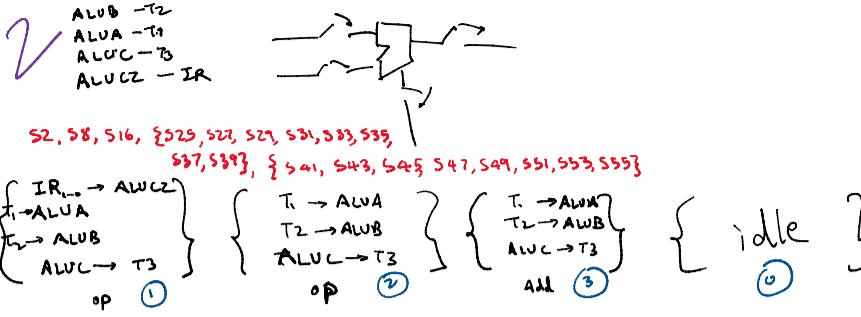
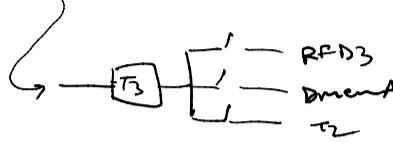


① ALU:



1	0	1
0	1	0
1	0	0

$$\begin{aligned} IR_{1-0} \rightarrow ALUC-Z &: \overline{X}Y \\ T_1 \rightarrow ALUA &: \overline{T}+X \\ T_2 \rightarrow ALUB &: \overline{T}++ \\ ALUC \rightarrow T_3 &: \overline{A}+X \\ op &: \underline{\underline{op}} \end{aligned}$$



$S_3, S_9, S_{13}, S_{14}, \{ S_{26}, S_{28}, S_{30}, S_{32}, S_{34}, S_{36}, S_{38} \},$
 $\{ S_{42}, S_{44}, S_{46}, S_{48}, S_{50}, S_{52}, S_{54} \}$

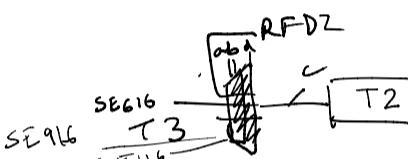
$\{ \text{idle} \} \quad \{ T_3 \rightarrow RFD3 \} \quad \{ T_3 \rightarrow D_{MemA} \} \quad \{ T_3 \rightarrow T_2 \}$

1	0	1
0	1	0
1	0	0

$\times Y$
 $X Y$
 $Y X$

②

3



$S_1, S_7, S_{15}, S_{17}, S_{19}, \{ S_{42}, S_{44}, S_{46}, S_{48}, S_{50}, S_{52}, S_{54} \} \rightarrow S_2, S_{40}$

$\{ S_{26}, S_{28}, S_{30}, S_{32}, S_{34}, S_{36}, S_{38} \},$

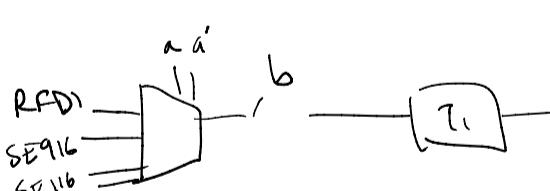
$\{ \text{idle} \} \quad \{ SE916 \} \quad \{ SE616 \} \quad \{ RFD2 \} \quad \{ T_3 \} \quad \{ SE116 \}$

	$\times Y$	00	01	11	10
\overline{Z}	0	0	1	1	0
0	0	1	0	0	1
1	1	0	1	0	0

$$\begin{aligned} c &= z + x \\ a &= \overline{z}x \\ b &= zx \\ d &= y \end{aligned}$$

④ T₁:

3



$S_1, S_6, S_{10}, S_{12}, S_{15}, S_{17}, S_{19}, S_{22}, \{ S_{24}, S_{26}, S_{28}, S_{30}, S_{32}, S_{34}, S_{36}, S_{38} \},$

$\{ S_{40}, S_{42}, S_{44}, S_{46}, S_{48}, S_{50}, S_{52}, S_{54} \}$

$\{ \text{idle} \}$

$\{ RFD1 \rightarrow T_1 \}$

② $\frac{aa'}{00}$

$\{ SE916 \rightarrow T_1 \}$

③ $\frac{aa}{01}$

$\{ SE116 \rightarrow T_1 \}$

④ $\frac{aa'}{10}$

$\times Y Z$	00	01	11	10
0	1	0	1	1
1	0	1	0	0

$$\begin{aligned} b &= Y \\ a &= XY \\ a' &= \overline{Y}Z + \overline{Z}Y \end{aligned}$$

⑤ $SE616 \rightarrow T_1$

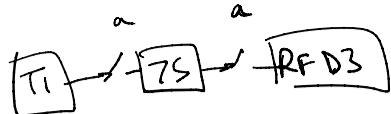
$$aa'$$

⑥ TS:

~S11

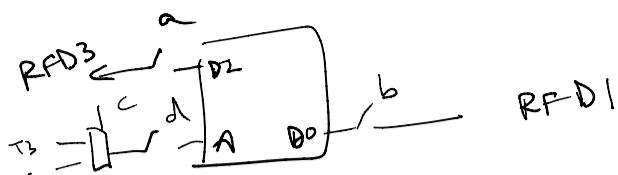


⑥ 10-
S1



⑥ Dmem:

3



(T3 → Dmem A, Dmem DO ← RF D3) ①

S3
(T3 → Dmem A, Dmem DO ← RF D1) ②

S4
(T2 → Dmem A, RF D3 ← Dmem DI) ③

{S22, S27, S29, S31, S33, S55, S71, S39}

(T2 → Dmem A, RF D1 → Dmem DO) ④

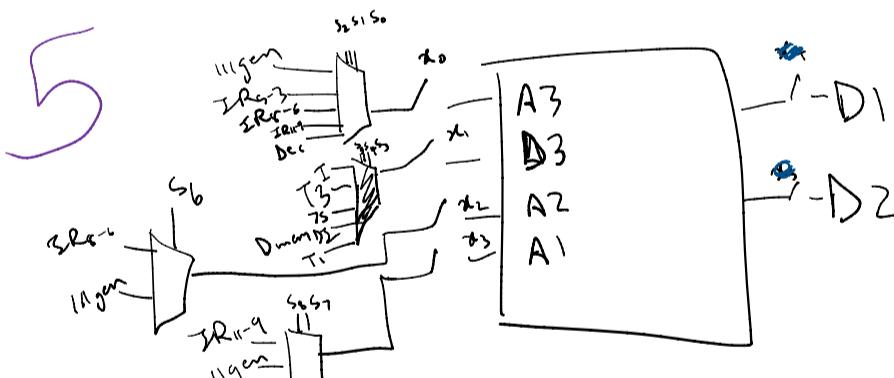
{S41, S43, S45, S47, S49, S51, S53, S55}

{idle} ⑤

X	Y2	60	01	11	10
0	⑥	X	X	+	+
1	0	②	④	②	②

$$\begin{aligned} b &= Y \\ a &= \bar{Y} \\ c &= \bar{Z} \\ d &= X + Y \end{aligned}$$

① RF:



① IR₄₋₆ → RFA1
IR₄₋₆ → RFA2
S1, S6 III gen → RFA3

~~RF D1 → T1~~
~~RF D2 → T2~~
RF D3 ← I

{ mgen → RFA1 RF D1 → Dmem A, I }

②

S0

② S3

{ T3 → RF D3; IR₅₋₃ → RFA3 }

④ S4 { $\text{llgen} \rightarrow \text{RFA1}; \text{RFDI} \rightarrow \text{MemA}, I \}$ }

⑤ S16, S5 { $I \rightarrow \text{RFD3}; \text{RFA3} \leftarrow \text{llgen} \}$ }

⑥ S7 { $\text{IR}_{11-9} \rightarrow \text{RFA1}; \text{RFDI} \rightarrow T_1$
 $\text{llgen} \rightarrow \text{RFA2}; \text{RFD2} \leftarrow I$ }

⑦ S9 { $\text{IR}_{8-6} \rightarrow \text{RFA3}$
 $T_3 \rightarrow \text{RFD3}$ }

⑧ S10 { $\text{llgen} \rightarrow \text{RFA1}; \text{RFDI} \rightarrow I \}$ }

⑨ S11 { $T_S \rightarrow \text{RFD3}$
 $\text{IR}_{11-9} \rightarrow \text{RFA3} \}$ }

⑩ S12 { $\text{IR}_{8-6} \rightarrow \text{RFA1}$
 $\text{RFDI} \rightarrow T_1$ }

⑪ S13 { $\text{IR}_{11-9} \rightarrow \text{RFA3}; \text{MemD1} \rightarrow \text{RFD3} \}$ }

⑫ S14 { $\text{IR}_{11-9} \rightarrow \text{RFA1}; \text{MemD0} \leftarrow \text{RFDI} \}$ }

⑬ S15 { ~~llgen~~ $\rightarrow \text{RFA1}, \text{RFDI} \rightarrow I, T_2 \}$ }

⑭ S17 { $\text{IR}_{8-6} \rightarrow \text{RFA2}; \text{RFD2} \rightarrow T_2$
 $\text{IR}_{11-9} \rightarrow \text{RFA1}; \text{RFDI} \rightarrow T_1 \}$ }

⑮ S21, S18: { $\text{IR}_{11-9} \rightarrow \text{RFA3}; I \rightarrow \text{RF D3} \}$ }

⑯ S23, S5b: { $\text{llgen} \rightarrow \text{RFA3}; T_3 \rightarrow \text{RF D3} \}$ }

⑰ S19: { $\text{IR}_{8-6} \rightarrow \text{RFA1}; \text{RFDI} \rightarrow T_1$
 $\text{llgen} \rightarrow \text{RFA2}; \text{RFD2} \rightarrow T_2 \}$ }

⑱ S57: { $\text{llgen} \rightarrow \text{RFA3}; T_1 \rightarrow \text{RF D3} \}$ }

① S40, S24, S22 : $\{ 2R_{11-9} \rightarrow RFA1; RF D1 \rightarrow T1 \}$

② S25, S27, S29 : $\{ Dec \rightarrow RFA1; RF D1 \rightarrow DmemD0 \}$
 S31, S33, S35,
 S37, S39.

③ S41, S43, S45 : $\{ Dec \rightarrow RFA3; DmemD2 \rightarrow RF D3 \}$
 S47, S49, S51,
 S53, S55

④ {idle}

cd ab	000	001	011	111	101	100	110	010
00	0	0	0	0	0	0	0	0
01	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
10	X	X	X	X	X	X	X	X

$$X_0 = \overline{a}\overline{b}\overline{c}\overline{d}\overline{e} + \overline{a}\overline{b}d(\overline{d}+e) + \overline{a}\overline{b}\overline{c}\overline{e}$$

$X_0 = 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0$

$$X_0 = \overline{a}\overline{b}\overline{c}\overline{e} + \overline{b}\overline{c}\overline{e} + b\overline{d}\overline{e} + \overline{a}\overline{b}\overline{d}\overline{e} + \overline{a}\overline{c}\overline{d}\overline{e}$$

the same

$X_1 = 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1$

$$X_1 = \overline{a}\overline{b}\overline{c}\overline{d}\overline{e} + \overline{a}\overline{b}\overline{c}\overline{d}e$$

$$X_1 = \overline{a}\overline{b}\overline{c}\overline{d}\overline{e} + \overline{a}\overline{b}\overline{c}\overline{d}e$$

$$+ \overline{b}\overline{c}\overline{d}\overline{e} + a\overline{b}\overline{c}\overline{d}e$$

$$+ \overline{b}\overline{c}\overline{d}\overline{e} = (\overline{a}\overline{b}\overline{c} + \overline{b}\overline{c})\overline{d}\overline{e}$$

A3 11gen : S2S1S0=000

000 0 0 0

A3 11-3 : S2S1S0=001

0 0 0 0 0

A3 11-1 : S2S1S0=000

0 0 0 0 1

A3 11-6 : S2S1S0=011

0 0 0 1 0

A3 Dec : S2S1S0=100

0 0 0 1 1

S2 : $a\overline{b}\overline{c}\overline{d}\overline{e}$

$$S1 : \overline{a}\overline{b}\overline{c}\overline{d}\overline{e} + \overline{a}\overline{b}\overline{c}\overline{d}e + \overline{a}\overline{b}\overline{c}\overline{d}\overline{e} + \overline{a}\overline{b}\overline{c}\overline{d}e$$

$$X_2 = \overline{a}\overline{b}\overline{c}\overline{d}\overline{e} \longrightarrow \overline{a}\overline{b}\overline{c}\overline{d}\overline{e}$$

$$+ \overline{a}\overline{b}\overline{c}\overline{d}e \} \overline{a}\overline{b}\overline{c}\overline{e} \} \overline{a}\overline{b}\overline{c}\overline{e}$$

$$+ \overline{a}\overline{b}\overline{c}de \} \overline{a}\overline{b}\overline{c}e \} \overline{a}\overline{b}\overline{c}e$$

$$+ \overline{a}\overline{b}\overline{c}\overline{d}e \} \overline{a}\overline{b}\overline{c}\overline{d}e \} \overline{a}\overline{b}\overline{c}\overline{d}e$$

D3 D2 : 0000 0 0 0 0 0

D3 I : 000 000 0 0 0

D3 T5 : 010 0 0 0 0

D3 T1 : 100 0 0 0 0

D3 T3 : 001 0 0 0 0

$\overline{a}\overline{b}\overline{c}\overline{d}e + \overline{a}\overline{b}\overline{c}e$
 $\overline{b}\overline{c}\overline{d}e + \overline{a}\overline{b}\overline{c}\overline{d} + b\overline{c}\overline{d}e$
 $\overline{a}\overline{b}\overline{d}\overline{e}$
 $\overline{a}\overline{c}\overline{d}e$
 $\overline{b}\overline{c}\overline{d}e + \overline{b}\overline{c}\overline{d}e + b\overline{c}\overline{d}e$

$$X_3 = (\overline{a}\overline{d}\overline{e} + ade)\overline{b}\overline{c} + \overline{a}\overline{b}e + \overline{a}\overline{c}eb$$

$$+ \overline{a}\overline{b}\overline{c}\overline{d}$$

$$+ \overline{a}\overline{b}\overline{c}\overline{e}$$

$$+ \overline{a}\overline{b}\overline{c}\overline{d}e$$

$$S3 = \overline{a}\overline{b}\overline{c}\overline{d}\overline{e} + \overline{a}\overline{b}\overline{c}\overline{d}e + \overline{a}\overline{b}\overline{c}\overline{d}\overline{e} + \overline{a}\overline{b}\overline{c}\overline{d}e + \overline{a}\overline{b}\overline{c}\overline{d}\overline{e}$$

$$= \overline{a}\overline{b}\overline{d}\overline{e} + \overline{a}\overline{b}d(\overline{c}\overline{e} + ce) + a\overline{b}c\overline{d}\overline{e}$$

$$S4 = \overline{a}\overline{b}\overline{c}\overline{d}\overline{e} + \overline{a}\overline{b}\overline{c}\overline{d}e + a\overline{b}c\overline{d}\overline{e}$$

$$S5 = \overline{a}\overline{b}\overline{c}\overline{d}\overline{e}$$

A2 IR_{reg} : 0 0 0 0 0

A2 Reg : 1 0 0 0 0

ab cde

$$S6 = a\overline{b}\overline{c}\overline{d}\overline{e}$$

1 00000
 2 00001
 3 00010
 4 00011
 5 00100
 6 00101
 7 00110
 8 00111
 9 D1000
 10 01001
 11 01010
 12 01011
 13 01100
 14 01101
 15 01110
 16 01111
 17 10000
 18 10001
 19 10010
 20 10011
 21 10100

$$\begin{aligned}
 \text{AI Schrit : } & S = 00 \quad \textcircled{1} \quad \textcircled{2} \quad \textcircled{3} \quad \textcircled{4} \quad \textcircled{5} \\
 \text{AI IRab : } & 01 \quad \textcircled{6} \\
 \text{AI IRbc : } & 10 \quad \textcircled{7} \quad \textcircled{8} \quad \textcircled{9} \quad \textcircled{10} \\
 \text{AI IRgen : } & 11 \quad \textcircled{11} \\
 \text{AI Dec : } & 11 \quad \textcircled{12}
 \end{aligned}$$

$$\begin{aligned}
 S_8 = & abde + abcde + \bar{b}\bar{c}\bar{d}e + \bar{b}\bar{c}de + \bar{b}\bar{c}\bar{d}\bar{e} \\
 S_2 = & abde + a\bar{b}\bar{c}\bar{d}e
 \end{aligned}$$

$$\begin{aligned}
 S_8 = & \bar{a}\bar{b}\bar{c}\bar{d}e + \bar{a}\bar{b}\bar{c}\bar{d}e + \bar{a}\bar{b}\bar{c}\bar{d}e \\
 & + a\bar{b}\bar{c}\bar{d}e + \bar{a}\bar{b}\bar{c}\bar{d}\bar{e} \\
 = & \bar{a}\bar{b}\bar{c}\bar{d}e + \bar{a}\bar{b}\bar{c}\bar{d}e + \bar{a}\bar{b}\bar{c}\bar{d}e \\
 = & \bar{a}\bar{b}\bar{c}\bar{d}e + \bar{a}\bar{b}\bar{c}\bar{d}\bar{e} \\
 & + a\bar{b}\bar{c}\bar{d}e \\
 = & \bar{a}\bar{b}\bar{c}\bar{d}e (\bar{c}+d) + \bar{a}\bar{b}\bar{c}\bar{d}\bar{e} + a\bar{b}\bar{c}\bar{d}e
 \end{aligned}$$

$$S_7 = abcd\bar{e} + a\bar{b}\bar{c}\bar{d}e = \underline{\underline{ab\bar{d}(c\bar{e}+\bar{c}\bar{e})}}$$

⑧ I. 2

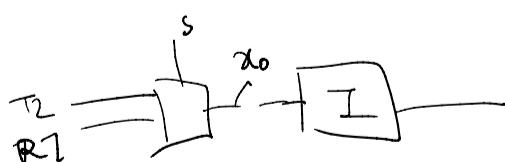
~~S1, S2, S3, S4, S5, S6, S7, S12, S16~~

R1 → I S10, S15 ①

~~T1 → I S18, S21~~

T2 → I S20 ②

③ idle.



x	0	1
0	0	x
1	0	0

$$x_0 = \bar{q}$$

$$s = \bar{x}$$

⑨

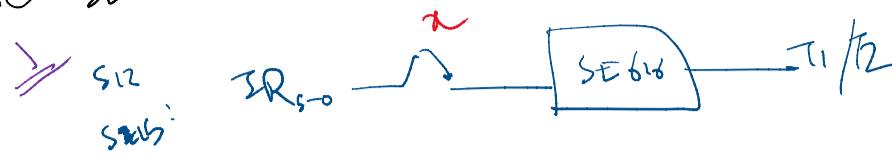
SET916:

~~S10 = 3R₁₀ → SET916 → T1 / T2~~

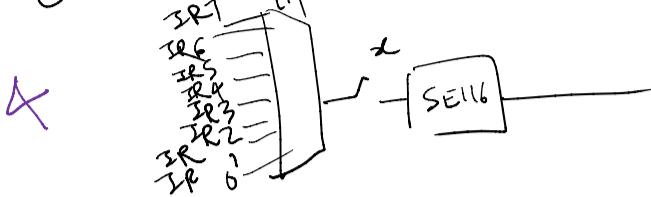
idle:

similarly

② SE616



① SE116: $SS_{250} 3+1$



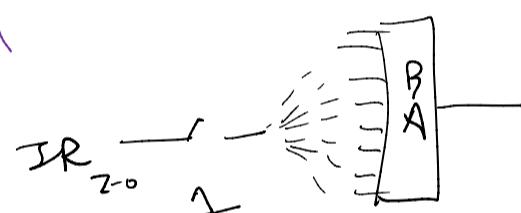
② IR:



③ Imem:



④ BA:



⑤ Dec

(W:

