

## Lab 9: Interactive Square Wave Generator

### Introduction

In this lab a square wave will be generated on Port B (like in Lab 6), except the user will interactively choose the frequency by entering commands on the dumb terminal. The serial communication interface (SCI) on the 68HC11 will be driven by an interrupt to process the user commands. You should implement this program in three steps.

**Step 1:** Write a program that reads single-character commands from the keyboard using an interrupt. The “main” program will be a simple infinite loop that does nothing. Your interrupt service routine (ISR) will be called when a received character is ready to be read from the serial communications data register (SCDR). The ISR should read this character and immediately send it to the video display. An outline of this program could look like:

```
Initialize the SCI
    Enable the P3 connector
    Set the SCI control registers (SCCR1 and SCCR2) as appropriate
    Set the BAUD register
Initialize the interrupt pseudovector in the vector jump table
Enable interrupts
Start main program
Interrupt Service Routine
    Read the character in SCDR
    Write the character to the video display
```

**Step 2:** After you get the interrupt-driven serial communications working, replace the infinite loop (that does nothing) with a modified version of your square wave generator program. The N value (which sets the square wave frequency) will be loaded into the IX register from a variable called `N_val`. This variable will be initialized with a default value so that the initial frequency of the square wave is 4 kHz. Test your program to insure that (1) the square wave on bit 0 of Port B has the correct frequency, (2) commands typed on the keyboard still appear on the video display, and (3) typing a command does not corrupt the square wave.

**Step 3:** Modify your ISR so that the variable `N_val` is loaded with the appropriate value, which will depend on the single-character command entered by the user. The user commands are:

- A     Generate a 6 kHz square wave
- B     Generate an 8 kHz square wave
- C     Generate a 10 kHz square wave
- R     Reset the frequency to the default value (4 kHz)
- Q     Quit the program

Note that the user can type A, B, C, or R in any order; the square wave must always change to the correct frequency.

Demonstrate your working program to the teaching assistant. In your report, include a *well-commented* listing of your program, and describe an approach for sending more informative output (such as the command and the wave frequency) to the video display.