CO Milestone 2

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Glossary:

* Instructions with timings (1)
* Equations for the inputs (2)
* Bus Selection (3)
* ALU Selection (4)

1. **Instructions with the timing:**

Default for all:

T0: AR <- PC T1: IR<-M[AR] , PC<-PC+1 T2: Decode D0..D7 IR(12-14), AR<-IR(0-11), I<- IR(15)

000 LDA A 200C D2T4: DR<-M[AR] D2T5: AC<-DR, SC<-0

001 ADD B 100D D1T4: DR <- M[AR] D1T5: AC<-AC+DR ~~, E<-Cout ,~~ SC<-0

002 SUB C 500E D5T4: DR <-M[AR] D5T5:TR<-AC, AC<-DR D5T6: DR<-TR D5T7:AC<-DR-AC ,SC<-0

003 SZA 7004 I’B2D7T3: (if AC=0, PC<- PC +1), SC<-0

004 BUN N1 4007 D4T4: PC <- AR, SC<-0

005 LDA B 200D D2T4: DR <- M[AR], D2T5: AC<- DR, SC<-0

006 BUN N2 400A D4T4: PC<-AR, SC<-0

007 (N1) LDA A 200C D2T4: DR<- M[AR], D2T5: AC<-DR, SC<-0

008 INC 7020 I’D7T3B5: DR<-AC , I’D7T4B5: AC <- DR +1, SC<-0

009 BUN N3 400B D4T4: PC <- AR , SC<-0

00A (N2) AND A 000C D0T4: DR <- M[AR] , D0T5: AC<-AC ^ DR, SC<-0

00B (N3) STA D 300F D3T4: M[AR] <- AC, SC<-0

00C DEC (value of A)

00D DEC (value of B)

00E DEC (value of C)

00F DEC (value of D)

1. **Equations for the inputs:**

LOAD DR: I’D7T3B5+ D0T4 + D5T4 + D2T4 + D5T6 + D1T4

LOAD PC: D4T4

LOAD AR: T0 + T2

LOAD IR: T1

LOAD AC: D1T5+D5T7+D2T5+D0T5+D5T5+I’D7T4B5

LOAD TR: D5T5

LOAD WRITE: D3T4

LOAD READ: T1 + D2T4 + D0T4 +D1T4 +D5T4

CLEAR SC: I’D7T4B5 + I’D7T3B2 + D0T5 + D1T5 + D3T4 + D4T4 + D5T7 + D2T5

INCREMENT PC: T1 + I’D7T3B2(AC)’

1. **BUS SELECTION:**

MEMORY (READ): T1 + D2T4 + D0T4 +D1T4 +D5T4

PC: T0

AR: D4T4

DR: D5T5 + D2T5

TR: D5T6

IR: T2

AC: I’D7T3B5 +D3T4+D5T5

1. **ALU SELECTION:**

001 (ADD) : D1T5

010 (SUB): D5T7

011 (TRANSFER): D5T5 + D2T5

100 (AND): D0T5

111(INCREMENT): I’D7T4B5