Requirements Specification for EE465 Lab Project 2: Liquid-Crystal Display and Keypad

Lab project goal: Entries from a 16-button keypad will be displayed on an LCD and also on a single-in-line string of 8 LEDs.

A 16-character-by-2 line LCD module will be added to the HCS908QG8 breadboard microcontroller circuit. Numbers entered via the keypad will be displayed as alphanumeric characters on the LCD module and also in a hexadecimal format on the single-in-line string of 8 LEDs.

Requirements for lab project completion:

1. Modify your HCS08QG8 breadboard to match the schematic titled "LAB2- Liquid Crystal Display and Keypad."

2. Your LCD should be a Microtips MTC-S16204XRYHS-10 display, 2 lines by 16 characters. Data sheets for this LCDs are available at our class web site. A Freescale Application Note, AN1745, describes how to interface an HC705 (closely related to the HCS08) to an LCD module. There is another Application Note, AN2940 that describes a LCD driver as well. The application notes are also available at our class web site.

3. After a reset by the reset switch connected to pin 1 on the HCS08QG8, the LCD screen should be blank and all 8 LEDs should be off. The reset switch can be used at any time to blank the LEDs and LCD.

4. When any key is pressed on the keypad, the key value should be displayed on the LCD. 0 through 9 and A through D should be displayed as alphanumeric characters. The '*' sign should display as 'E', the '#' sign as 'F.' Each entry should be shown on the LCD display until the top line is full with 16 characters. You may reset the LCD after the 17^{th} character is entered by first blanking the screen or by a manual reset on the reset switch and then displaying the 17^{th} character.

5. Use the first (bits 0-3) 4 LEDs in the string to display the hex value of the key that was last pressed. Examples:
If 9 is pressed, LED pattern is 1001.
If D is pressed, LED pattern is 1101.
If # is pressed, LED pattern is 1111.

6. Place the heartbeat LED on LED 8 on the SLK board. It should continuously toggle at 1.0 second on, 1.0 second off.

7. All LED time durations in this project are required to be within +/- 10% of specification.

8. Your project grade will be based on the report that you hand in during this or subsequent lab sessions. Your report must include:

a. A cover memo summarizing the methods you used to solve the problem. Follow the informative memo guidelines on the ECE web site.

b. A listing of your file containing a header section with a clear description of the program purpose, key variables, and other information that would be useful to another programmer reading your listing at a later date. Your header should also include your name and your partners name, the date, and your EE465 lab session.

c. A flow chart for this program.

d. A sign-off from the instructor or a TA indicating that your program performed as required and the required circuit modifications were completed. **Each lab team member must build a hardware circuit and receive a sign off for their own circuit**. Please attach this requirements specification with signoff and partner names together with your listing and flowchart.

Lab Demo Due Thursday February 20, 2014; Memo Report Due Tuesday Feb 25, 2014

Name(s) Instructor/TA Date

February 4, 2014