Microprocessor and Assembly Language Lab

Lab Material 3 for CSE 312 (M&AL Lab)

Dr. Shah Murtaza Rashid Al Masud
Associate Prof.
Dept. of CSE, UAP

Microprocessor Based Systems
How to see the (Physical) Address, OPCODE, operand and Memory

BUS INTERFACE UNIT (BU)

The BIU performs all bus operations for EU .

Fetching instructions

Responsible for executing all external bus cycles.

Read operands and write result.

EXECUTION UNIT (EU)

Execution unit contains the complete infrastructure required to execute an instruction

BCD

H = bit ?? 4 bit 1111H:0000H = PA?? (20 bit long)

1111H*10H+0000H=11110H+0000H=11110H=20 bit long

1000H*10H=10000H

BUS INTERFACE UNIT (BU)

BCD

H = bit ?? 4 bit 1111H:0000H = PA?? (20 bit long)

1111H*10H+0000H=11110H+0000H=11110H=20 bit long

1000H*10H=10000H

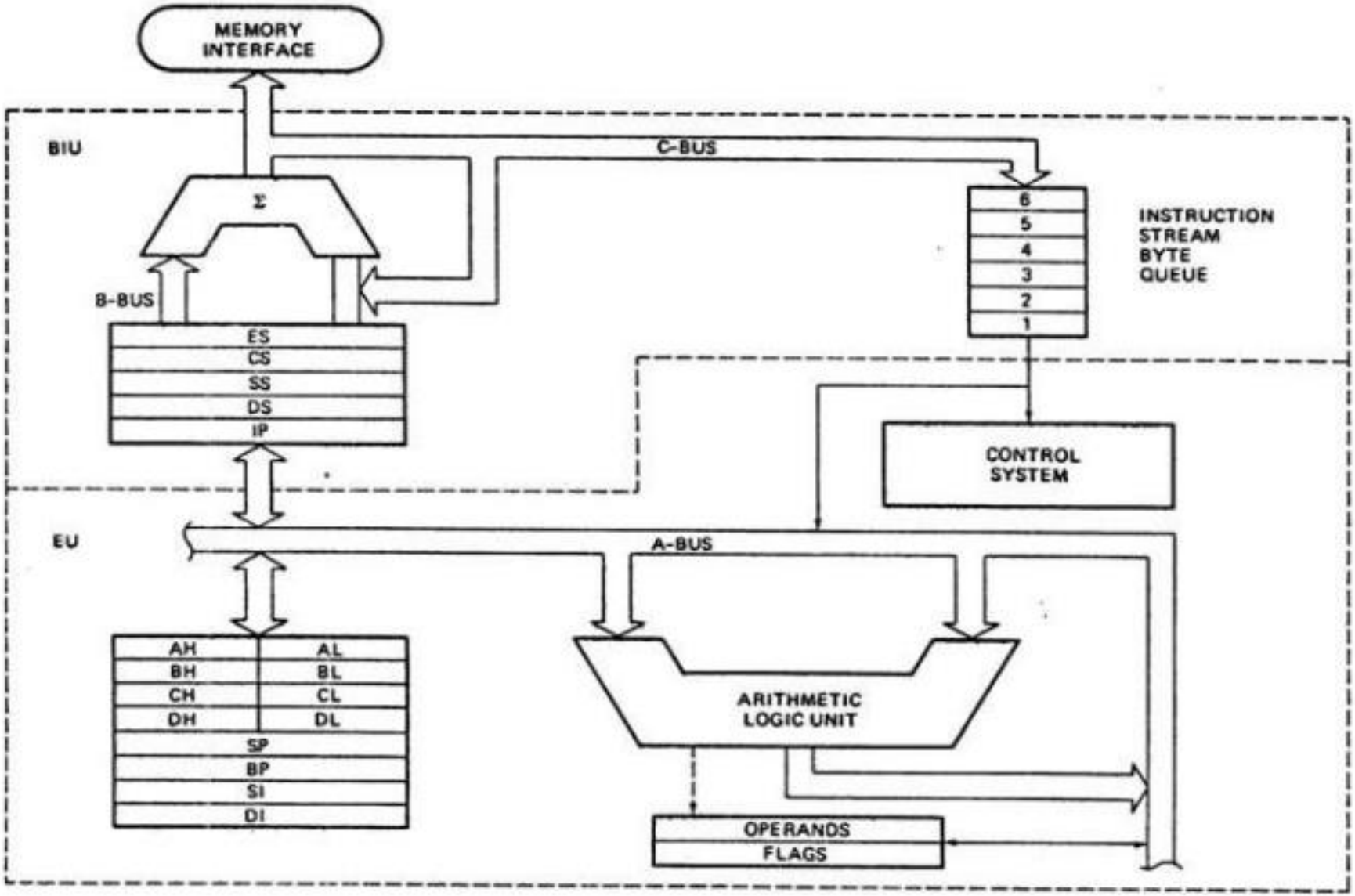
10h*10h=100h

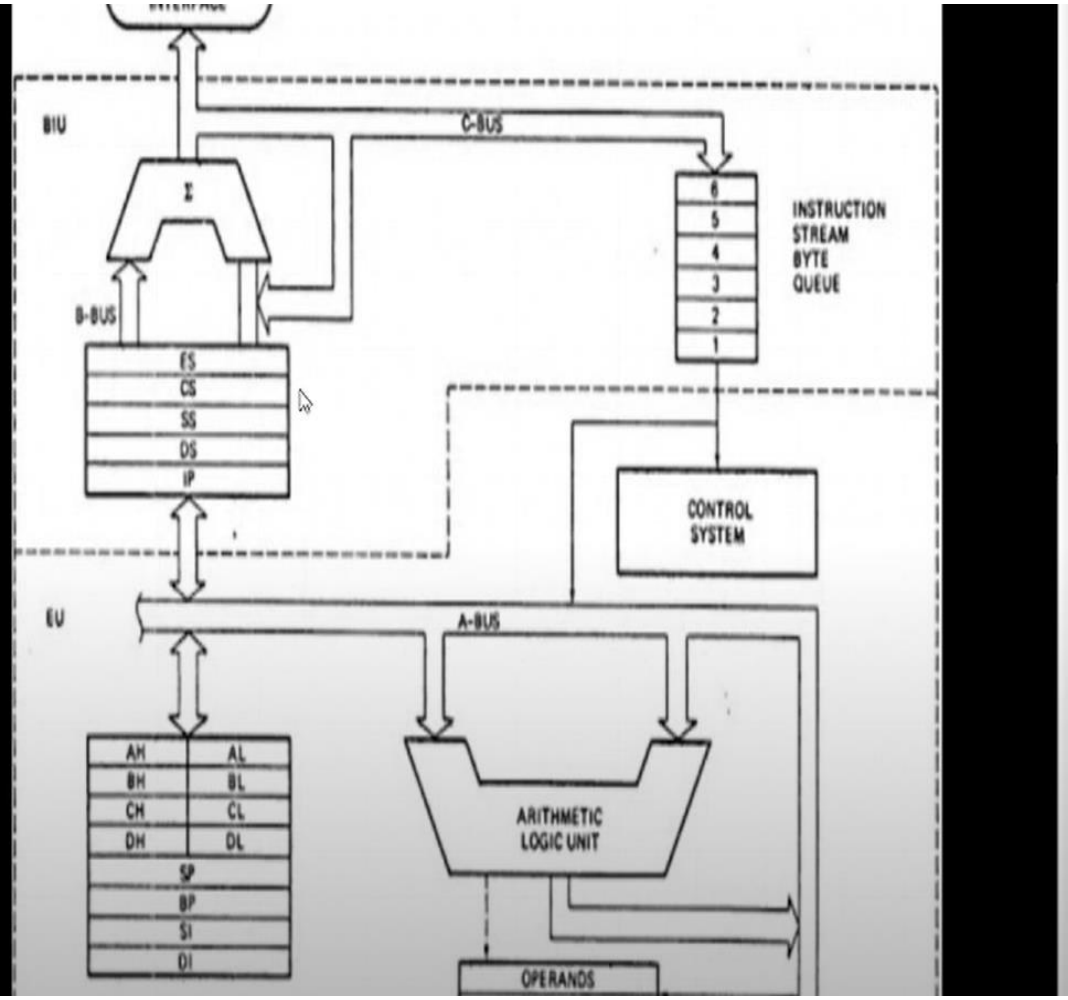
20h*10h=200h

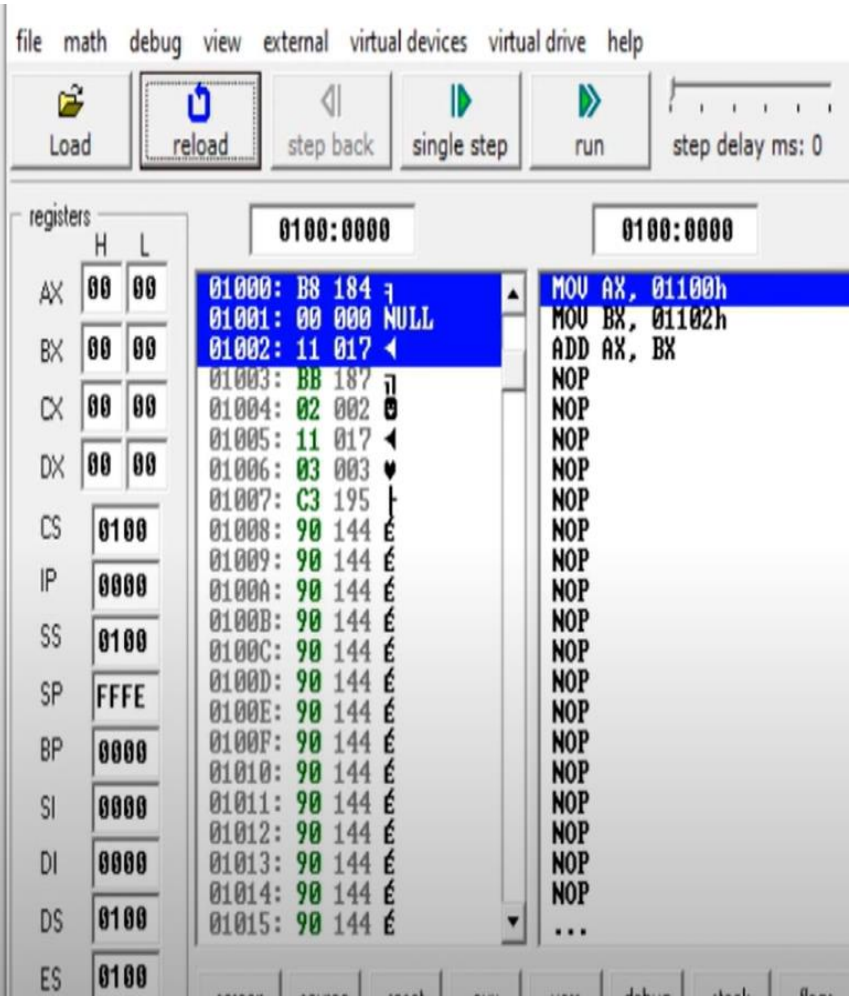
0100:0000

0100*10+0000=01000+0000=01000H(5*4=20bit long PA)

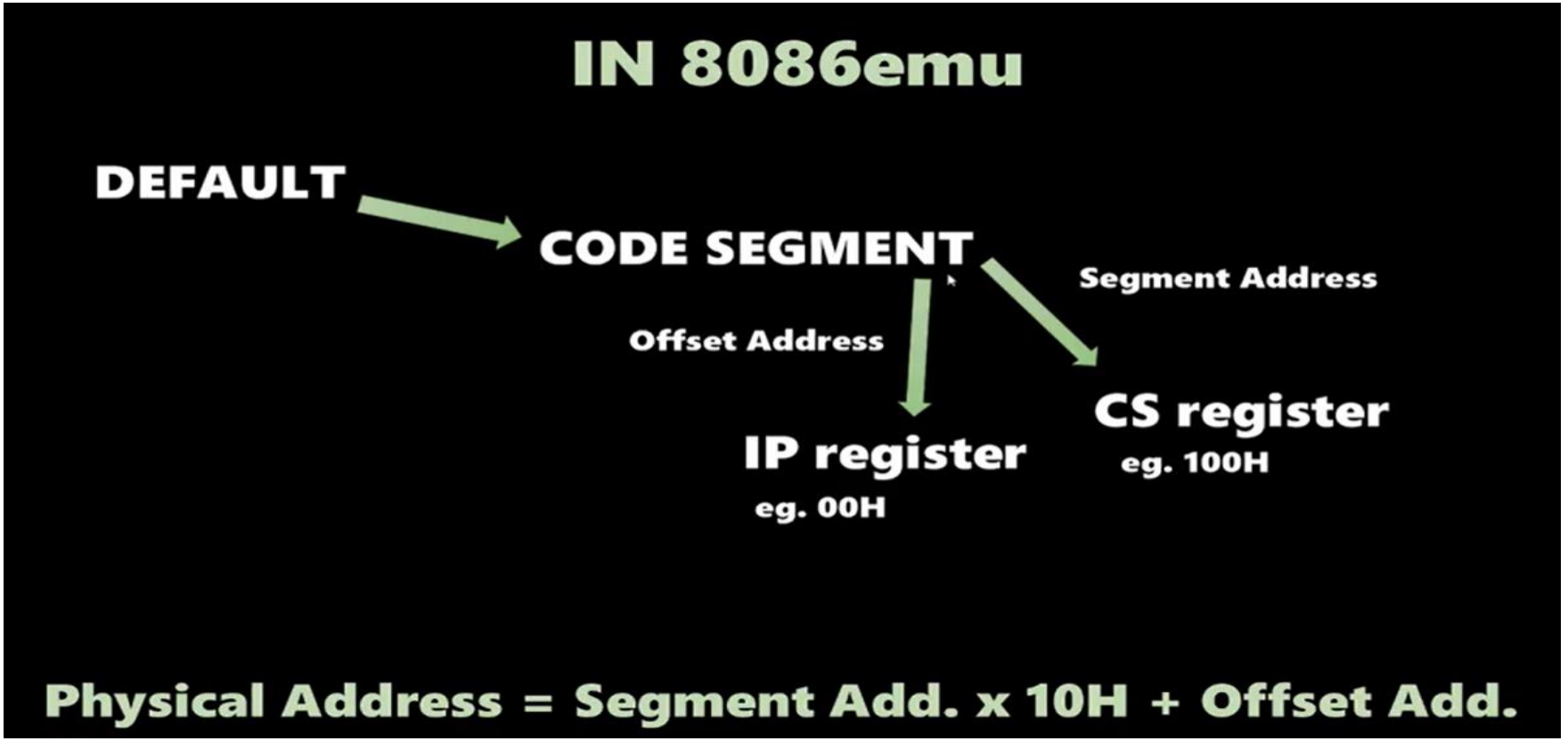
Internal Block Diagram



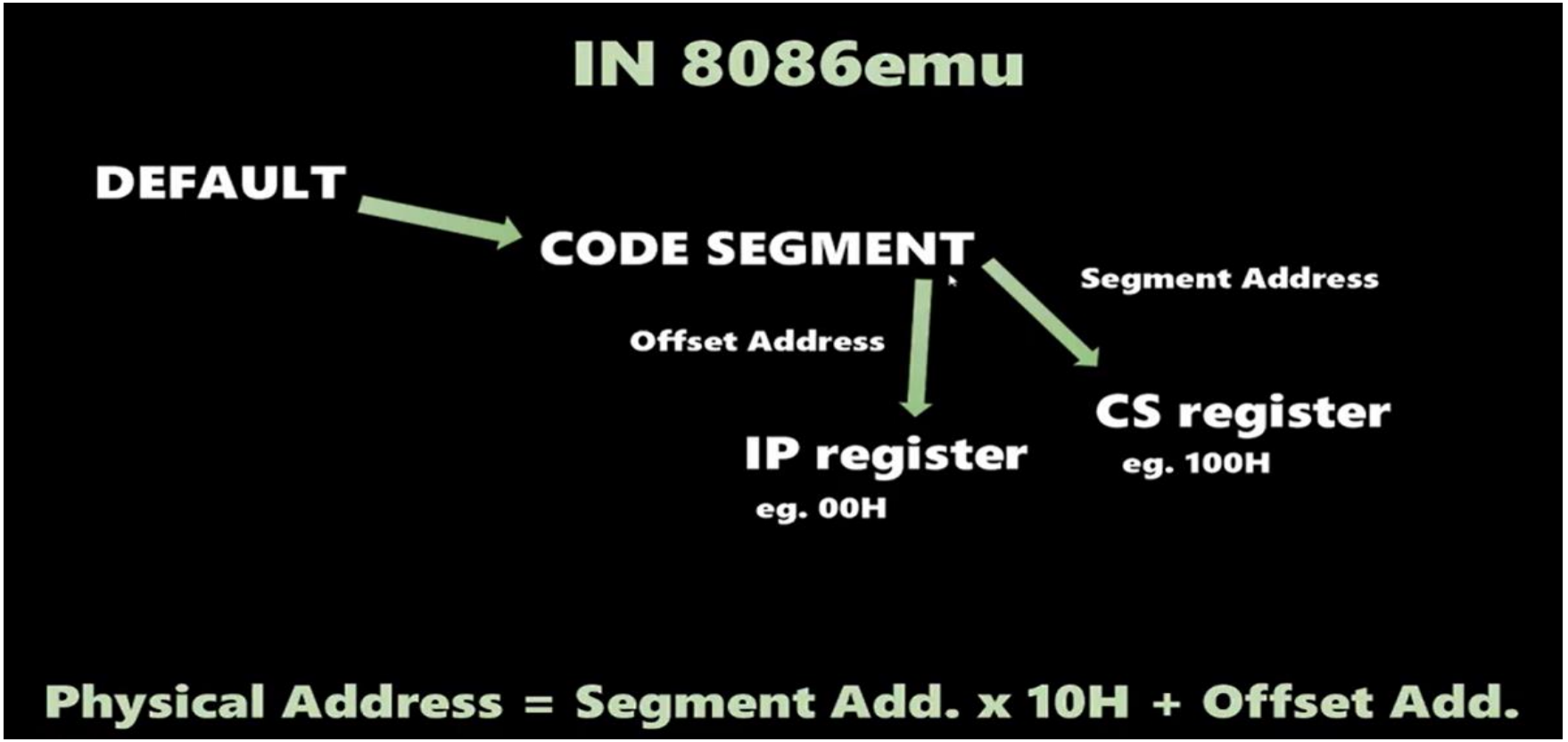

BIU
C-BUS
INSTRUCTION STREAM BYTE QUEUE
B-BUS
ES
CS
SS
DS
IP
CONTROL SYSTEM
EU
A-BUS
AH
AL
BH
BL
CH
CL
DH
DL
SP
BP
SI
DI
ARITHMETIC LOGIC UNIT
OPERANDS


file math debug view external virtual devices virtual drive help
Load
reload
step back
single step
run
step delay ms: 0
registers
H L
AX 00 00
BX 00 00
CX 00 00
DX 00 00
CS 0100
IP 0000
SS 0100
SP FFFE
BP 0000
SI 0000
DI 0000
DS 0100
ES 0100
0100:0000
0100:0000
01000: B8 184
01001: 00 000 NULL
01002: 11 017
01003: BB 187
01004: 02 002
01005: 11 017
01006: 03 003
01007: C3 195
01008: 90 144 É
01009: 90 144 É
0100A: 90 144 É
0100B: 90 144 É
0100C: 90 144 É
0100D: 90 144 É
0100E: 90 144 É
0100F: 90 144 É
01010: 90 144 É
01011: 90 144 É
01012: 90 144 É
01013: 90 144 É
01014: 90 144 É
01015: 90 144 É
MOV AX, 01100h
MOV BX, 01102h
ADD AX, BX
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
...

- CS-Code Segment Register points the code segment (segment address) in the memory
- IP-Instruction Pointer register points to the offset address of a code segment in a memory



- If we know the segment address and offset address of a particular instruction then we can calculate the actual physical address of a location in a memory.



- If we know the segment address and offset address of a particular instruction then we can calculate the actual physical address of a location in a memory.

```
MOV AX , 10H
MOV BX , 05H

ADD AX , BX
```

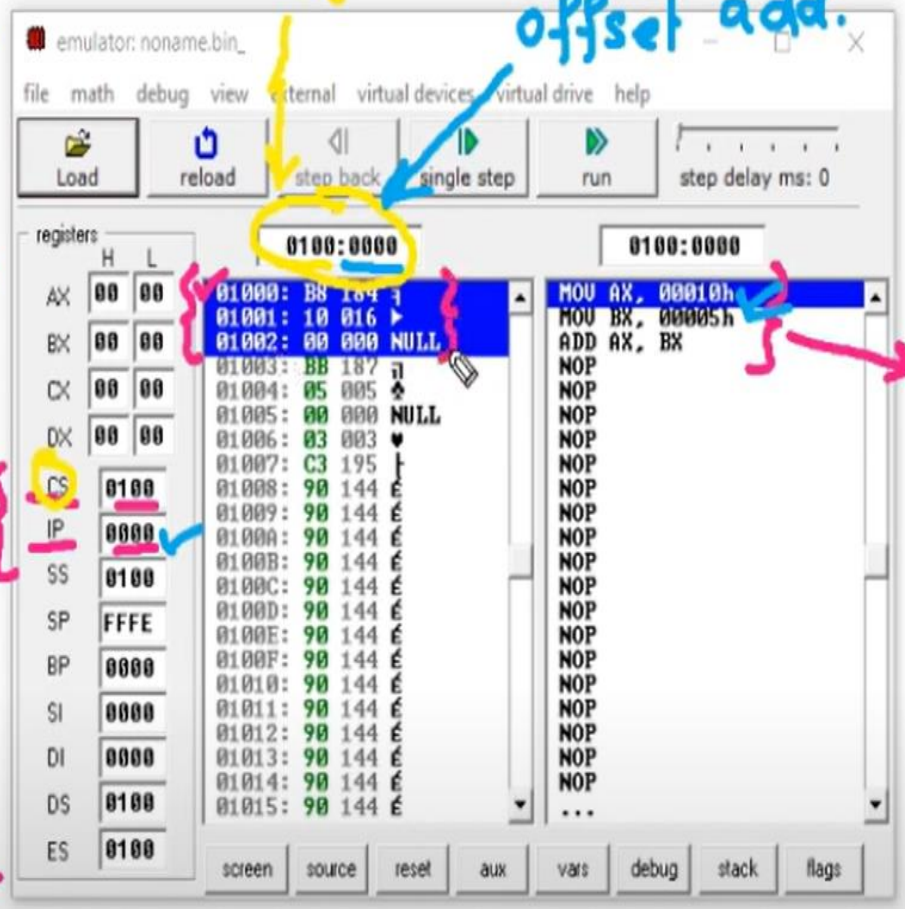
Seg. add

offset add.

Seg Add.
off Add.

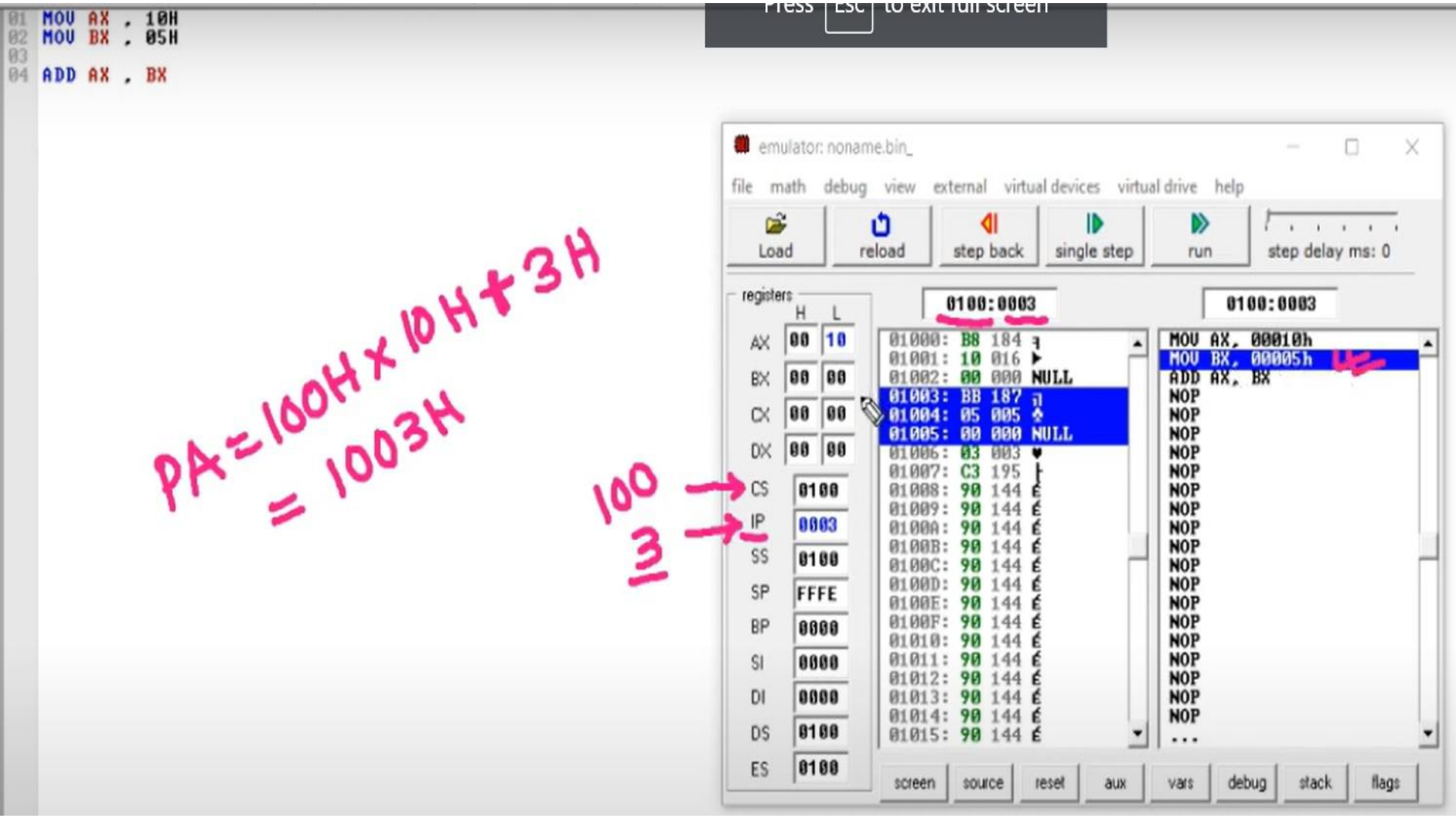
PA = Seg Add x 10H + off. add.
= 100H x 10H + 0H
PA = 1000H

Registers

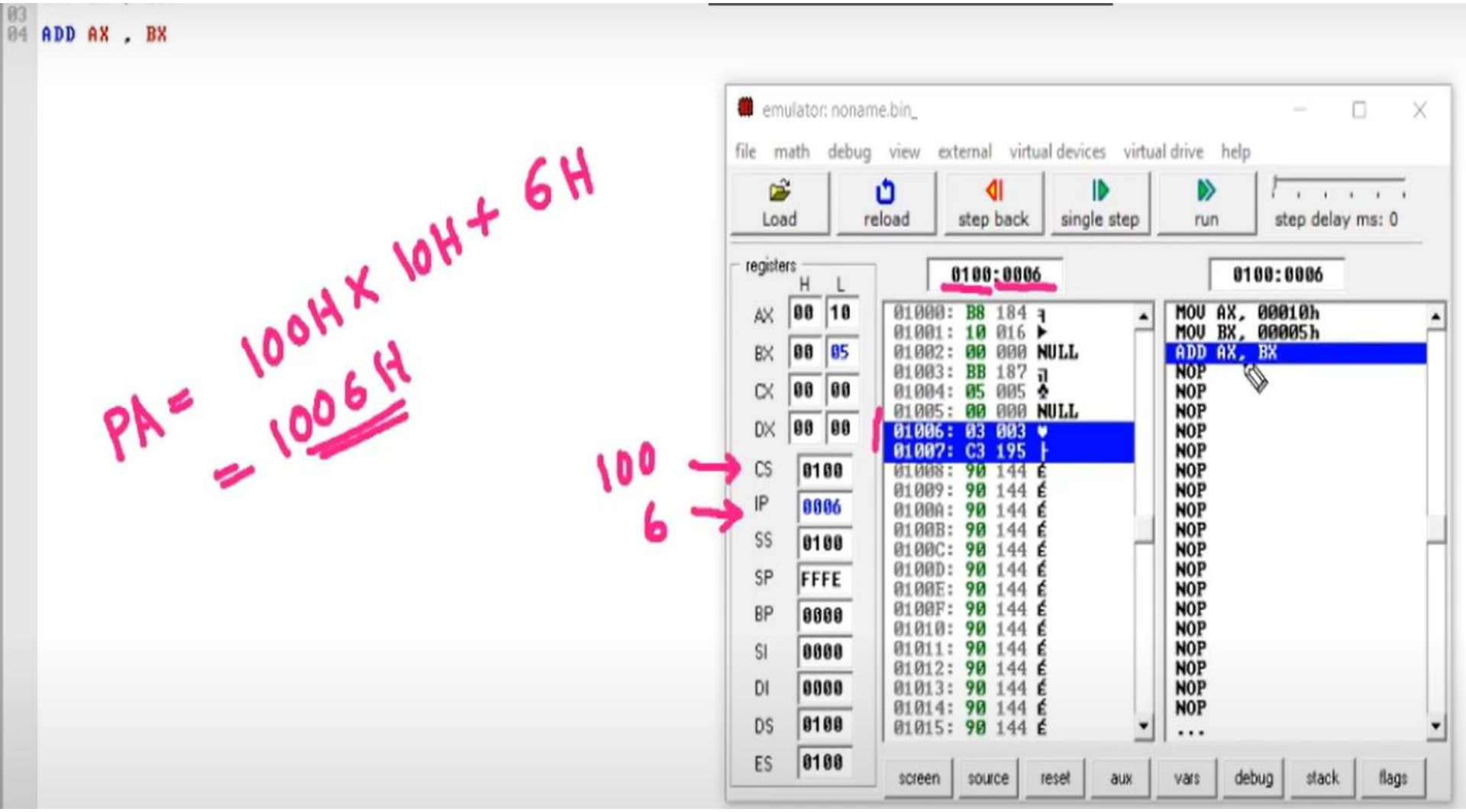


9 ns.

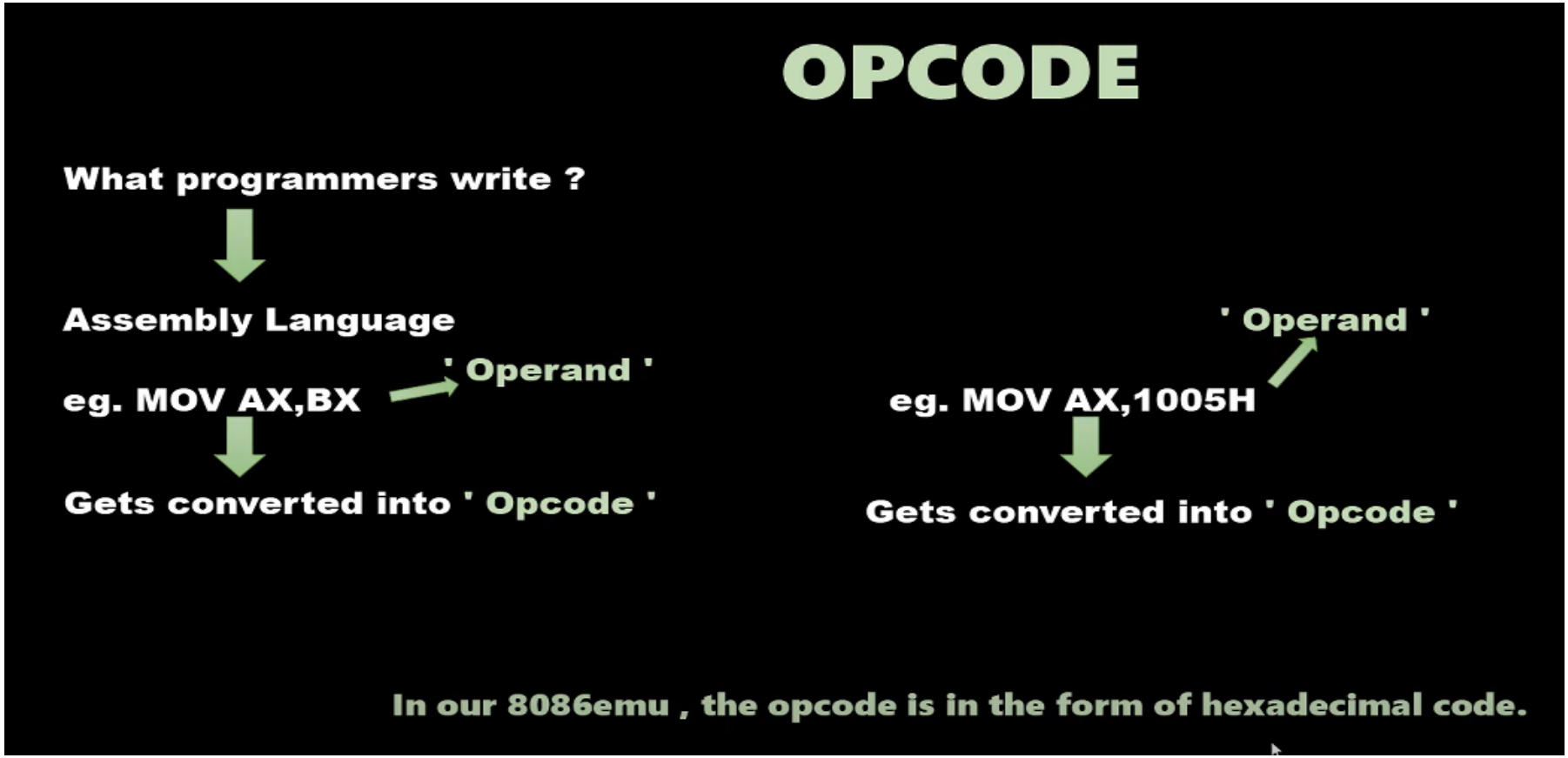
- After press on the single step



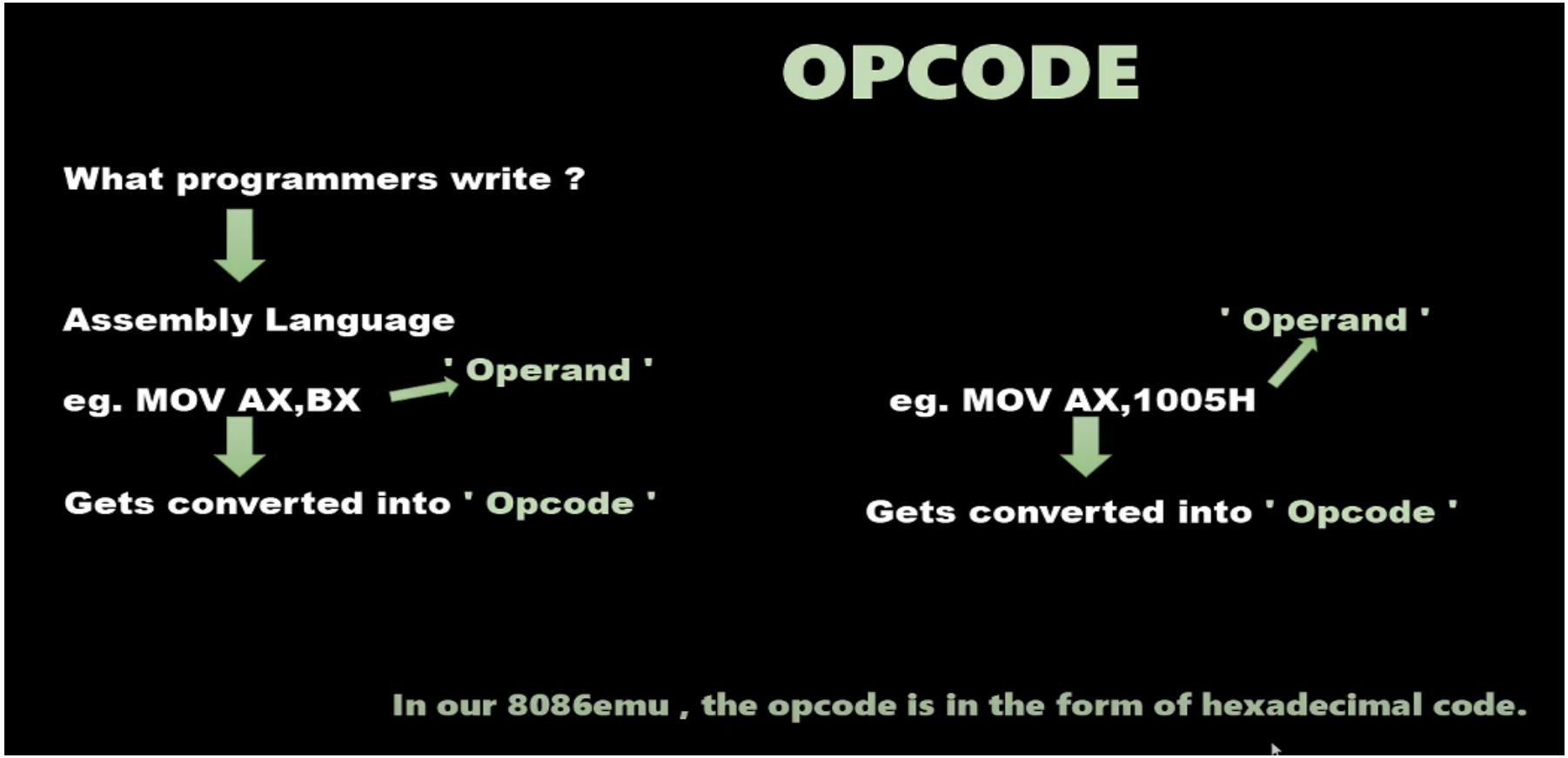
- After press on the single step



OPCODE: every instruction is converted into opcode. Opcode is the language that our MP speaks internally. We write in assembly language and our MP change it into OPCODE. **MOV AX, 0005H**



Opcode or operation code is the command where the task is actually defined.
The **operand** is the 2nd part which is the data to be operated on. **MOV AX, 0005H**



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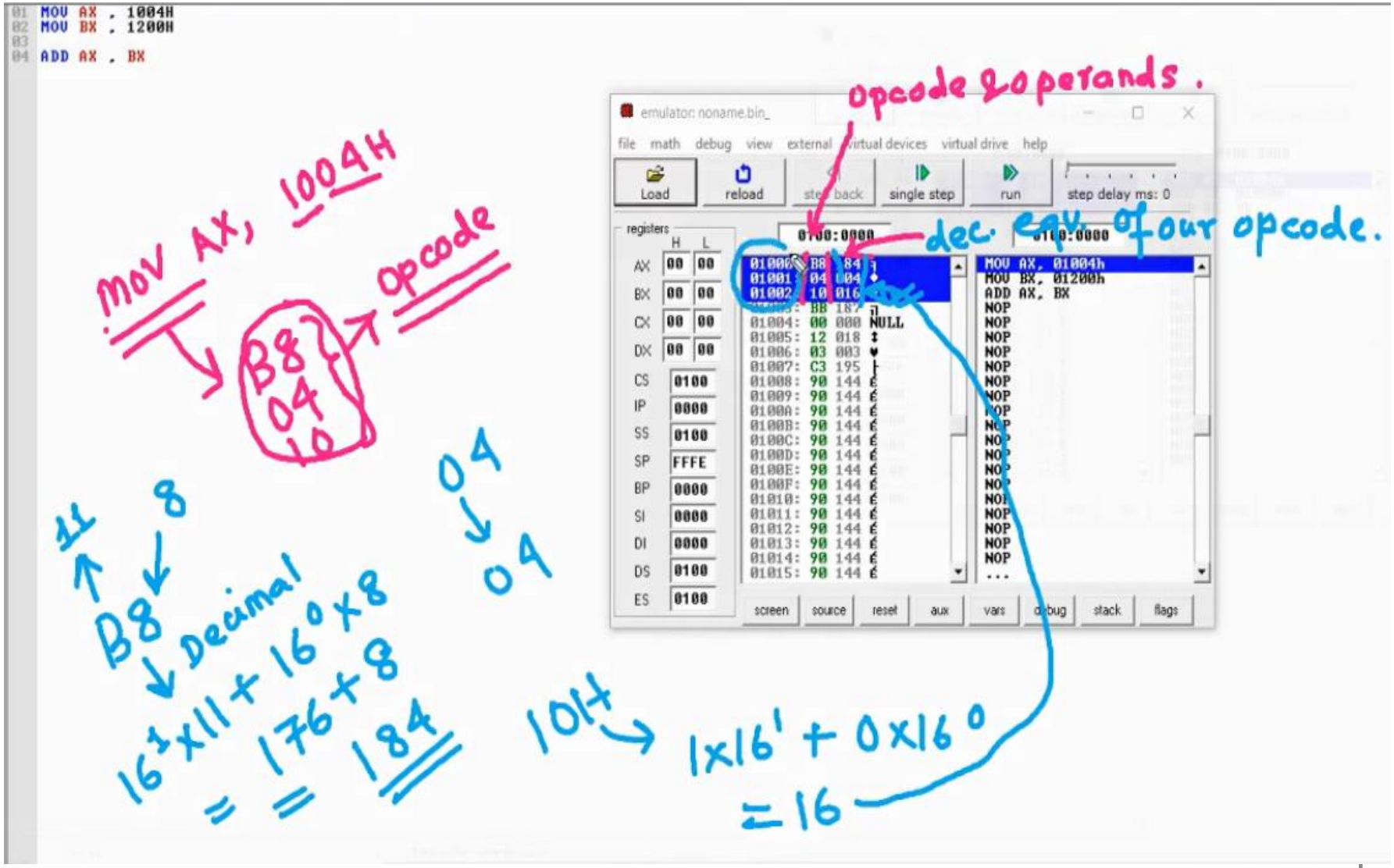
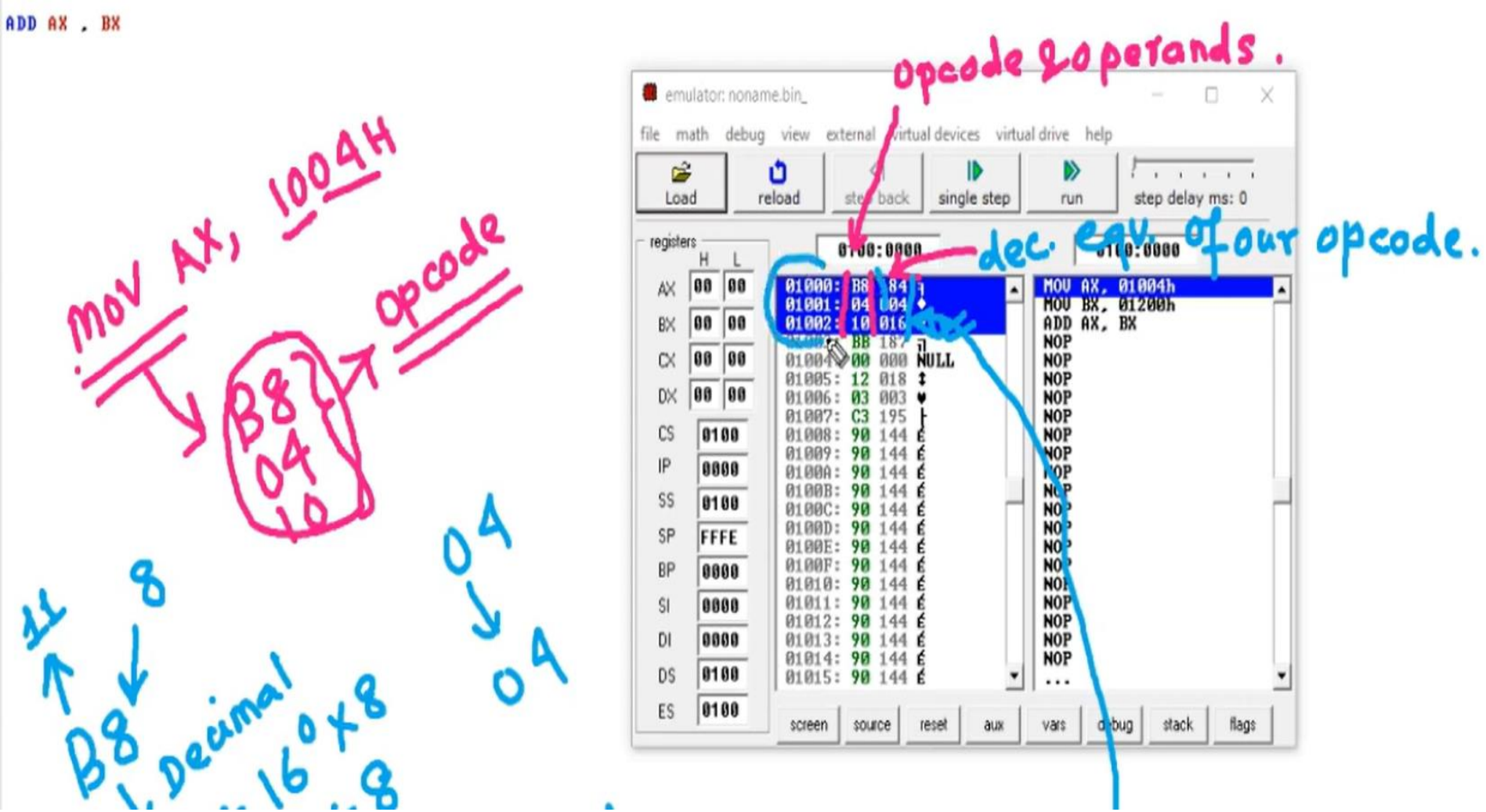


OPCODE: every instruction is converted into opcode

```
ADD AX , BX
```

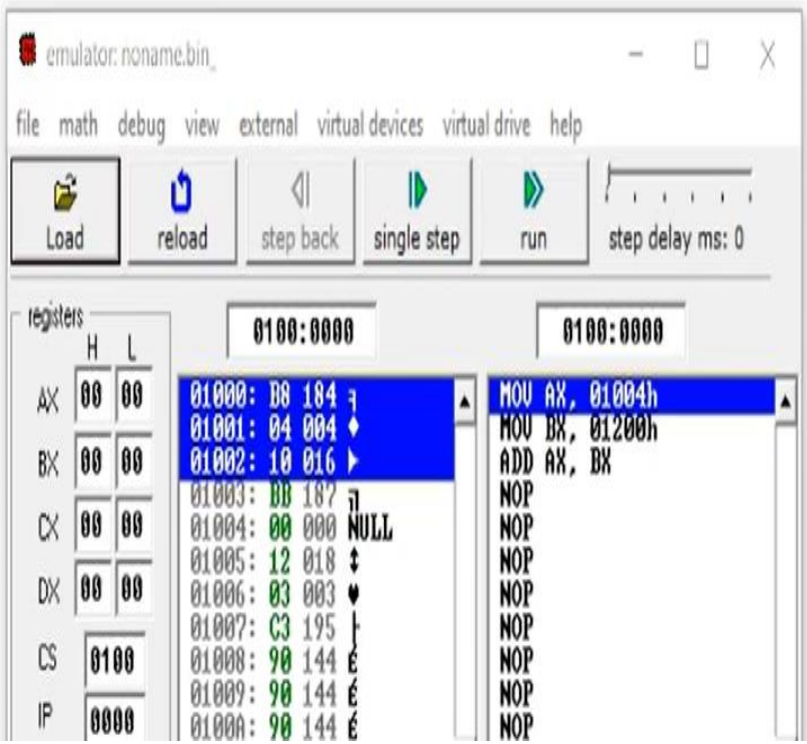


OPCODE: every instruction is converted into opcode

```
01 MOV AX , 1004H
02 MOV BX , 1200H
03
04 ADD AX , BX
```

Summary

Inst/ Mnemonics	Add.	Opcode
MOV AX, 1004H	1000H	B80410



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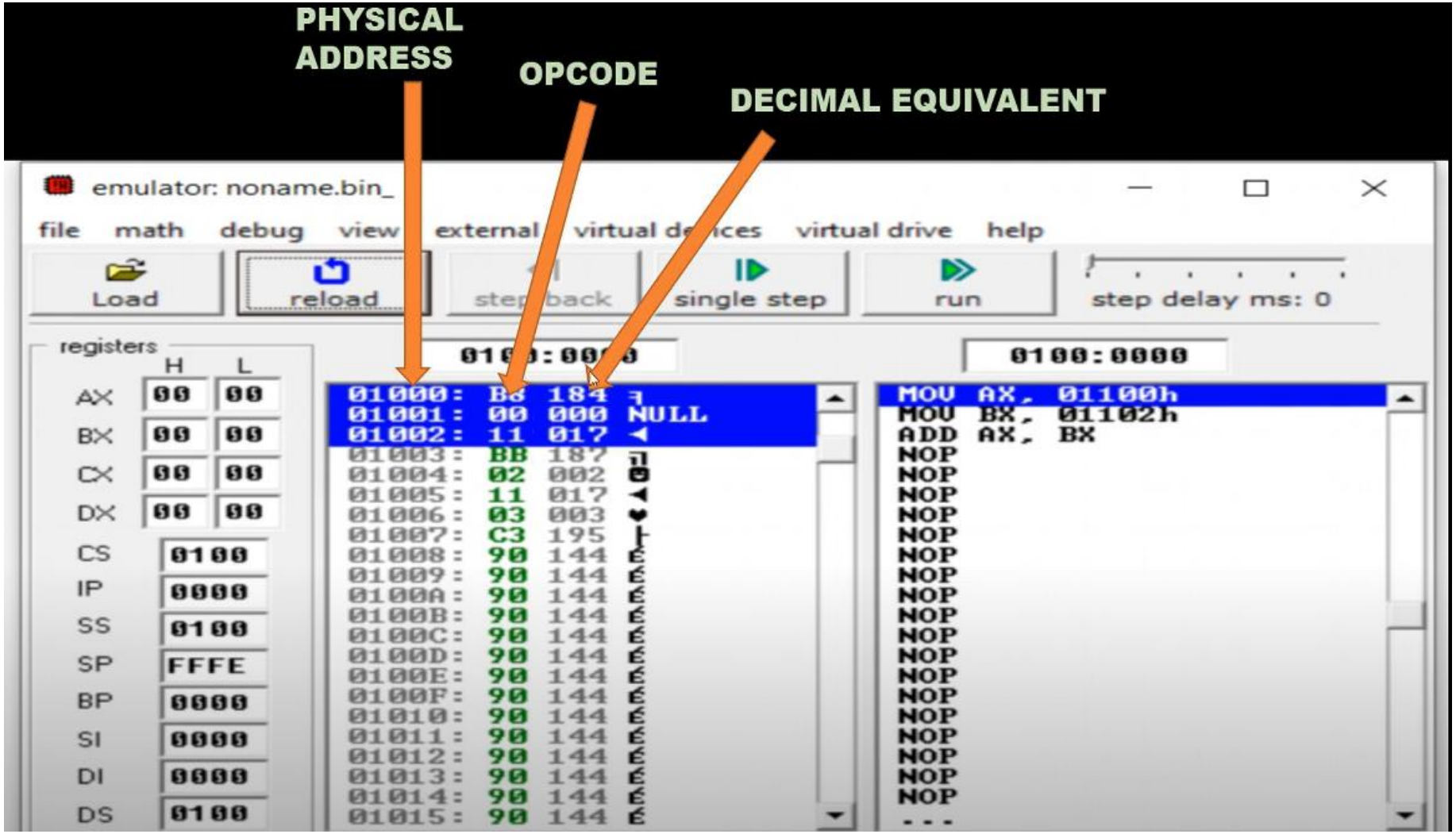

Add the following two numbers

1AAA H
2222 H

See the changes in the registers
Observe the Physical Address (PA)
See the Opcode and give your comments and
See the decimal equ of the opcode and show the calculation if required (hex to dec conversion)

We see the (Physical) Address, OPCODE, and Memory