Homework 7
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Due December 2nd, 2011

1 End of Term Problem

Atmel microcontrollers are used quite often in the ECE curriculum at OSU and throughout industry as a quick way to build an engineering product. A common feature to every Atmel microcontroller is a Timer/Counter. This homework assignment explores how the central control logic to a timer/counter could be constructed out of digital logic learned in ECE 271.

2 Reference Material

The tiny26 datasheet is 185 pages long, and explains every aspect of the microcontroller. The timer/counter section of the datasheet is on pages 66 - 79. Read this section and focus on how figure 40 of the datasheet, picture in figure 1 of this document.

3 Assignment

1. Top Level Diagram
   Draw the top level diagram for the control logic in figure 1. Ignore PCK, OCF1A, OCF1B, and TOV1.

2. Prescaler top level diagram
   Draw the top level diagram of the prescaler sub-block of the control logic. Assume PCKE is always 0, so that CK is always the input clock to TimerCounter 1.

3. Prescaler detailed diagram
   Draw a logic diagram of the prescaler sub-block using blocks covered in ECE 271. There was no 'prescaler' block in ECE 271.

4. Output Control top level diagram
   Draw the top level diagram of the Output Control sub-block of the control logic. This block looks at the comparator outputs and TCCR1A. It then decides what to do with the counter, PB0, PB1, PB2, and PB3.

5. Output Control detailed diagram
   Draw a logic diagram of the Output Control sub-block using blocks covered in ECE 271.
Figure 1: Block Diagram for the Timer/Counter1 in the Tiny26 microcontroller