# 8085 Microprocessor

Dr. Manju Khurana
Assistant Professor, CSED
TIET, Patiala
manju.khurana@thapar.edu

Instruction Formats

Each instruction has two parts:

- **Opcode (operation code)-** The first part is the task or operation to be performed.
- **Operand -** The second part is the data to be operated on. Data can be given in various forms.
  - It can specify in various ways: may include 8 bit/16 bit data, an internal register, memory location or 8 bit /16 bit address.
  - For Eg.:

MVI A,02H

Opcode   Operand

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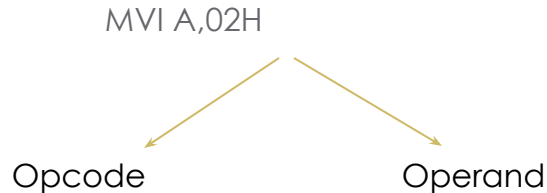
Instruction word Size

☐ An instruction is assembled in binary form (0,1) known as machine code or opcode. Due to different ways of specifying data or operand the machine code are not same for all the instructions.

☐ The size of an instruction signifies how much memory space is required to load an instruction in the memory. 8085 instructions are of following sizes:

✔ **One-byte or one word Instructions: opcode and operand in 8 bits**
only i.e. one byte. Operand(s) are internal register and are coded into the instruction.

e.g. MOV, ADD, ANA, SUB, ORA etc.

MOV A,B   Move the content of B in A

01 111 000 = 78H   01 for MOV operation, 111 binary code for register A and last 000 binary code for register B

Task	Op- code	Operand	Binary Code	Hex Code
Copy the contents of the accumulator in the register C.	MOV	C,A	0100 1111	4FH
Add the contents of register B to the contents of the accumulator.	ADD	B	1000 0000	80H
Invert (compliment) each bit in the accumulator.	CMA		0010 1111	2FH

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Instruction Format or Size….Cont…

✔ **Two-byte instructions:** first byte is opcode in 8 bits and second byte is operand either 8 bit data or 8 bit address.

e.g. MVI, ADI, ANI, ORI, XRI etc.

MVIB, 05H   Move 05 to register B

06,05   MVIB, 05H in the code form

Task	Op- code	Operand	Binary Code	Hex Code
Load an 8-bit data byte in the accumulator.	MVI	A, Data	0011 1110 DATA	3E (First Byte) Data(Second Byte)

Mnemonics	Hex code
MVI A, 32H	3E 32H

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Instruction Format or Size….Cont…

✔ **Three-byte instructions:** first byte is opcode in 8 bits and second and third byte are operand either 16 bit data or 16 bit address.

Operand 1 = lower 8 bit data/address

Operand 2 = Higher 8 bit data/address

opcode + data byte + data byte

e.g. LXI, LDA, STA, LHLD, SHLD etc.

LXIH , 2500H   load HL pair with 2500H

21,00,25   LXIH , 2500H in code form

Task	Op-code	Operand	Binary Code	Hex Code	Hex Code
Transfer the program sequence to the memory Location 2085H.	JMP	2085H	1100 0011	C3	First Byte
			1000 0101	85	Second Byte
			0010 0000	20	Third Byte

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Addressing Modes

- To perform any operation, we have to give the corresponding instructions to the microprocessor.

- In each instruction, programmer has to specify 3 things:

    - Operation to be performed.

    - Address of source of data.

    - Address of destination of result.

- The method by which the address of source of data or the address of destination of result is given in the instruction is called **Addressing Modes.**

- The term addressing mode refers to the way in which the operand of the instruction is specified.

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Types of Addressing Modes

Intel 8085 uses the following addressing modes:

1. Direct Addressing Mode

2. Register Addressing Mode

3. Register Indirect Addressing Mode

4. Immediate Addressing Mode

5. Implicit Addressing Mode

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Direct Addressing Mode

- In this mode, the address of the operand is given in the instruction itself.

LDA 2500 H	Load the contents of memory location 2500 H in accumulator.

- LDA is the operation.

- 2500 H is the address of source.

- Accumulator is the destination.

Register Addressing Mode

- In this mode, the operand is in one of the general purpose register or accumulator.

MOV A, B	Move the contents of register B to A.

- MOV is the operation.

- B is the source of data.

- A is the destination.

Register Indirect Addressing Mode

☐ In this mode, the address of operand is specified by a register pair.

MOV A, M	Move data from memory location specified by H-L pair to accumulator.

☐ MOV is the operation.

☐ M is the memory location specified by H-L register pair.

☐ A is the destination.

Immediate Addressing Mode

- In this mode, the operand is specified within the instruction itself.

MVI A, 05 H	Move 05 H in accumulator.

- MVI is the operation.

- 05 H is the immediate data (source).

- A is the destination.

Implicit Addressing Mode

- If address of source of data as well as address of destination of result is fixed, then there is no need to give any operand along with the instruction. It means there are certain instructions which operate on the content of the accumulator. Such instructions do not require the address of the operand.

CMA	Complement accumulator.

- CMA is the operation.

- A is the source.

- A is the destination.

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