

digital

VT15

Engineering Drawings

Digital Equipment Corporation

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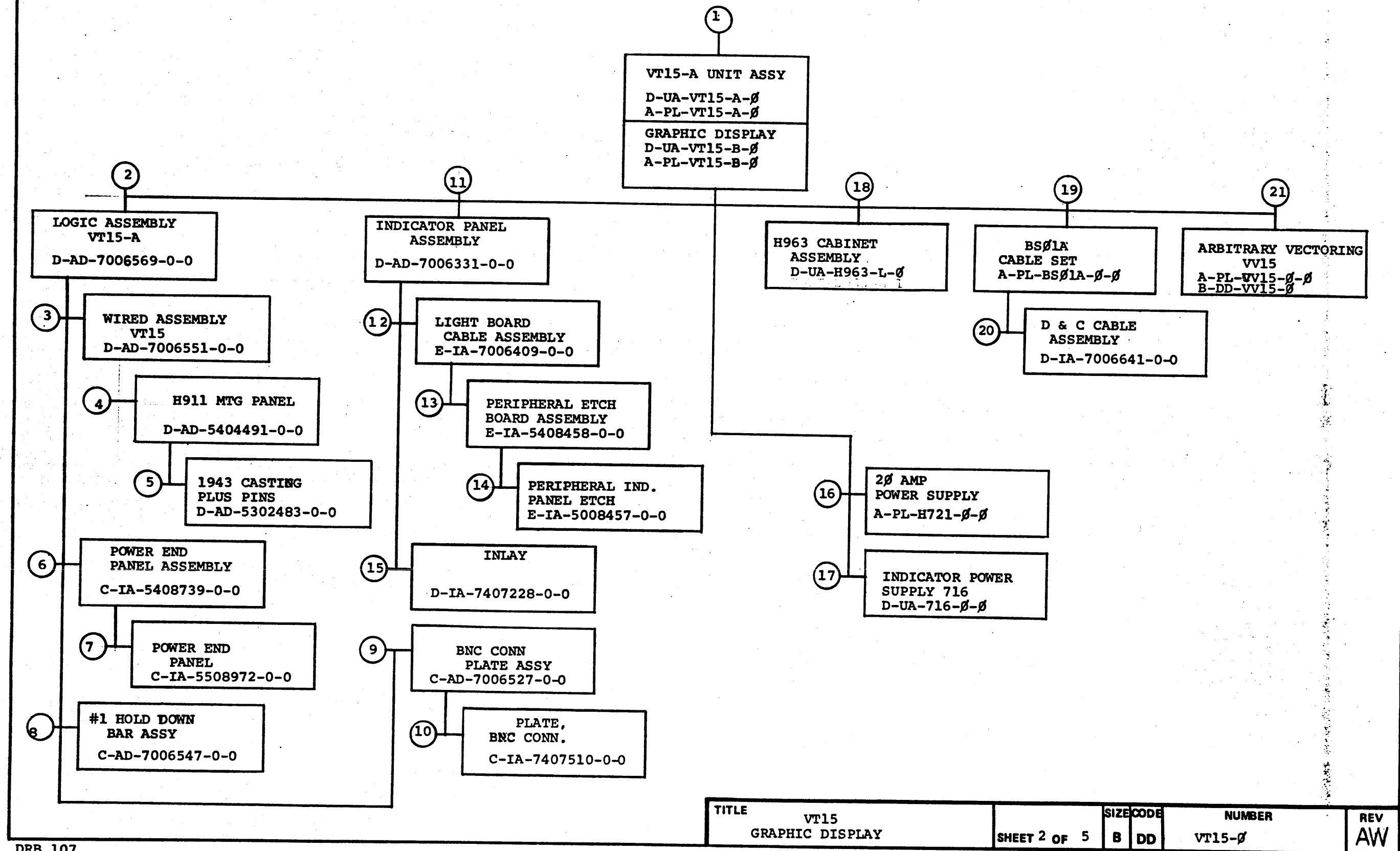
THIS IS PRINT SET

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[illegible]

REVISIONS		
DATE	CHG. NO.	REV
12/73	VT15-00055	AP
9/74	VT15-00056	AR
1/75	7006551-1	AS
4/75	VT15-57	AT
5-75	VT15-58	AU
9-75	VT15-59	AV
0-77	VT15-60	AW

USED ON OPTION/MODEL		DRN. D.K. CRABBE	DATE 12-10-73	TITLE VT15 GRAPHIC DISPLAY									
		CHK'D <i>W.K. Crabbe</i>	DATE 12-10-73										
		PROJ ENG. <i>Harold E. Lammie</i>	DATE 12-10-73										
		PROD. <i>C. Wlah.</i>	DATE 12/10/73	SIZE B	CODE DD	NUMBER VT15-Ø						REV AW	
		FIELD SERV. <i>H. Crasner</i>	DATE 12/11/73	DIST									
SHEET 1 OF 5													



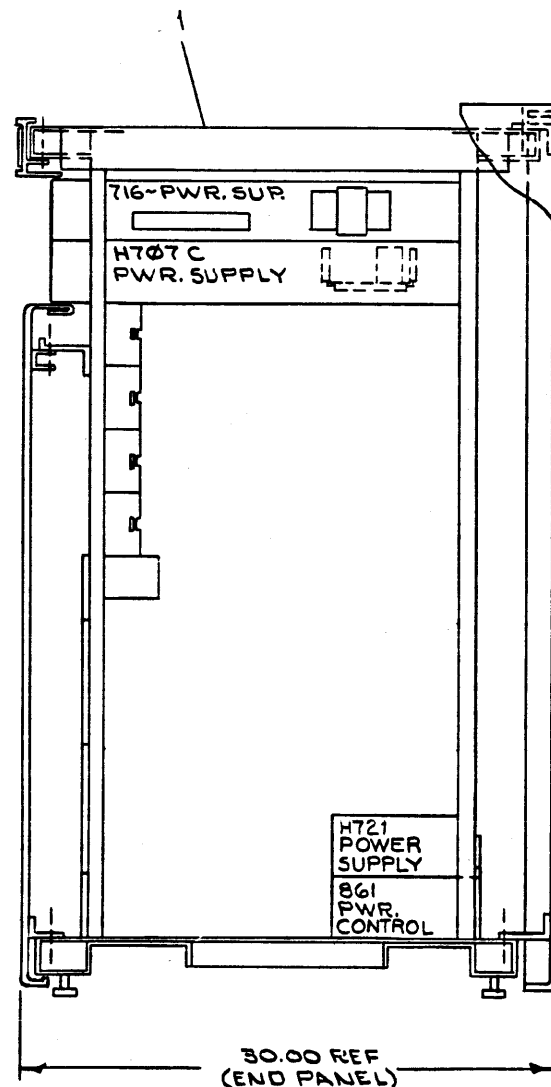
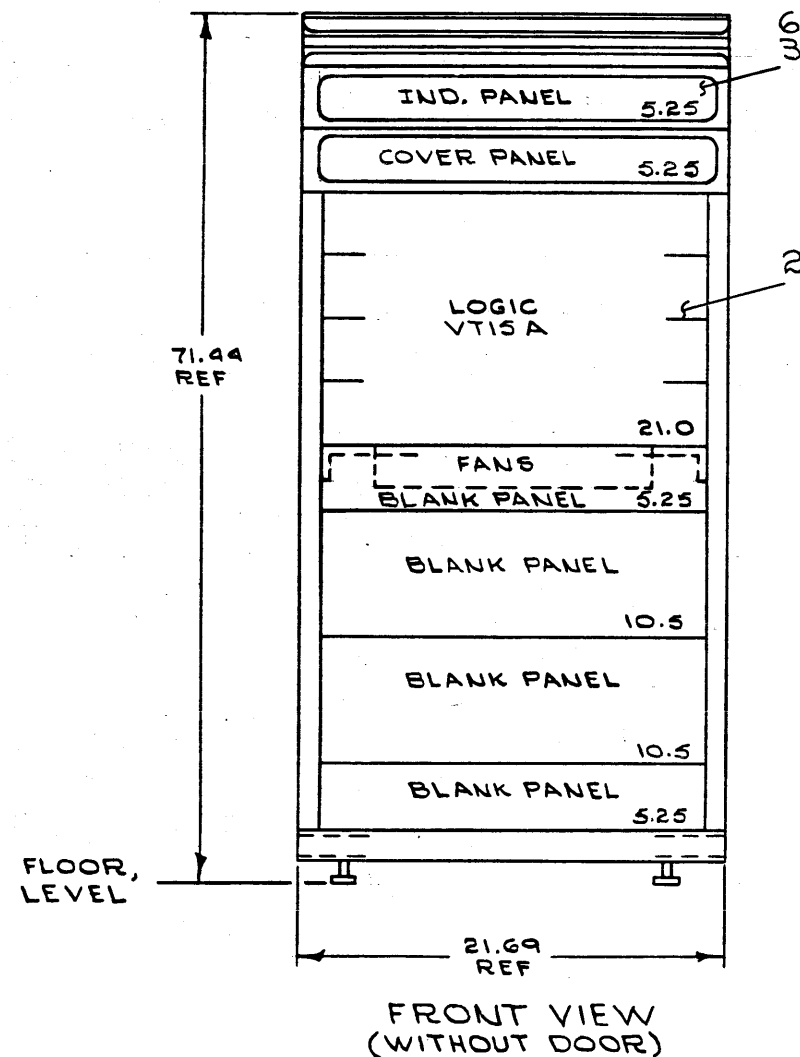
CUSTOMER PRINT SET				MECHANICAL					CUSTOMER PRINT SET				MECHANICAL									
VT15-Ø				MFG. SET	FIND NO.	DRAWING NO.	REV	NO OF SHT	DESCRIPTION	OPTION NO./FILE DATE	VT15-Ø				MFG. SET	FIND NO.	DRAWING NO.	REV	NO OF SHT	DESCRIPTION	OPTION NO./FILE DATE	
					13	E-IA-5408458-0-0			PERIPHERAL ETCH BD ASSY							20	D-IA-7006641-0-0			D&C CABLE ASSY		
																	D-AH-M912-Ø-5			ETCH BD ASSY		
																	B-MD-7408020-0-0			CABLE CLAMP VT15		
					14	D-IA-5008457-0-0			PERIPHERAL IND. PANEL ETCH							21	A-PL-VV15-Ø-Ø			ARBITRARY VECTORIZING		
						K-CO-5408458-0-4			X-Y COORDINATE HOLE LOC.								B-DD-VV15-Ø			DRAWING DIRECTORY VV15		
						C-AH-5408458-0-5			ASSY DRILLING HOLE LAYOUT													
					15	D-IA-7407228-0-0			INLAY													
						C-SS-7407228-0-2			REAR SCREEN													
						C-SS-7407228-0-3			FRONT SCREEN													
					16	D-UA-H721-Ø-Ø		3	2Ø AMP POWER SUPPLY													
						A-PL-H721-Ø-Ø		4	2Ø AMP POWER SUPPLY													
					17	D-UA-716-Ø-Ø		1	IND. POWER SUPPLY 716													
						A-PL-716-Ø-Ø		2	IND. POWER SUPPLY (PL)													
					X 18	D-UA-H963-L-Ø		#	H963-L CABINET ASSY													
					X	A-PL-H963-L-Ø		#	H963-L CABINET ASSY (PL)													
						A-PL-H963-L-1			ENG. DRAWING H963-L													
					19	A-PL-BSØ1A-Ø-Ø			BSØ1A CABLE SET													
						C-IA-7006577-0-0			COAX CABLE ASSY													
CUSTOMER PRINT SET CODES				X = PRINT OF DOCUMENT INCLUDED IN PRINT SET C = INCLUDES ALL PRINTS INDICATED ON DOCUMENT S = CONFIDENTIAL AUTHORIZED SIGNATURE REQUIRED							TITLE VT15 GRAPHIC DISPLAY				SHEET 4 OF 5		SIZE CODE B DD		NUMBER VT15-Ø		REV AW	

CUSTOMER PRINT SET										ELECTRICAL										CUSTOMER PRINT SET										ELECTRICAL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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NOTES:

1. FOR DRAWING INDEX LIST
REFER TO: B-DD-VT15-0
2. FOR CABLE CONFIGURATION OF
VT15A/B, REFER TO D-IC-VT15-A-2



REV.	CHANGE NO.	DATE
A	VT15-00004	4-2-70
B	VT15A-00004	4-2-70
C	MISC-00014	8-13-70
D	VT15-00014	10-14-70
E	VT15-00055	1-23-71
F	VT15-00058	1-23-71
G	VT15-00059	1-23-71
H	VT15-00060	1-23-71

FIRST USED ON OPTION/MODEL

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED

DIMENSION IN INCHES

TOLERANCES

DECIMALS FRACTIONS ANGLES

± .005 ± 1/64 ± 0°30'

FINAL SURFACE QUALITY

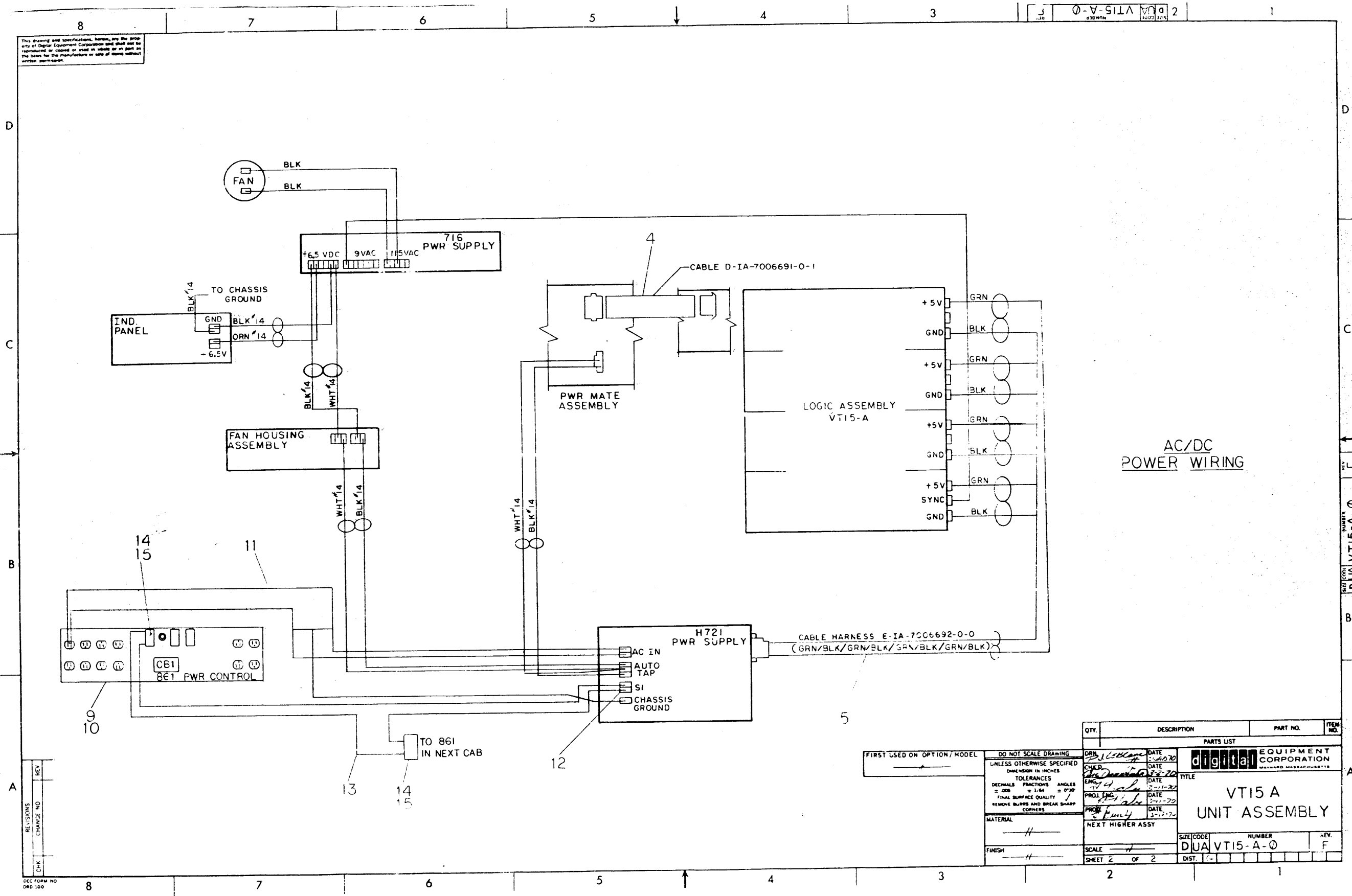
REMOVE BURRS AND BREAK SHARP CORNERS

MATERIAL

FINISH

QTY.	DESCRIPTION	PART NO.	ITEM NO.
PARTS LIST			
digital EQUIPMENT CORPORATION MAYFIELD, MASSACHUSETTS			
TITLE VT15 A UNIT ASSEMBLY			
SIZE/CODE DUA VT15-A-0			
REV. F			

DEC FORM NO. 100



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AC/DC
POWER WIRING

QTY.	DESCRIPTION	PART NO.	ITEM NO.
PARTS LIST			
digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS			
TITLE VT15 A UNIT ASSEMBLY			
SIZE CODE DUA		NUMBER VT15-A-0	REV. F
SCALE SHEET 2 OF 2		DIST. 1	

REV.	DESCRIPTION	DATE
1	Initial	3-10-70
2	Change	3-11-70
3	Change	3-11-70
4	Change	3-11-70

DO NOT SCALE DRAWING	UNLESS OTHERWISE SPECIFIED
DIMENSION IN INCHES	
TOLERANCES	
DECIMALS	FRACTIONS
± .005	± 1/64
ANGLES	
± 0°30'	
FINAL SURFACE QUALITY	
REMOVE BURRS AND BREAK SHARP CORNERS	
MATERIAL	
FINISH	

FIRST USED ON OPTION / MODEL	DATE

MAYNARD, MASSACHUSETTS

QUANTITY/VARIATION

1

ISSUED SECT.	
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DATE 3-3-70

DESCRIPTION

1

1

1

1

1

1

4

1

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REF

REF

REF

REF

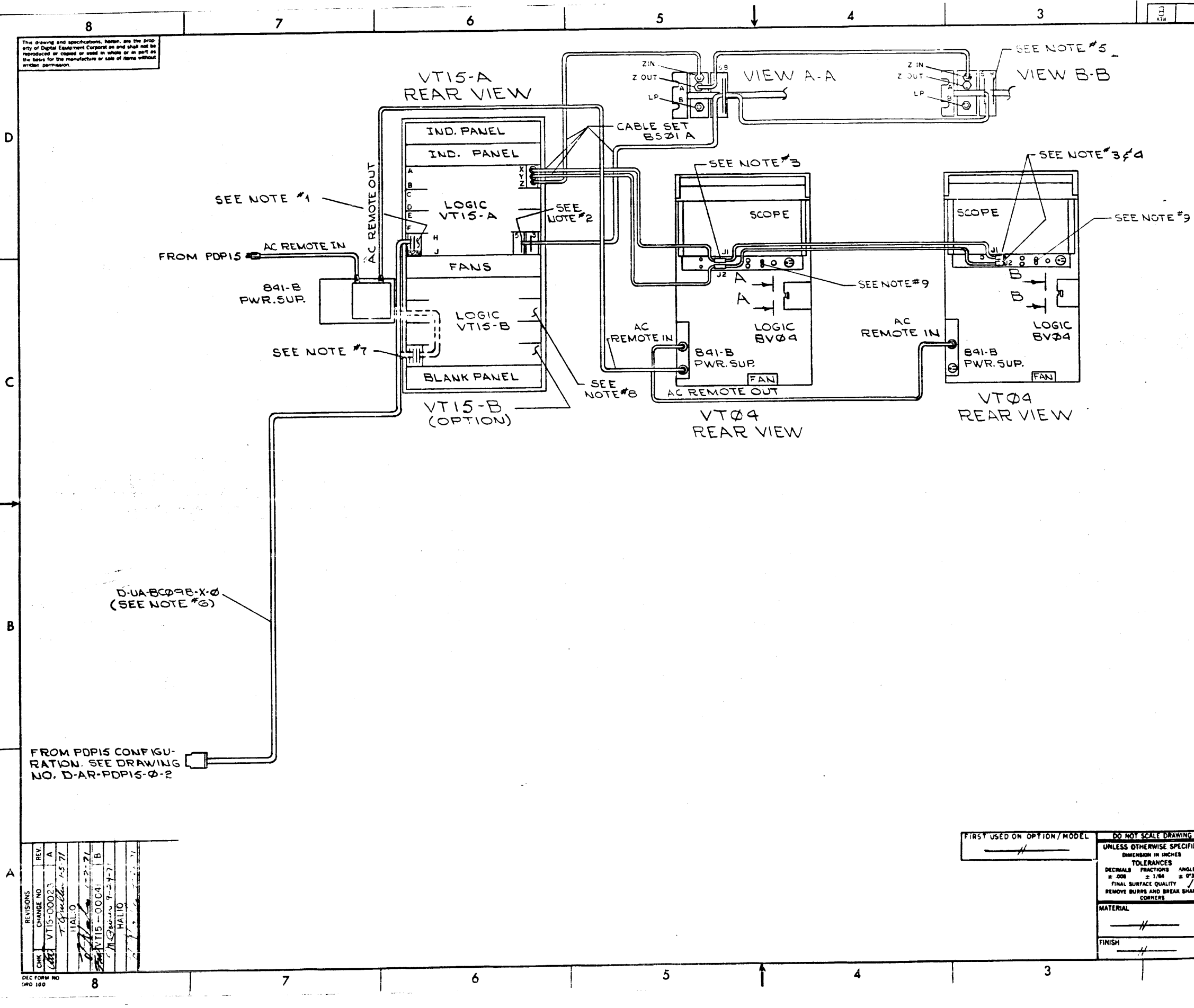
REF

REF

REV. F	ECO NO VT15- 100058
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DIST.	
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NOTES

1. TERMINATE SLOTS HJ-29 & 30 WITH M909.
2. TERMINATE SLOT HJ-5 WITH M910.
3. USE BNC (TEE) CONNECTOR NUMBER 1209746 IN J1 AND J2.
4. WHEN USING LAST VT04 IN SEQUENCE, TERMINATE J1 & J2 WITH ONE BNC TERMINATOR B-1A-5308786-0 AND ONE VARIABLE BNC TERMINATOR (0-200 OHMS) B-1A-7409303-0-0. FOR APPROPRIATE INSTALLATION REFER TO THE VT15 SYSTEM ADJUSTMENT PROCEDURE (SP-VT15-0-49).
5. IN LAST VT04, TERMINATE AT END OF BUS WITH AN M909 IF VM15 IS NOT USED.
6. LENGTH OF CABLE (BC09B-Y-0) WILL VARY TO SPECIFICATIONS OF CUSTOMER.
7. I/O CABLE WILL RUN TO VT15B (HJ-32 & 31) THEN TO VT15A (HJ-32 & 31) IF OPTION DESIGNATED IS USED.
8. ALL WIRING ON VT15B IS IDENTICAL TO WIRING ON VT15A.
9. REMOVE GROUND STRAP IN VT04 AND REPLACE WITH A 100 OHM, 1/4 WATT, 5% RESISTOR (PART #1300229) IN PARALLEL WITH A .01UF CAPACITOR.

FROM PDP15 CONFIGURATION. SEE DRAWING NO. D-AR-PDP15-0-2

REV	CHG	NO	DATE
A	1	VT15-00023	1-5-71
B	1	VT15-00041	1-2-71
C	1	VT15-00041	1-2-71
D	1	VT15-00041	1-2-71
E	1	VT15-00041	1-2-71
F	1	VT15-00041	1-2-71
G	1	VT15-00041	1-2-71
H	1	VT15-00041	1-2-71
I	1	VT15-00041	1-2-71
J	1	VT15-00041	1-2-71
K	1	VT15-00041	1-2-71
L	1	VT15-00041	1-2-71
M	1	VT15-00041	1-2-71
N	1	VT15-00041	1-2-71
O	1	VT15-00041	1-2-71
P	1	VT15-00041	1-2-71
Q	1	VT15-00041	1-2-71
R	1	VT15-00041	1-2-71
S	1	VT15-00041	1-2-71
T	1	VT15-00041	1-2-71
U	1	VT15-00041	1-2-71
V	1	VT15-00041	1-2-71
W	1	VT15-00041	1-2-71
X	1	VT15-00041	1-2-71
Y	1	VT15-00041	1-2-71
Z	1	VT15-00041	1-2-71

FIRST USED ON OPTION/ MODEL
#

DO NOT SCALE DRAWING		
UNLESS OTHERWISE SPECIFIED	DATE	DATE
TOLERANCES	DATE	DATE
DECIMALS FRACTIONS ANGLES	DATE	DATE
± .005 ± 1/64 ± 0°30'	DATE	DATE
FINAL SURFACE QUALITY	DATE	DATE
REMOVE BURRS AND BREAK SHARP CORNERS	DATE	DATE
MATERIAL	DATE	DATE
FINISH	DATE	DATE

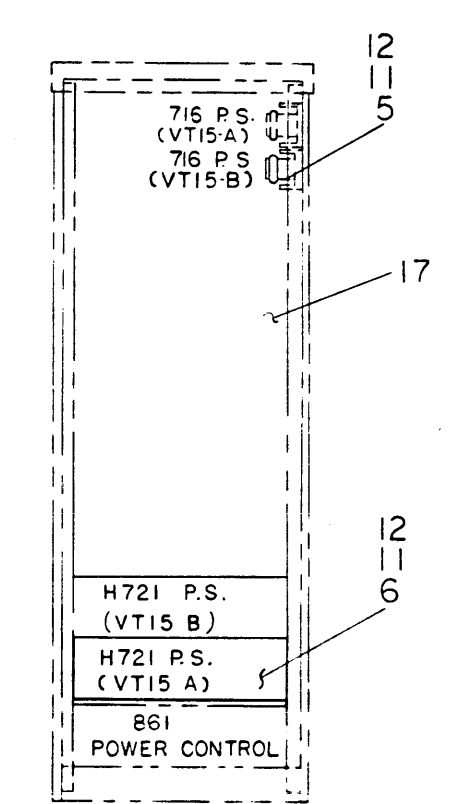
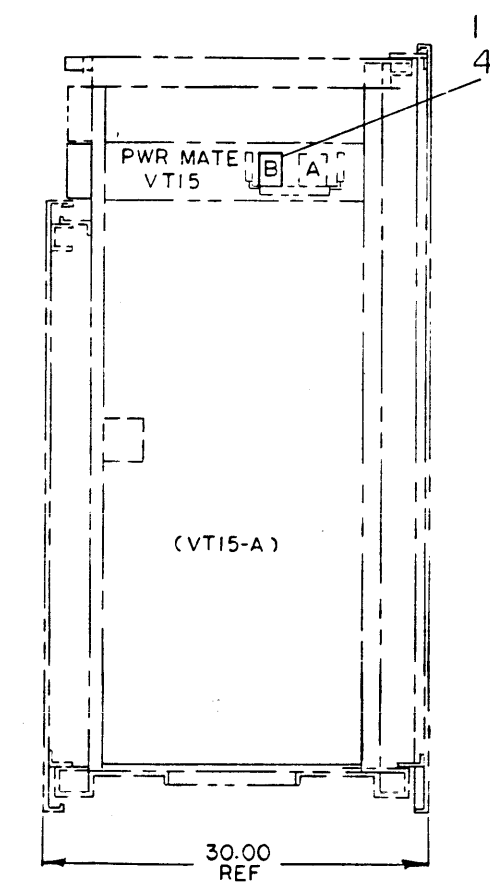
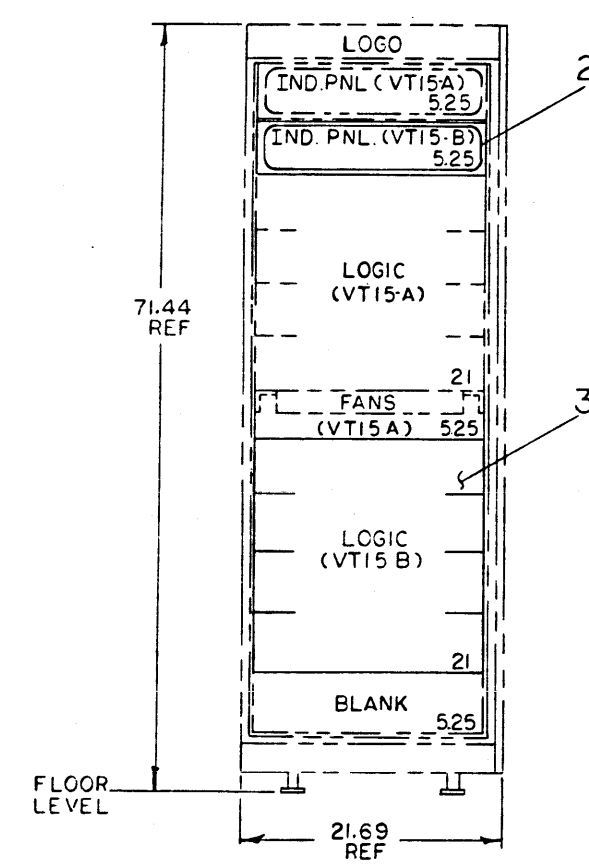
QTY.	DESCRIPTION	PART NO.	ITEM NO.
PARTS LIST			
digital CORPORATION MAYNARD, MASSACHUSETTS			
TITLE CABLE CONFIGURATION VT15A/B			
NEXT HIGHER ASSY D-VA-VT15-A-0			
SCALE SHEET OF			
SIZE CODE NUMBER DICTVT15-A-2			
REV B			

DICTVT15-A-2

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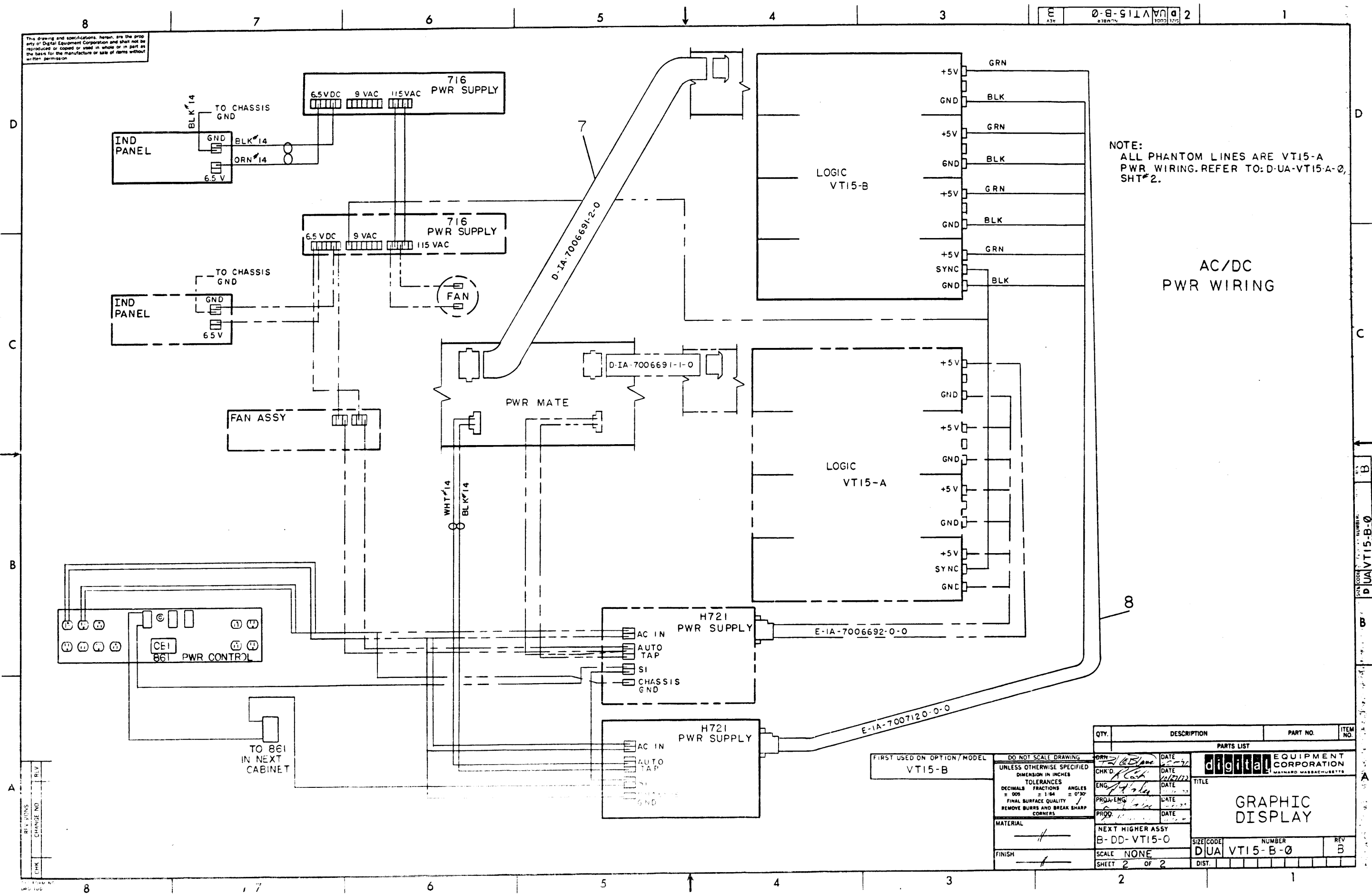
NOTES:

1. FOR DRAWING INDEX LIST REFER TO: 3-DD-VT15-D.
2. PUT BOTH H721 PWR SUPPLY ON REAR DOOR.



A		REVISIONS	
CHK	CHANGE NO	REV	
27	VT15-00055	A	
		27 March 1974	
		HALLO	
		HALL	
27	VT15-00058	B	
		E REMOND	
		F DOLL	
		27 March 1974	

FIRST USED ON OPTION, MODEL VT15-B	DO NOT SCALE DRAWING	DATE	PARTS LIST	
	UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES	CHK'D <i>1/2/80</i>	DATE <i>6/27/70</i>	digital EQUIPMENT CORPORATION MAYNARD MASSACHUSETTS
	TOLERANCES	CHK'D <i>6/27</i>	DATE <i>6/27/70</i>	
	DECIMALS FRACTIONS ANGLES ± .005 ± 1/64 ± 0°30'	ENG <i>6/27/70</i>	DATE <i>11-9-70</i>	
FINAL SURFACE QUALITY REMOVE BURRS AND BREAK SHARP CORNERS	PRO'G <i>6/27/70</i>	DATE <i>11-18-70</i>	TITLE	
MATERIAL — <i>A</i> —	PROD <i>6/27/70</i>	DATE <i>11-18-70</i>	GRAPHIC DISPLAY	
FINISH — <i>A</i> —	NEXT HIGHER ASSY B-DD-VT15-C	DATE		
	SCALE NONE	SIZE CODE	NUMBER	REP
	SHEET 1 OF 2	DUA	VT15-B-0	B
		DIST.		



MAYNARD, MASSACHUSETTS

QUANTITY / VARIATION

SECTION

1

ISSUED SECT.

1

DESCRIPTION

4

11

1

1

1

1

1

1

A/R

A/R

8

8

A/R

A/R

A/R

A/R

1

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[illegible]

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[illegible]

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ECO NO.

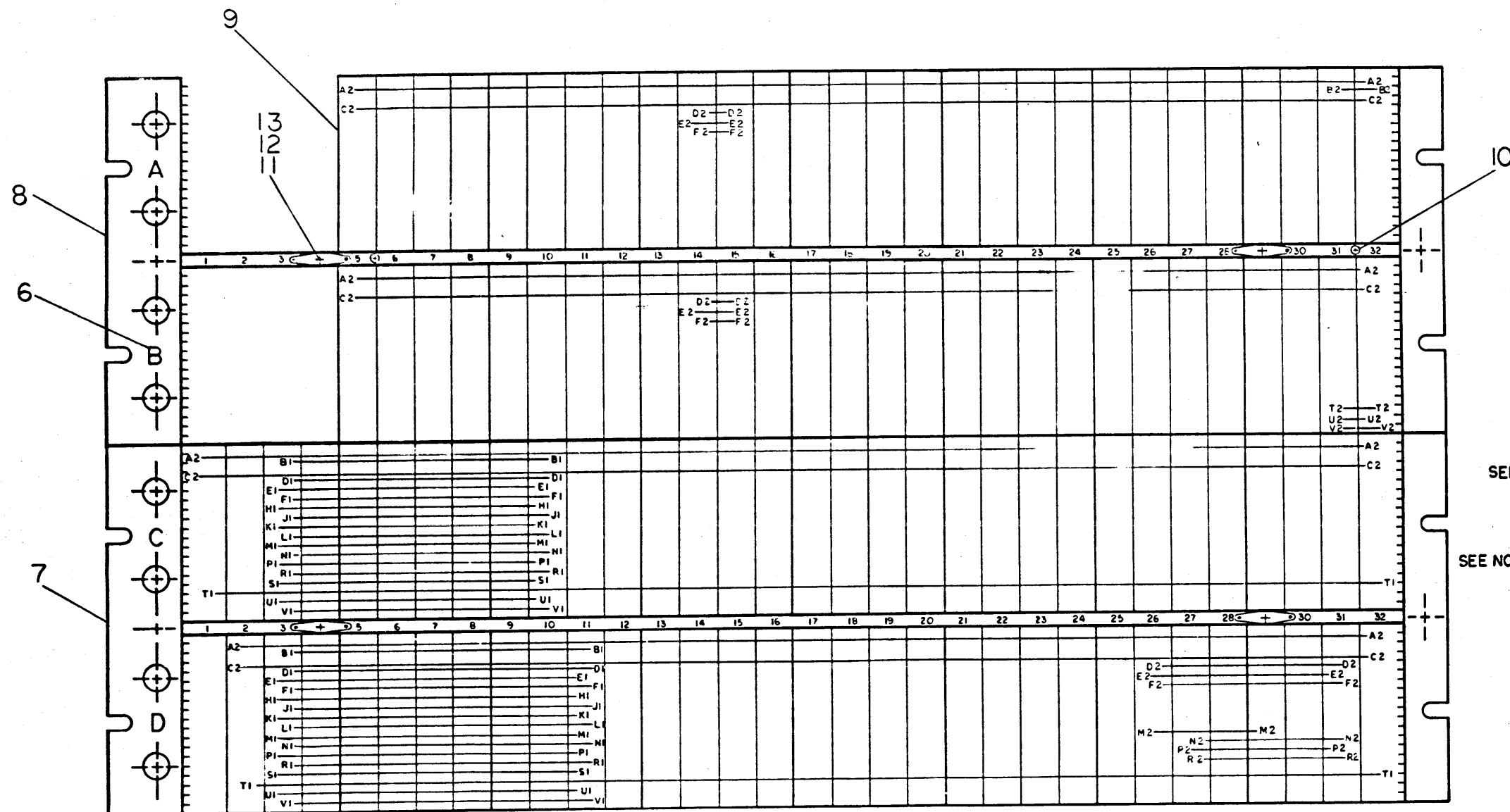
VT 15-
00058

	DIST
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NOTES:

1. CONNECTIONS ON ITEM NUMBER 1#2 TO BE LOCATED AND SOLDERED AT MINIMUM PRACTICAL HEIGHT ABOVE BLOCKS.
2. ALL CONNECTOR BLOCKS TO BE GROUNDED TO GROUND LUGS AS SHOWN, 4 PLACES
3. JUMPER GROUND BUSSING AS SHOWN, 8 PLACES.
4. USE YELLOW WIRE (ITEM#4) FOR MACHINE WRAPPED AND BLUE WIRE (ITEM#5) FOR HAND WRAPPED WIRING.



FIRST USED ON OPTION/MODEL		QTY.	DESCRIPTION	PART NO.	REV. NO.
VT15					
DO NOT SCALE DRAWING		QTY.	DATE	EQUIPMENT CORPORATION	
UNLESS OTHERWISE SPECIFIED		CHG.	DATE	MAYNARD, MASSACHUSETTS	
DIMENSION IN INCHES		ENG.	DATE	TITLE	
TOLERANCES		PROL. ENG.	DATE	WIRED ASS'Y	
DECIMALS FRACTIONS ANGLES		PROD.	DATE	VT15	
± .005 ± 1/64 ± 0°30'		NEXT HIGHER ASSY			
FINAL SURFACE QUALITY		D-AD-7006569-0-0			
REMOVE BURRS AND BREAK SHARP CORNERS		SCALE NONE			
MATERIAL		SHEET 1 OF 5			
FINISH		DIST.			

REV.	CHANGE NO.	DATE	BY	CHK.
A	1	10-1-70	W. J. HALL	
B	2	10-1-70	W. J. HALL	
C	3	10-1-70	W. J. HALL	
D	4	10-1-70	W. J. HALL	
E	5	10-1-70	W. J. HALL	
F	6	10-1-70	W. J. HALL	
G	7	10-1-70	W. J. HALL	
H	8	10-1-70	W. J. HALL	
I	9	10-1-70	W. J. HALL	
J	10	10-1-70	W. J. HALL	
K	11	10-1-70	W. J. HALL	
L	12	10-1-70	W. J. HALL	
M	13	10-1-70	W. J. HALL	
N	14	10-1-70	W. J. HALL	
O	15	10-1-70	W. J. HALL	
P	16	10-1-70	W. J. HALL	
Q	17	10-1-70	W. J. HALL	
R	18	10-1-70	W. J. HALL	
S	19	10-1-70	W. J. HALL	
T	20	10-1-70	W. J. HALL	
U	21	10-1-70	W. J. HALL	
V	22	10-1-70	W. J. HALL	
W	23	10-1-70	W. J. HALL	
X	24	10-1-70	W. J. HALL	
Y	25	10-1-70	W. J. HALL	
Z	26	10-1-70	W. J. HALL	

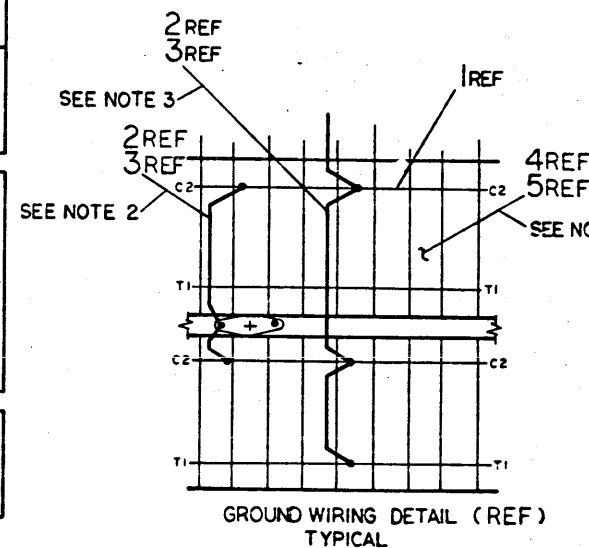
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NOTES:

1. CONNECTIONS ON ITEM NUMBER 1 & 2 TO BE LOCATED AND SOLDERED AT MINIMUM PRACTICAL HEIGHT ABOVE BLOCKS.
2. ALL CONNECTOR BLOCKS TO BE GROUNDED TO GROUND LUGS AS SHOWN, 4 PLACES.
3. JUMPER GROUND BUSSING AS SHOWN, 8 PLACES.
4. USE YELLOW WIRE (ITEM #4) FOR MACHINE WRAPPED AND BLUE WIRE (ITEM #5) FOR HAND WRAPPED WIRING.

7 REF

6 REF



FIRST USED ON OPTION/MODEL		QTY.	DESCRIPTION	PART NO.	ITEM NO.
VT15					
DO NOT SCALE DRAWING		DRN.	DATE	PARTS LIST	
UNLESS OTHERWISE SPECIFIED		CHUD.	DATE	EQUIPMENT CORPORATION	
DIMENSION IN INCHES		DATE	DATE	DATE	
TOLERANCES		DATE	DATE	DATE	
DECIMALS FRACTIONS ANGLES		DATE	DATE	DATE	
± .005 ± .001 ± .001		DATE	DATE	DATE	
FINAL SURFACE QUALITY		DATE	DATE	DATE	
REMOVE BURRS AND BREAK SHARP CORNERS		DATE	DATE	DATE	
MATERIAL		DATE	DATE	DATE	
NEXT HIGHER ASSY		DATE	DATE	DATE	
FINISH		DATE	DATE	DATE	
SCALE NONE		DATE	DATE	DATE	
SHEET 2 OF 3		DATE	DATE	DATE	

WIRED ASS'Y
VT15

SIZE CODE NUMBER REF.
D AD 7006551-0-0 J

DIST. 1

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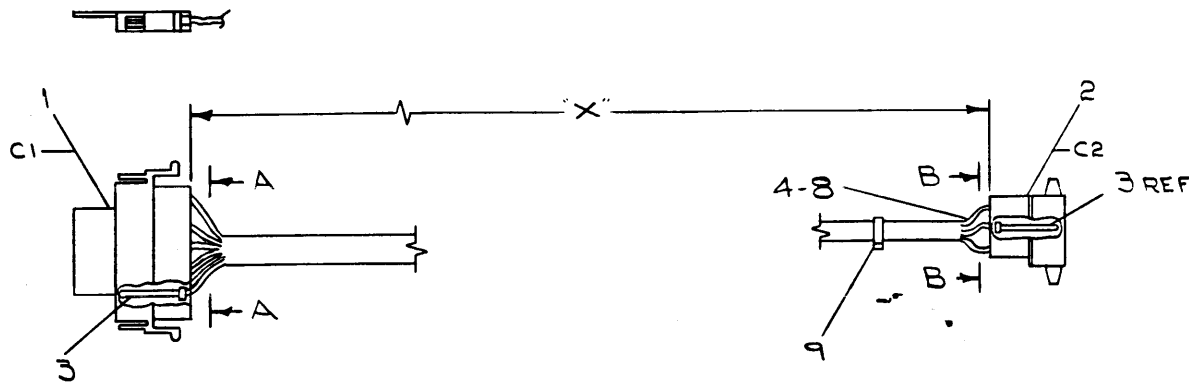
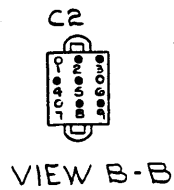
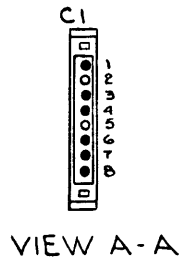
WIRE TABLE				
ITEM	DESCRIPTION		FROM	TO
NO	AWG	COLOR	CONNECTION	CONNECTION
2,3	22	WHITE	A31 - B2	A20 - E2
			A17 - E2	A15 - E2
			A17 - E2	A20 - E2
			A17 - F2	A15 - F2
			A17 - F2	A20 - F2
			A20 - D2	A15 - D2
			A14 - D2	B14 - D2
			A14 - E2	B14 - E2
			A14 - F2	B14 - F2
			B31 - T2	B28 - T2
			B31 - U2	B28 - U2
			B31 - V2	B28 - V2
			B25 - T2	B20 - F2
			B25 - U2	B20 - E2
			B25 - V2	B20 - D2
			B15 - D2	B17 - D2
			B15 - E2	B17 - E2
			B15 - F2	B17 - F2
			B17 - D2	E20 - D2
			B17 - E2	E20 - E2
			B17 - F2	E20 - F2
			B25 - T2	B28 - T2
			B25 - U2	B28 - U2
			B25 - V2	B28 - V2
			A15 - D2	A17 - D2
			A20 - F2	B20 - F2
2,3	22	WHITE	A17 - F2	B17 - F2
2,3	22	WHITE	B32 - D2	B20 - F2

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.		
VT15						
UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES TOLERANCES	DRN. LEBLANC CHK'D. LEBLANC ENG. HALIO PROJ. ENG. HALIO PROD. RUNDY	DATE 04-73 DATE 12-73 DATE 3-1-73 DATE 3-1-73 DATE 3-1-73	PARTS LIST			
DECIMALS .005 XX .02 X .1	ANGLES ±0° 30'	TITLE				
REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY		WIRED ASSY VT 5				
MATERIAL	NEXT HIGHER ASSY.	SIZE CODE	NUMBER	REV		
FINISH	D-AD-7006569-0-0	D-AD	7006569-0-0	J		
	SCALE NONE					
	SHEET 2 OF 2					

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LEGEND		
NUMBER	VARIATION	FIRST USED ON
7006691-1	13.25	VT15-A
7006691-2	52	VT15-B

WIRE TABLE							
ITEM DESCRIPTION		FROM		TO			
NO	AWG	COLOR	CONNECTION	WITH	CONNECTION	WITH	
4	18	BLK	C1-1	3	C2-4	3	
5	18	RED	C1-3	3	C2-9	3	
6	18	ORN	C1-4	3	C2-8	3	
7	18	BLU	C1-6	3	C2-3	3	
8	18	VIO	C1-7	3	C2-2	3	
4	18	BLK	C1-8	3	C2-5	3	



QTY.	DESCRIPTION	PART NO.	ITEM NO.
1	ARTIE WRAP PANDUIT SST-28	9007032	9
1	AR WIRE #18 STRD TEF VIO	9107360-77	8
1	AR WIRE #18 STRD TEF BLU	9107360-66	7
1	AR WIRE #18 STRD TEF ORN	9107360-33	6
1	AR WIRE #18 STRD TEF RED	9107360-22	5
1	AR WIRE #18 STRD TEF BLK	9107360-03	4
12	MTE CONTACT PIN	1209378	3
1	PANEL MOUNT CONN MATE-LOCK	1209351-09	2
1	SOCKET HOUSING MATE-LOCK	1209340-01	1

FIRST USED ON OPTION/ MODEL
SEE LEGEND

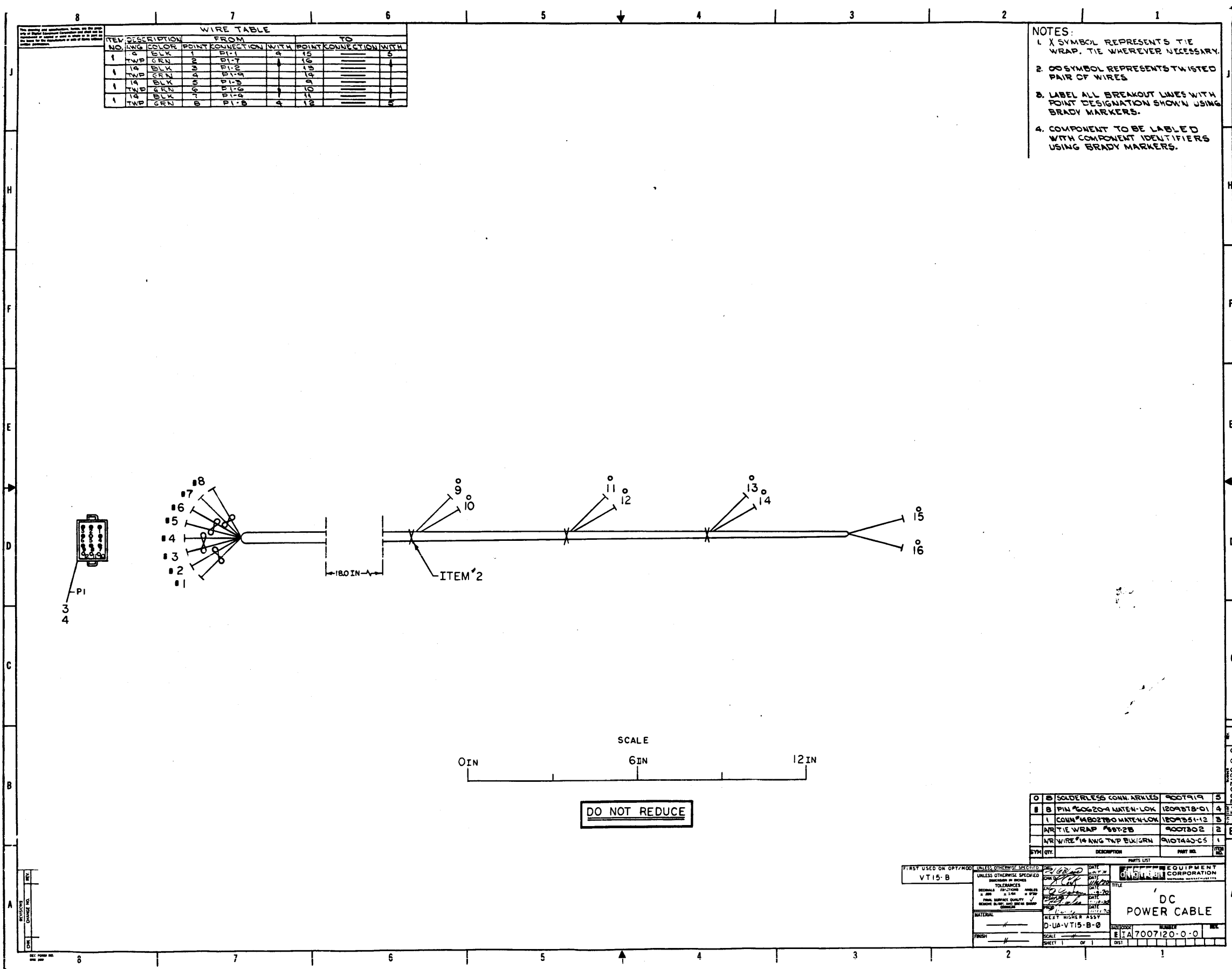
DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED
DIMENSION IN INCHES
TOLERANCES
DECIMALS FRACTIONS ANGLES
± .005 ± 1/64 ± 90°
FINAL SURFACE QUALITY
REMOVE BURRS AND BREAK SHARP CORNERS
MATERIAL
FINISH

DRN: *[Signature]* DATE: 1-10-70
CHKD: *[Signature]* DATE: 1-10-70
ENG: *[Signature]* DATE: 1-10-70
PROD: *[Signature]* DATE: 1-10-70
NEXT HIGHER ASSY
D-UA-VT15-A-0
SCALE: NONE
SHEET 1 OF 1

PARTS LIST
TITLE: ±15V PWR CABLE (VT15)
SIZE/ CODE: DIA7006691-0-0
NUMBER: 1
REV: A
SHEET 1 OF 1

REVISIONS		DATE	BY
CHG	CHANGE NO.		
1	VT15-0011	1-10-70	

DEC FORM NO
DRD 100



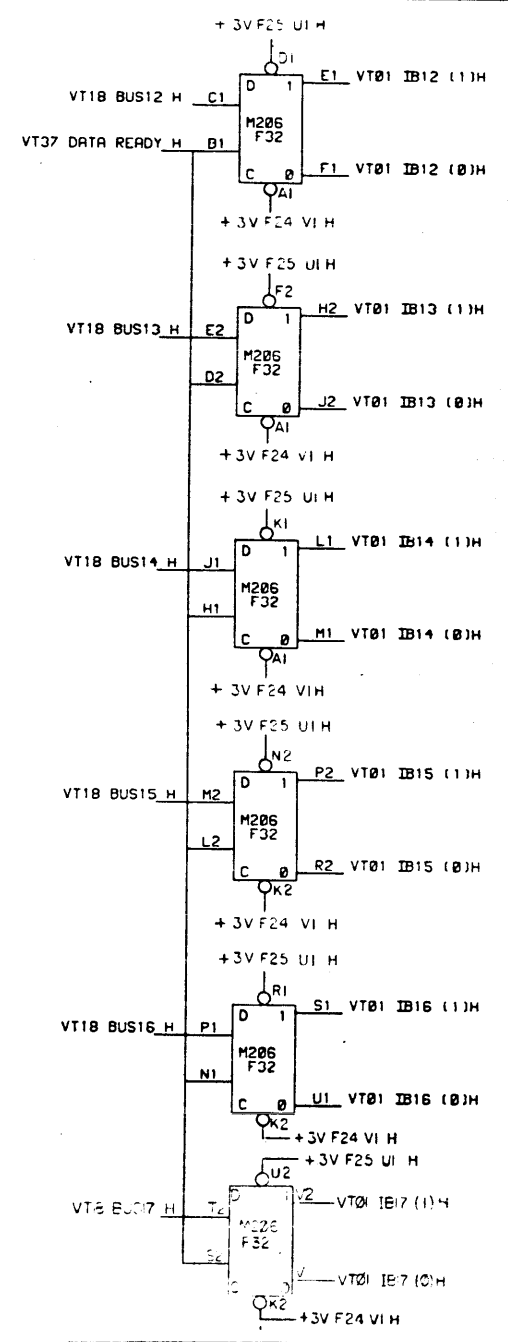
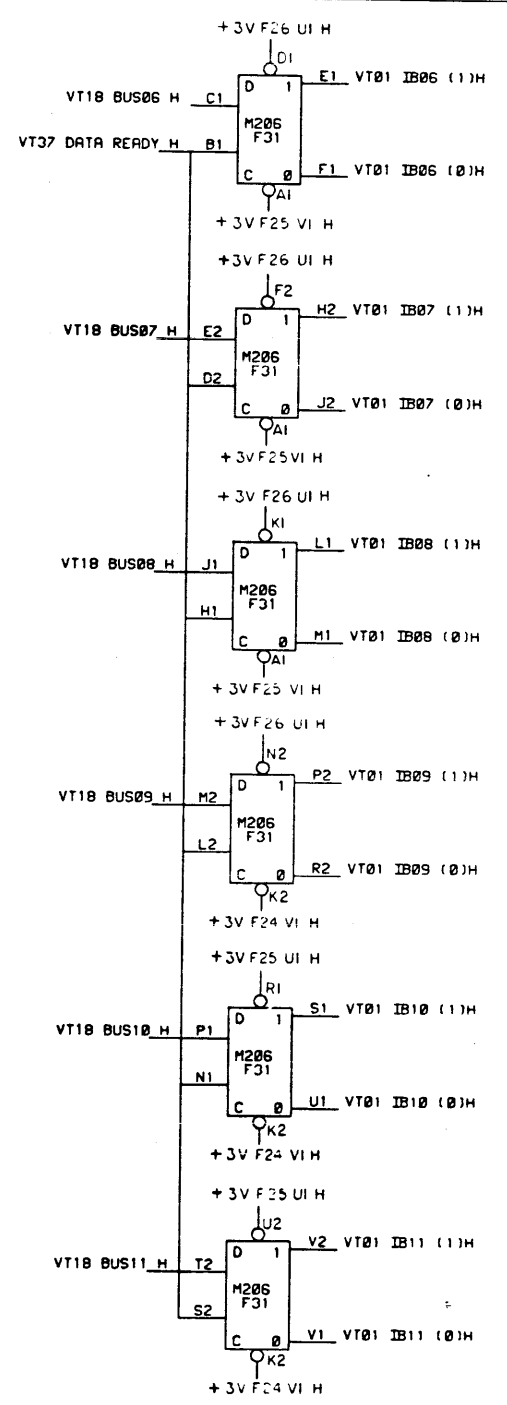
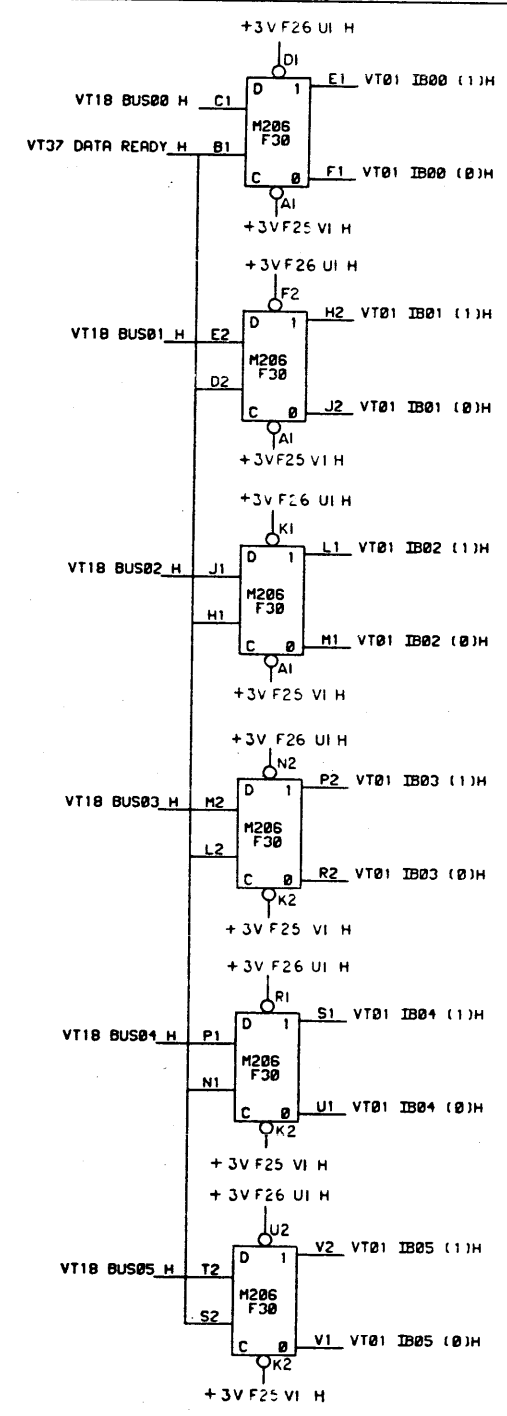
WIRE TABLE					
ITEM NO.	DESCRIPTION	FROM	TO	POINT CONNECTION WITH	POINT CONNECTION WITH
1	4 BLK	1	PI-1	4	15
1	14 GRN	2	PI-2	1	16
1	14 BLK	3	PI-3	1	13
1	14 GRN	4	PI-4	1	14
1	14 BLK	5	PI-5	1	9
1	14 GRN	6	PI-6	1	10
1	14 BLK	7	PI-7	1	11
1	14 GRN	8	PI-8	1	12

- NOTES:
1. X SYMBOL REPRESENTS TIE WRAP. TIE WHEREVER NECESSARY.
 2. OO SYMBOL REPRESENTS TWISTED PAIR OF WIRES.
 3. LABEL ALL BREAKOUT LINES WITH POINT DESIGNATION SHOWN USING BRADY MARKERS.
 4. COMPONENT TO BE LABELED WITH COMPONENT IDENTIFIERS USING BRADY MARKERS.

0	5	SOLDERLESS CONN. ARKLES	9007919	5
1	8	PIN #60620-4 MATEN-LOK	1204518-01	4
1	1	CONN #4002780 MATEN-LOK	1204518-12	3
1	1	TIE WRAP #80725	9007802	2
1	1	NR WIRE #14 AWG TWP BLK GRN	9107443-05	1
SYM	QTY	DESCRIPTION	PART NO.	FILE NO.
PARTS LIST				
EQUIPMENT CORPORATION				
DC POWER CABLE				
D-UB-VT15-B-0				
EIA 7007120-0-0				
SHEET 1 OF 1				

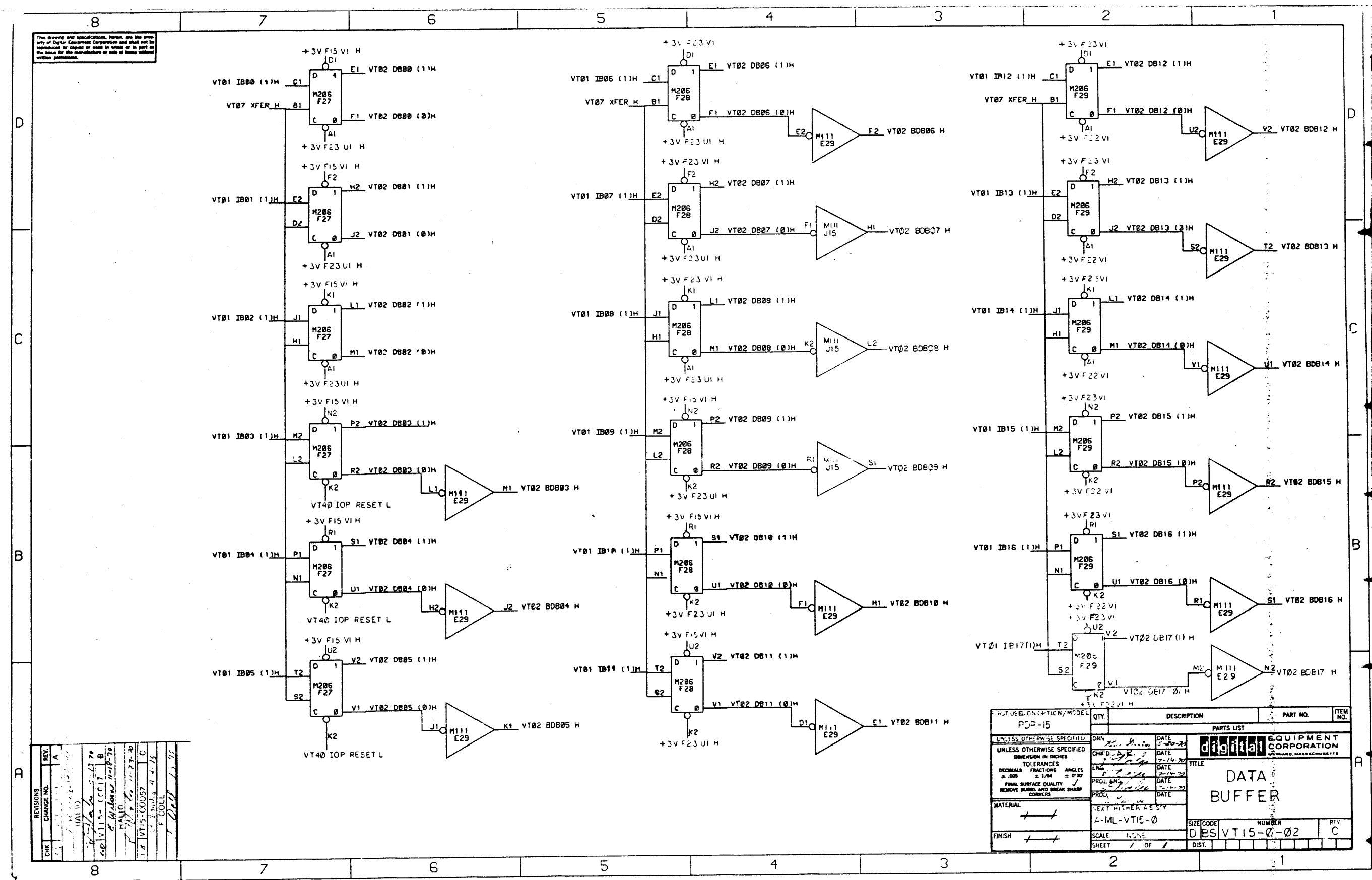
DO NOT REDUCE

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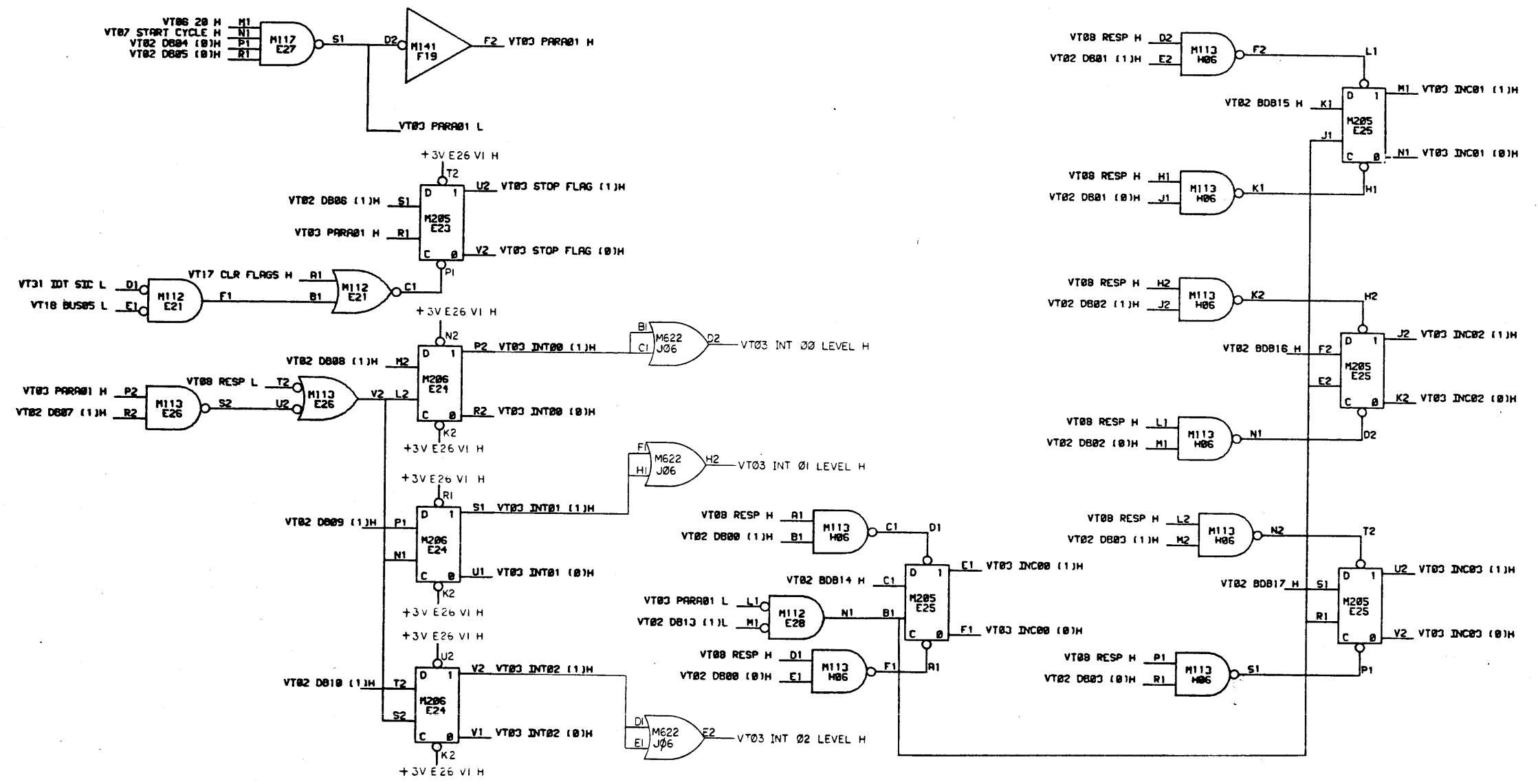


REV.	CHG.	NO.	DATE
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2	1	1	1/15/70
3	1	1	1/15/70
4	1	1	1/15/70
5	1	1	1/15/70
6	1	1	1/15/70
7	1	1	1/15/70
8	1	1	1/15/70

PART USED IN OPTION MODEL		QTY.	DESCRIPTION	PART NO.	ITEM NO.
DDP-15					
UNLESS OTHERWISE SPECIFIED		PARTS LIST			
DIMENSION IN INCHES		DATE	DATE		
TOLERANCES		DATE	DATE		
DECIMALS FRACTIONS ANGLES		DATE	DATE		
± .001 ± .002 ± .005		DATE	DATE		
FINISH SURFACE QUALITY		DATE	DATE		
REMOVE BURRS AND BREAK SHARP CORNERS		DATE	DATE		
MATERIAL		NEXT HIGHER ASSY			
FINISH		A-ML-1715-0			
SCALE		NONE			
SHEET		OF 1			
DIST.		DIST.			
TITLE		INPUT BUFFER			
SIZE/CODE		NUMBER			
REV.		REV.			
A		A			



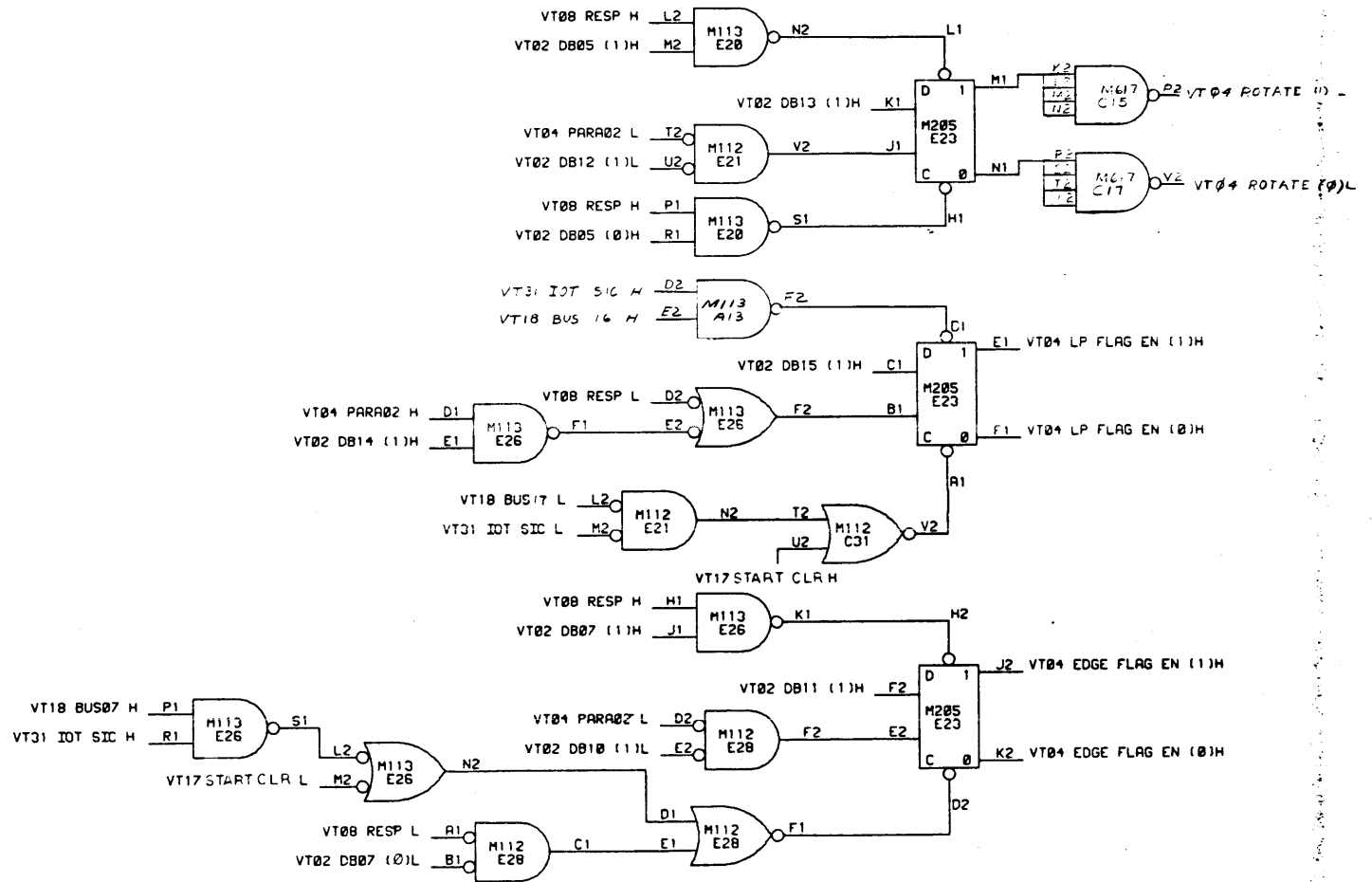
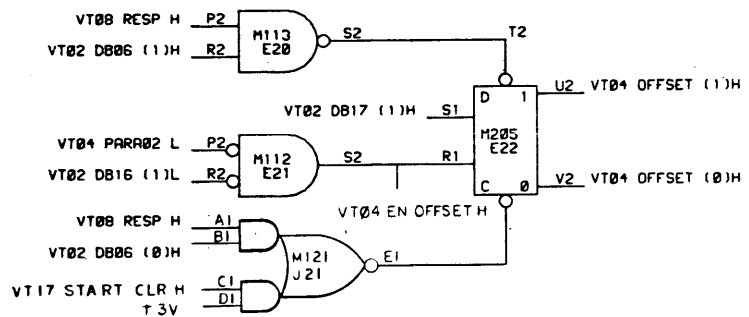
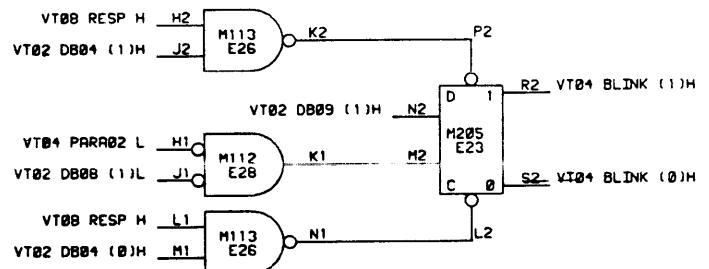
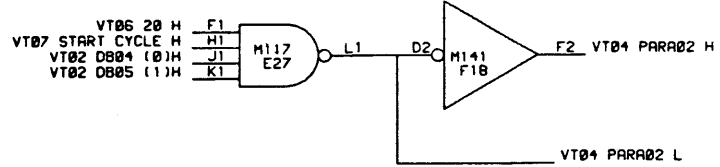
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REV.	CHG.	NO.	DATE
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2	1	1	10-1-70
3	1	1	10-1-70
4	1	1	10-1-70
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7	1	1	10-1-70
8	1	1	10-1-70

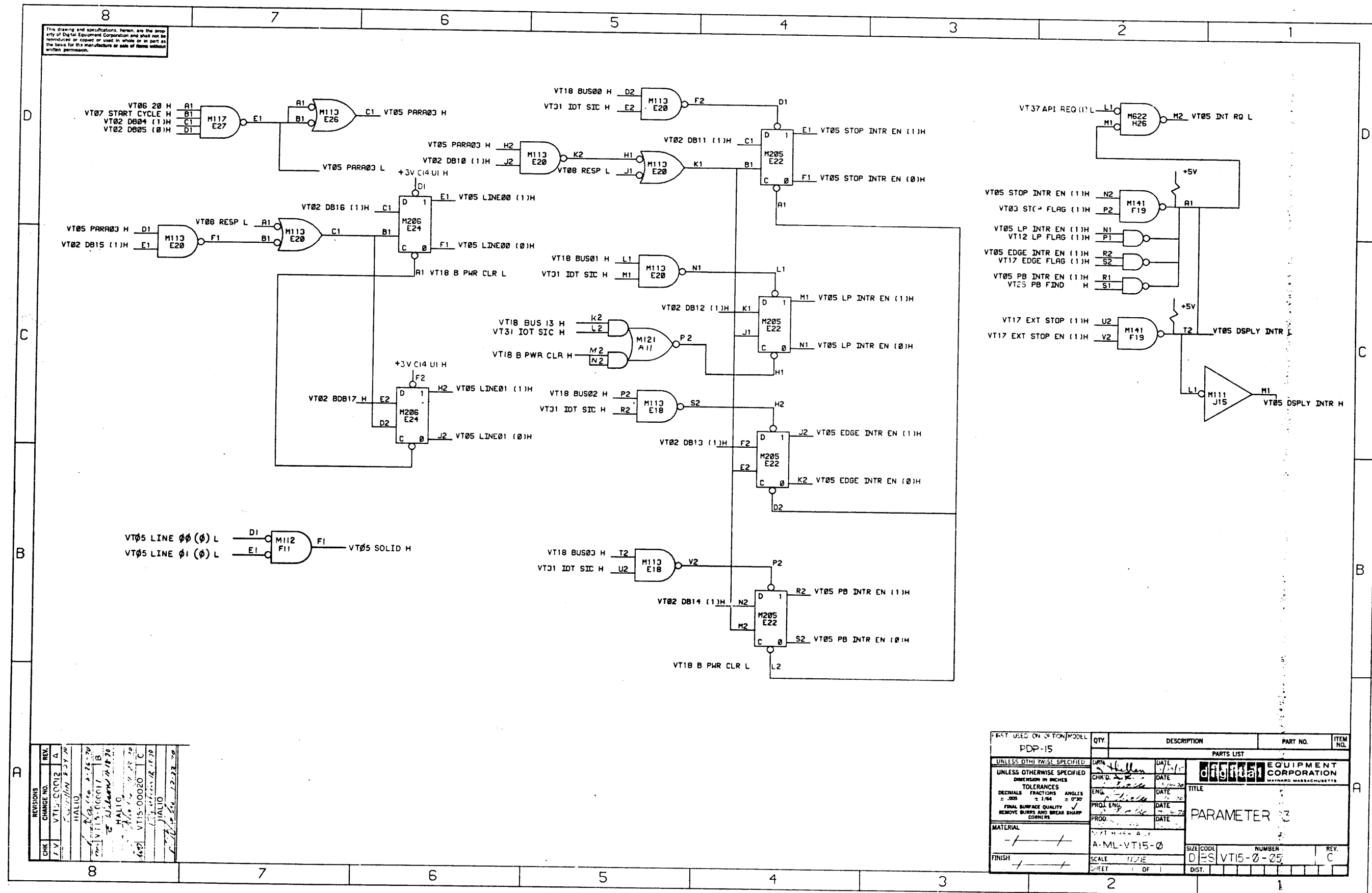
POP-15	QTY.	DESCRIPTION	PART NO.	ITEM NO.
PARTS LIST				
UNLESS OTHERWISE SPECIFIED	DATE	TITLE		
UNLESS OTHERWISE SPECIFIED	DATE	TITLE		
TOLERANCES	DATE	TITLE		
DECIMALS FRACTIONS ANGLES	DATE	TITLE		
± .008 ± 1/64 ± 0°30'	DATE	TITLE		
FINAL SURFACE QUALITY	DATE	TITLE		
REMOVE BURRS AND BREAK SHARP CORNERS	DATE	TITLE		
MATERIAL	DATE	TITLE		
FINISH	DATE	TITLE		
NEXT REVISION		SIZE CODE NUMBER REV.		
A-ML-VT-5-0		DIST. VT15-0-03 4		
SCALE NONE		SHEET 1 OF 1		

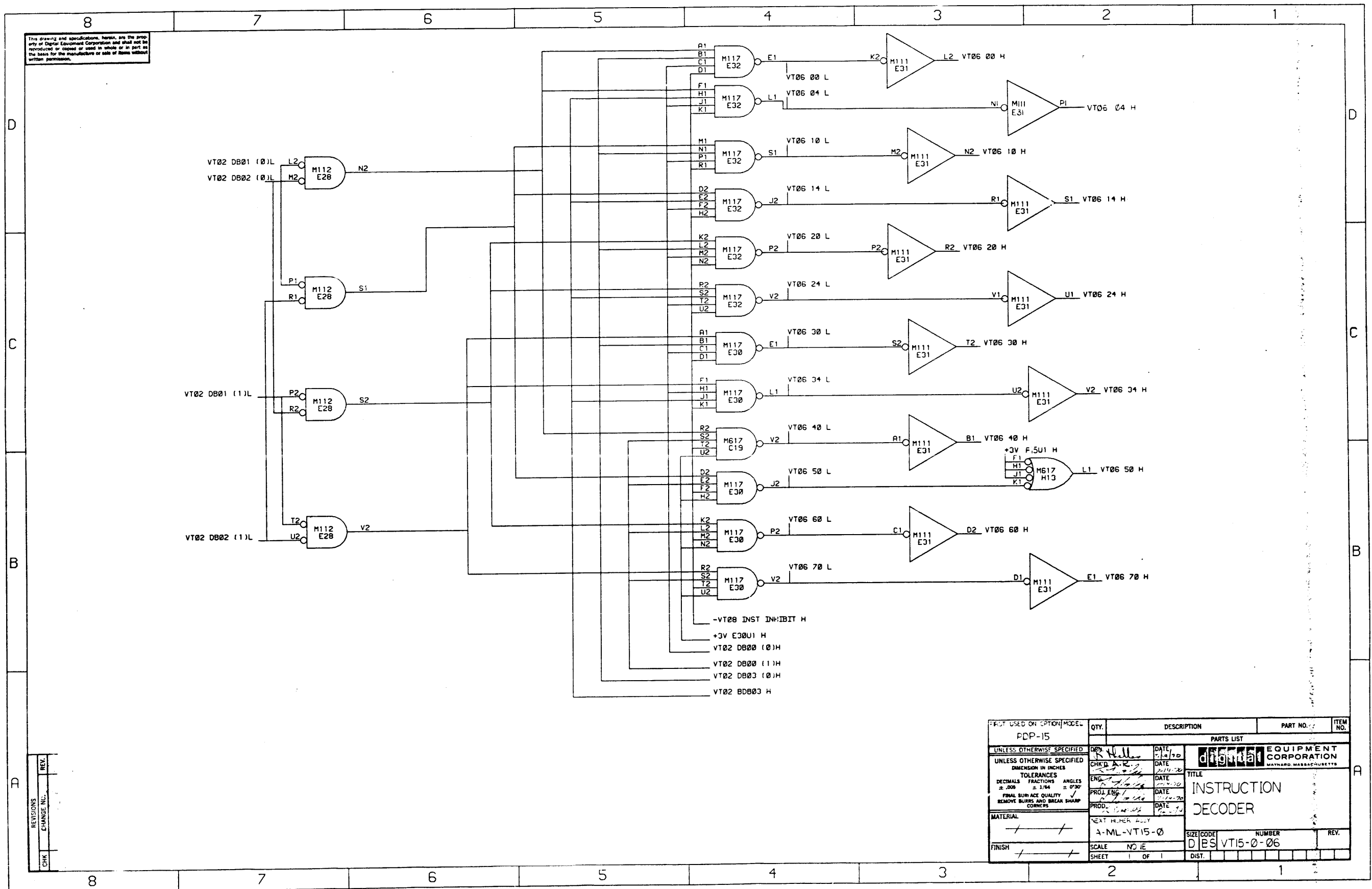
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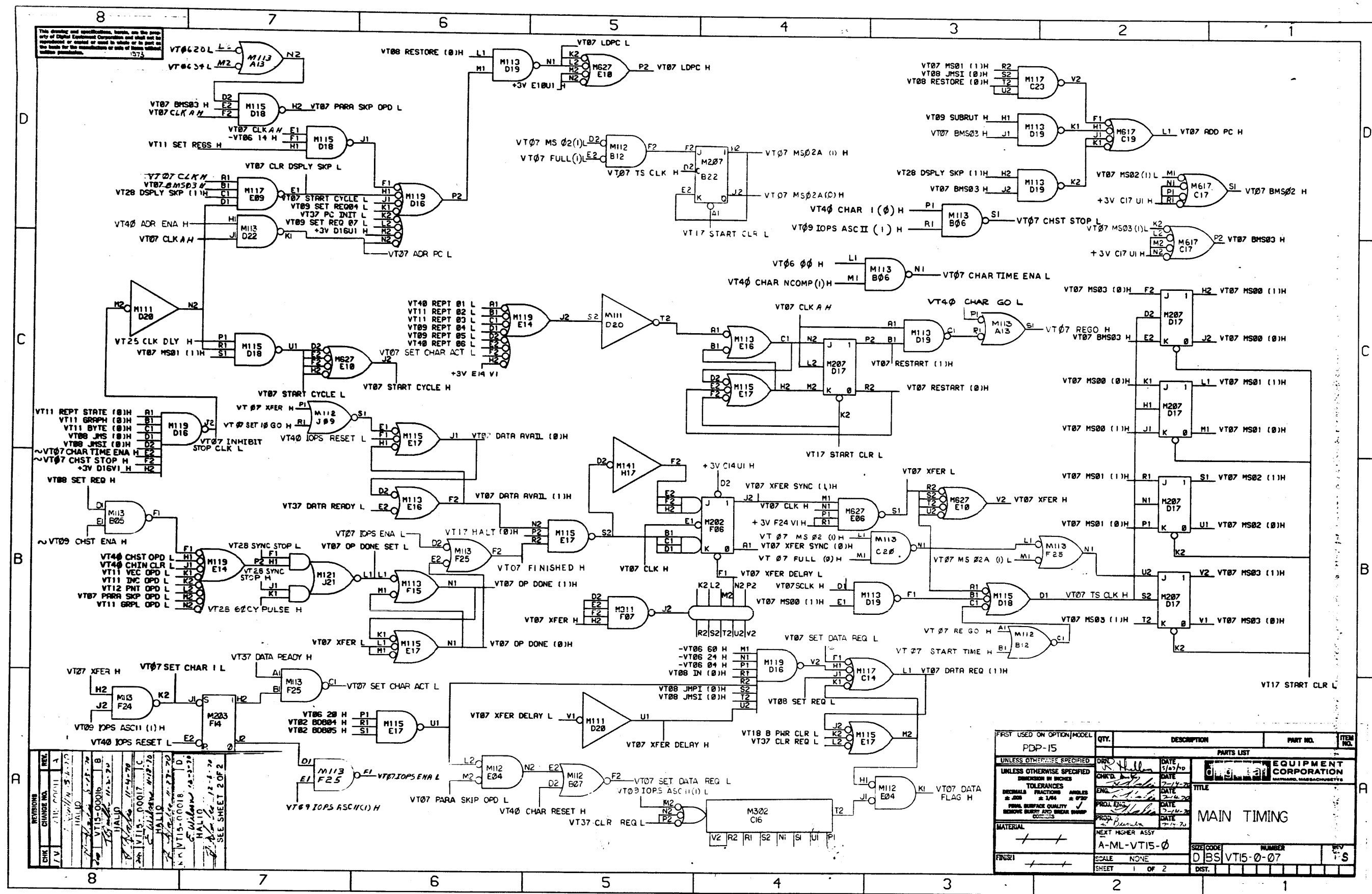


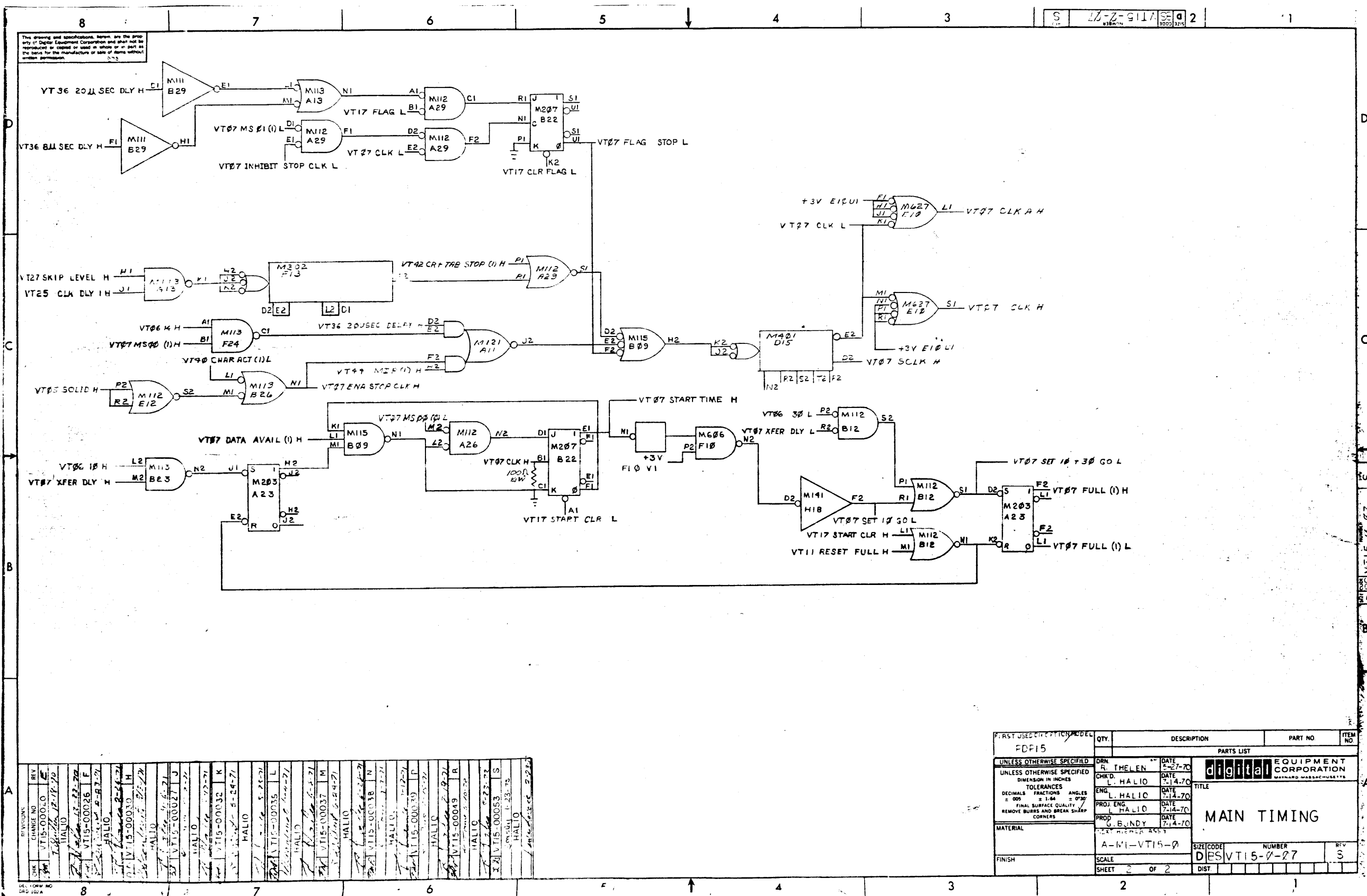
REV.	CHANGE NO.	DATE	BY	CHKD.
1	1	11-10-70	HALO	HALO
2	2	11-10-70	HALO	HALO
3	3	11-10-70	HALO	HALO
4	4	11-10-70	HALO	HALO
5	5	11-10-70	HALO	HALO
6	6	11-10-70	HALO	HALO
7	7	11-10-70	HALO	HALO
8	8	11-10-70	HALO	HALO
9	9	11-10-70	HALO	HALO
10	10	11-10-70	HALO	HALO
11	11	11-10-70	HALO	HALO
12	12	11-10-70	HALO	HALO
13	13	11-10-70	HALO	HALO
14	14	11-10-70	HALO	HALO
15	15	11-10-70	HALO	HALO
16	16	11-10-70	HALO	HALO
17	17	11-10-70	HALO	HALO
18	18	11-10-70	HALO	HALO
19	19	11-10-70	HALO	HALO
20	20	11-10-70	HALO	HALO

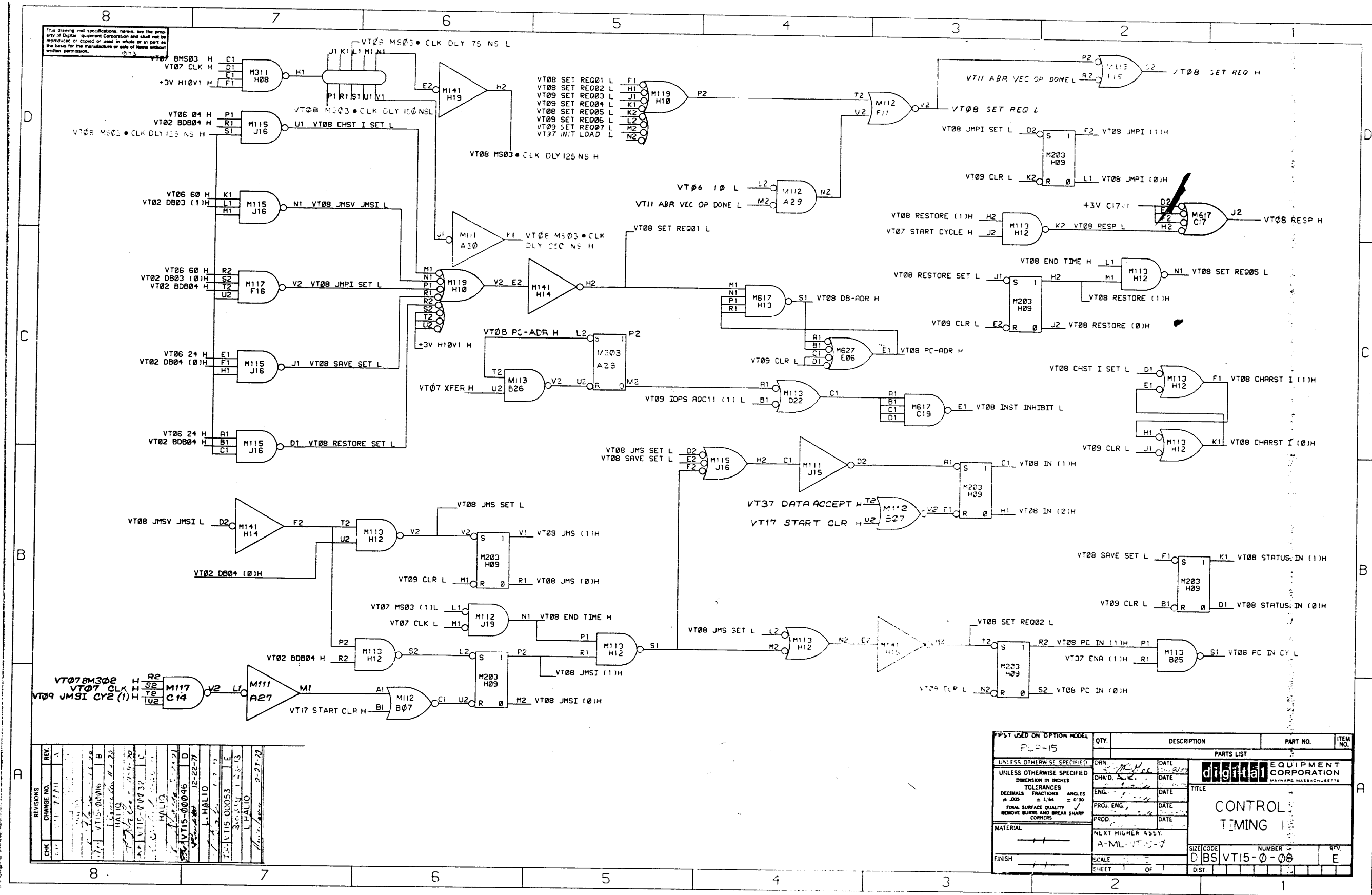
FIRST USED ON OPTION MODEL		QTY.	DESCRIPTION	PART NO.	ITEM NO.
PDP-15					
UNLESS OTHERWISE SPECIFIED		DRN	DATE	PARTS LIST	
UNLESS OTHERWISE SPECIFIED		CHKD.	DATE	digital EQUIPMENT CORPORATION	
DIMENSION IN INCHES		ENG.	DATE	TITLE	
TOLERANCES		PROJ. ENG.	DATE	PARAMETER 2	
DECIMALS FRACTIONS ANGLES		PROD.	DATE	NUMBER	
±.005 ±.004 ±.030				REV.	
FINISH SURFACE QUALITY				D ES VT 15-0-04	
REMOVE BURRS AND BREAK SHARP CORNERS				E	
MATERIAL		NEXT HIGHER ASSY.			
FINISH		SCALE			
		SHEET 1 OF 1			

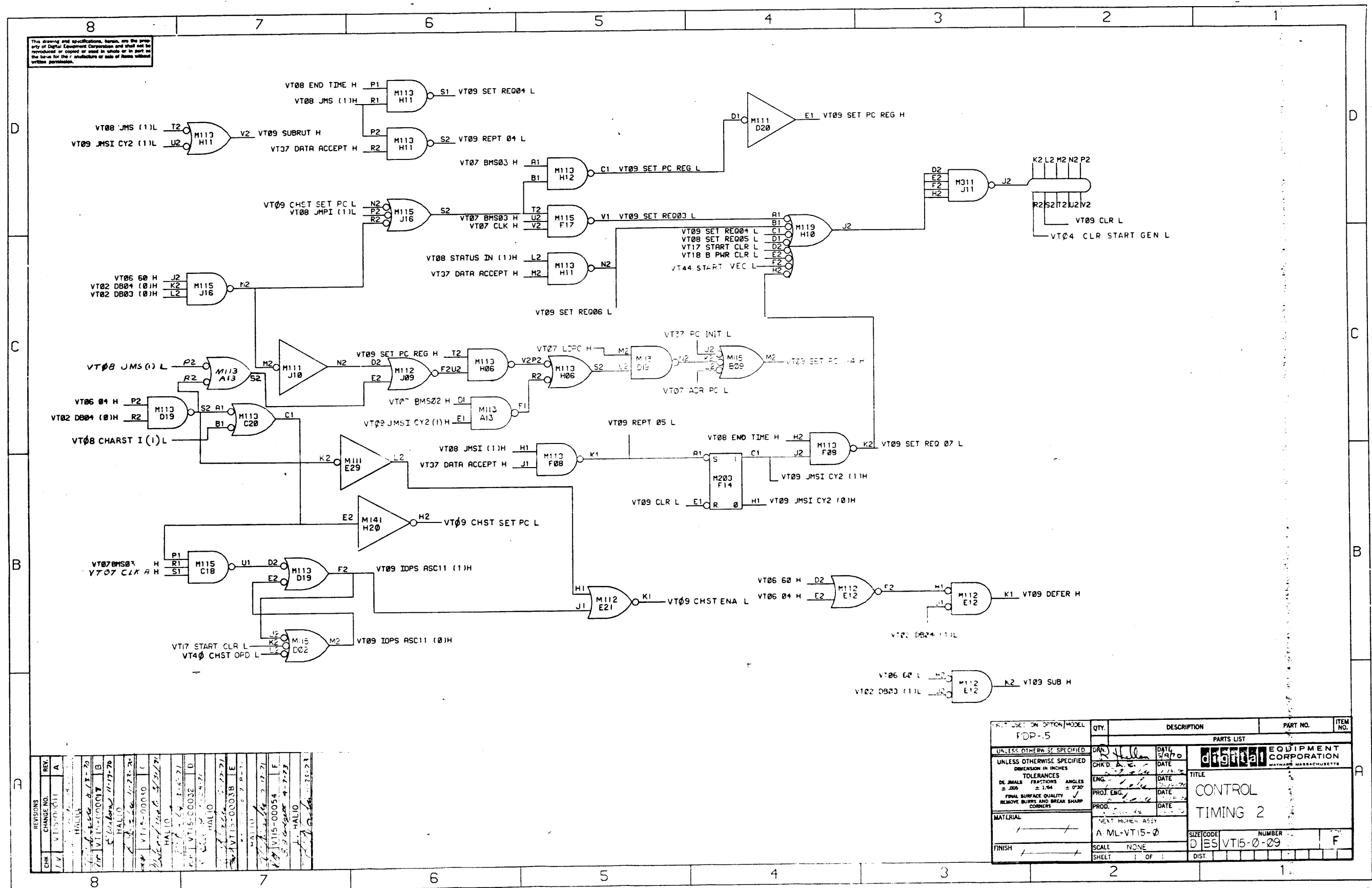


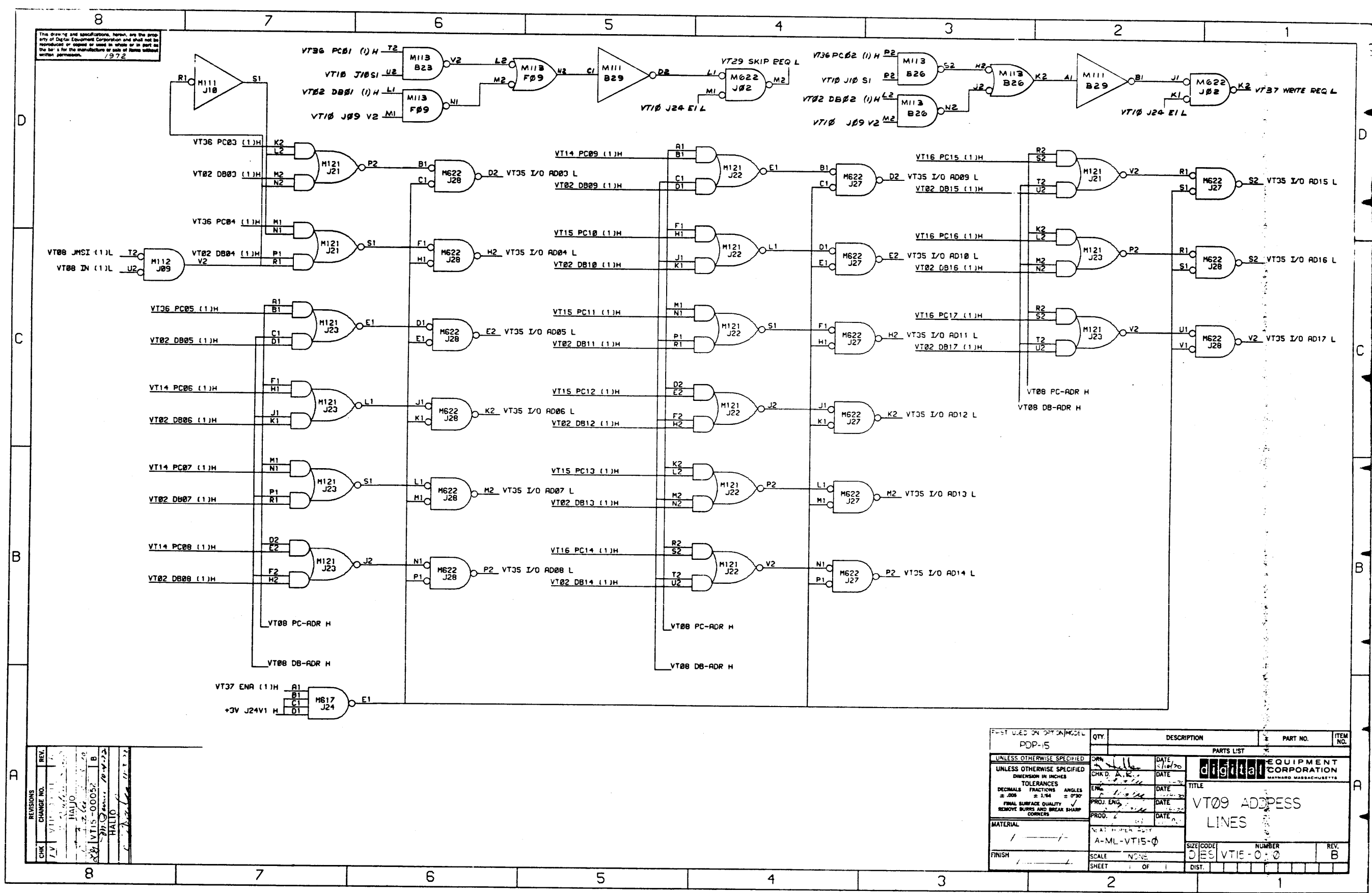






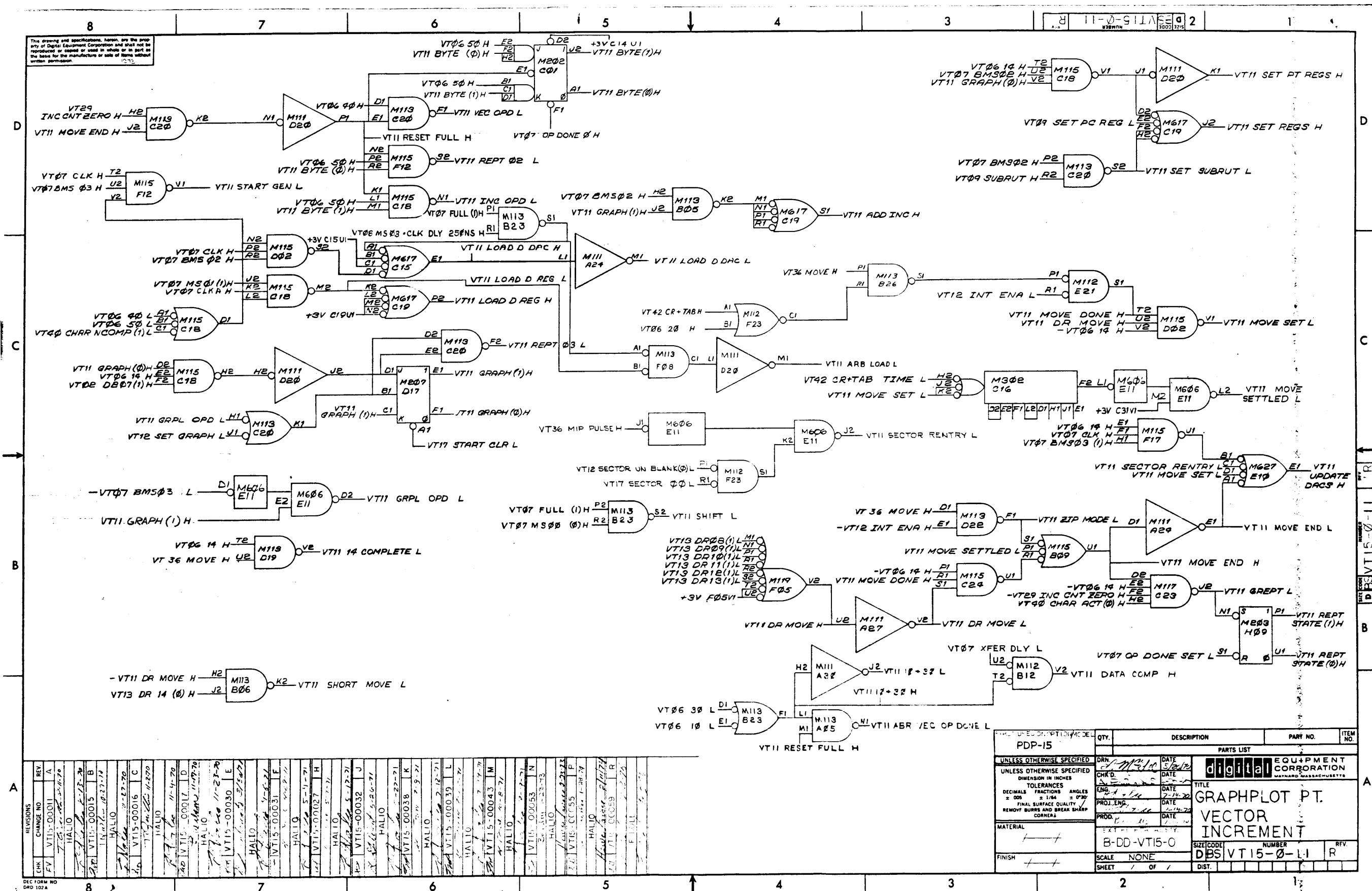


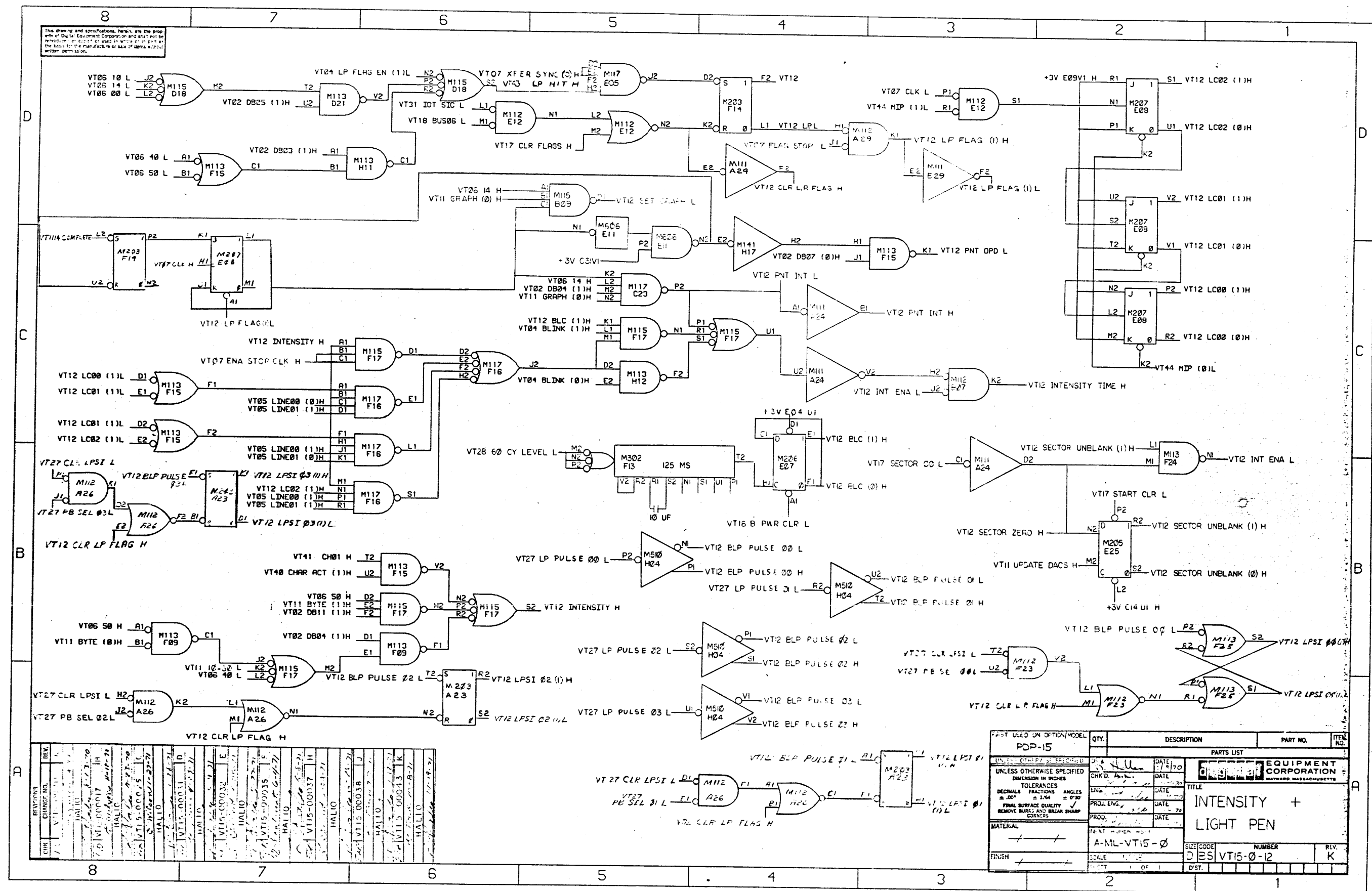


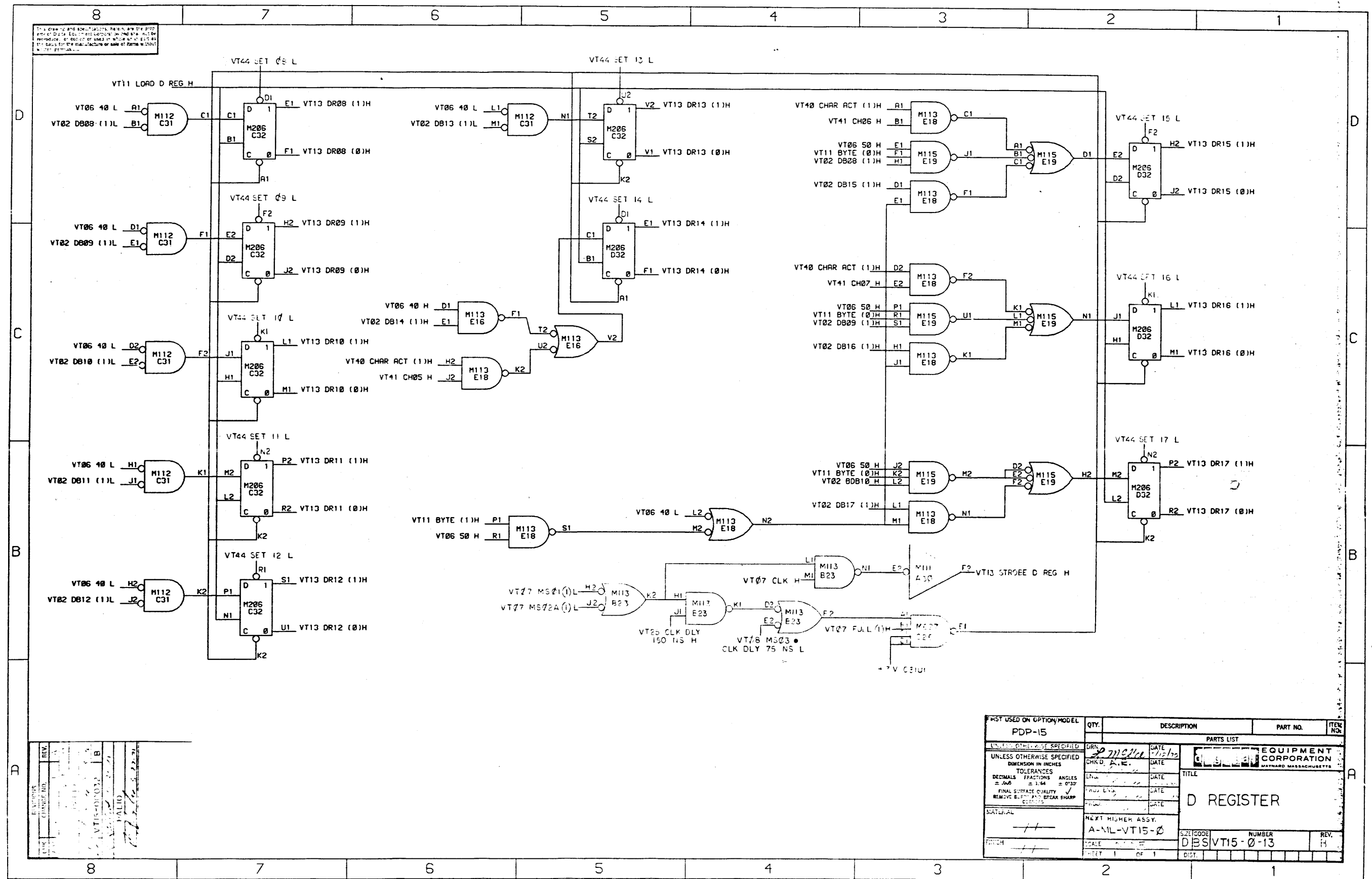


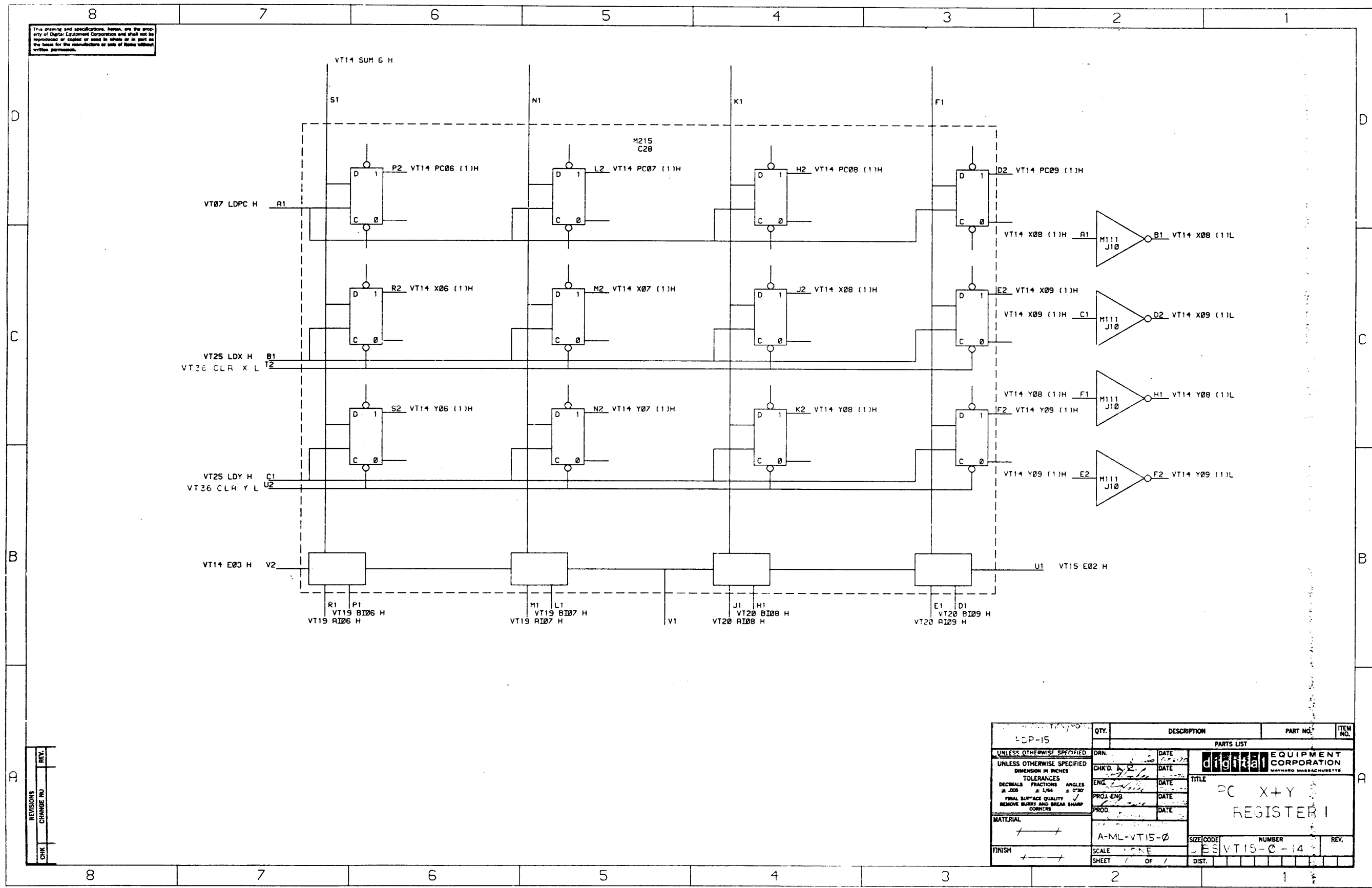
REV.	CHANGE NO.	DATE	BY	CHKD.
1	1	11/10/72	HALIO	HALIO
2	2	11/10/72	HALIO	HALIO
3	3	11/10/72	HALIO	HALIO
4	4	11/10/72	HALIO	HALIO
5	5	11/10/72	HALIO	HALIO
6	6	11/10/72	HALIO	HALIO
7	7	11/10/72	HALIO	HALIO
8	8	11/10/72	HALIO	HALIO

PART USED ON OTHER MODEL		QTY.	DESCRIPTION	PART NO.	ITEM NO.
POP-15					
UNLESS OTHERWISE SPECIFIED		DATE	PARTS LIST		
UNLESS OTHERWISE SPECIFIED		DATE	digital EQUIPMENT CORPORATION		
DIMENSION IN INCHES		DATE	MAYNARD MASSACHUSETTS		
TOLERANCES		DATE	TITLE		
DECIMALS FRACTIONS ANGLES		DATE	VT09 ADDRESS LINES		
±.008 ±.004 ±.030		DATE	SIZE CODE		
FINAL SURFACE QUALITY		DATE	NUMBER		
REMOVE BURRS AND BREAK SHARP CORNERS		DATE	REV. B		
MATERIAL		DATE	DIST.		
A-ML-VT15-0		DATE			
FINISH		DATE			
SCALE NONE		DATE			
SHEET 1 OF 1		DATE			

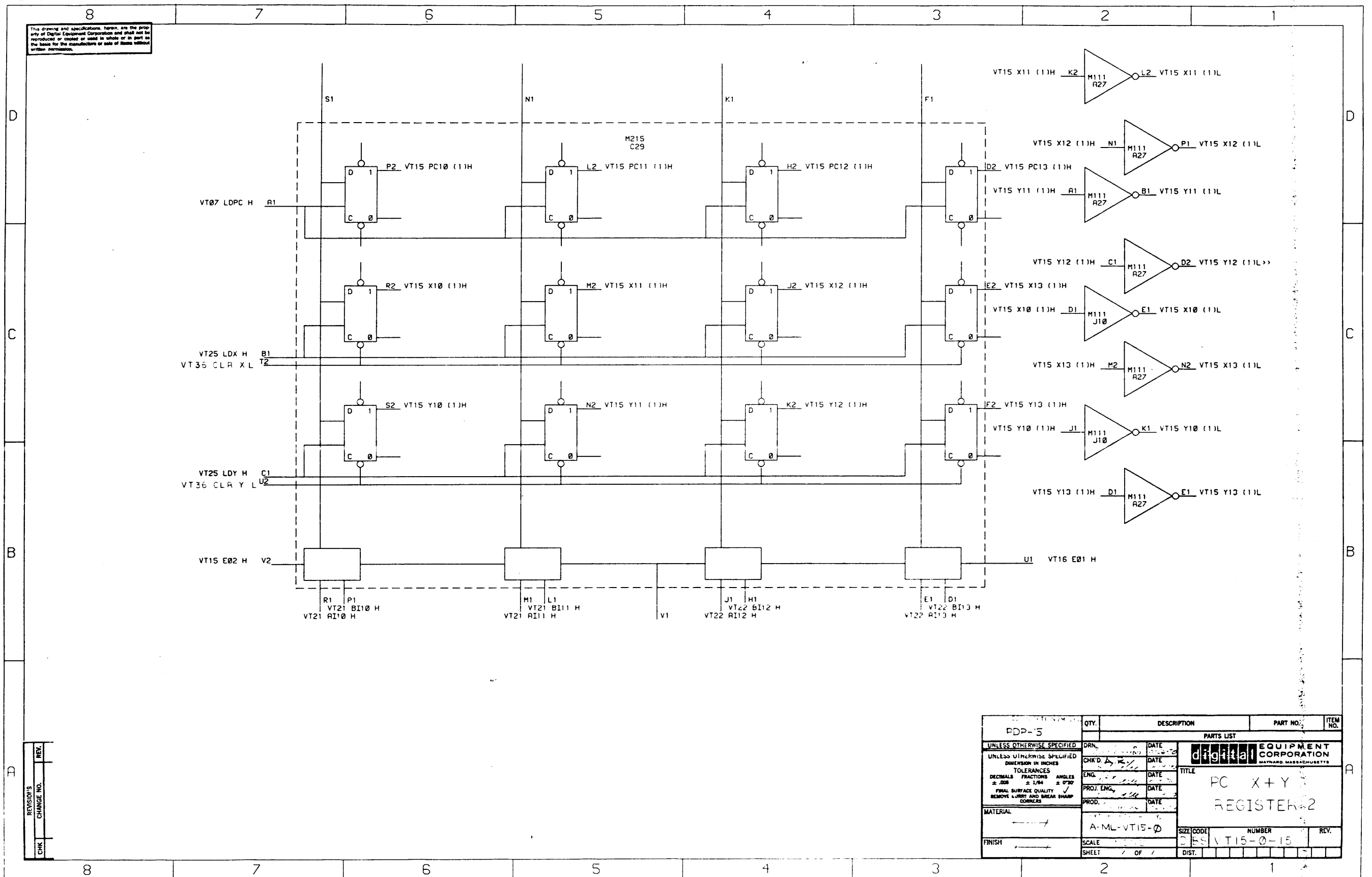


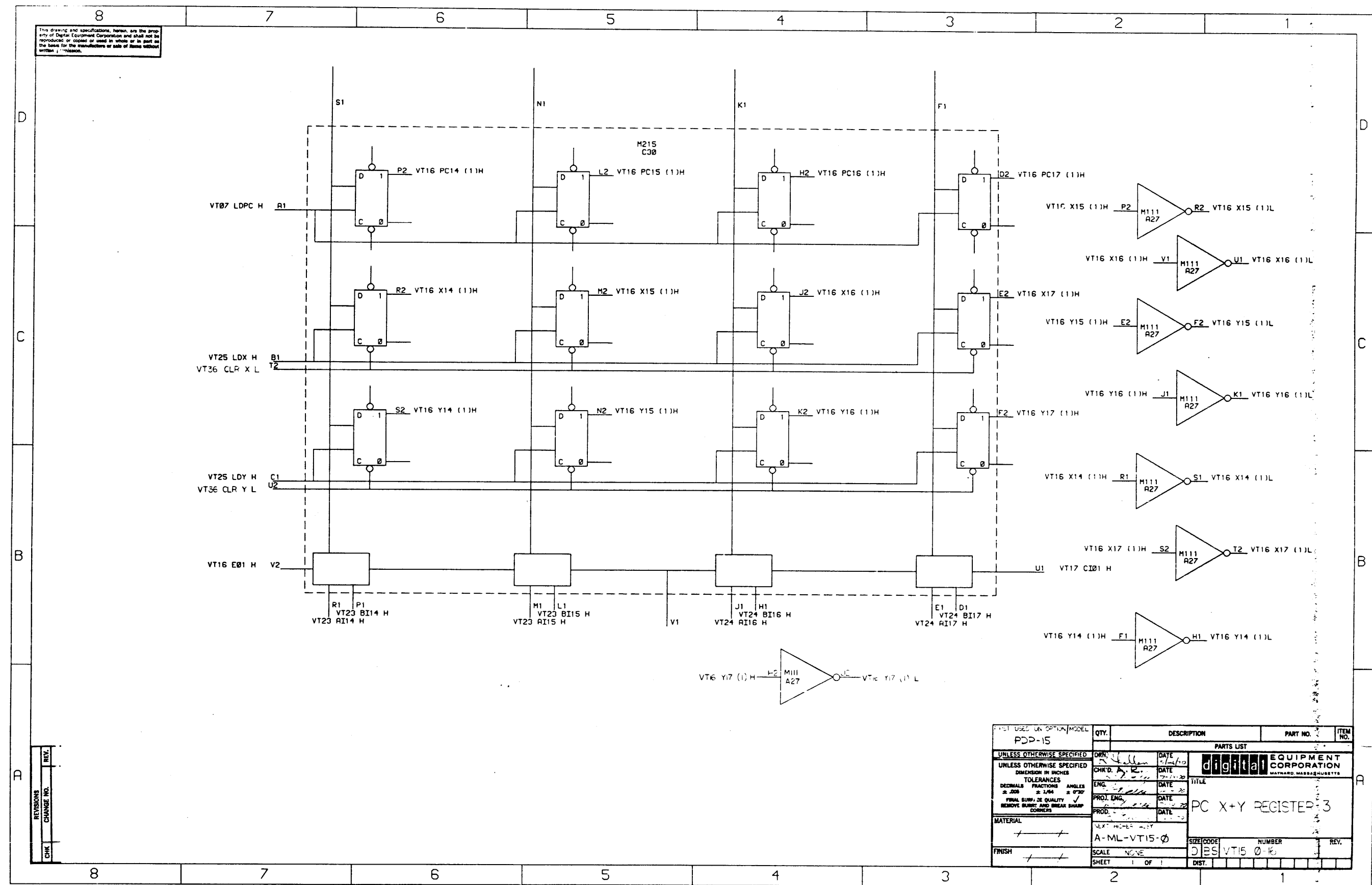


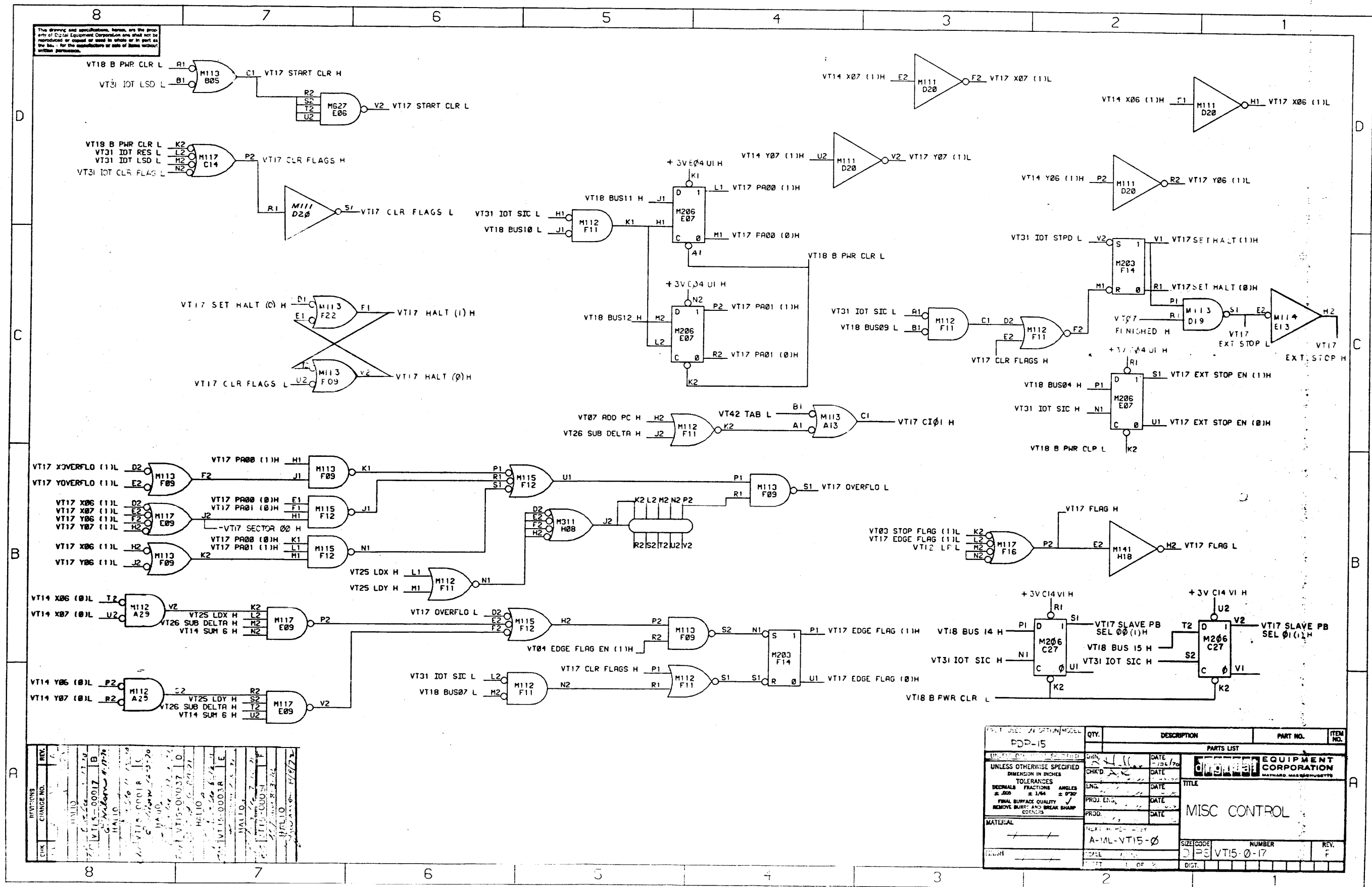


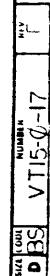


QTY.		DESCRIPTION		PART NO.		ITEM NO.	
PARTS LIST							
UNLESS OTHERWISE SPECIFIED				digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS			
UNLESS OTHERWISE SPECIFIED				TITLE PC X+Y REGISTER I			
DIMENSION IN INCHES				SIZE/CODE			
TOLERANCES				NUMBER			
DECIMALS FRACTIONS ANGLES				REV.			
± .005 ± .004 ± 0°30'				JESVT15-C-14			
FINAL SURFACE QUALITY				DIST.			
REMOVE BURRS AND BREAK SHARP CORNERS							
MATERIAL							
A-ML-VT15-0							
FINISH							
SHEET 1 OF 1							



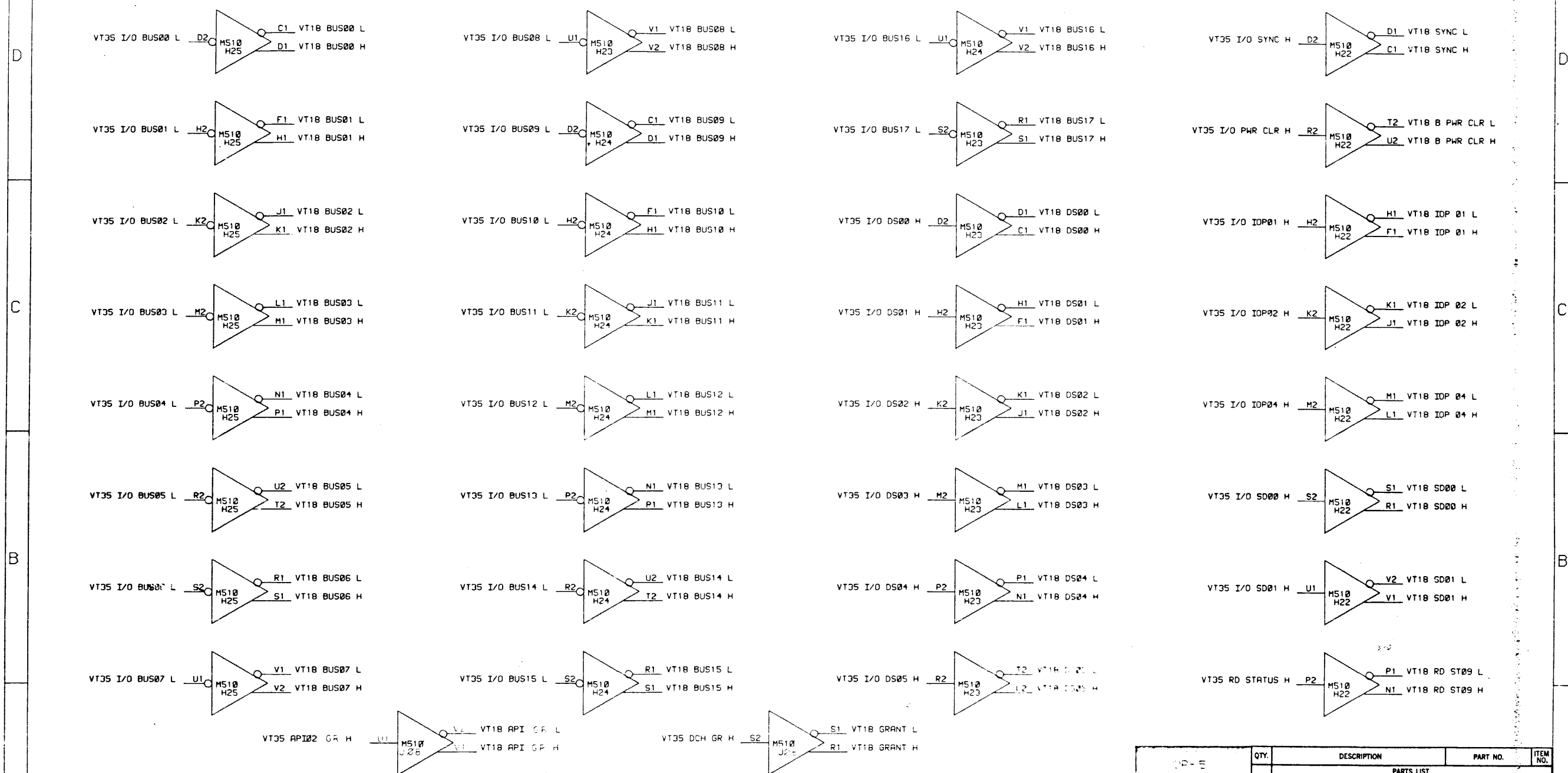






REVISIONS		
CHK	CHANGE NO	REV

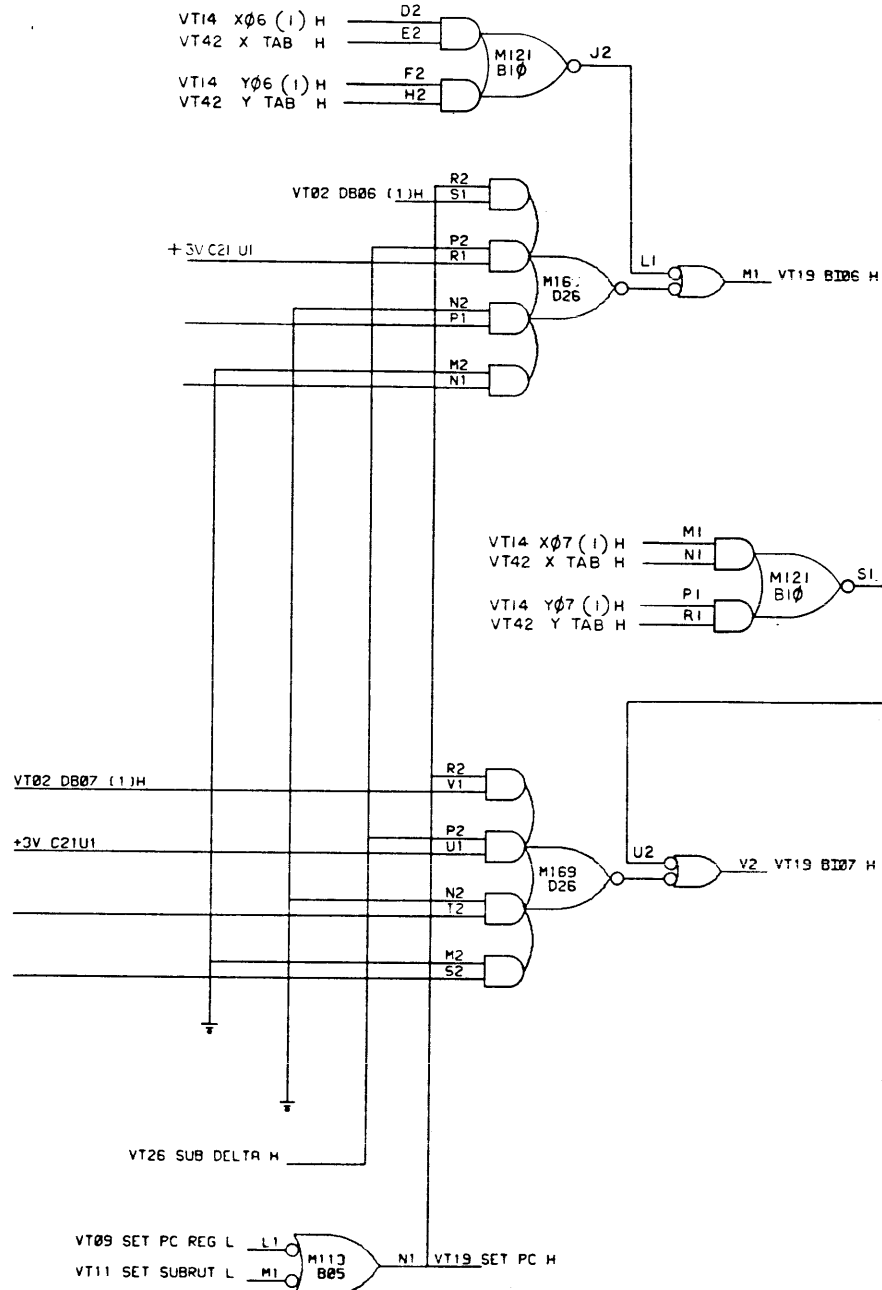
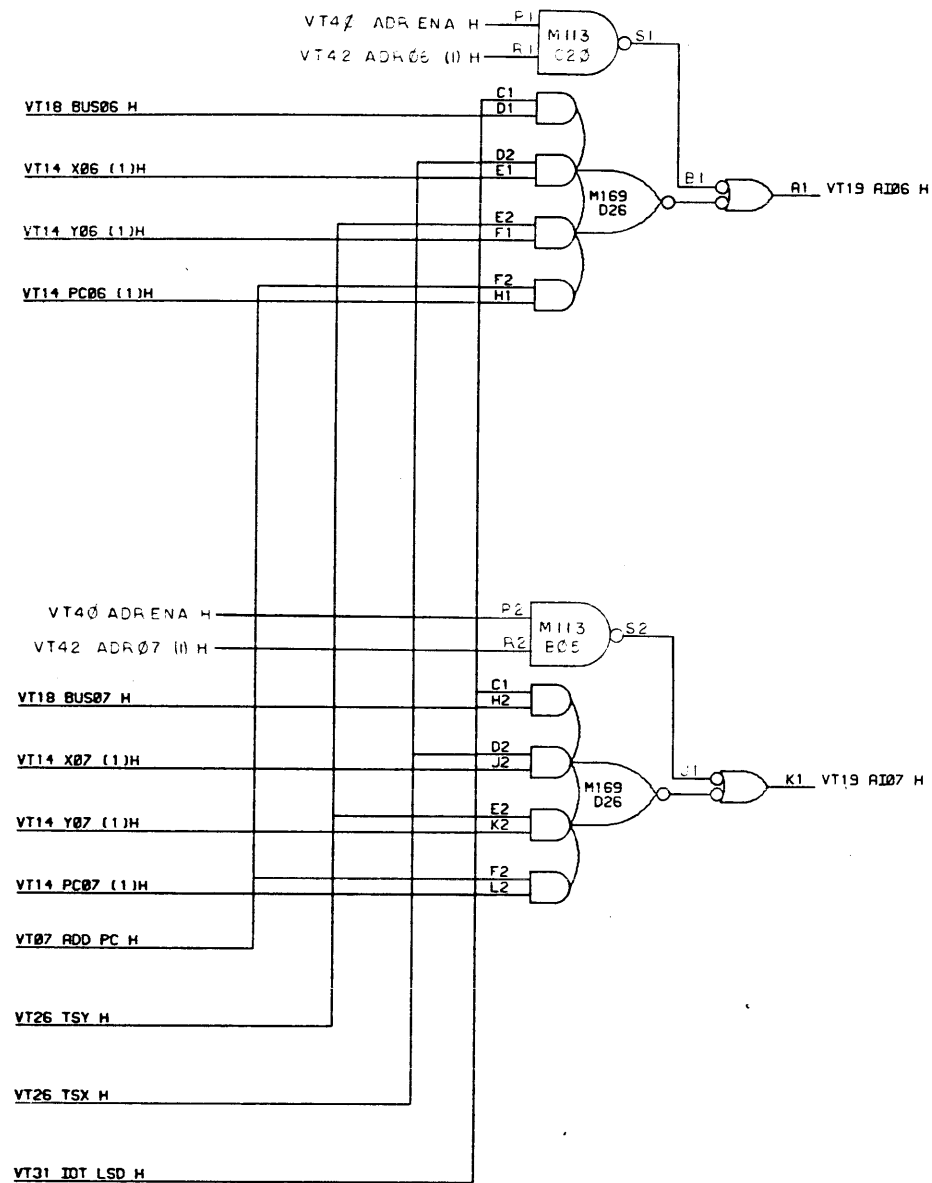
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REV.	CHANGE NO.	DATE
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2	2	11/1/73
3	3	11/1/73
4	4	11/1/73
5	5	11/1/73
6	6	11/1/73
7	7	11/1/73
8	8	11/1/73
9	9	11/1/73
10	10	11/1/73

UNLESS OTHERWISE SPECIFIED	QTY.	DESCRIPTION	PART NO.	ITEM NO.
UNLESS OTHERWISE SPECIFIED	DRN	DATE	PARTS LIST	
DIMENSION IN IN. HES	CHK'D	DATE	digital EQUIPMENT CORPORATION	
TOLERANCES	ENG.	DATE	MAYNARD MASSACHUSETTS	
DECIMALS FRACTIONS ANGLES	PROJ. ENG.	DATE	TITLE	
± .008 ± 1/64 ± 0°30'	PROD.	DATE	BUS RECEIVERS	
FINAL SURFACE QUALITY			SIZE CODE NUMBER REV.	
REMOVE BURRS - NO BREAK SHARP CORNERS			ESVT15-0-18 A	
MATERIAL			SCALE	
FINISH			SHEET / OF /	
			DIST.	

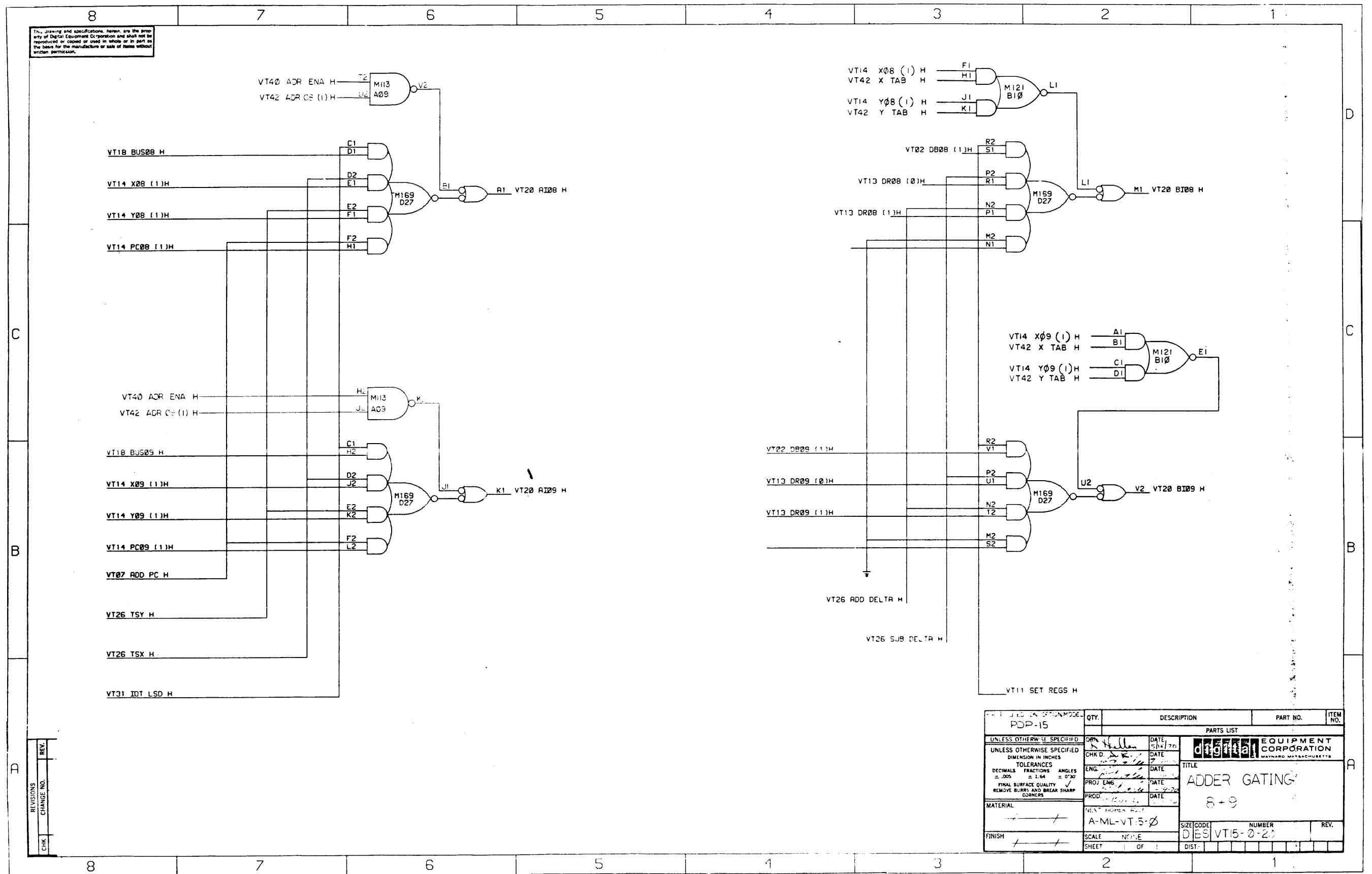
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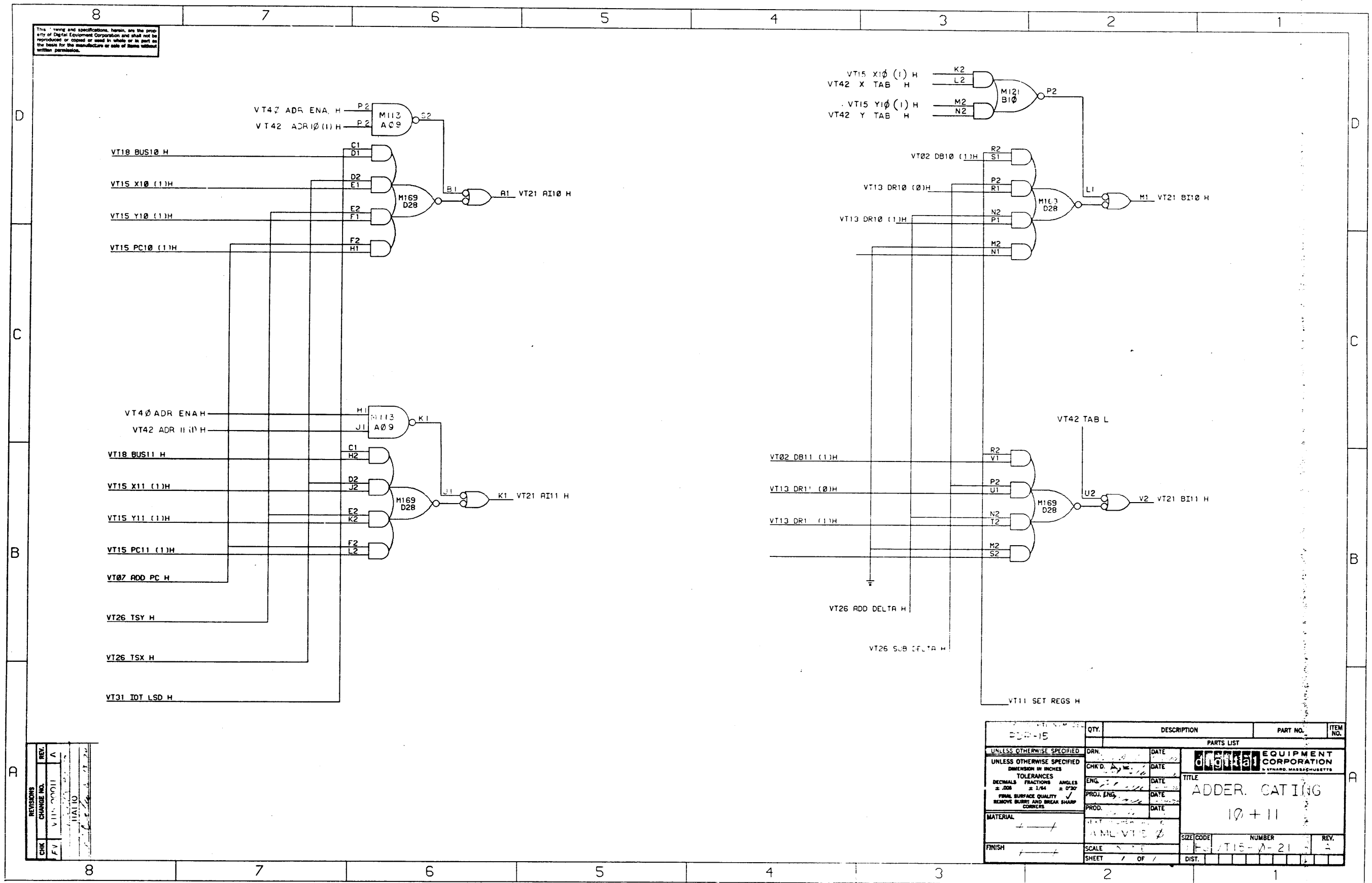
REV.	CHG.	NO.	DATE
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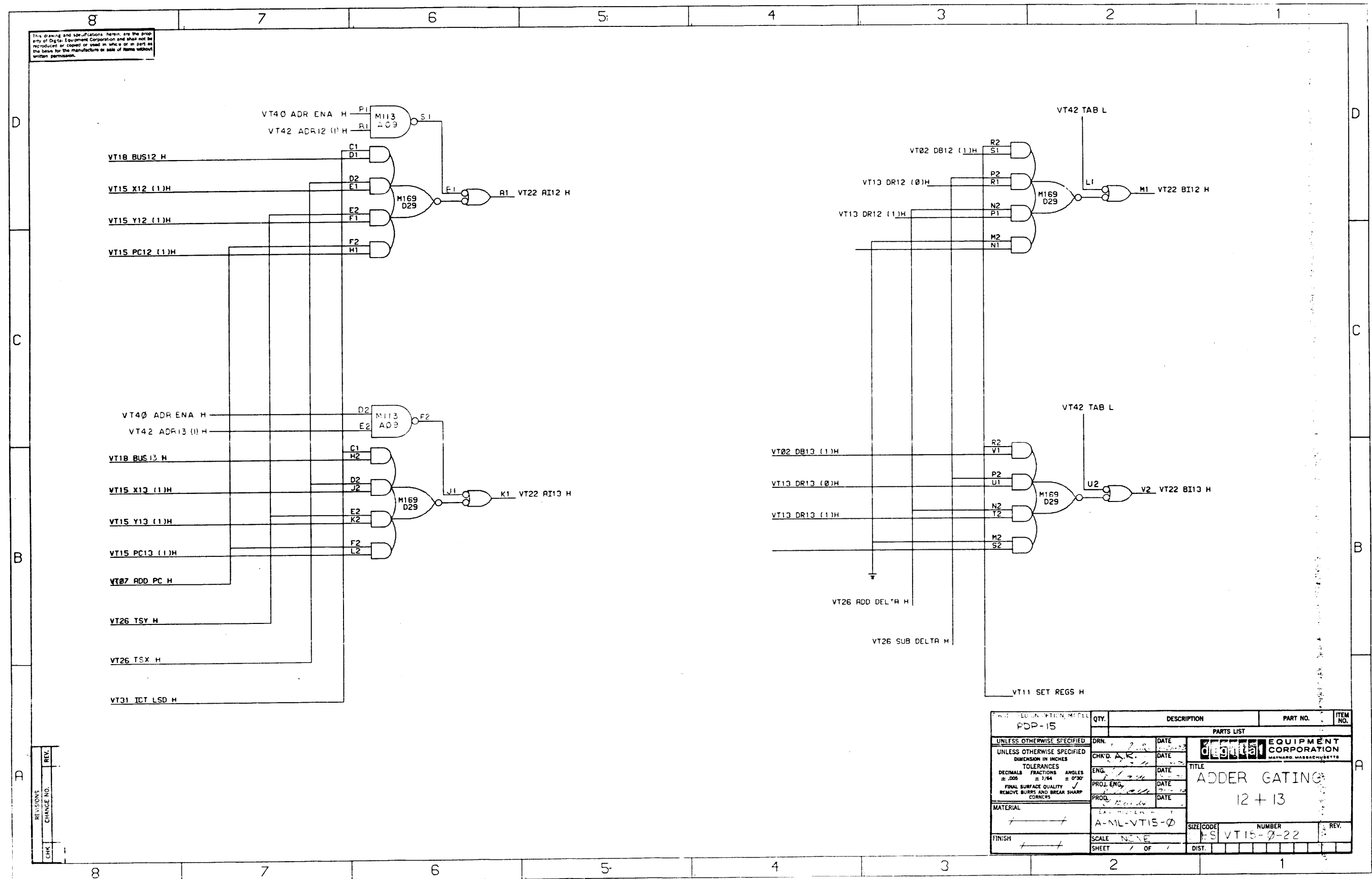
UNLESS OTHERWISE SPECIFIED		QTY.	DESCRIPTION	PART NO.	ITEM NO.
UNLESS OTHERWISE SPECIFIED		PARTS LIST			
DIMENSION IN INCHES		digital EQUIPMENT CORPORATION			
TOLERANCES		MAYNARD MASSACHUSETTS			
DECIMALS	FRACTIONS	ENG.	DATE	TITLE:	
± .005	± 1/64	PROJ. ENG.	DATE	ADDER GATING	
FINAL SURFACE QUALITY		PROD.	DATE	6+7	
REMOVE BURRS AND BREAK SHARP CORNERS		EXT. DIMENSIONS		NUMBER	
MATERIAL		A-ML-VT5-0		VT19-0-10	
FINISH		SCALE		REV.	
		SHEET / OF /		DIST.	

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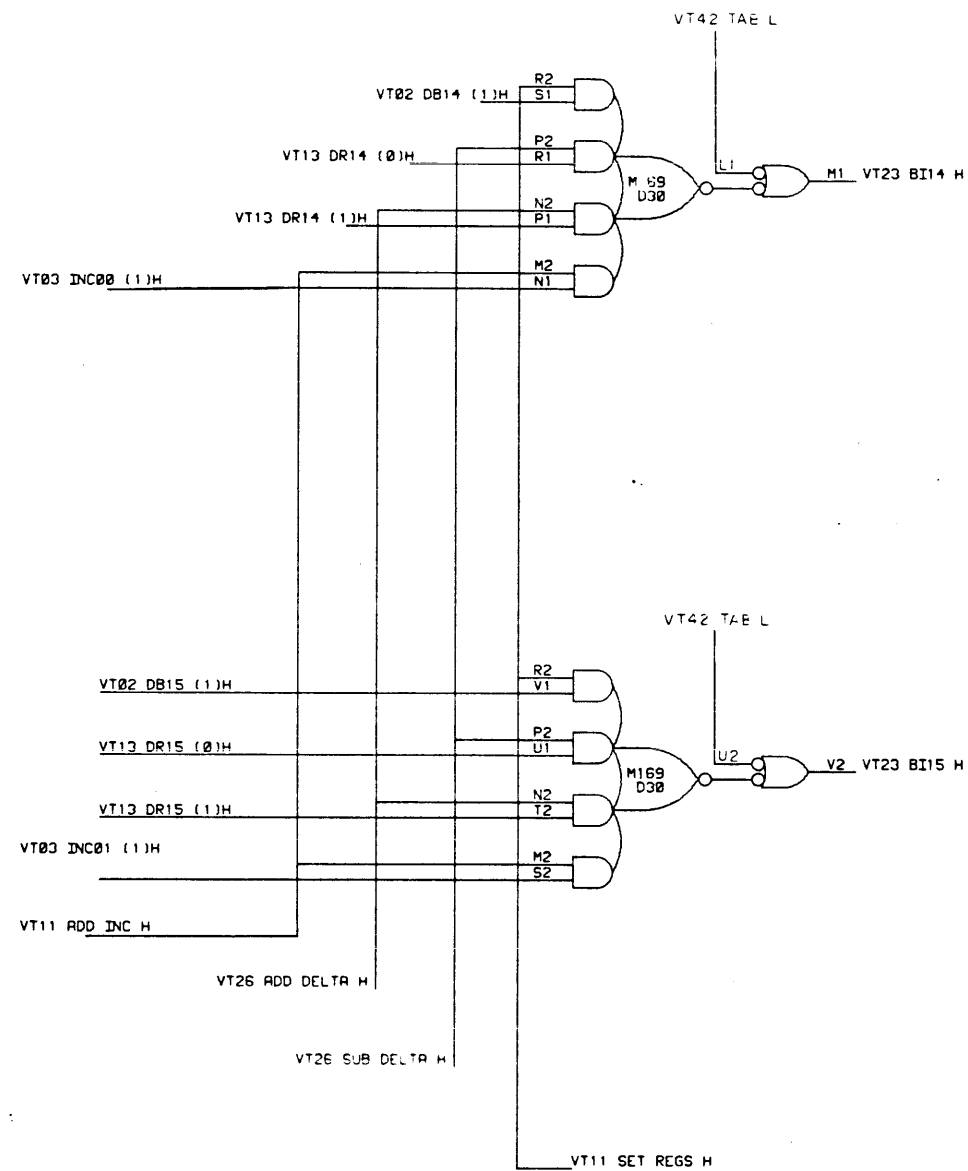
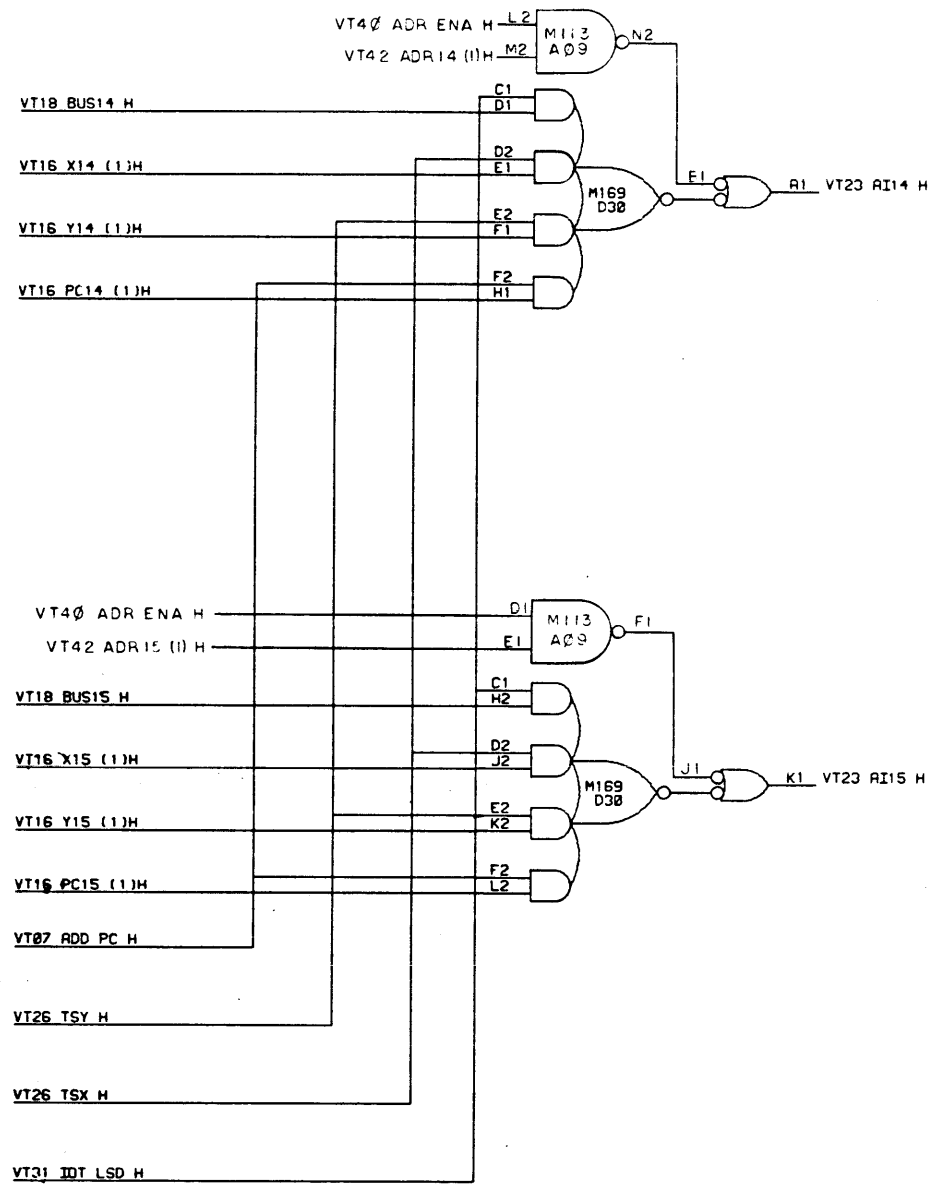


PART USED ON OPTION MODEL		QTY.	DESCRIPTION	PART NO.	ITEM NO.
PDP-15					
UNLESS OTHERWISE SPECIFIED		DATE	PARTS LIST		
UNLESS OTHERWISE SPECIFIED		DATE	TITLE		
DIMENSION IN INCHES		DATE	8-9		
TOLERANCES		DATE	A-ML-VT-5-0		
DECIMALS FRACTIONS ANGLES		DATE	SIZE CODE		
± .005 ± .001 ± 0°30'		DATE	NUMBER		
FINAL SURFACE QUALITY		DATE	REV.		
REMOVE BURRS AND BREAK SHARP CORNERS		DATE	DIST.		
MATERIAL		DATE	SHEET		
FINISH		DATE	OF		

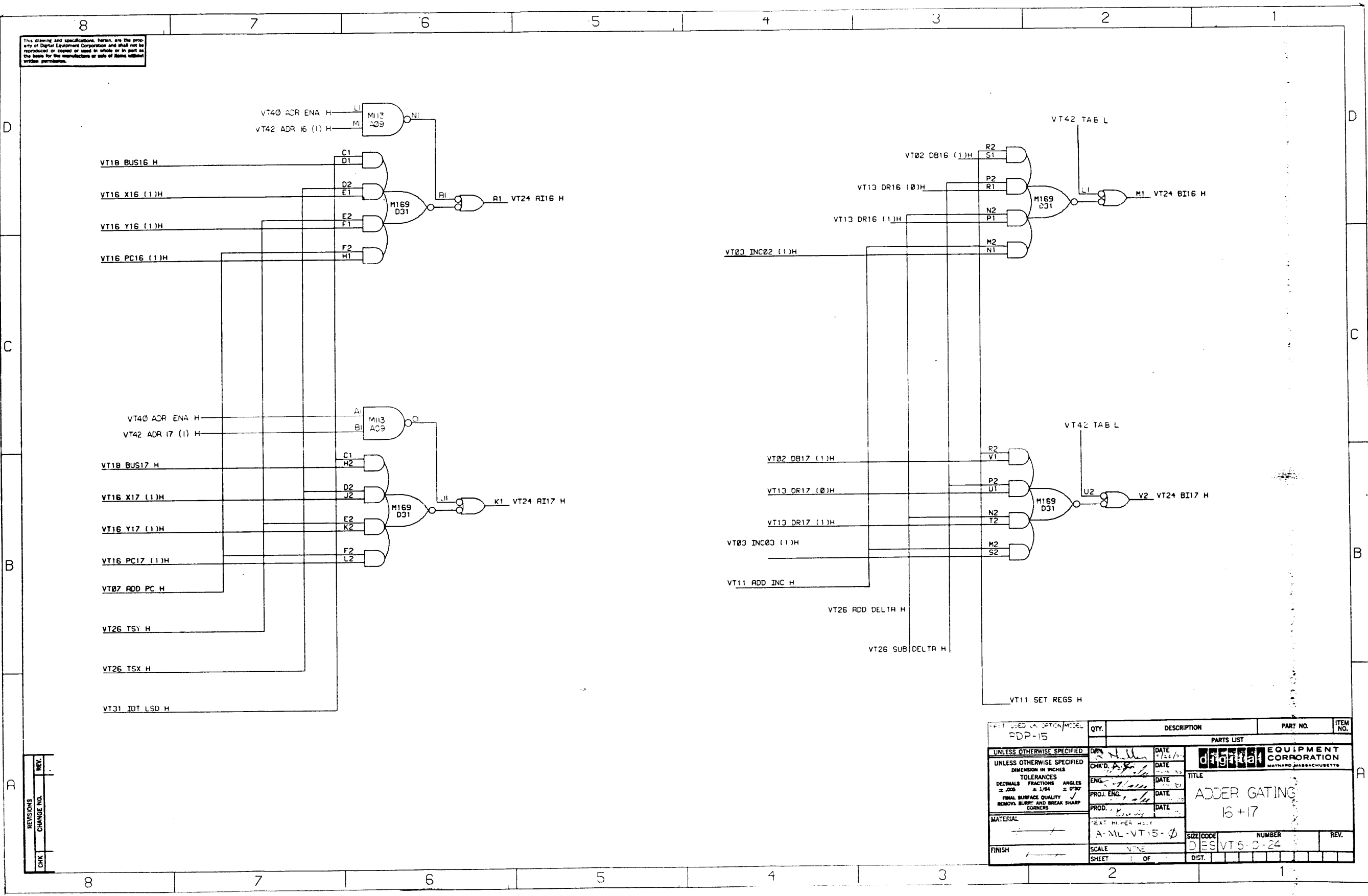


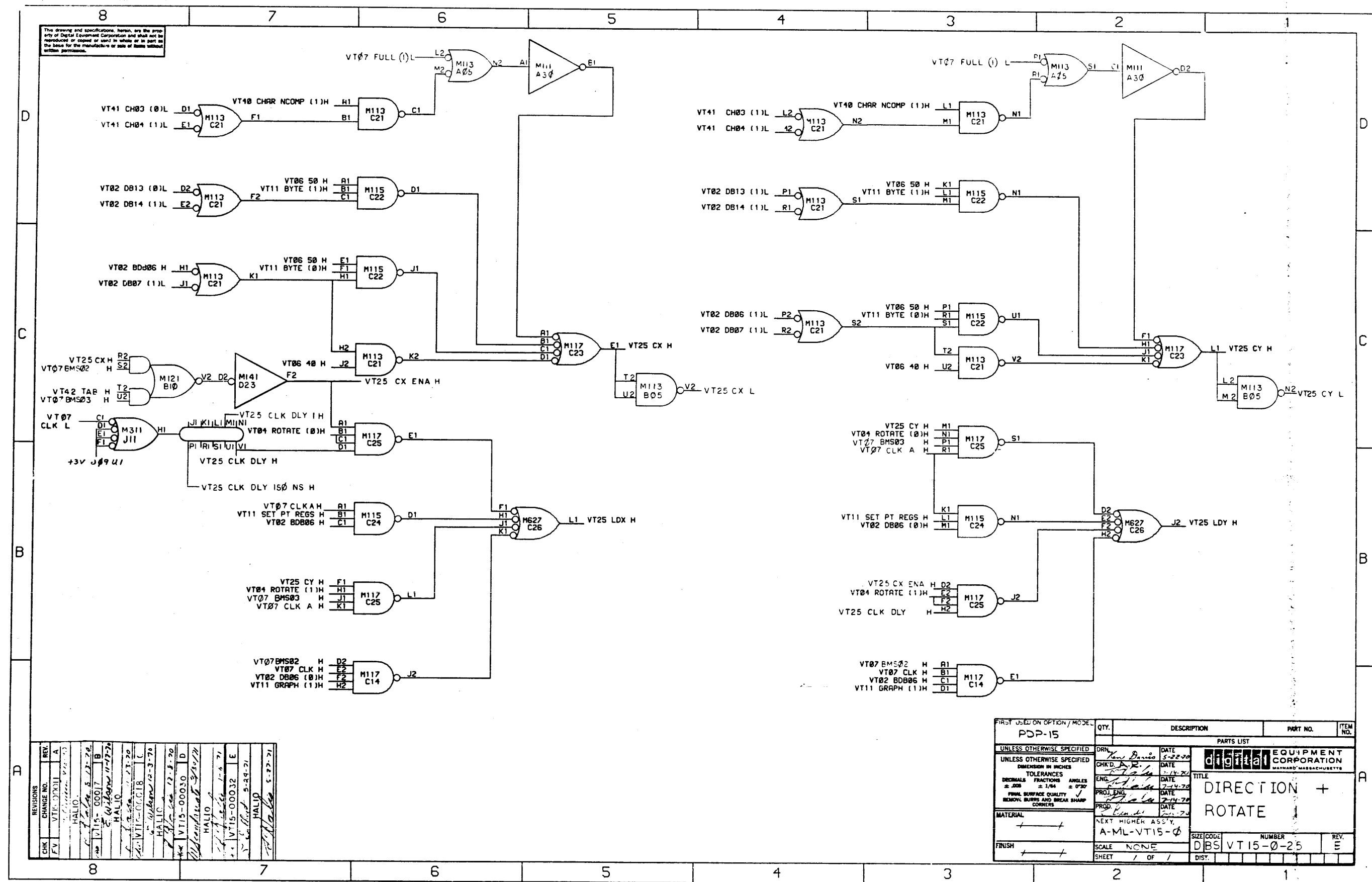


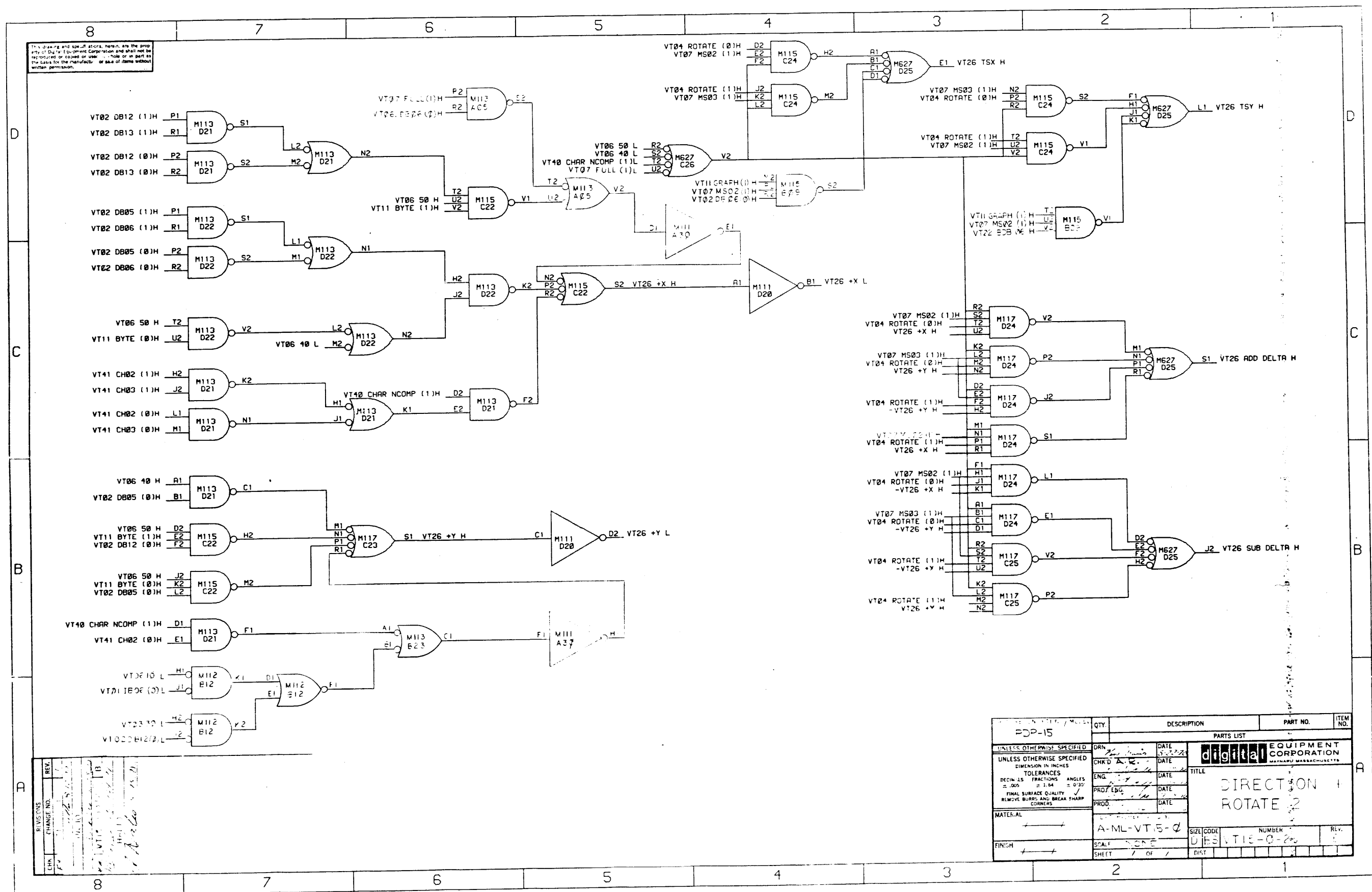
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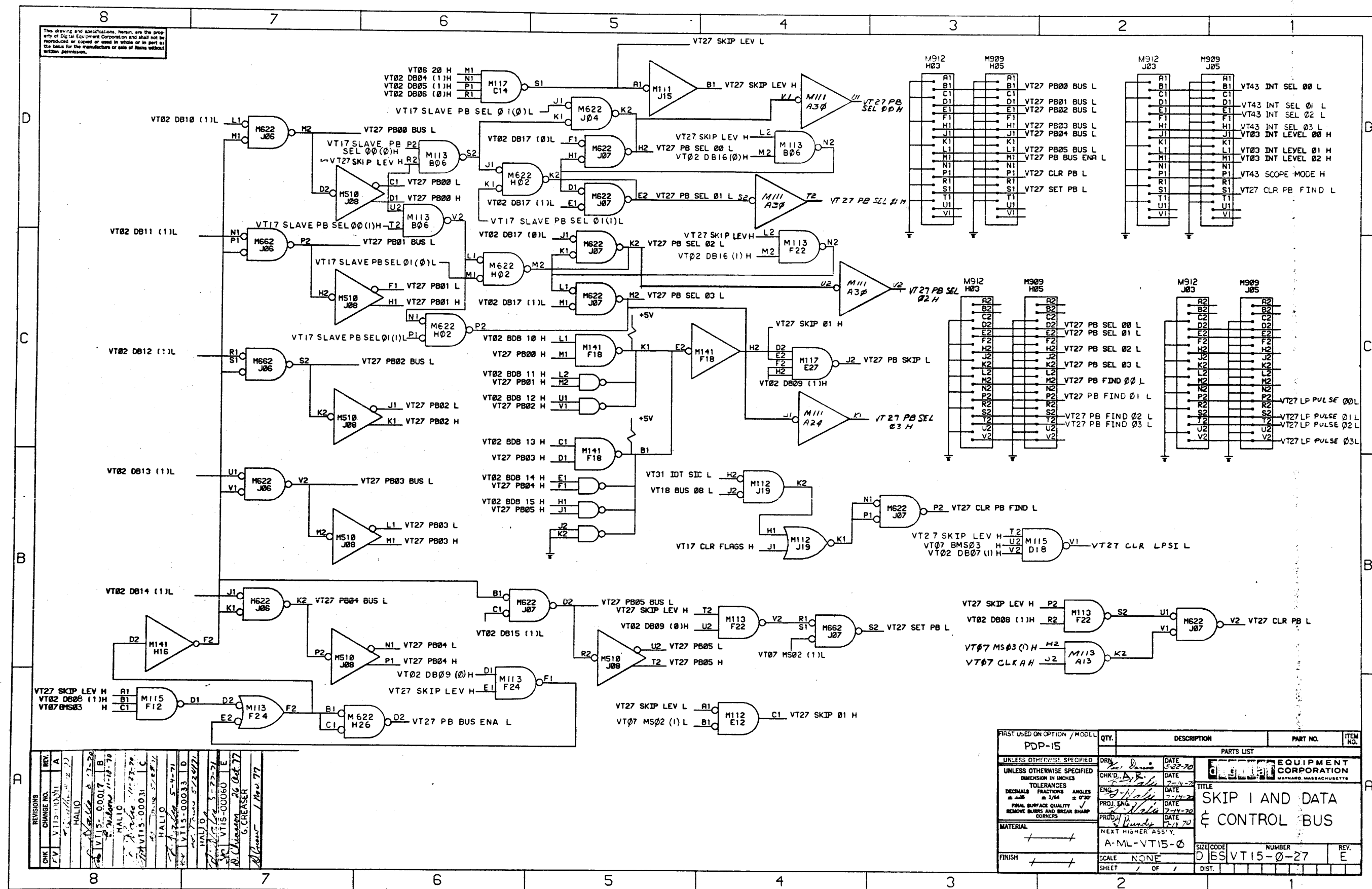


PDP-15		QTY.	DESCRIPTION	PART NO.	ITEM NO.
UNLESS OTHERWISE SPECIFIED		DRN	DATE	PARTS LIST	
UNLESS OTHERWISE SPECIFIED		CHKD.	DATE	digital EQUIPMENT CORPORATION MAYNARD MASSACHUSETTS	
TOLERANCES		ENG.	DATE	TITLE	
DECIMALS FRACTIONS ANGLES		PROJ. ENG.	DATE	ADDER GATING	
± .005 ± .1/64 ± 0°30'		PROD.	DATE	14 + 15	
FINAL SURFACE QUALITY		MATERIAL			
REMOVE BURRS AND BREAK SHARP CORNERS		A-VIL-VT15-0			
FINISH		SCALE			
SHEET		OF			
DIST.		SIZE/CODE			
DIST.		NUMBER			
DIST.		REV.			
DIST.		VT15-0-23			

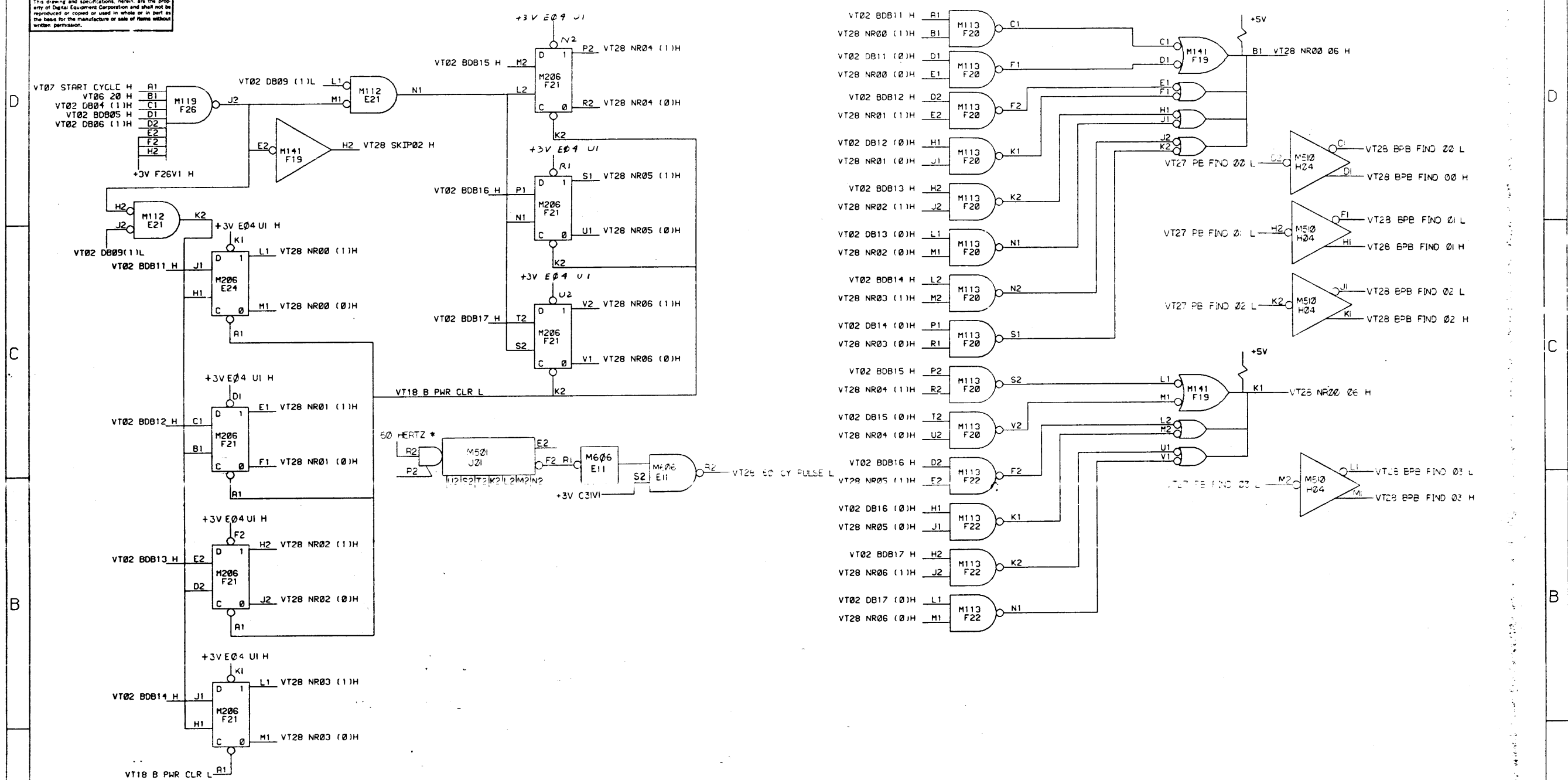






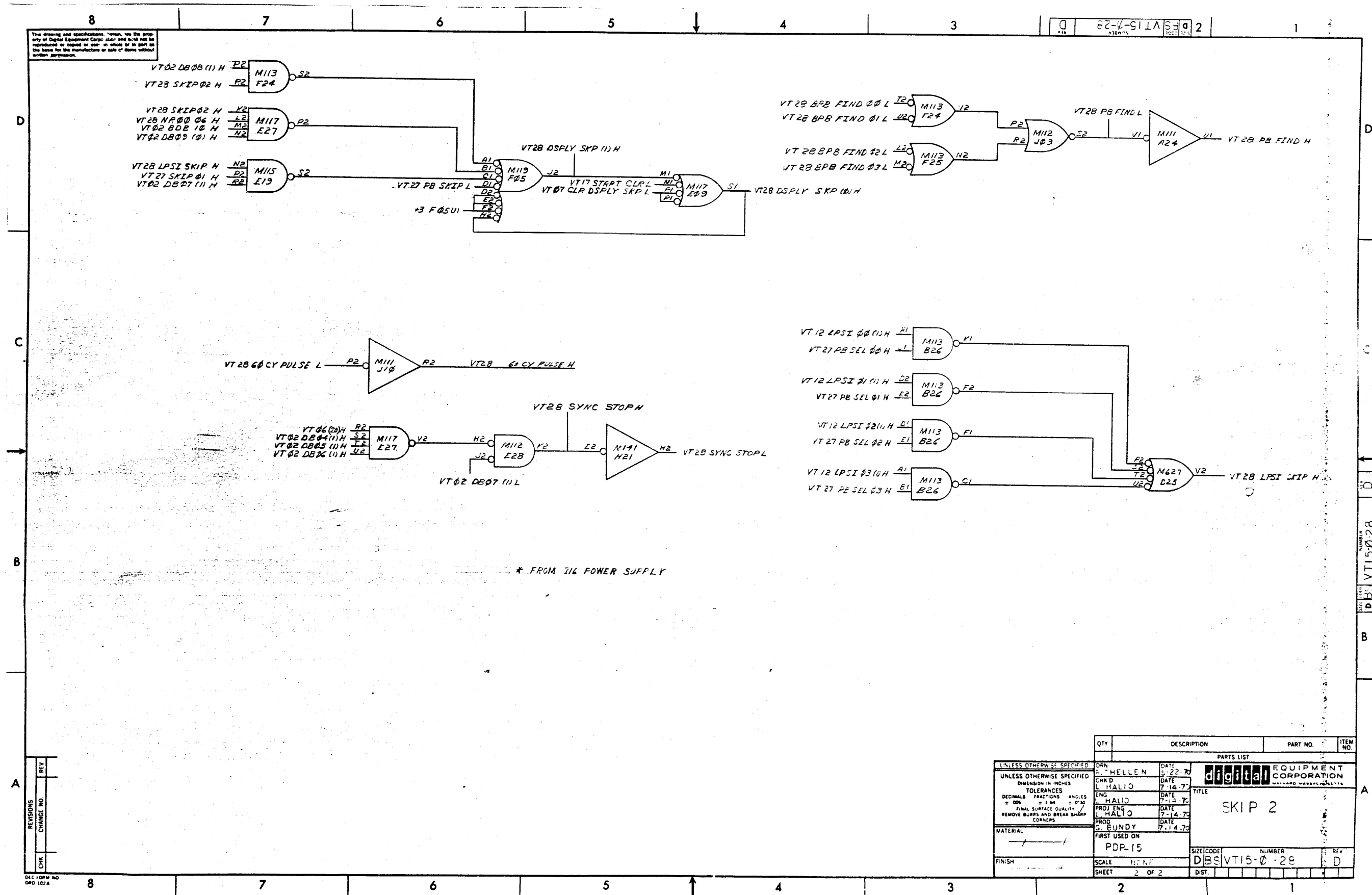


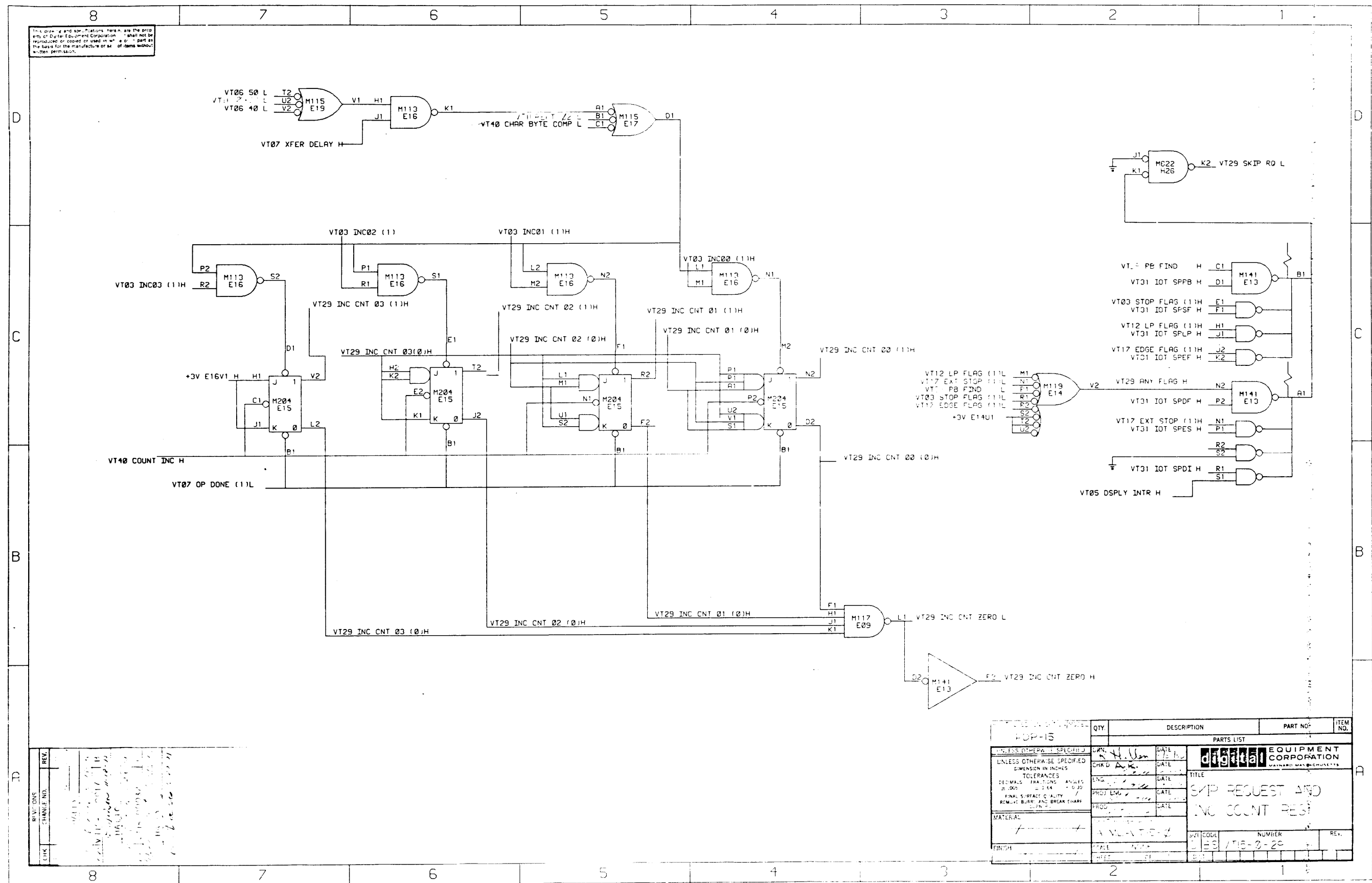
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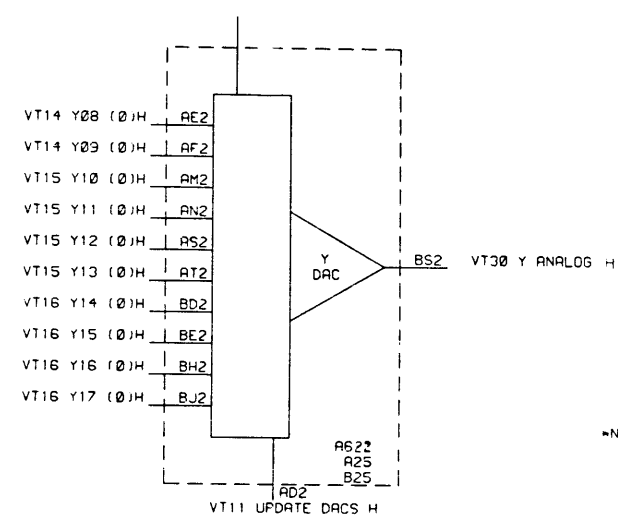
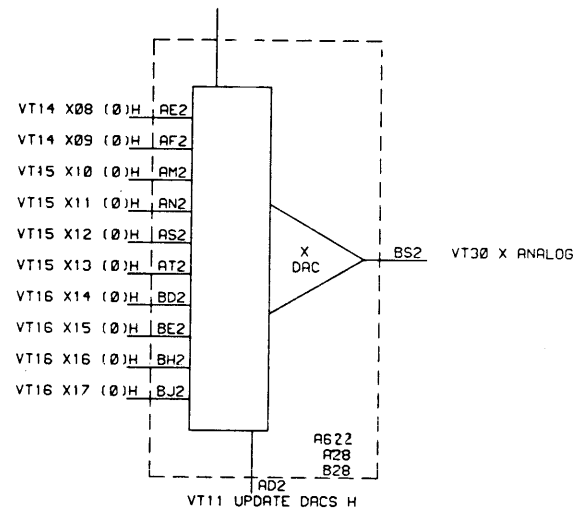
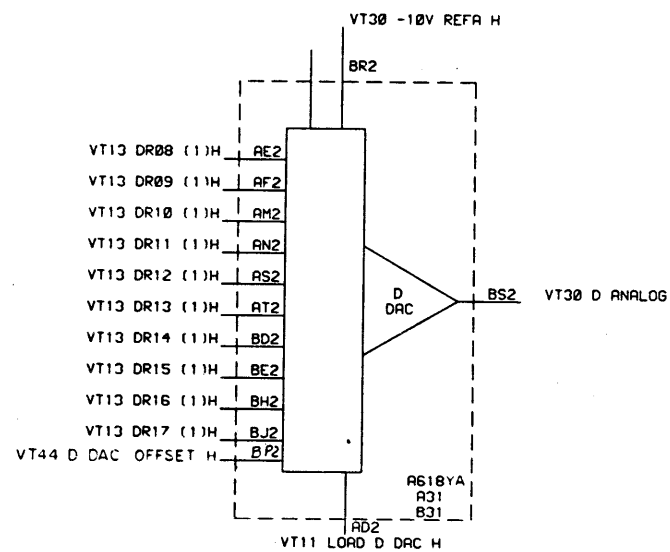
REV.	DATE	BY	CHKD	APPD
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2	11-10-70	HAL		
3	11-10-70	HAL		
4	11-10-70	HAL		
5	11-10-70	HAL		
6	11-10-70	HAL		
7	11-10-70	HAL		
8	11-10-70	HAL		

POP-15		QTY.	DESCRIPTION	PART NO.	ITEM NO.
UNLESS OTHERWISE SPECIFIED		PARTS LIST			
UNLESS OTHERWISE SPECIFIED		digital EQUIPMENT CORPORATION			
DIMENSION IN INCHES		TITLE			
TOLERANCES		SKIP 2			
DECIMALS FRACTIONS ANGLES		SIZE CODE			
± .005 ± 1/64 ± 0°30'		NUMBER			
FINAL SURFACE QUALITY		DIST			
REMOVE BUMPS AND BREAK SHARP CORNERS		SHEET			
MATERIAL		A-ML-VT15-0			
FINISH		SCALE 11/16			
		SHEET			

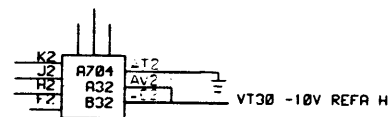




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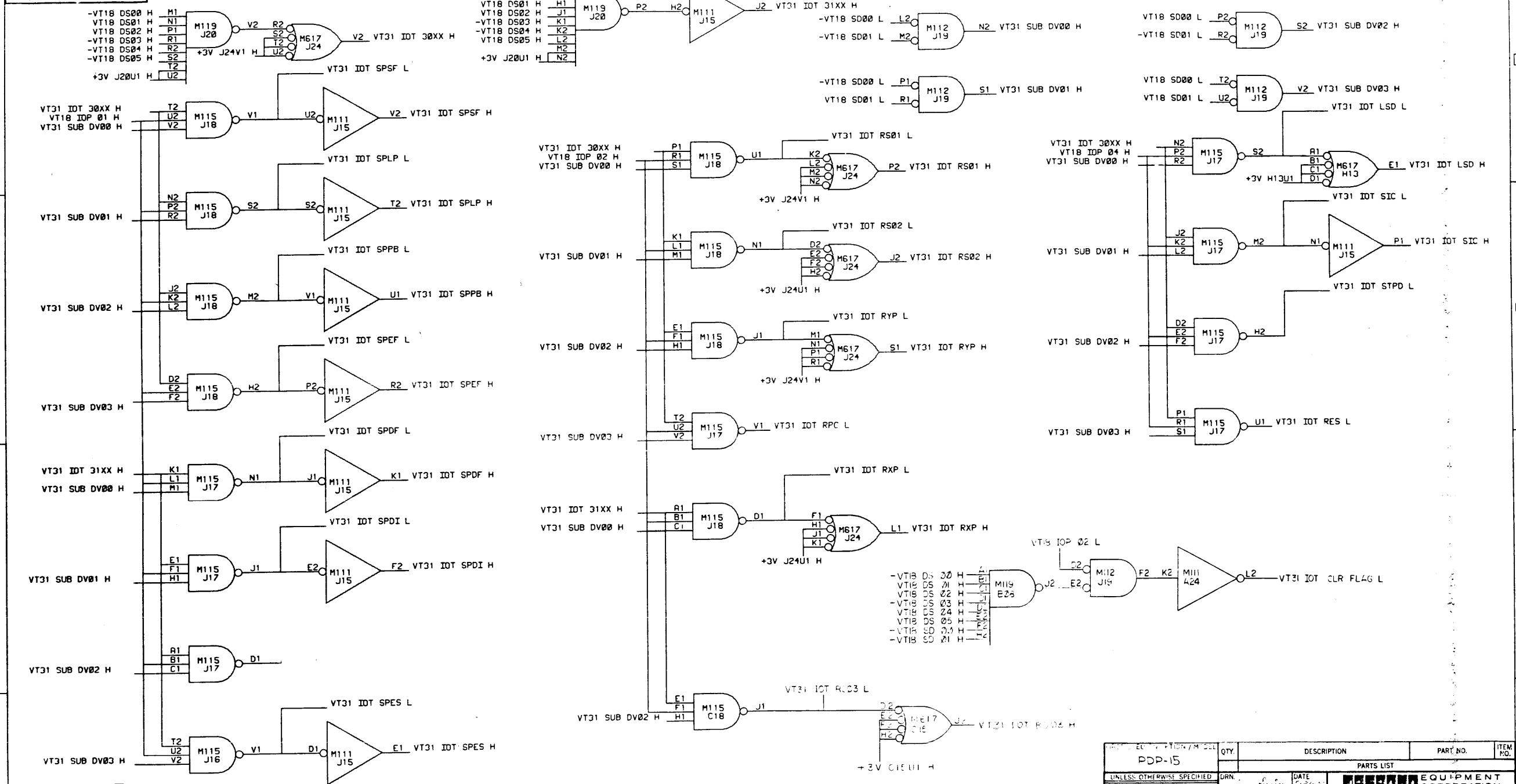
*NOTE: A618 YA OUTPUT 0V TO +5V
A622 OUTPUT 0V TO +5V



REV.	CHANCE NO.	REVISIONS
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2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
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95	95	95
96	96	96
97	97	97
98	98	98
99	99	99
100	100	100

PART USED ON DRAWING		QTY	DESCRIPTION	PART NO.	ITEM NO.
FDP-15					
UNLESS OTHERWISE SPECIFIED		CHK'D	DATE	PARTS LIST	
UNLESS OTHERWISE SPECIFIED		CHK'D	DATE	digital EQUIPMENT CORPORATION	
DIMENSION IN INCHES		ENG.	DATE	TITLE	
TOLERANCES		PROJ. ENG.	DATE	DAC	
DECIMALS FRACTIONS ANGLES		PROD.	DATE	SIZE CODE	
±.005 ±.001 ±.0005				NUMBER	
FINAL SURFACE QUALITY				VT15-2-32	
REMOVE BURRS AND BREAK SHARP CORNERS				REV.	
MATERIAL				C	
FINISH		SCALE	NOTE	SHEET	
		OF	1	DIST	

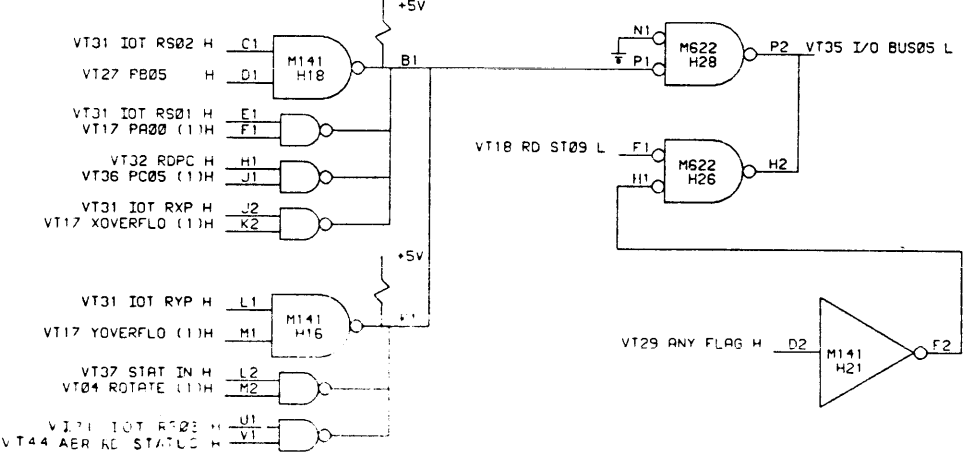
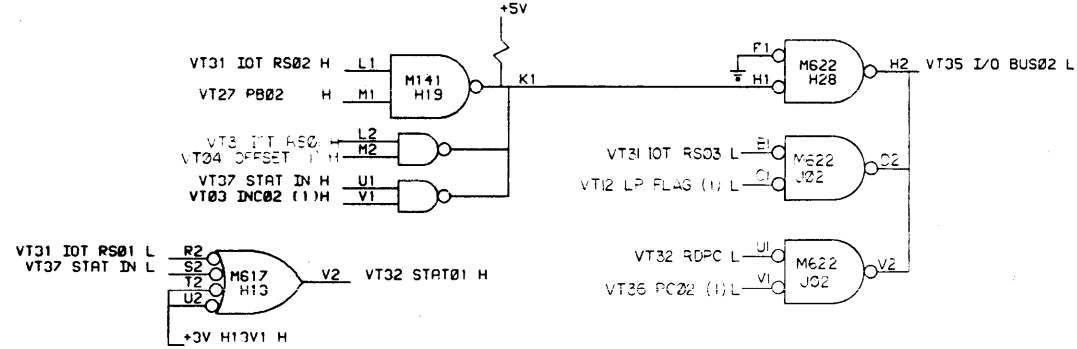
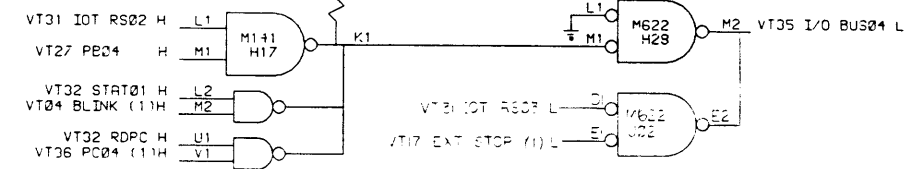
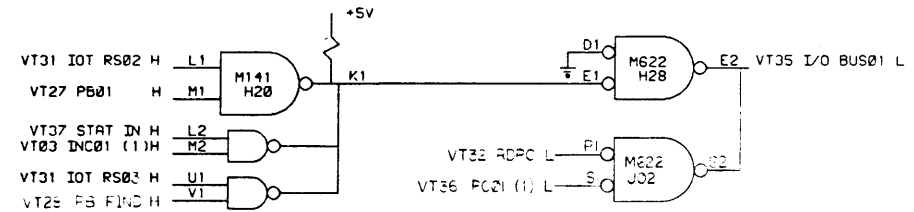
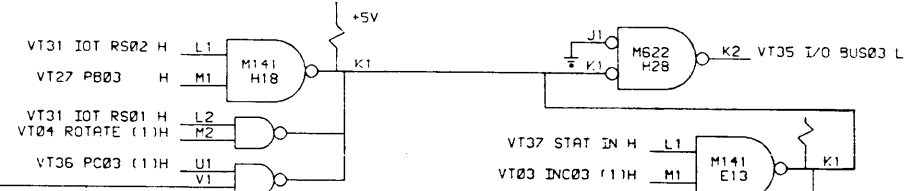
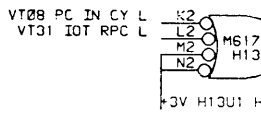
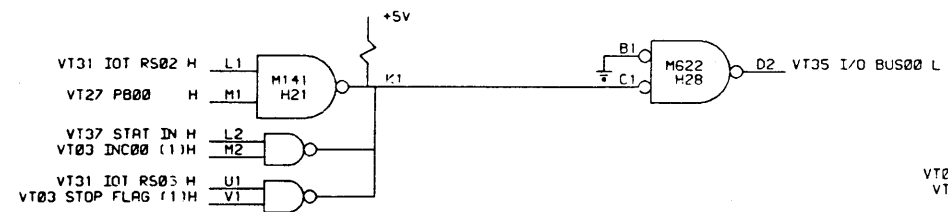
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REV.	CHANGE NO.	DATE	BY	CHK
1	1	11/11/70	W. J. ...	...
2	2	11/11/70	W. J. ...	...
3	3	11/11/70	W. J. ...	...
4	4	11/11/70	W. J. ...	...
5	5	11/11/70	W. J. ...	...
6	6	11/11/70	W. J. ...	...
7	7	11/11/70	W. J. ...	...
8	8	11/11/70	W. J. ...	...
9	9	11/11/70	W. J. ...	...
10	10	11/11/70	W. J. ...	...

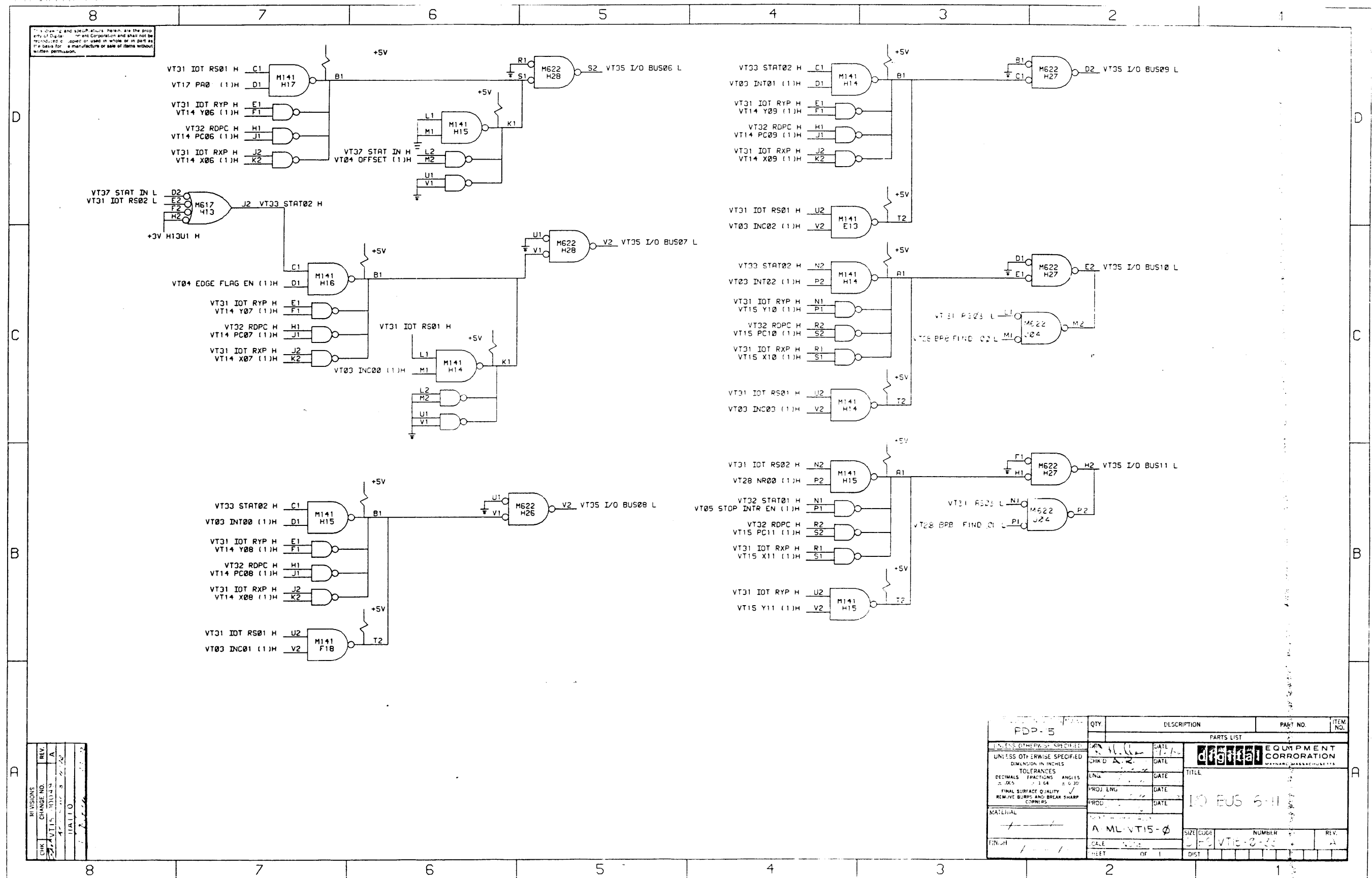
PDP-15		QTY	DESCRIPTION	PART NO.	ITEM NO.
UNLESS OTHERWISE SPECIFIED		DATE	PARTS LIST		
UNLESS OTHERWISE SPECIFIED		DATE	digital EQUIPMENT CORPORATION		
DIMENSION IN INCHES		DATE	MAYNARD MASSACHUSETTS		
TOLERANCES		DATE	TITLE		
DECIMALS FRACTIONS ANGLES		DATE	IOT		
±.005 ±.001 ±.001 ±.001		DATE	DECODER		
FINAL SURFACE QUALITY		DATE	SIZE CODE		
REMOVE BURRS AND BREAK SHARP CORNERS		DATE	NUMBER		
MATERIAL		DATE	REV.		
FINISH		DATE	DIST.		
SCALE		DATE	1		
SHEET		DATE	1		

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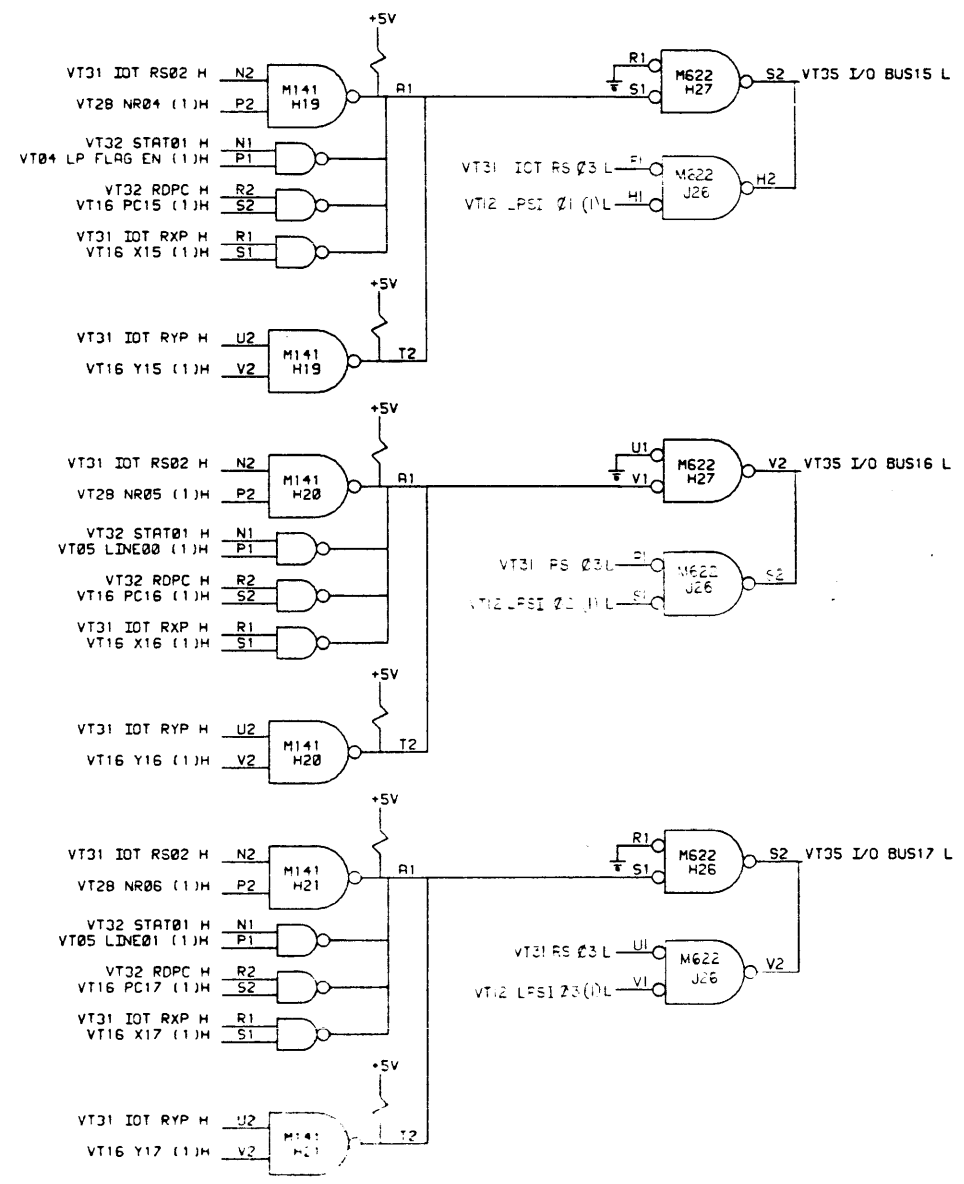
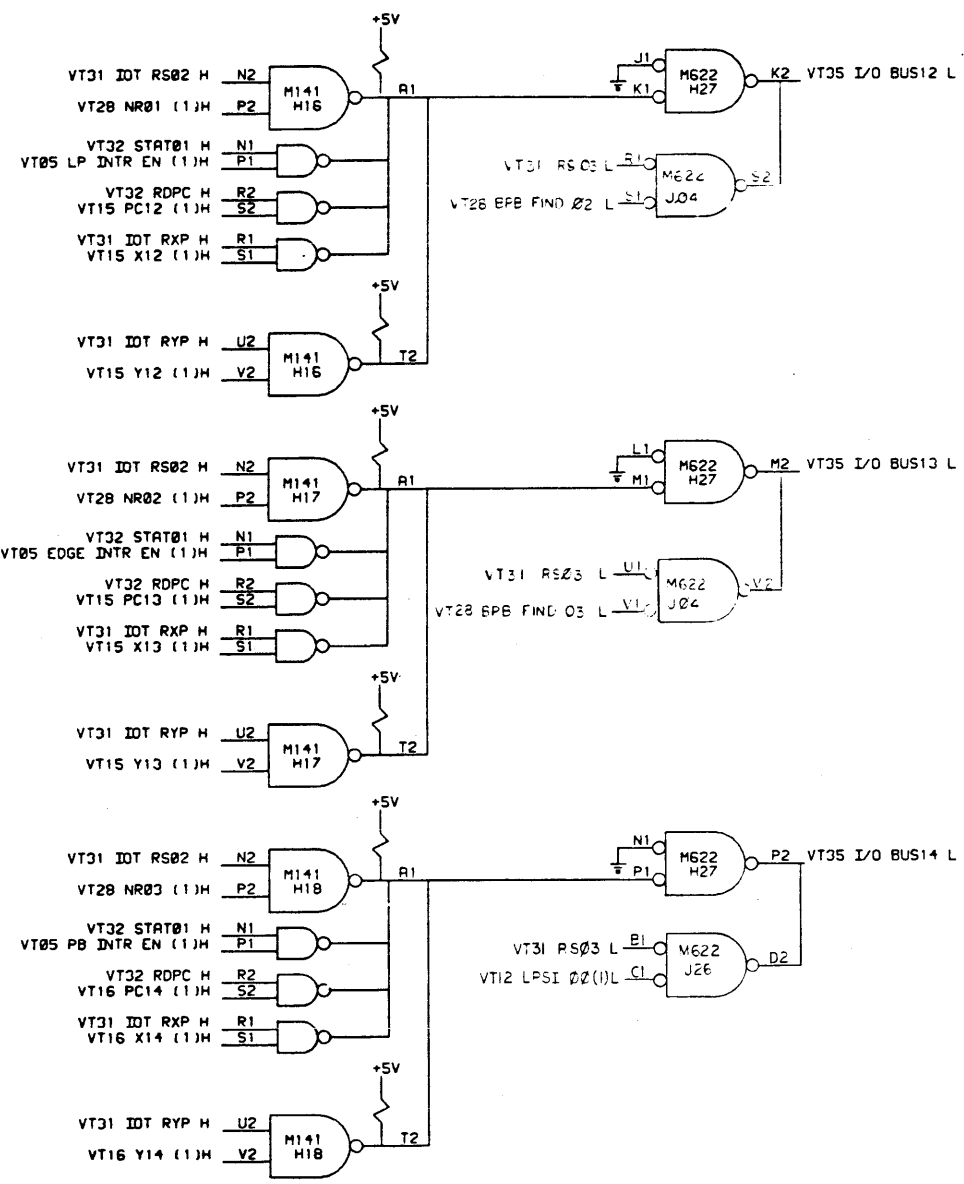


REV.	CHG.	NO.	DATE	BY	CHK.
1	A	1	1/15/70	HALO	HALO
2	B	1	1/15/70	HALO	HALO
3	C	1	1/15/70	HALO	HALO
4	D	1	1/15/70	HALO	HALO

PDP-15		QTY	DESCRIPTION	PART NO.	ITEM NO.
PARTS LIST					
UNLESS OTHERWISE SPECIFIED		CHK'D	DATE	digital EQUIPMENT CORPORATION	
DIMENSION IN INCHES		ENG	DATE	MAYNARD MASSACHUSETTS	
TOLERANCES		PROJ. ENGR	DATE	TITLE	
DECIMALS FRACTIONS ANGLES		PROD.	DATE	I/O BUS 2-5	
±.007 ±.125 ±.030		SIZE CODE NUMBER REV.			
FINAL SURFACE QUALITY		DIES VT-5-2-32			
REMOVE BURRS AND BREAK SHARP CORNERS		DST			
MATERIAL		SHEET 1 OF 1			
FINISH		DST			

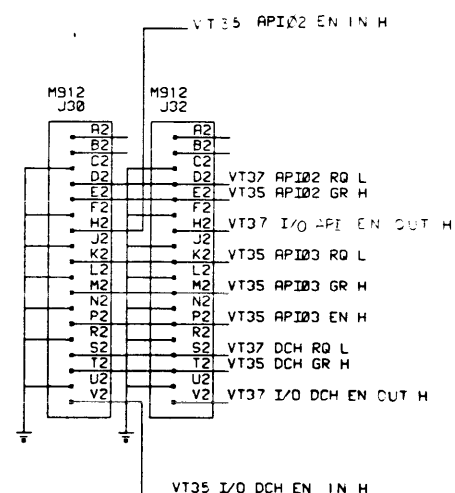
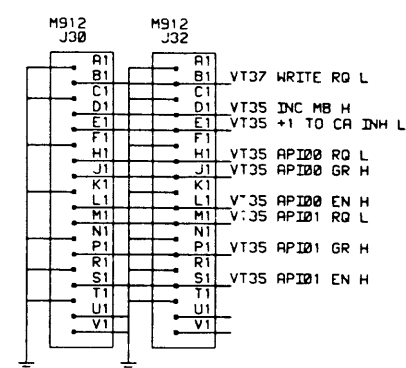


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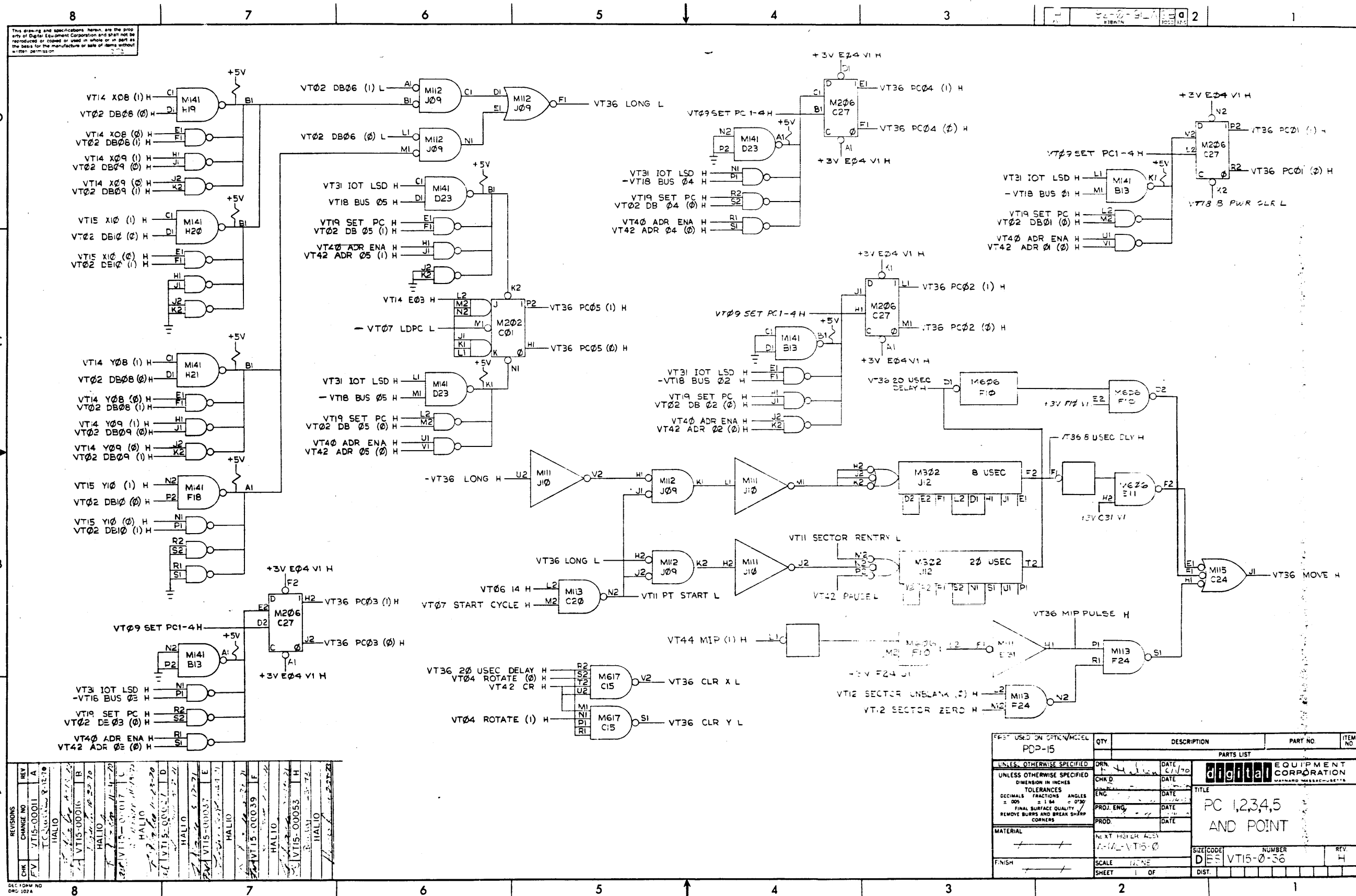


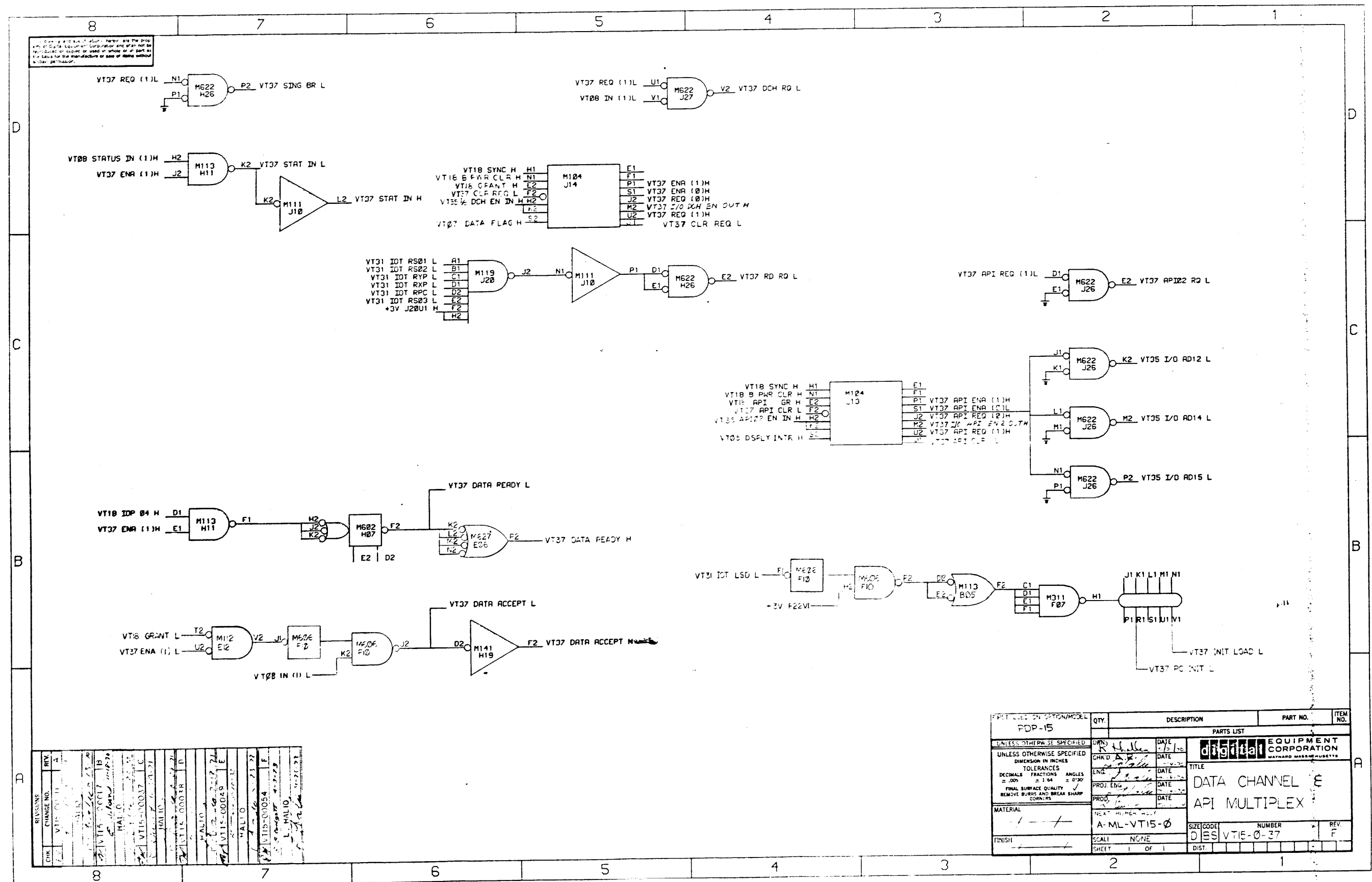
REV	CHANGE NO.	DATE
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B	2	10-1-71
C	3	10-1-71
D	4	10-1-71
E	5	10-1-71
F	6	10-1-71
G	7	10-1-71
H	8	10-1-71
I	9	10-1-71
J	10	10-1-71
K	11	10-1-71
L	12	10-1-71
M	13	10-1-71
N	14	10-1-71
O	15	10-1-71
P	16	10-1-71
Q	17	10-1-71
R	18	10-1-71
S	19	10-1-71
T	20	10-1-71
U	21	10-1-71
V	22	10-1-71
W	23	10-1-71
X	24	10-1-71
Y	25	10-1-71
Z	26	10-1-71

QTY.		DESCRIPTION		PART NO.		ITEM NO.	
PARTS LIST							
UNLESS OTHERWISE SPECIFIED							
DIMENSIONS IN INCHES							
TOLERANCES							
DECIMALS FRACTIONS ANGLES							
±.005 ±.004 ±.030							
FINAL SURFACE QUALITY							
REMOVE BURRS AND BREAK SHARP CORNERS							
MATERIAL							
A-ML-VT15-0							
FINISH							
SCALE NONE							
SHEET 1 OF 1							
DATE 10-1-71							
CHK'D. A. R.							
ENG. J. R.							
PROJ. ENG. J. R.							
PROD. J. R.							
TITLE							
I/O BUS 12-17							
SIZE CODE							
DIES VT15-0-24							
NUMBER							
REV. B							



PDP-15 UNLESS OTHERWISE SPECIFIED UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES TOLERANCES DECIMALS FRACTIONS ANGLES = .00 = 1/64 = .030 FINISH SURFACE QUALITY REMOVE BURRS AND BREAK SHARP CORNERS		QTY. DATE 12/1/70 CHK'D. DATE ENG. DATE PROJ. ENG. DATE PROD. DATE	DESCRIPTION PARTS LIST digital EQUIPMENT CORPORATION NATHAN, MASSACHUSETTS TITLE CABLES	PART NO. REV. A	ITEM NO.
MATERIAL A-ML-VT15-0		SCALE 1 OF 1 SHEET	SIZE CODE VT15-0-35	NUMBER	DIST.





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A1 VT06 00 H
B1 VT06 04 H
C1 VT06 10 H
D1 VT07 DATA REQ (1)H
E1 VT07 DATA AVAIL (1)H
F1 VT07 OP DONE (1)H
G1 VT11 BYTE (1)H
H1 VT20 DISPLY SKP (1)H
J1 VT05 DISPLY INTR H
K1 VT04 LP FLAG EN (1)H
L1 VT04 EDGE FLAG EN (1)H
M1 VT03 INT00 (1)H
N1 VT03 INT01 (1)H
P1 VT03 INT02 (1)H
R1 VT07 MS00 (0)H
S1 VT07 MS01 (1)H
U1 VT07 BMS22 H
V1 VT07 BMS03 H

G772
D01

B2 VT06 14 H
B2 VT06 20 H
C2 VT06 24 H
D2 VT04 BLINK (1)H
E2 VT04 OFFSET (1)H
F2 VT04 ROTATE (1)H
G2 VT17 PAR00 (1)H
H2 VT05 LINE00 (1)H
J2 VT05 LINE01 (1)H
K2 VT10 CHRR ACT (1)H
L2 VT42 CHRR (1)H
M2 VT39 CB00 (1)H
N2 VT39 CB01 (1)H
P2 VT39 CB02 (1)H
R2 VT39 CB03 (1)H
S2 VT39 CB04 (1)H
U2 VT39 CB05 (1)H
V2

G772
D01

A1 VT06 30 H
B1 VT06 34 H
C1 VT06 40 H
D1 VT12 LP FLAG (1)H
E1 VT17 EXT STOP (1)H
F1 VT03 STOP FLAG (1)H
G1 VT17 EDGE FLAG (1)H
H1 VT05 LP INTR EN (1)H
J1 VT05 PB INTR EN (1)H
K1 VT05 STOP INTR EN (1)H
L1 VT05 EDGE INTR EN (1)H
M1 VT28 NR00 (1)H
N1 VT28 NR01 (1)H
P1 VT28 NR02 (1)H
R1 VT28 NR03 (1)H
S1 VT28 NR04 (1)H
U1 VT28 NR05 (1)H
V1 VT28 NR06 (1)H

G775
E01

B2 VT06 50 H
B2 VT06 60 H
C2 VT06 70 H
D2 VT09 SUB H
E2 VT09 DEFER H
F2
G2 VT03 INC00 (1)H
H2 VT03 INC01 (1)H
J2 VT03 INC02 (1)H
K2 VT03 INC03 (1)H
L2 VT17 X OVER FLOW (1)H
M2 VT14 X06 (1)H
N2 VT14 X07 (1)H
P2 VT14 X08 (1)H
R2 VT14 X09 (1)H
S2 VT15 X10 (1)H
U2 VT15 X11 (1)H
V2 VT15 X12 (1)H

G775
E01

A1 VT36 PC01 (1)H
B1 VT36 PC02 (1)H
C1 VT36 PC03 (1)H
D1 VT36 PC04 (1)H
E1 VT36 PC05 (1)H
F1 VT14 PC06 (1)H
G1 VT14 PC07 (1)H
H1 VT14 PC08 (1)H
J1 VT14 PC09 (1)H
K1 VT15 PC10 (1)H
L1 VT15 PC11 (1)H
M1 VT15 PC12 (1)H
N1 VT15 PC13 (1)H
P1 VT16 PC14 (1)H
R1 VT16 PC15 (1)H
S1 VT16 PC16 (1)H
U1 VT16 PC17 (1)H
V1

G775
F01

B2 VT02 DB00 (1)H
B2 VT02 DB01 (1)H
C2 VT02 DB02 (1)H
D2 VT02 DB03 (1)H
E2 VT02 DB04 (1)H
F2 VT02 DB05 (1)H
G2 VT02 DB06 (1)H
H2 VT02 DB07 (1)H
J2 VT02 DB08 (1)H
K2 VT02 DB09 (1)H
L2 VT02 DB10 (1)H
M2 VT02 DB11 (1)H
N2 VT02 DB12 (1)H
P2 VT02 DB13 (1)H
R2 VT02 DB14 (1)H
S2 VT02 DB15 (1)H
U2 VT02 DB16 (1)H
V2 VT02 DB17 (1)H

G775
F01

A1 VT01 IB00 (1)H
B1 VT01 IB01 (1)H
C1 VT01 IB02 (1)H
D1 VT01 IB03 (1)H
E1 VT01 IB04 (1)H
F1 VT01 IB05 (1)H
G1 VT01 IB06 (1)H
H1 VT01 IB07 (1)H
J1 VT01 IB08 (1)H
K1 VT01 IB09 (1)H
L1 VT01 IB10 (1)H
M1 VT01 IB11 (1)H
N1 VT01 IB12 (1)H
P1 VT01 IB13 (1)H
R1 VT01 IB14 (1)H
S1 VT01 IB15 (1)H
U1 VT01 IB16 (1)H
V1 VT01 IB17 (1)H

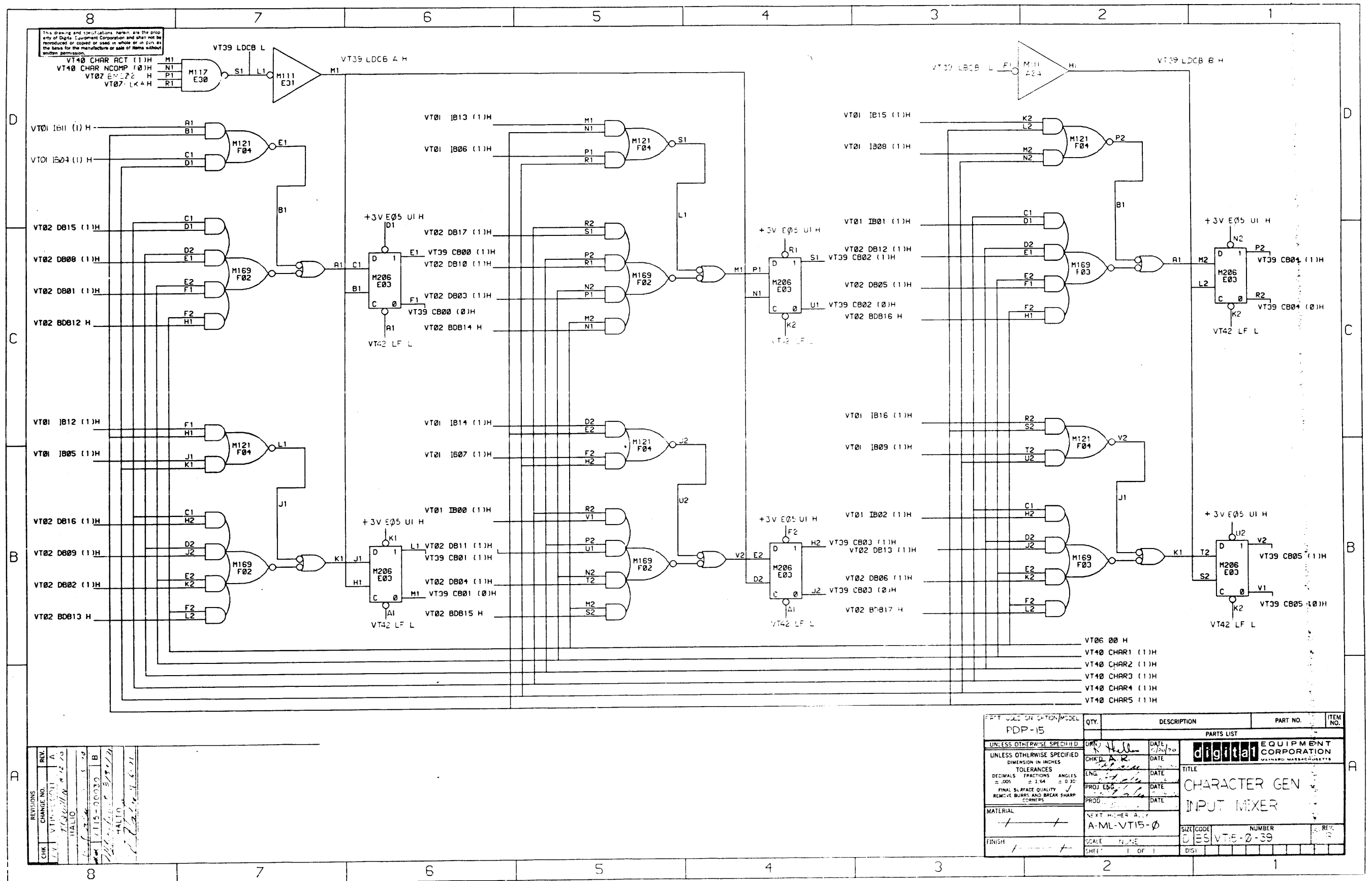
G775
H01

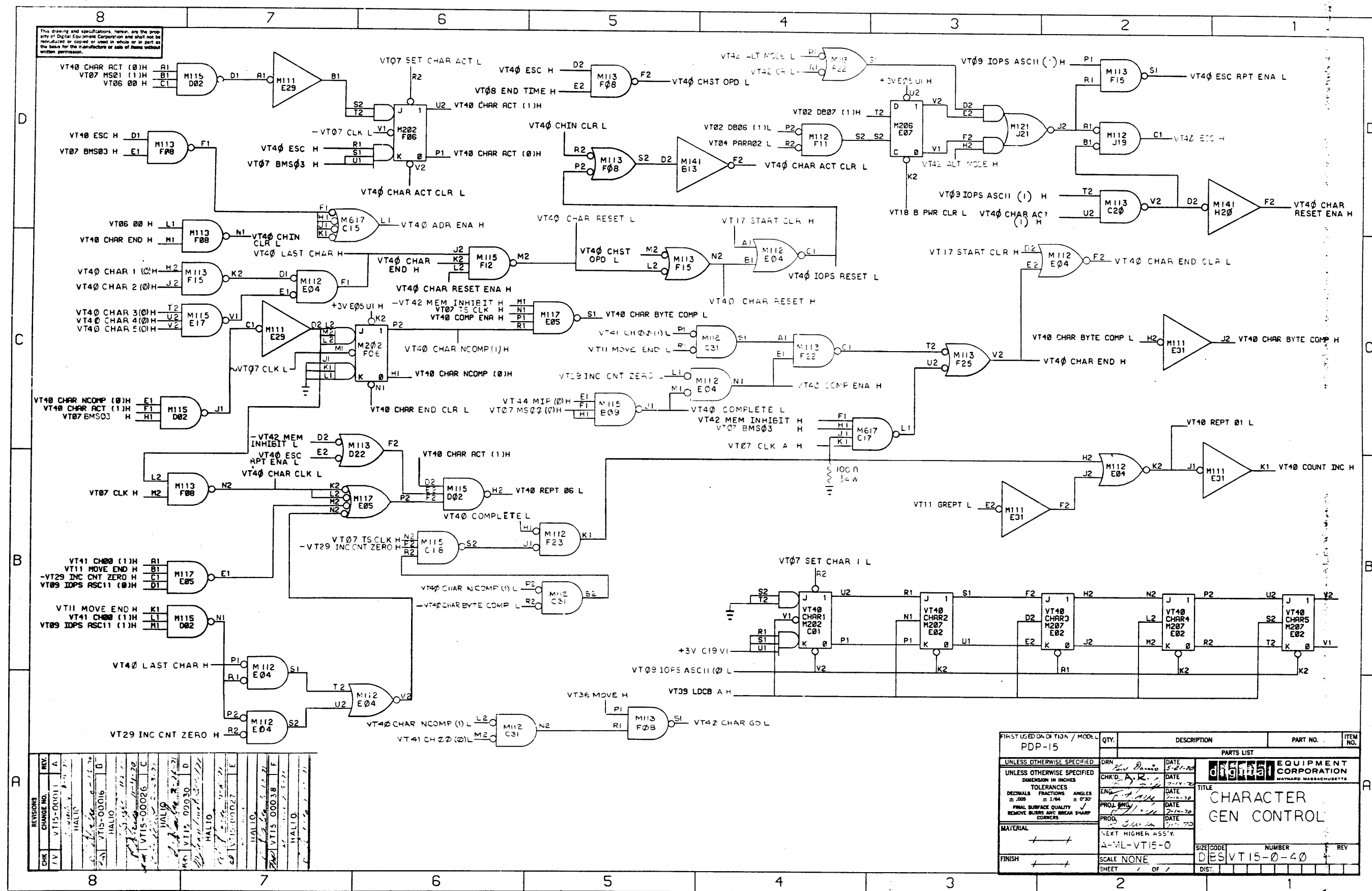
B2 VT15 X13 (1)H
B2 VT16 X14 (1)H
C2 VT16 X15 (1)H
D2 VT16 X16 (1)H
E2 VT16 X17 (1)H
F2 VT17 Y OVER FLOW (1)H
G2 VT14 Y06 (1)H
H2 VT14 Y07 (1)H
J2 VT14 Y08 (1)H
K2 VT14 Y09 (1)H
L2 VT15 Y10 (1)H
M2 VT15 Y11 (1)H
N2 VT15 Y12 (1)H
P2 VT15 Y13 (1)H
R2 VT16 Y14 (1)H
S2 VT16 Y15 (1)H
U2 VT16 Y16 (1)H
V2 VT16 Y17 (1)H

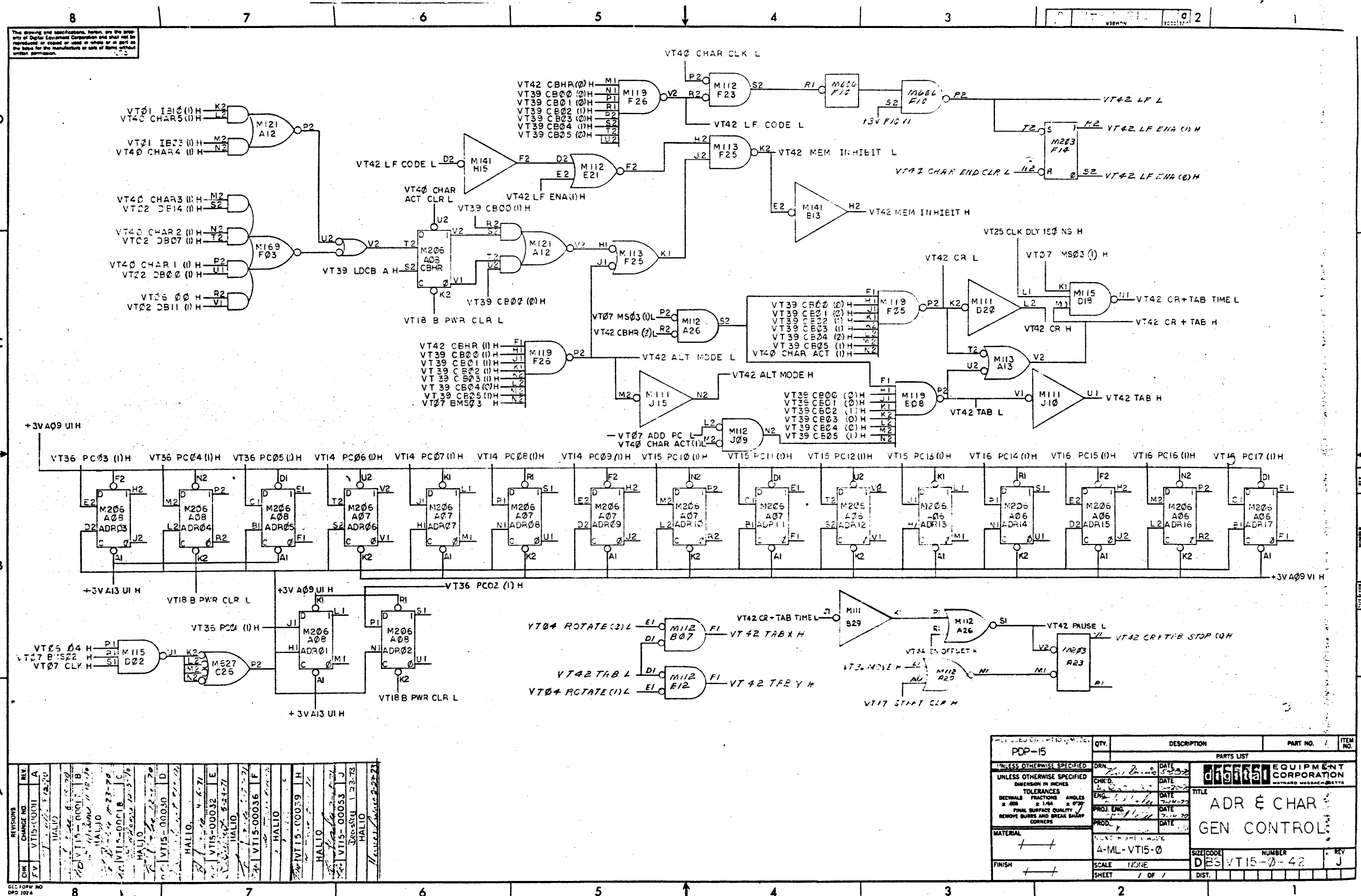
G775
H01

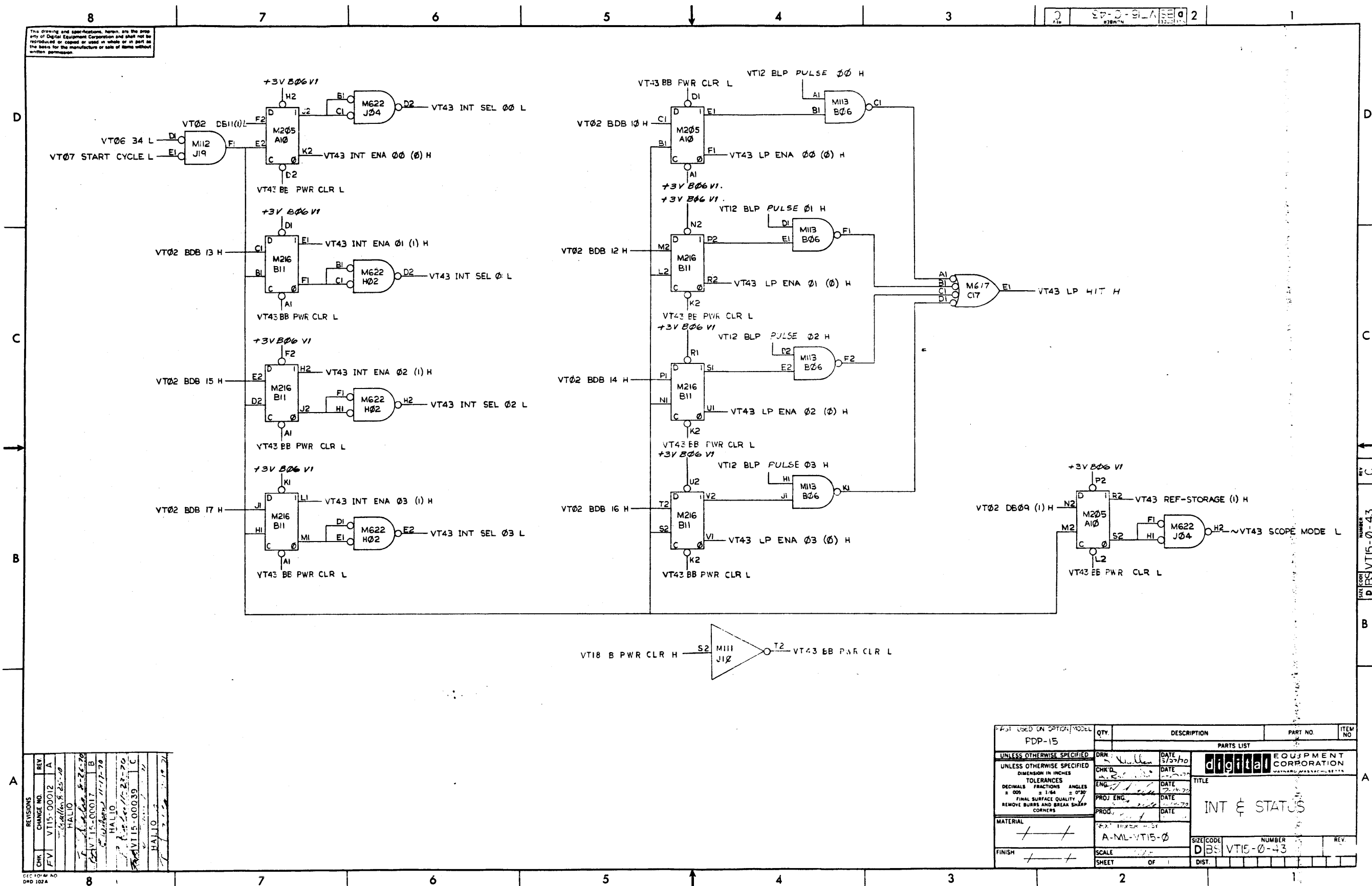
REV.	CHANGE NO.	DATE	BY
1	1	11/11/70	W. J. HALL
2	2	11/11/70	W. J. HALL
3	3	11/11/70	W. J. HALL
4	4	11/11/70	W. J. HALL
5	5	11/11/70	W. J. HALL
6	6	11/11/70	W. J. HALL
7	7	11/11/70	W. J. HALL
8	8	11/11/70	W. J. HALL

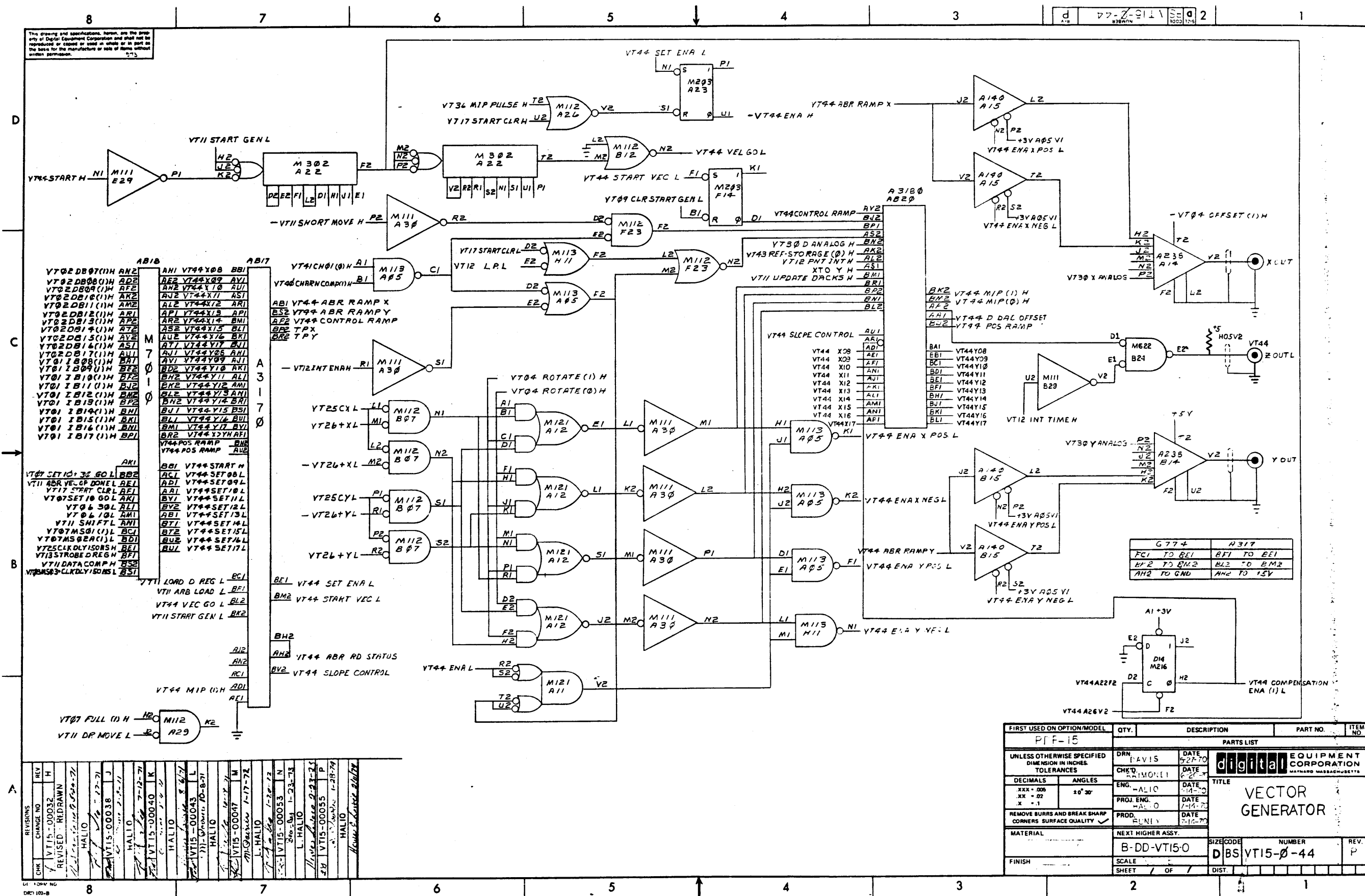
PART USED ON OTHER MODEL		QTY.	DESCRIPTION	PART NO.	ITEM NO.
PDP-15					
UNLESS OTHERWISE SPECIFIED		DATE	PARTS LIST		
UNLESS OTHERWISE SPECIFIED		DATE	digital CORPORATION		
DIMENSION IN INCHES		DATE	MAYNARD, MASSACHUSETTS		
TOLERANCES		DATE	TITLE		
DECIMALS	FRACTIONS	DATE	LIGHT CABLES		
± .005	± 1/64	DATE	SIZE CODE		
FINAL SURFACE QUALITY		DATE	NUMBER		
REMOVE BURRS AND BREAK SHARP CORNERS		DATE	REV.		
MATERIAL		DATE	A-ML-VT15-0		
FINISH		DATE	SCALE		
		DATE	SHEET 1 OF 1		
		DATE	DIST.		

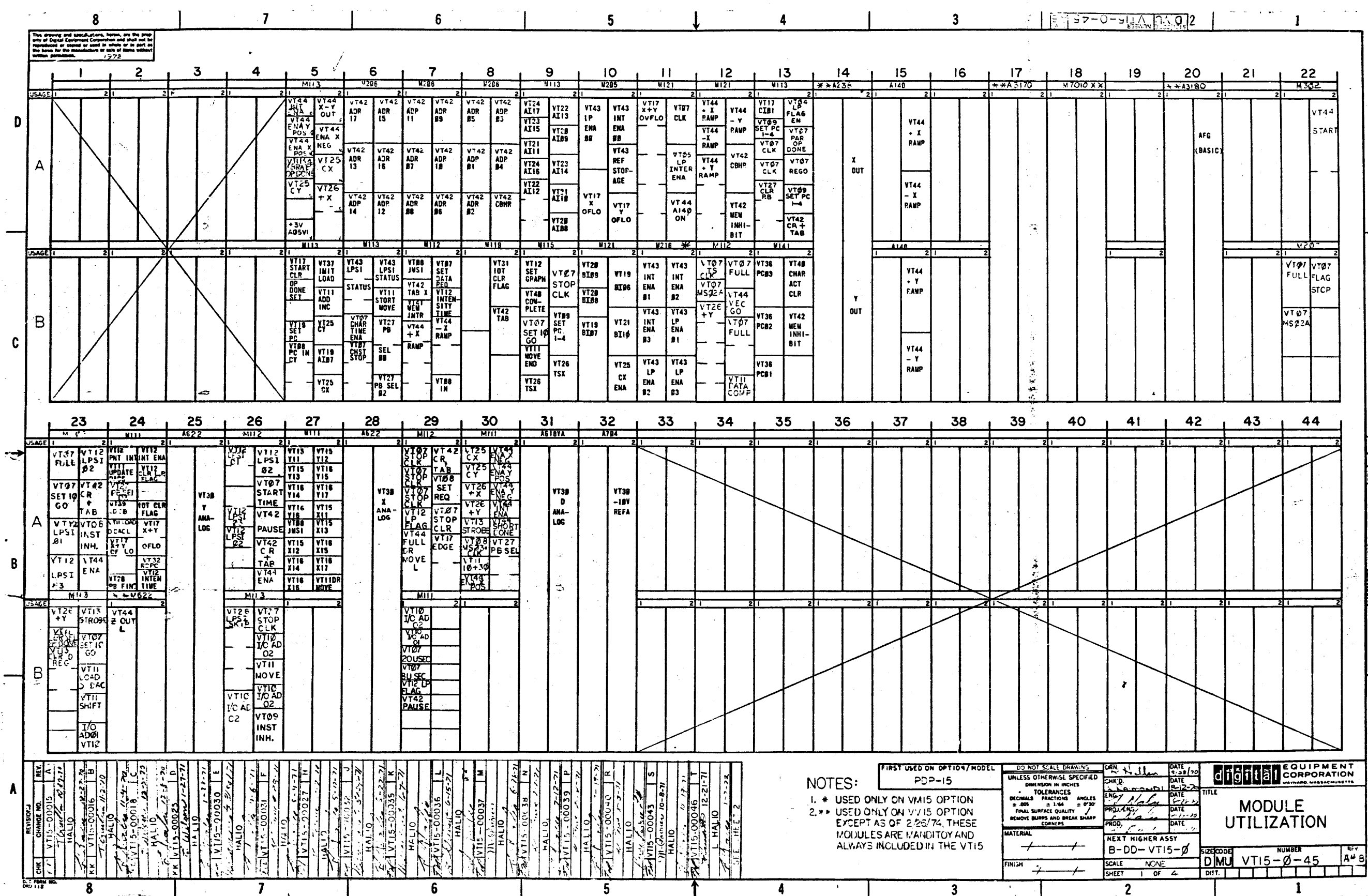










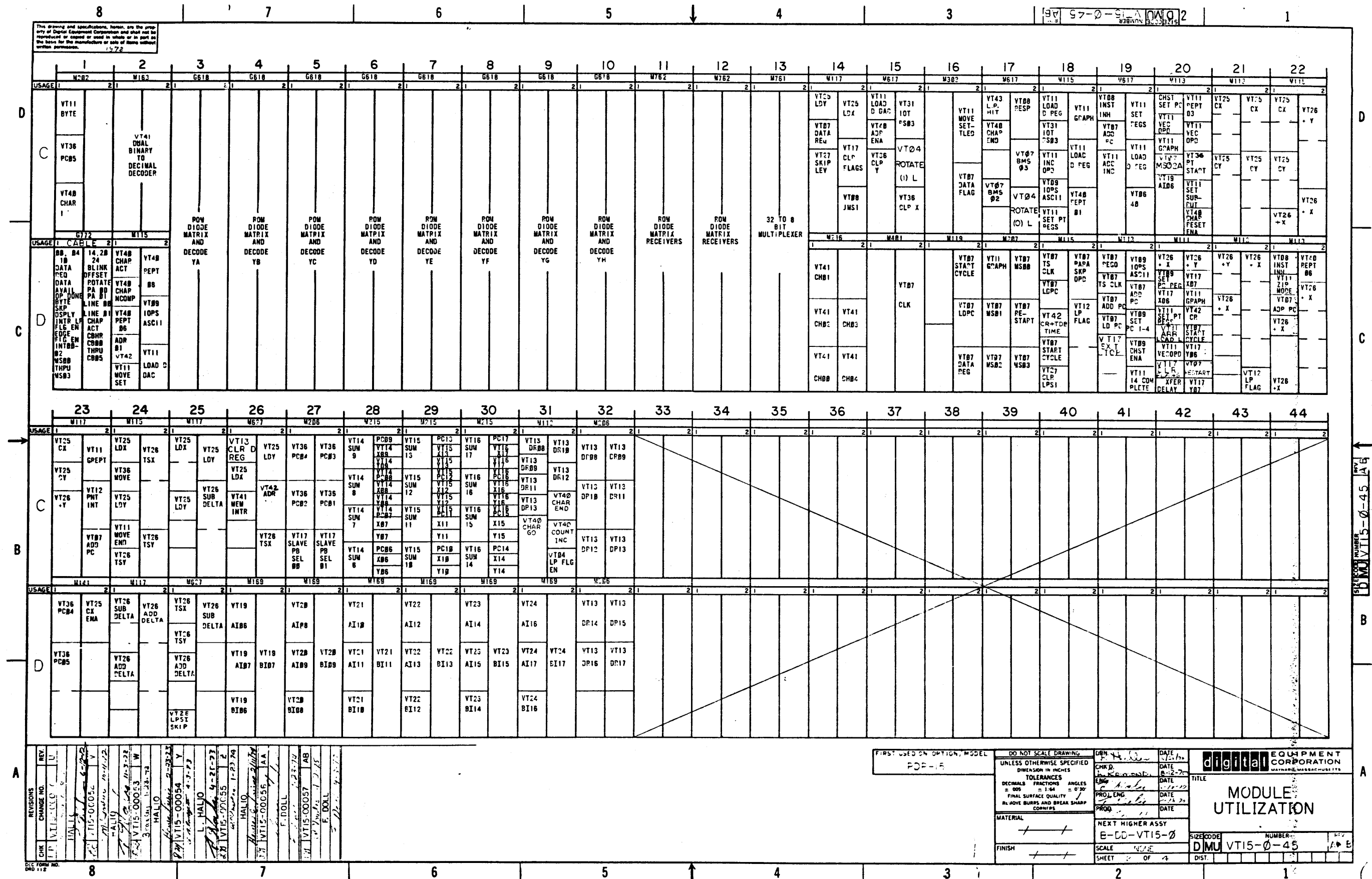


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1772

NOTES:
1. * USED ONLY ON VM15 OPTION
2. ** USED ONLY ON VM15 OPTION
EXCEPT AS OF 2/26/74, THESE
MODULES ARE MANDATORY AND
ALWAYS INCLUDED IN THE VT15

FIRST USED ON OPTION/MODEL PDP-15		DO NOT SCALE DRAWING UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES TOLERANCES DECIMALS FRACTIONS ANGLES ± .005 ± .005 ± .005 FINAL SURFACE QUALITY REMOVE BURRS AND BREAK SHARP CORNERS		DATE 10/1/70 DATE 10/1/70 DATE 10/1/70 DATE 10/1/70	
MATERIAL FINISH		NEXT HIGHER ASSY B-DD-VT15-0		TITLE MODULE UTILIZATION	
SCALE SHEET 1 OF 4		SIZE/CODE DIMU		NUMBER VT15-0-45	

REV	CHANGE NO.	DATE	BY	CHKD	DESCRIPTION
1	1	10/1/70	HALIO	VT15-00015	HALIO
2	2	10/1/70	HALIO	VT15-00016	HALIO
3	3	10/1/70	HALIO	VT15-00017	HALIO
4	4	10/1/70	HALIO	VT15-00018	HALIO
5	5	10/1/70	HALIO	VT15-00019	HALIO
6	6	10/1/70	HALIO	VT15-00020	HALIO
7	7	10/1/70	HALIO	VT15-00021	HALIO
8	8	10/1/70	HALIO	VT15-00022	HALIO
9	9	10/1/70	HALIO	VT15-00023	HALIO
10	10	10/1/70	HALIO	VT15-00024	HALIO
11	11	10/1/70	HALIO	VT15-00025	HALIO
12	12	10/1/70	HALIO	VT15-00026	HALIO
13	13	10/1/70	HALIO	VT15-00027	HALIO
14	14	10/1/70	HALIO	VT15-00028	HALIO
15	15	10/1/70	HALIO	VT15-00029	HALIO
16	16	10/1/70	HALIO	VT15-00030	HALIO
17	17	10/1/70	HALIO	VT15-00031	HALIO
18	18	10/1/70	HALIO	VT15-00032	HALIO
19	19	10/1/70	HALIO	VT15-00033	HALIO
20	20	10/1/70	HALIO	VT15-00034	HALIO
21	21	10/1/70	HALIO	VT15-00035	HALIO
22	22	10/1/70	HALIO	VT15-00036	HALIO
23	23	10/1/70	HALIO	VT15-00037	HALIO
24	24	10/1/70	HALIO	VT15-00038	HALIO
25	25	10/1/70	HALIO	VT15-00039	HALIO
26	26	10/1/70	HALIO	VT15-00040	HALIO
27	27	10/1/70	HALIO	VT15-00041	HALIO
28	28	10/1/70	HALIO	VT15-00042	HALIO
29	29	10/1/70	HALIO	VT15-00043	HALIO
30	30	10/1/70	HALIO	VT15-00044	HALIO
31	31	10/1/70	HALIO	VT15-00045	HALIO
32	32	10/1/70	HALIO	VT15-00046	HALIO
33	33	10/1/70	HALIO	VT15-00047	HALIO
34	34	10/1/70	HALIO	VT15-00048	HALIO
35	35	10/1/70	HALIO	VT15-00049	HALIO
36	36	10/1/70	HALIO	VT15-00050	HALIO
37	37	10/1/70	HALIO	VT15-00051	HALIO
38	38	10/1/70	HALIO	VT15-00052	HALIO
39	39	10/1/70	HALIO	VT15-00053	HALIO
40	40	10/1/70	HALIO	VT15-00054	HALIO
41	41	10/1/70	HALIO	VT15-00055	HALIO
42	42	10/1/70	HALIO	VT15-00056	HALIO
43	43	10/1/70	HALIO	VT15-00057	HALIO
44	44	10/1/70	HALIO	VT15-00058	HALIO



[illegible]

8	7	6	5	4	3	2	1
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DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS										PARTS LIST									
MADE BY A. RAINONDI					CHECKED A. RAINONDI					SECTION 1									
DATE 7/22/70					DATE 7/22/70														
ENG <i>A. Rainondi</i>					PROD <i>A. Rainondi</i>					ISSUED SECT. 1									
DATE 8/22/70					DATE														
DWG NO. / PART NO.										DESCRIPTION									
ITEM NO.										REV. ECO NO.									
A140										DUAL ANALOG SWITCH									
~~A228~~										~~ANALOG SUMMER DRIVER~~									
~~A318~~										~~DIGITAL TO ANALOG CONVERTER~~									
A618YA										DIGITAL TO ANALOG CONVERTER									
A704										-10V PRECISION POWER SUPPLY									
A622										D-A CONVERTER									
M104										IO BUS MULTIPLEXER									
M111										INVERTER									
M112										NOR GATE									
M113										10-2 INPUT NAND GATES									
M115										8-3, INPUT NAND GATES									
M117										6-4 INPUT NAND GATES									
M119										3-8 INPUT NAND GATES									
M121										X OR GATES									
M141										AND/NOR GATES									
M163										DUAL BINARY TO DECIMAL DECODER									
M169										GATE MODULE									
M202										TRIPLE J-K FLIP-FLOP									
M203										SET-RESET FLIP-FLOP MODULE									
M204										COUNTER BUFFER									
M205										5 "D" FLIP-FLOPS									
M206										SIX FLIP-FLOPS									
TITLE										MODULE UTILIZATION									
ASSY NO.										SIZE CODE									
D-MU-VT15-0-45										A PL									
SHEET 1 OF 3										DIST.									
DEC FORM NO. 110										REV. ECO NO. VT15-00057									

DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS										PARTS LIST									
MADE BY A. RAINONDI					CHECKED A. RAINONDI					SECTION 1									
DATE 7/22/70					DATE 7/22/70														
ENG <i>A. Rainondi</i>					PROD <i>A. Rainondi</i>					ISSUED SECT. 1									
DATE 8/22/70					DATE														
DWG NO. / PART NO.										DESCRIPTION									
ITEM NO.										REV. ECO NO.									
M207										FLIP-FLOP									
M215										REGISTER MODULE									
M216										SIX FLIP-FLOPS									
M302										ONE SHOT DELAY									
M311										TAP DELAY									
M401										CLOCK									
M501										SCHMITT TRIGGER									
M510										IO BUS RECEIVER									
M602										PULSE GENERATOR									
M606										PULSE GENERATOR									
M617										6-4 INPUT NOR BUFFERS									
M622										BUS DRIVER									
M627										POWER AMPLIFIER MODULE									
M761										32 TO 8 BIT MULTIPLEXER									
M762										ROM DIODE MATRIX RECEIVERS									
M910										CP TERMINATOR CARD									
~~A141~~										~~BREAK POINT GENERATOR~~									
G618YA										ROM DIODE MATRIX AND DECODE									
G618YB										ROM DIODE MATRIX AND DECODE									
G618YC										ROM DIODE MATRIX AND DECODE									
G618YD										ROM DIODE MATRIX AND DECODE									
G618YE										ROM DIODE MATRIX AND DECODE									
TITLE										MODULE UTILIZATION									
ASSY NO.										SIZE CODE									
D-MU-VT15-0-45										A PL									
SHEET 2 OF 3										DIST.									
DEC FORM NO. 110										REV. ECO NO. VT15-00057									

DIGITAL EQUIPMENT CORPORATION

MAYNARD, MASSACHUSETTS

PARTS LIST

MADE BY RAIMONDI	CHECKED RAIMONDI	SECTION
DATE 7/22/70	DATE 7/22/70	1
ENG <i>H. H. H.</i>	PROD <i>G. B. B.</i>	ISSUED SECT.
DATE 7-7-70	DATE 9-7-70	1

[illegible][illegible]

TITLE	ASSY NO.	SIZE	CODE	NUMBER	REV.	ECO NO.
MODULE UTILIZATION	D-MU-VT15-ø-45	A	PL	VT15-ø-45	A-B	
SHEET 3 OF 3	DIST.					

DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS						
						DATE 01-01-74
TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE						
REVISIONS						
REV	DESCRIPTION	CHG NO	ORIG	DATE	APPD BY	DATE
—	ORIGINATED PER ECO	VT15-00055	H.LAVOIE	11/73	—	—

ENG <i>Harold E. Lavoie</i>	APPD <i>Harold E. Lavoie</i>	SIZE A	CODE SP	NUMBER VT15-0-51	REV
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ENGINEERING SPECIFICATION

CONTINUATION SHEET**TITLE**

VT15 SYSTEM ADJUSTMENT PROCEDURE

- 1.0 Introduction
- 2.0 System Condition
 - Figure 2.1
- 3.0 Equipment
- 4.0 Summary Theory
 - 4.1 Supply Functions
 - 4.2 Arbitrary Vectoring and Modules
 - 4.3 Phasing Accuracy
 - 4.4 Noise Attention
 - 4.5 Display Front End
 - Figure 4.5.1
 - Table 4.5.1
- 5.0 Logic Checks and Adjustments
 - 5.1 Table Summary
 - 5.2 +5V
 - 5.3 System Clock
 - 5.4 System Displays
 - 5.5 Move Settle Delay
 - 5.6 Data Flag Delay
 - 5.7 Short Point Settle Delay
 - 5.8 Long Point Settle Delay
 - 5.9 Display Console Bus Delay
 - 5.10 Blink Delay
 - 5.11 Arbitrary Vector Start Up Settle Delay
 - 5.12 Arbitrary Vector Start Gen Delay

	SIZE A	CODE SP	NUMBER VT15-0-51	REV
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ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE	VT15 SYSTEM ADJUSTMENT PROCEDURE		
6.0 Analog Voltages - Checks and Adjustments Table 6.0 6.1 +15 Volts 6.2 -15 Volts 6.3 DDAC Reference Voltage 7.0 Initial Analog Adjustments 7.1 Pot Definitions 7.2 Initial Pot Set Up Figure 7.1 7.3 DDAC Adjustment 7.4 Display Phase Check and Adjustment 7.5 Variable Terminator Adjustment 7.6 Vector Time Verification 8.0 Analog Vectoring Adjustments 8.1 Set Up of Brightness Levels 8.2 Output Offset Adjustment 8.3 MDAC Phase Adjustments 8.4 Tuning of Vector Length and Intensity 8.5 Character Fine Tuning 8.6 Character Speed Verification Versus Quality 8.7 Closer Observation of Vector Gain Vs. Phase Error 8.8 Observation for Arbitrary Vector Mode Compensation			
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ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE	VT15 SYSTEM ADJUSTMENT PROCEDURE		
1.0 INTRODUCTION The VT15 display system adjustment must be undertaken with care and patience. Please attempt to understand the circuit and adjustment functions before starting. During adjustment try to correlate visual changes with the knowledge of how you are causing them. 2.0 SYSTEM CONDITION The display system must be reasonably up-to-date for this procedure to apply. A. Display Front End 1. Should have a new type yoke i.e. black and serialized rather than brown. 2. Should have a new type deflection amp mounted on the right side below muffin fan (when facing the screen), identifiable by the 200 potentiometer on it (old amplifier had no pot). 3. Should have an RC network on the rear chassis as shown in figure 2.1. If it is not correct, modify it to conform to figure 2.1. 4. Should have a variable terminator (74-09303-0-0) on one deflection axis (only on the last scope if there are multiple scopes). B. Backplane 1. ECO VT15 #47 should be installed.			
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TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE			
C. A3180 1. Should be up through circuit schematic rev.C. D. A3170 1. Should be circuit schematic Rev. B or greater. E. M7010 1. Should have a shield installed see ECO #M7010-1 F. A238 1. Should be circuit schematic Rev. C or greater. G. A140 1. Should be circuit schematic Rev. C or greater. See ECO #A140-3 3.0 EQUIPMENT The following equipment is needed: A. Dual trace ocsilloscope. B. 3 probes with grounding leads at least two lx probes are needed. C. Alignment tool or small screwdriver. Check that all probes are properly compensated and that both channels have their gains and phases calibrated. <u>Very Important.</u> 4.0 SUMMARY THEORY An understanding of how the analog portion of the system			
SIZE A		CODE SP	NUMBER VT15-0-51
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ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE			
works is necessary to get a good adjustment in a reasonable length of time. 4.1 Supply Functions The display processor uses +5V $\pm .15$, +15V $\pm .5V$, and -15V $\pm .5V$. All voltages should be stable. If they are outside of their specified ranges they may cause general deterioration of picture quality. Because of the dependence of the display on stable analog supply voltages, it is desirable to maintain an on-site record of the $\pm 15V$ supply voltages. The $\pm 15V$ supply should be checked as a part of PM procedure and at every adjustment session with a properly calibrated test instrument and the results recorded in a chart. 4.2 Arbitrary Vectoring and Modules In order to avoid redundancy in reading material you are referred to read the chapters in Volume 1 of the VT15 manual. They are as follows: 3.1.7 Analog Function Group 5.1.9 A3180 Vector Generator 5.1.10 M7010 VV15 Timing Control 5.1.11 A3170 Arbitrary Vector Generator 5.1.12 A140 Dual Analog Switch 5.1.13 A238 Dual Analog Summer Driver 4.3 Phasing An area which affects picture quality is differences in			
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TITLE

VT15 SYSTEM ADJUSTMENT PROCEDURE

throughput between the X and Y axis (that is signal path between the ramp generation of the integrator in the VT15 and the beam deflection in the CRT of the display unit). Differences in throughput may occur in the A3170 arbitrary vector generator module, the A140's analog switches the A238 summer-drivers, the coax cables, the deflection amplifier network. Phase distortion on the A3170 is compensated at the time of manufacture by capacitors C26 and C27 (see print D-CS-A3170-0-1). Phase distortion resulting from the A3170, A140, and A238 are factory tested. Phase distortion on the cables is adjusted by attaching a variable terminator to one end of one of the cables. Phase distortion in the display deflection amplifier and yoke are provided for by an adjustment potentiometer on the front end deflection amplifier.

4.4 Noise

The system is designed to provide adequate settling time between operation in the logic timing (refer to sec.5 to deal with normal noise within the analog circuits). Peculiarities at the beginning/or end of vectors are probably the result of excessive oscillation or noise and should be trouble-shot accordingly.

4.5 Display Front End

The display has a number of straight forward adjustments. See figure 4.5.1 and Table 4.5.1

SIZE	CODE	NUMBER	REV
A	SP	VT15-0-51	

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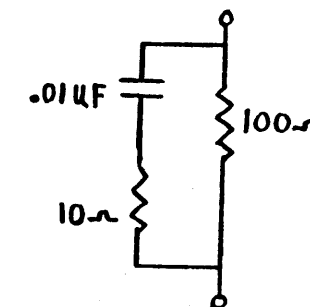
CONTINUATION SHEET

TITLE

VT15 SYSTEM ADJUSTMENT PROCEDURE

Figure 2.1

R.C. Grounding
Network



(Rear View)
Display C.R.T.

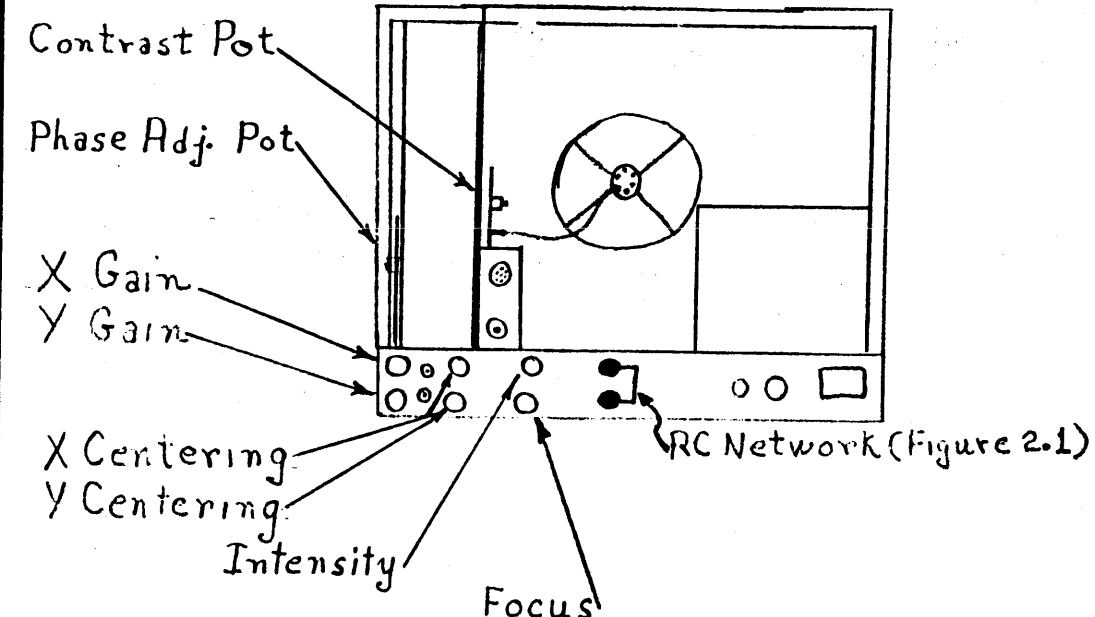


FIGURE 4.5.1

DISPLAY ADJUSTMENTS

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TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE			
TABLE 4.5.1 DISPLAY ADJUSTMENTS			
ADJUSTMENT	EFFECT	ADJUSTMENTS INDICATIONS	
X Centering	Lateral display position	So that display is centered	
Y Centering	Vertical display position	So that display is centered	
X Gain	Lateral display size	So that main display area is 9 1/4" on a side	
Y Gain	Vertical display size	Same as X Gain	
Intensity	Display brightness	So that little pictures test 5(8) intensity level 0 is at the boarder-line of visibility.	
Contrast	Range of digitally selected intensities	So that little pictures test 5(8) intensity 7 is set at which it does not bloom.	
Focus	Focus	So that little pictures test 16(8) shows uniform quality throughout the display area.	
		SIZE A	CODE SP
		NUMBER VT15-0-51	
		REV	

ENGINEERING SPECIFICATION		CONTINUATION SHEET		
TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE				
A. X Gain Controls the size of the display in the X axis by controlling attenuation of the X axis deflection input. Adjusted so that a full screen vector in X is 9 1/4 inches long. May be adjusted for shorter lengths if the customer desires (the smaller the viewing area the less visible any distortion). B. Y Gain Controls the size of the display in the Y axis by controlling attenuation of the Y axis deflection input. Adjusted so that a full screen vector in Y is 9 1/4 inches long (or to match X). C. X Centering Controls the position of the display in the X axis by controlling biasing of the X deflection amplifier. Adjusted to permit viewing of the entire display in the center of the viewing area. If the customer does not use the offset area he may desire that the main viewing area be centered. D. Y Centering Controls the position of the display in the Y axis by controlling the biasing of the Y deflection amplifier. Adjusted to permit viewing of the entire display in the center of the viewing area.				
		SIZE A	CODE SP	NUMBER VT15-0-51
		REV		

ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE			
E. Intensity Controls the intensity which will be displayed by controlling grid bias in the CRT. Has proportional control over all intensity levels. Adjusted (with contrast) to provide enough intensity so that level 0 is barely visible. F. Contrast Controls the intensity which will be displayed by controlling the cathode bias in the CRT. Has proportional control over all intensity levels. Adjusted so that level 7 does not bloom over 30 mil spot size. Note that the intensity and contrast adjustments are interactive. G. Focus Controls the focus by controlling the grid bias in the CRT. Adjusted to provide as uniform and sharp a picture throughout the displayable area as possible. Sharpest picture in center of screen. H. Phase See discussion on phasing, Section 7.3.			
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ENGINEERING SPECIFICATION		CONTINUATION SHEET																																													
TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE																																															
<table><tr><td colspan="4">TABLE 5.1 LOGIC ADJUSTMENTS</td></tr><tr><td>ADJUSTMENT</td><td>POT LOC</td><td>MODULE</td><td>SLOT</td></tr><tr><td>* Clock</td><td>Only</td><td>M401</td><td>D15</td></tr><tr><td>* Move settled Delay</td><td>Top</td><td>M302</td><td>C16</td></tr><tr><td>* Data Flag Delay (latency Delay)</td><td>Bottom</td><td>M302</td><td>C16</td></tr><tr><td>Short Point Settle Top Delay</td><td>Top</td><td>M302</td><td>J12</td></tr><tr><td>* Long Point Settle Delay</td><td>Bottom</td><td>M302</td><td>J12</td></tr><tr><td>* Display Console Bus Delay (push button Delay)</td><td>Top</td><td>M302</td><td>F13</td></tr><tr><td>Blink Delay</td><td>Bottom</td><td>M302</td><td>F13</td></tr><tr><td>* Arbitrary Vector Startup Settle Delay</td><td>Top</td><td>M302</td><td>A22</td></tr><tr><td></td><td></td><td></td><td></td></tr></table>				TABLE 5.1 LOGIC ADJUSTMENTS				ADJUSTMENT	POT LOC	MODULE	SLOT	* Clock	Only	M401	D15	* Move settled Delay	Top	M302	C16	* Data Flag Delay (latency Delay)	Bottom	M302	C16	Short Point Settle Top Delay	Top	M302	J12	* Long Point Settle Delay	Bottom	M302	J12	* Display Console Bus Delay (push button Delay)	Top	M302	F13	Blink Delay	Bottom	M302	F13	* Arbitrary Vector Startup Settle Delay	Top	M302	A22				
TABLE 5.1 LOGIC ADJUSTMENTS																																															
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* Arbitrary Vector Startup Settle Delay	Top	M302	A22																																												
SIZE A	CODE SP	NUMBER VT15-0-51	REV																																												

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ENGINEERING SPECIFICATION		CONTINUATION SHEET													
TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE															
(CONTINUED) TABLE 5.1 LOGIC ADJUSTMENTS <table><thead><tr><th>ADJUSTMENT</th><th>POT LOC</th><th>MODULE</th><th>SLOT</th><th>PIN #</th><th>SET TO</th></tr></thead><tbody><tr><td>* Arbitrary Vector Start Gen Delay</td><td>Bottom</td><td>M302</td><td>A22</td><td>T2</td><td>100 nsec high pulse</td></tr></tbody></table> * settings are made running VT15 Instruction Test Part II with ACS 17 on a Ø.				ADJUSTMENT	POT LOC	MODULE	SLOT	PIN #	SET TO	* Arbitrary Vector Start Gen Delay	Bottom	M302	A22	T2	100 nsec high pulse
ADJUSTMENT	POT LOC	MODULE	SLOT	PIN #	SET TO										
* Arbitrary Vector Start Gen Delay	Bottom	M302	A22	T2	100 nsec high pulse										
SIZE A	CODE SP	NUMBER VT15-0-51	REV												

ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE			
5.0 LOGIC CHECKS AND ADJUSTMENTS 5.1 Table Summary 5.1 5.2 +5 Volt Logic Power A. Scope Points - A05A2, C02A2, E02A2, F02A2 B. Adjustment - Accessible potentiometer on top left of the H721 power supply (bottom of VT15). C. Procedure - Adjust to achieve +5 volts average for all points - 0 or +.15volts. 5.3 System Clock A. Scope Points - D15D2 B. Adjustment - Potentiometer on back of M401 module in location D15. C. Procedure - With the display stopped, adjust for 250 ns between pulses. 5.4 System Delays The duration of a delay is the amount of time between the positive going leading edge and the trailing edge. To take the following measurements, use an oscilloscope and SYNC + on channel one. 5.5 Move Settled Delay A. Scope Points - C16F2 B. Adjustment - Top potentiometer on back of M302 module in location C16.			
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ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE			
C. Procedure - Run the first section of VT15 Part II (Blink Square) and adjust to 3.5 usec. 5.6 Data Flag Delay A. Scope Points - C16T2 B. Adjustment - Bottom potentiometer on back of M302 module in location C16. C. Procedure - Run the first section of VT15 Instruction Test, Part II (Blink Square) and adjust for minimum (400 nsec). NOTE: Early versions of VT15 Instruction Test, Part II will not run with this delay below 3 1/2 usec. To run the old version diagnostic, change memory location 3211 to 140.000. 5.7 Short Point Settle Delay A. Scope Points - J12F2 B. Adjustment - Top potentiometer on back of M302 module in location J12. C. Procedure - Run the Test 13₍₈₎ VT15^{L.R}_A and adjust for 8 usec. 5.8 Long Point Settle Delay A. Scope Points - J12T2 B. Adjustment - Bottom potentiometer on back of M302 module in location J12. C. Procedure - Run the first section of Instruction Test,			
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ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE			
Part II (Blink Square) and adjust for 20 usec. 5.9 Display Console Bus Delay A. Scope Points - F13F2 B. Adjustment - Top potentiometer on back of M302 module in location F13. C. Procedure - Run the first section of Instruction Test, Part II (Blink Square) and adjust to 750 nsec + (X-30) times 4 nsec, where X equals the cable length in feet between the VT15 and the furthest VT04 (for standard 30 Ft. cable adjust to 750 nsec). 5.10 Blink Delay A. Scope Points - F13T2 B. Adjustment - Bottom potentiometer on back of M302 module in location F13. C. Procedure - With the display stopped, adjust to between 80 and 120 milliseconds. 5.11 Arbitrary Vector Start Up Settle Delay A. Scope Points - A22F2 B. Adjustment - Top potentiometer on M302 module in location A22. C. Procedure - This delay is factory set to allow for the maximum settling time without exceeding the specification for the character drawing rate. Its normal setting is about 500 nsec, but will vary from system to system.			
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TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE			
If adjustment of this delay is necessary, run the first section of Instruction Test, Part II (Blink Squares) and adjust to 500 nsec. Then go to normal adjustment procedure starting in Section 8.			
5.12 Arbitrary Vector Start Gen Delay			
A. Scope Point - A22T2			
B. Adjustment - Bottom potentiometer on M302 module in location A22.			
C. Procedure - Run the first section of VT15 Instruction Test, Part II and adjust to 100 nsec.			
6.0 ANALOG VOLTAGES - CHECKS AND ADJUSTMENTS			
The +15 volt and -15 volt precision supplies provide a base for most of the VT15 analog adjustments. They may be set as much as one-half volts from nominal and still provide normal operation. However, once these voltages are set and the analog adjustments have all been done, these voltages should not be readjusted. If a precision voltage is changed for any reason, the vector length analog adjustment could possibly have to be redone.			
See Adjustment Summary Pot Table 6.0.			
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TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE			
TABLE 6.0 ADJUSTMENT SUMMARY POT TABLE			
ADJUSTMENT	TEST POINT	COMMENTS	
+5V	X01A2 and X32A2 of every row	Adjust H721 (through hole in its cover) - should be 5V $\pm .15V$ 0V	
+15V	B32V2	Adjust H707 - lefthand pot. Caution: On earlier VT15's it is possible to short live points within the power supply if a metal adjusting tool is used should be +15V $\pm .5V$.	
-15V	B32U2	Adjust H707 righthand pot. Caution: As above should be -15V $\pm .5V$	
SIZE	CODE	NUMBER	REV
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TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE			
6.1 +15 Volts A. Test Points - B32V2 B. Adjustment - Lefthand potentiometer on the H707 power supply (mounted in upper part of VT15). C. Procedure - Adjust to achieve +15.0 volts. 6.2 -15 Volts A. Test Point - B32U2 B. Adjustment - Righthand potentiometer on the H707 power supply (mounted in upper part of VT15). C. Procedure - Adjust to achieve -15.0 volts 6.3 D DAC Reference Voltage A. Test Point - A32V2 B. Adjustment - Potentiometer on the back of A704 module in location AB32. C. Procedure - Adjust to obtain -10 volts. May be factory set at a value slightly higher than -10 volts. NOTE: Additional information for adjustments is given in section 7.0.			
	SIZE A	CODE SP	NUMBER VT15-0-51
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ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE			
7.0 INITIAL ANALOG ADJUSTMENT PROCEDURE 7.1 Pot Definitions <u>A3180-P1 Point Intensity Delay</u> This pot controls a delay triggered by a signal called Start Generator which simultaneously starts up the vectoring. We delay the intensity turn on to match up the delay introduced in the X and Y analog networks. <u>A3180-P2 Vector Length</u> This pot controls the end point of the vector being drawn on the CRT. It is done by introducing a linear voltage error to the D DAC, which in turn controls the magnitude of the ramped voltage in the integrator. <u>A3170-P1 X Gain</u> This pot will allow one to match the vector length of the Y axis. Any error between vector lengths of a positive and negative direction will occur due to errors beyond the A3170 signal path. <u>A3170-P2 X Phase Control</u> <u>A3170-P4 Y Phase Control</u> These pots set the zero volt start position for the output of the MDAC's. When the pots are set so that the outputs are zero for a DC voltage level, turning more counter-clockwise on each pot generates a phase control which allows one to set the X and Y final outputs to a zero phase error			
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VT15 SYSTEM ADJUSTMENT PROCEDURE

referenced to each other. These controls should always be set last, after phasing in the CRT and the cables and setting the A3170-P3 and P5 pots to zero offset.

A3170-P3 X Output Offset

A3170-P5 Y Output Offset

These pots correct any inherent offsets produced by the operational amplifiers following the MDAC's. They cannot be used to correct an error produced by the MDAC.

A704-P1 Coarse Vector Length Error Control

A704-P2 Fine Vector Length Error Control

These pots should be used to correct percentage error of vector lengths meeting their predetermined end point. This is most noticable as the vector lengths determined are longer and longer. Test 13₍₈₎ with PE1 in a one or zero shows the accuracy of end point matching.

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VT15 SYSTEM ADJUSTMENT PROCEDURE

TABLE 7.2

INITIAL POT SET UP

MODULE	INSTRUCTION	DESCRIPTION
A3180:		
Pot 1	Turn pot fully CCW	(Intensity Turn On)
Pot 2	Leave pot in present position if paragraph 7.3 has been executed	(Vector Length)
A3170:		
Pot 1	Leave pot in present position if paragraph 7.3 has been executed	(X Gain Control)
Pot 2	Set both pots fully CCW	(X Phase Control)
Pot 4		(Y Phase Control)
Pot 3	Set both pots to approximately their center position	(X Output Offset)
Pot 5		(Y Output Offset)
A704:		
P1	Leave pot in present position if paragraph 6.0 has been executed	(Coarse Vector Length)
P2		(Fine Vector Length)

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TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE

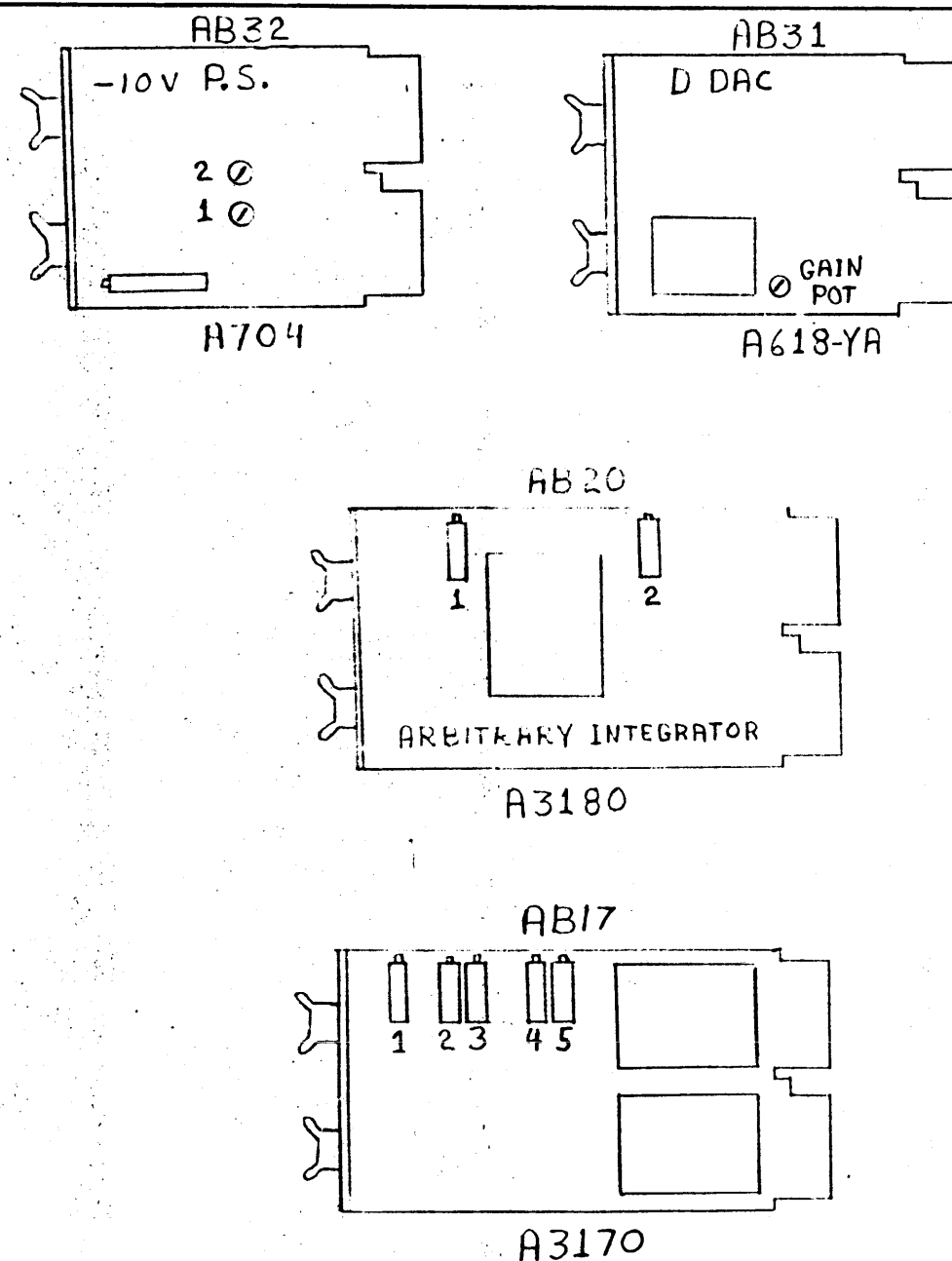


FIGURE 7.1

Pot Locations for Analog Adjustment

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7.3 D DAC (Digital to Analog Converter) Adjustment

NOTE: In addition to the Basic Vector adjustments, there is also a gain adjustment of the D DAC module. This adjustment is factory set to a very close tolerance; however, if the DAC drifts or is replaced, there is a method which may be used to adjust it.

- A. Select test 13(8) of the VT15 Little Pictures program with PBl on a 1. Assure that the shortest vectors just meet the point (A3180-P2 vector length adjustment). Observe for overshooting or undershooting on all length vectors. If so, follow next few steps to correct the error.
- B. To adjust, place the D DAC module (AB31) on a double height extender board and turn the "trim pot" until the lines just meet the points. Go back to the vector length adjustment and readjust if necessary.
- C. -10V Reference Voltage Adjustment
The D DAC reference voltage supplied from the A704 module has a direct control on the output of the D DAC. Since the adjustment on the A618YA D DAC module doesn't always allow a sufficient output of the D DAC, it is sometimes necessary to increase the negative voltage output of the A704.
- D. If a sufficient output cannot be obtained with the D DAC adjustment, then the -10 volt reference may be varied as follows:

1. Put the A704 module (AB32) on a double height extender module.

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2. Follow the D DAC adjustment given in Section 7.3-B but use the medium and coarse adjustments on the A704 instead of the adjustment on the D DAC module. NOTE: Both the -10 volt reference adjustment and the D DAC adjustment have a larger effect on long lines than on short lines. Since the vector length adjustment has the same effect on long and short lines, favorable results may be obtained by going back and forth between these adjustments. However, it must be remembered that there are some non-linearities in the system with regard to line lengths and it is nearly impossible to achieve perfect results over the entire range. 3. With PBI on a 0, observe the horizontal vector lengths. If lengths do not meet the intensified points adjust A3170-P1 for X Gain. This pot allows you to set X Vector lengths to Y Vector lengths. 7.4 Display Phase Check and Adjustment The VT15/VT04 system is sensitive to circuit delays and circuit throughput time. For this reason care is taken to make sure that the X and Y deflection signals leave the VT15 logic in the exact correct time relation to each other. This time relationship is termed "phase". Since the coax cables that connect the VT15 to the VT04 may introduce a phase change between the X and Y analog signals,			
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a variable resistance terminator is used at the end of one of these cables. The end of the other cable will have the standard 100 ohms terminator. The throughput time of the variable terminated cable may be changed by adjusting the terminator. In this way the phase of the X and Y cables may be corrected. Before adjusting the variable terminator check the phase of the display oscilloscope as follows: A. Turn the intensity on the Kratos display to minimum (fully counterclockwise) and remove power from the display chassis. B. Unplug the X input BNC connector at the display chassis. C. Using a lead with alligator clip terminations, (not longer than 3 inches) jumper the X and Y inputs under the chassis where the BNC connectors are soldered to wires leading to the amplifier. D. Load and start Little Pictures Test 2₍₈₎ (Phase). E. Apply power to the Kratos and slowly turn up the intensity, being careful not to burn any spots on the phosphor. F. The display should be a diagonal line of varying intensity. If the Kratos is not properly phased the display will appear as two lines touching at each end, but separating noticeably over some part of their length. Should there be a gap, observe this picture and adjust			
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the pot on the preamplifier of the Kratos unit until there is no gap. Non-linearities may show up at the end points of the lines which will show up in all adjustment tests concerning phasing.

- G. Turn the intensity on the Kratos to minimum and remove power from it.
- H. Remove the jumper between X and Y inputs and reconnect the X input.

7.5 Variable Terminator Adjustment

- A. Shutdown the system and remove the Y output coax termipoint on pin B14V2 and connect the termipoint to pin A14V2 using a lead with alligator clips (not longer than 2 inches).
- B. Select routing 2(8) (Vector Curvature) of the Little Pictures diagnostic and observe the large diagonal line display. This diagonal line is made up of two crosses, drawn in different directions, superimposed on each other. If any part of the superimposed lines of the cross separate much more than a line width, then adjust the variable terminator as necessary.
1. Put the variable terminator at the end of the X coax cable and leave the standard 100 ohm terminator on

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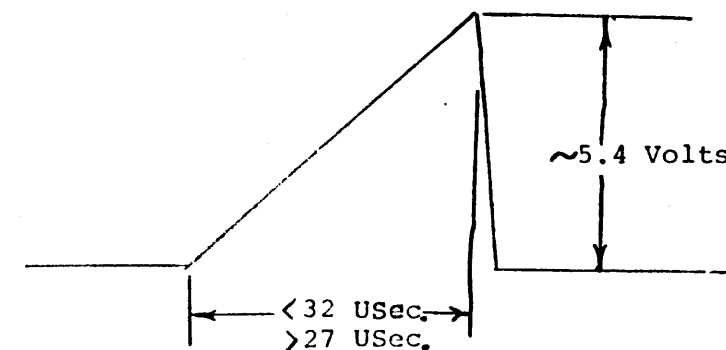
TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE

the coax cable.

2. Adjust the variable terminator until the superimposed lines line up on top of each other.
3. Remove the variable terminator and meter its resistance. If it is over 100 ohms, then swap it with the Y axis terminator and readjust it as described in 2 above. Again, meter the resistance value. It must be between 50 and 100 ohms. Otherwise there is a problem elsewhere in the system.
- C. Shutdown system and replace the Y output coax back to B14V2.

7.6 Vector Time Verification

- A. Select Test 16(8) in Little Pictures Test.
- B. Place oscilloscope channel A to 1 volt per cm on pin A17B1. Sync external positive with sync probe to pin E31B1. Set time base to 5 microseconds per centimeter.
- C. You are observing a full scale vector being executed. The time verification should be as shown below:



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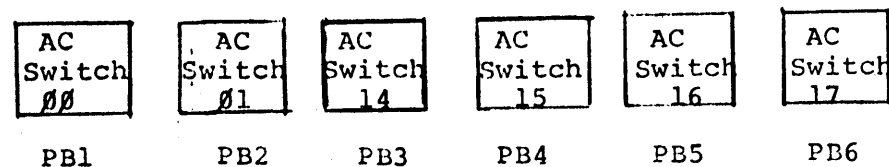
TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE

8.0 ANALOG VECTORING ADJUSTMENTS

8.1 Set Up of Brightness Levels

- A. Select Little Pictures Test 5⁽⁸⁾
- B. Set the $\emptyset$ level of intensity so that it is just barely visible.

NOTE: Use of Push Buttons on CRT console for selecting individual test and subtest is recommended. They are decoded as follows with the AC switch $\emptyset 3$ on the PDP15 console selected to a 1 position,



The only subpicture not possible to select is the vertical phosphor test, which is selectable by setting the PDP15 AC switch $\emptyset 2$ to a one position.

Be sure when setting Brightness of the CRT that you do it in the environment of ambient light that the customer will be frequently using. This will help in adjusting the CRT for best quality.

8.2 Output Offset Adjustment

- A. Select Little Pictures Test 2⁽⁸⁾
- B. Observe the box at top center. Turn the A3170-P3 pot and converge the six vertical lines to two lines.

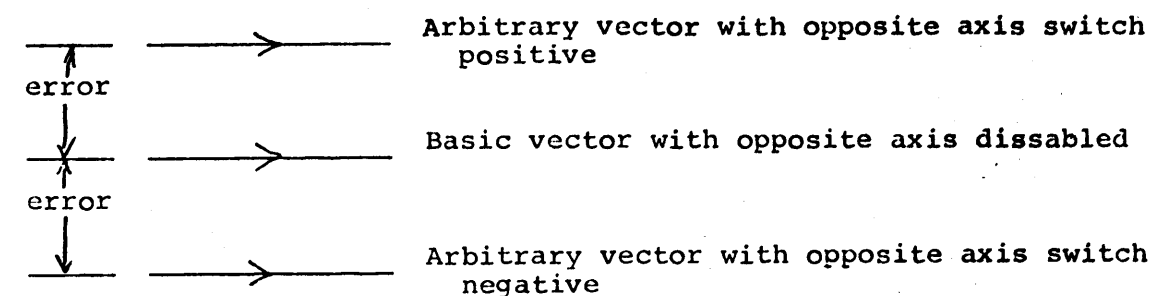
SIZE A	CODE SP	NUMBER VT15-0-51	REV
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- C. Turn the A3170-P5 pot and converge the six horizontal lines to two lines.

Concept of Box:

This box was drawn specifically to set the offset pots.
As can be observed each side of the box has three lines.
The lines are drawn as follows:



When there is no error on offset the three lines converge to one. Superimposition of lines drawn in this way do not include phase problems as long as A3170-P2 and P4 are fully counterclockwise

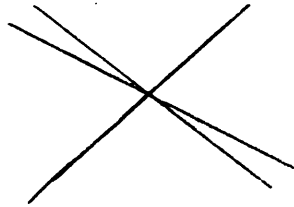
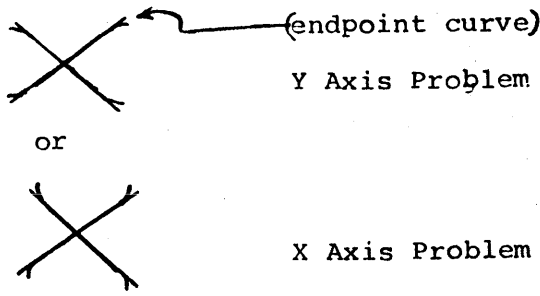
8.3 MDAC Phase Adjustment

- A. Select Little Pictures Test 2⁽⁸⁾
- B. Observe the 45° rotated box at the upper center of the screen.

NOTE: In this adjustment it is a prerequisite that the box above this one must be correctly aligned as explained in paragraph 8.2. Also paragraph 7.4 and 7.5 must be completed

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so as not to confuse the convergence of these lines. Do not bother observing the large X convergence at this point. C. Turn pot A3170-P2 while observing that the 45° box will converge from 2 lines on each side to one. If the lines are not converging set the pot back fully counter-clockwise. Then turn pot A3170-P4 to converge the lines to one on each side of the box. D. If there is a need to get more speed throughput in the A3170 you can turn one of the two pots clockwise a number of times. Then correct the out of phase 45° box by turning the other pot clockwise until line convergence occurs once again. NOTE: By turning either pot to far clockwise, the starting point of the intensified vector will move off its true position as an offset in the same axis as the vector is being generated. This can be easily noticed by observing the upper box starting positions. E. Observe the large X in Test 2(8). The X may look double visioned. If so, turn the pot A3170-P1 (the X Gain pot) so that the doubled X converges to one. NOTE: If you cannot get a perfect large X and you have tuned in the two boxes your possible problems may be as follows:			
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a) Set A3170-P1 (X Gain) so that the large X looks like this if possible: (somewhat exaggerated)  This means that the phase of the CRT when drawing from the positive of the X amplifier and the negative of the Y amplifier or vice-versa is in phase error. This would mean that the preamplifier in the CRT could be in error. Be sure to run tests in section 8.7 before accepting error to be in preamp. Otherwise the preamp should be replaced. b)  This would mean most likely that an op-amp reaches its limit in linearity; that possibly the A140 has not received ECO#A140-0003. If you change the position pots of the CRT display and the lines straighten out, the CRT preamplifier or power amplifier is in error.			
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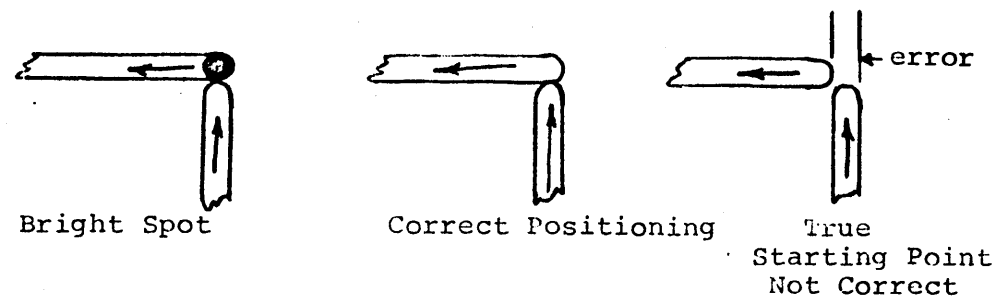
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8.4 Tuning of Vector Lengths and Intensity Turn On

- A. Select Test 3 (8) of Little Pictures Test.
- B. Set PBI to a one. This will give you a number of different size squares on the screen. Sizes 7, 17, 20, 37, 47, 77, 177, , and 1000 octal line lengths. They are drawn counter-clockwise.
- C. Observe starting points of lines. They should have a bright spot because the A3180-P1 is fully counter-clockwise. Turn this pot clockwise until the spot becomes equal in intensity as the rest of the line.

If you turn the pot some more you will observe that the starting point of the vector will move off its true position, as shown below. Arrows show direction of vector being drawn.



NOTE: A brighter spot may occur when the two lines overlap each other. Keep this in mind when setting up the intensity starting point. If necessary, turn the A3180-P2 (Vector length control) pot so the end of the vector appears as

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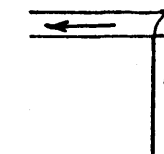
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shown above.

The fact that you cannot accomplish true position start up may be due to the offset controls A3170-P3 and P5 not set accurately enough, or the MDAC phase adjustments A3170-P2 and P4 are producing a positive from 0 volts starting position.

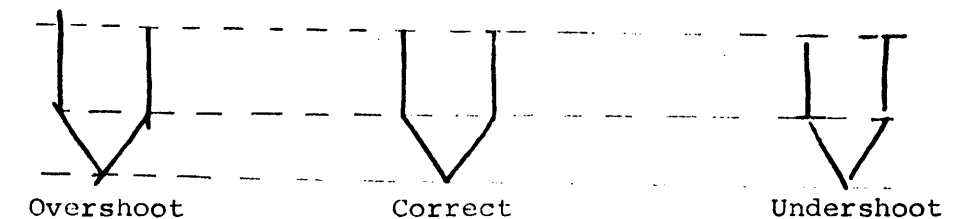
- D. Observe end points of lines. Especially lines on smaller boxes because they are the same vector lengths that generate characters.

Turn pot A3180-P2 so that the lines overlap the starting points of the next lines as shown below. Arrow shows direction of line being drawn.



8.5 Character Fine Tuning

- A. 1. Select Test 16 (8) and lengthen the vector length so that characters will look squared up as so. Pick this character from somewhere in the middle of the bottom of the screen.



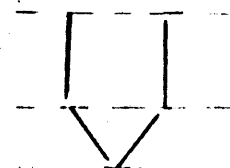
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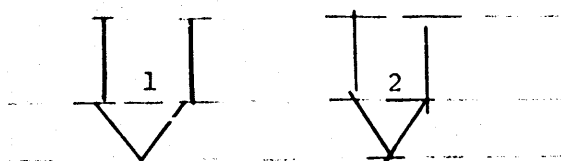
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2. If you cannot accomplish this it is possible you have not set another pot correctly. It may look like this:



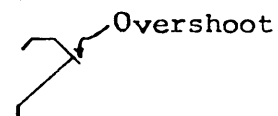
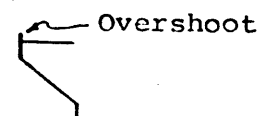
This would be a problem similar to paragraph 8.4, step C. Please refer to it.

3. Another phenomenon would be for the character to look like this:



This could mean that the X and Y output offsets A3170-P3 and P5 are not set accurately. They are producing here bad starting in the X axis on 1 and bad starting in the Y axis on 2.

- B. At this point all characters should be looked at for best quality in Test 16 (8). Vector length and Intensity delay should be moved so as to satisfy overall quality.
- C. The one error that may show up when everything else looks good is in either character may show up as follows:



This occurs due to nonlinearity in the start up of the

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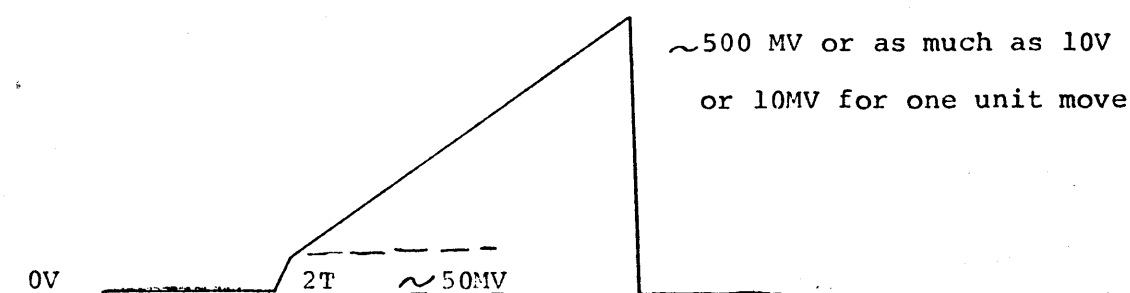
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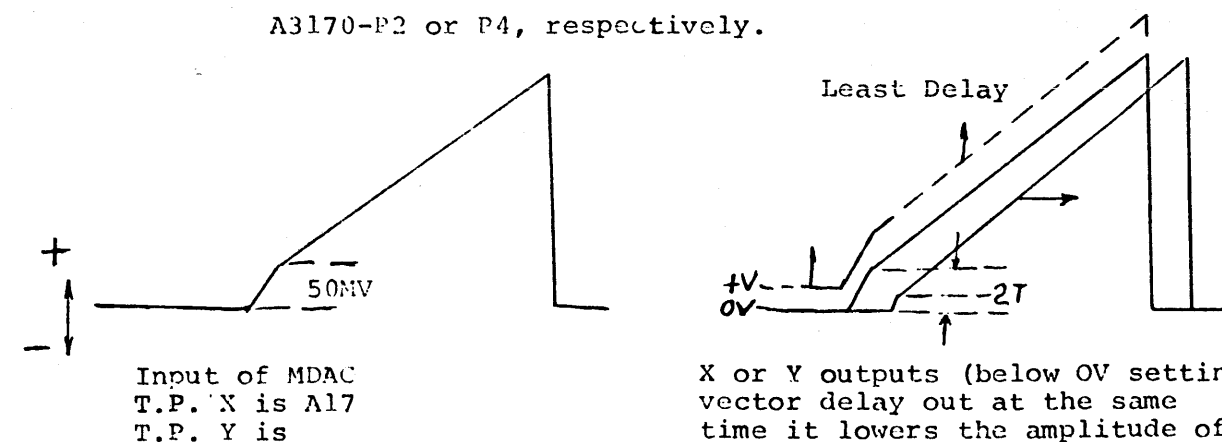
CRT. It is possible that your scope might exhibit this. You can get some of it out by understanding some technical points of the Analog.

1. The Integrator pin A20U2 looks like the example given below when drawing any line on the screen:



NOTE: This step is produced by capacitor C on the integrator in the A3180. A47 PF should be there. A 39 PF capacitor would make a faster step.

2. The X or Y outputs A17B1 or B17S2 respectively, look as follows, depending on the position of A3170-P2 or P4, respectively.



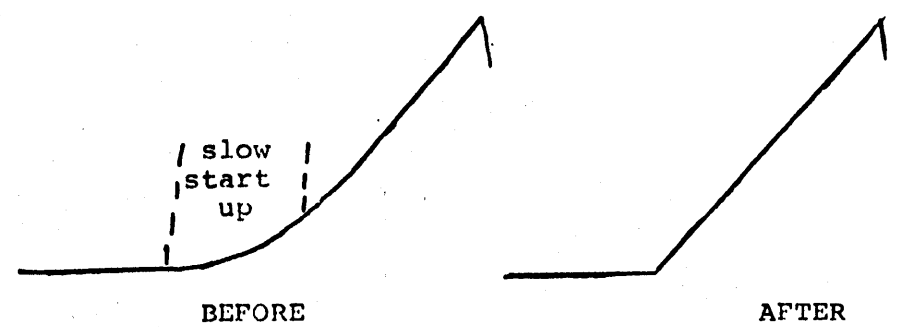
X or Y outputs (below OV setting vector delay out at the same time it lowers the amplitude of the 2T section of the vector).

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3. The reaction of this start up of the vector outputs will correct most CRT defficiencies.



8.6 Character Speed Verification vs Quality

- A. Place oscilloscope channel A to 1 volt per cm. on pin E31S1 (character Input H) and Sync. internal positive to Channel A. Set time base to .1 millisecond per centimeter.
- B. Select Test 16₍₈₎ of Little Pictures Test. Observe the time that Channel A remains high ($\sqrt{3}V$). It has to be less than 660 microseconds. This time is produced by a sentence structured in the test. It says, "The little brown fox jumped over the lazy dog."

The time for execution of each character averaged out is $660 \div 44$ characters = 12 microseconds.

- C. This time can be increased by two methods. Both involve eventually decreasing quality in the characters.
 1. By turning the pots A3170-P2 and P4 clockwise being careful for phase adjustment and non-true position start up of vectors. To avoid redundancy I refer you

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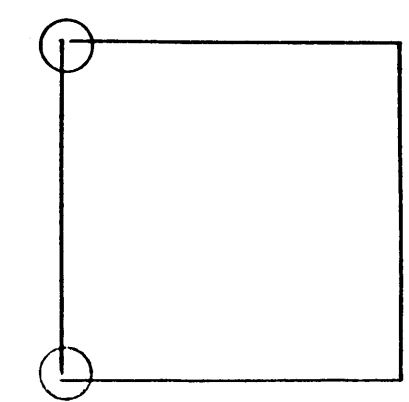
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- to paragraph 8.3 Section D.
2. By lowering the delay (Start Gen.L):
 - a) First select the Directory, Test $\emptyset_{(8)}$
 - b) Choose the line
 $\emptyset\emptyset1\emptyset = \text{OCTOGONS OR SQUARES}$
 - c) Turn the top potentiometer clockwise or counter-clockwise in slot A22 while observing the tops of the characters; scanning from character to character.

When the tops of these characters begin to look like they are waivering,back off with the pot until they are normal once again. This problem occurs due to the limitation of the position DAC's settling times.

8.7 Closer Observation of Vector Gain Versus Phase Errors

While observing lines of different vector lengths, for example in Test 13₍₈₎ or 3₍₈₎ with the push button PB1 on a one, you may observe errors such as below:



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These are possible errors of positive going vectors versus negative going vectors. These errors will deteriorate square looking larger boxes as well as the quality of the Large X in Test 2 (8) [Refer to section 8.3 E(a) which is effected by this error].

In order to help observe these errors more closely, two display files have been generated. They were generated in MACRO so as to allow one to generate a papertape from it, if so desired. The mnemonics for the file is as follows with the program following it.

703004	LSD=703004
703001	SDSF=703001
203020	PAR1=203020
215252	PAR2=215252
220004	PAR3=220004
144000	PX=144000
140000	PY=140000
400000	V0=400000
402000	V1=402000
404000	V2=404000
406000	V3=406000
410000	V4=410000
412000	V5=412000
414000	V6=414000
416000	V7=416000
600000	DJMP=600000
204000	DSTOP=204000
020000	INT=020000
750004	LAS=750004

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102000			.LOC 102000
102000	750004	START	LAS
102001	741100		SPA
102002	610210		JMP STR
102003	210272		LAC (ADD1)
102004	703004	DO	LSD
102005	703001		SDSF
102006	610205		JMP
102007	610200		JMP
102100	210273	STR	LAC (ADD0)
102111	610204		JMP DO
102112	203020	ADD0	PAR1
102113	215252		PAR2
102114	220004		PAR3
102115	144377		PX1377
102116	140777		PY1777
102117	421000		V011000!INT
102200	404010		V2110
102211	431000		V411000!INT
102222	144777		PX1777
102223	140377		PY1377
102224	425000		V211000!INT
102225	400010		V0110
102226	435000		V611000!INT
102227	144377		PX1377
102300	140377		PY1377
102311	421000		V011000!INT
102322	425000		V211000!INT
102333	431000		V411000!INT
102334	435000		V611000!INT
102335	204000		DSTOP
102336	203020	ADD1	PAR1
102337	215252		PAR2
102400	220004		PAR3
102411	144000		PX
102422	140000		PY
102433	423777		V111777!INT
102444	433777		V511777!INT
102455	145777		PX11777
102466	140000		PY
102477	427777		V311777!INT
102500	437777		V711777!INT
102511	144377		PX1377
102522	140357		PY1357
102533	423000		V111000!INT
102544	433000		V511000!INT
102555	145377		PX11377
102566	140357		PY1357
102577	427000		V311000!INT

SIZE	CODE	NUMBER	REV
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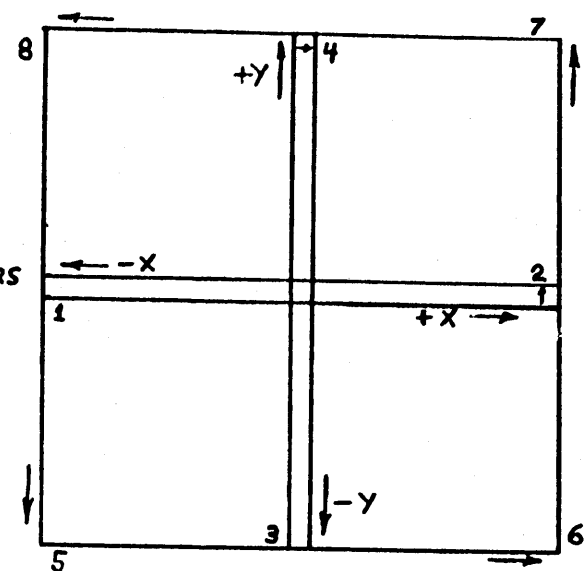
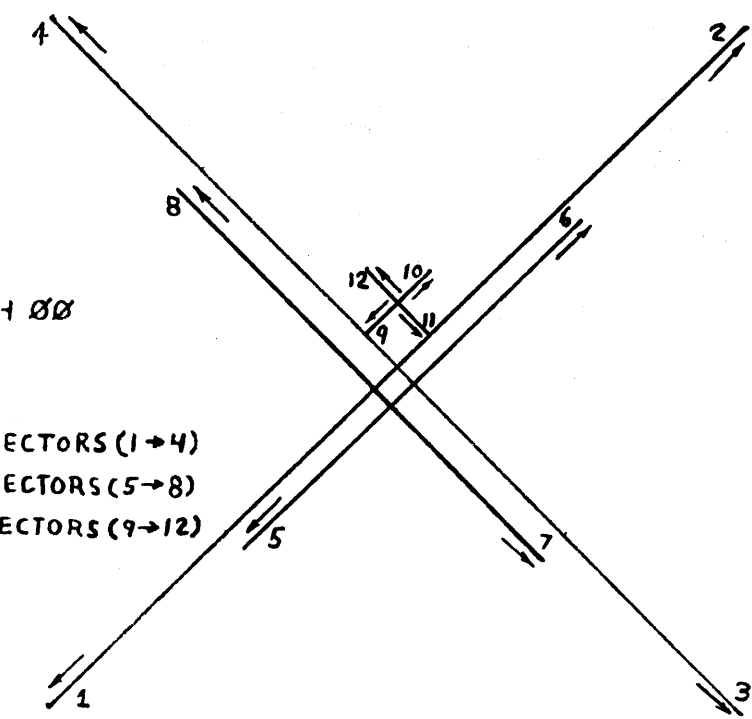
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10260 10261 10262 10263 10264 10265 10266 10267 10270 10271 10272 10273	437000 144730 141050 422100 432100 145050 141050 426100 436100 204000 000000 010236 010212	V711000!INT PX1730 PY11050 V11100!INT V51100!INT PX11050 PY11050 V31100!INT V71100!INT DSTOP .END *L *L	
SIZE A CODE SP		NUMBER VT15-0-51 REV	

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AC SWITCH 00 ON A ZERO 1000₈ UNIT VECTORS  Figure 8.7.1			
AC SWITCH 00 ON A ONE 1777₈ UNIT VECTORS (1→4) 1000₈ UNIT VECTORS (5→8) 100₈ UNIT VECTORS (9→12)  Figure 8.7.2			
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A. Figure 8.7.1 is on the screen when one starts the program at location 10200(8) with the AC switch 00 on a zero. This picture allows one to reference a perpendicular line against the end point of a 1000(8) unit vector. Caution must be observed that the starting positions of the opposite polarity lines are equal. The error you will find here is increased as the vector lengths are made longer and decreased as the vector lengths are made shorter. There are three possible problems that can produce this symptom. a. The A140 in that axis has unequal output waveform in positive to negative throughput. One easy way to check this is to switch the A140's axis. b. The A238 may be showing unequal gain entering the positive side compared to the negative side of the LM318 amplifier. In this case it is possible to retrim the amplifier by changing the value of the resistor R21 in the X axis and R16 in the Y axis. Instructions are if the negative vector is shorter than the positive vector decrease the R value by approximately 75 to 100K ohms. If the opposite vector errors occur than increase the R value by approximately 200K ohms.			
SIZE A		CODE SP	NUMBER VT15-0-51
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c. The CRT can exhibit nonlinearities as the vector is being drawn towards one end of the screen. A vector may start at true position because the CRT has been given time to catch up with the normal display file latencies. By moving the total picture with the position pots around the screen one can observe how the scope remains linear with position sensitivity. Increasing the Gain pots and moving the picture around will force the scope to work harder. Possibly showing up its inability to slew linearly. Observe though that the actual error will increase with the gains increased. Preamplifier and power amplifier stages have possibly been strained by some previous catastrophe. This test will show it up. Power transistor emitter balancing resistors could also have changed their values which would effect this type of problem. B. Figure 8.7.2 is on the screen when one starts the program at location 10200(8) with the AC switch 00 on a one. This picture allows one to accurately check if vectors drawn of different lengths in X pattern will show up any out of phase conditions. Possible errors can occur as follows:			
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a. Figure 8.7.2 has a gain error. The largest diagonal lines (3,4) will not match but cross each other towards the center. Lines (7,8) will show smaller errors. No error in lines in (11,12).

b. 100₍₈₎ unit vectors are out of phase, while others are in phase. Start up unlinearity in vectors, offsets the small vector phase accuracy making it look like a simple adjustment of phase pot necessary. If adjustment is made large vectors will be out of phase.

This is usually due to a bad preamplifier in the CRT. If not so the problem should be scoped out.

c. End points of vectors not meeting. This problem is mentioned in section 8.3.E(b) please refer to it for the case of the A140's.

This problem can also be in the CRT as mentioned in section 8.7.A(c). Please use those directions for this picture.

d. Lines waiver in and out of phase during their slew across the screen. This would mean that the vector being drawn is either exhibiting linearity limitations in the CRT, or an oscillation has been surperimposed on the waveform.

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CONTINUATION SHEET

TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE

If there is unlinearity limitations or superimposition it must be scoped out and the bad amplifier must be replaced. Superimposition can sometimes be due to queer effects of the AC ground terminator (figure 2.1) in the rear of the CRT. Bad ground shielding on the coax cables can also exhibit this problem.

SIZE	CODE	NUMBER	REV
A	SP	VT15-0-51	

ENGINEERING SPECIFICATION

original

CONTINUATION SHEET

TITLE VT15 SYSTEM ADJUSTMENT PROCEDURE

8.8 Observation For Arbitrary Vector Mode

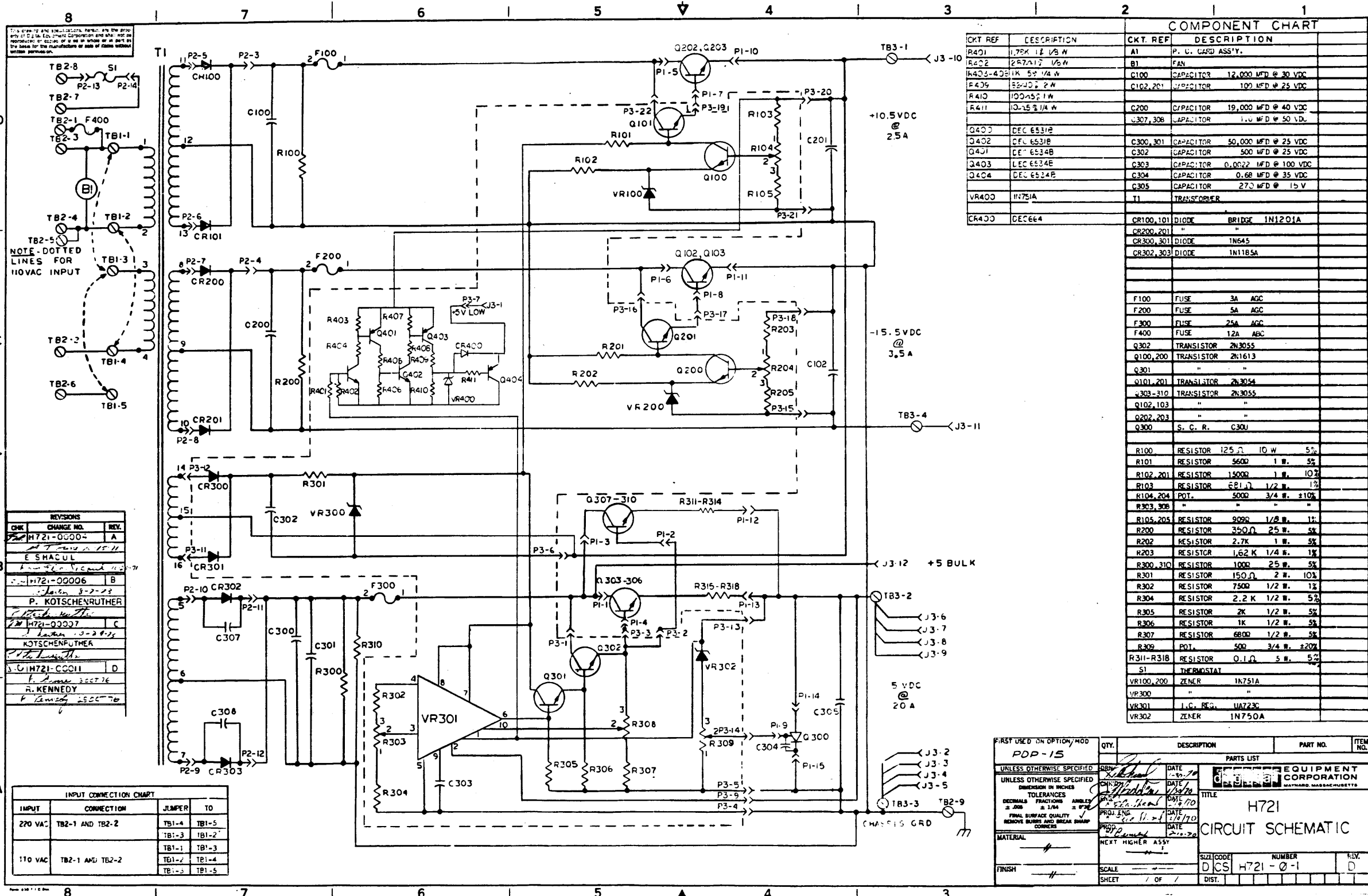
- A. Select Test 11 (8)
- B. Observe the 100 unit arbitrary box compared to basic box. The arbitrary vectored lines should not be any longer than 10 mils over or under the basic vectored lines. If this occurs as an error the compensation could be at fault in the A3180 module. It is also obviously erroring when the other arbitrary boxes vary in end point matching when all the respective basic boxes are correct.

SIZE
A

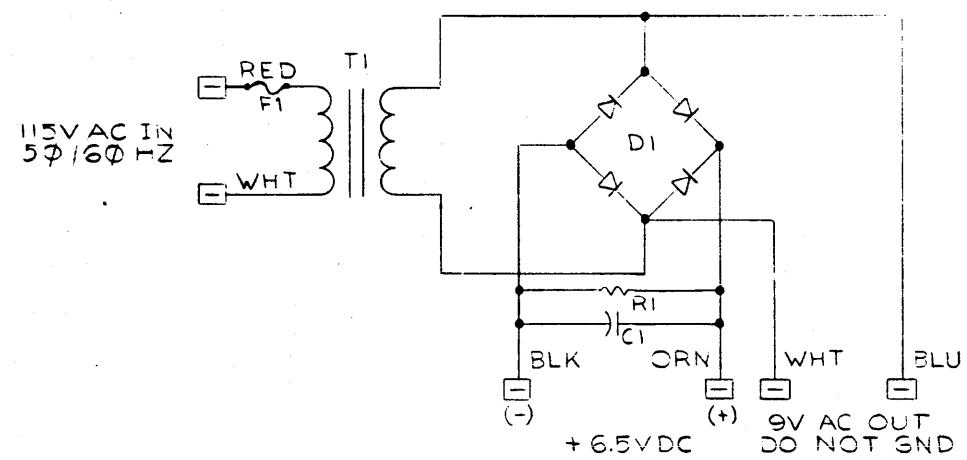
CODE
SF

NUMBER
VT15-0-51

REV



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F1	1/2 AMP S.E. FUSE	9007209
R1	5ohm 25W RES	1300165
C1	18000MFD 10V DC CAP	1009437
	PARTS LIST	D-UA-716-0-0
T1	XMFR*F64-U TRIAD	1609558
D1	DIODE PACK DM-2	1105397
REF DESIGNATION	DESCRIPTION	PART NO

PARTS LIST

REVISIONS		
CHG	NO	REV
1	00001	A
2	00002	B
3	00003	C
4	00004	D
5	00005	E
6	00006	F
7	00007	G
8	00008	H
9	00009	I
10	00010	J
11	00011	K
12	00012	L
13	00013	M
14	00014	N
15	00015	O
16	00016	P
17	00017	Q
18	00018	R
19	00019	S
20	00020	T
21	00021	U
22	00022	V
23	00023	W
24	00024	X
25	00025	Y
26	00026	Z
27	00027	AA
28	00028	AB
29	00029	AC
30	00030	AD
31	00031	AE
32	00032	AF
33	00033	AG
34	00034	AH
35	00035	AI
36	00036	AJ
37	00037	AK
38	00038	AL
39	00039	AM
40	00040	AN
41	00041	AO
42	00042	AP
43	00043	AQ
44	00044	AR
45	00045	AS
46	00046	AT
47	00047	AU
48	00048	AV
49	00049	AW
50	00050	AX
51	00051	AY
52	00052	AZ
53	00053	BA
54	00054	BB
55	00055	BC
56	00056	BD
57	00057	BE
58	00058	BF
59	00059	BG
60	00060	BH
61	00061	BI
62	00062	BJ
63	00063	BK
64	00064	BL
65	00065	BM
66	00066	BN
67	00067	BO
68	00068	BP
69	00069	BQ
70	00070	BR
71	00071	BS
72	00072	BT
73	00073	BU
74	00074	BV
75	00075	BW
76	00076	BX
77	00077	BY
78	00078	BZ
79	00079	CA
80	00080	CB
81	00081	CC
82	00082	CD
83	00083	CE
84	00084	CF
85	00085	CG
86	00086	CH
87	00087	CI
88	00088	CJ
89	00089	CK
90	00090	CL
91	00091	CM
92	00092	CN
93	00093	CO
94	00094	CP
95	00095	CQ
96	00096	CR
97	00097	CS
98	00098	CT
99	00099	CU
100	00100	CV
101	00101	CW
102	00102	CX
103	00103	CY
104	00104	CZ
105	00105	DA
106	00106	DB
107	00107	DC
108	00108	DD
109	00109	DE
110	00110	DF
111	00111	DG
112	00112	DH
113	00113	DI
114	00114	DJ
115	00115	DK
116	00116	DL
117	00117	DM
118	00118	DN
119	00119	DO
120	00120	DP
121	00121	DQ
122	00122	DR
123	00123	DS
124	00124	DT
125	00125	DU
126	00126	DV
127	00127	DW
128	00128	DX
129	00129	DY
130	00130	DZ
131	00131	EA
132	00132	EB
133	00133	EC
134	00134	ED
135	00135	EE
136	00136	EF
137	00137	EG
138	00138	EH
139	00139	EI
140	00140	EJ
141	00141	EK
142	00142	EL
143	00143	EM
144	00144	EN
145	00145	EO
146	00146	EP
147	00147	EQ
148	00148	ER
149	00149	ES
150	00150	ET
151	00151	EU
152	00152	EV
153	00153	EW
154	00154	EX
155	00155	EY
156	00156	EZ
157	00157	FA
158	00158	FB
159	00159	FC
160	00160	FD
161	00161	FE
162	00162	FF
163	00163	FG
164	00164	FH
165	00165	FI
166	00166	FJ
167	00167	FK
168	00168	FL
169	00169	FM
170	00170	FN
171	00171	FO
172	00172	FP
173	00173	FQ
174	00174	FR
175	00175	FS
176	00176	FT
177	00177	FU
178	00178	FV
179	00179	FW
180	00180	FX
181	00181	FY
182	00182	FZ
183	00183	GA
184	00184	GB
185	00185	GC
186	00186	GD
187	00187	GE
188	00188	GF
189	00189	GG
190	00190	GH
191	00191	GI
192	00192	GJ
193	00193	GK
194	00194	GL
195	00195	GM
196	00196	GN
197	00197	GO
198	00198	GP
199	00199	GQ
200	00200	GR
201	00201	GS
202	00202	GT
203	00203	GU
204	00204	GV
205	00205	GW
206	00206	GX
207	00207	GY
208	00208	GZ
209	00209	HA
210	00210	HB
211	00211	HC
212	00212	HD
213	00213	HE
214	00214	HF
215	00215	HG
216	00216	HH
217	00217	HI
218	00218	HJ
219	00219	HK
220	00220	HL
221	00221	HM
222	00222	HN
223	00223	HO
224	00224	HP
225	00225	HQ
226	00226	HR
227	00227	HS
228	00228	HT
229	00229	HU
230	00230	HV
231	00231	HW
232	00232	HX
233	00233	HY
234	00234	HZ
235	00235	IA
236	00236	IB
237	00237	IC
238	00238	ID
239	00239	IE
240	00240	IF
241	00241	IG
242	00242	IH
243	00243	II
244	00244	IJ
245	00245	IK
246	00246	IL
247	00247	IM
248	00248	IN
249	00249	IO
250	00250	IP
251	00251	IQ
252	00252	IR
253	00253	IS
254	00254	IT
255	00255	IU
256	00256	IV
257	00257	IW
258	00258	IX
259	00259	IY
260	00260	IZ
261	00261	JA
262	00262	JB
263	00263	JC
264	00264	JD
265	00265	JE
266	00266	JF
267	00267	JG
268	00268	JH
269	00269	JI
270	00270	IJ
271	00271	JK
272	00272	IL
273	00273	IM
274	00274	IN
275	00275	IO
276	00276	IP
277	00277	IQ
278	00278	IR
279	00279	IS
280	00280	IT
281	00281	IU
282	00282	IV
283	00283	IW
284	00284	IX
285	00285	IY
286	00286	IZ
287	00287	KA
288	00288	KB
289	00289	KC
290	00290	KD
291	00291	KE
292	00292	KF
293	00293	KG
294	00294	KH
295	00295	KI
296	00296	KJ
297	00297	KK
298	00298	KL
299	00299	KM
300	00300	KN
301	00301	KO
302	00302	KP
303	00303	KQ
304	00304	KR
305	00305	KS
306	00306	KT
307	00307	KU
308	00308	KV
309	00309	KW
310	00310	KX
311	00311	KY
312	00312	KZ
313	00313	LA
314	00314	LB
315	00315	LC
316	00316	LD
317	00317	LE
318	00318	LF
319	00319	LG
320	00320	LH
321	00321	LI
322	00322	LJ
323	00323	LK
324	00324	LL
325	00325	LM
326	00326	LN
327	00327	LO
328	00328	LP
329	00329	LQ
330	00330	LR
331	00331	LS
332	00332	LT
333	00333	LU
334	00334	LV
335	00335	LW
336	00336	LX
337	00337	LY
338	00338	LZ
339	00339	MA
340	00340	MB
341	00341	MC
342	00342	MD
343	00343	ME
344	00344	MF
345	00345	MG
346	00346	MH
347	00347	MI
348	00348	MJ
349	00349	MK
350	00350	ML
351	00351	MM
352	00352	MN
353	00353	MO
354	00354	MP
355	00355	MQ
356	00356	MR
357	00357	MS
358	00358	MT
359	00359	MU
360	00360	MV
361	00361	MW
362	00362	MX
363	00363	MY
364	00364	MZ
365	00365	NA
366	00366	NB
367	00367	NC
368	00368	ND
369	00369	NE
370	00370	NF
371	00371	NG
372	00372	NH
373	00373	NI
374	00374	NJ
375	00375	NK
376	00376	NL
377	00377	NM
378	00378	NN
379	00379	NO
380	00380	NP
381	00381	NQ
382	00382	NR
383	00383	NS
384	00384	NT
385	00385	NU
386	00386	NV
387	00387	NW
388	00388	NX
389	00389	NY
390	00390	NZ
391	00391	OA
392	00392	OB
393	00393	OC
394	00394	OD
395	00395	OE
396	00396	OF
397	00397	OG
398	00398	OH
399	00399	OI
400	00400	OJ
401	00401	OK
402	00402	OL
403	00403	OM
404	00404	ON
405	00405	OO
406	00406	OP
407	00407	OQ
408	00408	OR
409	00409	OS
410	00410	OT
411	00411	OU
412	00412	OV
413	00413	OW
414	00414	OX
415	00415	OY
416	00416	OZ
417	00417	PA
418	00418	PB
419	00419	PC
420	00420	PD
421	00421	PE
422	00422	PF
423	00423	PG
424	00424	PH
425	00425	PI
426	00426	PJ
427	00427	PK
428	00428	PL
429	00429	PM
430	00430	PN
431	00431	PO
432	00432	PP
433	00433	PQ
434	00434	PR
435	00435	PS
436	00436	PT
437	00437	PU
438	00438	PV
439	00439	PW
440	00440	PX
441	00441	PY
442	00442	PZ
443	00443	QA
444	00444	QB
445	00445	QC
446	0044	



UNLESS OTHERWISE INDICATED:
TRANSISTORS ARE 2N4339
DIODES ARE 1N4001
CAPACITORS ARE 100P, 100V, 5%
RESISTORS ARE 1/4W, 5%

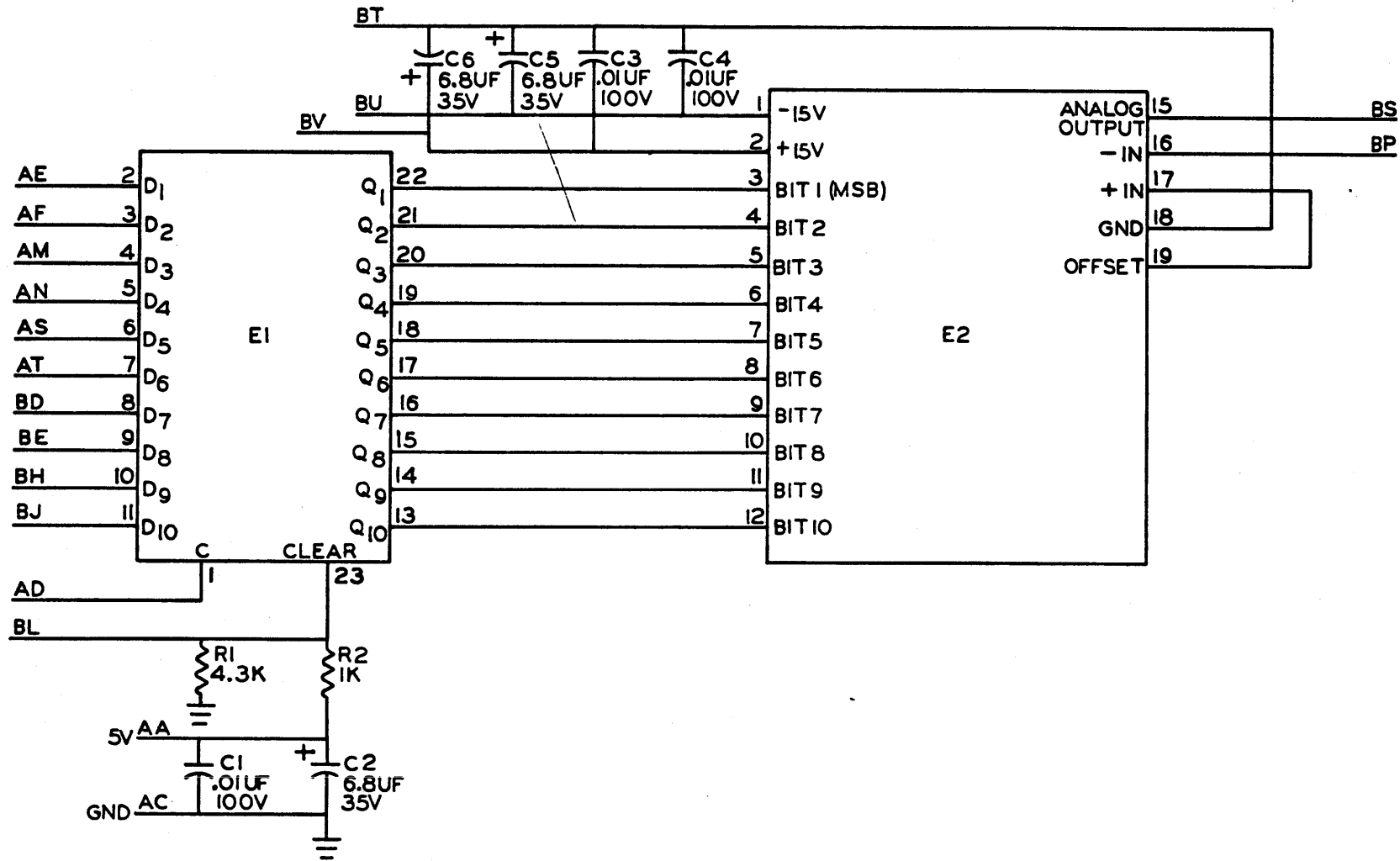
PIN 17 ON EACH IC = AG GND
 Q18 THRU Q20 ARE SELECTED DEC 300900 RD
 R33 IS 1/2W, 1%, 25PPM/°C
 R34 IS 1/2W, 1%, 25PPM/°C
 R35 IS 1/2W, 1%, 25PPM/°C
 R36 IS 1/2W, 1%, 25PPM/°C
 R37 IS 1/2W, 1%, 25PPM/°C
 R38 IS 1/2W, 1%, 25PPM/°C
 R39, R40, R41 & R43 ARE 1/8W, 1%, 25PPM/°C
 R42, R44, R45 & R54 ARE 1/8W, 1%, 25PPM/°C
 R46, R47, R48, R50 & R54 ARE 1/8W, 1%, 25PPM/°C
 R49, R50 & R54 ARE 1/8W, 1%, 25PPM/°C
 R51, R52 & R53 ARE 1/8W, 1%, 25PPM/°C
 R54, R55 & R56 ARE 1/8W, 1%, 25PPM/°C
 R57, R58 & R59 ARE 1/8W, 1%, 25PPM/°C
 R60, R61 & R62 ARE 1/8W, 1%, 25PPM/°C
 R63, R64 & R65 ARE 1/8W, 1%, 25PPM/°C
 R66, R67 & R68 ARE 1/8W, 1%, 25PPM/°C
 R69, R70 & R71 ARE 1/8W, 1%, 25PPM/°C
 R72, R73 & R74 ARE 1/8W, 1%, 25PPM/°C
 R75, R76 & R77 ARE 1/8W, 1%, 25PPM/°C
 R78, R79 & R80 ARE 1/8W, 1%, 25PPM/°C
 R81, R82 & R83 ARE 1/8W, 1%, 25PPM/°C
 R84, R85 & R86 ARE 1/8W, 1%, 25PPM/°C
 R87, R88 & R89 ARE 1/8W, 1%, 25PPM/°C
 R90, R91 & R92 ARE 1/8W, 1%, 25PPM/°C
 R93, R94 & R95 ARE 1/8W, 1%, 25PPM/°C
 R96, R97 & R98 ARE 1/8W, 1%, 25PPM/°C
 R99, R100 & R101 ARE 1/8W, 1%, 25PPM/°C
 R102, R103 & R104 ARE 1/8W, 1%, 25PPM/°C
 R105, R106 & R107 ARE 1/8W, 1%, 25PPM/°C
 R108, R109 & R110 ARE 1/8W, 1%, 25PPM/°C
 R111, R112 & R113 ARE 1/8W, 1%, 25PPM/°C
 R114, R115 & R116 ARE 1/8W, 1%, 25PPM/°C
 R117, R118 & R119 ARE 1/8W, 1%, 25PPM/°C
 R120, R121 & R122 ARE 1/8W, 1%, 25PPM/°C
 R123, R124 & R125 ARE 1/8W, 1%, 25PPM/°C
 R126, R127 & R128 ARE 1/8W, 1%, 25PPM/°C
 R129, R130 & R131 ARE 1/8W, 1%, 25PPM/°C
 R132, R133 & R134 ARE 1/8W, 1%, 25PPM/°C
 R135, R136 & R137 ARE 1/8W, 1%, 25PPM/°C
 R138, R139 & R140 ARE 1/8W, 1%, 25PPM/°C
 R141, R142 & R143 ARE 1/8W, 1%, 25PPM/°C
 R144, R145 & R146 ARE 1/8W, 1%, 25PPM/°C
 R147, R148 & R149 ARE 1/8W, 1%, 25PPM/°C
 R150, R151 & R152 ARE 1/8W, 1%, 25PPM/°C
 R153, R154 & R155 ARE 1/8W, 1%, 25PPM/°C
 R156, R157 & R158 ARE 1/8W, 1%, 25PPM/°C
 R159, R160 & R161 ARE 1/8W, 1%, 25PPM/°C
 R162, R163 & R164 ARE 1/8W, 1%, 25PPM/°C
 R165, R166 & R167 ARE 1/8W, 1%, 25PPM/°C
 R168, R169 & R170 ARE 1/8W, 1%, 25PPM/°C
 R171, R172 & R173 ARE 1/8W, 1%, 25PPM/°C
 R174, R175 & R176 ARE 1/8W, 1%, 25PPM/°C
 R177, R178 & R179 ARE 1/8W, 1%, 25PPM/°C
 R180, R181 & R182 ARE 1/8W, 1%, 25PPM/°C
 R183, R184 & R185 ARE 1/8W, 1%, 25PPM/°C
 R186, R187 & R188 ARE 1/8W, 1%, 25PPM/°C
 R189, R190 & R191 ARE 1/8W, 1%, 25PPM/°C
 R192, R193 & R194 ARE 1/8W, 1%, 25PPM/°C
 R195, R196 & R197 ARE 1/8W, 1%, 25PPM/°C
 R198, R199 & R200 ARE 1/8W, 1%, 25PPM/°C
 R201, R202 & R203 ARE 1/8W, 1%, 25PPM/°C
 R204, R205 & R206 ARE 1/8W, 1%, 25PPM/°C
 R207, R208 & R209 ARE 1/8W, 1%, 25PPM/°C
 R210, R211 & R212 ARE 1/8W, 1%, 25PPM/°C
 R213, R214 & R215 ARE 1/8W, 1%, 25PPM/°C
 R216, R217 & R218 ARE 1/8W, 1%, 25PPM/°C
 R219, R220 & R221 ARE 1/8W, 1%, 25PPM/°C
 R222, R223 & R224 ARE 1/8W, 1%, 25PPM/°C
 R225, R226 & R227 ARE 1/8W, 1%, 25PPM/°C
 R228, R229 & R230 ARE 1/8W, 1%, 25PPM/°C
 R231, R232 & R233 ARE 1/8W, 1%, 25PPM/°C
 R234, R235 & R236 ARE 1/8W, 1%, 25PPM/°C
 R237, R238 & R239 ARE 1/8W, 1%, 25PPM/°C
 R240, R241 & R242 ARE 1/8W, 1%, 25PPM/°C
 R243, R244 & R245 ARE 1/8W, 1%, 25PPM/°C
 R246, R247 & R248 ARE 1/8W, 1%, 25PPM/°C
 R249, R250 & R251 ARE 1/8W, 1%, 25PPM/°C
 R252, R253 & R254 ARE 1/8W, 1%, 25PPM/°C
 R255, R256 & R257 ARE 1/8W, 1%, 25PPM/°C
 R258, R259 & R260 ARE 1/8W, 1%, 25PPM/°C
 R261, R262 & R263 ARE 1/8W, 1%, 25PPM/°C
 R264, R265 & R266 ARE 1/8W, 1%, 25PPM/°C
 R267, R268 & R269 ARE 1/8W, 1%, 25PPM/°C
 R270, R271 & R272 ARE 1/8W, 1%, 25PPM/°C
 R273, R274 & R275 ARE 1/8W, 1%, 25PPM/°C
 R276, R277 & R278 ARE 1/8W, 1%, 25PPM/°C
 R279, R280 & R281 ARE 1/8W, 1%, 25PPM/°C
 R282, R283 & R284 ARE 1/8W, 1%, 25PPM/°C
 R285, R286 & R287 ARE 1/8W, 1%, 25PPM/°C
 R288, R289 & R290 ARE 1/8W, 1%, 25PPM/°C
 R291, R292 & R293 ARE 1/8W, 1%, 25PPM/°C
 R294, R295 & R296 ARE 1/8W, 1%, 25PPM/°C
 R297, R298 & R299 ARE 1/8W, 1%, 25PPM/°C
 R300, R301 & R302 ARE 1/8W, 1%, 25PPM/°C
 R303, R304 & R305 ARE 1/8W, 1%, 25PPM/°C
 R306, R307 & R308 ARE 1/8W, 1%, 25PPM/°C
 R309, R310 & R311 ARE 1/8W, 1%, 25PPM/°C
 R312, R313 & R314 ARE 1/8W, 1%, 25PPM/°C
 R315, R316 & R317 ARE 1/8W, 1%, 25PPM/°C
 R318, R319 & R320 ARE 1/8W, 1%, 25PPM/°C
 R321, R322 & R323 ARE 1/8W, 1%, 25PPM/°C
 R324, R325 & R326 ARE 1/8W, 1%, 25PPM/°C
 R327, R328 & R329 ARE 1/8W, 1%, 25PPM/°C
 R330, R331 & R332 ARE 1/8W, 1%, 25PPM/°C
 R333, R334 & R335 ARE 1/8W, 1%, 25PPM/°C
 R336, R337 & R338 ARE 1/8W, 1%, 25PPM/°C
 R339, R340 & R341 ARE 1/8W, 1%, 25PPM/°C
 R342, R343 & R344 ARE 1/8W, 1%, 25PPM/°C
 R345, R346 & R347 ARE 1/8W, 1%, 25PPM/°C
 R348, R349 & R350 ARE 1/8W, 1%, 25PPM/°C

PARTS LIST IS A-PL-AB-8-1A-D
WROB IS INSERTED IN ASSEMBLY, BUT MAY BE REPLACED BY A
DIFFERENT CHINC VALUE FOR FINE THINNING PURPOSES AT THE
DISCRETION OF THE MODULE TEST DEPARTMENT ONLY. POWER AND
ACCURACY TOLERANCES WILL REMAIN THE SAME.

TITLE		DIGITAL TO ANALOG CONVERTER A618-YA			
SIZE	CODE	NUMBER			REV
D	CS	A618-YA-1			6
PRINTED CIRCUIT REV.		E			

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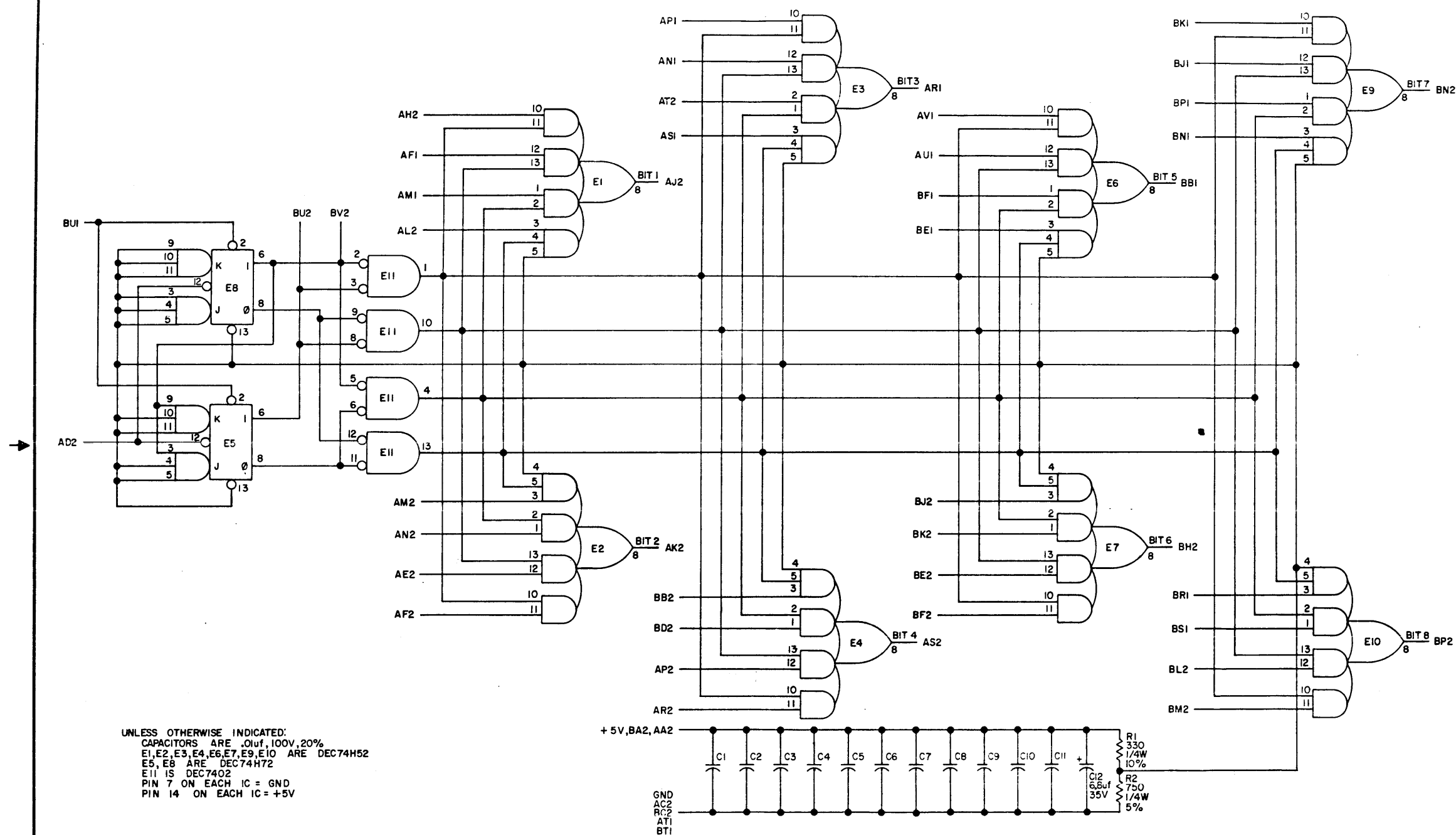
REV 5
NUMBER A622-0-1
SIZE B
CODE CS



UNLESS OTHERWISE INDICATED:
CAPACITORS ARE 20%
RESISTORS ARE 1/4W,5%
PIN 12 = GND ON E1
PIN 24 = +5V
E1=DEC 8202
E2=(DAC-HB-10B-5) CONVERTER

REVISIONS				DRN. <i>John J. Donnell</i> DATE <i>4/8/71</i>		TRANSISTOR & DIODE CONVERSION CHART				TITLE 10 BIT SINGLE BUFFERED DAC 0 TO 5V			
CHK	CHG	NO	REV.	CHK'D	DATE	DEC	EIA	DEC	EIA	SIZE	CODE	NUMBER	RIV
				<i>R. Walden</i>	<i>4/12/71</i>					B	CS	A 622-0-1	C
ENG. <i>F. DOLL</i> DATE <i>6-23-71</i>						EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS				PRINTED CIRCUIT REV. <i>C</i>			
PROD. DATE													

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CIRCUITS ARE PROPRIETARY IN NATURE AND SHOULD BE TREATED ACCORDINGLY.
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REVISIONS
CHK CHG NO. EV

DEC FORM NO.
DRC 102

M761-O-1

DATE 2-26-70
ALLAN RITCEY
DATE 3/24/70
DATE 3/24/70

TRANSITION & CODE CONVERSION CHART

FROM	TO	FROM	TO

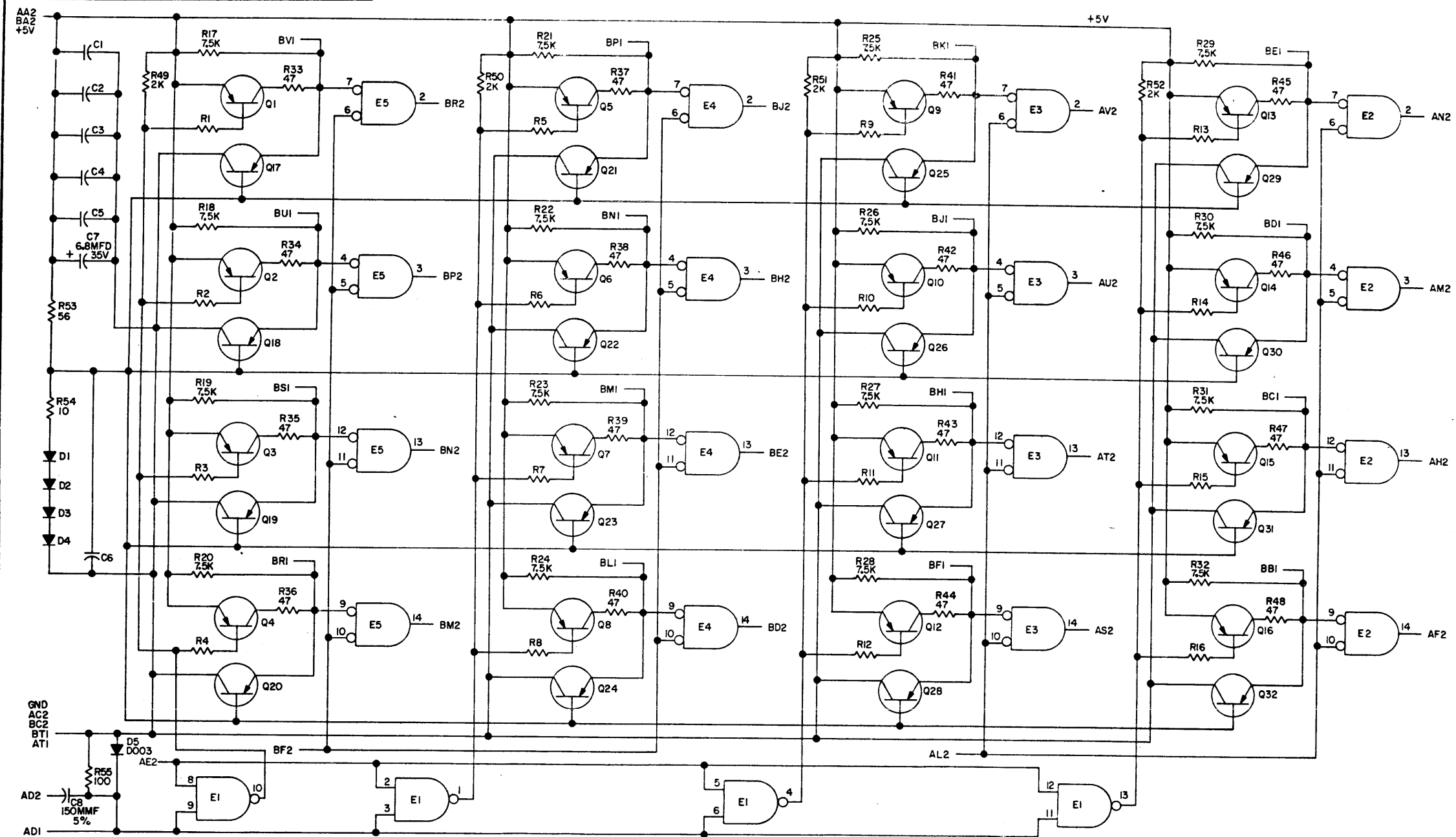
EQUIPMENT
CORPORATION
NATURAL MASSACHUSETTS

32- TO-8 BIT
MULTIPLEXER M761

SIZE CODE NUMBER
C CS M761-O-1

PRINTED CIRCUIT REV A

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UNLESS OTHERWISE INDICATED:
 RESISTORS ARE 15K, 1/4W, 5%
 CAPACITORS ARE 0.1MFD, 100V, 20%
 DIODES ARE D662
 TRANSISTORS ARE 2N3639B
 E2, E3, E4, E5 ARE DEC380
 PIN 1 ON E2-E5 = GND
 PIN 8 ON E2-E5 = +5V
 E1 IS DEC7401
 PIN 7 ON E1 = GND
 PIN 14 ON E1 = +5V

REV	NO	CHG	DATE
1	1		

DATE	BY	CHKD	DATE
11-15-69	J. J. J.	J. J. J.	11-15-69

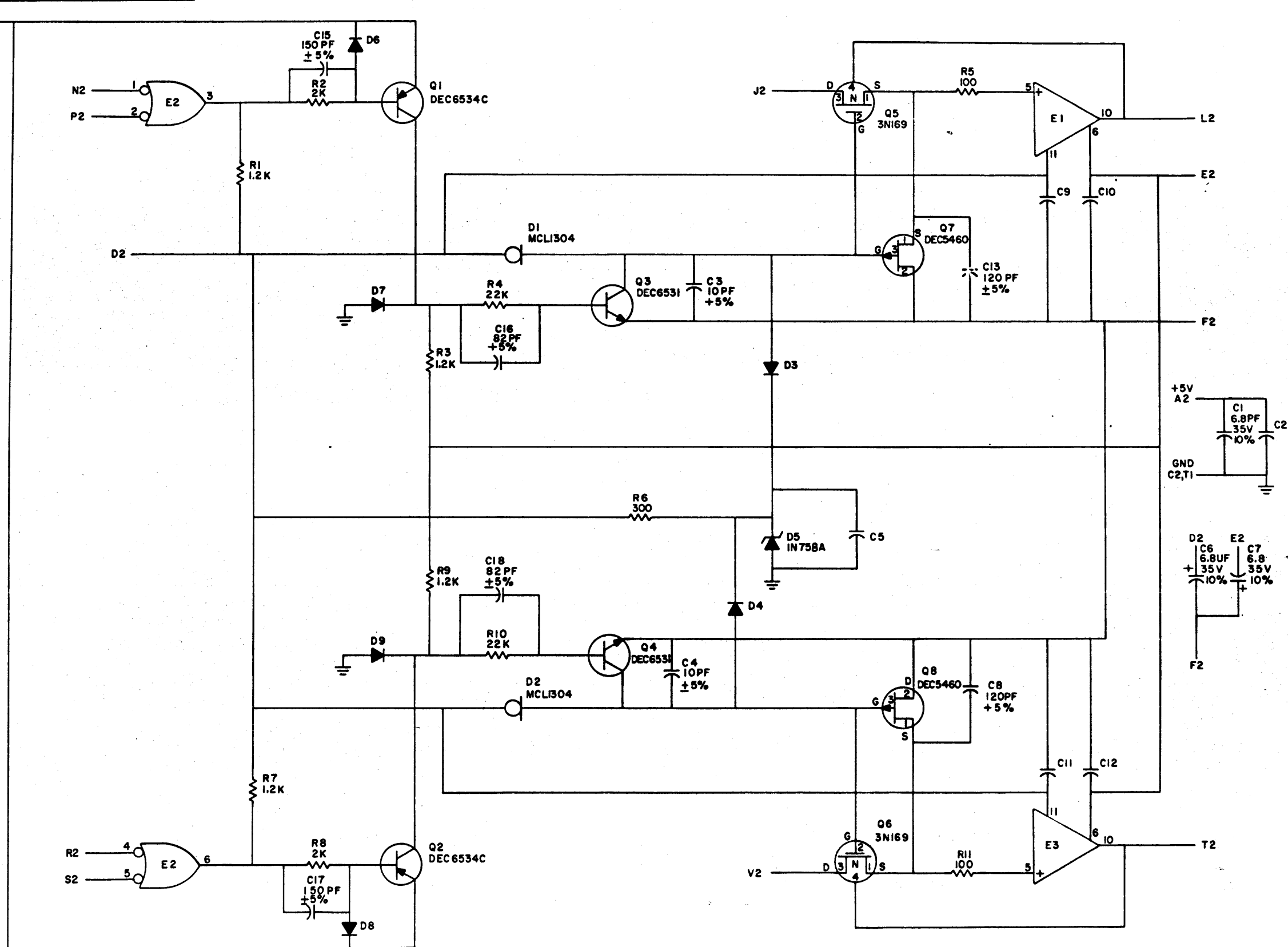
TRANSDUCER & DIODE CONVERSION CHART			
DIODE	DIODE	DIODE	DIODE
D662	1N45		
2N3639B	2N3639		
DEC380	1N45		



TITLE ROM DIODE MATRIX RECEIVERS M762			
SIZE	CODE	NUMBER	REV
C	CS	M762-0-1	
PRINTED CIRCUIT REV			A

DEC FORM NO. DRC 102

UNLESS OTHERWISE INDICATED:
RESISTORS ARE 1/4W, 5%
CAPACITORS ARE .01UF, 100V, 20%
DIODES ARE D664
E1 AND E3 ARE DEC310
E2 IS DEC7426
PIN 7= GND
PIN 14= +5V ON E2 ONLY



REVISIONS			
CHK	CHG NO.	REV	
	00001	A	
REV	00002	B	
	00003	C	
H. LAVOIE			

DRN N. MOORE	DATE 4-22-70
CHK'D D. SMITH	DATE 4-22-70
ENG <i>H. Lavoie</i>	DATE <i>4-23-71</i>
PROD R SILVERMAN	DATE 7-20-70

DEC	EIA	DEC	EIA
D664	IN3606	DEC6534C	NONE
IN756A		DEC6531	
MCL1304		2N5460	
		3N169	

digital
EQUIPMENT
CORPORATION
MAYNARD, MASSACHUSETTS

TITLE									
DUAL ANALOG SWITCH A140									
SIZE	CODE	NUMBER						REV	
C	CS	A140-0-1						C	
PRINTED CIRCUIT REV					C				

THIS IS PRINT SET

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[illegible]

DRB 106

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DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

ENGINEERING SPECIFICATION

DATE 5/25/71

TITLE VV15 ARBITRARY VECTOR OPTION TO VT15

REVISIONS

REV	DESCRIPTION	CHG NO	ORIG	DATE	APPD BY	DATE
	ORIGINATED		L. Halio	9/30/71	LD	10-5-71
A	ECO CHANGE	VV15-00001	ADELMAN	12/73	HAR	1/15/74
B	ECO CHANGE	VV15-00002	CREASER	8/74	T D.	10/1/74

/jan

ENG	Len Halio	APPD	SIZE	CODE	NUMBER	REV
			A	SP	VV15-0-1	B

DEC FORM NO.
DRA 107A

SHEET 1 OF 12

TITLE VV15 ARBITRARY VECTOR OPTION TO VT15

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DEC FORM NO
DRA 108A

SHEET 2 OF 12

TITLE VV15 ARBITRARY VECTOR OPTION TO VT15

1.0 GENERAL

The need for this option arises out of the inability of the basic system to draw vectors in more than the normal eight directions in hardware. Previously, if a "non-basic" vector was desired, a software algorithm was required to simulate that vector by a series of basic vector commands. This tends to be very inefficient from a core usage and time of execution standpoint. For example, a 22.5° vector would take 512 basic vector instructions whereas by using the VV15 option only two are required. Addition of the VV15 option however, does slow down execution of basic vectors and characters due to the longer overhead of the option.

The Graphic 15 with the arbitrary vector option (VV15) installed are shown below:

Character*	15us AVE
Long Vector†	
17g Units	14us MAX
20g	18us MAX
100g	19us MAX
400g	26us MAX
1777g	50us MAX
*Execution time of "The quick brown fox jumps over the lazy dog," in Character Input Mode/44 characters.	
† Execution time of 10 vectors including I/O Latency with the I/O loading delay (C16T2) adjusted to .3us, divided by 10.	

Further, since the arbitrary vector data requires two PDP-15 words, the vector execution requires two fetches from the PDP-15 memory and therefore extends the time of execution. In essence, this means the double buffering action of the VT15 on basic vectors is not available on arbitrary vectors.

2.0 THEORY OF OPERATION

The VV15 option consists of two modules. The first, the M7010, is concerned with routing the data from the DB (data buffer) and IB (input buffer) through to the proper registers, in the proper sequence, depending on the instruction (long or short arbitrary vector). The second, the A317, is analog in nature and takes its inputs from the M7010 and the existing basic vector generator, and modifies the slope of the output ramp to reflect the given vector command. A general theory of operation of each board and a overall system view will follow.

SIZE A	CODE VV15	NUMBER -0-1	REV B
-----------	--------------	----------------	----------

TITLE VV15 ARBITRARY VECTOR OPTION TO VT15

3.0 M7010

The M7010 consists of the following logical groups. An input data multiplexer, two - 10 bit registers, a timing chain, magnitude comparator, and gated output circuits (see Figure 1).

The 8263 input multiplexers are connected to the input buffer, data buffer, and the outputs of the ΔX and ΔY holding registers (8202) mounted on the M7010. The function of the multiplexer is to take the data from the IB and DB and gate it into the X and Y register. The data is unpacked in format according to the actual instruction being executed. For example, if the instruction is a long arbitrary vector (two - 18 bit words) then the DB register is gated through to the ΔX and the IB gated to the ΔY holding registers. Should the instruction be a short arbitrary vector, then the proper bits of the DB are routed into the X and Y registers. Upon a "go pulse" from the main VT timing the registers are loaded and the 8263's are set up for the shift left operation. In order to draw at an approximately constant rate on the screen, the vectors must be scaled up proportionately. The most significant bit of the X and Y registers is examined for a logical one. When this bit is found shifting stops, and a "START GEN" is given causing the start of the actual drawing process. The last state of the 8263 multiplexer is that of "all ones", where each output is a logical one. This occurs whenever an instruction 10 or 30 is not being processed.

The 8202 ten bit registers hold the X and Y Slope information and are directly connected to the Multiplying Digital-to-Analog Converters (MDAC) located on the A317 module.

Before shifting, the SN7485 magnitude comparators sense the larger value of the two values of ΔX and ΔY slopes and sets a FET switch located on the A317 as well as gate the larger value into the DR Register at the proper time.

The timing consists of a 250 NS delay line where a pulse is put in one end. Timing sequencing occurs as the pulse travels down the line, and is reshaped and recycled if a logical one is not sensed in the MSB position of either the X or Y 8202 register.

The output gating circuitry connects the X Register, the Y Register, and the larger of the two, to the DR Register at the appropriate times.

SIZE A	CODE SP	NUMBER VV15-0-1	REV B
-----------	------------	--------------------	----------

TITLE VV15 ARBITRARY VECTOR OPTION TO VT15

BLOCK DIAGRAM OF M7010

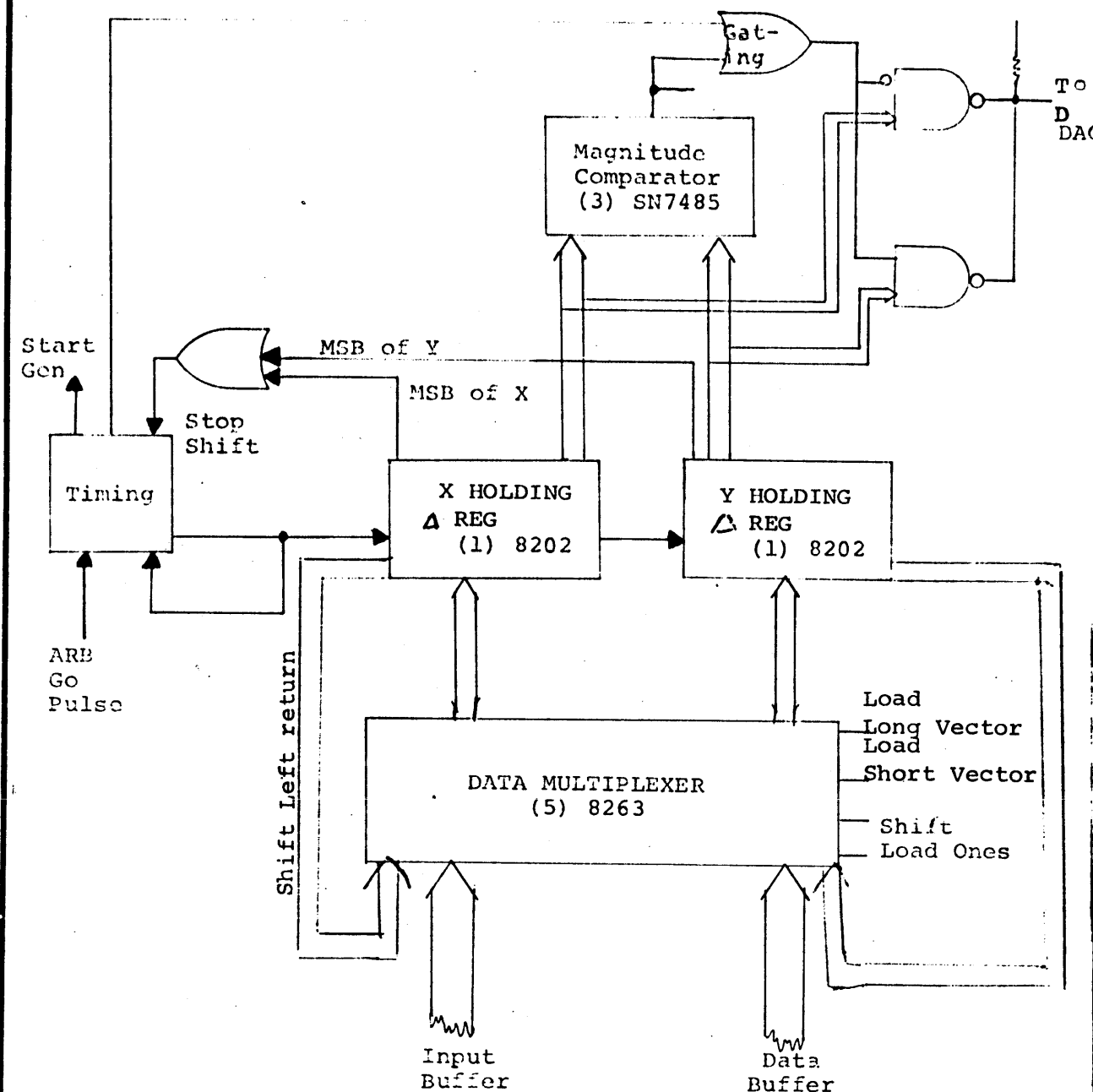


FIGURE 1

SIZE A	CODE SP	NUMBER VV15-0-1	REV B
-----------	------------	--------------------	----------

TITLE VV15 ARBITRARY VECTOR OPTION TO VT15

4.0 A3170

The A3170 consists of distinct sections:

1. Two multiplying digital-to-analog converters (MDACS), and associated amplifiers.
2. Magnitude controlled feedback switches.

Each of the two MDACS receive 10 bits of digital slope information from the M7010 module. The basic ramp is brought into the A3170 and buffered by two DEC 310 voltage followers (see Figure 2). The output of the followers drive the reference input of the MDACS. In addition, an offset adjustment is provided at the MDAC reference input to bias up the MDAC input for phase relationship between X and Y.

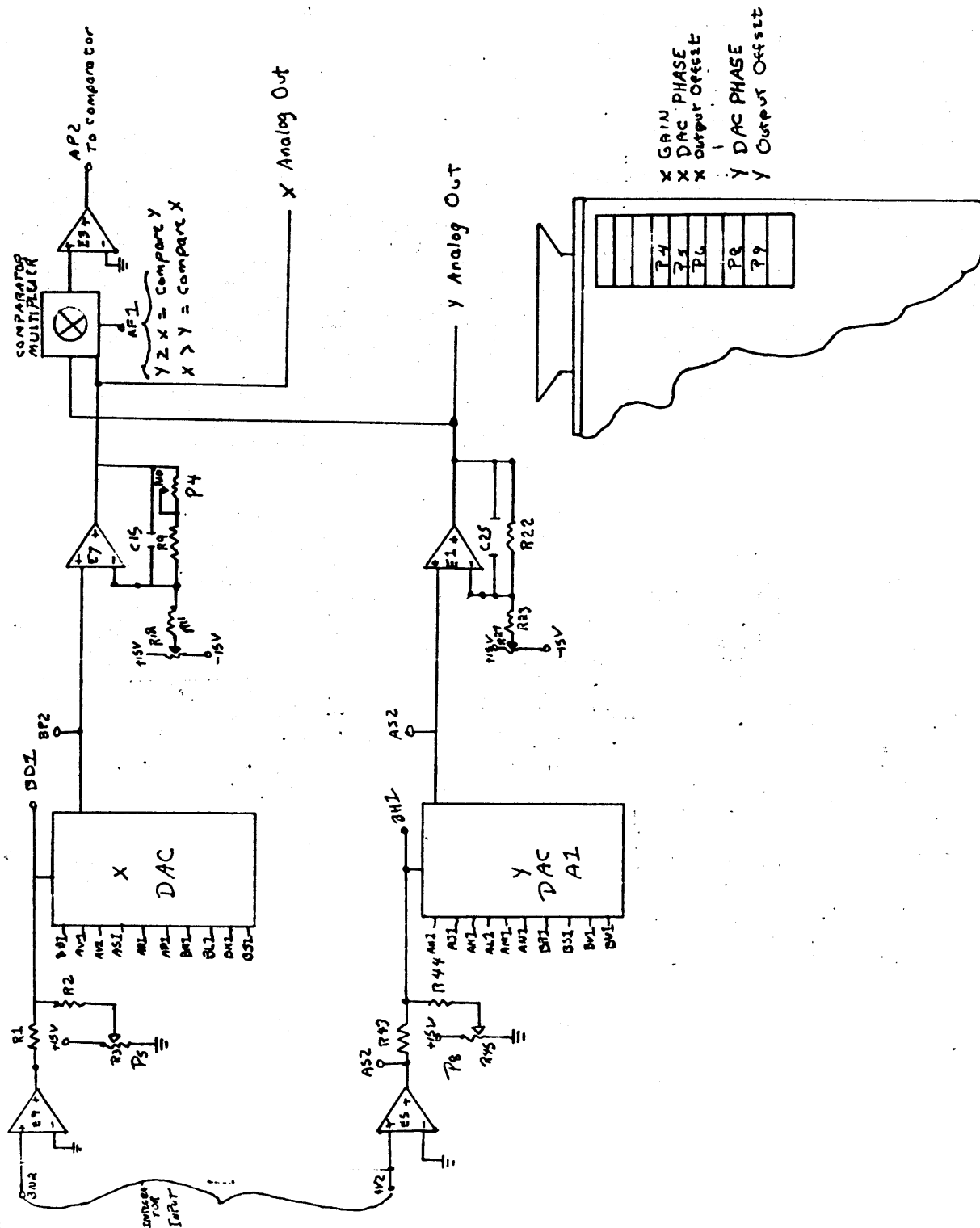
The output of the MDAC is a current that is converted to a voltage of the proper polarity and magnitude by the output op-amps (LM318). An offset adjustment is provided for in both X and Y, and a gain trim for the X output. Slope modification is performed by the MDAC; whereas the output is equal to the reference input times the 10 bit digital input word. In other words, the MDAC is digitally adjustable variable gain follower where MAX gain is equal to all ones at the digital input and zero gain is equal to all zeros at the digital input. At maximum gain the amplification through the MDAC chain is 1/2.

The output of the MDACS are fed-back to two FETS driven by the "greater than" output of the M7010. If X is > than Y; X is fed-back to the A3180 comparator otherwise Y is fed-back.

The maximum gain (MDAC inputs all ones) from the input of the LM310 to the output of the LM318 is one half. Therefore, addition of the Arbitrary vector option to the VT15 system will require that the ramp output of the A3180 module (input to the A3170) will have to ramp to twice the voltage to reach the final compare value on the output of the A3170. To compensate for the doubling of the execution time which this would cause and the system non linearities which this would show, the ramp speed is automatically doubled in the A3180 module.

SIZE A	CODE SP	NUMBER VV15-0-1	REV B
-----------	------------	--------------------	----------

TITLE VV15 ARBITRARY VECTOR OPTION TO VT15



SIZE	CODE	NUMBER	REV
A	SP	VV15-0-1	B

TITLE

4.0 (Continued)

Adjustment of the input ramp's slope is necessary due to the CRT monitor's sensitivity to vector speed. For example, if a vector of $X = Y = 1000$ units were to be drawn in the arbitrary vector mode, the "normalization" sequence would leave the A3170 adjusted for half gain. This would mean the vectors would be drawn at half the speed of maximum comparable basic vectors. Under these conditions the length of the lines would be longer than the same basic vectors due to non-linearities in the CRT monitor performance. To compensate for this problem, the A3180 provides a ten bit DAC which monitors the major axis normalized binary number and corrects the speed of the integrator. As an example of the correction, if the above example were executed the DAC would return a voltage sufficient to double the ramp speed thereby overcoming the one-half gain of the MDAC. The arbitrary and basic vectors would now be drawn in about the same time.

Arbitrary vectors cannot be rotated using the rotate bit of parameter 2.

SIZE	CODE	NUMBER	REV
A	SP	VV15-0-1	B



CONTINUATION SHEET

TITLE VV15 ARBITRARY VECTOR OPTION TO VT15

5.0 SYSTEM OVERVIEW

5.1 Arbitrary Long Vector

When an instruction 10 is brought into the data buffer (DB) and decoded, initiation of the instruction is delayed until the second word is received into the input buffer (IB). Upon receipt of the second word the following timing sequence occurs:

- Time State 1: 1) increment PC
MS01 + 150us 2) DB 8-17 to the ΔX holding register
MS01 + CLK 3) ΔX holding register into DR register
Time State 2: 1) Add DR to X position register, IB 8-17 to the ΔY holding register
Time State 2A: 1) ΔY holding register to DR register
Time State 3: 1) add DR to Y position register
MS03 + 150ns: 1) Compare ΔX and ΔY slope values
2) greatest component to DR register
MS03 + 250ns: 1) DR register to Δ DAC
2) begin normalization

The "arbitrary go" pulse initiates the M7010 internal timing where both the ΔX and ΔY holding registers on the M7010 module are shifted together until a logical "1" is sensed at the MSB position of either register.

It is for this reason that $\Delta X = \Delta Y = 0$ is not allowed in mode 10 and mode 30 instructions.

At this time a start pulse is initiated by the M7010 to the control circuitry associated with the analog generator.

The pulse drives a 500ns delay and supplies the time delay necessary for the multiplying DAC's setting before moving the reference input.

At the termination of this delay time a pulse sets the generator start flip-flop and the ramp generator begins.

SIZE	CODE	NUMBER	REV
A	SP	VV15-0-1	B



CONTINUATION SHEET

TITLE VV15 ARBITRARY VECTOR OPTION TO VT15

Previously, signals to determine which component, ΔX or ΔY , is greater sets the comparator multiplex switches.

BEFORE the input ramp goes from zero to its proper level, the MDAC's modify its slope according to their "normalized" inputs. The greater of these output slopes is returned via the comparator multiplexer to the magnitude comparator on the A3/80 where it is compared for equality with the Δ DAC, as well as being summed at the A238 for line drawing on the CRT monitor.

When comparison is reached the MIP flip-flop goes to zero, terminating the vector and recycling the mode if the repeat register is not zero, or going on to the next instruction if it is.

5.2 Arbitrary Short Vector

This mode operates essentially the same as the Arbitrary Long Vector mode with the exception of eliminating two requests on the I/O bus before initiating the mode. Since, both vector components are contained within one instruction word, only a single pass at the memory is required. Usually the vector will be in the Data Buffer when desired due to the double buffering action of the VT15.

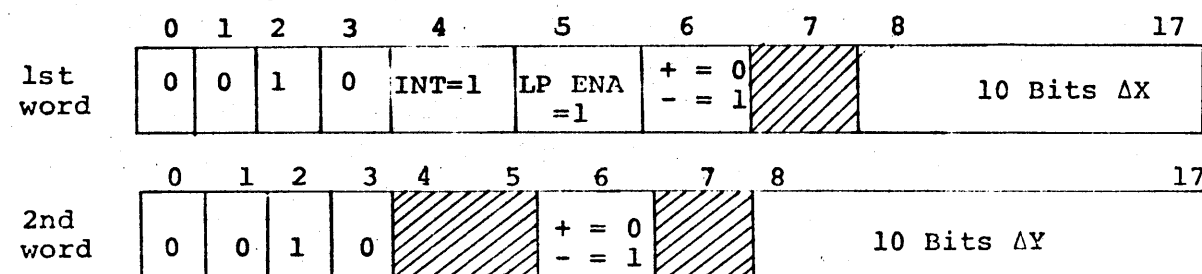
SIZE	CODE	NUMBER	REV
A	SP	VV15-0-1	B

TITLE VV15 ARBITRARY VECTOR OPTION TO VT15

6.0 Programming

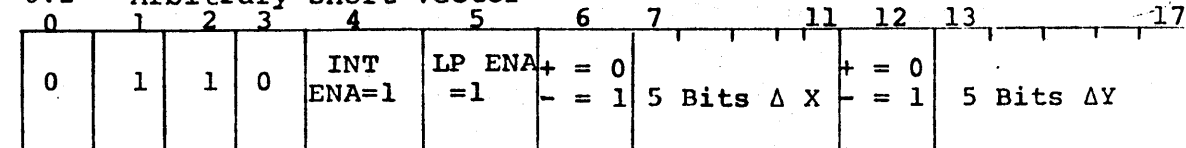
Two instructions are added to the Graphic 15 repertoire as part of the VV15 option - Arbitrary Long Vector and Arbitrary Short Vector.

6.1 Arbitrary Long Vector



The long vector instruction requires two PDP-15 words for definition. The first word defines the ΔX component (bits 8 through 17), its relative direction (right = 0, left = 1, bit 6), whether the full vector is intensified (bit 4 = 1) or blanked (bit 4 = 0) and has the option to enable the light pen for this vector (bit 5 = 1). The second word contains the ΔY component (bits 8 through 17), and its relative direction (bit 6 = 0 is up, bit 6 = 1 is down). Order codes for both words are 10₈ as shown. Restrictions to this mode are that both words must be present to properly execute the vector and that the condition of ΔX = ΔY = 0 (zero) is illegal. Under the conditions of ΔX = ΔY = 0, the VT15 will hang in an endless "normalization" loop.

6.2 Arbitrary Short Vector



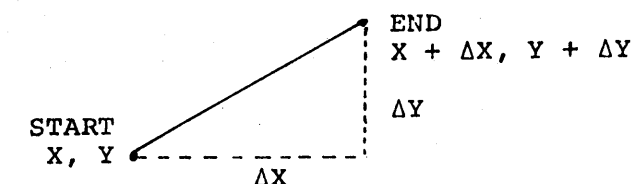
The arbitrary short vector is very similar to the long vector with the exception of both ΔX and ΔY components being defined within one PDP-15 word. This gives the advantage of both compact core usage and more efficient bus timing (double buffering is in effect for short vector instructions), but allows only short vectors to be drawn (up to 37 raster units). However, by

SIZE	CODE	NUMBER	REV
A	SP	VV15-0-1	B

TITLE VV15 ARBITRARY VECTOR OPTION TO VT15

using the scaling register longer effective vectors may be drawn. The definition of the bit functions are the same as long vector.

Both modes draw in relative format, that is the start point in from the present position on the screen and moves to an end position equal to X INITIAL + ΔX, Y INITIAL + ΔY as shown below.



In addition, care must be taken not to allow the condition of ΔX = ΔY = 0 to occur in either Arbitrary Long or Short Vector modes. A zero length vector maybe defined in the basic vector modes. ALSO SEE PAR. 5.3.1.

6.3 PROGRAMMING RESTRICTIONS

6.3.1 ZERO LENGTH VECTOR

X = Y = 0 is not allowed and will cause the VT15 to hang in an endless normalization loop. Zero length vectors may be specified in the basic vector modes. OPTION ECO *M7010-00003 WILL ALLOW THE VV15 TO ACCEPT ZERO LENGTH VECTORS.

6.3.2 ROTATE:

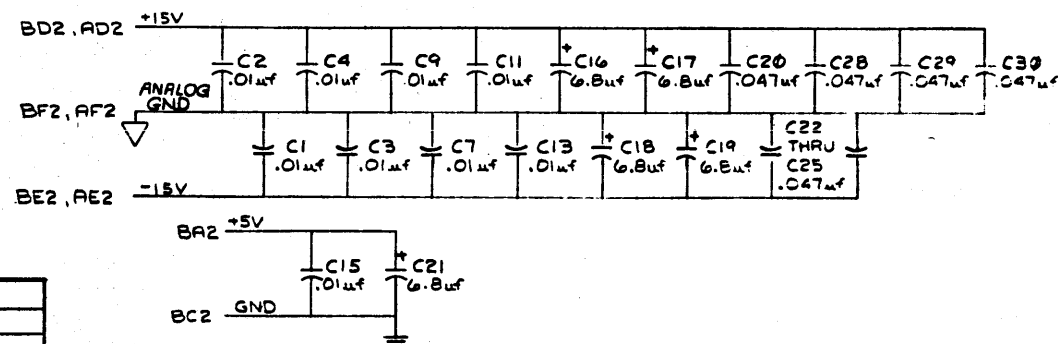
Arbitrary vectors must not be rotated. Care must be taken to clear the rotate flip-flop before entering arbitrary vector modes.

7.0 ADJUSTMENT PROCEDURE

The adjustment procedure is covered in detail in "VT15 system adjustment procedure" A-SP-VT15-0-51.

SIZE	CODE	NUMBER	REV
A	SP	VV15-0-1	B

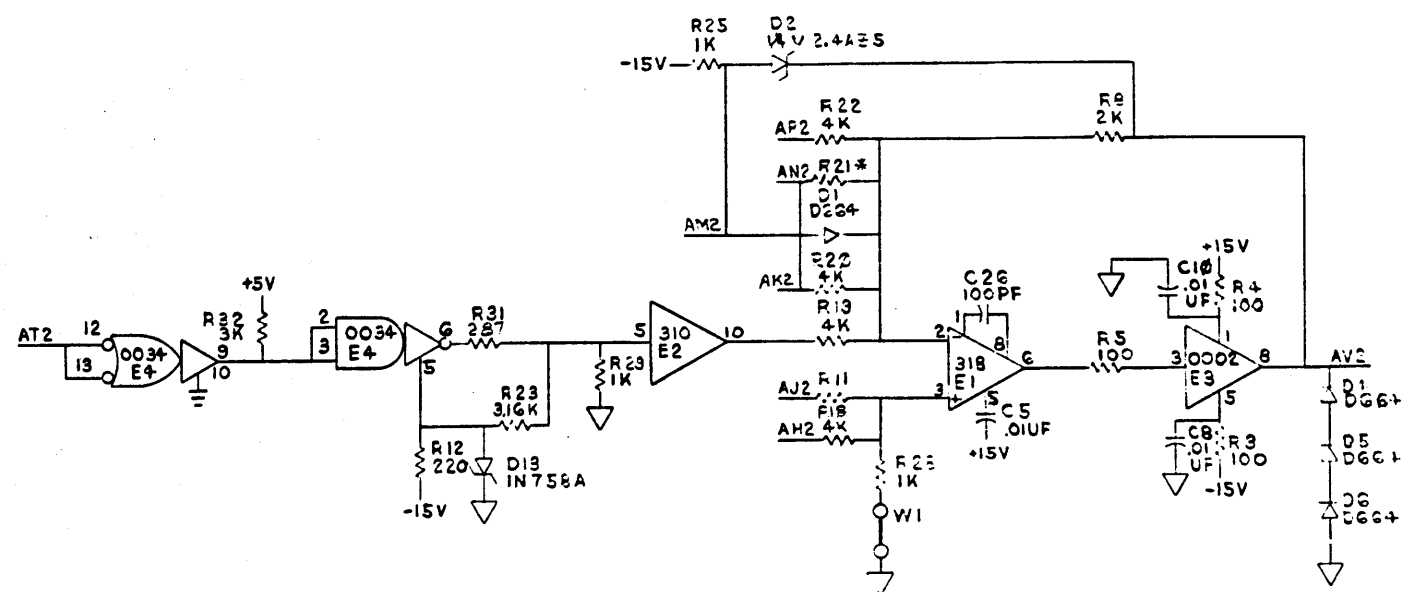
NOTES:



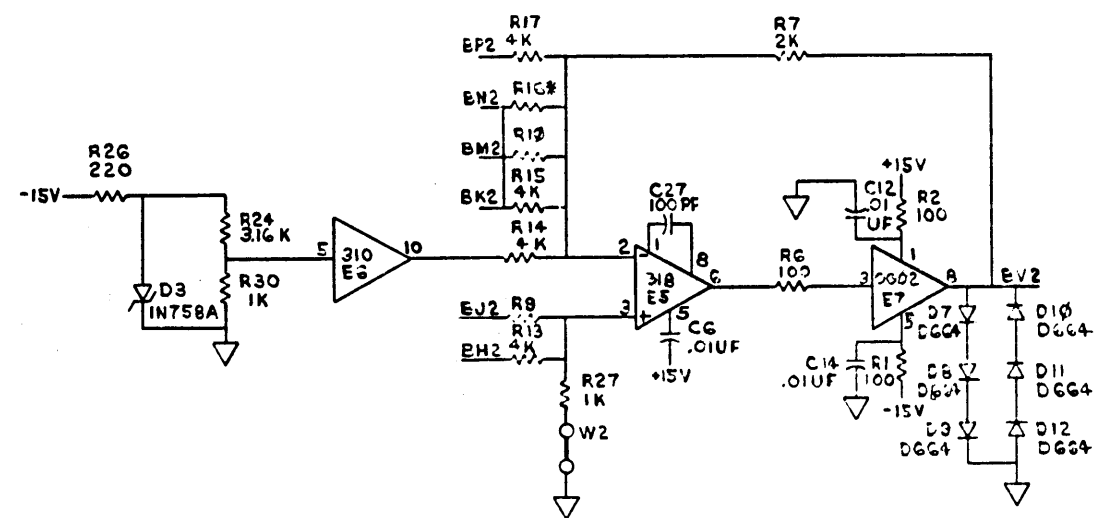
**GND AND 5V ARE USUALLY PIN 7 AND 14
RESPECTIVELY. EXCEPTIONS ARE STATED ABOVE.**

FIRST USED ON OPTION MODEL		QTY		KEY DESIGNATION		DESCRIPTION		PART NO		NO	
/T15		ETCH BOARD REV		C		PARTS LIST					
REV						DATE		digital EQUIPMENT CORPORATION			
C						10/18/73		TITLE DUAL ANALOG			
D						10/19/73		SUMMER & DRIVER			
CHANGED						10/26/73		SIZE/COD			
NO						10/26/73		NUMBER			
REV						10/26/73		P.V.			
1		1/4M24A25		1N437D		NEXT HIGHER ASSY		D/CS			
2		D664		1N3666				A230 0-1			
3		1N758A		NONE				D			
4		DEC NO		DEC NO							
5		EIA NO		EIA NO							
SEMICONDUCTOR CONNECTION CHART											

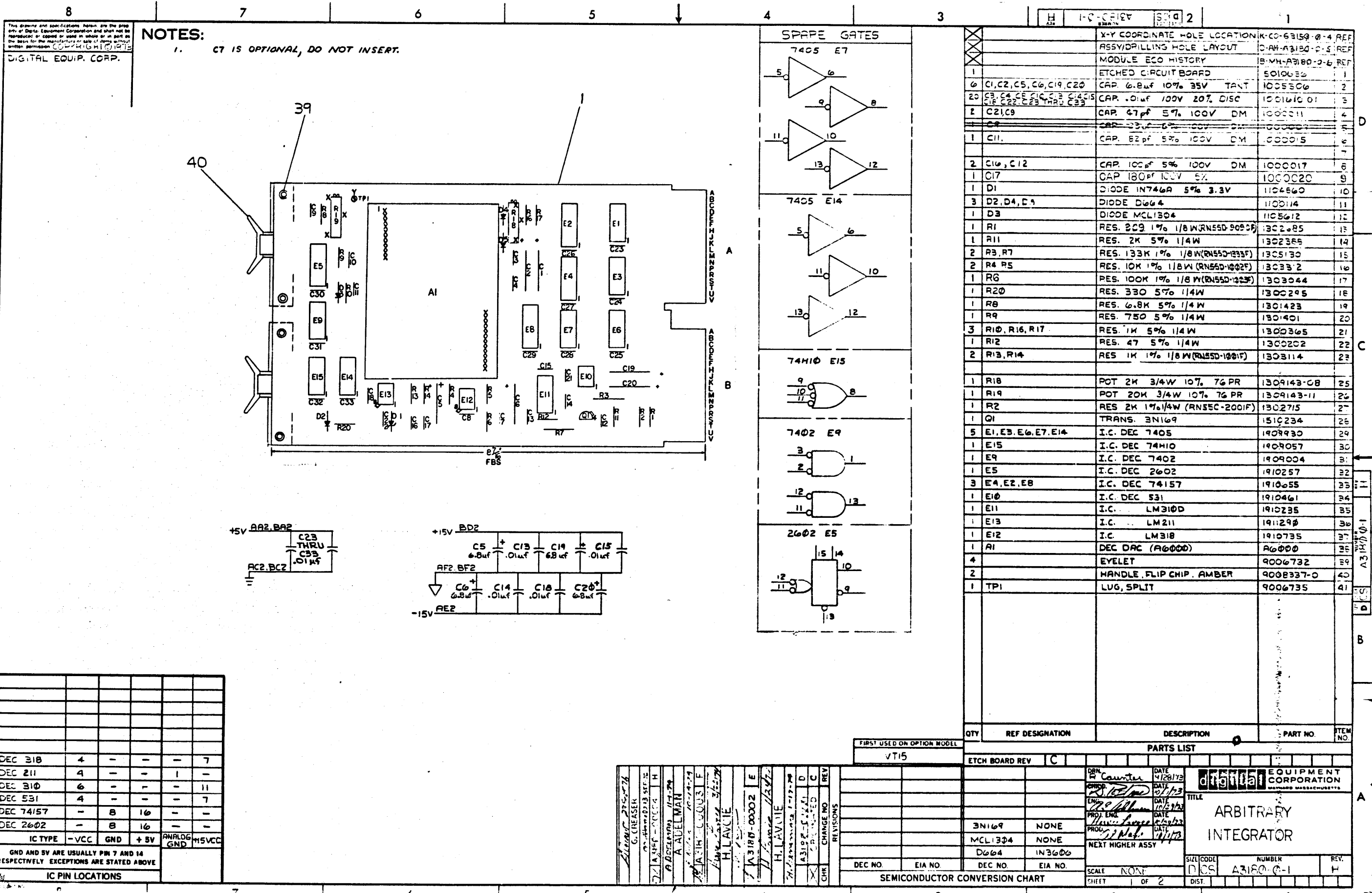
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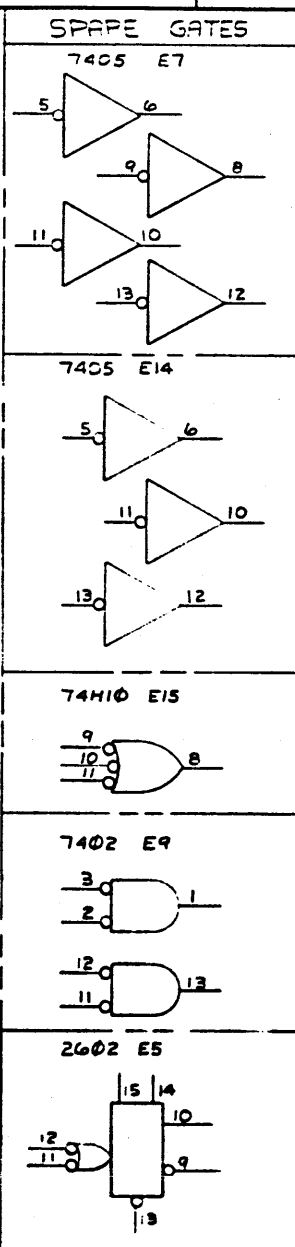
NOTES
R9, R10, R11, ARE OPTIONAL COMPONENTS - DO NOT INSERT.
* R10, R21 MAY BE CHANGED IN TEST TO IMPROVE GAIN ACCURACY.



REVISIONS		
CHK	CHANGE NO	REV



NOTES:
1. C7 IS OPTIONAL, DO NOT INSERT.



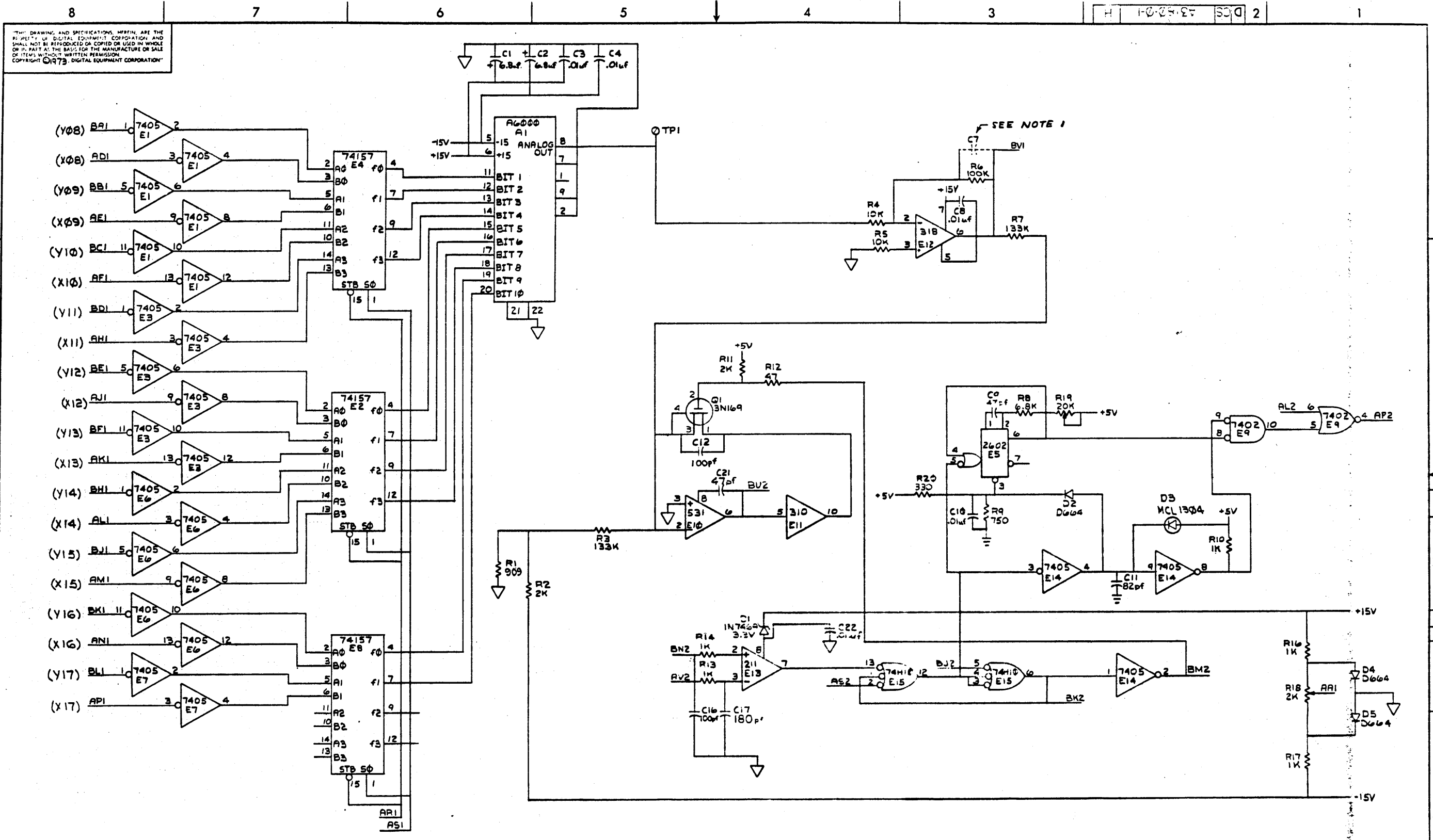
X-Y COORDINATE HOLE LOCATION		K-C-63159-0-4 REF	
ASSY/DRILLING HOLE LAYOUT		3-AH-A3180-0-5 REF	
MODULE ECO HISTORY		B-MH-A3180-0-6 REF	
1	ETCHED CIRCUIT BOARD	5010630	1
6	C1, C2, C5, C6, C19, C20	CAP. 6.8uf 10% 35V TANT	1005306
20	C3, C4, C8, C10, C13, C14, C15, C16, C22, C23 THRU C33	CAP. .01uf 100V 20% DISC	1001610 01
2	C21, C9	CAP. 47pf 5% 100V DM	1000011
1	C7	CAP. 33uf 6% 100V DM	1000007
1	C11	CAP. 82pf 5% 100V DM	1000015
2	C16, C12	CAP. 100pf 5% 100V DM	1000017
1	O17	CAP. 180pf 100V 5%	1000020
1	D1	DIODE 1N746A 5% 3.3V	1104560
3	D2, D4, D1	DIODE D664	1100114
1	D3	DIODE MCL1304	1105612
1	R1	RES. 209 1% 1/8W(RN55D-9090P)	1302085
1	R11	RES. 2K 5% 1/4W	1302365
2	R3, R7	RES. 133K 1% 1/8W(RN55D-133K)	1305130
2	R4, R5	RES. 10K 1% 1/8W(RN55D-1000F)	1303312
1	R6	RES. 100K 1% 1/8W(RN55D-100K)	1303044
1	R20	RES. 330 5% 1/4W	1300295
1	R8	RES. 6.8K 5% 1/4W	1301423
1	R9	RES. 750 5% 1/4W	1301401
3	R10, R16, R17	RES. 1K 5% 1/4W	1300365
1	R12	RES. 47 5% 1/4W	1300202
2	R13, R14	RES. 1K 1% 1/8W(RN55D-1001F)	1303114
1	R18	POT 2K 3/4W 10% 76 PR	1309143-08
1	R19	POT 20K 3/4W 10% 76 PR	1309143-11
1	R2	RES. 2K 1% 1/4W (RN55C-2001F)	1302715
1	Q1	TRANS. 3N169	1510234
5	E1, E3, E6, E7, E14	I.C. DEC 7405	1909930
1	E15	I.C. DEC 74H10	1909057
1	E9	I.C. DEC 7402	1909004
1	E5	I.C. DEC 2602	1910257
3	E4, E2, E8	I.C. DEC 74157	1910655
1	E10	I.C. DEC 531	1910461
1	E11	I.C. LM310D	1910235
1	E13	I.C. LM211	1911298
1	E12	I.C. LM318	1910735
1	A1	DEC DAC (A6000)	A6000
4		EYELET	9006732
2		HANDLE, FLIP CHIP, AMBER	9008337-0
1	TP1	LUG, SPLIT	9006735

QTY	REF DESIGNATION	DESCRIPTION	PART NO.	ITEM NO.
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3N169 NONE				
MCL1304 NONE				
D664 IN3606				
SEMICONDUCTOR CONVERSION CHART				
DEC NO.	EIA NO.	DEC NO.	EIA NO.	
SCALE NONE				
SHEET 1 OF 2				

IC TYPE	-VCC	GND	+5V	ANALOG GND	+5VCC
DEC 318	4	-	-	-	7
DEC 211	4	-	-	-	1
DEC 310	6	-	-	-	11
DEC 531	4	-	-	-	7
DEC 74157	-	8	16	-	-
DEC 2602	-	8	16	-	-
GND AND 5V ARE USUALLY PIN 7 AND 14 RESPECTIVELY. EXCEPTIONS ARE STATED ABOVE.					
IC PIN LOCATIONS					

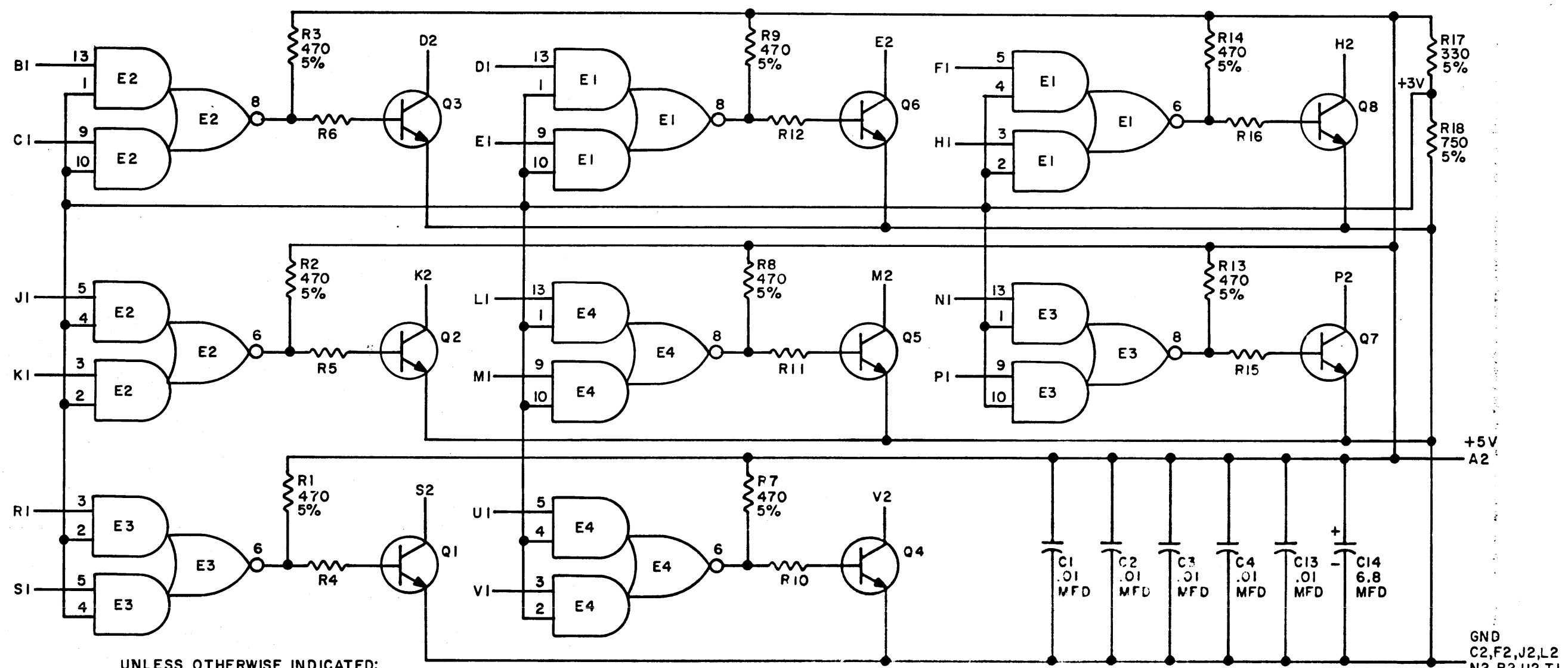
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4	1/12/74	H. LAVIE		
5	1/12/74	H. LAVIE		
6	1/12/74	H. LAVIE		
7	1/12/74	H. LAVIE		
8	1/12/74	H. LAVIE		
9	1/12/74	H. LAVIE		
10	1/12/74	H. LAVIE		
11	1/12/74	H. LAVIE		
12	1/12/74	H. LAVIE		
13	1/12/74	H. LAVIE		
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59	1/12/74	H. LAVIE		
60	1/12/74	H. LAVIE		
61	1/12/74	H. LAVIE		
62	1/12/74	H. LAVIE		
63	1/12/74	H. LAVIE		
64	1/12/74	H. LAVIE		
65	1/12/74	H. LAVIE		
66	1/12/74	H. LAVIE		
67	1/12/74	H. LAVIE		
68	1/12/74	H. LAVIE		
69	1/12/74	H. LAVIE		
70	1/12/74	H. LAVIE		
71	1/12/74	H. LAVIE		
72	1/12/74	H. LAVIE		
73	1/12/74	H. LAVIE		
74	1/12/74	H. LAVIE		
75	1/12/74	H. LAVIE		
76	1/12/74	H. LAVIE		
77	1/12/74	H. LAVIE		
78	1/12/74	H. LAVIE		
79	1/12/74	H. LAVIE		
80	1/12/74	H. LAVIE		
81	1/12/74	H. LAVIE		
82	1/12/74	H. LAVIE		
83	1/12/74	H. LAVIE		
84	1/12/74	H. LAVIE		
85	1/12/74	H. LAVIE		
86	1/12/74	H. LAVIE		
87	1/12/74	H. LAVIE		
88	1/12/74	H. LAVIE		
89	1/12/74	H. LAVIE		
90	1/12/74	H. LAVIE		
91	1/12/74	H. LAVIE		
92	1/12/74	H. LAVIE		
93	1/12/74	H. LAVIE		
94	1/12/74	H. LAVIE		
95	1/12/74	H. LAVIE		
96	1/12/74	H. LAVIE		
97	1/12/74	H. LAVIE		
98	1/12/74	H. LAVIE		
99	1/12/74	H. LAVIE		
100	1/12/74	H. LAVIE		

DRN Counter DATE 1/26/73
PROJ. ENG. DATE 1/26/73
PROJ. MGR. DATE 1/26/73
PROJ. PROD. DATE 1/26/73
NEXT HIGHER ASSY
TITLE
ARBITRARY INTEGRATOR
SIZE CODE NUMBER REV.
DCS A3180-0-1 H



REVISIONS		
CHK	CHANGE NO	REV

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UNLESS OTHERWISE INDICATED:
CAPACITORS ARE 100MMF
RESISTORS ARE 220; 1/4W; 10%
TRANSISTORS ARE DEC3009B
IC'S ARE DEC74H50

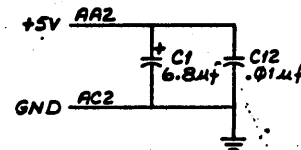
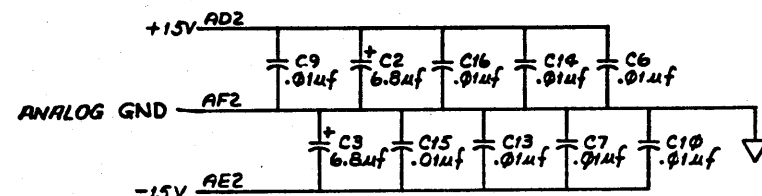
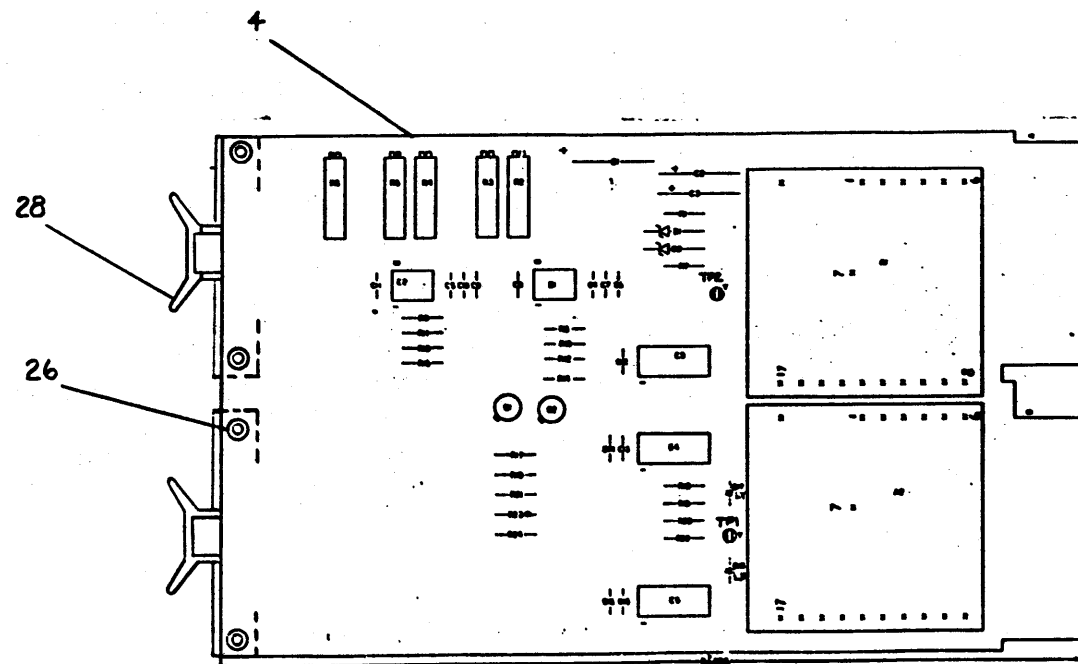
PIN 7 ON EACH IC = GND
PIN 14 ON EACH IC = +5V

REVISIONS				DRN		DATE		TRANSISTOR & DIODE CONVERSION TABLE				EQUIPMENT CORPORATION				BJS DRIVER M622			
CHK	CHG	NO	REV	m. Haller		2-26-69		DEC	EIA			DEC3009B				2N3009			
1	1	00001	B	DATE		DATE													
2	2	00002	C	DATE		DATE													
				ENG		DATE													
				PROD.		DATE													

EQUIPMENT CORPORATION		NUMBER		REV	
M622-0-1		A		C	

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NOTES:



IC TYPE	QTY	REF	DESCRIPTION	PART NO.	ITEM NO.
DEC 310	1	1	ETCHED CIRCUIT BOARD	5010654	1
IC PIN LOCATIONS					
DEC 310	1	1	ETCHED CIRCUIT BOARD	5010654	1
IC PIN LOCATIONS					

REF.	QTY	REF.	DESCRIPTION	PART NO.	ITEM NO.
1	1	1	ETCHED CIRCUIT BOARD	5010654	1
2	1	2	ASSY/DRILLING HOLE LAYOUT	E-AH-A3170-0-5	2
3	1	3	MODULE ECO HISTORY	B-MH-A3170-0-6	3
4	1	4	ETCHED CIRCUIT BOARD	5010654	4
5	1	5	CAP. 10pf 100V 5% D.M.	1000006	5
6	1	6	CAP. 0.01uf 100V 20% DISC.	1001610-01	6
7	1	7	CAP. 0.01uf 35V 10% TANT	1005306	7
8	1	8	DIODE .4M5.1Z1 5.1V 1%	1105873	8
9	1	9	RES. 470 5% 1/4W	1300316	9
10	1	10	RES. 1.5K 5% 1/4W	1300391	10
11	1	11	RES. 4.7K 5% 1/4W	1300447	11
12	1	12	RES. 6.81K 1% 1/8W (RN55D-681F)	1304870	12
13	1	13	RES. 619 1% 1/8W (RN55D-619F)	1305126	13
14	1	14	RES. 5.62K 1% 1/8W (RN55C-562F)	1303527	14
15	1	15	RES. 825 1% 1/8W (RN55D-825F)	1305143	15
16	1	16	RES. 68.1K 1% 1/8W (RN55D-681F)	1305252	16
17	1	17	RES. 2K 1% 1/8W (RN55C-2001B)	1305353	17
18	1	18	POT. 5K 10% 3/4W 76PR	1309143-06	18
19	1	19	POT. 2K 10% 3/4W 76PR	1309143-08	19
20	1	20	SPLIT LUG	9006735	20
21	1	21	TRANS. 3N169	1510234	21
22	1	22	I.C. DEC 310	1910235	22
23	1	23	I.C. DEC 7426	1910236	23
24	1	24	I.C. LM 318	1910735	24
25	1	25	5553 MULT D/A CNV	1910736	25
26	1	26	EYELET	9006732	26
27	1	27	SOCKET COMPONENT	9007812-1	27
28	1	28	HANDLE, FLIPCHIP, AMBER	9008337-6	28
29	1	29	RES. 19.5K 1/8W 1% (RN55D194F)	1309419	29

QTY	REF DESIGNATION	DESCRIPTION	PART NO.	ITEM NO.
1	1	ETCHED CIRCUIT BOARD	5010654	1
2	2	ASSY/DRILLING HOLE LAYOUT	E-AH-A3170-0-5	2
3	3	MODULE ECO HISTORY	B-MH-A3170-0-6	3
4	4	ETCHED CIRCUIT BOARD	5010654	4
5	5	CAP. 10pf 100V 5% D.M.	1000006	5
6	6	CAP. 0.01uf 100V 20% DISC.	1001610-01	6
7	7	CAP. 0.01uf 35V 10% TANT	1005306	7
8	8	DIODE .4M5.1Z1 5.1V 1%	1105873	8
9	9	RES. 470 5% 1/4W	1300316	9
10	10	RES. 1.5K 5% 1/4W	1300391	10
11	11	RES. 4.7K 5% 1/4W	1300447	11
12	12	RES. 6.81K 1% 1/8W (RN55D-681F)	1304870	12
13	13	RES. 619 1% 1/8W (RN55D-619F)	1305126	13
14	14	RES. 5.62K 1% 1/8W (RN55C-562F)	1303527	14
15	15	RES. 825 1% 1/8W (RN55D-825F)	1305143	15
16	16	RES. 68.1K 1% 1/8W (RN55D-681F)	1305252	16
17	17	RES. 2K 1% 1/8W (RN55C-2001B)	1305353	17
18	18	POT. 5K 10% 3/4W 76PR	1309143-06	18
19	19	POT. 2K 10% 3/4W 76PR	1309143-08	19
20	20	SPLIT LUG	9006735	20
21	21	TRANS. 3N169	1510234	21
22	22	I.C. DEC 310	1910235	22
23	23	I.C. DEC 7426	1910236	23
24	24	I.C. LM 318	1910735	24
25	25	5553 MULT D/A CNV	1910736	25
26	26	EYELET	9006732	26
27	27	SOCKET COMPONENT	9007812-1	27
28	28	HANDLE, FLIPCHIP, AMBER	9008337-6	28
29	29	RES. 19.5K 1/8W 1% (RN55D194F)	1309419	29

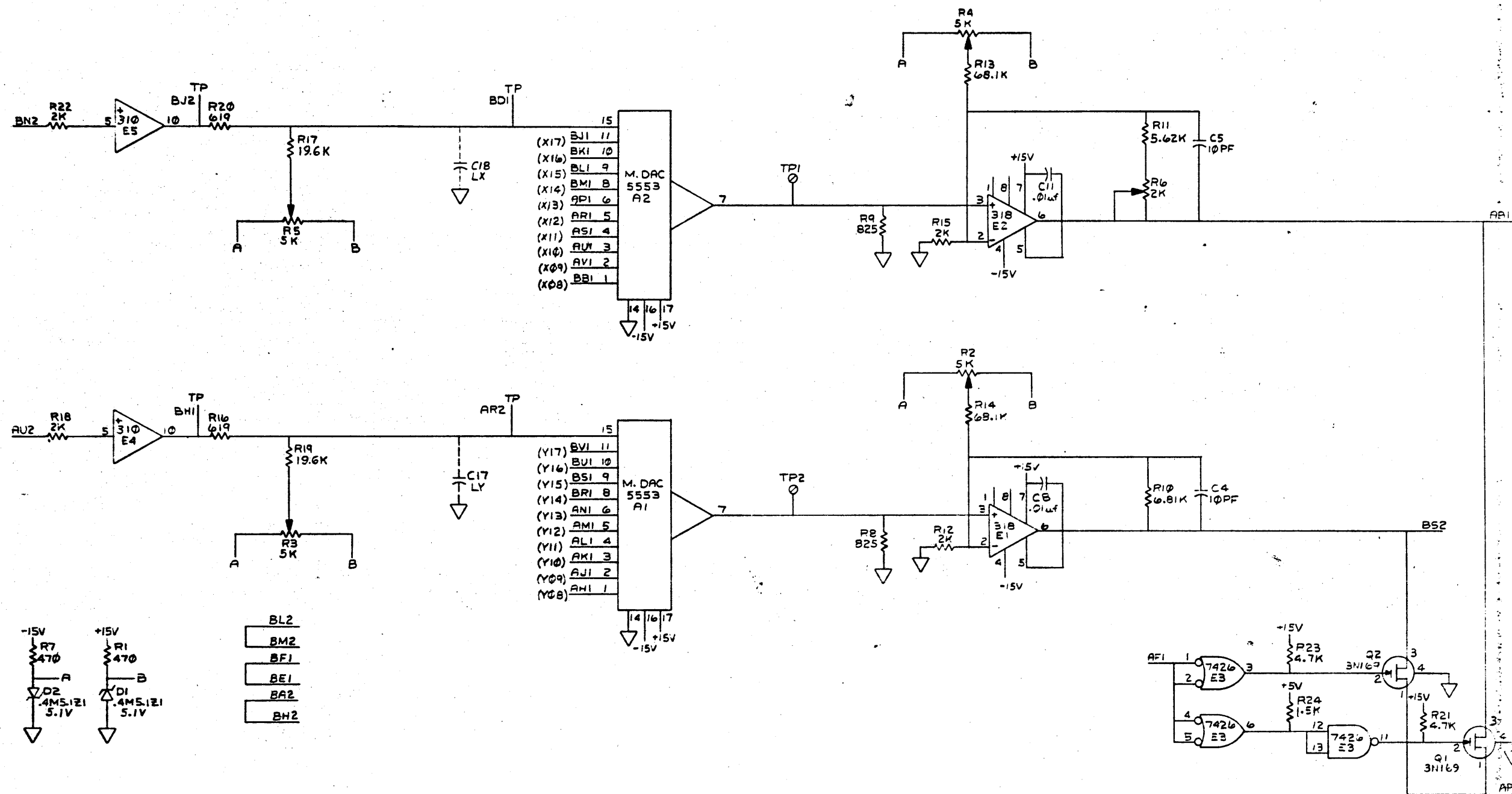
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5	CHANGED	10/1/73
6	CHANGED	10/1/73
7	CHANGED	10/1/73
8	CHANGED	10/1/73
9	CHANGED	10/1/73
10	CHANGED	10/1/73
11	CHANGED	10/1/73
12	CHANGED	10/1/73
13	CHANGED	10/1/73
14	CHANGED	10/1/73
15	CHANGED	10/1/73
16	CHANGED	10/1/73
17	CHANGED	10/1/73
18	CHANGED	10/1/73
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20	CHANGED	10/1/73
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24	CHANGED	10/1/73
25	CHANGED	10/1/73
26	CHANGED	10/1/73
27	CHANGED	10/1/73
28	CHANGED	10/1/73
29	CHANGED	10/1/73

DEC NO.	EIA NO.	DEC NO.	EIA NO.
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
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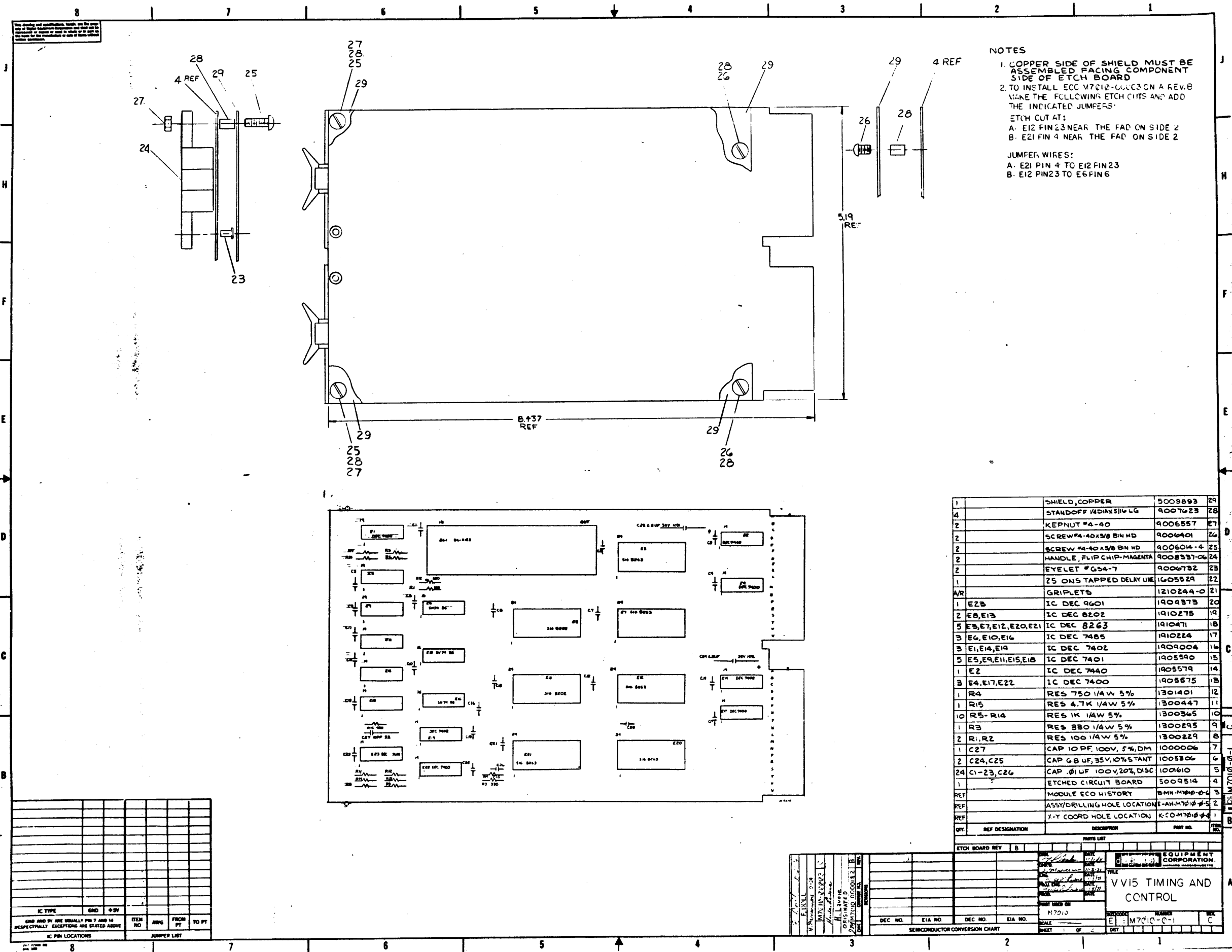
digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

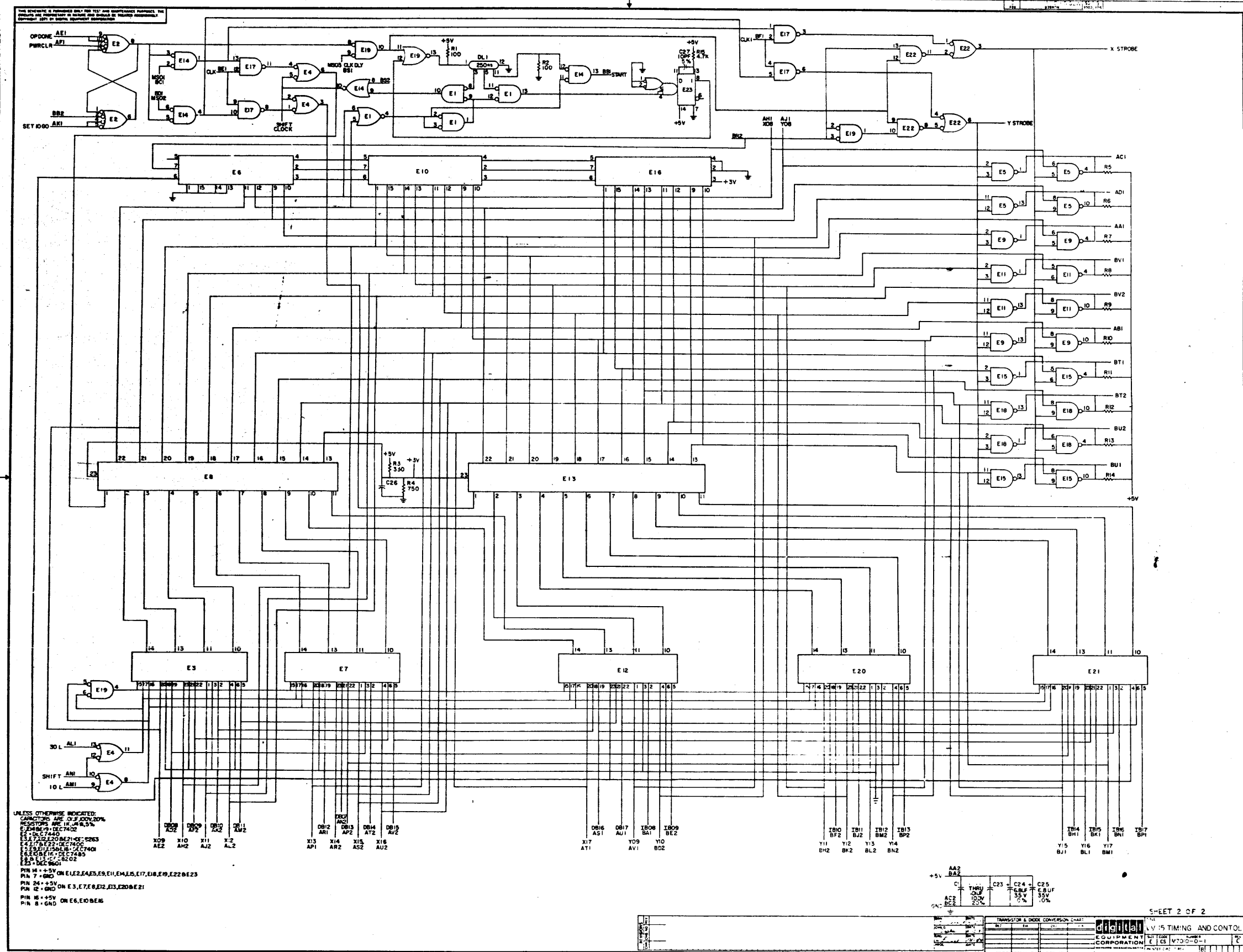
ARBITRARY
VECTOR GENERATOR

SIZE CODE: DCS
NUMBER: A3170-0-1
REV: C



REVISIONS		
CHG	CHANGE NO	REV

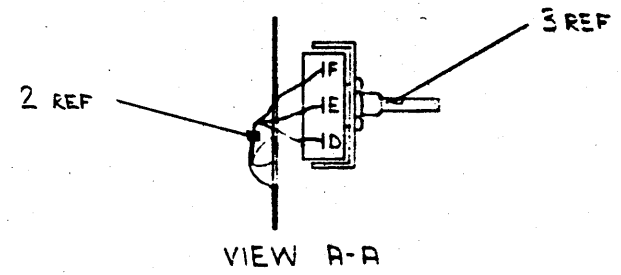
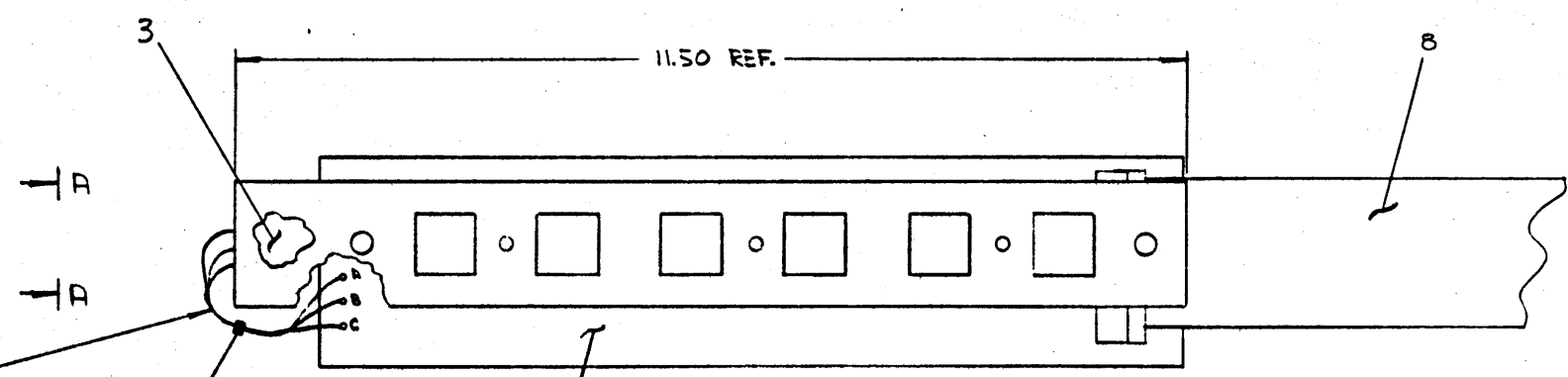




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WIRE TABLE						
ITEM NO.	DISCRIPTION		FROM		TO	
	AWG	COLOR	CONNECTION	WITH	CONNECTION	WITH
4	#22	BLK	PCB - C	SOLD.	R1-D	SOLD., 7
5	#22	ORN	PCB - B	SOLD.	R1-E	SOLD., 7
6	#22	RED	PCB - A	SOLD.	R1-F	SOLD., 7

MAKE ITEMS 4, 5, 6
APPROX 8 INCH. LG.



VIEW A-A

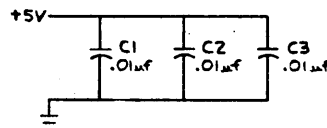
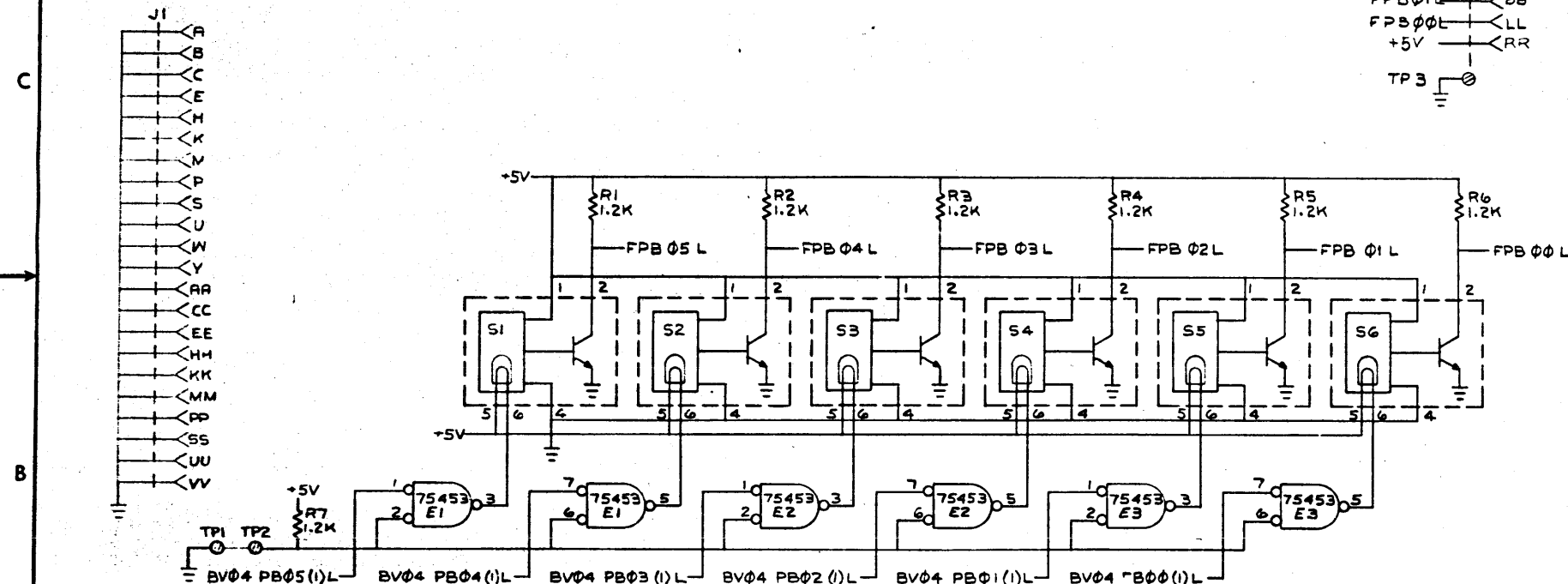
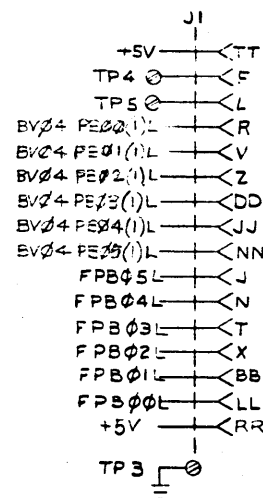
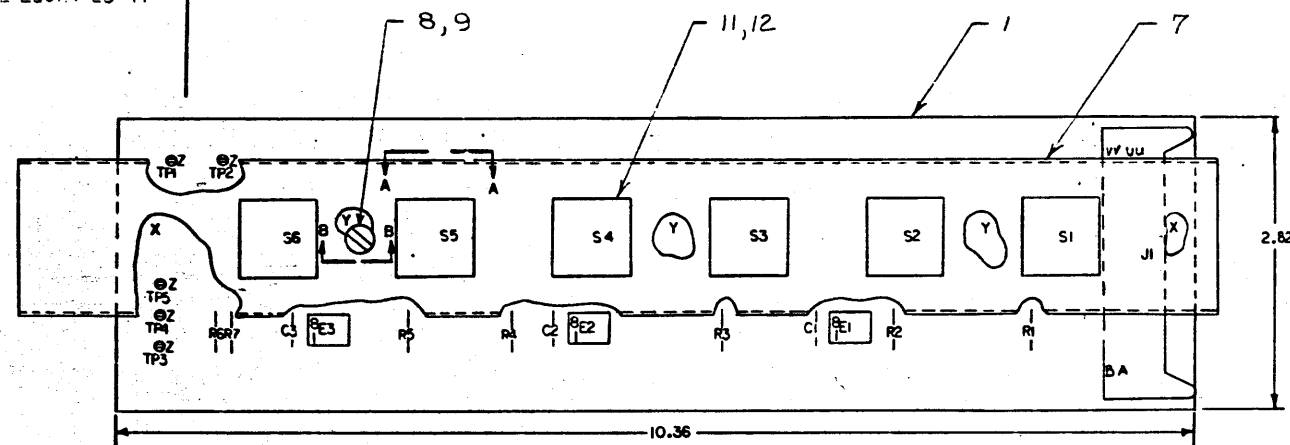
1	1/8 CABLE	BC08J-06	8
R/R	TUBING SHRINKABLE 1/8 OD	9107255-09	7
R/R	#22 AWG STRD INS. (RED)	9107350-22	6
R/R	#22 AWG STRD INS. (ORN)	9107350-33	5
R/R	#22 AWG STRD INS. (BLK)	9107350-00	4
1	POT REMOVR FOR 10K POT	B-10-7407865-10	3
1	TIE WRAP SST-1M	9207031	2
1	SWITCH BOARD ASSY	D-18-5410685-00	1

FIRST USED ON OPTION/MODEL VT07		QTY.		DESCRIPTION		PART NO.		ITEM NO.	
UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES		DRN B. O. Reed		DATE 9/10/73		digital		EQUIPMENT CORPORATION	
TOLERANCES		CHK'D B. O. Reed		DATE 9/13/73		TITLE		SWITCH ASSY VT07	
DECIMALS	ANGLES	ENG. J. L. Hall		DATE 8-2-73		SIZE CODE		NUMBER	
.XXX = .005	±0° 30'	PROL ENG J. L. Hall		DATE 8-14-73		DAD		7009597-0-0	
REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY V		PROD. J. L. Hall		DATE 8-14-73		REV.		B	
MATERIAL SEE PARTS LIST		NEXT HIGHER ASSY.		SCALE 1/1		DIST			
FINISH		SHEET		OF					

REVISIONS	REV	DATE	BY	APP
1	1	9/10/73	B. O. Reed	
2	2	9/13/73	B. O. Reed	
3	3	8-2-73	J. L. Hall	
4	4	8-14-73	J. L. Hall	

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DIGITAL EQUIP. CORP.

NOTES:



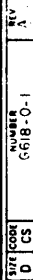
75453	4	8
IC TYPE	GND	+5V
GND AND 5V ARE USUALLY PIN 7 AND 14 RESPECTIVELY. EXCEPTIONS ARE STATED ABOVE.		
IC PIN LOCATIONS		

DEC FORM NO. 1394

X-Y COORDINATE HOLE LOCATION: K-CO-5410685-0-1 REF	
ASSY/DRILLING HOLE LAYOUT: D-AH-5410685-0-5 REF	
MODULE ECO HISTORY: B-MH-5410685-0-6 REF	
1	ETCHED CIRCUIT BOARD: 5210684 1
3	C1, C2, C3: CAP. .01µf 100V 20% DISC.: 1001010-01 2
1	J1: CONN. 40 PIN RT ANGLE HEADER: 1209941 3
6	S1 THRU S6: SWITCH, PUSH BUTTON (LIGHTED): 1211066 4
7	R1 THRU R7: RES. 1.2K 5% 1/4W: 1301320 5
3	E1, E2, E3: I.C. DEC 75453: 1911036 6
1	BRACKET, SWITCH: D-MD-7411357-0-0 7
6	SCR. PHL. HD PAN #6-32 X 3/8 LG.: 9006022-1 8
3	SPACER #1/4 AF X 7/8 LG.: 90060861 9
5	TP1 THRU TP5: SPLIT LUG: 9206735 10
6	LAMP: 1211068 11
6	KEY CAP: 1211564 12

QTY	REF DESIGNATION	DESCRIPTION	PART NO.	ITEM NO.
PARTS LIST				
ETCH BOARD REV B				
digital EQUIPMENT CORPORATION TITLE: PUSH BUTTON BOARD				
SIZE CODE: C CS NUMBER: 5410685-0-1 REV. A				
SEMICONDUCTOR CONVERSION CHART				

A	1-0-8-99	SO	D
AIN	WIMON	FOUN	US



REVISES	DATE	BY	TITLE	ROM DIODE MATRIX		REV	
	CHG	DATE		AND DECODE G618			A
DATE	DATE	DATE	 EQUIPMENT CORPORATION MAYNARD MASSACHUSETTS	SIZE	CODE	NUMBER	REV
DATE	DATE	DATE		D	CS	G618-0-1	
DATE	DATE	DATE	PRINTED CIRCUIT REV				



↑

