EE 308
Homework 13
Due April 27, 2005

1. Compare the SCI interface to the SPI interface.
   (a) What is the maximum data transmission rate (in bytes/second) possible with the HCS12 SCI interface? How long will it take the HCS12 to transmit 1024 bytes of data at this rate?
   (b) What is the maximum data transmission rate (in bytes/second) possible with the HCS12 SPI interface? How long will it take the HCS12 to transmit 1024 bytes of data at this rate?
   (c) Why is there such a large difference in data rates?

2. Write a C function

   int sci_init(int device, int nbits, int baud, int parity, int rcvr, int xmtr)

which does the following:

   • device should be either 1 or 2, 1 indicating that the function should initialize SCI1, and 2 indicating that the function should initialize SCI2.
   • nbits should be either 8 or 9, for the number of data bits the SCI should transmit.
   • baud should be a number which corresponds to a possible baud rate for the HCS12.
   • parity should be 0, 1, or 2, with 0 indicating no parity, 1 indicating odd parity, and 2 indicating even parity.
   • rcvr should by either 0 or 1, with 0 indicating that the receiver should not be enabled, and 1 indicating that the receiver should be enabled.
   • xmtr should by either 0 or 1, with 0 indicating that the transmitter should not be enabled, and 1 indicating that the transmitter should be enabled.

If all the parameters are in the valid ranges, the function should initialize the appropriate device as requested, and return a 0. If any of the parameters are outside the valid range, the function should return a -1, indicating that it was unsuccessful.

3. A tipping bucket rain gage works as follows: A funnel directs rainwater into a small bucket on a pivot. When 0.01” of rain falls, the bucket tips over and dumps out the water. This repeats for every 0.01” of rain. Write a C program which measures the amount of rain which falls in a day:
   (a) Whenever the bucket tips, it generates an output pulse. These pulses are connected to the input pin of Pulse Accumulator A. Set up PACA to count the pulses.
   (b) Use the timer subsystem to tell when 24 hours has passed. You might set up a Real Time Interrupt to run at the slowest rate possible, and count the number of interrupts until it equals 24 hours.
   (c) Print the amount of rain which fell in 24 hours on the computer screen.