ECE 241 **Home Work 2** **Spring 2016**

Due: April 14, 2016 **30 points**

In this homework, a software version of a serial transmitter is to be built. The choice of a transmitter was done in order to simplify the problem, as receiving data is a more involved process.

The prime objective is to use TimerOne to generate a waveform similar to that shown in Figure HW2-1. The software will use an ISR that will be fire at the bit time for a desired Baud rate. Each time the ISR runs it should work its way through the waveform.

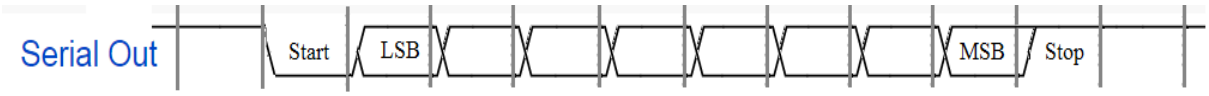

Figure HW2-1. Serial Transmit Waveform.

In setup, a start up function should be called

> void SW_Serial_Initialize(int BaudRate, int PinNumber);
> Compute bit time, and set an interrupt to run SW_Serial_ISR at every bit time
> 1,000,000 (microseconds/second) * (1/BaudRate) (seconds/bit) = microseconds / bit
> PinNumber is the number of the pin to be used as the output.
> Be sure to set this pin to be an output.

The ISR, called for in setup, needs to be written, and will look like

> void SW_Serial_ISR(void);
> Interrupt Service Routine that is called at every bit time. It should check to see if there is a byte in a circular buffer to be transmitted*. Once a byte is available, the process of transmitting that byte will commence, starting with the transmitting of the start bit, each data bit and then the stop bit. Figure HW2-2. is a STD for handling the transmission.

Finally a function for placing data into the circular buffer.

> void SW_Serial_String (char Input[]);
> Load the characters in Input into a circular buffer, which will be emptied by the ISR.

A simple test program should be written. This can simply be a program that sends a string of characters, such as "Test", every 2 seconds. And if you want test your system, I suggest that you can hook up the BlueTooth modem in you parts kit similar to what is shown in Figure HW2-3. Or as follows

Vcc -> 5V, Gnd -> Gnd, and the pin used as an output (might I suggest pin 12) -> RXD (on Modem).

Any smart-phone or a laptop with BlueTooth can be used to connect with the modem. Then there are a number of free BlueTooth Terminals available allowing the monitoring of the test.

* An example of a circular buffer can be found in the file MorseCodeTransmitter.pdf posted under Files->Coding Examples

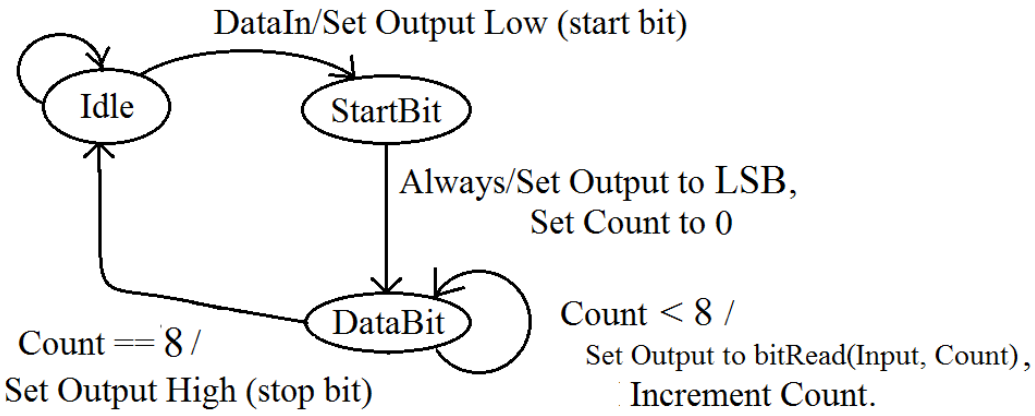

Figure HW2-2. State Transition Diagram for Serial Transmitter.

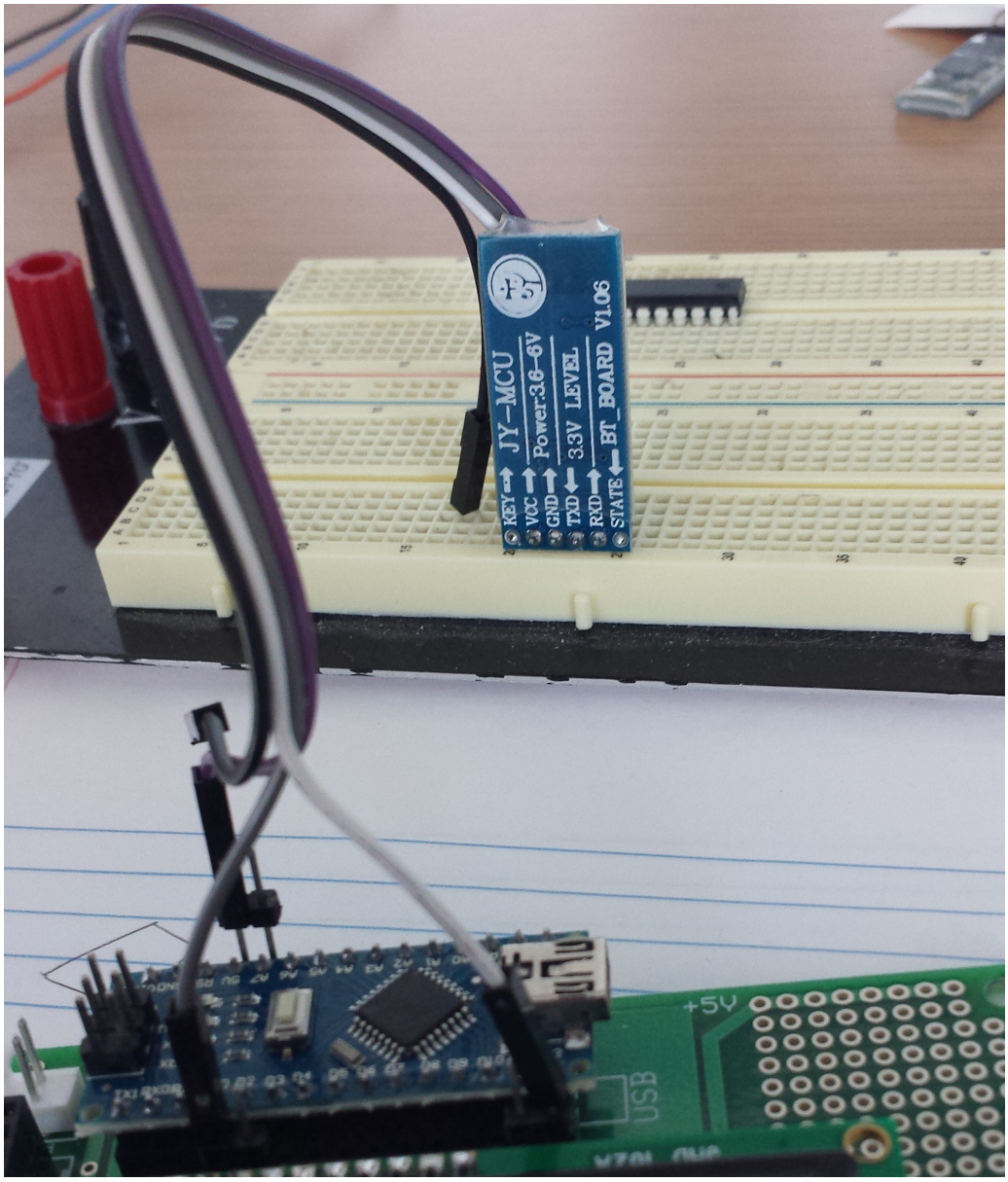

Figure HW2-3. Image of BlueTooth Modem Test.