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Password Based Circuit Breaker

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Abstract: From the study, we found that security is being compromised in every sector of work. Due to this compromise, there is an increase in the number of deaths of linemen. Considering this as one of the major issues we are working on a project called 'Password Based Circuit Breaker' which will be focusing on the safety of linemen. We hope that this project will help in decreasing the no. of deaths due to compromise in safety. This project helps in cutting off the electricity of a particular area or line. This thing will be done with the help of a password so that the specific authority has the power to do so and unnecessary cut-offs and other issues won't rise. This project can also be used in the industrial sector for the safety purpose.

Index Terms - Microcontroller, Password, Lineman Safety, Circuit Breaker, Security.

I. INTRODUCTION

From the study, we found that security is being compromised in every sector of work. Due to this compromise, there is an increase in the number of deaths of linemen. Considering this as one of the major issues we are working on a project called 'Password Based Circuit Breaker' which will be focusing on the safety of linemen. We hope that this project will help in decreasing the no. of deaths due to compromise in safety. This project helps in cutting off the electricity of a particular area or line. This thing will be done with the help of a password so that the specific authority has the power to do so and unnecessary cut-offs and other issues won't rise. This project can also be used in the industrial sector for the safety purpose.

II. METHODOLOGY

A. Components

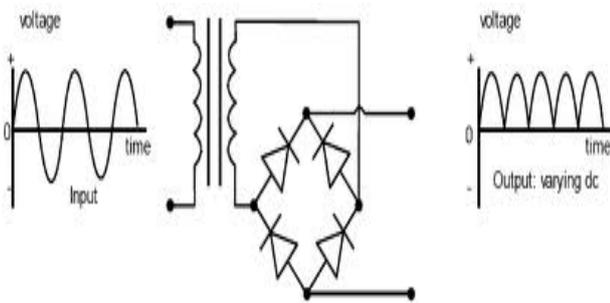
1. MICROCONTROLLER (AT89S52):

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density non volatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.



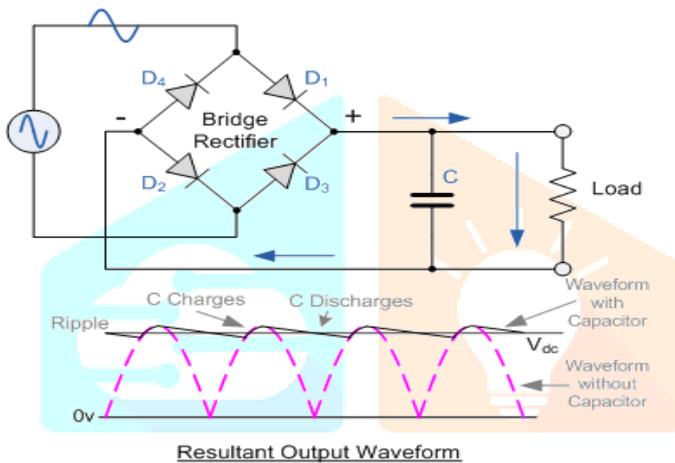
2. RECTIFIER:

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. Rectifiers have many uses including as components of power supplies and as detectors of radio signals. Rectifiers may be made of solid state diodes, vacuum tube diodes, mercury arc valves, and other components. The output from the transformer is fed to the rectifier. It converts A.C. into pulsating D.C. The rectifier may be a half wave or a full wave rectifier. In this project, a bridge rectifier is used because of its merits like good stability and full wave rectification. In positive half cycle only two diodes(1 set of parallel diodes) will conduct, in negative half cycle remaining two diodes will conduct and they will conduct only in forward bias only.



3. FILTER:

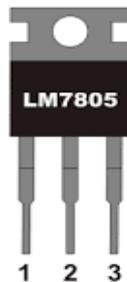
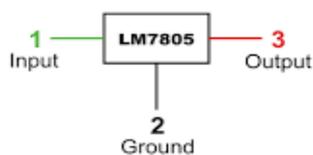
Capacitive filter is used in this project. It removes the ripples from the output of rectifier and smoothens the D.C. Output received from this filter is constant until the mains voltage and load is maintained constant. However, if either of the two is varied, D.C. voltage received at this point changes. Therefore a regulator is applied at the output stage. The simple capacitor filter is the most basic type of power supply filter. The use of this filter is very limited. It is sometimes used on extremely high-voltage, low-current power supplies for cathode-ray and similar electron tubes that require very little load current from the supply. This filter is also used in circuits where the power-supply ripple frequency is not critical and can be relatively high. Below figure can show how the capacitor charges and discharges.



4. VOLTAGE REGULATOR (7805):

The LM78XX/LM78XXA series of three-terminal positive regulators are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a Wide range of applications. Each type employs internal current limiting, thermal shutdown and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output Current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

LM7805 PINOUT DIAGRAM



5. RELAY & RELAY DRIVER (ULN 2003):

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. 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.

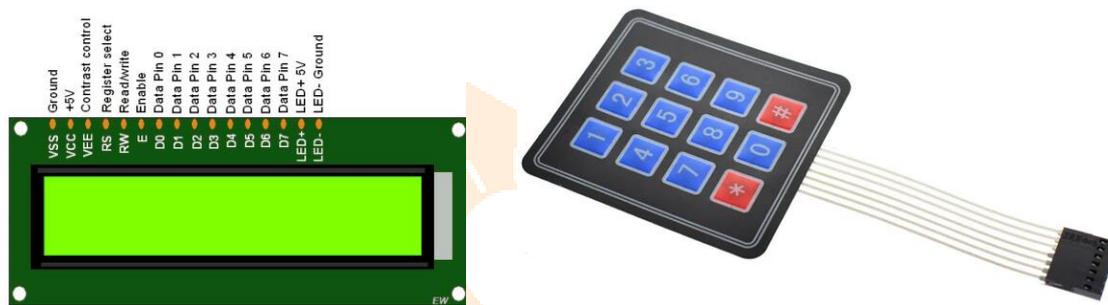


The ULN2003 is a monolithic high voltage and high current Darlington transistor arrays. It consists of seven NPN Darlington pairs that feature high-voltage outputs with common-cathode Clamp diode for switching inductive loads. The collector-current rating of a single Darlington pair is 500mA. The Darlington pairs may be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED gas discharge), line drivers, and logic buffers. The ULN2003 has a 2.7k Ω series base resistor for each Darlington pair for operation directly with TTL or 5V CMOS devices.



6. LCD & MATRIX KEYPAD:

Frequently, an 8051 program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to an 8051 is an LCD display. Some of the most common LCDs connected to the 8051 are 16x2 and 20x2 displays. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.



Keypads are a part of HMI or Human Machine Interface and play really important role in a small embedded system where human interaction or human input is needed. Matrix keypads are well known for their simple architecture and ease of interfacing with any microcontroller.

SOFTWARE REQUIRMENTS:

We are using Keil software to write code for Microcontroller. Keil development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development. When starting a new project, simply select the microcontroller you use from the Device Database and the μ Vision IDE sets all compiler, assembler, linker, and memory options for you. Keil is a cross compiler. A cross compiler is similar to the compilers but we write a program for the target processor (like 8051 and its derivatives) on the host processors (like computer of x86). It means being in one environment you are writing a code for another environment is called cross development. And the compiler used for cross development is called cross compiler. So the definition of cross compiler is a compiler that runs on one computer but produces object code for a different type of computer.

Keil is a German based Software development company. It provides several development tools like

- IDE (Integrated Development environment)
- Project Manager
- Simulator & Debugger
- C Cross Compiler, Cross Assembler, Locator/Linker

The programming language used is Embedded c language The Keil ARM tool kit includes three main tools, assembler, compiler and linker. An assembler is used to assemble the ARM assembly program. A compiler is used to compile the C source code into an object file. A linker is used to create an absolute object module suitable for our in-circuit emulator.

B. Method

The Password Based circuit breaker project comes with an 8051 controller based system which has four loads and a keypad through which the user can input to the system. The system is powered through a 12VAC 1A step down transformer. The input of this transformer is taken directly from 230VAC mains. Once the transformer input (230VAC) and outputs (12VAC) are properly connected, the system turns on displaying Password Based Circuit Breaker on the LCD.

Now, there are three modes in which the system can go after the first displayed screen. The keywords to select from the various modes, as displayed on the LCD are

- *(asterisk) for entering password,
- # (hash) to change current password and

Once * is pressed, the system asks for the 4 character password from the user which the user has to input via keypad. Then it compares this password with the one pre-configured in the EEPROM. If it does not match the user is notified about it on LCD.

When the password match event occurs, the system proceeds with displaying the load information on the LCD and waits for user inputs. At this moment, if number 1 is sent from through the keypad, the load 1 gets complemented i.e., if it was off then it will turn on else vice versa happens. Similarly goes for load 2, 3 and 4. The system comes out of this mode when # is pressed.

In the change password mode, the user is asked first for the old password. If the password gets matched, the user is asked for new password which gets stored in the EEPROM. In this way the Password Based Circuit Breaker Project works in controlling 4 AC loads while having the system password protected.

C. Testing

CONTINUITY TEST:

In electronics, a continuity test is the checking of an electric circuit to see if current flows (that it is in fact a complete circuit). A continuity test is performed by placing a small voltage across the chosen path. If electron flow is inhibited by broken conductors, damaged components, or excessive resistance, the circuit is "open". This test is performed just after the hardware soldering and configuration has been completed. This test aims at finding any electrical open paths in the circuit after the soldering.

POWER ON TEST:

This test is performed to check whether the voltage at different terminals is according to the requirement or not. We take a multi meter and put it in voltage mode. This test is performed without microcontroller. Firstly, we check the output of the transformer, whether we get the required 12 v AC voltage. Then we apply this voltage to the power supply circuit. We check for the input to the voltage regulator i.e., are we getting an input of 12v and an output of 5v. This 5v output is given to the microcontrollers' 40th pin. Hence we check for the voltage level at 40th pin. Similarly, we check for the other terminals for the required voltage. In this way we can assure that the voltage at all the terminals is as per the requirement.

III. RESULTS AND DISCUSSIONS

- The proposed model will perform switching of CB's with minimal manual work.
- The proposed model will significantly improve safety of Line-men.
- The proposed model will make operation of CB's easy, efficient and encrypted.

Applications:

1. Can be used in electrical substations to ensure lineman safety.
2. Can be used in hotels and shopping malls.
3. Can also be used as Password based electrical appliance control or Password based Load Control system.



Step 1. Interface



Step 2. Entering Password



Step 3. Press the respective number to switch the line on/off.

IV. FUTURE SCOPE

The SCADA system can be integrated with the system so that fault detection and fault realisation in the line will become easier and the lineman will be able to easily disable that faulty line with the help of circuit breaker.

A GSM module can be integrated with the system so that when a line stops working, the gsm module will send an SMS to the workstation and a quicker response can be given for the repairing process.

V. CONCLUSION

In this system it is operated only by using password. In this system we used microcontroller, relay drivers, LCD display, LED indicators and bulbs are act as load. This is easy method for solving life of the line man as its operation is very simple as it requires entering of the password for switching on/off the load. This process is better and accurate to safety purpose of the line man.

VI. ACKNOWLEDGMENT

We would like to thank our Honorable Director Prof. (Dr.) R.M. Jalnekar for giving us the opportunity to do this project under the Capstone Project 1 (CP1) curriculum. We would like to thank Prof. (Dr.) Chandrashekhhar Mahajan HOD, DESH for providing us with the necessary resources and support. We hereby also express our deep gratitude and thanks to our project Guide Surabhi Kakade for providing her erudite guidance, vision support and constant encouragement in order to complete our Capstone Project 1 successfully.

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