

Requirements Specification for EE465 Lab Project 3: 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 with a student programmed I2C interface will be added to the student built custom breadboard microcontroller circuit built in Lab 2. 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. Use Eagle Schematic Software to generate a schematic of the circuit developed in class using I2C to communicate between the three MSP430's that interface to the LCD, Keypad and LEDs.
2. Your LCD should be a Microtips NMTC-S16204XRGHS-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 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 the MSP430s, 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. Make sure to enable your reset switch on each MSP430 device.
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 17th character is entered by first blanking the screen or by a manual reset on the reset switch and then displaying the 17th character. Or you can display the 17th character by wrapping around to the second line of the LCD.
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.

7. Your project grade will be based on the memo report that you hand in during this or subsequent lab sessions and your demonstration of your code written for this lab.

Your **Memo Report** must include:

- a. A memo report summarizing the methods you used to solve the problem. Your memo report should include a flow chart for your program. See the “Example Lab Report” folder for an example.
- b. Each student should upload their commented code to the appropriate “Dropbox” for this lab on D2L.
- c. Upload a copy of your Eagle Schematic for Lab 2 to the “Dropbox” for this lab on D2L.

Memo Report Date: Tuesday, March 3, 2020 (by 6 PM)

Code Demonstration:

- c. 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 and demo a hardware circuit to receive a sign off for their own circuit.** A sign-off sheet will be kept by the instructor and TA indicating completion of the lab.

Demo Due Date: Thursday, February 27, 2020 (by end of lab time)