Department of Electronics Engineering

EE 3710 Lab 6

Title: Interfacing an LCD module

Objective: The student should understand the nature of a bus and how to connect components to it. The student should be able to write a program that interfaces with the LCD controller and verify proper operation of both the hardware and the software.

Parts: Project from Lab 5
1 18-pin male header
2 18-pin female solder tail connector
4 #4-40 standoffs (1/2”)
8 #4-40 machine screws (1/4")
1 74HC138
1 0.1µF capacitor
1 S12864N LCD module

Preparation: Write the title and a short description of this lab in your lab book. Make sure the page is numbered and make an entry in the table of contents for this lab.

Design a circuit that interfaces the LCD module to the C8051F020 using the external memory interface. Include an address decoder so that as many as 8 other devices can share the bus, each with 4k address space. The first block should start at 8000H. You will need to connect the LCD reset signal to a port line on the microcontroller. P4.4 is a good choice for that.

You may acquire an address latch (74HC373) to demultiplex the lower 8 bits of the address bus, but since the only non-multiplexed address line required for the project this semester is A0 of the LCD module, you may choose to connect it to one of the non-multiplexed address lines (A8-A15) of the microcontroller. Be sure to study all the ramifications of this choice before you make it.

Record your schematic in your lab book. Remember to label all components and give numbers and names to each pin of each component

Determine the timing constraints for the LCD controller (ST7565R) and record them in your lab book. Document the configuration of the C8051F020 external memory interface based on these constraints.

Information on the ST7565R, along with the list of command codes needed to initialize the LCD can be found at:

www.displaytech-us.com/pdf/application/Graphic_Module/Sitronix

Compute the external memory addresses you will use to access the command and data registers on the LCD and record them in your lab book. Add a memory map to your lab book for the external data memory space (This should show the address ranges of the internal XRAM and the LCD controller.)

Assemble your circuit. Solder the 18-pin male header so it protrudes from the back of the S12864N LCD module. Solder the 2 18-pin female connectors into your proto board. Mount the module using the 8 #4-40 screws and the four ½" standoffs.

Make all connections to the LCD as shown in your schematic and bring the assembled circuit, with your lab book, to your lab period.

Lab Work: Create a project file for this lab. As a starting point, you may use the lcd.asm module on the course website. Modify the code as necessary to account for (a) the external memory interface configuration you documented in your lab book, (b) the port line you used to reset the LCD controller, and (c) the memory addresses of the LCD registers in your memory map.

If your project combines C code with the lcd.asm module, you should include the header file lcd.h (also on the course website).

Write code to fill the LCD with a cross-hatch pattern (diagonal lines that repeat every 8 pixels). The easiest way to do this is to modify the blank_screen function so it initializes the accumulator with 1 and rotates it each time a byte is stored.

Build your code and make sure there are no assembly errors.

Download your program then run it. Correct errors if necessary (a common error is to reverse the order of the data lines). If necessary, your lab instructor can show you how to use the logic analyzer. With it, you can verify that a) the reset to the LCD module is asserted briefly, b) that before any command is sent, the status of the LCD is read to make sure it is not busy, and c) that the data being sent to the LCD is as expected (no bit reversals, etc.).

Once the LCD shows the cross hatch pattern, print your code (C, assembly and header files) and affix it to your lab book.

Write a summary/conclusion in your lab book and demonstrate your working system to the lab instructor.