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Password Based Circuit Breaker Using 8051 Microcontroller

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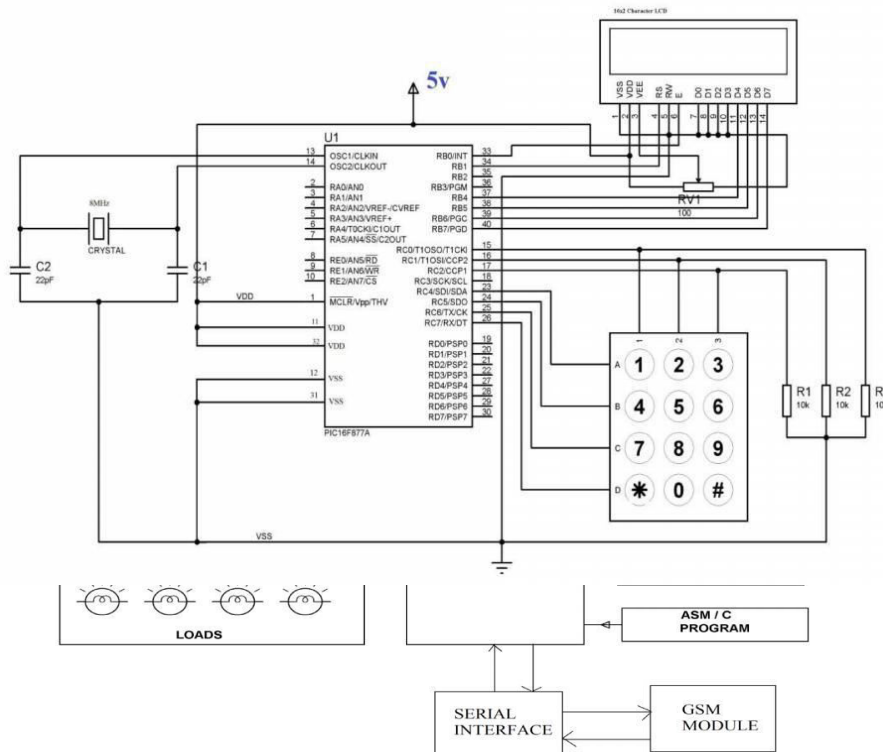
ABSTRACT:- The Project Is Designed To Control A Circuit Breaker With Help Of A Password Only. A Keypad Is Connected To The Project To Enter The Password. Fatal Electrical Accidents To The Line Man Are Increasing During The Electric Line Repair Due To The Lack Of Communication And Coordination Between The Maintenance Staff And The Electric Substation Staff. This Proposed System Provides A Solution, Which Can Ensure The Safety Of The Maintenance Staff E.G. Line Man. The Control To Turn ON/OFF The Line Lies With The Line Man Only. This System Has 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 Return To The Substation, Then Turn On The Line By Entering The Correct Password. The System Is Fully Controlled By A Microcontroller From 8051 Family. A Matrix Keypad Is Interfaced To The Microcontroller To Enter The Password. The Entered Password Is Compared With The Password Stored In The ROM Of The Microcontroller. If The Password Entered Is Correct, Then Only The Line Can Be Turned ON/OFF. Activation / Deactivation Of The Circuit Breaker Are Indicated By A Lamp (ON/OFF). This Project Is Enhanced By Using An EEPROM For User To Change The Password For A More Secured System. It Can Also Be Interfaced With A GSM Modem For Remotely Monitoring The Circuit Breaker Conditions Via SMS.

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. Critical electrical accidents to line men are on the rise during electric line repair due to lack of communication and co-ordination between the maintenance staff and electric substation staff. This proposed system provides a solution that ensures safety of maintenance staff, i.e., line man. The control to turn on or off the line will be maintained by the line man only because this system has an arrangement such that a password is required to operate the circuit breaker (on/off). The system is fully controlled by a microcontroller from AVR family. A matrix keypad is interfaced to the microcontroller to enter the password. The entered password is compared with the password generated. If the password entered is correct, only then the line can be turned ON/OFF. To repair a particular section of the electric supply line, the lineman wants to turn off the supply to that line. 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 send to the phone (the no of which is stored in the program). 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.

REPORT ON PRESENT INVESTIGATION

PRINCIPLE:- The main component in the circuit is 8051 microcontroller. In this project 4×3 keypad is used to enter the password. The password which is entered is compared with the predefined password. If entered password is correct then the corresponding electrical line is turned ON or OFF. In this project a separate password is provided to each electrical line. Activation and deactivation of the line (circuit breaker) is indicated by the load.



II. WORKING

Power supply:- The circuit uses standard power supply comprising of a step-down transformer from 230V to 12V and 4 diodes forming a bridge rectifier that delivers pulsating dc which is then filtered by an electrolytic capacitor of about 470µF to 1000µF. The filtered dc being unregulated, IC LM7805 is used to get 5V DC constant at its pin no 3 irrespective of input DC varying from 7V to 15V. The input dc shall be varying in the event of input ac at 230volts section varies from 160V to 270V in the ratio of the transformer primary voltage V1 to secondary voltage V2 governed by the formula $V1/V2=N1/N2$. As $N1/N2$ i.e. no. of turns in the primary to the no. of turns in the secondary remains unchanged V2 is directly proportional to V1. Thus if the transformer delivers 12V at 220V input it will give 8.72V at 160V. Similarly at 270V it will give 14.72V. Thus the dc voltage at the input of the regulator changes from about 8V to 15V because of A.C voltage variation from 160V to 270V the regulator output will remain constant at 5V.

Microcontroller Pin Configuration:- Microcontroller is interfaced with keypad, EEPROM, relay driver, voltage regulator and C program module. Out of four ports of microcontroller pin configuration, the upper pins of port 1, i.e., pin 1.0 to pin 1.3 of the microcontroller are connected to the row lines of the keypad and lower pins (pin 1.4 to pin 1.6) are connected to the column lines. These are connected in such a way that the column lines acts as input to the microcontroller, and the row line as output lines. The input lines are pulled up internally. Here 16x2 LCD is connected to the port 0 and port 2 pins. As the port 0 has no internal pull up, it is pulled up externally using a set of resistors which are connected to 8-data lines of the LCD. And control lines of the LCD are connected to the Port 2 pins.

OPERATION:- For the operation of circuit breaker through a password, program is written in keil software and created into a .hex file that is further burnt onto the controller with the help of flash magic. 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. 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 and displays status line on the LCD screen. If the password is wrong then it displays “access denied”. Since this is a user changeable one, to change the password click on “*”, “#”. It will display ‘enter password’. Here the circuit is provided with a master code that is used to access the circuit by anyone. 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.



III. RESULTS AND DISCUSSIONS

This proposed system provides a solution, which can ensure the safety of the maintenance staff e.g. line man. The control to turn ON/OFF the line lies with the line man only. This system has 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 return to the substation, then turn on the line by entering the correct password. Since it has the provision of changing the password, person can give any password of his will and have his work done safer.

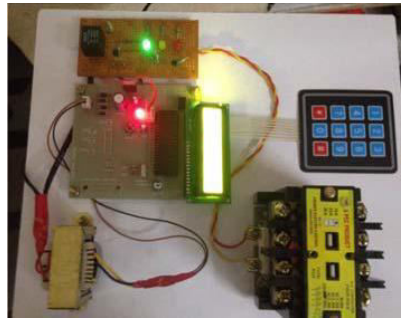


Fig: CB in closed state shown by green LED

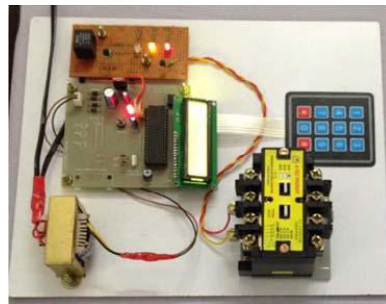
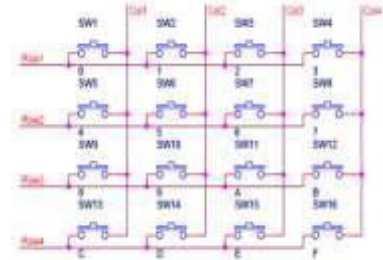
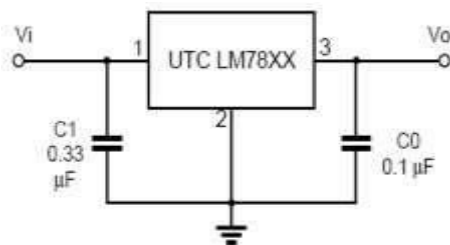


Fig: CB in open state shown by red LED

IV. HARDWARE AND DESCRIPTION

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.



89c51 Microcontroller Chip:- The micro controller 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 micro controller it will generate the OTP. And if the passwords are matched or not, it will switches a relay also. The GSM modem helps to send the generated OTP. OTP generation is the main part of this project. This is done by the micro

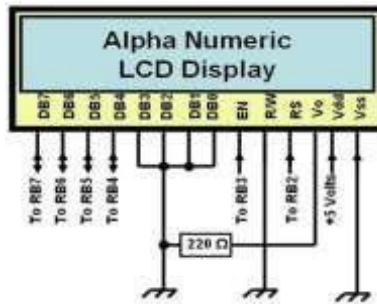


controller. The RISC based micro controller consists of four ports. In which port A is dedicated for ADC.

Relay:- It is basically a switch based on electromagnetic induction. Here uses a 12V DC SPDT relay. It is normally open and closes when the OTPS are the same.

Matrix Keypad:- Here it is used for entering the password. A 4x4 matrix keypad is used.

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.



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.

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.

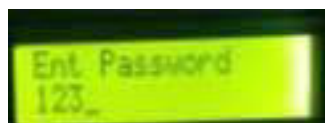
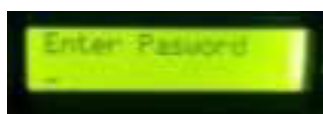
SOFTWARE USED

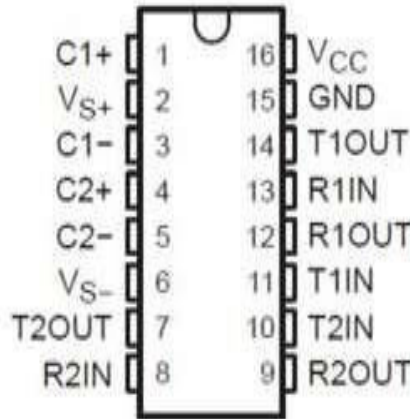
- 1. Keil compiler
- 2. Language: Embedded C

V. EXPERIMENTAL TECHNIQUES

The following steps and snapshots show the prototype working scenario and outcomes of this system.

Step1: Display to show **Step2:** Entering the password **Step3:** Both passwords are matched





VI. CONCLUSION

It can work on a single given known password. No other person can reclose the breaker until the stored password is entered. It gives no scope of password stealing. It is effective in providing safety to the working staff. It is economical and it can be easily installed. Whenever the HT wire sag is higher than the predetermined range/value then ultrasonic sensor sends a message to the substation through GSM and intimates the operator about the trouble occurred. PIR sensor provides safety to human/animal by sensing their presence and alerting through a buzzer. It can be concluded that the proposed system can be used as an effective application in the present working system and provides safety to lineman and also corrective measures can be taken after HT wire sag intimation

- It can work on a single given known password
- The password to operate can be changed and system can be operated efficiently with the changed password
- No other person can reclose the breaker once the changed password is given into system other than the person who had changed it.
- It gives no scope of password stealing
- It is effective in providing safety to the working staff
- It is economical
- It can be easily installed

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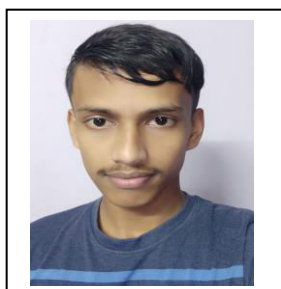
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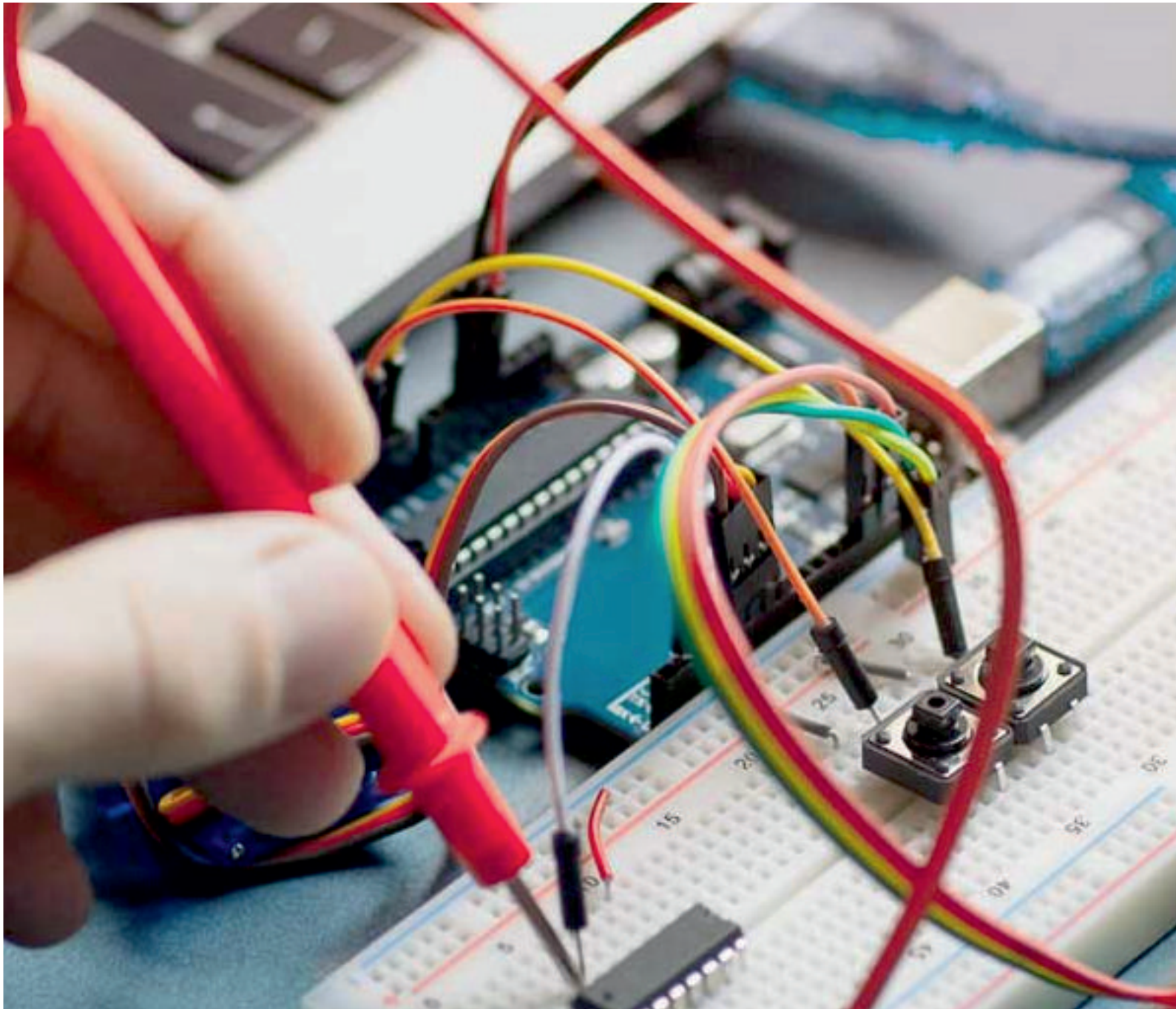
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