic 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.

E. *Relay Driver*

A Relay drivers IC are an electromagnetic 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. In order to avoid using transistor so that the connection can be reduced and a more refined circuit diagram can be made, ULN2003A IC was used. It was a relay driver IC, an electromagnetic switch which is used to turn the relays ON or OF. 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, the capability to stand ESD and drive circuit isolation are the unique properties of Relays.

F. *LCD Display*

16*2 Liquid Crystal is a flat display used in digital watches, cameras, and many portable components. LCD displays utilize two sheets of polarizing material with a liquid crystal solution between them. An electric current passed through the liquid causes the crystal to align so that light cannot pass through them. 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.

H. Resistor
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.

$$V=IR$$

I. Capacitor
Another two terminal devices. Instead of opposing the flow of the current in the circuit in the circuit this device actually stores the electrical current in it in form of electrical fields. The effect is greatest between wide, flat, parallel, narrowly separated conductors.

J. GSM Module
The GSM modem helps to send the generated OTP. OTP generation is the main part of this project. This is done by the microcontroller. The RISC-based microcontroller consists of four ports. In which port A is dedicated for ADC. The microcontroller used for the implementation of this system is ATmega32. It is an 8-bit microcontroller with 32KB on-chip programmable flash memory. Based on the program stored in the microcontroller it shells generate the OTP. And if the passwords are matched or not, it will switch a relay also.

K. EEPROM
Electronically Erasable Read Only Memory plays a major part in this project. It is a non-volatile memory which is often used to store small data for immediate uses and which must be saved when the power turns off. The EEPROM store the password in our project which can be both read and overwritten when a new password is added.

L. Rectifier
 A circuit which is used to convert AC to DC is known as a rectifier. The process of converting AC to DC is called rectification.

M. Diode
Diodes are used to convert AC into DC these are used as half wave rectifier or full wave rectifier. A semiconductor device with two terminals, typically allowing the flow of current in one direction only.

O. Transistor
It is composed of semiconductor material with at least three terminals for connection to an external circuit. A transistor is a semiconductor device used to amplify and switch electronic signals and electric power. A voltage or current applied to one pair of the transistor's terminals changes the current through another pair of terminals.

3.   WORKING
Now let's see how the project works. First, when the power is turned on, the LCD displays a welcome screen and then asks you to enter the password to unlock it. In our case, the password is fixed i.e. 1234. By using the Keypad, the password is input and as we type it the password is seen on the LCD. If the wrong password is entered, it will display a wrong password message and ask you to enter it again. When the correct password is entered, the main screen of the circuit breaker is opened. Now the status of the 1 loads connected to the microcontroller is shown on the LCD as N for on and F for off. By the help of the keypad, when you press the desired button, the output goes to port A and turns on the relay driver IC which in turn switches the magnetic relay and thus the load turns on. By pressing the same button again, the load can be turned off. GSM modem is an important factor in proposed work The 'AT' commands which are received by the microcontroller through level shifted IC Max232**.** As per the program, an acknowledgment is received by SMS being sent depending on status and acknowledgment sent and received. The LCD screen is used to here for displaying complete operation.

ADVANTAGES
They are smaller in size than fuses. Avoids electrical accidents to lineman and used in electrical substations to ensure lineman safety.

FUTURE SCOPE
Supervisory control and data acquisition (SCADA) is a control system so SCADA can also be implemented to know where the fault occurs in the system directly and so a lineman can directly locate the fault location and can rectify it. We can also use EEPROMS than can be interfaced to the system so the circuit breaker can, not only operate from the substation, but also from distance through wireless communication. The project can be interfaced with the GSM modem for the remote control of circuit breaker via SMS.

CONCLUSION
This project is arranged in such a way that maintenance staff or lineman has to enter the password to ON/OFF the electrical line. Now if there is any fault in electrical line then lineman will switch off the power supply to the line by entering the password and comfortably repair the electrical line, and after coming to the substation lineman switch on the supply to the particular line by entering the password.

REFERENCES

1. The 8051 Microcontroller Architecture, Programming & Applications -Kenneth J. Ayala.
2. "The 8051 Microcontroller and Embedded Systems" by Muhammad Ali Mazidi and Janice Gillispie Mazidi. Pearson Education.
3. IJSRD - International Journal for Scientific Research & Development| Vol. 4, Issue 01, 2016 | ISSN (online): 2321-0613.
4. Hudedmani, M., Ummannanavar, N., Mudaliar, M., Sooji, C., & Bogar, M. (2017). Password Based Distribution Panel and Circuit Breaker Operation for the Safety of Lineman during Maintenance Work. Advanced Journal of Graduate Research, 1(1), 35-39.
5. P. N. Mahadik, P. A. Yadav, S. B. Gotpagar, and H. P. Pawar, "Electric Line Man Safety using Micro Controller with GSM Module," Int. J. Sci. Res. Dev., vol. 4, no. 1, pp. 205–207, 2016.
6. D. R. Brooks, "ARDUINO-Based Dataloggers: Hardware and Software," 1.3, 2016.