

ELEC 2220 – System Design Project

Due at time of last class: Monday, August 2

You are to design a keyless entry system for a laboratory. The system is to comprise an HCS12 microcontroller, a keypad, an LCD display, and a door latch mechanism. For this project, the simulated keypad and LCD components provided with CodeWarrior are to be used. The door latch mechanism is to be simulated with an LED that will be turned ON, to simulate unlocking the door (showing activation of a door latch opening mechanism), and OFF, to simulate locking the door (deactivating the door latch opening mechanism).

Operation of the system is as follows.

1. When the door is locked, the LCD should display the prompt “**Enter code:**”, and the door latch mechanism should be OFF.
2. A user who wishes to enter the lab must enter a four-digit personal ID code on the keypad. The LCD should display asterisks, in lieu of the four digits, following the “Enter code” prompt. For example: **Enter code: ******
3. If the entered code matches one of the numbers stored in memory, the door latch opening mechanism should be activated for exactly three seconds, and then deactivated. The LCD should then return to the “Enter code:” prompt.
4. If the entered code does not match one of the numbers in memory, the LCD should display the message “Access Denied” for three seconds, and then the LCD should return to its original “Enter code:” prompt.
5. If a user begins entering a code, and fails to enter all four digits within five seconds of entering the first digit, this is to be considered entry of an invalid code, and the action in step 4 should be taken.

Up to five access codes can be stored in the system. These are to be entered from the keypad as follows.

1. A “lab manager” should enter code 0000 to change the database. The LCD should then read “Enter new ID:”
2. The manager then enters a 4-digit code.
3. When the fourth digit has been entered, the manager will be prompted to reenter the code to verify it, with the LCD reading “Reenter ID:”
4. The manager then reenters the code.
5. If the code matches the first value, it should be stored in memory and the message “Valid code” displayed for three seconds. If the code does not match, the message “Invalid code” should be displayed for three seconds.

6. The system then returns to normal mode, with the LCD displaying the “Enter code:” prompt.

For extra credit – implement a procedure for the lab manager to remove ID codes from the system.

All time delays are to be implemented using programmable timer interrupts, and response to the keypad is to be interrupt-driven.

Your design will be graded against three criteria.

1. The degree to which the program satisfies the above requirements.
2. The quality of the design, including such factors as modular design, effective use of the assembly language features.
3. Documentation, including a block diagram or flow chart illustrating the system design and effective use of comments throughout the program.

You are to submit a one to two-page description of your program design and a printout of the assembly language source file. In addition, the assembly language file is to be emailed to me for testing.