

Liquid crystal display is very important device in embedded system. It offers high flexibility to user as he can display the required data on it. But due to lack of proper approach to LCD interfacing many of them fail. Many people consider LCD interfacing a complex job but according to me LCD interfacing is very easy task, you just need to have a logical approach. This page is to help the enthusiast who wants to interface LCD with through understanding. Copy and Paste technique may not work when an embedded system engineer wants to apply LCD interfacing in real world projects.

First thing to begin with is to know what LCD driver/controller is used in LCD. Yes, your LCD is dumb it does not know to talk with your microcontroller. LCD driver is a link between the microcontroller and LCD. You can refer the datasheet of LCD to know the LCD driver for e.g. JHD 162A is name of LCD having driver HD44780U. You have to interface the LCD according to the driver specification. To understand the algorithm of LCD interfacing user must have datasheet of both LCD and LCD driver. Many people ignore the datasheets and end up in troubles. If you want to interface LCD successfully you must have datasheets.

Why people ignore datasheets? Most of us do not like to read 100 pages of datasheet. But for a accurate technical specification datasheets are must. I will show you a technique to manipulate a datasheet within minutes.

First thing to find out in datasheet is the features viz. operating voltage, type of interface, maximum speed for interface in MHz, size of display data RAM, number of pixels, bits per pixel, number of row and columns.

You must have the pin diagram of LCD. Pin diagram of LCD driver can be omitted.

Study the type of communication protocol whether it is parallel or serial interface. Check how LCD discriminates data bytes and command bytes, which pins on LCD are used for communication. Study Interface timing diagram given in the datasheet.

From datasheet of LCD driver find out whether hardware reset is required at startup, what is the time of reset pulse, is it active low and which pins of LCD are to be toggled.

Major task in LCD interfacing is the initialization sequence. In LCD initialization you have to send command bytes to LCD. Here you set the interface mode, display mode, address counter increment direction, set contrast of LCD, horizontal or vertical addressing mode, color format. This sequence is given in respective LCD driver datasheet. Studying the function set of LCD lets you know the definition of command bytes. It varies from one LCD to another. If you are able to initialize the LCD properly 90% of your job is done.

Next step after initialization is to send data bytes to required display data RAM memory location. Firstly set the address location using address set command byte and then send data bytes using the DDRAM write command. To address specific location in display data RAM one must have the knowledge of how the address counter is incremented.

Study my tutorials on different type of LCD interfacing with microcontroller and parallel port

### LCD interfacing Tutorials

#### **Color LCD interfacing with AT89C51**

This is an excellent tutorial to begin with color lcd interfacing. Nokia 6610 lcd with Philips PCF 8833 driver is used here. LCD pinouts and interface diagram with micro controller is given here .It explains 9-bit SPI protocol with reset timing. Details on color interface of pixel and information on pixel color format is given. Addressing a pixel and displaying a 256 color image is also shown. It has free programming code which helps to understand the programming sequence of Nokia6610 lcd.

#### [Graphic LCD Interfacing with AT89C51](#)

This is a tutorial on graphic lcd interfacing with AT89C51.Nokia3310 is used as graphic lcd. It has 48x84 pixels. Programming algorithm is for PCD 8544 lcd driver.LCD pin outs and circuits diagram are given. It has complete details on display data RAM (DDRAM) and addressing a pixel with different modes. Serial Interfacing protocol is explained in detail with timing diagram. Very rare information on BMP to HEX conversion is also listed here.

<http://www.lcdinterfacing.info/Nokia-3310-LCD-Interface.php>

#### LCD Interfacing with AT89C51

This is a tutorial on alphanumeric 16x2 lcd interfacing with AT89C51.The programming algorithm is compatible with HITACHI HD44780U lcd controller .Complete programming code is given with neat circuit diagram.

<http://www.lcdinterfacing.info/Interface-LCD-to-8051.php>

#### LCD interfacing to parallel port using Visual Basic

This is a easy tutorial on interfacing LCD module to parallel port of your computer. Visual basic is used to program the interface between LCD and parallel port. There is open source VB code which works under Windows Xp. It also shows how to use inpout32.dll and port.dll

<http://www.lcdinterfacing.info/Interfacing-LCD-with-VB6.php>