

Experiment Name: Multiplexing 7 segment displays using PIC Microcontroller

Theory: The seven segments were driven individually through separate I/O pins of the microcontroller. If we do just like that then for 4 seven segment LED displays, 28 I/O pins will be required, which is quite a bit of resources and is not affordable by mid-range PIC microcontrollers. That's why a multiplexing technique is used for driving multiple seven segment displays. This tutorial shows how to multiplex 4 common anode type seven segment LED displays with a PIC16F628A microcontroller.

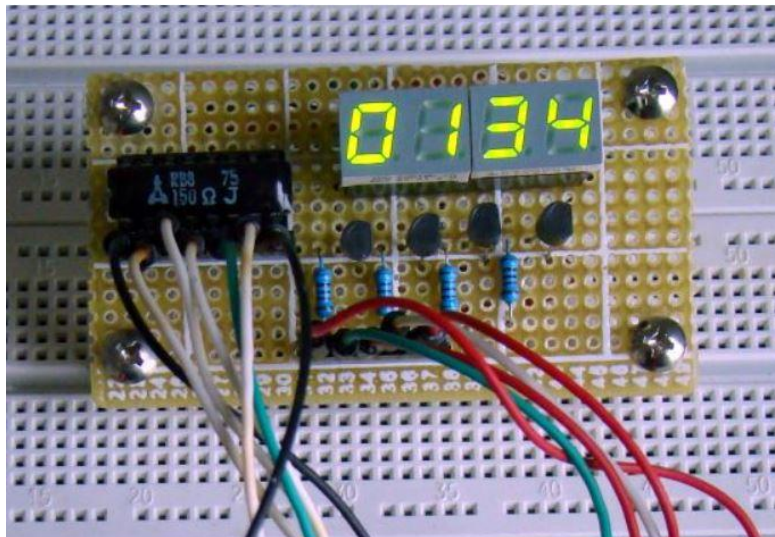


Figure-1: Multiplexing 4 common anode seven segment LED displays

The theory behind the multiplexing technique is simple. All the similar segments of multiple LED displays are connected together and driven through a single I/O pin. In the circuit below, the seven segments are connected to PORTB through current limiting resistors R_s . A particular segment is active when the corresponding PORTB pin is low. However, it will not glow until its anode is connected to Vcc. You can see the anodes of the four LED displays are not directly connected to Vcc. Instead, 4 PNP transistors are used as switches to connect or disconnect the anode terminals from Vcc. When the base of the PNP transistor is low, the transistor conducts and corresponding digit's common anode is connected to Vcc. Therefore, the transistor selects which displays is active. The conduction of the transistors are controlled by RA0 through RA3 pins of PORTA. Suppose, if we want to display 7 in the units digit place, then segments a, b, and c should be turned on first (which means RB0, RB1, RB2 are 0 and RB3-RB6 are 1) and then RA0 should be pulled low (while keeping RA1-RA3 high) so that only units digit display will be active. In order to display all 4 digits, each seven-segment display is activated sequentially using an appropriate refresh frequency so that it will appear that all they are turned on at the same time.

Circuit Diagram:

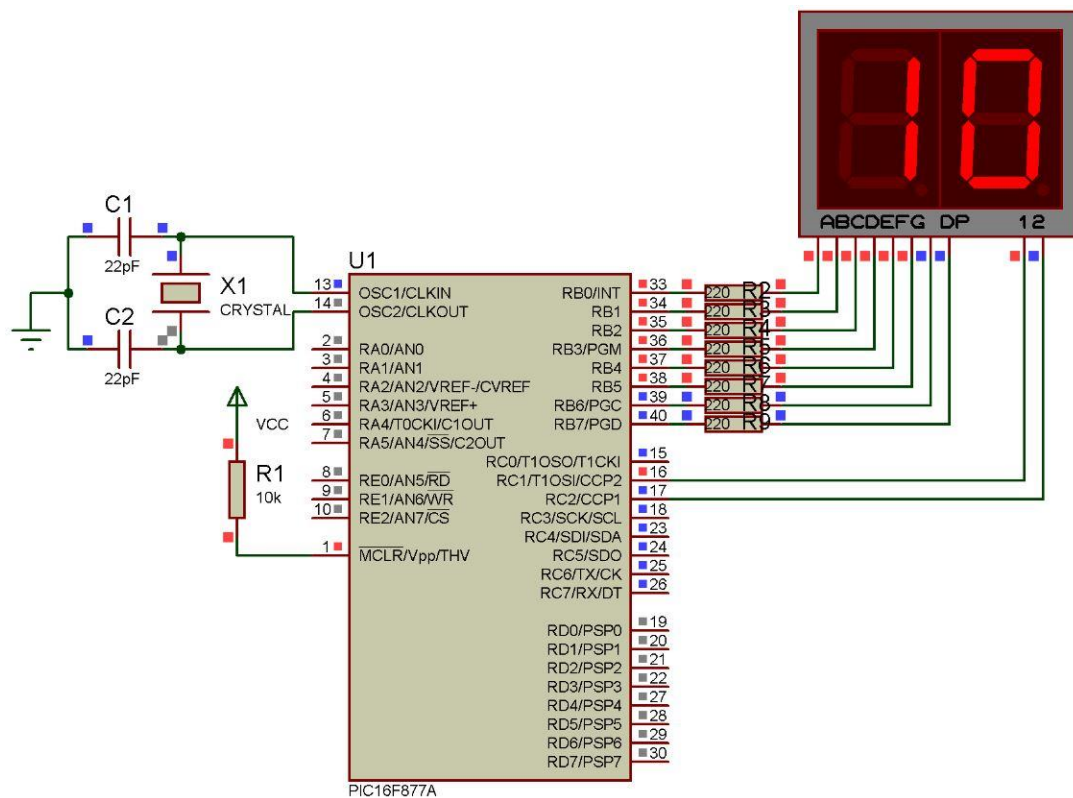


Figure-2: Multiplex of 7 segment display using PIC16F877A

MikroC Code:

```
#define digitL portc.f1
#define digitR portc.f2
unsigned char array[]={0x3f, 0x06, 0x5b, 0x4f, 0x66, 0x6d, 0x7d, 0x07, 0x7f, 0x6f};
void main()
{
    int i=0;
    int j, Left_digit=0, Right_digit=0, count;
    TRISB=0x00;
    TRISC=0x00;

    portb=0x00;
    portc=0x00;
    while(1)
    {
        Left_digit=i/10;
        Right_digit=i%10;

        for(j=0; j<50; j++)
        {
```

```
    portb=array[Left_digit];
    digitL=0;
    delay_ms(10);
    digitL=1;

    portb=array[Right_digit];
    digitR=0;
    delay_ms(10);
    digitR=1;
}
i++;
if(i>99)
    i=0;
}
}
```