Interfacing LCD module with PT-51 Board

This application involves simple port configurations and understanding of different LCD commands.

LCD:

In an LCD, displaying a character involves turning on or off different pixels. The control for implementing all this is cumbersome. To manage LCD displays, Hitachi introduced a microcontroller (HD44780U) which was preprogrammed to control displays. Apart from providing appropriate square waves to pixels, it has a local memory which stores the characters to display and a programmable memory which stores fonts.

The LCD display provided to you is JHD162A. This display also uses the controller HD44780U.

Thus, controlling the LCD display is just a matter of sending commands and data from the microcontroller on Pt-51(AT89C5131A) to the microcontroller on the display (HD44780U). JHD162A can display up to 16 characters per line in two lines (hence its name – 16 2A). When the data to be displayed is sent to the LCD board, it is stored in the RAM of the on-board microcontroller. The LCD microcontroller must be told that new data has arrived and should be given time for it to read this data and to act on it, before further data can be sent to it. The interfacing protocol is built around these requirements.

Hardware Interfacing:

The 44780 interface uses three control lines.

RS (register select): Low for command transfer and high for data transfer

RW (read/write): Low for write and high for read

EN (Enable): Provides hand shake for data transfer

The Pt-51 board has a slot for the LCD. The microcontroller pins used in LCD interfacing are shown as follows

P0.0 -----------**RS**
P0.1-----------**RW**
P0.2-----------**EN**
P2   -----------**Command/Data**

LCD commands and data:
Different commands can be put to use to perform operations like blinking the cursor, clearing the LCD screen, controlling the location of data etc. This can be done as shown below

RS - The status of this pin (high or low) decides whether the message sent through PORT2 is data or command. If low, it is perceived as command and on the contrary as data
R/W - A low is maintained on this line to perform a write operation
EN - A negative edge trigger makes the LCD module read the data on PORT2.
Writing data is done as shown below
RS - A high should be maintained on this line and the data to be written should be represented in ASCII

Commonly used commands are:

0x38	Initialization of 16X2 LCD in 8bit mode
0x01	Clear LCD
0x0C	Cursor off
0x80	8 means go to first line and 0 is for 0th position

Coding
The code can be divided into two parts

1. Port configuration
2. Algorithm

A. Port configuration
We would be configuring the PORT2 and the PORT0 pins P0.0, P0.1 and P0.2 as output for the microcontroller to communicate with the LCD module.

B. Algorithm
Step1: If command is to be sent to the LCD, then perform the following
RS=0
R/W=0
EN=1
PORT2=command

If data is to be sent then,
RS=1
R/W=0
EN=1
PORT2= ASCII equivalent of the data to be written
Step2: Execute the delay routine
Step3: Set EN=0.
Remember that data gets transferred on the negative edge.