Lab 11
LCD and KEYPAD interfacing

Objective

In this lab students will be able to learn

- How LCD is interfaced with PIC microcontroller for displaying output.
- How Keypad is connected to PIC microcontroller for providing input.

Introduction

LCD is finding widespread use replacing LEDs because of declining prices of LCD and the ability to display numbers, characters, and graphics. Incorporation of a refreshing controller into the LCD thereby relieves the CPU of the task of refreshing the LCD. Ease of programming for characters and graphics.

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

Code (Hex)	Command to LCD Instruction Register
1	Clear display screen
2	Return home
4	Decrement cursor (shift cursor to left)
6	Increment cursor (shift cursor to right)
5	Shift display right
7	Shift display left
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 cursor position to right
18	Shift the entire display to the left
1C	Shift the entire display to the right
80	Force cursor to beginning to 1st line
C0	Force cursor to beginning to 2nd line
38	2 lines and 5x7 matrix

Keypad

Keyboards are organized in a matrix of rows and columns. The CPU accesses both rows and columns through ports. Therefore, with two 8-bit ports, an 8 x 8 matrix of keys can be connected to a microprocessor. When a key is pressed, a row and a column make a contact otherwise; there is no connection between rows and columns. A 4x4 matrix is connected to two ports. The rows are connected to an output port and the columns are connected to an input port.

It is the function of the microcontroller to scan the keyboard continuously to detect and identify the key pressed. To detect a pressed key, the microcontroller grounds all rows by providing 0 to the output latch, and then it reads the columns. If the data read from columns is D3 – D0 = 1111, no key has been pressed and the process continues till key press is detected. If one of the column bits has a zero, this means that a key press has occurred. For example, if D3 – D0 = 1101, this means that a key in the D1 column has been pressed. After detecting a key press, microcontroller will go through the process of identifying the key. Starting with the top row, the microcontroller grounds it by providing a low to row D0 only. It reads the columns, if the data read is all 1s, no key in that row is activated and the process is moved to the next row. It grounds the next row, reads the columns, and checks for any zero. This process continues until the row is identified. After identification of the row in which the key has been pressed find out which column the pressed key belongs to.
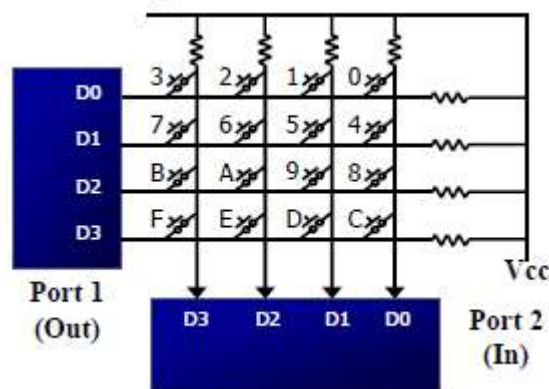
Exercise

Write a program for displaying your name on LCD in second line and at 6th location. Show simulation results on PROTEUS. [5]

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Why do we need to test busy flag before issuing any command to LCD? [5]

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Write an assembly language program for displaying any pressed key from keypad on LCD. Show your result on PROTEUS. [10]

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