Lab 5

Using the 4 Digit, 7-Segment Display

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**Purpose of the Lab:**

In the lab there was a lot of emphasis on how the wiring of the LED display worked and the signaling of the different segments on the individual digits. More importantly, a lot of focus was put on the connection of the pins to different ports and how these were used in assembly to get an output. Manipulation of these ports took up a good portion of the lab and learning how to change outputs was key in succeeding in the lab.

**Description of Solutions:**

There were 3 main problems to the lab which could be broken down as: setup of ports, selection of digits, and selection of segments on a digit to show number. The first one of setting up ports was straightforward and after looking over the lectures, it was setting the 0x0A and 0x04 addresses to OUTPUT. The second one of selecting the digit from 0-3, was setting up a counter and then loading a register with the corresponding member from the table and adding one until the counter became the same as the global digit variable. Once it reached that point, the member of the table was outputted to port B. Then, finally, was the selection of what number to show. The function was pretty much the same as the select\_digit, where there was a counter that loaded a register with a corresponding value from a table. After finding what value from the table it should retrieve, it then found if PORTB0 was 1 or 0 and then mutated the value of the PORTB0 bit to 1 if it was 1.

**Test Results:**

In this lab I tested each of the assembly functions individually and used the C counterparts for the other functions to ensure that I could break it down and find out what exactly was going wrong. Some of the bugs, or should I say errors, that I encountered was that I also was setting up the DDRx I/O ports as output because I didn’t know what they did. Unfortunately, what they ended up doing is that the LEDs wouldn’t turn on at all. After weeding out this problem, I ensured that everything worked by lighting up 0 and 2 in each of the digits as, between the both, they lit up all of the segments in the digits.

**Answer to Questions:**

N/A

**Discussion:**

Overall, this lab was very enriching to me. I learned a lot about port manipulation and more specifically the difference between DDRx and PORTxk. The lab was hard but not impossible if you followed the instructions and used the resources like the powerpoint slides and the book. The lab was also entertaining and rewarding once you were able to get the gist of it. The only suggestion I would make is that in the videos, there could be more content on how it actually works inside the AVR, but was otherwise great.

**Contribution to Team Work:**

N/A

**References:**

* *The AVR Microcontroller and Embedded Systems using Assemble and C*
* *AVR Instruction Set Manual*

[*http://ww1.microchip.com/downloads/en/devicedoc/atmel-0856-avr-instruction-set-manual.pdf*](http://ww1.microchip.com/downloads/en/devicedoc/atmel-0856-avr-instruction-set-manual.pdf)

* [*https://www.elecrom.com/avr-tutorial-2-avr-input-output/*](https://www.elecrom.com/avr-tutorial-2-avr-input-output/)
* *Used Lab 3 as Reference*