

EX2: TD3

Example: (TP) write an assembly program to add three immediate numbers using registers A, B, C

observe the results and note the status of flag registers

Solution:

and PC register?

MVI A, 10H	; load 10H into A	No flags	2 Bytes 3E 10
MVI B, 20H	; load 20H into B	No flags	2 Bytes 06 20
MVI C, 30H	; load 30H into C	No flags	2 Bytes 0E 30
ADD B	$A \leftarrow A + B \Rightarrow 10H + 20H = 30H$	Cy=0, Z=0, S=0, P=1	1 Byte 8B
ADD C	$A \leftarrow A + C \Rightarrow 30H + 30H = 60H$	Cy=0, Z=0, S=0, P=0	1 Byte 31
HLT	; Stop execution		1 Byte 76

After execution All flags = 0

(4200H : Default start address in GNUsim 8085):

Total size of program: $2 + 2 + 2 + 1 + 1 + 1 = 9$ Bytes

Program occupies
addresses from: 4200H $\rightarrow$ 4208

After execution HLT $\rightarrow$ Next address

would be 4209H

Ex1:

TD3: (4)

A = 0xFF, B = 0x01

$$\begin{array}{r}
 A + B \\
 \text{0xFF} + \text{0x01} \\
 \hline
 \text{0x00}
 \end{array}$$

bit 7
0 → result parity
S = 0

Flags:

S	Z	AC	P	Cy
0	1	1	1	1

A = 40H, B = 10H → Sub B (40H) - (10H) = (30H)

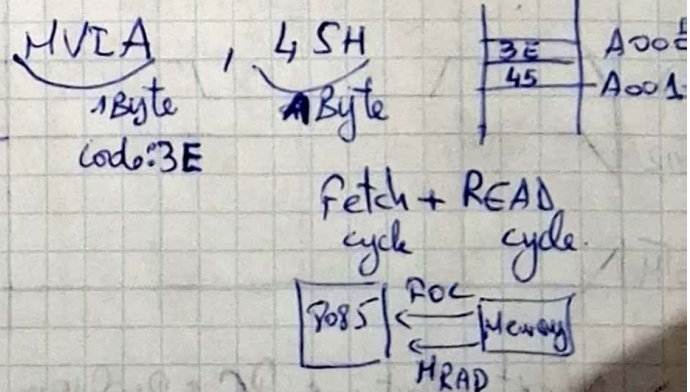
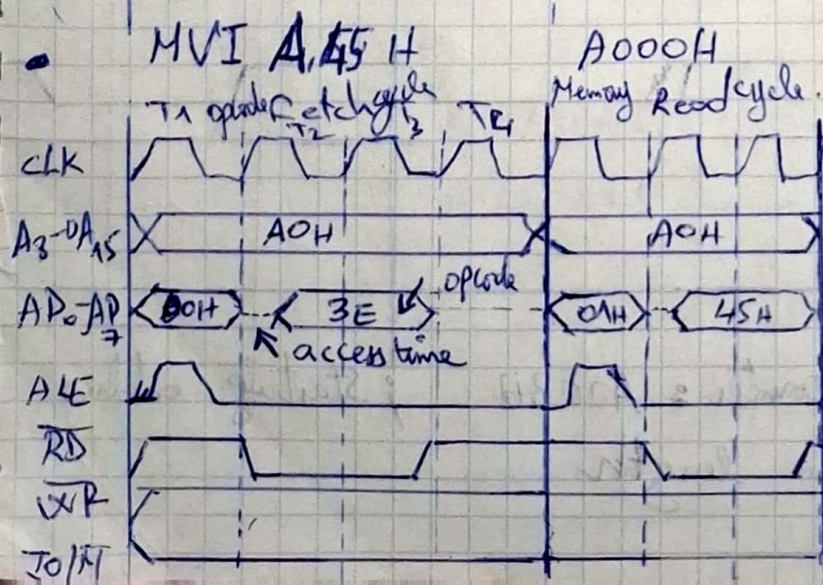
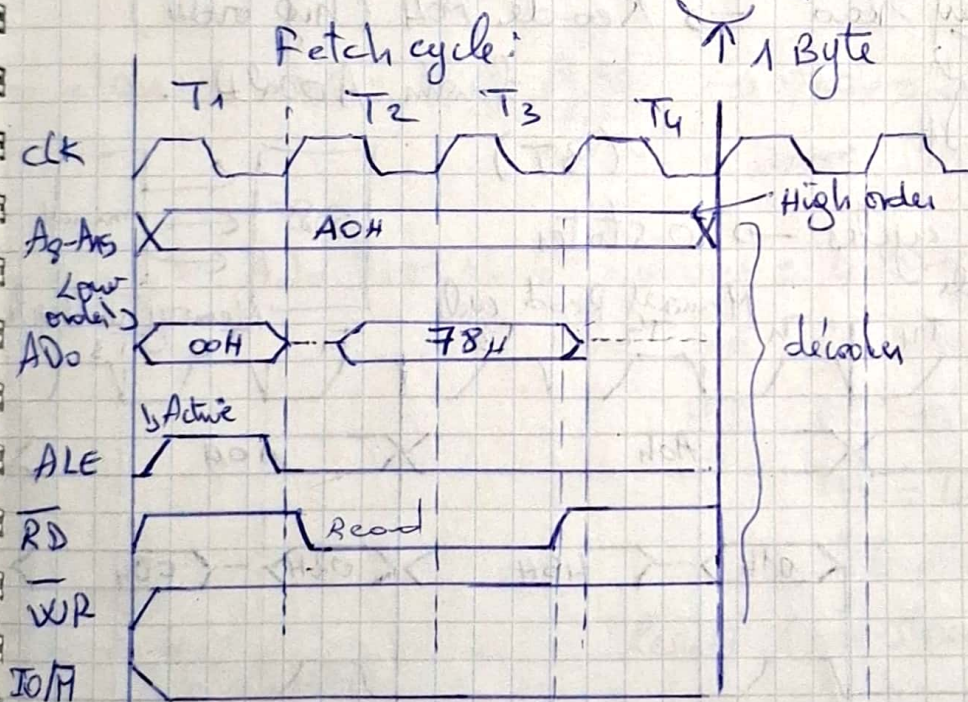
$$\begin{array}{r}
 01000000 \\
 - 00001000 \\
 \hline
 00111000
 \end{array}$$

S = 0, Z = 0, AC = 0, P = 1, C = 0

Ex3: MOV A, B

A000H ← Address memory.

78H ← corresponding coding
↑ 1 Byte



$\underbrace{\text{LXI H, F045H}}_{\substack{\text{1 Byte} \\ \nearrow \text{21H} \\ \text{coding}}}$
 $\underbrace{\text{F045H}}_{\substack{\text{1 Byte} \quad \text{1 Byte}}}$

Loads the 16 bits value F045H into HL register pair

$[A000H] = 21H$
 $[A001H] = 45H$
 $[A002H] = F0H$

$(L = 45H, H = F0H)$

Low-order Byte

High-order Byte

Cycle 1 $\rightarrow$ OP-code Fetch $\Rightarrow$ Fetch 21H from A000H (4T)

Cycle 2 $\rightarrow$ Memory read $\Rightarrow$ Read 45H (low byte) from A001H (3T)

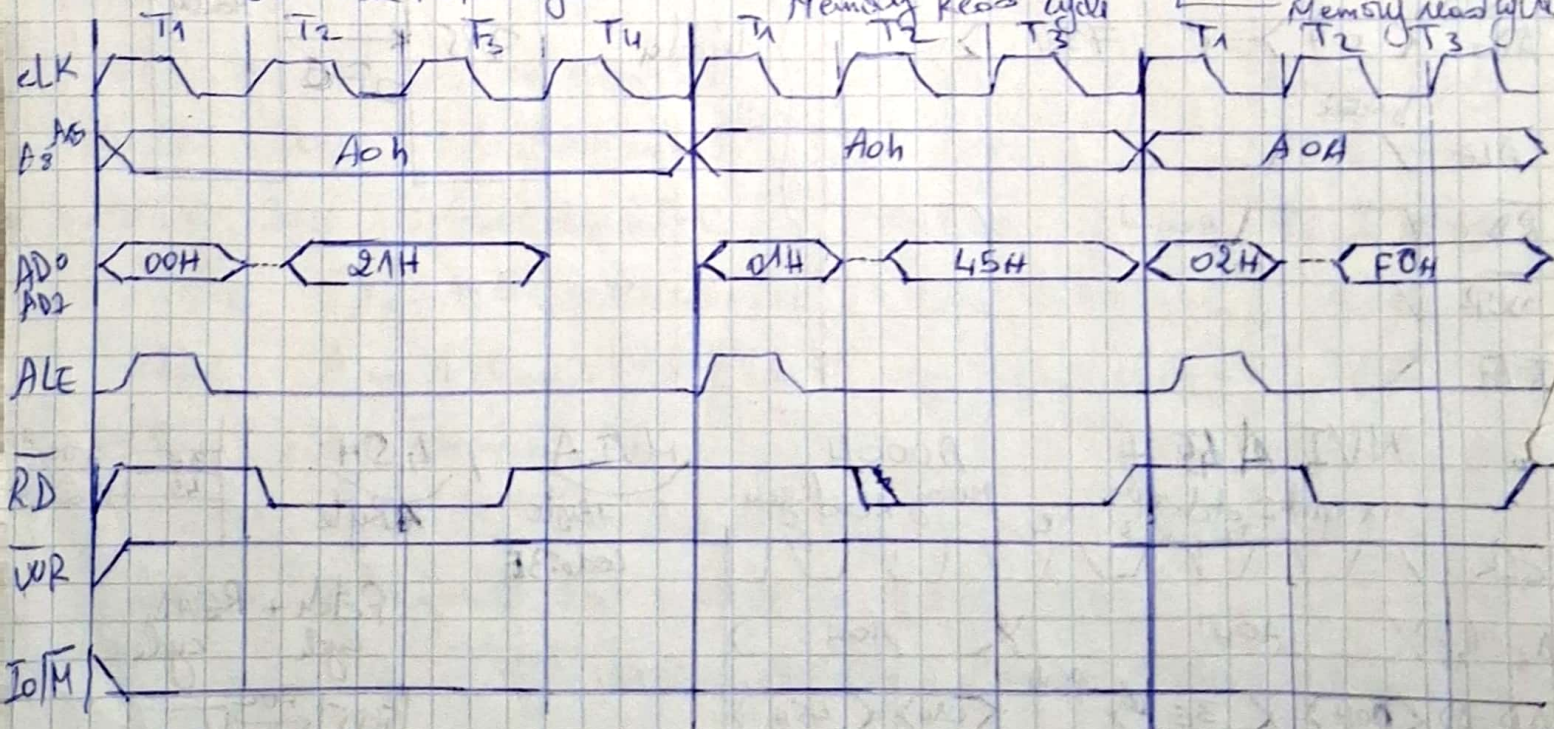
Cycle 3 $\rightarrow$ Memory read $\Rightarrow$ Read F0H (high order) from A002H (3T)

Total machine cycles $\rightarrow$ 10 states

OP-code Fetch cycle

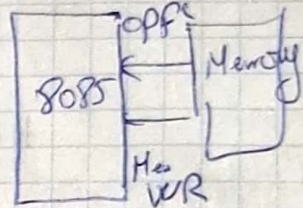
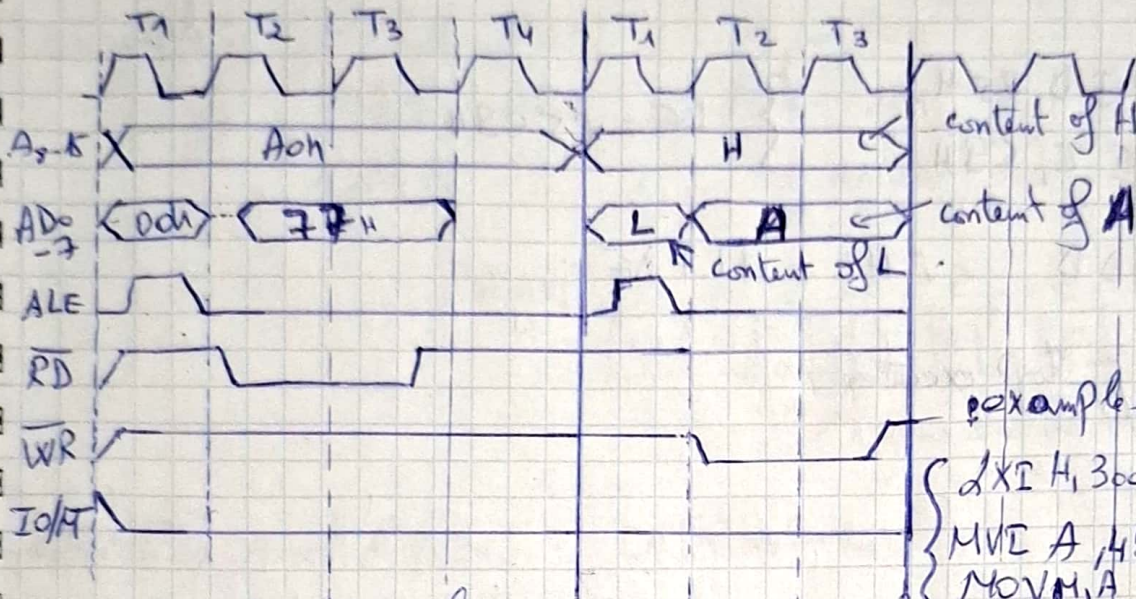
Memory Read cycle

Memory read cycle



$\rightarrow$ Next instruction address : PC : program counter = A003H ; Starting address instruction length

$\text{MOV } M, A$ opcode = 7E = 1 Byte [A000H] = 7E
 (M: Register indirect using)



Op code Fetch cycle

Memory write cycle

examples

$LXI H, 3000H$; $HL = 3000H$
 $MVI A, 45H$; $A \leftarrow 45H$
 $MOV M, A$; memory [3000H] = 45H

Total machine cycles:

clause cas: $MOV A, M$
 Micro 2

opcode = 7E ; $4 + 3 = 7$ T-states.

Diagram Timing: Fetch + read

$M \Rightarrow A$

Ex 4: Add two 16-bit numbers: 4A37H and 25C9H

use DE for source

HL Destination

$HL = 4A37H$

$DE = 25C9H$

Reminder: ADD(8bits)

$MVI A, 37H$
 $MVI B, 25H$
 $ADD B$; $A = 37H + 25H = 5CH$
 $A \leftarrow B + A$

Result: stored in HL (So: $HL = HL + DE$)

DAD(16bits)
 $LXI H, 4A37H$
 $LXI D, 25C9H$
 $DAD D$; $HL = 4A37H + 25C9H = 7000H$
 $HL \leftarrow HL + DE$

Program:

MVI H, 4AH

MVI L, 37H

} HL = 4A37H

MVI D, 25H

MVI E, 09H

} DE = 2509H

DADD

; HL = HL + DE

HLT ; stop execution