

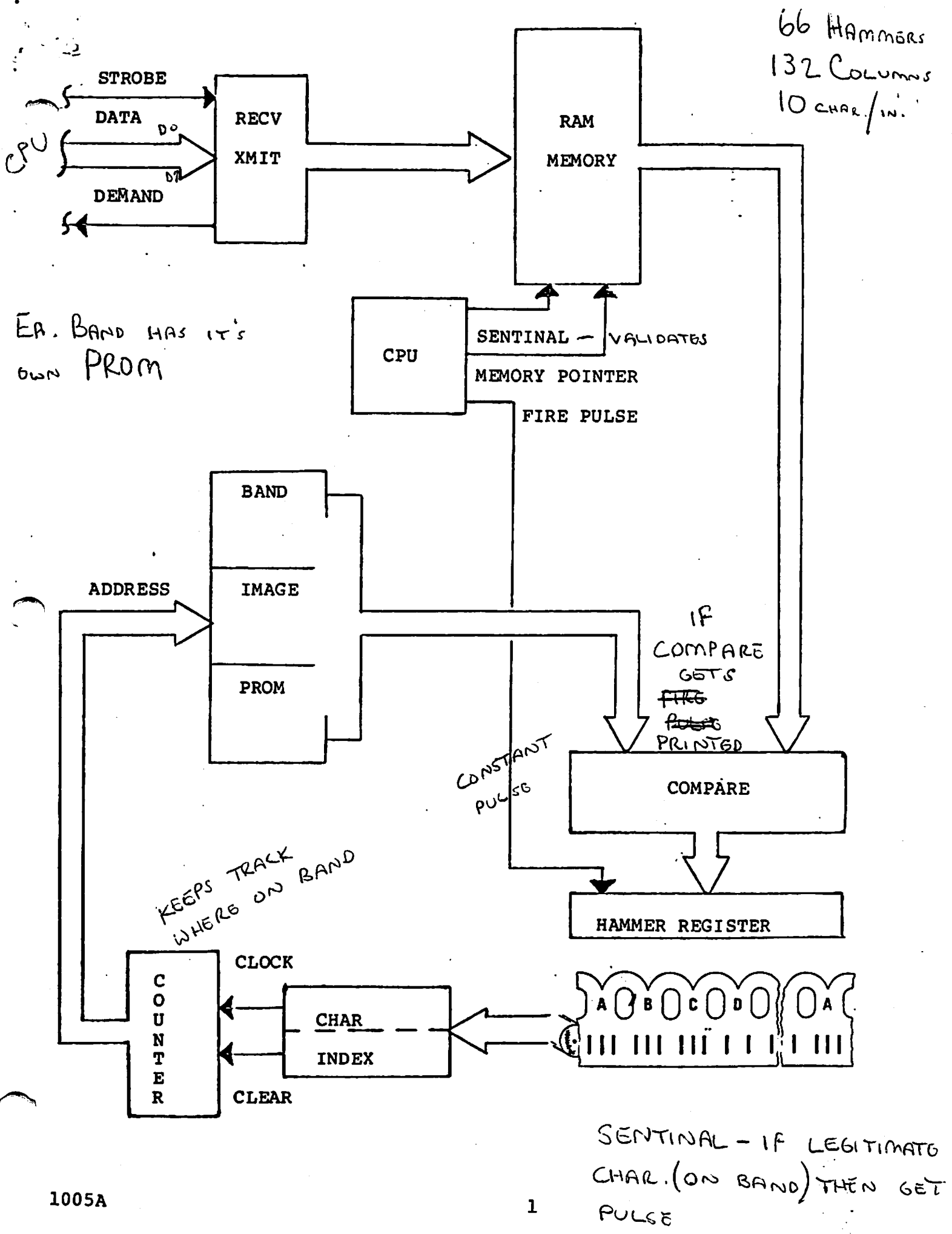
M. Bahia

WANG TECHNICAL TRAINING CENTER

VOLTAGES 14  
FLOWCHARTS 44

B-300 DATAPRODUCTS BAND PRINTER

STUDENT HANDOUTS



66 HAMMERS  
 132 COLUMNS  
 10 CHAR./IN.

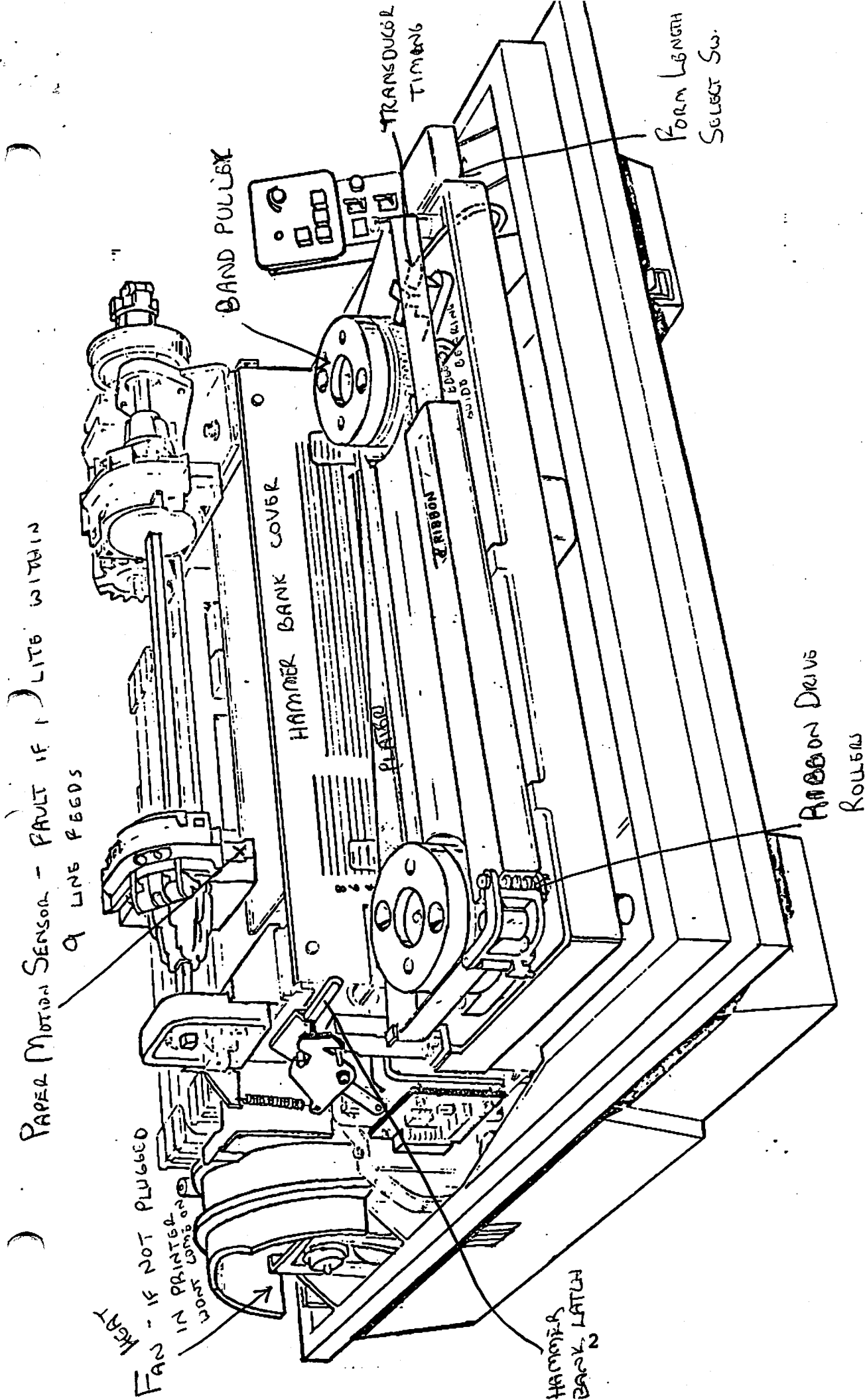
ER. BAND HAS IT'S  
 OWN PROM

IF COMPARE  
 GETS  
~~FLAG~~  
 PULSES  
 PRINTED

SENTINAL - IF LEGITIMATE  
 CHAR. (ON BAND) THEN GET  
 PULSE

PAPER MOTION SENSOR - FAULT IF 1 LITE WITHIN 9 LINE FEEDS

FAN - IF NOT PLUGGED IN PRINTER WORKS COMPARE



BAND PULLEY

HAMMER BANK COVER

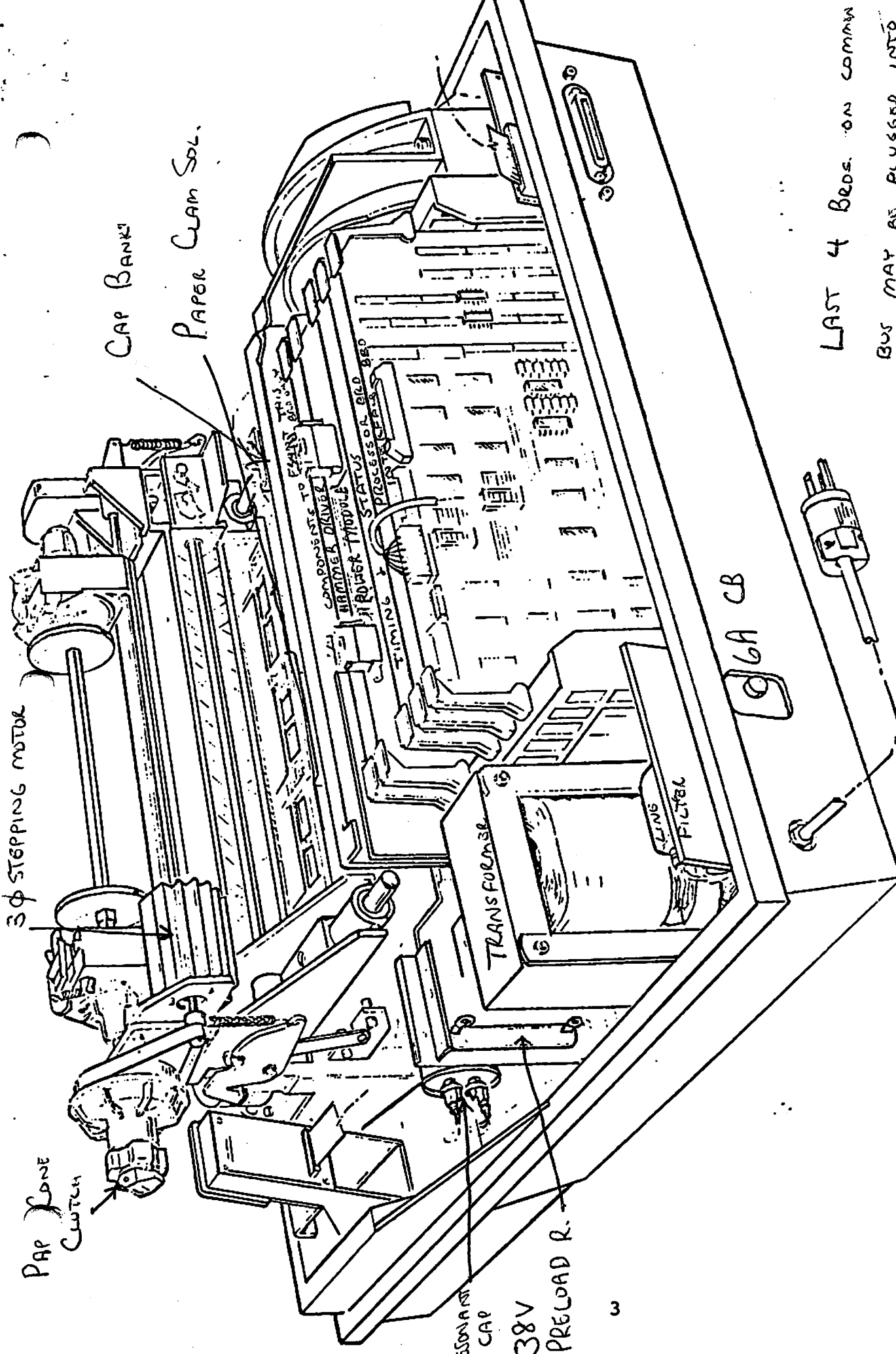
RIBBON

TRANSDUCER TIMING

FORM LENGTH SELECT SW.

ARIBON DRIVE ROLLERS

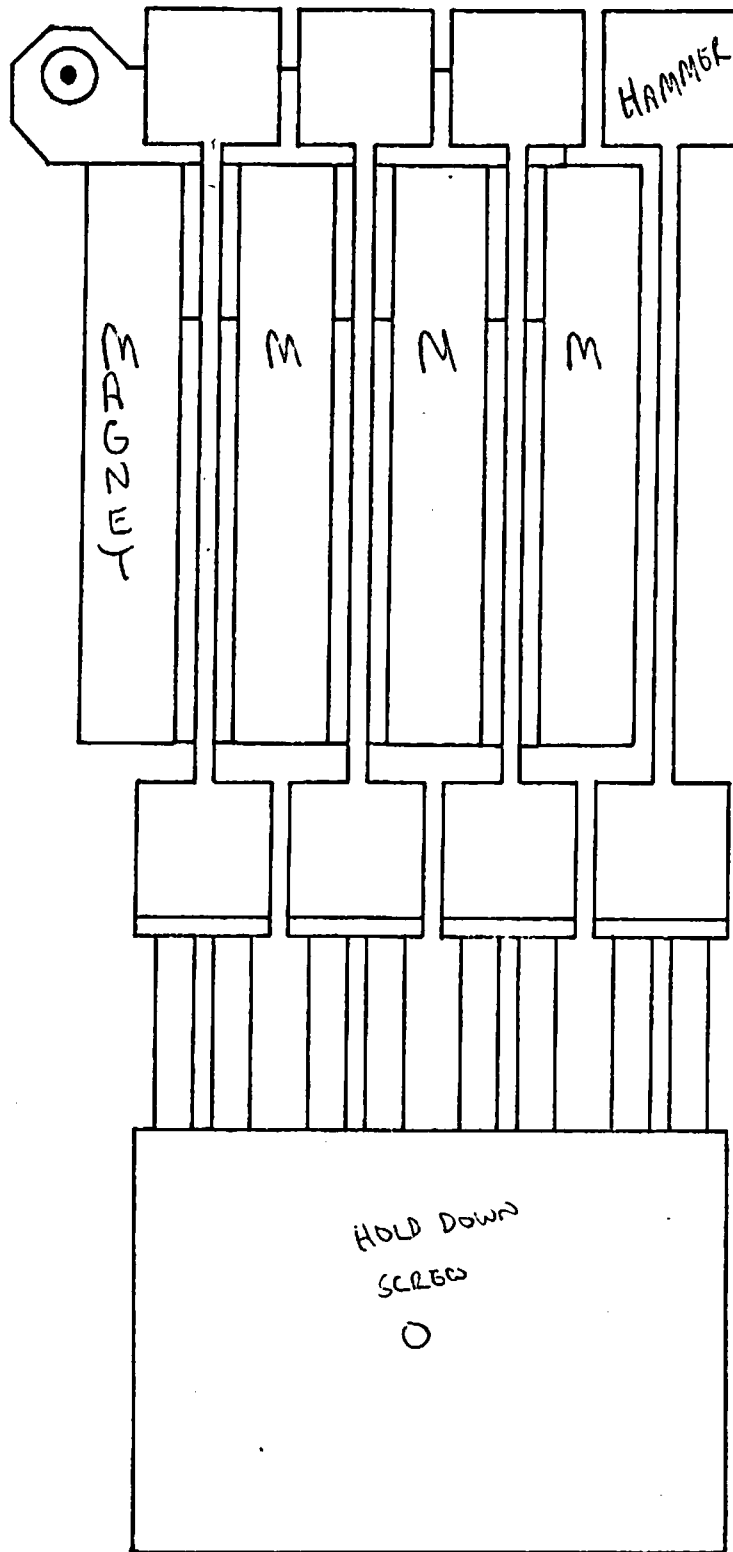
HAMMER BACK LATCH

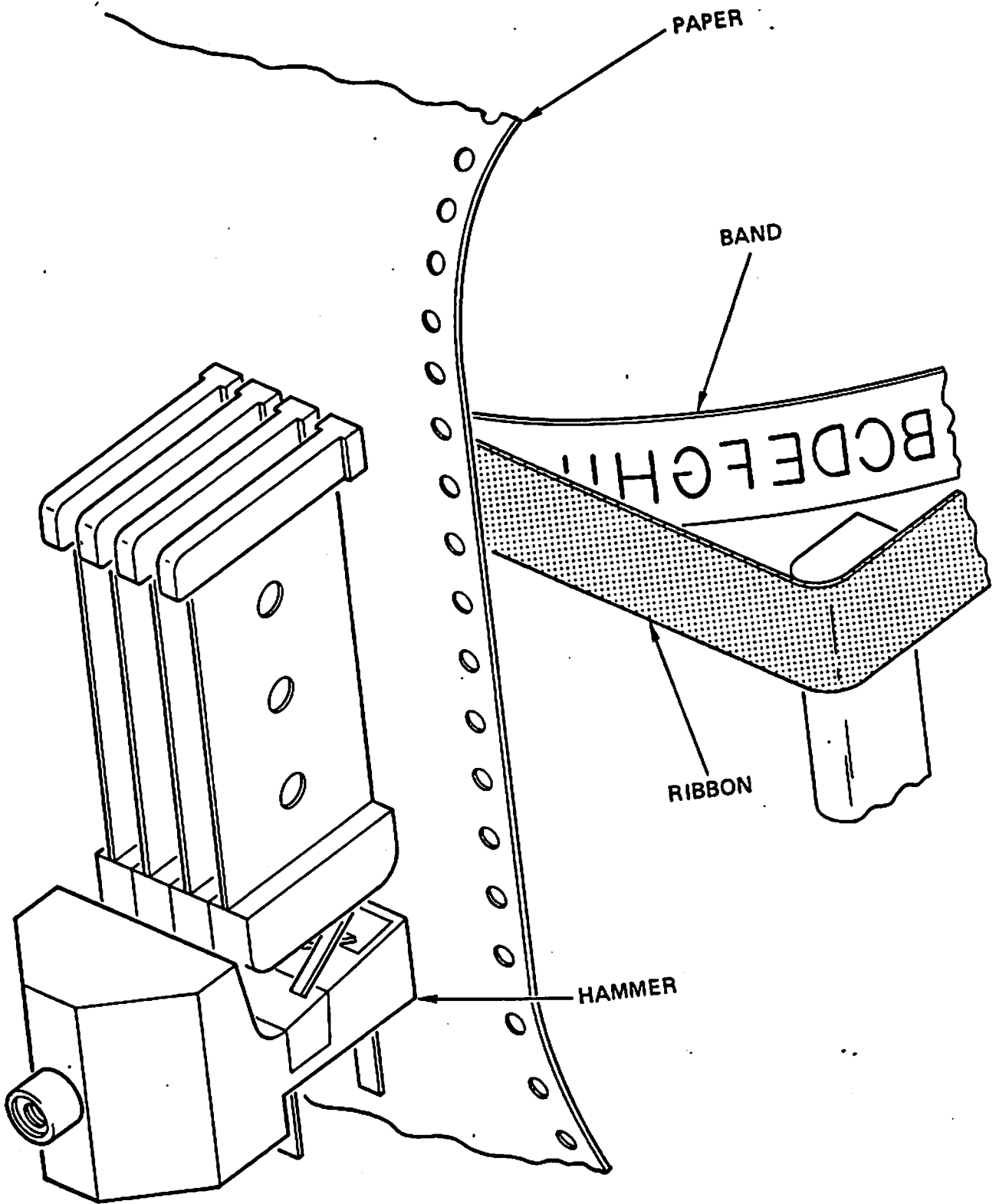


LAST 4 BEDS. ON COMMON  
 BUS MAY BE PLUGGED INTO  
 ANY SLOT COMPONENTS FACE  
 BACK.

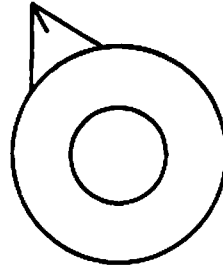
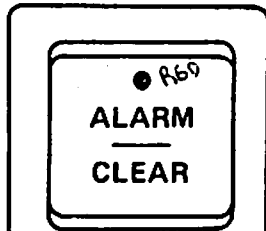
HAMMER DRIVER  
 CLOSEST TO FRONT,  
 COMPONENTS FACE FRONT.

# HAMMER ASSY.

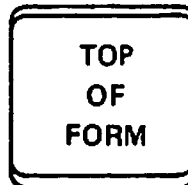
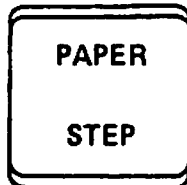
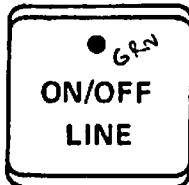




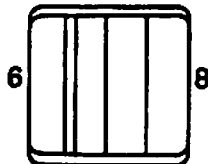
POWER INDICATOR LIGHT



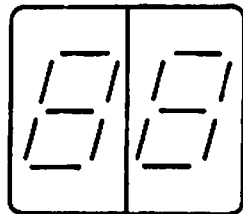
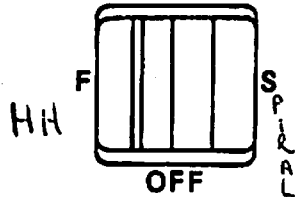
PHASE



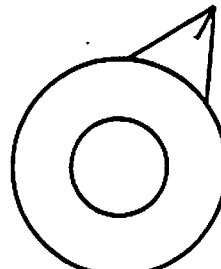
LINES



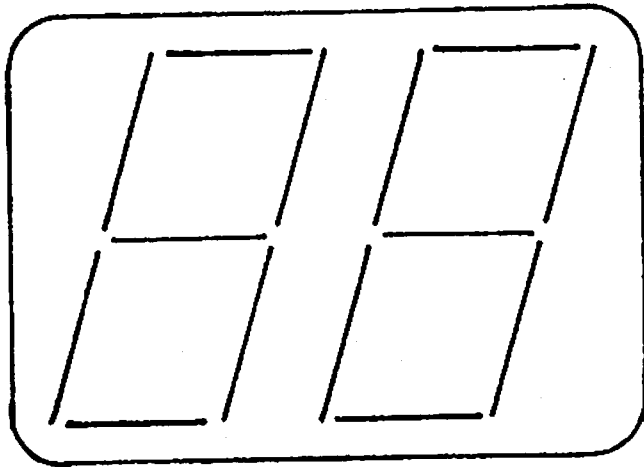
TEST



STATUS DISPLAY

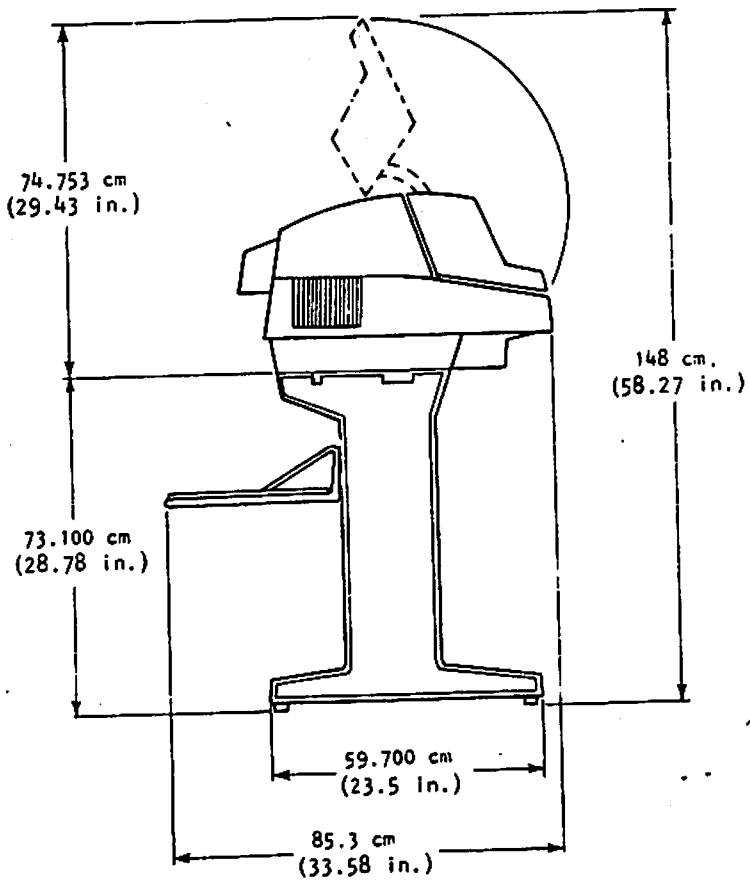
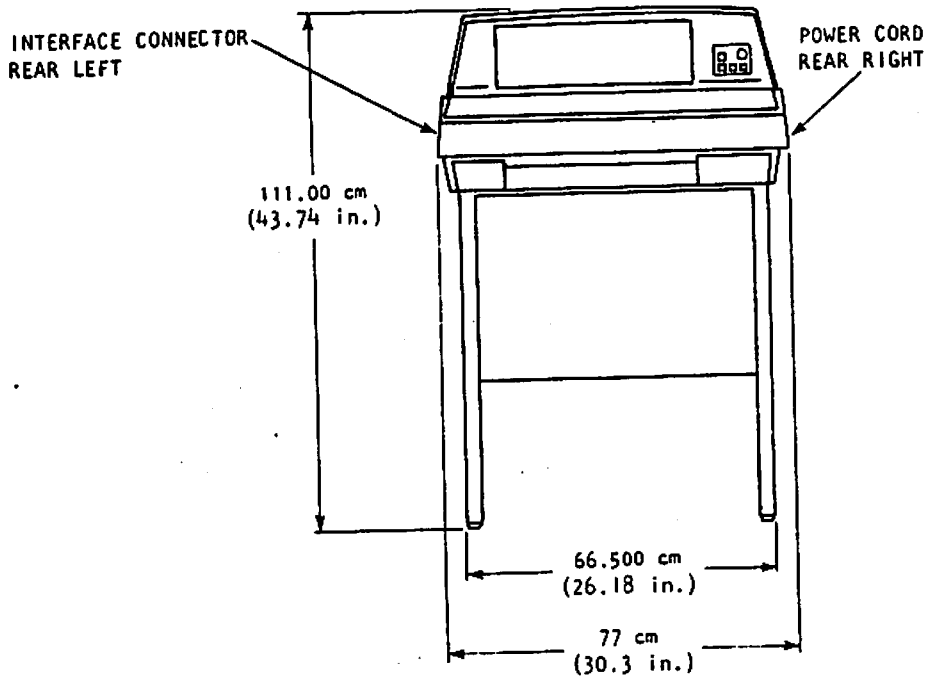


COPIES



**STATUS DISPLAY**





Band Arrangement 64 character set

48 48 48 48 16

Characters contained in 64 character set, four (4) sets:

SPACE, ! " # \$ % & ' ( ) \* + , \_ . / 0 1 2 3 4  
5 6 7 8 9 : ; < = > ? @ A B C D E F G H  
I J K L M N O P Q R S T U V W X Y Z [ \\  
] ^ -

Characters contained in low usage 16 character set, one (1) set:

£ ! " # ' + ; ( = ) ? @ [ \ ] ^

Band Arrangement. 96 character set

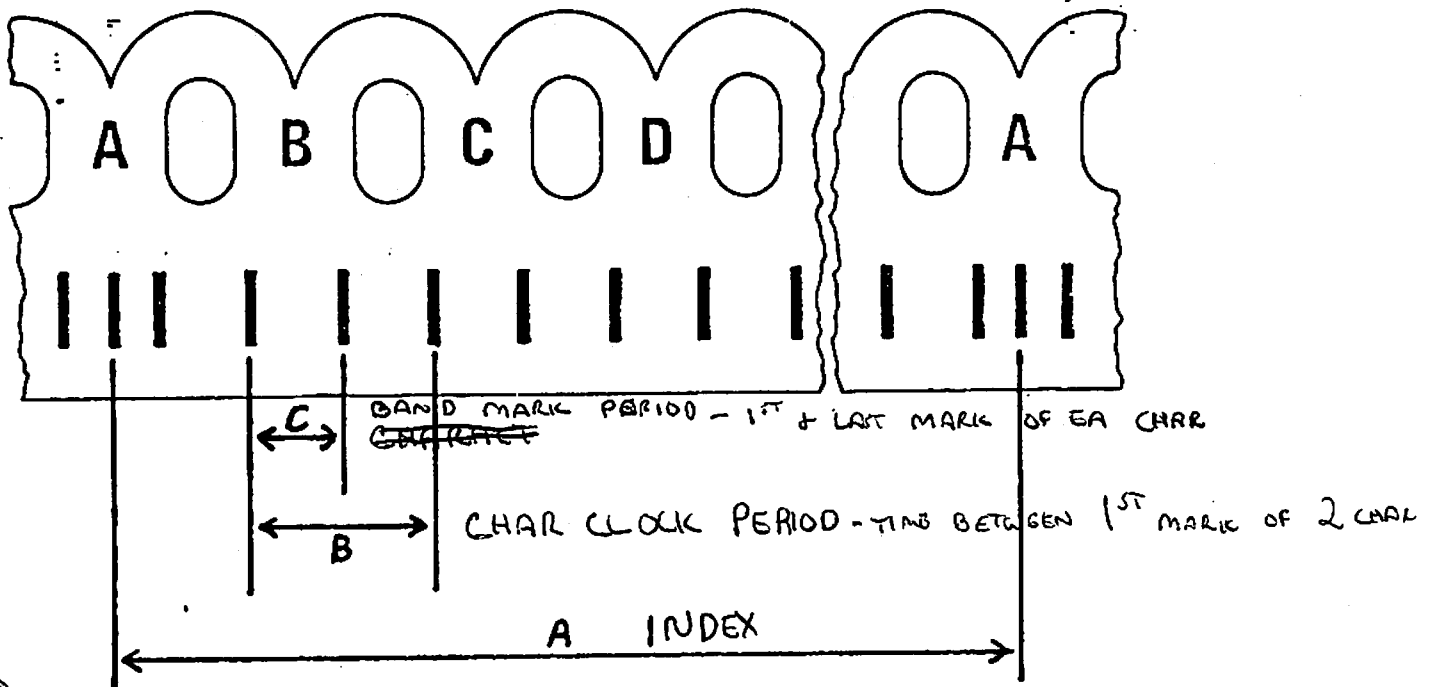
96 96 16

Characters contained in 96 character set, two (2) sets:

SPACE,	!	"	#	\$	%	&	'	(	)	*	+	,	_	.	/	0	1	2	3	4
5'	6	7	8	9	:	;	<	=	>	?	@	A	B	C	D	E	F	G	H	
I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	
]	^	-	\	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	
q	r	s	t	u	v	w	x	y	z											

Characters contained in high usage 16 character set, one (1) set:

. \* a , e t 0 1 2 3 4 5 6 7 8 9

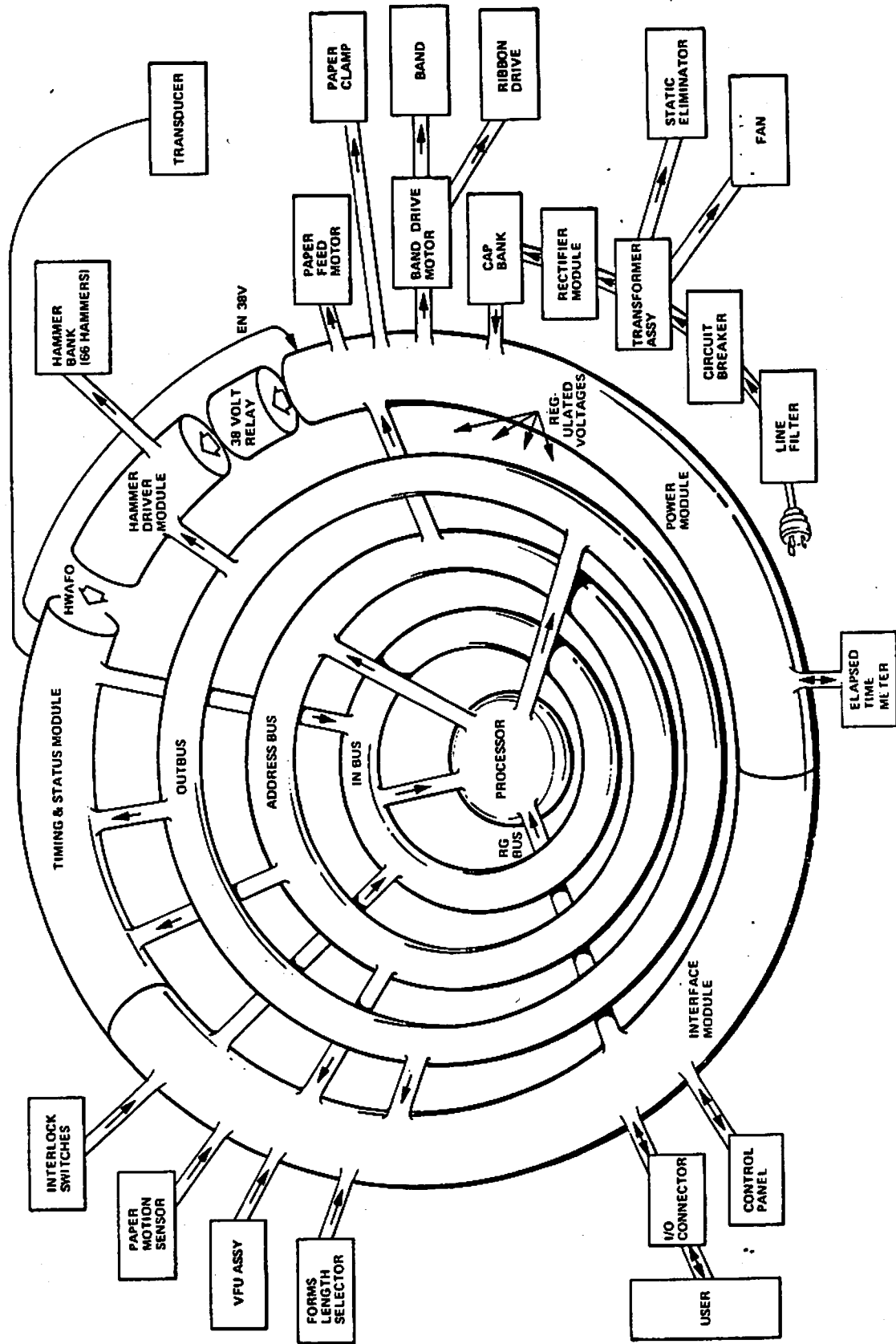


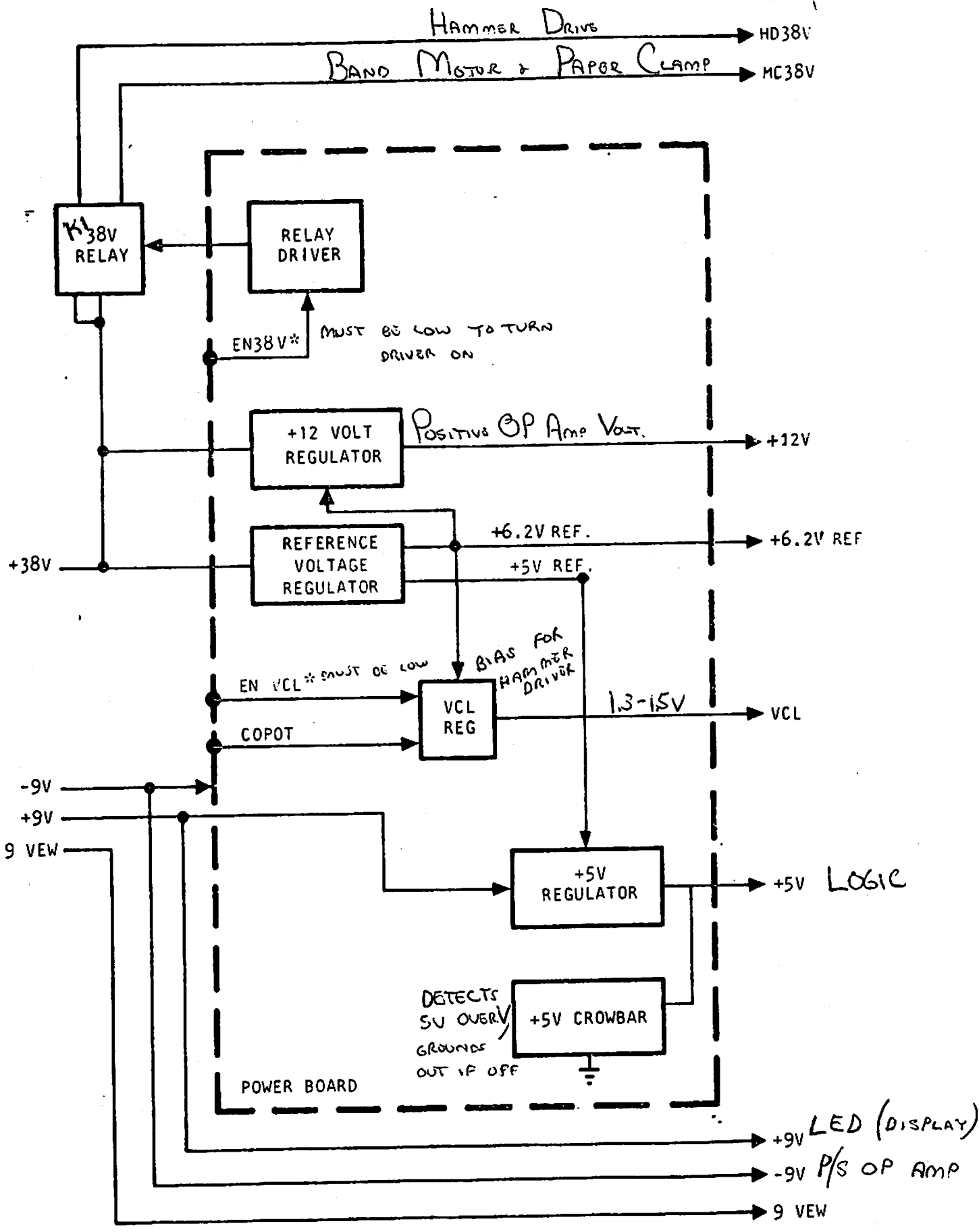
BAND SPEED \_\_\_\_\_ = BS 165"/SEC.  
 BAND LENGTH \_\_\_\_\_ = BL 46.8"  
 CHAR ON BAND \_\_\_\_\_ = CB 208

$$A = \frac{BL}{BS} = \frac{46.8''}{165''/\text{SEC.}} = \underline{283.6} \text{ MSEC.}$$

$$B = \frac{A}{CB} = \frac{283.6 \text{ msec.}}{208 \text{ CHAR.}} = \underline{1.364} \text{ MSEC.}$$

$$C = \frac{B}{2} = \frac{1.364 \text{ msec.}}{2} = \underline{682} \text{ USEC.}$$



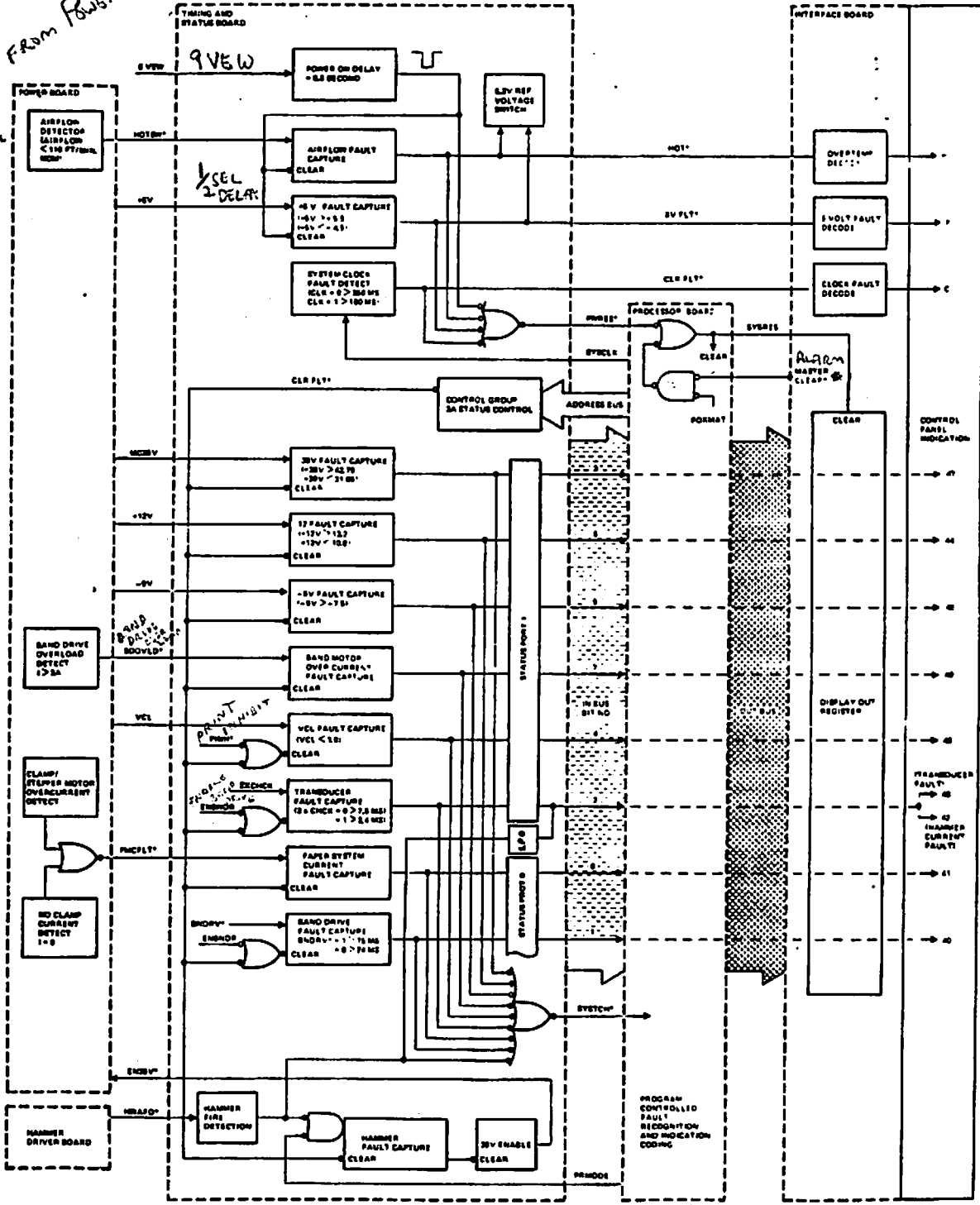


Low - < 1 VOLT  
 Hi - 5V

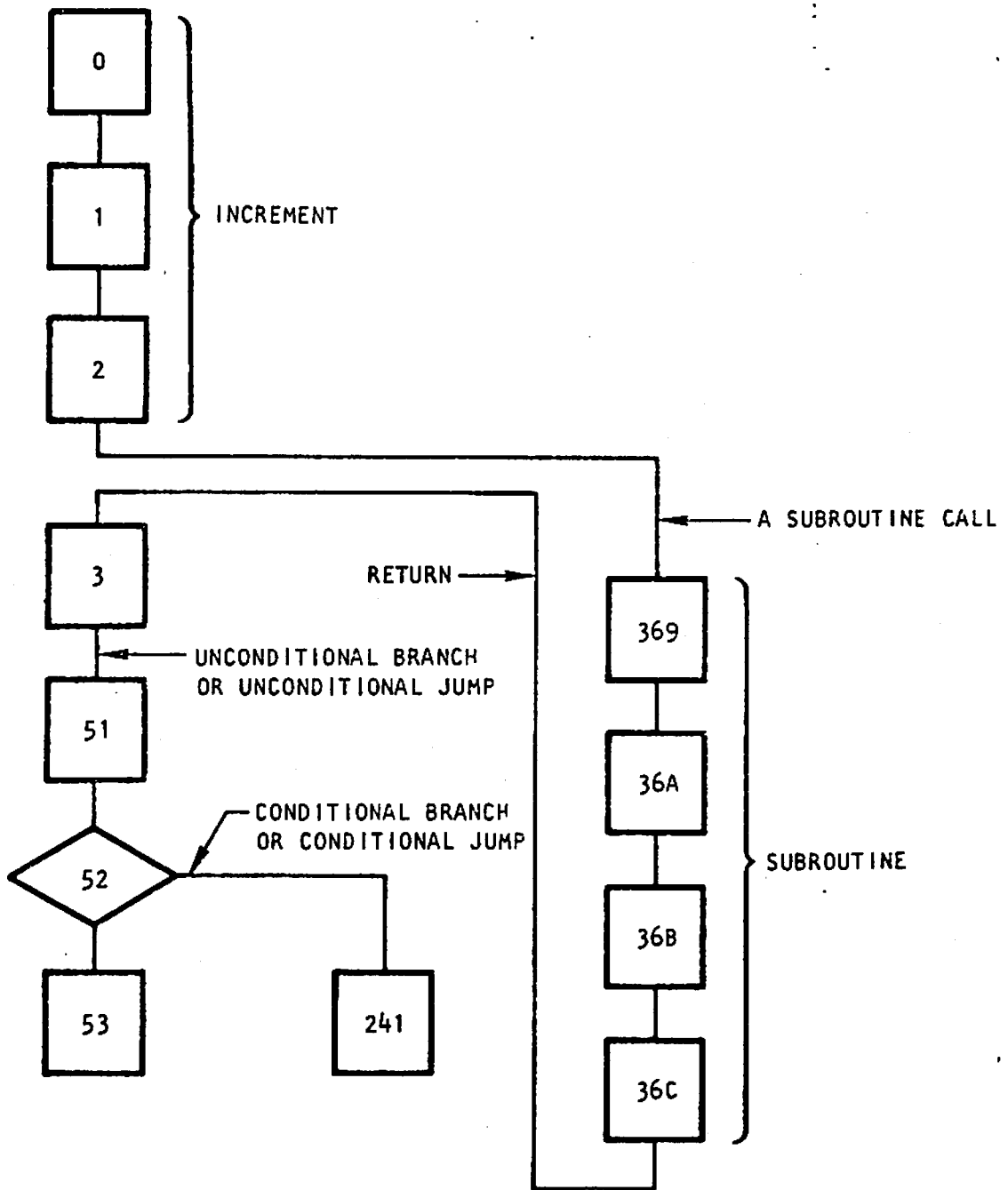
\* ACTIVE LOW

TIMING & STATUS BOARD

2 MIN FROM POW5R ON  
80 USEC WHILE RUN



HWAFO 7.5 NORMAL  
4.2 WHEN FIRING





ADR OP CODE

INSTRUCTION MNEUMONIC

COMMENTS

//  
//INITIALIZE  
/

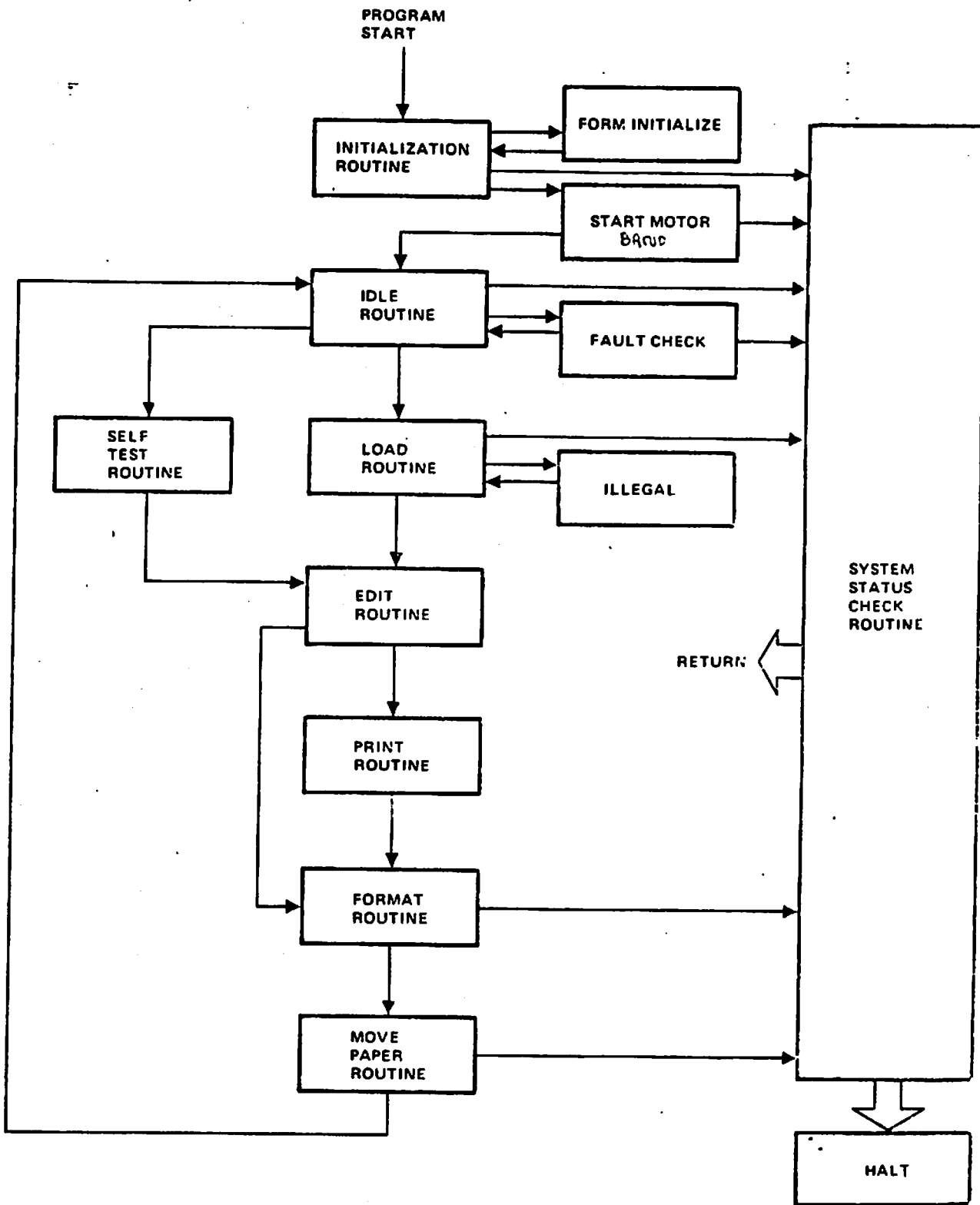
000	003C4	MVI TIME 001	/55 USEC DELAY
001	70A1A	CALL TMCK1	/TIMEOUT?
002	11044	MVI TAC1 088	//// NORMAL DISPLAY TEST ////
003	0043F	XFRA FAC1	/OUTPUT DISPLAY DATA
004	D3024	LDISPY	/LOAD DISPLAY
005	0760D	CLR W RD	/CLR FLAG REG
006	73024	CLFLTS	
007	1B423	ITSTS STP1	/MINUS 9V FLT?
008	6763C	BOEQ STA3	/YES
"	"	"	"
"	"	"	"
"	"	"	"
"	"	"	"
"	"	"	"
"	"	"	"

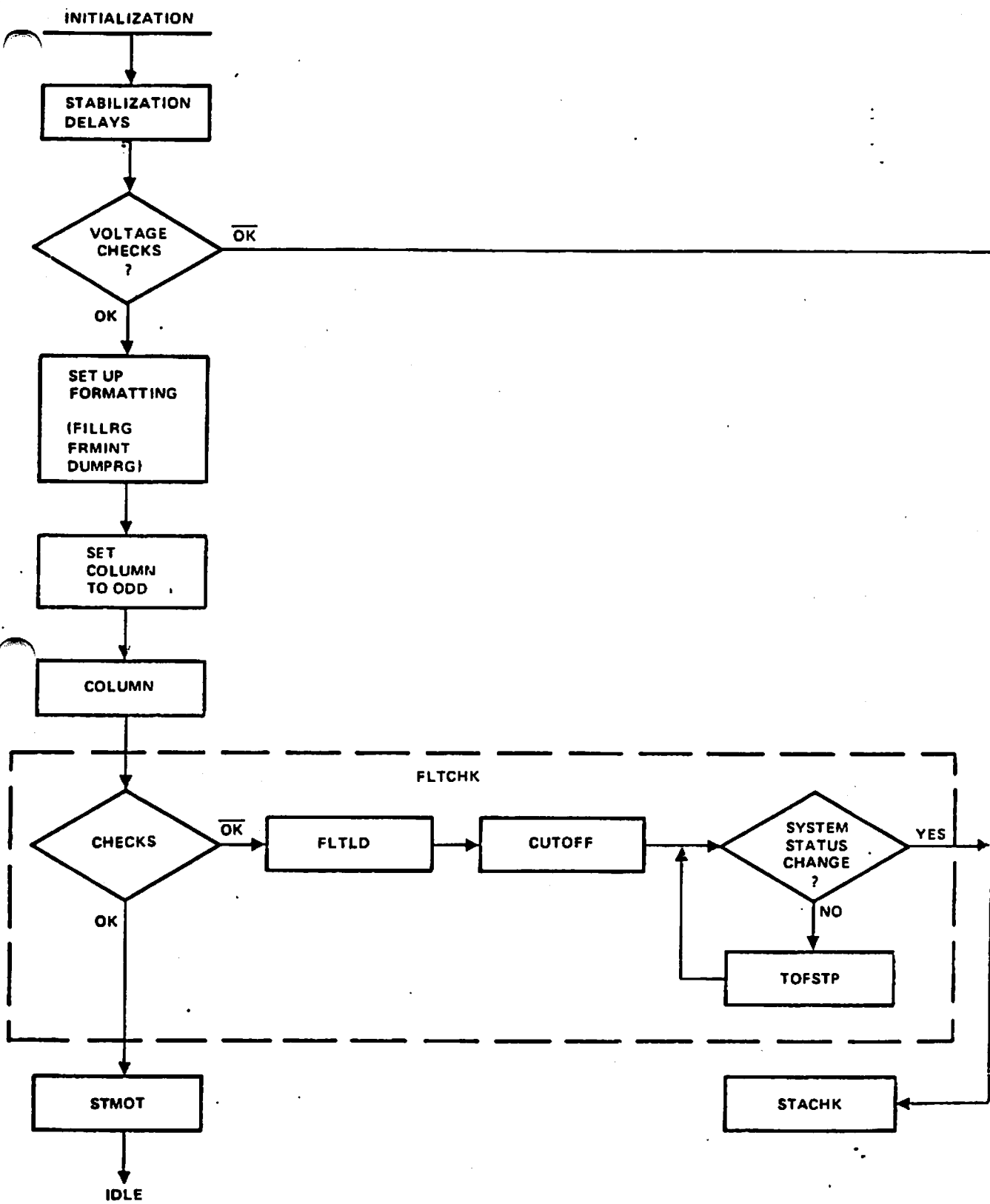
/

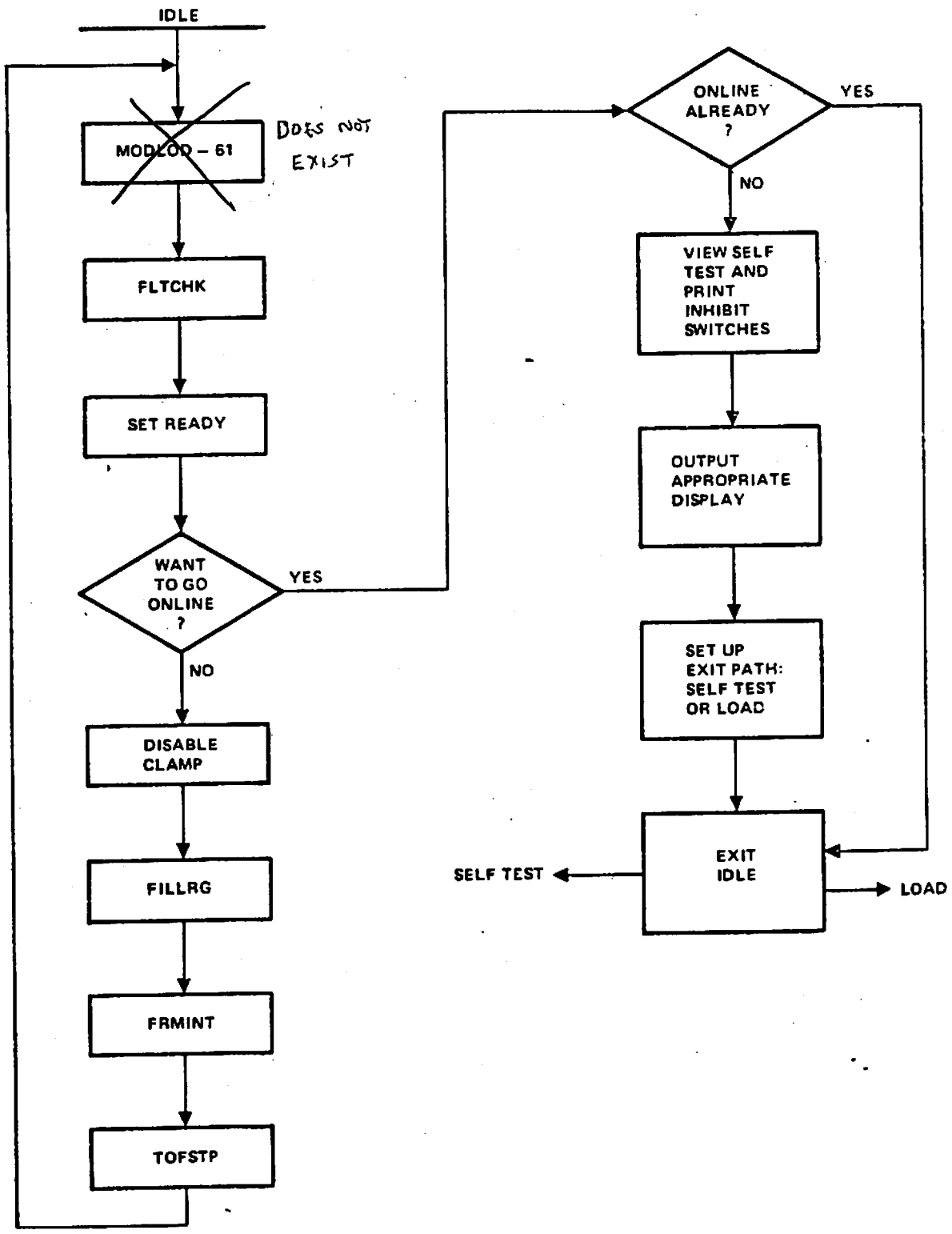
//SUBROUTINE TO WAIT FOR TIMEOUT

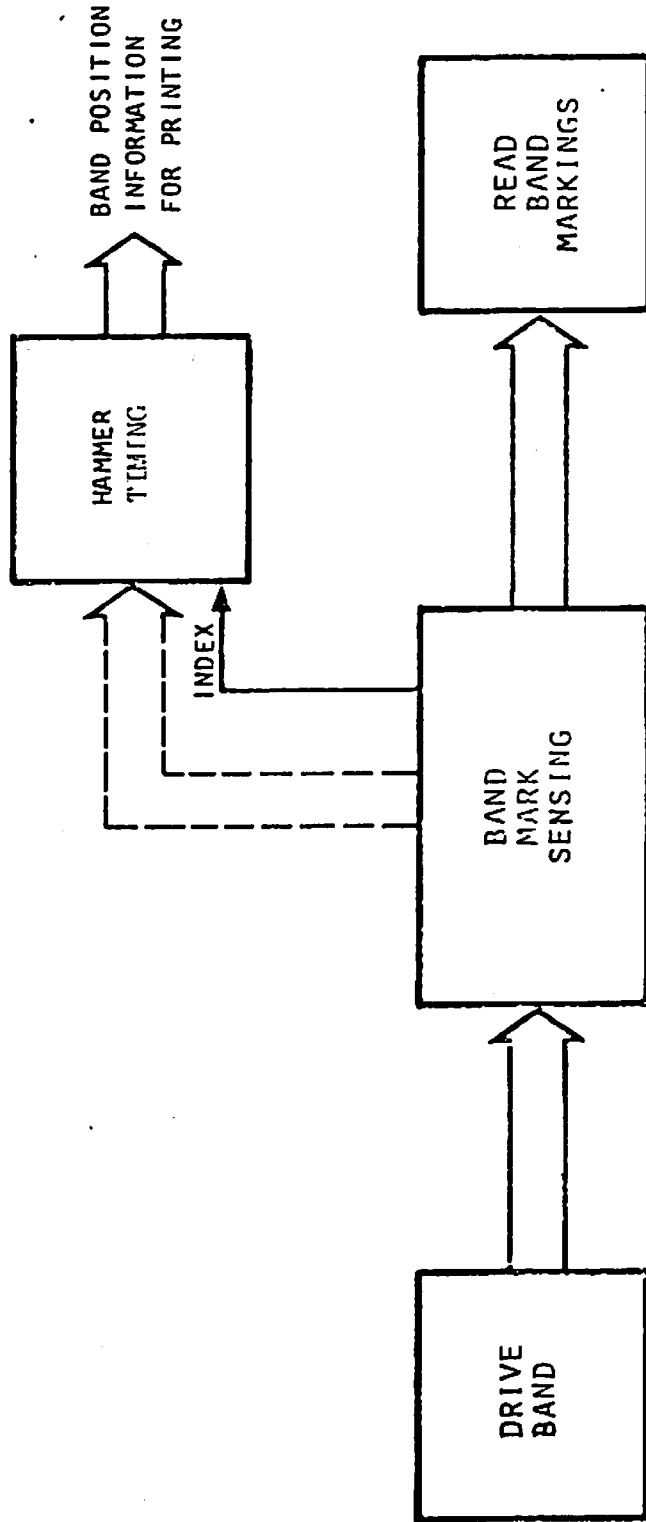
/

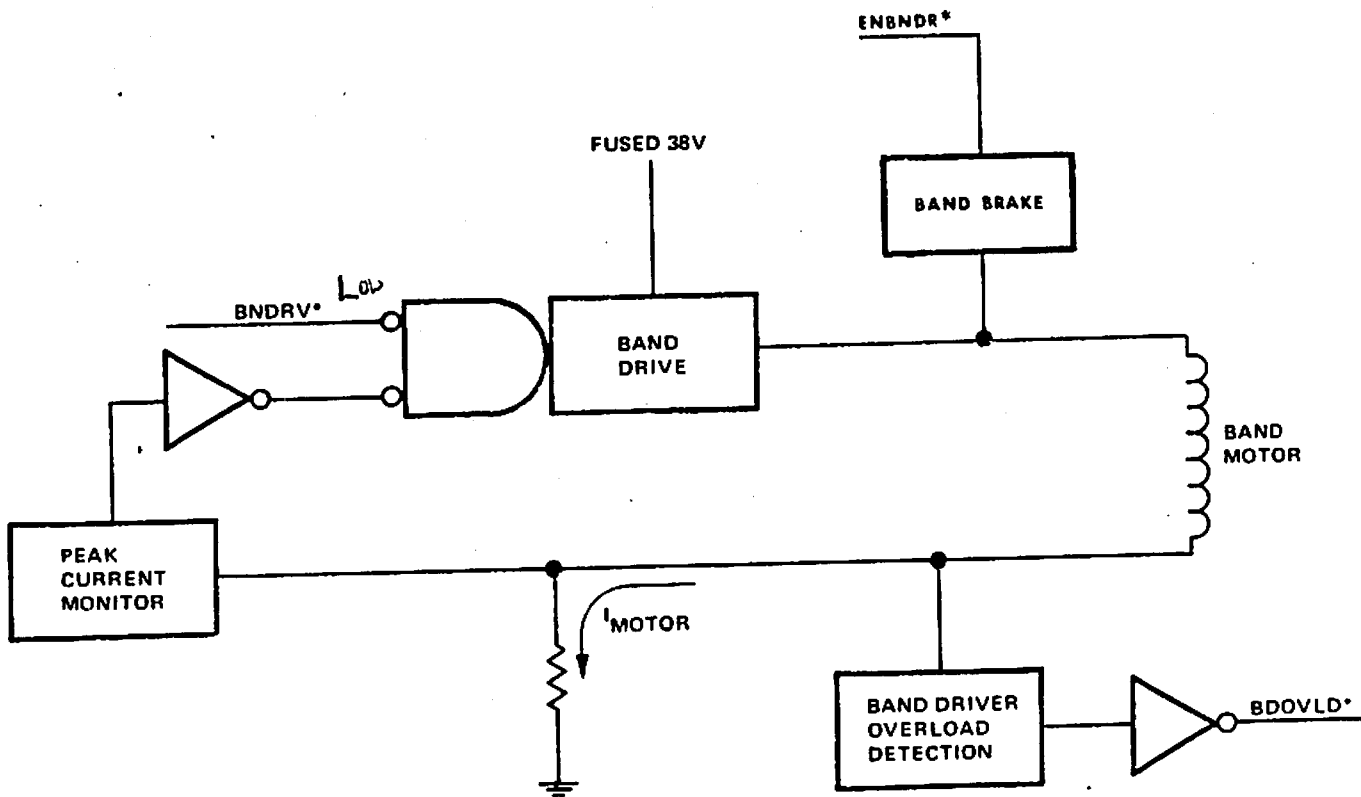
387	22823	TMCK1: ITST2 PORT1	/TIMEOUT?
388	00050	RNEQ	/YES
389	70E1C	Bun -2	/NO
"	"	"	"
"	"	"	"
38C	00010	RETURN	

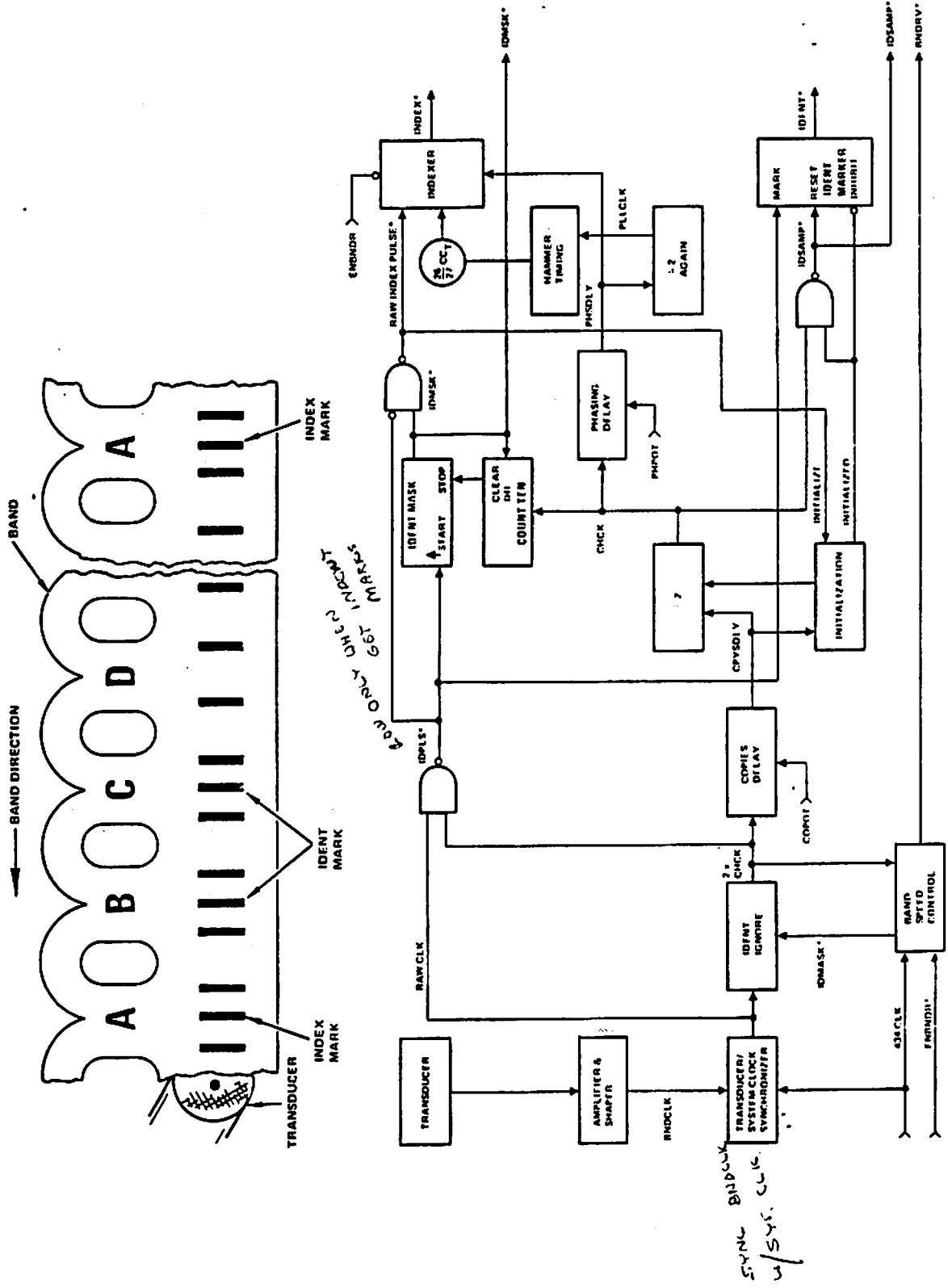


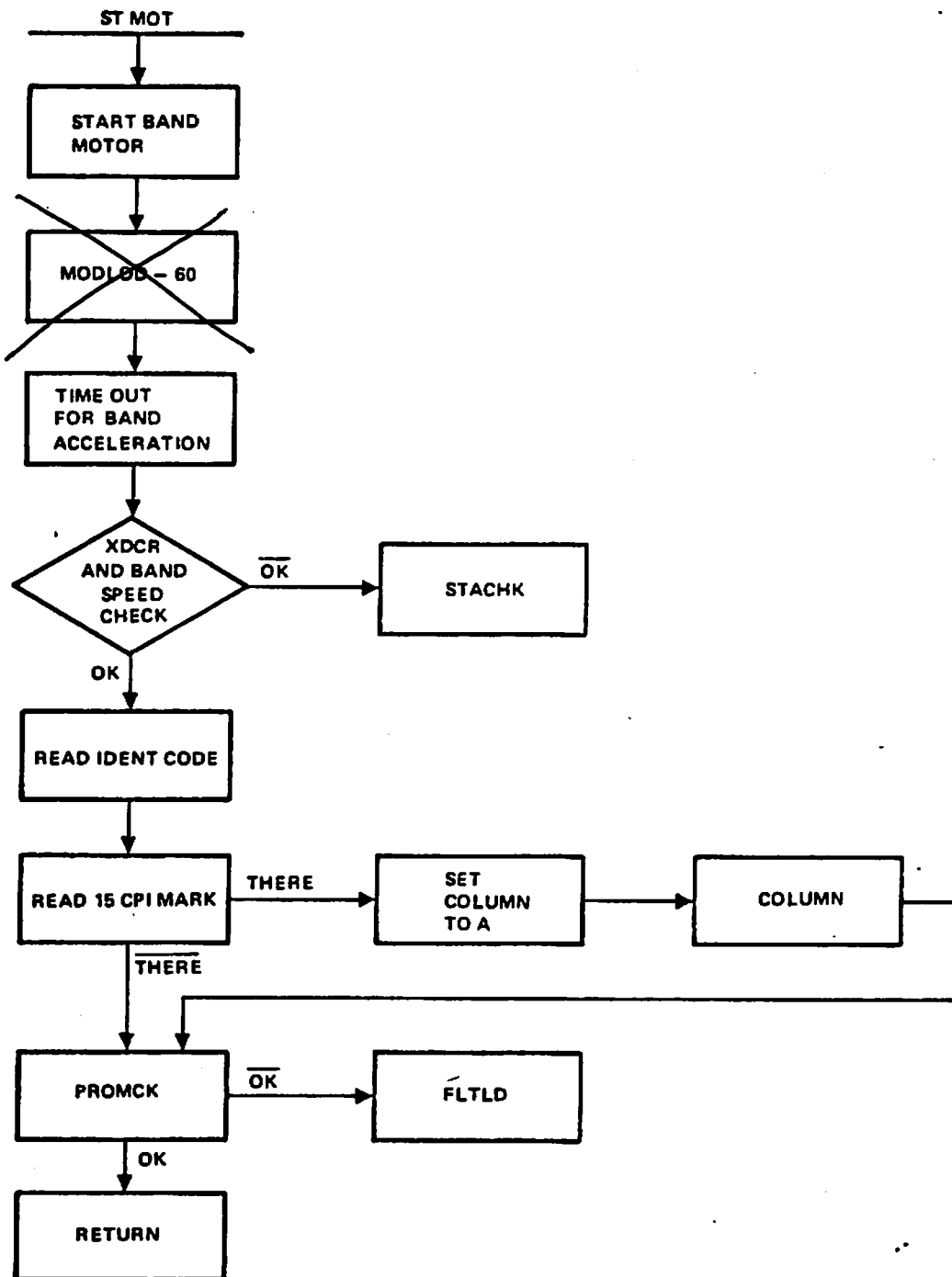




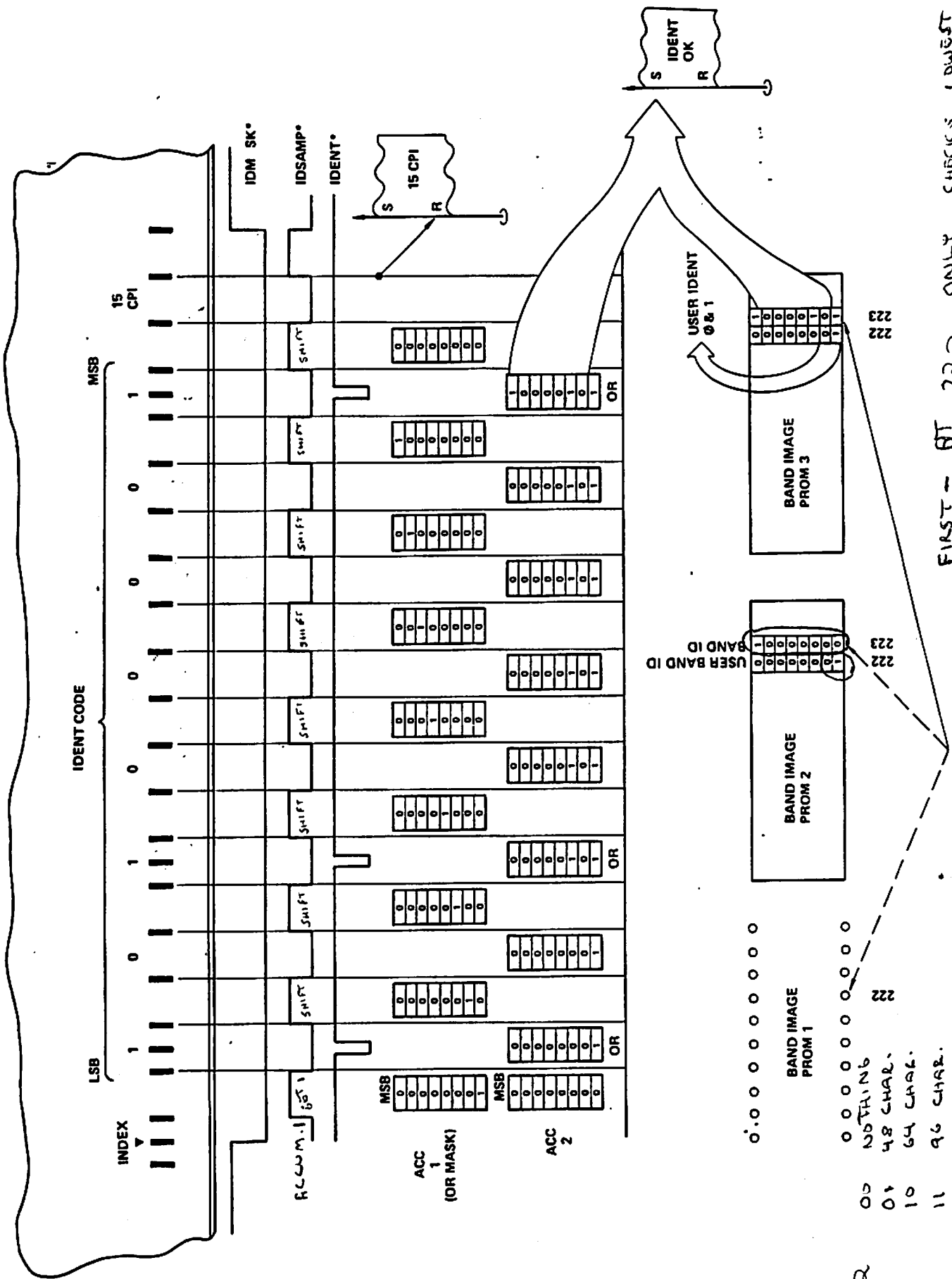








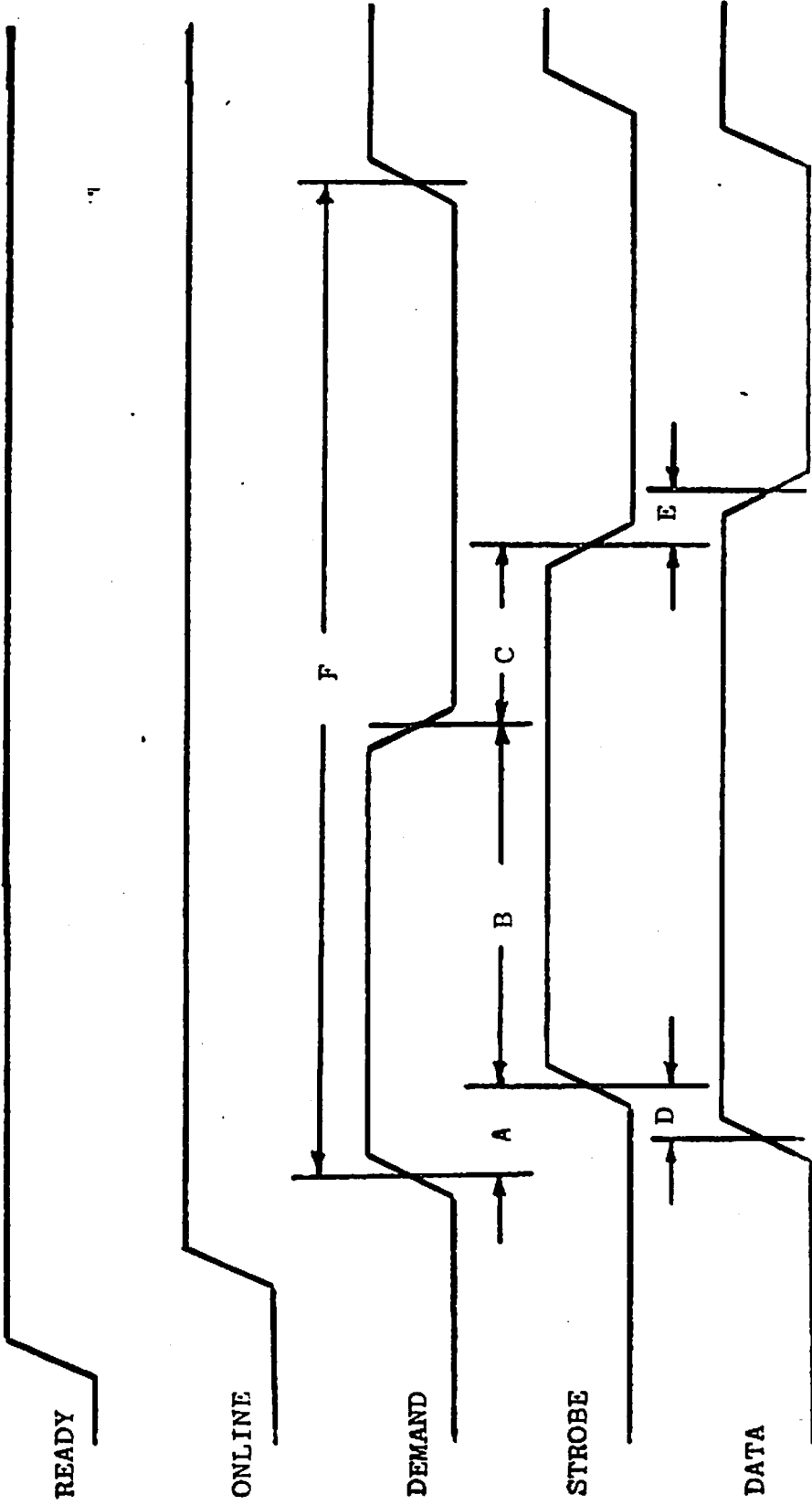




FIRST - AT 222 ONLY CHECKS LOWEST 2 CHAR  
 IF COMPARES - CHECK ALL EIGHT TO 223

- 00 0000000000000000 BAND IMAGE PROM 1
- 01 0000000000000000 BAND IMAGE PROM 2
- 10 0000000000000000 BAND IMAGE PROM 3
- 11 0000000000000000

222



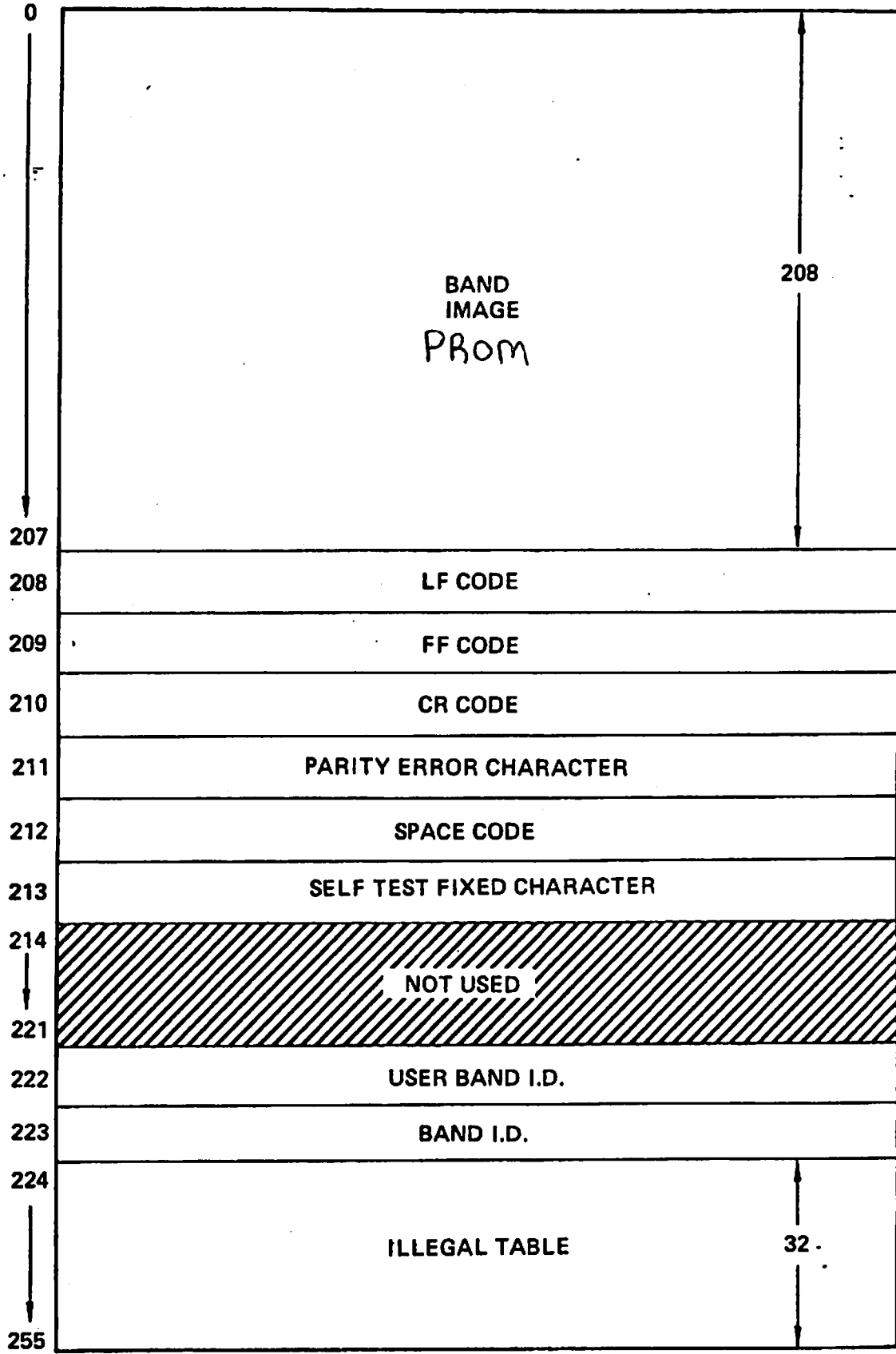
Interface Timing:

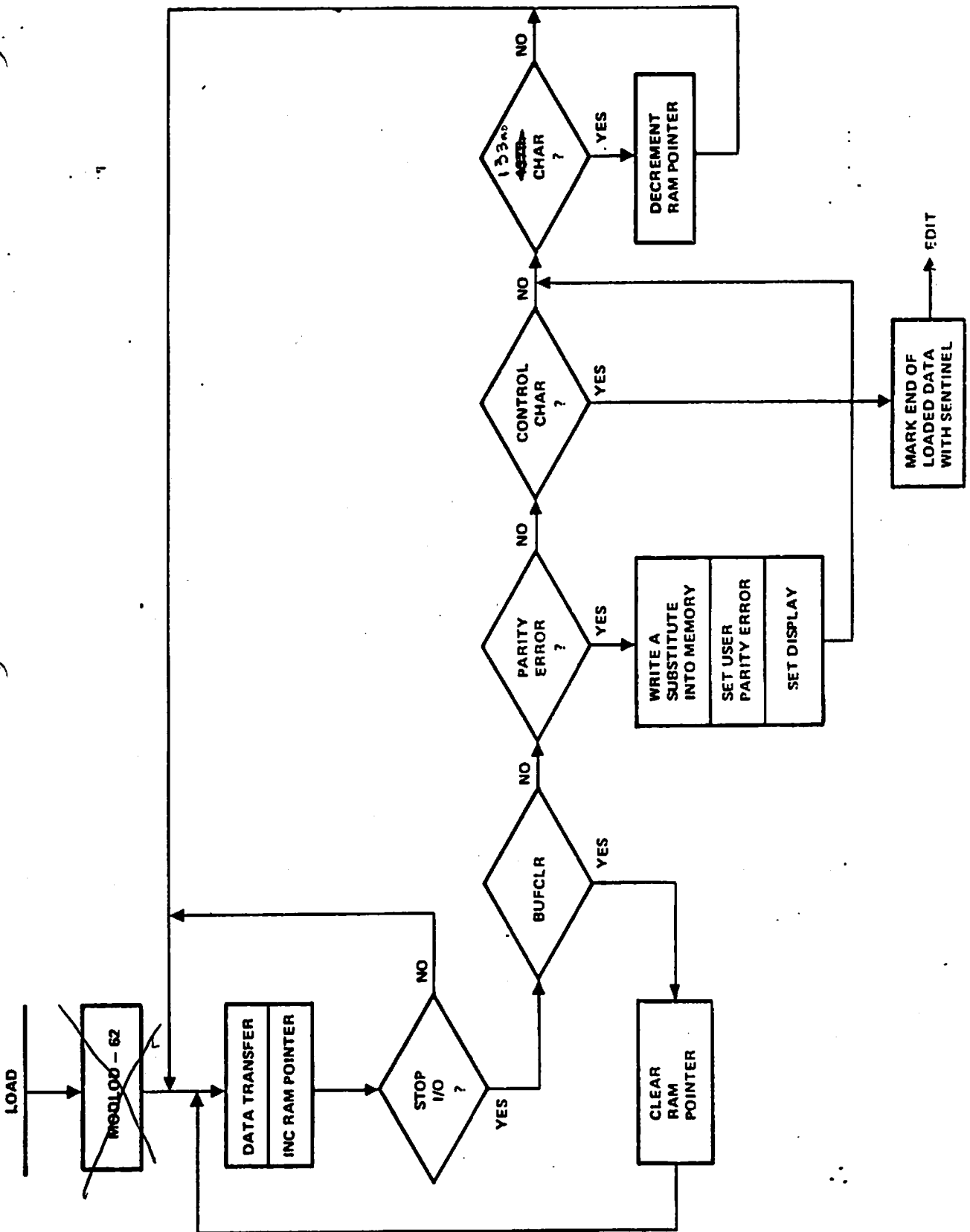
- A. Demand ON to Strobe ON: 300nSEC Max.
- B. Strobe ON to Demand OFF: 143nSEC Max.
- C. Demand OFF to Strobe OFF: 850nSEC Max.
- D. Data Setup: 50nSEC Min.
- E. Data Hold: 50nSEC Min.
- F. Character Transfer Period: 1.954uSEC Min.

## RAM ADDRESS DIRECTORY

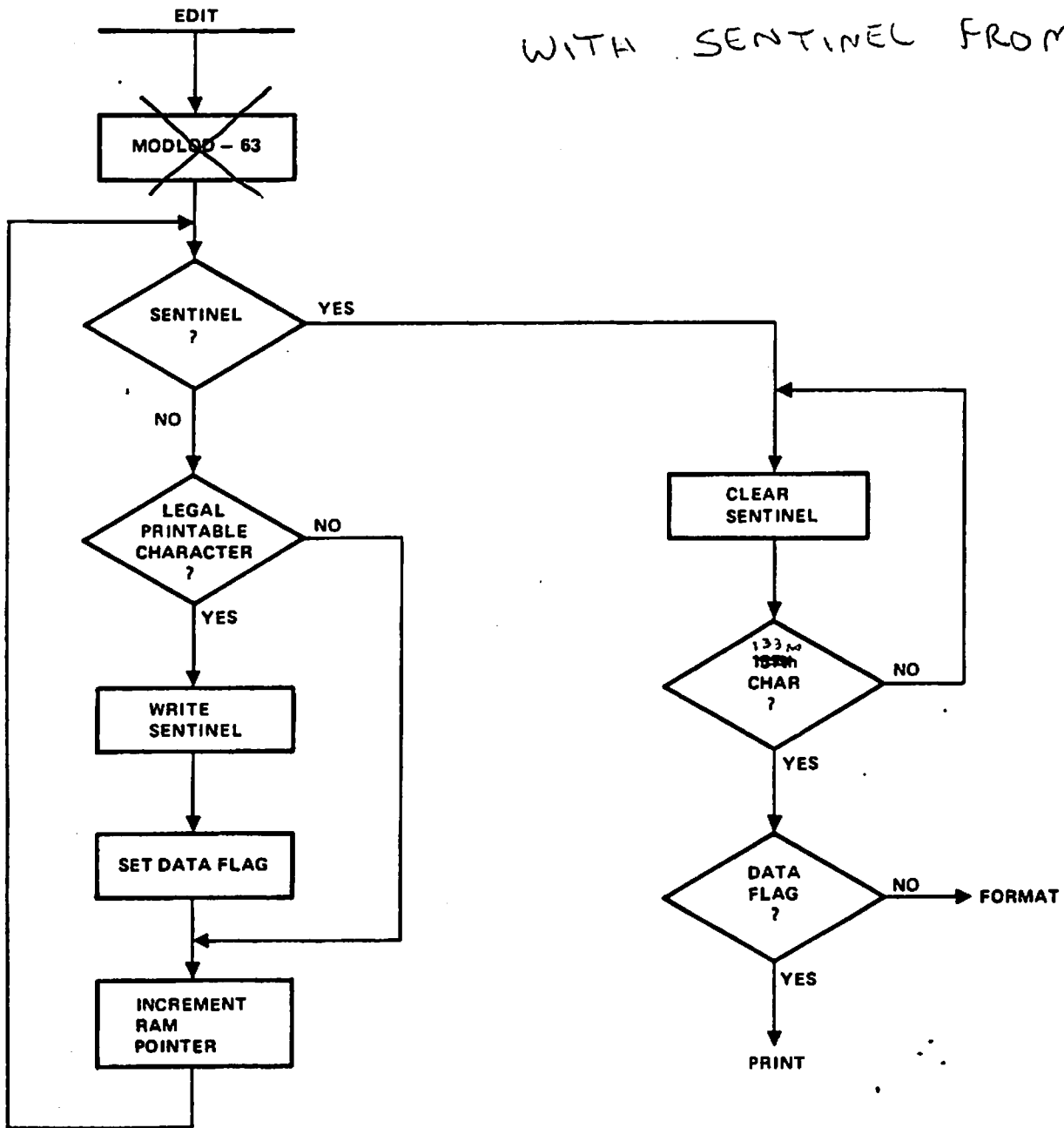
<u>HEX ADDRESS</u>	<u>CONTENTS</u>
00	USER'S DATA
89	USER'S DATA
8A	NOT USED
DF	NOT USED
E0	ADDRESS OF FIRST CHARACTER USED IN SELF TEST SHIFT PATTERN
E1	NOT USED
E2	MOTION LINE COUNT
E3	PENDING FAULT NUMBER
E4	LAST MODE OF OPERATION
E5	B.O.F. LINE COUNT
E6	LOW BYTE OF "VFU" CHECKSUM WORD
E7	HIGH BYTE OF "VFU" CHECKSUM WORD
E8	ADDRESS OF CHANNEL STOP FOR B.O.F.
E9	NOT USED
EF	NOT USED
F0	CURRENT LINE
F1	LAST PRINTABLE LINE
F2	FORM SIZE
F3	CARRIAGE RETURN COUNT
F4	LAST TAPE LINE
F5	CURRENT TAPE LINE

ADDRESS





CONTROL CHAR COME WITH SENTINEL FROM CPU

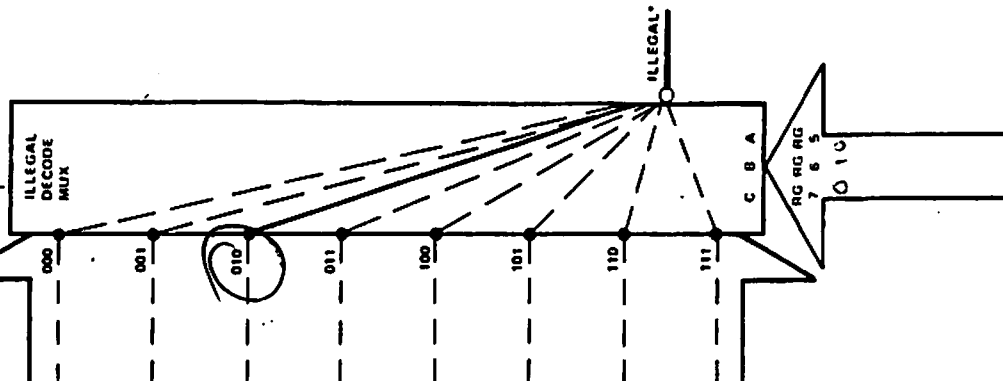


BAND IMAGE P. 3M

IDENT

RG 4  
RG 3  
RG 2  
RG 1  
RG 0

273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295																							
!	SPACE	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z		\	/	.	-	'	(	)	*	+	,	;	:	<	=	>	?



RG RG RG RG RG  
4 3 2 1 0  
0 0 0 0 1

RG BUS DATA

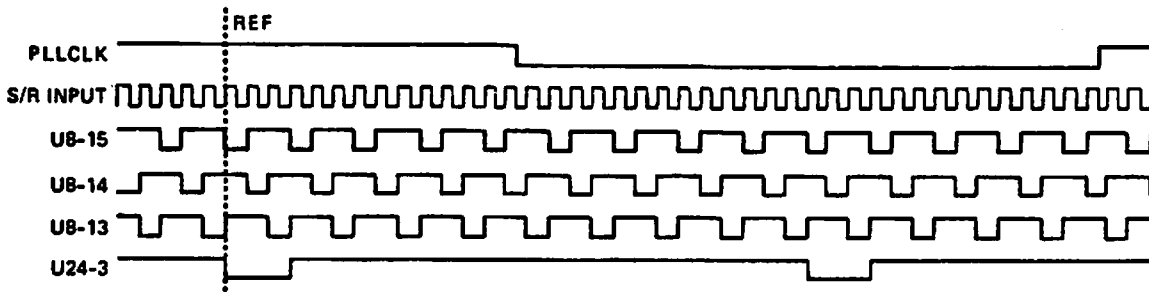
A = 41 - 0100 0001

ONE BIT IN LOCATION FOR ILLEGAL CHAR.  
ZERO FOR LEGAL

THE FIRING OF ANY ONE HAMMER ULTIMATELY IS DEFINED BY TWO CONDITIONS

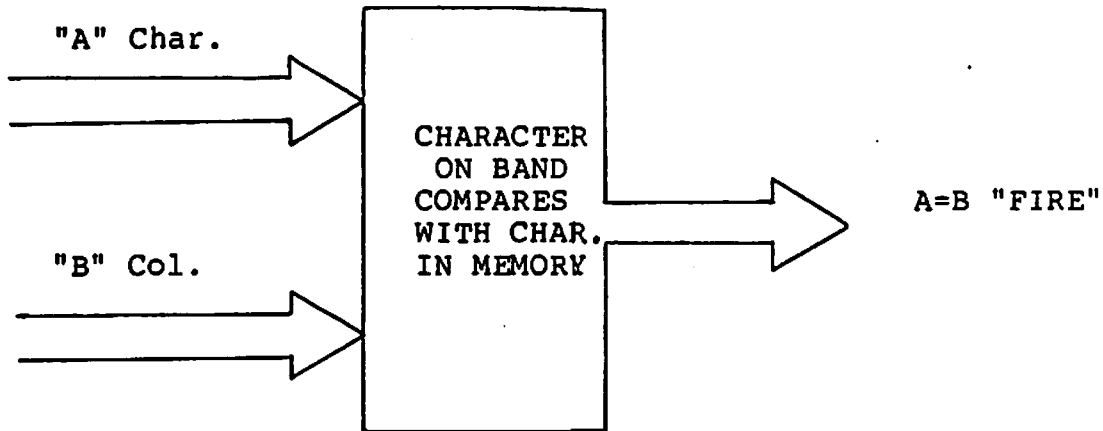
CONDITION 1 TIMING

HAMMER TRIGGERING IS TIMED SO THAT, AT IMPACT, THE HAMMER WILL BE ALIGNED WITH A BAND CHARACTER.

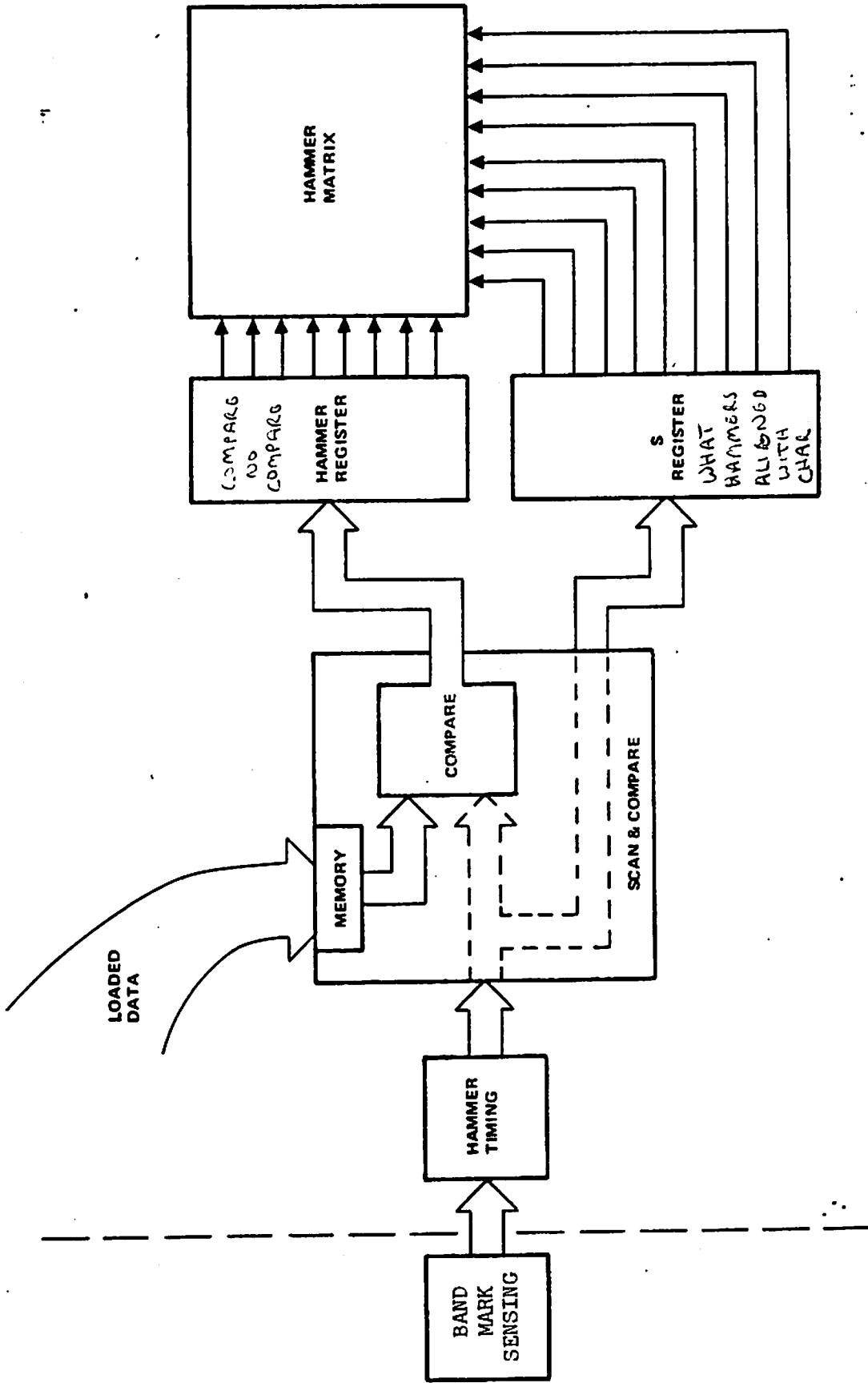


CONDITION 2 COMPARE

THE BAND CHARACTER ALIGNED WITH THE HAMMER IS THE SAME AS THE CHARACTER IN THE RESPECTIVE COLUMN POSITION IN MEMORY







10-10-60

GROUP A										GROUP B									
01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20

HAMMERS  
COLUMNS

- 0) A B C D E F G H I I J
- 1) A B C D E F G H I J
- 2) A B C D E F G H I J
- 3) A B C D E F G H I J
- 4) A B C D E F G H I J
- 5) A B C D E F G H I J
- 6) A B C D E F G H I J
- 7) A B C D E F G H I J
- 8) A B C D E F G H I J K
- 0) A B C D E F G H I J K

← BAND DIRECTION

THE PHYSICAL RELATIONSHIP OF THE BAND, COLUMNS, AND HAMMERS

HAMMER GROUPS

HAMMERS	GROUP A	GROUP B	GROUP C	GROUP D	GROUP E	GROUP F	GROUP G	GROUP H
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0

ALL I HAMMERS ARE TRIGGERED AT THE SAME TIME

ALL II HAMMERS ARE TRIGGERED AT THE SAME TIME

ALL III HAMMERS ARE TRIGGERED AT THE SAME TIME

ALL IV HAMMERS ARE TRIGGERED AT THE SAME TIME

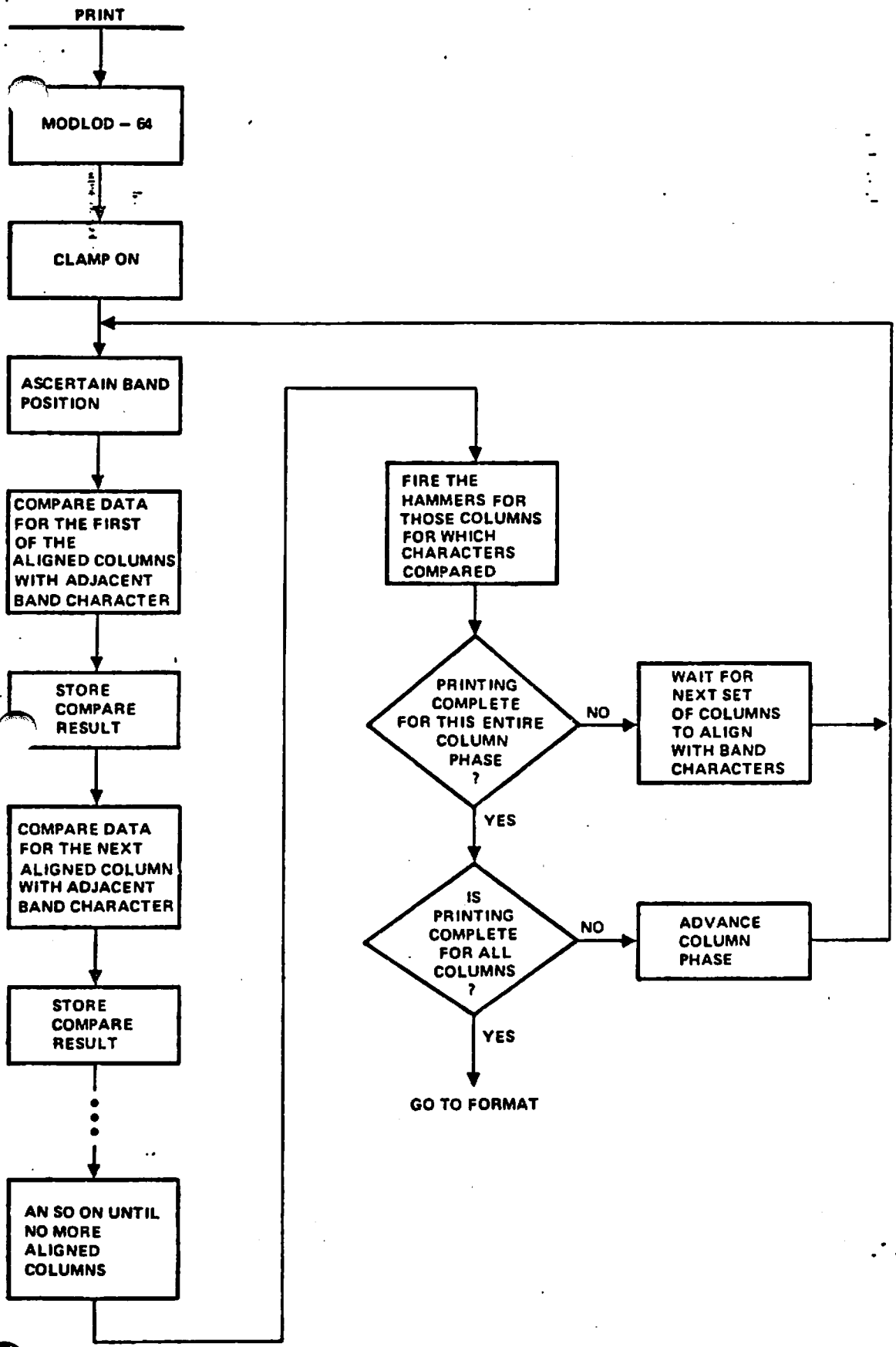
ALL V HAMMERS ARE TRIGGERED AT THE SAME TIME

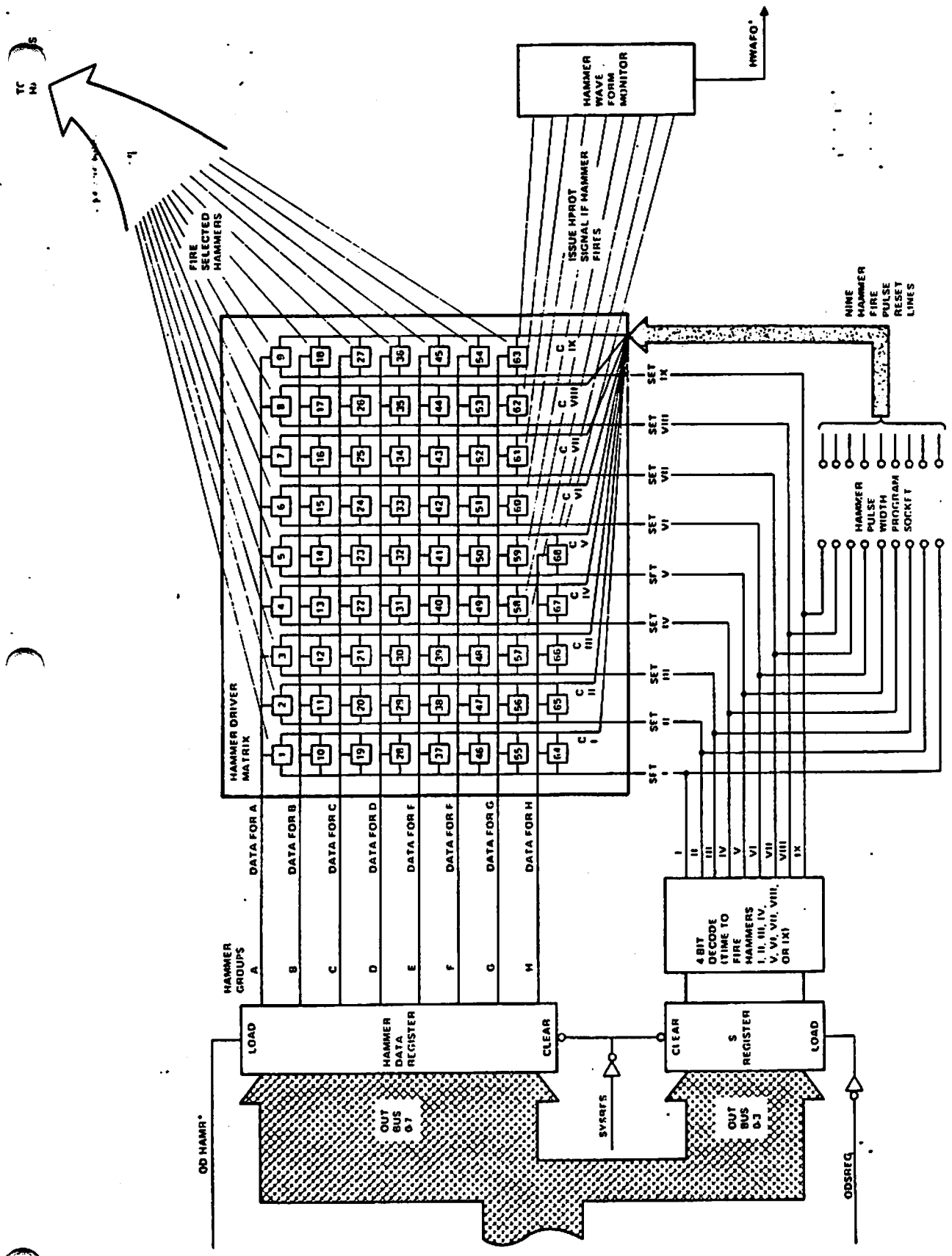
ALL VI HAMMERS ARE TRIGGERED AT THE SAME TIME

ALL VII HAMMERS ARE TRIGGERED AT THE SAME TIME

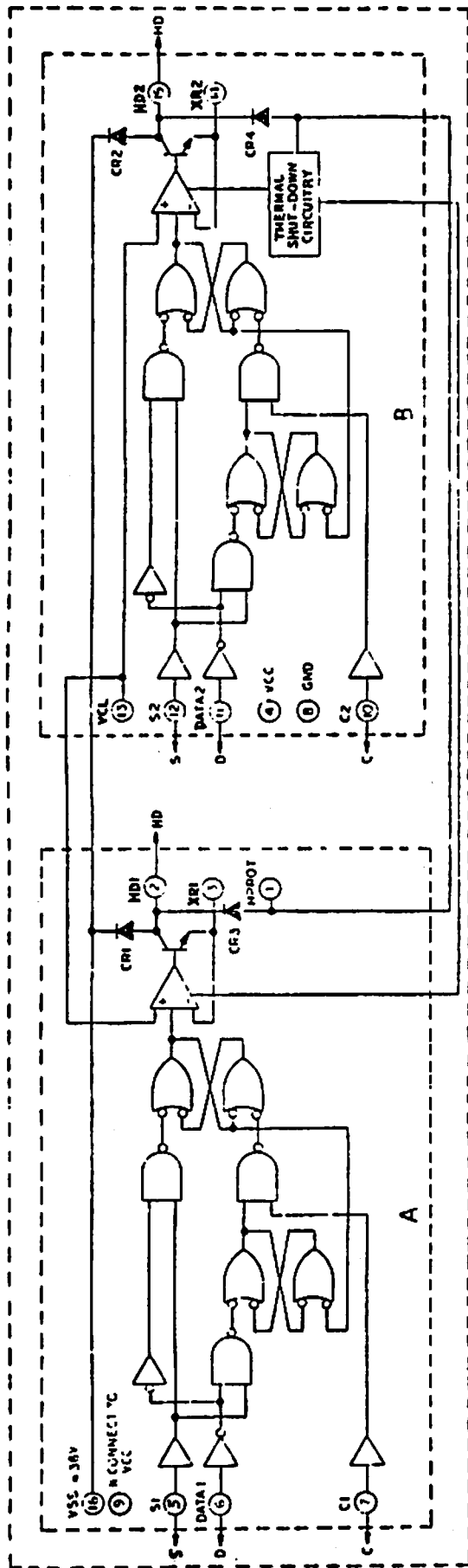
ALL VIII HAMMERS ARE TRIGGERED AT THE SAME TIME

ALL IX HAMMERS ARE TRIGGERED AT THE SAME TIME





# HAMMER DRIVER CIRCUIT

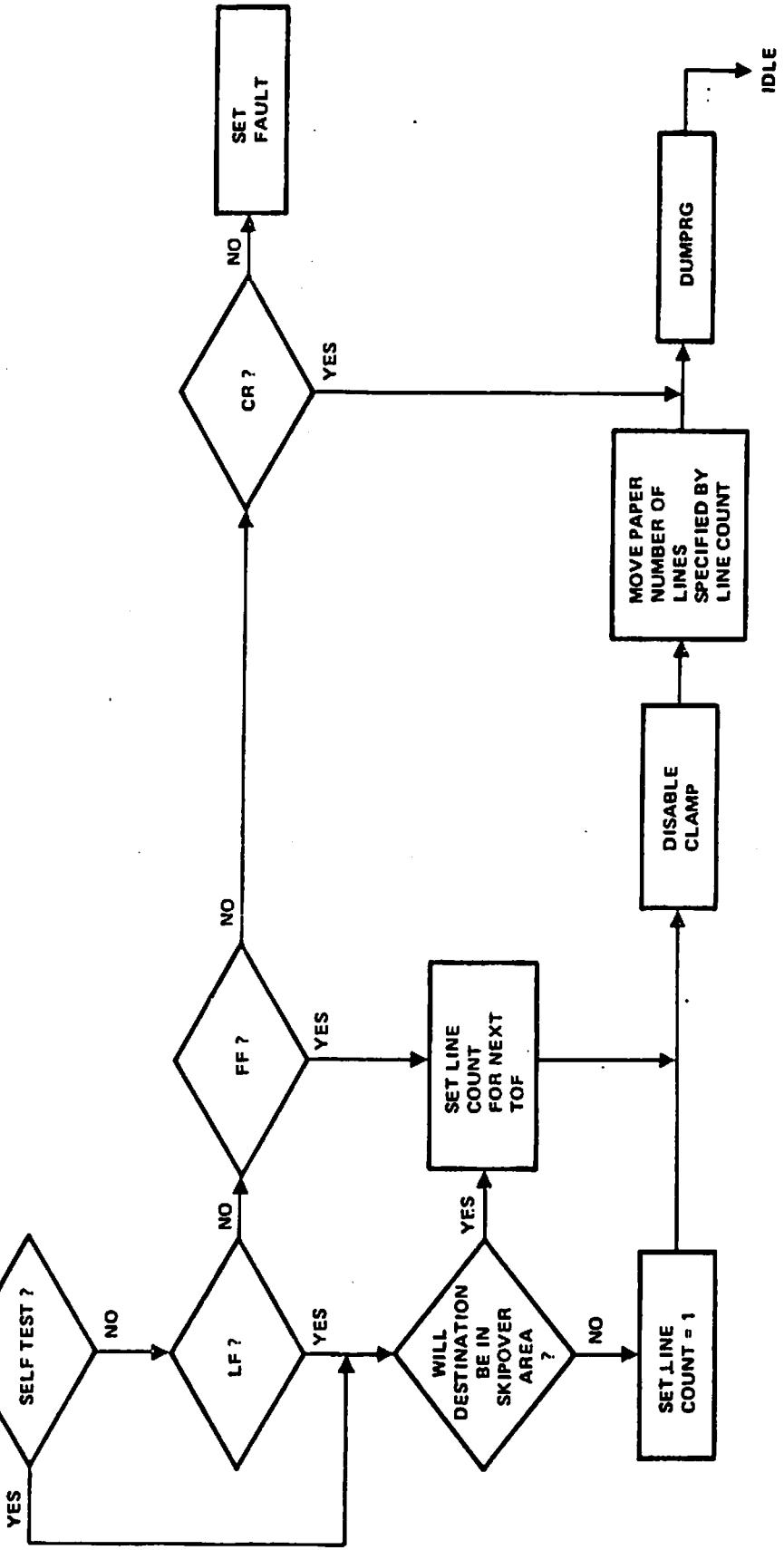


1CHIP FOR 2 HAMMERS

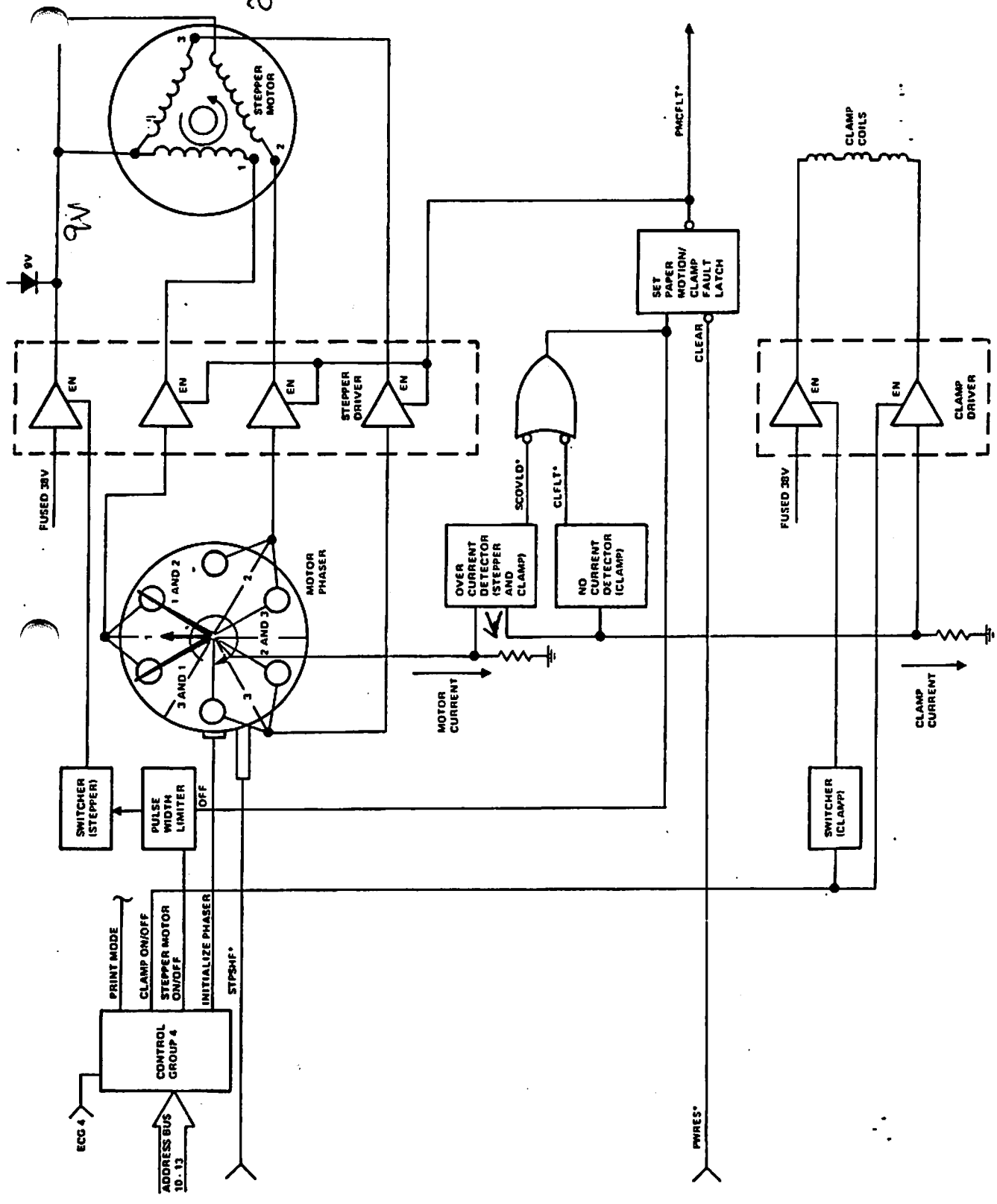
FORMAT

MODLOD - 65

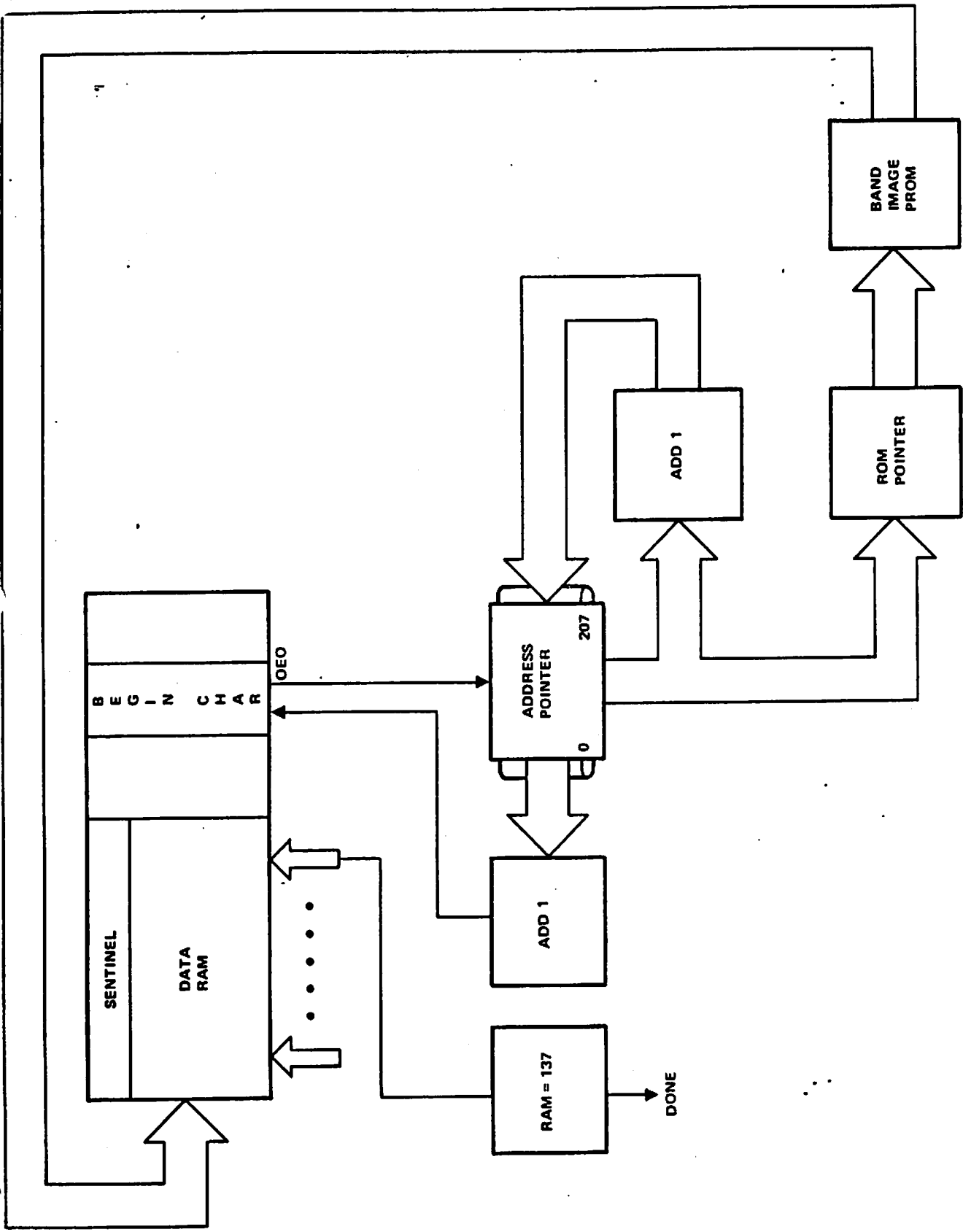
FILLRG

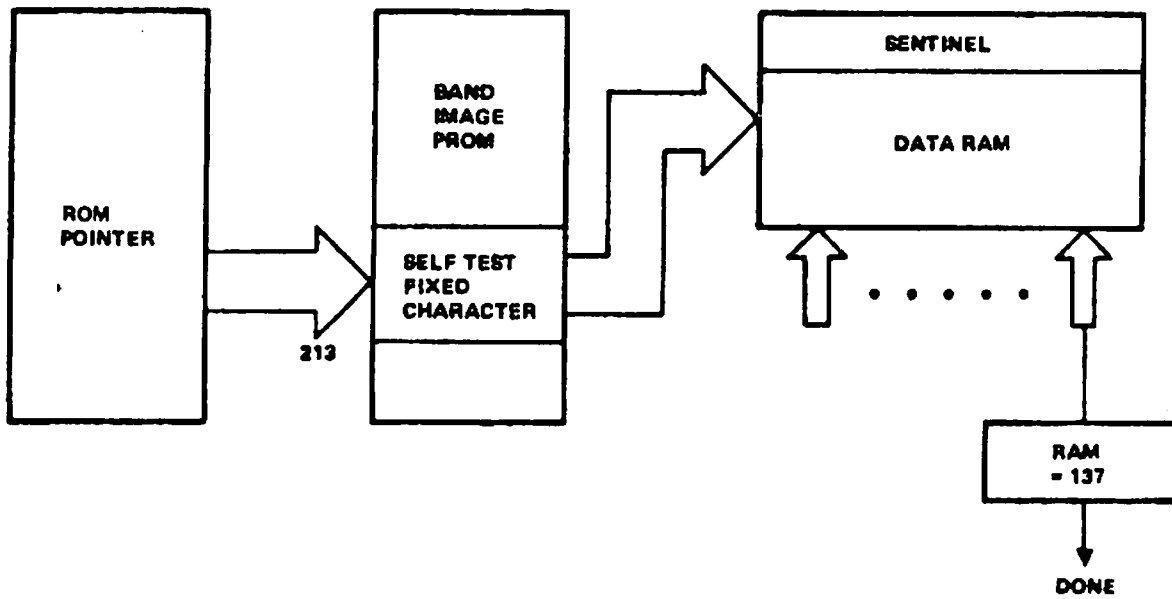


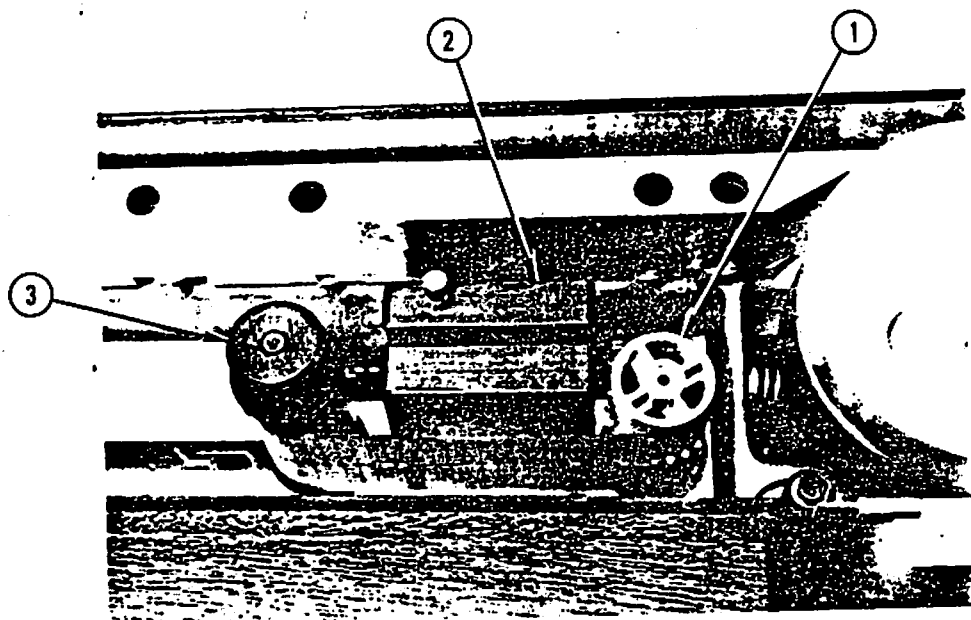
27 steps/LF





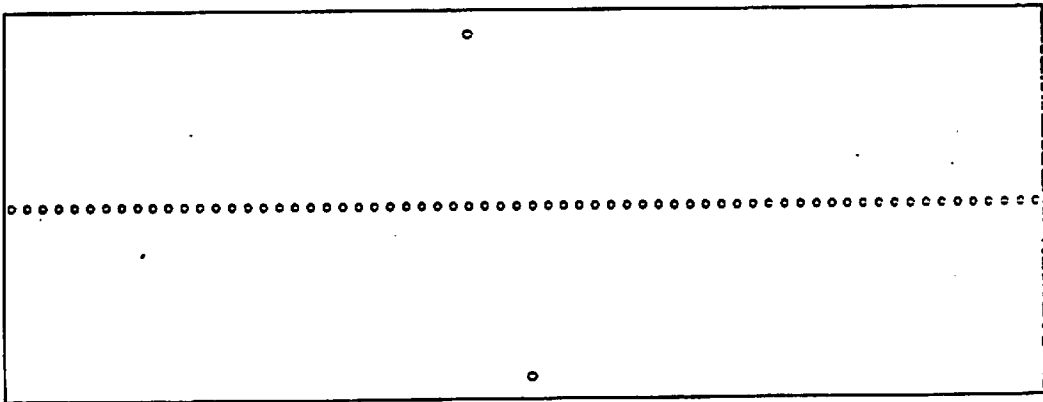






1 2 3 4 5 6 7 8 9 10 11 12

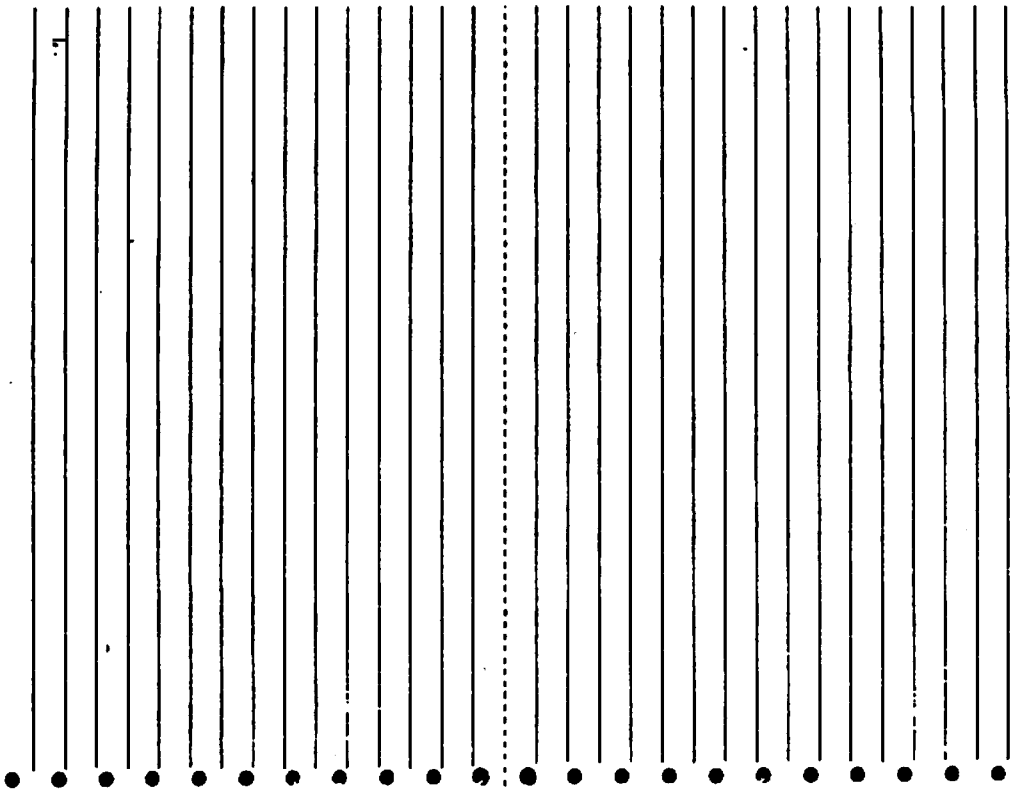
CHANNEL NUMBER

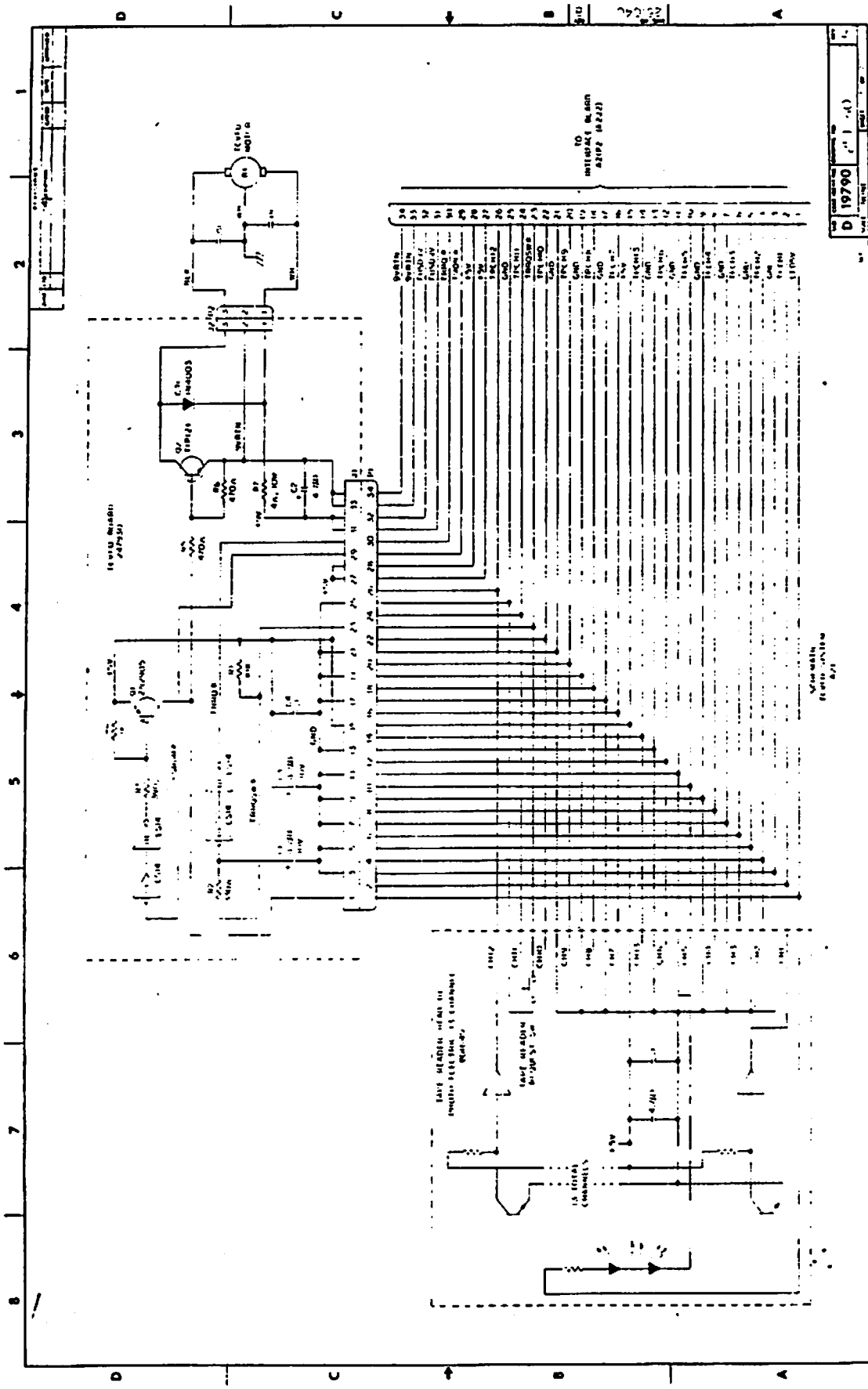


BOP (CHANNEL 12)

TOP (CHANNEL 1)

PAPER PERFORATION



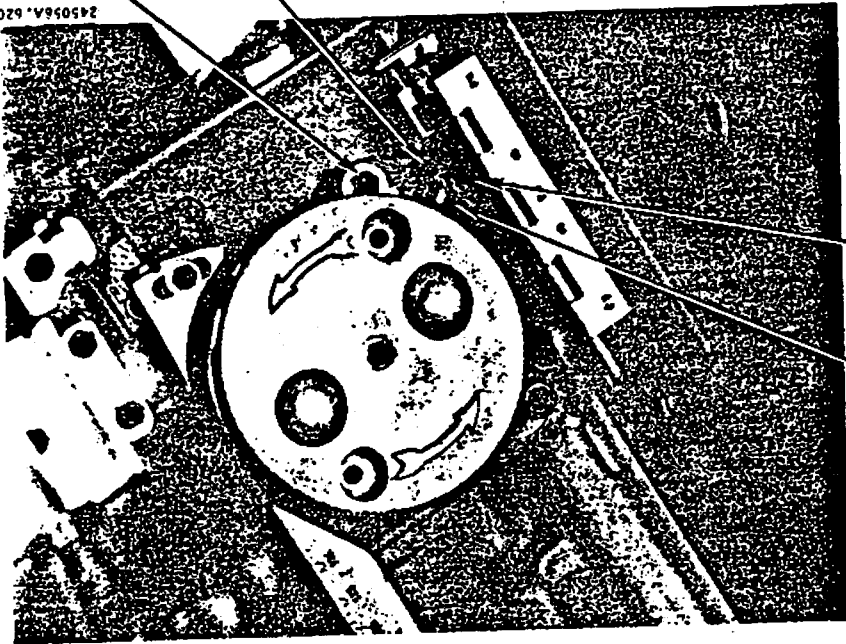


Model B-300  
Interim Schematic Package  
Figure 1 (SII 5 of 7)  
B-300 Electronics  
Reference Documents

PHASING (COARSE)  
ADJUSTMENT  
SCREW

BRACKET

245056A.620



TRANSDUCER  
SET SCREW

TRANSDUCER

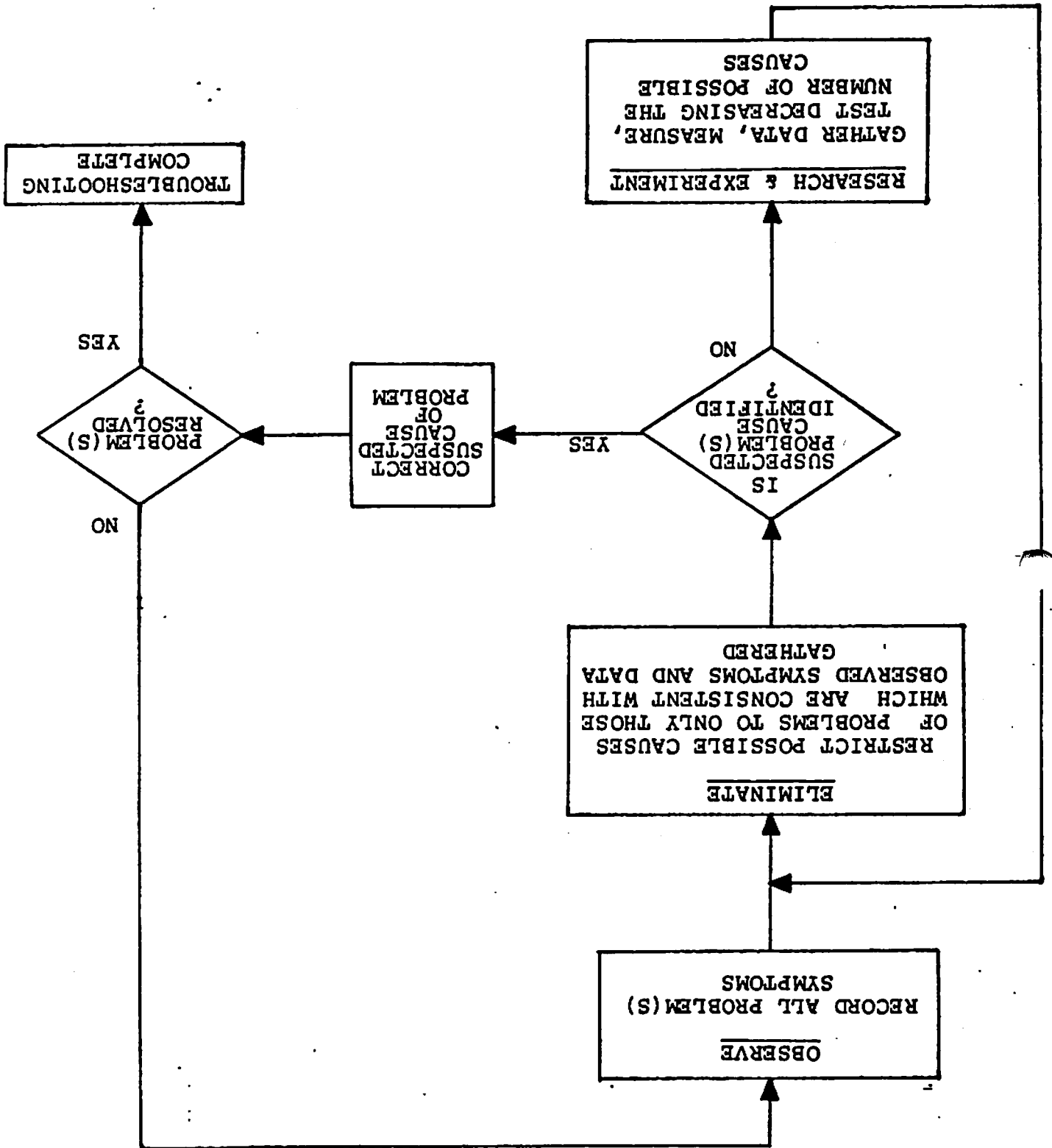
Display	Definition	Action	Probable cause	Remedy
01	Paper supply low	1	No paper	Insert paper
02	Paper motor fault	1	No paper motion for 8 line feed commands	Clear paper jam, plug in support motor connector
03	Band or cover not loaded	1	Band of cover open	Close band cover or band release lever
04	Hammer band not closed	1	Open hammer band gate	Close hammer band gate
05	Undefined character band loaded	2, 1	Wrong band or PRCM	Replace with valid band or PRCM
06	Undefined form length selected	2, 1	Time length & line pitch not compatible (illegal form size)	Set 6/8 LPT with or FLS5 ---- (FLS5 option on)
07	No tape in reader	1	No tape in reader during tape load operation	Replace VTU motor
08	VTU memory not loaded	1	VTU memory not loaded & paper instruction received	Replace VTU memory
09	VTU reader jam	1	Tape reader halted or jammed	Replace or service VTU tape
10	No Top of Form in tape	1	No channel 1 hole or tape inserted wrong	Replace with valid tape or install/correct Limit ICVTU to feed lines
11	Channel not found	1	Channel data not found in VTU memory	Install valid tape or reload DAVFL
12	Unable to read tape	1	Unable to successfully read and verify tape	Validate tape
13	No data compression	1	Data loaded and defined ok but can't print	Validate data
14	Print inhibit	2	Print inhibit switch on	Place print inhibit switch in CTF position
15	Interface cable error	2	Interface cable not connected	Connect or reseat interface transmitter board cable
16	I/O parity error, data load	1	Illegal character from user (valid, but will print)	Normally cleared by user
17	Formal code not recognized	1	User system - no LPT between print data and carriage return	(User system - do not over print)
18	DAVFL data transfer > 14)	1	Illegal VTU format codes received from user system	Channel 212 in print inhibit command
19	VTU check sum error	1	DAVFL memory error (bit response or hard failure)	Correct user system, and initialize new DAVFL via Reload VTU
20	Bad VTU memory	1	Data error (odd parity check)	Validate input data
21	IO parity error, DAVFL load	1	RAM will not load data	Replace interface board
22	Band system fault	1	Access band ring or paper too thick	Clean band, plates, or change paper
23	Hammer system fault	1	Access band ring or paper too thick	Replace power board or hammer mechanism
24	Hammer driver fault	1, 3	Hammer fitting in not print mode (open hammer or connector off)	Replace hammer driver board, reconnect connector
25	12 volt fault	3	Over-voltage and under-voltage	Replace power board
26	9 volt fault	3	Power supply, fuse F1	Replace power board, replace FT, replace resistor
27	VCL fault	3	VCL under/over-voltage or shorted to ground	Replace power board, replace hammer driver board
28	-36 volt fault	3	Power supply, defective relay, fuse F1	Replace power supply, replace relay, replace timing
29	Transfer fault	3	Transfer out of adjustment, defective or unplugged	Adjust gap to OLF or replace transfer
30	Start motor routine (failure mode)	1, 3	Undeclared (hard tone on system status line)	Interface, Processor, or Power Board
31	Idle routine (failure mode)	1, 3	Undeclared (hard tone on system status line)	Interface, Processor, or Power Board
32	Data load routine (failure mode)	1, 3	Undeclared (hard tone on system status line)	Interface, Processor, or Power Board
33	Print routine (failure mode)	1, 3	Undeclared (hard tone on system status line)	Interface, Processor, or Power Board
34	Format routine (failure mode)	1, 3	Undeclared (hard tone on system status line)	Interface, Processor, or Power Board
35	Self test mode - print inhibit	2	Self test and print inhibit switches ON	Place self test and print inhibit switches in CTF
36	ON LINE - print inhibit	2	Normal indication	Place switch to OLF position
37	ON LINE - Ready	2	-5V, -12V, or +6, 2V ref out of tolerance	Reset circuit breaker or replace power supply, fuse
38	Power fault	3	No air flow, or disconnected fan	Clean and/or replace fan, or connect fan
39	Hot condition	3	System clock or processor board	Replace timing and status board, processor board
40	Clear fault	3		

TABLE 2-1. SYSTEM TROUBLESHOOTING GUIDE

NOTE: The most likely board to be replaced is signified by number 1, conversely, the least likely is number 3.

State	Definition	Interface Board (A1)	Processor Board (A2)	Timing / Status Board (A3)	Power Board (A4)	Interface Board (A5)	Power Board (A6)	Timing / Status Board (A7)	Power Board (A8)	Interface Board (A9)	Power Board (A10)
01	Paper supply low	1	1	1	1	1	1	1	1	1	1
02	Paper motor fault	1	1	1	1	1	1	1	1	1	1
03	Band or cover not loaded	1	1	1	1	1	1	1	1	1	1
04	Hammer band not closed	1	1	1	1	1	1	1	1	1	1
05	Undeclared character band loaded	1	1	1	1	1	1	1	1	1	1
06	Undefined form length selected	1	1	1	1	1	1	1	1	1	1
07	No tape in reader	1	1	1	1	1	1	1	1	1	1
08	VTU memory not loaded	1	1	1	1	1	1	1	1	1	1
09	VTU reader jam	1	1	1	1	1	1	1	1	1	1
10	No Top of Form in tape	1	1	1	1	1	1	1	1	1	1
11	Channel not found	1	1	1	1	1	1	1	1	1	1
12	Unable to read tape	1	1	1	1	1	1	1	1	1	1
13	No data compression	1	1	1	1	1	1	1	1	1	1
14	Print inhibit	1	1	1	1	1	1	1	1	1	1
15	Interface cable error	1	1	1	1	1	1	1	1	1	1
16	I/O parity error, data load	1	1	1	1	1	1	1	1	1	1
17	Formal code not recognized	1	1	1	1	1	1	1	1	1	1
18	DAVFL data transfer > 14)	1	1	1	1	1	1	1	1	1	1
19	VTU check sum error	1	1	1	1	1	1	1	1	1	1
20	Bad VTU memory	1	1	1	1	1	1	1	1	1	1
21	IO parity error, DAVFL load	1	1	1	1	1	1	1	1	1	1
22	Band system fault	1	1	1	1	1	1	1	1	1	1
23	Hammer system fault	1	1	1	1	1	1	1	1	1	1
24	Hammer driver fault	1	1	1	1	1	1	1	1	1	1
25	12 volt fault	1	1	1	1	1	1	1	1	1	1
26	9 volt fault	1	1	1	1	1	1	1	1	1	1
27	VCL fault	1	1	1	1	1	1	1	1	1	1
28	-36 volt fault	1	1	1	1	1	1	1	1	1	1
29	Transfer fault	1	1	1	1	1	1	1	1	1	1
30	Start motor routine (failure mode)	1	1	1	1	1	1	1	1	1	1
31	Idle routine (failure mode)	1	1	1	1	1	1	1	1	1	1
32	Data load routine (failure mode)	1	1	1	1	1	1	1	1	1	1
33	Print routine (failure mode)	1	1	1	1	1	1	1	1	1	1
34	Format routine (failure mode)	1	1	1	1	1	1	1	1	1	1
35	Self test mode - print inhibit	1	1	1	1	1	1	1	1	1	1
36	ON LINE - print inhibit	1	1	1	1	1	1	1	1	1	1
37	ON LINE - Ready	1	1	1	1	1	1	1	1	1	1
38	Power fault	1	1	1	1	1	1	1	1	1	1
39	Hot condition	1	1	1	1	1	1	1	1	1	1
40	Clear fault	1	1	1	1	1	1	1	1	1	1

TABLE 2-2. FAULT PROBABILITY GUIDE

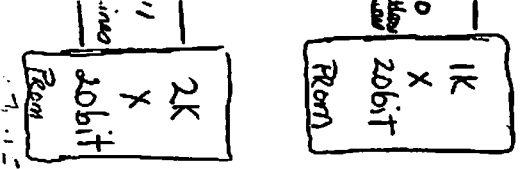


THE PROCESS OF TROUBLESHOOTING

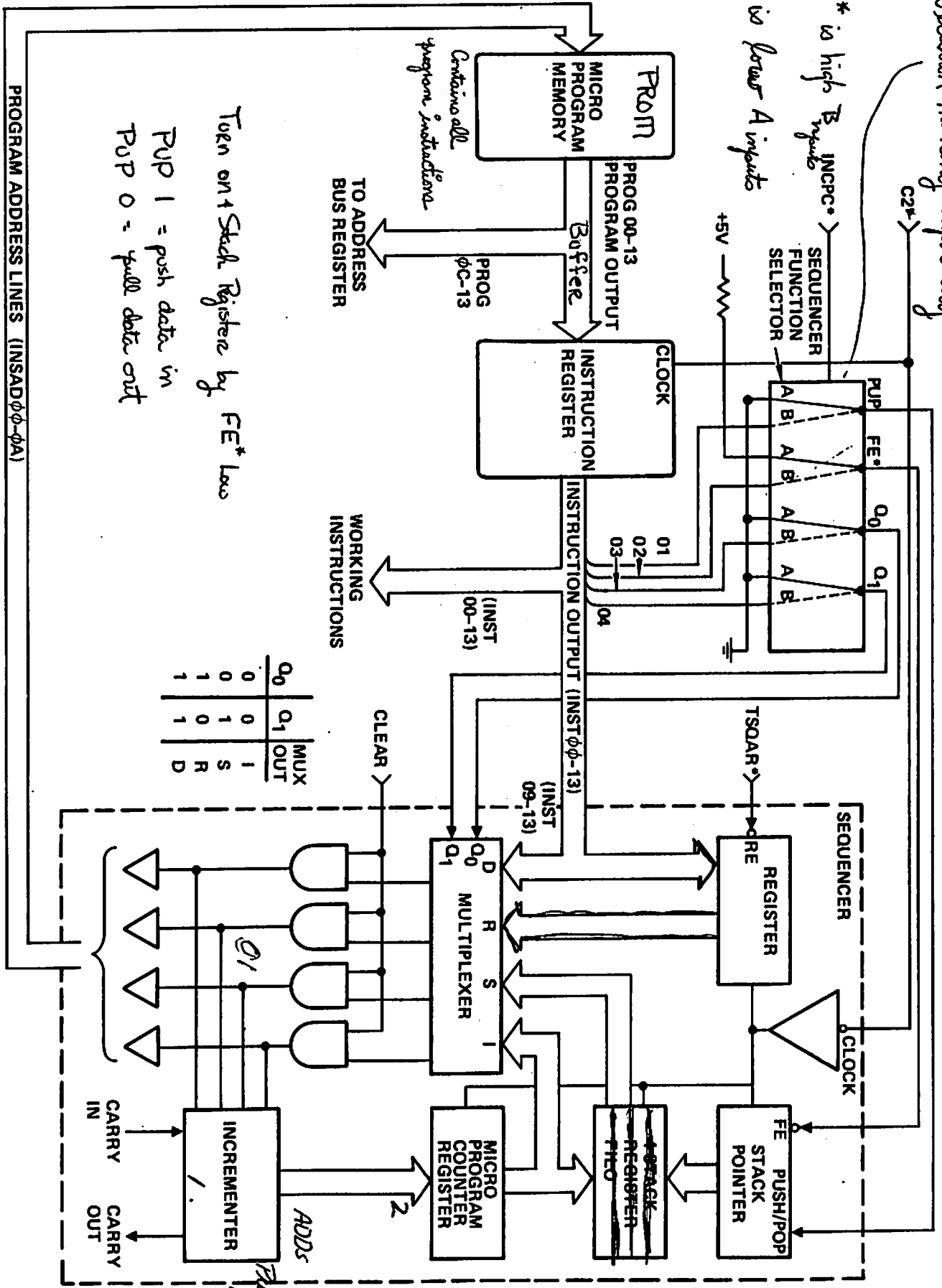


# Decision Making Capability

When INCRPC\* is high  $\rightarrow$  INCRPC\* is high  $\rightarrow$  INCRPC\* is high  $\rightarrow$  INCRPC\* is high  
 if INCRPC\* is low  $\rightarrow$  A inputs



Increment by 1 have 03, 04 low for Q0, Q1, low

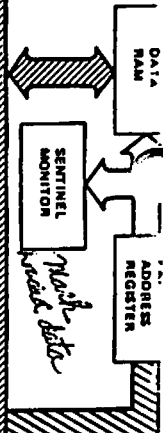


Turn on 4 Stack Registers by FE\* low  
 PUP 1 = push data in  
 PUP 0 = pull data out

Q <sub>0</sub>	Q <sub>1</sub>	MUX OUT
0	0	1
0	1	S
1	0	R
1	1	D

1 to 2  
 Address

PROCESSOR BOARD



Every BUS operation over the processor  
 Every ALL operation over the processor

