LCD (LIQUID CRYSTAL DISPLAY) INTERFACE

       LCDs can display numbers, characters, and graphics. To produce a proper display, the information has to be periodically refreshed. This can be done by the CPU or internally by the LCD device itself. Incorporating a refreshing controller into the LCD, relieves the CPU of this task and hence many LCDs have built-in controllers. These controllers also facilitate flexible programming for characters and graphics. Table 5.1 shows the pin description of an LCD. from Optrex.

Pin no.	Symbol	External connection	Function
1	Vss		Signal ground for LCM
2	V_{DD}	Power supply	Power supply for logic for LCM
3	V_0		Contrast adjust
4	RS	MPU	Register select signal
5	R/W	MPU	Read/write select signal
6	E	MPU	Operation (data read/write) enable signal
7~10	DB0~DB3	MPU	Four low order bi-directional three-state data bus lines. Used for data transfer between the MPU and the LCM. These four are not used during 4-bit operation.
11~14	DB4~DB7	MPU	Four high order bi-directional three-state data bus lines. Used for data transfer between the MPU

Table 5.4.1 Pin description of LCD

- Vss and VDD provide +5v and ground, V0 is used for controlling LCD contrast.

- If RS=0, the instruction command register is selected, allowing the user to send a command such as clear display, cursor at home, etc.

- If RS=1 the data register is selected, allowing the user to send data to be displayed on the LCD.

- R/W input allows the user to Read/ Write the information to the LCD.

- The enable pin is used by the LCD to latch information presented to its data pins.

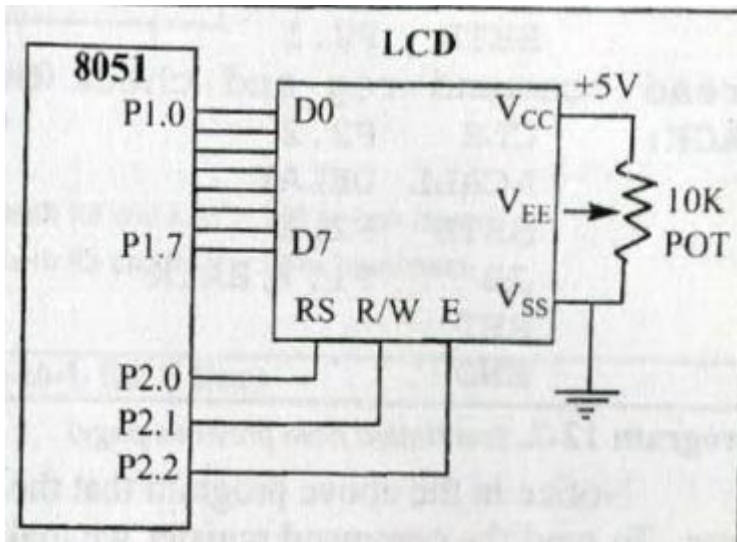- The 8-bit data pins are used to send information to LCD.

LCD COMMAND CODES

The LCD's internal controller can accept several commands and modify thedisplay accordingly. These commands would be things like:

✓ Clear screen

✓ Return home

✓ Decrement/Increment cursor

After writing to the LCD, it takes some time for it to complete its internal operations. During this time, it will not accept any new commands or data. Figure 5.4.1 shows the command codes of LCD and Figure 5.4.2 shows the LCD interfacing. We need to inserta time delay between any two commands or data sent to LCD.

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

LCD Command Codes

LCD Connections to 8051