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Password Based Circuit Breaker

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Abstract-**The electric line man safety system make use of a new concept of password. 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. 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. If there is a problem in any particular section of the supply line, then staff wants to turn off that line and repair it. For that the Using a matrix keypad he can enter it in the system. Then the system compares the entered password with the generated password. If the passwords are matched, then the supply to that line will be made OFF. Now he can repair the line more safely and after it is over he can turn on that line by using the password. This ensures security of the worker because no one can turn on the line without his permission.**

Keywords- **circuit breaker, electrical accidents, electric substation, and password.**

I. INTRODUCTION

Circuit breakers play a crucial role in switching for the reasons of both the routine network operation and protection of other devices in power systems. To ensure circuit breakers are in healthy condition, periodical inspection and preventive maintenance are typically performed. The maintenance schedules and routines usually follow the recommendation of circuit breaker vendors, although the recommended schedules may be conservative. 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 PIC microcontroller from. 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 line man wants to turn off the supply to that line. For this he first put 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.

II. COMPONENTS

a) Resistor

A resistor is a passive two terminal electrical component that implements electrical resistance as circuit element. Resistors act to reduce current flow at the same time act to lower voltage level within circuit. This follow the ohm's law [V=IR].

b) Capacitor

Capacitor is an electronic component that store electric charge. The capacitor is made of 2 close conductors (usually plates) that are separated by a dielectric material. The plates accumulates electric charge when connected to power source.

An ideal capacitor is wholly characterized by a constant capacitance C, defined as the ratio of charge ±Q on each conductor to the voltage V between them. The equation is given as C=Q/V.

c) 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.

d) Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other

operating principles are 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.

e) Voltage Regulator

The series of fixed-voltage integrated-circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. Each of these regulators can deliver up to 1.5 A of output current. The internal current-limiting and thermal-shutdown features of these regulators essentially make them immune to overload. In addition to use as fixed-voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents, and also can be used as the power-pass element in precision regulators. 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.

f) PIC Microcontroller

The name PIC initially referred to peripheral interface controller. All current models of pic use flash memory for program storage, and newer models allow the pic to reprogram itself. Program memory and data memory are separated. Data memory is 8 bit wide. Program instruction vary in bit count by family of pic, and may be 12, 14, 16 or 24 bits long. Pic16 is a mid-range family pic microcontroller with program memory addressable in the same word size as the instruction width 14 bits.

g) LCD Display

The term liquid crystal is used to describe a substance in a state between liquid crystal tend to and solid but which exhibits the properties of both. Molecules in liquid arrange themselves until they all point in the same specific direction. This arrangement of molecules enables the medium to flow as a liquid. Depending on the temperature and particular nature of a substance, liquid crystals can exist in one of several distinct phases. Liquid crystals in a Pneumatic phase, in which there is no spatial ordering of the molecules, for example, are used in LCD technology. Here this used to display the password entered by us to ON/OFF the circuit breakers.

h) 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. Here ULN2003A is used as relay driver. The ULN2003A are monolithic high-voltage, high-current Darlington transistor arrays. Each consists of seven n-p-n Darlington pairs that feature high-voltage outputs with common cathode clamp diodes for switching inductive loads. The collector current rating of a single Darlington pair is 500 mA. The Darlington pairs may be paralleled for higher current capability.

i) Hexadecimal Keypad

HEX keypad is a standard device with 16 keys connected in a 4x4 matrix, giving the characters 0-9, A, B, C, D, * and #. Interfacing of Hex key pad to PIC 16F886 microcontroller is essential while designing embedded system projects which requires character or numeric input or both. For example projects like digital code lock, numeric calculator etc. Here we are using this to enter numeric password for turn ON/OFF the circuit breaker.

j) LED

A LED is a semiconductor device. It is a p n junction diode that emits light when forward biased. When an LED's anode lead has a voltage that is more positive than its cathode lead by at least the LED's forward voltage drop, current flows. Electrons are able to recombine with holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, the energy band gap of the semiconductor determines the color of light. In our project LEDs are used for power indications.

III. PRINCIPLE

The main component in the circuit is PIC 16F886 microcontroller. In this project 4×4 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.

IV. 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.

V. RESULTS 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 changing the password, person can give any password of his will and have his work done safer.

VI. CONCLUSION

The implementation of this project gives an idea of security. Thus proposed system can be used to maintain one password that cannot be stolen .The control over power supply is maintained continually.

TABLE 1

LIST OF COMPONENT

S. NO.	Name Of Component	Rating	Qty.	Purpose
1.	Relay	10amp 24V DC	3	ON/OFF Ckt
2.	Capacitor	220µF 47µF 0.01µF	2 1 2	Filter
3.	PIC 16F886		1	Programming
4.	Relay Driver ULN 2003AN	5V, 0.5amp	1	Operate relay
5.	Voltage Regulator LM 7805	5V	1	Constant Voltage
6.	LCD Display		1	Password Display
7.	4*4 Keypad		1	Input Password
8.	Resistor	2.2kΩ,120Ω,230 Ω		Voltage Drop
9.	Transformer	220V/9V	3	Power Supply
10.	Bulb	100W 220V	3	Load
11.	Diode		6	Rectifier
12.	Buzzer	5V	1	Indication
13.	LED	2V	3	Indication

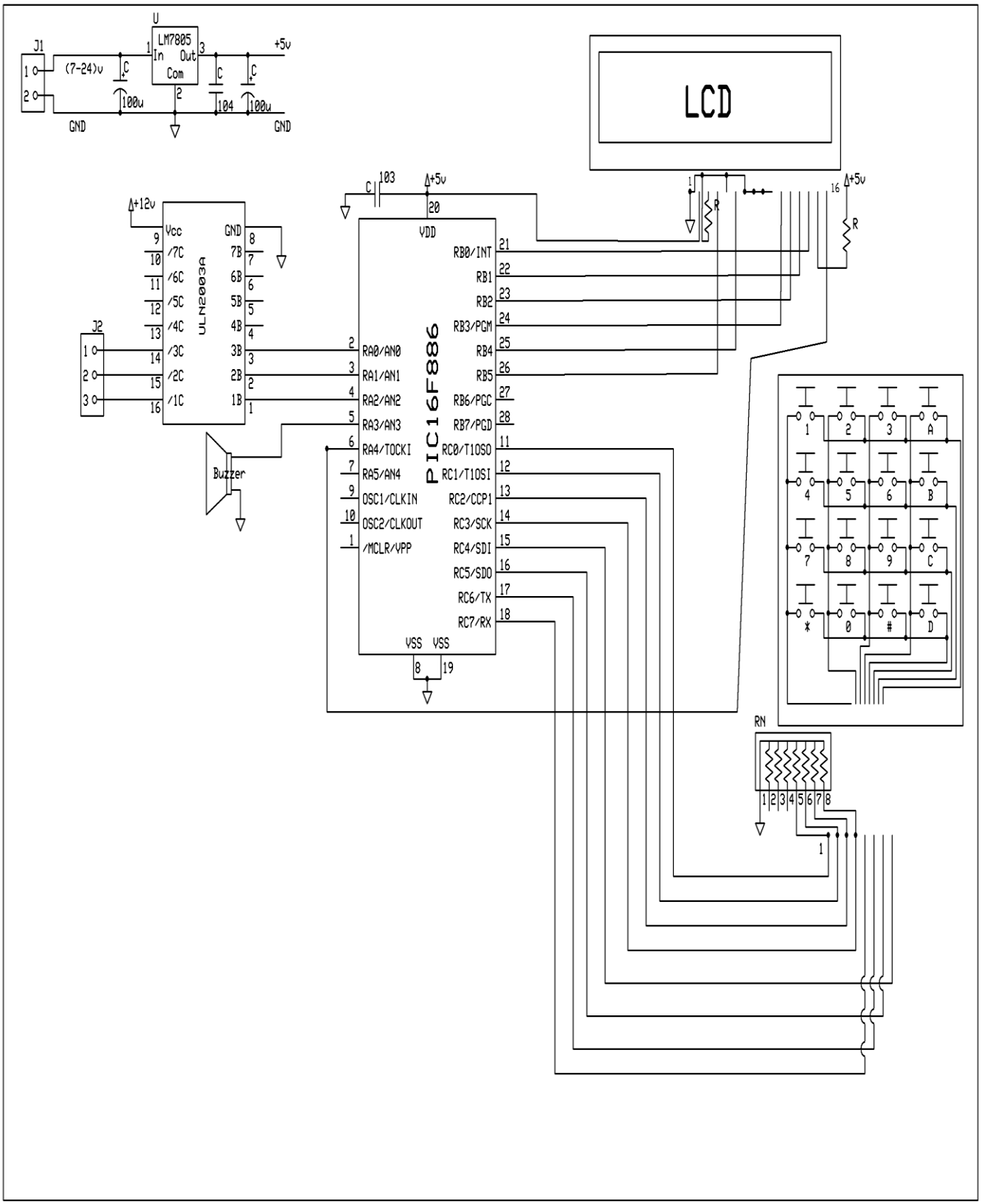

Fig. 1 Circuit Diagram for Password based circuit breaker

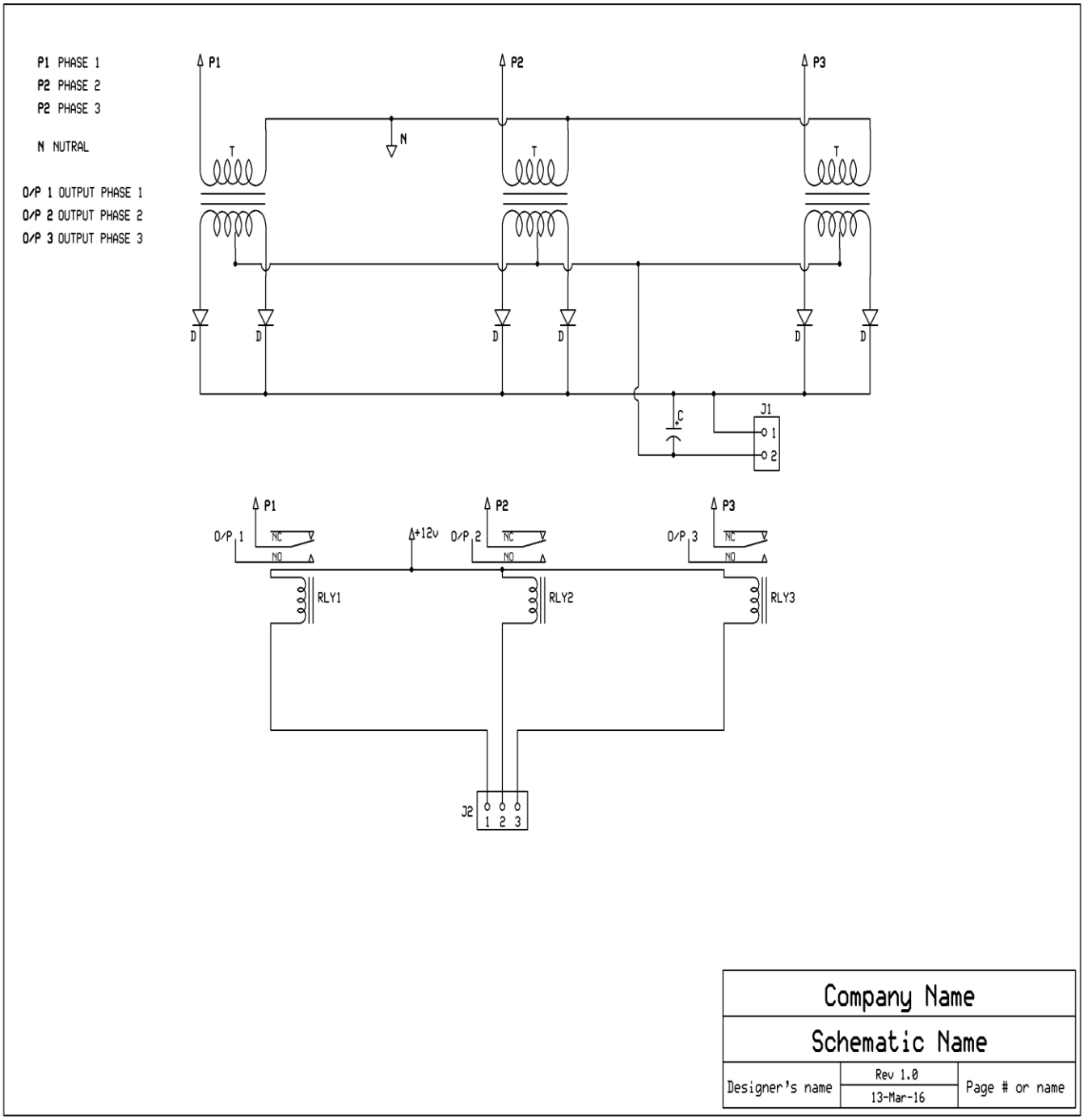

Fig. 2 Circuit Diagram for 3 Phase Electrical System

VII. REFERENCES

[1] M. Kezunovic, "Improving circuit breaker maintenance management tasks by applying mobile agent software technology"IEEE.

[2] Sebin J Olickal, "Electric line man safety system with one time password based circuit breaker" IJRET, vol. 04 Special Issue: 03 Apr-2015

[3] Narendra Khandelwal, Tanuj Manglani, Ganpat Singh, Amit Kumar, Dilip Khatri, "Automated load distribution with password protected circuit breakers" International Journal of Recent Research and Review, vol. VIII, Issue 1, March 2015.

[4] K.B.V.S.R.Subrahmanyam, "Electric lineman protection using user changeable password based circuit breaker" IJCESR, vol. 2, ISSUE-5, 2015.

[5] Michael faxa, "Application of disconnecting circuit breakers, p.11" Retrieved 9 July 2012.

[6] Muhammad Ali Mazidi and Janice Gillispie Mazidi, "The microcontroller and embedded systems", Person Education.

[7] 16F886 Data sheets.

[8] Vincent Del Toro, "Electrical engineering fundamentals".

[9] "Disconnecting circuit breakers, buyer's and application guide, p.10" Retrieved 15 September 2014.

[10] Thomas L. Floyd, "Electronic Devices", Vol. I, 6th edition, 2003, Pearson Education, pp. 16-19.

