Department of Engineering

EE 3710 Lab 2

Title: Basic Input and Output

Objective: The student should be able to write, assemble, download and test a simple program that manipulates the I/O ports on a microcontroller.

Parts:
1-C8051FX20-TB Evaluation Board & USB Debug Adapter
Project Board
1 96-pin edge card connector
3 32-pin connectors
1 10-LED bar graph
2 6-pin Bussed Resistor Networks (220Ω)
1 8-position DIP switch
2 pushbutton switches
jumper wire

Software: Silicon Laboratories IDE version 3.50.00 or greater

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 connects the 10-LED bar graph to ports of the C8051F020. You are free to choose any ports you like, but avoid port 0 (bits 0 and 1 will be used for the serial port) and ports 4, 6 and 7 (these will be used for bus expansion later). Make the LEDs turn on when the corresponding port lines are low.

Design another circuit that connects the two pushbutton switches and the eight DIP switches to other ports on the C8051F020. The pushbuttons have 4 pins, but you will only need to connect to two of them. Use an ohm meter to decide which pins to use.

Be sure to include all design work including schematics in your lab book.

Solder on the 96-pin connector, the three 32-pin connectors, the bar graph, resistors, pushbuttons and DIP switch. Use jumper wire to implement the circuits you designed in your lab book.

Write an 8051 assembly program (lab2.asm) that continually reads the pushbutton and DIP switches and reflects the state of the

pushbuttons on two of the LEDs and the state of the DIP switches on the other 8 LEDs.

Note. In order for the C8051F020 to behave as a normal 8051, you must execute the following instructions when your program starts:

```
mov     wdtcn,#0DEh     ; disable watchdog
mov     wdtcn,#0ADh
mov     xbr2,#40h       ; enable port output
```

Remember to include (c8051f020.inc)

Create a project using the IDE and build your code as you did in Lab 1. Find and correct syntax errors, if any. Bring your lab book, completed circuit and assembly code to your laboratory period. Demonstrate to the instructor that the preparatory work is complete.

Lab Work: Using the IDE, download your program code and run it.

Stop the program by pressing the red button. Display the “Ports” Debug window (under the View menu). Verify that the current DIP switch settings are displayed on the ports you have chosen.

Change the DIP switches and “refresh” the values (there is a button on the toolbar). Verify that the new DIP switch settings are reflected on the ports.

Modify the ports so the even numbered LEDs are on and the odd LEDs are off. Refresh the values and verify that every other LED is turned on. Repeat the process but reverse the bits. Refresh the values and verify that the LEDs that were on are now off and vise-versa.

Press the green button to resume program execution. Verify that all the LEDs follow their corresponding DIP switches and pushbuttons.

Print out your (working) assembly code and affix it to your lab book.

Demonstrate lab1a.asm to your lab instructor. Then stop the program and demonstrate that you can set the LEDs manually.

Write a summary/conclusion in your lab book and present it to your lab instructor for grading.