PIC Memory Organization & Register File Structure

PIC Memory Organization

▪PIC microcontroller has 13 bits of program memory address.

▪ Hence it can address up to 8k of program memory.

▪The program counter is 13-bit. PIC 16C6X or 16C7X program memory is 2k or 4k. While addressing 2k of program memory, only 11- bits are required. Hence two most significant bits of the program counter are ignored.

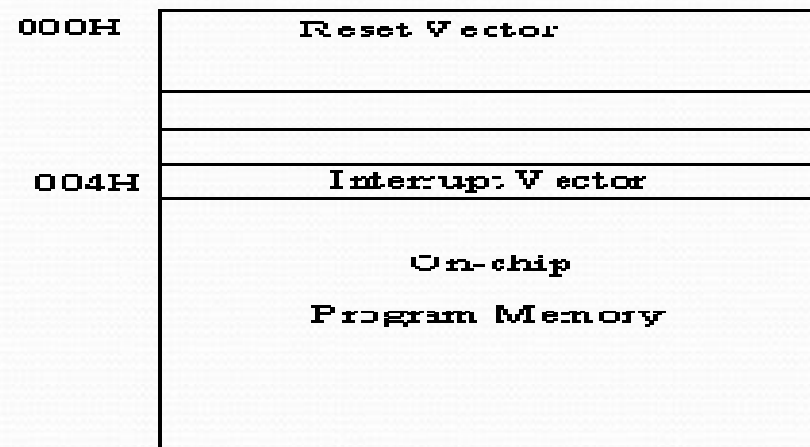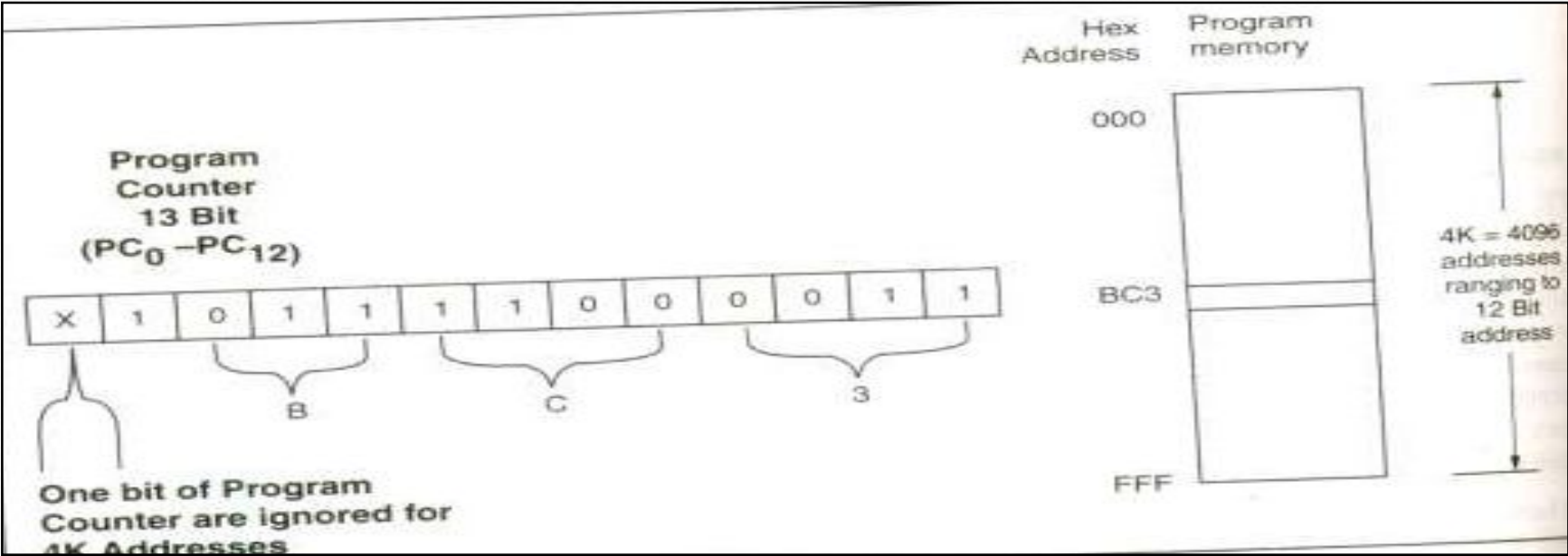▪Similarly, while addressing 4k of memory, 12 bits are required. Hence the MSB of the program counter is ignored.
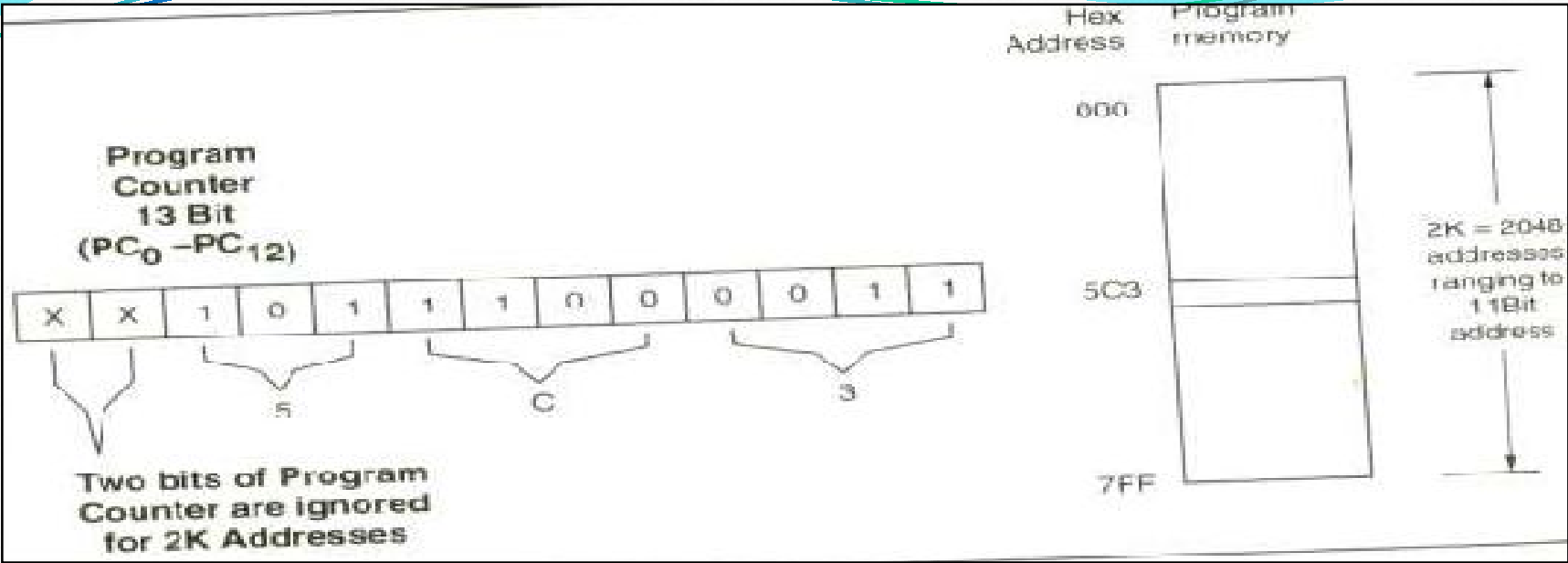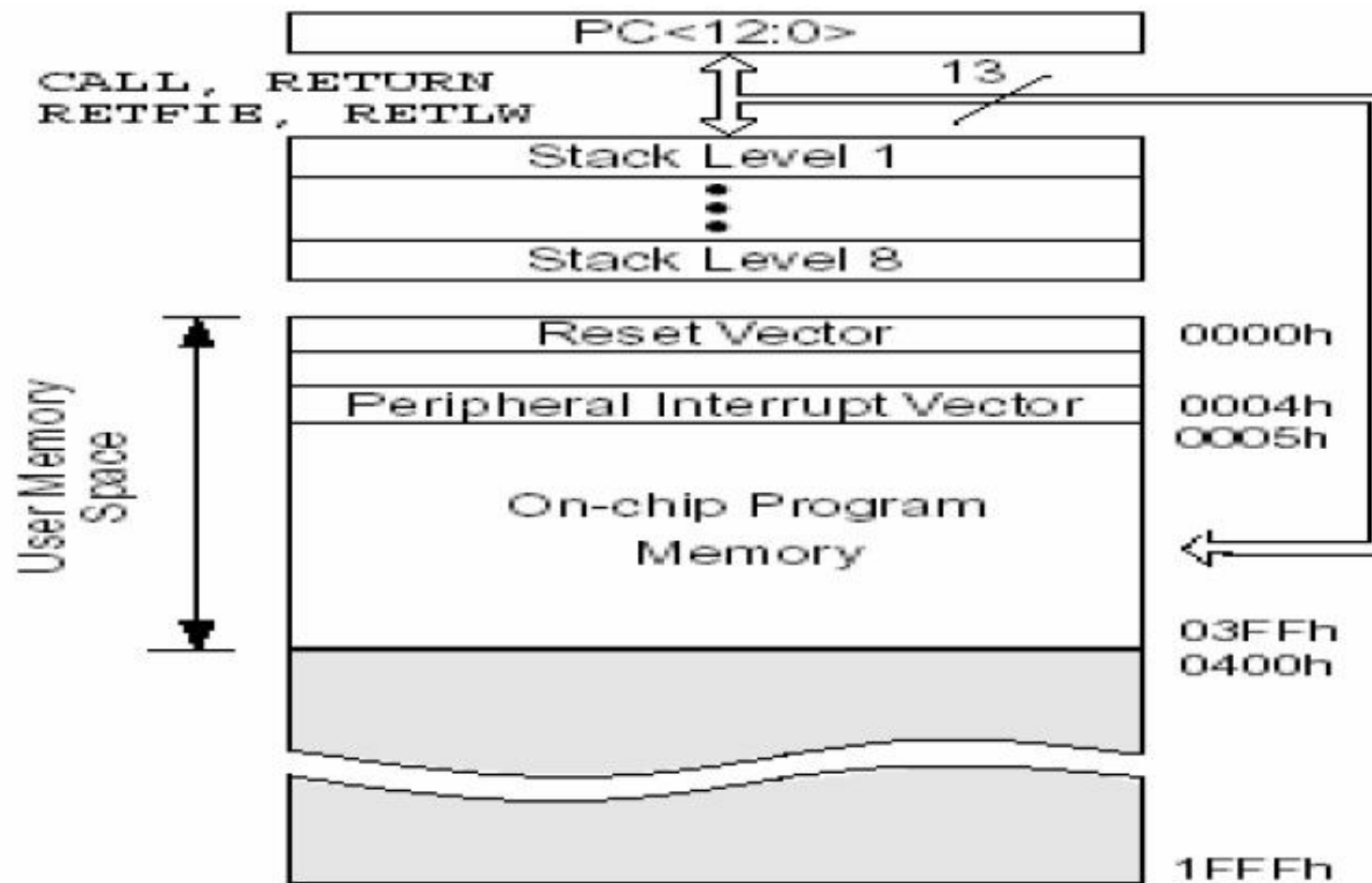

Fig 4. Program Memory map

Program Memory

- PIC 16c6X/7X is 2K or 4K.
- 11 bit or 12 bit address is used out of 13 bits in PC.
- Maximum memory that can be accessed is 8K.
- After reset program counter is cleared.
- At 0000h there is "goto Mainline" Instruction which takes PC to 0005h.

Program
Counter
13 Bit
$(PC_0 - PC_{12})$

| X | X | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |

5

C

3

Two bits of Program
Counter are ignored
for 2K Addresses

Hex
Address

Program
memory

000

5C3

7FF

2K = 2048
addresses
ranging to
11Bit
address

Program
Counter
13 Bit
$(PC_0 - PC_{12})$

| X | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |

B

C

3

One bit of Program
Counter are ignored for
4K Addresses

Hex
Address

Program
memory

000

BC3

FFF

4K = 4095
addresses
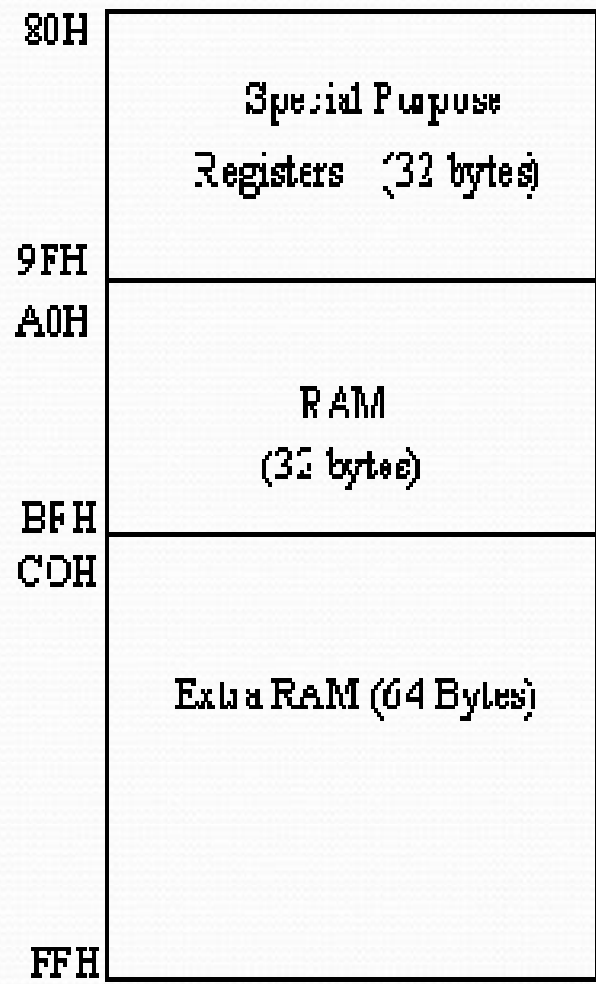ranging to
12 Bit
address

Program Memory Contd..

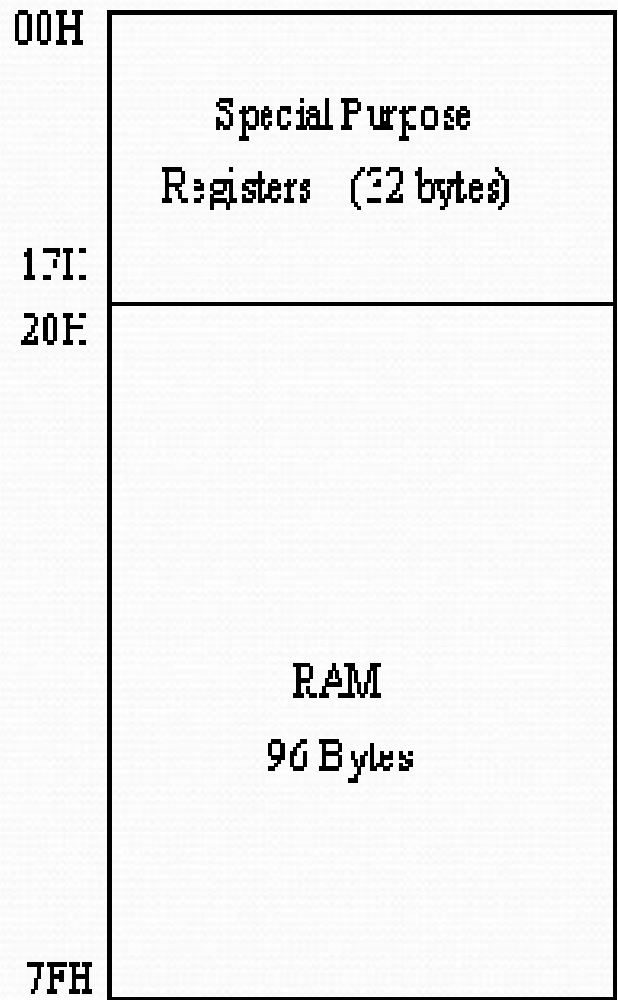# Data Memory

- **Register File Structure.**

  They are the memory locations that are addressed by instruction.

  There is general purpose and special purpose register file.

  General purpose are 8 bit RAM locations and special purpose are I/O ports and control registers.

Data Memory map

	Bank 0	Bank 1	
00h	INDF[1]	INDF[1]	80h
01h	TMR0	OPTION	81h
02h	PCL	PCL	82h
03h	STATUS	STATUS	83h
04h	FSR	FSR	84h
05h	PORTA	TRISA	85h
06h	PORTB	TRISB	86h
07h			87h
08h			88h
09h			89h
0Ah	PCLATH	PCLATH	8Ah
0Bh	INTCON	INTCON	8Bh
0Ch			8Ch
	General Purpose Register	Mapped in Bank 0[2]	
2Fh			AFh
30h			B0h
7Fh			FFh

Bank 0   Bank 1

Specifications of some popular PIC microcontrollers:

Device	Program Memory (14bits)	Data RAM (bytes)	I/O Pins	ADC	Timers 8/16 bits	CCP (PWM)	USART SPI / I2C
16C74A	4K EPROM	192	33	8 bits x 8 channels	2/1	2	USART SPI / I^2C
16F877	8K Flash	368 (RAM) 256 (EEPROM)	33	10 bits x 8 channels	2/1	2	USART SPI / I^2C
Device	**Interrupt Sources**	**Instruction Set**					
16C74A	12	35					
16F877	15	35					