Homework 4

Due: Sep. 25, 2023 11:30pm

Objective

Learn simple HC12 assembly program for the parallel port I/O, subroutine, looping, and timing. Dimming the LED lights using PWM (Pulse Width Modulation) technique.

Introduction/Background

1. This Semester, we are using ONLY the CodeWarrior Debugger/Simulator to show the hardware and program workings. For the grading of all homework during this Semester, we will be testing your program on the CodeWarrior simulator only.

2. If your program works on the simulator, it will be working on the actual board, in most cases. However, there is one **major difference** between running your program on the CodeWarrior simulator and running your program on the actual CSM-12C128 board, that is **timing**. Running your program on the CodeWarrior simulator is about 100 times slower than running your program on the actual CSM-12C128 board.

3. If you correctly complete your Homework 4 program and running it on the CodeWarrior simulator, you will see the fast blinking LED on the simulator Visualization Tool window. And you will notice the duty cycle of an LED ON/OFF ratio change. However, when you run your Homework 4 program on the actual CSM-12C128 board, you will see the real LED dimmed - it is blinking at least 100 times faster than the simulator, so that your eyes perceive it as simply "dimmed" and not blinking.)

4. Another words, the dimming the LED light on the actual CSM-12C128 board means fast blinking LED on the simulator Visualization Tool window and you will see the duty cycle of the LED ON/OFF ratio gradually change.

Instruction Steps

1. Write the program, 'main.asm', to dimm the LED lights on CSM-12C128 board as follows:

   (0) Initially LED 2 is OFF (0%), LED 3 is ON (100%), and LED 4 is OFF (0%),
   (1) LED 1 goes from 0% light level to 100% light level in 0.1 seconds,
   (2) LED 1 goes from 100% light level to 0% light level in 0.1 seconds,
   (3) repeat the sequence from (1) to (2).

2. You may want to see the Flow Chart of the above algorithm (for LED 3 in 3 seconds as an example).

3. Design the program to start at $3100 and data to start at $3000.

4. Be sure to put much comments so that grader and others can clearly and quickly understand your program. Comments are very important in assembly language programs.

5. You may want to see and check the Sample Grading Sheet for this homework.

6. Copy your 'main.asm' file to 'cmpen472hw4_YourLastName.asm'. For example, mine will be 'cmpen472hw4_choi.asm' Then turn-in your .asm file (do NOT ZIP your file).

7. Turn-in your project source code file through Penn State CANVAS. Upload your source code file into the CANVAS Assignment's Homework submission. Be sure to select CMPEN 472 class and correct Homework number, and correct file name.

Congratulations on your fourth CMPEN 472 homework completion!

Epilogue:

Flow chart of the Homework 4 program (for LED 3 in 3 seconds as an example). Click here.

Aid for the Homework 4. Click here.
