Experiment 11 Fall 2012

Due: Week 14 lab Sessions (12-04-2012)

Count Up/Down Timer

Design and implement a one second interval count up/down timer system with the following specification:

I. Input:

1. 4X4 Matrix Keypad

   See this old experiment for keypad interface tips.

   a. Keys 0 - 9 used for single digit numeric input. All other keys should not be displayed. Use PM2-5 for keypad column input. Use PT4-7 for output to the keypad rows.
   b. Assign Key A for START/STOP
   c. Assign Key B for UP/DOWN
   d. Asign RESET pin to Reset

II. Output:

Same setup as experiment 4.

1. Use two seven segment displays (with 1K Ohm current limiting resistors.)

   The displays are Common Cathode type. See this old experiment for the correct connection of the current limiting resistors and display pin-out. You will need (14) 33o ohm resistors. Use them. DO NOT run the seven segment displays with out the current limiting resistors. The displays should be connected to (i.e. driven by) 74HC373 latches. The latches will be driven by NanoCore12 output pins (Port T for data and Port M for enable lines).

III. Operation:

At power up the display should be blank.

1. Press a single digit key and the least significant digit display (ones place) should display this first digit.
2. Press a single digit key and the ones place digit moves over to the tens place and the new digit move into the ones place. The above step should continue to function in the same manner for more key presses. The system needs to save only the last two keys pressed.
3. Press UP/DOWN to set the direction of the count.
4. Press the START/STOP key and timer should begin to count down in one second intervals. If START/STOP is pressed again the counting should pause. The counting should resume when START/STOP is pressed again. So, START/STOP is a toggle function. If UP/DOWN is pressed during counting the direction of the count should reverse.
5. When the count down reaches 00 the display should flash the 00 off and on rapidly 3 times and then the display should go blank.
6. When the count up reaches 99 then on the next count the display should flash the 00 off and on

rapidly 3 times and then the display should go blank.

7. If RESET is pressed at any time the display should go blank and wait for new input as in item 1 above.

Note: If START/STOP is pressed after only a single digit has been pressed then countdown should commence from the single digit.

You must write the code using the C programming language. See the Cexamples.c program examples on the Course Information page of the ECE 367 blackboard site.

Standard report format applies.

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ECE 367: Experiment 11

Count Up/Down Timer in C Language

Semester: Fall 2012

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Due Date: 2012 December 04

Lab Section: T11

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User Manual:

This program is a count up/down timer. The user should first supply power to the circuit and then press the reset button to clear the display. On startup, the counter is a slow count up counter that starts at 00. The user has an option of inputting the 2 digits where the counter should begin. The user has an option for the speed of counting. The user finally has the option of pressing the up/down button for the counter to count up or down. When the user is ready, the user should press the start/stop key to start the timer.

'A' starts/stops the count

'B' backspaces the ones place

'C' clears both the tens place and the ones place

'D' sets count direction down/up

'E' sets speed fast/slow

'F' sets count step size 2/1

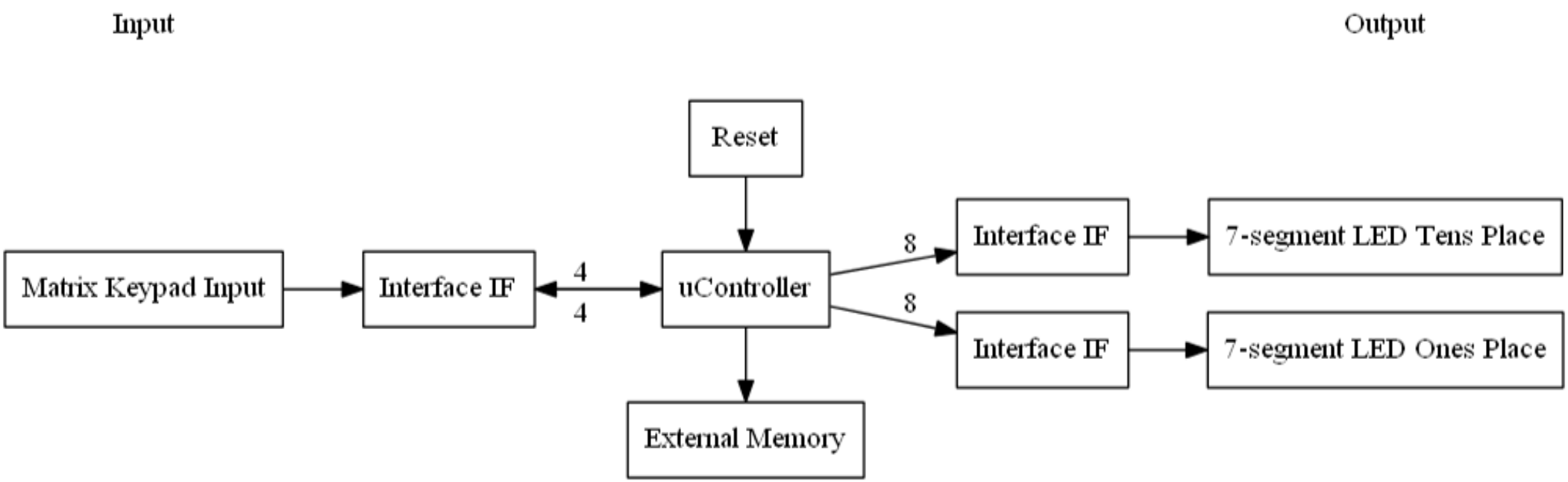
Conclusion:

Yes, my circuit meets the specifications and function properly.

I had trouble using C Language due to writing error. It turns out that I selected the wrong microcontroller chip family. It took me a while to understand the sample code to grab user input and output the data. Furthermore, I did not know how to use the LCD at all use to the phase lock loop. I would do this project differently by using a LCD display to display the other variables.

Besides the start/stop and up/down keys, I have implemented the backspace, clear, speed, and size key.

I learned about programming in C language and how it is so much better than assembly language due to efficiency.


Input
Output
Reset
Matrix Keypad Input
Interface IF
4
4
uController
8
Interface IF
7-segment LED Tens Place
8
Interface IF
7-segment LED Ones Place
External Memory