CLO 2 Lab 10
LCD Interfacing with PIC Microcontroller (PIC18F4550/PIC16F887/PIC16F877A)

Objective

In this lab students will be able to learn

- Define the basic working principle of LCDs and list the necessary connections required for LCD interfacing with PIC microcontrollers.
- Explain the role of RS, RW, E, and data pins in LCD communication.
- Demonstrate the procedure of initializing the LCD and sending commands/data to it using PIC microcontroller programming.

Introduction

LCD (Liquid Crystal Display) modules are widely used to display characters, numbers, and special symbols in embedded systems projects. One of the most common LCDs used is the 16x2 alphanumeric LCD**,** which can display 2 rows of 16 characters each. Interfacing this LCD with PIC microcontrollers like PIC18F4550, PIC16F887, or PIC16F877A follows a very similar procedure since all three microcontrollers have similar GPIO (General Purpose Input Output) architectures.

Components Needed:

- PIC18F4550 / PIC16F887 / PIC16F877A microcontroller
- 16x2 Character LCD
- Potentiometer (for contrast adjustment)
- 10kΩ resistor (optional for pull-up)
- Power supply (typically +5V)
- Breadboard and connecting wires

PIN DESCRIPTION OF LCD

Pin	Symbol	Description
1	Vss	Ground
2	Vcc	+5V power supply
3	Vee	Power Supply to control contrast
4	RS	RS=0 ;command register RS=1 ;Data register
5	R/W	R/W=0 ;Write R/W=1; Read
6	E	Enable
7	DB1	The 8-bit data bus
8	DB2	The 8-bit data bus
9	DB3	The 8-bit data bus
10	DB4	The 8-bit data bus
11	DB5	The 8-bit data bus
12	DB6	The 8-bit data bus

13	DB7	The 8-bit data bus
14	DB8	The 8-bit data bus

LCD Command Codes

Command	Function
0x01	Clear Display
0x02	Return Home
0x06	Entry Mode Set (cursor move direction)
0x0C	Display ON, Cursor OFF
0x38	8-bit mode, 2-line display
0x28	4-bit mode, 2-line display

Connection Overview:

- Connect RS, RW, and E pins to the microcontroller's digital output pins.
- Connect D0-D7 (8-bit mode) or D4-D7 (4-bit mode) to microcontroller pins.
- Use a potentiometer connected to V0 for contrast adjustment.
- Connect VSS to GND and VDD to +5V.
- If using a backlight, connect LED+ through a current-limiting resistor to +5V and LED- to GND

Exercise

Write a program for displaying your name on LCD. Show simulation results on PROTEUS as well. Draw the complete circuit diagram showing all the connections of LCD with PIC Microcontroller. [5+5+5]

Circuit Diagram

Introduction to embedded systems **Total Marks: 25**

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What is the Role of RS, E and R/W pin of LCD? [3]

How to control the contrast of LCD? [3]

If you have to display the text in the second line and at 4th position, then what values should be issued to command register? [2]

Conclusion? [2]