Experiment #11: Count Up/Down Timer

ECE 367 – Microprocessor Design (Spring 2013)

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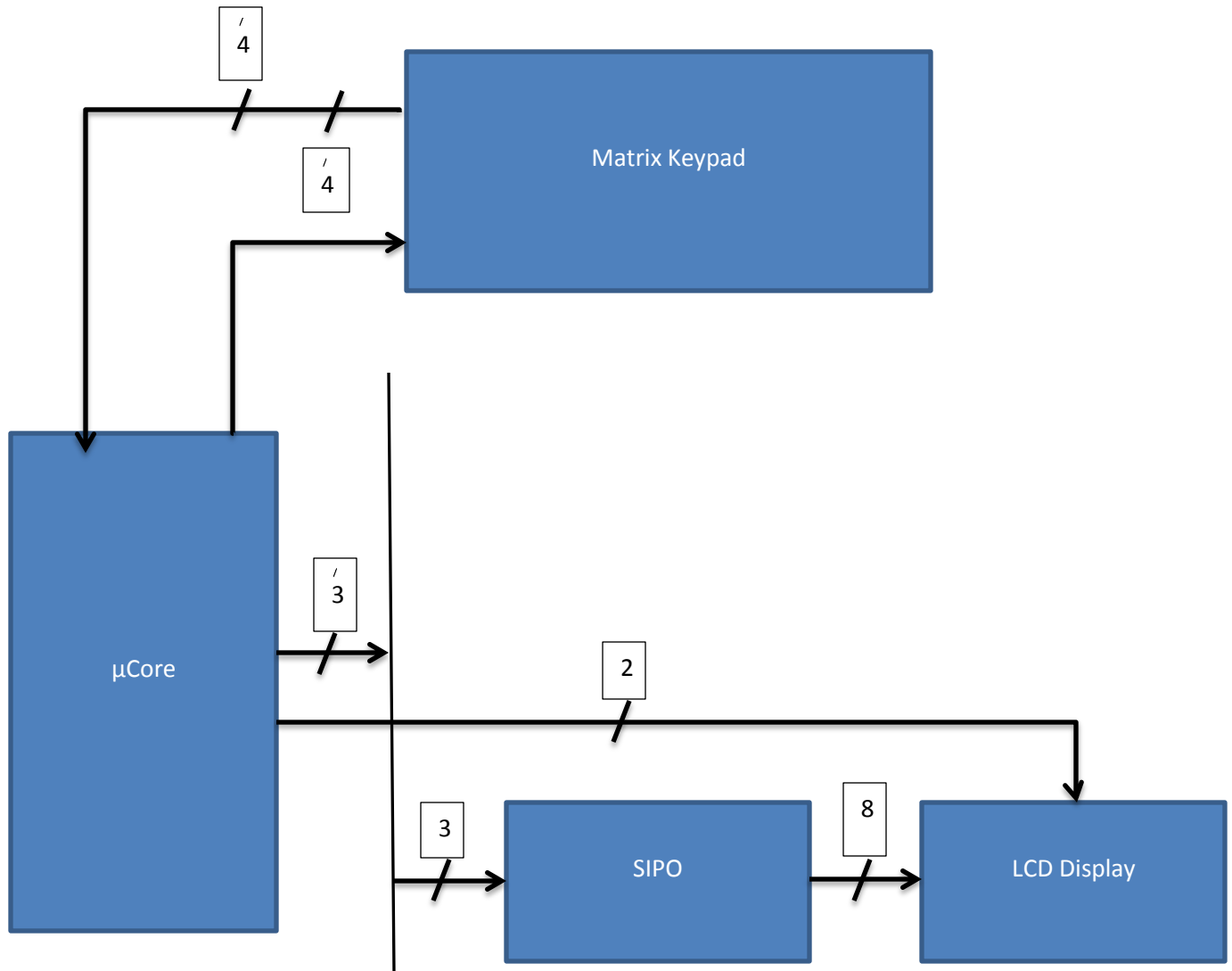MWF – 10:00AM – 11:50PM

T Lab: 8:00AM – 10:50AM

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I.   Logic Diagram

II.   Schematic Diagram
        I.   See attached sheet following this page.

III.   9S12 Assembler Program

IV.   USER MANUAL
    I.   Start Up
        I.   To start this system, use the USB to miniUSB cable and connect to computer. If you have a USB-outlet adapter, power may be supplied this way as well.
        II.   Verify the system is in "Run" mode (the switch on the microcontroller board).
        III.   Press the reset button to begin (left-most black button).
    II.   Operation
        I.   After pressing the reset button, the system directions will be displayed on the screen.
        II.   The system will next display "PAUSED   UP" on the first line. On the second line will be the prompt, "00" where it will be awaiting input. The system defaults in the "Paused" and "Count Up" modes.
        III.   Enter a number using the numeric portion of the keypad by pressing and releasing a button. Each time a new keypad number is entered, the system will take the value entered and move it into the ones place LED. If the ones place LED has a value in it, it will be moved to the tens place LED. A new number can be entered at any time during operation.
        IV.   If no values are input, the system will initialize to 00 and begin counting up after the Start/Pause button is pressed.
        V.   The system operates using the "A". Each time the "A" button is pressed; the system will either Run/Resume or Pause the countdown. This will be indicated on the display as well, you will either see "RUN" or "PAUSED" on the LCD screen.
        VI.   The direction of the count (up or down) may be changed at any time by pressing and releasing the "B" button. When the system is in count up mode, "UP" will be displayed in the screen and "DOWN" will be displayed when the system is counting down.
        VII.   When the shot clock reaches "00" the display will blink "00" 3 times and then reset to the initial screen indicating it is ready for input again.
        VIII.   The system can be restarted/reinitialized at any time by simply pressing the reset button during operation.
    III.   Shut Down
        I.   To shut the system down, disconnect the power source (USB cable) from the breadboard.

V. Conclusion.
  I.   How well does your project meet the specifications?
      I.   It meets project requirements as explained on the ECE 367 website for experiment #11.
  II. What were the most difficult issues in realizing the system?
      I.   Translating the entire codebase into C.
      II. Troubleshooting code and being new to using C and understanding what each construct does at the assembly level.
  III. Were you able to add extra features? If so, explain them.
      I.   There were no extra features added for this experiment.
  IV. What would you have done differently if you were to do this project again?
      I.   If I had more time, I probably would have added more information to the LCD screen and made it look better.
  V.   What did you learn from working on this project?
      I.   How to use C code to implement a product using the HC12S microcontroller.