

**IBM**

Manual of Instruction

**1401**

Data Processing System  
Instructional Logic Diagrams  
Volume **4**

IBM Form 56-398

Ausgabe August 1962

# 1401 INTERMEDIATE LEVEL DIAGRAMS

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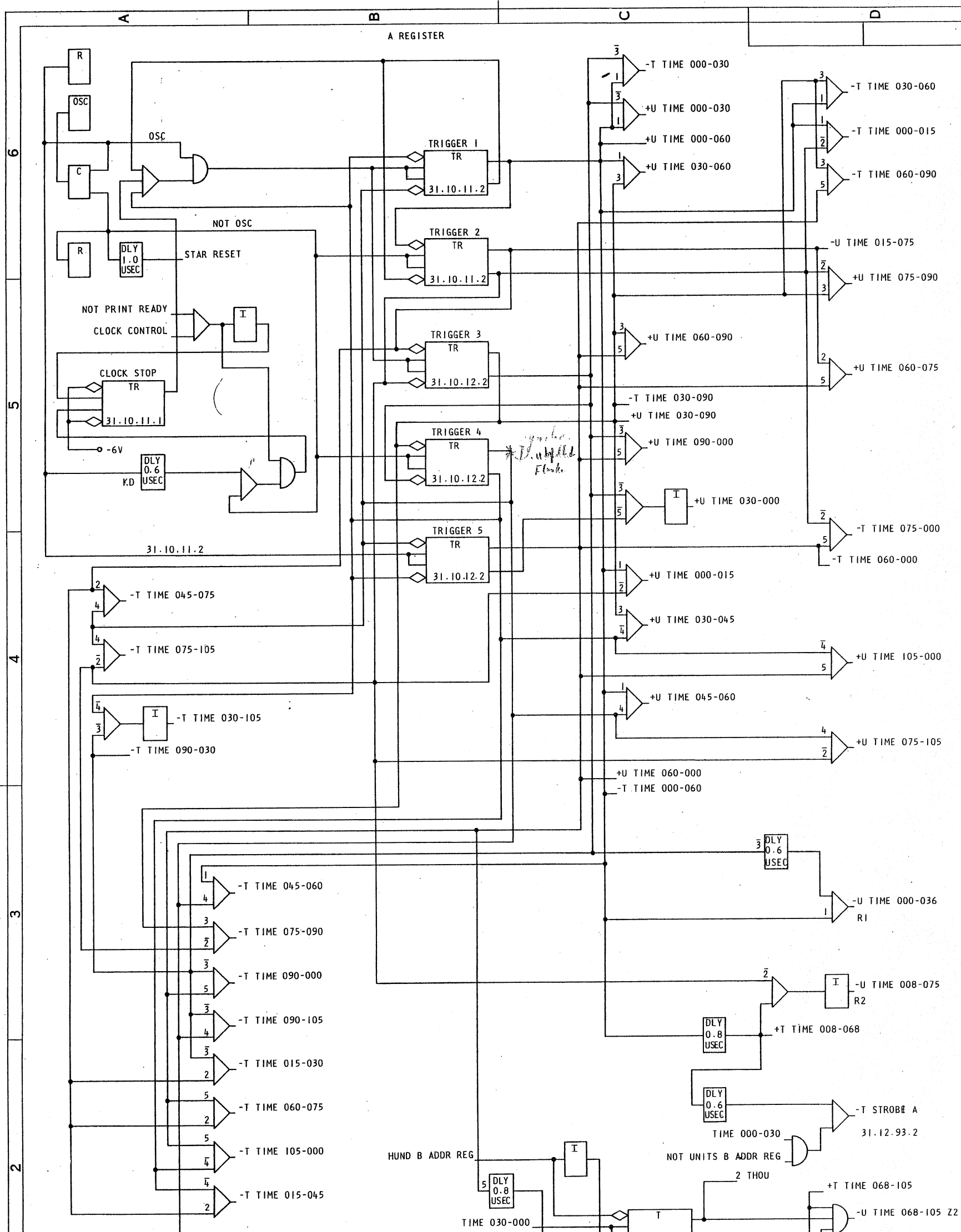
### Units Addr.

no A or B Bit = 0000 - 3999  
A Bit = 4000 - 7999  
B Bit = 8000 - 11999  
A+B Bit = 12000 - 16000

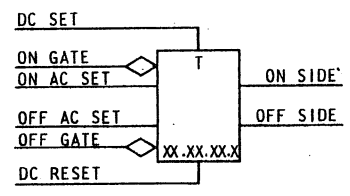
### Hundr. Addr

no. A or B Bit = 000 - 999  
A Bit = 1000 - 1999  
B Bit = 2000 - 2999  
A+B Bit = 3000 - 3999



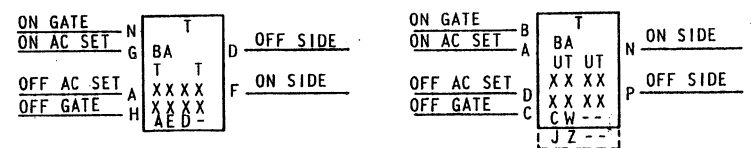


NOTE: TRIGGERS WILL BE ILLUSTRATED FOR ILD'S IN THE FOLLOWING MANNER.

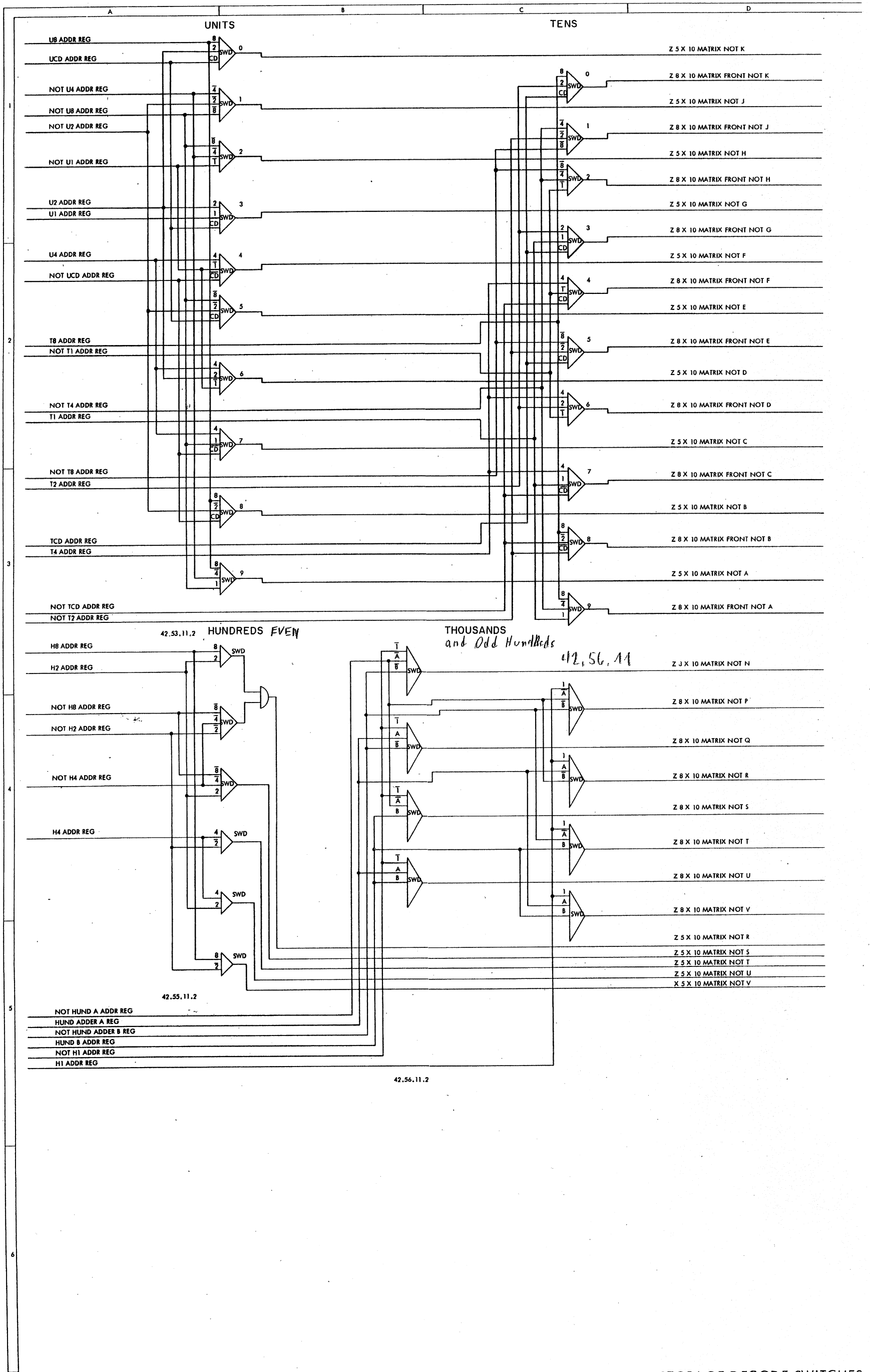


THIS STANDARD WILL BE FOLLOWED REGARDLESS OF TRIGGER TYPE. IT SHOULD BE NOTED THAT TRIGGERS IN THE ALD'S DO NOT NECESSARILY CORRESPOND TO THIS STANDARD.

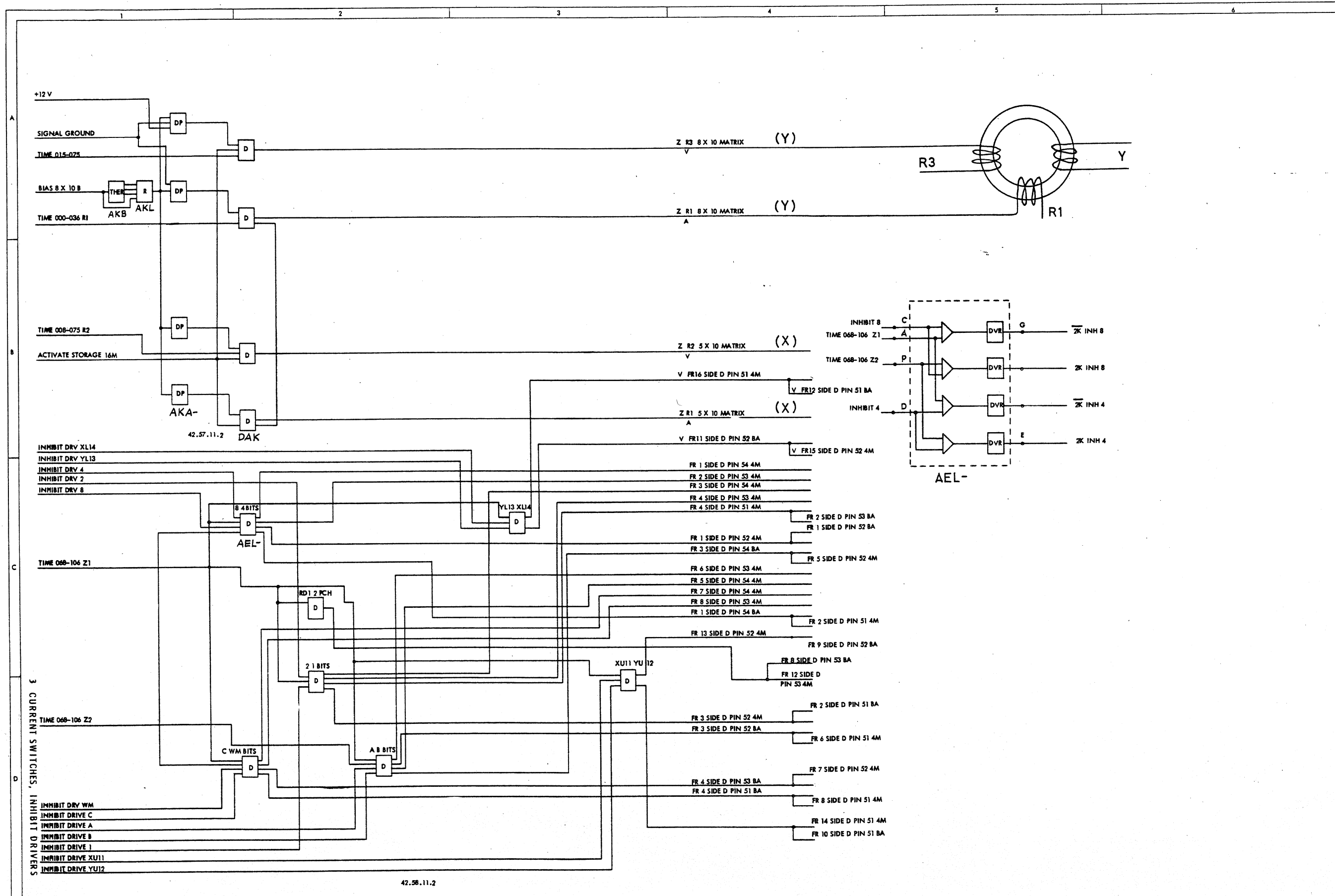
FOR EXAMPLE:



1. CLOCK CONTROL AND CLOCK PULSES



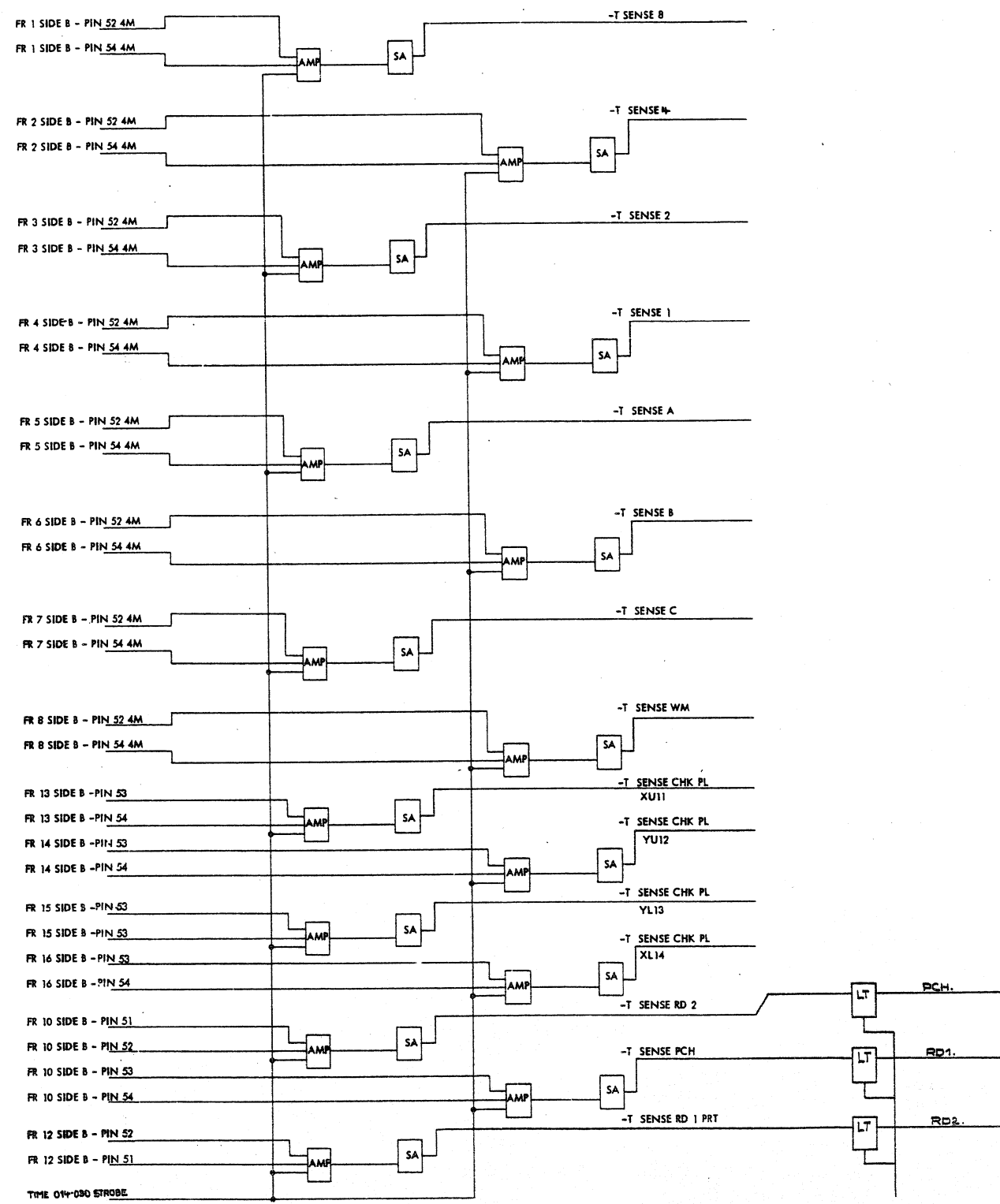
2. STORAGE DECODE SWITCHES



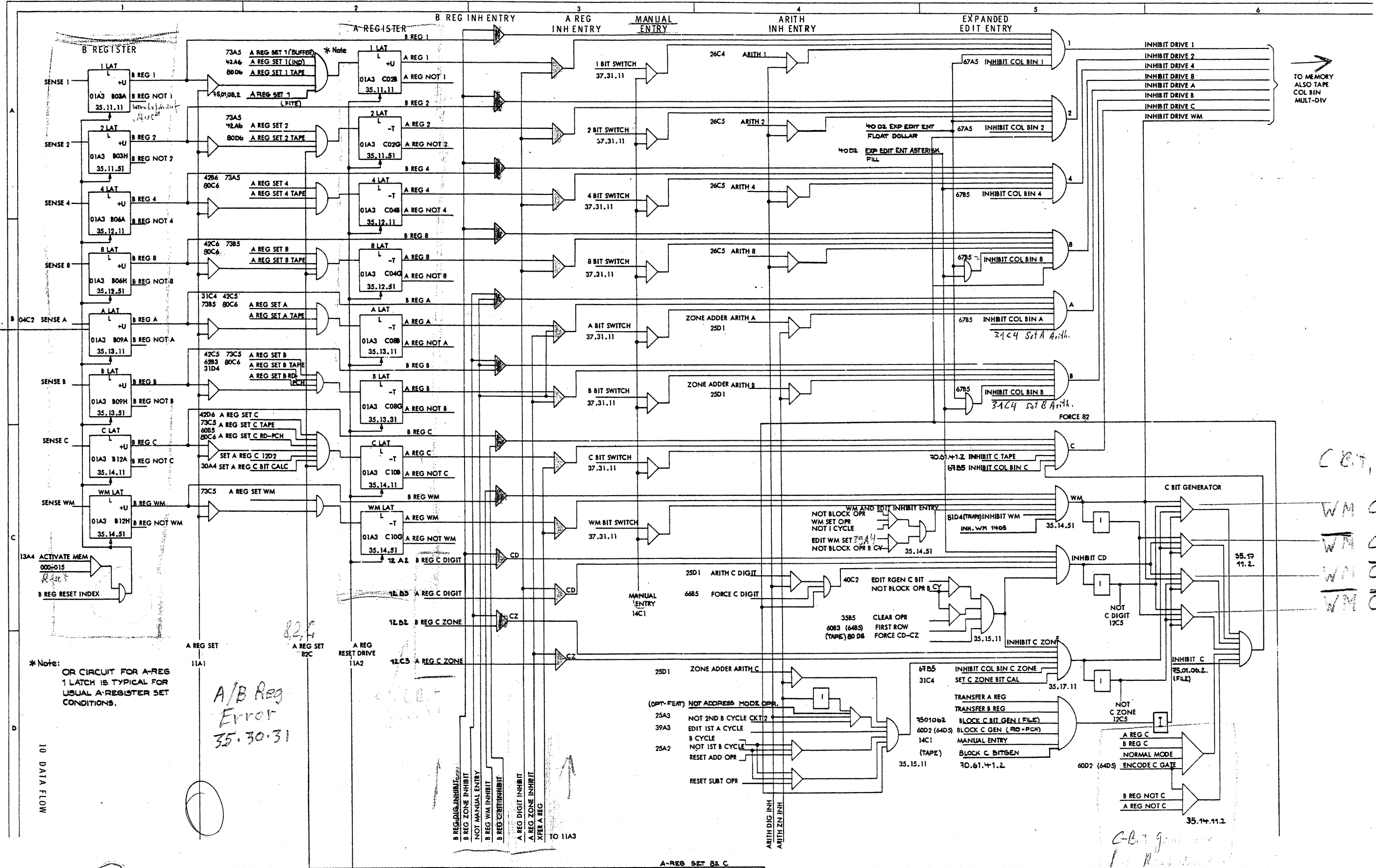
42.56.11.2

3 CURRENT SWITCHES, INHIBIT DRIVERS

4 PRESENSE AND SENSE AMPLIFIERS







\* Note:  
OR CIRCUIT FOR A-REG  
1 LATCH IS TYPICAL FOR  
USUAL A-REGISTER SET  
CONDITIONS.

A/B Reg  
Error  
35.30.31

TO MEMORY  
ALSO TAPE  
COL BIN  
MULT-DIV

C BIT, wmm:  
WM CZ CD  
WM CZ CD  
WM CZ CD  
WM CZ CD

10 DATA FLOW

B

A

H86 11

8.2 G

C-B7 gate  
for...

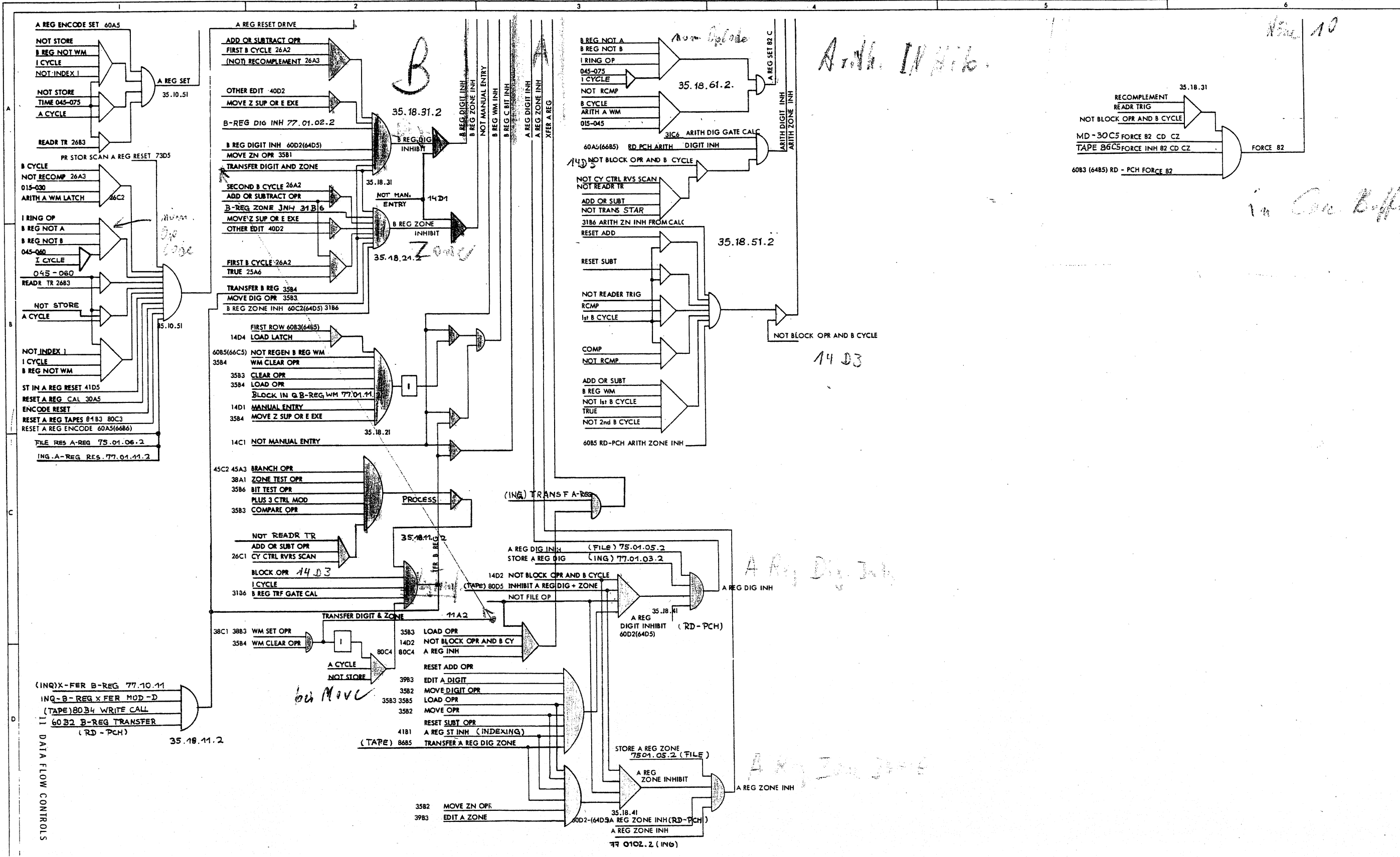
Set 8.2.

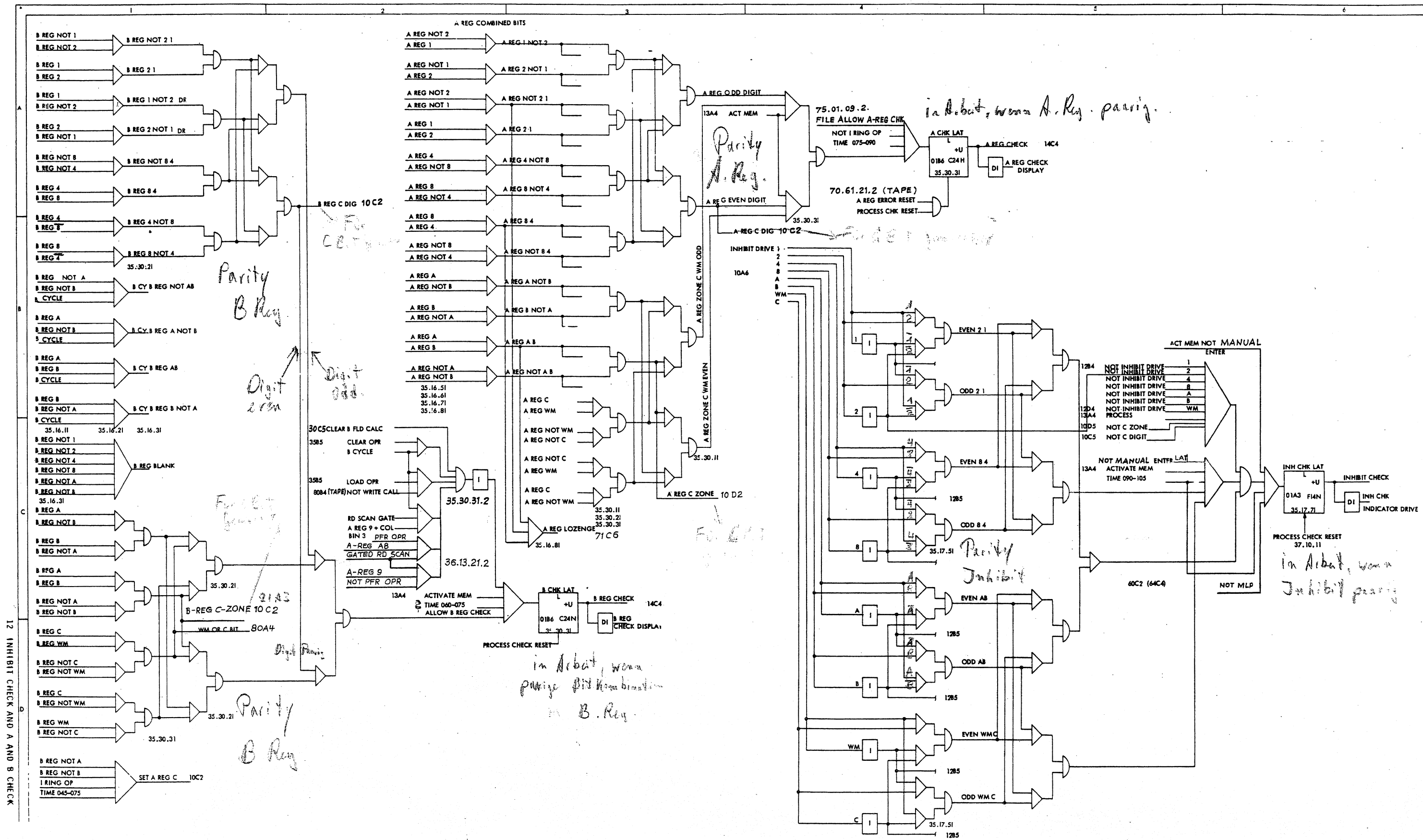
Force 8.2

Line 10

Arith. Inhib.

In Core Buffer





12 INHIBIT CHECK AND A AND B CHECK

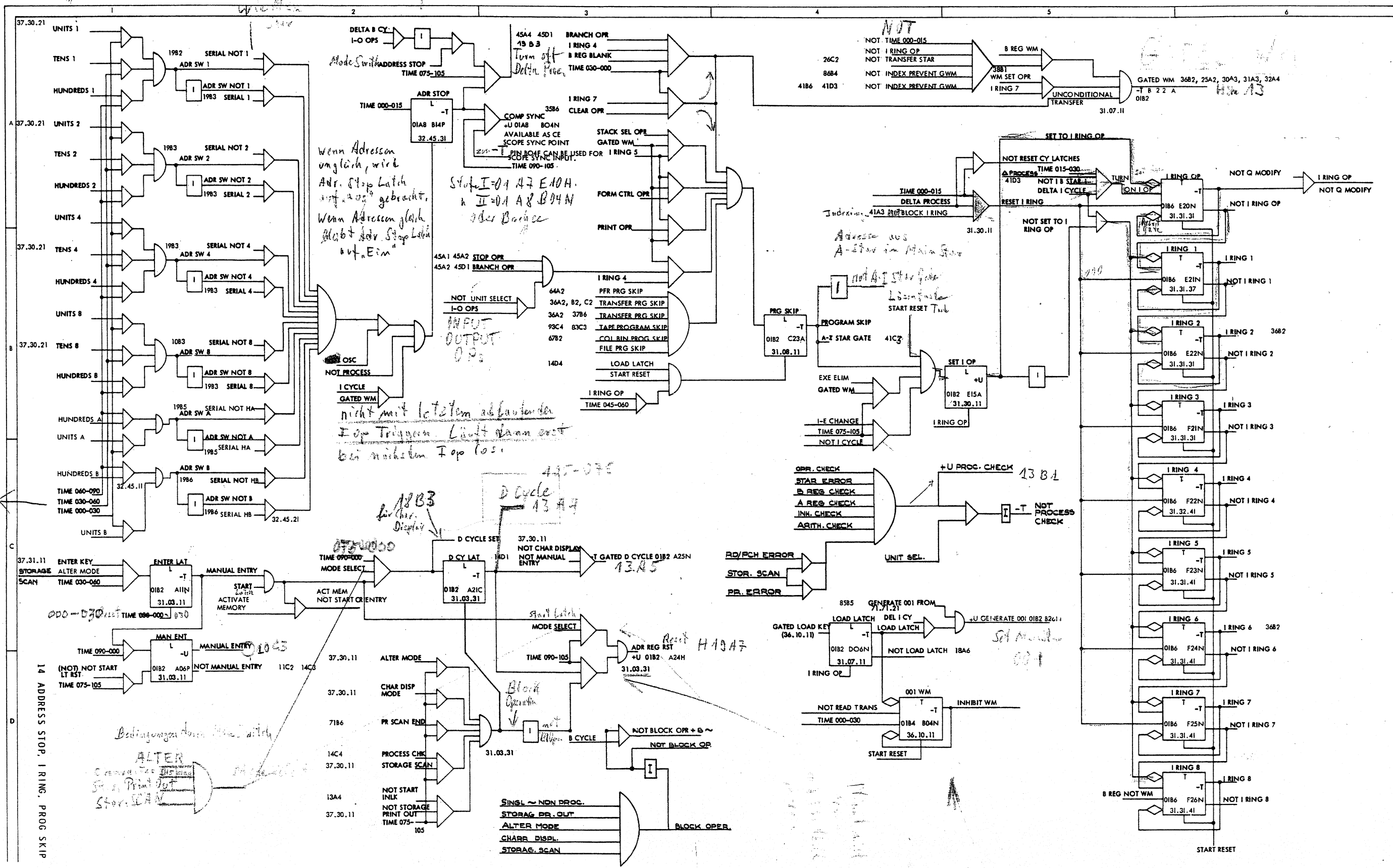


Abgang der Adressen

Adress Stop

95Z =  
0-15  
30-45  
60-75  
90-105  
  
05Z =  
15-30  
45-60  
75-90  
105-120

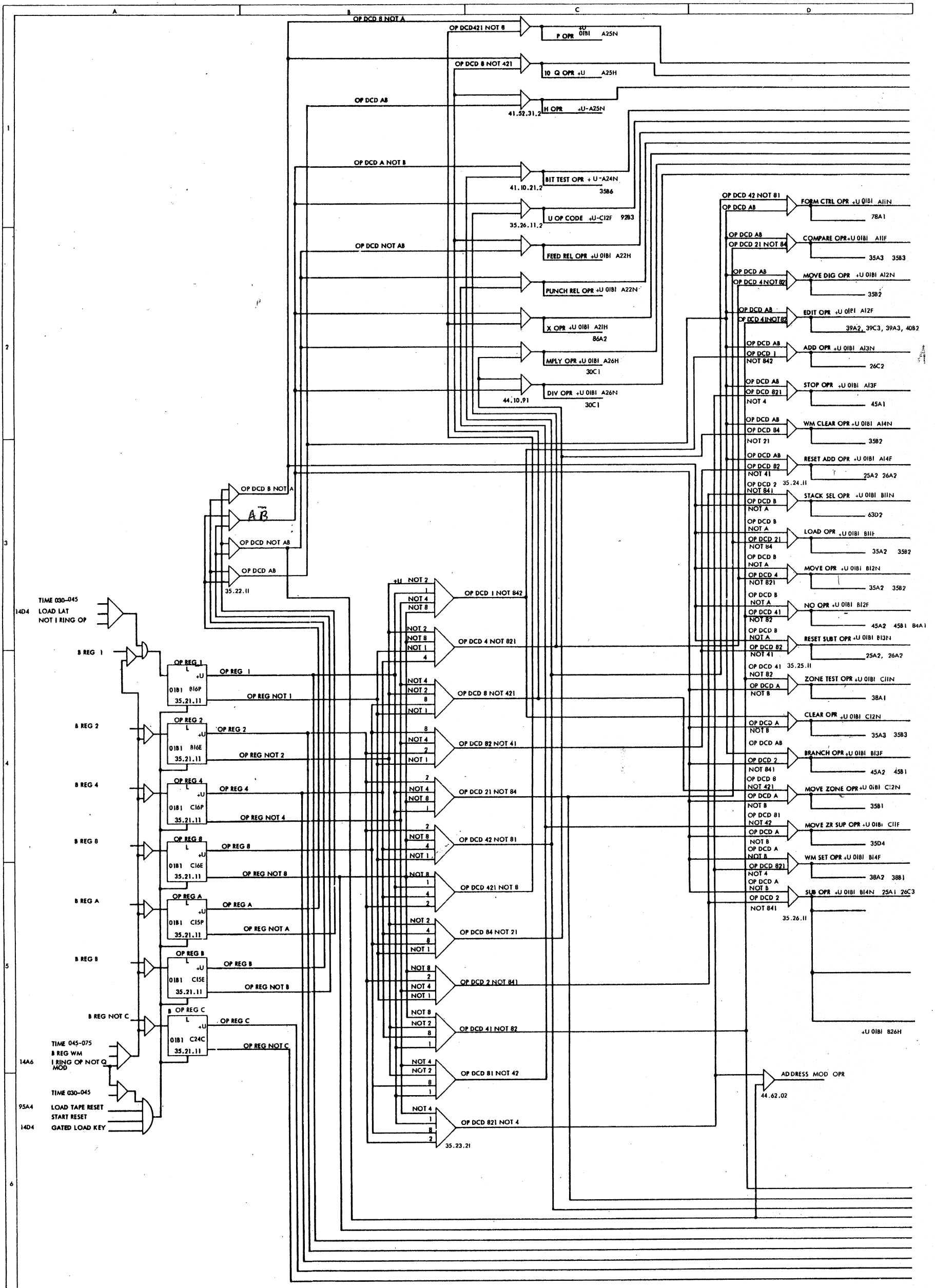
Siehe Delta Flow Main Stop

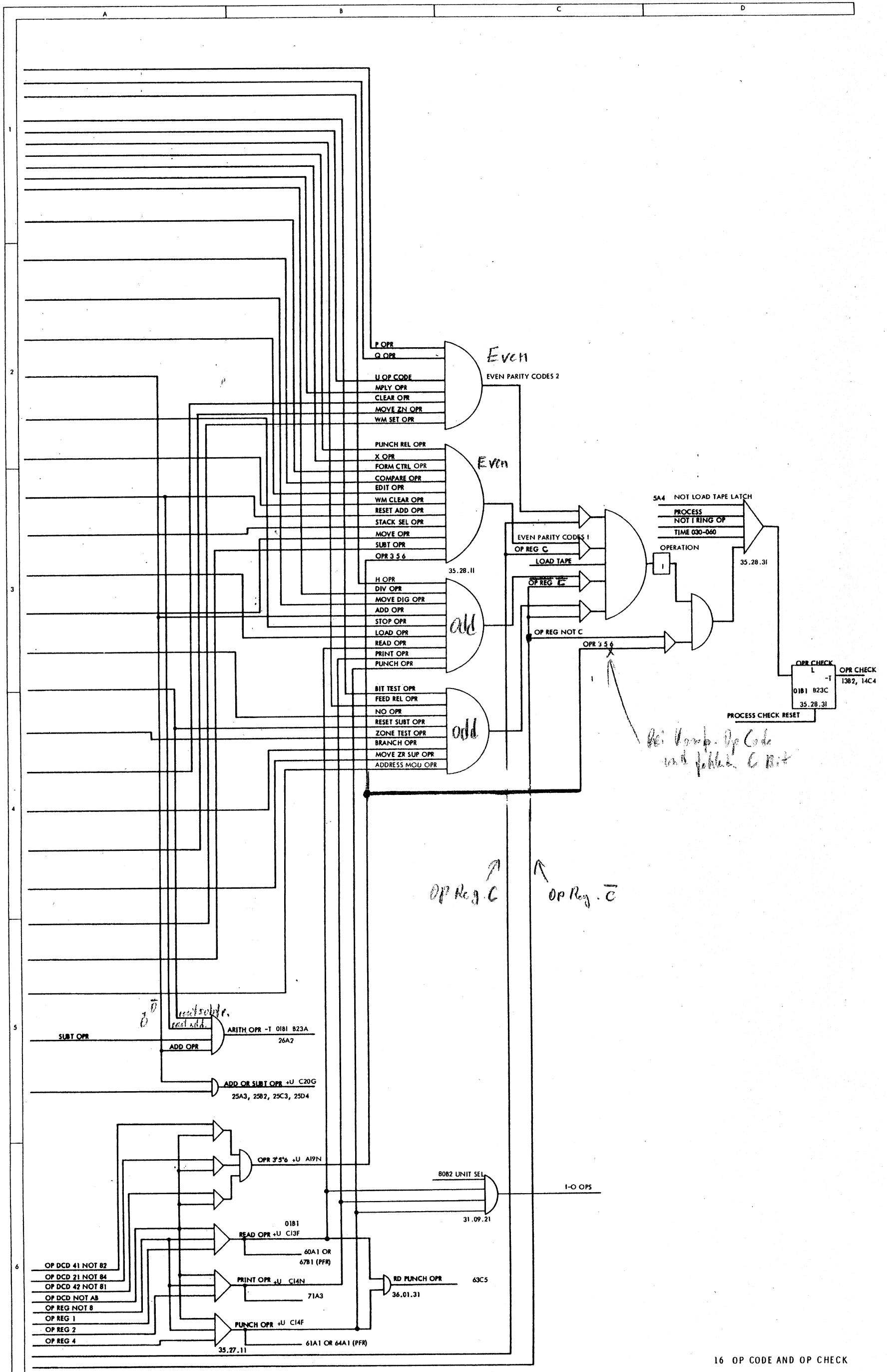


14 ADDRESS STOP, I RING, PROG SKIP

ALTER  
Seri. Print Out  
Stor. SCAN

Top Seite 85





Oscillator Time = Star Reset

001 30 40 50 10000

Star Reset Zeit

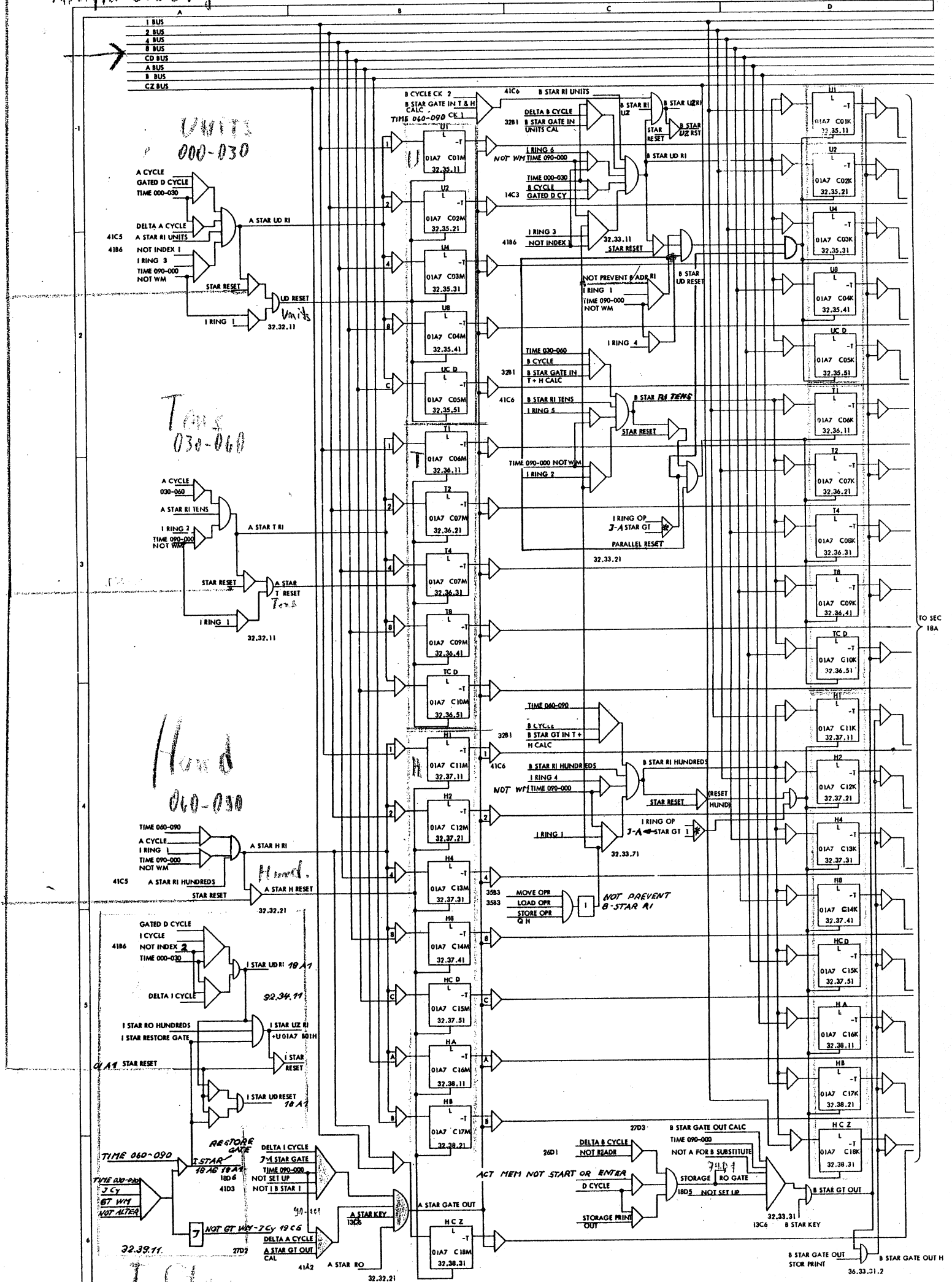
Reset Zeit = OSZ.

OSZ. not OSZ.

Ausgänge von Multiplier und B Reg.

A-Star

B-Star



\* ONLY IF NO INDEXING

out 090-000

17 A STAR AND B STAR

out 090-000



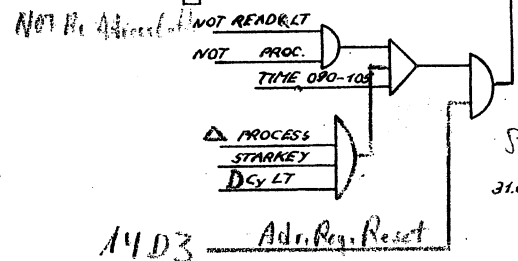
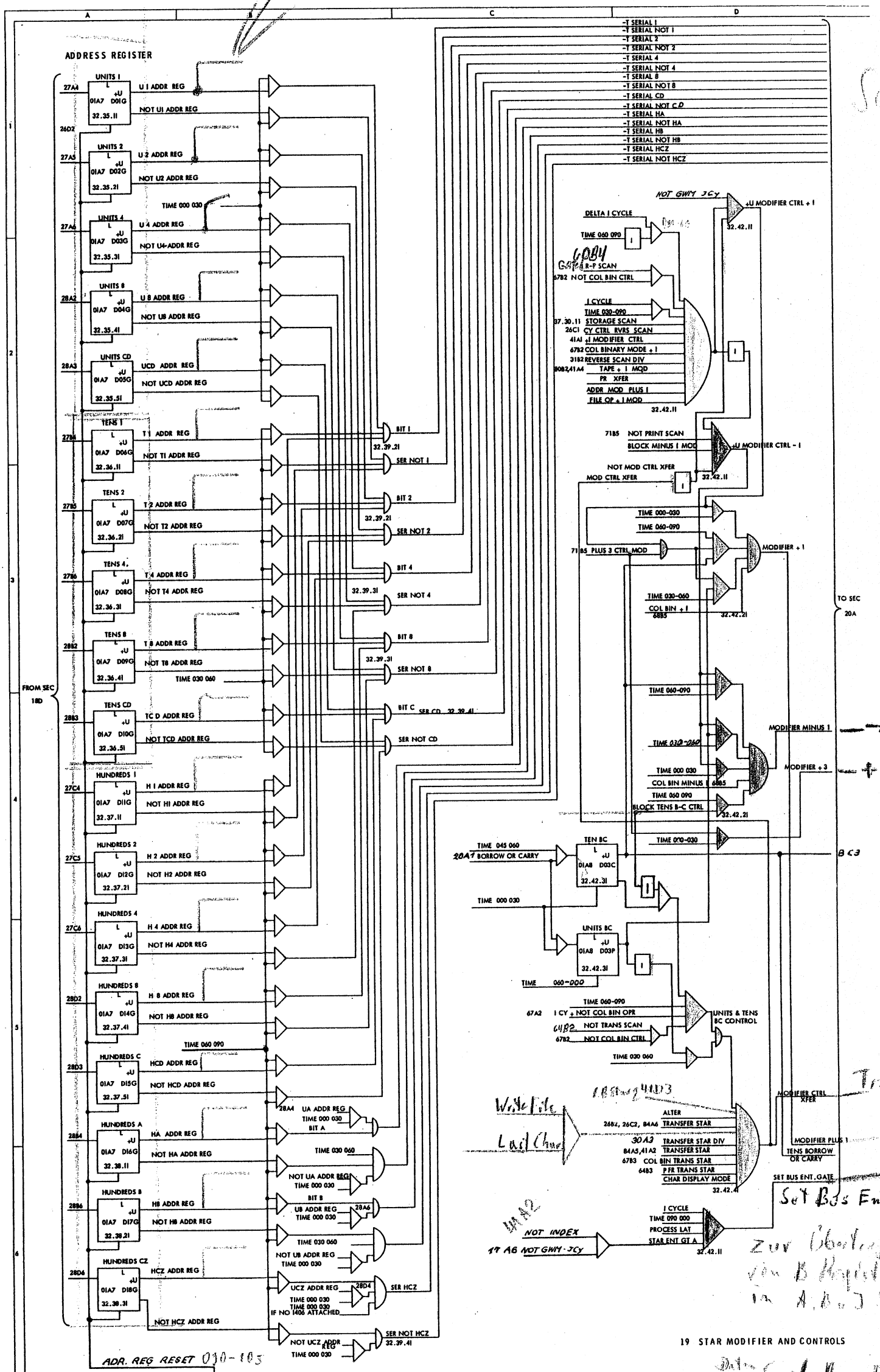




Ausgänge Main Star  
 direkt nach I-Star über  
 F-Star Restore Gate  
 18 A A-6

Löschung siehe 17

Main Star



14D3 ADR. REG. Reset

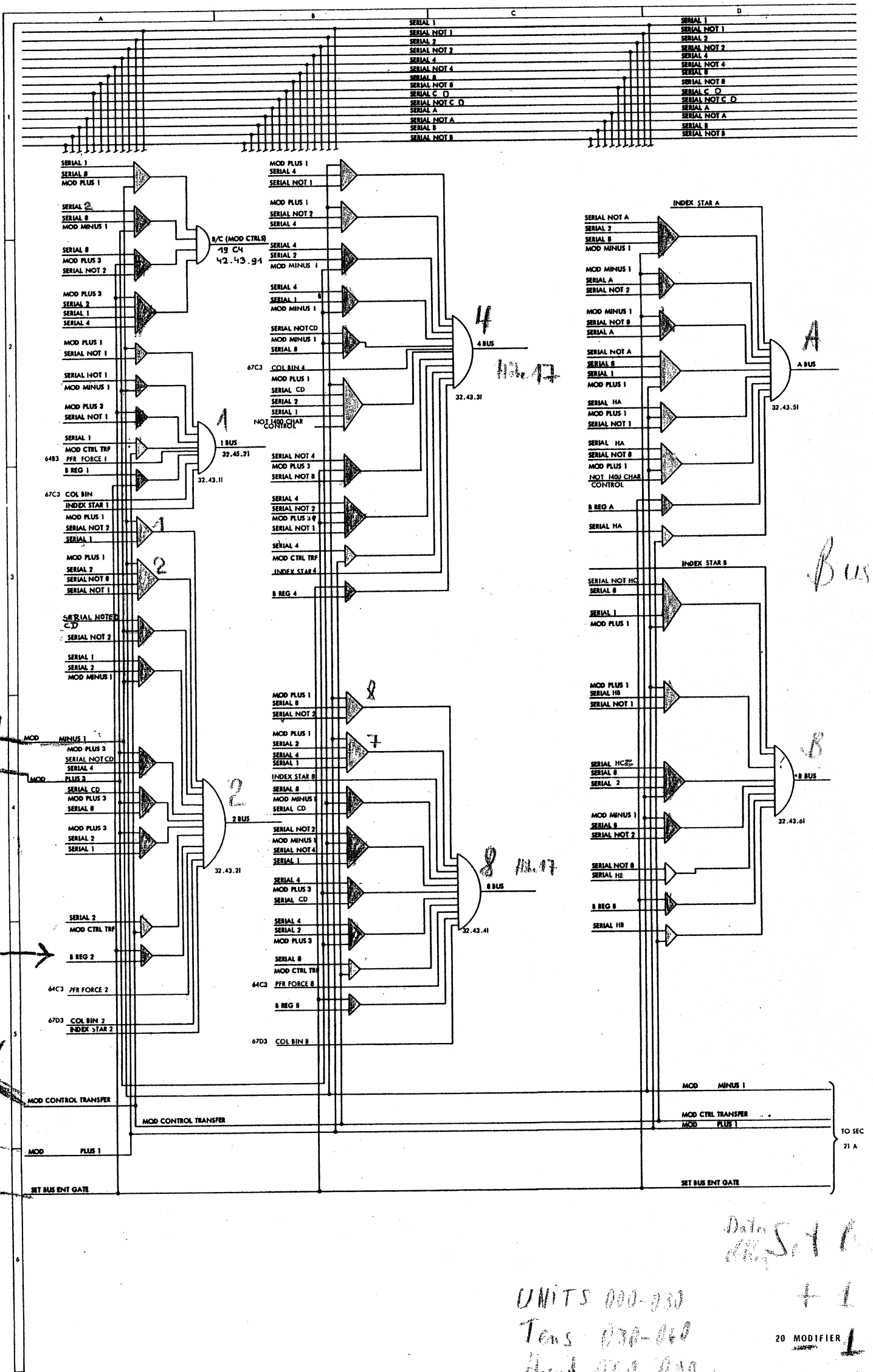
Signal...  
 31.04.77

UNITS 000-030  
 Tens 030-060  
 Hund 060-090

19 STAR MODIFIER AND CONTROLS  
 Daten von B-Register  
 Set Bus Ent. Gate

+ 1  
 - 1  
 + 3

Transfer



über Set Bus  
Enter Gate

Transfer

Set Bus  
Enter Gate

Bus Line

UNITS 000-030  
Tens 030-060  
Hundreds 060-090

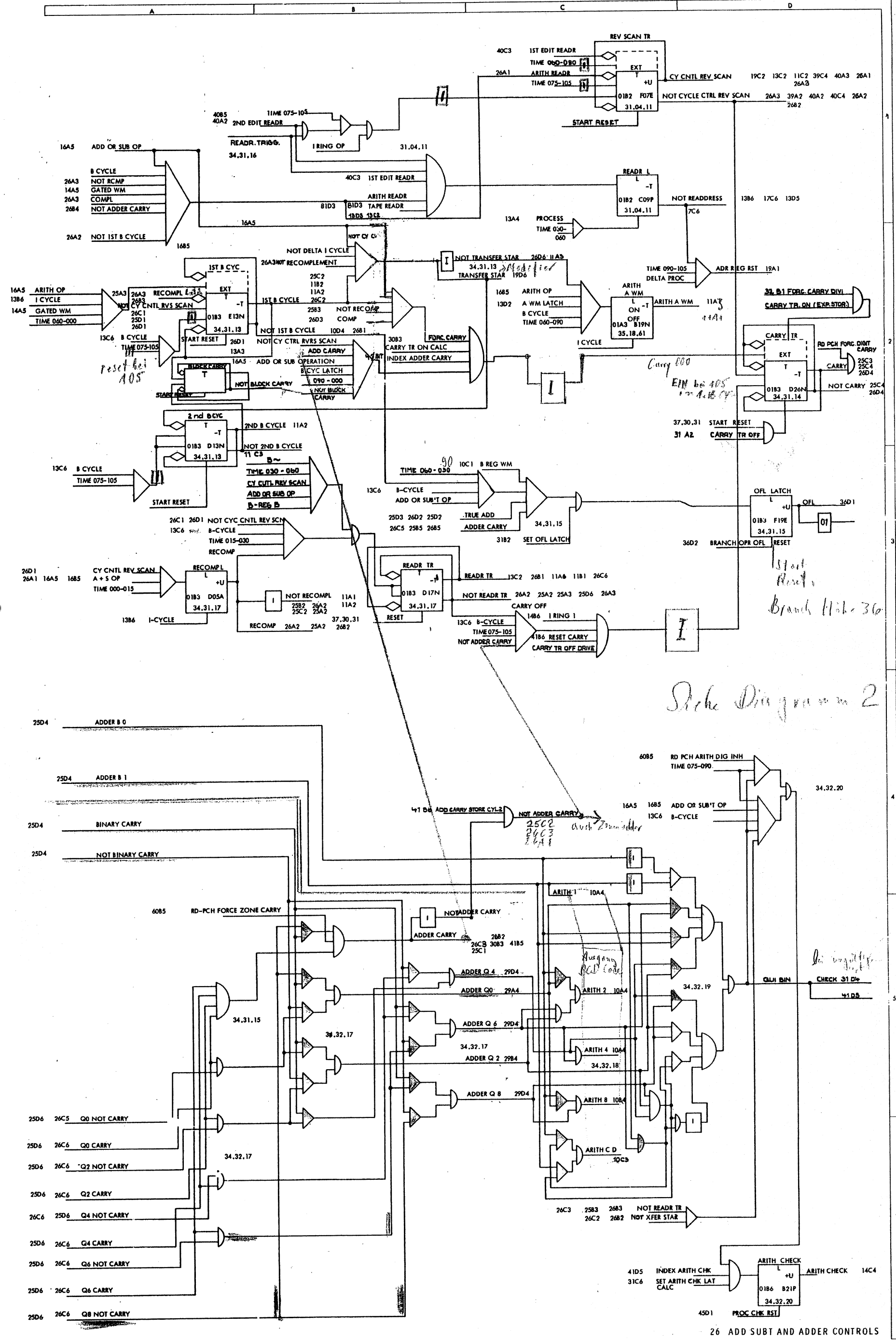
Data Set Bus EC

+ 1  
20 MODIFIER 1  
+ 3

Transfer





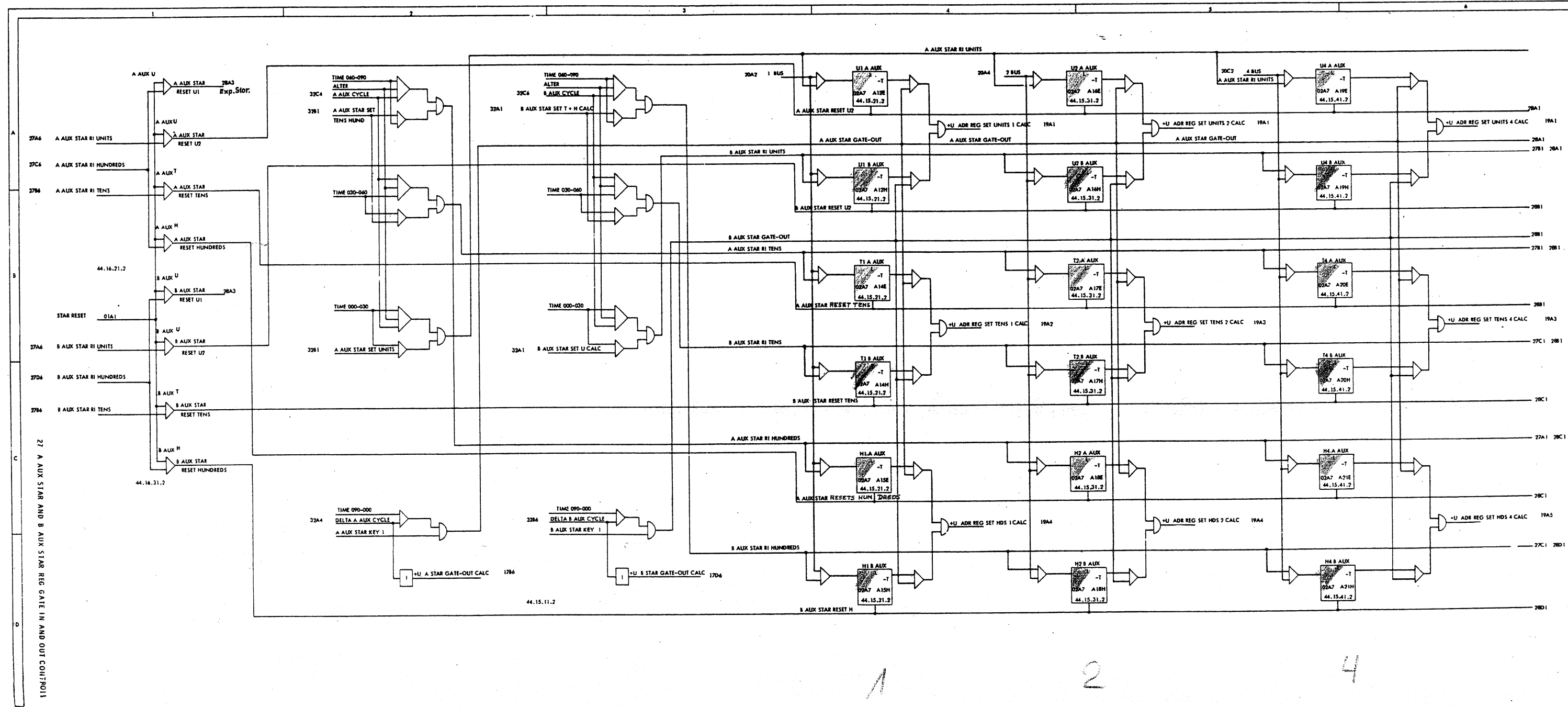


*Sketch Diagram 2*

A  
B  
1

2

4



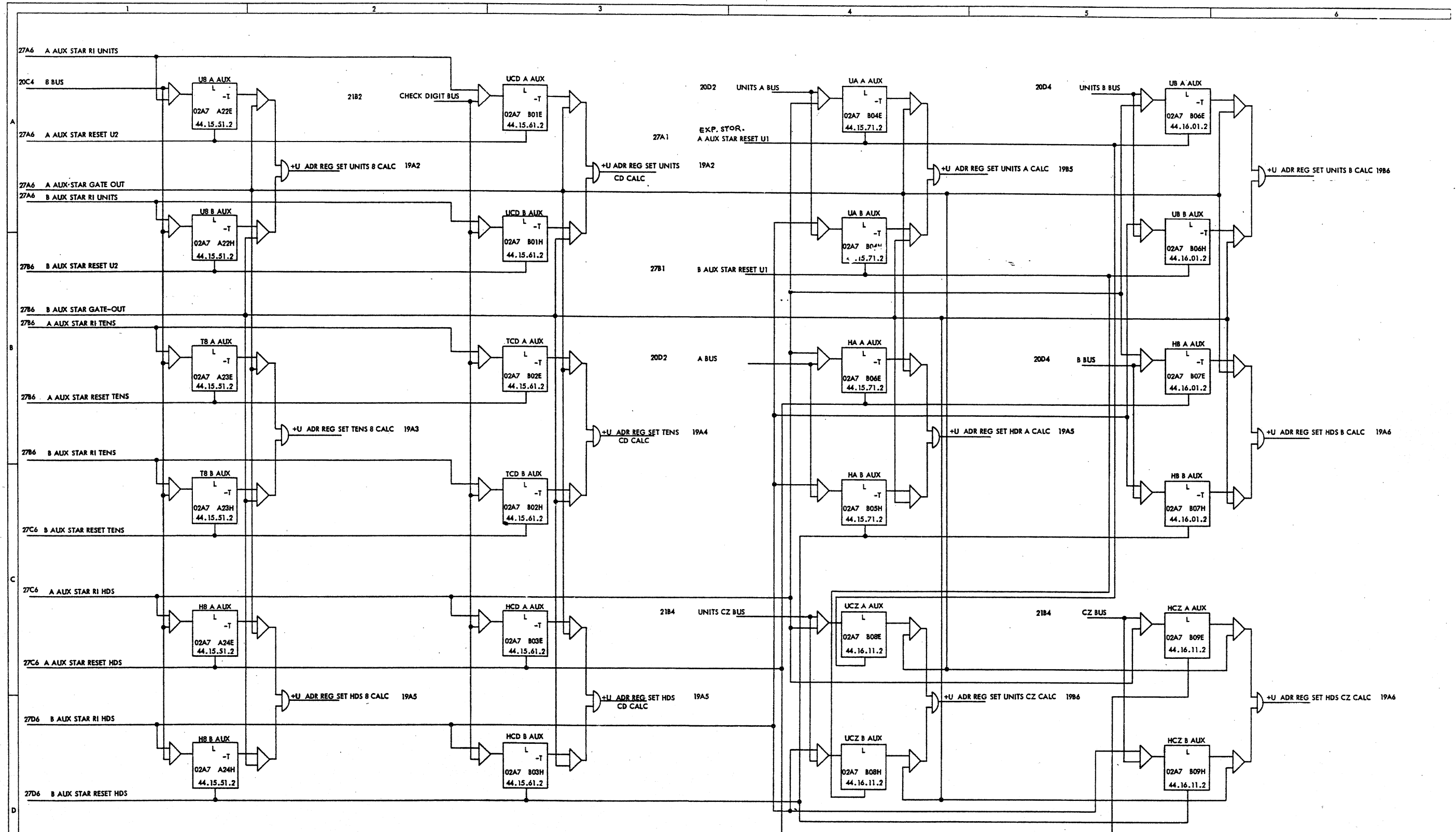
A  
B

2

4

27 A AUX STAR AND B AUX STAR REG GATE IN AND OUT CONTROL

28 A AUX STAR AND B AUX STAR REG GATE IN AND OUT CTRLS



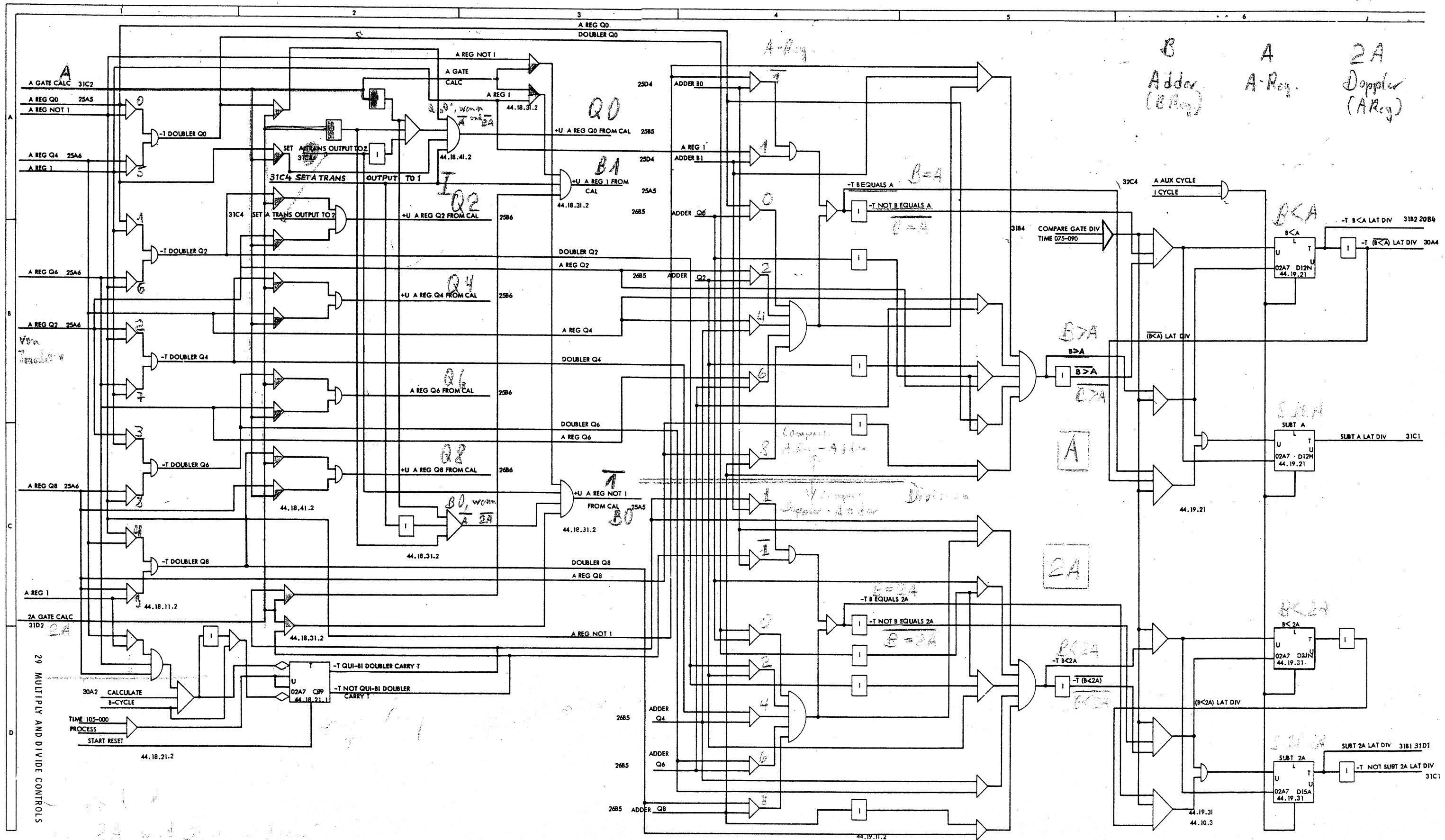
8

CD

ABC

ABC

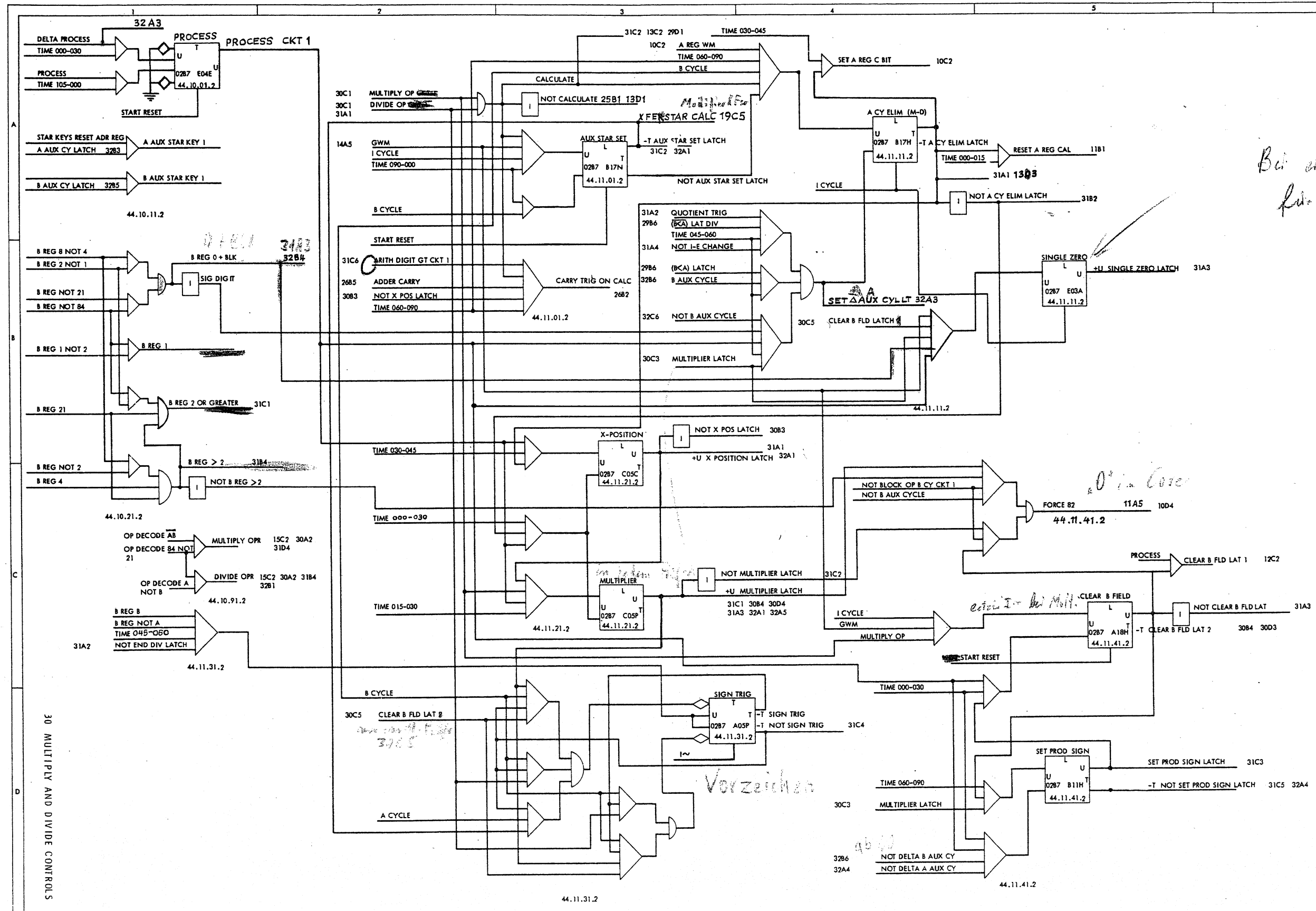




29 MULTIPLY AND DIVIDE CONTROLS

2A and 2A  
B-A output

3000

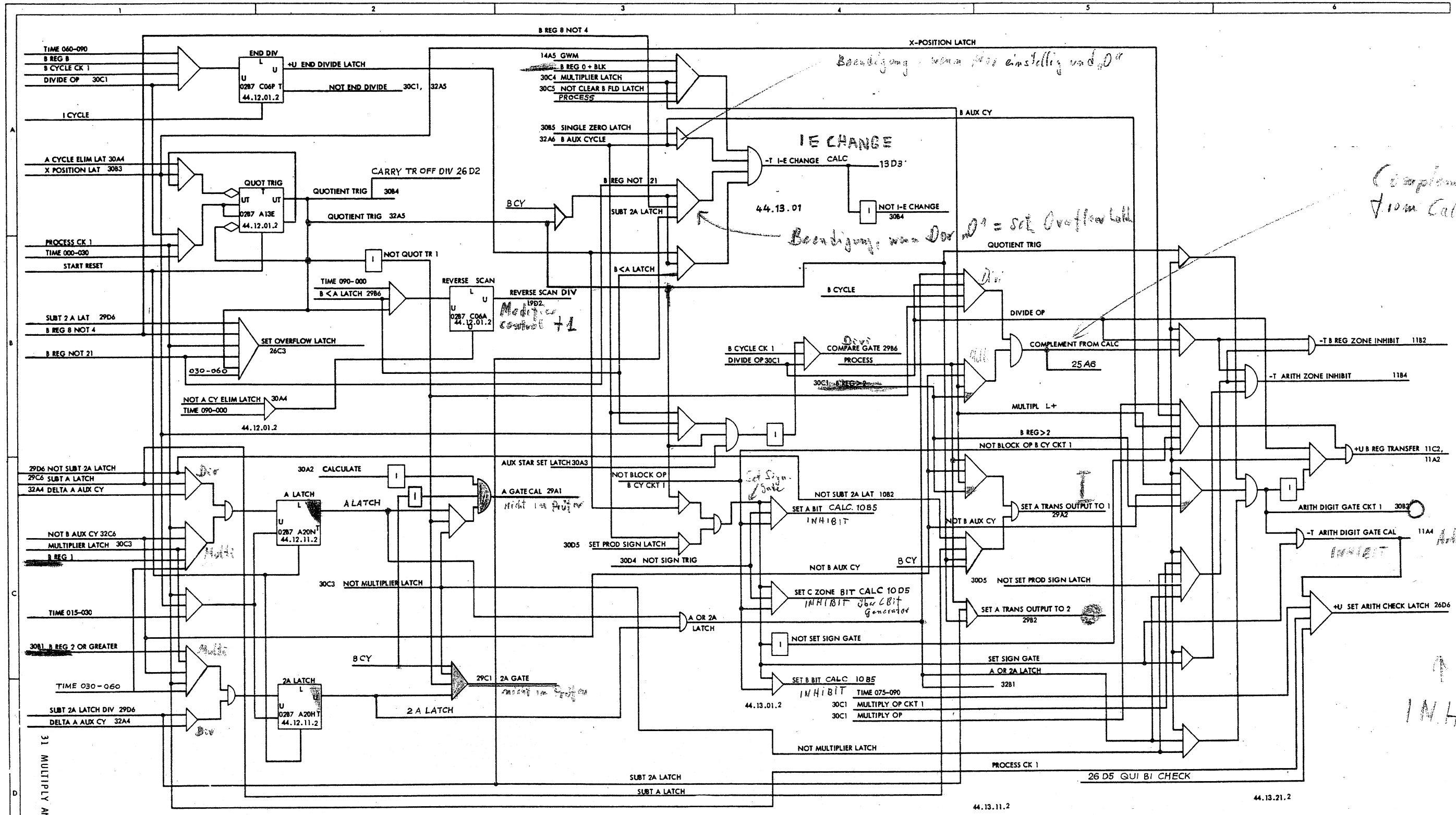


Bei Einstellung der Vorzeichen

0 in Core

Vorzeichen

30 MULTIPLY AND DIVIDE CONTROLS



31 MULTIPLY AND DIVIDE CONTROLS

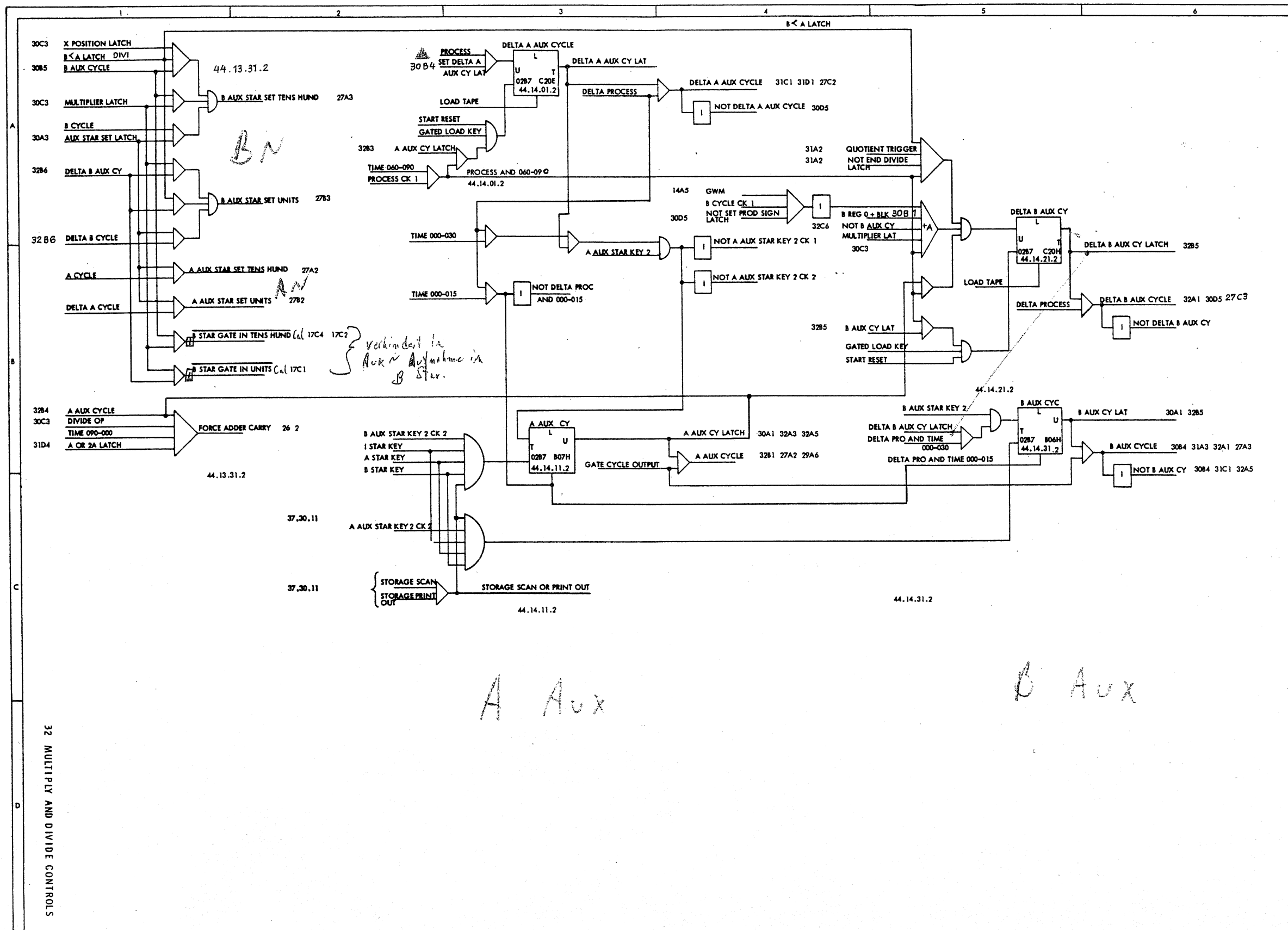
44.13.11.2

44.13.21.2

Complement from Calculator

A.M. D. 1.11

INHIBIT



32 MULTIPLY AND DIVIDE CONTROLS

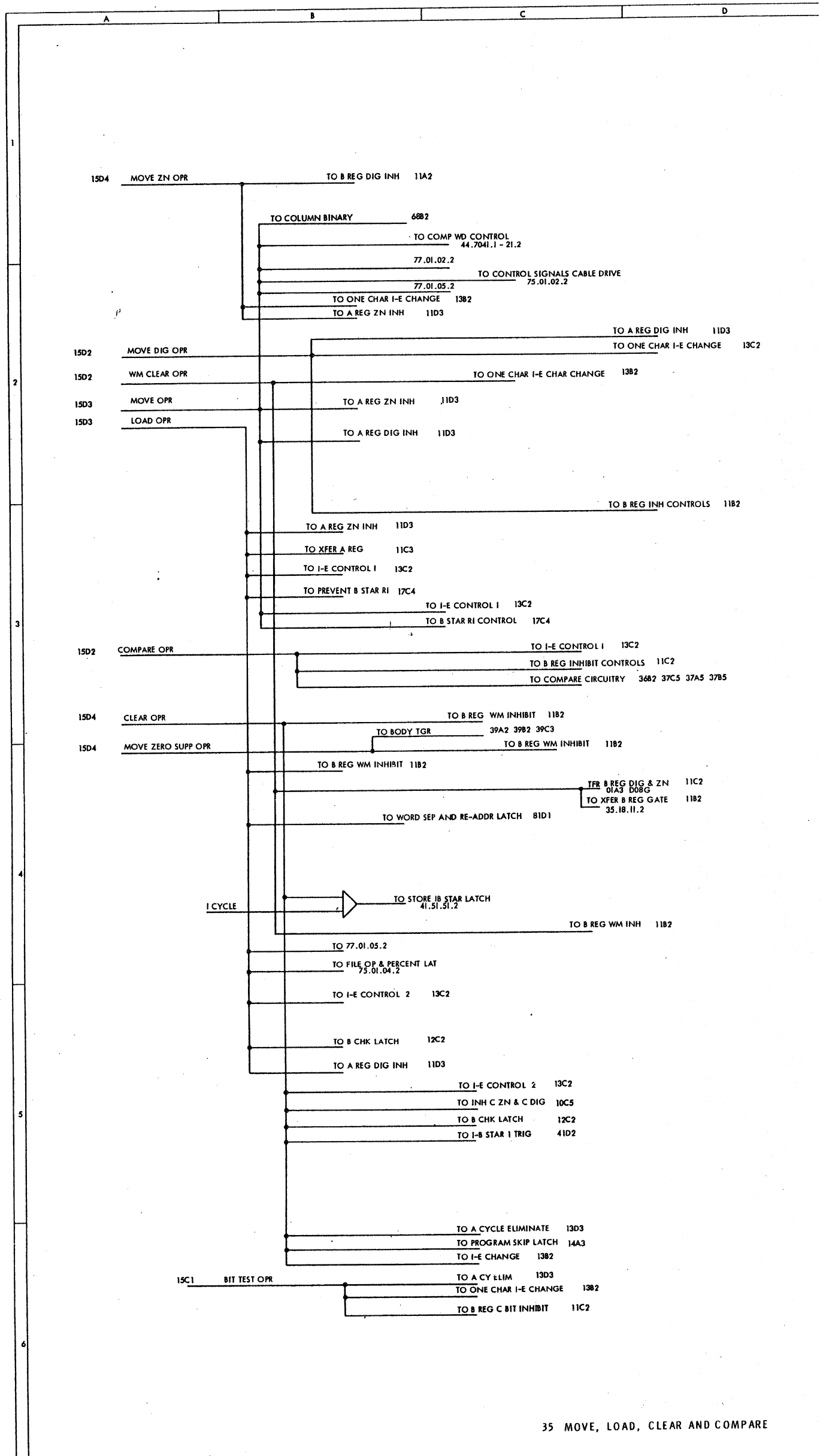
A Aux

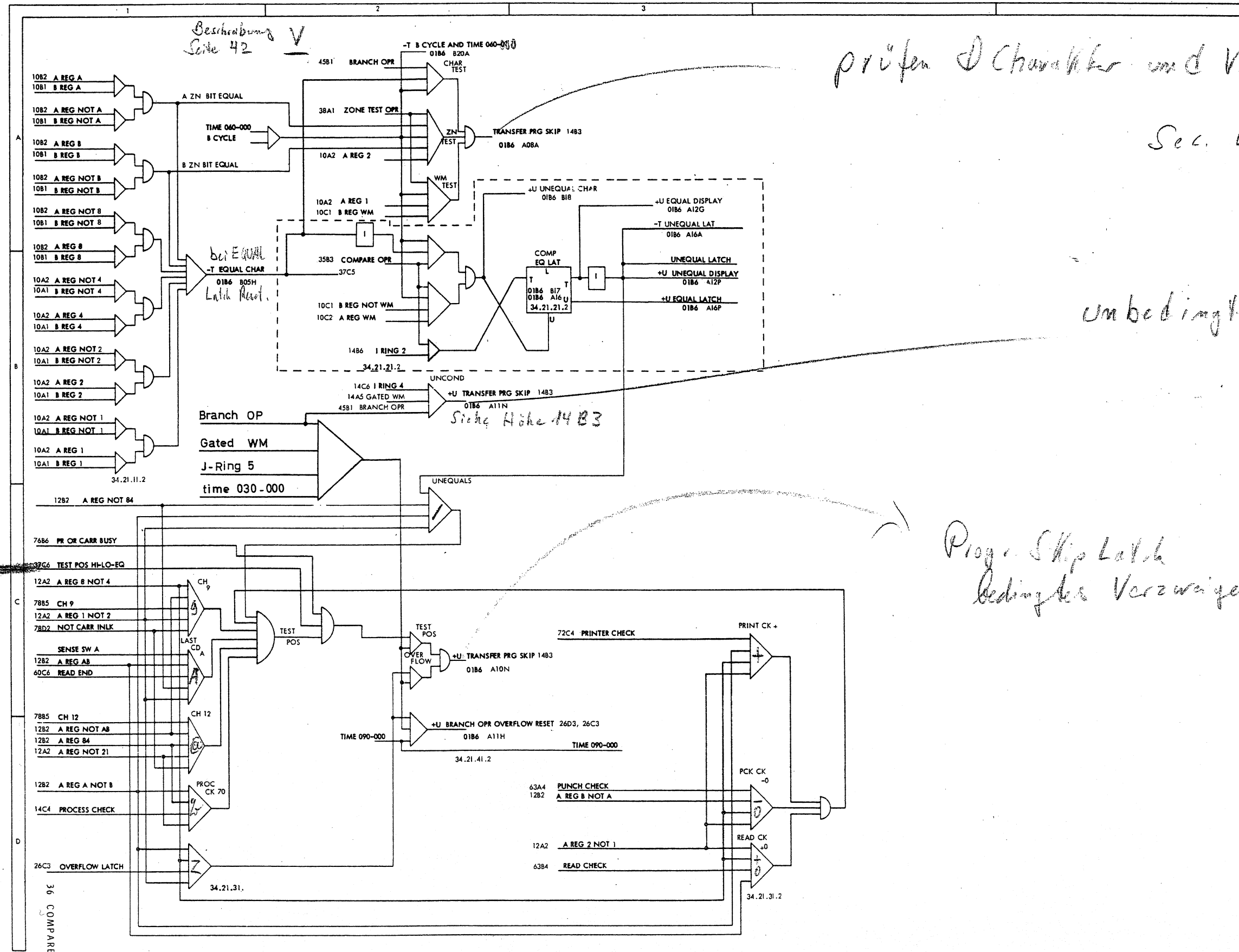
B Aux

BN

AN

verhindert die Auk ~ Aufnahme in B Star.





Beschreibung  
Seite 42

prüfen Charakter und Verzweigen

Sec. Lev. 14B3

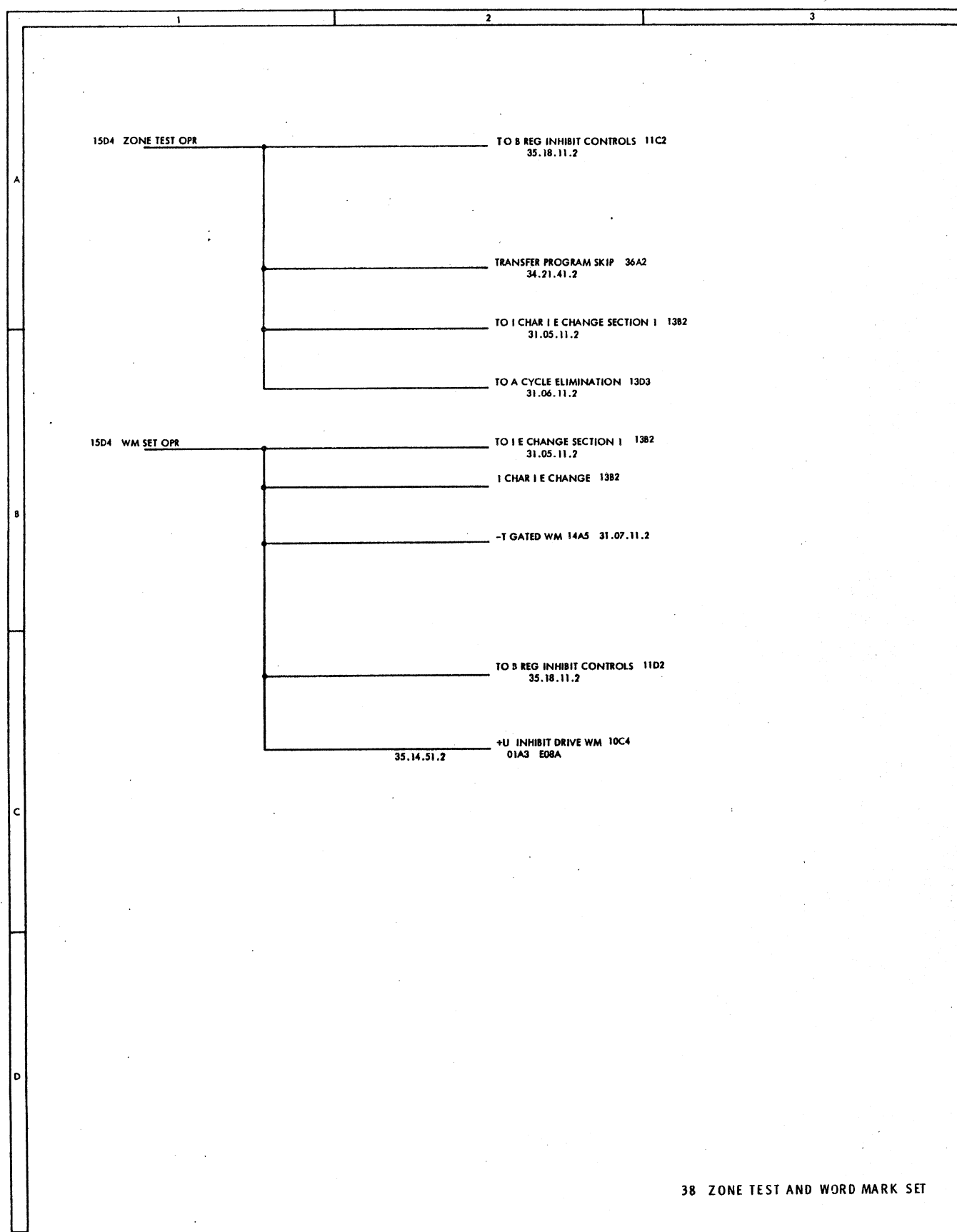
unbedingt Verzweigen

Siehe Höhe 14B3

Prog. Skip Latch  
bedingtes Verzweigen

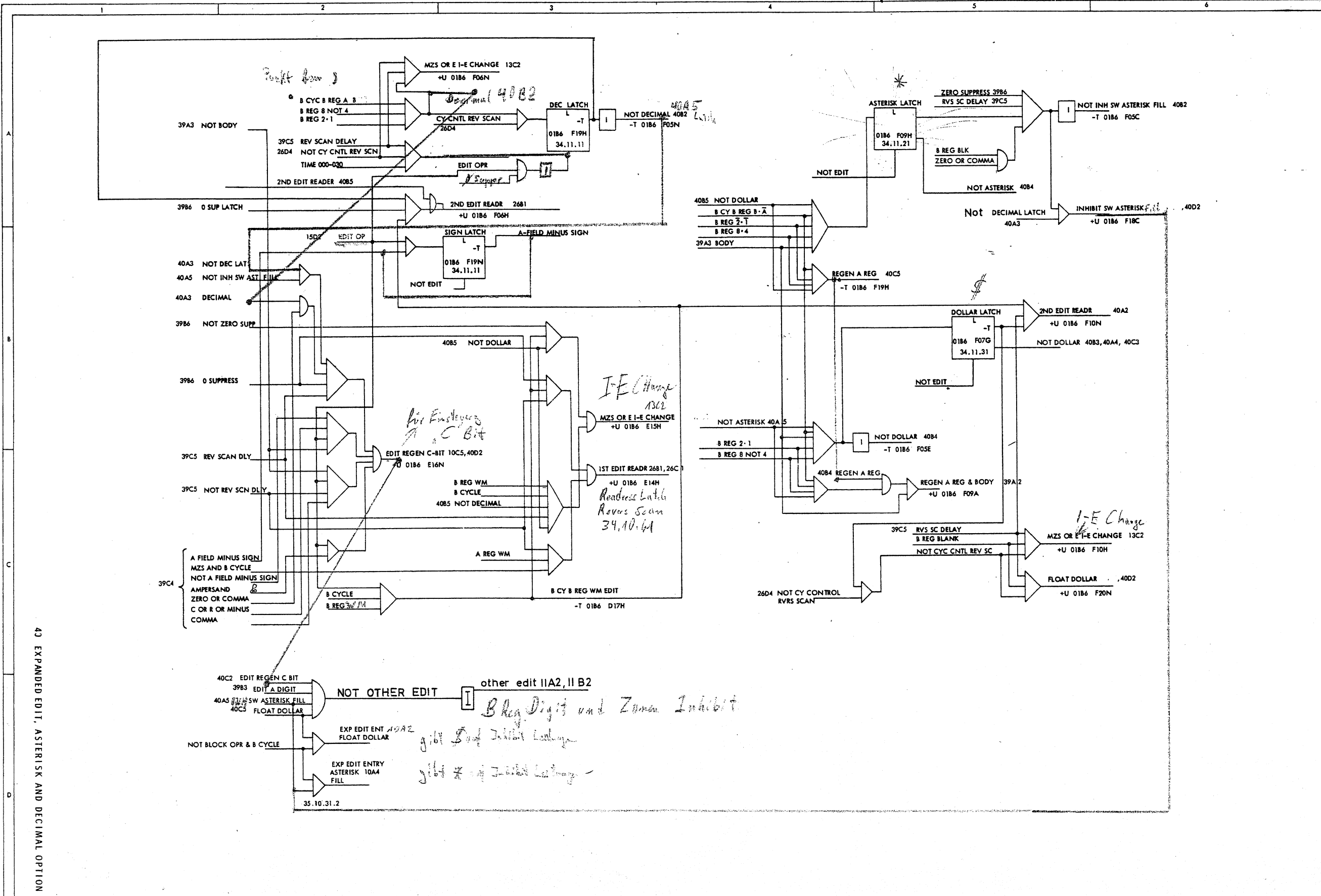
36 COMPARE











43 EXPANDED EDIT, ASTERISK AND DECIMAL OPTION

*Right hand*

*Original 40B2*

*40A5*

*I-E Change 13C2*

*Pvt. Engineer A.C. Bit*

*Address Latch Reverse Scan 34.10.64*

*I-E Change*

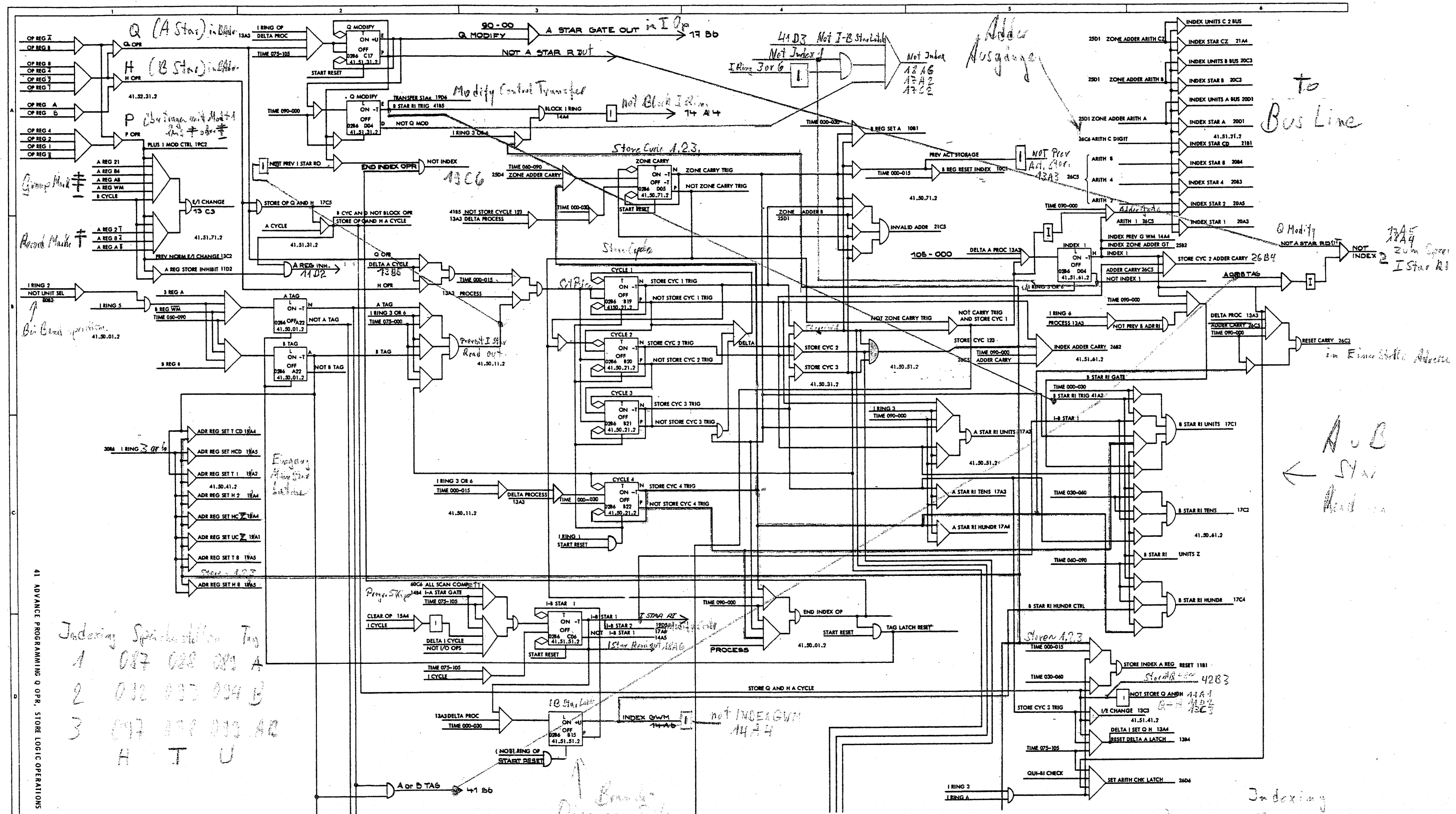
*other edit IIA2, IIB2*

*B Reg. Digit und Zonen Inhibit*

*gibt 500 Inhibit Latch*

*gibt 700 Inhibit Latch*

35.10.31.2



41 ADVANCE PROGRAMMING Q OPR. STORE LOGIC OPERATIONS

Indexing Specifications Table

1	007	028	001	A
2	032	003	004	B
3	047	009	000	AR
				H T U

↑ Bus to Diagram Side 30

Populate Side 31 Diagram

Indexing Diagram Engine (2) Side 31

to Bus Line

A, B Star Address

17A5  
17A9  
Zone Oper  
I Star H1

Address Ausgang

41D3 Not I-B Star Latch  
Not Index 1  
17A6  
17A2  
17C2

Modify Control Transfer

not Block I Star

Store Cycle 1, 2, 3

Store Cycle

Prevent I Star Read out

Delta Process

Delta Process

Index OWM

NO BLKING OF START RESET

A or B TAG

41 Bb

41 Bb

in Engine Side Address

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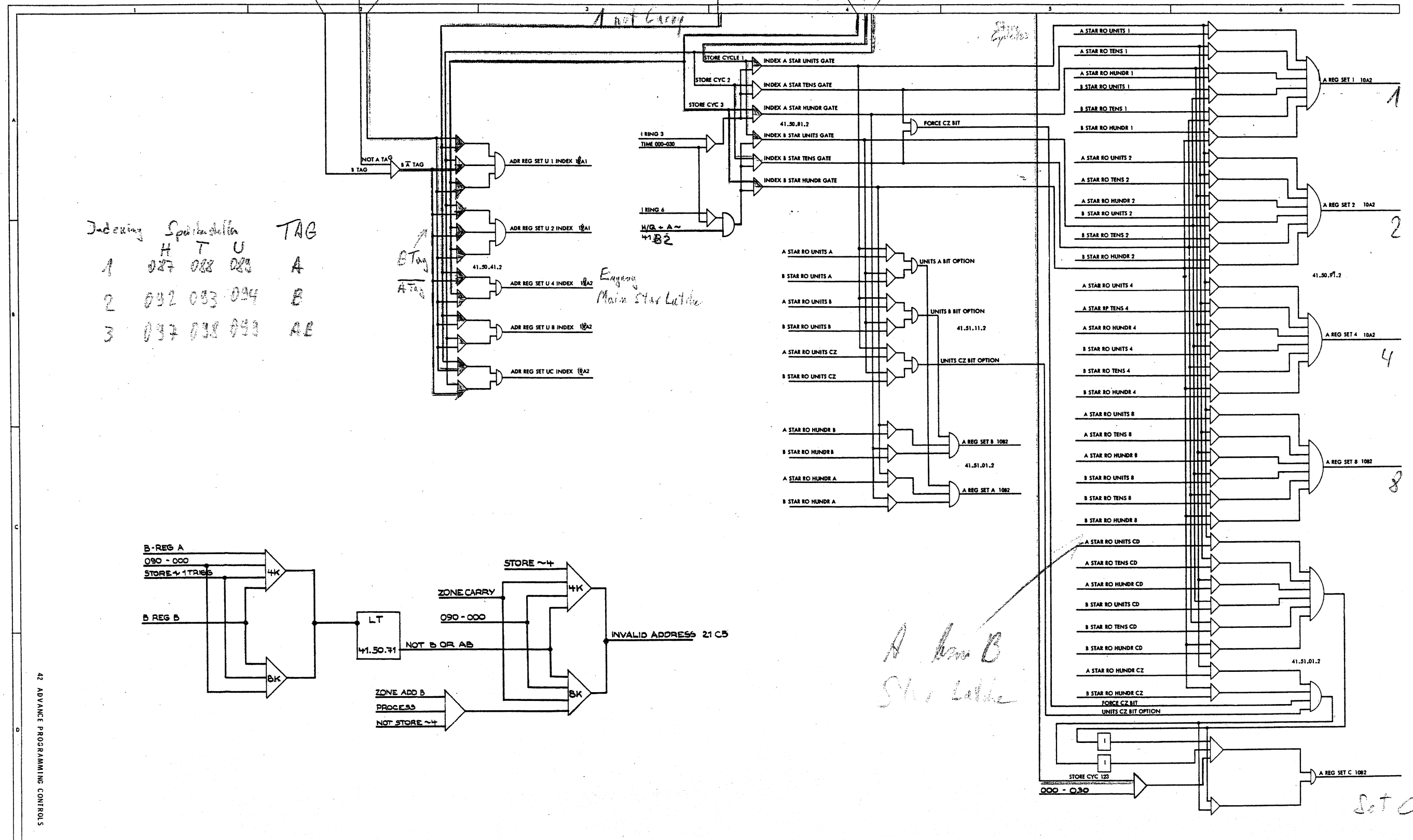
INDEX 96

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Indexing Spallachella TAG

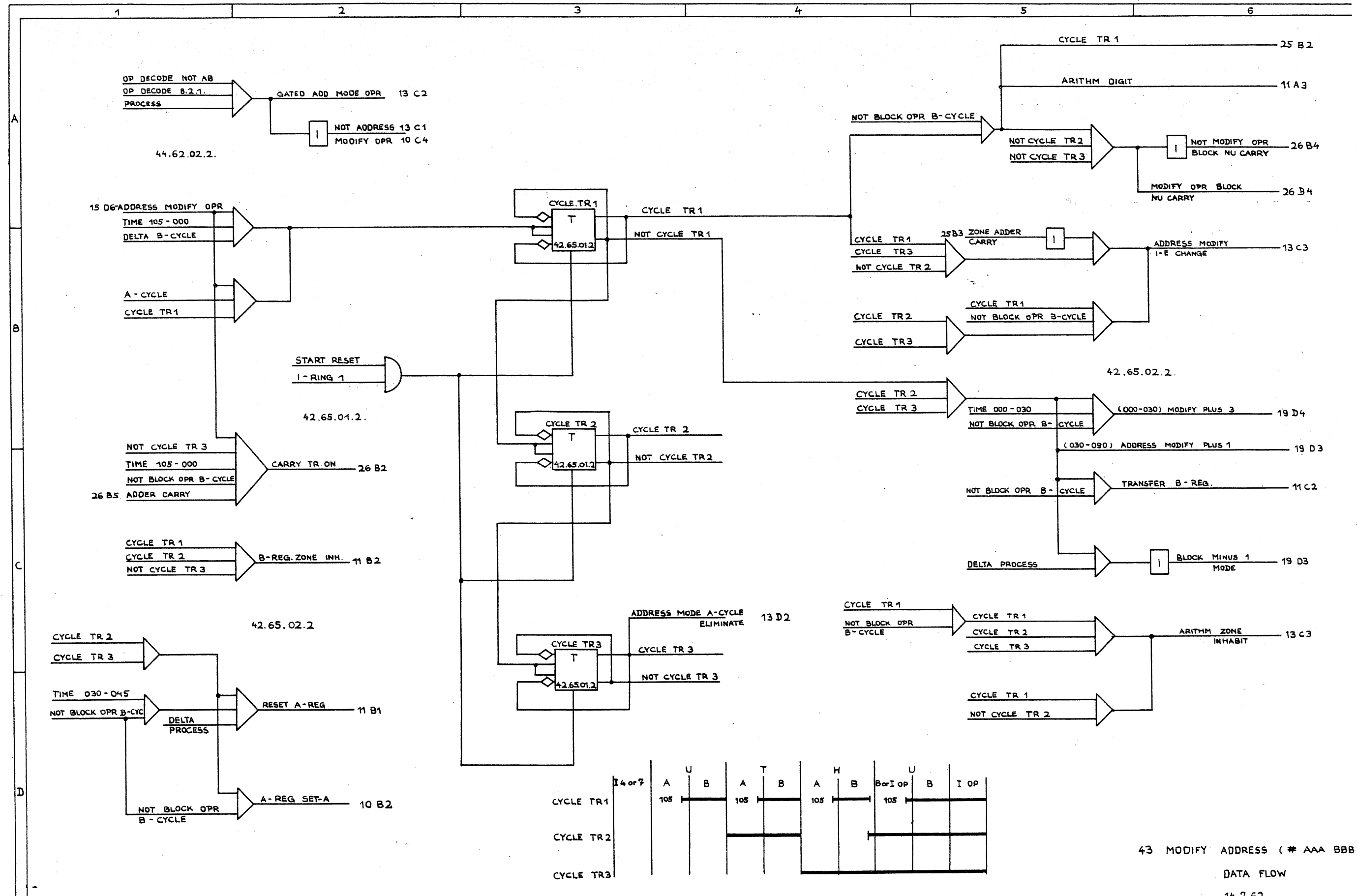
	H	T	U	TAG
1	027	028	029	A
2	032	033	034	B
3	037	038	039	AB

42 ADVANCE PROGRAMMING CONTROLS

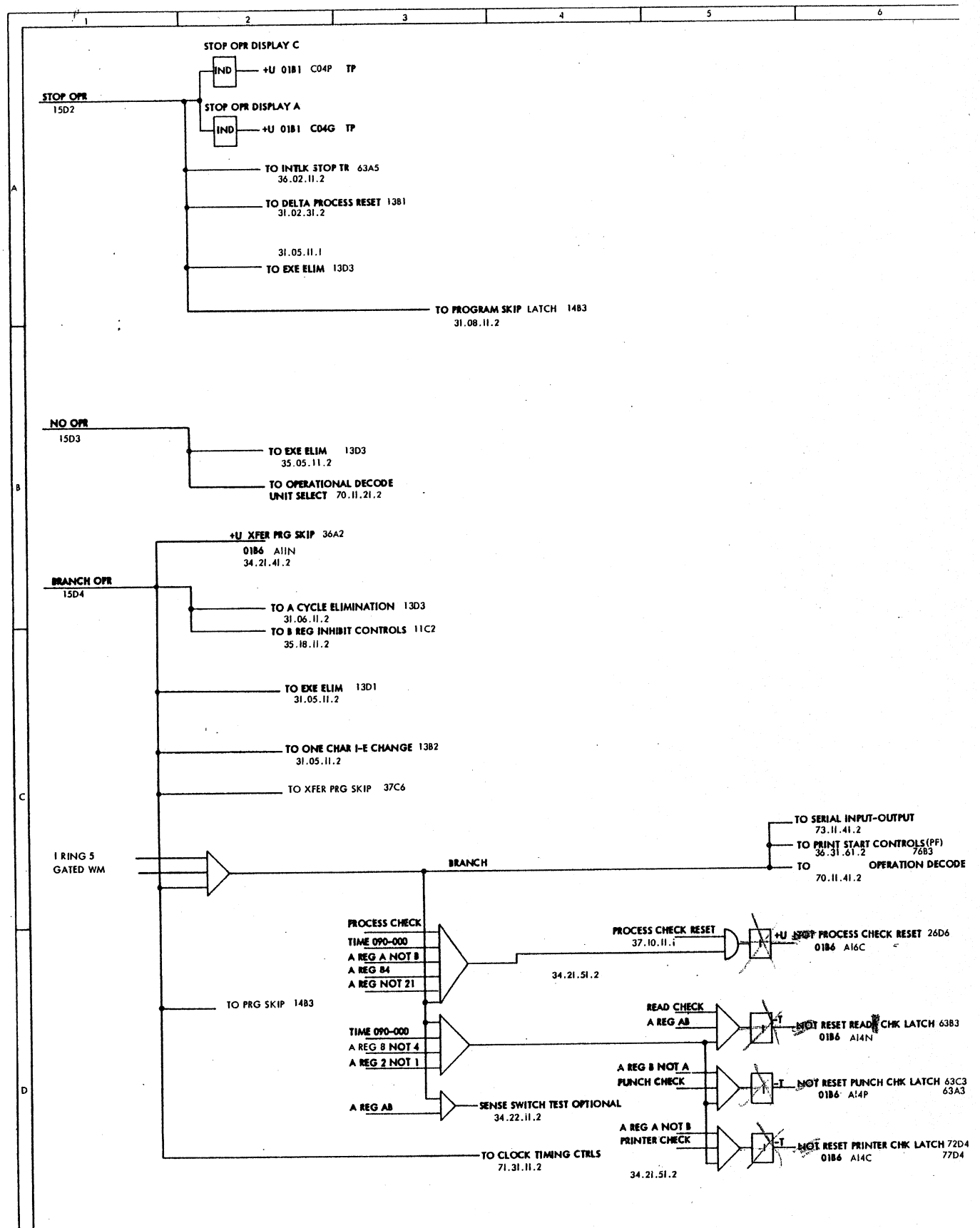
A how B  
Star Letter

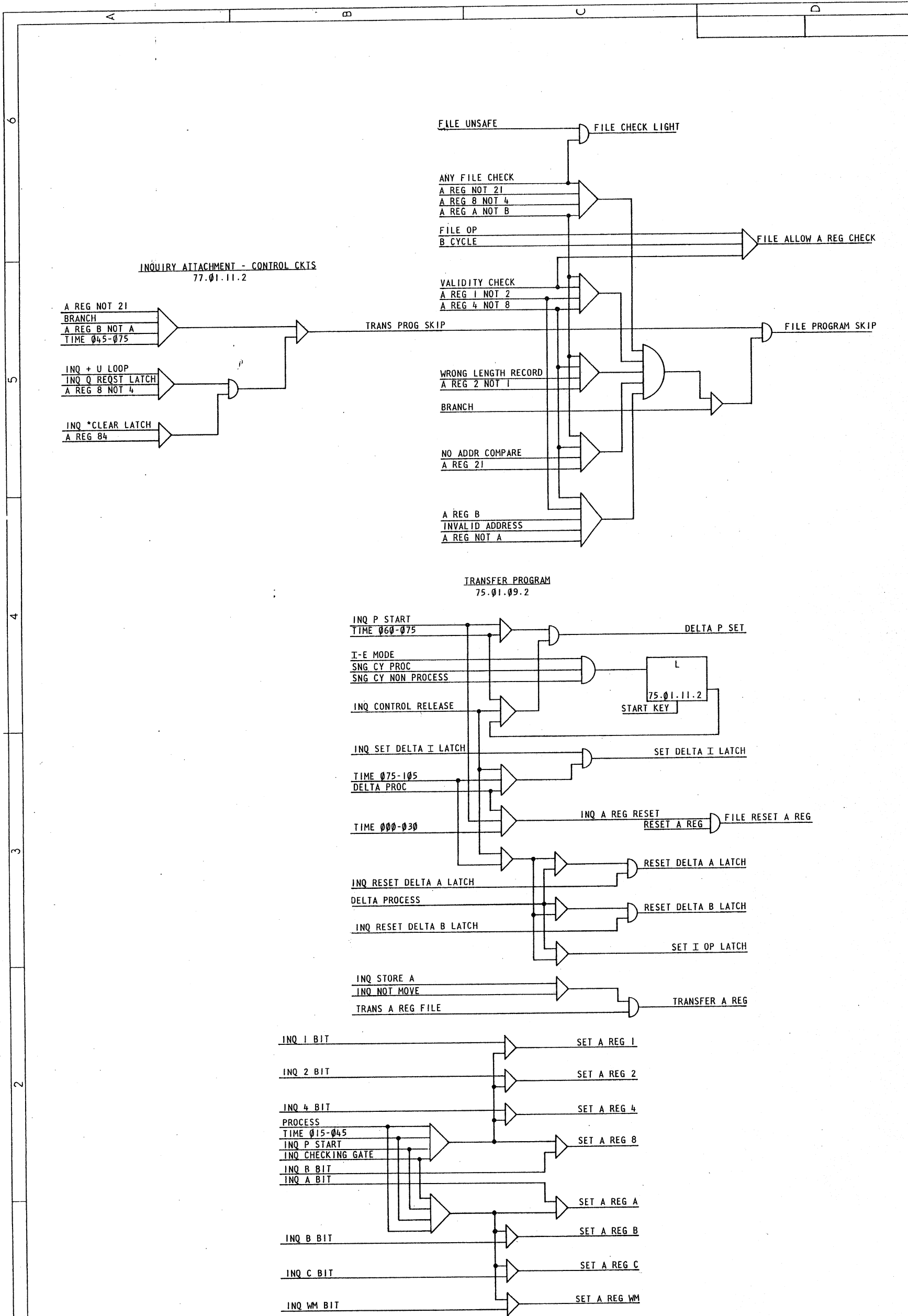
not A Reg.

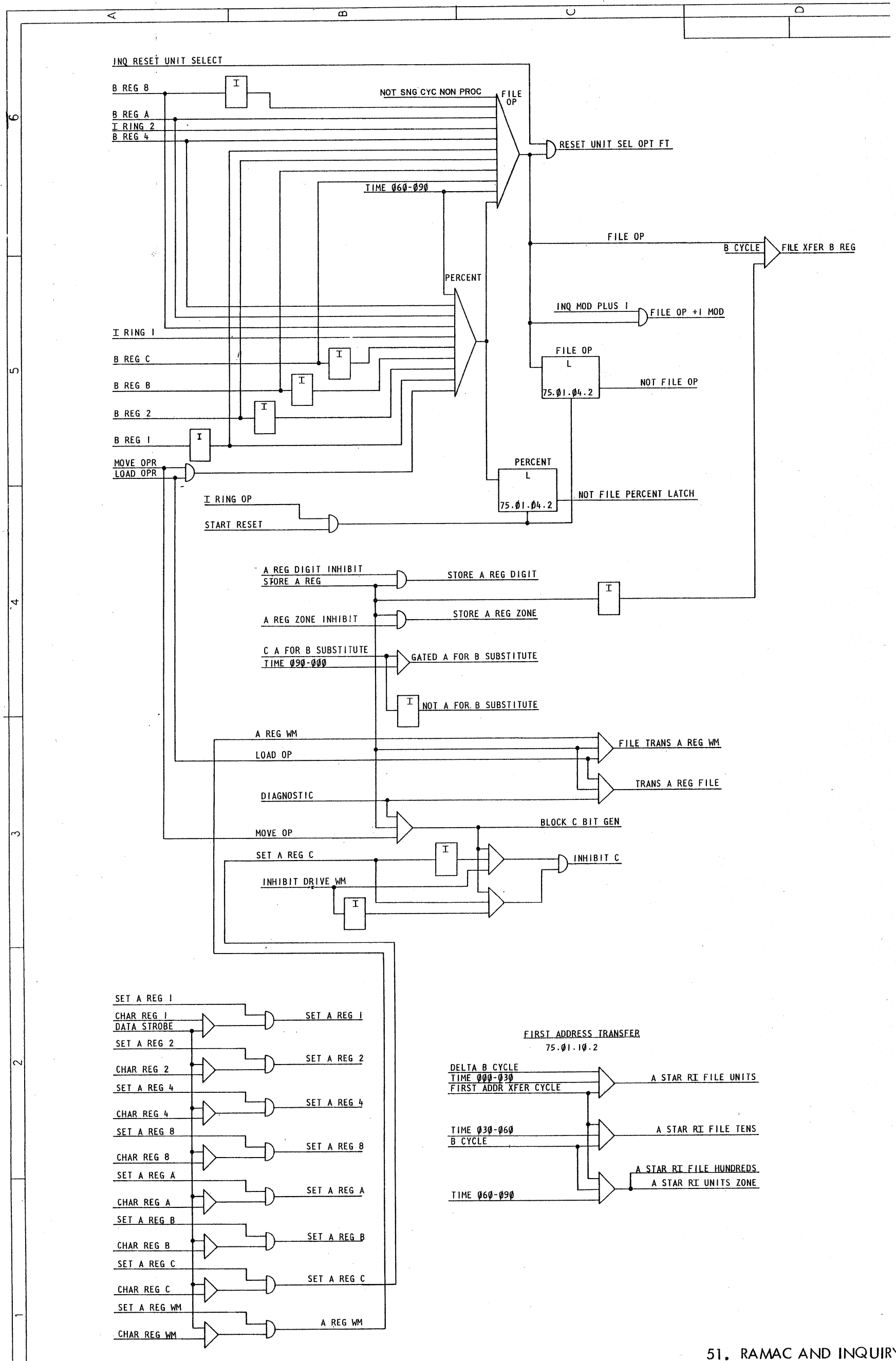
Set C



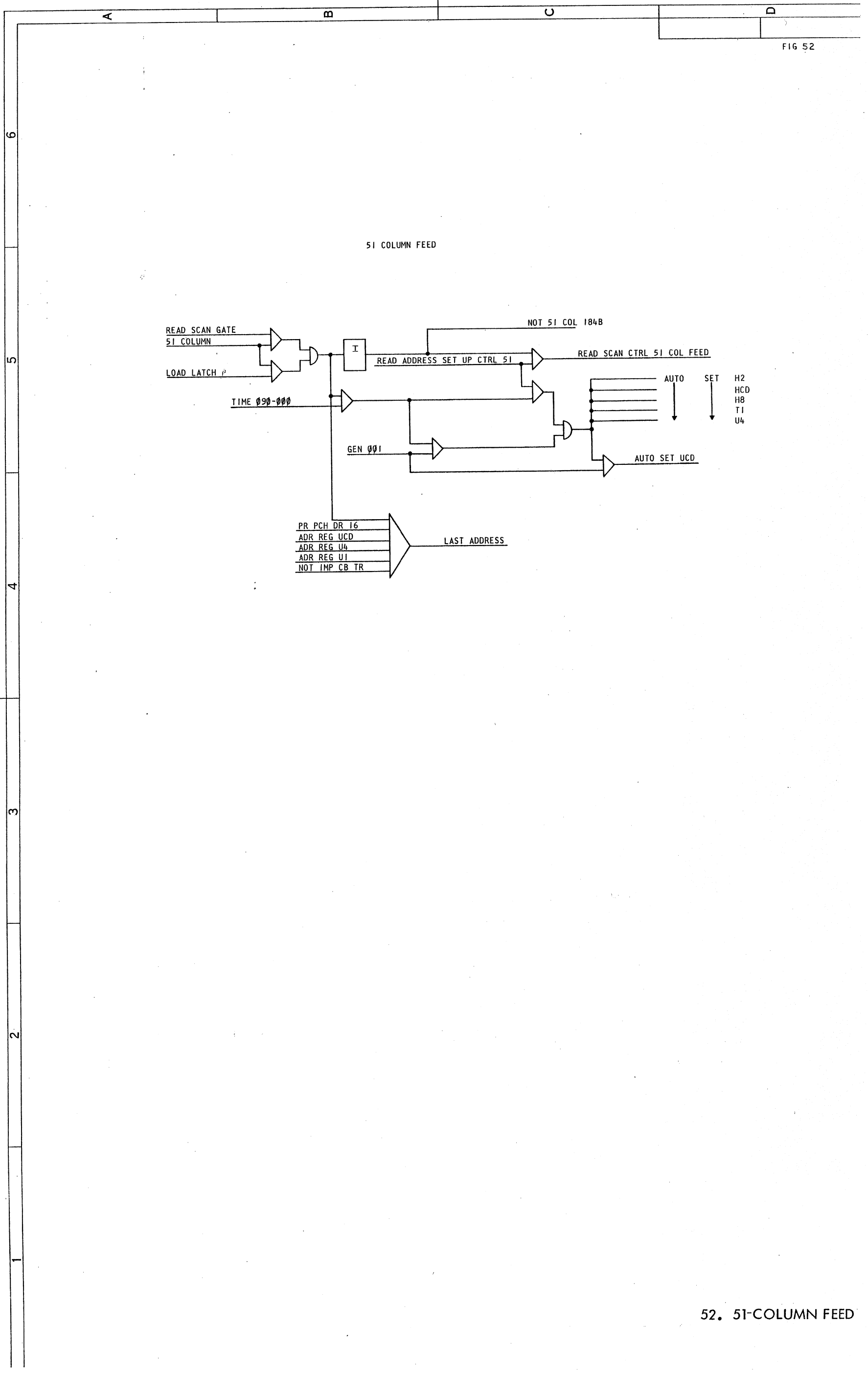
43 MODIFY ADDRESS (# AAA BBB)  
 DATA FLOW  
 14.7.62.

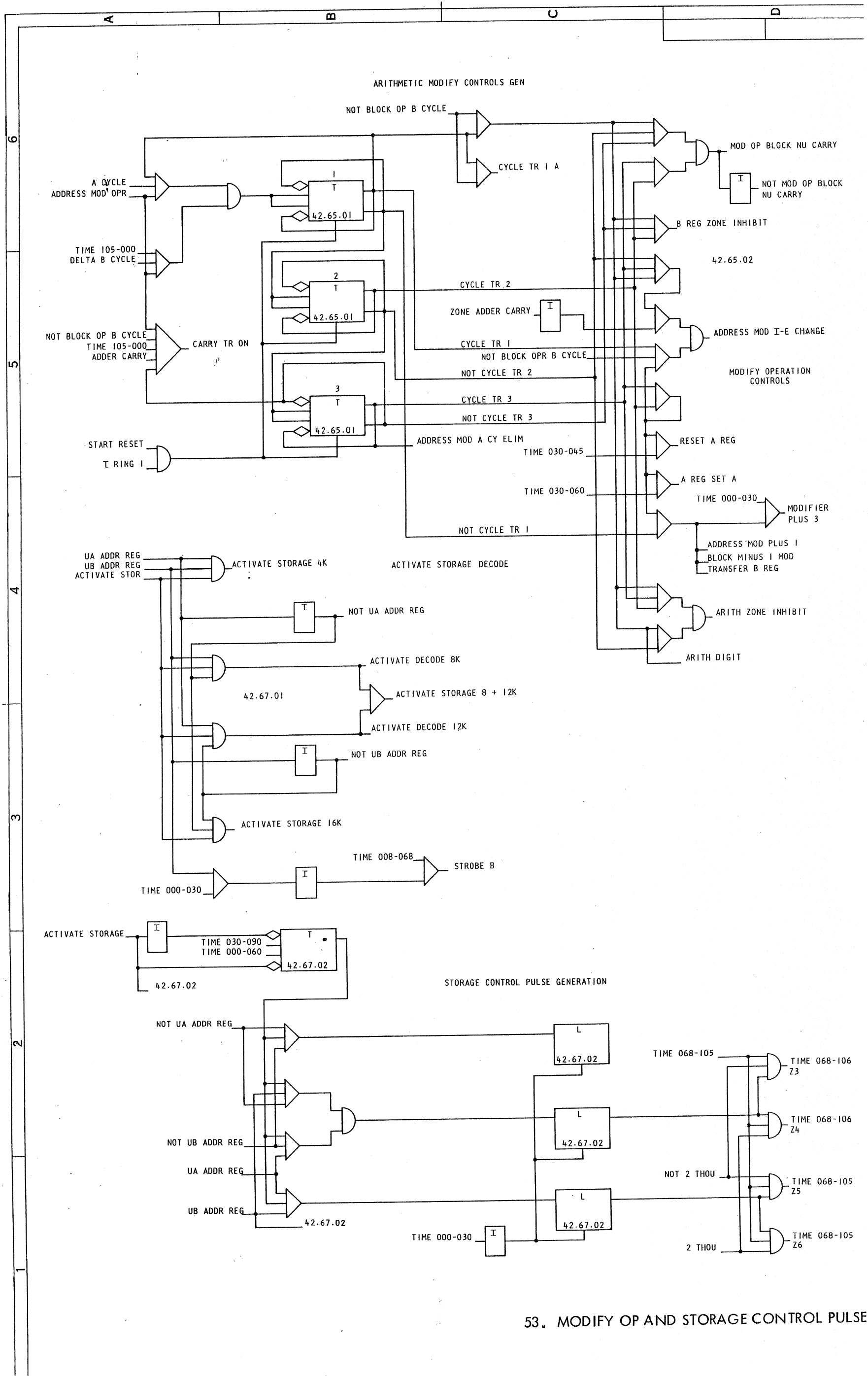




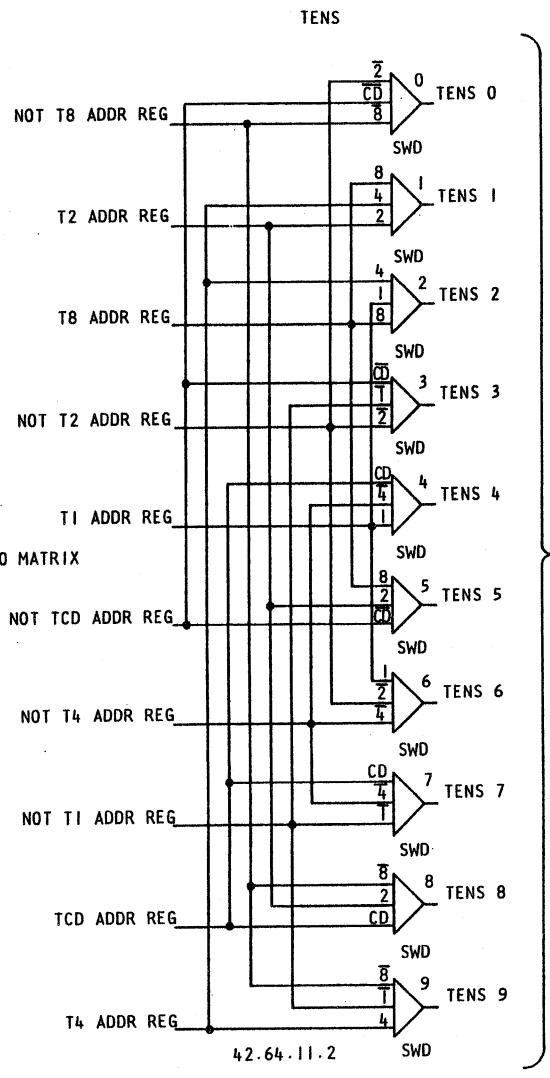
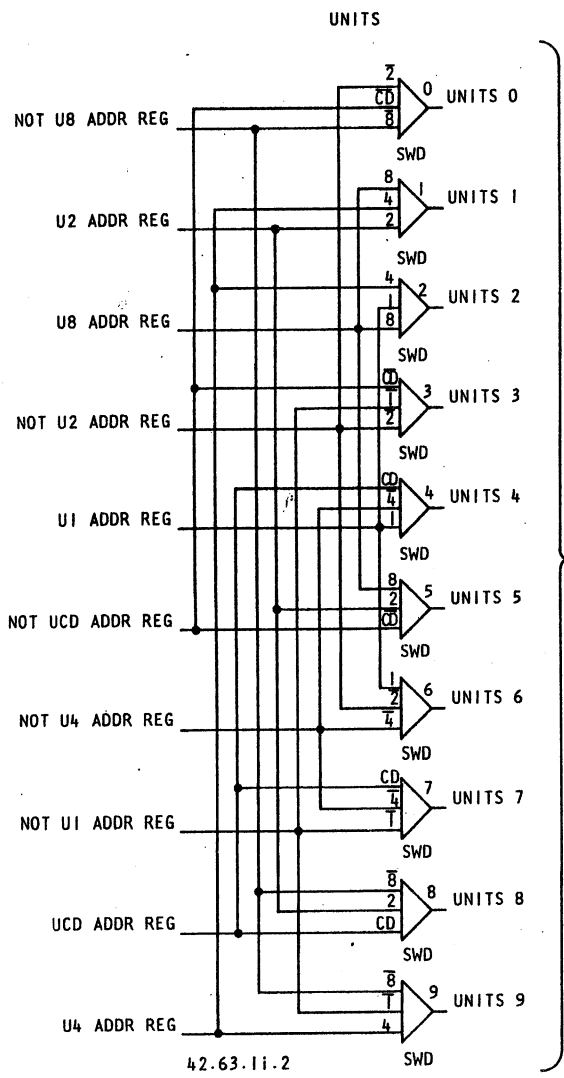
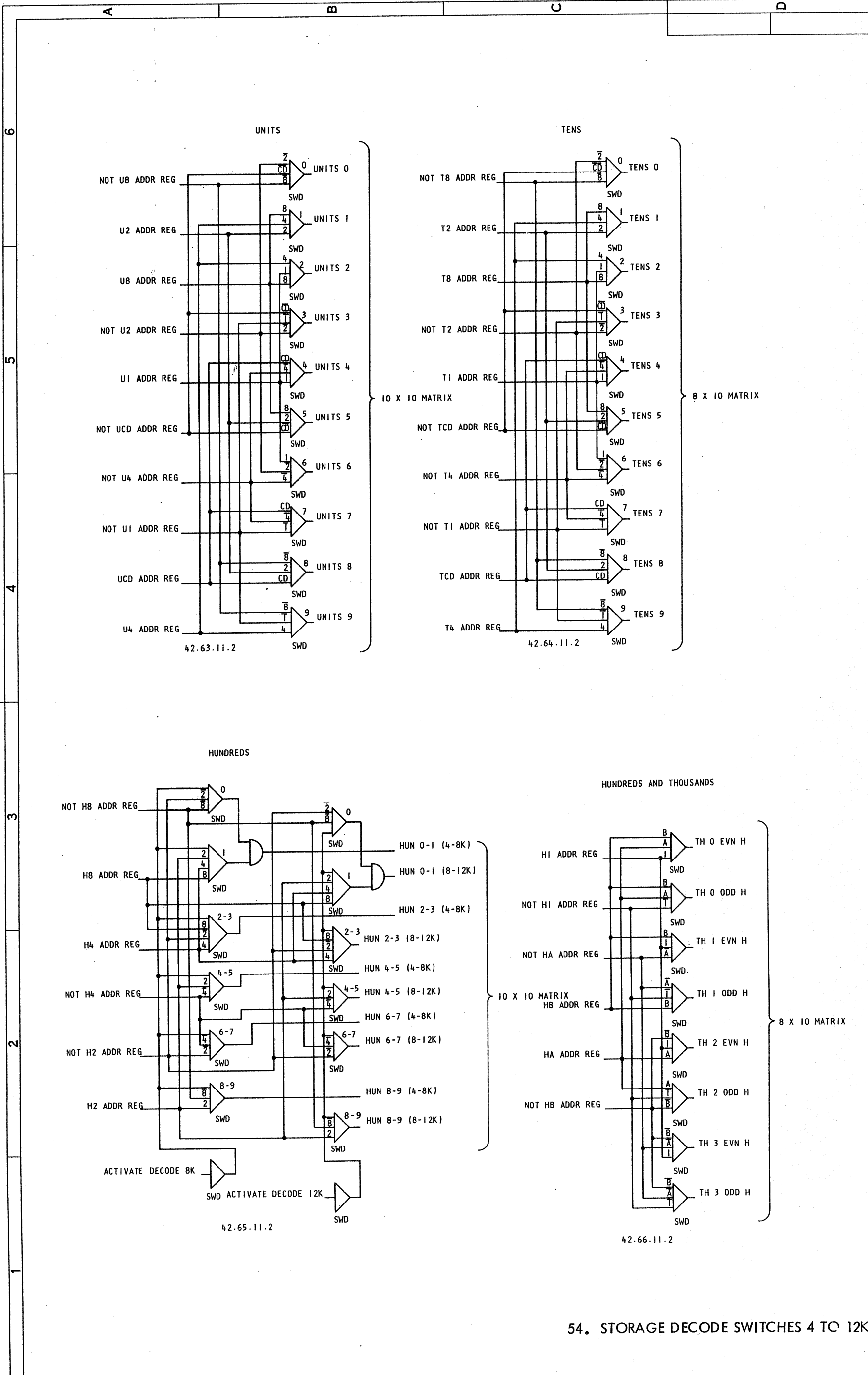






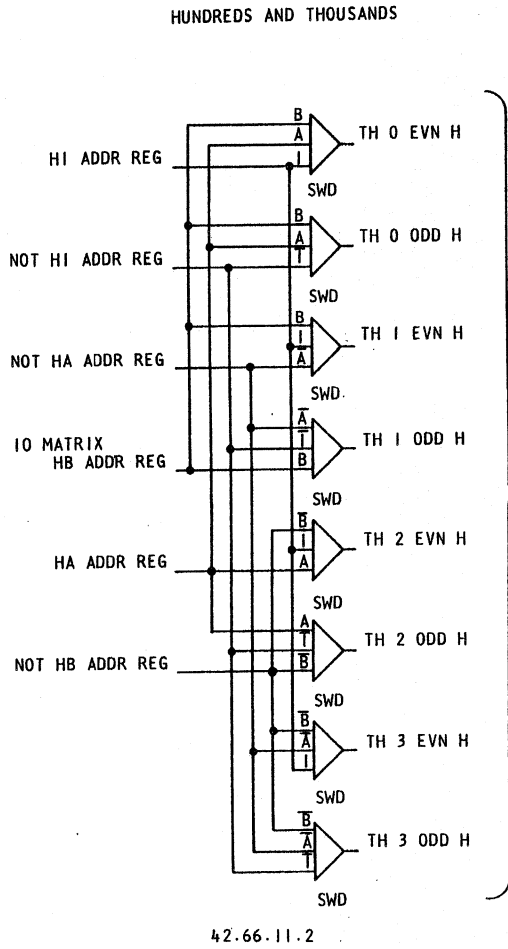
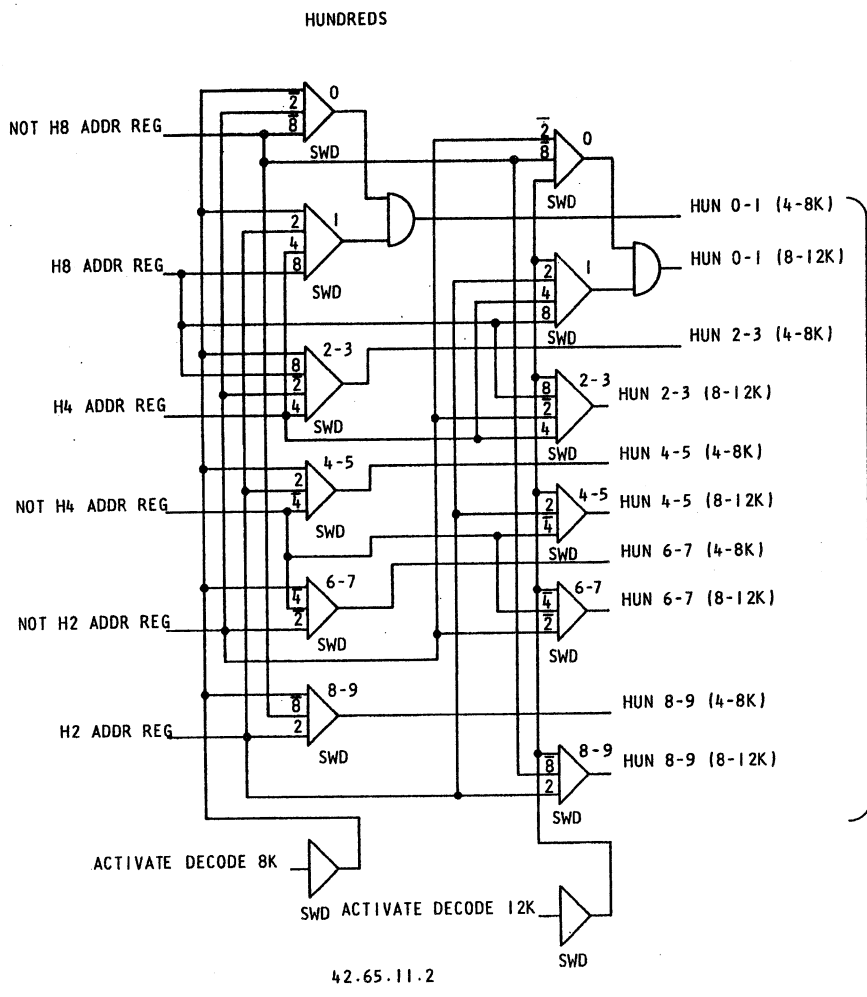


53. MODIFY OP AND STORAGE CONTROL PULSES



10 X 10 MATRIX

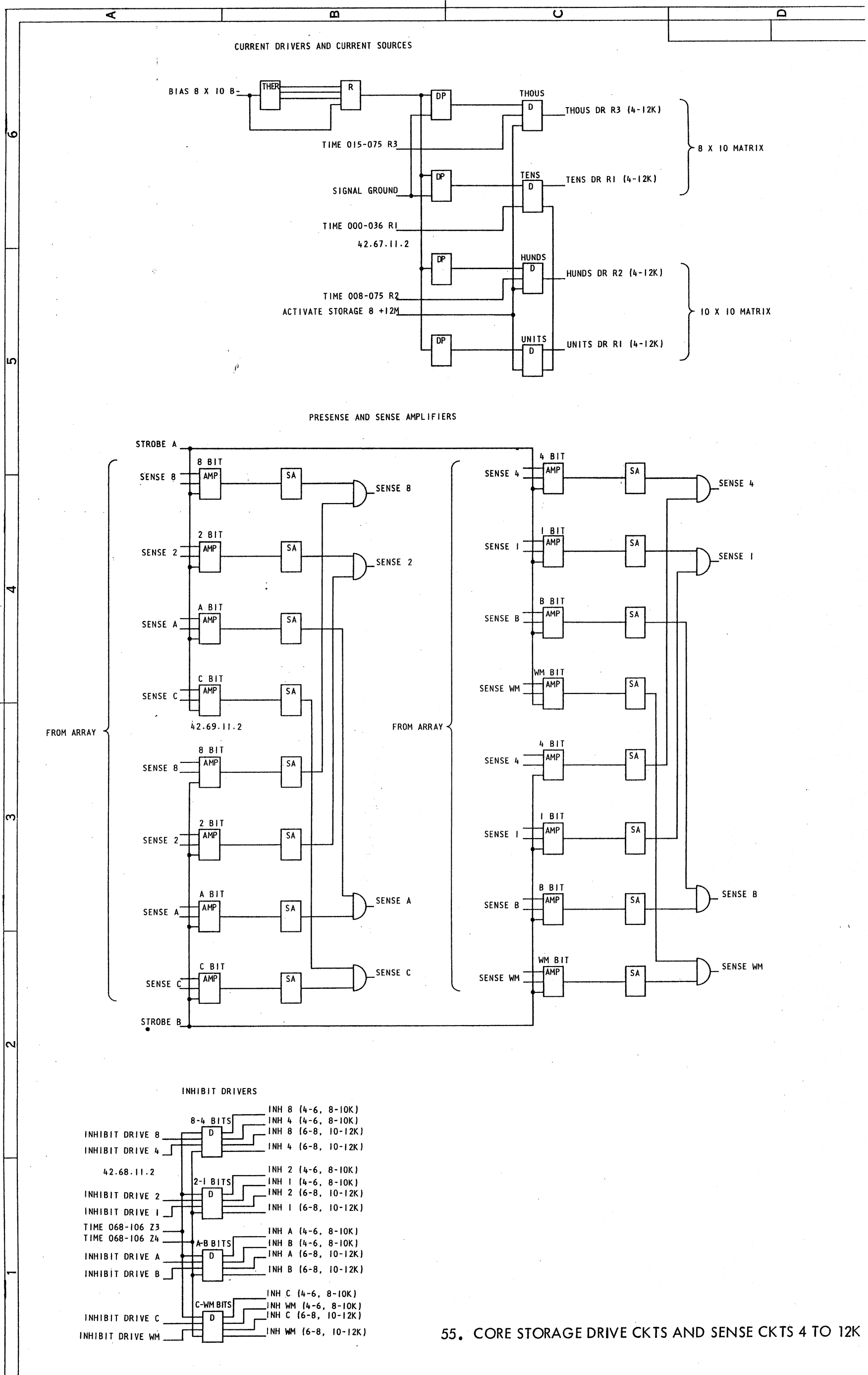
8 X 10 MATRIX



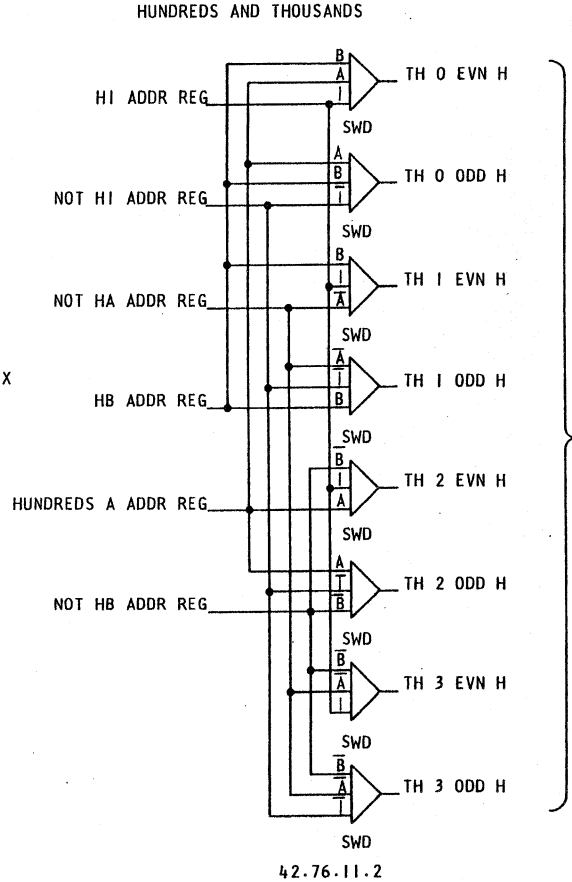
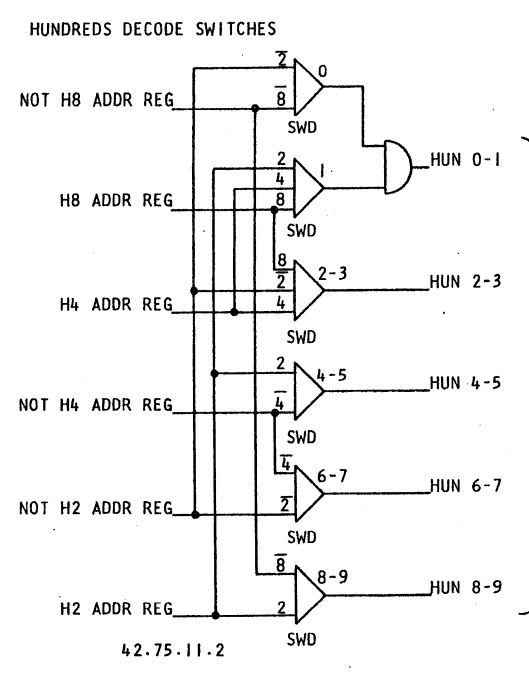
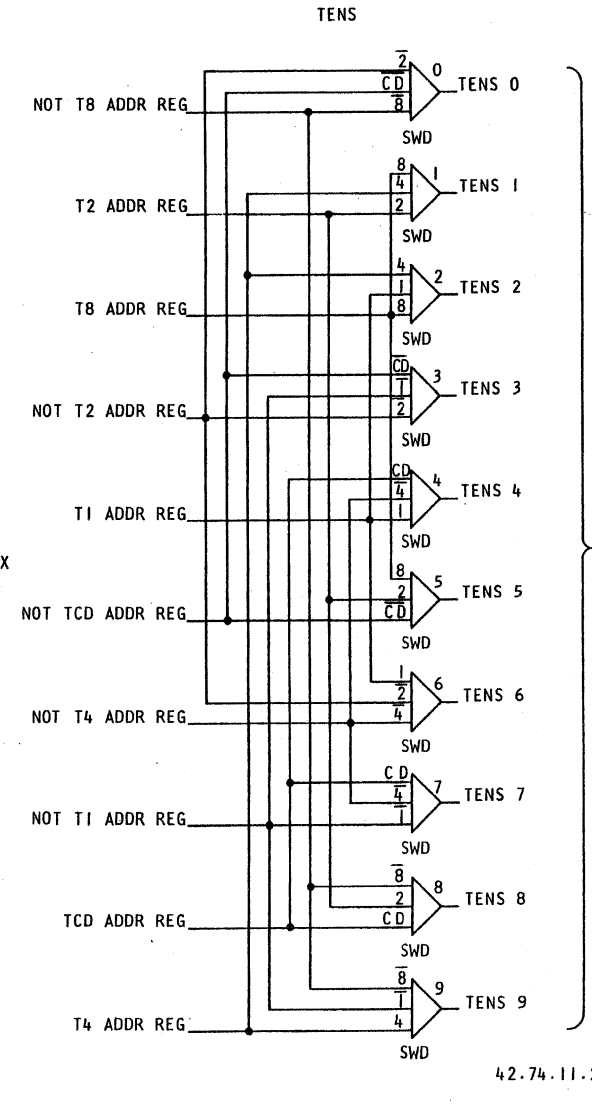
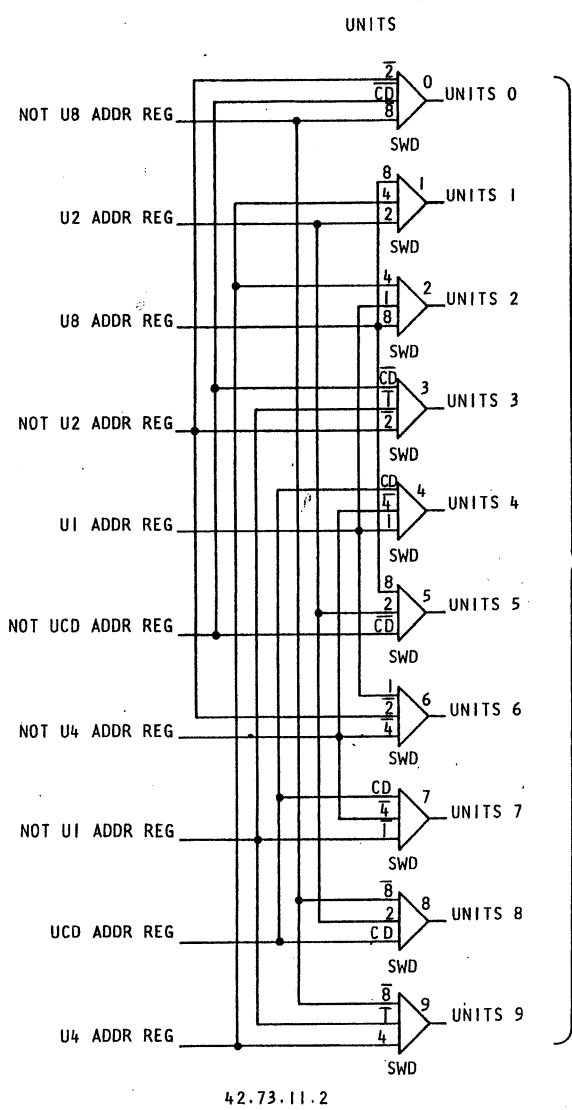
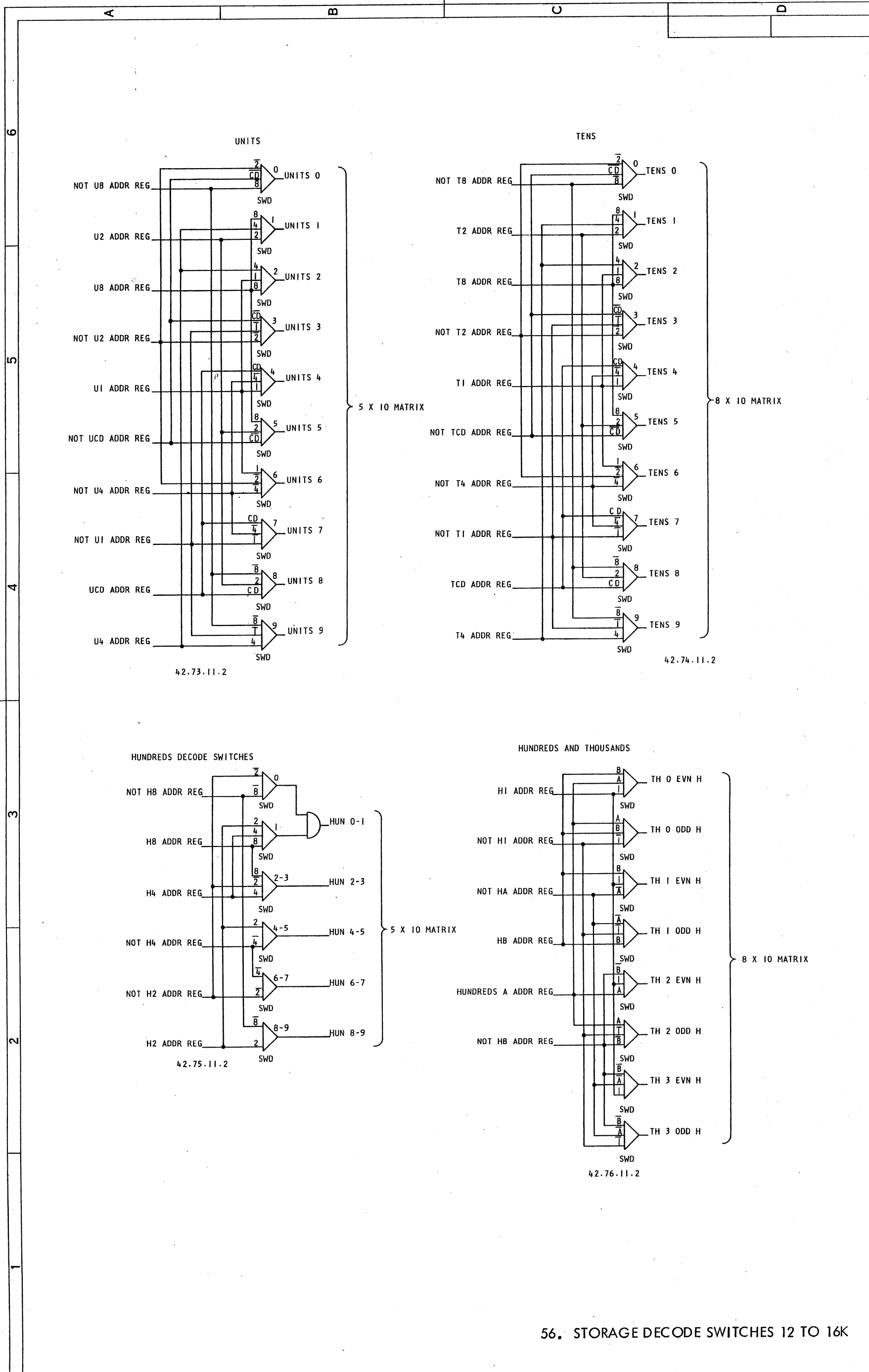
10 X 10 MATRIX

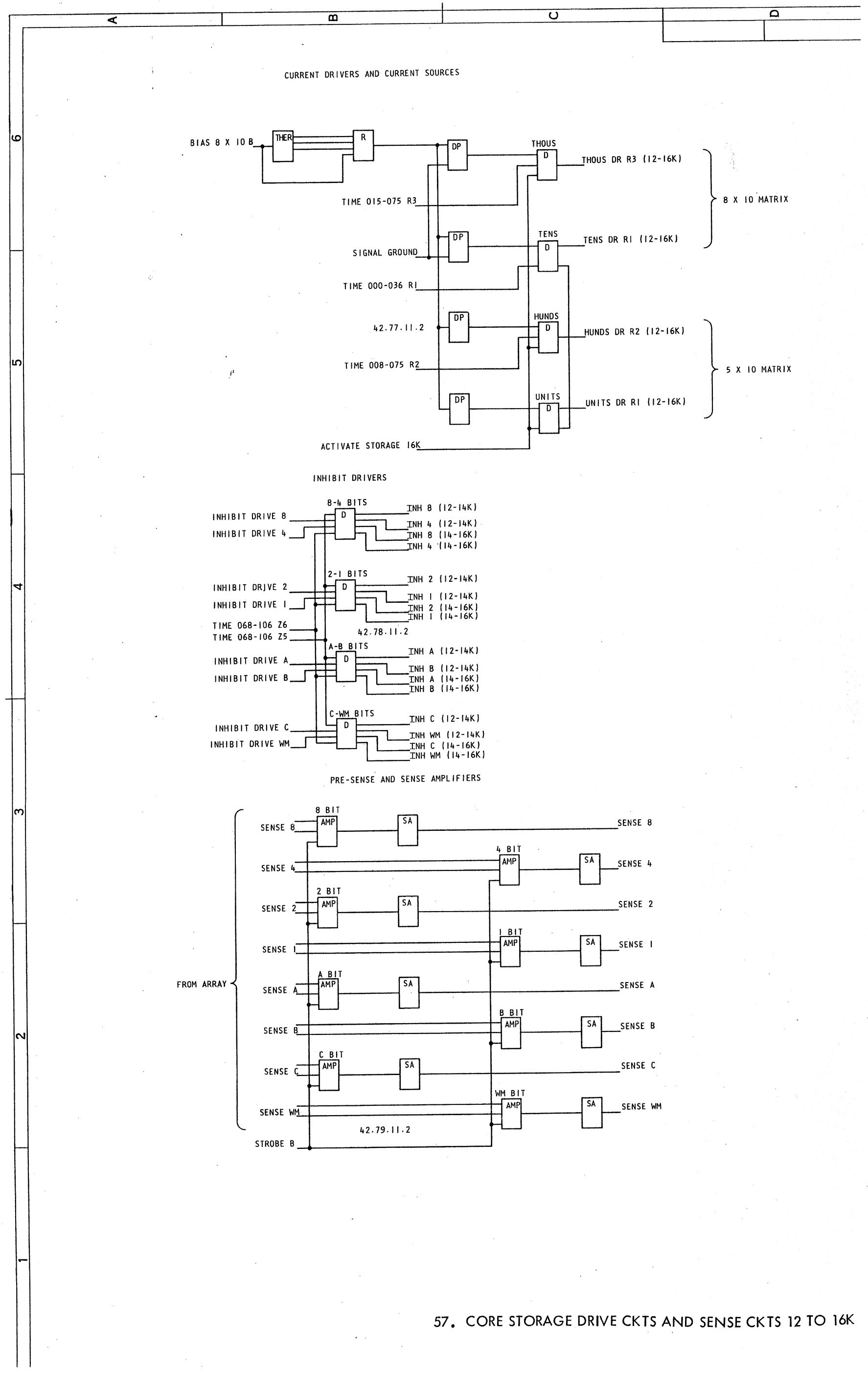
8 X 10 MATRIX

54. STORAGE DECODE SWITCHES 4 TO 12K

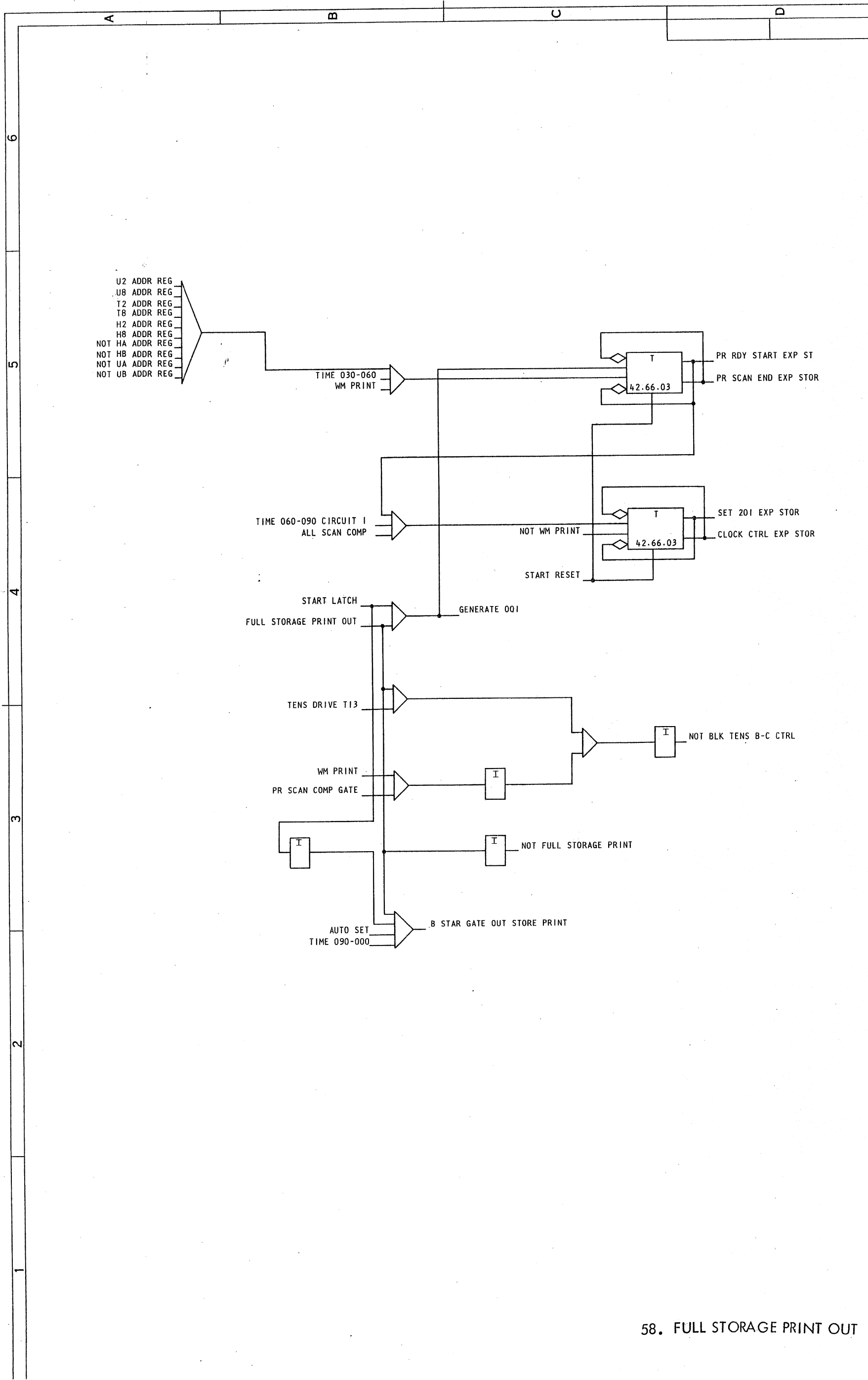


55. CORE STORAGE DRIVE CKTS AND SENSE CKTS 4 TO 12K





57. CORE STORAGE DRIVE CKTS AND SENSE CKTS 12 TO 16K



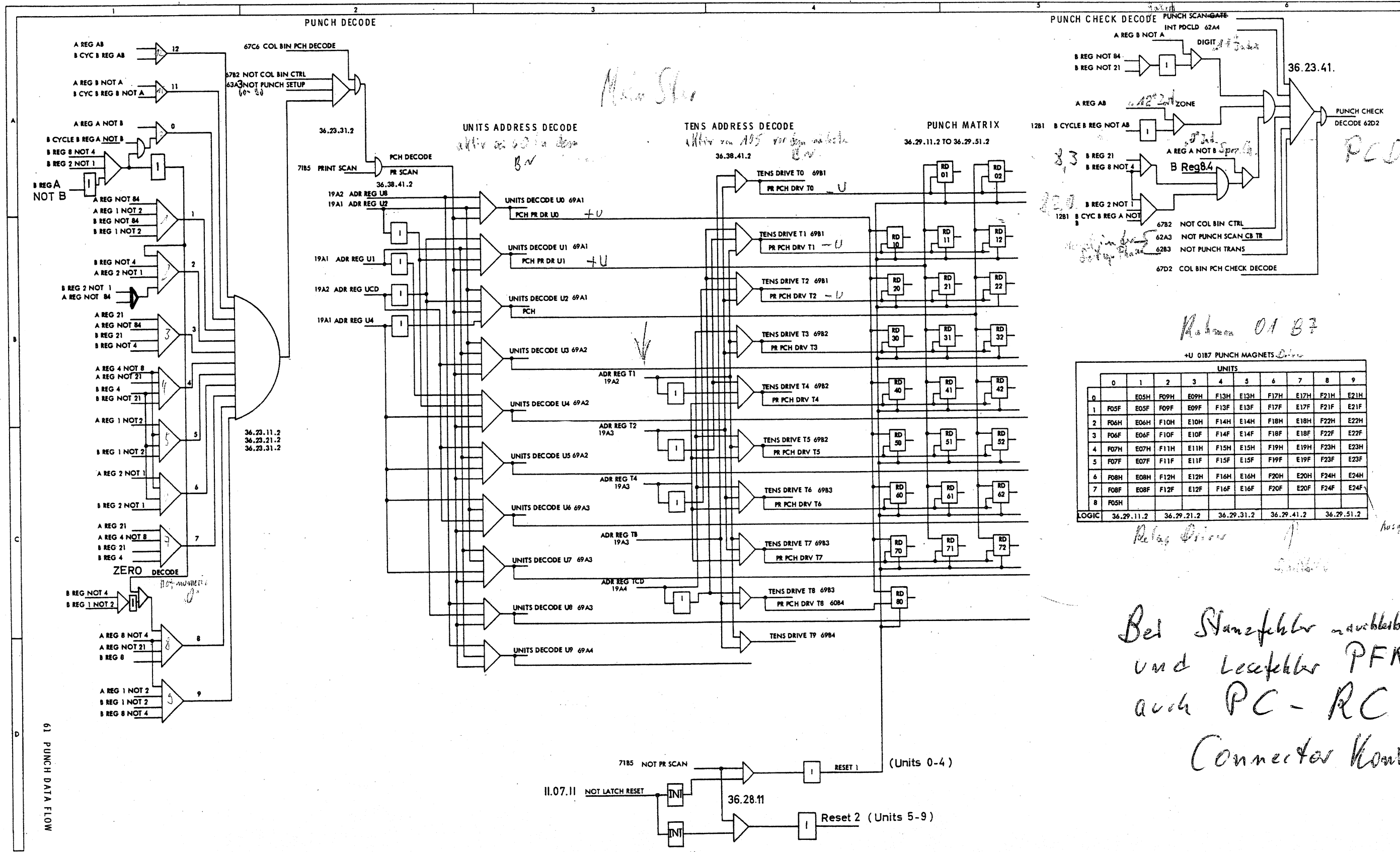
58. FULL STORAGE PRINT OUT

## Lade Taste:

- |        |    |   |
|--------|----|---|
| 1404   | 1) | Ladetaste $\rightarrow$ Load Latch                    |
| 15A3+6 | 2) | Op. Register Reset $\rightarrow$ Set $M^*$ (Read Op.) |
| 6405   | 3) | Read Scan Compl. $\rightarrow$ Aus                    |
| 13     | 4) | Set $\Delta B$ -Latch und Read $\Delta A$ I Latch     |
| 1404   | 5) | Set WM in 001   |
| 00B2   | 6) | Reset WM in 002-020                                   |
| 18.3   | 7) | Set Memory for 001                                    |
| 0003   | 8) | Read Scan Compl. erst im 3. Zuf. Gang                 |
| 1404   | 9) | Load Latch $\rightarrow$ Aus.                         |







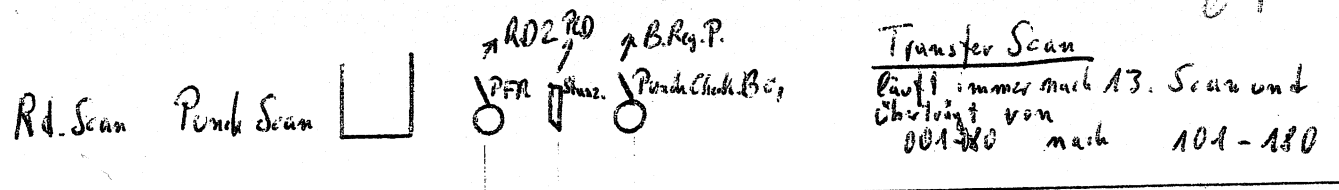
+U 01B7 PUNCH MAGNETS Drive

	UNITS									
	0	1	2	3	4	5	6	7	8	9
0	E05H	F09H	E09H	F13H	E13H	F17H	E17H	F21H	E21H	
1	F05F	E05F	F09F	E09F	F13F	E13F	F17F	E17F	F21F	E21F
2	F06H	E06H	F10H	E10H	F14H	E14H	F18H	E18H	F22H	E22H
3	F06F	E06F	F10F	E10F	F14F	E14F	F18F	E18F	F22F	E22F
4	F07H	E07H	F11H	E11H	F15H	E15H	F19H	E19H	F23H	E23H
5	F07F	E07F	F11F	E11F	F15F	E15F	F19F	E19F	F23F	E23F
6	F08H	E08H	F12H	E12H	F16H	E16H	F20H	E20H	F24H	E24H
7	F08F	E08F	F12F	E12F	F16F	E16F	F20F	E20F	F24F	E24F
8	F05H									
LOGIC	36.29.11.2	36.29.21.2	36.29.31.2	36.29.41.2	36.29.51.2					

Bei Stanzfehler nachbleiben ledig  
und Lochfehler PFR  
auch PC-RC  
Connector Kontrolle

61 PUNCH DATA FLOW

PFA Hole Count Check siehe auch Höhe 64



Rd. Scan	Punch Scan	Diagram	Transfer Scan
X	X	[Diagram: 3 horizontal lines]	Y Planes → Y Planes
X	Y	[Diagram: 3 horizontal lines]	Y Planes → X Planes
X	X	[Diagram: 3 horizontal lines]	Y Planes → Y Planes
X	Y	[Diagram: 3 horizontal lines]	Y Planes → X Planes

Read Scan mit X Gate und PFA B<sub>i</sub> liest im Y Planes 001-080  
 Read Scan mit Y Gate und PFA B<sub>i</sub> liest im X Planes 001-080  
 Punch Scan mit X Gate und P.C.D. liest im X Planes 101-180  
 Punch Scan mit X Gate und P.C.B. liest im Y Planes 101-180  
 Punch Scan mit Y Gate und P.C.D. liest im Y Planes 101-180  
 Punch Scan mit Y Gate und P.C.B. liest im X Planes 101-180

In der Station PFA + P.C.D = P.C.B.

Falls durch Fehler im 13. Scan noch regeneriert wird, sorgt im Transfer Scan X oder Y Select (62C5) dafür, daß von den B. Reg. Check Latches nichts auf die Jackbit leitungen kommen kann.

Kartenlänge	K. Länge	RD2	RD1
9	1	0	0
8, 3, 12	2	0	0
4	3	0	0
	4	0	0

Hole Count Check Read

Agang	1 X	2 Y	3 X	4 Y
XU	1	0	1	0
XL	1	0	1	1
YU		1	0	
YL		1	0	1

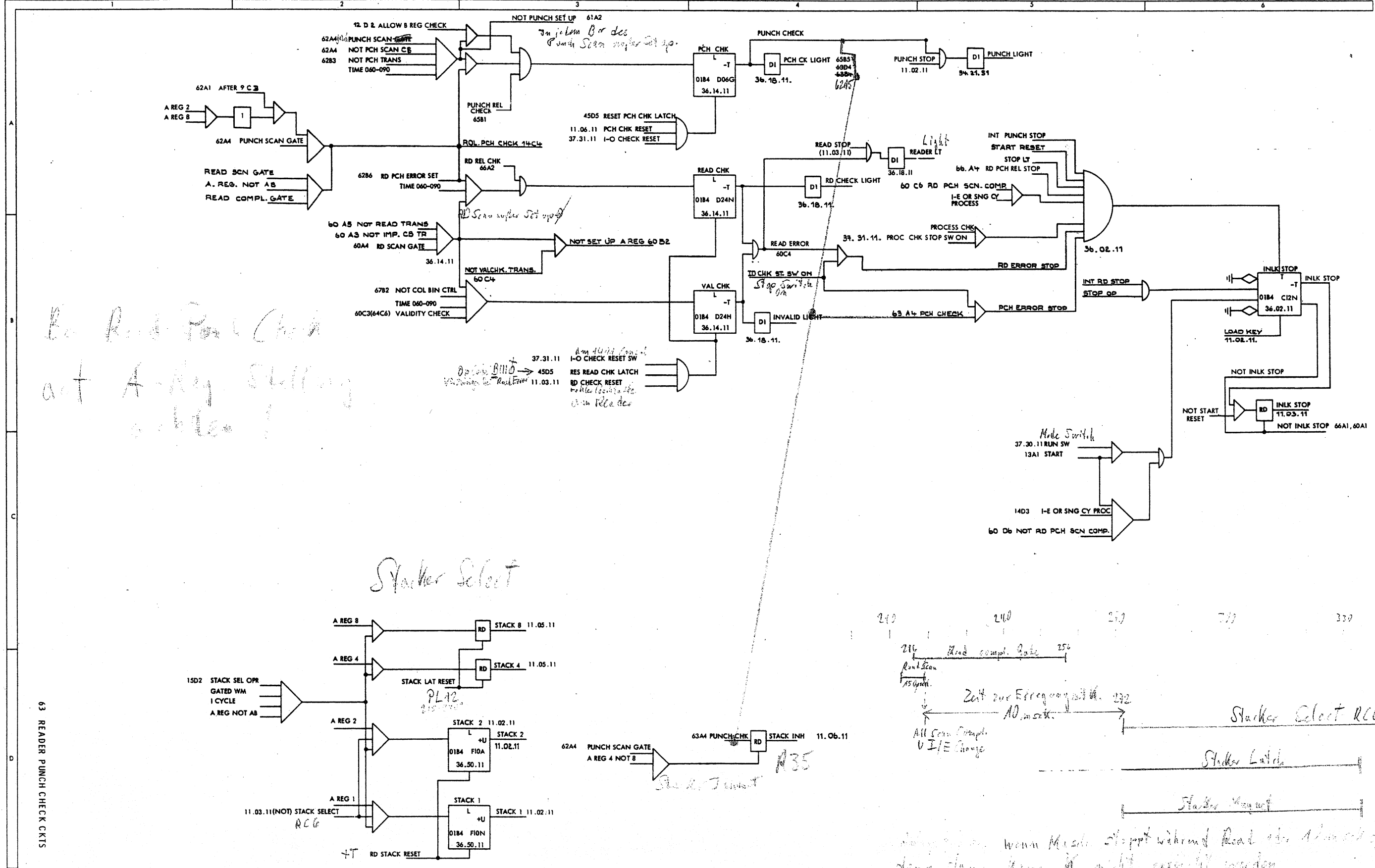
X Gate + RD1 = Row Bit X  
 Y Gate + RD2 = Row Bit Y

Y Gate + RD1 = Row Bit X  
 X Gate + RD2 = Row Bit Y

ROW Bit X setzt X Planes  
 ROW Bit Y setzt Y Planes

U<sub>upper</sub> = 1X  
 L<sub>lower</sub> = für jede Lochung





*Bei Read-Punch Check  
act A-Key Stellung  
problem!*

*Stacker Select*

*210 240 250 270 300 330*

*216 Read compl. Gate 250*

*Zeit zur Erzeugung d. 232*

*10 m. sek.*

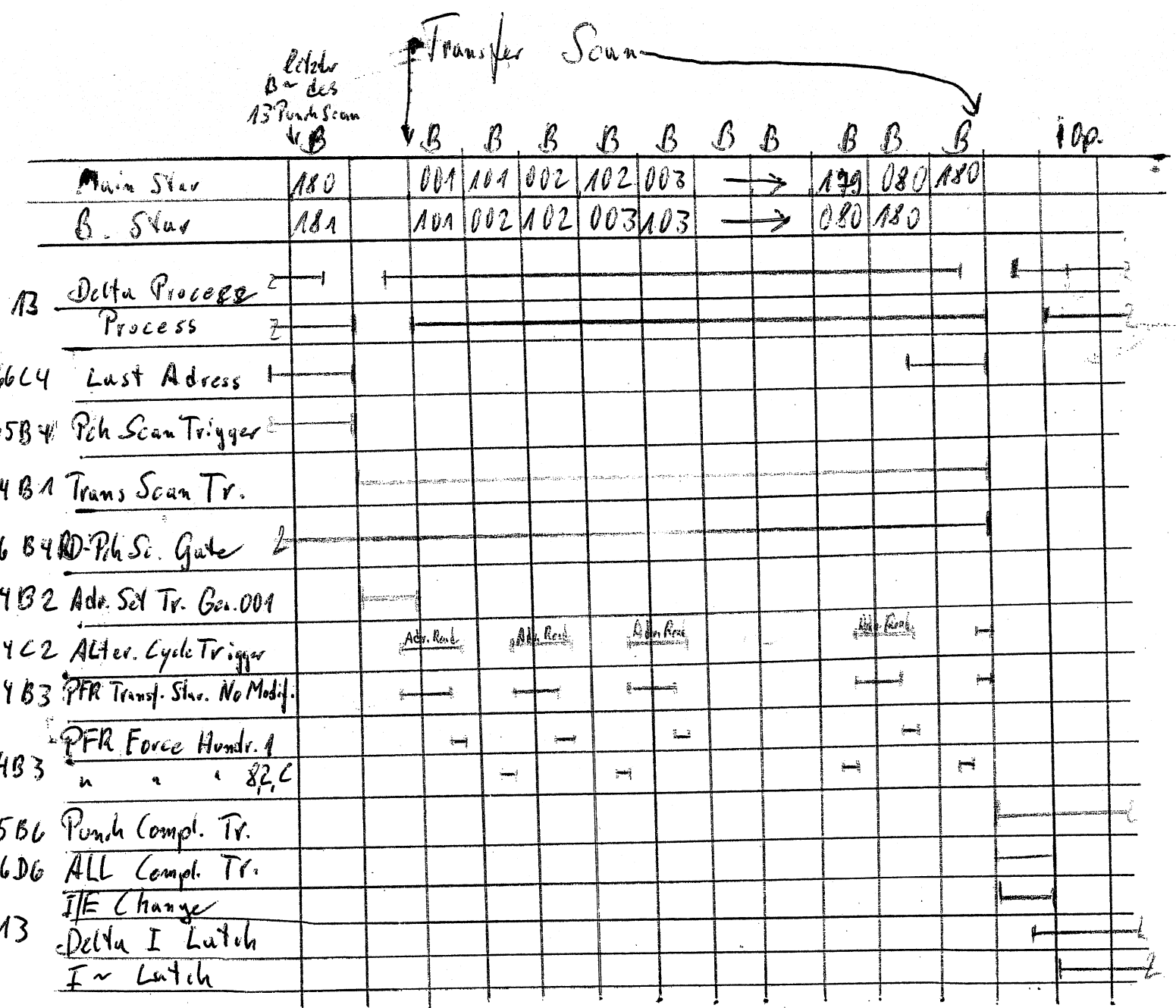
*Stacker Select RCG 342*

*Stacker Latch*

*Stacker Magnet*

*Wenn Maschine stoppt während Read über A-Key Stellung  
dann kann K nicht erreicht werden,  
10 m. sek. sind dann vorbei.*

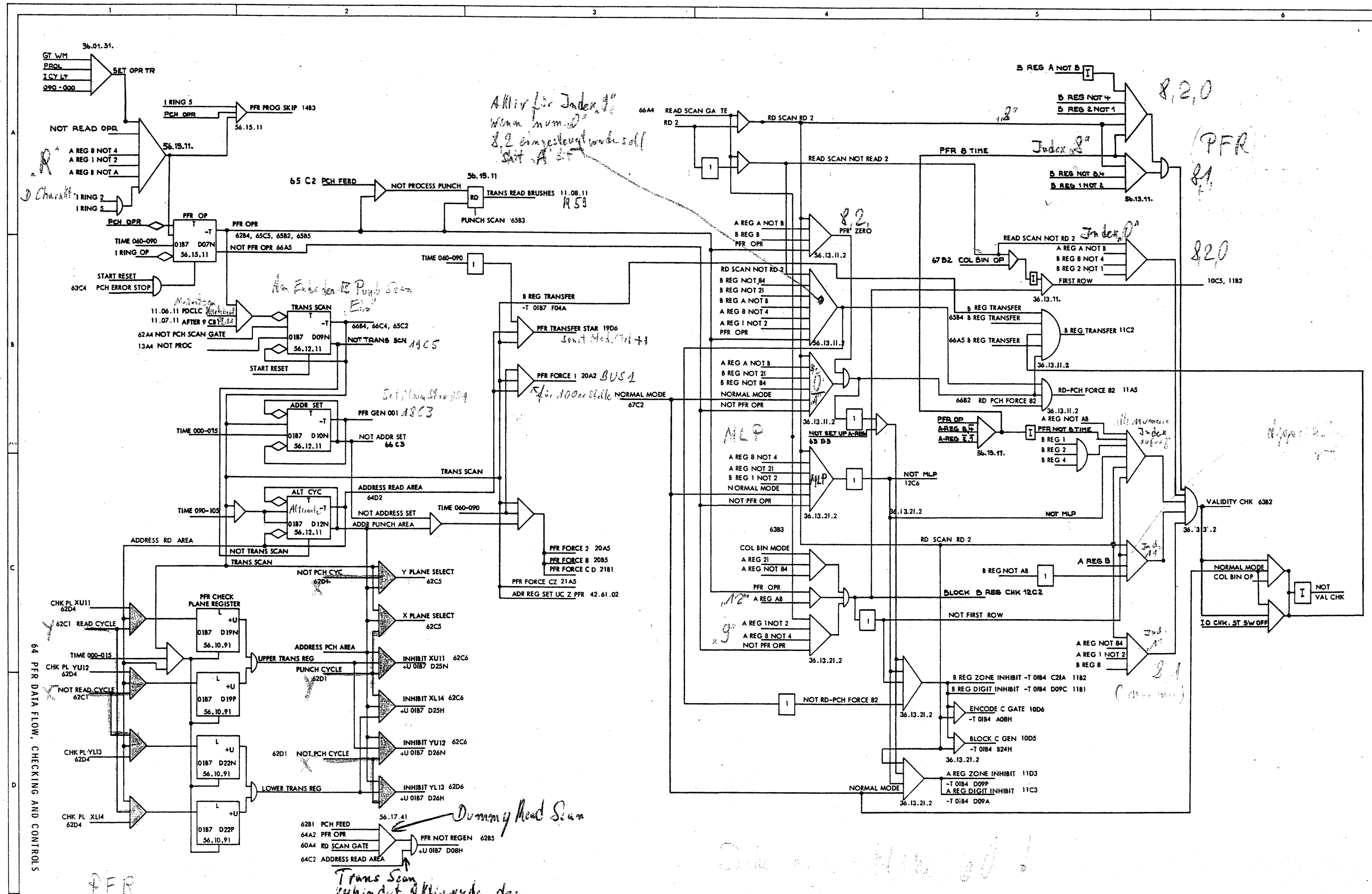
63 READER PUNCH CHECK CKTS



19D5 Hundr. kann nicht modifiziert werden, da Not Trans Scan fehlt. 19D5

Bei Transfer Star immer B-Reg. Transfer für Daten

Upper = 1x  
Lower = für jede Löschung



64 PFR DATA FLOW, CHECKING AND CONTROLS

PFR

Check

*Dummy Head Scan*  
 Trans Scan verhindert Aktivwerden der Inhibit-Leitungen auf 62 C06

*Aktiv für Index?*  
 wenn num. 0  
 8.2 eingesteuert werden soll  
 SAT A 25

*Index...*

8,2,0

(PFR 8,1)

8,2,0

*Index...*

8,1

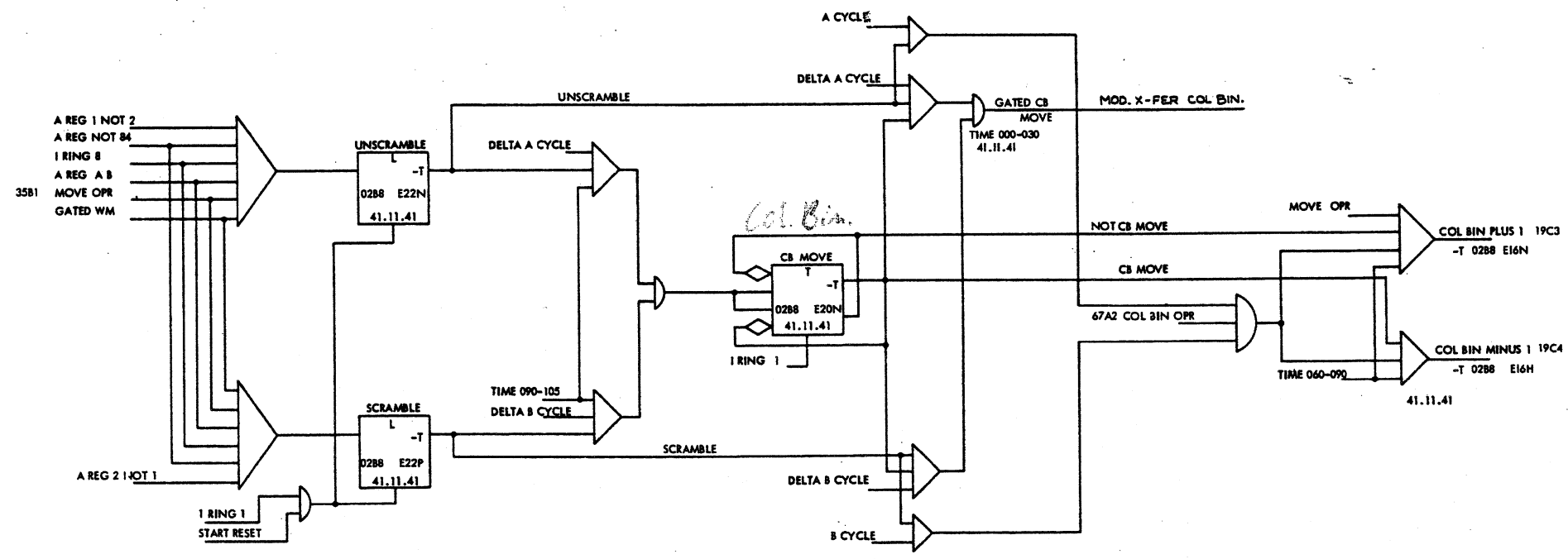






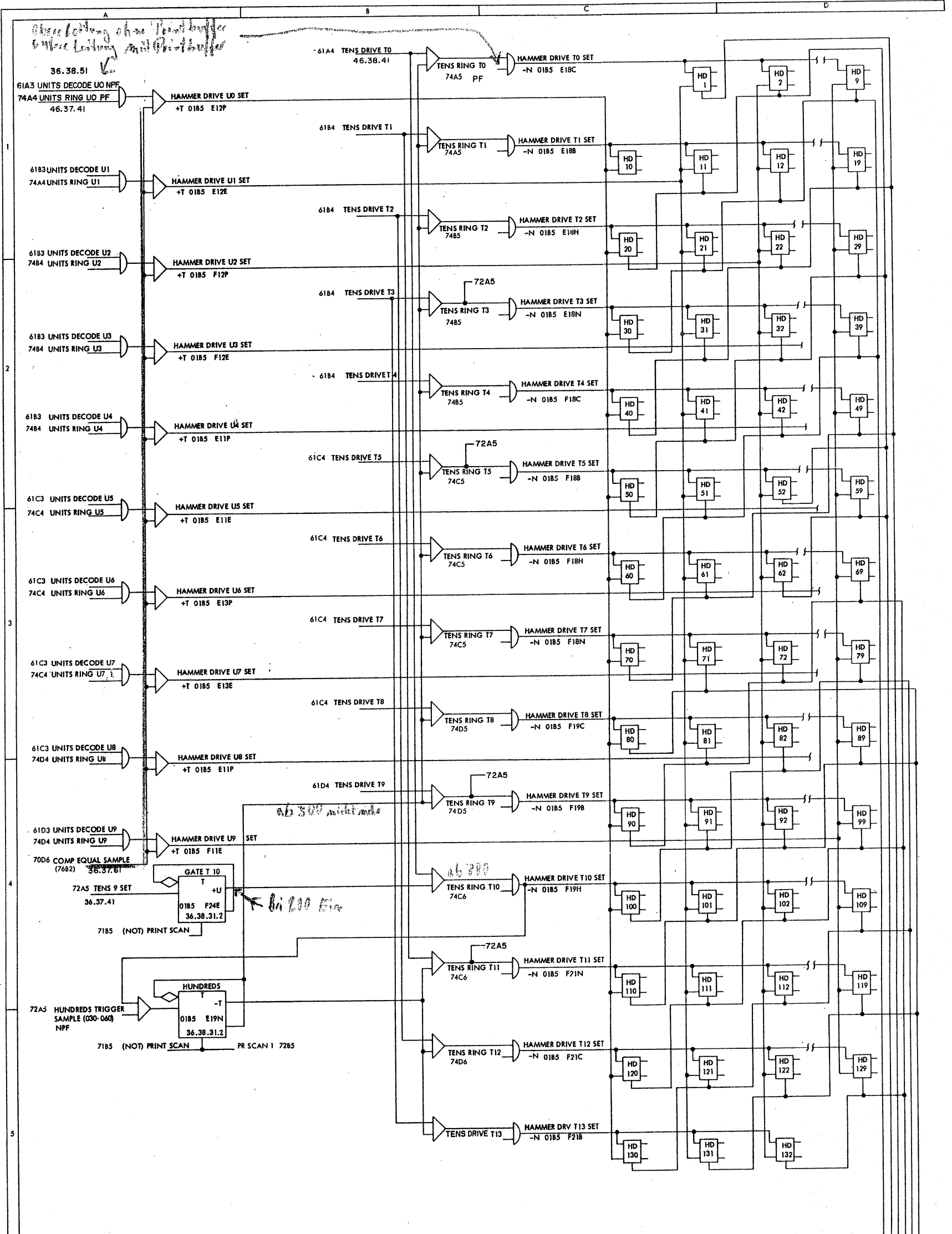


A  
B  
C  
D



68 MOVE COLUMN BINARY CONTROLS

*Col. Bin*



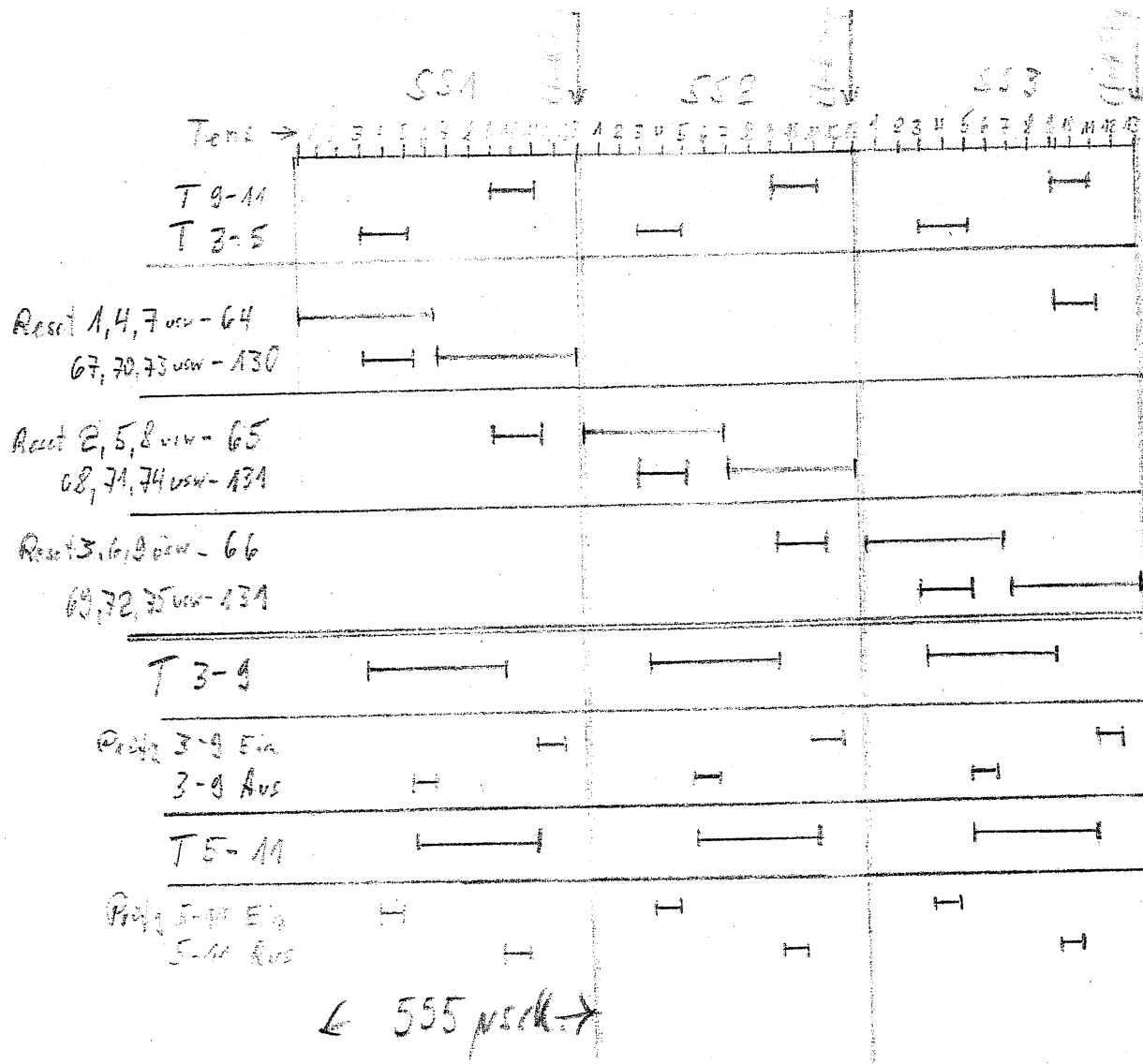
HAMMER FIRE TEST POINTS V 01B5

		UNITS								
		1	2	3	4	5	6	7	8	9
0		B05D	C05R	D05D	B05R	C05D	D05R	B06D	C06R	D06D
1	B06R	C06D	D06R	B07D	C07R	D07D	B07R	C07D	D07R	B08D
2	C08R	D08D	B08R	C08D	D08R	B09D	C09R	D09D	B09R	C09D
3	D09R	B10D	C10R	D10D	B10R	C10D	D10R	B11D	C11R	D11D
4	B11R	C11D	D11R	B12D	C12R	D12D	B12R	C12D	D12R	B13D
5	C13R	D13D	B13R	C13D	D13R	B14D	C14R	D14D	B14R	C14D
6	D14R	B15D	C15R	D15D	B15R	C15D	D15R	B16D	C16R	D16D
7	B16R	C16D	D16R	B17D	C17R	D17D	B17R	C17D	D17R	B18D
8	C18R	D18D	B18R	C18D	D18R	B19D	C19R	D19D	B19R	C19D
9	D19R	B20D	C20R	D20D	B20R	C20D	D20R	B21D	C21R	D21D
10	B21R	C21D	D21R	B22D	C22R	D22D	B22R	C22D	D22R	B23D
11	C23R	D23D	B23R	C23D	D23R	B24D	C24R	D24D	B24R	C24D
12	D24R	B25D	C25R	D25D	B25R	C25D	D25R	B26D	C26R	D26D
13	B26R	C26D	D26R							

- HAMMER RESET 3-66
- HAMMER RESET 2-65
- 72A6 HAMMER RESET 1-66
- HAMMER RESET 69-132
- HAMMER RESET 67-130
- HAMMER RESET 68-131







Reset können über Lötde

┌───┐ Reset  
 └───┘ mögliche Frequenz  
 20%

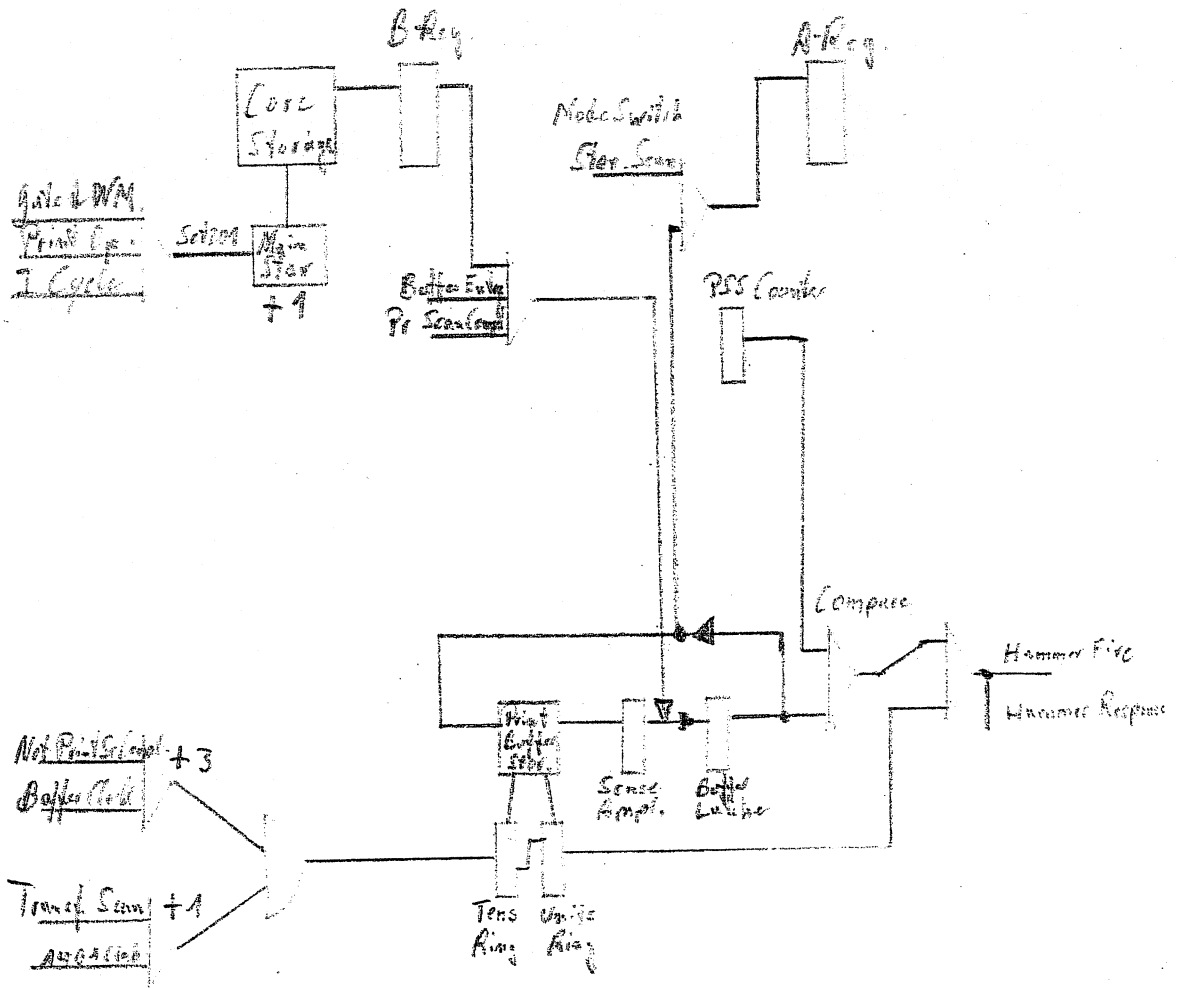
Check

← 1.665  
 ms. →

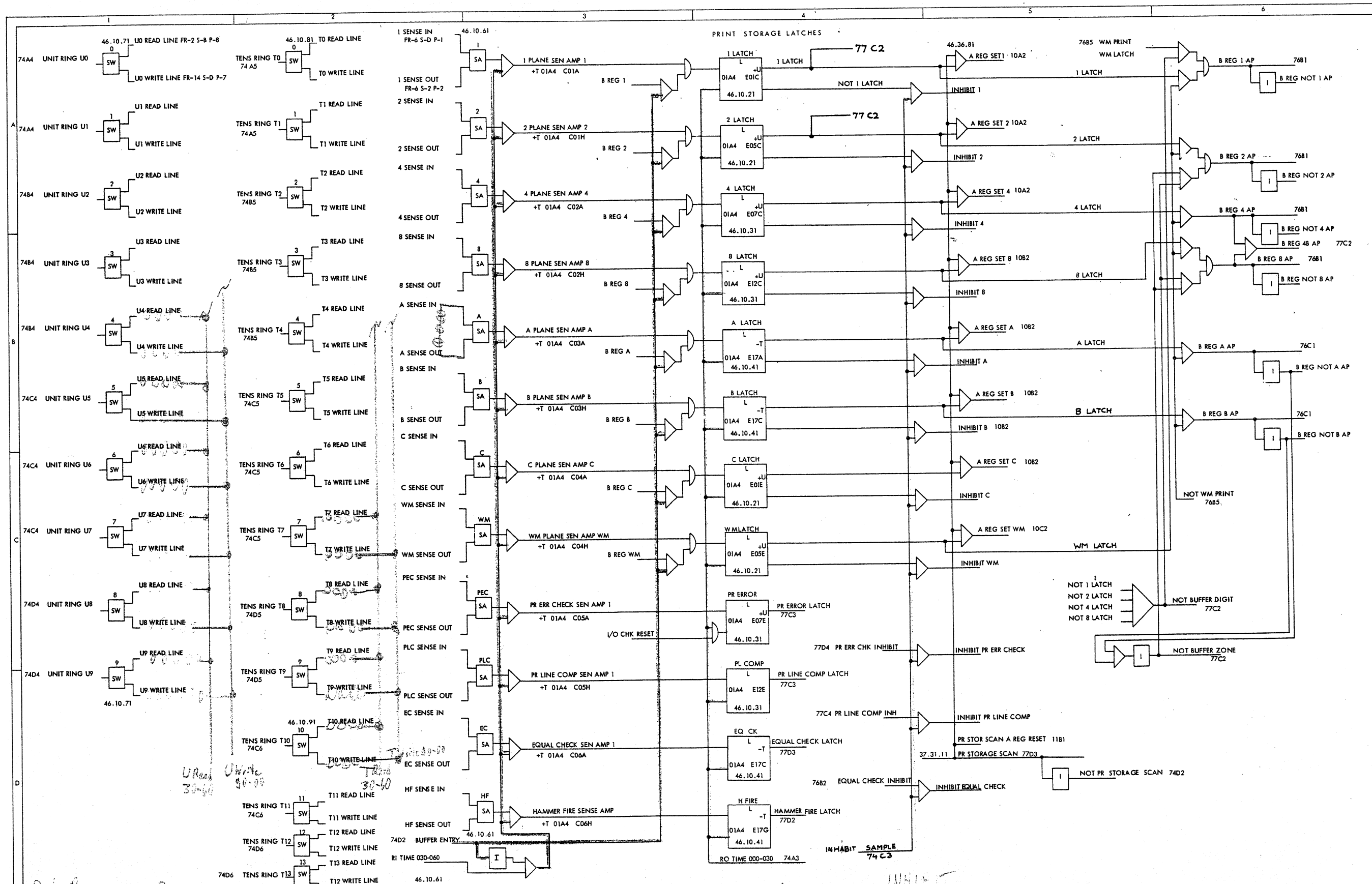




# Data Flow Print Buffer



73. PRINT BUFFER STORAGE AND DATA FLOW



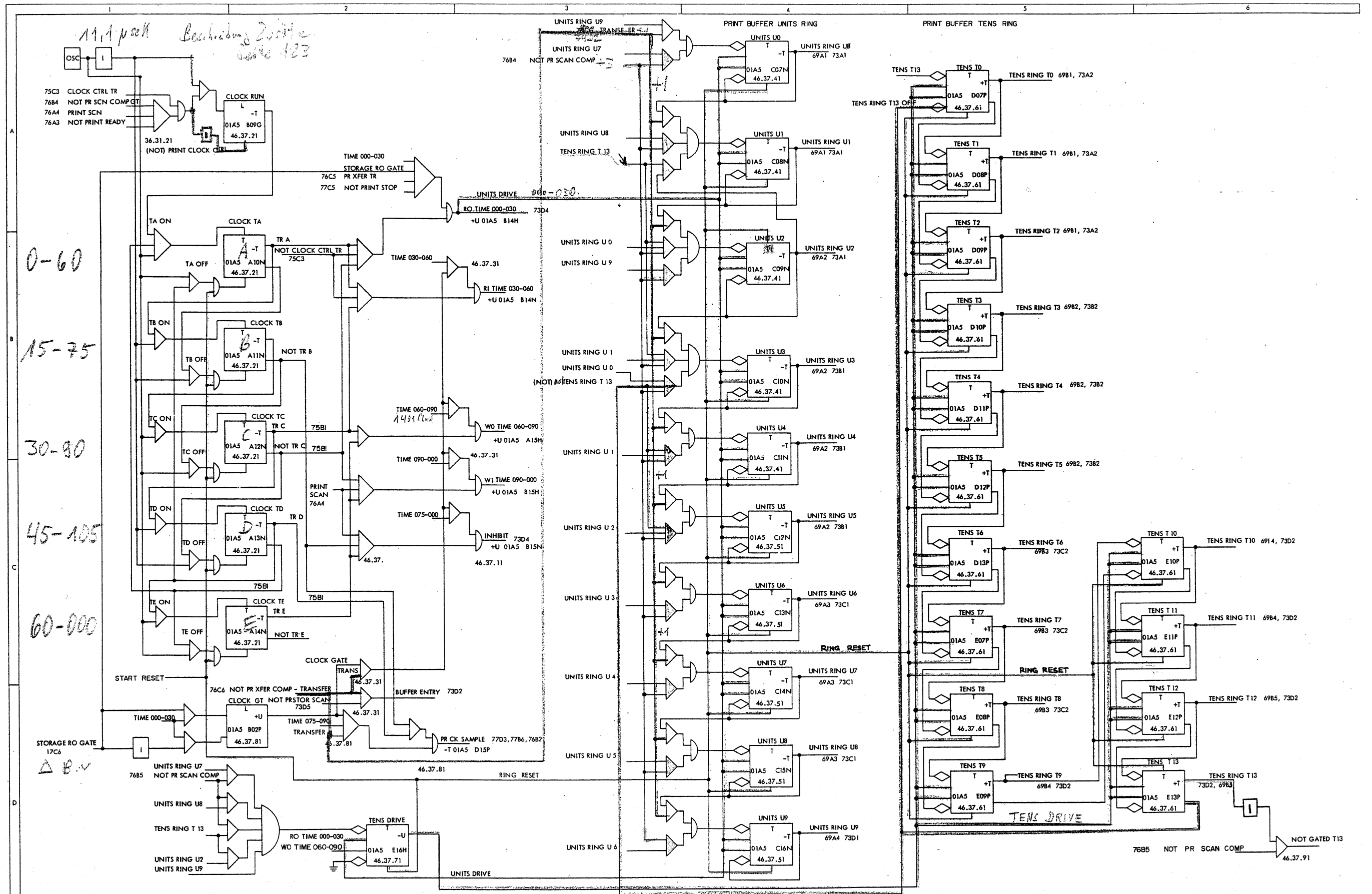
Side Buffer 200  
24 125

Sense Amp

Inhibit

74C2

74. PRINT BUFFER RINGS AND CONTROLS



11.1 p sec  
Beschreibung Zentrale  
Seite 123

0-60

15-75

30-90

45-105

60-000

Δ B W

A  
B  
C  
D

UNITS RING UP  
UNITS RING U7  
UNITS RING U8  
UNITS RING U9  
UNITS RING U0  
UNITS RING U1  
UNITS RING U2  
UNITS RING U3  
UNITS RING U4  
UNITS RING U5  
UNITS RING U6  
UNITS RING U7  
UNITS RING U8  
UNITS RING U9  
UNITS RING U0  
UNITS RING U1  
UNITS RING U2  
UNITS RING U3  
UNITS RING U4  
UNITS RING U5  
UNITS RING U6  
UNITS RING U7  
UNITS RING U8  
UNITS RING U9

PRINT BUFFER UNITS RING  
UNITS U0  
UNITS U1  
UNITS U2  
UNITS U3  
UNITS U4  
UNITS U5  
UNITS U6  
UNITS U7  
UNITS U8  
UNITS U9

PRINT BUFFER TENS RING  
TENS T0  
TENS T1  
TENS T2  
TENS T3  
TENS T4  
TENS T5  
TENS T6  
TENS T7  
TENS T8  
TENS T9  
TENS T10  
TENS T11  
TENS T12  
TENS T13

76B5 NOT PR SCAN COMP  
46.37.91

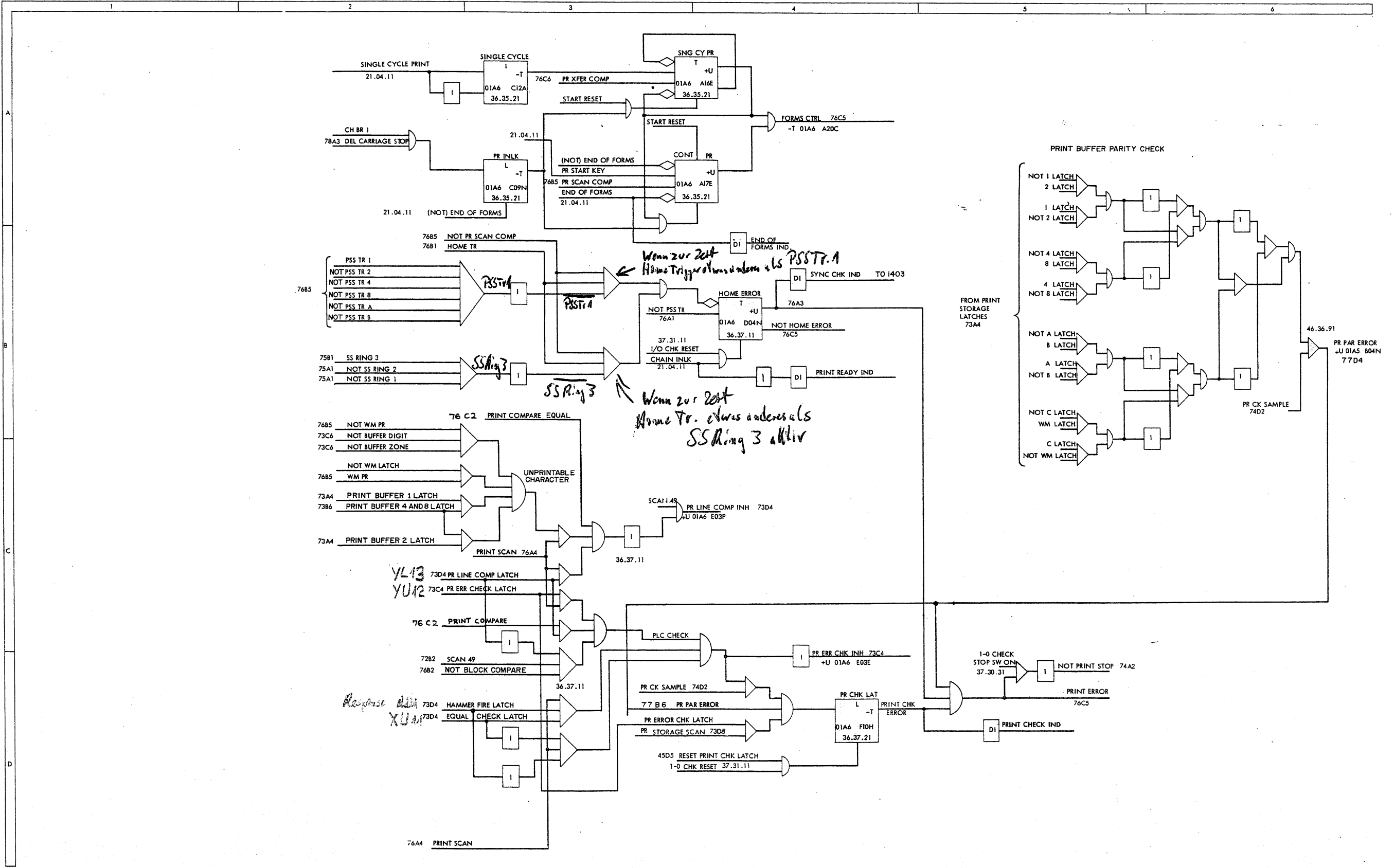
NOT GATED T13  
46.37.91







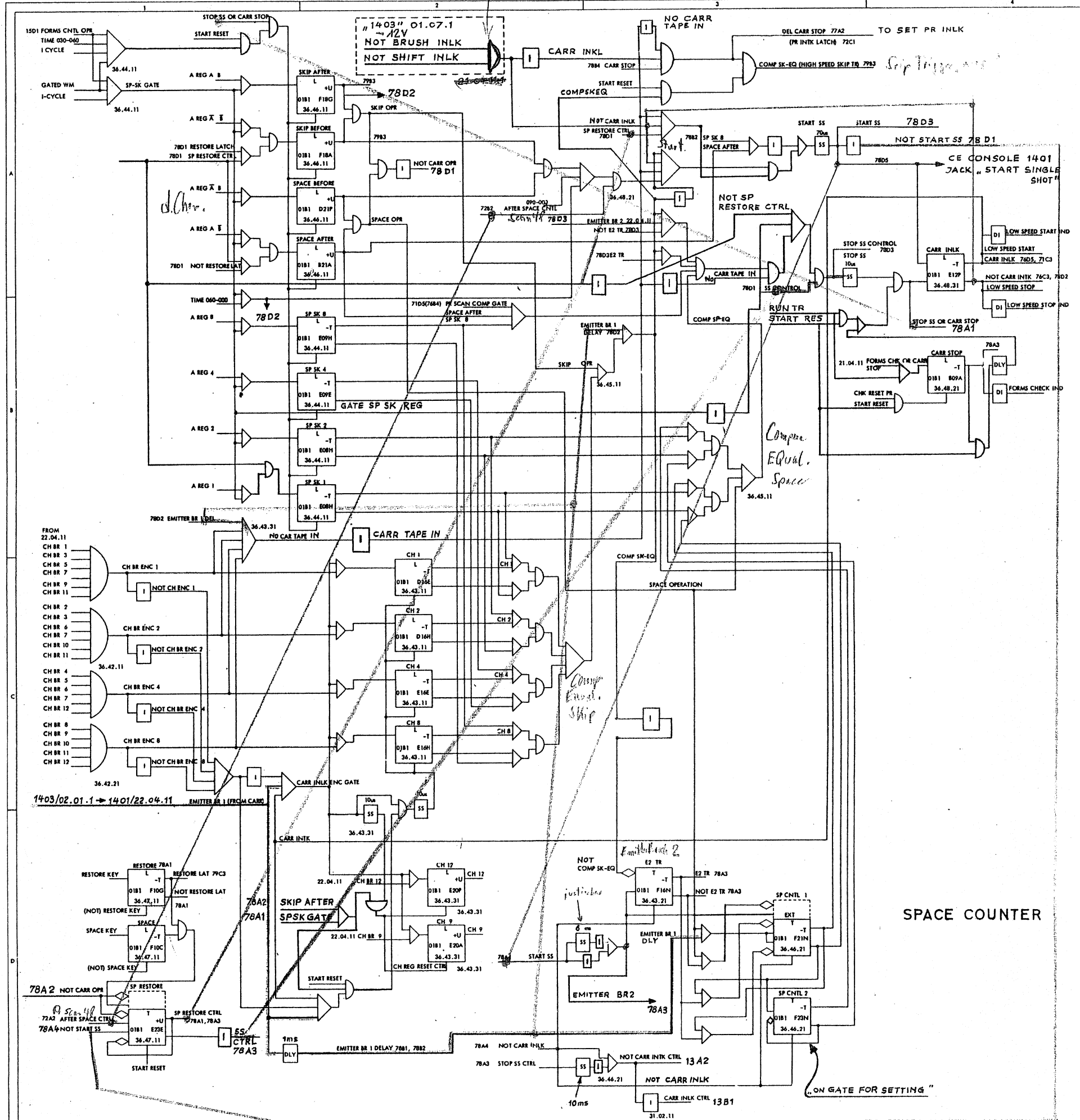
77. PRINT BUFFER CONTROLS



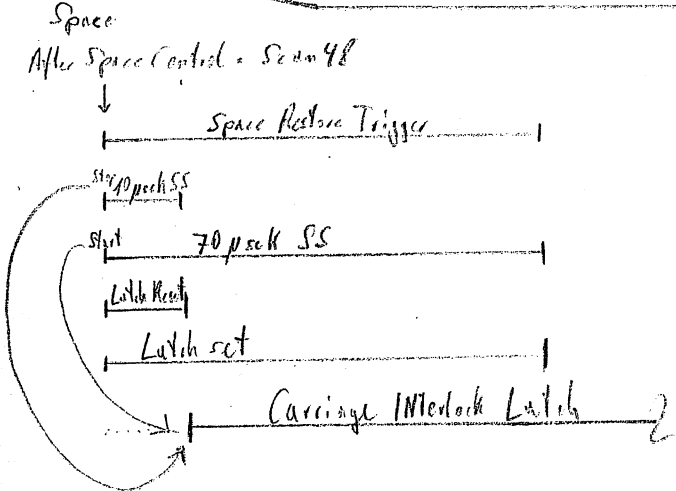




*Handwritten note: "Karr Inlet in Printer"*



SPACE COUNTER



78 CARRIAGE CONTROLS



Ret 2.3.1980

Proje AV 230 CO4 Remind bleibt aus  
weil Load Point von CO3 erhalten bleibt!

Load Pt Lücke zu spät Reset (an Indicator zu sehen)

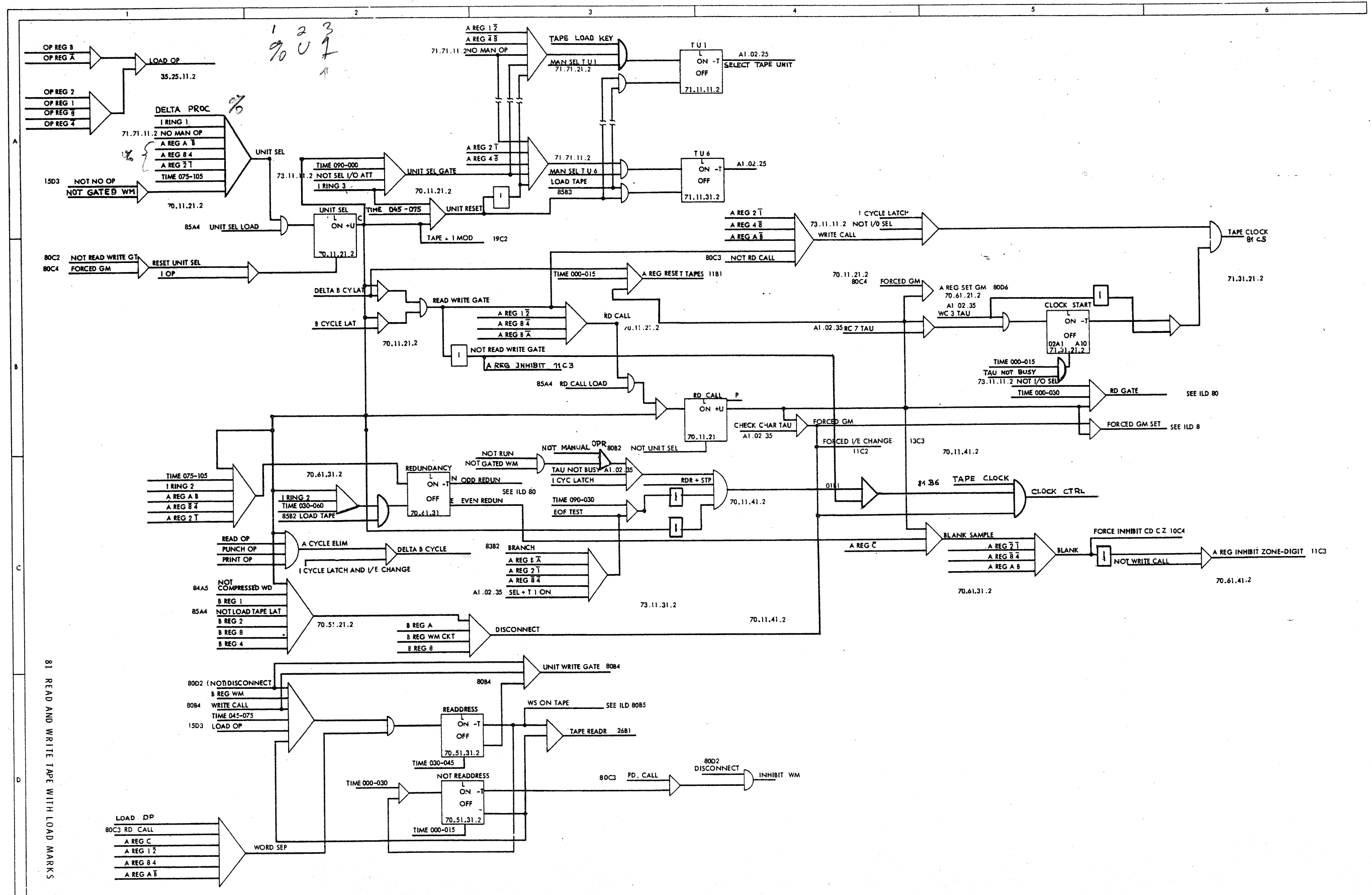
- U Load Pt. (71.31.21.)

LP Lücke (89.60.02)

DB2 Karte in OLBL CO8 - CO9 getauscht

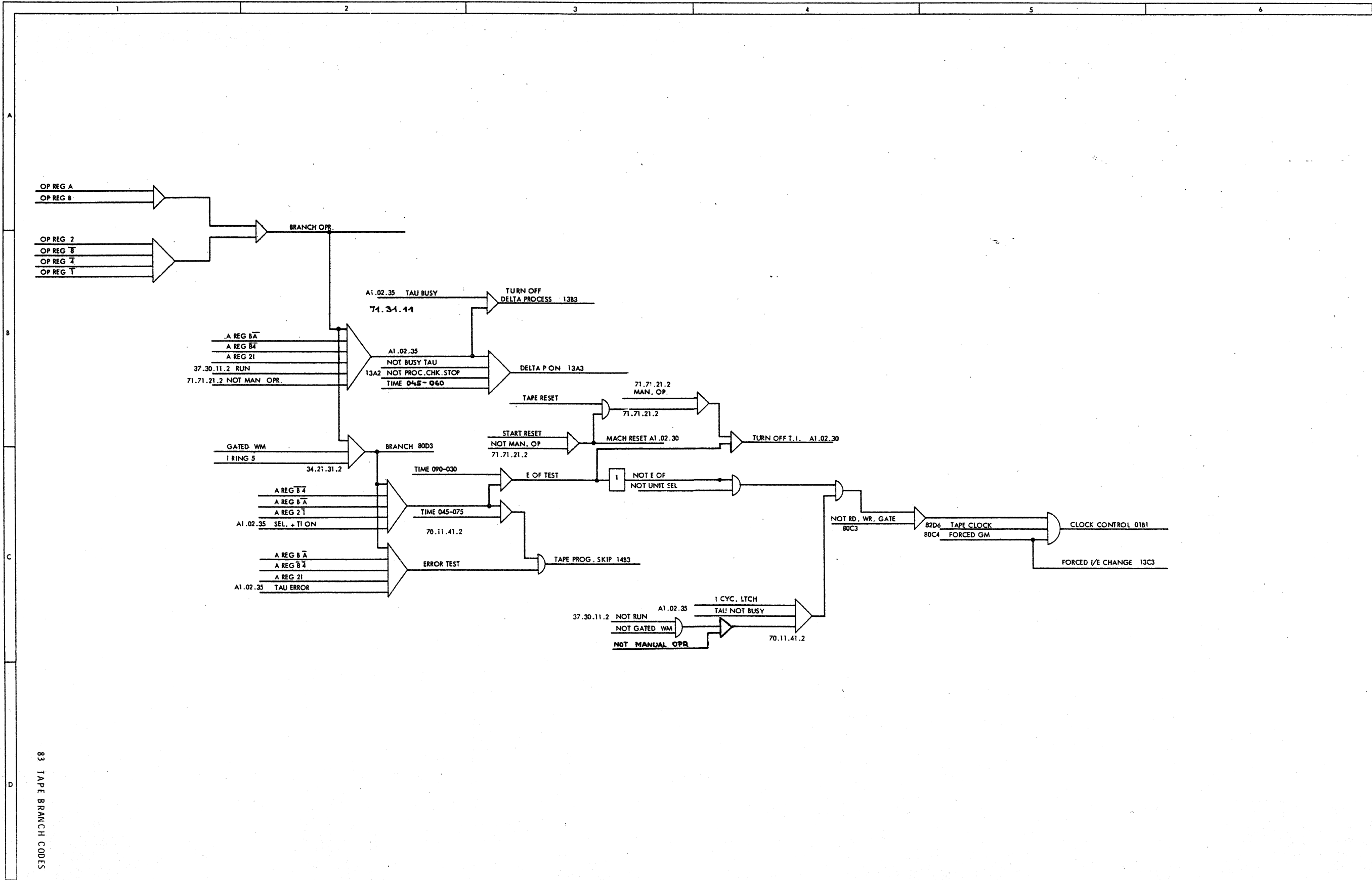
A-B System in CO9 wird  
nicht benötigt



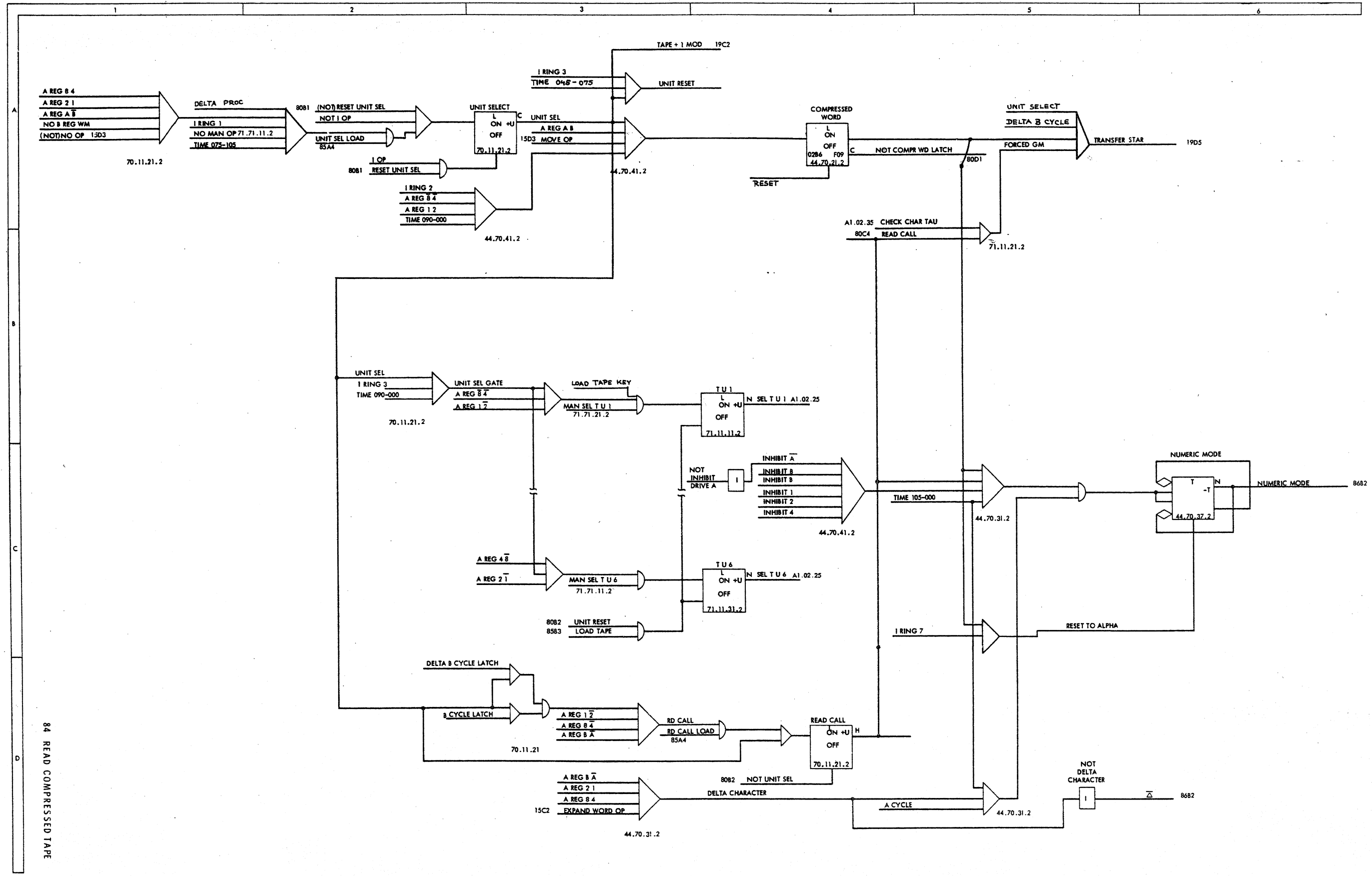


81 READ AND WRITE TAPE WITH LOAD MARKS



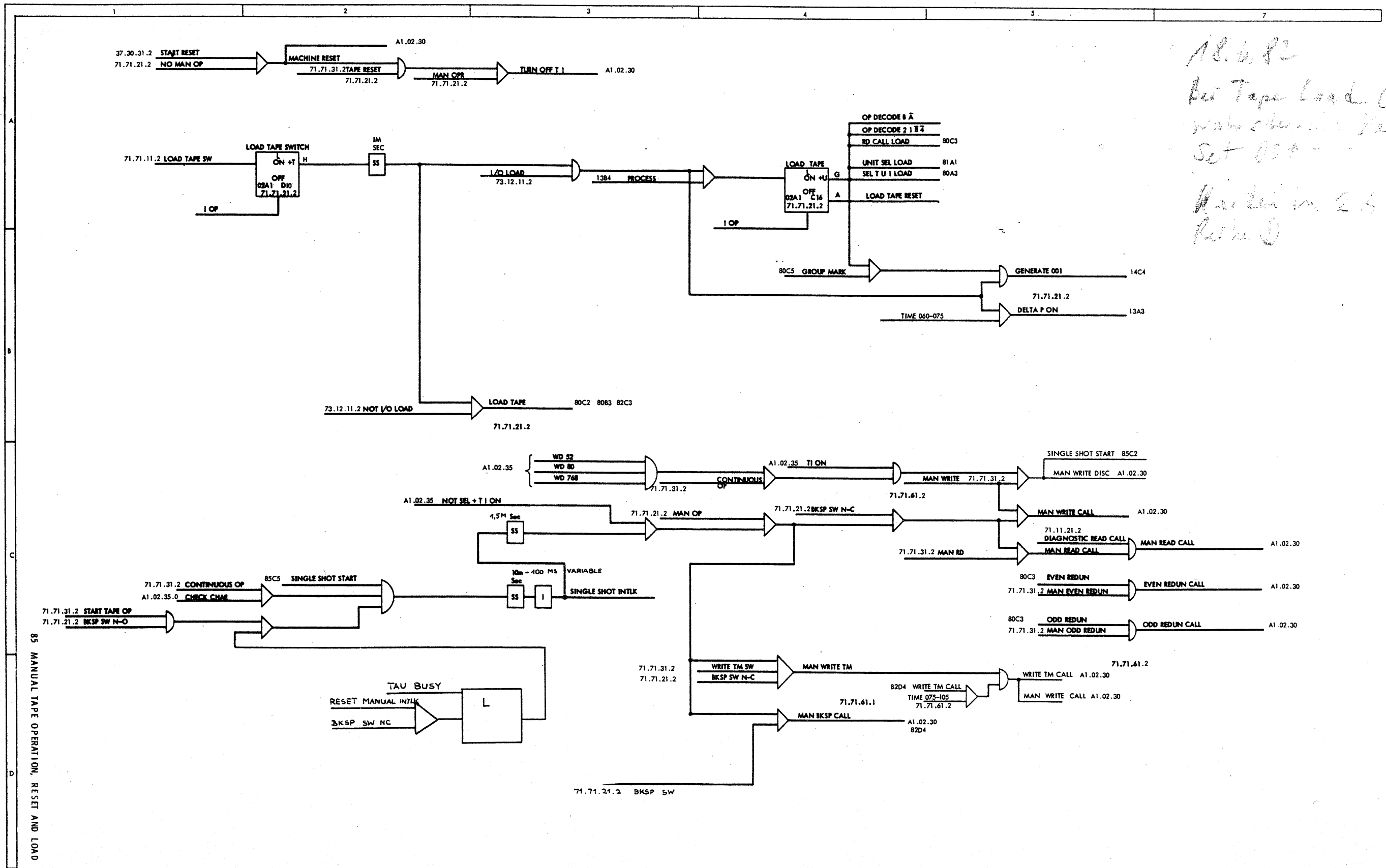


83 TAPE BRANCH CODES



84 READ COMPRESSED TAPE





*18.6.82*  
*for Tape Load (Khan on)*  
*write & check the table*  
*Set 001 -*  
*Warden in 2.5.1*  
*Relay 0*

85 MANUAL TAPE OPERATION, RESET AND LOAD

