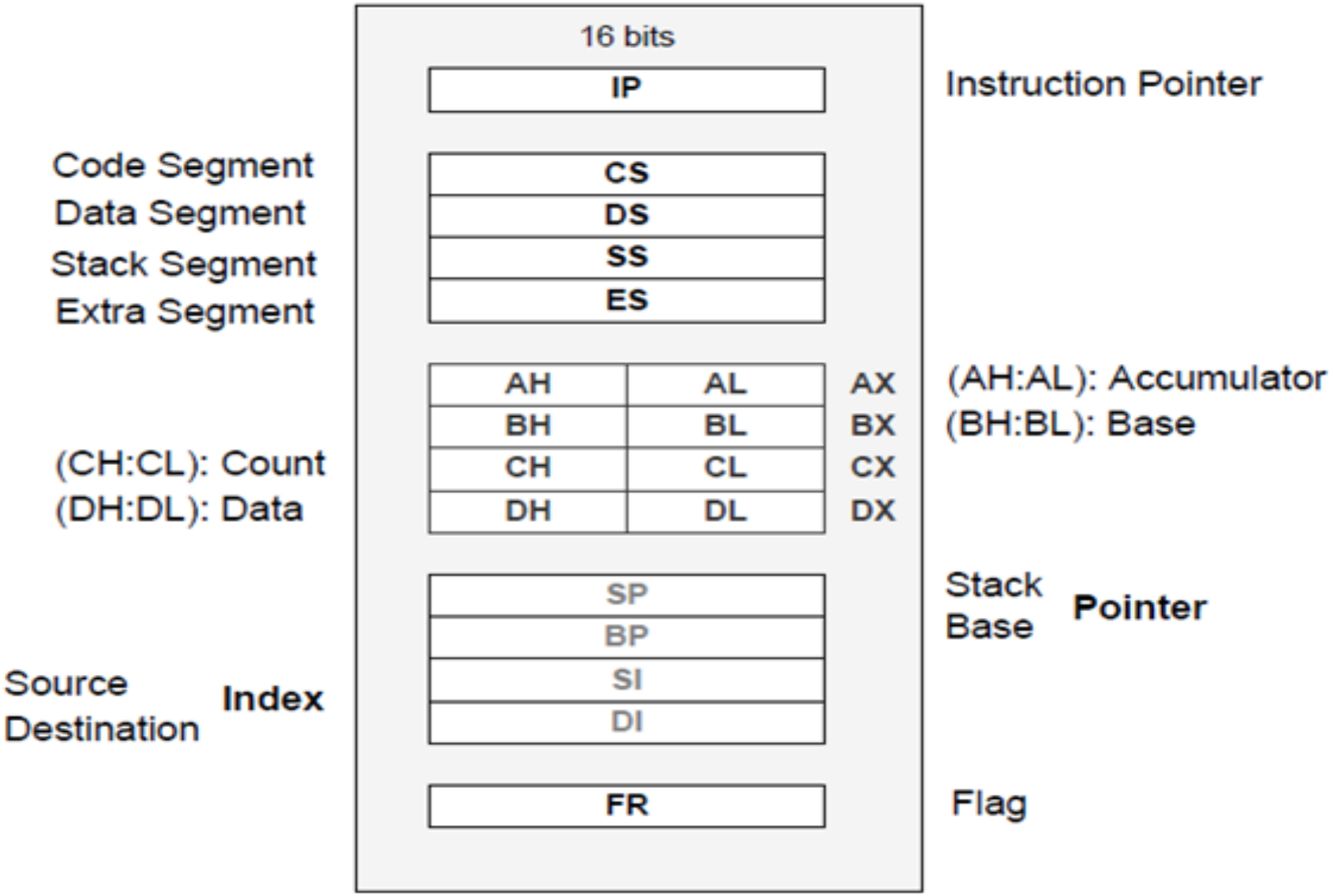
Microprocessor

Lecture 4

AssemSite8.wix.com/site8

Remember the 8086 register's names



The Assembly Instruction Set Architecture (ISA) for 8086

- The ISA for 8086 has approximately 117 instructions with more than different 300 op-codes.
- The 8086 don't allow the memory/memory operations but it allows the memory/register and register/register operations
- The 8086 assembly instructions may have double operands, single operand and none-operand(more details later).

The instruction types of 8086

- The ISA of 8086 includes **9 types** of instructions as following:

1) Data Transfer Instructions.
2) Logical operation instructions.
3) Arithmetic operation Instructions.
4) Shift and Rotate Instructions.
5) Branch Instructions.
6) Loop Instructions.
7) Input/ output instructions.
8) Machine Control Instructions.
9) Flag Manipulation Instructions.

The instructions' Mnemonic

Each instruction is known by the shortened of its operation and called "Mnemonic" likes:

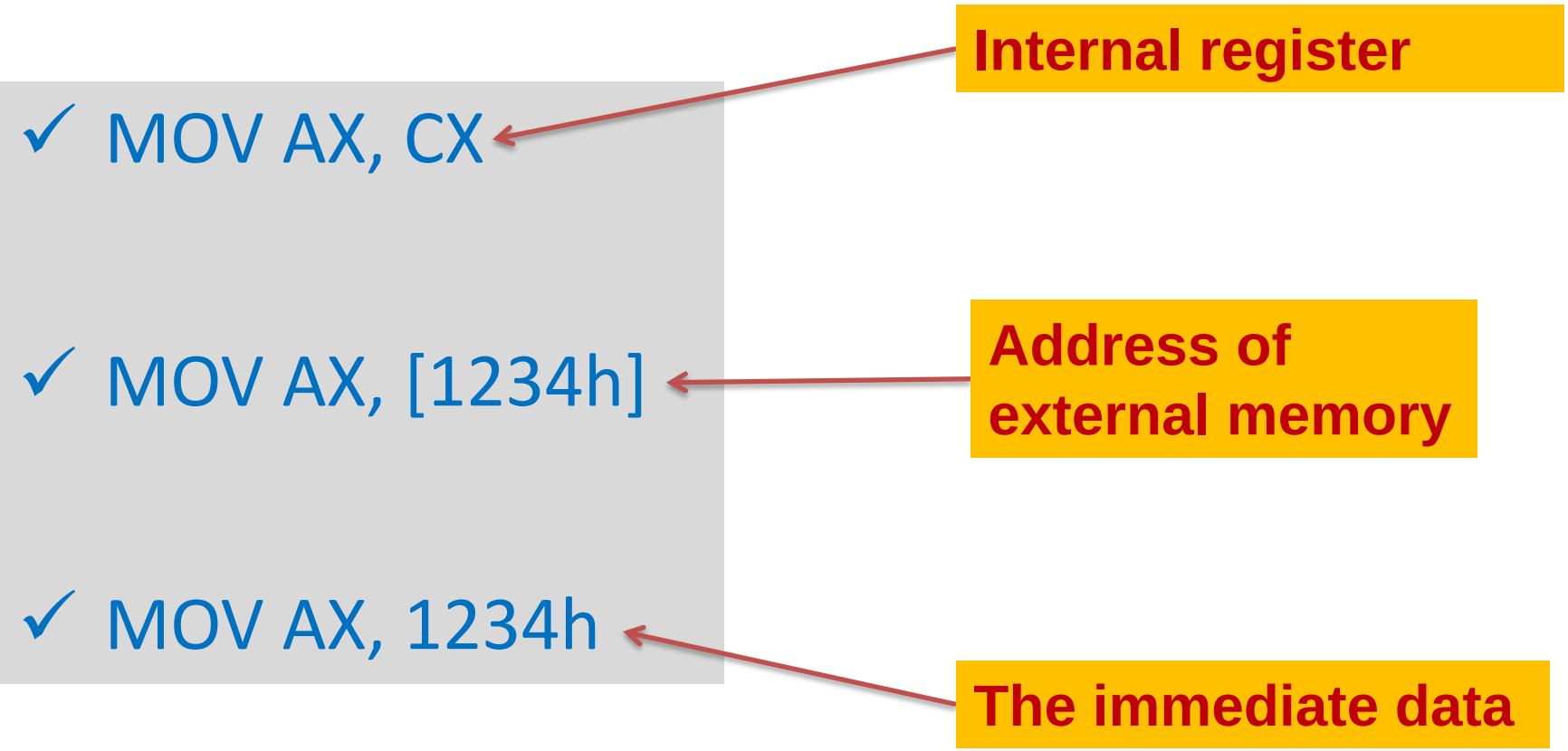
Instruction's operation	Mnemonic
Moving/transfer data	MOV
Adding 2 data	ADD
ANDing 2 data	AND
Division 2 data	DIV
No operation	NOP
Jump if carry flag is set	JC
Increment data	INC

The relations between 2 operands

- There is coma “**,**” between any 2 operands.
- The 2 operands must have similar widths (data-word or data-byte).
- The source operand is placed in the right-hand side of instruction while the destination is placed near the mnemonic.
- The destination may be register or memory location, the source can be register, memory location or immediate value.
- There isn’t any memory to memory instruction.

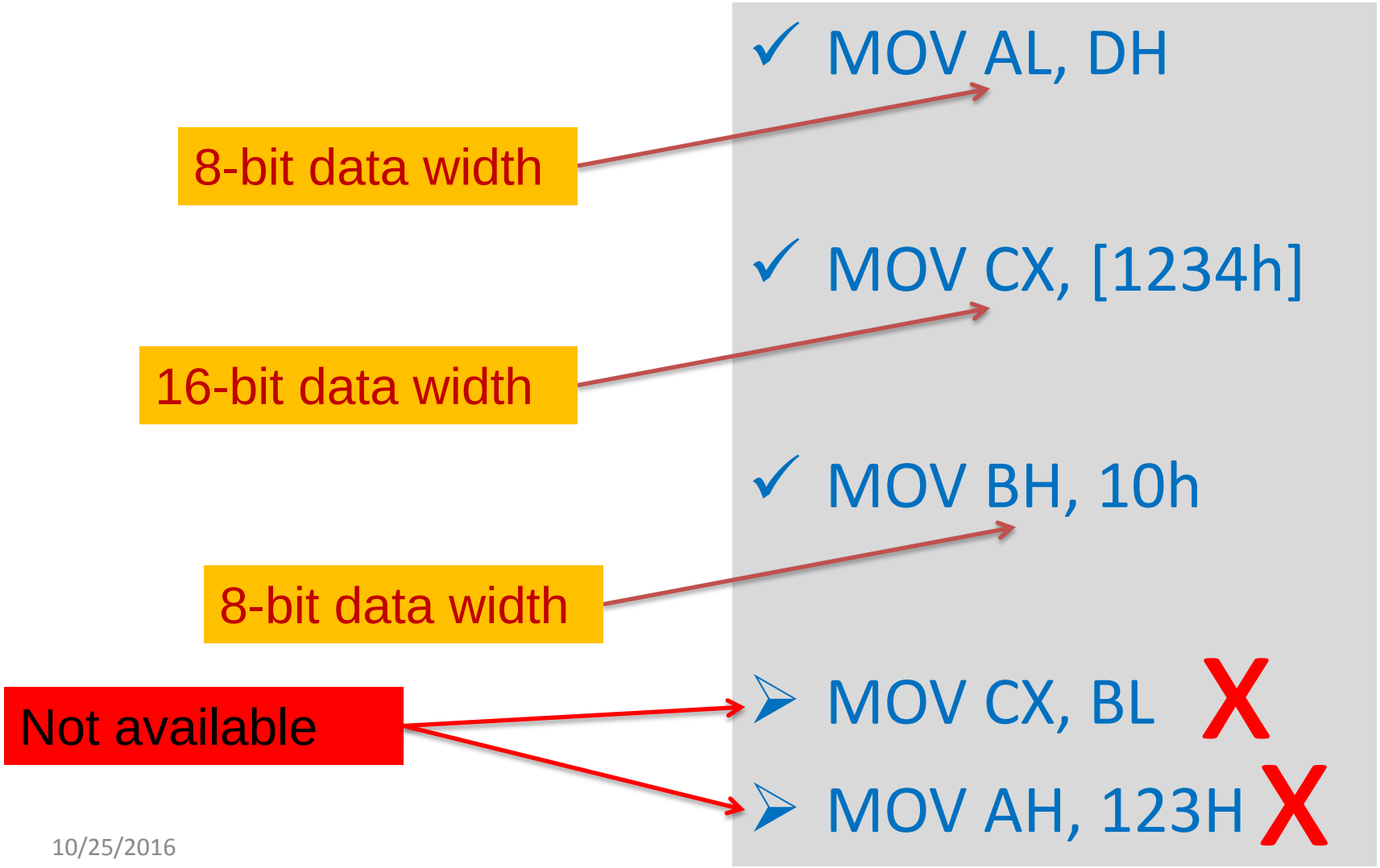
Examples of the source operand formats

- ✓ MOV AX, CX
- ✓ MOV AX, [1234h]
- ✓ MOV AX, 1234h



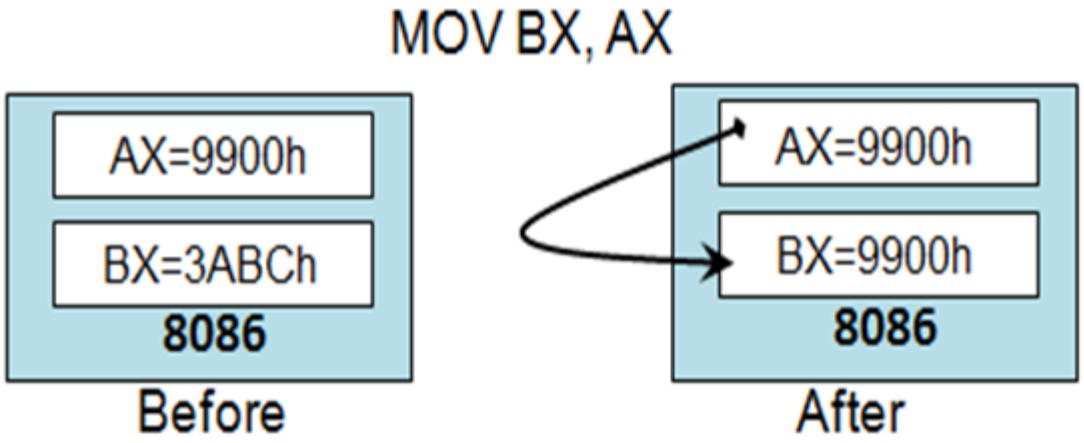
Examples of instruction data width

The register operand defines the data width

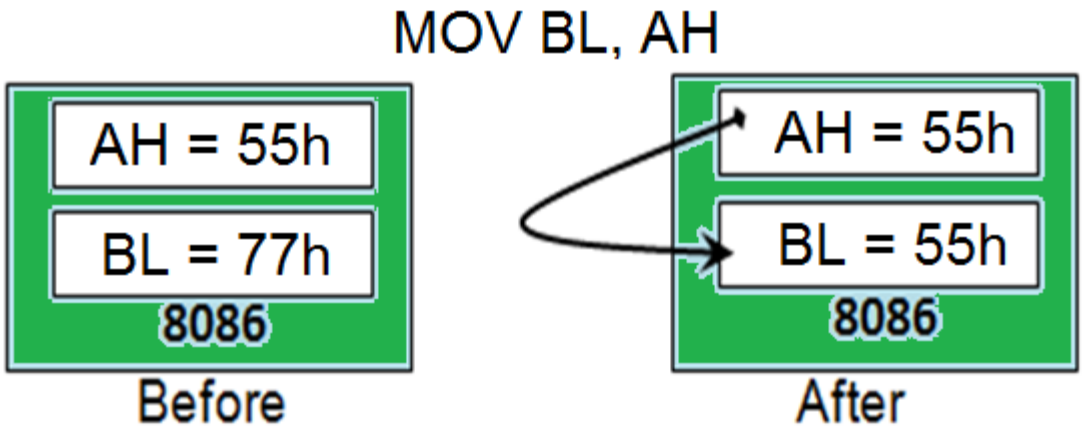


The data-transfer instruction examples

Register to Register 16-bit data transfer.



Register to Register 8-bit data transfer.



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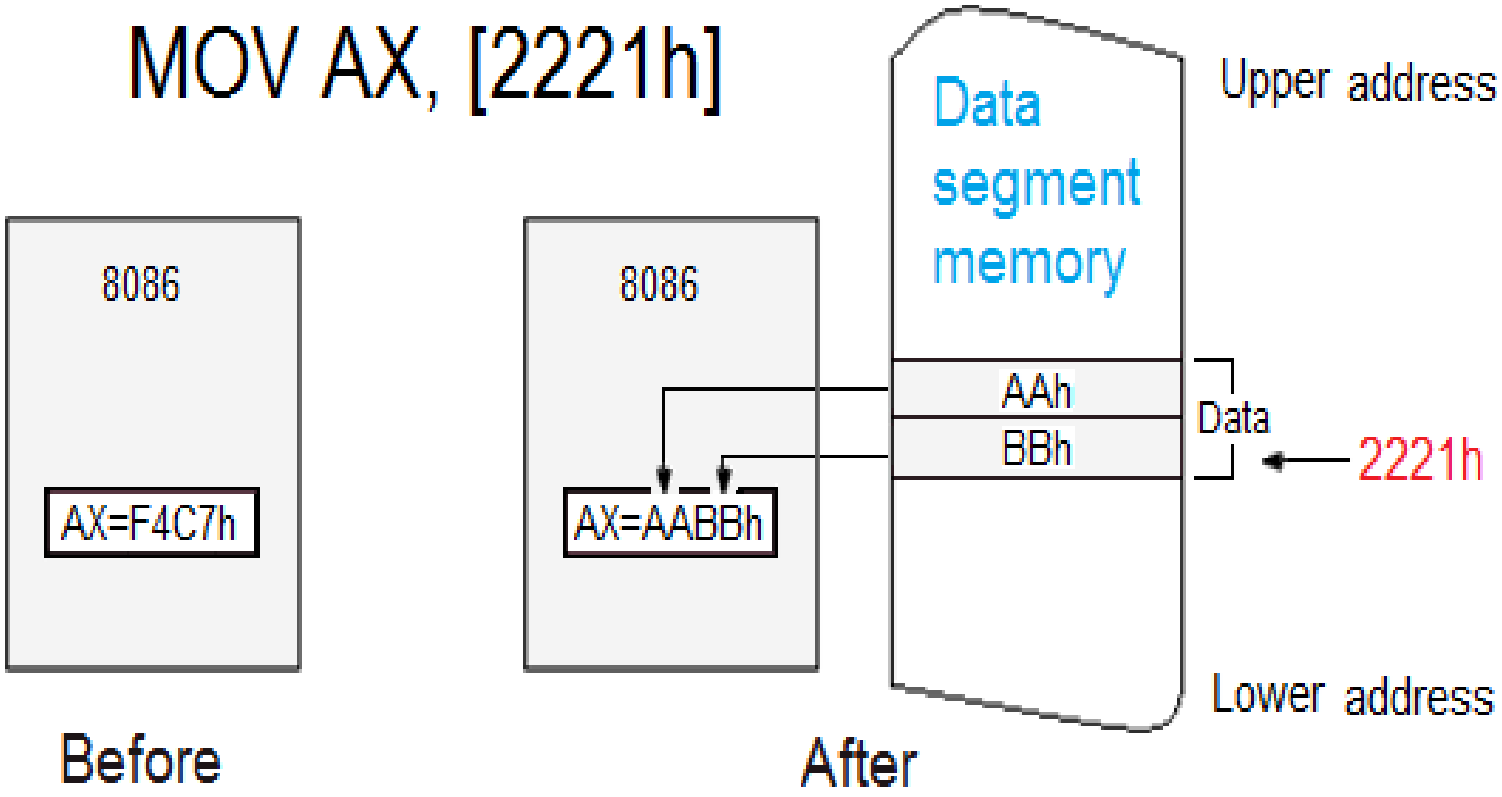
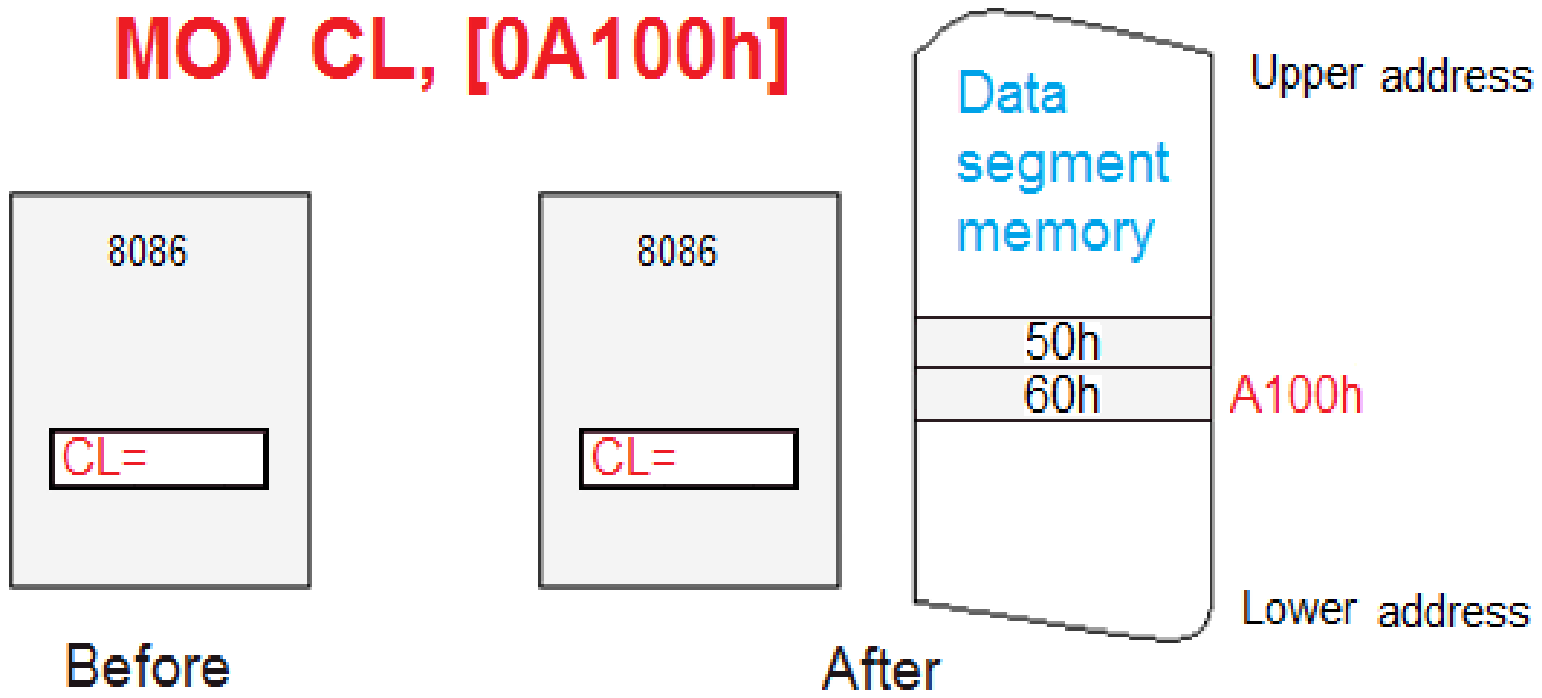
The 16-bit memory to register data transfer



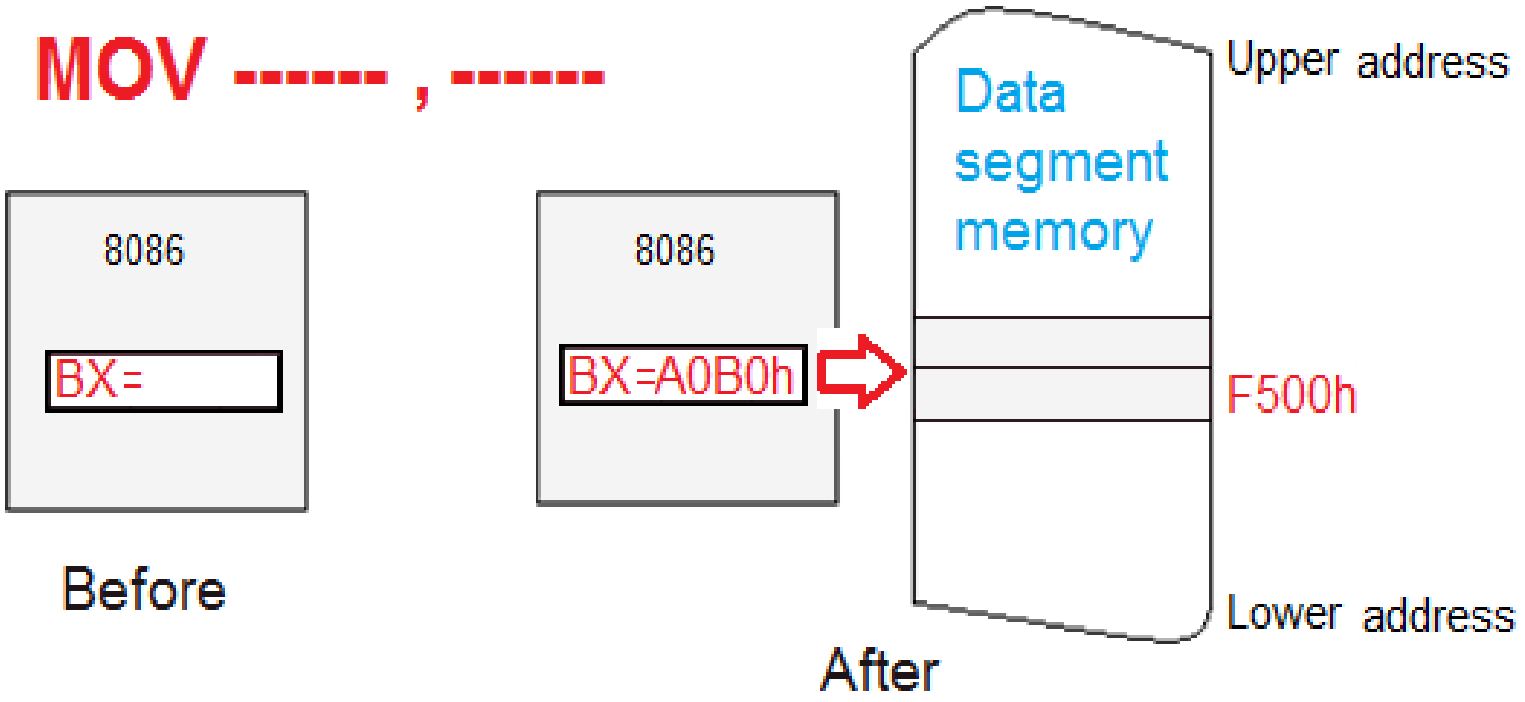
Complete the figure

The 8-bit memory to register data transfer



Complete the figure & instruction

The 16-bit register to memory data transfer



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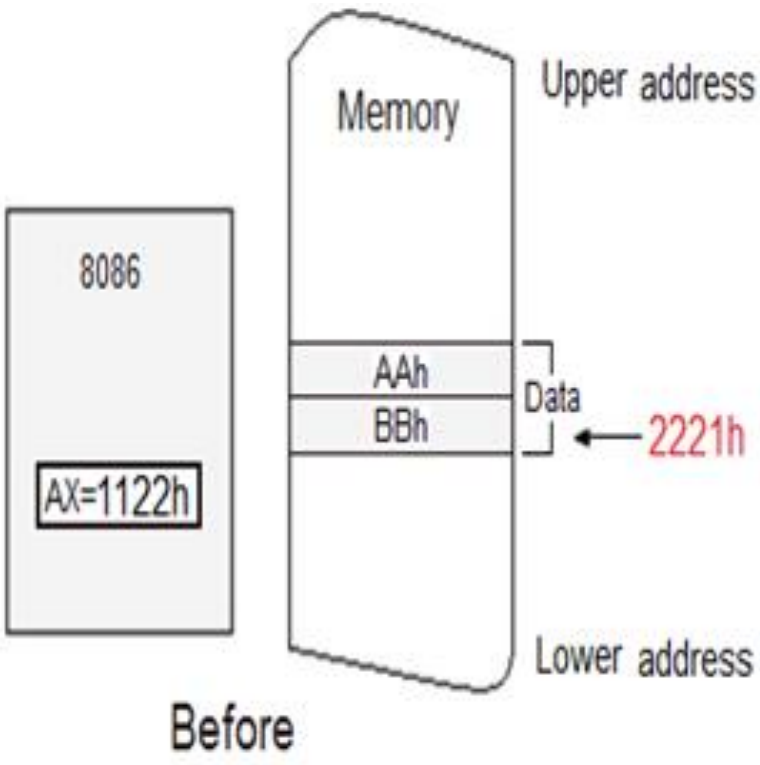
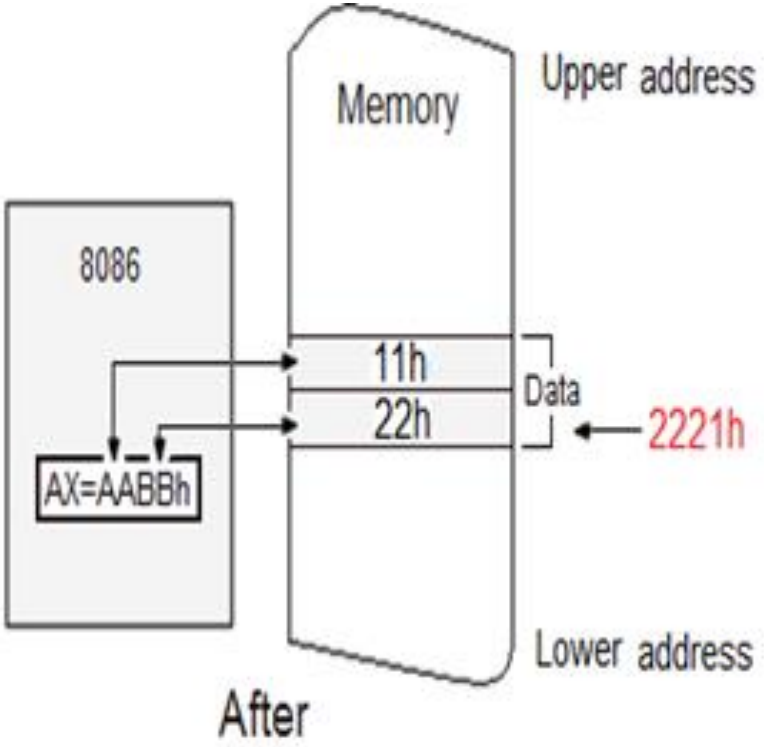
The 16-bit register/memory Data Exchange

XCHG AX, [2221h]





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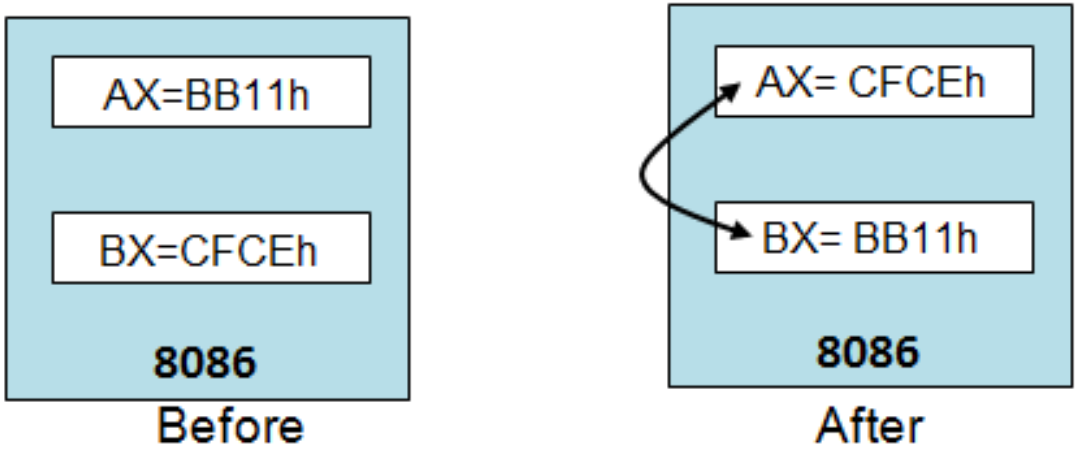
The 16-bit register/register Data Exchange

XCHG AX, BX



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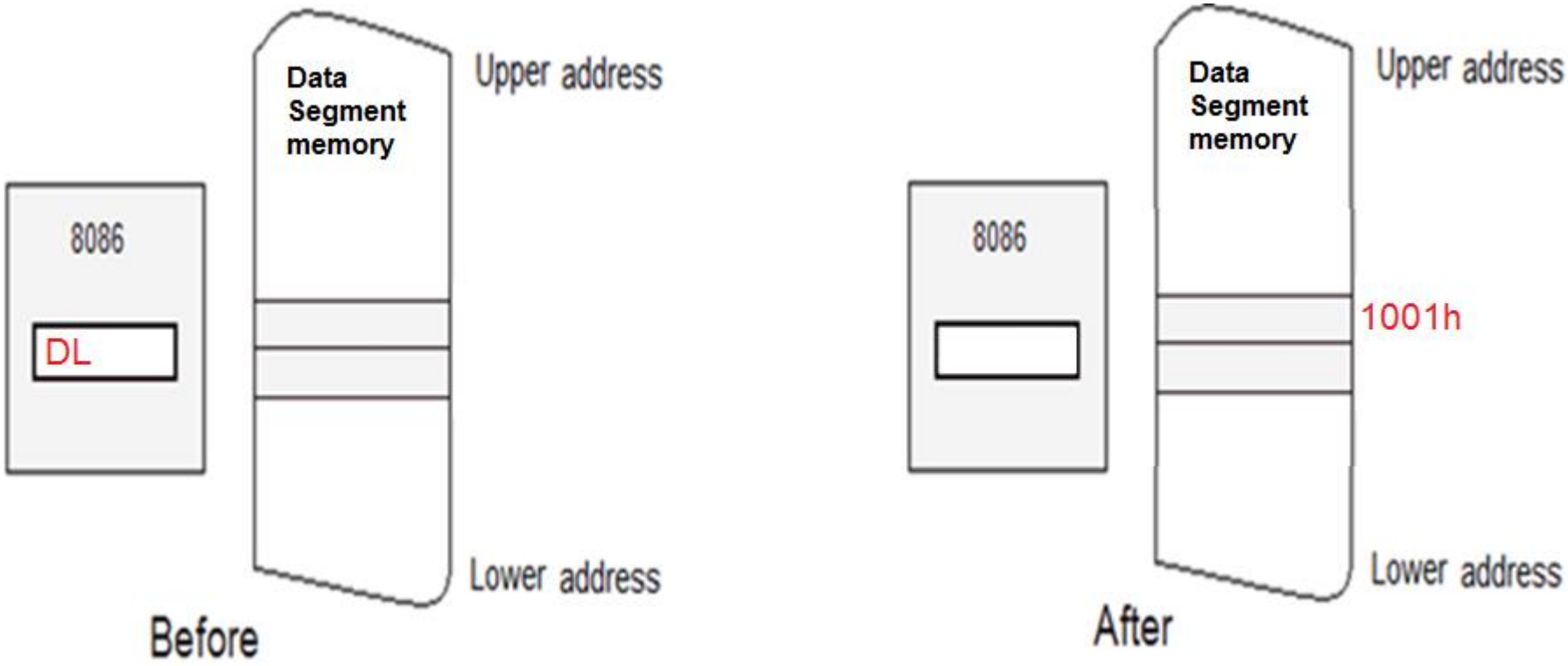
The ?-bit -----?----/-----?----- Data Exchange

XCHG [1000h], DL



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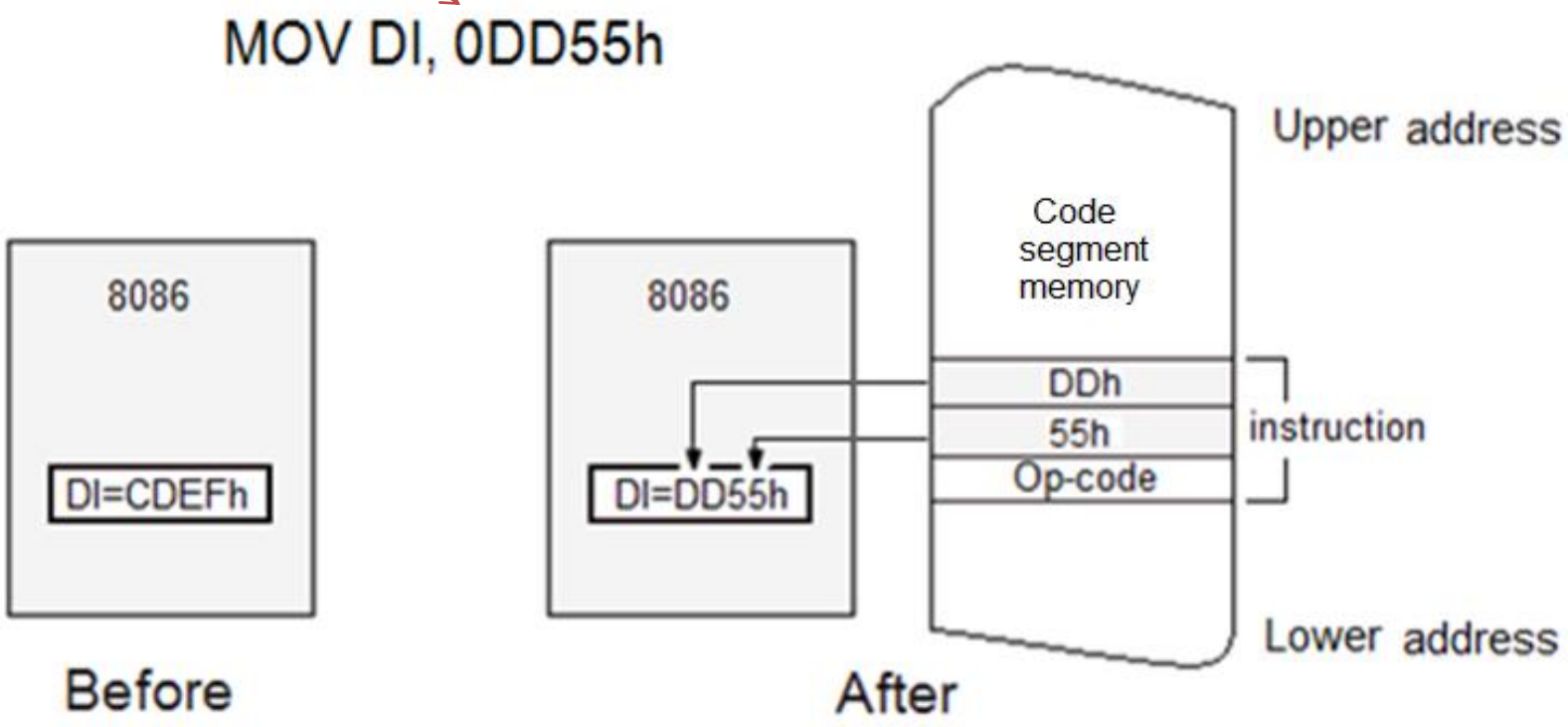
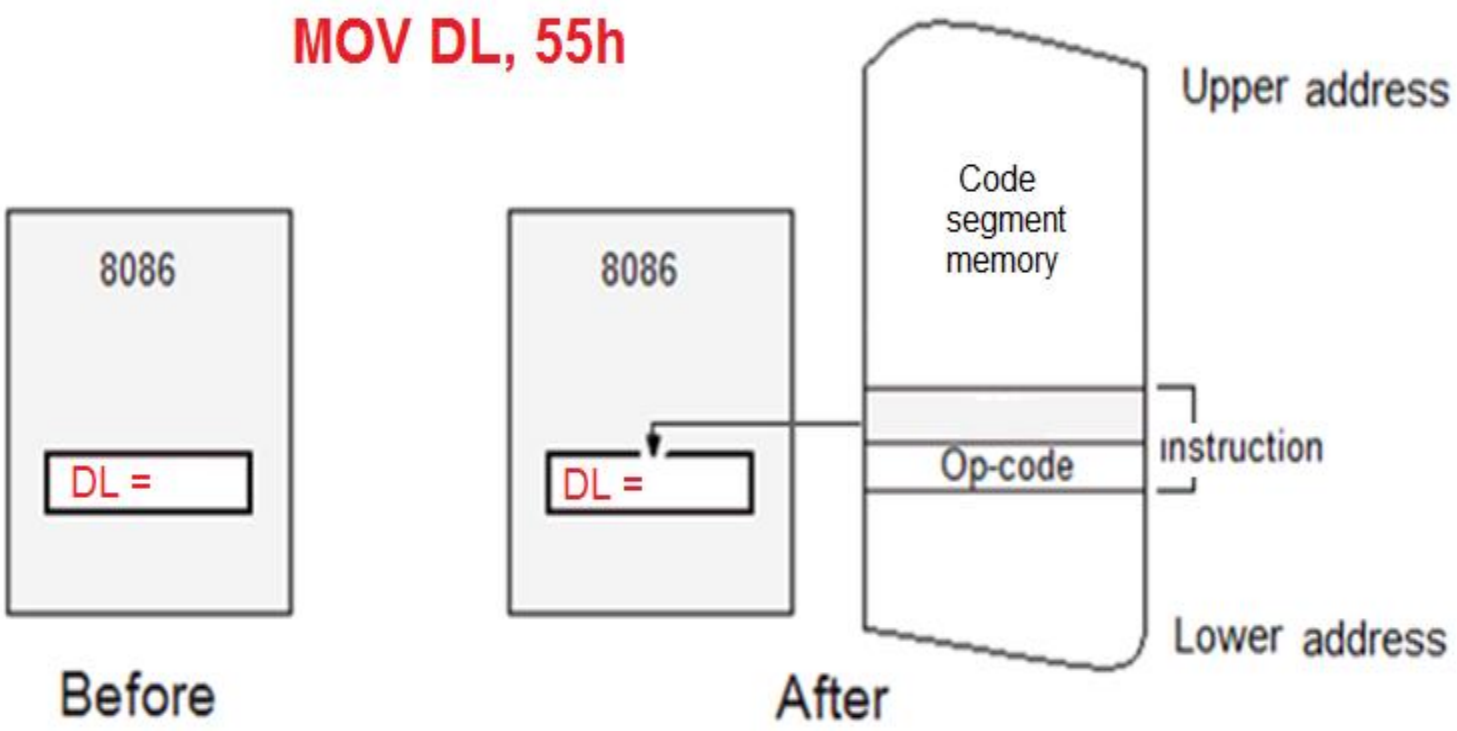
The 16-bit immediate data transfer

Note: “0” for define numeral value



Complete the figure

The 8-bit immediate data transfer



Practical task

Download the simulator Emu8086 from my site.

1- Delate the extension "**.ODT**" from the program name.

2- Extract it.

3- Install the software simulator "Emu8086" in your personal computer

Continue Practical task

1) Run the simulator and write any instruction (guide with lecture's examples).
2) Click the command-button "Emulate" to display the emulator form and press "Single Step".
3) Press the "Print screen" on your keyboard.
4) Paste the copied screen into the "paint brush" program.
5) Don't forget to indicate the date and time.
6) Print hard-copy and Present it as report.

Example of report