

University of Salahaddin – College of Engineering
Software & Informatics Dep.

Computer Architecture II
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Lecture 3

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Addressing mode

- ✓ Register addressing mode
- ✓ Immediate addressing mode
- ✓ Direct addressing mode
- ✓ Register Indirect addressing mode
- ✓ Base plus index addressing mode
- ✓ Register Relative addressing mode
- ✓ Base relative plus index addressing mode

Addressing Modes

- When the 8088 executes an instruction, it performs the specified function on data
- These data, called operands,
 - May be a part of the instruction
 - May reside in one of the internal registers of the microprocessor
 - May be stored at an address in memory

Addressing Mode types

1- **Register Addressing Mode** - references the data in a register or in a register pair.

Example:

- MOV AX, BX
- MOV ES, AX
- MOV AL, BH

2- **Immediate Addressing Mode** - the data is provided in the instruction.

Example:

- MOV AL, 15h
- MOV AX, 2550h
- MOV CX, 625

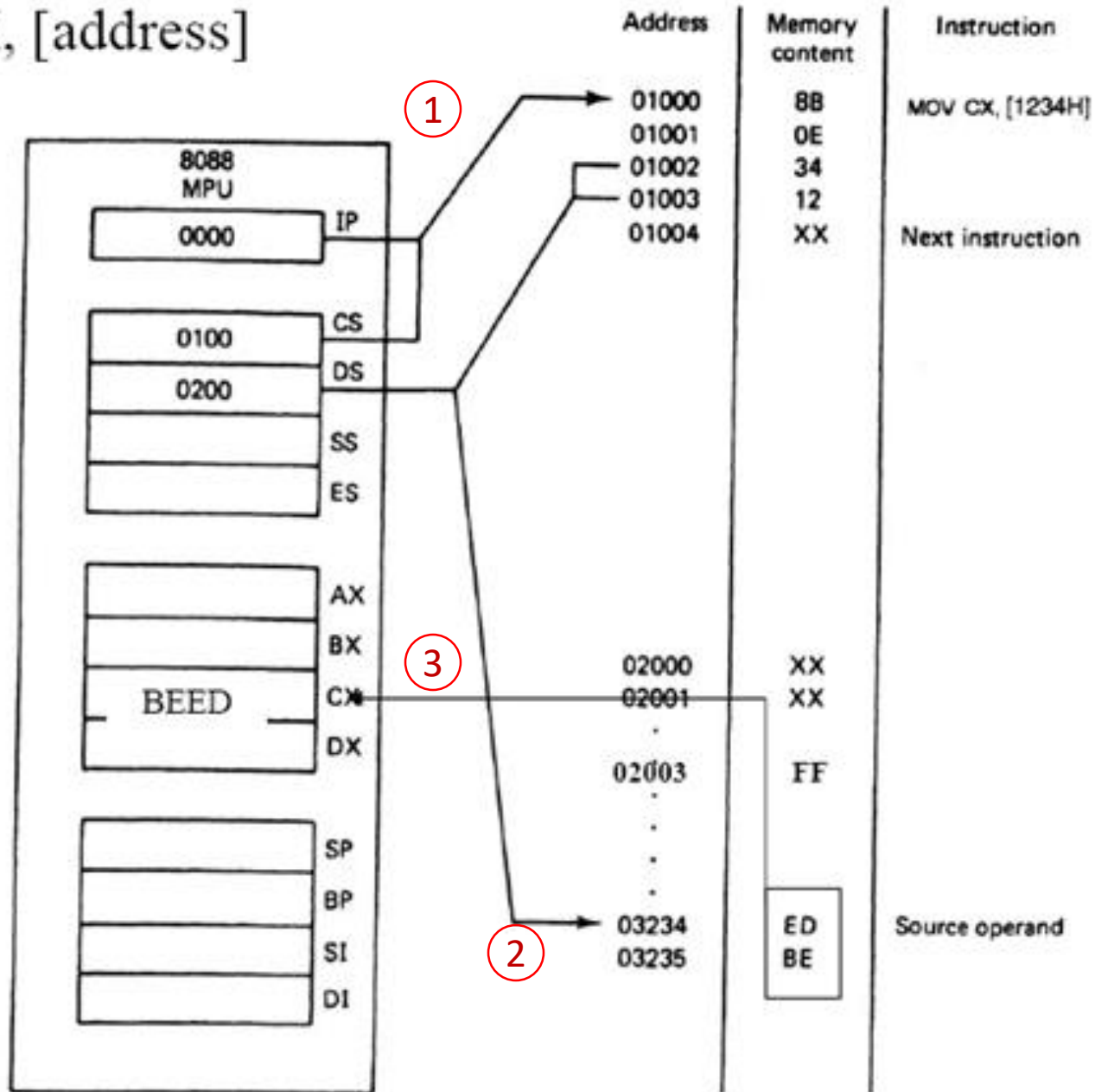
3- **Direct Addressing Mode** operand specifies the memory address where data is located. (only from Data Segment)

Example:

- MOV CX, [1234h]

Direct Addressing Mode

MOV CX, [address]

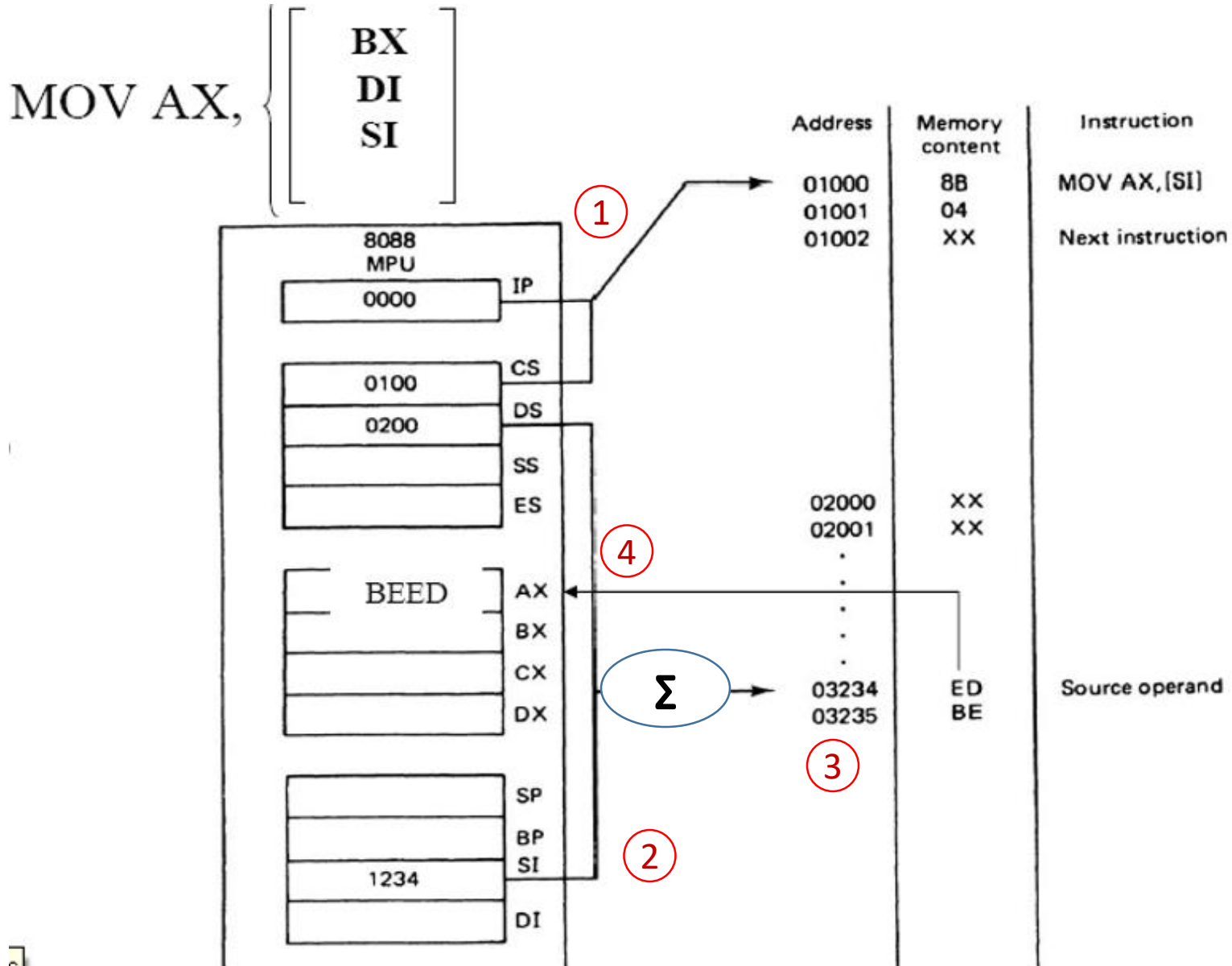


Example : Use the memory configuration in the previous example to execute the instruction

MOV AL,[03]

AL=?

4- **Register indirect Addressing Mode** - instruction specifies a register (BX,SI,DI) containing an address, where data is located



Example for Register Indirect Addressing

- Assume that DS=1120, SI=2498 and AX=17FE show the memory locations after the execution of:

MOV [SI],AX

Physical Address : DS shift left +SI = 13698

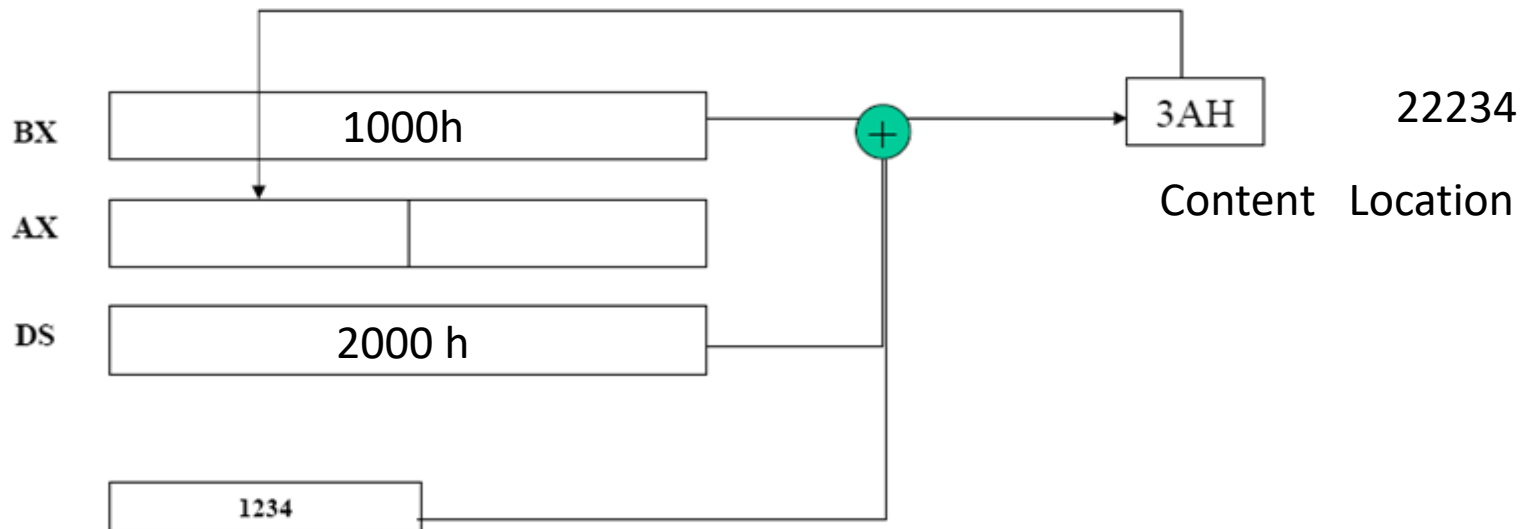
Lower Byte [13698] = FE

Higher Byte [13699] =17

5- Based relative Addressing Mode - 8-bit, 16-bit or 32 bit instruction operand is added to the contents of a base register (BX or BP), the resulting value is a pointer to location where data resides.

Example:

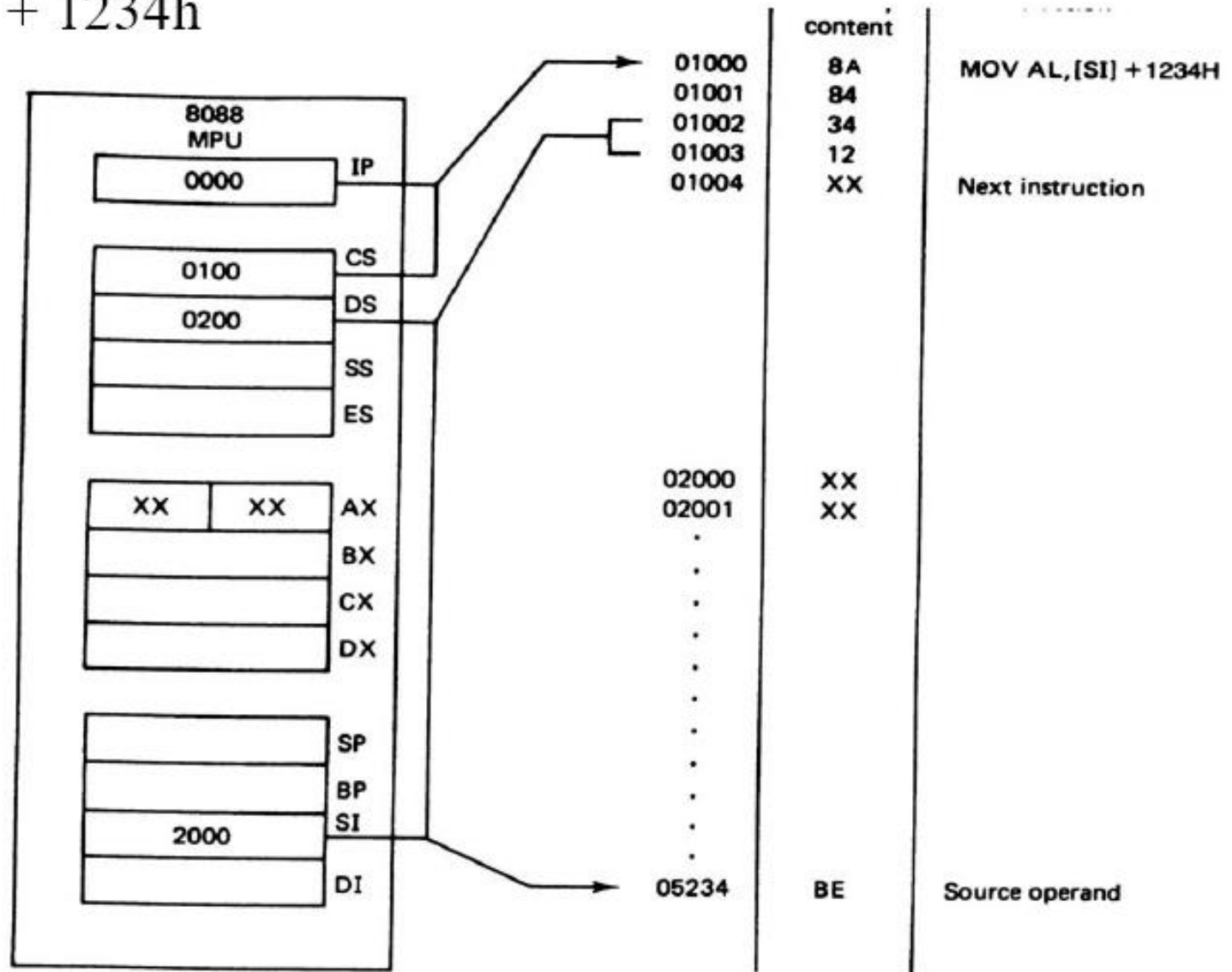
MOV AH, [$\begin{matrix} \text{DS:BX} \\ \text{SS:BP} \end{matrix}$] + 1234h



6- Indexed relative Addressing Mode :- 8-bit, 16-bit or 32 bit instruction operand is added to the contents of an index register (SI or DI), the resulting value is a pointer to location where data resides.

Indexed Relative Addressing Mode

MOV AH, [SI] + 1234h



Example: What is the physical address MOV [DI-8],BL if DS=200 & DI=30h ?
 DS:200 shift left once 2000 + DI + -8 = 2028

7- Based Indexed Addressing Mode :- the contents of a base register (BX or BP) is added to the contents of an index register (SI or DI), the resulting value is a pointer to location where data resides.

- Based Relative + Indexed Relative
- We must calculate the PA (physical address)

$$PA = \begin{array}{|c|} \hline SS \\ \hline DS \\ \hline ES \\ \hline \end{array} : \begin{array}{|c|} \hline BX \\ \hline BP \\ \hline \end{array} + \begin{array}{|c|} \hline SI \\ \hline DI \\ \hline \end{array} + \begin{array}{|c|} \hline 8 \text{ bit displacement} \\ \hline 16 \text{ bit displacement} \\ \hline \end{array}$$

MOV AH,[BP+SI+29]
or
MOV AH,[SI+29+BP]
or
MOV AH,[SI][BP]+29

The
register
order does
not matter

Summary of the addressing modes

Addressing Mode	Operand	Default Segment
Register	Reg	None
Immediate	Data	None
Direct	[offset]	DS
Register Indirect	[BX] [SI] [DI]	DS DS DS
Based Relative	[BX]+disp [BP]+disp	DS SS
Indexed Relative	[DI]+disp [SI]+disp	DS DS
Based Indexed Relative	[BX][SI or DI]+disp [BP][SI or DI]+disp	DS SS

Example for default segments

- The following registers are used as offsets. Assuming that the default segment used to get the logical address, give the segment register associated?

a) BP b)DI c)IP d)SI, e)SP, f) BX

- Show the contents of the related memory locations after the execution of this instruction

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MOV [BP][SI]+10,DX
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if DS=2000, SS=3000,CS=1000,SI=4000,BP=7000,DX=1299 (all hex)