

①

Ex^o

For 4MHz oscillator the following program segment creates almost 0.8 sec delay

```
        movlw 255,  
        movwf Counter1;  
  
loop1   movlw 255;  
        movwf Counter2;  
  
loop2   decfsz Counter2, F;  
        goto loop2;  
  
        decfsz Counter1, F;  
        goto loop1;
```

we can put the above segment into a subroutine as:

```
delay   movlw 255,  
        movwf Counter1,  
        .  
        .  
        goto loop1  
        return; ← Placed at the  
                  end of subroutine
```

(2)

Ex 8 Write a program that turns ON and OFF ^{all} the LEDs connected to PORTB with 0.8 sec delays.

Sln:

list p=16f84A

include "16f84A.INC"

Counter1 equ 0x0C

Counter2 equ 0x0D

clrf PORTB;

bsf STATUS, RPO;

clrf TRISB;

bsf STATUS, RPO;

loop

movlw 0x00;

movwf PORTB;

call delay-08-sec;

movlw 0xFF;

movwf PORTB;

call delay-08-sec;

goto loop

⇒ Main Program

Subroutine is called

delay-08-sec

movlw 0xFF
movwf Counter1;

delay-loop1 movlw 0xFF;
movwf Counter2;

delay-loop2 decfsz Counter2, F;
goto delay-loop2;

decfsz Counter1, F;
goto delay-loop1;
return end

Important

Subroutine (Function)

3

`incf f,d` → Increment `f`



The contents of register 'f' are incremented.
If `d=0`, the result is placed into W register.
If `d=1`, the result is placed back in register `f`.

Ex 3

`movlw 10;`

`movwf 0x0C;` (0x0C) contains 10

`incf 0x0C, W;` (0x0C) contains 10

`incf 0x0C, 0;` (0x0C) contains 10

`incf 0x0C, 1;` (0x0C) contains 11

`incf 0x0C, F;` (0x0C) contains 12

`incf 0x0C, F;` (0x0C) contains 13

$(0x0C) \leftarrow (0x0C) + 1$

$(W) \leftarrow (0x0C) + 1$

`decf f,d` → decrement `f`

4

sublw k → subtract W from Literal

(w) ← k - (w)

The W register is subtracted (2's complement method) from the eight-bit literal 'k'. The result is placed into the W register.

Status register bits C, DC, Z are affected from this operation.

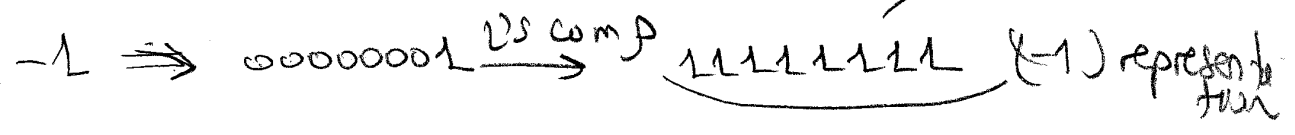
Ex 20

movlw 10; (w) ← 10
sublw 30; (w) ← 30 - (w)
(w) ← 20

Ex 8

movlw 10; (w) ← 10
sublw 9; (w) ← 9 - (w)
(w) ← (-1)

2's comp (-1) represent to hex



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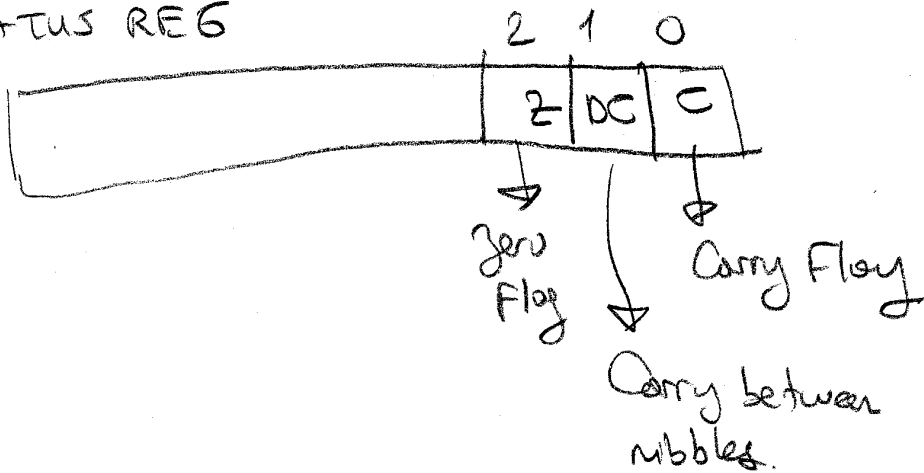
movlw 10, (w) $\leftarrow 10$

sublw 10, (w) $\leftarrow 10 - (w)$

(w) = 0

Status Z-bit is set after this operation.

STATUS REG



Ex:

movlw 10,
sublw 9;

C-bit of status reg is set after these commands.

subwf f, d \rightarrow Subtract w from f

(destination = w d=0
= f d=1) $\leftarrow (f) - (w)$

C, DC, Z are affected.

Subtract w register from register 'f'. If d=0 the result is stored in the w register. If d=1 result is stored back in register 'f'.