ADDRESSING MODES OF 8086

The set of mechanisms by which an instruction can specify how to obtain its operands is known as Addressing modes. The CPU can access the operands (data) in a number of different modes.

The addressing modes available in Intel 8086 are:

1. Register Addressing

2. Immediate Addressing

3. Direct Addressing

4. Register Indirect Addressing

5. Based Relative Addressing

6. Indexed Relative Addressing

7. Based Indexed Relative Addressing

Register Addressing Mode:

With the Register Addressing mode the operand to be accessed is specified as residing in an internal register of the 8086.

Example: MOV AX , BX

This stands for move the contents of BX (the source operand) to AX (the destination operand).Both the source and the destination operands have been specified as the contents of internal registers of the 8086.

Immediate Addressing Mode:

If a source operand is part of the instruction instead of the contents of a register or memory location, it represents what is called the *immediate operand* and is accessed using immediate addressing mode. Typically immediate operand represents constant data.
Immediate operands can be either a byte or word of data.

Example: MOV AL , 015H

In this instruction the operand 015H is an example of a byte wide immediate source operand. The destination operand, which consists of the contents of AL, uses register addressing. Thus this instruction employs both immediate and registers addressing modes.

Direct Addressing Mode:

Direct addressing differs from immediate addressing, that the locations following the instruction op-code hold an effective memory address (EA). This effective address is a 16-bit offset of the storage location of the operand from the current value in the data segment (DS) register .EA is combined with the contents of DS in the BIU to produce the physical address of the operand.

Example: MOV CX , BETA

This stands for move the contents of the memory location, which is offset by BETA from the current value in DS into internal register CX.

Register Indirect Addressing Mode:

Register indirect addressing is similar to direct addressing, that an effective address is combined with the contents of DS to obtain a physical address. However it differs in a way that the offset is specified. Here EA resides in either a pointer register or an index register within the 8086.The pointer register can be either a base register BX or a base pointer register BP and the index register can be source index register SI or the destination index register DI.

Example MOV AX , [SI]

This instruction moves the contents of the memory location offset by the value of EA in SI from the current value in DS to the AX register.

Based Addressing Mode:

In the based addressing mode, the physical address of the operand is obtained by adding a direct or indirect displacement of the contents of either base register BX or base pointer register BP and the current value in DS and SS respectively.

Example MOV [BX] . BETA , AL

This instruction uses base register BX and direct displacement BETA to derive the EA of the destination operand. The based addressing mode is implemented by specifying the base register in the brackets followed by a period and direct displacement .The source operand is located in the byte accumulator AL.

Indexed Addressing Mode:

Indexed addressing mode works identically to the based addressing but it uses the contents of the index registers instead of BX or BP, in the generation of the physical address.

Example MOV AL , ARRAY [SI]

The source operand has been specified using direct index addressing. The notation this time is such ARRAY, which is a direct displacement, prefixes the selected index register, SI.

Based Indexed Addressing Mode:

Combining the based addressing mode and the indexed addressing mode together results in a new, more powerful mode known as based indexed addressing.

Example: MOV AH , [BX] . BETA [SI]

Here the source operand is accessed using the based indexed addressing mode. The effective address of the source operand is obtained as EA=(BX)+BETA+(SI)

8086 ADDRESS MODES

TYPE	INSTRUCTION	SOURCE	ADDRESS GENERATION	DESTINATION
1) REGISTER	MOV AX, BX	REGISTER BX		REGISTER AX
2) IMMEDIATE	MOV CH,3AH	DATA 3AH		REGISTER CH
3) DIRECT	MOV [1234], AX	REGISTER AX	(DS x 10H) + DISPLACEMENT 10000H + 1234	MEMORY 11234H
4) REGISTER INDIRECT	MOV [BX], CL	REGISTER CL	(DS x10H) + BX 10000H + 0300H	MEMORY 10300H
5) BASE PLUS INDEX	MOV [BX + SI], BP	REGISTER BP	(DS x 10H) + BX + SI 10000H + 0300H + 0200H	MEMORY 10500H
6) REGISTER RELATIVE	MOV CL, [BX +4]	MEMORY 10304H	(DS x 10H) + BX + 4 10000H + 0300H + 4	REGISTER CL
7) BASE RELATIVE PLUS INDEX	MOV ARRAY [BX + SI], DX	REGISTER DX	(DS x 10H) + ARRAY + BX + SI 10000H+1000H+0300H+0200H	MEMORY 11500H

ASSUME: BX = 0300H; SI = 0200H; ARRAY = 1000H; DS = 1000H.