EMBEDDED SYSTEMS DESIGN
Lab- 4 Generating PWM signal using the Capture/Compare/PWM module on PIC16F886

Distributed: Tuesday, February 18th, 2022.
Demo: You can demo this lab on Monday, Tuesday, Wednesday and Thursday February 28th, through March 3th to theTAs.
In this lab, you will:

- Learn how to use PWM module on your PIC16F866 chip and configure the PWM period, pulse width and duty cycle.

- Write a correct, well-documented program to control the LED (this is correct, pin 22 leads toDS2: an LED) on your development board.

1. Instructions

Instructions (please read the instructions on the PIC16F866 and the MPLAB® XC8C Compiler User's Guide):

We are going to generate a PWM signal on pin 22 (if you trace pin 22, it will leadyou to DS2, that is the LED across a chip in your development board). This is possible with the pulse steering mode available.

- In 11.6.7 Pulse steering mode section in the datasheet, you can find a note stating that this is available only after setting certain bits in the CCP1CON register.

- Read section 11.6.7 and set the bits in CCP1CON register.

- Go to section 11.5 PWM mode and read the section. We need to set Timer 2moduleto use the PWM module.

- Section 11.5.1 and 11.5.2 show you the formulae for PWM period, pulse width andduty cycle.

- The next section PWM resolution gives you examples of PWM frequencies and PR2 values for a given oscillator frequency 20Mhz or 8Mhz – this is in the line definedby XTALat the very top of your program.

- Go to section 7.0 Timer 2 module and look at the block diagram. We have a pre-scalar that divides the input frequency to the timer 2 and a post-scalar thatdelays the interrupt that is raised.

- Section 7.1 describes the Timer 2 control register that needs to be set accordingly.We will go with pre-scalar and post-scalar values both equal to 1:1.

- In table 7-1 we have the summary of associated Timer 2 registers. Set the Global Interrupt GIE and Peripheral Interrupt PIE flags along with the Timer 2 interrupt enable bit TMR2IE.

- Read 11.5.2 on PWM duty cycle and set the CCPR1L register, CCP1CONregisters for a near 50% duty cycle.

- Now set the Pulse steering control register to choose P1C pin as output PWM pin.Remember to set theTRIS register to set the direction as output.

2.Exercise

This exercise will be done in the Laboratory. Probe the PIC pin and the VSS pin on your board to display the PWM signal on the oscilloscope. Record three different waveforms with the corresponding register values (PR2, CCP1CON, CCP1RL, Timer2 pre-scale value), use your phone to capture the screen or save theoutput waveform on a USB dongle as .CSV file and replot it using Excel or MATLAB and show them to the TAs.