

Lab-2: LCD Display

In this set of experiments, we develop display and other utilities which will be useful to us for the later experiments. For these experiments, you will have to attach the LCD unit to the Pt51 board. Please remember that the display has to be plugged in such a way that it extends *outside* the board and *not* over it. Plugging in the display in the wrong orientation may damage it! Please refer to the tutorial on Liquid Crystal Display Control, which was put up on the WEL LAB site.

For this lab, a subroutine which writes characters to the LCD display is being supplied to you. Study it to see how it works, so that you can write variations of it in your future programs yourself.

Homework

1. Write a subroutine which converts a byte in binary to two ASCII characters representing its Hexadecimal representation. The byte will be placed in A by the calling program. The subroutine should return the two characters in registers A and B. Debug this using the assembler/debugger on a PC or laptop.
2. Using the supplied routine for writing characters to the LCD, Write a program which will display “EE 337 - Lab 2” on the first line and your name on the second line. Pad the display lines with spaces such that these are centered on the LCD when displayed. Your name should not be hard coded in the program, but stored as a 16 byte array of characters in the upper RAM. The program should display whatever is stored in this array. You should assemble, debug, download and run this program on the supplied kit before coming to the lab.

Lab Assignments

1. Write a program which will display the contents of 8051 registers on the liquid crystal display in the following format:

First line of display should show the values of registers A, B and PSW in the format: "ABPSW = ?? ?? ??", The second line should display the contents of R0, R1 and R2 in the format "R012 = ?? ?? ??". Here ?? represents the actual content of those registers in Hex. This display should be held for about 5 seconds.

After this, the display should show "R345 = ?? ?? ???" on the first line and "R67SP = ?? ?? ???" on the second line.

2. Write a program which will display the contents of 16 locations in the on-chip RAM. The location will be specified by setting switches on the board. (These are connected to the lower nibble of P1 on the Pt51 board). These 4 bits will be interpreted as the more significant nibble of the RAM address, the less significant nibble will be taken as 0. You have to read the switches twice with a delay and only when the two values agree that you will proceed to display the memory contents.

The contents should be displayed 4 bytes per line. Thus 8 bytes will be displayed at a time. The next 8 bytes should be displayed after a pause of 5 seconds.

Notice that you have to check whether the address range in question is in the directly addressable memory (00-7FH) or in the indirectly addressable memory (80-FFH). The contents shown should have been fetched using the correct addressing mode.

The whole sequence should repeat endlessly. That is, read switches, display 8 bytes, wait for 5 seconds, display the next 8 bytes, wait for 5 seconds, read the switches again ... and so on.