



SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35



**DEPARTMENT OF ELECTRONICS & COMMUNICATION
ENGINEERING**

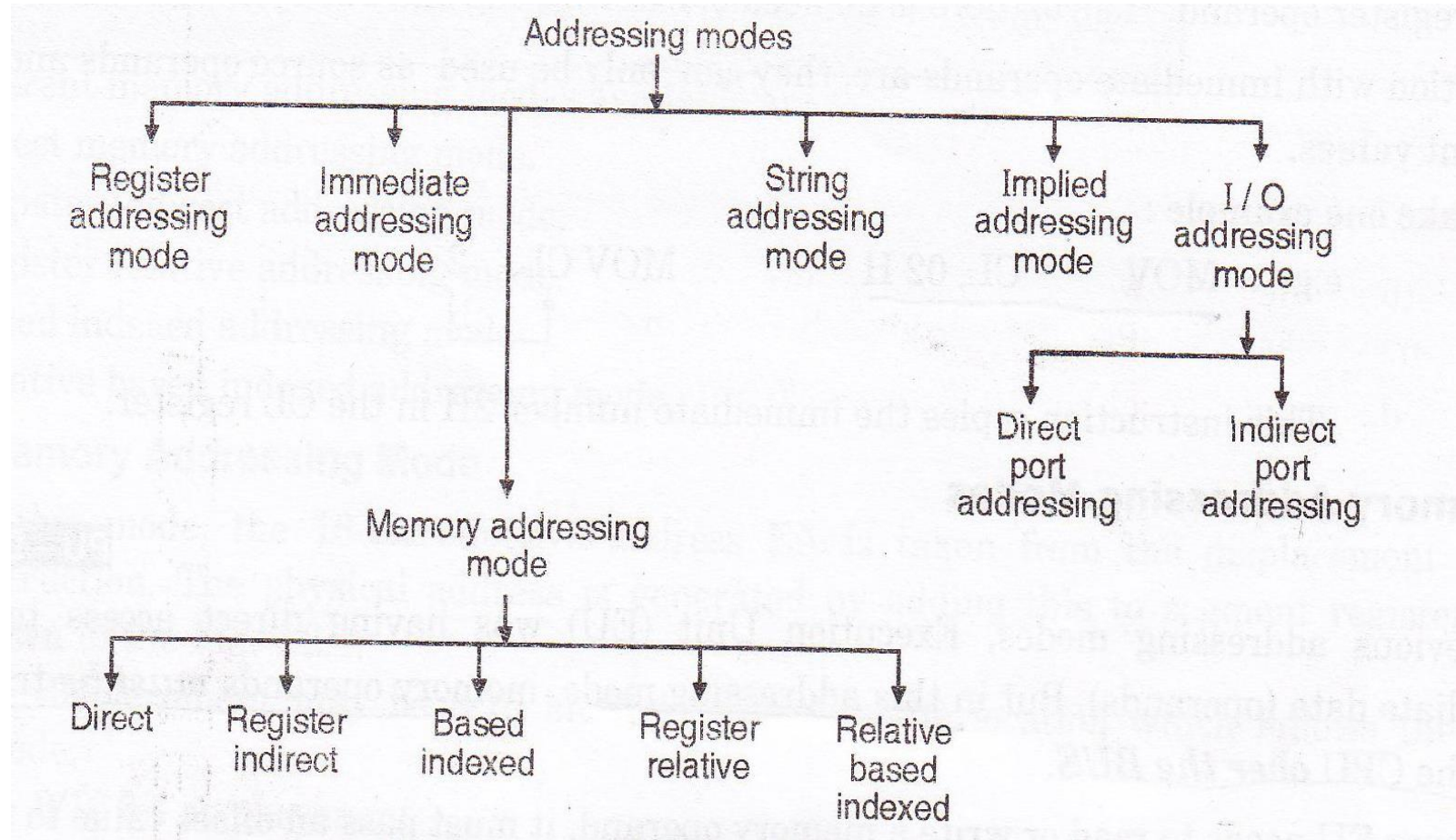
19ECT221 – MICROPROCESSORS AND MICROCONTROLLERS

Addressing Modes of 8086 Microprocessor

Addressing Modes

1. Register Addressing Mode
2. Immediate Addressing Mode
3. Memory Addressing Mode
4. String Addressing Mode
5. I/ OAddressing Mode
6. Implied Addressing Mode

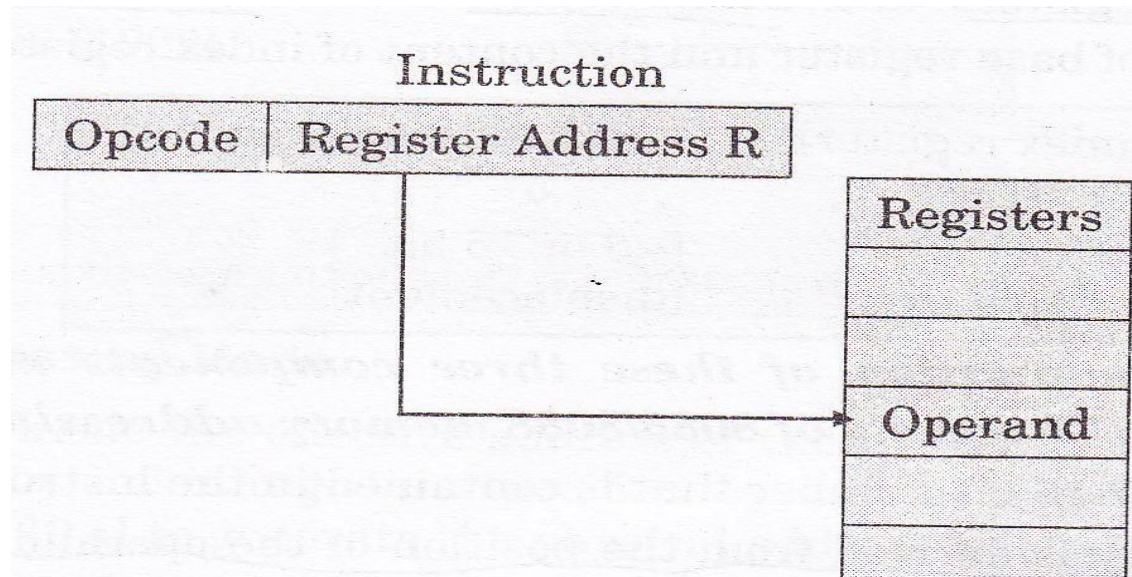
8086 Addressing Modes



Register Addressing Mode

- Data is in register and Instruction Specifies the particular register
- E.g

MOV AX, BX

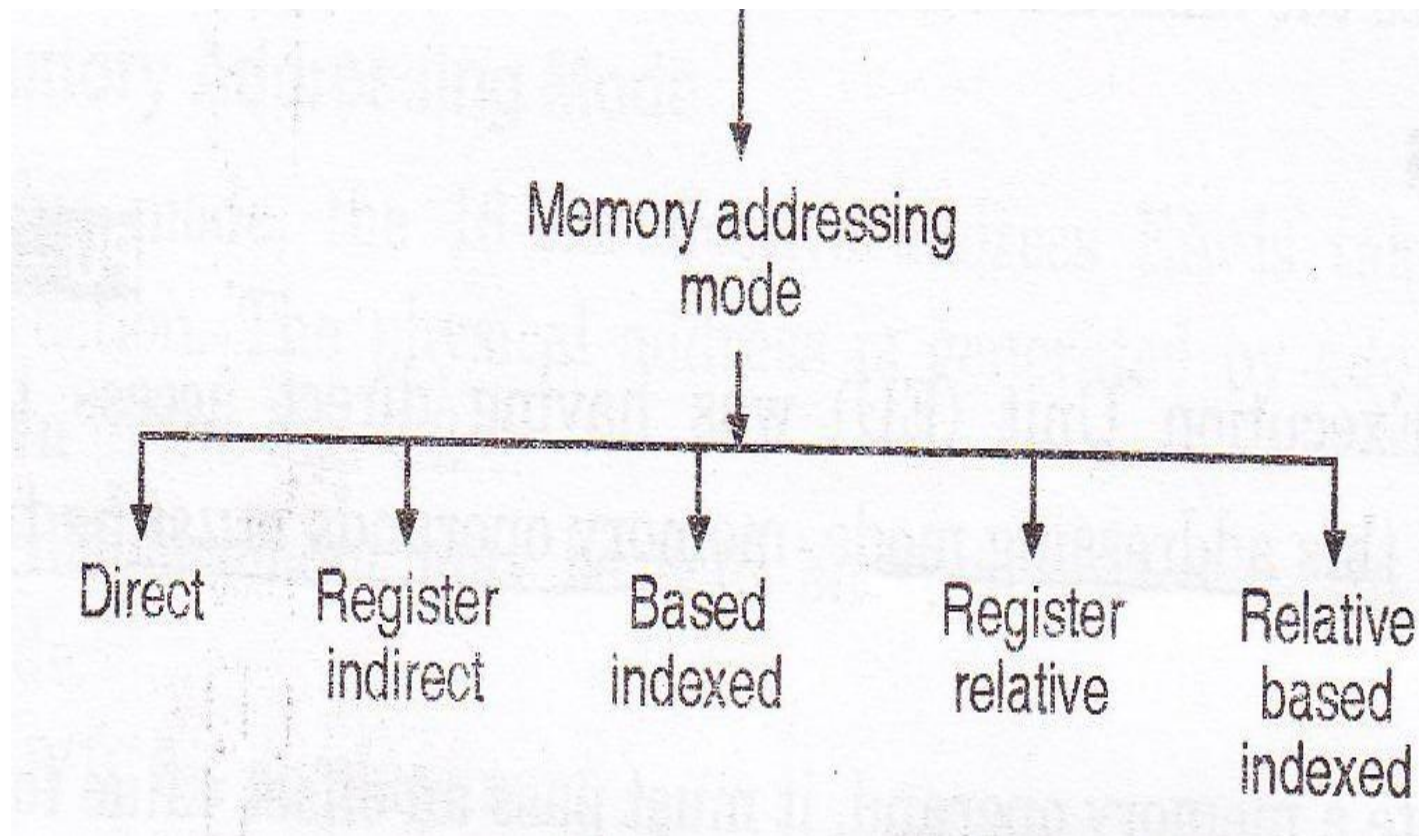


Immediate Addressing Mode

- Immediate operand is *Constant* data contained in an *Instruction*
- *i.e.* The source operand is a part of instruction instead of register memory
- E.g

```
MOV CL, 02H
```

Memory Addressing Mode



Effective Address

- The *offset of a memory operand* is called the operand's effective address (EA).
- Is an *unsigned 16 bit no*. That expresses the *operands distance* in byte from the *begining of the segment*
- 8086 has Base register and Index register
- So EU calculates EA by summing a *Displacement*, *Content of Base register and Content of Index register*.

$$\begin{aligned} \text{EA} &= \{\text{Base register}\} + \{\text{Index register}\} + \{8 \text{ or } 16 \text{ bit displacement}\} \\ &= \begin{Bmatrix} \text{BX} \\ \text{BP} \end{Bmatrix} + \begin{Bmatrix} \text{SI} \\ \text{DI} \end{Bmatrix} + \{8 \text{ or } 16 \text{ bit displacement}\} \end{aligned}$$

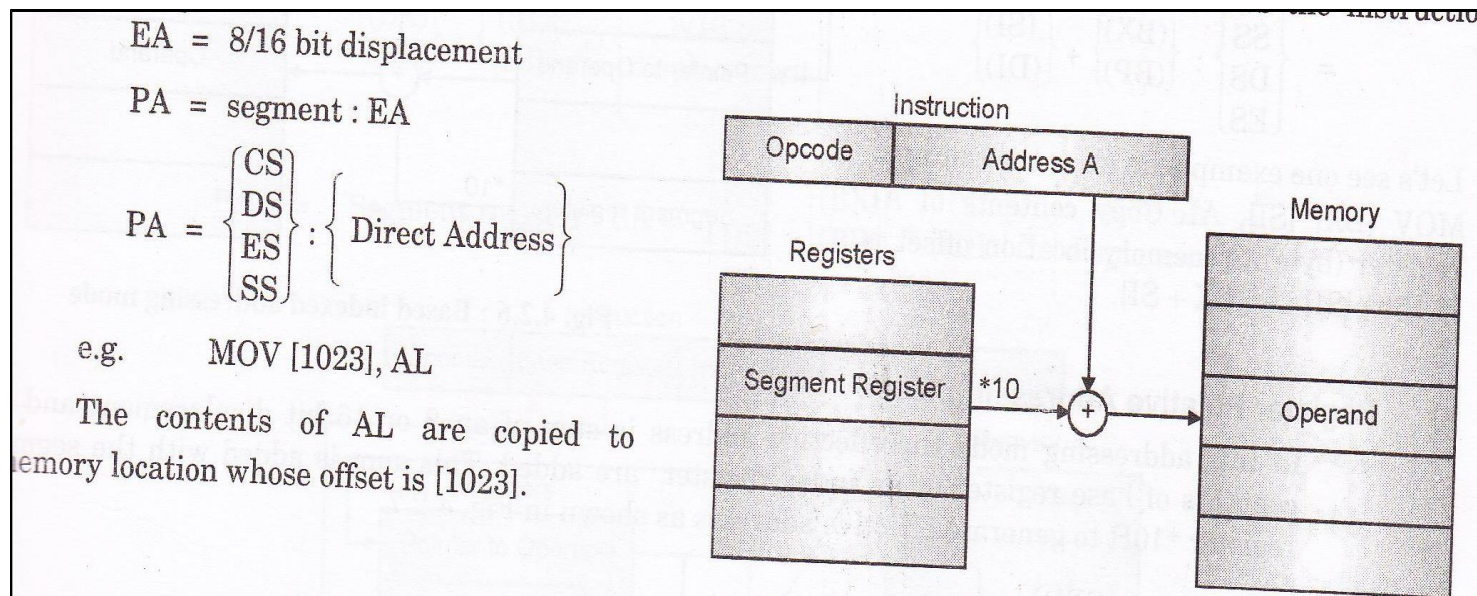
Memory Addressing Mode

- Displacement is an 8 or 16 bit no
- It is generally derived from the position of operand name.
- It's value is constant.
- *Pogrammer may specify either BX or BP is to be used as Base Register*
- *Similarly either SI od DI may be specified as Index Register*

Direct Memory Addressing Mode

- EA is taken from the *displacement field* of instruction.
- PA = This addr. Is added with Seg.Reg $\times 10$ H

MOV [1023], AL

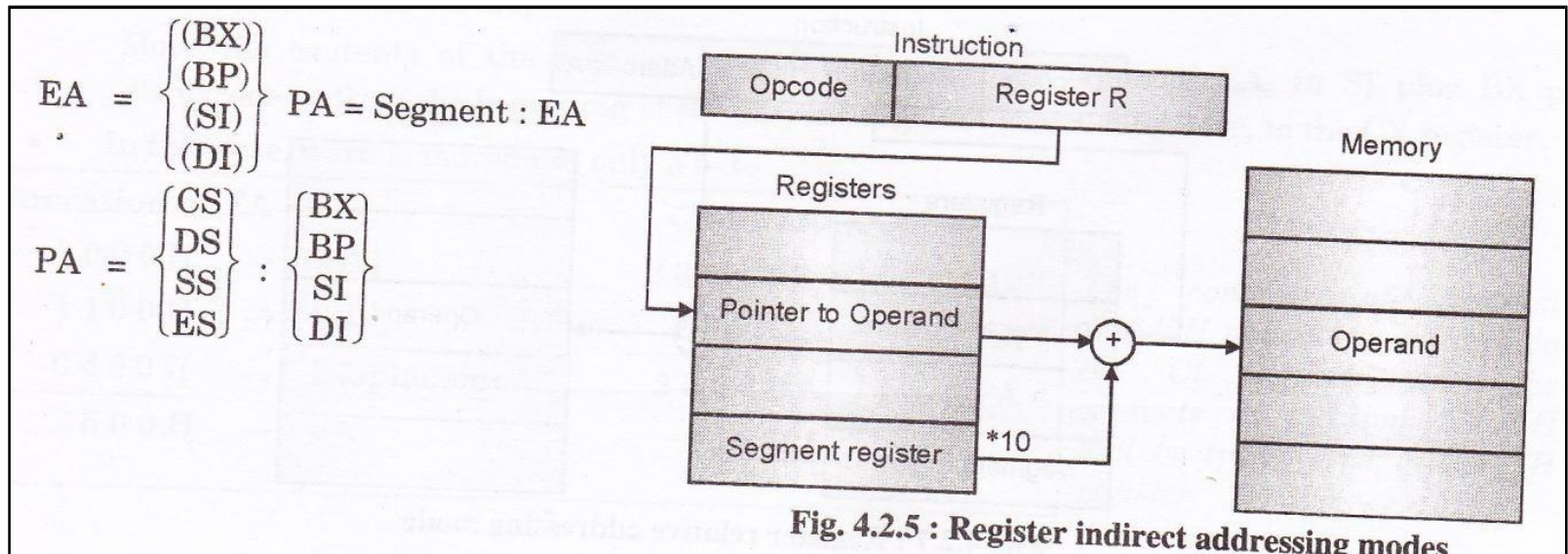


Register Indirect Addressing Mode

- EA of may be taken directly from *one of the base register or index register* .

- PA=This addr. Is added with Seg.Reg \times 10H

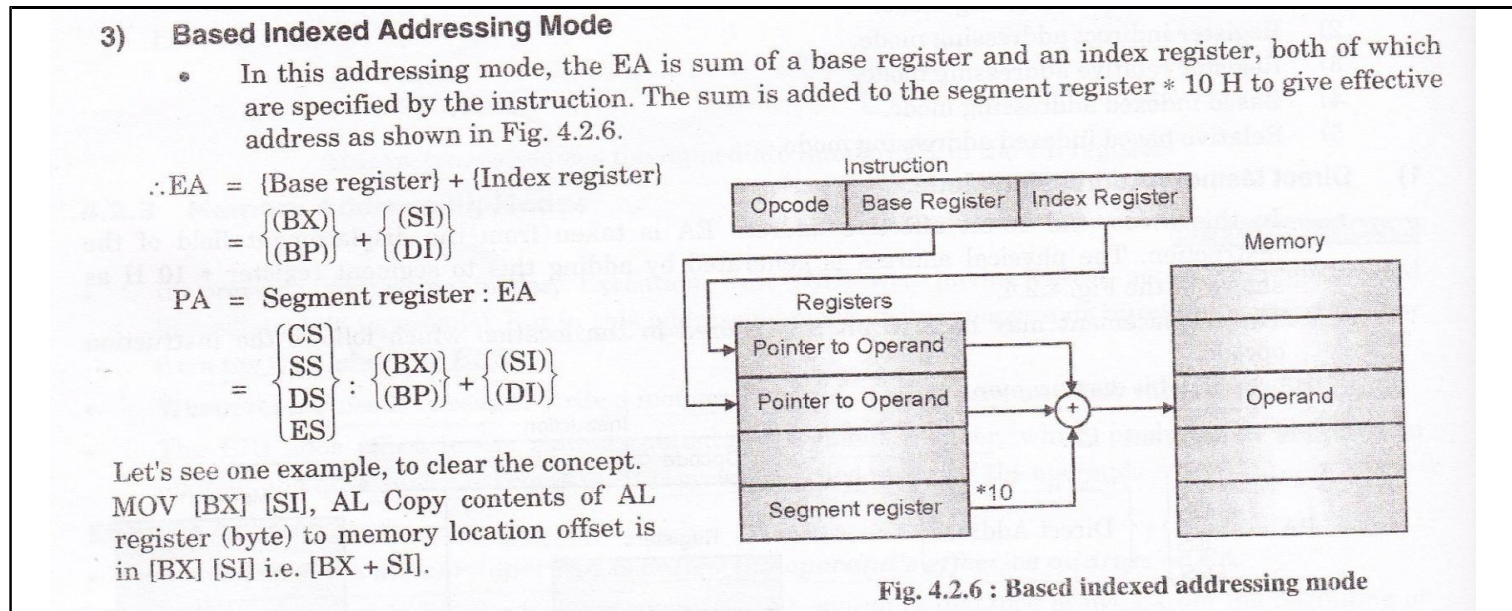
MOV [SI] , AL



Based Indexed Addressing Mode

- EA is sum of *Base register and Index register* .
- Both of which are specified by the instruction
- PA=This addr. Is added with Seg.Reg*10H

MOV [BX+SI] , AL



Register Relative Addressing Mode

- EA is Sum of 8 or 16 bit *displacement and contents of base register or an index register*
- PA = This addr. Is added with Seg.Reg $\times 10H$
 $MOV [BX+1100], AL$

$$EA = \begin{cases} (BX) \\ (BP) \\ (SI) \\ (DI) \end{cases} + \begin{cases} 8 \text{ bit displacement} \\ (\text{sign extended}) \\ 16 \text{ bit displacement} \end{cases}$$

$$PA = \text{Segment} : EA = \begin{cases} CS \\ ES \\ DS \\ SS \end{cases} : \begin{cases} (BX) \\ (BP) \\ (SI) \\ (DI) \end{cases} + \begin{cases} 8/16 \text{ bit} \\ \text{offset} \end{cases}$$

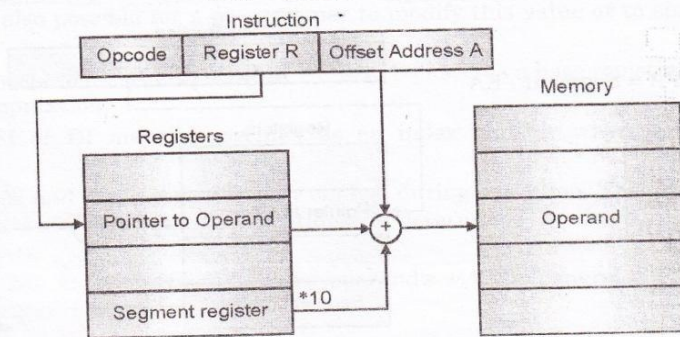


Fig. 4.2.7 : Register relative addressing mode

Generation of EA		Generation of PA	
1000H	→ [BX]	23140H	→ [DS]
1100H	→ [SI]	+ 2500H	→ EA
0400H	→ Displacement	<hr/>	
2500H	→ EA	25640H	→ PA

Relative based Addressing Mode

- EA is Sum of a *Base register*, an *Index Register* and *Displacement*.
- PA=This addr. Is added with Seg.Reg \times 10H
`MOV CX, [BX+SI+0400]`

Relative based Addressing Mode

$$EA = \{ \text{Base register} \} + \{ \text{Index register} \} + \left\{ \begin{array}{l} 8 \text{ bit displacement} \\ \text{(sign extended)} \\ 16 \text{ bit displacement} \end{array} \right\}$$

$$= \left\{ \begin{array}{l} (BX) \\ (BP) \end{array} \right\} + \left\{ \begin{array}{l} (SI) \\ (DI) \end{array} \right\} + \left\{ \begin{array}{l} 8/16 \text{ bit} \\ \text{displacement} \end{array} \right\}$$

$$PA = \text{Segment register} : EA = \left\{ \begin{array}{l} CS \\ SS \\ DS \\ ES \end{array} \right\} : \left\{ \begin{array}{l} (BX) \\ (BP) \end{array} \right\} + \left\{ \begin{array}{l} (SI) \\ (DI) \end{array} \right\} + \left\{ \begin{array}{l} 8/16 \text{ bit} \\ \text{displacement} \end{array} \right\}$$

Generation of EA		Generation of PA	
1000H	→ [BX]	23140H	→ [DS]
+ 1100H	→ [SI]	+ 2500H	→ EA
+ 0400H	→ Displacement	<hr/>	
	2500H → EA	25640H	→ PA

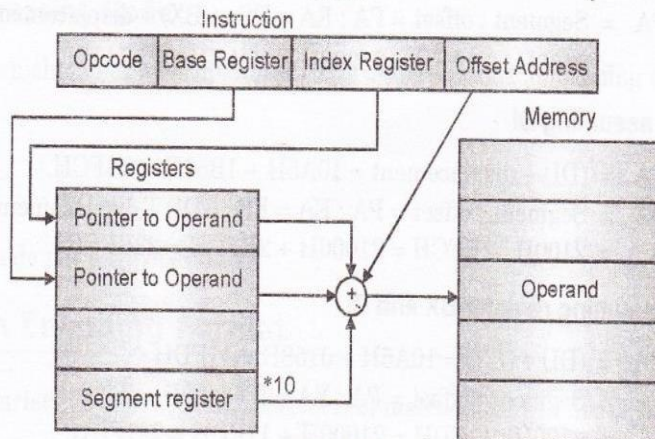


Fig. 4.2.8

The contents of location 25640H will be transferred to the CL register and the contents of location 25641H will be transferred to the CH register.

THANK YOU