x86 Addressing Modes

Topic 4
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Addressing modes

Immediate	Register addr. << Data
Reg. direct	Register addr. << Register addr.
Reg. indirect	Memory addr. << Register
Reg. relative	Register addr. << Memory addr.
Direct	Memory addr. << Register addr.

[2]

Addressing modes

Immediate

Reg. direct

Reg. indirect

Reg. relative

Indirect

MOV AX,BX

Destination
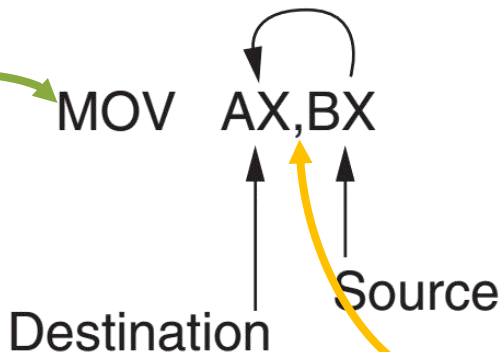
Source

An opcode, or operation code, tells the microprocessor which operation to perform.

Instructions

Opcode	Operands

[3]

Addressing modes

Immediate

Reg. direct

Reg. indirect

Reg. relative

Direct

Destination

Register
CH

Source

Data
3AH
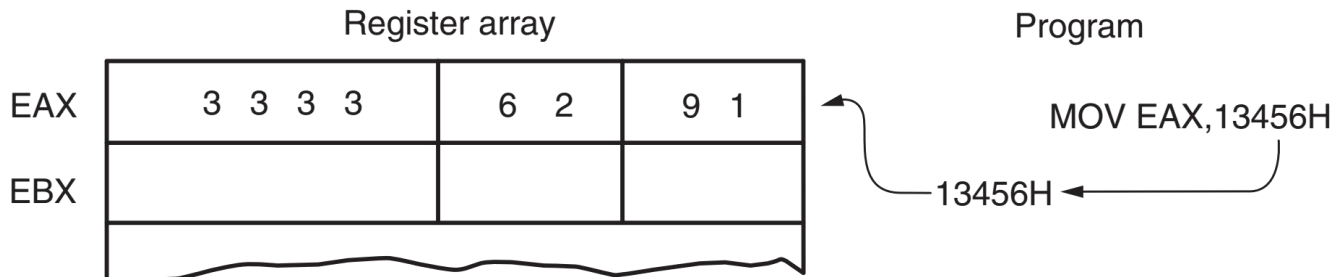
Register addr. << Data

- `MOV CH,3AH`
- `MOV AL,'N'`

Not allowed
- `MOV AL,0200H`

[4]

FIGURE 3–4 The operation of the MOV EAX,3456H instruction. This instruction copies the immediate data (13456H) into EAX.

MOV EAX, 3456H

[5]

Addressing modes

Immediate

Reg. direct

Reg. indirect

Reg. relative

Direct

Destination

Register
BX

Source

Register
AX

Instructions

Opcode	Reg. Address

Register

Operand

[6]

Addressing modes

Immediate

Reg. direct

Reg. indirect

Reg. relative

Direct

Destination

Register BX

Source

Register AX

Register addr. << Register addr.

• **MOV BX,AX**

Not allowed
• **MOV ES,DS ;** segment to segment
• **MOV CS , AL ;** Code segment is not destination
• **MOV BL , DX ;** Mixed Sizes
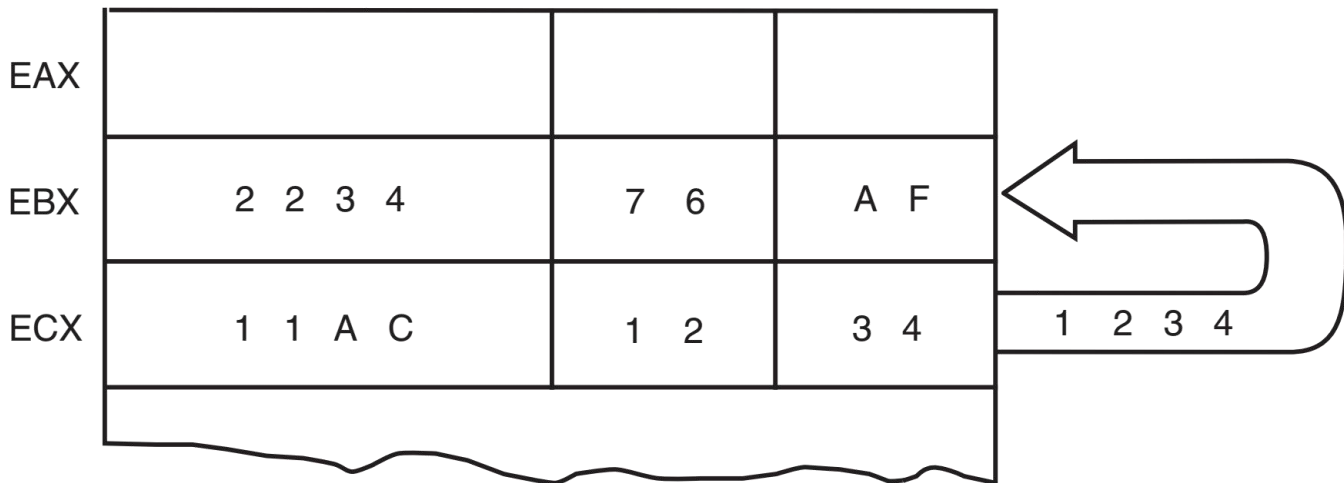
[7]

MOV BX, CX

Register array

EAX		
EBX 2 2 3 4	7 6	A F
ECX 1 1 A C	1 2	3 4

[8]

Addressing modes

Immediate

Reg. direct

Reg. indirect

Reg. relative

Direct

Destination

| Mem. addr. 10300h |

Source

| Register CL |

Instructions

| Opcode | Reg. Address |

Register

| Address |
| |
| |
| |
| |

Memory

| |
| |
| |
| Operand |
| |

[9]
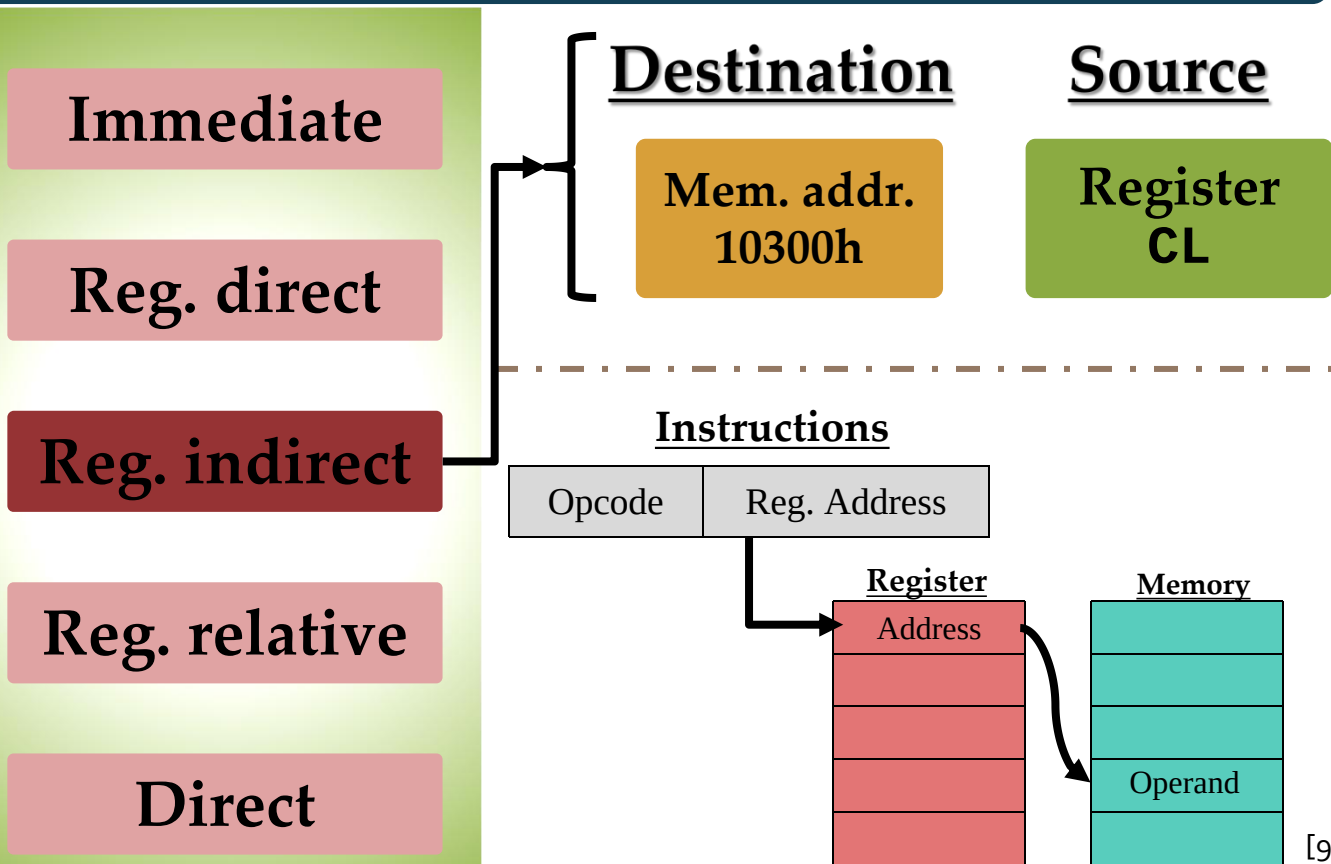
Addressing modes

Immediate

Reg. direct

Reg. indirect

Reg. relative

Direct

Destination

Mem. addr. 10300h

Source

Register CL

Memory addr. << REgister addr.

- `MOV [BX],CL`

Memory address:
$$DS \times 10H + BX$$
`10000H + 0300H = 10300H`

✎ | Addressing modes

Immediate

Reg. direct

Reg. indirect

Reg. relative

Direct

Destination   **Source**

Register
CL

Mem. addr.
10304h

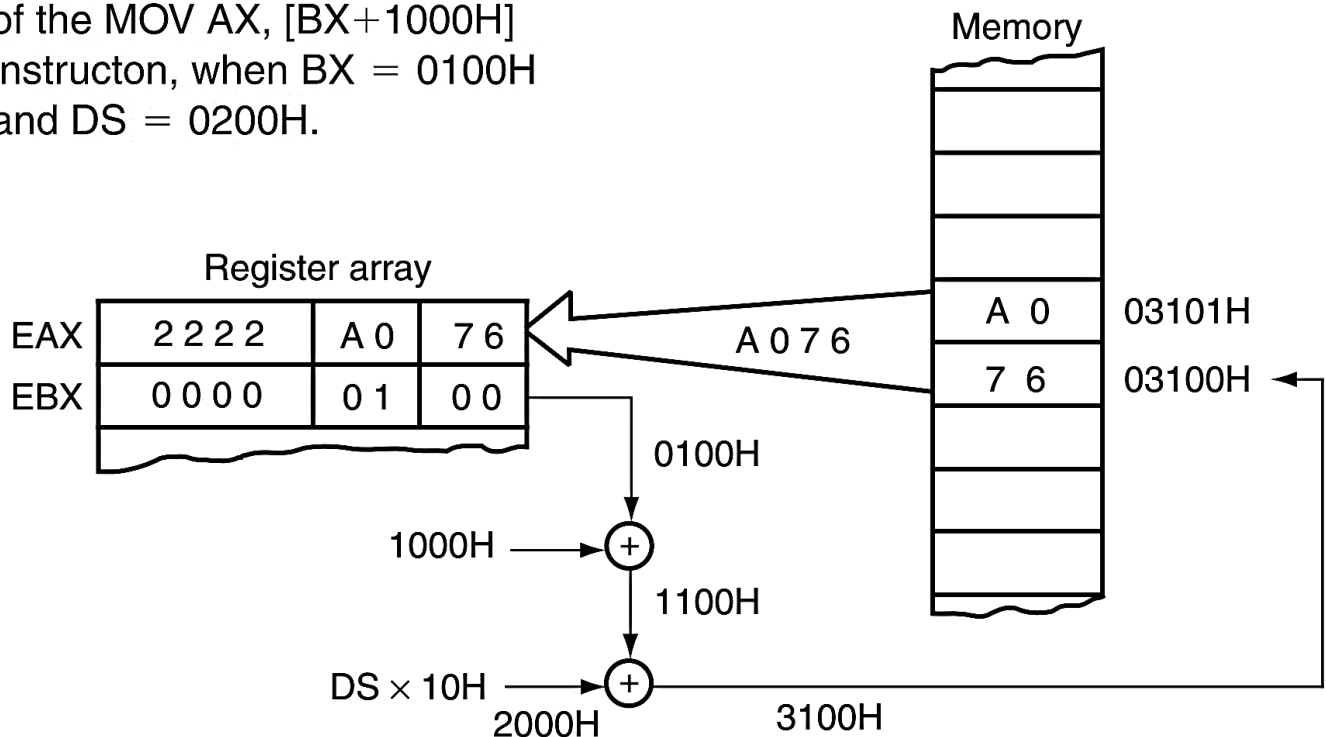Register addr. << Memory addr.

- `MOV CL,[BX+4]`

Memory address:
$$DS \times 10H + BX + 4$$
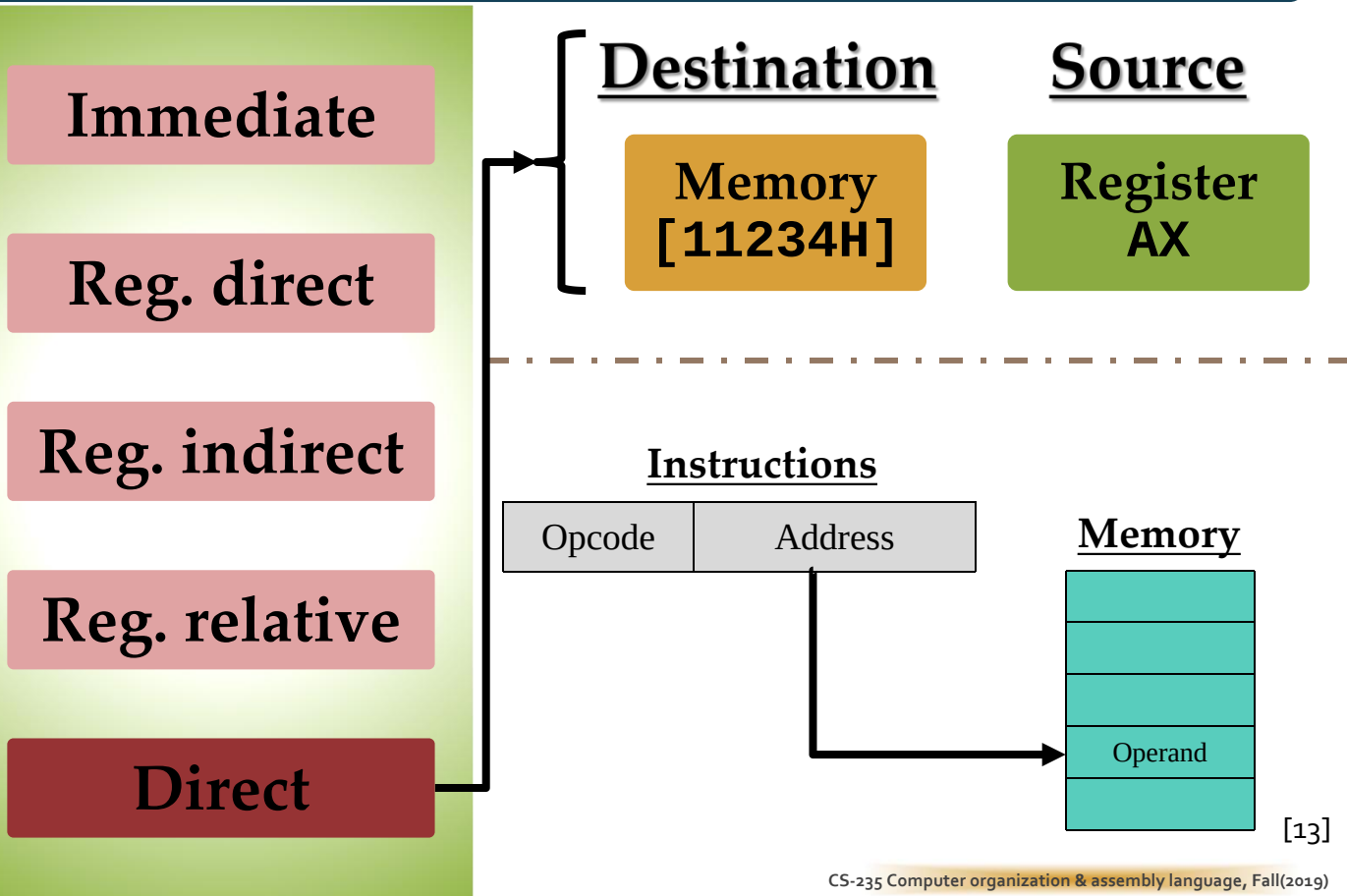`10000H + 0300H + 4`
`= 10304H`

[11]

Reg. relative addressing modes

FIGURE 3–10 The operation of the MOV AX, [BX+1000H] instructon, when BX = 0100H and DS = 0200H.

Addressing modes

Immediate

Reg. direct

Reg. indirect

Reg. relative

Direct

Destination

Memory
[11234H]

Source

Register
AX

Instructions

Opcode	Address

Memory

Operand

[13]

✎ | Addressing modes

Immediate

Reg. direct

Reg. indirect

Reg. relative

Direct

Destination   ## Source

| Memory [11234H] | | Register AX |

Memory addr. << Memory addr.

- `MOV [1234H],CL`

Memory address:
$$DS \times 10H + DISP$$
`10000H + 1234H = 11234H`
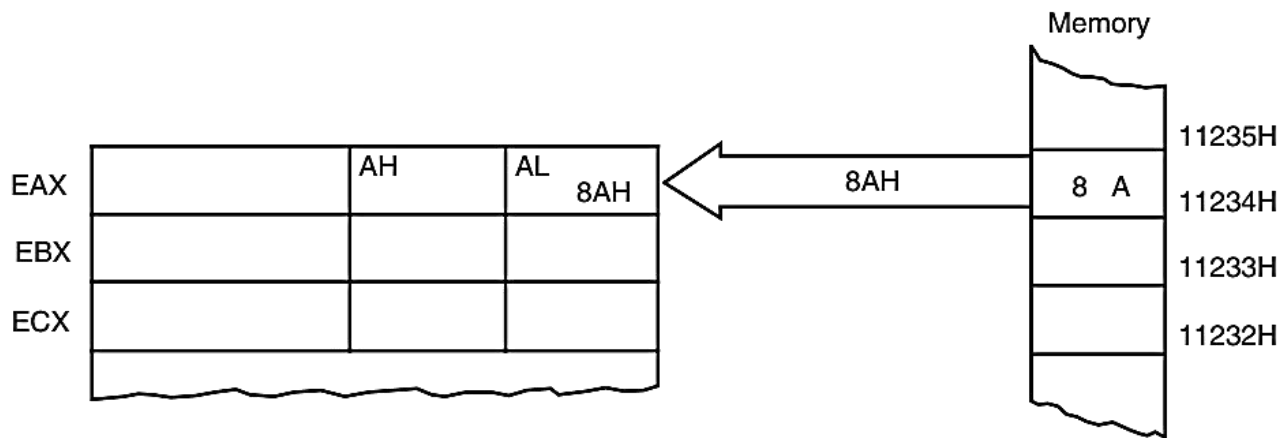
[14]

MOV AL, [1234H]

FIGURE 3–5 The operation of the MOV AL,[1234H] instruction when DS = 1000H.

[15]

Questions?

THANK YOU!