

# ECE 376: Handout #5

*Timing*

Determine the frequency of the square wave on RC0

```
#include <p18f4620.inc>

; Variables
CNT0 EQU 1
CNT1 EQU 2

; Program
    org 0x800
    call Init
Loop:
    btg    PORTC,0
    call Wait
    goto Loop

; --- Subroutines ---

Init:
    clrf TRISA
    clrf TRISB
    clrf TRISC
    clrf TRISD
    clrf TRISE
    movlw 0x0F
    movwf ADCON1
    return

Wait:
    movlw 124
    movwf CNT1
    nop
W1:
    movlw 210
    movwf CNT0
    nop
    nop
W0:
    nop
    nop
    decfsz CNT0, F
    goto W0
    decfsz CNT1, F
    goto W1
    return
end
```

Solution: Count instructions.

- 1 clock per instruction
- Plus one for each jump

Total:

$$N = 5 + 5 + 7 \cdot 124 + 5 \cdot 210 \cdot 124 = 131,078 \text{ clocks}$$

$$f = \left( \frac{10\text{MHz}}{2 \cdot N} \right) = 38.145\text{Hz}$$

```
; Variables
CNT0 EQU 1
CNT1 EQU 2
```

```
; Program
org 0x800
call Init
```

```
Loop:
    btg    PORTC,0           5 clocks
    call Wait
    goto Loop
```

```
; --- Subroutines ---
```

```
Init:
    clrf TRISA
    clrf TRISB
    clrf TRISC
    clrf TRISD
    clrf TRISE
    movlw 0x0F
    movwf ADCON1
    return
```

```
Wait:
    movlw 124                5 clocks (4 instructions + a jump)
    movwf CNT1
    nop
```

```
W1:
    movlw 210                7 clocks * 124
    movwf CNT0              ( 6 instructions plus a jump )
    nop                    ( called 124 times )
    nop
```

```
W0:
    nop                    5 * 210 * 124
    nop
    decfsz CNT0, F
    goto W0
```

```
    decfsz CNT1, F
    goto W1
```

```
return
end
```