

Laboratory Worksheet #05

Timer Overflow Interrupts Exercise

The following is an exercise on Timer Overflow interrupts and will serve as a good starting point for Lab 1-2. The hardware used for this activity should already be ready on your board from Lab 1-1.

Exercise 1:

- 1) On what page of the LITEC manual does the discussion of 34
Timer Functions start?

Utilizing the timer on the microcontroller requires initializing and interacting with a number of SFRs. Based on the following descriptions, identify which SFR is indicated.

- 2) The high byte of Timer0 0x8C
- 3) The SFR which contains a bit to turn the Timer0 on/off 0x8B (Bit 4)
- 4) The SFR that sets Timer0 to 16 bit mode 0x89 (Bit 0, Bit 1)
- 5) What is the frequency of the system clock (to 6 decimal places)? 22.1184 x 10⁶ Hz

Exercise 2:

The program configures Timer0 to use SYSCCLK/12 as its source and in a 13-bit mode.

- 1) Complete the initialization code that follows. Note: this example code is only part of the full initialization routine. The indicated initial settings of the SFRs are here for example.

//current state of TMOD is xxxx 1111 \Rightarrow xxxx 0000

//current state of CKCON is xxxx xxxx

TMOD 8 = F0

CKCON 8 = F7 xxxx 0xxx

- 2) How much time (in seconds) is required for a timer overflow interrupt (assume the Timer is initialized to 0)? 4.444 x 10⁻³ s
- 3) How many overflows will occur in 1 second? 225
- 4) Assume a variable counts keeps track of the number of overflows. After 2.5 seconds, what is the value of counts? (assume counts is zero at 0 seconds) 562

Exercise 3:

The sample code, *Worksheet_05.c*, is available on the LMS website under the “Laboratories” section, under Lab 1, part 2. You need to complete the initialization routines for the Port I/O, the Timer, and Interrupts. Once you have done that, compile, link, download and run this program. This program counts the number of timer overflows occurring while the slide switch is in the Off position.

Exercise 4:

In the *Worksheet_05.c* code, the variable *counts* keeps track of the number of timer overflows and this value is printed on the terminal.

- 1) Modify the printf statement to also print out the corresponding time period in seconds.
- 2) Using a handy watch or online clock, turn the switch to the ‘count’ position for 10 seconds and compare the accuracy of the counter to the time you measure.

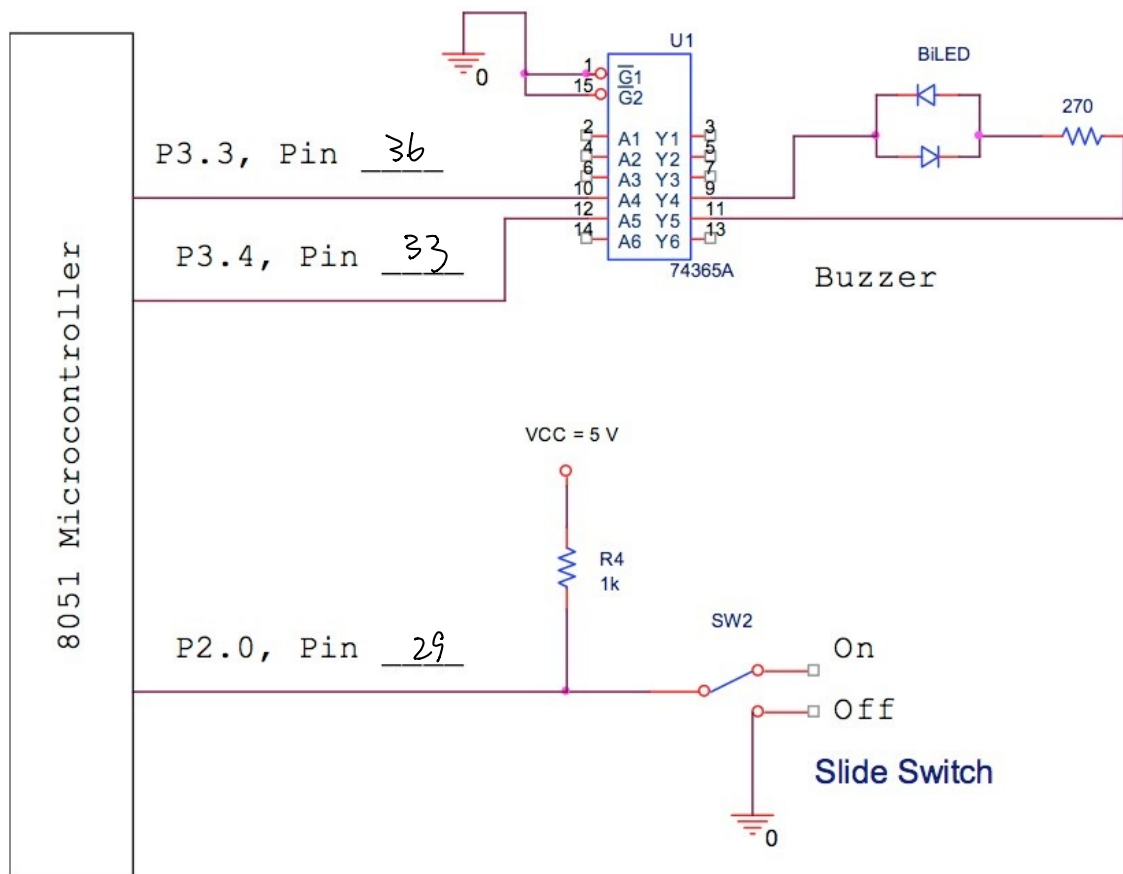


Figure 1: Worksheet 3 Schematic

When complete, include Worksheet 5 with your Laboratory 1-2 Pre-lab submission.