

CO Milestone 2

Team 61

Team members:

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Control Signals :

LD DR

$(D0 + D1 + D2 + D5)T4 + D5T5 + D7T3B5$

LD AC

$(D0 + D1 + D2 + D5)T5 + D5T6 + D7T4B5$

LD AR

$T0 + T2$

LD PC

$D4T4$

LD IR

$T1$

MEMORY READ

$(D0 + D1 + D2 + D5)T4 + T1$

MEMORY WRITE

$D3T4$

INC PC

$D7T3B2(AC=0) + T1$

CLR SC

$(D0 + D1 + D5)T5 + (D3 + D4)T4 + D5T6 + D7B2T3 + D7B5T4$

Instructions RTL and Timings

FETCH

T0: $AR \leftarrow PC$

T1: $IR \leftarrow M[AR]$, $PC \leftarrow PC + 1$ T2: $D0...D7 \leftarrow \text{Decode } IR(12-14)$, $AR \leftarrow IR(0-11)$, $I \leftarrow IR(15)$

AND

D0T4: $DR \leftarrow M[AR]$

D0T5: $AC \leftarrow AC \wedge DR$, $SC \leftarrow 0$

ADD

D1T4: $DR \leftarrow M[AR]$

D1T5: $AC \leftarrow AC + DR$, $E \leftarrow \text{Cout}$, $SC \leftarrow 0$

LDA

D2T4: $DR \leftarrow M[AR]$

D2T5: $AC \leftarrow DR$, $SC \leftarrow 0$

STA

D3T4: $M[AR] \leftarrow AC$, $SC \leftarrow 0$

BUN

D4T4: $PC \leftarrow AR$, $SC \leftarrow 0$

SUB

D5T4: $DR \leftarrow M[AR]$

D5T5: $DR \leftarrow AC$, $AC \leftarrow DR$

D5T6: $AC \leftarrow AC - DR$, $SC \leftarrow 0$

SZA

D7T3B2: (If $AC = 0$) $PC \leftarrow PC + 1$

INC

D7T3B5: $DR \leftarrow AC$

D7T4B5: $AC \leftarrow DR + 1$

BUS Selection Lines:

Selection Line	Signals
0	$(D0 + D1 + D2 + D5)T4$
1	$D4T4$
2	0
3	0
4	$D7B5T3 + D3T4 + D5T5$
5	$T0$
6	$T2$
7	0

+T1

ALU Selection Lines:

Selection Line	Signals
0	0
1	D1T5
2	D5T6
3	D2T5 + D5T5
4	D0T5
5	0
6	0
7	D7B5T4

Instructions used in testing :

LDA A 200C
ADD B 100D
SUB C 500E
SZA 7004
BUN N1 4007
LDA B 200D
BUN N2 400A
N1,LDA A 200C
INC 7020
BUN N3 400B
N2,AND A 000C
N3,STA D 300F
A, DEC 2
B, DEC 5
C, DEC 7
D, DEC 0