22/11/2021 Microprocessor

① Arrange numbers in ascending order

WAP to sort given 10 numbers from memory location 2200H in ascending order.

```
        MVI B, 09H
START:  LXI H, 2200H
        MVI C, 09H
BACK:   MOV A, M
        INX H
        CMP M
        JC SKIP
        JZ SKIP
        MOV D, M
        MOV M, A
        DCX H
        MOV M, D
        INX H
SKIP:   DCR C
        JNZ BACK
        DCR B
        JNZ START
        HLT
```

Compare two number → Stored at consecutive memory location

Use JNC for descending order.

JC SKIP → If first no. is smaller than second no., don't interchange

JZ SKIP → If both are equal don't interchange

interchange the numbers memory location if first no. > second no.

Control inner loop.

Control outer loop.

INPUT / OUTPUT Device Interfacing

* The transfer of data between keyboard and µp OR transfer of data between display device and µp is referred as I/O data transfer.

* The data is read by µp from input device through input port.

* The data is send or write by µp to output device through output port.

→ How Input or output devices can be connected to microprocessor ?.

* The I/O devices can be interfaced with 8085 µp in one of the two ways :-

1) I/O MAPPED I/O

2) MEMORY MAPPED I/O

USING INDEPENDENT INSTRUCTIONS

IN INSTRUCTION

OUT INSTRUCTION

I/O devices are treated as memory location and instructions for memory access are used.
(LDA, STA, MOV A, M etc.)

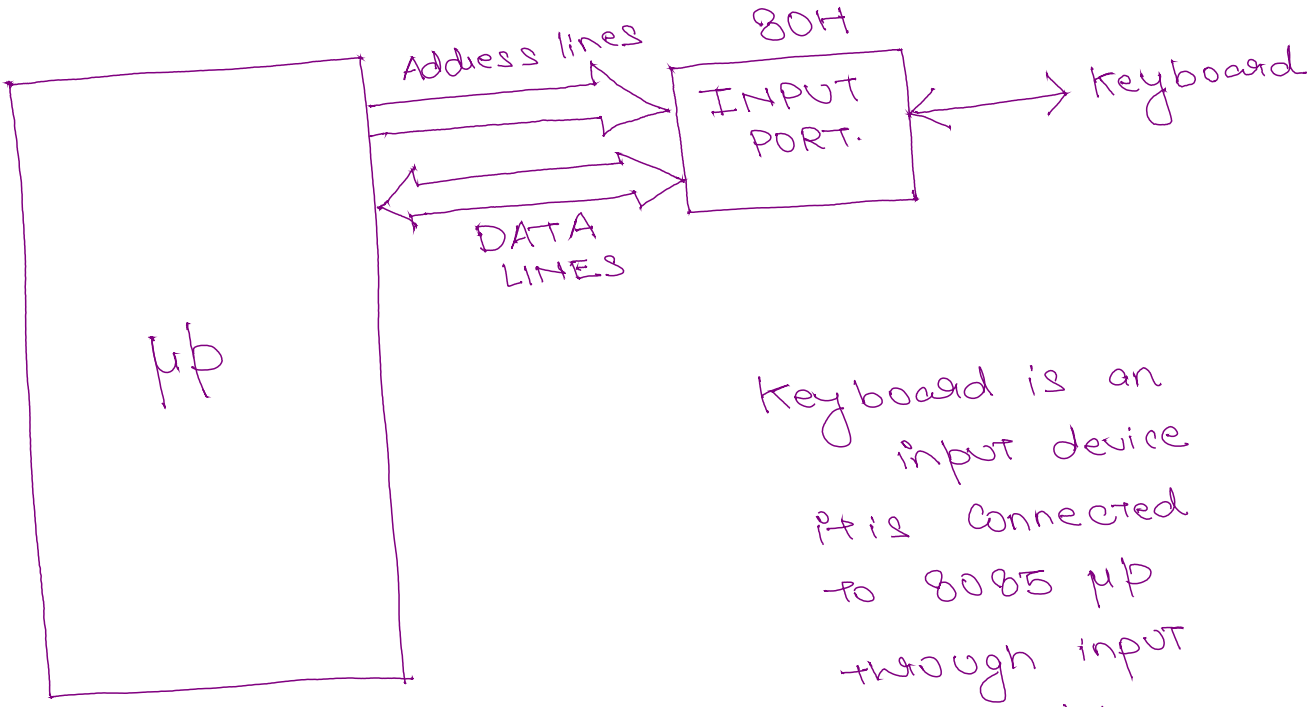
IN INSTRUCTION : This instruction reads 8-bit data from an input device and the 8-bit data is stored in accumulator.

Syntax : IN 8-bit address

↳ is the address of input port.

Example : IN 80H

This instruction will store 8-bit data received from an input port. 80H is the address of the input port.



Keyboard is an input device it is connected to 8085 μp through input port with address 80H.

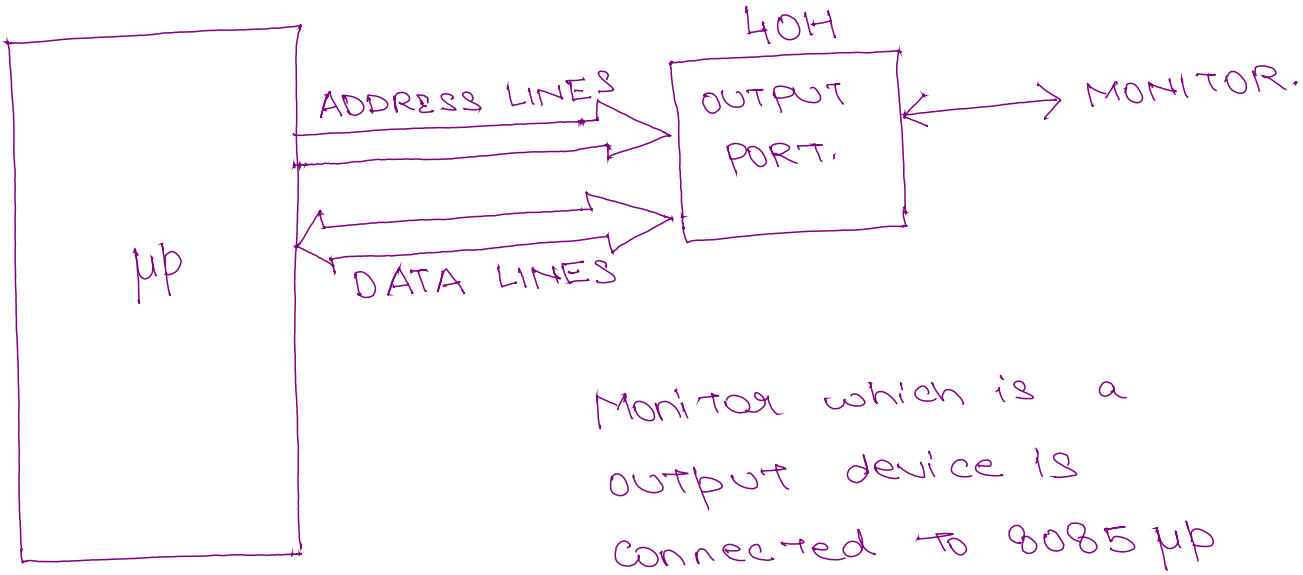
OUT INSTRUCTION : This instruction writes or send data (8 bit) in the accumulator to the output port.

Syntax : OUT 8-bit address

↳ is the address of output port.

Example : OUT 40H

This instruction will send the data in the accumulator to the output port with address 40H.



Monitor which is a output device is connected to 8085 μp through output port with address 40H.

COMPARISON : I/O MAPPED I/O VS MEMORY MAPPED I/O.

I/O MAPPED I/O	MEMORY MAPPED I/O
8-bit address is used to identify the devices	16-bit address is used to identify devices.
IN and OUT INSTRUCTIONS are used for reading and writing data	Memory access instructions are used.
Data transfer always between accumulator and I/O device	Data transfer between any register and I/O device based on instruction used.
Maximum number of devices that can be connected is $2^8 = 256$ devices.	Maximum number of devices that can be addressed or connected is $2^{16} = 65536$ devices.
Preffered method as it doesnot effect the memory interfacing.	This scheme will reduce the memory size as few addresses designed for memory will be utilized by I/O devices.

STACK OPERATION IN 8085 µp

→ What is stack memory?.

* It is a portion of Read/write memory set aside by the user (or programmer) for the purpose of storing temporary data.

→ How data is accessed or read/write in stack memory?.

* PUSH ← writting data onto stack memory.

POP → Reading data from stack memory.

→ How stack data is organized?.

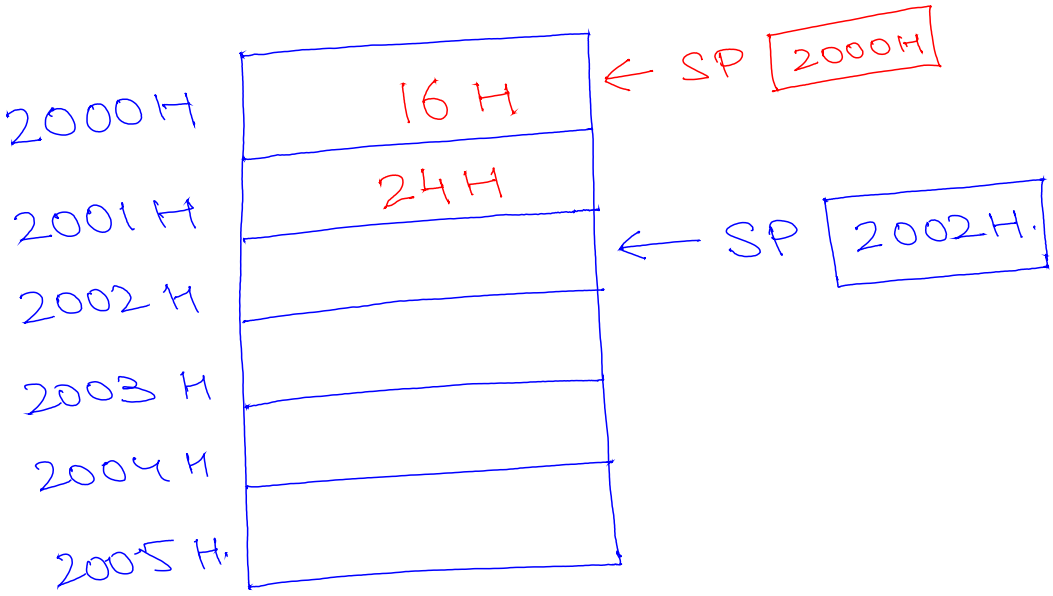
* FILO (First IN LAST OUT).

LIFO (Last IN First OUT).

→ How stack is implemented in 8085 µp?.

* STACK POINTER (16-bit register)

B = 24H
C = 16 H.
BC = 2416
H L



PUSH B → . IN 8085 PUSH is the opcode for writing value in stack memory.

B indicates BC register pair

- The value to be stored in stack memory will always be a 16-bit value.
- We will always use register pair with PUSH instruction.

Syntax of PUSH instruction

PUSH rp.

register pair

B → BC
D → DE
H → HL

- How PUSH is executed :-

① SP ← SP − 1
(SP) ← rpH
SP ← SP − 1
(SP) ← rpL