ADDRESSING MODES/8086

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ADDRESSING MODES

- DATA ADDRESSING MODES
  - » Register Addressing
  - » Immediate Addressing
  - » Direct Addressing
  - » Register Indirect Addressing
  - » Base-plus-Index Addressing
  - » Register relative Addressing
  - » Base relative-plus-index Addressing
- PROGRAM MEMORY ADDRESSING MODES
  - – Program relative
  - – Direct
  - – Indirect

How to find actual address from *Segment: offset*

- **34BA:4214**
  - **denotes offset 4214H from segment 34BAH.**
- The actual address it refers to is obtained in the
- following way:
  - **1- Add zero to the right hand side of the segment address.**
  - **2- Add to this the offset.**

Hence the actual address referred to by **34BA:4214 is ?**

Default segments for offset

SEGMENT	OFFSET	SPECIAL PURPOSE
CS	IP	Instruction Address
SS	SP (or) BP	Stack address
DS	BX,DI,SI an 8-bit number 16 – bit number	Data address
ES	DI for string Instructions	String destination address

Register Indirect Addressing

- Allows data to be addressed at any memory location through an offset address held in any of the following registers: BP, BX, DI, and SI.

- MOV AX,[BX]

consider BX = 1000H and DS = 0100H.

Register Indirect Addressing

- In some cases, indirect addressing requires specifying the size of the data by the **special assembler directive** BYTE PTR or WORD PTR.
  - these directives indicate the size of the memory data addressed by the memory **pointer** (PTR)
- The directives are with instructions that address a memory location through a pointer or index register with immediate data.

- MOV BYTE PTR [DI],10H
- MOV BL,DS:BYTE PTR [437AH]

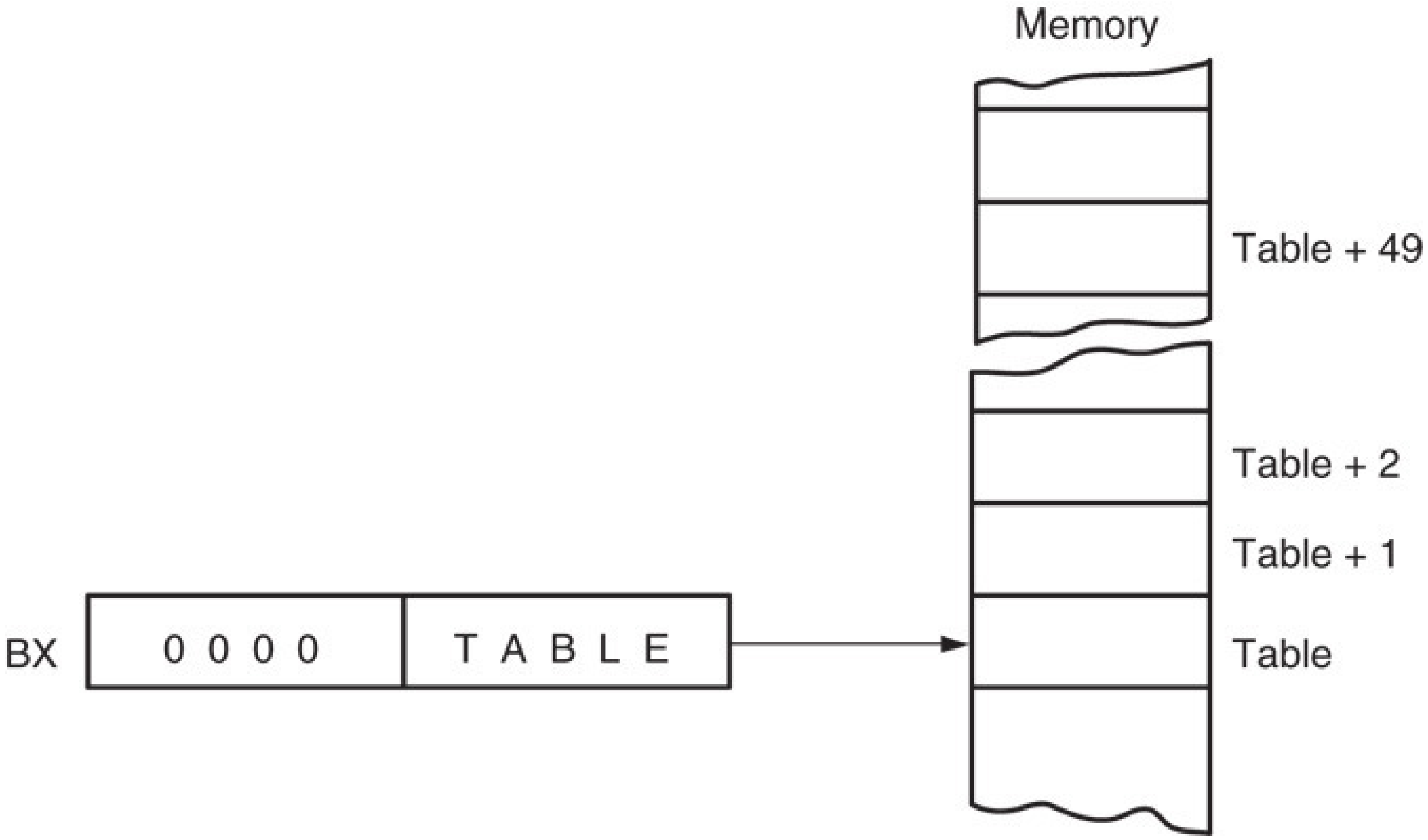
Register Indirect Addressing

- Indirect addressing often allows a program to refer to tabular data located in memory.

Ex: Create a table of information that contains 50 samples taken from extra segment memory location 0000:046C

- Store starting location of table into BX
  - Immediate addressing mode with MOV
  - MOV BX,OFFSET TABLE
- Store 50 samples sequentially
  - Register indirect addressing mode
  - MOV AX,ES:[046CH]
  - MOV [BX],AX

An array (TABLE) containing 50 bytes that are indirectly addressed through register BX.



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Base- plus Index Addressing

- Similar to indirect addressing because it indirectly addresses memory data.
- The base register often holds the beginning location of a memory array.
  - the index register holds the relative position of an element in the array
  - whenever BP addresses memory data, both the stack segment register and BP generate the effective address

Base- plus Index Addressing

- MOV DX,[BX + DI]
- Let DS=0100H, BX=1000H and DI=0010H.
- Whatis the memory address accessed?
  - Beginning of array BX=1000H
  - Relative movement:DI=0010
  - OFFSET=1010
  - Actual adress: 1000+1010
- memory address 2010H is accessed

Locating Array Data Using Base-Plus-Index Addressing

- Load the BX register (base) with the beginning address of the array
- and the DI register (index) with the element number to be accessed.
  - MOV BX,OFFSET ARRAY
  - MOV DI,10H
  - MOV AL,[BX+DI]
  - MOV DI,20H
  - MOV [BX+DI],AL

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Register Relative mode

- Similar to base-plus-index addressing and displacement addressing.
  - data in a segment of memory are addressed by adding the displacement to the contents of a base or an index register (BP, BX, DI, or SI)
- MOV AX,[BX+1000H]
  - when BX=0100H and DS=0200H
  - What is actual ML accessed?
  - 3100

Addressing Array Data with Register Relative

- It is possible to address array data with register relative addressing.
  - Ex.3.9/Brey

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Base Relative-Plus-Index Addressing

- Similar to base-plus-index addressing.
  - adds a displacement
  - uses a base register and an index register to form the memory address
- This type of addressing mode often addresses a two-dimensional array of memory data.

Addressing Data with Base Relative-Plus-Index

- Least-used addressing mode.
- MOV AX,[BX + SI + 100H].
  - displacement of 100H adds to BX and SI to form the offset address within the data segment
- This addressing mode is too complex for frequent use in programming.

Addressing Arrays with Base Relative-Plus-Index

- Suppose a file of many records exists in memory, each record with many elements.
  – displacement addresses the file, base register addresses a record, the index register addresses an element of a record

TRY YOURSELF

MOV BX, 2000_H

MOV DI, 10_H

MOV AL, [BX+DI]

MOV DI, 20_H

MOV [BX+DI], AL