# **Lab-7**

**PIC Counter Programming microcontroller using assembly & C language**

**Objective:**

In this lab students will learn

* How to program PIC18F4550 for counter purposes.
* How a buzzer can be turned ON and OFF using counters.

**Theory**

When the timer is used as a timer, the PIC18's crystal is used as the source of the frequency. When it is used as a counter, however, it is a pulse outside the PIC 18 that increments the TH, TL registers. In counter mode, notice that registers such as TOC0N, TMR0H, and TMR0L are the same as for the timer discussed in the Previous post; they even have the same names.

Recall from the previous posts that the T0CS bit (Timer0 clock source) in the
T0CON register decides the source of the clock for the timer. If T0CS = 0, the
timer gets pulses from the crystal oscillator connected to the OSC 1 and OSC2 pins(Fosc/4).

In contrast, when T0CS = 1, the timer is used as a counter and gets its
pulses from outside the PIC 18. Therefore, when T0CS = 1, the counter counts up as pulses are fed from pin RA4 (PORTA.4). The pin is called T0CKI (Timer0 clock input). Notice that the pin belongs to Port A. In the case of Timer0, when T0CS =1, pin RA4 (PORTA.4) provides the clock pulse and the counter counts up for each clock pulse coming from that pin. Similarly, for Timer 1, when TMR1 CS = 1, each clock pulse coming in from pin RC0 (PORTC.0) makes the counter count up.

**Exercise**

Assume that clock pulses are fed into pin T0CK1, write a program for counter 0 in 8-bit mode to count the pulses and display the state of the TMR0L count to PORTB.

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Assuming that clock pulses are fed into pin T0CK1 and a buzzer is connected to pin PORTB.1, write a program for counter 0 in 8-bit mode to sound the buzzer every 100 pulses. Also show simulations on Proteus.

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Assume that a 1-HZ frequency pulse is connected to input for Timer1 (pin PORTC.0). Write a a program to display the counter values of TMR1H, TMR1L on PORTB and D. Set initial values to 0. Use Timer1, 16 bit mode, no prescalar, and positive-edge clock.

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Write a C18 program to toggle all the bits of PORTB continuously with some delay. Use Timer0, 16-bit mode, and no prescalar options to generate the delay. Show simulations on Proteus.

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