NEW HORIZON
COLLEGE OF ENGINEERING
New Horizon Knowledge Park, Ring Road, Marathalli
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, Accredited by NBA

PASSWORD BASED CIRUIT BREAKER

A MINI PROJECT

REPORT

Submitted by

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In partial fulfilment for the award of the degree of

BACHELOR OF ENGINEERING

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

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Bonafide Certificate

This is to Bonafide that the mini project report entitled "**Password based Circuit Breaker**" submitted by **Sankeerthini D, Saranya S and Vishnupriya G G,** Department of Electrical and Electronics Engineering, New Horizon College of Engineering, Bangalore in partial fulfilment for the award of the degree of Bachelor of Engineering, is a record of bonafide work carried out by him/her under my supervision, as per the NHCE code of academic and research ethics.

The contents of this report have not been submitted and will not be submitted either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university. The project report fulfils the requirements and regulations of the institution and in my opinion meets the necessary standards for submission.

Mr. Lithesh
Guide

Dr. Mahesh.M
HoD

Acknowledgement

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Place: New Horizon College of Engineering

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Abstract

In this project, we will be constructing an 8051-microcontroller based circuit to build a circuit breaker with an effective password control system. Linemen and substation staff communication tend to, sometimes, be faulty, leading to linemen electric accidents. This project is built to ensure the safety of the maintenance personnel. The microcontroller has been programmed to enable password control on load. Two sources, namely, AC and DC, are connected to the circuit to the lightbulbs and microcontroller respectively. The AC source supplies standard 220/230 V to the lightbulbs (used as load). The DC source may be a battery of 5 V. A 4x4 matrix keypad is connected to the microcontroller that will act as the input device. The 16x2 LCD projects the password and status of the loads. Alongside the loads, the relay module ensures a safe current supply to the lightbulbs. In this project, we will be demonstrating using four lightbulbs, each operated using its unique password. When the current provided is enabled, the lightbulbs are initially OFF. The LCD requests a password to permit the current supply to the particular loads. The user may enter the required password through the keypad. The entered password is compared to the provided password in the program. Depending on the correctness of the passcode, the appropriate lightbulbs are switched ON. If the password is incorrect, a suitable message is displayed on the LCD. This project can hence provide the control of the lightbulbs(load) on the maintenance staff alone. Thus, this eliminates the need for communication between the linemen and the sub-station personnel. Henceforth, linemen accidents will be avoided.

Introduction

An electric circuit is prone to short-circuiting and overload situations due to possible excess current flow in the line that will damage the entire loop. To protect the line from the damaging current, a circuit breaker is used. It is an electrical switch with is automatically operated to protect circuit lines from exceeding current amounts. When a fault is sighted in the flowing circuit, the circuit breaker automatically terminates the flow of current in the line. When a fuse on one side can be used only once, a circuit breaker can be recovered as it may be automatically or manually be reset. Linemen are sent to work on the damaged electric lines via communication by the substation operator. Due to the lack of rigid and assured communication between the same, the linemen are prone to fatal electric accidents during repairs. To ensure the safety of the maintenance staff, the circuit breaker can be designed such that only the authorized person may operate it, in our case, the linemen. The project is assembled to allow the control of a circuit breaker through a password-based system. Only the linemen may operate the circuit during its repair at that place. This also enables a direct control on the hand of the maintenance and no requirement of substation staff and communication. The project is designed around the principle of operation of 8051 microcontrollers which is used alongside the keypad interface to build password control of the circuit.

Scope and Objective

Scope

This project works on the general principle of password-based system control. We, in this project, are demonstrating the password control of load for the welfare of linemen safety. This project, however, can be modified to other applications such as,

(i) Home technology using various loads
(ii) Apartment security by increasing the range
(iii) In malls and schools for secure access
(iv) In private lifts and hospitals

Objective

Secure systems are very essential in advancement towards technology and safety. In this project we will learn,

(i) The functions and working of 8051 microcontrollers
(ii) Circuit control with 2 types of supply
(iii) Programming in 8051 using Keil uVision software
(iv) Operation of LCD
(v) Password control system

Components

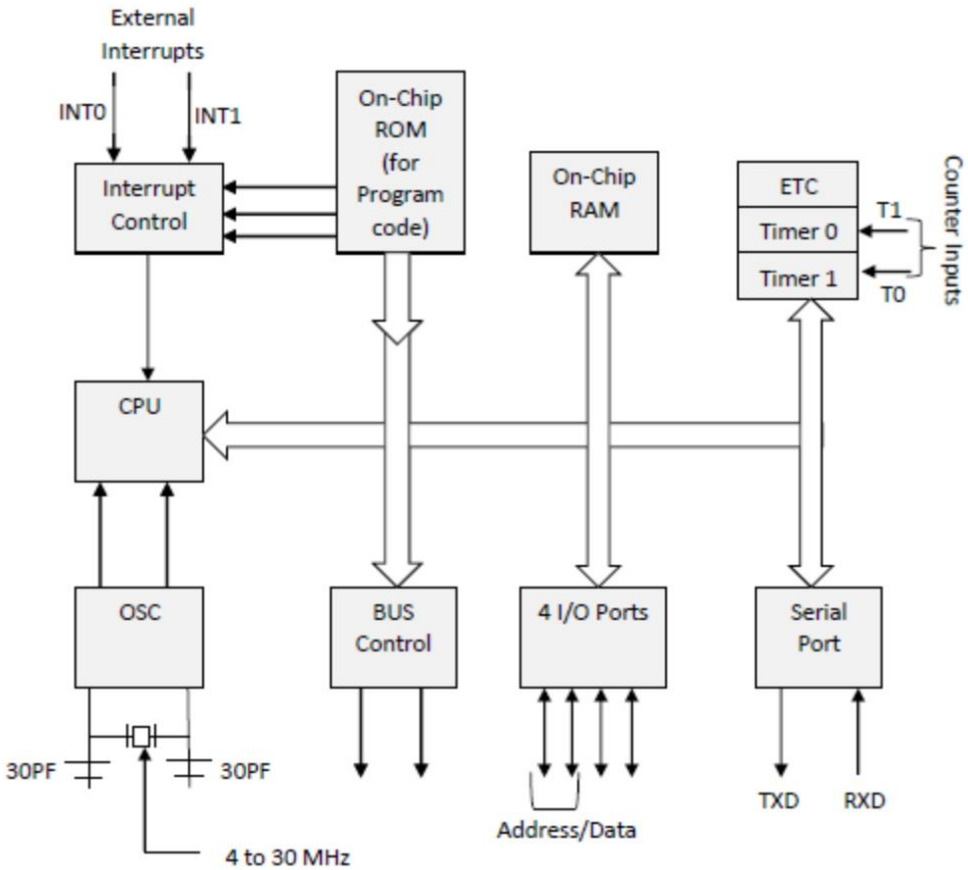
1. 8051 microcontroller and programmer
2. 4x4 matrix keypad
3. 16x2 LCD
4. 4 - channel Relay module
5. AC power supple
6. DC power supply source
7. 4 lightbulbs(loads)
8. Connecting wires
9. 10k ohm potentiometer

Components Description

8051-microcontroller

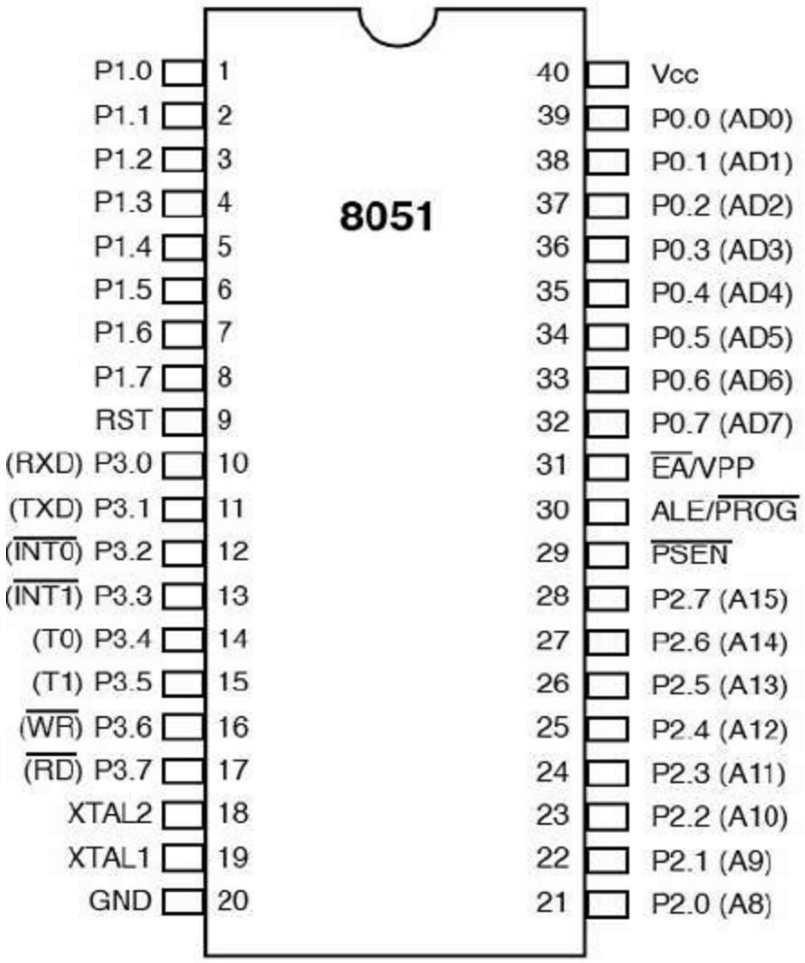
The 8051 8-bit microcontroller of embedded memory type has a total of 40 pins and storage ROM of 4 Kilobyte, RAM of 128 Byte and two 16-bit timers. It also comprises of 4 parallel ports of 8-bit memory that is both addressable or programmable. It also includes a crystal oscillator of 12 MegaHz.

The architectural structure of 8051 microcontroller depicts a system bus which connects the CPU to the remaining supporting devices. The system bus structure shows the 16-bit Address Bus alongside the 8-bit Data Bus and the bus control. To the system bus, other devices are interfaced like interrupt control, program memory, timers, ports, serial interface, data memory with the CPU.



The 8051-microcontroller pin diagram locates the various 40 pins

1. The port 1 is depicted by the pins 1-8 which serve no purpose. It is a bi-directional input-output port that is internally pulled-up.
2. The RESET pin is depicted by the pin number 9 which is used to reset the desired value to the initial condition.
3. Port 3 is indicated by the pin numbers 10-17 which houses the pins performing operations including control signals, interrupts, input timer, RxD & TxD signals of serial communication etc.
4. Pin numbers 18 and 19 are interfaced to the external crystal referred by XTAL 1&2 which in turn connects with the crystal oscillators.
5. Power supply unit is given through pin number 20.
6. Port 2 is represented by pin numbers 21-28 that serve as input-output ports. This port also multiplexes address ports of higher order.
7. PSEN abbreviation of 'Program Store Enable' is defined by pin number 29 that reads memory signal of external memory.
8. EA abbreviation of 'External Access' input controls the interfacing of external memory.
9. ALE abbreviation of 'Address Latch Enable' controls the demultiplexing of address-data port signal.
10. Port 0 is represented by pin numbers 32-39 input-output ports. This port also multiplexes address ports of lower order and data ports.
11. Just like pin number 20, pin 40 is also used to connect to the power supply for the circuit.



Interrupts of 8051

8051 microcontroller comprises of five interrupt signals indicated as, INT0, INT1, TF0, TF1 and RI/T1. Each of this interrupt signals can be disabled or enabled by the IE register and the entire interrupt system's disabling control is borne by the EA bit.

By setting the EA bit of interrupt enable to 0 or 1, the control is disabled or enabled respectively.

EA	-	-	ES	ET1	EX1	ET0	EX0

EA	IE.7	It disables all interrupts. When EA = 0 no interrupt will be acknowledged and EA = 1 enables the interrupt individually.
-	IE.6	Reserved for future use.
-	IE.5	Reserved for future use.
ES	IE.4	Enables/disables serial port interrupt.
ET1	IE.3	Enables/disables timer1 overflow interrupt.
EX1	IE.2	Enables/disables external interrupt1.
ET0	IE.1	Enables/disables timer0 overflow interrupt.
EX0	IE.0	Enables/disables external interrupt0.

The priority levels can be controlled by the register, Interrupt Priority.

-	-	PT2	PS	PT1	PX1	PT0	PX0
bit7	bit6	bit5	bit4	bit3	bit2	bit1	

-	IP.6	Reserved for future use.
-	IP.5	Reserved for future use.
PS	IP.4	It defines the serial port interrupt priority level.
PT1	IP.3	It defines the timer interrupt of 1 priority.
PX1	IP.2	It defines the external interrupt priority level.
PT0	IP.1	It defines the timer0 interrupt priority level.
PX0	IP.0	It defines the external interrupt of 0 priority level.

The external interrupt type specification is controlled by the TCON register.

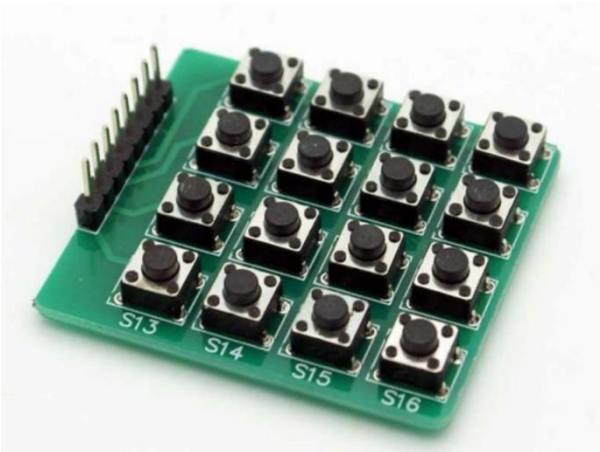
4x4 Keypad

The matrix keypad is generally used as an input device in many project systems. The keypad comprises of a total of 16 switches. The keypad can be modified to different shapes and sizes and designed based on the requirement.

Specifications and features:

1. Each push button can withstand a maximum voltage 24 Volts.
2. Each button withstands a maximum current 30 mAmps.
3. The tolerable temperature range is 0 to 50 degree Centigrade.
4. The keypad is small and has an ultra-thin design for compactness.
5. The back is adhesive and insulted.
6. Interfacing is easy.
7. The keypad has a long life.

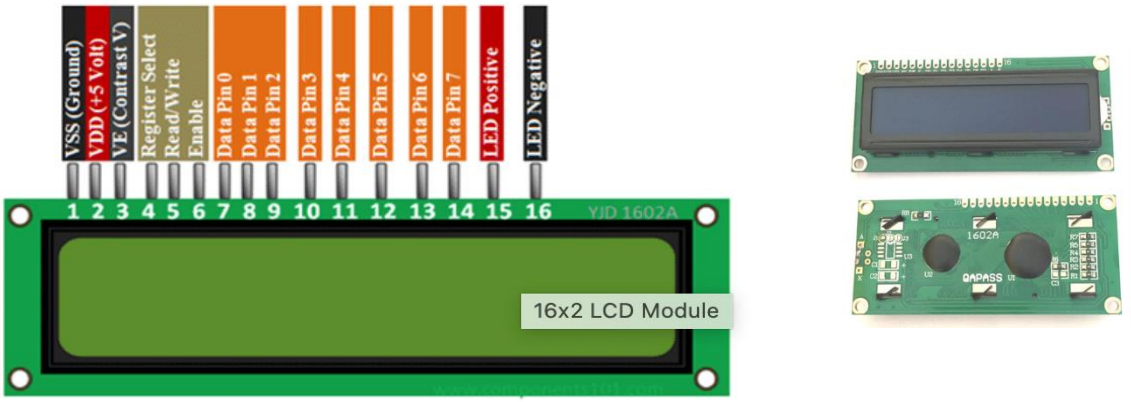
Apart from its basic application, the keypad can also be used in other cases. Input modules have fewer pins but, in some applications processors, developed with less pins requires more pins to for input device connections. In such cases, the keypad can be used as it provides 16 pins as inputs.



16x2 LCD

LCD modules are widely used in many projects and embedded systems due their cheap price point and easy availability. The 16x2 as its name depicts includes 2 rows and 16 columns. There are different varieties in LCDs like 8x1 and 16x1, but the 16x2 type is the most widely used due

to its perfect display. There is a total of 32 character and each of these individual characters are made of 5x8, a total of 40 pixels. Thus, for 32 characters, there is a total of 1,280 pixels. The LCD should be versed on the location of these individual pixels. For this purpose, on the backside of the LCD, there is the H44780 Interface IC which is used to receive the data and commands from the microcontroller unit thus displaying the desired meaningful information on the display.



There are 16 pins:

1. The 1st pin is the ground pin Vss.
2. The second pin is the one connected to the power supply 5V, the Vcc pin.
3. The 3rd pin is the VE pin which is used to set contrast levels in the display.
4. 4th pin is the Register Select which is the pin that's connects to the microcontroller and shifts data or command register.
5. Read or write function in the LCD is depicted by the 5th pin which is usually grounded for performing write operation.
6. Enable pin 6 controls toggling between high and low inputs for acknowledgment of data.
7. Pins 7 to 14 namely data pins 0 to 7 are connected to the microcontroller for the 8-bit data transfer. However, only 4 pins are also enough for the same.
8. Pin 15 is positive backlight pin.
9. Pin 16 is negative backlight pin.

4-Channel Relay

Relays are basically switches which electrically or electromagnetically switches circuits ON or OFF. They are used in circuits of generally low current and voltages and also in solenoids or in small motors. However, their function can control large voltages with amplification changes. The way a relay is works in a circuit is such that, which it enables the current flow in one part of the circuit, it does so while disconnecting another part of the same circuit. A 4-channel relay has an extended purpose of connecting four different paths of the same circuit.

The 4-channel relay is of 5V capacity in which each channel can transport to around 20 mAmps each. They can be used in control of appliances and in high current cases.

While a relay functions in circuit control, it also features as a supporter of AC DC conversion. The relay can be directly controlled by a microcontroller through its DC supply and with the instructions of the MCU, it can control the circuit of AC loads such as light bulbs. Basically, a relay can control AC units from DC source.

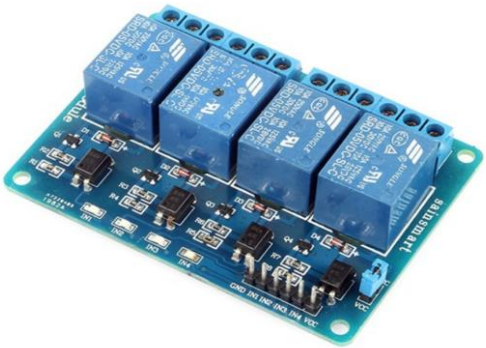
Pin Description

Input

1. Vcc is the supply voltage pin (positive).
2. GND or the group pin is the negative terminal.
3. Remaining for IN1 to 4 are the control ports on the relay.

Output

The DC supply for upto 30 Volts and the AC loads of 220 to 230 Volts.



10k Ohm Potentiometer

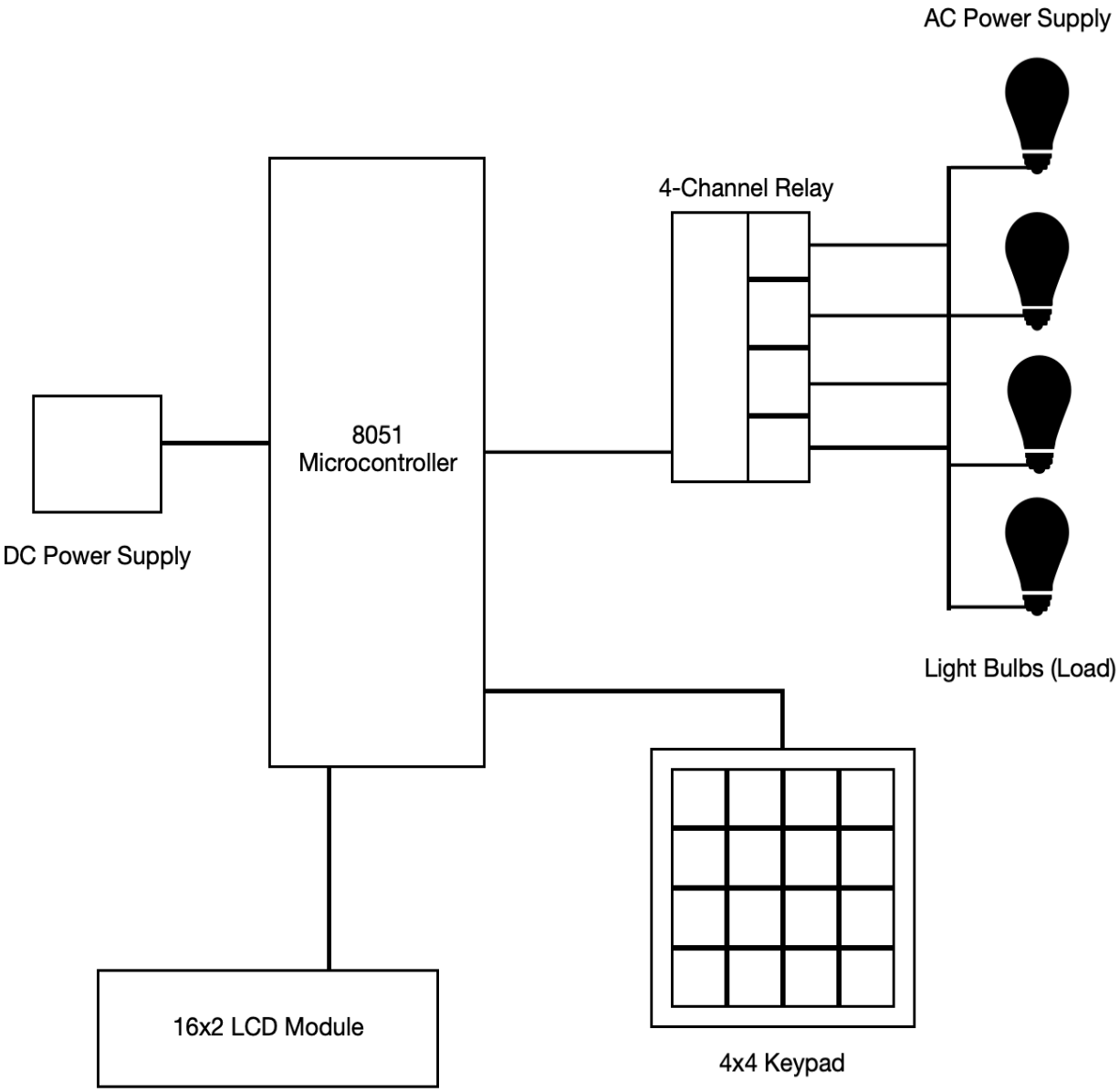
A potentiometer is a small device which is used to determine the voltage value of an unknown voltage with the help of a known voltage value. It's a highly precise drive which uses very low current to determine the precise unknown voltage value. It has 3 pins:

Pin Configuration:

1. Pin 1 is the fixed end connected to the resistive unit on one end.
2. Pin 2 is a variable end connected to viper for variable voltage.
3. Pin 3 is similar to pin 1, fixed to another end of resistive unit.

It is available in various resistance size ranges like 2k, 10k or even 1M ohms. In this project we are using the 10k ohms potentiometer. Power rating is very low, about 0.2 to 0.3 Watts and had a maximum input voltage range of about 200 to 220 Volts.

Block Diagram



Construction

This project revolves around the principle of operation of the 8051 microcontrollers. The following is the scheme of construction of password-controlled load system.

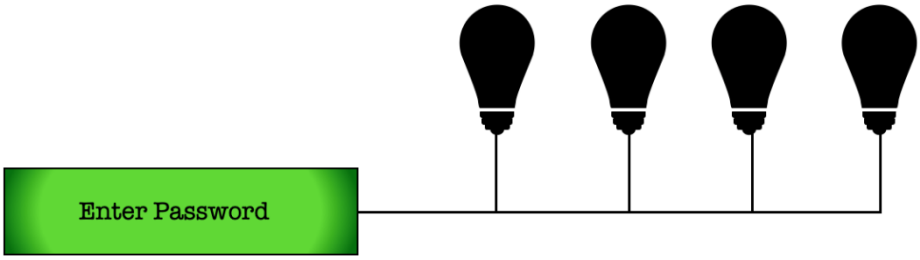
1. We are using 8051 microcontroller AT89C52. The microcontroller is connected to a programming board in which the crystal oscillator and pull-up resistor connections are already pre-made.
2. The microcontroller is connected to a 4x4 keypad matrix which acts as the input device for accepting the password for operation of the load.
3. Alongside, microcontroller connections are extended to the 16x2 LCD which is one of the two output devices. The LCD displays the required message for accepting the input and also displays the status of each load.
4. Microcontroller connections are given to the 4-channel relay which in turn is connected to the loads. We are using 4 light bulbs as our loads. They act as output devices as well.
5. A DC supply source should be given to the microcontroller. A 5 Volt battery can be used for the same.
6. For the light bulbs, a separate AC source is given. The light bulbs will be inserted in a 4-port extension unit connected to a three-pin cord which can be plugged in to an AC source for supplying general 200 to 230 Volts to the individual light bulbs.
7. While giving the circuit connections, it should also be ensured that the AC and DC supplies are given without being interlinked to one another safety to their respective parts of the circuit.
8. Once the connections are safely given and a closed circulation unit is established, the AC and DC supplies can be switched ON.

Working

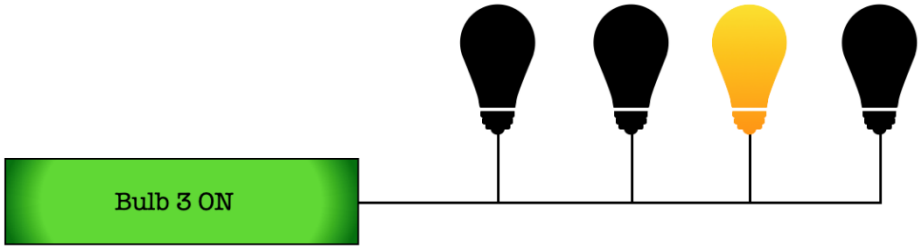
1. The program for the project is coded in Keil uVision software and along with the help of Willard Software, the program is burnt into the AT89C52 microcontroller. The microcontroller is connected to the programmer board and to the 5 Volts DC supply. The password for the individual bulbs is saved beforehand in the microcontroller.
2. The light bulbs are connected to the AC source plug.
3. When the circuit is switched ON, the light bulbs are all in switched OFF state.
4. The LCD shows an appropriate message to the user to enter the suitable password to operate the light bulbs.
5. The user may enter the password through the keypad, which is the input device.
6. When the password entered by the user is correct, the assigned light bulb to that particular password is switched ON. Similarly, when the same light bulb can be switched OFF by re-entering the same password. The status of that particular bulb is displayed on the LCD.
7. When the password entered is incorrect, then the LCD displays the appropriate incorrect message and the user may try again.

Theoretical Demonstration

1. When the circuit is switched ON, a display message is shown on the LCD and all the light bulbs are initially OFF.

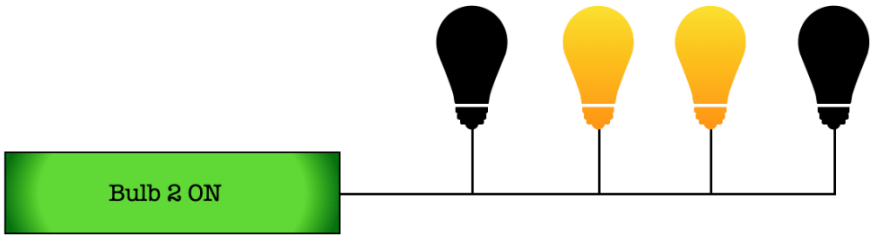


2. Suppose the password for bulb 3 is entered and it is correct, then the light bulb numbered 3 is switched ON and the status of that particular bulb is displayed.

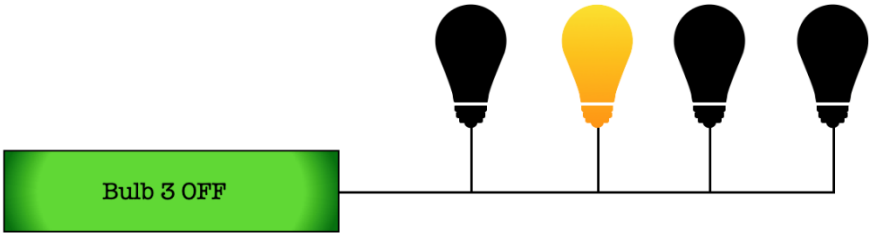


3. Then, when the password of light bulb 2 is entered, the light bulb 2 is switched ON and the status is displayed on the screen. Note that light bulb 3 is still switched ON as the

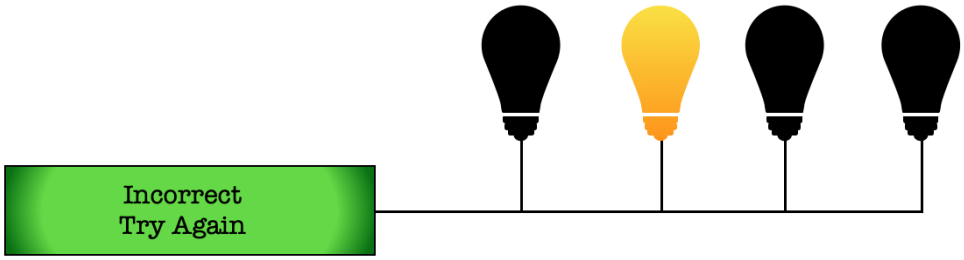
password needs to re-entered to switch the light bulb OFF. Thus, both the light bulbs 2 and 3 are ON.



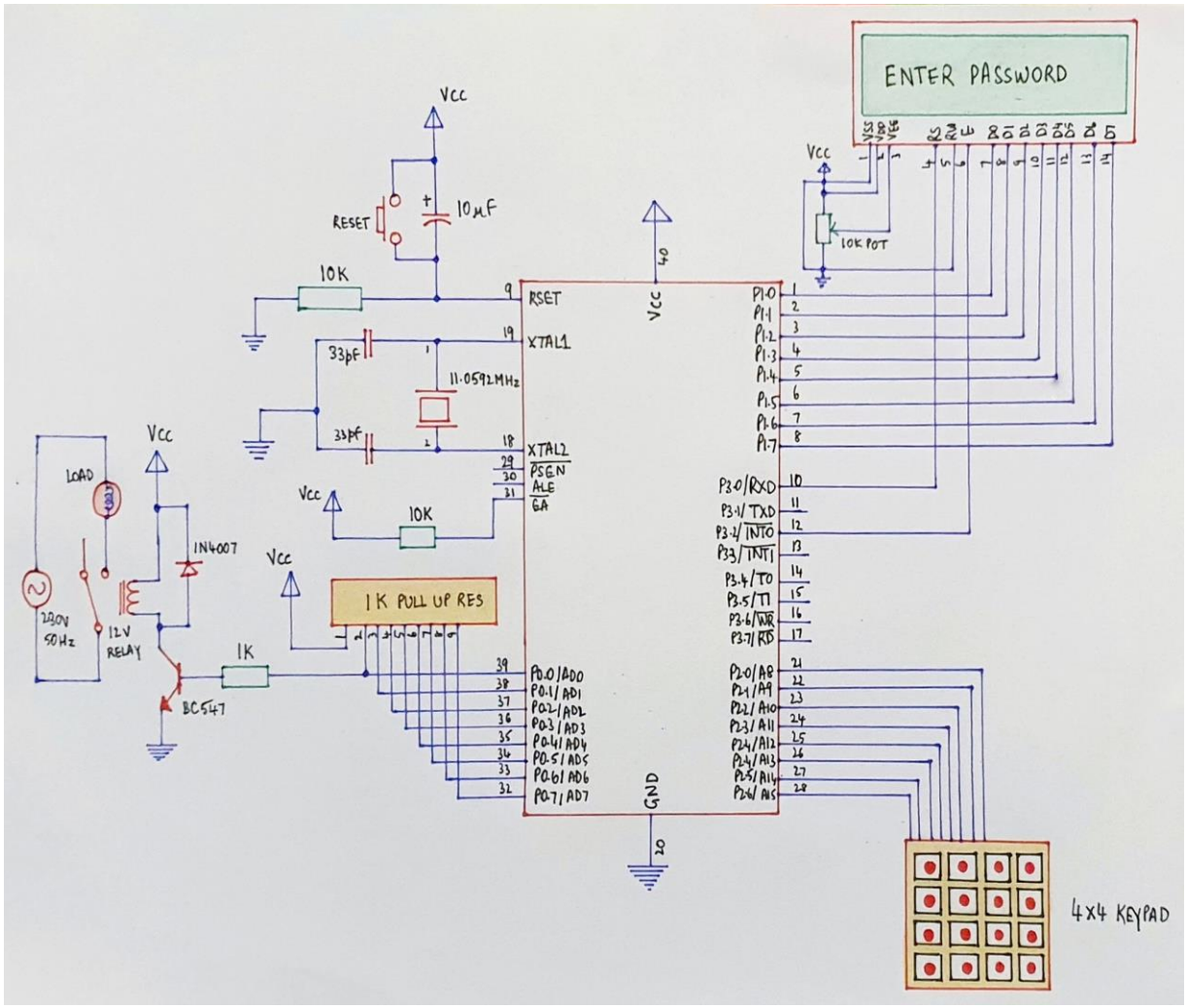
4. Again, when the password for bulb 3 is entered, the light bulb 3 which was initially in the ON state is now switched ON. Light bulb 2 remains ON.



5. When the user enters the incorrect password, the appropriate error message is displayed on the LCD. Due to the invalid password, the state of the bulbs remains as it was.



Circuit Diagram



Conclusion

Advancements towards technology should be utilized in all possible helpful manners to benefit all walks of life. Password based home appliance control is neither a complicated or new concept. However, these methods are often considered only at places to improve technology. But priorities should be given to safety over lavishness. This project was designed to ensure the safety of labors. One of a very common kind of accident in India are electric accidents. Especially to the linemen. Linemen are sent to the electric poles to make repairs and whilst they do, the substation staff communicate the status and accordingly switch ON of OFF the supply. The failure for improper communication can lead to fatal electric accidents to the linemen. This password control will lend the supply control to the linemen and they may freely turn ON or OFF the supply based on their working status. The substation will also not require to communicate with them. Thus, safety and one-man control is established.

This project as we know it can also be used in home appliance control or in apartments. This can also be used in hospitals or schools. Personal computers can all be connected to the password circuit and individual ones are operated by entering the appropriate password. This lifts privacy issues and wastage of current supplies. Classroom lights and fans can be in password control so when the schools or colleges close, the security can switch OFF all supplies from his desk. This load control through password not only serves as a safety tool but also as an affordable technological advancement in many many places.

Application

1. To ensure safety of linemen by lending password control of supplies to one man and also reduce requirement of substation communication.
2. In hospitals to switch ON or OFF devices with control solely lend to the doctors so that no unauthorized personnel or accidents are involved.
3. In schools and colleges to lend supply control of individual classrooms to one security guard so he may switch ON or OFF lights, fans and projectors at stipulated closing and opening times.
4. Can be used in home security systems for electric gates and for security cameras.
5. Can be used in apartment complexes to avoid unauthorized control of personal lifts, personal apartment gym equipment or outside lights.
6. It can be used in shopping malls where personal shop lights can be given password control to increase safety.
7. It will also be helpful in offices where each computer will have a personal password and can be accessed only through the same ensuring high safety for the office staff.
8. Can also be used in restaurants to lend control of lights and appliances to the head staff.

Algorithm and Program

1. Initial input is given from the user and the keypad is accepted as the input device.
2. Individual passwords for each load are pre-set in the program.
3. LCD is set as output device to display message ‘Enter Password’ when supply switched ON.
4. If else loop or while loop is set.
5. When password is correct, the load linked to that password is switched ON.
6. When password is invalid, LCD displays ‘Incorrect Try Again’.

```
#include<reg52.h>
#define lcd P1
sbit rspin=P3^0;
sbit epin=P3^2;
sbit bulb1=P0^0;
sbit bulb2=P0^1;
sbit bulb3=P0^2;
sbit bulb4=P0^3;
sbit r0=P2^0;
sbit r1=P2^1;
sbit r2=P2^2;
sbit r3=P2^3;
sbit c0=P2^4;
sbit c1=P2^5;
sbit c2=P2^6;
sbit c3=P2^7;
unsigned char key[4][4] = {0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15};
void delay (int);
void cmd (unsigned char);
void display (unsigned char);
void string (char *);
void init (void);
unsigned char keypress (void);
void delay (int d)
{       unsigned char i=0;
        for (; d>0; d--)
        {       for (i=250; i>0; i--);
                for (i=248; i>0; i--);
        }
```

```
}
void cmd (unsigned char c)
{           lcd=c;
            rspin=0;
            epin=1;
            delay (5);
            epin=0;
}
void display (unsigned char c)
{           lcd=c;
            rspin=1;
            epin=1;
            delay (5);
            epin=0;
}
void string (char *p)
{           while(*p)
            {       display(*p++);
            }
}
void init (void)
{           cmd(0x38);
            cmd(0x01);
            cmd(0x0c);
            cmd(0x80);
}
unsigned char keypress (void)
{           unsigned char row=-1, col=-1;
            r0=r1=r2=r3=0;
            c0=c1=c2=c3=1;
            while(c0&c1&c2&c3);
            r0=0;
            r1=r2=r3=1;
if((c0&c1&c2&c3) ==0)
{           row=0;
            goto check;
}
            r1=0;
            r0=r2=r3=1;
if((c0&c1&c2&c3) ==0)
{           row=1;
            goto check;
}
            r2=0;
            r1=r0=r3=1;
if((c0&c1&c2&c3) ==0)
{           row=2;
```

```
            goto check;
}
r3=0;
r1=r2=r0=1;
if((c0&c1&c2&c3) ==0)
{           row=3;
            goto check;
}
            check:
            if(c0==0)
                    col=0;
            else if(c1==0)
                    col=1;
            else if(c2==0)
                    col=2;
            else if(c3==0)
                    col=3;
            delay (20);
            while (! (c0&c1&c2&c3));
            return key[row][col];
}
void main ()
{           char i=0;
            char a=1, b=1, c=1, d=1;
            int temp1[5] = {0,1,2,3,4};
            int temp2[5] = {1,2,3,4,5};
            int temp3[5] = {2,3,4,5,6};
            int temp4[5] = {3,4,5,6,7};
            int temp [5];
            P0=0x00;
            init ();
            delay (5000);
            string ("   Password    ");
             cmd(0xc0);
             string (" Based Relay ");
             delay (3000);
             cmd(0x01);
while (1)
{            a=~a;
             b=~b;
             c=~c;
             d=~d;
             bala:
             cmd(0x80);
             string ("Enter password ");
             cmd(0xc0);
for (i=0; i<5; i++)
```

```
{               temp[i]=keypress ();
                display(temp[i]+48);
}
for (i=0; i<5; i++)
{           if(temp1[i]!=temp[i])
{         for(i=0;i<5;i++)
{        if(temp2[i]!=temp[i])
{          for(i=0;i<5;i++)
{         if(temp3[i]!=temp[i])
{          for(i=0;i<5;i++)
{         if(temp4[i]!=temp[i])
{               cmd(0x80);
                string ("Wrong password ");
                cmd(0xc0);
                string ("               ");
                delay (2000);
                goto bala;
} }
a=~a;
if(a==1)
{             cmd(0x80);
              string ("Bulb 4 ON       ");
              cmd(0xc0);
              string ("               ");
              bulb4=1;
              delay (2000);
              goto bala;
}
else
{             cmd(0x80);
              string ("Bulb 4 OFF      ");
              cmd(0xc0);
              string ("               ");
              bulb4=0;
              delay (2000);
              goto bala;
} } }
b=~b;
if(b==1)
{             cmd(0x80);
              string ("Bulb 3 ON       ");
              cmd(0xc0);
              string ("               ");
              bulb3=1;
              delay (2000);
              goto bala;
}
```

```
else
{          cmd(0x80);
           string ("Bulb 3 OFF      ");
           cmd(0xc0);
           string ("               ");
           bulb3=0;
           delay (2000);
           goto bala;
} } }
c=~c;
if(c==1)
{          cmd(0x80);
           string ("Bulb 2 ON       ");
           cmd(0xc0);
           string ("               ");
           bulb2=1;
           delay (2000);
           goto bala;
}
else
{          cmd(0x80);
           string ("Bulb 2 OFF      ");
           cmd(0xc0);
           string ("               ");
           bulb2=0;
           delay (2000);
           goto bala;
} } }
d=~d;
if(d==1)
{          cmd(0x80);
           string ("Bulb 1 ON       ");
           cmd(0xc0);
           string ("               ");
           bulb1=1;
           delay (2000);
           goto bala;
}
else
{          cmd(0x80);
           string ("Bulb 1 OFF      ");
           cmd(0xc0);
           string ("               ");
           bulb1=0;
           delay (2000);
           goto bala;       } } }
```

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