

Requirements Specification for EELE465 Lab Project 1: Keypad and Time-Varying Patterns on Eight LEDs

Lab project goal: Select a Pattern and Display time-varying patterns on eight LEDs.

Four distinct patterns will be displayed on eight LEDs using your MC9S08QG8s and a breadboard with a student built custom circuit. Patterns will be selected based on which button is pressed on your keypad. Three patterns will be time-varying and repeating sequences, one will be static.

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 two MC9S08QG8s.
- 2.. Using your MC9S08QG8s and a breadboard build a circuit to match your schematic. developed in class for lab 1.
2. Use your 16-button keypad as the select switches for the patterns described below.
3. Obtain data sheets from our D2L website for the following CMOS device: 74AHC273. The data sheets is also available on the Texas Instruments web site at www.ti.com and other vendor's web sites. Download the Keypad, LED bar graph data sheets from our class web site.
4. Four patterns, (a) through (d) below, will be generated and displayed for this project:
 - a. Select this pattern with switch "A" (static)

4 LED's on, 4 off in the pattern X0X0X0X0. (**X indicates LED lit, 0 is off**).

- b. Select this pattern with switch "B"

Pattern rotates to the right. Pattern is one LED off, seven on. Pattern should start with the all LEDs lit except left-most LED. One LED in the string should be off at any one time. Each LED should go off for 1.0 second, then the next LED to the right should turn off and the previous LED should light. The pattern should repeat.

A representation of the sequence of this pattern is:

left 0 1 2 3 4 5 6 7 right (X indicates LED lit, 0 is off)

i.	0	X	X	X	X	X	X	X
ii.	X	0	X	X	X	X	X	X
iii.	X	X	0	X	X	X	X	X
iv.	X	X	X	0	X	X	X	X
v.	X	X	X	X	0	X	X	X
vi.	X	X	X	X	X	0	X	X

- vii. **X X X X X X 0 X**
- viii. **X X X X X X X 0**
- ix. **0 X X X X X X X** (start sequence over again)

c. Select this pattern with switch “C”

Two LEDs are on at any one time. LEDs are on for 1.0 seconds followed by off time of 1.0 seconds. This pattern starts in the middle, works to both ends, then works back to the middle.

A representation of the sequence of this pattern is:

- left 01234567 right (X indicates LED lit, 0 is off)**
- i. **000XX000**
 - ii. **00X00X00**
 - iii. **0X0000X0**
 - iv. **X000000X**
 - v. **0X0000X0**
 - vi. **00X00X00**
 - vii. **000XX000** (start sequence over again)

d. Select this pattern with switch “D”

The following pattern

- left 0 1 2 3 4 5 6 7 right (X indicates LED lit, 0 is off)**
- i. **0 0 X X X X 0 0**
 - ii. **0 0 0 X X X X 0**
 - iii. **0 0 0 0 X X X X**
 - iv. **0 0 0 0 0 X X X**
 - v. **0 0 0 0 0 0 X X**
 - vi. **0 0 0 0 0 0 0 X**
 - vii. **0 0 0 0 0 0 X X**
 - viii. **0 0 0 0 0 X X X**
 - ix. **0 0 0 0 X X X X**
 - x. **0 0 0 X X X X 0**
 - xi. **0 0 X X X X 0 0**

(sequence repeats)

5. After power-on reset, your microcontroller circuit should display pattern (a). When the proper switch is depressed on your keypad and held for one second, the displayed pattern advances to the appropriate pattern. (A,B,C or D)

6. The microcontrollers will be restarted using the reset switch – enable the reset switch on your MC9S08QG8s.

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 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 1 to the “Dropbox” for this lab on D2L.

Memo Report Date: Tuesday, Feb 12, 2019 (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.

- 1. Sign off for pattern A
- 2. Sign off for pattern B
- 3. Sign off for pattern C
- 4. Sign off for pattern D

Demo Due Date: Thursday, Feb 7, 2019 (by end of lab time)