

digital

TS03-M

Engineering Drawings

Digital Equipment Corporation

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DRAWING DIRECTORY

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CUSTOMER PRINT SET INDEX

THIS IS PRINT SET

SEQUENCE \uparrow

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TS03 SYSTEM OVERVIEW
TS03 MODULE UTILIZATION
TS03 FUNCTIONAL DIAGRAM
POWER SUPPLY
SERVO PREAMP TAPE TENS. SERVO
SERVO PREAMP CAPSTAN DR SERVO q
RAMP GENERATOR
SENSOR AMPL/DRIVER
MOTION CONTROL LOGIC
CONTR TERM. & OTHER SOURCES
CONTROL INTERFACE LOGIC
READ LOGIC
READ CONNECTIONS
DELAY TIMING/SKEW GATE
WRITE LOGIC 4 CHAN, STROBE
WRITE LOGIC 5 CHAN
TS03 SIGNAL GLOSSARY
BOARD HOLDER ASSY
INTERFACE BOARD

(SHEET 1 ONLY)

SEQUENCE \uparrow

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C-CS-TS03-0-16
C-AR-TS03-0-17
D-AD-7010456-0-0
D-CS-M8920-0-1

UNIT VARIATIONS		PRINT SET		
VAR	TITLE	1		
TS03-MA	MASTER DRIVE, 225V, 60 HZ	X		
TS03-MB	MASTER DRIVE, 220V, 50 HZ	X		

DEC 15-11-350-1045-1A-0072

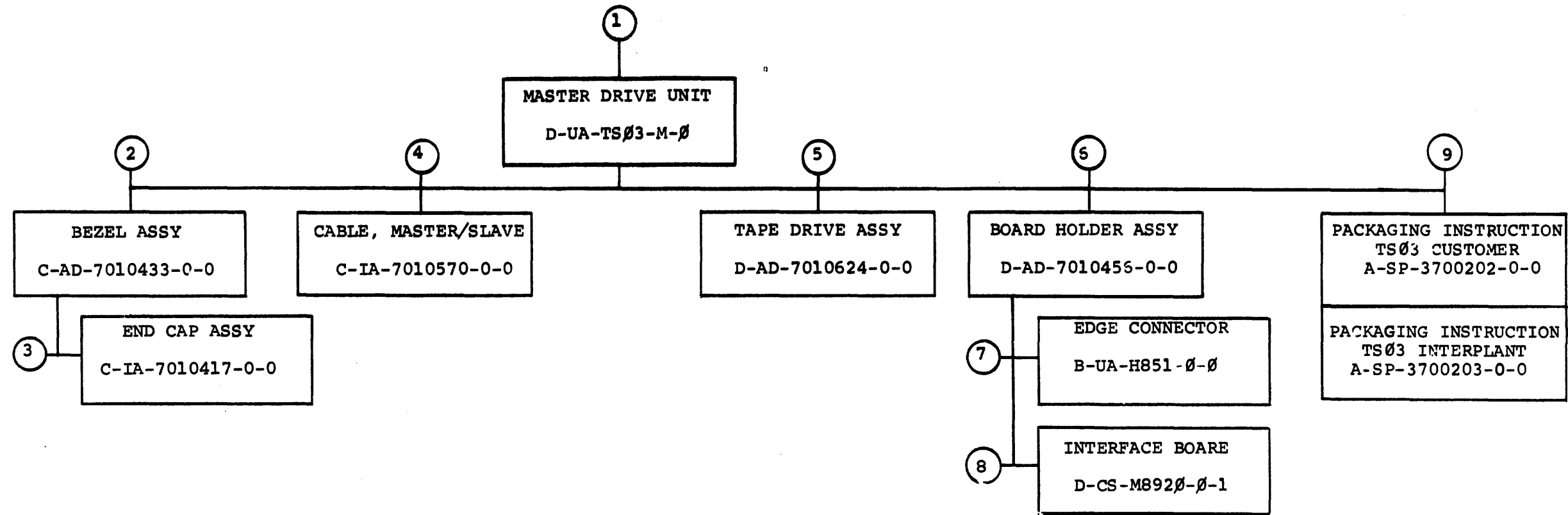
REV	CHG. NO.	DATE
A	1	6-75

DRN.	DATE	TITLE
F. Carberry	1/24/75	MASTER DRIVE UNIT
CHK'D. F. Carberry	7-19-75	
PROJ ENG. H. Friedman	12-1-75	

PROD.	DATE	SIZE	CODE	NUMBER	REV
H. Friedman		B	DD	TS03-M	A

FIELD SERV.	DATE
H. Friedman	12-1-75

SHEET 1	OF 3	DIST							
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TITLE	SHEET	SIZE	CODE	NUMBER	REV
MASTER DRIVE UNIT	2 OF 3	B	DD	TS03-M	A

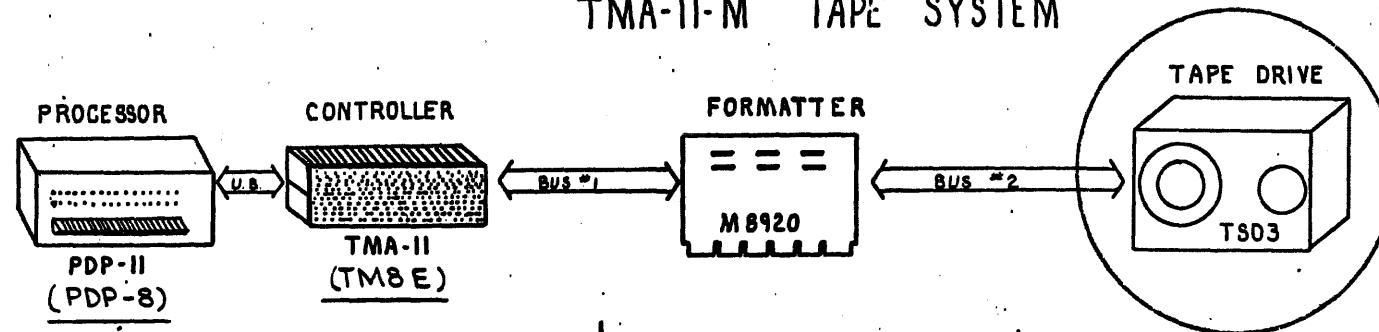
CUSTOMER PRINT SET		ELECTRICAL					CUSTOMER PRINT SET		MECHANICAL						
1	MFG. SET	FIND NO.	DRAWING NO.	REV	NO OF SHT	DESCRIPTION	OPTION NO./FILE DATE	1	MFG. SET	FIND NO.	DRAWING NO.	REV	NO OF SHT	DESCRIPTION	OPTION NO./FILE DATE
X		1	B-DD-TS03-M	*	3	DRAWING DIRECTORY				1	E-UA-TS03-M-0	#	1	MASTER DRIVE UNIT	
X			C-IC-TS03-0-1	#	1	TS03 SYSTEM OVERVIEW					B-MD-7409817-0-0	#	1	PLATE, CABLE CLAMP	
X			C-MU-TS03-0-2	#	1	TS03 MODULE UTILIZATION					C-MD-7409479-0-0	#	1	PLATE, PRESSURE	
X			C-BS-TS03-0-3	#	1	TS03 FUNCTIONAL DIAGRAM					D-IA-7010832-0-0	#	1	HARNESS, INTERFACE POWER	
X			C-CS-TS03-0-4	#	1	POWER SUPPLY					C-IA-7010570-0-0	#	1	MASTER/SPLACE CABLE	
X			C-CS-TS03-0-5	#	1	SERVO PREAMP TAPE TENS. SERVO									
X			C-CS-TS03-0-6	#	1	SERVO PREAMP CAPSTAN DR SERVO									
X			C-CS-TS03-0-7	#	1	RAMP GENERATOR									
X			C-CS-TS03-0-8	#	1	SENSOR AMPL/DRIVER									
X			C-CS-TS03-0-9	#	1	MOTION CONTROL LOGIC				2	C-AD-7010433-0-0	#	1	BEZEL ASSY	
X			C-CS-TS03-0-10	#	1	CONTROL TERM. & OTHER SOURCES					C-PS-1212132-0-0	#	1	EXTRUSION, BEZEL	
X			C-CS-TS03-0-11	#	1	CONTROL INTERFACE LOGIC									
X			C-CS-TS03-0-12	#	1	READ LOGIC									
X			C-CS-TS03-0-13	#	1	READ CONNECTIONS									
X			C-CS-TS03-0-14	#	1	DELAY TIMING/SKEW GATE									
X			C-CS-TS03-0-15	#	1	WRITE LOGIC 4 CHAN, STROBES									
X			C-CS-TS03-0-16	#	1	WRITE LOGIC 5 CHAN				3	C-IA-7010417-0-0	#	1	END CAP ASSY	
X			C-AR-TS03-0-17	#	1	TS03 SIGNAL GLOSSARY					C-MD-7412887-0-0	#	1	CAP, END	
			A-SP-TS03-0-18	#	12	TS03-M/TS03-S ACCEPTANCE PROC					B-MD-7412891-0-0	#	1	BAR, MOUNTING	
			A-SP-TS03-0-19	#	3	INCOMING INSPECTION PROCEDURE									
			A-SP-TS03-0-20	#	7	TS03-M/TS03-S RELIABILITY TEST									
			A-SP-TS03-0-21	#	28	TS03 CHECKOUT PROCEDURE				5	D-AD-7010624-0-0	#	1	TAPE DRIVE ASSY	
		4	C-IA-7010570-0-0	#	1	CABLE, MASTER/SLAVE					A-PS-3012058-0-0	#	21	MAG TAPE DRIVE	
			D-CS-5411472-0-1	#	1	CABLE TERMINATOR					C-MD-7413006-0-0	#	1	COVER, PERFORATED	
		6	D-AD-7010456-0-0	#	1	BOARD HOLDER ASSY									
		7	B-UA-H851-0-0	#	1	EDGE CONNECTOR									
			D-IA-5008903-0-0	#	1	ETCH BOARD									
X		8	D-CS-M8920-0-1	#	1	INTERFACE BOARD									
			A-SP-M8920-0-2	#	12	M8920 PRELIM CHECKOUT PROC		X		6	D-AD-7010456-0-0	#	1	BOARD HOLDER ASSY	
	X	9	A-SP-3700202-0-0		2	PACKAGING INSTRUCTIONS TS03 CUSTOMER					D-MD-7412892-0-0	#	1	RETAINER ETCH BOARD	
			A-PS-9905765-0-0		2	FULL TELESCOPE CAP					D-MD-7412889-0-0	#	1	RETAINER, ETCH BOARD SIDE	
			A-PS-9905766-0-0		2	FOAM PAD					B-MD-7412907-0-0	#	1	INSULATOR	
			A-PS-9905764-0-0		2	LAMINATED BUILDUP					C-MD-7412888-0-0	#	1	BRKT, HINGE	
			A-PS-9905734-0-0		2	PLASTIC STRAPPING									
			A-SP-3700203-0-0			PKG. INST. TS03 INTERPLANT									
			A-PS-9905767-0-0			LAMINATED BUILDUP									
			A-PS-9905768-0-0			REGULAR SLOTTED CARTON									
			A-PS-9905769-0-0			SCORED SHEET									
			A-PS-9905729-0-0			CARTON SEALING TAPE									

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: MASTER DRIVE UNIT
SHEET 3 OF 3
SIZE CODE: DD
NUMBER: TS03-M
REV: A

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TMA-II-M TAPE SYSTEM



CONTROLLER PROVIDES:

- Control Functions (CR)**
 1. command reception
 2. command decoding
 3. illegal command detection
 4. illegal drive detection
- Data Transfer Operations (NPR)**
 1. memory interfacing
 2. bus addressing
 3. data synchronization
 4. word/byte formatting
 5. RECORD/word counting
 6. bus error indication
- Status Maintenance**
 1. drive status to processor
 2. tape run-away prevention
 3. drive selection

FORMATTER PROVIDES:

1. command buffering
2. drive related timing (write)
3. gap width control
4. record, VPE, CRC, LRC, & tape-mark detection
5. VPE, CRC & tape-mark generation
6. EOT status for two drives
7. non-existent drive detection

TAPE DRIVE PROVIDES:

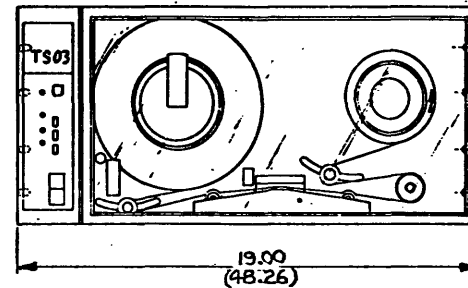
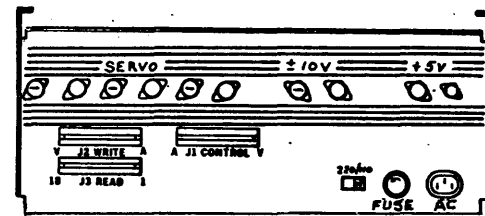
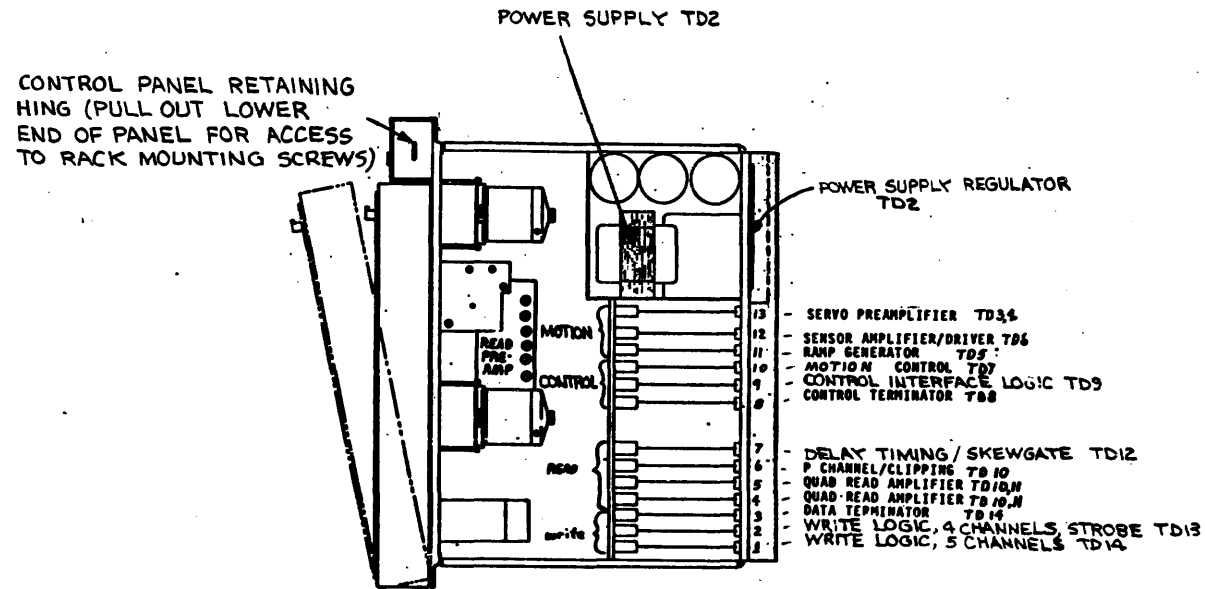
- Tape Handling**
 1. constant 8oz. tension
 2. three sources of control
 3. tape threaded, LP, & EOT indication
- Data Functions**
 1. erase, write, read, capability
 2. LRC generation
 3. automatic data error recovery

REV.	
CHG	
CHK	
CHANGE NO.	
REVISIONS	

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
PARTS LIST				
UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES	DRN. <i>H. Sanderson</i>	DATE 9/15/75	 digital EQUIPMENT CORPORATION <small>MAYNARD, MASSACHUSETTS</small>	
TOLERANCES	CHK'D. <i>C. Schurda</i>	DATE 9/15/75		
DECIMALS	ENG. <i>John C. Edwards</i>	DATE 9/15/75		
ANGLES	PROJ. ENG. <i>H. Sanderson</i>	DATE 9/16/75		
.xxx = .005 .xx = .02 .x = .1	PROD. <i>J. P. ...</i>	DATE 9/16/75		
REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY $\sqrt{\quad}$	NEXT HIGHER ASSY.		TS03 SYSTEM OVERVIEW	
MATERIAL	B-DD-TS03-M			
FINISH	SCALE $\sqrt{\quad}$			
SHEET 1 OF 1		SIZE CODE CIC	NUMBER TS03-0-1	REV.
DIST.				

SIZE CODE
CIC
 NUMBER
TS03-0-1
 REV

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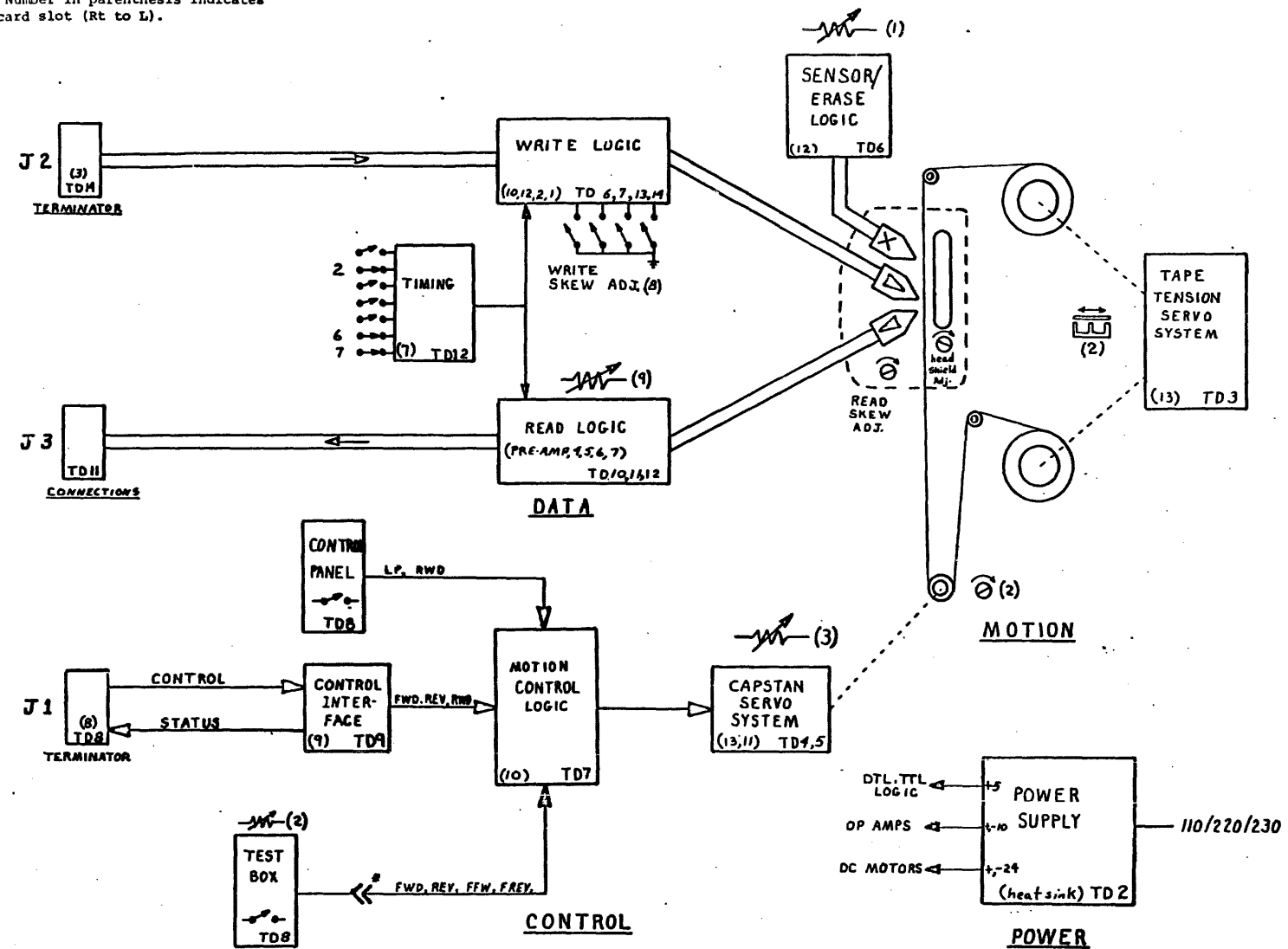
REV.	CHANGE NO.	REV.
3	TS03-00002	A
REVISED AND REDRAWN		
H. F. Edwards 29 Apr 76		
H. F. Edwards 10.2.75		

FIRST USED ON OPTION/MODEL			QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03						
DIMENSIONAL TOLERANCE			PARTS LIST			
DIMENSIONS ARE MILLIMETERS INCHES UNLESS OTHERWISE SPECIFIED			DRN. <i>H. F. Edwards</i>	DATE 9/15/75	digital	
			CHK'D. <i>J. C. Edwards</i>	DATE 9/15/75		
			ENG. <i>J. C. Edwards</i>	DATE 9/15/75		
			PROJ. ENG. <i>H. F. Edwards</i>	DATE 9/16/75		
MILLIMETERS	INCHES	ANGLES	PROD. <i>H. F. Edwards</i>	DATE 9/16/75	TITLE TS03 MODULE UTILIZATION	
M/M - ±0.10	M/M - ±0.05	90° 30'				
X.X - ±0.5	J.X - ±0.2					
X - ±2	X - ±1					
THIRD ANGLE PROJECTION	REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY ✓		NEXT HIGHER ASSY.			
MATERIAL	+ + +		B-DD-TS03-M	SIZE CODE	NUMBER	REV.
FINISH	+ + +		SCALE + + +	C MU	TS03-0-2	A
			SHEET 1 OF 1	DIST.		

REV. A
NUMBER TS03-0-2
SIZE CODE C MU

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NOTE: Number in parenthesis indicates P.C. card slot (Rt to L).

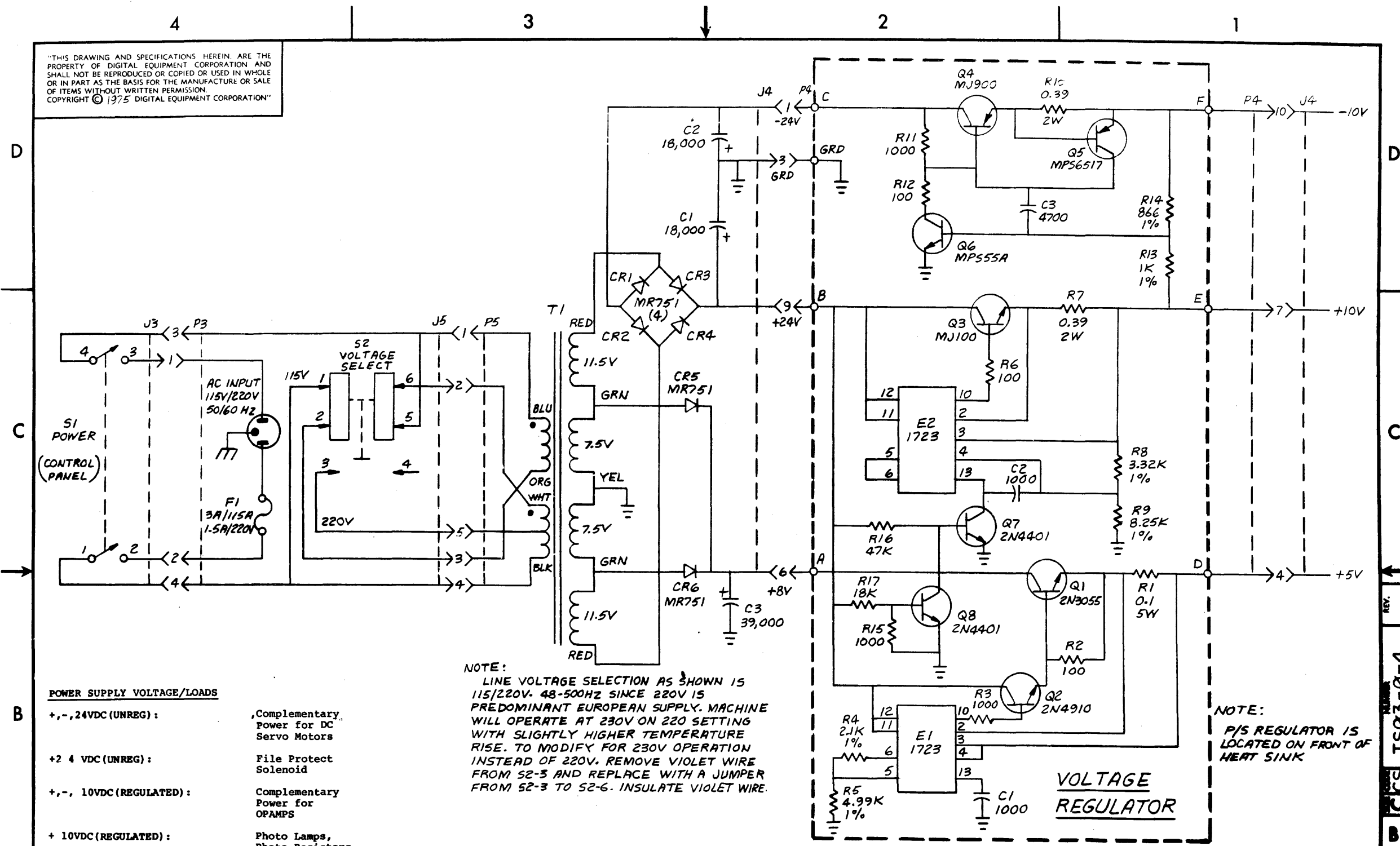


REV.	
CHANGE NO.	
CHK	

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03				
DIMENSIONAL TOLERANCE				
DIMENSIONS ARE MILLIMETERS INCHES UNLESS OTHERWISE SPECIFIED				
MILLIMETERS	INCHES	ANGLES		
X,XX = ±0.10	.XXX = ±.005	10° 30'		
X,X = ±0.5	.XX = ±.02			
X = ±2	.X = ±.1			
THIRD ANGLE PROJECTION	REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY			
MATERIAL	FINISH			
		SCALE		
		SHEET	OF	
		PARTS LIST		
DRN	DATE	digital		
CHK'D.	DATE			
ENG.	DATE			
PROJ. ENG.	DATE			
PROD.	DATE			
		TITLE		
		TS03		
		FUNCTIONAL DIAGRAM (TD1)		
		SIZE CODE	NUMBER	REV.
		CBS	TS03-0-3	
		DIST.		

REV. NUMBER TS03-0-3

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POWER SUPPLY VOLTAGE/LOADS

- | | |
|---------------------------------|---|
| +, -, 24VDC (UNREG): | Complementary Power for DC Servo Motors |
| +2.4 VDC (UNREG): | File Protect Solenoid |
| +, -, 10VDC (REGULATED): | Complementary Power for OPAMPS |
| + 10VDC (REGULATED): | Photo Lamps, Photo Resistors |
| + 5VDC (REGULATED): | TTL, DTL, CMOS, Led Power |

NOTE:
 LINE VOLTAGE SELECTION AS SHOWN IS 115/220V. 48-500HZ SINCE 220V IS PREDOMINANT EUROPEAN SUPPLY. MACHINE WILL OPERATE AT 230V ON 220V SETTING WITH SLIGHTLY HIGHER TEMPERATURE RISE. TO MODIFY FOR 230V OPERATION INSTEAD OF 220V. REMOVE VIOLET WIRE FROM S2-3 AND REPLACE WITH A JUMPER FROM S2-3 TO S2-6. INSULATE VIOLET WIRE.

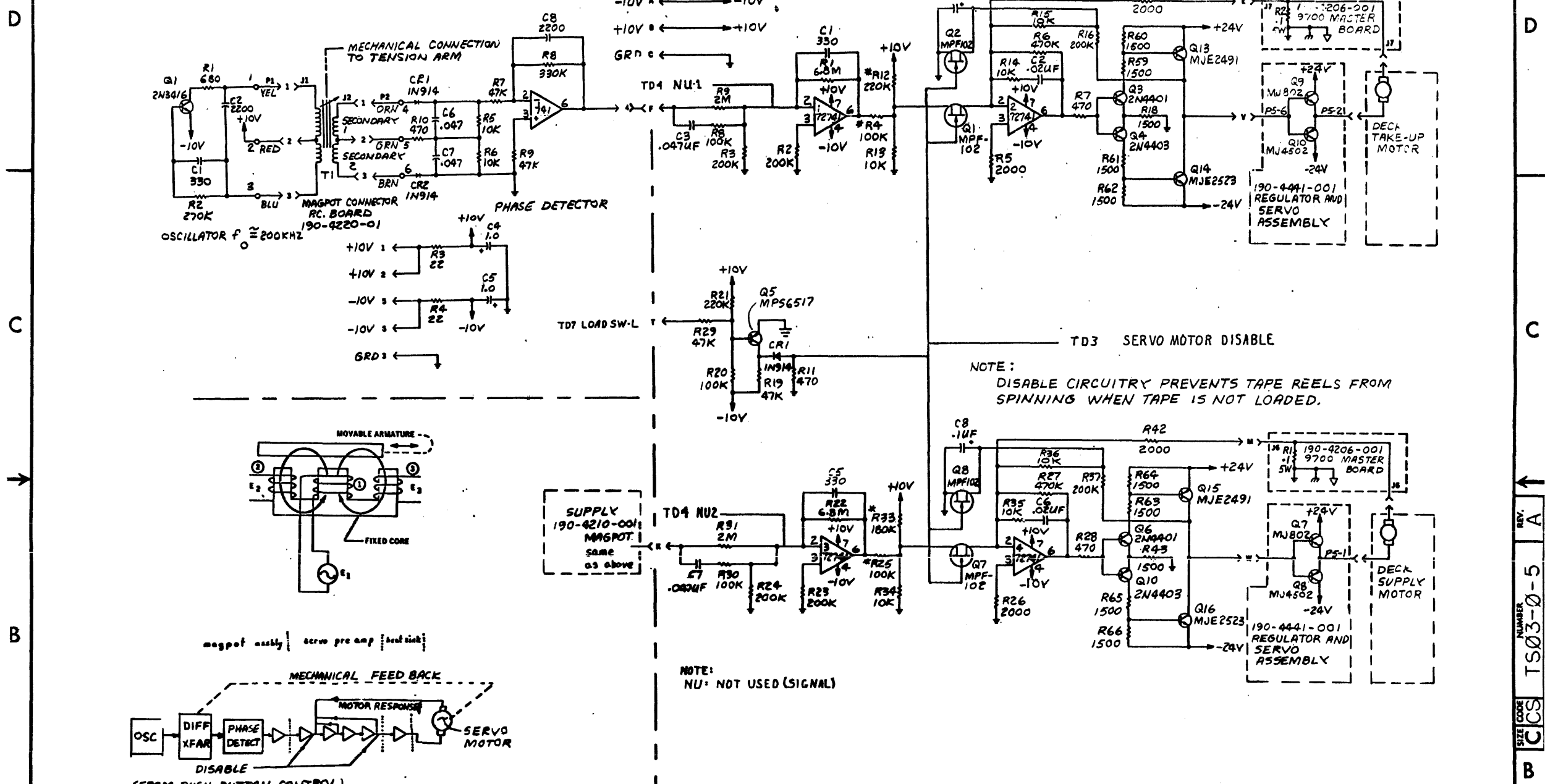
NOTE:
 P/S REGULATOR IS LOCATED ON FRONT OF HEAT SINK

REV.	CHANGE NO.

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03				
PARTS LIST				
DIMENSIONAL TOLERANCE		DRN. <i>[Signature]</i>	DATE 3 SEPT 75	digital
DIMENSIONS ARE MILLIMETERS UNLESS OTHERWISE SPECIFIED		CHK'D. <i>[Signature]</i>	DATE 7/15/75	
		ENG. <i>[Signature]</i>	DATE 7/15/75	
MILLIMETERS	INCHES	ANGLES	TITLE	
X,XX ±0.10	J,JK ±.005	45° 30'	POWER SUPPLY (TD2)	
X,X ±0.5	J,K ±.02			
X ±.2	X ±.1			
THIRD ANGLE PROJECTION	REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY ✓		NEXT HIGHER ASSY.	
MATERIAL	FINISH		SIZE CODE	NUMBER
			B-DD-TS03-M	CS TS03-0-4
			SCALE	REV.
			SHEET 1 OF 1	

REV. CCS TS03-0-4

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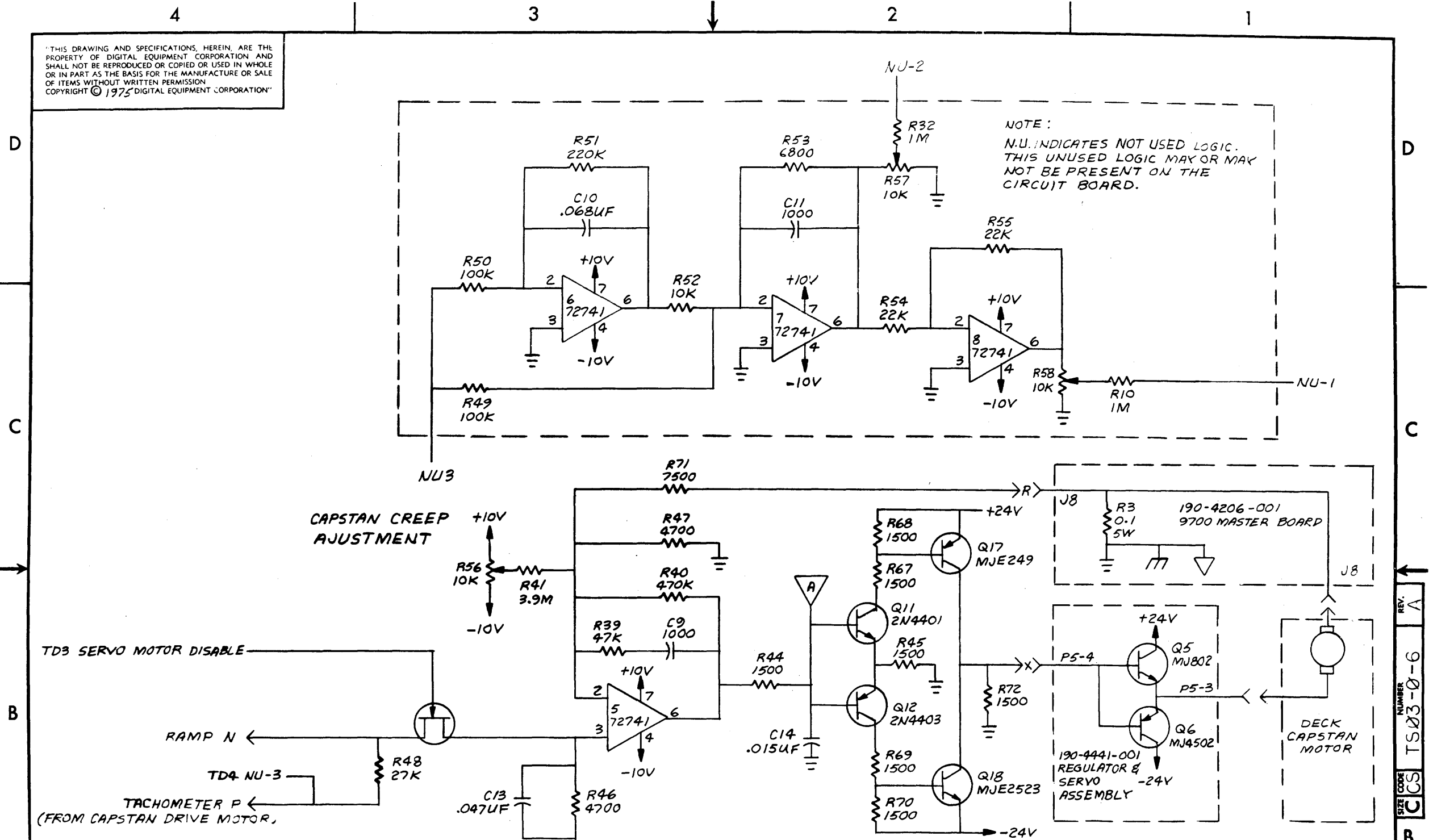


REV.	CHANGE NO.	REV.
A	TS03-0002	A
REVISED AND REDRAWN		
H. FINDEISEN		

FIRST USED ON OPTION/MODEL		QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03					
DIMENSIONAL TOLERANCE					
DIMENSIONS ARE		MILLIMETERS		INCHES	
UNLESS OTHERWISE SPECIFIED					
MILLIMETERS	INCHES	ANGLES			
XXX	±0.10	JXX	±0.005	10° 30'	
XX	±0.5	XX	±0.02		
X	±2	X	±1		
THIRD ANGLE PROJECTION	REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY		NEXT HIGHER ASSY.		
MATERIAL	FINISH		SCALE		
			SHEET 1 OF 1		
PARTS LIST			TITLE		
DRN. DATE			SERVO PREAMP		
CHK'D. DATE			TAPE TENSIONING SERVO		
ENG. DATE			(TD3)		
PROJ. ENG. DATE			SIZE CODE		
PROD. DATE			NUMBER		
			REV.		
			C/CS		
			TS03-0-5		
			A		

REV. A
NUMBER TS03-0-5
SIZE CODE C/CS

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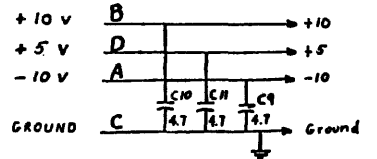
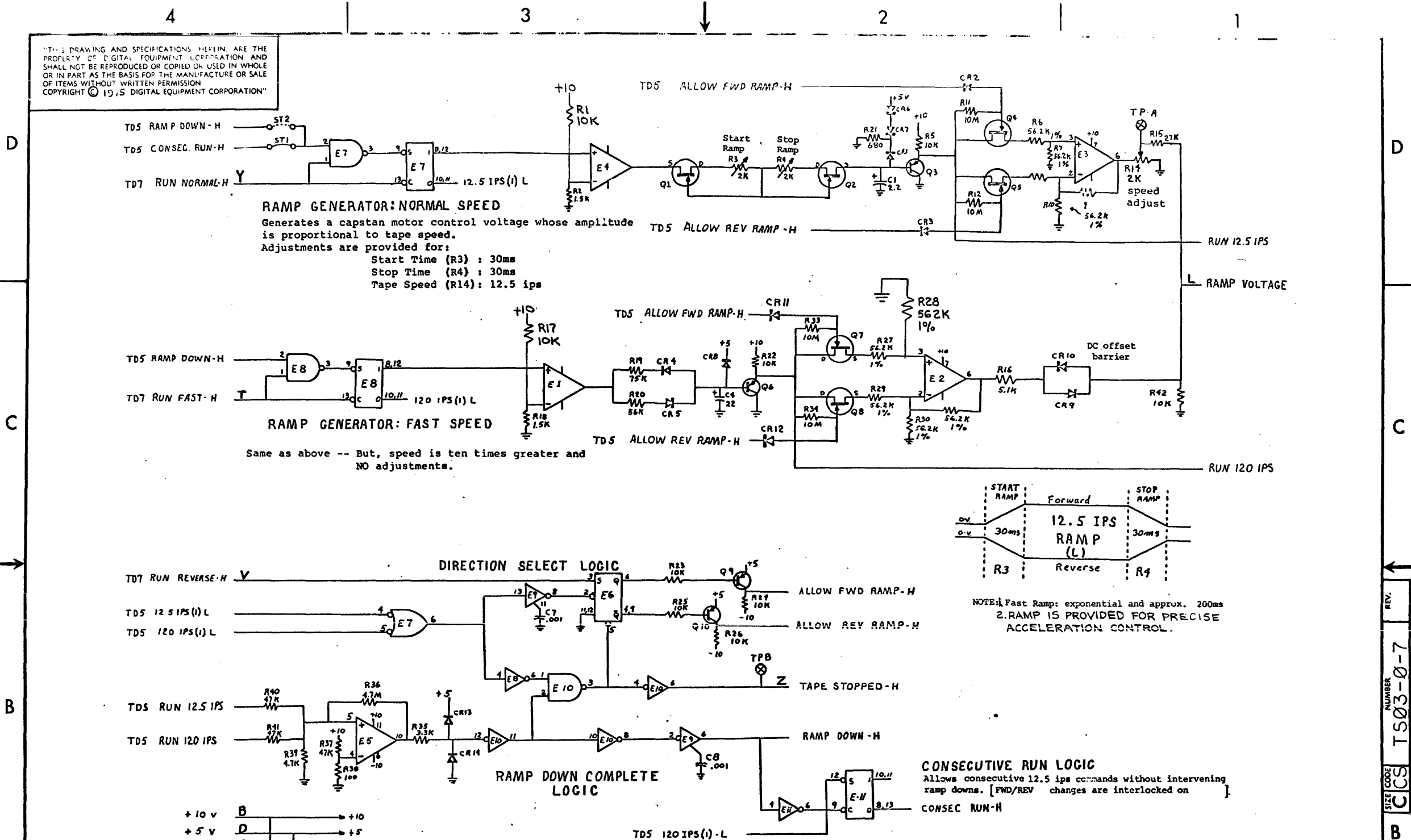


This circuitry provides power to drive the capstan motor. Power is controlled by a DC level input (RAMP VOLTAGE) which is compared to a voltage level representing actual motor speed (TACHOMETER). The error difference ensures precise speed control.

REV.	A
CHANGE NO.	TS03-00002
REVISED AND RE-DRAWN	H. F. FINDEISEN
DATE	10.2.71
CHK	38

FIRST USED ON OPTION/MODEL		QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03					
DIMENSIONAL TOLERANCE		PARTS LIST			
DIMENSIONS ARE MILLIMETERS INCHES UNLESS OTHERWISE SPECIFIED		DRN. <i>H. Findeisen</i>	DATE 3 SEPT 75	digital	
		CHK'D. <i>C. Edwards</i>	DATE 9/15/75		
MILLIMETERS	INCHES	ANGLES	ENG. <i>H. Findeisen</i>	DATE 9/15/75	TITLE
X,XX ±0.10	.XXX ±.005	90° 30'	PROJ. ENG. <i>H. Findeisen</i>	DATE 7/14/75	SERVO PREAMP CAPSTAN DRIVE SERVO (TD4)
X,X ±0.5	.XX ±.02		PROD. <i>H. Findeisen</i>	DATE 7/14/75	
X ±.2	.X ±.1		NEXT HIGHER ASSY.		
THIRD ANGLE PROJECTION	REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY ✓		MATERIAL	B-DD-TS03-M	SIZE CODE C CS
			FINISH		NUMBER TS03-0-0
					REV. A
			SCALE		
			SHEET 1 OF 1		

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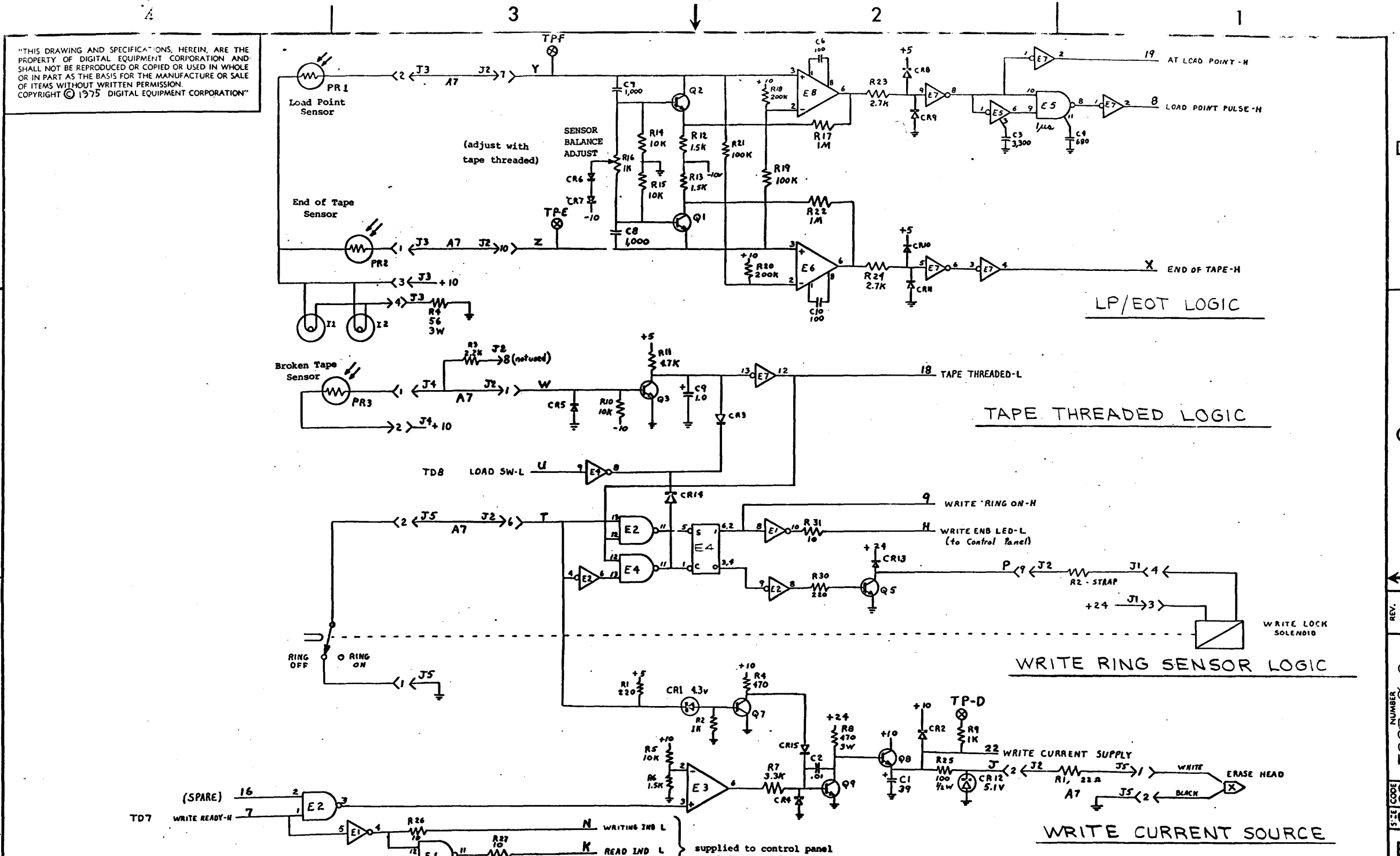


REV.	
CHANGE NO.	
REVISIONS	
CHK	

FIRST USED ON OPTION/MODEL		QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03					
DIMENSIONAL TOLERANCE		PARTS LIST			
DIMENSIONS ARE MILLIMETERS OR INCHES UNLESS OTHERWISE SPECIFIED		DRN. <i>[Signature]</i>	DATE 2 SEPT 75		
		CHK'D. <i>[Signature]</i>	DATE 9/15/75		
		ENG. <i>[Signature]</i>	DATE 9/15/75		
		PROJ. ENG. <i>[Signature]</i>	DATE 7/16/75		
THIRD ANGLE PROJECTION		REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY	PROJ. DATE 7/16/75	RAMP GENERATOR (TD5)	
MATERIAL		FINISH	NEXT HIGHER ASSY.		
SCALE		SIZE CODE		NUMBER	REV.
SHEET 1 OF 1		C CS		TS03-0-7	

REV. NUMBER TS03-0-7

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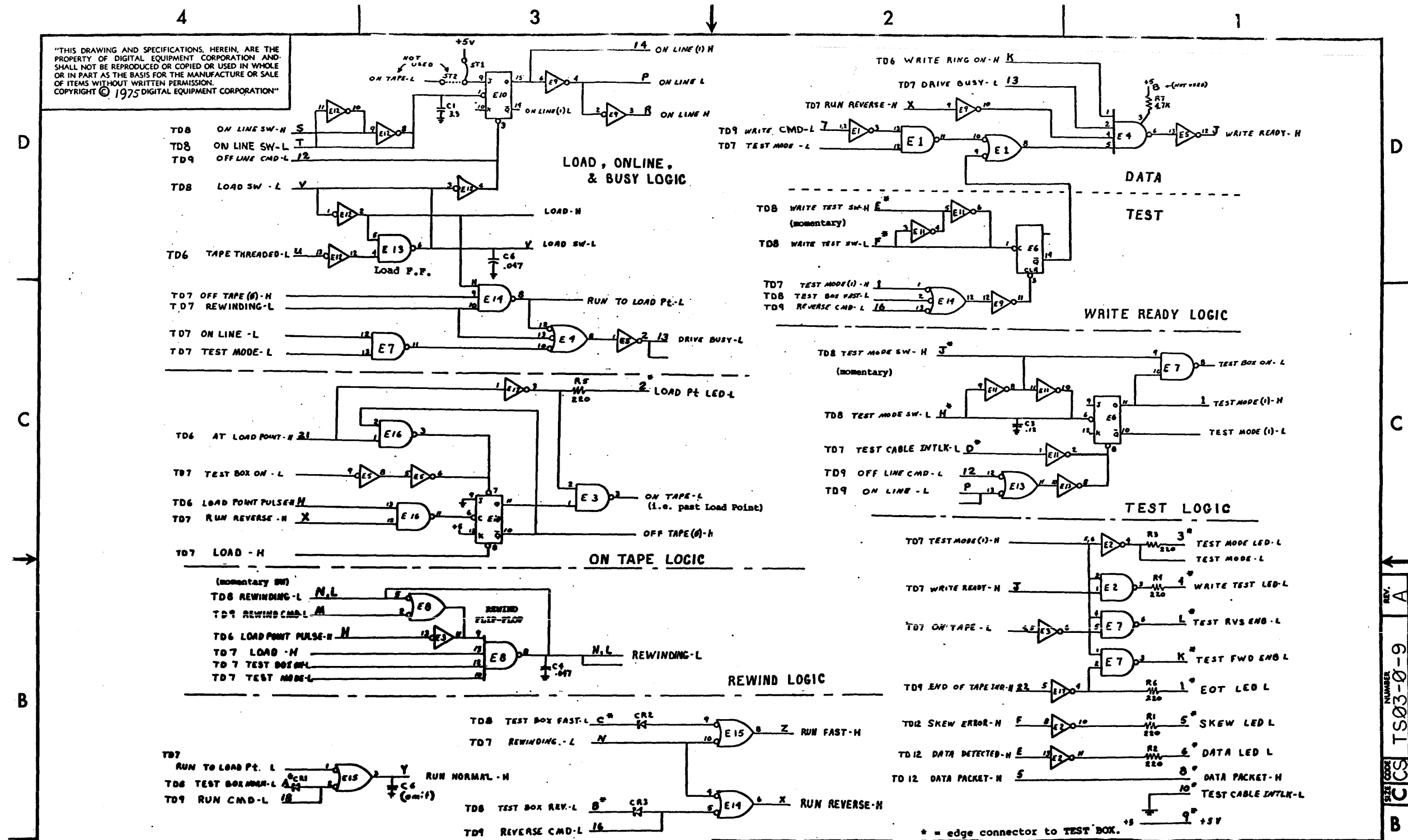


REV.	
CHANGE NO.	
CHK	

FIRST USED ON OPTION/MODEL		QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03					
DIMENSIONAL TOLERANCE		PARTS LIST			
DIMENSIONS ARE MILLIMETERS INCHES UNLESS OTHERWISE SPECIFIED		DRN.	DATE		
		CHK'D.	DATE		
		ENG.	DATE		
		PROL. ENG.	DATE		
MILLIMETERS	INCHES	ANGLES		TITLE	
XXX = ±0.10	.XXX = ±.008	90° 30'		SENSOR AMPL/DRIVER (TD6)	
XX = ±0.5	.XX = ±.02			SIZE CODE	
X = ±2	.X = ±.1			C CS	
THIRD ANGLE PROJECTION	REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY ✓	NEXT HIGHER ASSY.		NUMBER	
				TS03-0-8	
MATERIAL	FINISH	SCALE		REV.	
		SHEET 1 OF 1		DIST.	

REV. NUMBER TS03-0-8

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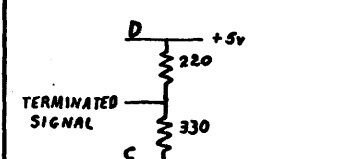
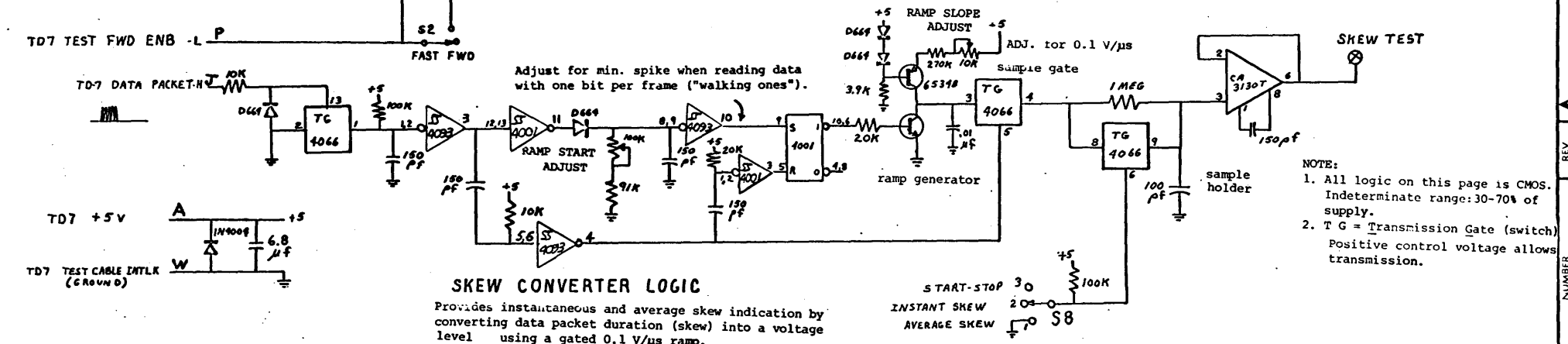
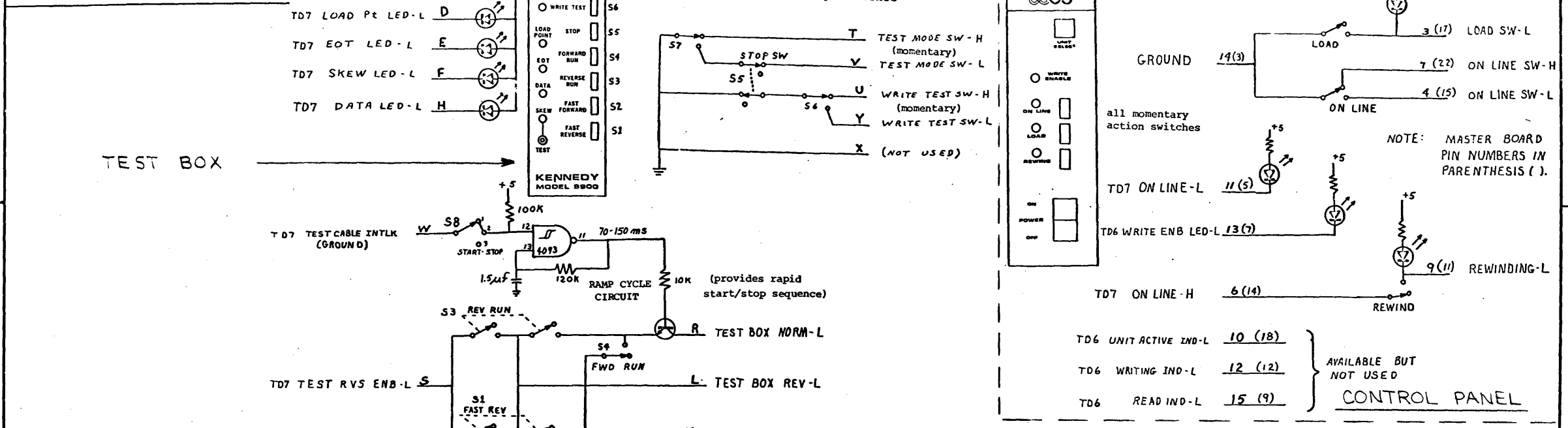


REV.	CHANGE NO.	REV.
A	TS03-00002	A

REVISED AND REDRAWN
H. Findeisen
 H. FINDEISEN

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03				
PARTS LIST				
DIMENSIONAL TOLERANCE		DRN <i>H. Findeisen</i>	DATE 8 SEPT 75	digital
DIMENSIONS ARE MILLIMETERS INCHES UNLESS OTHERWISE SPECIFIED		CHKD. <i>J. C. Edwards</i>	DATE 9/15/75	
MILLIMETERS INCHES ANGLES		ENG. <i>J. C. Edwards</i>	DATE 7/15/75	
X,XX ±0.10 JOXX ±.008 30° 30'		PROJ. ENG. <i>H. Findeisen</i>	DATE 7 16 75	
THIRD ANGLE PROJECTION		PROD. <i>H. Findeisen</i>	DATE 9 16 75	TITLE MOTION CONTROL LOGIC (TD7)
REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY ✓		NEXT HIGHER ASSY.		
MATERIAL + + +		B-DD-TS03-M	SIZE CODE C'CS	
FINISH + +		SCALE + + +	NUMBER TS03-0-9	REV. A
		SHEET 1 OF 1	DIST.	

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CONTROL		STATUS	
FWD MOT L	J1-C	E	TERM
REV MOT L	J1-E	J	TERM
RMND PLS L	J1-H	L	TERM
SEL DRIVE L	J1-J	M	(TERM ON TD9)
OFF LINE PLS - L	J1-L	P	TERM
WRE LTCH - L	J1-K	N	TERM
NOT USED			
OVER WRITE	J1-B	A	TERM
WRITE ENB.	J1-S		
TAPE RUNNING	J1-V		

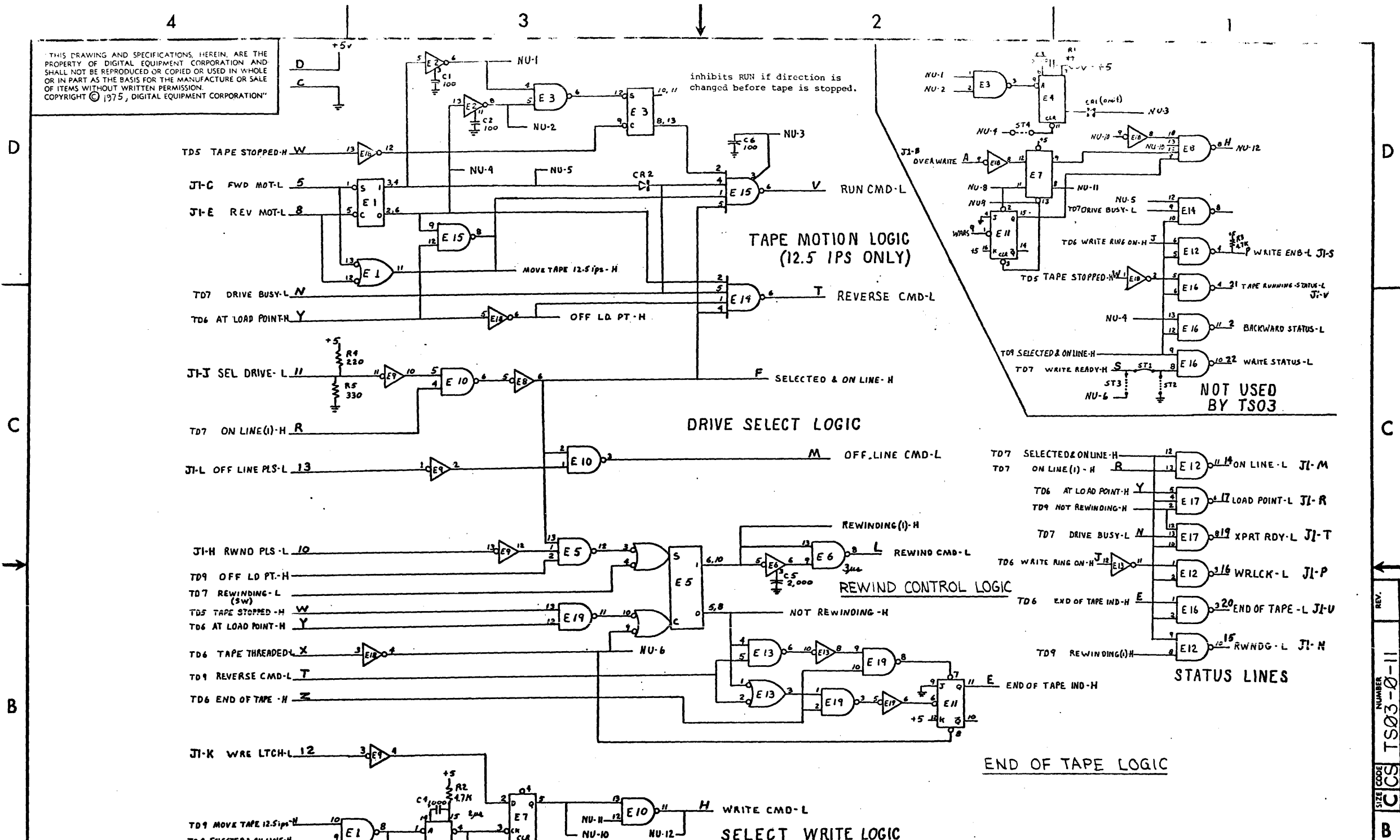
CONTROL TERMINATOR
CONTROL INPUT PIN ASSIGNMENTS

CONTROL		STATUS	
FWD MOT L	J1-C	E	TERM
REV MOT L	J1-E	J	TERM
RMND PLS L	J1-H	L	TERM
SEL DRIVE L	J1-J	M	(TERM ON TD9)
OFF LINE PLS - L	J1-L	P	TERM
WRE LTCH - L	J1-K	N	TERM
NOT USED			
OVER WRITE	J1-B	A	TERM
WRITE ENB.	J1-S		
TAPE RUNNING	J1-V		

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03				
UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES				
TOLERANCES				
DECIMALS	ANGLES			
.xxx = .005	:0° 30'			
.xx = .02				
.x = .1				
REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY V				
MATERIAL				
FINISH				
NEXT HIGHER ASSY.		PARTS LIST		
B-DD-TS03-M		digital EQUIPMENT CORPORATION MAYNARD MASSACHUSETTS		
SCALE		TITLE		
SHEET 1 OF 1		CONTROL TERMINATOR & OTHER SOURCES (TD8)		
SIZE CODE		NUMBER		
C CS		TS03-0-10		
DIST.		REV.		

REV. NUMBER TS03-0-10

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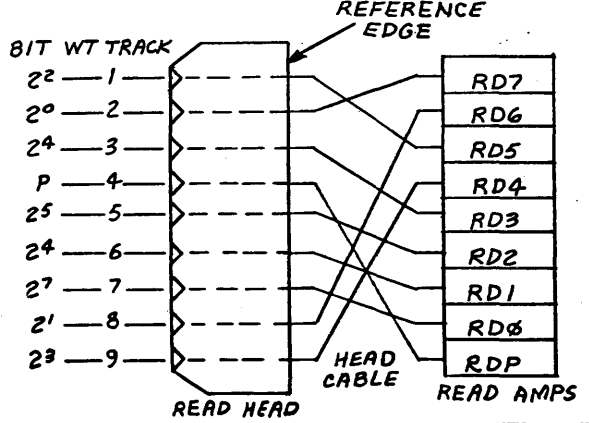
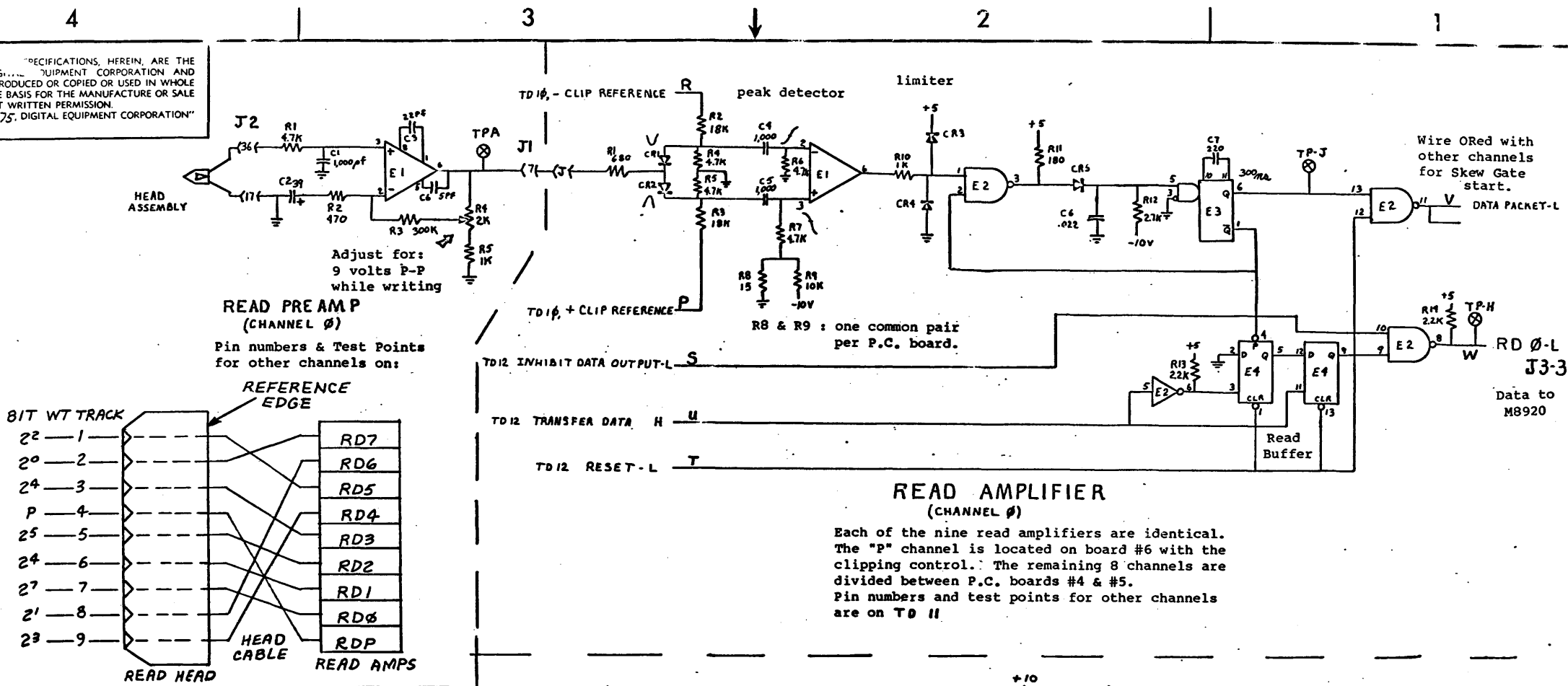


REV.	
CHANGE NO.	
CHK	

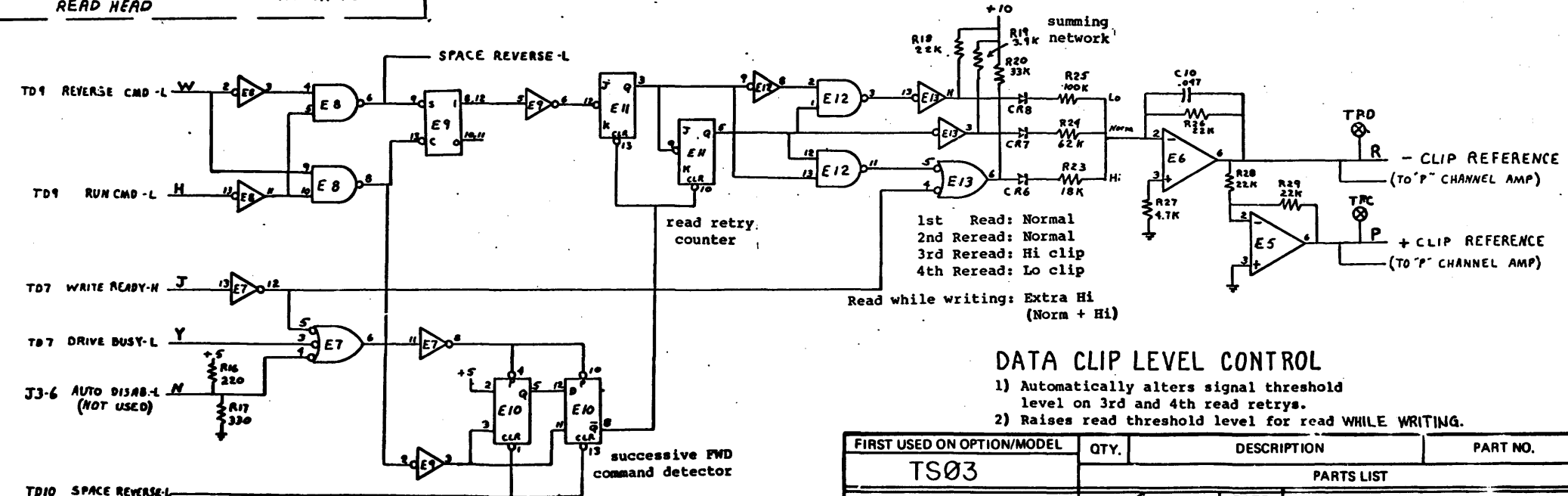
FIRST USED ON OPTION/MODEL		QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03					
DIMENSIONAL TOLERANCE		PARTS LIST			
DIMENSIONS ARE MILLIMETERS INCHES UNLESS OTHERWISE SPECIFIED		DRN. <i>H. Edwards</i>	DATE 9/5/75		
		CHK'D. <i>H. Edwards</i>	DATE 9/13/75		
		ENG. <i>H. Edwards</i>	DATE 9/15/75		
		PROJ. ENG. <i>H. Edwards</i>	DATE 9/16/75		
THIRD ANGLE PROJECTION		REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY ✓		TITLE CONTROL INTERFACE LOGIC (TD9)	
MATERIAL		NEXT HIGHER ASSY.		SIZE CODE NUMBER REV.	
FINISH		B-DD-TS03-M		C/CS TS03-0-11	
		SCALE		SHEET 1 OF 1	
		DIST.			

REV. NUMBER TS03-0-11

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READ AMPLIFIER (CHANNEL Ø)
 Each of the nine read amplifiers are identical. The "P" channel is located on board #6 with the clipping control. The remaining 8 channels are divided between P.C. boards #4 & #5. Pin numbers and test points for other channels are on TØ 11



DATA CLIP LEVEL CONTROL
 1) Automatically alters signal threshold level on 3rd and 4th read retries.
 2) Raises read threshold level for read WHILE WRITING.

REV.	CHANGE NO.	REVISIONS
A	00002	TSØ3-00002
		REVISED AND REDRAWN
		2/10/75
		H.F. INDEISEN
		pe. 2.71

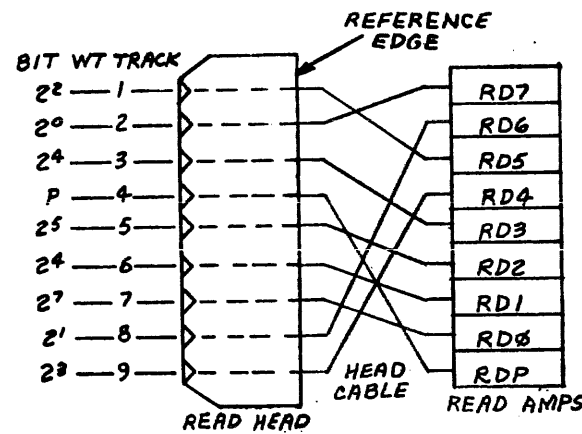
FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
TSØ3		PARTS LIST		
UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES	DRN. <i>[Signature]</i>	DATE 9 SEPT 75	digital EQUIPMENT CORPORATION MAYNARD MASSACHUSETTS	
TOLERANCES	CHK'D. <i>[Signature]</i>	DATE 9/13/75		
DECIMALS	ENG. <i>[Signature]</i>	DATE 9/15/75	TITLE READ LOGIC (TD1Ø)	
ANGLES	PROL. ENG. <i>[Signature]</i>	DATE 9/16/75		
REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY ✓	PROD. <i>[Signature]</i>	DATE 9/16/75	NUMBER B-DD-TSØ3-M	
MATERIAL	NEXT HIGHER ASSY.	SCALE	SIZE CODE	REV.
FINISH		SHEET 1 OF 1	C CS	A
			TSØ3-Ø-12	

REV. A
 NUMBER TSØ3-Ø-12
 CODE C CS
 B
 A

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READ PREAMPLIFIER PIN NUMBERS

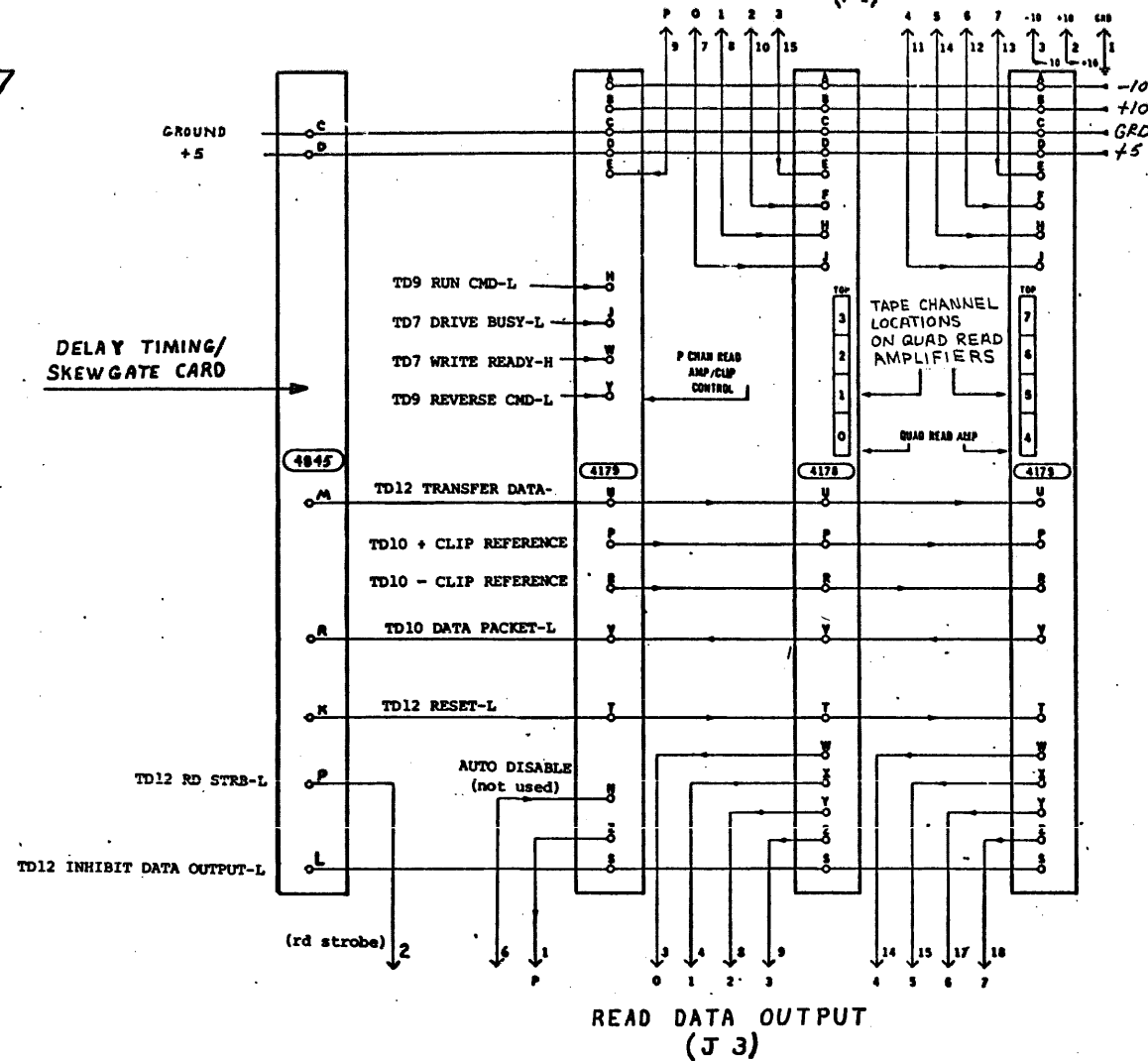
Read Channel #	Test Point	Head Connector Pin #
0	A	17,36
1	B	15,34
P	C	13,32
2	D	11,30
4	E	9,28
6	F	7,26
7	H	5,24
5	J	3,22
3	K	1,20



READ AMPLIFIER TEST POINTS

MODULE SLOT #	6	5	4
CHANNEL #	P	0,1,2,3	4,5,6,7
DATA OUTPUT	A	H,E,C,A	H,E,C,A
DATA PACKET	B	J,F,D,B	J,F,D,B

READ PREAMP CONNECTOR (P1)



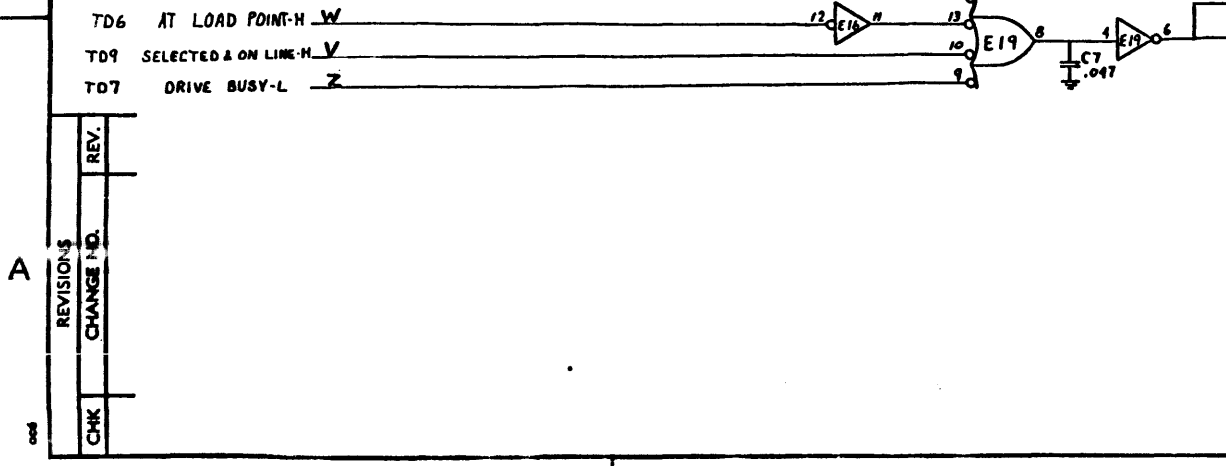
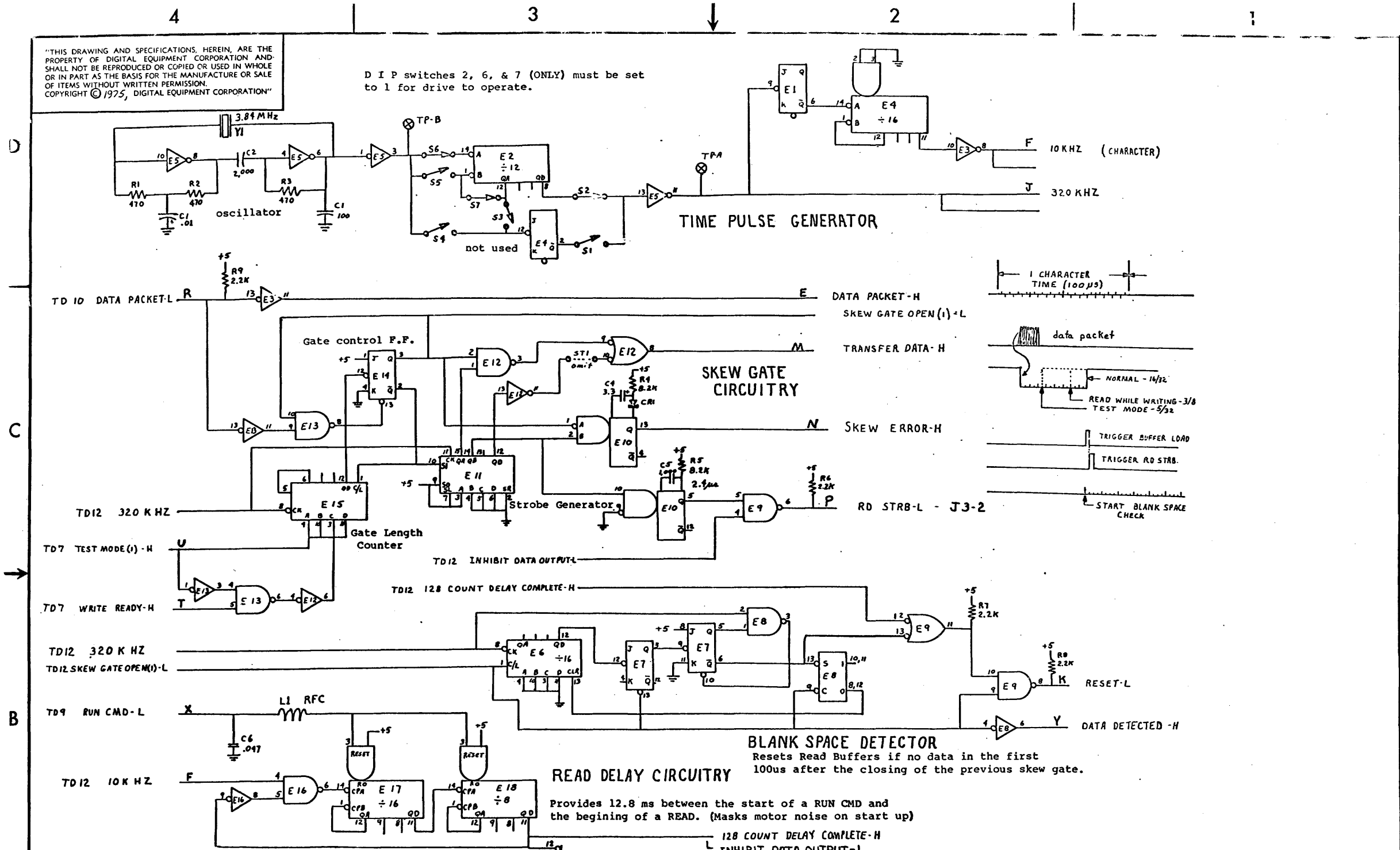
REV.	
CHANGE NO.	
CHK	

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03		PARTS LIST		
UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES	DRN. <i>H. Friedman</i>	DATE 9/15/75	 digital EQUIPMENT CORPORATION <small>MAYNARD MASSACHUSETTS</small>	
TOLERANCES	CHK'D. <i>J. C. Edwards</i>	DATE 9/15/75		
DECIMALS .xxx = .005	ENG. <i>J. C. Edwards</i>	DATE 9/15/75		
ANGLES ±0° 30'	PROJ. ENG. <i>H. Friedman</i>	DATE 9/15/75		
.xx = .02	PROD. <i>H. Friedman</i>	DATE 9/15/75	TITLE READ CONNECTIONS (TD11)	
.x = .1			NUMBER CCS TS03-0-13	
REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY ✓			REV.	
MATERIAL + + +	NEXT HIGHER ASSY.		SIZE CODE CCS	
FINISH + + +	B-DD-TS03-M		NUMBER TS03-0-13	
	SCALE + + +		REV.	
	SHEET 1 OF 1		DIST.	

REV. NUMBER
CCS TS03-0-13

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D I P switches 2, 6, & 7 (ONLY) must be set to 1 for drive to operate.

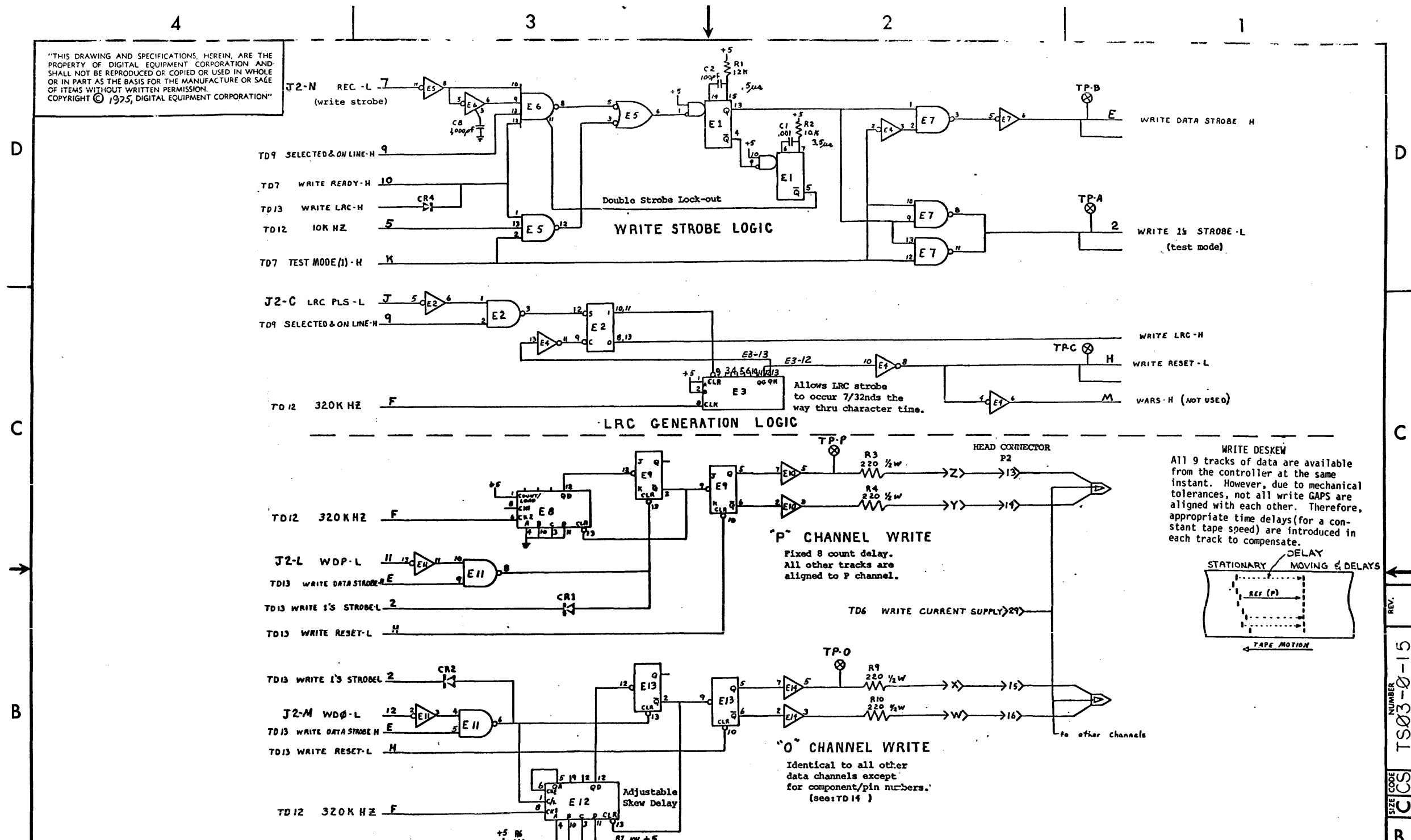


FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03				
PARTS LIST				
DIMENSIONAL TOLERANCE		DRN. <i>H. Norman</i>	DATE 9 SEPT 75	digital
DIMENSIONS ARE MILLIMETERS INCHES UNLESS OTHERWISE SPECIFIED		CHK'D. <i>C. Edwards</i>	DATE 9/15/75	
MILLIMETERS	INCHES	ENG. <i>C. Edwards</i>	DATE 9/15/75	
XXX ±0.10	XXX ±.005	PROT. ENG. <i>H. Norman</i>	DATE 7.16	
XX ±0.5	.XX ±.02	PROD. <i>H. Norman</i>	DATE 7.16.75	TITLE DELAY TIMING/ SKEW GATE (TD12)
X ±2	X ±.1			SIZE CODE C CS
THIRD ANGLE PROJECTION	REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY ✓	NEXT HIGHER ASSY.		NUMBER TS03-0-14
MATERIAL + + +				REV.
FINISH + + +				
		B-DD-TS03-M		
		SCALE + + +		
		SHEET 1 OF 1		

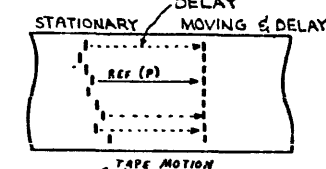
REV. NUMBER TS03-0-14

REV.	
CHANGE NO.	
CHK	

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WRITE DESKEW
 All 9 tracks of data are available from the controller at the same instant. However, due to mechanical tolerances, not all write GAPS are aligned with each other. Therefore, appropriate time delays (for a constant tape speed) are introduced in each track to compensate.



REV.	CHANGE NO.
CHK	

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03				
PARTS LIST				
DIMENSIONAL TOLERANCE		DRN.	DATE	
DIMENSIONS ARE MILLIMETERS INCHES UNLESS OTHERWISE SPECIFIED		CHK'D.	DATE	
MILLIMETERS	INCHES	ENG.	DATE	
X,XX = ±.10	.XXX = ±.005	PROJ. ENG.	DATE	
XX = ±.05	.XX = ±.02	PROD.	DATE	
X = ±.2	.X = ±.1			
THIRD ANGLE PROJECTION	REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY ✓	TITLE WRITE LOGIC 4 CHANNELS, STROBES (TD13)		
MATERIAL	FINISH	NEXT HIGHER ASSY.	SIZE CODE	NUMBER
		B-DD-TS03-M	C CS	TS03-0-15
		SCALE	DIST.	REV.
		SHEET 1 OF 1		

REV. NUMBER TS03-0-15

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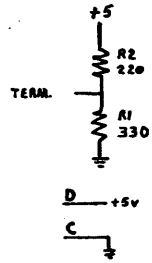
All WRITE DATA signals are terminated on DATA TERMINATOR card in SLOT 3.

Also terminated on this card:

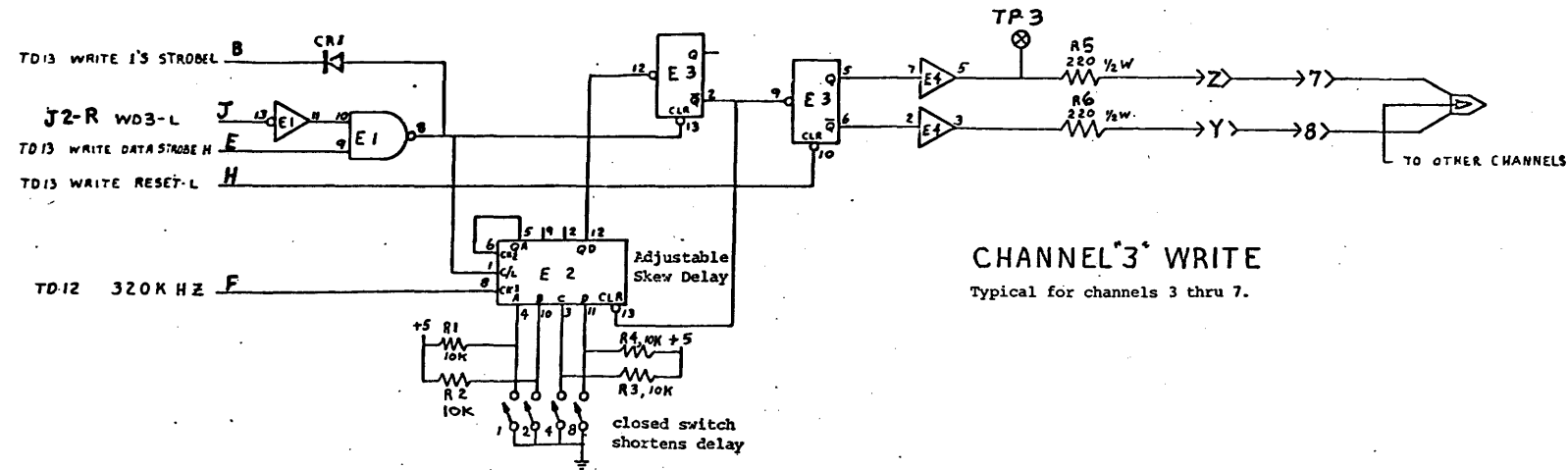
J2-C LRC PLS-L pin J

J2-N REC-L pin H

Auto Disable (not used) pin E



	Channel	Connector	Terminator	Input	Receiver	AND	Output	Head Connector
See "0" CHANNEL WRITE (TD-13) for logic and pin numbers.	0	J2-M	N	12	E11-3	E11-6	X,W	15,16
	1	J2-N	P	13	E15-11	E15-8	V,U	11,12
	2	J2-P	R	14	E15-3	E15-6	T,S	9,10
See CHANNEL "3" WRITE (below) for logic and pin numbers.	3	J2-R	Z	J	E1-11	E1-8	Z,Y	7,8
	4	J2-S	Y	K	E1-3	E1-6	X,W	5,6
	5	J2-T	X	L	E5-11	E5-8	V,U	17,18
	6	J2-U	W	M	E5-3	E5-6	T,S	3,4
	7	J2-V	V	N	E6-11	E6-8	R,P	1,2



CHANNEL 3 WRITE
Typical for channels 3 thru 7.

REVISION:	REV.
CHANGE NO.	
CHK	

FIRST USED ON OPTION/MODEL TS03	QTY.	DESCRIPTION	PART NO.	ITEM NO.
PARTS LIST				
UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES	DRN. <i>H. V. ...</i>	DATE 8 SEPT 75	digital EQUIPMENT CORPORATION MAYNARD MASSACHUSETTS	
TOLERANCES	CHK'D. <i>J. C. Edwards</i>	DATE 7/15/75		
DECIMALS .xxx = .005	ENG. <i>J. C. Edwards</i>	DATE 7/15/75	TITLE WRITE LOGIC 5 CHANNELS (TD14)	
ANGLES ±0° 30'	PROJ. ENG. <i>H. F. ...</i>	DATE 7/16/75		
REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY V	PROD. <i>H. F. ...</i>	DATE 7/16/75	SIZE CODE NUMBER REV. C CS TS03-0-16	
MATERIAL + +	NEXT HIGHER ASSY.	SCALE + + +		
FINISH + +	B-DD-TS03-M	SHEET 1 OF 1		

REV. NUMBER TS03-0-16

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TS03 SIGNAL GLOSSARY

SERVO LOOP (TD-3)	
Servo Motor Disable	TD4
<hr/>	
RAMP GENERATOR (TD5)	
12.5 IPS (1) L	
RUN 12.5 IPS	
RAMP VOLT	TD4
120 IPS (1) L	
RUN 120 IPS	
ALLOW FWD RAMP	
ALLOW REV RAMP	
TAPE STOPPED-H	TD9
RAMP DOWN-H	
CONSEC RUN-H	
<hr/>	
SENSOR LOGIC (TD6)	
AT LOAD POINT-H	TD7,9,12
LOAD POINT PULSE-H	TD7
END OF TAPE-H	TD9
TAPE THREADED-L	TD7,9
WRITE RING ON-H	TD7,9
WRITE ENB LED L	TD8
WRITE SUPPLY CURRENT	
WRITING IND L	TD8
READ IND L	TD8
UNIT ACTIVE IND L	TD8
<hr/>	
MOTION CONTROL LOGIC (TD7)	
ON LINE (1) H	TD9
ON LINE L	TD8
ON LINE H	TD8
LOAD -H	
* LOAD SW -L	TD3,6,7
LOAD PT LED-L	TD8
RUN TO LOAD PT -L	
DRIVE BUSY-L	TD6,7,9,10,12
* REWINDING - L	TD7,8
RUN NORMAL - H	TD5
RUN FAST - H	TD5
RUN REVERSE - H	TD5,7
WRITE READY - H	TD6,7,10,12,13

MOTION CONTROL LOGIC (cont.)	
TEST BOX ON-L	TD7
TEST MODE (1) -H	TD7,12,13
TEST MODE (1) -L	
TEST MODE LED - L	TD8
TEST MODE - L	TD8
WRITE TEST LED - L	TD8
TEST RVS ENB - L	TD8
TEST FWD ENB - L	TD8
EOT LED - L	TD8
SKEW LED - L	TD8
DATA LED - L	TD8
TEST PULSE - H	TD7,8
TEST CABLE INTLK - L	
OFF TAPE (β) -H	
<hr/>	
CONTROL SOURCES (TD8)	
TEST MODE SW - L	TD7
TEST MODE SW - H	TD7
WRITE TEST SW - L	TD7
WRITE TEST SW - H	TD7
TEST BOX REV - L	TD7
TEST BOX NORM - L	TD7
TEST BOX FAST - L	TD7
*LOAD SW - L	TD3,6,7
ON LINE SW - H	TD7
ON LINE SW - L	TD7
* REWINDING - L	TD7,8
<hr/>	
CONTROL INTERFACE LOGIC (TD9)	
RUN CMD-L	TD7,10,12
REVERSE CMD-L	TD7,10
MOVE TAPE 12.4 IPS-H	
OFF LD PT-H	
SELECTED & ON LINE-H	TD6,12,13
OFF LINE CMD -L	TD7
REWINDING (1) -H	
REWIND CMD -L	
NOT REWINDING -H	
END OF TAPE IND-H	TD9
WRITE CMD - L	TD7
ON LINE - L	
LOAD POINT - L	
XPRY RDY - L	
WRICK - L	
END OF TAPE - L	
RWINDG - L	

READ LOGIC (TD10)	
DATA PACKET -L	TD12
RDβ - L	
SPACE REVERSE - L	
- CLIP REFERENCE	TD11
+ CLIP REFERENCE	TD11
<hr/>	
DELAY TIMING (TD12)	
10 K HZ	TD13
320 K HZ	TD13
TEST PULSE H	
SKEW GATE OPEN (1) - L	
TRANSFER DATA - H	TD10,11
SKEW ERROR - H	
RD STROBE - L	
RESET - L	TD10,11
DATA DETECTED - H	
128 COUNT DELAY COMPLETE - H	
INHIBIT DATA OUTPUT - L	TD10,11
<hr/>	
WRITE LOGIC (TD13)	
WRITE DATA STROBE	TD14
WRITE 1's STROBE - L	TD14
WRITE LRC - H	
WRITE RESET - L	
WARS - H	

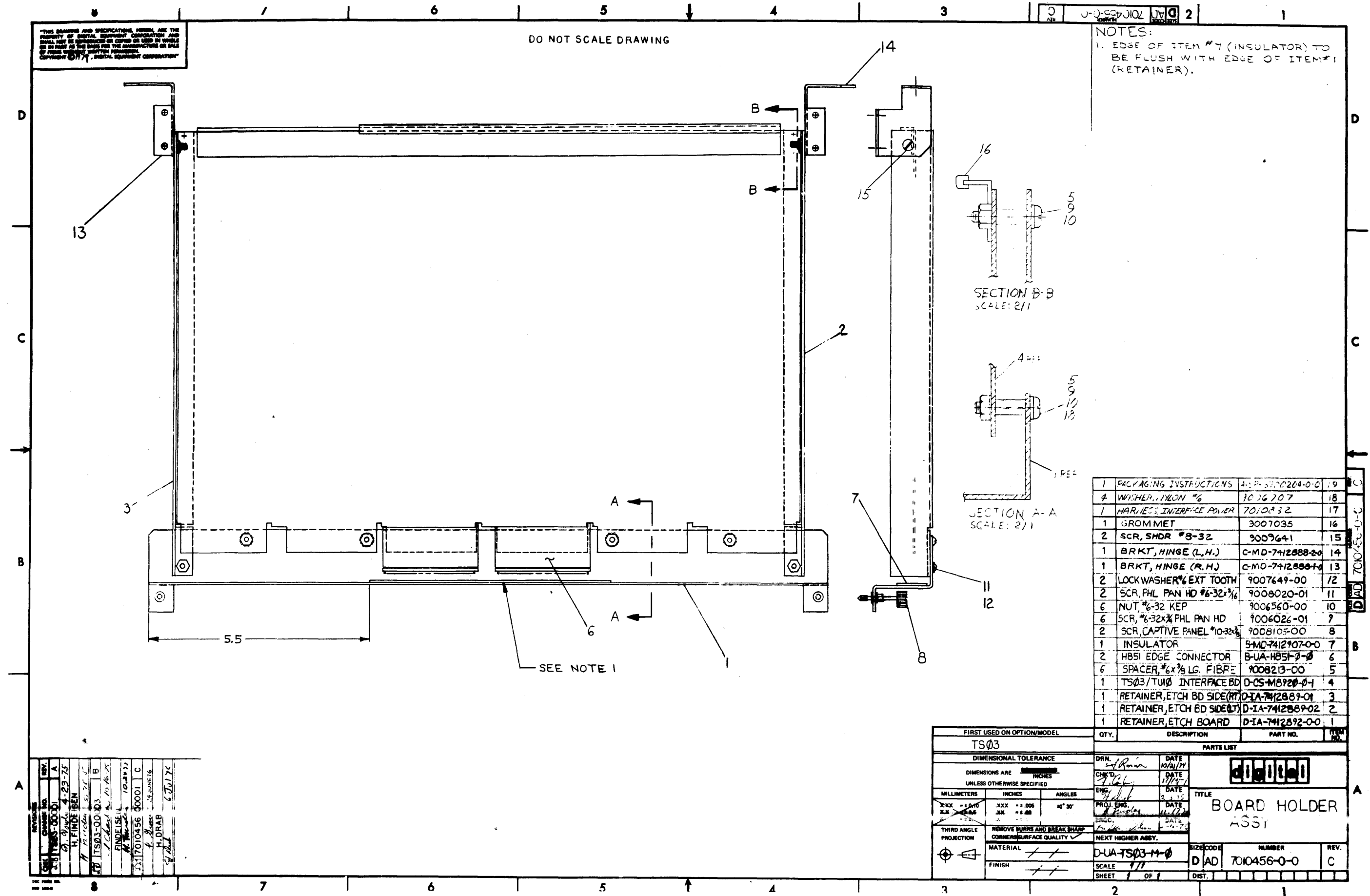
REV.	
CHG	

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
TS03		PARTS LIST		
UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES	DRN. <i>H. Friedman</i>	DATE 9 SEPT 75	 digital EQUIPMENT CORPORATION <small>MAYNARD MASSACHUSETTS</small>	
TOLERANCES	CHK'D. <i>J. C. Edwards</i>	DATE 9/15/75		
DECIMALS	ENG. <i>J. C. Edwards</i>	DATE 9/15/75		
ANGLES	PROJ. ENG. <i>H. Friedman</i>	DATE 7-2-75		
.xxx = .005	TITLE		TS03	
.xx = .02	SIGNAL GLOSSARY			
.x = .1	REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY √			
MATERIAL	NEXT HIGHER ASSY.	SIZE CODE	NUMBER	REV.
+ + +	B-DD-TS03-M	CAR	TS03-0-17	
FINISH	SCALE + + +	DIST.		
+ + +	SHEET 1 OF 1			

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DO NOT SCALE DRAWING

NOTES:
 1. EDGE OF ITEM #7 (INSULATOR) TO BE FLUSH WITH EDGE OF ITEM #1 (RETAINER).



QTY.	DESCRIPTION	PART NO.	ITEM NO.
1	PACKAGING INSTRUCTIONS	4-SP-370204-0-0	19
4	WASHER, NYLON #6	1016707	18
1	HARNESS INTERFACE POWER	7010832	17
1	GROMMET	3007035	16
2	SCR, SHDR #8-32	9009641	15
1	BRKT, HINGE (L.H.)	C-MD-7412888-20	14
1	BRKT, HINGE (R.H.)	C-MD-7412888-10	13
2	LOCK WASHER #6 EXT TOOTH	9007649-00	12
2	SCR, PHL PAN HD #6-32x3/8	9008020-01	11
6	NUT, #6-32 KEP	9006560-00	10
6	SCR, #6-32x3/8 PHL PAN HD	9006026-01	9
2	SCR, CAPTIVE PANEL #10-32x3/8	9008105-00	8
1	INSULATOR	B-MD-7412907-0-0	7
2	H851 EDGE CONNECTOR	B-UA-H851-0-0	6
6	SPACER, #6x3/8 LG. FIBRE	9008213-00	5
1	TS03/TUI0 INTERFACE BD	D-CS-M8920-0-1	4
1	RETAINER, ETCH BD SIDE (RT)	D-IA-7412889-01	3
1	RETAINER, ETCH BD SIDE (LT)	D-IA-7412889-02	2
1	RETAINER, ETCH BOARD	D-IA-7412892-00	1

FIRST USED ON OPTION/MODEL		PARTS LIST	
TS03		DRN. <i>sd Rain</i>	DATE 10/21/74
DIMENSIONAL TOLERANCE		CHK'D <i>sd Rain</i>	DATE 11/15/74
DIMENSIONS ARE INCHES UNLESS OTHERWISE SPECIFIED		ENG. <i>sd Rain</i>	DATE 2-3-75
MILLIMETERS		PROJ. ENG. <i>sd Rain</i>	DATE 11/15/74
XXX = ±.010	XXX = ±.005	ENGR. <i>sd Rain</i>	DATE 11/15/74
XXX = ±.005	XXX = ±.002	THIRD ANGLE PROJECTION	
XXX = ±.002	XXX = ±.001	REMOVE BURRS AND BREAK SHARP CORNERS/SURFACE QUALITY	
MATERIAL		NEXT HIGHER ASSY.	
FINISH		SIZE CODE	NUMBER
		D-UA-TS03-M-0	D AD 7010456-0-0
		SCALE 1/1	REV. C
		SHEET 1 OF 1	DIST.

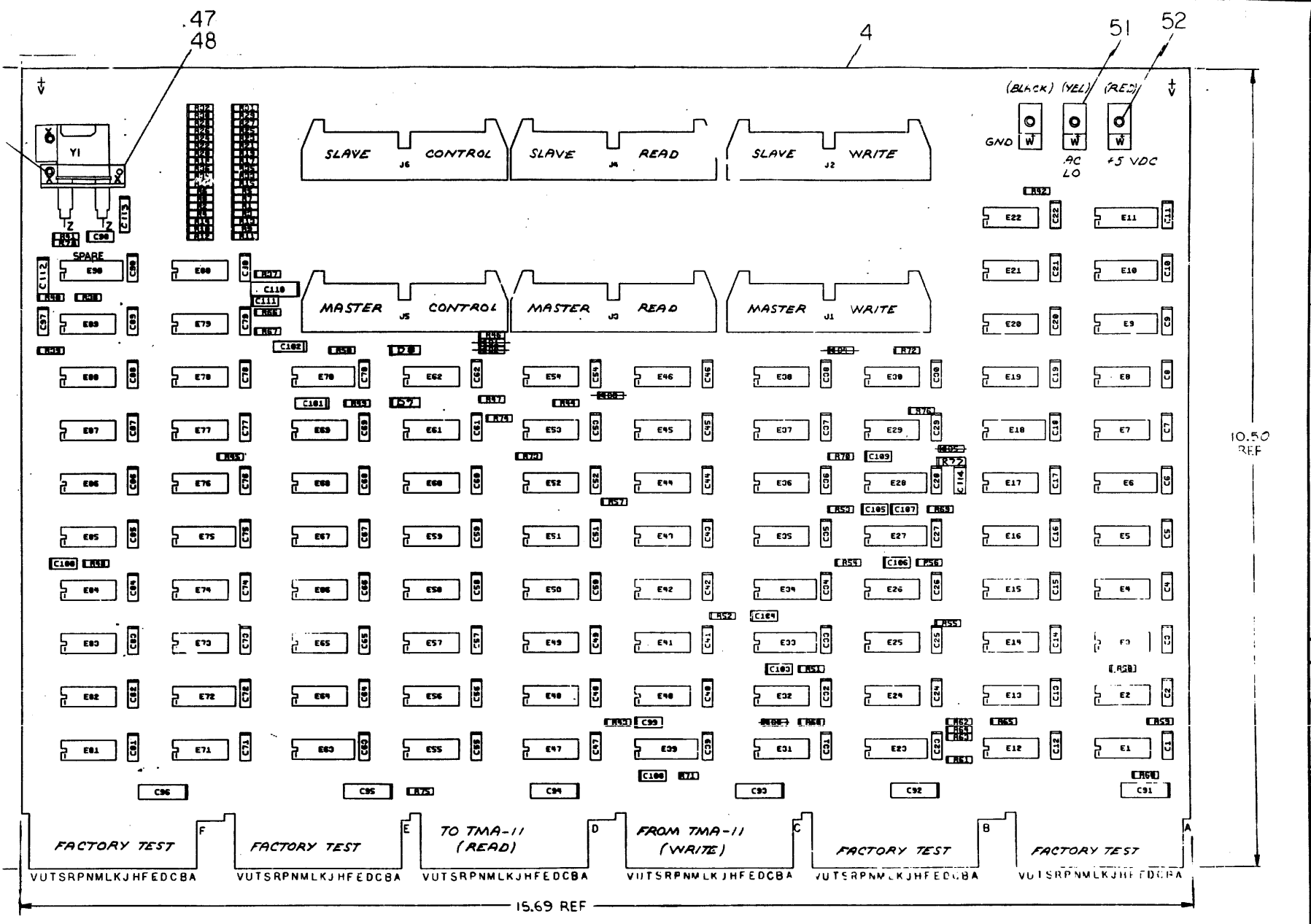
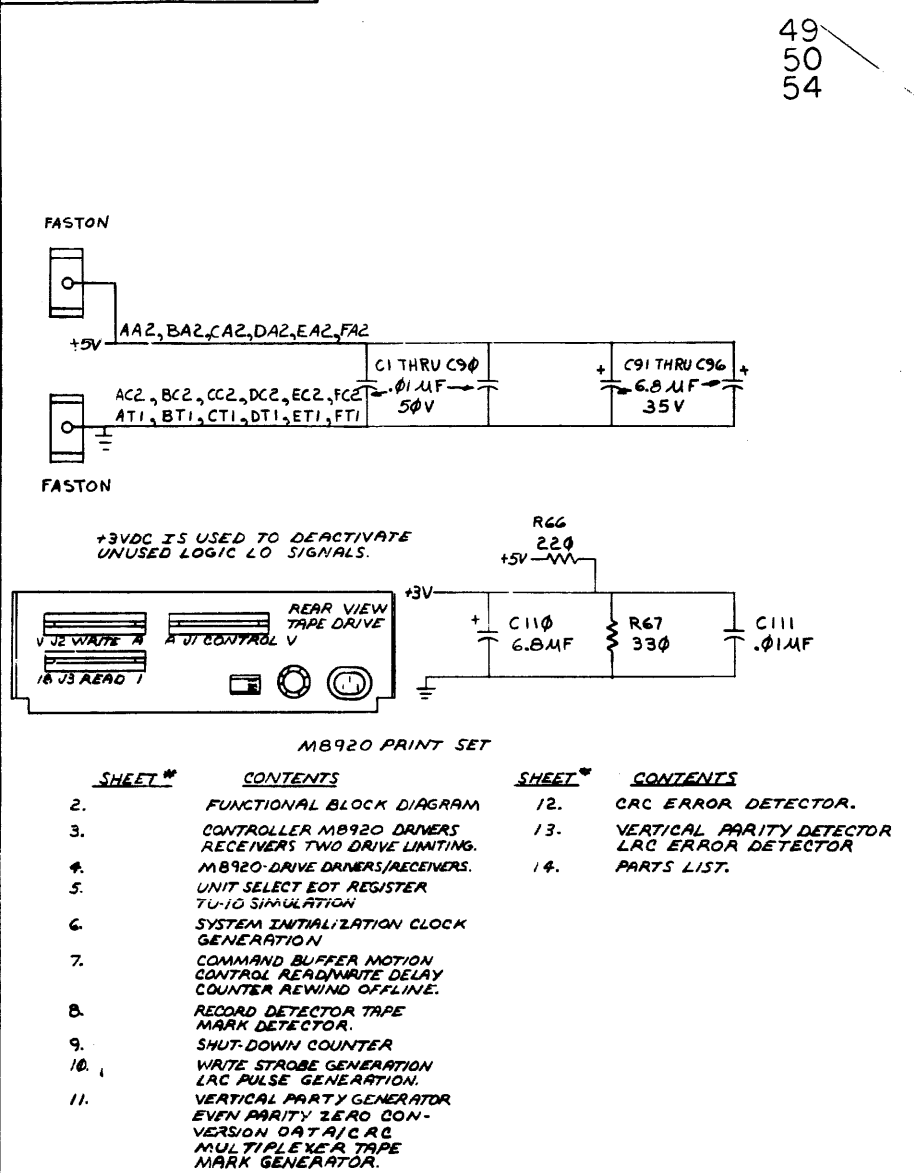
REV.	DATE	BY	CHK'D
A	4-23-75	H. FINDEISEN	
B	10-21-74	H. FINDEISEN	
C	10-21-74	H. FINDEISEN	
D	10-21-74	H. FINDEISEN	
E	10-21-74	H. FINDEISEN	
F	10-21-74	H. FINDEISEN	
G	10-21-74	H. FINDEISEN	
H	10-21-74	H. FINDEISEN	
I	10-21-74	H. FINDEISEN	
J	10-21-74	H. FINDEISEN	
K	10-21-74	H. FINDEISEN	
L	10-21-74	H. FINDEISEN	
M	10-21-74	H. FINDEISEN	
N	10-21-74	H. FINDEISEN	
O	10-21-74	H. FINDEISEN	
P	10-21-74	H. FINDEISEN	
Q	10-21-74	H. FINDEISEN	
R	10-21-74	H. FINDEISEN	
S	10-21-74	H. FINDEISEN	
T	10-21-74	H. FINDEISEN	
U	10-21-74	H. FINDEISEN	
V	10-21-74	H. FINDEISEN	
W	10-21-74	H. FINDEISEN	
X	10-21-74	H. FINDEISEN	
Y	10-21-74	H. FINDEISEN	
Z	10-21-74	H. FINDEISEN	

BOARD HOLDER ASSY

SIZE CODE: D AD
 NUMBER: 7010456-0-0
 REV: C

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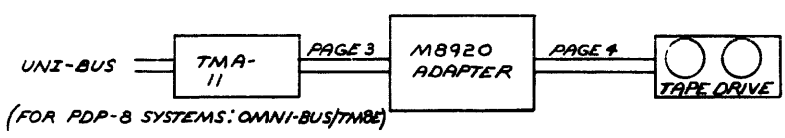
NOTES:
 1. UNLESS OTHERWISE SPECIFIED:
 A. RESISTORS ARE 1/4 W ±5%



IC TYPE	QTY	LOC
74175	8	16
74174	8	16
74123	8	16
8266	8	16
8640	1	8
384	1	8
IC TYPE	QTY	LOC

QTY AND BY ARE USUALLY PIN 7 AND 14 RESPECTIVELY EXCEPT WHERE STATED ABOVE

IC PIN LOCATIONS



NOTES:
 1. POWER FOR THIS MODULE IS DERIVED FROM AN EXTERNAL POWER SUPPLY (M720)
 2. THE TMA-11 CONNECTION USES A DUAL HEIGHT CONNECTOR (HBS1) ATTACHED TO A UNIBUS TYPE CABLE.

QTY	REF. DESIGNATION	DESCRIPTION	PART NO.	ITEM NO.
	TS03-M	ETCH BOARD REV. C		

DATE: 2-14-75
 DATE: 2/18/75
 DATE: 2/18/75
 DATE: 2/18/75

digital

TITLE: TS03-TUIOM INTERFACE (TTII)

NUMBER: M8920-0-1

REV. B

SCALE: 1:1

SHEET: 14

DATE: 2-14-75

DRG: S. Jove

CHKD: [Signature]

ENL: [Signature]

PROJ. ENR: [Signature]

PROD: [Signature]

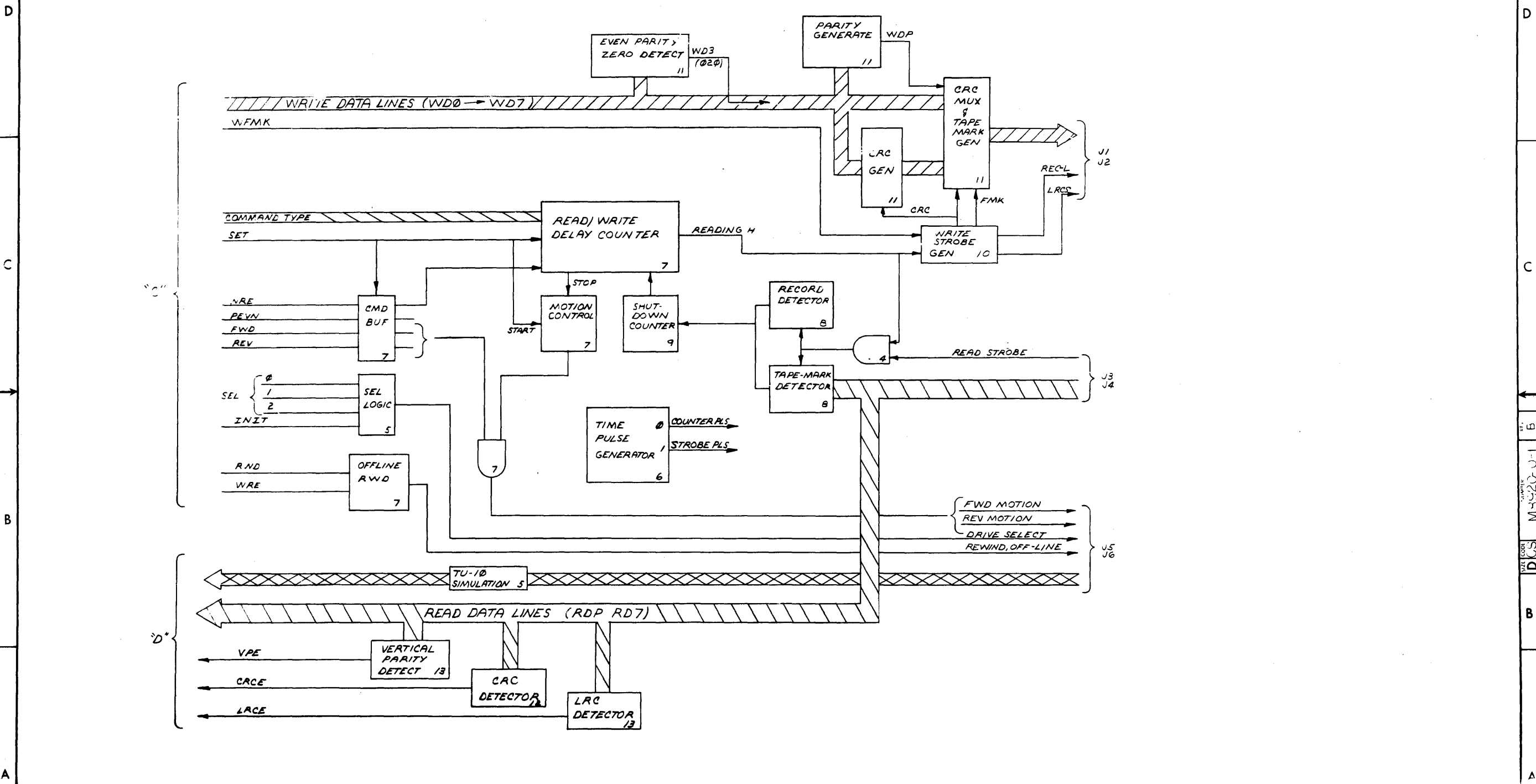
NEXT HIGHER ASSY: [Signature]

DEC NO. EIA NO. DEC NO. EIA NO.

SEMICONDUCTOR CONVERSION CHART

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8 7 6 5 4 3 2 1



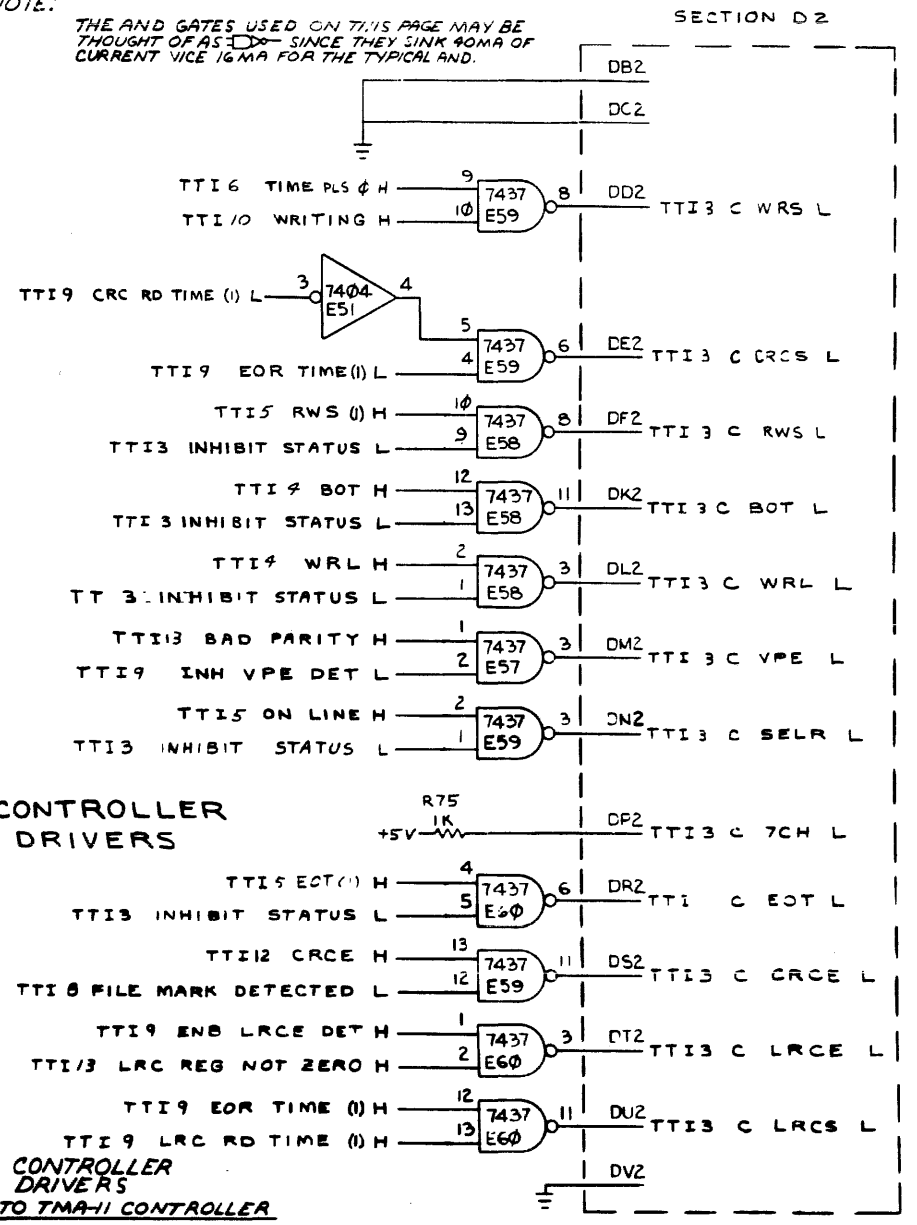
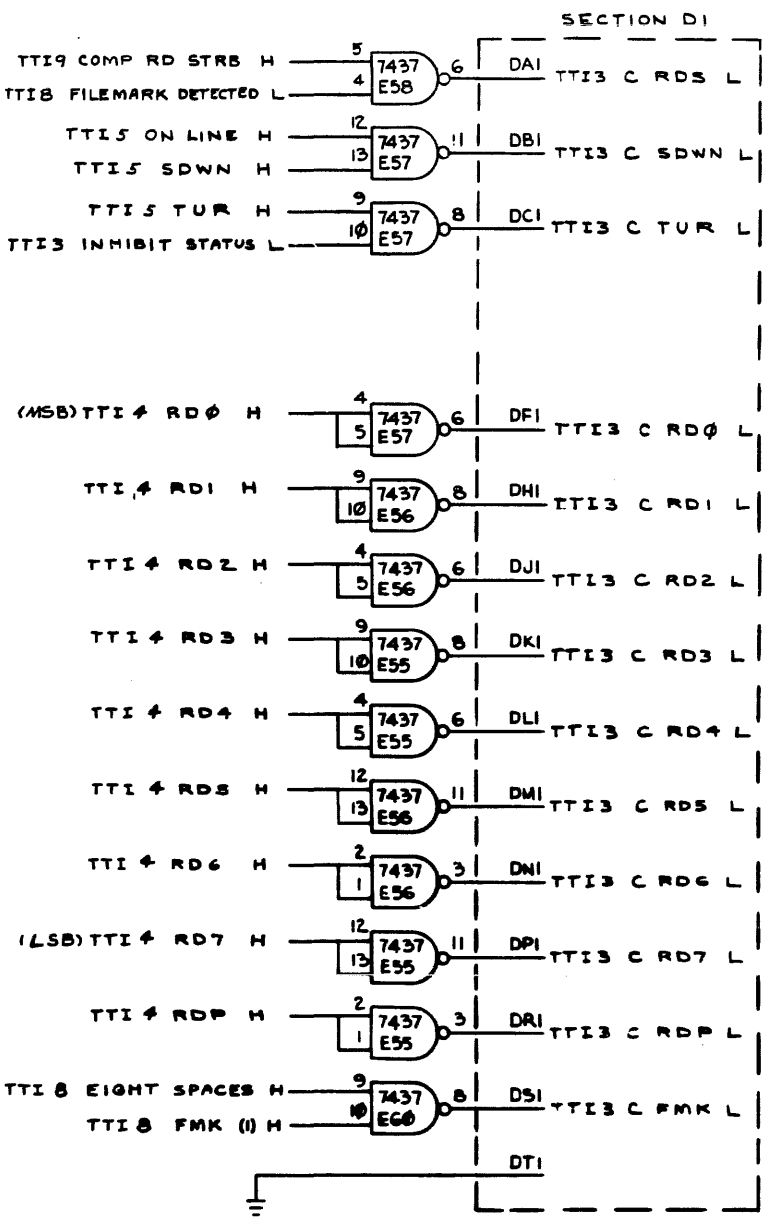
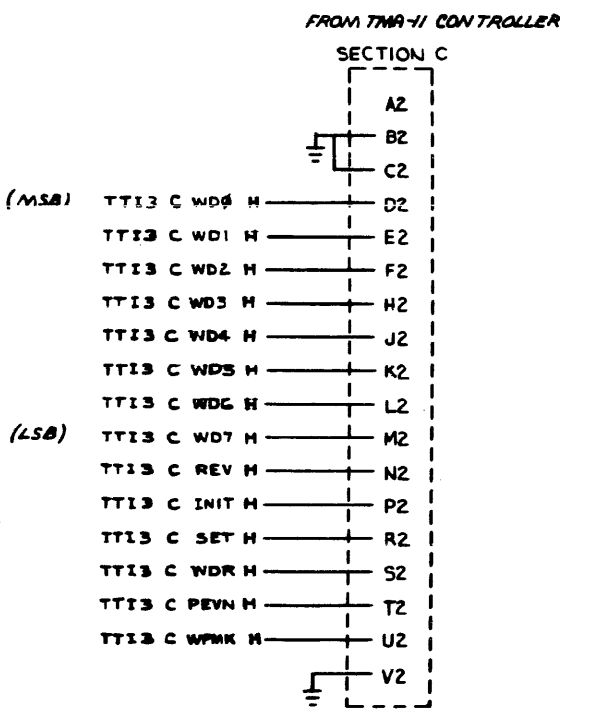
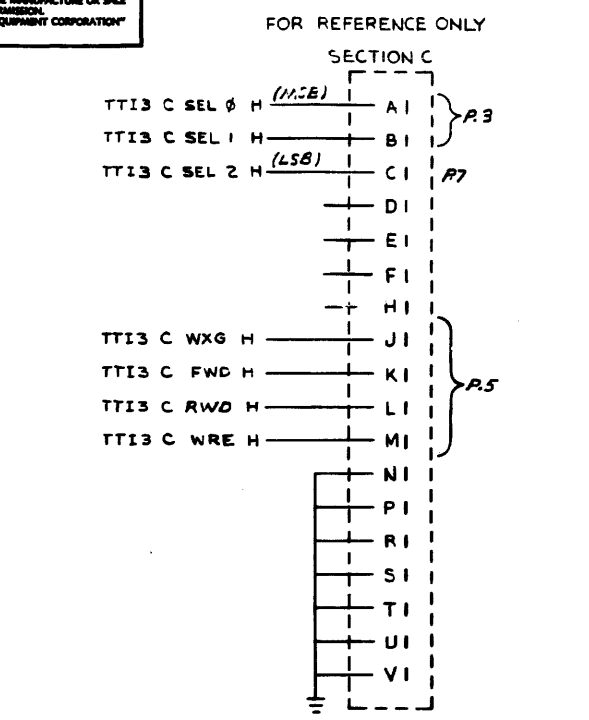
REV. 10/75 M8920-0-1 B

REVISIONS		
CHK	CHANGE NO.	REV.

TITLE TS03 TU10M INTERFACE (TT12) SIZE CODE DCS NUMBER M8920-0-1
 SCALE SHEET 2 OF 14 DIST.

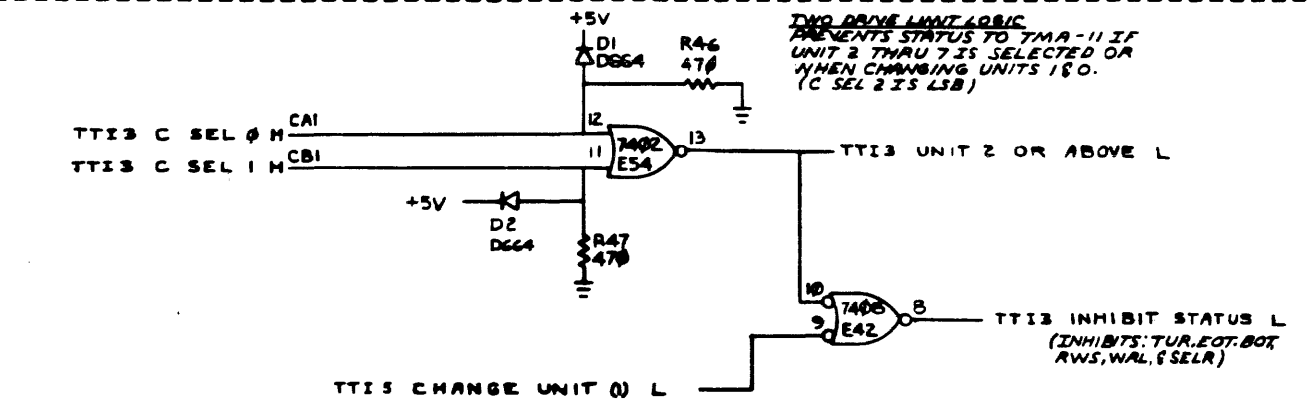
8 7 6 5 4 3 2 1

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NOTE: THE AND GATES USED ON THIS PAGE MAY BE THOUGHT OF AS "OR" SINCE THEY SINK 40MA OF CURRENT VICE 16MA FOR THE TYPICAL AND.

CONTROLLER DRIVERS
CONTROLLER DRIVERS TO TMA-11 CONTROLLER



TWO DRIVE UNIT LOGIC PRESENTS STATUS TO TMA-11 IF UNIT 2 THRU 7 IS SELECTED OR WHEN CHANGING UNITS IS 0. (C SEL 2 IS LSB)

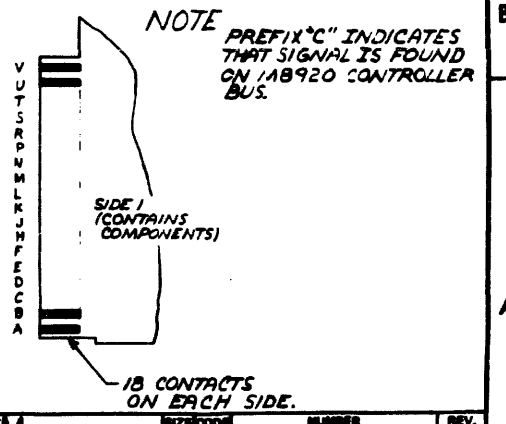
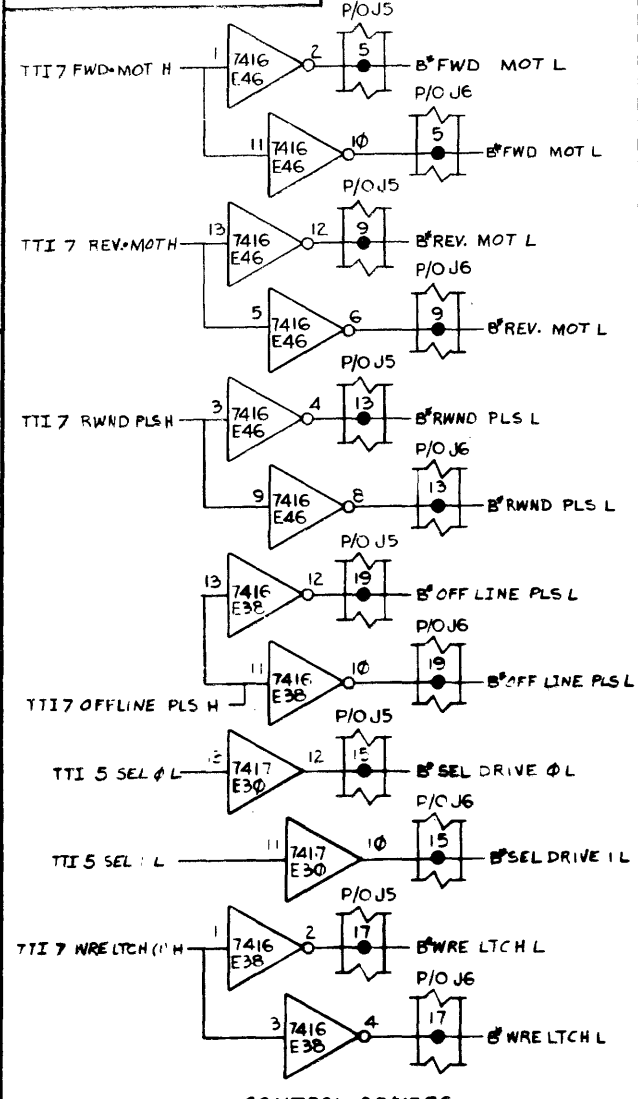


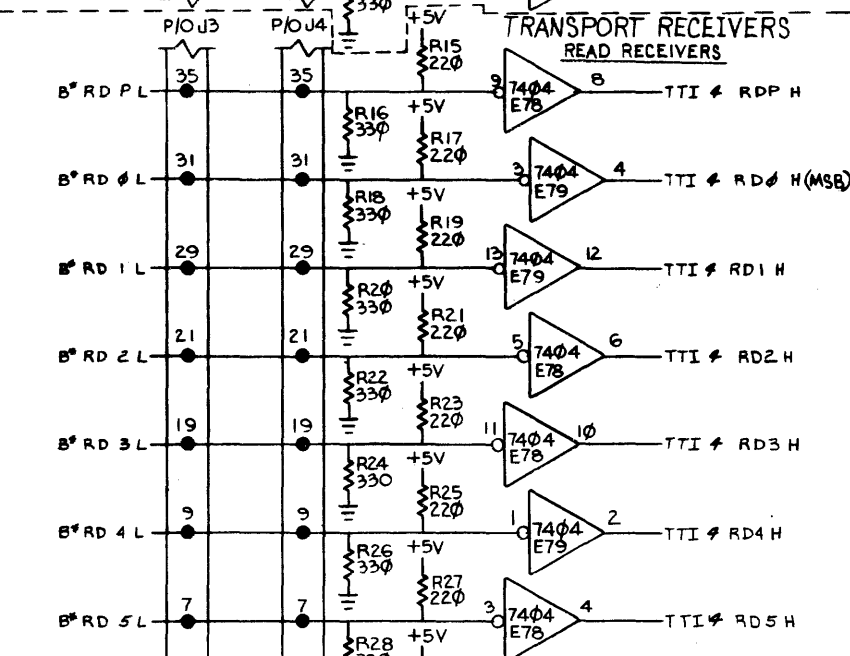
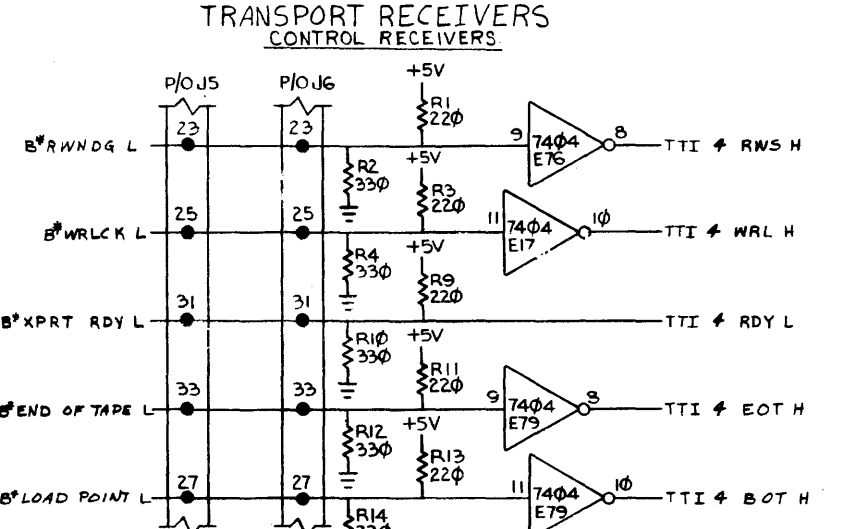
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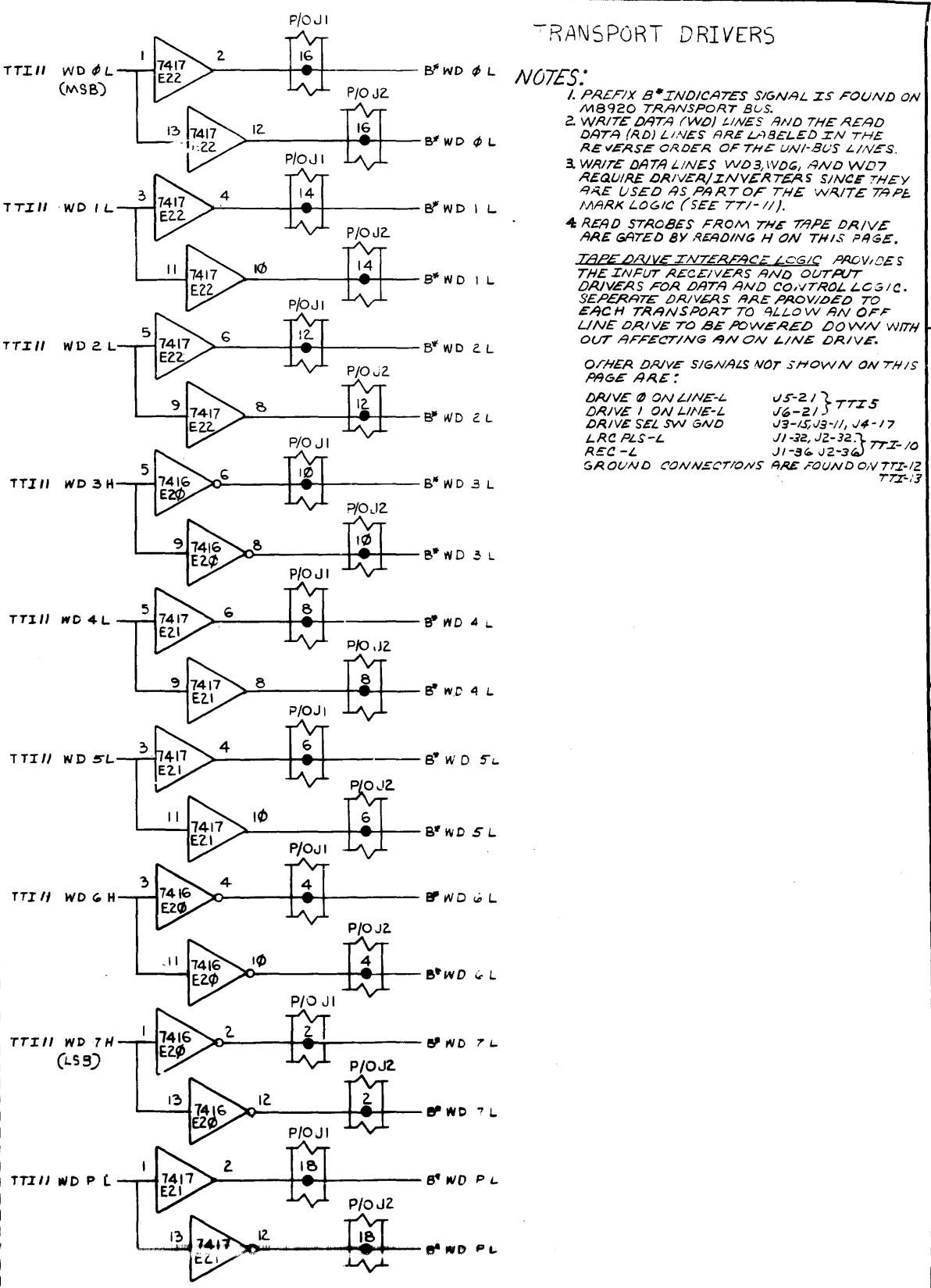


CONTROL DRIVERS

TRANSPORT DRIVERS



TRANSPORT RECEIVERS READ RECEIVERS



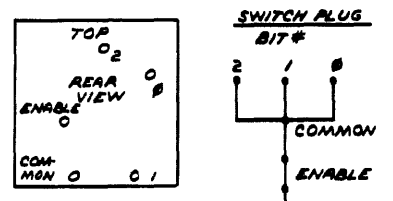
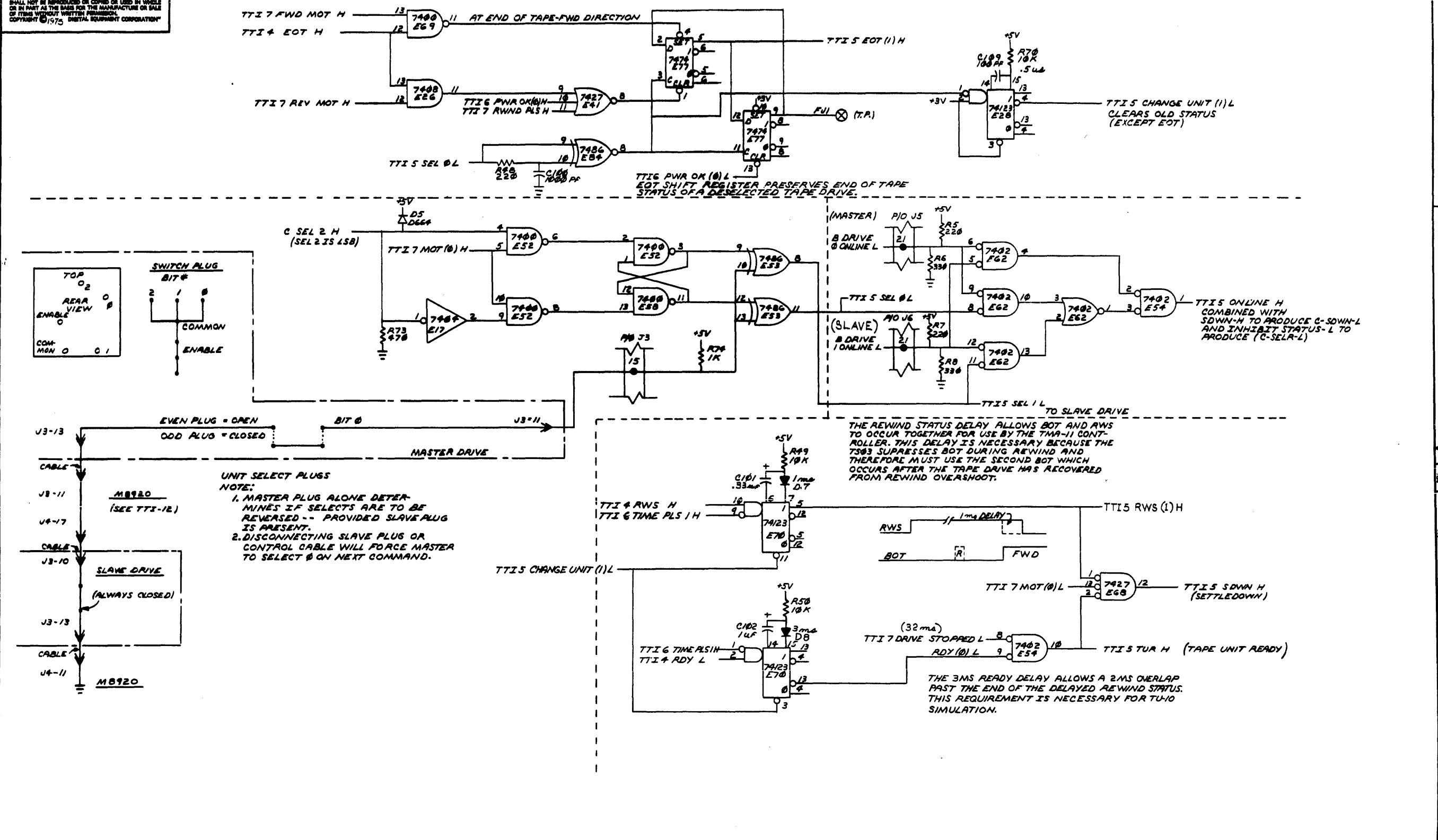
TRANSPORT DRIVERS

- NOTES:
1. PREFIX B* INDICATES SIGNAL IS FOUND ON MB920 TRANSPORT BUS.
 2. WRITE DATA (WD) LINES AND THE READ DATA (RD) LINES ARE LABELED IN THE REVERSE ORDER OF THE UNI-BUS LINES.
 3. WRITE DATA LINES WD3, WD6, AND WD7 REQUIRE DRIVER/INVERTERS SINCE THEY ARE USED AS PART OF THE WRITE TAPE MARK LOGIC (SEE TTI-11).
 4. READ STROBES FROM THE TAPE DRIVE ARE GATED BY READING H ON THIS PAGE.
- TAPE DRIVE INTERFACE LOGIC PROVIDES THE INPUT RECEIVERS AND OUTPUT DRIVERS FOR DATA AND CONTROL LOGIC. SEPARATE DRIVERS ARE PROVIDED TO EACH TRANSPORT TO ALLOW AN OFF LINE DRIVE TO BE POWERED DOWN WITHOUT AFFECTING AN ON LINE DRIVE.
- OTHER DRIVE SIGNALS NOT SHOWN ON THIS PAGE ARE:
- DRIVE 0 ON LINE-L J5-21 } TTI 5
 - DRIVE 1 ON LINE-L J6-21 } TTI 5
 - DRIVE SEL SW GND J3-15, J3-11, J4-17
 - LRC PLS-L J1-32, J2-32 } TTI-10
 - REC-L J1-36, J2-36
 - GROUND CONNECTIONS ARE FOUND ON TTI-12 TTI-13

REVISIONS		
CHK	CHANGE NO.	REV.

REV. B
D CS MB920-0-1

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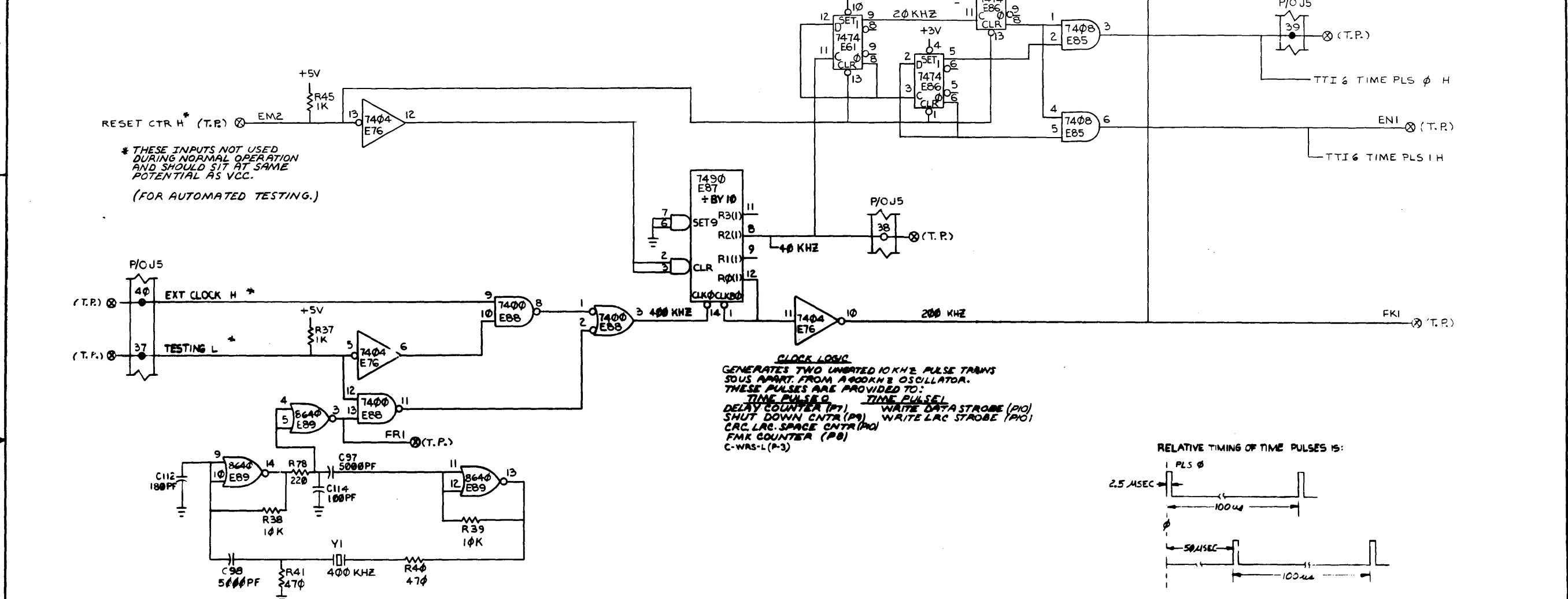


UNIT SELECT PLUGS
 NOTE:
 1. MASTER PLUG ALONE DETERMINES IF SELECTS ARE TO BE REVERSED -- PROVIDED SLAVE ALUG IS PRESENT.
 2. DISCONNECTING SLAVE PLUG OR CONTROL CABLE WILL FORCE MASTER TO SELECT 0 ON NEXT COMMAND.

REVISIONS		
CHK	CHANGE NO.	REV.

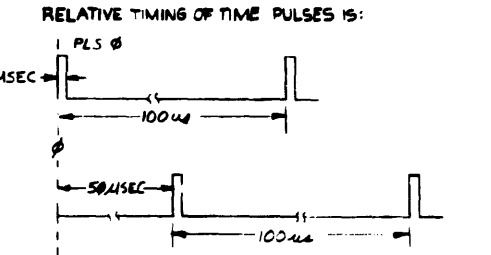
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CLOCK LOGIC

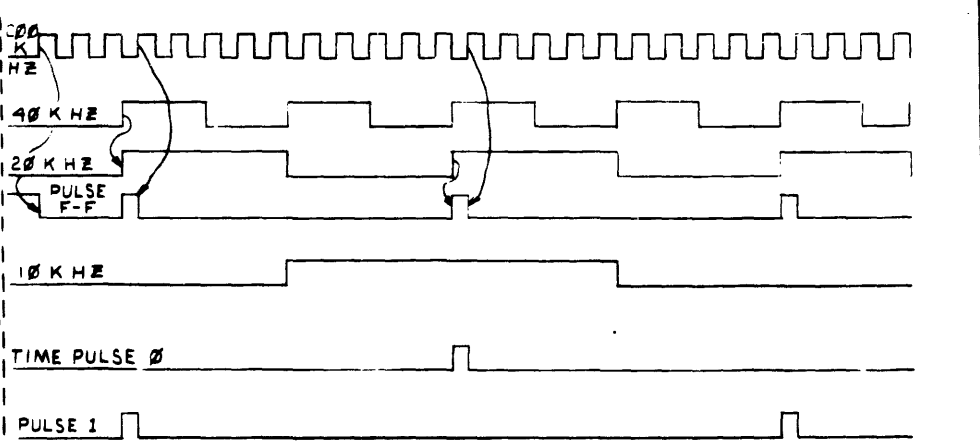
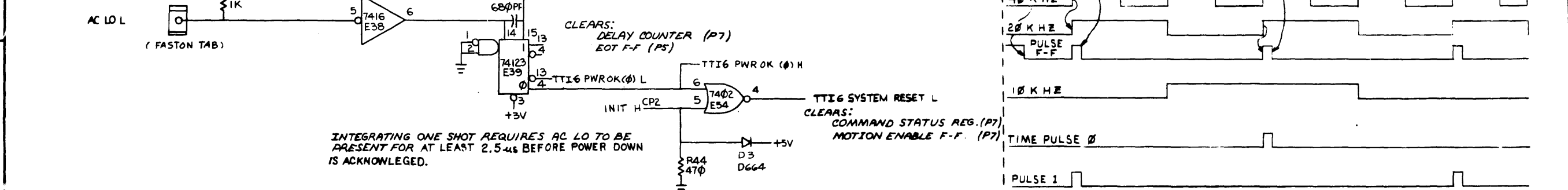


* THESE INPUTS NOT USED DURING NORMAL OPERATION AND SHOULD SIT AT SAME POTENTIAL AS VCC. (FOR AUTOMATED TESTING.)

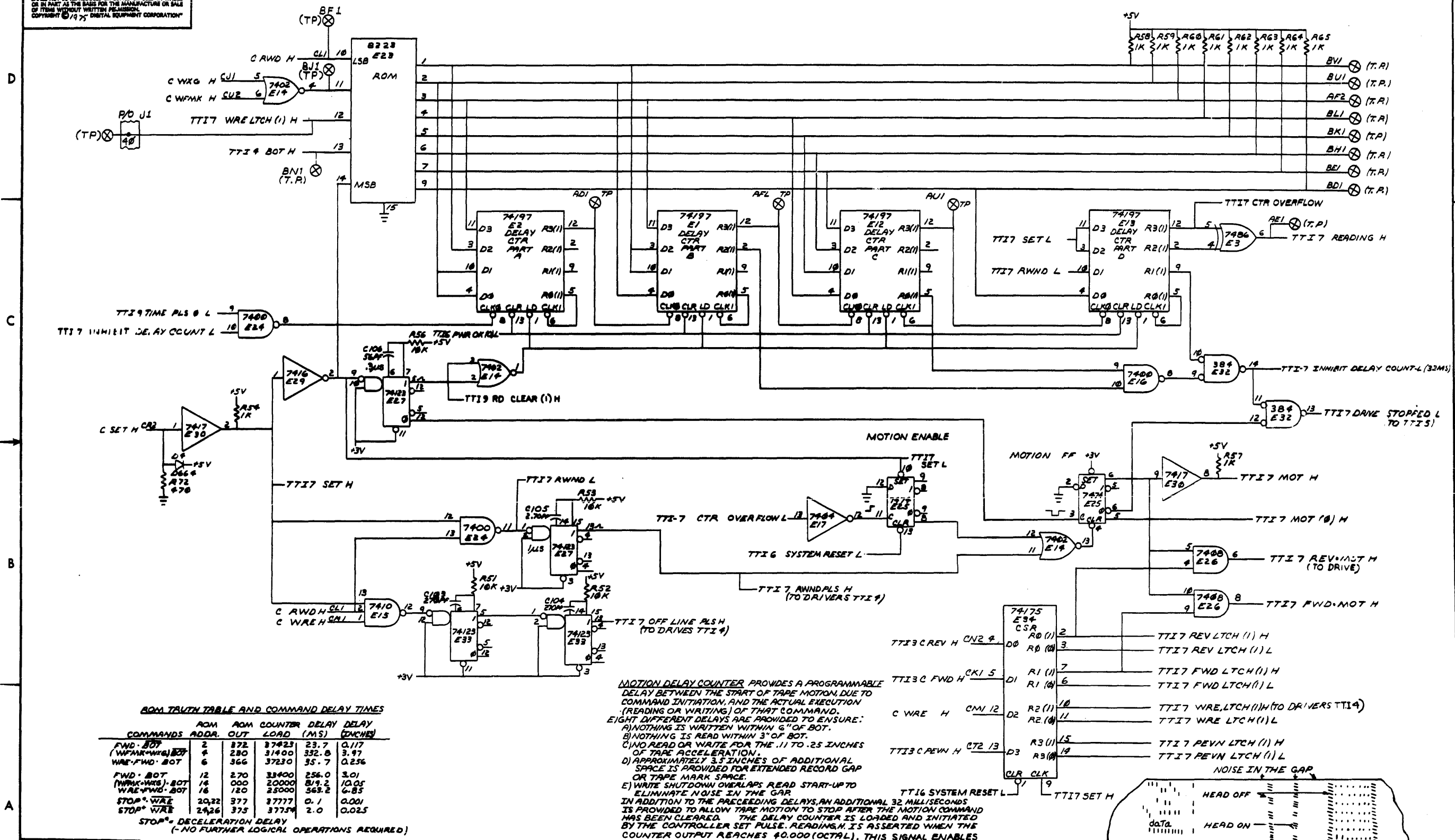
CLOCK LOGIC
 GENERATES TWO UNPHASED 10 KHZ PULSE TRAINS 90° APART FROM A 400 KHZ OSCILLATOR. THESE PULSES ARE PROVIDED TO:
 TIME PULSE 0
 DELAY COUNTER (P7)
 SHUT DOWN CNTR (P9)
 CAC LRC SPACE CNTR (P10)
 FMX COUNTER (P8)
 C-WAS-L (P-3)



SYSTEM INITIALIZATION LOGIC



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ROM TRUTH TABLE AND COMMAND DELAY TIMES

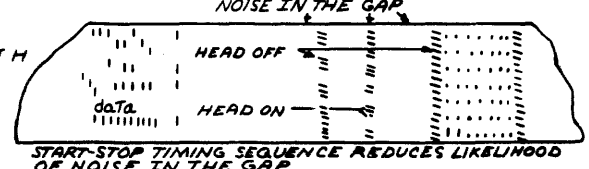
COMMANDS	ROM ADDR.	ROM OUT	COUNTER LOAD	DELAY (MS)	DELAY (CLOCK)
FWD · BOT	2	872	37423	23.7	0.117
(WFMK+WRE) · BOT	4	280	31400	32.8	3.97
WAE · FWD · BOT	6	366	37230	35.7	0.256
FWD · BOT	12	270	33400	256.0	3.01
(WFMK+WRE) · BOT	14	000	20000	819.2	10.05
WAE · FWD · BOT	16	120	25000	563.2	6.85
STOP · WAE	20,22	377	37777	0.1	0.001
STOP · WRE	24,26	375	37755	2.0	0.025

STOP · DECELERATION DELAY (-NO FURTHER LOGICAL OPERATIONS REQUIRED)

MOTION DELAY COUNTER PROVIDES A PROGRAMMABLE DELAY BETWEEN THE START OF TAPE MOTION, DUE TO COMMAND INITIATION, AND THE ACTUAL EXECUTION (READING OR WRITING) OF THAT COMMAND. EIGHT DIFFERENT DELAYS ARE PROVIDED TO ENSURE:

- NOTHING IS WRITTEN WITHIN 6" OF BOT.
- NOTHING IS READ WITHIN 3" OF BOT.
- NO READ OR WRITE FOR THE .11 TO .25 INCHES OF TAPE ACCELERATION.
- APPROXIMATELY 3.5 INCHES OF ADDITIONAL SPACE IS PROVIDED FOR EXTENDED RECORD GAP OR TAPE MARK SPACE.
- WRITE SHUTDOWN OVERLAPS READ START-UP TO ELIMINATE NOISE IN THE GAP.

IN ADDITION TO THE PRECEDING DELAYS, AN ADDITIONAL 32 MILLISECONDS IS PROVIDED TO ALLOW TAPE MOTION TO STOP AFTER THE MOTION COMMAND HAS BEEN CLEARED. THE DELAY COUNTER IS LOADED AND INITIATED BY THE CONTROLLER SET PULSE. READING IS ASSERTED WHEN THE COUNTER OUTPUT REACHES 40,000 (OCTAL). THIS SIGNAL ENABLES WRITE STROBES, READ STROBES AND RECORD DETECTION LOGIC (TTI-10 & TTI-4).



REVISIONS

CHK	CHANGE NO.	REV.

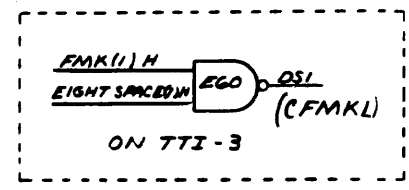
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(MSB) TTI 4 RD0 H
 TTI 4 RD1 H
 TTI 4 RD2 H

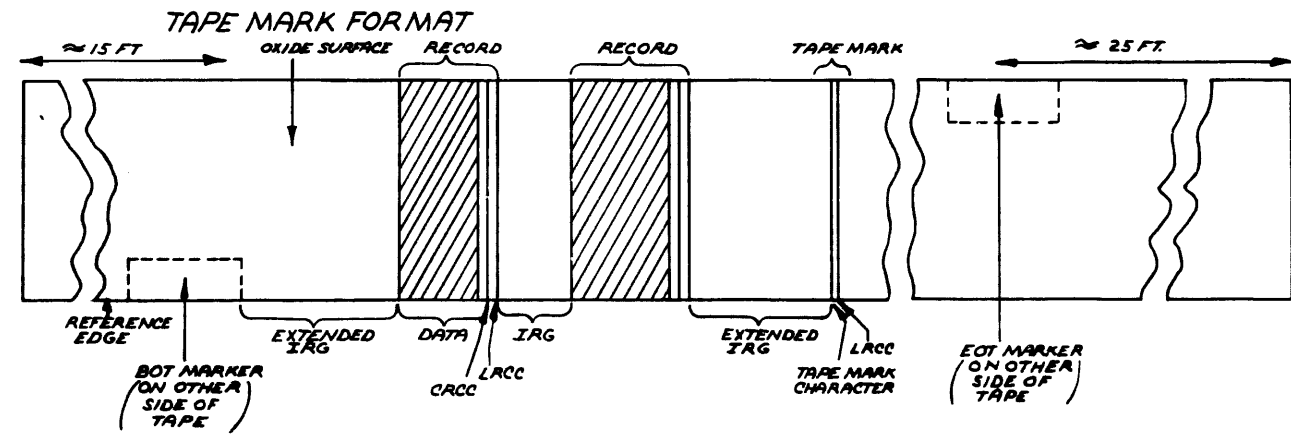
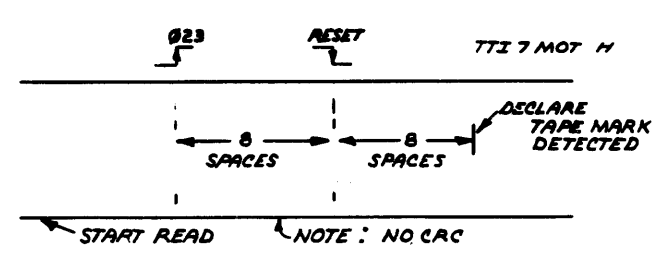
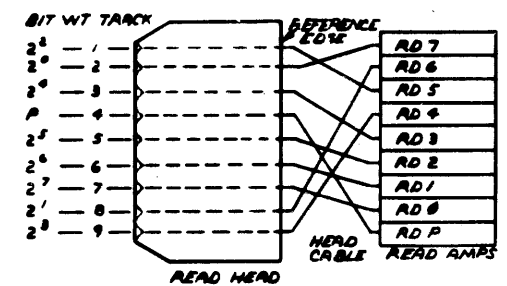
 TTI 4 RD4 H
 TTI 4 RD5 H
 TTI 4 RD6 H
 TTI 4 RD3 H
 (LSB) TTI 4 RD7 H

TAPE MARK DETECTION LOGIC USES THE RECORD DETECTION COUNTER TO COUNT TWO READ STROBES (COUNTER=3). THE ABSENCE OF FURTHER READ STROBES ENABLES THE TAPE MARK COUNTER TO CHECK FOR EIGHT BLANK CHARACTER SPACES. IF BOTH OF THE INITIAL READ STROBES WERE EQUAL TO 023; A TAPE MARK SIGNAL WILL BE PROVIDED TO THE CONTROLLER AND RECORD ACTIVE WILL BE ASSERTED.

NOTE: THE LRC OF A TAPE MARK IS THE SAME AS THE TAPE MARK.

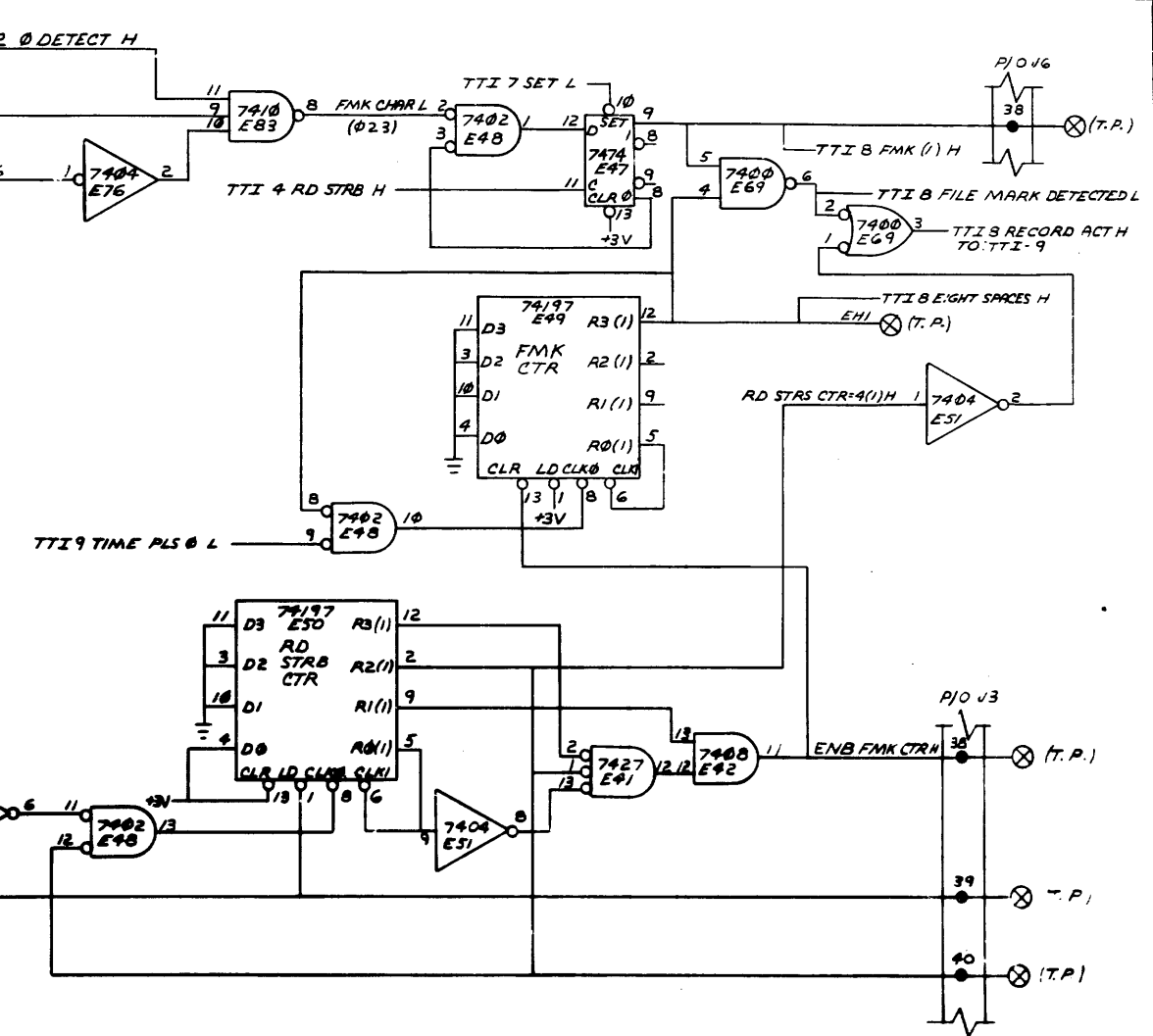


RECORD DETECTION COUNTER IS PRESET TO A ONE AT THE END OF THE PREVIOUS MOTION COMMAND. AFTER THREE READ STROBES (MINIMUM RECORD), RECORD ACTIVE IS ASSERTED



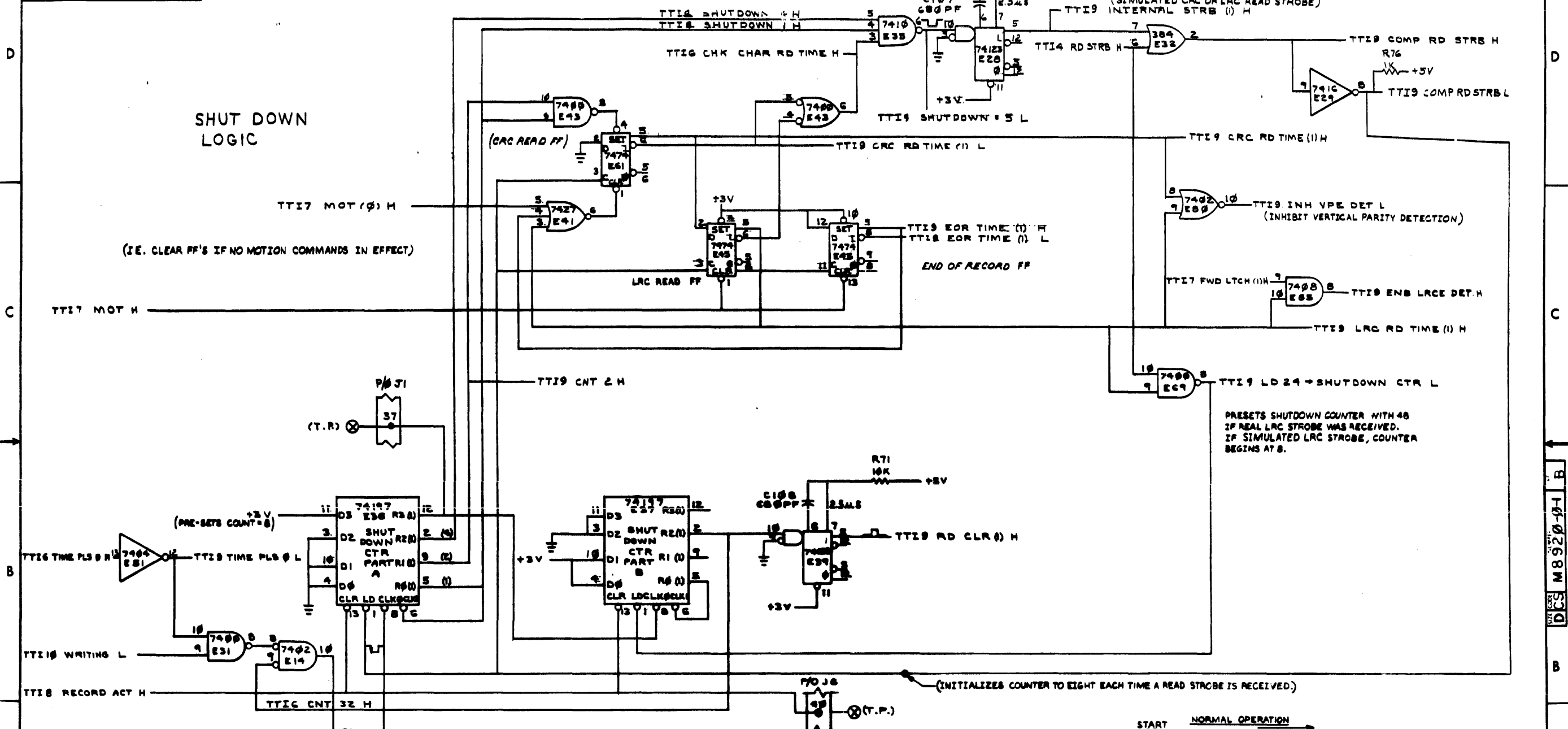
RECORD FORMAT

RECORD DETECTION AND TAPE MARK DETECTION LOGIC
 THERE ARE TWO PURPOSES TO THE LOGIC ON THIS PAGE:
 1. DETECT A TAPE MARK (FILE MARK) CHARACTER (023) FOR USE BY THE CONTROLLER.
 2. ENABLE THE SHUTDOWN LOGIC TO STOP THE TAPE DRIVE AFTER THE MINIMUM RECORD SIZE (3 DATA FRAMES) HAS BEEN DETECTED; OR AFTER A TAPE MARK (FMK) HAS BEEN DETECTED. THE SHUTDOWN LOGIC (TTI-9) IS ENABLED BY QUALIFYING RECORD ACTIVE H.



REV.	CHG.	DATE	BY.

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SHUT DOWN LOGIC

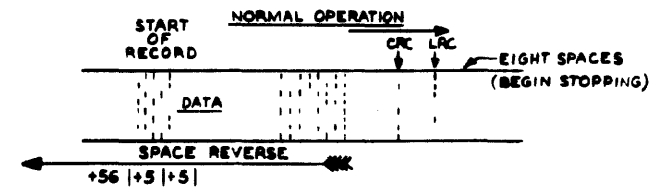
(I.E. CLEAR FF'S IF NO MOTION COMMANDS IN EFFECT)

PRESETS SHUTDOWN COUNTER WITH 48 IF REAL LRC STROBE WAS RECEIVED. IF SIMULATED LRC STROBE, COUNTER BEGINS AT 8.

(INITIALIZES COUNTER TO EIGHT EACH TIME A READ STROBE IS RECEIVED.)

THE SHUTDOWN COUNTER LOGIC CHECKS FOR THE PRESENCE OF CRC AND LRC CHARACTERS, AS WELL AS FOR SUFFICIENT ERASED TAPE AT THE END OF EACH RECORD, BEFORE ALLOWING THE TAPE DRIVE TO STOP. SPECIFICALLY, THIS LOGIC:

1. ENABLES THE CRC CHARACTER TO BE READ AFTER 300µS HAVE PASSED WITHOUT A READ STROBE BEING DETECTED (E-43-8).
2. ENABLES THE LRC CHARACTER TO BE READ ANY TIME WITHIN THE FIRST FIVE SPACES PAST THE CRC CHARACTER. (E-45-5).
3. GENERATES A SIMULATED READ STROBE WHEN SPACING REVERSE, OR IN THE RARE INSTANCE WHEN THE CRC AND/OR LRC CHARACTER EQUALS ZERO (E-28-5).
4. ENSURES THAT THERE IS NO DATA WITHIN THE EIGHT CHARACTER SPACES FOLLOWING THE LRC READ STROBE BEFORE ALLOWING THE TAPE DRIVE TO STOP. (E-39-5).
5. ENSURES THAT THERE IS NO DATA FOR 56 CHARACTER TIMES AFTER A SIMULATED LRC STROBE (I.E. NO LRC STROBE RECEIVED FROM TAPE) BEFORE ALLOWING THE TAPE DRIVE TO STOP. (E-68-8).

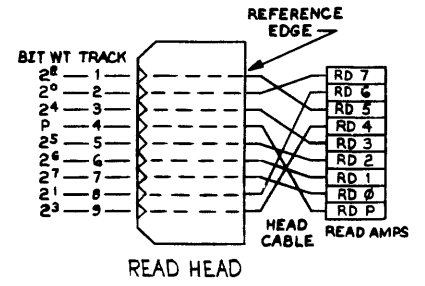
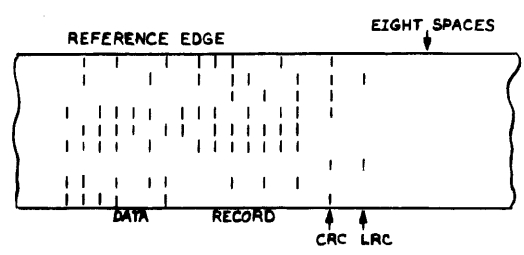
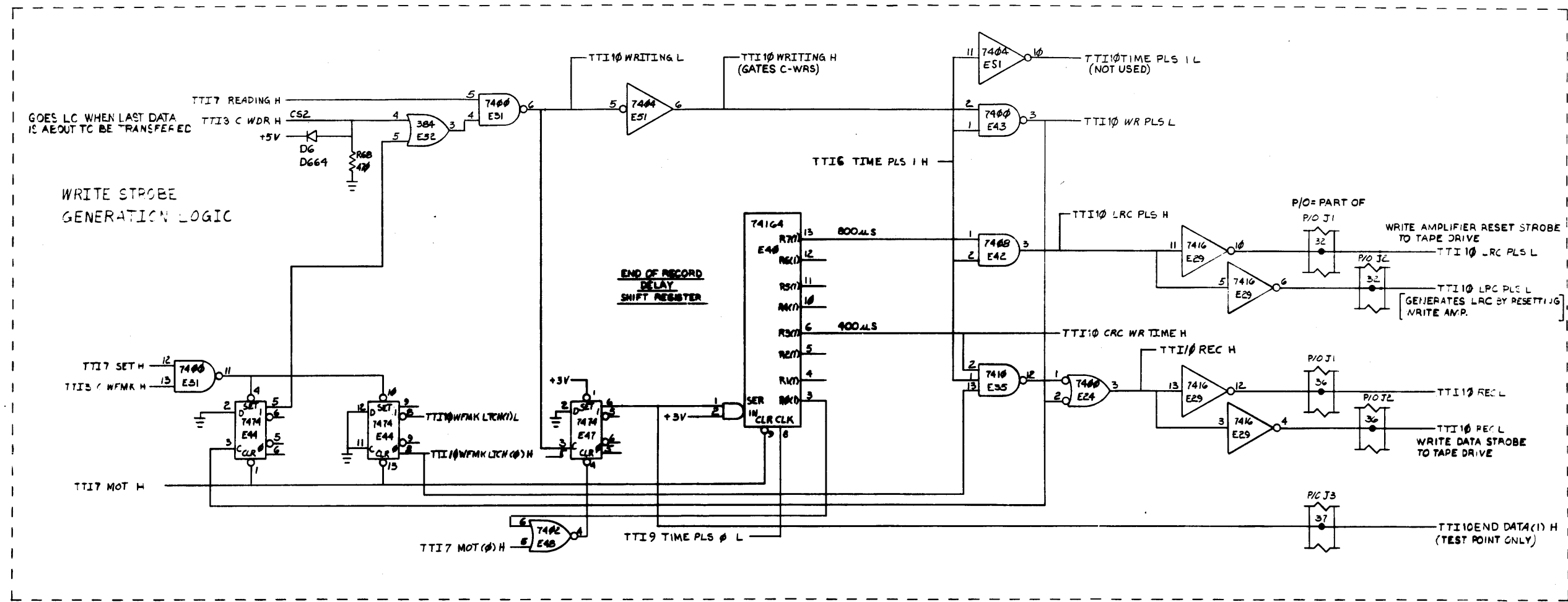


SHUT DOWN CONTROL LOGIC

REVISIONS		
CHK	CHANGE NO.	REV.

TITLE	TS03-TUIOM	SIZE CODE	NUMBER	REV.
INTERFACE (TTI9)	DCS M8920-01		B	
SCALE	SHEET 9 OF 14	DIST.		

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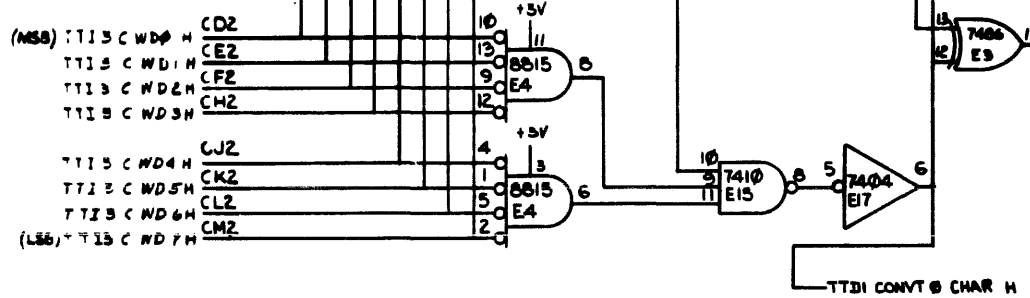
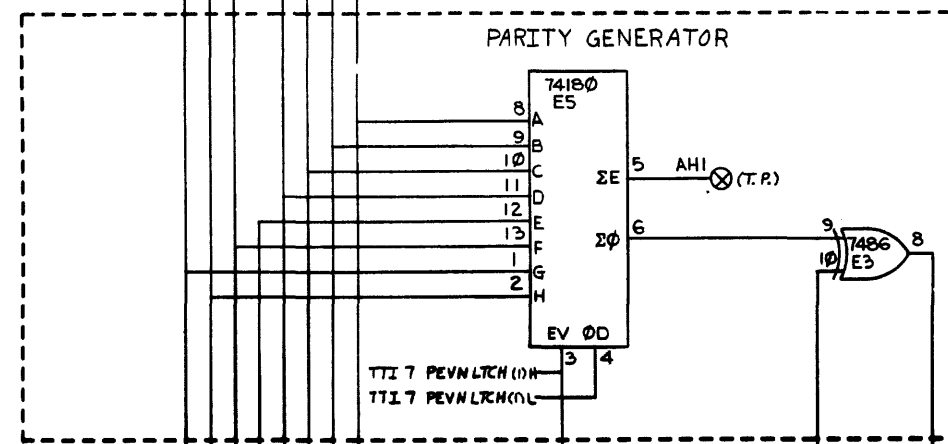
WIRE LOGIC

- THE WRITE LOGIC ON THIS PAGE:
1. DETECTS END OF A WRITE DATA COMMAND (C-WDR); SEQUENCES A WRITE FILE MARK COMMAND (C-WFMK)
 2. GENERATES WRITE STROBE PULSES FOR DATA AND CRC CHARACTERS (REC-L)
 3. GENERATES A PULSE TO WRITE AN LRC CHARACTER (LRC-PLS-L)
 4. PROVIDES 3 BLANK FRAMES BETWEEN DATA AND THE CRC CHARACTER, AS WELL AS BETWEEN THE CRC AND LRC CHARACTERS.

REV.	CHG.	CHANGE NO.	REV.

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WRITE DATA
MULTIPLIER LOGIC
W.D. 012|3|4|5|6|7
BUS 76,5|4|3,2|1|0

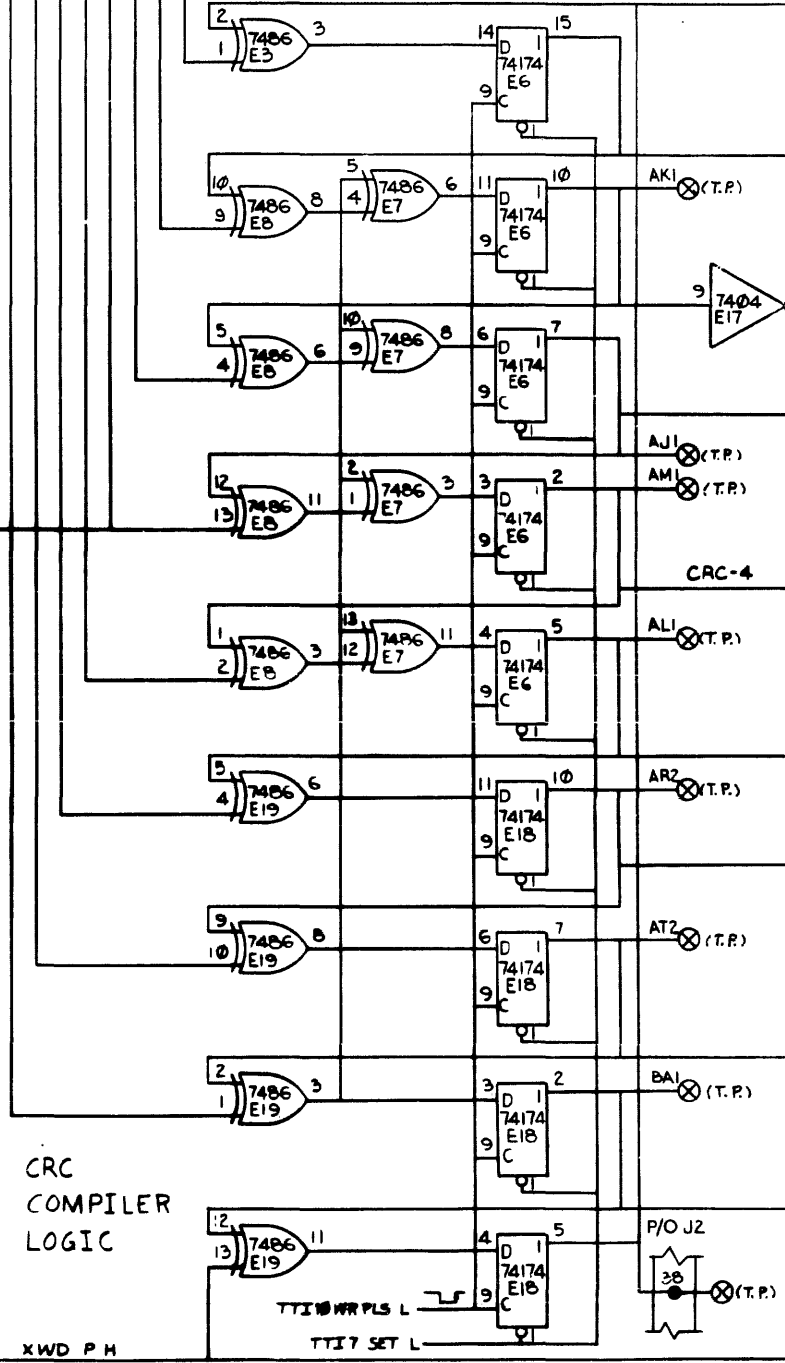


ZERO CHARACTER DETECT AND LOGIC CONVERSION WRITE LOGIC

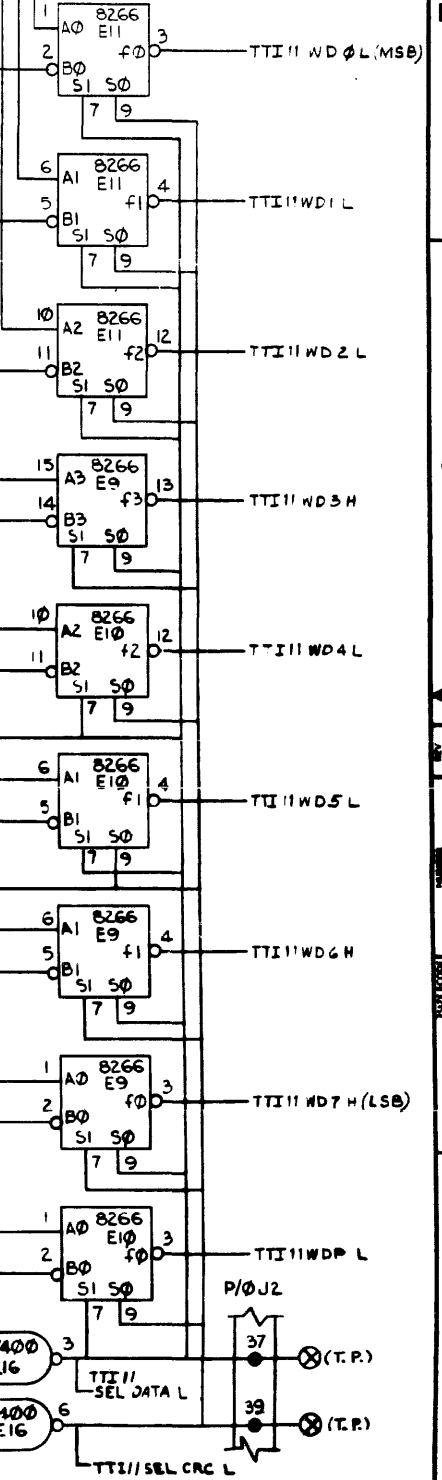
- THE WRITE DATA PATH LOGIC:**
1. TRANSFERS WRITE DATA TO THE TAPE DRIVE.
 2. GENERATES A PARITY BIT FOR EACH FRAME OF DATA.
 3. CONVERTS AN ALL ZERO CHARACTER INTO A 020 (ASCII DELETE) IF EVEN PARITY IS BEING USED.
 4. GENERATES THE CRC CHARACTER.
 5. MULTIPLEXES THE CRC CHARACTER ON TO THE WRITE DATA LINES AT THE END OF A RECORD.
 6. GENERATES A WRITE FILE-MARK CHARACTER - 023 (ASCII DEVICE CODE 3)
- CYCLICAL REDUNDANCY CHECK CHARACTER ALGORITHM:**
1. CLEAR THE CRC REGISTER. (START ONLY)
 2. EXCLUSIVE OR THE WRITE DATA WITH THE CRC REGISTER.
 3. SHIFT ONE PLACE RIGHT AND RETURN RESULT TO THE CRC REGISTER.
 4. COMPLIMENT CRC BITS 2 THRU 5 IF CRC P IS A 1; OTHERWISE, GO BACK TO STEP 2.
 5. WHEN WRITING THE CRC CHARACTER ON TAPE AT THE END OF A RECORD, INVERT ALL BITS EXCEPT CRC-2 AND CRC-4.

- NOTES:**
1. ALL WRITE DATA LINES ARE INVERTED BY THE CRC/DATA MULTIPLEXER EXCEPT FOR WD-3,6,47 (023, FILEMARK). THESE BITS ARE INVERTED AT THE OUTPUT DRIVERS.
 2. BOTH SELECTS HI ON THE CRC MUX WILL FORCE AN ALL HIGHS OUTPUT (GENERATING A FMK OF 023).

CRC COMPILER LOGIC



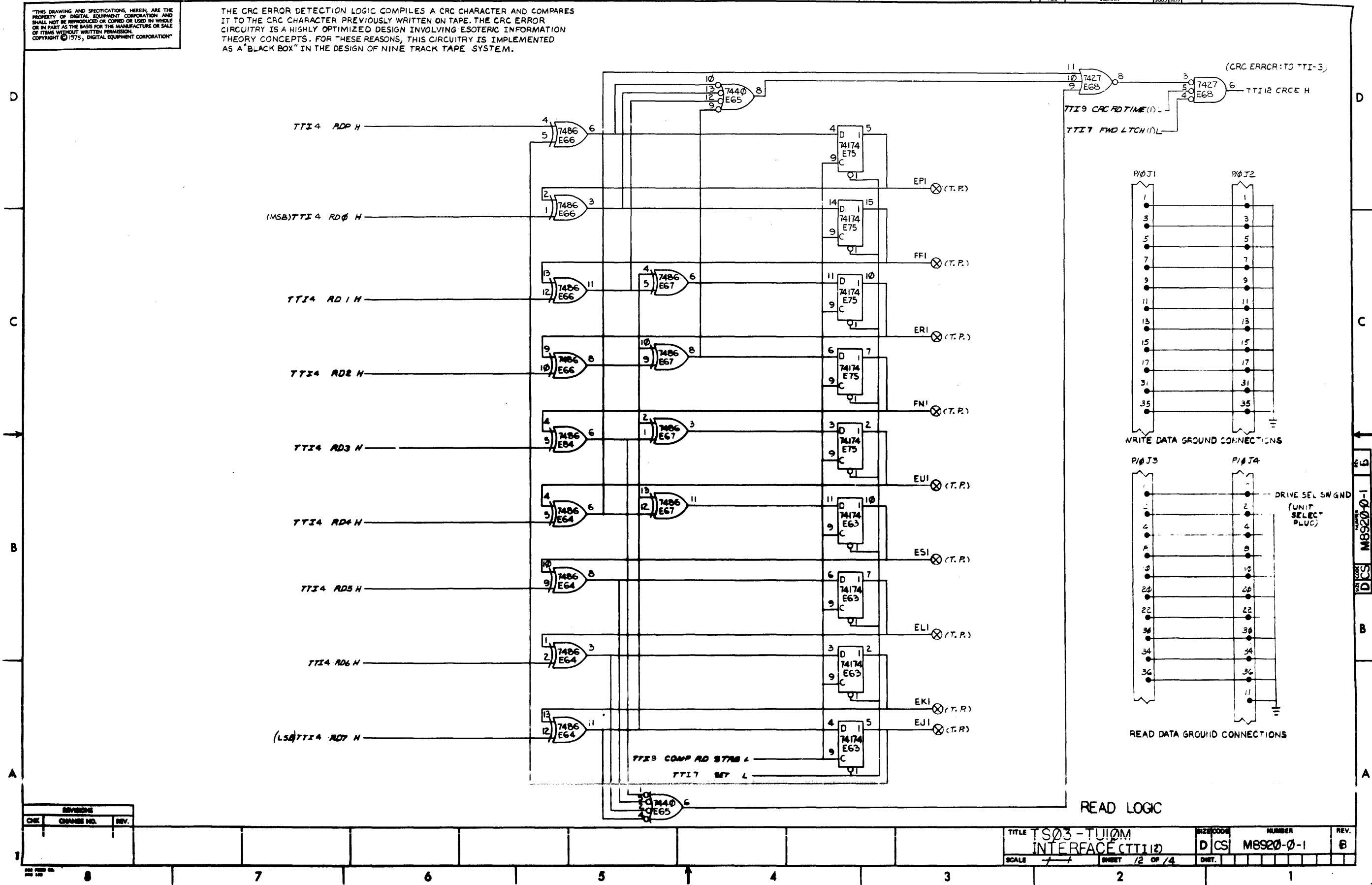
(FUNCTIONS AS AN INVERTER)



REVISIONS		
CHK	CHANGE NO.	REV.

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THE CRC ERROR DETECTION LOGIC COMPILES A CRC CHARACTER AND COMPARES IT TO THE CRC CHARACTER PREVIOUSLY WRITTEN ON TAPE. THE CRC ERROR CIRCUITRY IS A HIGHLY OPTIMIZED DESIGN INVOLVING ESOTERIC INFORMATION THEORY CONCEPTS. FOR THESE REASONS, THIS CIRCUITRY IS IMPLEMENTED AS A "BLACK BOX" IN THE DESIGN OF NINE TRACK TAPE SYSTEM.

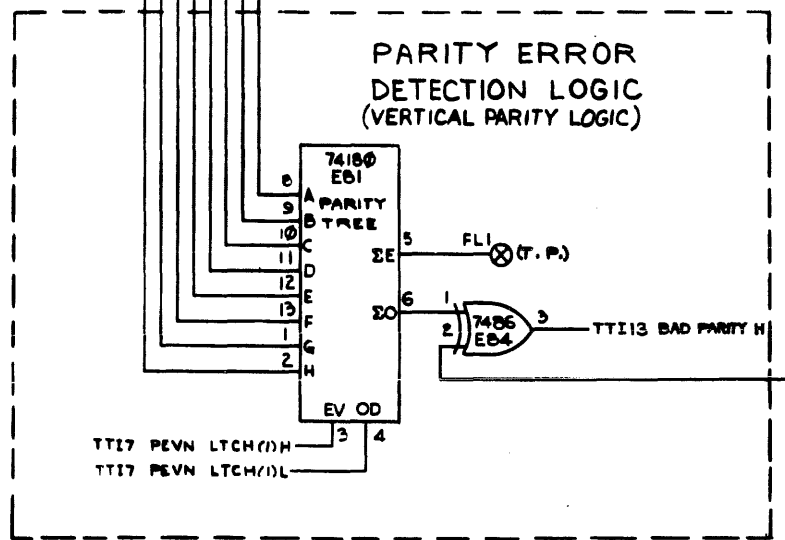


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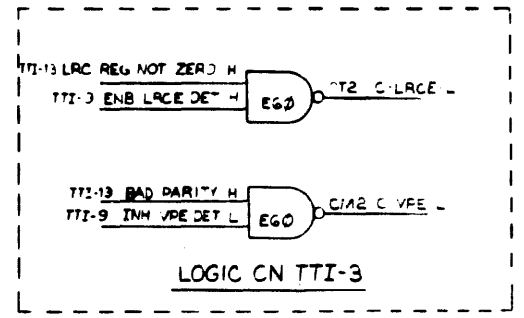
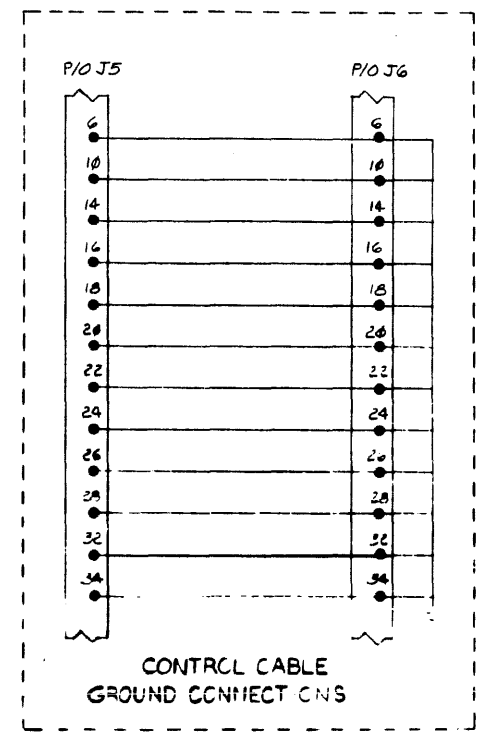
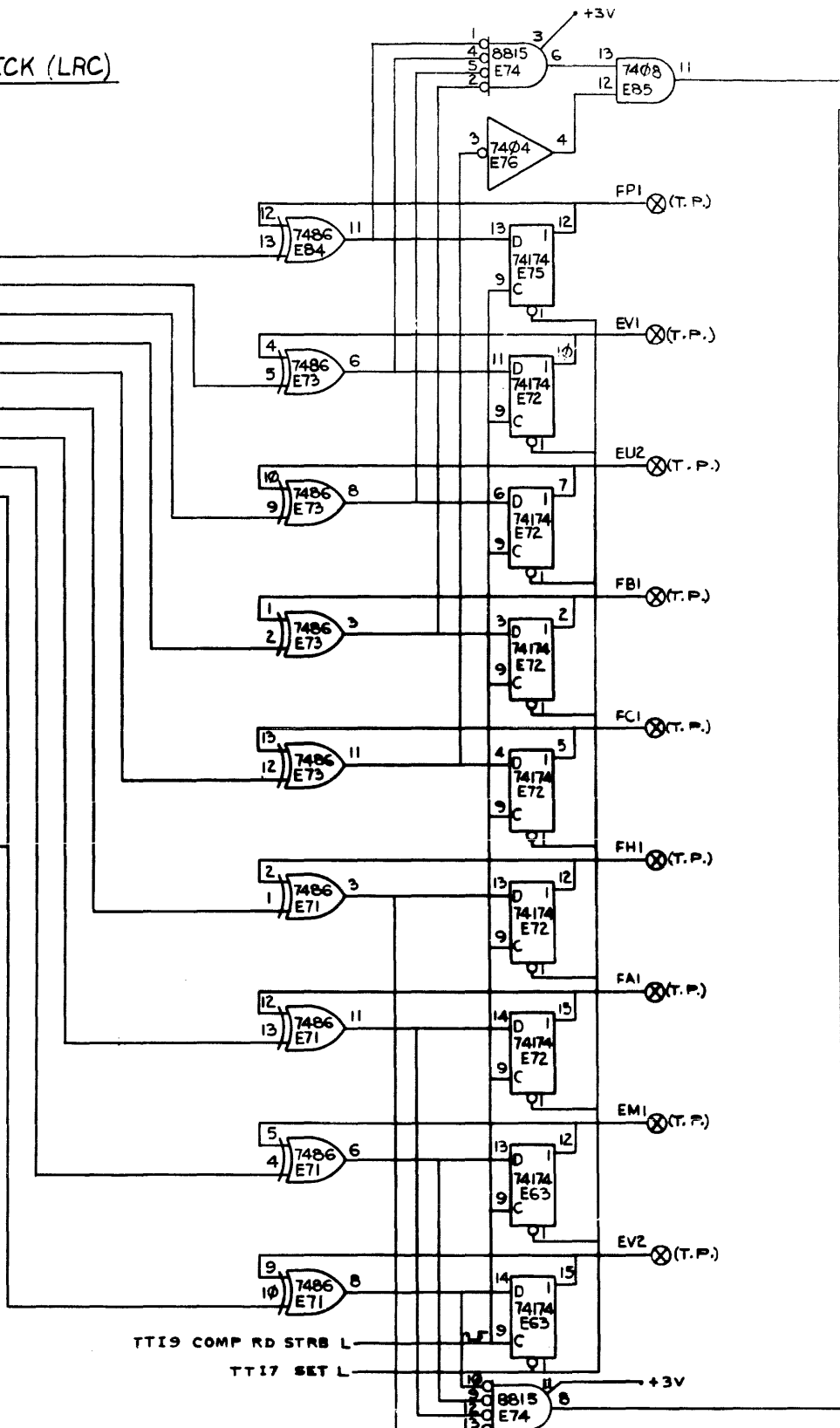
LONGITUDINAL REDUNDANCY CHECK (LRC)
CHARACTER COMPILER

(MSB) TTI4 RD0 H
TTI4 RD1 H
TTI4 RD2 H
TTI4 RD3 H
TTI4 RD4 H
TTI4 RD5 H
TTI4 RD6 H
(LSB) TTI4 RD7 H
TTI4 RDP H



THE LOGIC ON THIS PAGE PERFORMS TWO FUNCTIONS:
1. TESTS FOR A VERTICAL PARITY ERROR IN EACH DATA FRAME.
2. TESTS FOR A HORIZONTAL PARITY ERROR IN EACH DATA TRACK.
SEPARATE INDICATIONS ARE PROVIDED TO THE TMA-11 FOR EACH TYPE OF ERROR.

NOTE: THERE IS NO HARDWARE PROVISION FOR RETURNING AN EVEN PARITY ZERO (000) TO ALL ZEROS (000).



READ LOGIC

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PARTS LIST				
QTY	REF. DESIGNATION	DESCRIPTION	PART NO.	ITEM NO.
	REF	X-Y COORDINATE HOLE LOCATION	K-CO-M8920-0-4	1
	REF	ASSY/DRILLING HOLE LAYOUT	D-AH-M8920-0-5	2
	REF	MODULE ECO HISTORY	B-MH-M8920-0-8	3
1		ETCHED CIRCUIT BOARD	5011388	4
1	C108	CAPACITOR 50PF 100V 5% DM	1000012-00	5
2	C109, C114	CAPACITOR 100PF, 100V, 5% DM	1000016-00	6
2	C103, C104	CAPACITOR 270 PF, 100V, 5% DM	1000022-00	7
3	C99, C107, C108	CAPACITOR 680 PF, 100V, 5% DM	1000028-00	8
2	C100, C105	CAPACITOR 1000PF, 100V, 5% DM	1000042-00	9
91	C1 THRU C90, C111	CAPACITOR .01UF 100V, 20% DISC	1001610-01	10
2	C97, C98	CAPACITOR 5000PF, 100V, 20% DISC	1001765-00	11
7	C91 THRU C96, C110	CAPACITOR 6.8UF 35V 10% S.TANT	1005306-00	12
1	C102	CAPACITOR 1.0UF, 35V, 10% S.TANT	1001776-00	13
6	J1 THRU J6	3M CONN 40 PIN	1209941-01	14
8	D1 THRU D8	DIODE D664	1100114-00	15
2		INSULATOR 8000 PG1	1202812-00	16
21	R15, R19, R25, R27, R31, R35, R3, R13, R11, R9, R17, R21, R25, R29, R33, R1, R48, R5, R66, R7, R78	RESISTOR 220 $\frac{1}{4}$ W 5%	1300271-00	17
19	R16, R20, R24, R28, R32, R36, R2, R14, R12, R10, R18, R22, R26, R30, R34, R8, R4, R6, R67	RESISTOR 330 $\frac{1}{4}$ W 5%	1300295-00	18
8	R44, R40, R41, R47, R46, R73, R68, R72	RESISTOR 470 $\frac{1}{4}$ W 5%	1300316-00	19
17	R55, R45, R37, R75, R57, R74, R58, R59, R80 THRU R85, R42, R9, R26	RESISTOR 1K $\frac{1}{4}$ W 5%	1300365-00	20
12	R52, R43, R39, R38, R50, R49, R70, R71, R69, R53, R51, R56	RESISTOR 10K $\frac{1}{4}$ W 5%	1300479-00	21
1	Y1	CRYSTAL 400 KHZ	1805504-02	22
7	E61, E86, E77, E47, E44, E45, E25	I.C. 7474	1905547-00	23
7	E16, E88, E69, E24, E43, E52, E31	I.C. 7490	1905575-00	24
3	E15, E83, E35	I.C. 7410	1905576-00	25
1	E65	I.C. 7440	1905579-00	26
5	E54, E82, E80, E14, E48	I.C. 7402	1909004-00	27
1	E87	I.C. 7490	1909051-00	28
1	E32	I.C. 384	1909486-00	29
5	E17, E76, E78, E79, E51	I.C. 7404	1909686-00	30
2	E4, E74	I.C. 8815	1909713-00	31
4	E20, E46, E38, E29	I.C. 7416	1909828-00	32
3	E22, E21, E30	I.C. 7417	1909929-00	33
3	E9 THRU E11	I.C. 8288	1909934-00	34
11	E3, E8, E19, E7, E84, E86, E84, E87, E73, E71, E53	I.C. 7488	1910811-00	35
8	E1, E2, E12, E13, E36, E37, E48, E50	I.C. 7487	1910835-00	36
1	E48	I.C. 74184	1910841-00	37
9	E59, E80, E57, E58, E55, E56	I.C. 7437	1910881-00	38
3	E85, E28, E42	I.C. 7488	1910885-00	39
1	E88	I.C. 8648	1911400-00	40
5	E38, E78, E33, E27, E28	I.C. 74123	1918436-00	41
1	E34	I.C. 74175	1918851-00	42
5	E6, E18, E75, E83, E72	I.C. 74174	1918852-00	43

PARTS LIST				
QTY	REF. DESIGNATION	DESCRIPTION	PART NO.	ITEM NO.
2	E5, E81	I.C. 74188	1910724-00	44
3	E88, E82, E41	I.C. 7427	1910878-00	45
1	E23	PROM 16 PIN	23092A1	46
1		BRACKET, HOLDER	5302825-00	47
1		HOLDER, CRYSTAL	5303154-00	48
3		SCREW, PPH 2-56 X 1/4	8008001-01	49
3		NUT, HEX 2-56 X 3/16	8008555-00	50
3		FASTON TAB	9007112-00	51
7		EYELET	9006732-00	52
1	C101	CAPACITOR .33UF 20V 10% S.TANT	1005328-00	53
3		WASHER, LOCK #2	9006631	54
1		STIFFENER, ETCH BOARD	7413774	55
1	R77	RESISTOR, 47, $\frac{1}{4}$ W, 5%	1300202	56
				57
1	C112	CAPACITOR, 180PF, 100V, D.M.	1000020	58
1	C113	CAPACITOR, 470PF, 100V, D.M.	1000024	59

REVISIONS		
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