

Laboratory 11: Timer/Counter

Problem 23:

Consider the following program.

- a. Explain what the program does.
- b. Simulate the program in MPLAB. Send pulses to RA4/T0CKI using stimulus and observe what happens when the timer overflows.
- c. Modify the program such that
 - the timer starts counting from 253 after the interrupt subroutine
 - the prescaler with rate 1 : 2 is used.

Simulate the modified program using the stimulus and explain what you observe.

```
LIST    P=16F84A
INCLUDE "P16f84A.INC"
__config _CP_OFF&_WDT_OFF&_XT_OSC
org     0x00;
goto   main
org     0x04;
goto   counter_ISR
main
    bsf    STATUS,RPO;
    movlw b'00010000';
    movwf TRISA;
    bsf    OPTION_REG, TOCS;
    bsf    OPTION_REG, TOSE;
    bsf    OPTION_REG, PSA;
    bcf    STATUS,RPO;
    clrf   PORTB;
    bsf    INTCON,GIE;
    bsf    INTCON,TOIE;
    bcf    INTCON,TOTF;
    movlw .253;
    movwf TMRO;
loop    nop;
        nop;
        nop;
        nop;
        goto loop;
counter_ISR
    bcf    INTCON, TOTF;
    nop;
    nop;
    nop;
    nop;
    retfie;
end
```

Problem 24:

- a. Assume that the oscillator frequency is 4 Mhz. Configure the Timer 0 such that an interrupt occurs after approximately 65.5 msec.
- b. Write a program that
 - increments `PORTB` every 65.5 msec
 - clears `PORTB` and `TMR0` if the button at pin `RA2` is pressed.
- c. Simulate your program in MPLAB.
- d. Run your program on the test card and observe the LEDs at `PORTB`.