

Experiment no:- 4

Rajdhani

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Aim:- Interfacing of LED & LCD Display with a PIC16F877A microcontroller.

part A:- Interfacing LED's with PIC microcontroller (PIC16F877A):

Theory:-

PORT B & the TRIS B Registers:-

- PORT B is also an 8 bit bi-directional port. Its direction controlled & maintained by TRIS B data direction register.
- Setting the TRIS B into logic '1' makes the corresponding "PORT B" pin as an input. Clearing the TRIS B bit makes PORT B as an output.
- Three pins of PORT B are multiplexed with the In circuit Debugger & low voltage programming pins. Its alternate pins are RB3/PAGT, RB6/PAGC & RB7/PAGD. For programming its alternate pins.

Algorithm of program:

- 1) Specify the output port.
- 2) Start infinite loop [while (1) {} is used here].
- 3) Pass 0x00 value to the output port.
- 4) Provide a delay.
- 5) Pass 0xFF value to the output port.
- 6) Provide a delay.
- 7) Repeat the loop.

Program:-

```
void main() {  
    TRISB = 0 // set port b as output  
    while (1)  
    {  
        PORT B = 0x00;  
        delay - ms(1000);  
    }  
}
```

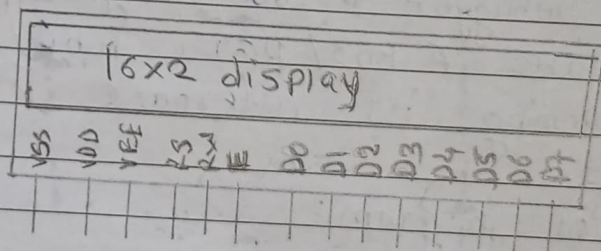
PORT B :-

Interfacing LCD display with PIC16877A:

Theory:-

16x2 LCD Display:

pin diagram:-



- A 16x2 LCD means it can display 16 character per line & there are 2 such lines.
- This LCD has two registers namely command & data.
- The command register stores the command instructions given to LCD to do a predefined task like initializing it, clearing its screen, setting cursor position etc.
- The data register stores the data to be displayed on the LCD.

o pin Discription

- 1) VSS - Ground.
- 2) VDD - +5V supply.
- 3) VEE - Contrast adjustment (Vo).
- 4) RS - Register select 0: Command, 1: data.
- 5) R/W - Read/write R/W = 0: write, R/W = 1: Read.
- 6) EN - Enable falling edge triggered.
- 7) D0 - Data bit 0.
- 8) D1 - Data bit 1.
- 9) D2 - Data bit 2.
- 10) D3 - Data bit 3.
- 11) D4 - Data bit 4.
- 12) D5 - Data bit 5.
- 13) D6 - Data bit 6.
- 14) D7 - Data bit 7 / Busy flag.
- 15) A/LED⁺ - Back-light Anode (+).
- 16) K/LED⁻ - Back-light Cathode (-).

- The LCD display module requires 3 control lines as well as either 4 or 8 I/O lines for the data bus.
- The user may select whether the LCD is to operate with a 4 bit data bus is used or an 8 bit data bus.
- If a 4 bit data bus is used the LCD will require a total of 7 data lines (3 control lines plus the 4 lines for the data ~~lines~~ bus).
- If an 8 bit data bus is used the LCD will require a total of 11 data lines (3 control lines plus the 8 lines for the data bus).

• LCD commands:

code (Hex)	command to LCD Instructn Reg.
1	clear Display screen.
2	Return Hom
4	Decrement cursor (shift cursor to left)
6	Increment cursor (Shift cursor to Right)
5	Shift display Right.
8	Display off, cursor OFF.
A	Display OFF, cursor ON.
C	Display ON, cursor OFF
E	Display ON, cursor blinking
F	Display ON, cursor blinking.
10	Shift cursor position to left.
14	Shift the entire cursor position to Right.
18	Shift the entire display to the left.
1C	Shift the entire display to the Right.
80	Force cursor to begining of 1st line
OC0	Force cursor to begining of 2 nd line
38	2 liner & 5x7 matrix
7	Shift display left.

• program:-

```
// Title: LCD interfacing with PIC16F877A.
// LCD module connections.
sbit LCD_RS at RC2_bit; // LCD reset
sbit LCD_EN at RC3_bit; // LCD enable.
sbit LCD_D4 at RC4_bit; // LCD reset data.
```



```

shift LCD-D5 at RC5-bit; // Data
shift LCD-D6 at RC6-bit; // Data
shift LCD-D7 at RC7-bit; // Data.

```

// LCD pin Direction.

```

shift LCD-RS-Direction at TRISC2-bit;
shift LCD-EN-Direction at TRISC3-bit;
shift LCD-D4-Direction at TRISC4-bit;
shift LCD-D5-Direction at TRISC5-bit;
shift LCD-D6-Direction at TRISC6-bit;
shift LCD-D7-Direction at TRISC7-bit;

```

char i;

void main() {
while (1)

{ LCD-Init();

LCD-cmd(-LCD-CLEAR);

LCD-cmd(-LCD-CURSOR-OFF);

LCD-out.(2,1,"welcome to GRE, Karad");

Delay-ms(1000);

for (i=0; i<10; i++) {

LCD-cmd(-LCD-shift-left);

delay-ms(250); }

}

Conclusion:- Hence, we have learnt the program
interfacing of LED & LCD in PIC16F877A
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