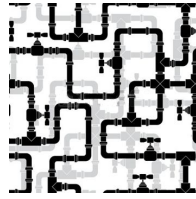


SERIE 4 – PIPELINE AND INSTRUCTION EXECUTION

Information systems



Question 1 – Instruction timing

Let's consider the following code:

```

1  var1 equ 0x3
2
3  goto lab2
4
5  lab1:
6    movwf var1
7    btfss var1, 0
8
9  lab2:
10   sublw 10

```

(a) Give the encoding of the following instructions:

1) Instruction at line 6

1) _____

2) Instruction at line 7

2) _____

3) Instruction at line 10

3) _____

(b) Considering that there are no instructions before line 1, what is the address at which goto lab2 will jump to? Explain why. Beware, there is a small difficulty here.

.....
.....
.....
.....

(c) How many cycles are required to execute this code?

.....
.....
.....

(d) If you have a PIC18F processor running at 4 [MHz], how long does this code take to execute?

.....
.....
.....

Question 2 – Instruction effects on the datapath

Given are the following instructions, starting at address 0 in program memory:

```

1  movlw .10
2  movwf 0x03
3  incf 0x00, F
    
```

(a) Show the effect of those instructions on the following figures (1 figure per instruction, show the status at the end of the execution). Consider that the CPU has just been reset. *Don't forget to show the values present on the buses as well!*

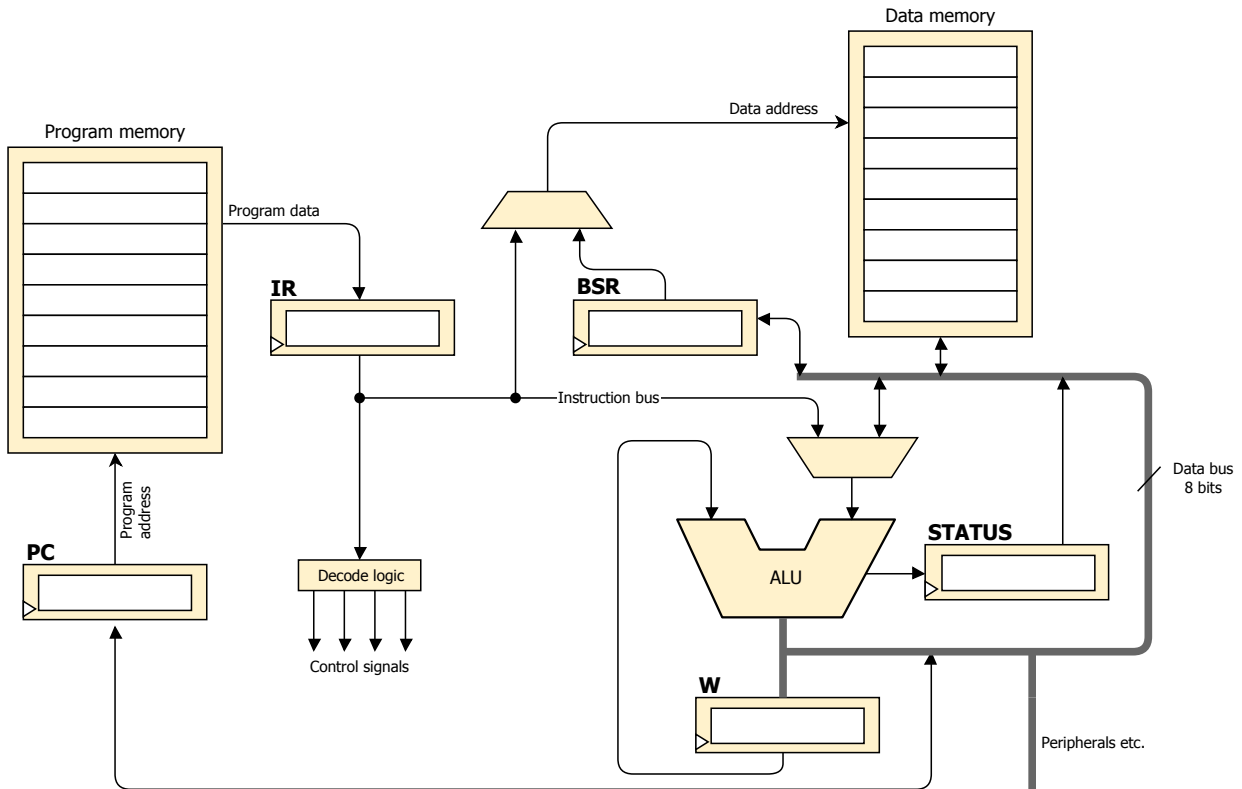


Figure 1 – Status after executing `movlw .10`

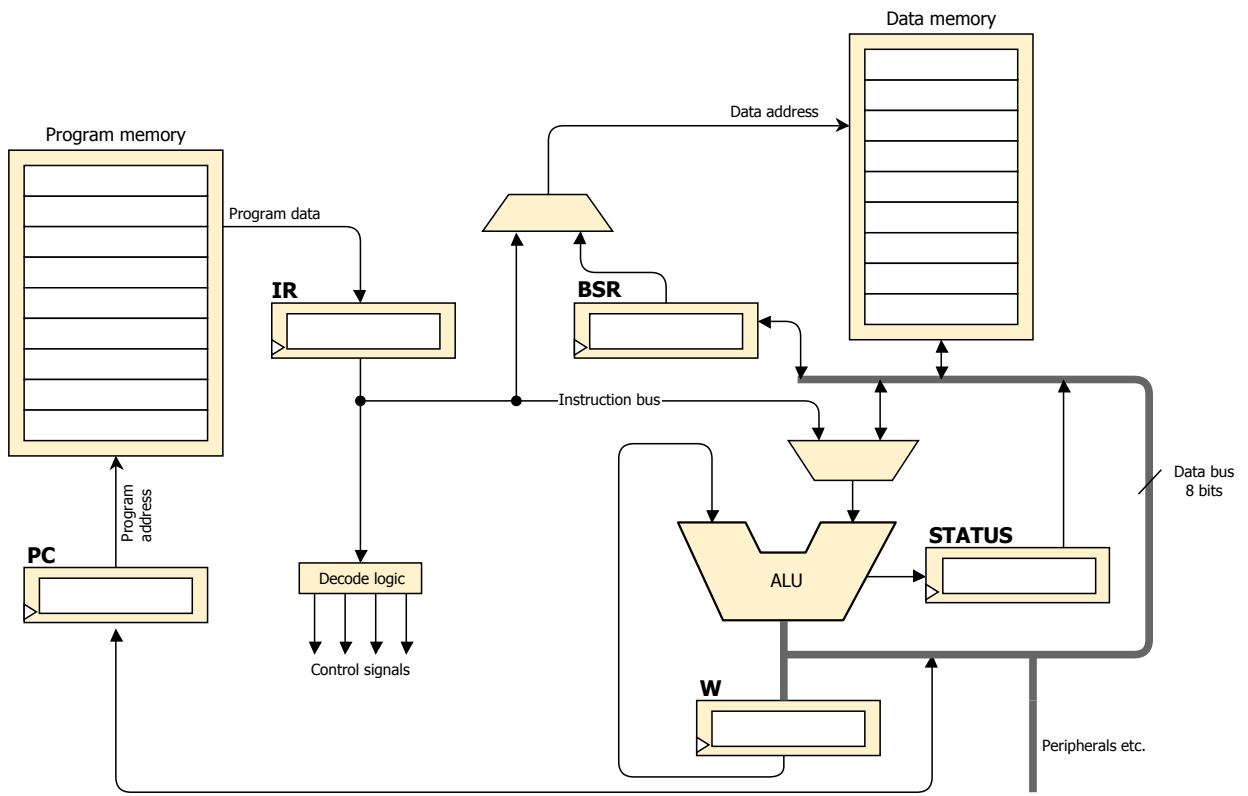


Figure 2 – Status after executing `movwf 0x03`

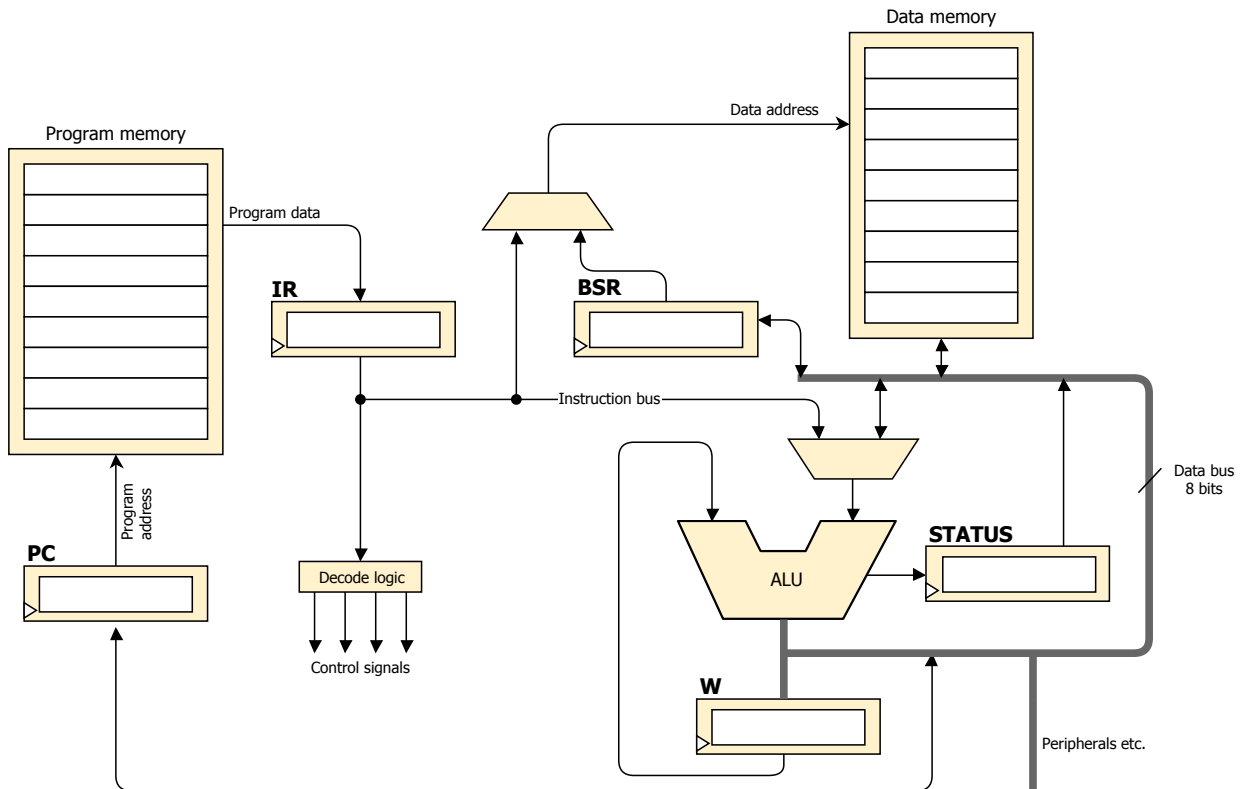


Figure 3 – Status after executing `incf 0x00, F`