CHAPTER 5

MICROPROCESSOR - 8086 ADDRESSING MODES

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The different ways in which a source operand is denoted in an instruction is known as **addressing modes**. This specifies that the given data is an immediate data or an address. It also specifies whether the given operand is register or register pair.

5.1 TYPES OF ADDRESSING MODES:

The 8086 microprocessors have 8 addressing modes. Two addressing modes have been provided for instructions which operate on register or immediate data.

These two addressing modes are:

1. **Register Addressing mode**

In register addressing, the operand is placed in one of the 16-bit or 8-bit general purpose registers.

Fig. 5.1 Register addressing mode

Example

o MOV AX, CX

o ADD AL, BL

o ADD CX, DX

2. Immediate Addressing mode

In immediate addressing, the operand is specified in the instruction itself.

Example

o MOV AL, 35H

o MOV BX, 0301H

o MOV [0401], 3598H

o ADD AX, 4836H

The remaining 6 addressing modes specify the location of an operand which is placed in a memory.

These 6 addressing modes are:

3. Direct Addressing

In direct addressing mode, the operand offset is given in the instruction as an 8-bit or 16-bit displacement element.

In Absolute/ Direct Addressing Mode the effective address of memory location where operand is present is written directly in the instruction.
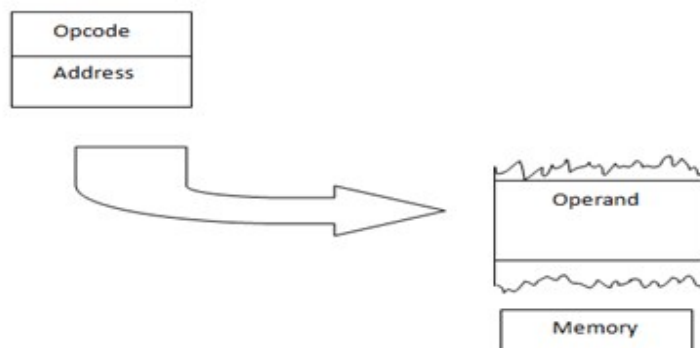
Example: Mov Ax, [5000H]

Fig. 5.2 Direct addressing mode

4. Register Indirect Addressing

The operand's offset is placed in any one of the registers BX, BP, SI or DI as specified in the instruction.

Example

o MOV AX, [BX]

It moves the contents of memory locations addressed by the register BX to the register AX.

5. Based Addressing mode

The operand's offset is the sum of an 8-bit or 16-bit displacement and the contents of the base register BX or BP. BX is used as base register for data segment, and the BP is used as a base register for stack segment.

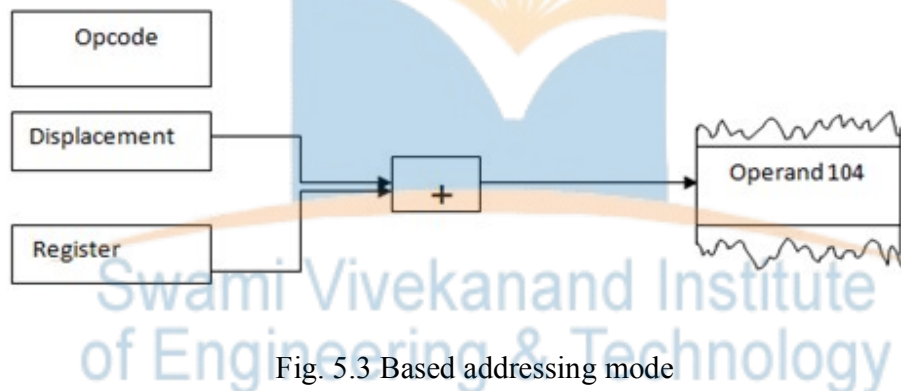**Effective address (Offset)** = [BX + 8-bit or 16-bit displacement].

Fig. 5.3 Based addressing mode

Example

o MOV AL, [BX+05]; an example of 8-bit displacement.

o MOV AL, [BX + 1346H]; example of 16-bit displacement.

6. Indexed Addressing

The offset of an operand is the sum of the content of an index register SI or DI and an 8-bit or 16-bit displacement.

Offset (Effective Address) = [SI or DI + 8-bit or 16-bit displacement]

Example

- ○ MOV AX, [SI + 05]; 8-bit displacement.

- ○ MOV AX, [SI + 1528H]; 16-bit displacement.

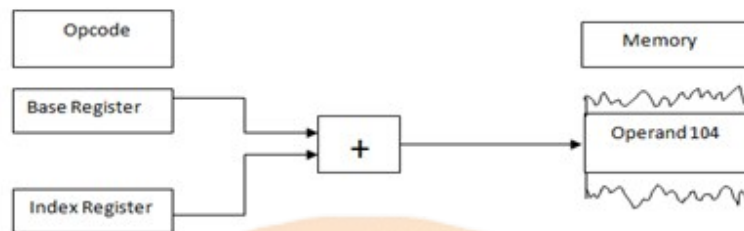### 7. Based Indexed Addressing

Fig. 5.4 Based Indexed Addressing

The effective address of data is formed by adding content of base register any one of Bx or Bp to the content of index register any one of SI or DI. The default segment may be ES or DS. Example: ADD CX, [AX+SI],

MOV AX, [AX+DI]

Here Bx is the base register and SI is the index register.

8. Based Indexed with Displacement

In this mode of addressing, the operand's offset is given by:

Effective Address (Offset) = [BX or BP] + [SI or DI] + 8-bit or 16-bit displacement

Example

- ○ MOV AX, [BX + SI + 05]; 8-bit displacement

- ○ MOV AX, [BX + SI + 1235H]; 16-bit displacement

5.2 REFERENCES

1. https://www.geeksforgeeks.org/addressing-modes-8086-microprocessor/