14/3/20

PIC :

Unit-5

PIC Micro Controller

PIC - peripheral Interface Controller.

It is advanced microcontroller than 8051.

Microcontroller	8051	PIC	ARM (Advanced Risk Machines)
	RAM, ROM, EPROM.	EEPROM, FLASH ROM, UVROMS. (8 bit)	UVROM (128 bit)

1) PIC is an advanced 8 bit microcontroller given by Microchip technology Corporation in 1989.
2) PIC Combines a small amount of data RAM Onchip ROM few I/o ports and One timer on a single chip.
3) There are 5 major 8-bit microcontrollers
   1) MOTOROLA - 6811 (US)
   2) INTEL - 8051 (US)
   3) XILOG - Z8 - (china)
   4) ATMEL AVR (US)
   5) MICRO CHIPS - PIC. (US)

There are 6 different generations of 8 bit PIC introduced by MICRO CHIP Over the last few years.

8086 is not having inbuilt pheripherals

www.Jntufastupdates.com Scanned by CamScanner

1) PIC-12xxx	8 pin	12 bit instruction format
2) PIC-14xxx	26 pin	14 bit instruction format
3) PIC-16C5X	18-28 pin	12 bit
4) PIC-16CXX	28-40 pin	14 bit
5) PIC-17XXX	8 - 40 pin	16 bit
6) PIC-18XXX	18-80 pin	16 bit

PIC 18 is advanced 8 bit micro Controller comprises 4 kbytes of RAM and 2MB ROM USART (Universal Synchronous Asynchronous Receiver Transmitter) watched dog timer I^2C (Buses inter integrated circuit) SPI (Serial peripheral Interface) CAN (Computer Aided network), pulse width modulation, LPO (Lower power Operation mode) 4-8bit timers, 1-Serial port, ADC (Analog-Digital Converter) Analog Comparator, flash memory, EPROM, EEPROM, SRAM

1) PIC is having inbuilted ADC but 8051 is not having inbuilted ADC.
2) SPI, I^2C, ADC are buses reading and writing data to from master to Slave. (buses for Communication).
3) Microprocessor is inbuilted in 8051 as it holds Only instructions.
4) Microprocessor is known as master as it holds the instructions.
5) Slaves are 8255, Serial port, RAM, ROM, Timers etc in 8051

www.Jntufastupdates.com Scanned by CamScanner

6) SPI interfaces the data and transfers the data in Serial (bit by bit transmission)

7) I^2C is a true bidirectional interfacing device (Serial)

8) CAN is used to control the master devices of the System.

9) Watchdog timer is a hardware timer in that timer the timer module is designed by n Counter (ctrl+Alt+del) the Signal is going to connect watch dog timer.
This timer is used to Solve the hang up condition of the device.

9) USART - Synchronous and Asynchronous way of communication

10) flash memory is used to protect the program code. This protected memory is known as catch memory

11) It is hardware architecture (PIC 18) Supported

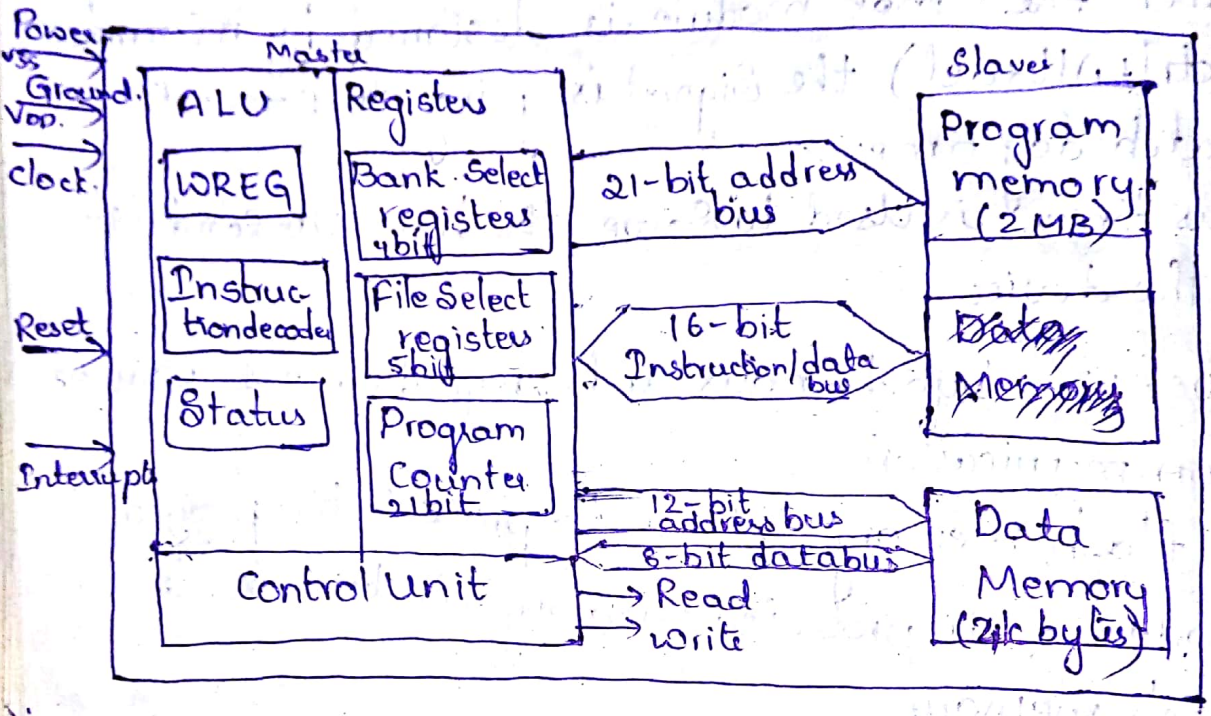
12) by using RISC processor (Risk instruction Set Computer)

8051	PIC
1). 8051 is a 8bit processor	1) PIC is also a 8bit processor
2) 128 bytes of RAM	2) 4kbytes of RAM.
3) 64 kbytes of program memory	3) 2MB of program memory.

www.Jntufastupdates.com Scanned by CamScanner

4) Two Timers in 8051	4) 4 Timers in PIC.
5) One Serial port	5) One Serial port
6) 32 I/o pins	6) 33 I/o pins
7) 8051 is not having inbuilted ADC.	7) PIC is having inbuilt ADC.

Architecture of PIC-18 MicroController



Data Memory is Variable memory and program memory is having inbuilt program dumper.

Data Memory and program Memory are two Sep Onchip memories.

The capacity of prog

3 parts are present in microprocessor Unit

1) ALU (Arithmetics logical Unit)
2) Registers. (To perform ALU registers are Used
3) Control Unit

www.Jntufastupdates.com Scanned by CamScanner

Arithmetic and logical Unit is Used to perform all Arithmetic and logical Operations Using register. WREG is nothing but Accumulator. It is a destination register. It holds the data result temporarily. WREG (Working register). It performs read and Write Operations. (It is 8 bit)

Status: Status register is nothing but flags. It shows the result of ALU. It is an 8 bit register.

7	6	5	4	3	2	1	0
-	-	-	N	OV	Z	DC	C

Carry flag - If the result is generating Carry it is Set 1
1 - Carry
0 - No Carry

Digit Carry - Nothing but Auxilary Carry flag.
The 4th bit Send a Carry to the 5th bit.
It is generally present in Multiplication and division Operations.

Zero flag : 1 - Result 0
0 - Result not Zero

Overflow flag : It will appear in Mul and div. more than 8 bits. 8x8 = 64.

Negative flag : result Negative = 1
Positive = 0

www.Jntufastupdates.com Scanned by CamScanner

Instruction decorder

It is Used to decode 16 bit instructions

Control Unit

It is Used to control Read and Write Operations

Registers

There are 3 types of Registers Used in PIC micro Controller

1. Bank Select registers (4 bit)
2. File Select register (5 bit)
3. program Counter (21 bit)

Program Counter:

1) It Counts the total no of lines of program.
2) It is interlinked with interrupter
3) It also Connects with memory
4) This program Counter is Used to hold program memory addresses.
5) but in 8051 we have DPTR as program Counter which is 16 bit (DPTL and DPTH)
6) In PIC it is divided into 3 register.

1) PCU (5 bit) 2) PCH (8) bit 3) PCL (8 bit)

By default PCL is available for starting address of any memory location.

Bank Select Registers

Bank Registers are Used to Select file register file registers are Used to hold the program code

www.Jntufastupdates.com Scanned by CamScanner

It is a 4bit Special function register Used in direct addressing data memory.

File registers are Used to Select Indirect data memo

Bank registers are Used to Select direct data memo

whole memory is divided to banks.

Banks are divided into 16 banks

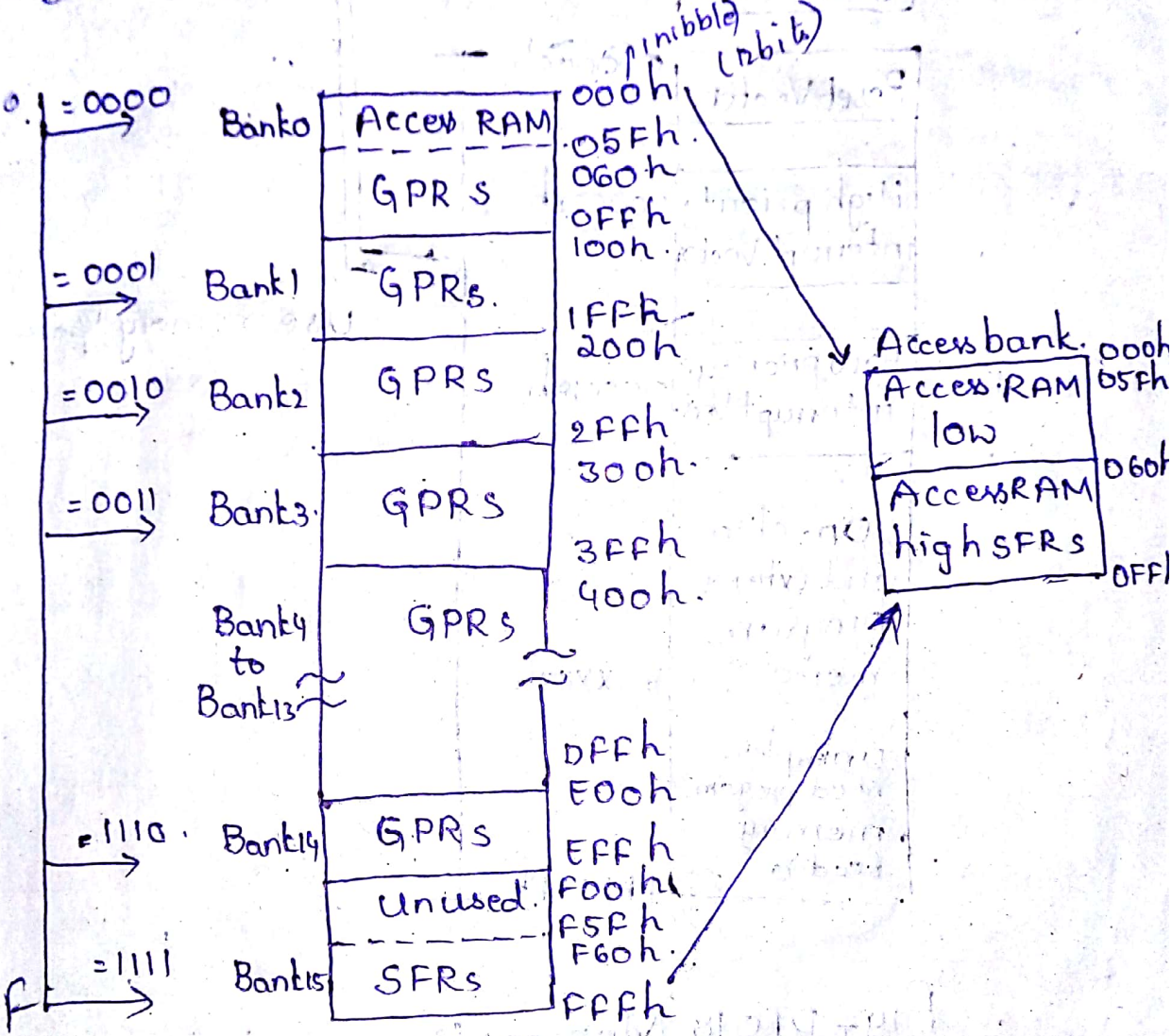
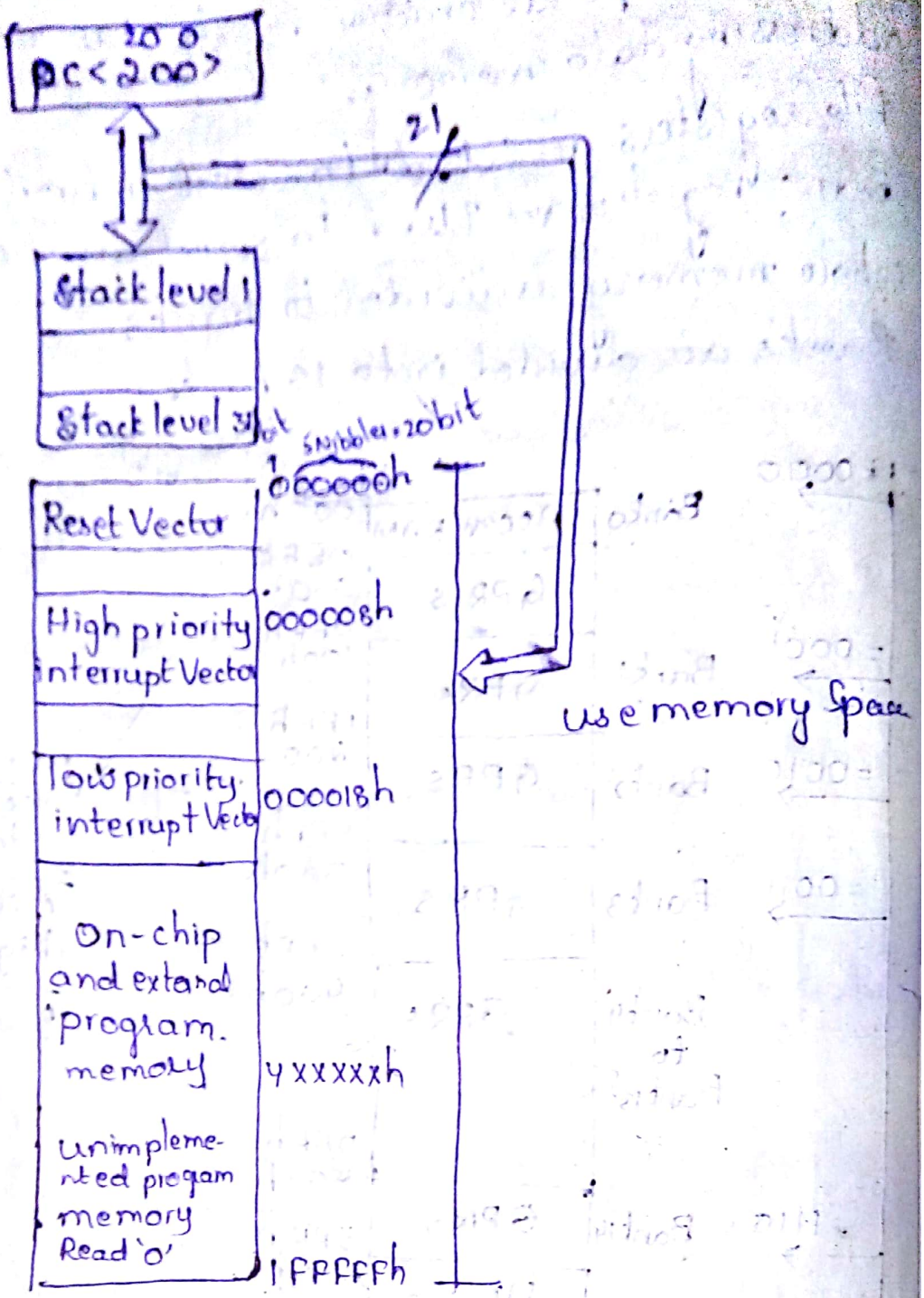


Fig: Data Memory Map for PIC 18

Each bank holds 256 bytes: Out of these banks Only One bank is active at a time.

Out of these 16 banks the data memory is having a memory Space for Unused purpose i.e F00h to F5Fh It holds the data temporarily.

www.Jntufastupdates.com Scanned by CamScanner



Fig+ PIC 18 Memory Organisaton

The Stack is Used to hold the temporarily. Here the program memory Contains 31 Stack addresses which is to hold the retun addresses for Subroutine program.

www.Jntufastupdates.com Scanned by CamScanner

CPU registers of PIC 18

Name	Description
1) TOSU	Top of Stack (Upper)
2) TOSH	Top of Stack (Higher)
3) TOSL	Top of Stack (lower)
4) STKPTR	Stackpointer
5) PCLATU	Upper program Counter latch.
6) PCLATH	Higher program Counter latch
7) PCL	Program counter lower byte
8) TBLPTRU	Table pointer upper byte
9) TBLPTRH	Table pointer Higher byte. High program Counter latch
10) TBLPTRL	Table pointer lower byte
11) TABLAT	Table latch.
12) PRODH	High product register.
13) PRODL	Low product register.
14) INTCON	Interrupt Control register.
15) INTCON2	Interrupt Control register2
16) INTCON3	Interrupt control register3.
17) INDF0	Indirect file register pointer0
18) POSTINC0	post-increment pointer0 (to GPR's)
19) POSTDEC0	post-decrement pointer0. (to GPR's)

www.Jntufastupdates.com Scanned by CamScanner

20) PREINC0	pre increment pointer 0 (to GPR's)
21) PLUSW0	Add WREG to FSR0
22) FSR0H	File Select register Zero high byte.
23) FSR0L	File Select register zero low byte.
24) WREG	Working register.
25) INDF1	Indirect file register pointer-1
26) POSTINC1	post increment pointer-1 (to GPR's)
27) POSTDEC1	post decrement pointer-1 (to GPR's)
	pre increment pointer-1 (to GPR's)
28) PREINC1	pre increment pointer 1 (to GPR's)
29) FSR1H	File Select register 1 high byte
30) FSR1L	File Select register 1 lower byte
31) BSR	Bank Select register.
32) INDF2	Indirect file register pointer 2.
33) POSTINC2	post increment pointer-2 (to GPR's)
34) POSTDEC2	post decrement pointer 2 (to GPR's)
35) PREINC2	pre increment pointer 1 (to GPR's)
36) PLUSW2	Add WREG to FSR2
37) FSR2H	File Select register 2 higher byte
38) STATUS	Status register.
39) FSR2L	File Select register 2 lower byte

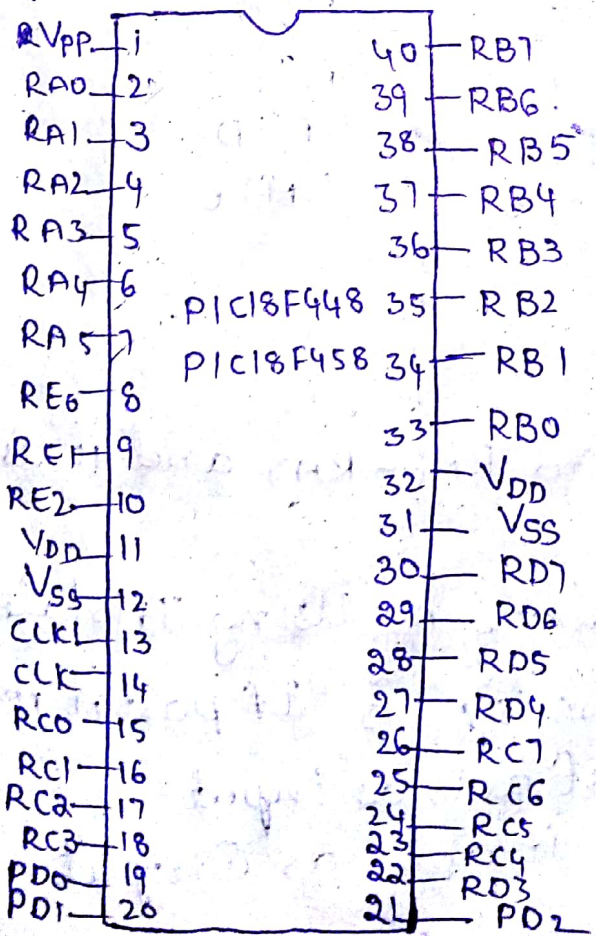
www.Jntufastupdates.com Scanned by CamScanner

I/O ports of PIC-18 Micro Controller

Audmo boards

Pins / chip	18pin PIC18F1220	28pin PIC18F2220	40pin PIC18F458	64pin PIC18F6652H	80pin PIC18F8525
Port A	X	X	X	X	X
Port B	X	X	X	X	X
Port C		X	X	X	X
Port D			X	X	X
Port E			X	X	X
port F				X	X
port G				X	X
port H				X	X
port J				X	X
port k					X
port L					X

Pin diagram of PIC 18



www.Jntufastupdates.com Scanned by CamScanner

The no of I/o ports in PIC 18 family Varies according to the Selected number of PIC.

Examples PIC 18F448 / 58 family Consist 53 pins for reseved 5 ports (port A port B port C port D and port E)

It is not necessary to have all 8 ports pins are 8 pins

Here the port A is assigned 7 pins and port B, C, D are 8 pin and port E is having 3 pins.

Out of these ports has 3 Special functions registers associated with it. Those are Called port X, TRISX, latches LATX.

Port X	TRIS X	LAT X
Port A	TRIS A	LAT A
Port B	TRIS B	LAT B
Port C	TRIS C	LAT C
Port D	TRIS D	LAT D
Port E	TRIS E	LAT E

Port A

Here Port A is Copied $RA_0 - RA_7$ and it is Used for I/o pin

This port is enabling by Using Tristate A register Logic 0 If the register is If port A returns all Ones it acts as input otherwise it acts as Output

www.Jntufastupdates.com Scanned by CamScanner

Port B

RB0 - RB7 for using these pins as both input & Output by enabling bits of tristate B register.

If this register returns all ones it acts as i/p. otherwise o/p.

Port C

www.Jntufastupdates.com Scanned by CamScanner