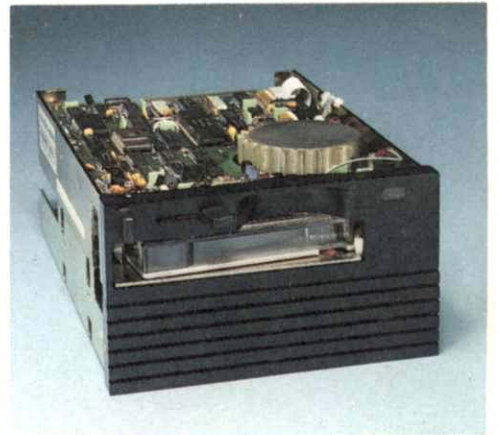
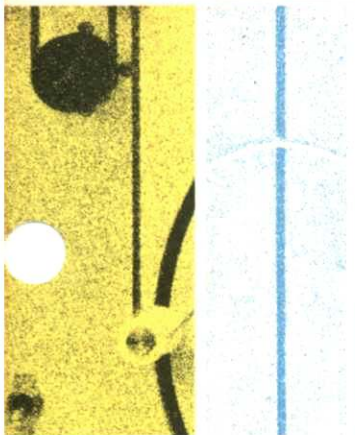
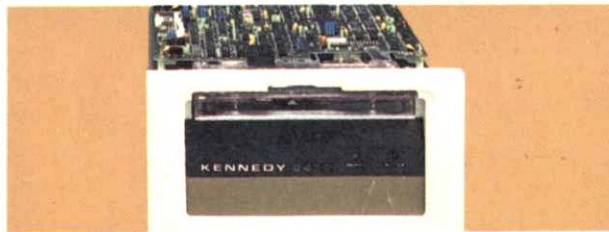


Model 9600

Auto-Load Digital Tape System



FCC CERTIFIED COMPUTER EQUIPMENT

This equipment, freestanding with shielded Data and Control Cables, complies with Part 15, Subpart J of FCC Rules Governing Class A Computing Devices Operated In A Commercial Environment. However, the equipment generates radio frequency energy and, when operated in a residential area, the user must take adequate precautions against interference to radio communications.

MODEL 9600 TAPE DRIVE

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SECTION I
APPLICATION DATA

SECTION I

GENERAL DESCRIPTION AND SPECIFICATIONS

1.1 GENERAL DESCRIPTION

The Kennedy Model 9600 (Figure 1-1) is a rack mount, automatic load, tape drive that includes an embedded Formatter capable of communicating between an industry standard interface bus and ANSI- and IBM-compatible PE 1600 BPI and NRZ1 800 BPI tapes. The drive can operate in either of two modes — 100 ips streaming mode and 45 ips start/stop mode and can read in either forward or reverse direction.

1.1.1 FEATURES

The Kennedy Model 9600 features:

- 1) Automatic tape threading and tensioning
- 2) True 45 ips Start/Stop Mode with standard 0.6 inch gaps.
- 3) 100 ips streaming mode provides high speed data transfers for backup needs.
- 4) Low profile height saves rack space.
- 5) Two independent microprocessors: one for the drive servo electronics: one for the Formatter.
- 6) Modular configuration that allows for future expansion.
- 7) Self diagnostic capability.
- 8) Front-panel eight-character LED readout that displays operational status, errors, abnormalities, and diagnostic parameters.

1.1.2 HOST INTERFACE

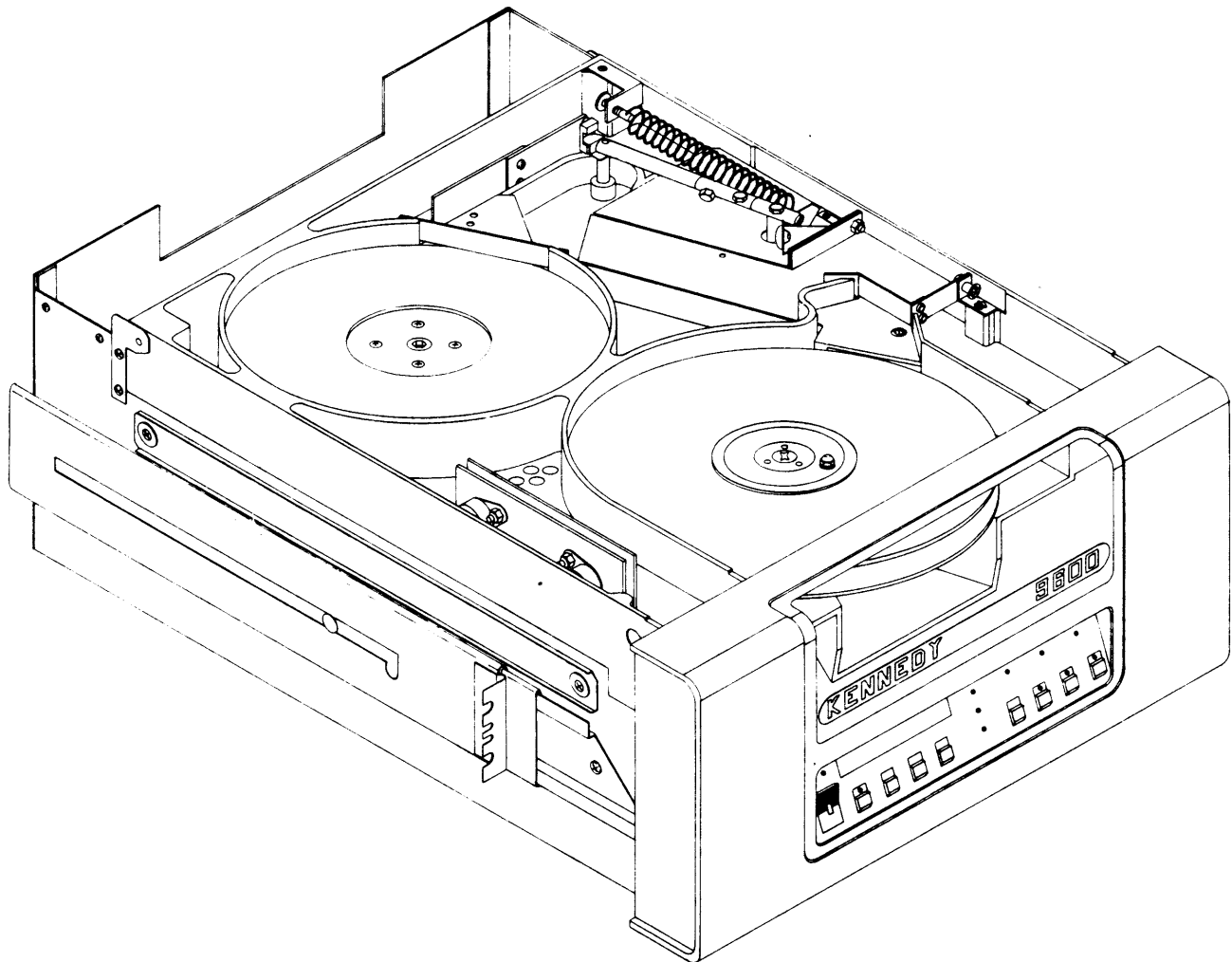
The 9600 Drive has the Industry Standard Interface for Formatted 1/2-inch Tape Drives.

1.1.3 MICROCOMPUTER BASED DESIGN

The 9600 uses two 8051 bit-mapped microprocessors: one in the Formatter, and one in the drive control electronics.

1.1.4 DIAGNOSTICS AND FAULT ISOLATION

The 9600 includes built-in diagnostics with front-panel eight-character LED readout for fault isolation.



**FIGURE 1-1 Model 9600 Auto-load Tape Drive
(shown with cover removed)**

1.2 SPECIFICATIONS

1.2.1 OPERATIONAL SPECIFICATIONS

TABLE 1-1 OPERATIONAL SPECIFICATIONS

TAPE SPECIFICATION	
Width	0.498 (+/- .002) inch
Thickness	1.9 or 1.3 mil (0.038 or 0.0226 mm)
Tension	8.0 +/- 2.0 ounces
Reel Size	7.0, 8.5, or 10.5 inch open reels
Tape Capacity	
1.9 mil tape	600, 1200, or 2400 feet
1.3 mil tape	900, 1800, or 3600 feet
PERFORMANCE SPECIFICATION	
Data Density	800 BPI (NRZ1) 1600 BPI (PE)
Format	NRZ1, ANSI and IBM compatible PE, ANSI and IBM compatible
Tape Speed	
Start/Stop	45 ips
Streaming	100 ips
Rewind, nominal	200 ips
Gap Length	NRZ1/PE 0.6" (Read/Write) nominal
Data Access Time (nominal)	
Streaming (100 ips)	
Read	100 ms
Write	100 ms
Start/Stop (45 ips)	8.3 ms
Command Reissue Time (streaming mode)	
Write command	4.5 ms
Write command, long gap	10.5 ms
Read command	6.0 ms
Repositioning Time (streaming mode)	400 ms nominal
Speed Variation	
Instantaneous	+/- 3%
Long Term	+/- 1%
Data Transfer Rate	
45 ips	PE - 72 KB/sec; NRZ1 - 36 KB/sec
100 ips	PE - 160 KB/sec; NRZ1 - 80 KB/sec

TABLE 1-1 OPERATIONAL SPECIFICATIONS (CONT.)

MAGNETIC HEAD ASSEMBLY	
Surface	Hard coated
Number of tracks	9 tracks, read after write
Write to read gap	0.150 inch
Erase head	full width
Wrap Angle	7.0 degrees
Write skew	100 microinches
Read skew	100 microinches
Tape cleaner	Sapphire
BOT/EOT detection	infrared
Broken tape detection	infrared
Motion Control	Microprocessor controlled capstan and reel servo with swing arm tape buffering
Tape Threading	Automatic tape threading
MAINTENANCE STATISTICS	
MTBF (Design Goal)	5000 hours
MTTR (Design Goal)	30 minutes
1.2.2 ELECTRICAL POWER SOURCE SPECIFICATIONS	
TABLE 1-2 ELECTRICAL SPECIFICATIONS	
POWER REQUIREMENTS	
60 Hz voltage	120 vac +10% -15%
Input current, nominal	4.5 amp
Power, nominal	500 watts
50 Hz voltage	220 vac +10% -15%
Input current, nominal	2.5 amps
Power, nominal	500 watts

1.2.3 PHYSICAL/ENVIRONMENTAL SPECIFICATIONS

TABLE 1-3 PHYSICAL/ENVIRONMENTAL SPECIFICATIONS

PHYSICAL SPECIFICATIONS (See Figure 2-5)	
Dimensions	
Height	8.75 inches (22.23 cm)
Width	17.00 inches (43.18 cm)
Depth	
from mounting surface	22.00 inches (55.88 cm)
overall	24.50 inches (62.23 cm)
Mounting	standard 19 inch Retma rack, with slides
	Weight 105 lbs. (47.72 Kgm) with packing material 110 lbs. (50 Kgm)
ENVIRONMENTAL SPECIFICATIONS	
Temperature, operating	60° to 90° F (15° to 32° C)
Temperature, nonoperating	36° to 122° F (2° to 50° C)
Humidity, operating	20 to 80% non-condensing
Humidity, storage	5% to 95% non-condensing
Altitude, operating	0 to 10,000 ft. (0 to 3000 meters)
Altitude, shipping	0 to 50,000 ft. (0 to 15,000 meters)

1.3 TAPE AND TRACK LAYOUT

The Kennedy Model 9600 Tape Drive is capable of reading and writing ANSI and IBM Standard Tapes in 9 Track NRZI and 9 Track PE Formats (See Table 1-1 Performance Specifications).

1.4 INTERFACE DESCRIPTION

The interface connectors on the 9600 are designed for flat ribbon cables. Each active pin will have an associated ground pin.

1.5 INDUSTRY STANDARD INTERFACE CHARACTERISTICS

The following paragraphs describe the signal requirements and characteristics of the industry standard Interface between the 9600 Tape Drive and the Host/Controller.

1.5.1 LOGIC STATE DEFINITIONS

Signals from the Host to the Model 9600 must conform to the following specifications:

Levels:	Low	= True	= 0v
	High	= False	= +3v (approximate)
Pulses:	Low	= True	= 0v
	High	= False	= +3v (approximate)
Minimum Pulse Width = 1.0 microsecond			
Edge Transmission Delay: no greater than 200 nanoseconds over a 20-foot cable.			

1.5.2 CABLING

Two 50 lead flat ribbon cables (3M 3365-50 or equivalent) are required. The following criteria must be considered before connecting interface cabling:

- 1) The maximum recommended length of the interconnecting cables is 20 feet (6.1 m).
- 2) Unless otherwise specified all host wires should be 28 AWG minimum, with a minimum insulation thickness of 0.01 inch.

1.5.3 RECEIVER/DRIVER CONFIGURATION AND TERMINATIONS

All output signals from the Model 9600 are driven by open collector type line drivers capable of sinking up to 36 ma (25 standard unit loads) in the (low) true state. Open lines will result in a false signal.

1.5.3.1 INPUT/OUTPUT SIGNAL TERMINATIONS

Input: The input lines to the tape Drive are terminated with a 220 ohm (5%) resistor to plus five volts, and a 330 ohm (5%) resistor to ground (Figure 1-2). All input circuits have low level input voltage of 0.8v maximum and a high level input voltage of 2.0v minimum. The input receivers are all 74LS type circuits.

Output: All output lines must be terminated at the far end of the daisy chained cable with a 220 ohm (5%) resistor to plus five volts and a 330 ohm (5%) resistor to ground. Output circuits are 7406 or 7438 TTL open collector drivers as shown in Figure 1-2.

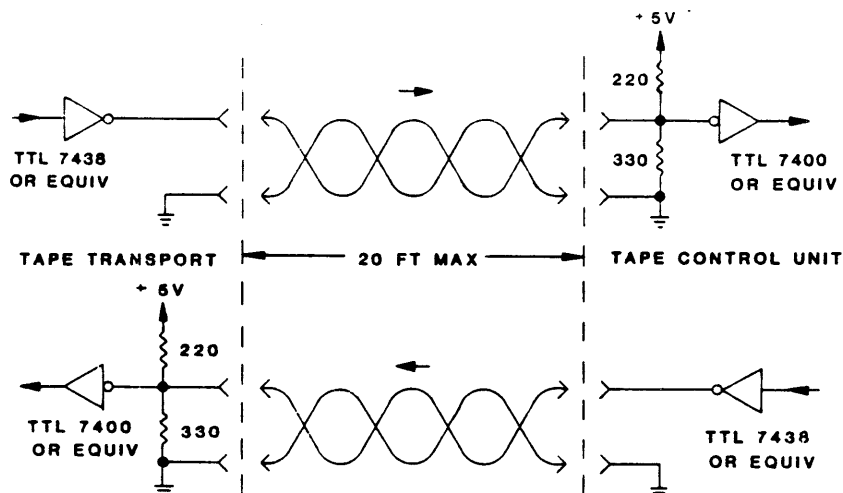


Figure 1-2 Receiver/Driver Interface Configuration

1.6 INTERFACE SIGNALS

The following paragraphs describe the specifications and functions for each signal required between the Host/controller and the 9600 tape Drive. Under the signal name are listed its mnemonic designation, the connector, active pin and associated ground pin designations for each signal line. Connector designations refer to the interface cable connector that mates with the corresponding card edge connector on the Drive. Paragraph 1.6.1 describes interface input signals, while paragraph 1.6.2 describes interface output signals. Table 1-4, which follows, is a complete summary of Drive interface signals.

TABLE 1-4 INTERFACE SUMMARY (SHEET 1 OF 2)

Interface I/O Connection P1/P2				
Live Pin	Ground Pin	Signal Name	Mnemonic	In/Out
P1-				
2	1	FORMATTER BUSY	IFBY	OUT
4	3	LAST WORD	ILWD	IN
6	4	WRITE DATA 4	IW4	IN
8	5	INITIATE COMMAND	IGO	IN
10	9	WRITE DATA 0	IW0	IN
12	11	WRITE DATA 1	IW1	IN
14	13	Reserved	—	—
16	15	LOAD ON-LINE	ILOL	IN
18	17	REVERSE/FORWARD	IREV	IN
20	19	REWIND	IREW	IN
22	21	WRITE DATA PARITY	IWP	IN
24	23	WRITE DATA 7	IW7	IN
26	25	WRITE DATA 3	IW3	IN
28	27	WRITE DATA 6	IW6	IN
30	29	WRITE DATA 2	IW2	IN
32	31	WRITE DATA 5	IW5	IN
34	33	WRITE/READ	IWRT	IN
36	35	Reserved	—	—
38	37	EDIT	IEDIT	IN
40	39	ERASE	IERS	IN
42	41	WRITE FILE MARK	IWFM	IN
44	43	LONG GAP	ILGP	IN
46	45	TRANSPORT ADDRESS 0	ITAD0	IN
48	47	READ DATA 2	IRD2	OUT
50	49	READ DATA 3	IRD3	OUT

TABLE 1-4 INTERFACE SUMMARY (SHEET 2 OF 2)

Interface I/O Connection P1/P2				
Live Pin	Ground Pin	Signal Name	Mnemonic	In/Out
P2-				
1	5	READ DATA PARITY	IRP	OUT
2	5	READ DATA 0	IRD0	OUT
3	5	READ DATA 1	IRD1	OUT
4	5	LOAD POINT	ILDP	OUT
6	5	READ DATA 4	IRD4	OUT
8	7	READ DATA 7	IRD7	OUT
10	9	READ DATA 6	IRD6	OUT
12	11	HARD ERROR	IHER	OUT
14	13	FILE MARK	IFMK	OUT
16	15	ID BURST/ CHECK CHARACTER GATE	ID/ICCG	OUT
18	17	FORMATTER ENABLE	IFEN	IN
20	19	READ DATA 5	IRD5	OUT
22	21	END OF TAPE	IEOT	OUT
24	23	OFF-LINE	IOFL	IN
26	25	NRZ1	INRZ1	OUT
28	27	READY	IRDY	OUT
30	29	REWINDING	IRWD	OUT
32	31	FILE PROTECT	IFPT	OUT
34	33	READ STROBE	IRSTR	OUT
36	35	WRITE STROBE	IWRST	OUT
38	37	DATA BUSY	IDBY	OUT
40	39	SPEED	ISPD	OUT
42	41	CORRECTED ERROR	ICER	OUT
44	43	ON-LINE	IONL	OUT
46	45	TRANSPORT ADDRESS 1	ITAD1	IN
48	47	TRANSPORT ADDRESS 2	ITAD2	IN
50	49	HIGH SPEED	IHSP	IN

1.6.1 INTERFACE INPUT SIGNALS (HOST TO DRIVE)

1.6.1.1 DRIVE ADDRESS

ITAD0, ITAD1, ITAD2

Level

P1-46, P2-46, P2-48

The three Drive Address lines comprise a 3-bit binary code used by the host to select one of up to eight tape drives. Table 1-5, which follows, defines the tape drive addresses produced as a result of ITAD0, ITAD1, and ITAD2.

TABLE 1-5 DRIVE ADDRESS SELECTION

ITAD0	ITAD1	ITAD2	ADDRESS
0	0	0	SLT0
0	1	0	SLT1
1	0	0	SLT2
1	1	0	SLT3
0	0	1	SLT4
0	1	1	SLT5
1	0	1	SLT6
1	1	1	SLT7

1.6.1.2 INITIATE COMMAND

IGO Pulse P1-8

The IGO pulse initiates any command specified by the command lines described in the following paragraphs. Information on the command lines is latched by the Formatter on the trailing edge of the IGO pulse. IFBY is set true (low) when the IGO pulse is given to the Formatter and the selected Drive is ready.

Note: Command lines must be stable 0.5 microseconds before and after the IGO pulse.

1.6.1.3 REVERSE/FORWARD

IREV Level P1-18

The IREV level initiates reverse tape motion when true (low). When false (high), this level specifies forward tape motion.

1.6.1.4 WRITE/READ

IWRT Level P1-34

Write mode is specified when IWRT is true (low); read mode is specified when IWRT is false (high).

1.6.1.5 WRITE FILE MARK

IWFM Level P1-42

The Formatter will write a file mark on tape when both IWFM and IWRT are true (low).

1.6.1.6 EDIT

IEDIT Level P1-38

When both IEDIT and IWRT are true (low), the Drive operates in the edit mode. Both IEDIT and IREV true (low) modify the read reverse stop delay to optimize head positioning for a subsequent edit operation.

1.6.1.7 ERASE

IERS	Level	P1-40
------	-------	-------

When IERS, IWRT, and IWFM are all true (low), approximately 3.75 inches of tape will be erased. Both IERS and IWRT true (low) will cause the Formatter to execute a dummy write command; the Formatter will issue a normal write command but no data will be recorded. A length of tape, as defined by ILWD, will be erased.

1.6.1.8 HIGH SPEED

IHSP	Level	P2-50
------	-------	-------

IHSP true (low) causes the selected on-line Drive to operate in high speed mode (100 ips).

1.6.1.9 REWIND

IREW	Pulse	P1-20
------	-------	-------

A pulse which causes the Drive to rewind to load point. IREW pulse is directly routed to the Drive and does not cause the Formatter to go busy.

1.6.1.10 LONG GAP

ILGP	Level	P1-44
------	-------	-------

ILGP true (low), during a write mode, causes gaps of 1.2 inches to be erased on tape between data blocks instead of the normal 0.6 inch gaps.

1.6.1.11 OFF-LINE/UNLOAD

IOFL	Pulse	P2-24
------	-------	-------

Asserting the IOFL pulse causes the Drive to rewind to load point, go off-line, and unload the tape onto the supply reel.

1.6.1.12 LAST WORD

ILWD	Level	P1-4
------	-------	------

ILWD goes true (low) when the last data character is placed on the interface lines. ILWD true (low) during a WRITE or ERASE command indicates that the next character to be strobed into the Formatter is the last character of the record.

1.6.1.13 FORMATTER ENABLE

IFEN	Level	P2-18
------	-------	-------

IFEN false (high) causes all formatters in the system to revert to the quiescent state. The IFEN signal line may be used to: 1) disable the formatters if Host power is lost or 2) clear Formatter logic when illegal commands or unusual conditions occur.

1.6.1.14 WRITE DATA LINES

IWP, IW0-IW7 Levels (see table 1-4)

WRITE DATA LINES are present in both NRZ1 and PE writing modes and will be defined for each application.

NRZ1:

The nine WRITE DATA LINES transmit write data from the Host to the Formatter. The data bits appearing on IW0-IW7 are written onto the corresponding channels on tape; IW7 corresponds to the least significant bit of the character.

The IWP line is optional and is utilized only if it is required to write the parity bit specified by the customer. When this option is not employed, the Formatter generates odd parity internally on the basis of data contained on IW0-IW7.

The first character of a record should be available on these lines within one character period after IDBY goes true (low) and remain until the trailing edge of the first IWSTR is issued by the Formatter. The next character of information must then be placed on these lines within one half of a character period. Subsequent characters of a record are processed in this manner until ILWD is set true (low) by the Host when the last character is transmitted.

PE:

The eight WRITE DATA LINES (nine, in the case of external parity option) are utilized to transmit write data from the Host to the Formatter. IW0 corresponds to the most significant bit and IW7 to the least significant bit of each character.

The first character of a record should be available on these lines within one character period after IDBY goes true (low) and remain until the trailing edge of the first IWSTR is issued by the Formatter. The next character of information must then be placed on these lines within one half of a character period. Subsequent characters of a record are processed in this manner until ILWD is set true (low) by the Host when the last character is transmitted.

1.6.1.15 LOAD ON LINE

ILOL Pulse P1-16

ILOL causes the Drive to be placed on line. If the Drive had been running when it went off line, the tape remains at its current position when ILOL is asserted. If the tape is installed but not yet loaded when ILOL is asserted, the tape will be loaded, but will not rewind to BOT.

1.6.2 INTERFACE OUTPUT SIGNALS (DRIVE TO HOST)**1.6.2.1 FORMATTER BUSY**

IFBY Level P1-2

IFBY goes true (low) on the trailing edge of IGO when a command is issued by the Host. IFBY will remain true until tape motion ceases.

1.6.2.2 DATA BUSY

IDBY Level P2-38

IDBY goes true (low) during the active execution of all commands initiated by IGO. A new command may be issued 0.5 microseconds after IDBY goes false (high).

1.6.2.3 HARD ERROR

IHER

Pulse

P2-12

NRZ1 Mode:

IHER true (low) indicates a read error. IHER line will be true (low) during read operation when one or more of the following occurs:

- 1) Longitudinal parity error
- 2) Improper record format
- 3) CRCC parity error
- 4) Vertical parity error on a data character

In all cases except a vertical parity error, IHER will be pulsed after the complete record has been read. In the case of a vertical parity error, the IHER line will be pulsed when a read strobe (RSTR) pulse is issued for the character in error. IDBY goes false (high) after all error information has been transferred to the Host.

PE Mode:

IHER true (low) indicates that an uncorrectable read error has occurred and that the record should either be reread or rewritten. The table below illustrates the possible IHER/ICER signal combinations:

TABLE 1-6 IHER/ICER SIGNAL COMBINATIONS

IHER	ICER	Meaning
0	0	No error detected
0	1	Single channel error
1	0	Postamble, VRC or multiple channel error
1	1	Overflow or single track error with postamble and VRC error

1.6.2.4 CORRECTED ERROR

ICER

Pulse

P2-42

ICER true (low) indicates that a single track dropout has been detected and the Formatter is performing an error correction.

1.6.2.9 FILE PROTECT

IFPT Level P2-32

IFPT is true (low) when a reel of tape without a write-enable ring is mounted on the Drive supply hub.

1.6.2.10 LOAD POINT

ILDLP Level P2-4

ILDLP is true (low) when the load point marker is under the BOT sensor and the Drive is not rewinding. After receipt of a motion command the signal will remain true until the load point marker leaves the BOT sensor area.

1.6.2.11 END OF TAPE

IEOT Level P2-22

IEOT is true (low) when the EOT marker is detected in the forward direction. IEOT goes false (high) when the EOT marker is detected in reverse (REWIND).

1.6.2.12 REWINDING

IRWD Level P2-30

IRWD is true (low) when the Drive is engaged in a rewind operation or returning to the load point at the end of the rewind operation.

1.6.2.13 WRITE STROBE

IWSTR Pulse P2-36

IWSTR pulses each time a data character is written onto tape. IWSTR samples the write data lines IWP, IW0-IW7 from the Host and copies this information character-by-character into the Formatter logic. The first character should be available prior to the first write strobe pulse and succeeding characters should be set up within half a character period after the trailing edge of each write strobe pulse. The write strobe is also active during variable length erase command; however, the data being copied into the Formatter will have no meaning.

1.6.2.14 READ STROBE

IRSTR Pulse P2-34

IRSTR is pulsed for each character of read information to be transmitted to the Host. IRSTR is used to sample the read data lines IRP and IRD0-IRD7.

In NRZ1 formatters, the transmission of CRC and LRC data characters will be flagged by the check character gate (ICCG) signal as described above under IHER.

1.6.2.15 READ DATA LINES

IRP, IR0-IR7

Levels

(see table 1-4)

The READ DATA LINES transmit the read data for NRZ1 and PE modes. Each character read from tape is made available by parallel sampling the read lines using the Read Strobe. Since the data remains on the read lines for a full character period, the corresponding IRSTR pulses are timed to occur after approximately the center of the character period.

1.6.2.16 SPEED

ISPD

Level

P2-40

ISPD true (low) indicates the selected Drive is in the high speed streaming mode.

1.6.2.17 NRZ1

INRZ1

Level

P2-26

INRZ1 true (low) indicates the selected Drive is operating in NRZ1 mode. A false (high) level on INRZ1 indicates the selected Drive is operating in the PE mode.

1.6.3 COMMAND LINE CONFIGURATIONS

Host Commands are conveyed on some of the Interface Lines listed in Table 1-4. The following Table 1-7 lists these commands and shows the configurations that control the various modes of operation, which are described in detail in the following subparagraphs.

TABLE 1-7 COMMAND CONFIGURATION

COMMAND	Line—> Signal—>	P1-18 IREV	P1-34 IWRT	P1-42 IWFM	P1-38 IEDT	P1-40 IERS
READ FORWARD		H	H	H	H	H
READ REVERSE		L	H	H	H	H
READ REVERSE EDIT		L	H	H	L	H
WRITE		H	L	H	H	H
WRITE EDIT		H	L	H	L	H
WRITE FILEMARK		H	L	L	H	H
ERASE VARIABLE LENGTH		H	L	H	H	L
ERASE FIXED LENGTH		H	L	L	H	L
ERASE DATA SECURITY		H	L	L	L	L
SPACE FORWARD		H	H	H	H	L
SPACE REVERSE		L	H	H	H	L
FILE SEARCH FORWARD		H	H	L	H	H
FILE SEARCH REVERSE		L	H	L	H	H
FILE SEARCH FORWARD*		H	H	L	H	L
FILE SEARCH REVERSE*		L	H	L	H	L
SET 800 BPI (NRZ1)		H	L	L	L	H
SET 1600 BPI (PE)		H	H	L	L	L

* Ignore Data

1.6.3.1 READ FORWARD

READ FORWARD command causes tape on the selected Drive to be accelerated to the normal Drive operating speed. The Drive generates the delays necessary for proper positioning of the Drive read head in the interblock gap. Another read command can be issued before the tape decelerates to a stop, reducing the access time by at least one ramp time.

1.6.3.2 READ REVERSE AND READ REVERSE EDIT

READ REVERSE command is similar to a READ FORWARD command except that tape motion is in the reverse direction. During the reverse operation, the unit always resets to the quiescent state when the BOT signal is present. In this operation the head can be repositioned further back in the gap by issuing the EDIT command, to optimize head positioning for rewriting the block.

1.6.3.3 WRITE

WRITE command causes the unit to accelerate tape, and after the appropriate prerecord delay time, to begin transferring data from the Host to the Drive. This process continues until a LAST WORD input is received from the Host.

1.6.3.4 WRITE EDIT

WRITE EDIT command causes the write current to be switched off slowly at the end of an edit sequence in order to minimize the possibility of recording a glitch on tape.

1.6.3.5 WRITE FILE MARK

WRITE FILE MARK command causes either a PE or an NRZ1 file mark to be written on tape, depending on the selected mode.

1.6.3.6 ERASE VARIABLE

ERASE VARIABLE command, issued when both the Erase and Write lines are true, causes the Drive to execute a Dummy Write, erasing tape until LAST WORD is issued by the Host.

1.6.3.7 ERASE FIXED LENGTH

FIXED LENGTH ERASE command causes a 4.0 inch length of tape to be erased. This command is always executed while moving tape in the forward direction.

1.6.3.8 ERASE DATA SECURITY

Data Security Erase command causes tape to be erased from the present tape position to a point 3 to 5 feet past End of Tape (EOT). Tape is then rewound to Beginning of Tape (BOT).

1.6.3.9 SPACE FORWARD

SPACE FORWARD command is similar to the READ FORWARD command, except that no read strobes are supplied to the Host and no error checking is performed. However, the record read is checked for a file mark.

1.6.3.10 SPACE REVERSE

SPACE REVERSE command is similar to a READ REVERSE command, except that tape motion is in reverse.

1.6.3.11 FILE MARK SEARCH FORWARD/REVERSE

A FILE MARK SEARCH FORWARD command causes the Drive to execute a series of READ FORWARD commands, while the REVERSE command causes the Drive to execute a series of READ REVERSE commands. Both series are terminated by the recognition of either a file mark character or the EOT tab. Tape is stopped following the reading of a file mark in a manner similar to terminating a normal read operation.

If the BOT tab is encountered during a file mark search operation, the operation is terminated. The FILE MARK SEARCH FORWARD command may be combined with a SPACE FORWARD command, thereby preventing IRSTR, ICER, and IHER signals from being presented at the Drive unit to Host interface. The FILE MARK SEARCH REVERSE command may be combined with a SPACE REVERSE command, thereby preventing IRSTR, ICER, and IHER signals from being presented at the Drive unit to Host interface.

1.6.3.12 DENSITY SELECT (SET 800 BPI/SET 1600 BPI)

Density Select Commands set the Drive for operation in the Density Mode designated by the command. SET 800 BPI sets the Drive for NRZ1 Mode at 800 BPI. Set 1600 BPI sets the Drive for PE Mode at 1600 BPI. These commands will be accepted only when the tape is at BOT.

1.6.3.13 REWIND (IREW) (Single-Line Command - Table 1-4)

REWIND command causes the Drive to rewind to BOT. In systems where more than one Drive is daisy chained, it is possible to rewind several drives while transferring data to or from another Drive in the chain.

1.6.3.14 OFF-LINE (IOFL) (Single-Line Command - Table 1-5)

OFF-LINE command places the unit under local control and causes the Drive to perform a Rewind/Unload Operation.

1.6.4 FORMATTER TIMING

Refer to Figure 1-3 through 1-10 for interface timing.

1.6.5 DAISY CHAINING

Up to eight Model 9600 Drives may be daisy chained from a single Host. For further details on daisy chaining see Section II, paragraph 2.3.1.

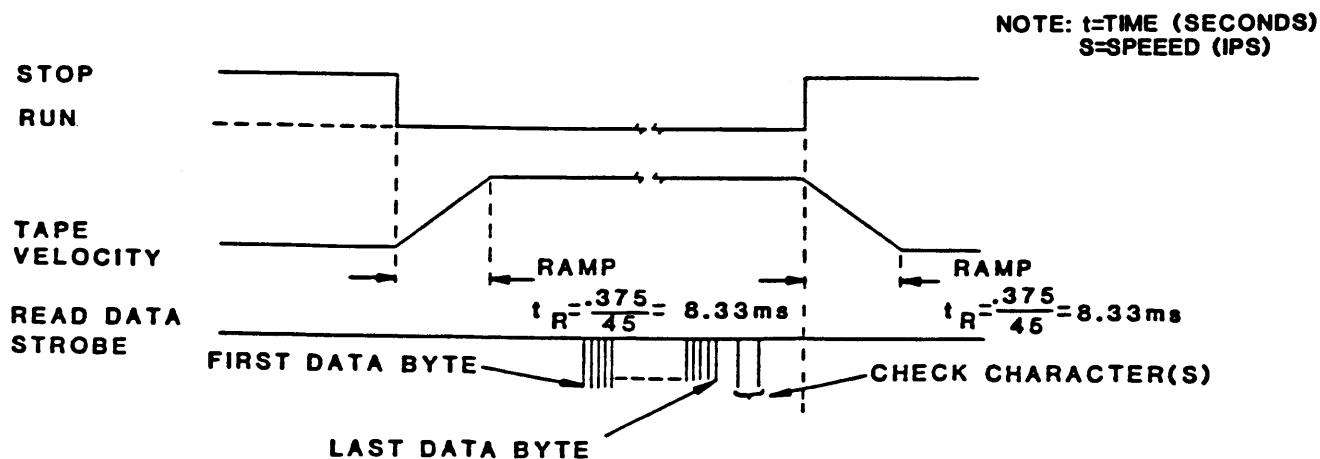
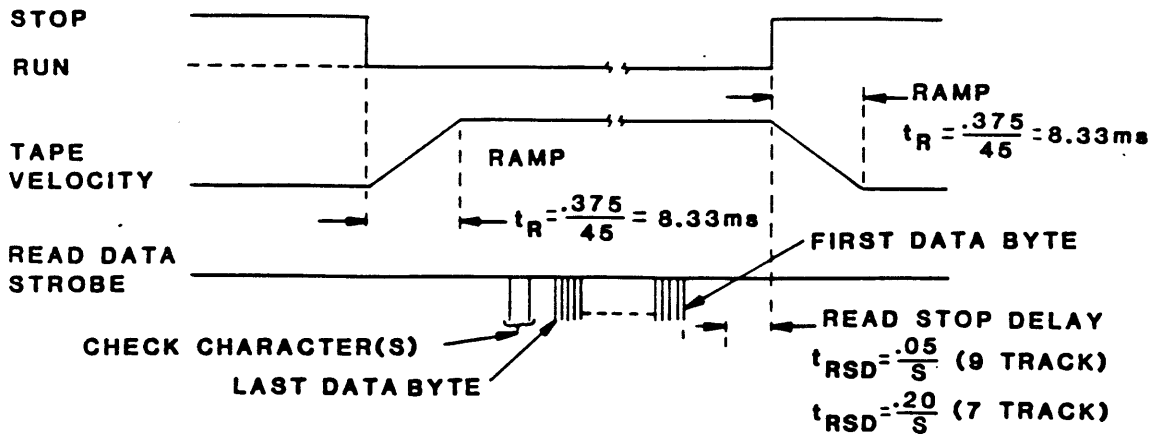
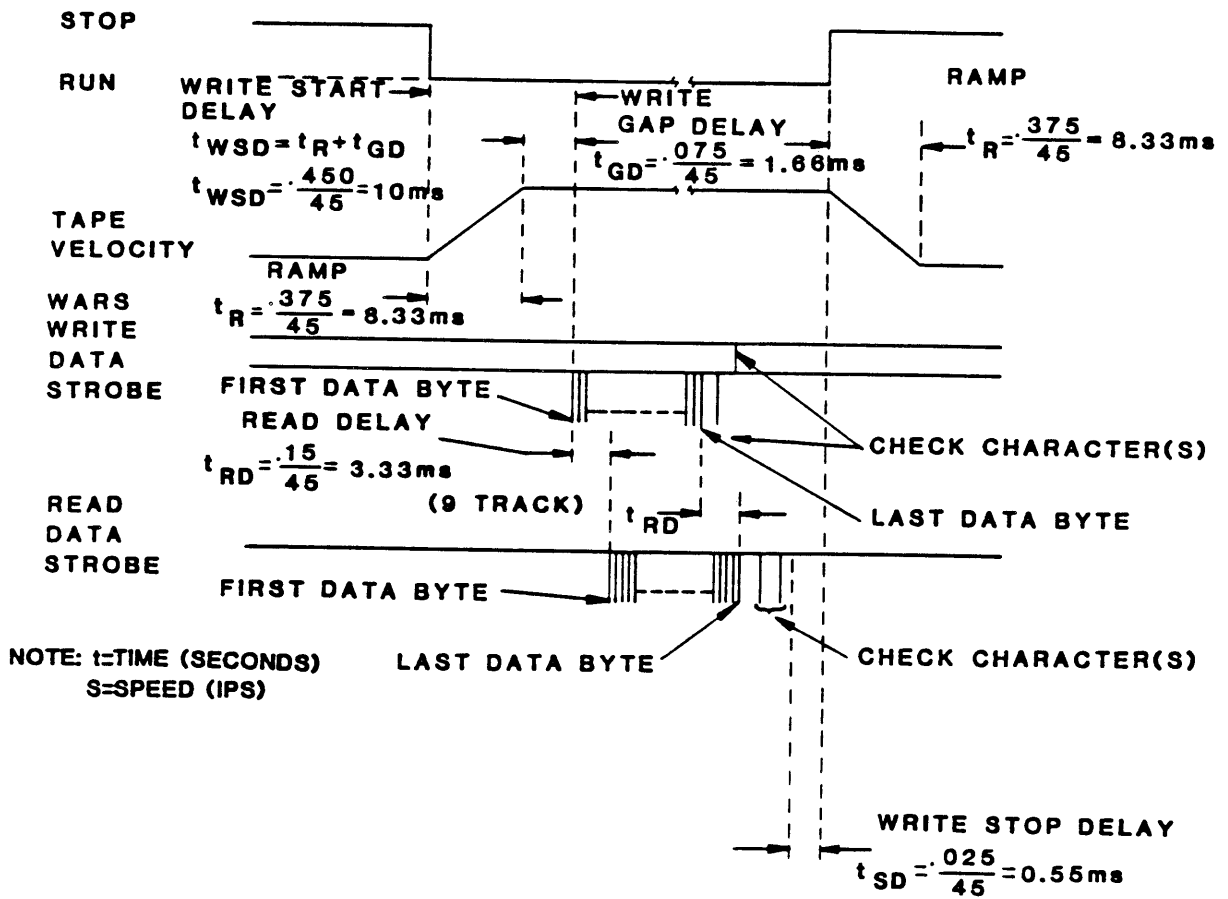


Figure 1-3 Read Forward Timing



NOTE: t=TIME (SECONDS)
S=SPEED (IPS)

Figure 1-4 Read Reverse Timing



NOTE: t=TIME (SECONDS)
S=SPEED (IPS)

Figure 1-5 Write Timing

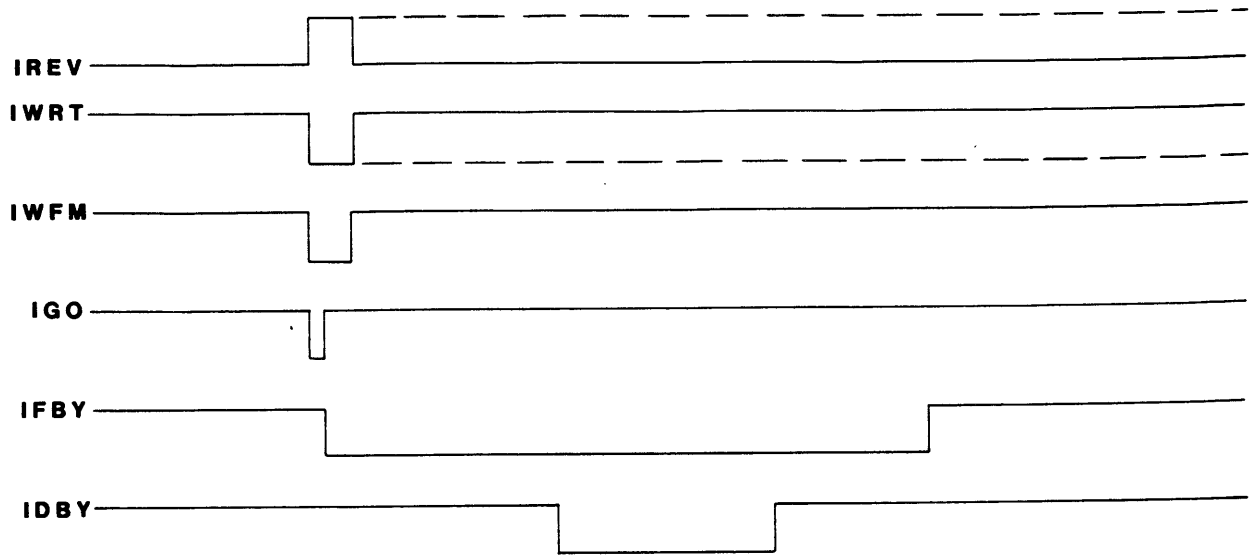


Figure 1-6 NRZ1 Write File Mark

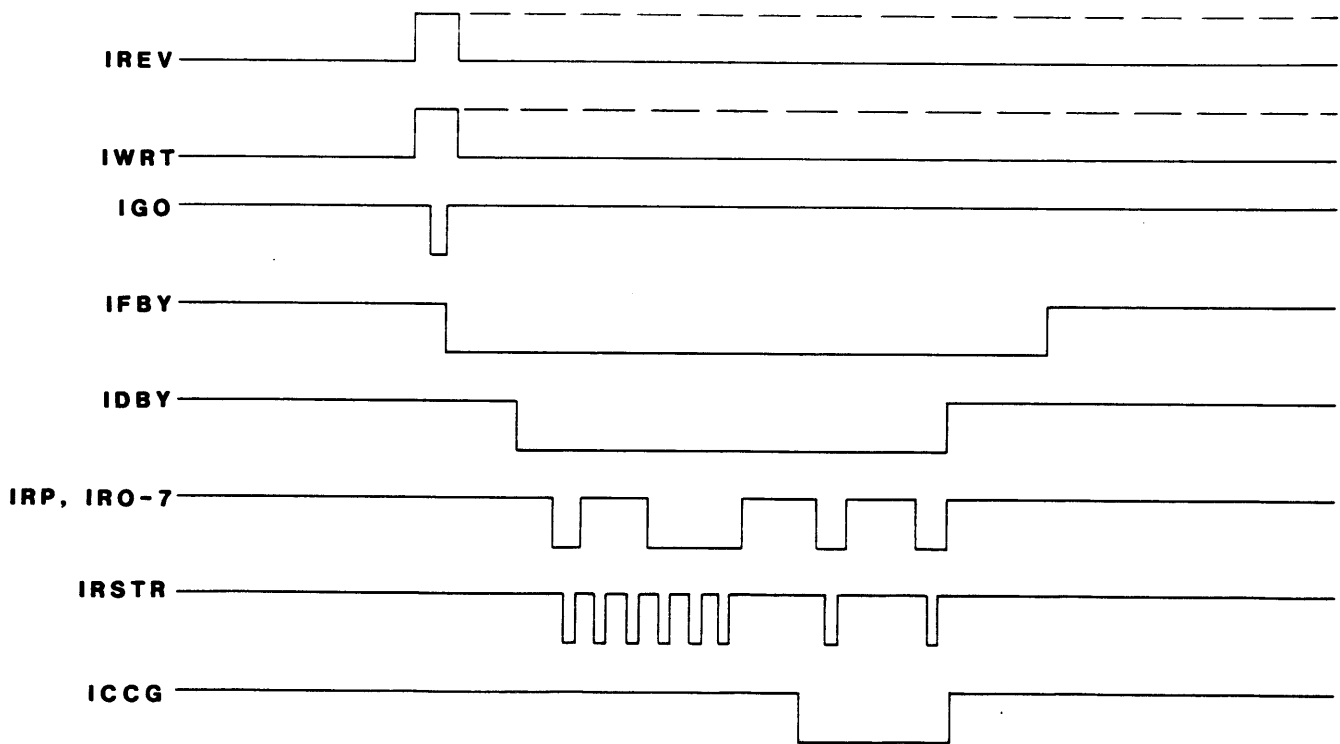


Figure 1-7 NRZ1 Read Timing

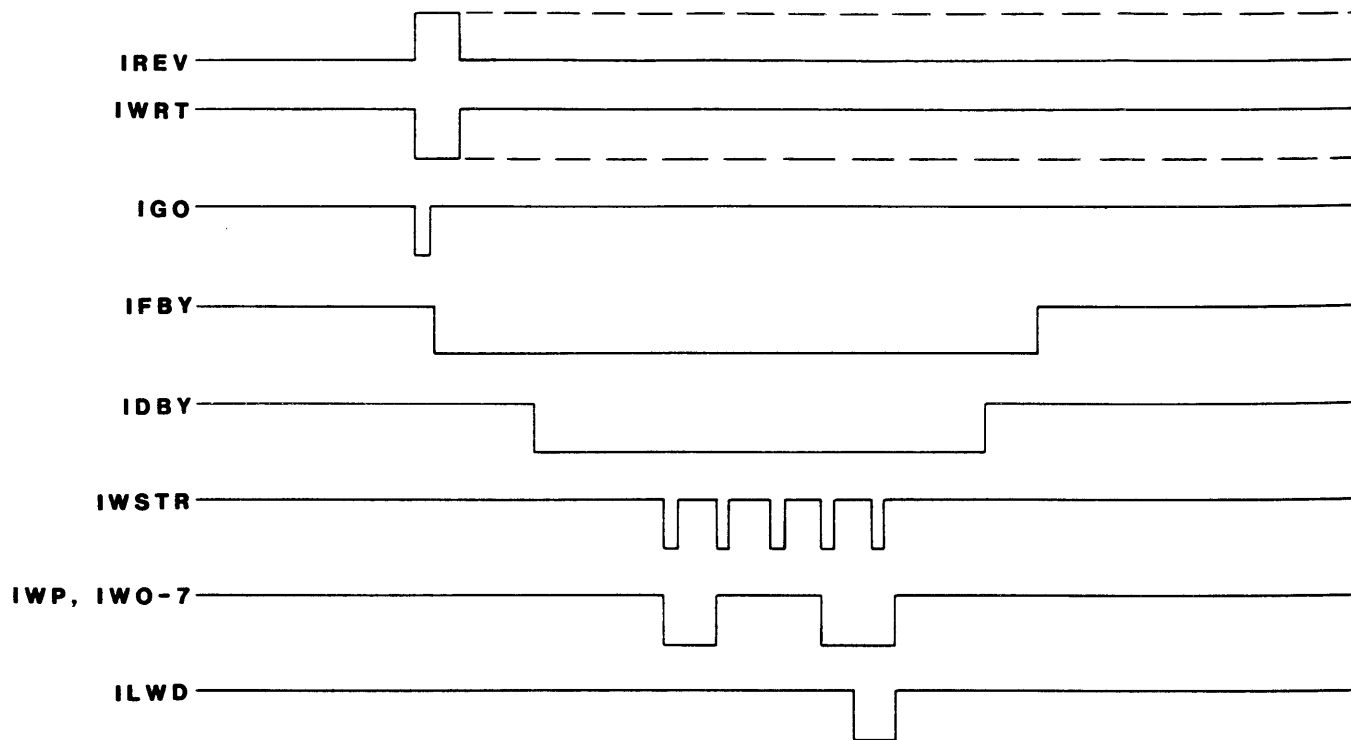


Figure 1-8 NRZ1 Write Timing

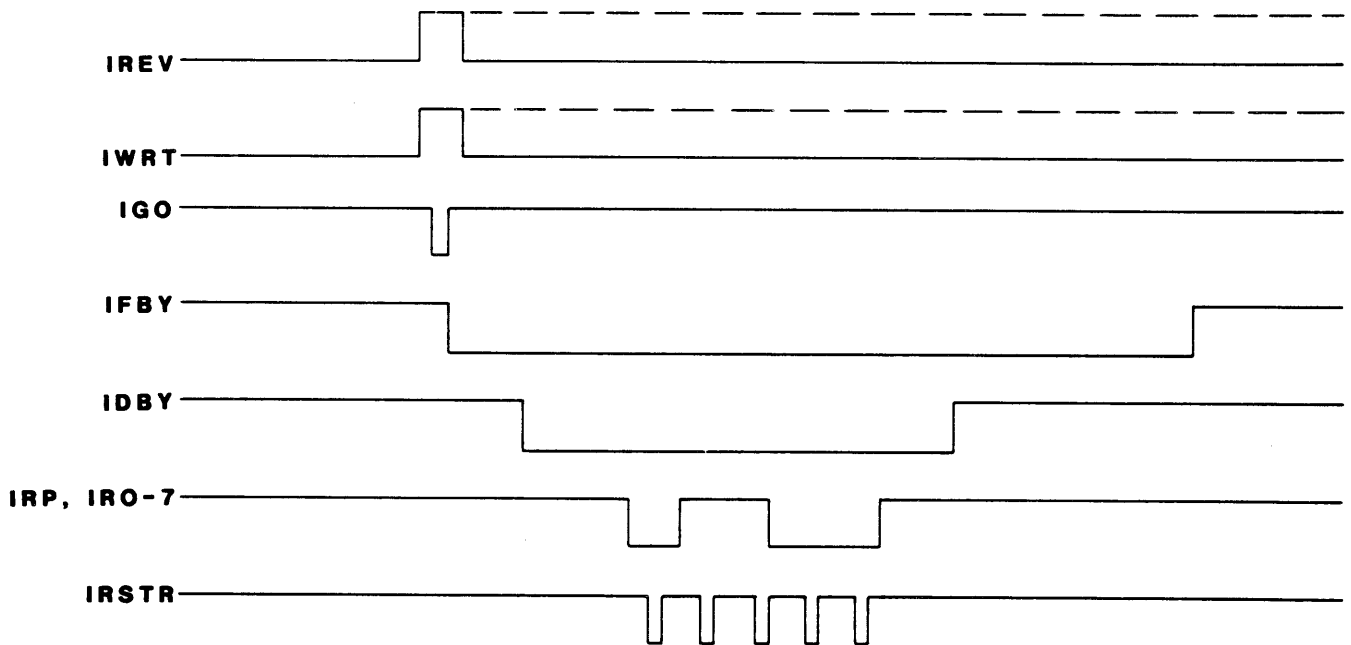


Figure 1-9 PE Read Timing

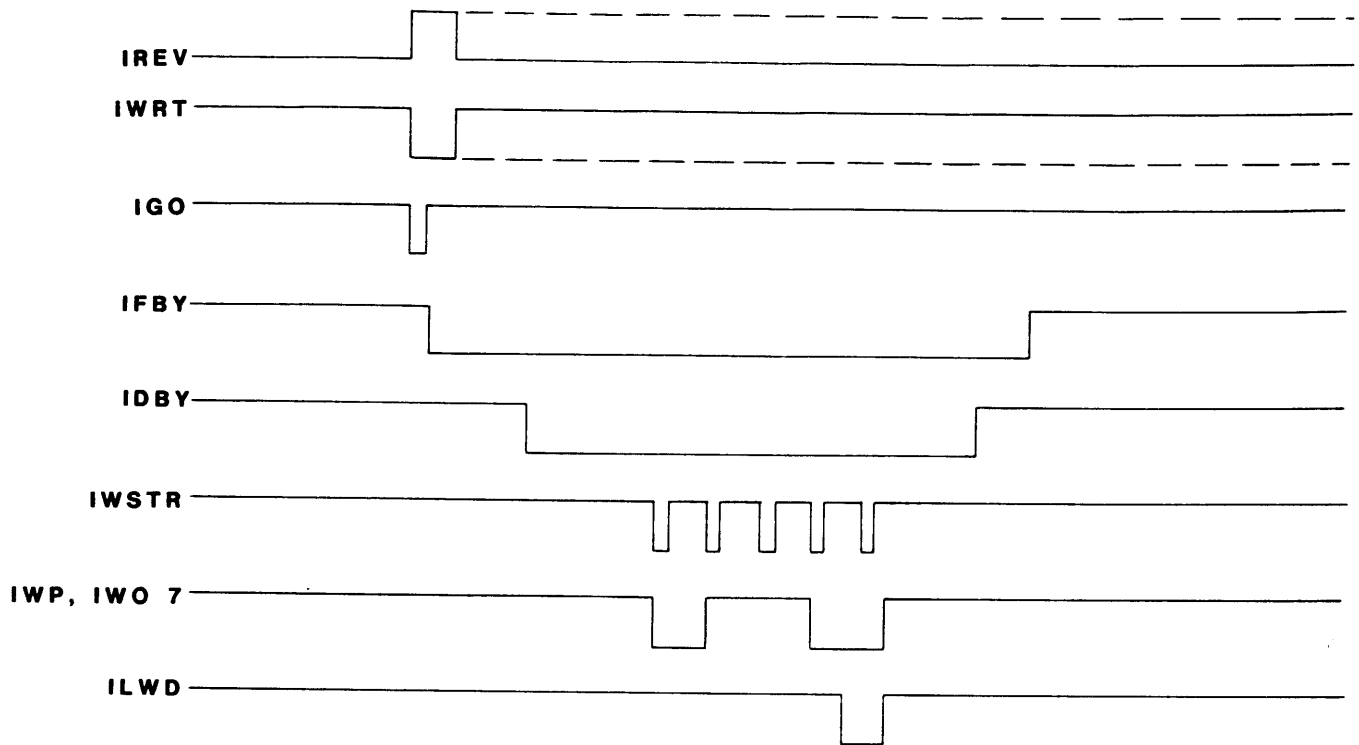


Figure 1-10 PE Write Timing

SECTION II
INSTALLATION AND OPERATION

SECTION II

INSTALLATION AND OPERATION

2.0 INTRODUCTION

Section II describes the unpacking, inspection, installation, cabling, and operation of the Model 9600 Tape Drive.

2.1 UNPACKING

WARNING

The Model 9600 Tape Drive weighs approximately 105 pounds. Use safe lifting practices to remove the drive from the container.

The Model 9600 is cushioned by styrofoam supports and shipped in a heavy construction cardboard container (Figure 2-1). Place the shipping container on a flat, dry, non-slip surface. Carefully open the shipping container. Remove and save the following items found inside the carton: The rack mount slide rails, AC power cord, fuse for 220/240 volt operation, flat cable strain-reliefs, and 9600 Manual. Fold back the polyethylene wrap, remove the Drive from the shipping container, and set it on a flat surface. Retain the shipping container, polyethylene wrap, and styrofoam supports for future shipment.

2.2 INSPECTION

Inspect the drive for shipping damage such as scratches, dents, or cracks in the frame. On the Dust Cover (top of Drive), turn the two holding screws 1/4th turn counterclockwise, open the dust cover and, with the Cover Support Bar (Figure 2-2), latch the Dust Cover in Maintenance position. Check for loose or missing parts, and foreign material. Open the Tape Path Cover and verify that all parts/areas of the tape path are clean. Remove the PCBA Cover and verify that all PC boards (Figure 2-4) are seated properly. Reinstall PCBA cover plate.

2.3 CABLING AND DAISY CHAINING REQUIREMENTS

Host-to-Drive interconnect cables and connectors must be provided by the user. Recommended connectors and cables are listed and described below:

- 1) Card Edge connectors: For single unit, two 50-pin edge-to-ribbon connectors without mounting ears are required. For daisy chains, two connectors are required for each unit (maximum 8 units - 16 connectors). (See Figures 2-3 and 2-4).

<u>VENDOR</u>	<u>P/N</u>
3M	3415-0001 or equivalent
Kennedy	121-00162-002

- 2) Ribbon Cables: Two flat Ribbon Cables, 50-wire, 28-gauge, UL Style 2651. The maximum length of the cable from the Host to a single Drive, or from the host to the last Drive in a Daisy Chain, is 20 feet.

<u>VENDOR</u>	<u>P/N</u>	<u>VENDOR</u>	<u>P/N</u>
3M	3365/50 or	Winchester	55-5038-10 or
Berg	76164-050 or	Kennedy	160-00056-001 or equivalent

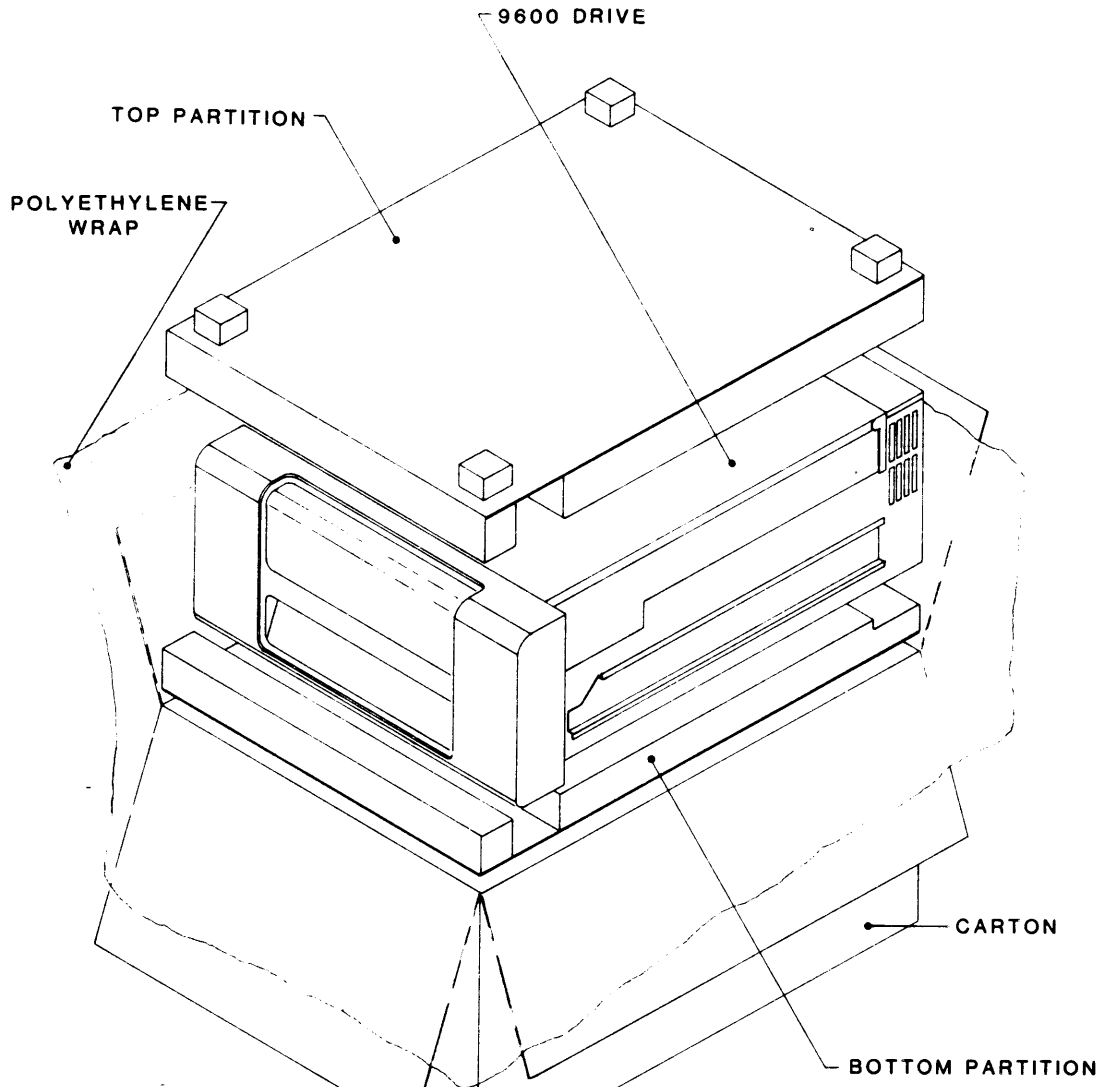


Figure 2-1 Unpacking

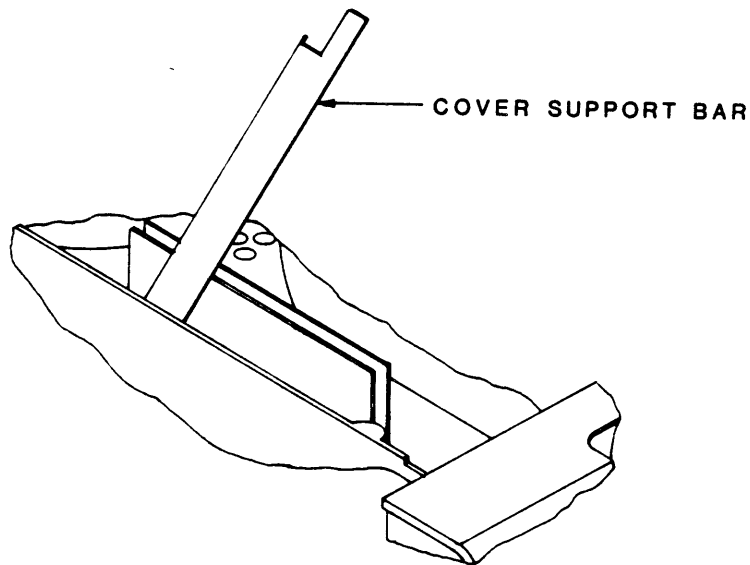


Figure 2-2 Dust Cover Support Bar

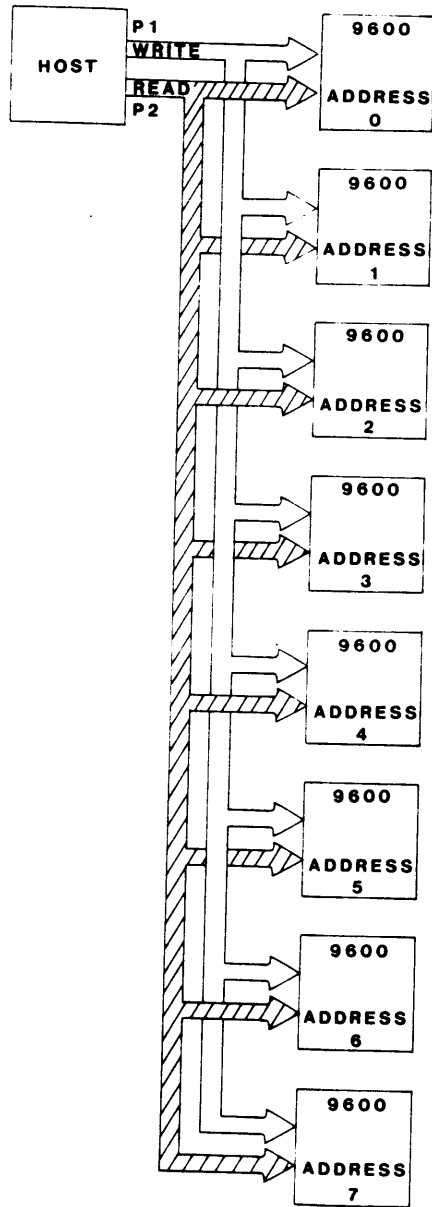


Figure 2-3 Daisy Chaining

NOTE: Boards can be placed in Card Cage in any order.

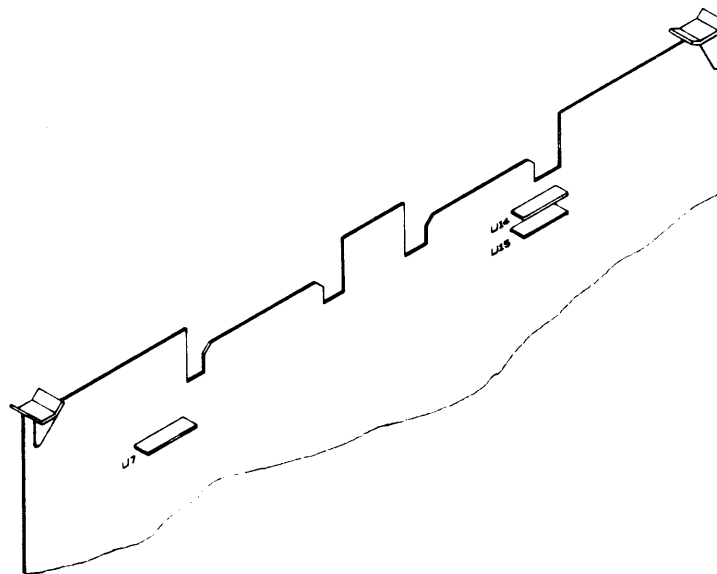
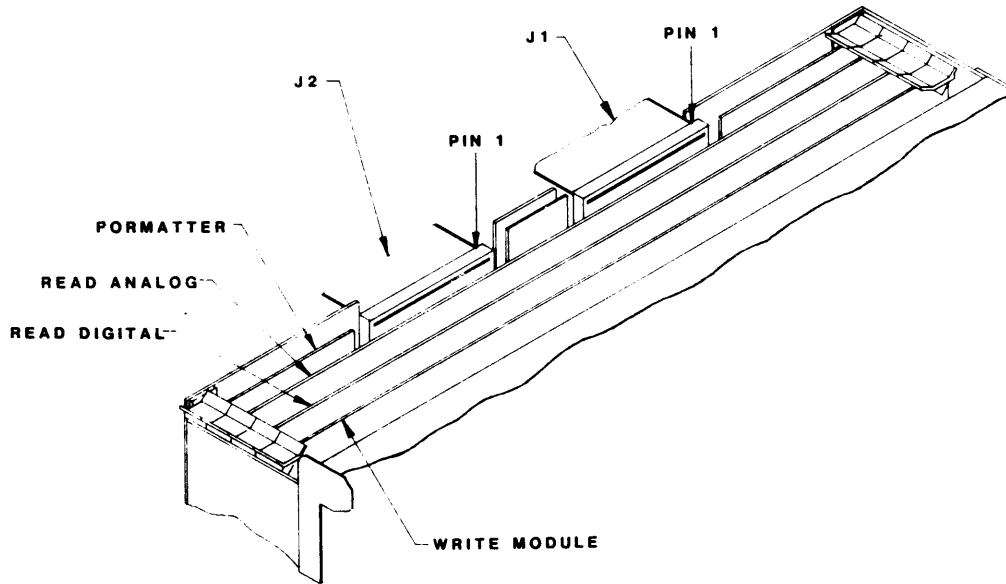


Figure 2-4 Card Cage, Cables, And Terminators

2.4 POWER UP AND INITIAL CHECKOUT

2.4.1 AC LINE VOLTAGE (100/120-Volt or 220/240-Volt Operation)

Unless otherwise ordered, the Drive is factory-set for 120-volt operation. Other voltage choices can be 100, 220, or 240. Locate the Power-In Assembly (Figure 2-5) at the rear of the unit (Figure 2-6), and verify that the Voltage Selector Card behind the plastic slide cover is installed with the correct voltage legible (as ordered).

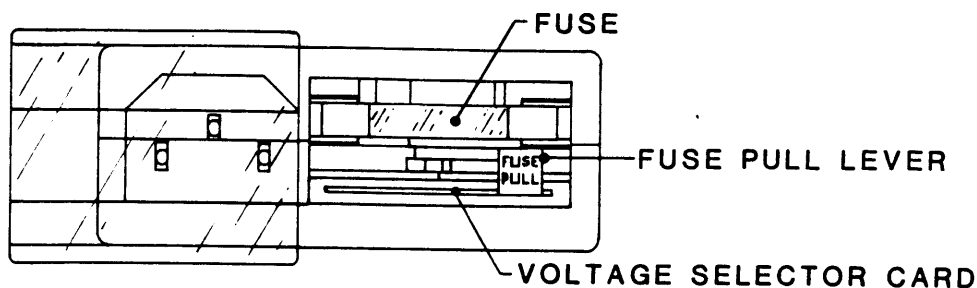


Figure 2-5 Power-In Assembly

2.4.1.1 CHANGING OPERATING VOLTAGE

Assuming that the Voltage Selector Card setting is other than the site voltage, proceed as follows:

- A) Remove the ac power cord (if installed) from the Power-In Assembly (Figure 2-5), slide the plastic cover to the left and, using long nose pliers (if necessary), remove the Voltage Selector Card.
- B) Slide the "FUSE PULL" lever to the right, remove the fuse (if fuse is incorrect size) and install the proper-size fuse supplied (6-amp for 220/240-Volt; 3-amp for 100/120-Volt).
- C) Position the Voltage Selector Card so that the correct voltage (100, 120, 220, or 240) is legible, and install the Voltage Selector Card into the Power-In Assembly.
- D) Install (as applicable*) an appropriate power plug on the source end of the power cord.

* The factory-supplied power cord may already have the appropriate power plug. 220/240-volt ac connectors may vary from country to country. The user must supply this connector.

- E) Plug the power-cord female connector into the male receptacle in the Power-In Assembly.
- F) Plug the power-cord male connector into an appropriate ac outlet.

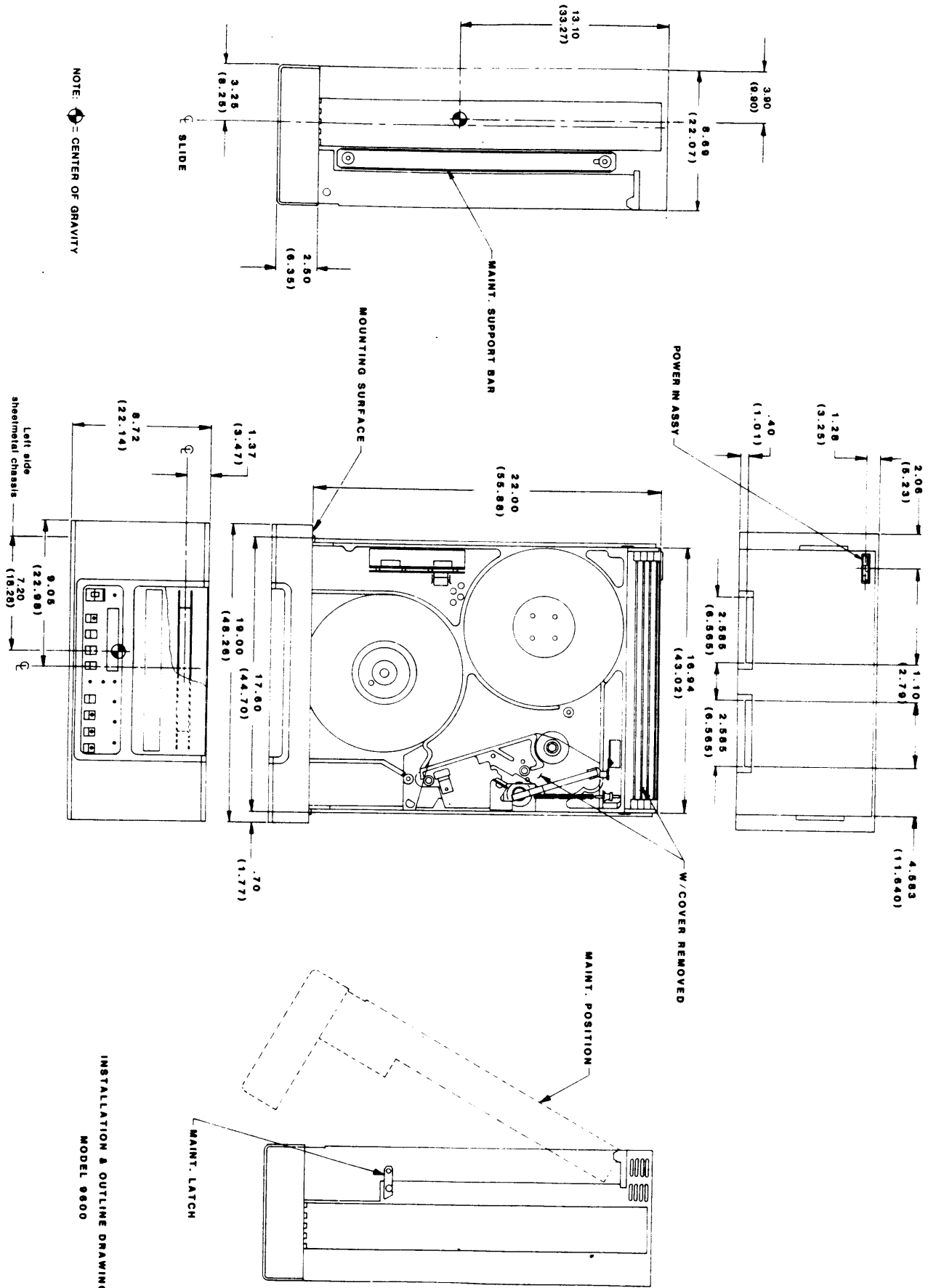
2.4.2 POWER UP

- A) Check that the Voltage-Selector Card is set for the line voltage of the installation site per paragraph 2.4.1.
- B) Turn Power ON-OFF switch ON (Figure 2-7).
- C) Check that the following panel indicators light: the Power-On LED (unmarked, located above the Power switch), the Power ON-OFF switch, the PE and REMOTE LEDs and, the Character Display Readout indicates "9600". (NOTE: If Drive fails to power up, Display reads out "TESTING").

2.4.3 CHECKOUT

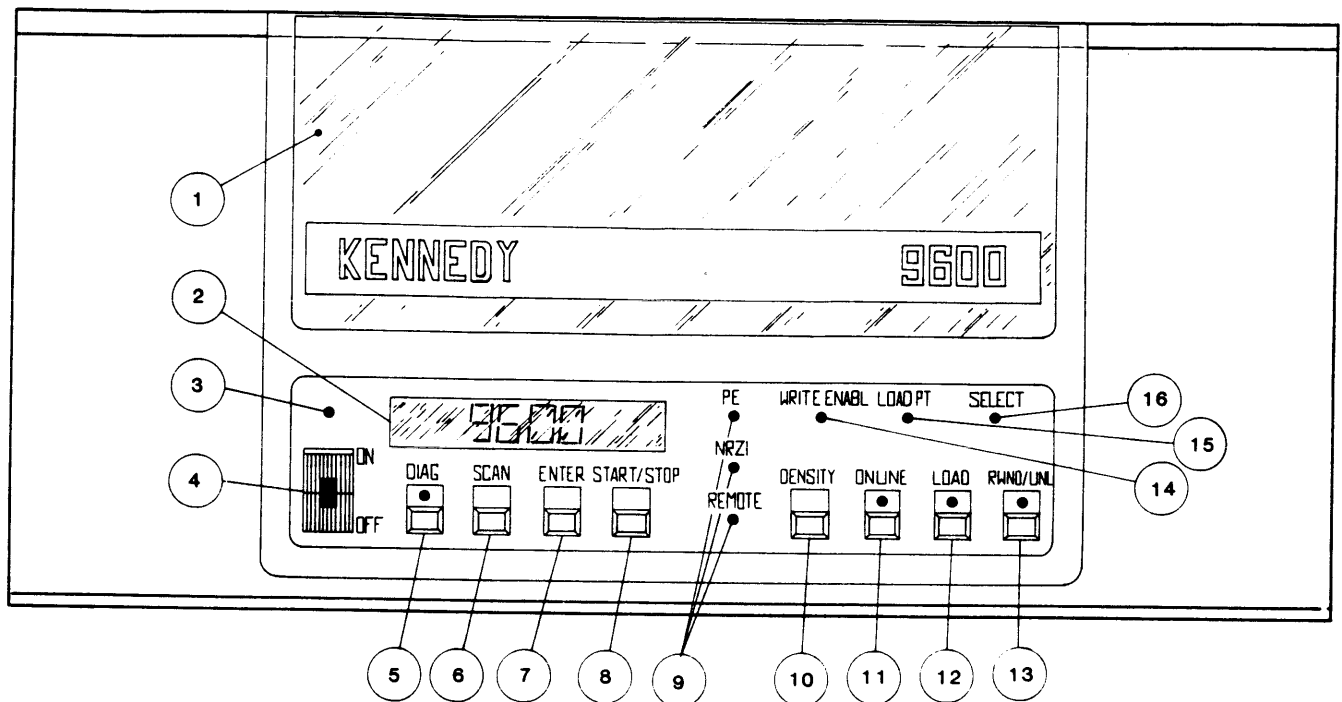
- A) Swing open the Tape Access Door as shown in Figure 2-8, and mount a 10-1 /2 inch reel onto the Hub. The reel must be properly seated with write enable ring side facing downward toward the Deck Plate. If reel is installed upside down, the RWND/UNLD LED blinks, tape will not load, and the Readout will display "REV REEL".
- B) Close the Tape Access Door.
- C) Depress LOAD. The supply reel spins slowly and the Readout displays "LOADING". The Drive vacuum system automatically threads and loads tape onto the take-up reel. The loading process continues until the tape reaches the Beginning of Tape (BOT). At BOT, the LOAD and LOAD PT (Load Point) LEDs light and the Readout displays "9600". If the Supply Reel has the Write Enable Ring installed, the WRITE ENABLE LED lights.
- D) Depress ON-LINE. ON-LINE LED lights and the Readout displays the Unit Number. If the Drive was previously selected, the SELECT LED lights.
- E) Depress ON-LINE. ON-LINE LED goes out and the Readout displays "9600".
- F) Depress DIAG. DIAG LED lights and the Readout displays "DIAG".
- G) Depress ENTER. Readout displays "MOTION". Depress SCAN. Readout displays "CAL". Depress SCAN. Readout displays "SET UP". Depress SCAN. Readout displays "MOTION".
- H) Depress ENTER. Readout displays "45 FWD" (45 ips Forward).
- I) Repeatedly depress SCAN and observe the Readout each time SCAN is depressed. The Readout should display as indicated in Table 2-1 beginning with Step 2 then returning to Step 1.
- J) Repeatedly depress SCAN until Readout displays "100 FWD".
- K) Depress ENTER. Tape moves forward at 100 ips, the LOAD PT LED goes out, and the DIAG LED blinks at 0.5 Hz. Let Drive run to the End of Tape (EOT). Readout displays "EOT".
- L) Scan through the entire menu. In the step for any Forward Motion Command, such as Step 1 (45 FWD), Step 3 (45 FSS), Step 5 (45 FRF), etc., the Display reads "EOT".
- M) Depress SCAN. Readout displays "100 REV".

- N) Depress ENTER. Tape runs at 100 ips in reverse. Let Drive run to the Beginning of Tape (BOT). Readout displays "BOT".
- O) Scan through the entire menu. In the step for any Reverse Motion Command, such as Step 2 (45 REV), Step 4 (45 RSS), etc., the Display reads "BOT" and the Command cannot be entered.
- P) Depress DIAG. DIAG LED goes out, and Readout displays "9600".
- Q) Depress RWND/UNL. Tape rewinds to the supply reel, and Readout displays "UNLDNG" until tape is unloaded (stops motion), then the readout displays "9600".
- R) Open the Tape Access Door, remove the tape, and turn off power.



INSTALLATION & OUTLINE DRAWING
MODEL 9600

Figure 2-6 Outline And Installation Drawing



- 1) **Tape Access Door** - Supply Hub Access (Ref).
- 2) **Character Display Readout** - Displays operating mode, status, parameters, and diagnostic messages.
- 3) **Unmarked LED** - Lights when ac power is applied to Drive.
- 4) **ON/OFF Switch** - Controls ac power to Drive. Lights internally when Drive is ON.
- 5) **DIAG Pushbutton** - Turns diagnostics ON and OFF when Drive is off-line. Internal LED lights when in the diagnostics mode.
- 6) **SCAN Pushbutton** - Scans diagnostics and calibrate menus.
- 7) **ENTER Pushbutton** - Enters selected commands when in diagnostics or calibrate mode.
- 8) **START/STOP Pushbutton** - Starts or stops selected commands in the diagnostics or calibrate mode.
- 9) **REMOTE LED** - Lights when density is selectable by Host.
PE/NRZI LEDs - Indicates selected density.
- 10) **DENSITY Pushbutton** - Selects data density (PE or NRZI).
- 11) **ON-LINE Pushbutton** - Lights when Drive is On-line.
- 12) **LOAD Pushbutton** - Initiates Load sequence.
- 13) **RWND/UNL Pushbutton** - Initiates Rewind or Unload when Drive is Off-line.
- 14) **WRITE ENABL LED** - Lights when supply reel is not write protected.
- 15) **LOAD PT LED** - Lights when tape is at Load Point.
- 16) **SELECT LED** - Lights when Drive is selected by the Host.

Figure 2-7 Panel Controls and Indicators

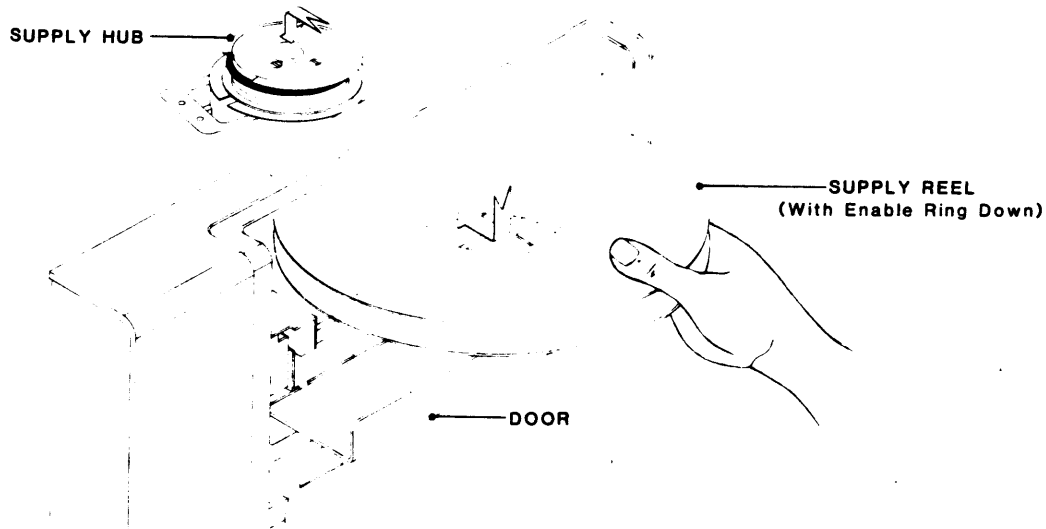


Figure 2-8 Installing Supply Reel

TABLE 2-1 MOTION CONTROL SEQUENCE

STEP	NORMAL *	DISPLAY		MOTION
		AT EOT	AT BOT	
1	45 FWD	EOT		45 ips Forward
2	45 REV		BOT	45 ips Reverse
3	45 FSS	EOT		45 ips Forward Start/Stop
4	45 RSS		BOT	45 ips Reverse Start/Stop
5	45 FRF	EOT	BOT	45 ips Forward/Reverse/Forward
6	100 FWD	EOT		100 ips Forward
7	100 REV		BOT	100 ips Reverse
8	100 FSS	EOT		100 ips Forward/Start/Stop
9	100 RSS		BOT	100 ips Reverse/Start/Stop
10	100 FRF	EOT	BOT	100 ips Forward/Reverse/Forward
11	45/100 F	EOT		45 ips / 100 ips Forward
12	45/100 R		BOT	45 ips / 100 ips Reverse
13	BURN IN			45 ips / 100 ips /45 ips (Forward)/ Auto Rewind/. . .(Repeat) . . . etc.

NOTE: Normal display is defined as any display after loading when the tape is neither at BOT nor EOT

2.4.3.1 MOTION TEST SUMMARY

All Motion Tests, with the exception of Burn In, automatically stop at either BOT (Reverse Tests) or EOT (Forward Tests). Burn In consists of a 100/45/100 ips forward sequence until EOT is reached. At EOT, the Drive automatically rewinds tape to BOT at 200 ips. At BOT, the Drive repeats the 100/45/100 ips sequence and continues to repeat until the operator intervenes. All Motion Tests, including Burn In, may be stopped by depressing START/STOP, except when the tape is at EOT or BOT.

2.4.4 UNIT SELECTION

The Drive is factory-set for Unit Address "0". In daisy-chained systems, if the Drive is other than Drive "0", this setting must be changed as follows:

- A) Turn ac power On.

CAUTION

Turning ac power off and on while the Calibration Jumper is in Calibrate position could cause loss of programmed parameters on the Drive Electronics Board. This loss will require reentry of parameters by Kennedy service personnel. Therefore, during the following procedure, **DO NOT TURN AC POWER OFF UNTIL DIRECTED TO DO SO** (Step O).

- B) Remove the Bolt on the right side of the unit, raise the Deck Assembly and, using the Support Bar, secure the Deck Assembly in Maintenance Position as shown in Figure 2-6.
- C) On Drive Electronics Board (Figure 2-9), move the Calibration Jumper from IC Connector U75 pins 8 and 9 to pins 9 and 10 .
- D) Unlatch Support Bar and lower the Deck Assembly.
- E) In turn, depress DIAG, ENTER, SCAN, SCAN. Readout displays in sequence: "DIAG", "MOTION", "CAL", SET UP".
- F) Depress ENTER. Drive enters SET UP Mode; Readout displays "DEFL DEN"
- G) Depress SCAN. Readout displays "UNIT NUM".
- H) Depress ENTER. Readout displays "UNIT 0".
- I) Depress SCAN until the Readout displays the desired Unit Number.
- J) Depress RWND/UNLD. Readout displays "LOAD?".
- K) Depress LOAD to save new Unit Number. Drive goes off-line and displays "9600".
- L) Lift the Deck Assembly and brace it in Maintenance Position.
- M) Replace the Calibration Jumper to its original position in IC Connector U75.
- N) Release the Maintenance Support Bar, and lower and bolt the Deck Assembly in operate position.
- O) The Drive will now respond to an address from the Host using the new Unit Number. AC power can now be safely turned off, as desired.

NOTE: For temporary Unit Number change, follow the above procedure, Steps E through K. This will enter the new Unit Number to be effective until power is turned off, after which the original Unit Number will be effective.

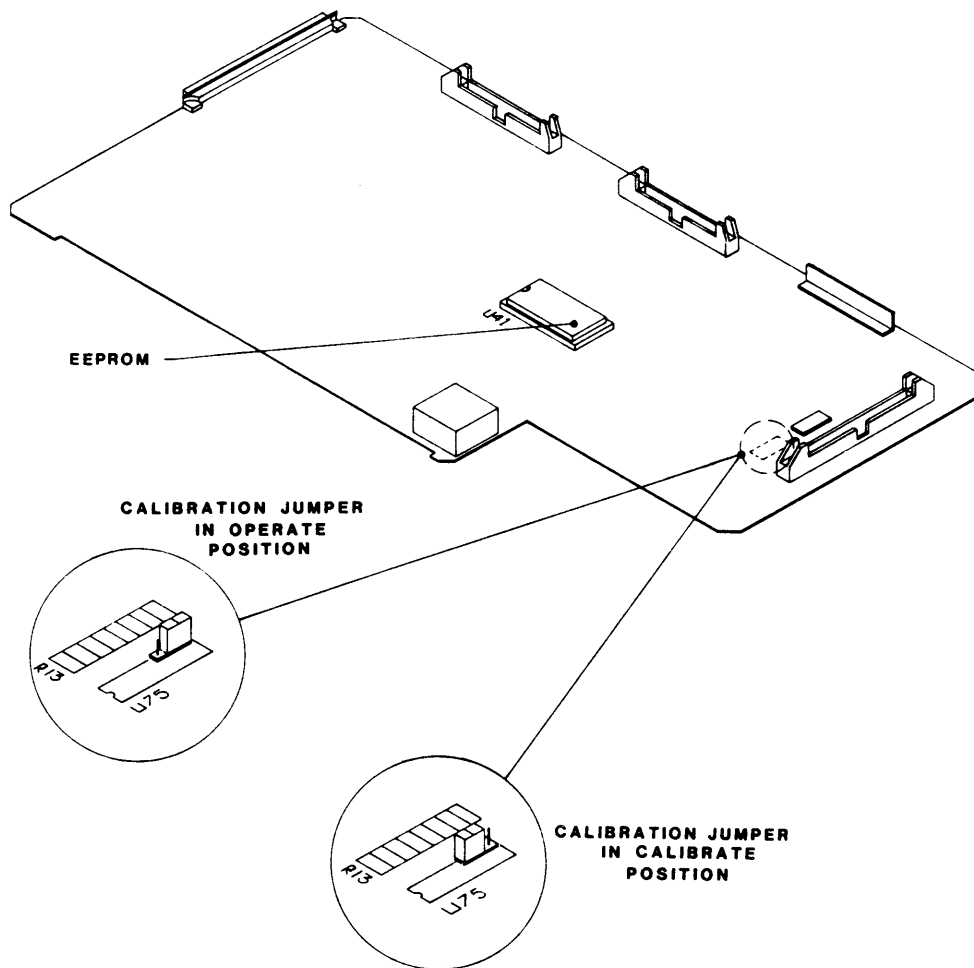


Figure 2-9 Calibration Jumper Location

2.4.5 DATA DENSITY - INTRODUCTION

The Model 9600 can operate at 800 BPI density in Non-Return-to-Zero (NRZ1) format, or at 1600 BPI density in Phase-Encoded (PE) format. When powered up, the Drive automatically defaults* to REMOTE/PE (1600 BPI), in which the Host can control density selection. The operator can override the default operating density by setting the Drive for local control wherein the operator can set the density as desired or can return control to the Host. The operator sets the Drive for Local or Remote Control by operating the DENSITY Switch as follows:

* Default Mode is factory-set, but can be changed as described in paragraph 2.6.2, Step 4) C.1.

Changing Operating Density:

- A) If tape is loaded, rewind tape to BOT and set the Drive to off-line. The Readout displays 9600 and the PE and REMOTE LEDs light. The Drive is in Remote PE Mode.
- B) Depress DENSITY. The PE and REMOTE LEDs go out, and the NRZ1 LED lights. The Drive is in Local NRZ1 mode.
- C) Depress DENSITY. The REMOTE LED lights, and the NRZ1 LED remains lit. The Drive is in Remote NRZ1 mode (can be changed by Host).
- D) Depress DENSITY. The REMOTE LED goes out, and the PE LED lights. The Drive is in Local PE mode.
- E) Depress DENSITY. The REMOTE LED lights, and the PE LED remains lit. The Drive is in Remote PE mode (can be changed by Host).

Operation:

- 1) In Read operations, the Drive reads automatically in the mode/density in which the tape was written.
- 2) In Write operations, the Drive writes in the mode/density indicated by the Density LEDs.

2.5 INSTALLATION

Mount the Tape Drive in a standard EIA/RETMA 19-inch Rack allowing at least 9-3/4 inches * vertical space. Install The Rack-Mount Rail Assembly supplied with the Drive as described in the following subparagraph 2.5.1.

*This dimension allows a 1-inch clearance minimum for accessing the Tape Access Door.

2.5.1 RACK-MOUNT RAIL ASSEMBLY INSTALLATION

2.5.1.1 COMPONENT CHECKOUT

The Rack-Mount Rail Assembly consists of two Track Subassemblies: a Left Track Subassembly and a Right Track Subassembly. Each Track Subassembly consists of the following items:

ITEM	<u>Outer/Center Track Assembly</u>
1	Center Track
2	Outer Track
3	Fixed Mounting Bracket
4	One Chassis Rail
5	One Adjustable Mounting Bracket
6	Three Nut Plates
7	Six 10-32 by 1/2-inch Panhead Slotted Screws

Note: The Left Track Assembly is identified by the Letter "L" inscribed on the Outer Track just forward of the Bracket Mounting Holes. The Right Track Assembly is similarly marked with a letter "R".

Note: The standard Rack-Mount Rail Assembly has rails that fit cabinets up to 24 inches deep. For deeper cabinets, use Slide Extender P/N 28-00352-101. Order from Kennedy Co. Spare Parts Order Department, 1600 Shamrock Ave, Monrovia, California 91016.

2.5.1.2 MOUNTING PROCEDURE

- A) Referring to Figure 2-10, Install the Right Track Assembly on the right side of the 19-inch Rack as follows:
 - 1) Using the 10-32 Slotted Screws (7) and Nut Plates (6)* provided, loosely assemble an Adjustable Mounting Bracket (5) to the rear of the Right Track Assembly.
 - * Nut Plates not required for Racks with threaded mounting holes.
 - 2) Measure upward 2 inches from the bottom of the Rack opening allotted for the Drive, and mark the Rack at that point.
 - 3) Aligning the bottom of the Fixed Mounting Bracket (3) at the 2-inch mark on the front of the 19-inch Rack, and using the 10-32 Screws (7) provided, mount the Fixed Mounting Bracket (3) to the front of the 19-inch Rack, and mount the Adjustable Mounting Bracket (5) (loosely attached to the rear of the Center Track) to corresponding holes in the the rear of the 19-inch Rack. Level the Track and tighten all Screws.
 - 4) Repeat Steps 1) through 3) for mounting the Left Track.
- B) Inspect all work and check that all screws are tight.
- C) Remove power cable from the Drive Chassis.
- D) With a minimum of two persons, one on each side of the Drive, lift and guide the Chassis Rails onto the Left and Right Center Tracks. Verifying that the rails are correctly aligned, push the Drive into the Rack.
- E) Connect AC Power and Interface Cables.
- F) Mount the two flat cable Strain Reliefs provided onto the rear of the unit just below the interface cable access holes, and insert the interface cables into the Strain Reliefs. The strain reliefs have self adhesive backings.

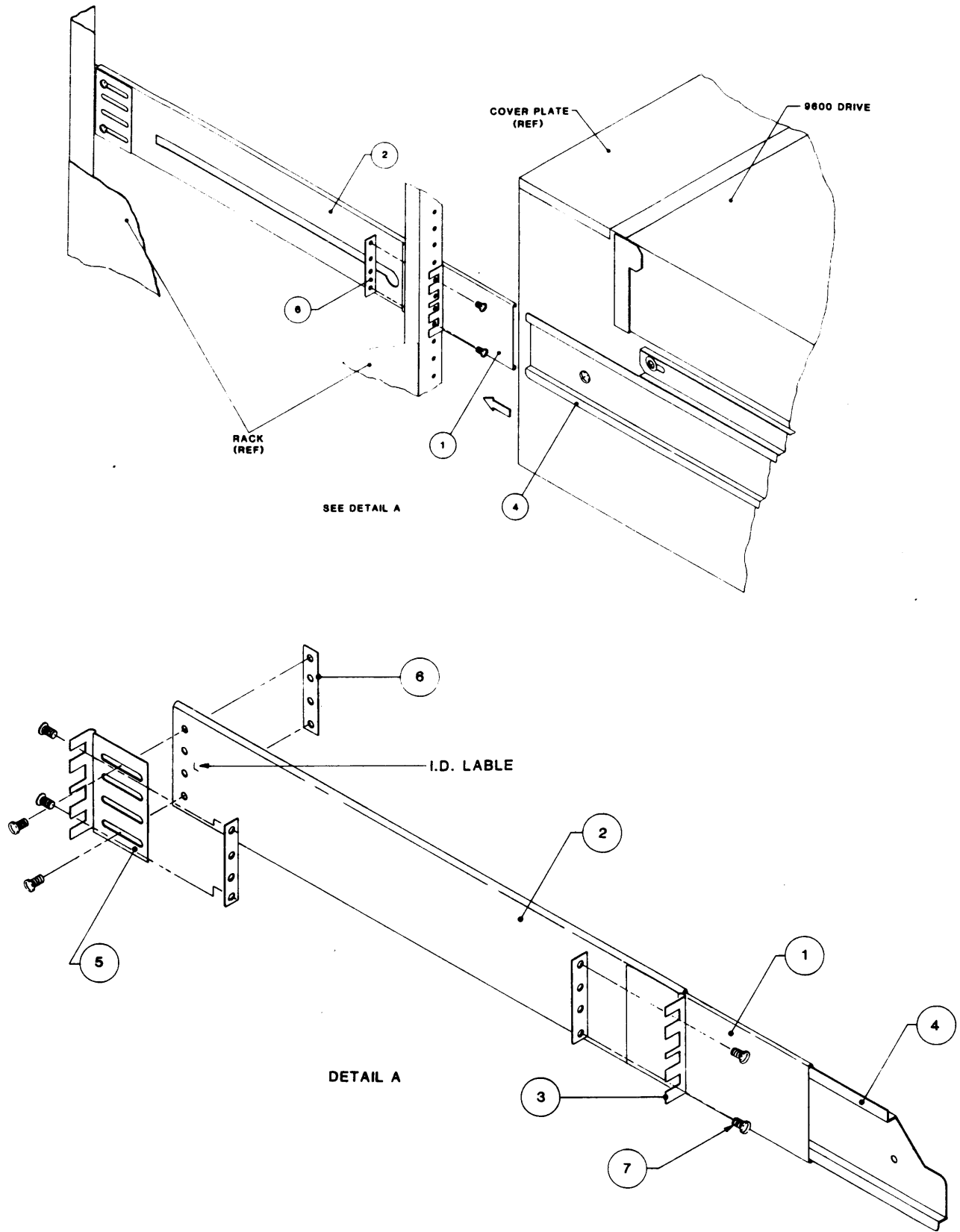


Figure 2-10 Track Subassembly Mounting

2.6 OPERATING INSTRUCTIONS

2.6.1 OPERATING PROCEDURE

- A) Turn Power On. Readout displays "9600".
- B) Place Tape Reel on Reel Hub with Write Enable Ring facing downward.
- C) Depress LOAD *. The Readout displays "LOADING" and the Drive automatically loads** tape. When loading is successful, the Readout displays "9600" and the WRITE ENBL, LOAD POINT, and LOAD LEDs light. If loading is unsuccessful, the Readout displays a diagnostic message such as: CHK HUB, ABORTED, REV REEL, etc, and the RWND/UNL LED flashes.

* or Host can send a Load On-Line Command (IOL) to start Load.

** The loading sequence begins with the Supply Tape Reel rotating three revolutions in reverse to ensure that tape is wound on the Reel.

If loading is unsuccessful, correct the condition indicated by the Readout and depress LOAD to repeat the load operation. If load is successful, the Readout displays "9600".

- D) Depress ON-LINE. ON-LINE LED lights and the Readout displays the Unit Number.
- E) The Tape Drive is now ready to accept commands from the Host. The Drive can be taken Off-line manually by the operator pressing ON-LINE or by the Host issuing an Off-Line Command.

2.6.2 FAULT INDICATIONS

The Drive provides automatic diagnostic readouts for the following common faults:

<u>DISPLAY</u>	<u>FAULT CONDITION</u>
1) CLOSE/DOOR *	Tape Access Door open - Drive cannot load .
2) BKN TAPE	Broken Tape.
3) ABORTED	Automatic Load aborted
4) REV REEL	Reel upside down.
5) TESTING	Formatter not communicating with the Drive.
6) CHK SLND	Hub not locking, check Hub Lock Solenoid.
7) CHK HUB	Faulty Supply Hub

* 2-step display (CLOSE/, /DOOR).

2.6.3 OPERATION NOTES

1) On-line Operations

- A. When the Drive is on-line, the Readout will display the Unit Number whether or not the Drive is selected.
- B. If a Load Command is issued by the Host, but the tape is already on the Supply and Takeup Reels, the Drive will tension tape but not move tape to the Load Point.

2) Load Operations

- A. If the Drive is unable to Load, the Readout will display a diagnostic message such as: "CHK HUB", "ABORTED", "REV REEL" etc., and the RWND/UNL LED will flash.
1. Pressing LOAD will start another Load attempt.
 2. Pressing RWND/UNL will initiate an Unload.
 3. If nothing is done, the Drive will time out in one minute and display "9600".
- B. Pressing RWND/UNL while the Drive is Loading, but before the Drive starts repositioning to Load Point, will abort the Load Operation, and do an Unload.

3) Rewind Operations

- A. Pressing RWND/UNLD once causes the Drive to rewind tape to BOT.
- B. Pressing RWND/UNL while the Drive is rewinding, but before the Drive starts to reposition to Load Point, will initiate an Unload Operation after the Drive has completed Rewind.

SECTION IV
MAINTENANCE INSTRUCTIONS

SECTION IV MAINTENANCE

4.0 GENERAL

Section IV describes preventive and corrective maintenance of the Model 9600 Tape Drive.

4.1 PREVENTIVE MAINTENANCE

To ensure continued trouble-free operation, do the following preventive maintenance tasks regularly as recommended.

4.1.1 DAILY INSPECTION

All components in the tape path must be kept scrupulously clean. Daily, or after 8 hours of tape motion, inspect Deck Assembly, Read/Write/Erase Head, Rollers, and Sensors, for cleanliness. Look for evidence of dirt and oxide accumulation. Clean as required.

4.1.2 CLEANING

CAUTION

NEVER clean the Drive with power on. If, with power on, the Takeup Arm should be inadvertently moved past the Limit Sensor, the Drive Arm Motor will drive the Arm into the chassis wall, destroying calibration, and the Drive's ability to load.

4.1.2.1 GENERAL AREA

Using a vacuum cleaner with a blower attachment, carefully blow dust from all surfaces within the Drive Assembly. Remove any residue or dirt accumulations with a clean lint-free cloth or cotton swab dampened with trichloroethane or isopropyl alcohol.

CAUTION

Using **non-recommended** cleaning fluids can damage components of the Tape Drive. Using excessive amounts of the recommended cleaning fluid can damage the Tape Drive by penetrating roller bearings, idler rollers, tape guides, capstan, or drive motor, and destroying lubrication.

4.1.2.2 ERASE/WRITE/READ HEAD CLEANING

Remove accumulation of oxide and/or dirt from the Erase/Write/Read Head surface (Fig. 4-1) using a clean lint-free cloth or cotton swab dampened with trichloroethane or isopropyl alcohol (See **CAUTION** above). Wipe the Head with firm but gentle vertical strokes.

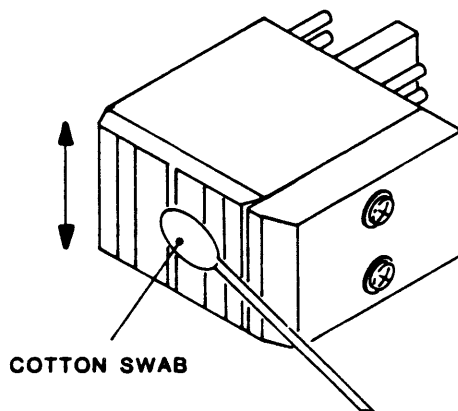


Figure 4-1 Erase/Write/Read Head Cleaning

4.1.2.3 TAPE PATH CLEANING (Figure 4-2)

Clean tape guides, rollers, and the sapphire cleaning post with a cotton swab dampened with isopropyl alcohol or 1.1.1 trichloroethane. Clean the capstan rubber roller with a cotton swab dampened with **water only** or, if excessively dirty, dampened with **mild soapy water**.

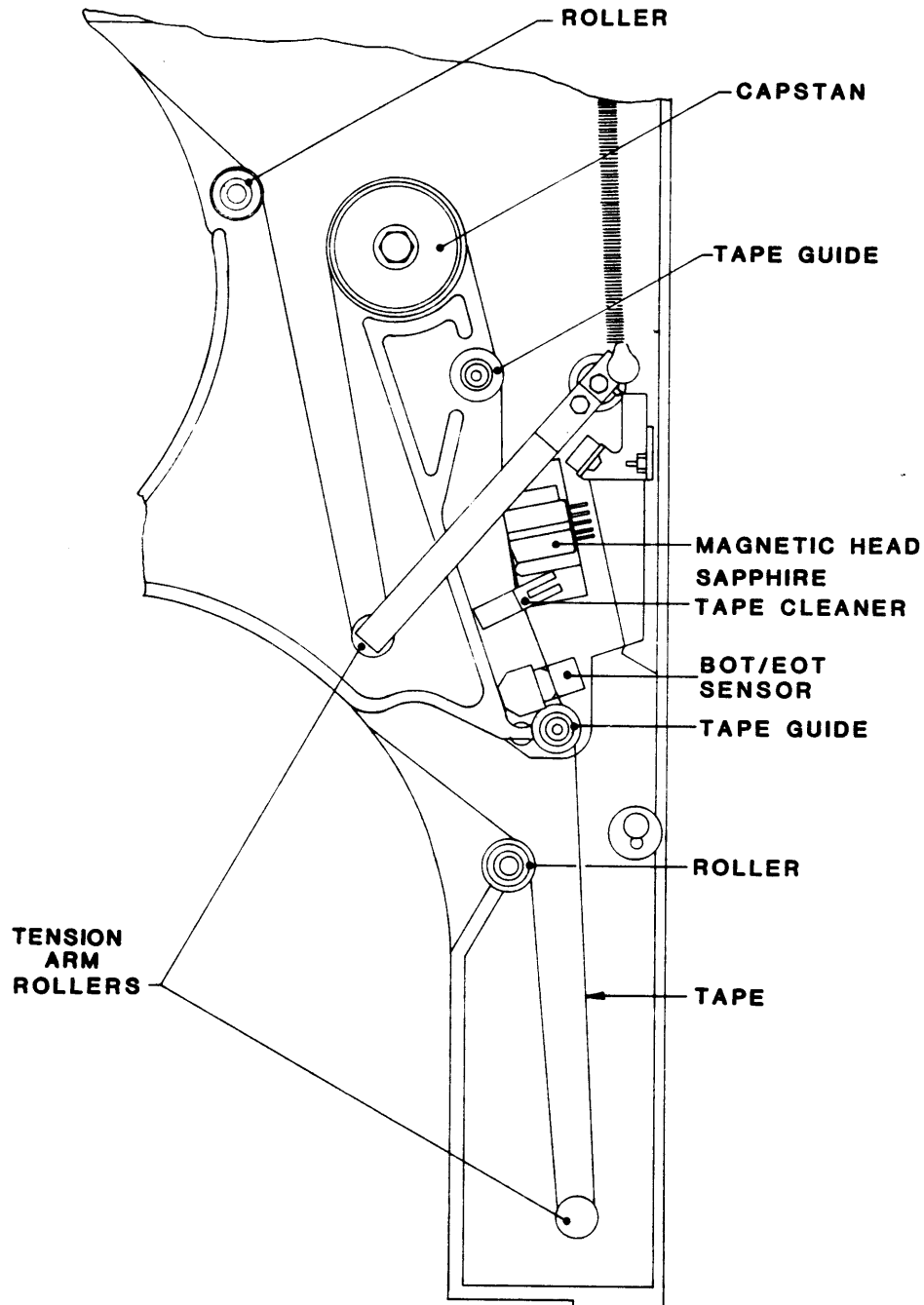


Figure 4-2 Tape Path Cleaning

4.1.3 ROUTINE ADJUSTMENTS

There are no routine adjustments necessary to the Tape Drive. **DO NOT** make any adjustments except for corrective maintenance.

4.1.4 LUBRICATION

The Tape Drive uses only sealed, life-time lubricated bearings. No lubrication is required.

CAUTION

Life-time lubricated bearings can be damaged by adding lubricant. **DO NOT LUBRICATE.**

4.1.5 HEAD WEAR

The Kennedy Co. Tribaloy-coated Head normally lasts the lifetime of the Tape Drive. Head wear is evidenced by an increase in Read Amplifier output voltage. However, if excessive wear occurs, it will be evidenced by a sudden decrease in Read Amplifier output and an increase of Read Error Rate. Head wear can be verified by checking the output of any Track Read Amplifier (R719 typ - Fig. 4-3). Normal output voltage is 2.0 volts +/-10% p-p for NRZ1, and 3.0 volts +/-10% p-p for PE. If Head is excessively worn, return the Tape Drive to Kennedy Co. for replacement of Head.

4.2 CORRECTIVE MAINTENANCE

Corrective Maintenance consists of tests and diagnostics for isolating malfunctions to a field-replaceable component. Field replaceable components are itemized in the Recommended Spare Parts List (Table 5-2).

4.2.1 TOOLS AND TEST EQUIPMENT REQUIRED (Table 4-1)

TABLE 4-1 TOOLS AND TEST EQUIPMENT REQUIRED

ITEM	DESCRIPTION
Screwdrivers (2)	Phillips, No. 1 and No. 2
Screwdriver	Spade Tip
Screwdriver	Stubby, No. 1 Phillips
Screwdriver	Offset, No. 1 Phillips
Allen Wrench	5/32 (0.79 mm)
Pliers	long-nose
Jumpers	with miniature alligator clips
Cloth or Q-Tip	Lint Free
Cleaner Fluid	trichloroethane or isopropyl alcohol
Multimeter	digital
Vacuum Cleaner	standard w/Blower Attachment
9600 Capstan Pulley Puller	P/N 154-00100-001

4.2.2 TROUBLESHOOTING

Troubleshooting the Tape Drive consists of diagnosing mechanical and electromechanical malfunctions, diagnostic testing, and self testing.

4.2.2.1 MECHANICAL PROBLEMS

Problems that occur in electronic equipment may involve mechanical malfunctions. These problems are diagnosed by inspection or with a continuity checker (ohmmeter), and should be checked first if any of the following occurs:

Reel-Related Symptoms:

- 1) Tape Supply Reel cannot be seated onto Supply Reel Hub.
- 2) Supply Reel is mounted on Supply Reel Hub, but Drive cannot be initialized.
- 3) Supply Reel cannot lock onto Hub.

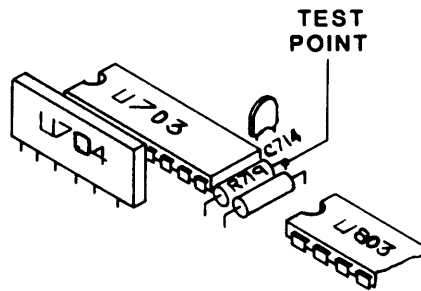


Figure 4-3 Read Data Test Point Location

- 4) Tape cannot be written to.
- 5) Tape cannot be read from.

Corresponding Item-for-Item possible causes for these symptoms are:

Supply-Reel Related Causes:

- 1) Foreign object in tape reel entrance.
- 2) Reel-In-Place Sensor defective.
- 3) Hub Lock Solenoid defective.
- 4) Supply Reel has Write Protect Ring installed, or Write-Protect Sensor defective.
- 5) Cartridge tape compatibility problem, or blank tape.

4.2.4 DIAGNOSTICS

Diagnostics include firmware-controlled tests that can be initiated by the operator from the Drive Front Panel. The Digital Display on the Front Panel provides diagnostic readouts. Refer to Diagnostics and Calibration Notes, paragraph 4.

4.3 PARTS REPLACEMENT

Major components of the Drive are not considered to be field repairable. If a major component is found defective, replace it with an appropriate spare part (ref Table 5-1). The following subparagraphs describe replacement procedures for these components. For these procedures, unless otherwise directed, place the Drive on a table top right side up. Refer to Figure 5-1 through 5-4 for parts illustration.

4.3.1 TOOLS REQUIRED

Tools required to replace components of the Tape Drive are:

No. 1 Phillips Screwdriver	7/64-inch Allen Wrench
Offset No. 1 Phillips Screwdriver	5/32-Inch T-handle Allen Wrench
Stubby No. 1 Phillips Screwdriver	5/16-Inch Hex-Head Nut Driver
Blade-Tip Screwdriver	C-Clip Removal Tool
5/64-inch Allen Wrench	1/4-inch Box Wrench

4.3.2 PRINTED CIRCUIT BOARD ASSEMBLIES IN CARD CAGE (Fig. 4-4)

- 1) Remove Top Cover at rear top of the Drive (2 screws).
- 2) As applicable, disconnect cables from PCB to be removed.
- 2) Grasp PCB Ejectors firmly, and pull ejectors towards the side of the unit. Board should pop partly out of the slot.

To replace: Insert PCB in Card Cage and press firmly inward until PCB is fully seated in Mother Board. Re-install Top Cover.

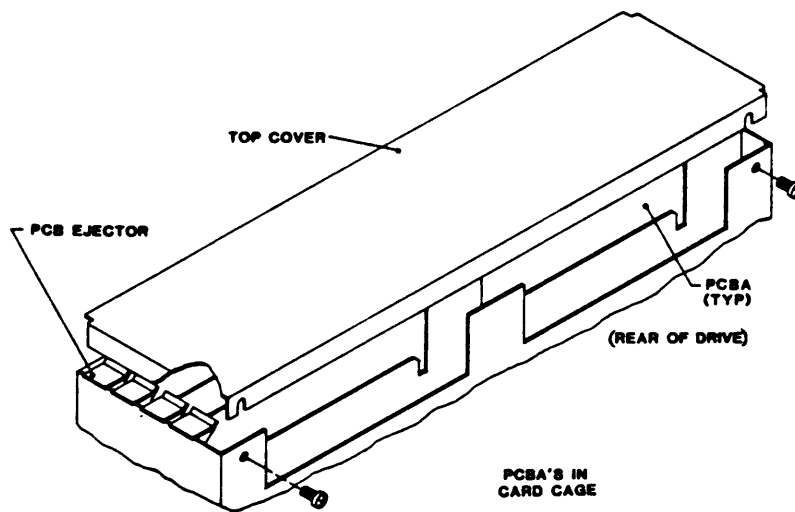


Figure 4-4 Card Cage

4.3.3 HUB LOCK SOLENOID (Fig. 4-5)

- 1) Disconnect two wires from Solenoid Body.
- 2) Remove 2 screws holding Mounting Bracket to Deck.
- 3) Remove Solenoid/Bracket assembly from Deck.
- 4) Remove Bracket from the Solenoid (4 screws).
- 5) Remove Pine from end of Plunger.

To replace: Reverse removal procedure. Align per paragraph 4.4.2.6 -2).

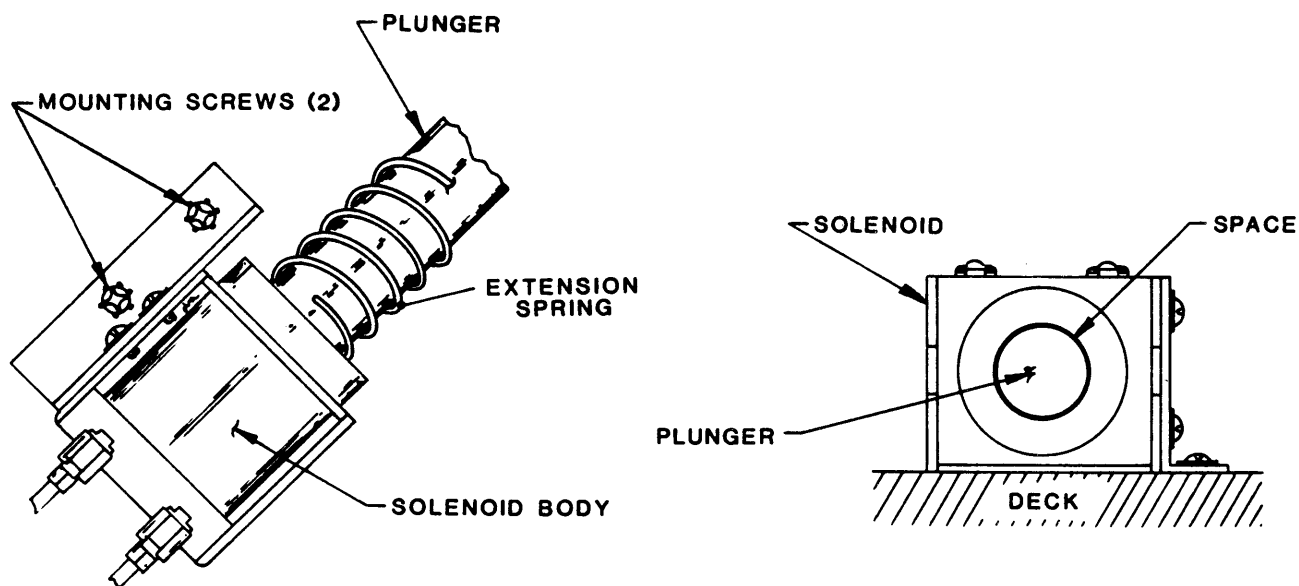


Figure 4-5 Hub Lock Solenoid

4.3.4 SPRING, EXTENSION (Fig. 4-6)

- 1) Remove Hub Lock Solenoid (See 4.3.3).
- 2) Slide Extension Spring off Plunger Shaft.

To replace: Reverse removal procedure.

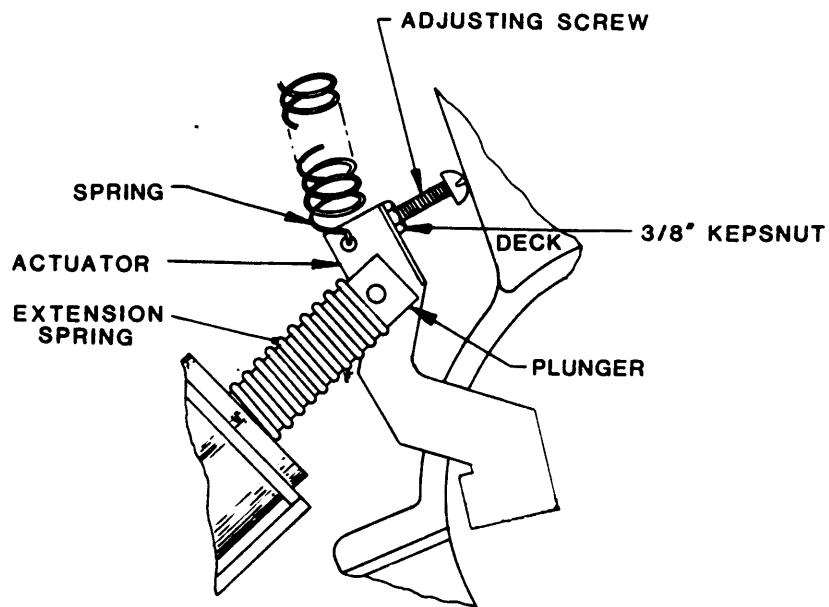


Figure 4-6 Hub Lock Solenoid Actuator

4.3.5 FAN (Fig. 4-7)

- 1) Remove all PCBs from Card Cage (paragraph 4.3.2).
 - 2) Unplug connector at Fan Body.
 - 3) Using stubby Phillips screwdriver, remove 4 screws holding Fan to sheetmetal.
- To replace: Reverse removal procedure.

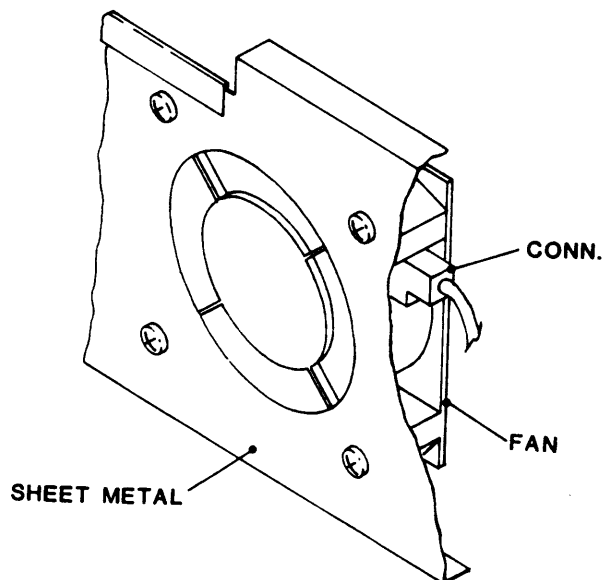


Figure 4-7 Fan

4.3.6 PROM's

- 1) PROM's are plug-in type. Remove PROM's with IC Extractor Tool (not supplied).

To replace: Taking care to align the pin-1 marker notch on the PROM with the pin-1 marker notch on the IC socket, insert the PROM pins into the IC socket and press the PROM firmly until it is properly seated in place.

4.3.7 VACUUM HUB ASSEMBLY (Fig. 4-8)

- 1) Lift open Top Cover of the Drive.
- 2) Using a 1/4-inch T-handle Allen wrench, remove the bolt from the center of the Hub.
- 3) Remove four Phillips Screws from top of Reel, and remove top of Reel.
- 4) Grasp the Reel firmly with both hands and pull upwards to remove the Reel/Hub combination.

To replace: Reverse removal procedure.

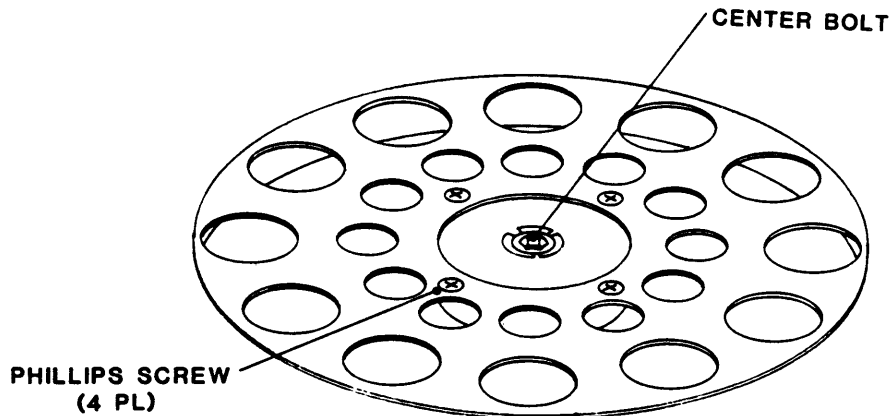


Figure 4-8 Vacuum Hub Assembly

4.3.8 TAKEUP-ARM RETRACT AND PIVOT SENSOR ASSEMBLY (Fig. 4-9)

- 1) Remove the Takeup Arm Assembly (See paragraph 4.3.18).
- 2) Cut tie-wraps and unplug connector P14 from Connector Board 7228. This detaches the Takeup-Arm Retract Motor and Microswitch.
- 3) Unplug J1 from Position Sensor PCBA.
- 4) Using Allen wrench, remove 3 bolts that attach the Retract and Pivot Sensor Assembly to the Deck.
- 5) Lower and remove the Retract and Pivot Sensor Assembly.

To replace: Reverse removal procedure. Align per paragraph 4.4.2.2.

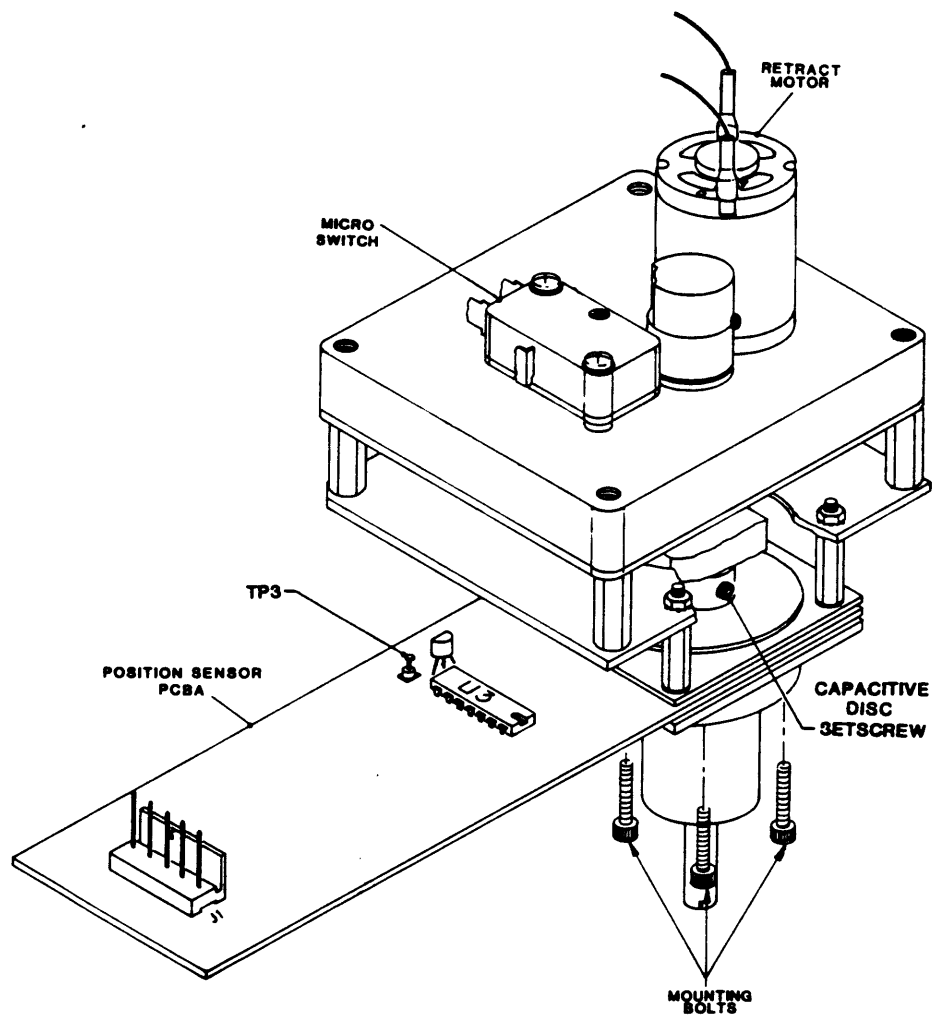


Figure 4-9 Takeup Arm Retract and Pivot Sensor Assembly

4.3.9 MOTHER BOARD PCBA (Fig. 4-10)

- 1) Remove Card Cage Cover (paragraph 4.3.2).
- 2) Remove all PCBAs from Card Cage.
- 3) Unplug power connector J13 from Mother Board.
- 4) Remove 6 Phillips screws from Mother Board.
- 5) Slide PCBA towards rear of unit and upward to remove.

To replace: Reverse removal procedure.

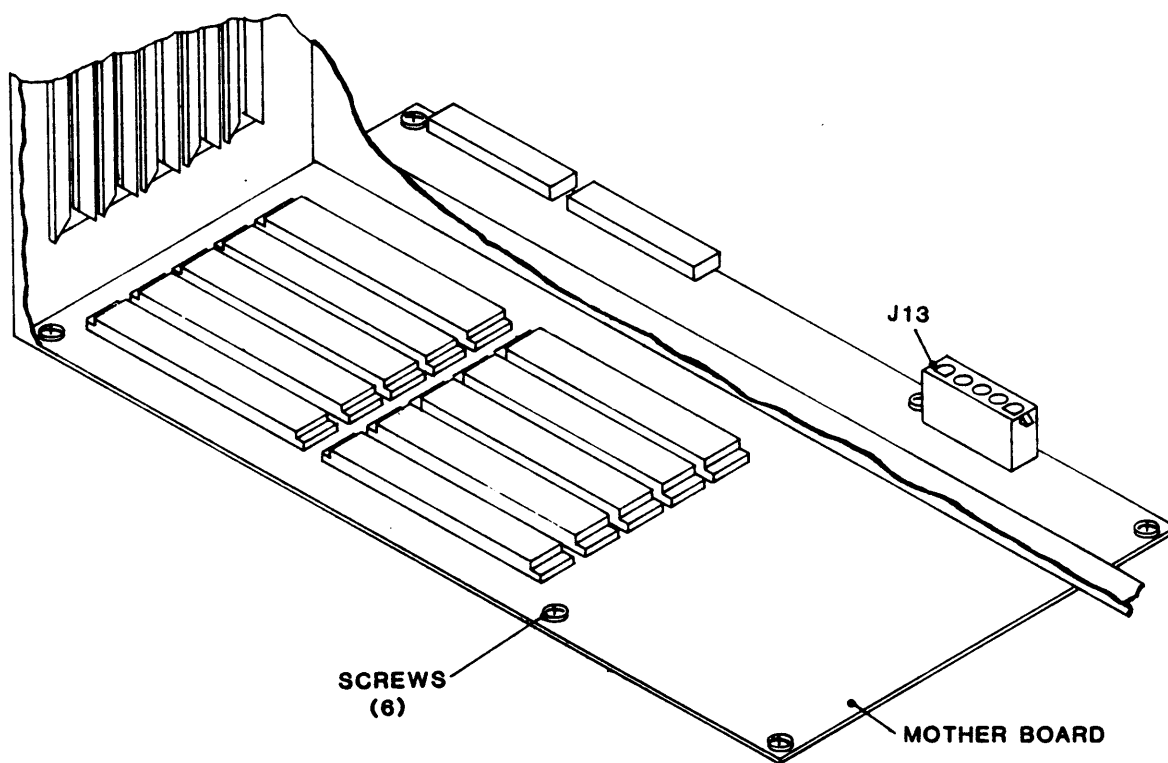


Figure 4-10 Mother Board

4.3.10 OPERATOR CONTROL PANEL PCBA (Fig. 4-11)

- 1) Using stubby Phillips screwdriver, remove 10 screws at rear of control panel (6 kepnuts through panel, 4 screws on bottom bracket holding PCBA).
- 2) Lower the PCBA and unplug the ribbon cable at J1.

To replace: Reverse removal procedure.

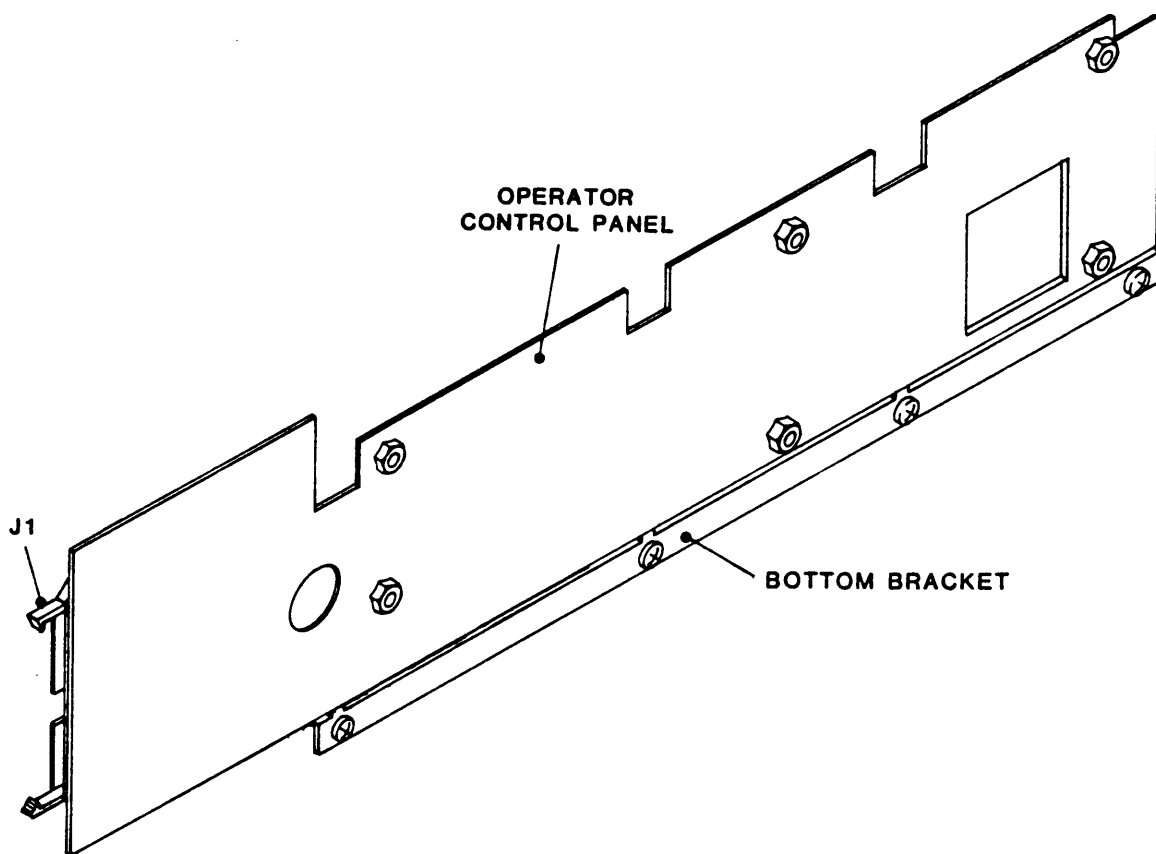


Figure 4-11 Operator Control Panel PCBA

4.3.11 REEL-IN-PLACE SENSOR ASSEMBLY (Fig. 4-12)

- 1) Remove 2 Phillips screws and 2 spacers.
- 2) Cut away tie wraps as necessary, and unplug the cable from the interconnect PCBA.
- 3) Remove the Reel-In-Place Sensor Assembly.

To replace: Reverse removal procedure. **Make sure** that there is no more than 1/8" gap between the Reel-In-Place Tab on the Hub and the Reel-In-Place Sensor.

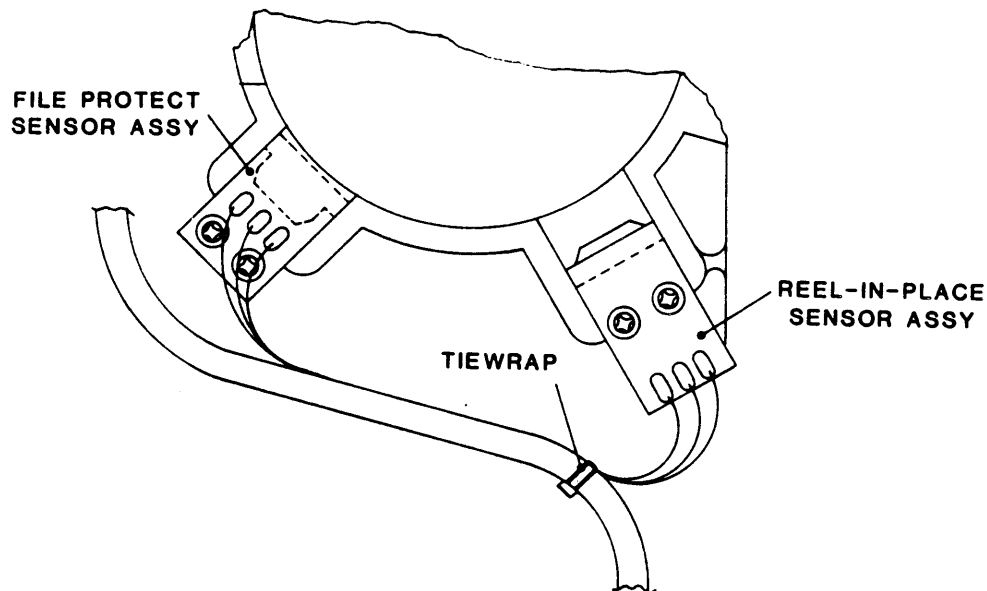


Figure 4-12 File-Protect and Reel-In-Place Sensor Assemblies

4.3.12 FILE PROTECT SENSOR ASSEMBLY (Fig. 4-12)

- 1) Do Steps 1 and 2 in paragraph 4.3.11, and remove File Protect Sensor.

To Replace: Reverse removal procedure.

4.3.13 TAKEUP ARM LIMIT SENSOR PCBA (Fig. 4-13)

- 1) Open Top Cover of Drive.
- 2) Remove 2 Phillips screws that hold the assembly to the Deck.
- 3) Remove tie wraps and unplug the cable from the interconnect board.
- 4) Remove pins from connector housing, and pull the cable through the grommet in the Deck.
- 5) Remove the PCBA.

To replace: Reverse removal procedure.

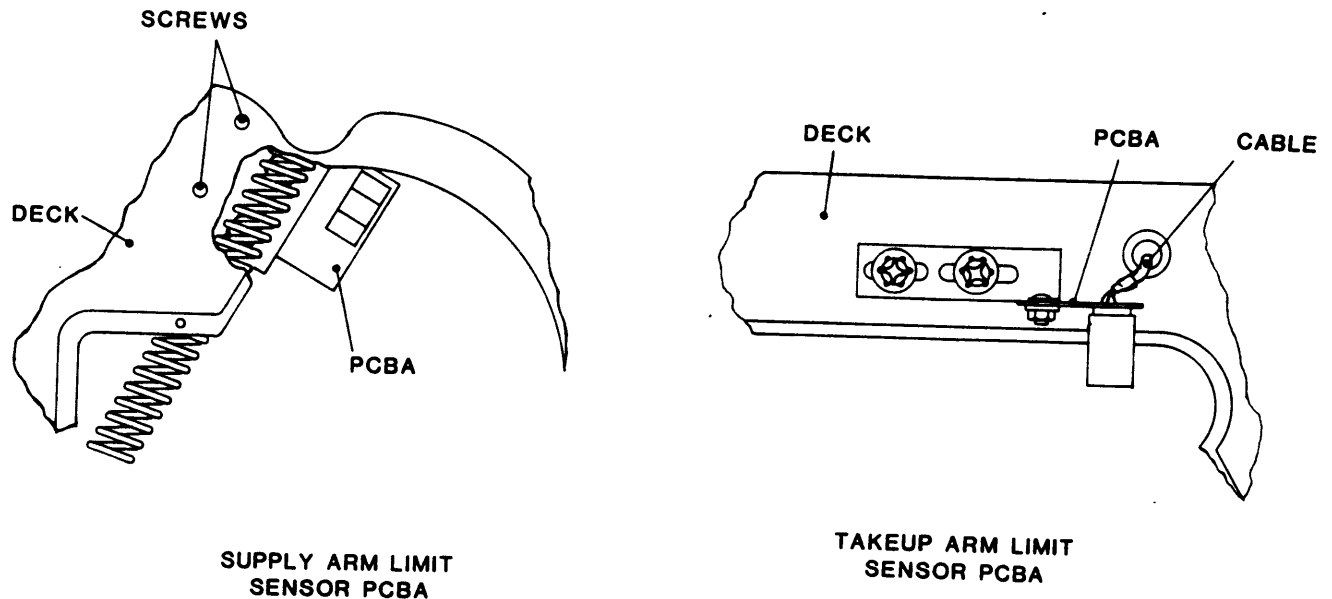


Figure 4-13 Supply-Arm and Takeup-Arm Limit Sensor PCBA's

4.3.14 SUPPLY ARM LIMIT SENSOR PCBA (Fig. 4-13)

- 1) Open Top Cover of the Drive.
- 2) Remove 3 phillips screws, and lift off the plate that covers the Supply Arm.
- 3) Remove 2 Phillips screws that hold the Bracket to the Deck.
- 4) Disconnect the cable from the Interconnect PCBA.
- 5) Remove tie wraps as necessary, and remove the Assembly.

To replace: Reverse removal procedure.

4.3.15 12 VDC REGULATOR ASSEMBLY (Fig. 4-14)

- 1) Remove 2 Phillips screws that hold the Heat Sink to the Deck.
- 2) Unplug connector J1, and remove the Assembly.

To replace: Reverse removal procedure.

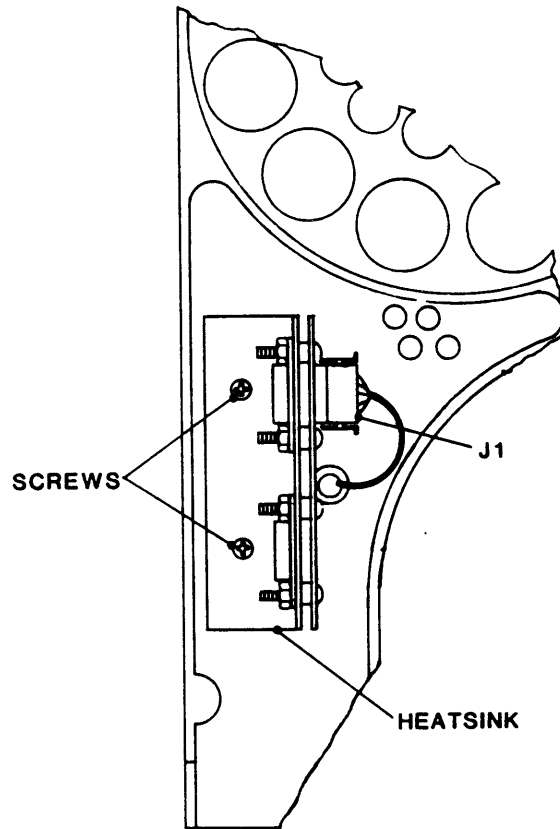


Figure 4-14 12 VDC Regulator Power Supply

4.3.16 5 VDC REGULATOR POWER SUPPLY (Fig. 4-15)

- 1) Unplug the five connectors shown in Figure 4-15 from the Power Supply: Tag each connector for identification as you disconnect it, noting its mating receptacle.
- 2) Remove four kepnuts that hold the Power Supply Bracket to the sheet metal, and remove Power Supply.

To replace: Reverse removal procedure.

4.3.17 BLOWER ASSEMBLY (Fig. 4-16)

- 1) Remove eight Phillips screws at bottom of blower box, and remove the Cover.
- 2) Remove the Vacuum Hub Assembly per par. 4.3.7.
- 3) Remove twelve Phillips screws that attach the Blower Assembly to Deck (these screws are located on top of the deck).
- 4) Unplug the Reel Motors from the Box.
- 5) Unplug the control cable that connect to the Power Amplifier.
- 6) Remove the Blower Assembly.

To replace: Reverse removal procedure.

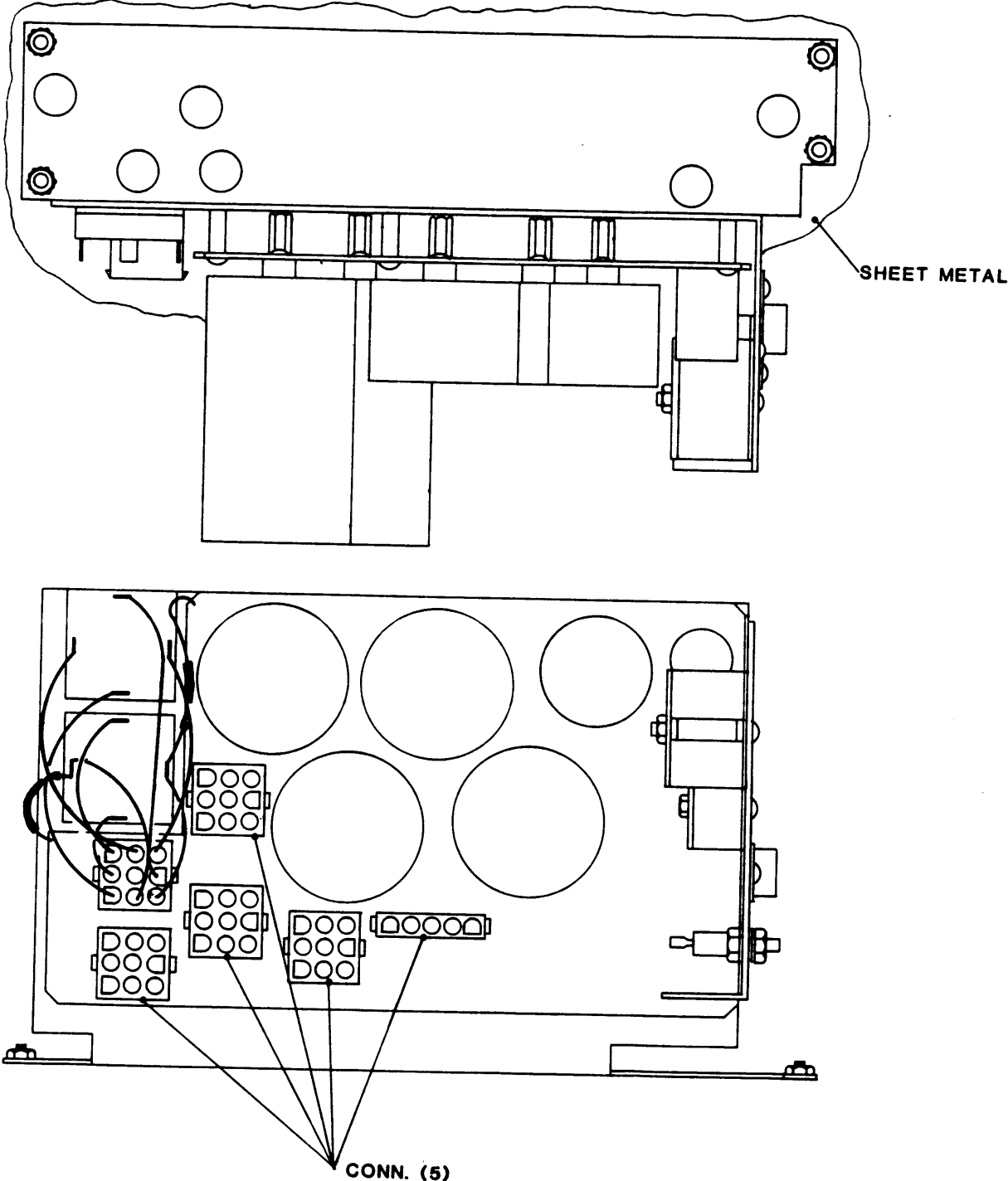


Figure 4-15 5VDC Regulator Power Supply

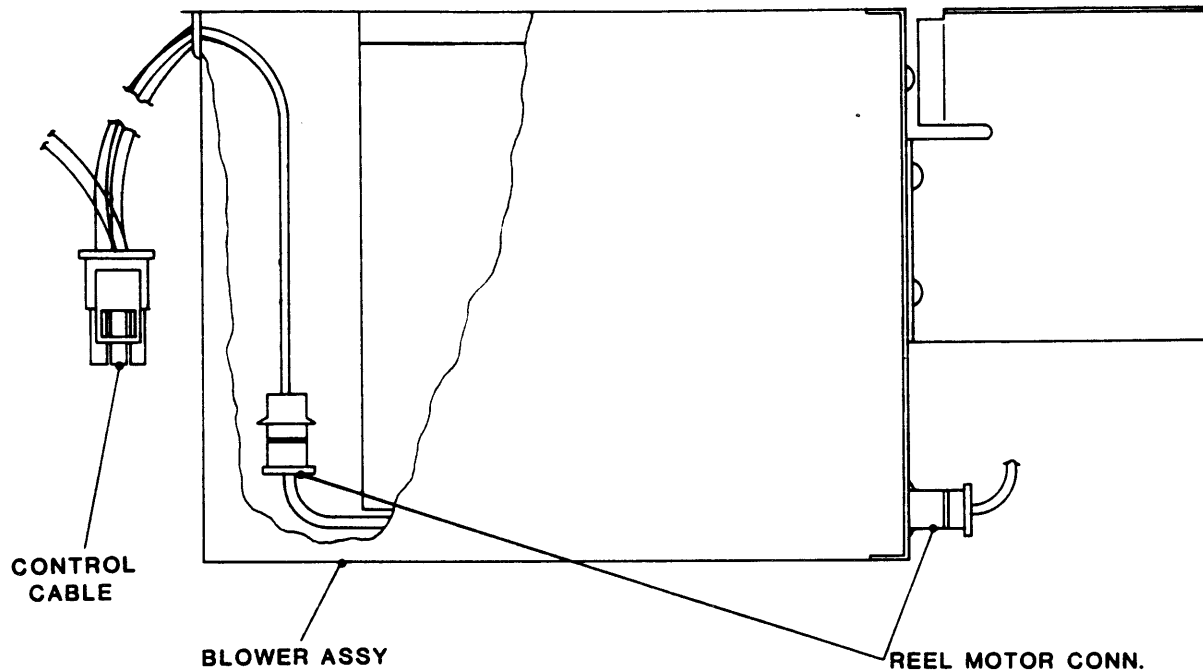


Figure 4-16 Blower Assembly

4.3.18 TAKEUP ARM ASSEMBLY (TOP) (Fig. 4-17)

- 1) To ensure that the new Arm will be installed in exactly the same relative position on the Shaft as the original Arm, and the zero point will not be altered, mark the location of the original Arm on the Shaft.
- 2) Using a clip-removal (expander) tool, remove C-clip from the top of the Arm.
- 3) Noting the order of disassembly, and being careful of Arm spring tension, lift off the washer, spring mounting plate, and shims.
- 4) Using a 1/4-inch box wrench, loosen the Bolt that secures the Arm to the Shaft. and lift the Arm Assembly off the Shaft being careful not to remove shims from under the Arm.

To replace: Reverse removal procedure.

4.3.19 SUPPLY ARM ASSEMBLY (BOTTOM) (Fig. 4-17)

- 1) Remove 3 Phillips screws and remove Cover Plate from the top of the Deck.
- 2) Do procedure in paragraph 4.3.18.

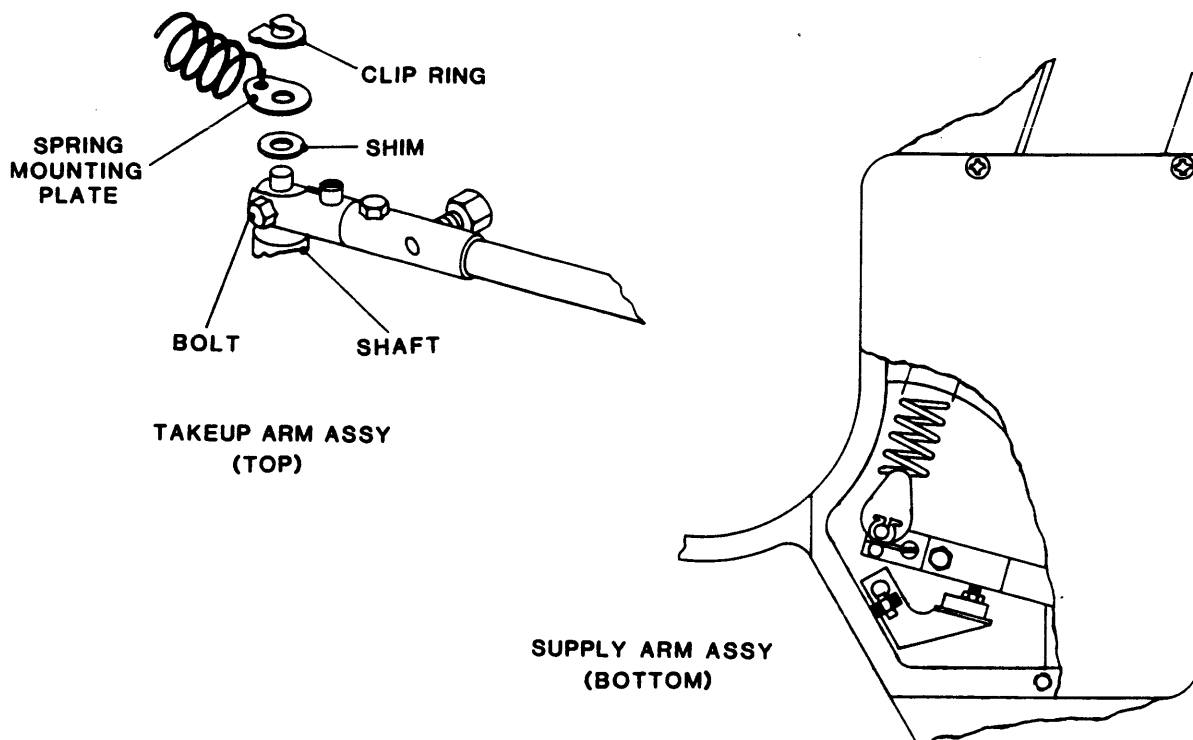


Figure 4-17 Takeup-Arm and Supply-Arm Assemblies

4.3.20 RETRACT AND PIVOT SENSOR (TAKEUP) (Fig. 4-9)

- 1) Lift the Deck Assembly and lock it in Maintenance Position.
- 2) Remove tie wraps and unplug Connector P14 from connector Board 7228. This disconnects the Takeup-Arm Retract Motor Microswitch. Remove 4 Allen head bolts, one at each corner of the Assembly, and remove the Retract and Pivot Assembly.

To replace: Reverse removal procedure.

4.3.21 RETRACT AND PIVOT SENSOR (SUPPLY) (Figure 4-18)

- 1) Do procedure in paragraph 4.3.20, except in Step 2, remove Connector P17 from Connector Board 7228.

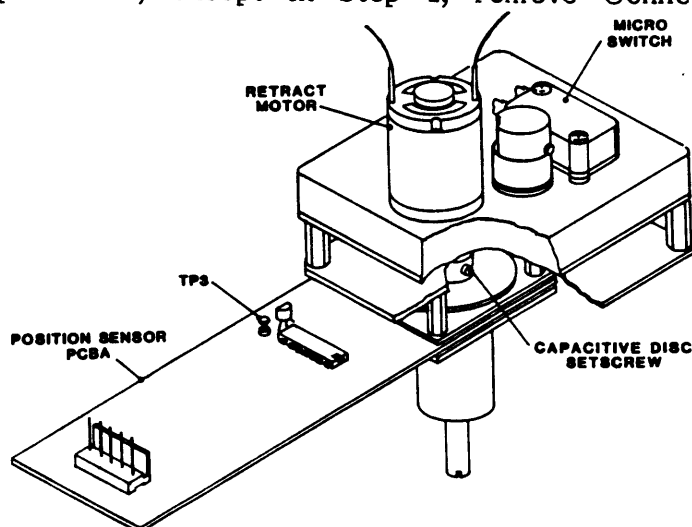


Figure 4-18 Supply-Arm Retract and Pivot Sensor Assembly

4.3.22 PANEL ASSEMBLY (Figure 4-19)

- 1) Remove four Phillips screws (two at each side) that attach the Panel Assembly to the Deck via 2 angle brackets.
- 2) Slide the Panel forward, and disconnect AC Power Switch Connector, 2 wires from Microswitch, and 2 wires from Solenoid (Remove the wraps as necessary). When the Panel is clear, slide the Panel back and away from the Deck.

To replace: Reverse removal procedure..

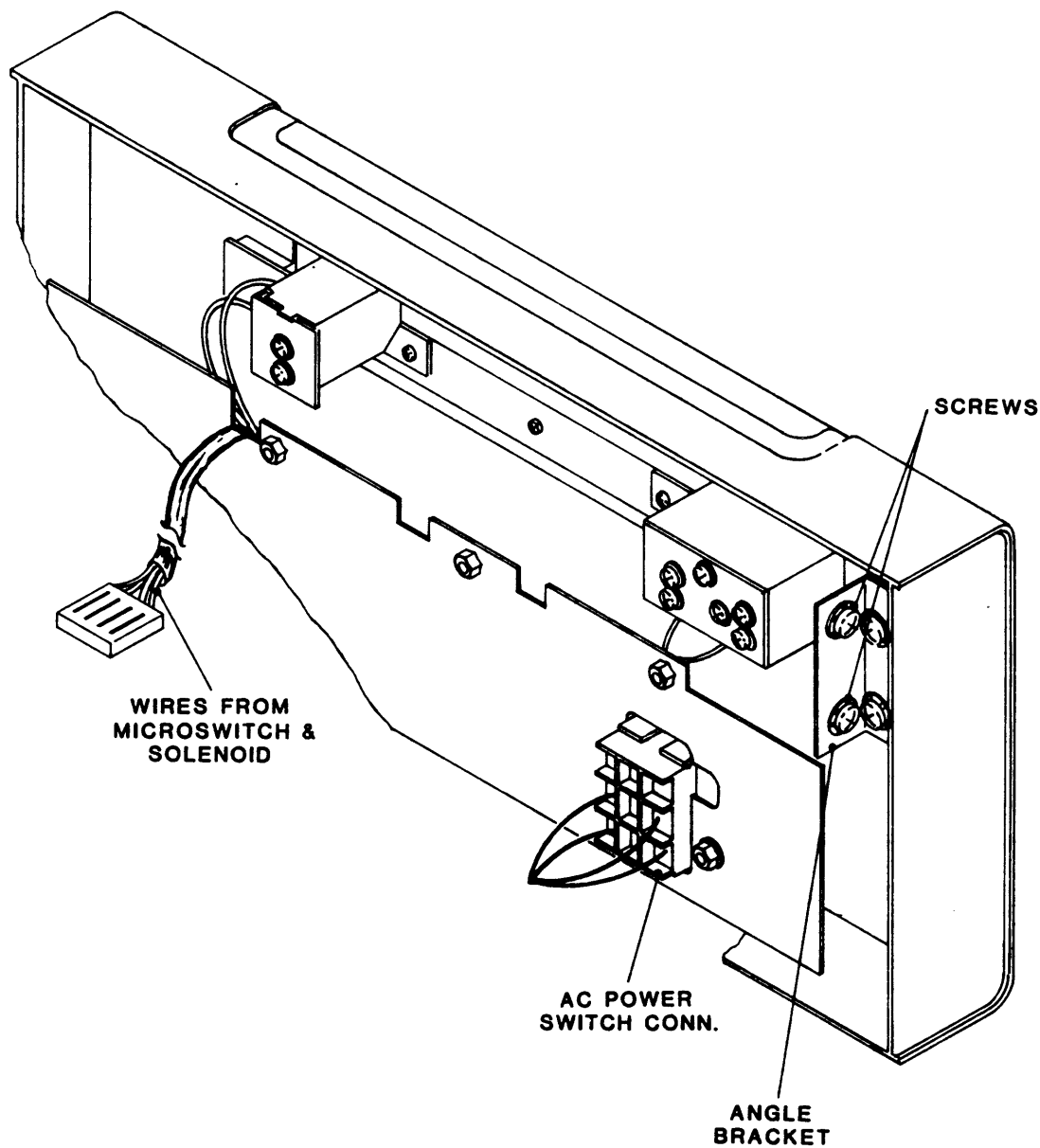


Figure 4-19 Panel Assembly

4.3.23 SUPPLY HUB ASSEMBLY (Figure 4-20)

- 1) Open Top Cover.
- 2) Using a 1/4-inch T-handle Allen wrench, remove the bolt from the center of Hub.
- 3) Grasp the edges of the Hub firmly and pull upwards.

To replace: Reverse removal procedure.

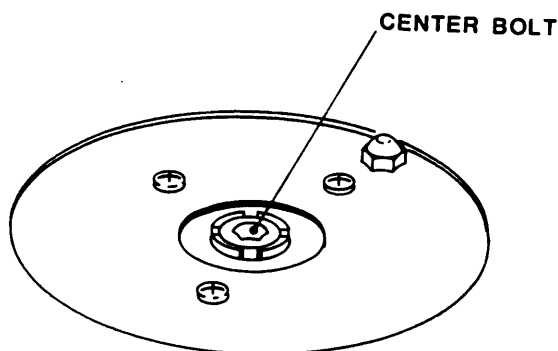


Figure 4-20 Supply Hub Assembly

4.3.24 CAPSTAN MOTOR ASSEMBLY (Figure 4-21)

- 1) Unplug two wires from the Capstan Motor, and unplug the Tachometer Cable from the Interconnect Board (remove tie wraps as required).
- 2) Remove three Phillips screws that hold the Capstan Assembly to the Deck.
- 3) Remove the Capstan Assembly by lowering it through the Deck.

To replace: Reverse removal procedure.

4.3.25 BOT/EOT SENSOR ASSEMBLY (Figure 4-22)

- 1) Unplug the cable from the Interconnect Board (Remove tie wraps as required).
- 2) Using a blade-tip screwdriver (or similar tool) remove the pins from the cable connector.
- 3) Using a right-angle offset Phillips screwdriver, remove one screw from beneath the Sensor.
- 4) Remove the Sensor and pull wires through the hole in the Deck.

To replace: Reverse removal procedure.

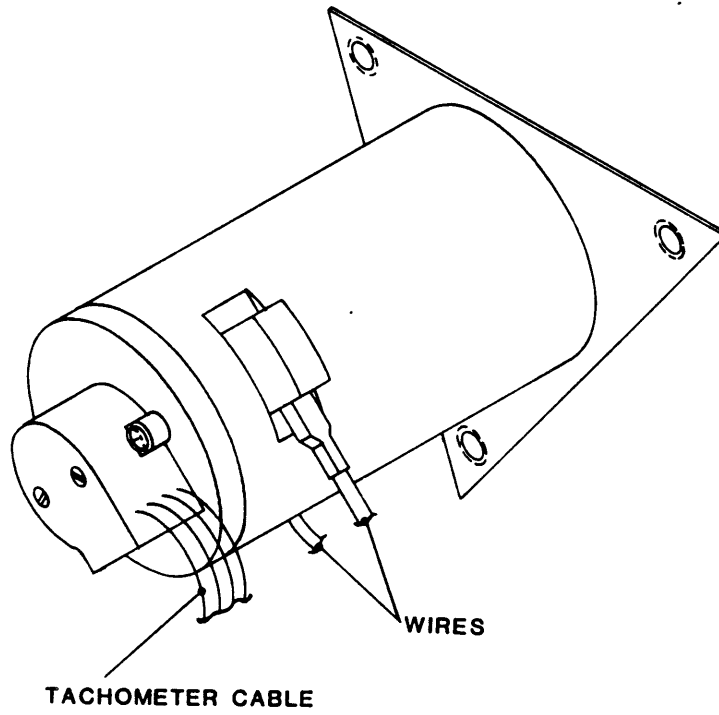


Figure 4-21 Capstan Motor Assembly

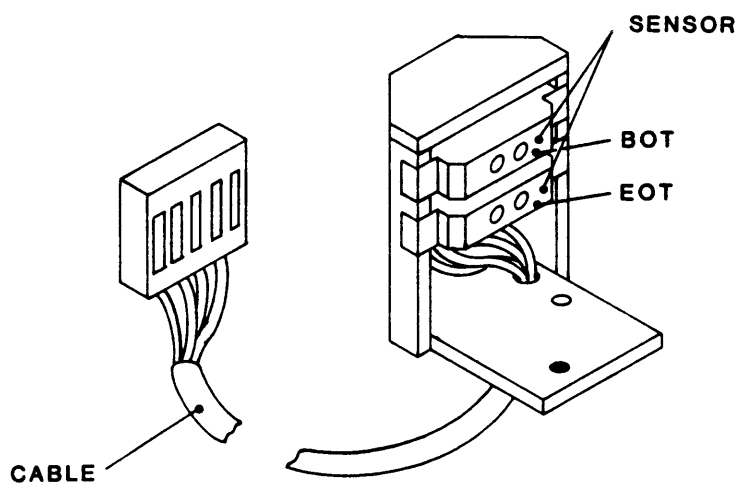


Figure 4-22 BOT/EOT Sensor Assembly

4.3.26 TAPE-IN-CHANNEL EMITTER ASSEMBLY (Figure 4-23)

- 1) Lift the Deck Assembly and latch it in Maintenance Position.
- 2) Unplug Connector J10 from the Interconnect Board.
- 3) Using a knife blade (or equivalent), remove the two Pins from the Connector Housing.
- 4) Cut the tie wraps that hold the two wires in the Harness Assembly.
- 5) Using a right-angle No. 1 Phillips screwdriver, remove mounting screw from the Emitter Assembly.
- 6) Remove the Emitter Assembly through the top of the Deck, bringing the two wires up with the Assembly: Push each Connector Pin through the hole in the Deck one at a time.

To replace: Reverse removal procedure. Align the Emitter with the Tape-In-Channel Sensor before tightening the Emitter Assembly Mounting Screw.

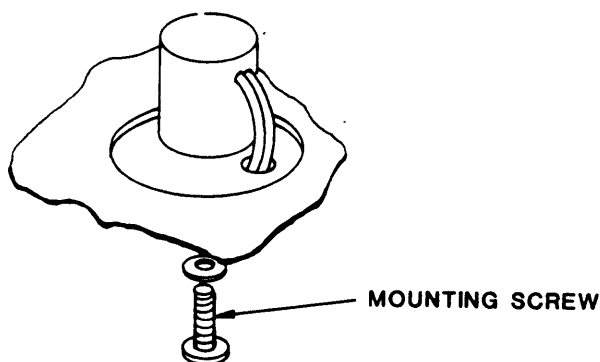


Figure 4-23 Tape-In-Channel Emitter Assembly and Tape-In-Channel Sensor Assembly

4.3.27 TAPE-IN-CHANNEL SENSOR ASSEMBLY (Figure 4-23)

- 1) Lift the Deck Assembly and latch it in Maintenance Position.
- 2) Unplug Connector J11 from the Interconnect Board.
- 3) Using a knife blade (or equivalent), remove the two Pins from the Connector Housing.
- 4) Cut the tie wraps that hold the two wires in the Harness Assembly.
- 5) Using a No. 1 Phillips screwdriver, remove the three screws securing the Interconnect Board Mounting Plate to the Deck. Carefully pull the Interconnect Board and its Mounting Plate away from the Deck.
- 6) Using a No.1 Phillips Screwdriver, remove the Sensor Assembly mounting screw through the opening provided by removal of the Interconnect Board.
- 7) Pull the Sensor Assembly through the top of the Deck, pushing the wires through the opening one at a time.

To replace: Reverse removal procedure. Align the Sensor with the Tape-In-Channel Emitter before tightening the Sensor Assembly Mounting Screw.

4.3.27 TAPE CLEANER ASSEMBLY (Figure 4-24)

- 1) Open the tape path cover.
- 2) Remove two 5/64-inch Allen screws that hold the Tape Cleaner Assembly, and remove the Tape Cleaner Assembly.

To replace: Reverse removal procedure. Align Tape Cleaner Assembly per paragraph 4.4.2.6 -1).

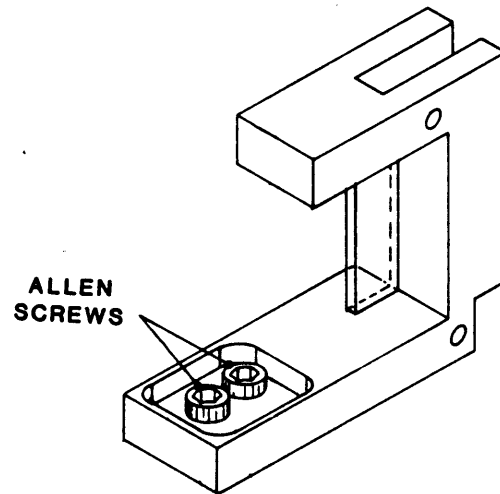


Figure 4-24 Tape Cleaner Assembly

4.3.28 VACUUM MOTOR ASSEMBLY (Figure 4-25)

- 1) Remove the Blower Assembly per paragraph 4.3.17.
- 2) Remove four Phillips screws that hold the Vacuum Motor Mounting Bracket to the Blower Box.
- 3) Disconnect and remove Vacuum Motor Assembly.

To replace: Reverse removal procedure.

4.3.29 REEL MOTOR ASSEMBLY (Figure 4-26)

- 1) Remove associated Hub Assembly per paragraph 4.3.23.
- 2) Remove four Phillips screws that attach The Reel Motor to the Deck.
- 3) Unplug the Reel Motor Connector and remove the Reel Motor Assembly.

To replace: Reverse removal procedure.

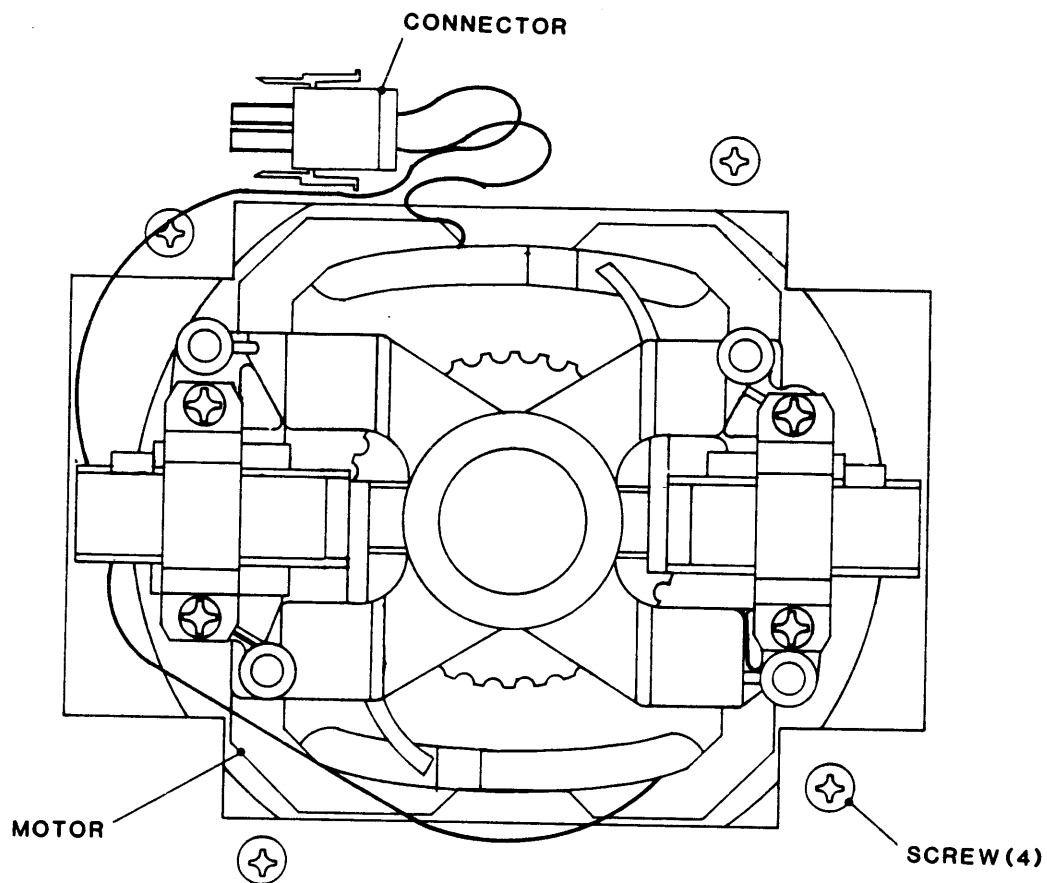


Figure 4-25 Vacuum Motor Assembly

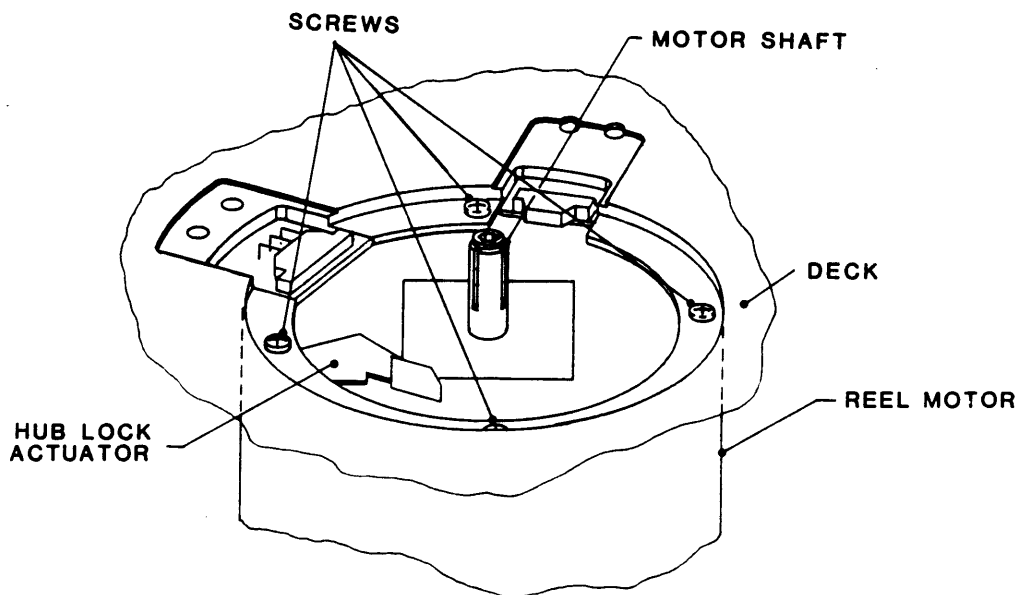


Figure 4-26 Supply Reel Motor Assembly

4.3.30 MAGNETIC HEAD ASSEMBLY (Figure 4-27)

- 1) Remove two Phillips head screws and remove Card Cage Cover.
- 2) Unplug Erase Cable from the Write Board (7116).
- 3) Unbolt and lift Deck Assembly. Latch the Assembly in Maintenance Position.
- 4) Cut the tie wraps that secure the Erase Cable.
- 5) Remove 1 Phillips screw and remove the Plate through which the Erase Cables are routed from the underside of the Deck.
- 6) Unlatch and lower the Deck Assembly.
- 7) Open the Top Cover and brace it open.
- 8) Open the Tape Path Cover and pull the Erase Cable through the Deck.
- 9) Disconnect the Write Cable from the Magnetic Head
- 10) Unplug the Read Preamp from the Read Head and remove the Read Preamp.
- 11) With a 7/64-inch Allen wrench, remove the screw that holds the Magnetic Head, and remove the Magnetic Head.

To replace: Reverse removal procedure. Be sure that the Magnetic Head is pushed as far as possible toward the tape before tightening the Allen screw that hold the Magnetic Tape. Realign and adjust the Tape Cleaner per paragraph 4.4.2.6 -1). Realign and adjust the Magnetic Head Assembly per paragraph 4.4.2.7 -5).

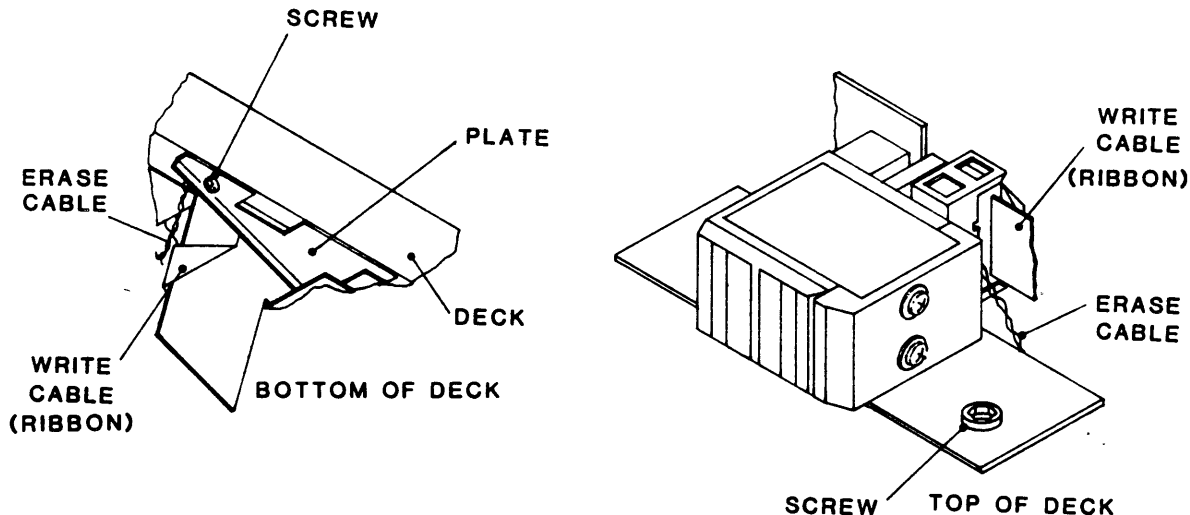


Figure 4-27 Magnetic Head Assembly

4.3.31 CAPSTAN (Figure 4-28)

- 1) Remove hex-head screw and washer from the center of the Capstan Wheel.
- 2) Grasp the Wheel firmly with both hands and wiggle it until it comes loose and pops out.

To replace: Reverse removal procedure.

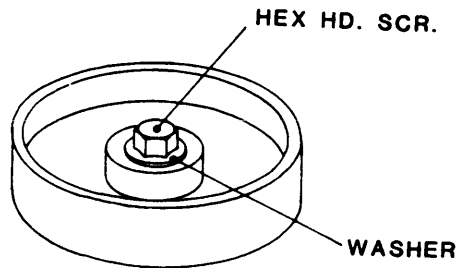


Figure 4-28 Capstan

4.3.32 ROLLER (Figure 4-29)

- 1) Remove associated Arm Assembly per paragraph 4.3.18.
- 2) Push down on the Roller to compress the associated spring and, using C-Clip Removal Tool (not supplied), remove exposed clip at the end of the Shaft.
- 3) Being careful of spring tension, slide the Roller off the Shaft.

To replace: Reverse removal procedure.

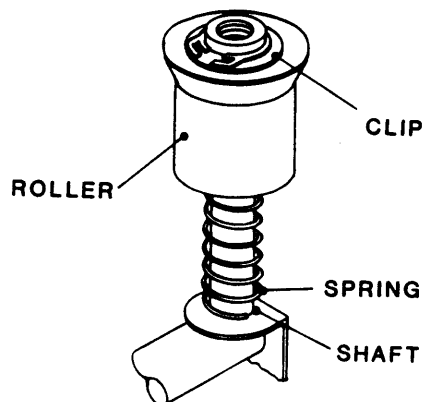


Figure 4-29 Roller

4.4 ADJUSTMENTS

4.4.1 PRELIMINARY CHECKOUT

Inspection:

- 1) Disconnect the AC Power Cable from the Drive.
- 2) Unlatch and lift the Deck Plate Assembly and set the support to hold the Deck Plate in Maintenance Position.
- 3) Carefully * remove all PCBAs from the Cardcage.
 * **CAUTION:** PCBAs are mounted very close together. Pull each PCBA out straight, being careful not to damage components on adjacent Boards.
- 4) Check all cables for proper routing. Make sure that none are pinched or broken. Check that connectors are properly seated.

Power Supply Check:

- 1) Disconnect Power Connectors P4 from the Drive-Electronics PCBA and P1 from the Servo Power Amplifier PCBA.
- 2) Connect the AC Power Connector to the Drive and an ac outlet, and turn on ac power.
- 3) Using a digital voltmeter, verify voltages at Power Connector P4 as follows:

<u>Pin</u>	<u>Voltage</u>	<u>Tolerance</u>	<u>Pin</u>	<u>Voltage</u>	<u>Tolerance</u>
1	+5	+0.25/-0.05	7	-50	+/-15%
2	+12	+/-0.5	8	+50	+/-15%
3	-12	+/-0.5	9	+24	+1.0/-4.0

- 3) Turn ac power off and Wait about 10 seconds; then reconnect Power Connectors P4 and P1 to Drive Electronics and Servo Power Amplifier PCBAs.

4.4.2 PRE-LOAD TESTS

4.4.2.1 RESET CHECK

- 1) Turn ac power on. All indicators on the front panel should flash once, but POWER indicator should remain lit, and Display should indicate: TESTING.
- 2) Turn ac power off, and replace all PCBAs in cardcage.
- 3) Turn on ac power. All indicators on the front panel should flash once, but POWER indicator should remain lit, and Display should indicate: 9600.

4.4.2.2 POSITION SENSOR CALIBRATION

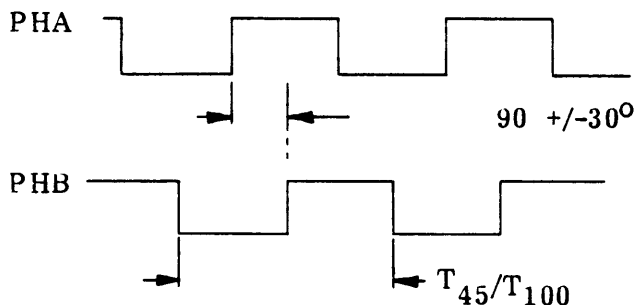
Position Sensor Calibration requires that the Drive be **not loaded**, and set to CALIBRATE, BUF ARMS Mode.

- 1) Open Tape Path Cover.
- 2) Unlatch and lift the Deck Plate, and set the support to lock the Deck Plate in Maintenance Position.
- 3) Turn on ac power.
- 5) Takeup Arm Calibration:
 - A. Connect an oscilloscope probe to Test Point TP3 on the Takeup Arm Position Sensor PCBA.
 - B. With Drive not loaded, set the Drive to CAL - BUF ARMS Mode. The Readout momentarily displays "RELAXING", then displays "TAKE ARM".
 - C. Manually move Takeup Arm to the zero mark at the center of the Arm movement path.
 - D. Note voltage output at TP3. Voltage should be 0 volt. If voltage is incorrect, loosen Capacitive Disc Setscrew and rotate the Disc until voltage is correct. Tighten Setscrew.
 - E. Manually move the Takeup Arm toward the front of the Drive until the Stop Screw just touches the Rubber Bumper on the Mechanical Stop. The Screw depth should be such that the end of the Takeup Arm is positioned at 4.8 inches from the side wall. Adjust Stop Screw as necessary.
 - F. Manually move the Takeup Arm toward the rear of the Drive until the Interrupter Paddle just enters the optical path of the Limit Sensor.
 - G. Manually move the Takeup Arm until it just contacts the rubber bumper of the front limit stop, and reconnect the Retraction Spring.
 - H. With Allen wrench, loosen Setscrew on the Camshaft Coupling and adjust the plastic Cam on the Arm Shaft so that the microswitch engages the notch and actuates just as the Arm touches the Rubber Bumper on the Mechanical Stop.
- 6) Supply Arm Calibration:
 - A. Connect an oscilloscope probe to Test Point TP3 on the Supply Arm Position Sensor PCBA.
 - B. With Phillips Screwdriver, remove Supply Arm cover.
 - C. With Drive not loaded, set the Drive to CAL - BUF ARMS Mode. The Readout momentarily displays "RELAXING", then displays "TAKE ARM". Press SCAN until Readout displays "SUP ARM".

- D. Manually move the Supply Arm away from the Limit Sensor to the extreme of its movement path until it just touches the Rubber Bumper on the Mechanical Stop. Remove the Arm Retraction Spring.
 - E. Manually move Supply Arm to the zero mark at the center of the Arm movement path.
 - F. Note voltage output at TP3. Voltage should be 0 volt. If voltage is incorrect, loosen Capacitive Disc Setscrew and rotate the Disc until voltage is correct. Tighten Setscrew.
 - G. Manually move the Supply Arm toward the front of the Drive until the Stop Screw just touches the Rubber Bumper. The Screw depth should be such that the end of the Supply Arm is positioned at 4.8 inches from the side wall. Adjust Stop Screw as necessary.
 - H. Manually move the Supply Arm toward the rear of the Drive until the Interrupter Paddle just enters the optical path of the Limit Sensor.
 - I. Manually move the Supply Arm until it just contacts the rubber bumper of the front limit stop, and reconnect the Retraction Spring.
 - J. With Allen wrench, loosen Setscrew on the Camshaft Coupling and adjust the plastic Cam on the Arm Shaft so that the microswitch engages the notch and actuates just as the Arm touches the Rubber Bumper on the Mechanical Stop.
- 7) Turn off ac power and reconnect J2 to the Drive Electronics Board.

4.4.2.3 CAPSTAN CHECK

- 1) Turn on ac power.
- 2) Press DIAG. DIAG indicator lights.
- 3) Press SCAN. MOTION indicator lights.
- 4) Press ENTER. Display indicates: 45 FWD.
- 5) Press ENTER. Capstan should move in forward direction.
- 6) On the Drive Electronics Board: connect a dual trace oscilloscope to U17 Pin 15 (PHA), and J5 Pin 20 (PHB). The two signals should be squarewaves 90 \pm 30 $^{\circ}$ out of time phase with one another, as illustrated below:



Note:

PHB can be asymmetrical by $\pm 30^{\circ}$.

$V_{p-p} = 5V$ at all speeds.

$T_{45} = 140 \pm 0.5 \mu s$

$T_{100} = 63 \pm 0.5 \mu s$

Capastan Drive Voltages Phase Relationship

- 6) Check time period, T_{45} .
- 7) Press START/STOP. Capstan should stop motion.

- 8) Repeatedly press SCAN until Display indicates: 100 FWD.
- 9) Check time period. T_{100} .

4.4.2.4 LOAD TEST

With the Drive in Diagnostic-Motion Mode per paragraph 4.5.2.3, Steps 1 and 2:

- 1) Open the Tape Access Door and insert a 10-1/2 inch Test Reel.
- 2) Leaving the Access Door open, attempt to load the tape. The display should indicate: CLOSE DOOR.
- 3) Close the Tape Access Door. The Drive should now load with the following sequence:
 - a. Display indicates: LOADING.
 - b. Supply Hub Solenoid engages.
 - c. Supply Hub reverses.
 - d. Supply Hub Solenoid disengages.
 - e. Vacuum Blowers starts.
 - f. Tape threads onto Takeup Reel, and Vacuum shuts off.
 - g. Tension Arms engage and apply tension to tape.
 - h. Drive searches for Load Point.
 - i. Drive stops at Load Point, and lights LOAD POINT indicator.
 - j. Displays indicates: 9600, and Tension Arms center at zero point.
If Write Ring is installed, WRITE ENABL indicator lights.

4.4.2.5 DIAGNOSTIC WITH TAPE LOADED

With a tape reel in the Drive, and the Drive in Diagnostic-Motion Mode per paragraph 4.6.2.3, Steps 1 and 2:

- 1) Repeatedly press SCAN and verify the sequence of displays:

<u>Step</u>	<u>Display</u>	<u>Step</u>	<u>Display</u>
a.	45 FWD	h.	100 FSS
b.	45 REV	i.	100 RSS
c.	45 FSS	j.	100 FRF
d.	45 RSS	k.	45/100 F
e.	45 FRF	l.	45/100 R
f.	100 FWD	M.	BURN-IN
g.	100 REV		

- 2) Repeat Step 1), but after each substep, press ENTER, and verify that the Drive does the operation indicated by the Display: for each test, allow the Drive to run for several seconds, then press START/STOP. Then do the next substep.
- 3) Repeatedly press SCAN until Display indicates: 100 FWD. Press ENTER and let the tape run to the end of tape. Verify that the Display indicates: EOT.
- 4) Press DIAG; Display would indicated: 9600.
- 5) Press RWND/UNLD. The tape should run to the beginning of tape, and the Display should indicate: BOT.

4.4.2.6 CALIBRATION, MECHANICAL

With a tape reel in the Drive, and the Drive in Diagnostic-Motion Mode per paragraph 4.5.2.3, Steps 1) and 2), adjust the Drive As follows: (Refer to figures as required.)

1) Tape Cleaner Adjustment (Figure 4-24):

- a. Using a small screwdriver adjust the Setscrew on the Tape Cleaner to move the Sapphire away from the tape.
- b. Move the tape forward at 45 ips and at the same time, using the Setscrew adjustment, move the Tape Cleaner Sapphire surface toward the tape until it just touches the tape.
- c. Turn the Setscrew 1/6th turn more, driving the Sapphire so that it exerts a slight pressure on the tape.
- d. Using a penlight, and with the tape moving at 45 ips first forward then reverse, verify that the the tape moves smoothly along the sapphire surface without leaving the surface at any time. Also, verify that the tape rides smoothly over the Read/Write Head without lifting off at any point.

2) Hub Lock Solenoid Adjustment (Figure 4-5):

With ac power off, adjust the Hub Lock Solenoid as follows: (Refer to Figures 4-5, and 4-6 as necessary.)

- a. Loosen the four Solenoid mounting screws until the Solenoid Body can be moved freely: **Do not remove screws.**
- b. Position the Solenoid Body so that the Plunger is exactly centered in its channel and can move freely.
- c. Holding the Solenoid Body firmly in its location on the Deck, tighten the four Solenoid Mounting Screws.
- d. Loosen the 3/8-inch Locknut on the Hub Lock Actuator.
- e. While rotating the Hub by hand, turn the Adjusting Screw clockwise until the Hub just touches the Actuator.
- f. Turn the Adjusting Screw counterclockwise 3 turns, then tighten the Locknut.
- g. Verify that the Hub does not touch the Actuator by rotating the Hub by hand several turns.

4.4.2.7 CALIBRATION, ELECTRONIC

With the Calibration Jumper on the Drive Electronics Board moved to the Calibrate Position as described in Section II (paragraph 2.4.4, Steps A thru C), a reel of tape in the Drive, and the Drive set to Diagnostic-Motion Mode per paragraph 2.4.4, Step E, run tape to BOT by pressing LOAD.

- 1) Setting Default Data Format (Default Density): The Drive is factory-set to PE Data Format under Remote control (Display indicates: REMOTE/ PE). The operator can change the Default Data Format as follows:

CAUTION

Power must NOT be turned off during the following procedures. See CAUTION in paragraph 2.3.4.

- a. Press DIAG. Display indicates: DIAG.
 - b. Press ENTER, then repeatedly press SCAN until Display indicates SET-UP. Then press ENTER.
 - c. Repeatedly press SCAN until Display indicates: DEFL DEN.
 - d. Press ENTER. Display indicates: PE REM (the factory-set default format).
 - e. Repeatedly press SCAN until desired Data Format (Density) displays. The sequence of displays is:

1) PE	3) NRZ1
2) PE REM	4) NRZ1 REM
 - f. Press ENTER. The selected data format is now the Default Data Format.
 - g. To exit from the Calibrate Mode, press DIAG; to continue calibration, proceed with next appropriate Step.
- 2) Unit Number (Drive Address): With Drive in Set-Up Mode, and the Calibrate Jumper in Calibrate Position:
 - a. Repeatedly press SCAN until Display indicates: UNIT NUM.
 - b. Press ENTER. Display indicates the currently-assigned Unit Number.
 - c. Repeatedly press SCAN until the Display indicates: UNIT X (X = the desired Unit Number: 0 through 7).
 - d. Press ENTER. The displayed Unit Number is now the assigned Unit Number.
 - e. To exit from Calibrate Mode, press DIAG; to continue calibration, proceed with the next Step.

- 3) Read Amplitude, Course Adjustment: With the Drive in Calibrate Mode and the Calibration Jumper in Calibrate Position (Ref Fig. 2-8):
- a. Using an Extender Card, extend the Read Analog Board above the chassis for easy access.
 - b. Press DENSITY as required to set Data Format (Density) to PE.
 - c. Momentarily press LOAD and ENTER at the same time. This places the Drive in Amplifier Adjust Mode. The Display should indicate: 45 IPS, and the Front Panel pushbuttons should now have the following functions:

<u>Pushbutton</u>	<u>Function</u>
SCAN	Selects Data Amplifier Channel to be calibrated. CHG (Course Gain - all Channels) and CH0 through CH7, and CHP (Channels 0 through 7, and P).
ENTER	Increments gain value (high value = low gain)
START/STOP	Decrements gain value.
RWND/UNLD	Stops the present operation.
LOAD	Enters (stores) Read gain values.

- d. Press ENTER. Drive should start moving tape forward, and the display should indicate CHG GXX (CHG = Course Gain; XX = gain value 00 to 15: 00 = highest gain; 15 = lowest gain).
- e. In turn, connect an oscilloscope probe to either end of Resistor Rx19 * on each Channel of the Read Analog Board (7114), and verify that by repeatedly pressing ENTER and/or START/STOP, the gain of each Channel changes accordingly.

* x represents the Track Number.
- f. By pressing ENTER or START/STOP, set Course Gain (CHG) for all Channels to G08 (Gain = 08). Readouts should be: CHG G08; CH0 G08; CH1 G08 ... etc.
- g. Press RWND/UNL to stop the operation; then press LOAD to store the values.
- h. Exit the Calibration Mode by pressing DIAG.
- i. Run tape to Load Point

Read Amplitude, Fine Adjustments:

Note: Drive Data Format (Density) is presently set to PE 45 - Steps 3) b. and c.

- a. Connect oscilloscope probe to R719 in Channel 0 of the Read Analog Board.
- b. Repeatedly press SCAN until Display indicates: CH 0.
- c. Set Gain by repeatedly pressing ENTER or START/STOP until voltage amplitude at R719 is 3 volts p-p.
- d. In turn, connect oscilloscope probe to Rx19 in each Read Channel of the Read Analog Board, and set gain by repeatedly pressing ENTER or START/STOP until voltage amplitude at each point is 3 volts p-p. The following chart shows Channel/Track/Resistor relationships.

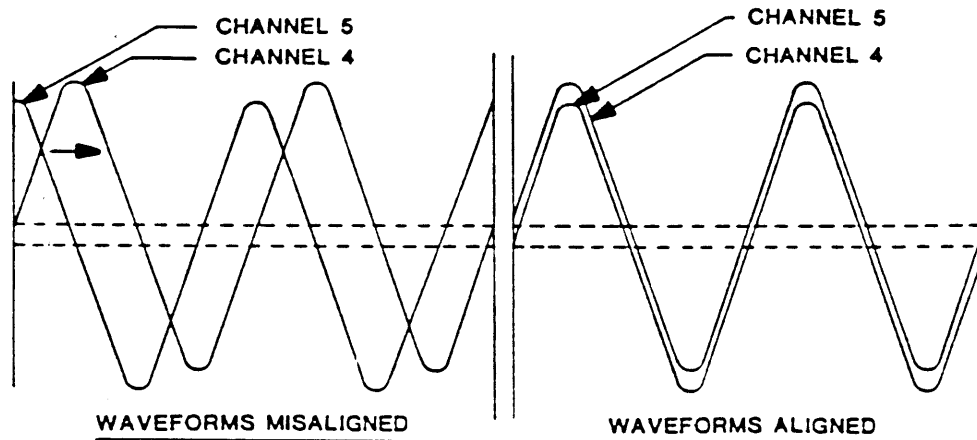
<u>Channel</u>	<u>Track</u>	<u>Resistor</u>	<u>Channel</u>	<u>Track</u>	<u>Resistor</u>
0	7	R719	5	1	R194
1	6	R619	6	8	R819
2	5	R519	7	2	R219
3	3	R319	P	4	R419
4	9	R919			

- e. Set Drive per Step 3 to PE 100.
- f. Repeat Steps a, b and c.
- g. Set Drive to NRZ1 45 per Step 3.
- h. Repeat Steps a, b and c.
- i. Set Drive to NRZ1 100 per Step 3.
- j. Repeat Step h.

5) Read Skew Adjustment:

- a. Load a Skew Tape into the Drive.
- b. Connect a dual-trace oscilloscope, one probe to Channel 4, the other to Channel 5. Trigger on Channel 4. (See Item 4)d above for test point location).
- c. In Motion Mode, run the tape forward at 45 ips.

- d. Using a small-blade screwdriver and, with the tape in motion, and while observing the waveforms on the Oscilloscope, turn the adjustment screw on the Magnetic Head counterclockwise until there is no apparent waveform motion. Then, turn the screw slowly clockwise until the two waveforms move into phase as illustrated below: but continue to turn the screw clockwise until the two waveforms come in phase a second time.



- e. Move the Channel-4 probe to Channel P, and triggering on Channel P, in turn, connect the other probe to each Read Channel and record the waveform displacement in microseconds. Prepare a chart similar to:

<u>Channel</u>	<u>Scatter Value</u>	<u>Channel</u>	<u>Scatter Value</u>	<u>Max Scatter</u>
0	_____ us	4	_____ us	_____ us
1	_____ us	5	_____ us	
2	_____ us	6	_____ us	
3	_____ us	7	_____ us	

- f. Subtract the largest positive value from the largest negative value. The difference constitutes the maximum scatter, which should not exceed 3.4 us. If maximum scatter is out of specification, repeat Steps d and e.
- g. Run the tape in Read Reverse, and repeat Steps e and f. The maximum scatter should be within specification per the chart above. If maximum scatter is out of specification, repeat Steps e, f, and g.
- h. Exit from the Motion Mode, and unload the tape reel.
- 6) Write Skew Adjustment:
- Load a work tape.
 - Select CAL WRT SKEW Mode. Panel controls should now have the same functions as listed under 3)c above.
 - Press ENTER. Tape should start moving forward and the display should indicate, CH0 SKxx (xx = a number from 01 to 15).

- d. Connect an oscilloscope probe to Channel-P Test Point (Ref Step 4)d above) and, triggering on Channel P, in turn, connect the other input probe to each Channel Test Point. Make a chart similar to that in Step 3)e above, and record all Write Values. Each of these Values should be within 2.2 us. of each corresponding Read Value. Adjust as necessary per the following Steps e thru g.
- e. Press SCAN as necessary to display the Channel that is out of specification.
- f. Repeatedly press ENTER or STOP/STOP to change gain as necessary until waveforms are within tolerance.
- g. Repeat Steps e and f until all Channels are within specification.

4.5 DIAGNOSTICS AND CALIBRATION NOTES

4.5.1 DIAGNOSTICS OPERATIONS

- 1) General: In Diagnostic Mode, repeatedly pressing SCAN displays the diagnostic function: MOTION, CAL, and SET UP. Pressing ENTER enables the function.
- 2) Having selected a diagnostic function per Step A, repeatedly pressing SCAN displays the parameters or functional categories of the selected diagnostic function:

MOTION Parameters	Functions listed in Table 2-1
CAL Functions	WRT SKEW, READ AMP, and BUF ARMS
SET UP Functions	DEFL DEN, and UNIT NO.
- 3) In Diagnostic Mode, if tape has already been loaded, pressing LOAD will initiate another Tape Load Sequence. However, the tape will not go to Load Point, and the Drive will remain in Diagnostics Mode.
- 4) Motion Mode:
 - A. After selecting Motion Mode per Step A above, repeatedly pressing SCAN displays motion parameters as listed in Table 2-1.
 - B. After selecting the motion parameter per Step 1, pressing ENTER enters the parameter and starts the motion selected.
 - C. When tape is in motion, the DIAG LED flashes at 0.5 Hz.
- 5) Cal Mode:
 - A. General
 1. In Cal Mode, the Calibration Jumper must be installed to store the selected parameters. If the jumper is not installed, and a store operation is attempted, the Readout displays, "JUMPER?" and the RWND/UNL LED flashes. Pressing RWND/UNL aborts the calibration procedure.

CAUTION

NEVER TURN AC POWER OFF OR ON WHILE THE CALIBRATION JUMPER IS IN CALIBRATE POSITION. TO DO SO COULD CAUSE CATASTROPHIC PROGRAM FAILURE.

2. In Cal Mode, repeatedly pressing SCAN displays the Calibrate Functions: WRT SKEW, READ AMP, and BUF ARMS. Then pressing LOAD and ENTER at the same time, enters the currently displayed Function.
3. Once a Function has been selected per Item b, again repeatedly pressing SCAN displays the Parameters for that Function.
4. Once a Parameter has been selected per Item c above, pressing RWND/UNLD prepares the entry of that Parameter for the selected Function. Then, pressing LOAD enters the parameter.

B. Write Skew

1. With NRZ1 Density selected, Write Skew Function entered per Item 1.b above, repeatedly pressing SCAN displays the various tape speeds. Pressing RWND/UNLD, prepares the entry of that Parameter for the selected Function. Then, pressing LOAD enters the displayed speed.
2. With tape speed entered, the Drive moves tape at the selected speed. The Readout displays the Channel Number and its Skew Value in the form: CHO SK08 (CH0 = Channel Overall; SK08 = Current Skew Value). (Skew Value Range = SK00 - SK15).
3. Repeatedly pressing SCAN successively displays each Channel and its current Skew Value in the form: CHx SKyy. (x = Channel - Range 0 through 7; yy = Current Skew Value).
4. Pressing ENTER decrements the Skew Value for the displayed Channel. Pressing START/STOP increments the Skew Value.
5. Pressing RWND/UNLD displays the question LOAD?. Then:
 - a. Pressing LOAD saves the Skew Values just set, and displays the next Mode: "READ AMP".
 - b. Pressing DIAG aborts the Write Skew Procedure, leaving the Skew Values at their original settings, and sets the Drive to Off-line, displaying "9600".

C. Read Amp

1. With Read Amp Function entered per Item 1.b above, repeatedly pressing SCAN displays the various tape speeds. Pressing ENTER enters the displayed speed.
2. With tape speed entered, the Drive moves tape at the selected speed. The Readout displays the Channel Number and its Gain Value in the form: CHG G08 (CHG = Channels Gain - overall; G08 = Current Gain Value). (Gain Value Range = G00 - G15)

3. Repeatedly pressing SCAN successively displays each Channel and its Gain Value: Channels 0 through 7, P and Overall Gain Channel G.
4. Pressing ENTER decrements the Gain Value for the displayed Channel. Pressing START/STOP increments the Gain Value.
5. Pressing RWND/UNLD displays the question LOAD?. Then:
 - a. Pressing LOAD saves the Gain Values just set for the speed and density set per Step a, and displays the next Mode: "BUF ARMS".
 - b. Pressing DIAG aborts the Read Amp Procedure, leaving the Read Amp Values at their original settings, and sets the Drive to Off-line, displaying "9600".

D. Buf Arms

1. If the Drive is loaded, the Readout displays, "LOADED" and the RWND/UNL LED flashes. Pressing DIAG or RWND/UNL sets the Drive to Off-line. Pressing SCAN changes the Mode and the Readout displays, "WRITE-SKEW".
2. If the Drive is not loaded, the Readout momentarily displays "RELAXING", then displays, "TAKE ARM", and the Buffer Arms relax, and can be calibrated. Again pressing SCAN causes the Readout to display "SUP ARM". Repeatedly pressing SCAN causes the Readout to alternately display, "TAKE ARM" and "SUP ARM", designating each for calibration. Pressing DIAG retracts the Arms, exits the test, and sets the Drive to Off-line, displaying "9600".

6) Set Up

A. Default Density

1. Repeatedly pressing SCAN changes the Density Parameters and the corresponding Readout to each of the four Density Configurations: PE, PE REM, NRZ1, and NRZ1 REM.
2. Pressing ENTER stores the configuration displayed.
3. Pressing DIAG exits the procedure, setting the Drive to Off-line, displaying "9600".

NOTE: The Default Density is effective only following power up, and will not affect the present Operating Density.

B. Unit Number

1. Repeatedly pressing SCAN displays each of eight Numbers: 0 through 7.
2. Pressing DIAG designates the displayed Number for temporary storage to be used as the current Unit Number, and exits to Off-line, displaying "9600".
3. Pressing RWND/UNL prepares the displayed Number for permanent storage, and the Readout displays, "LOAD?".
4. Pressing LOAD stores the Number as the new permanent Drive Unit Number, and sets the Drive to Off-line, displaying "9600".

SECTION V
PARTS IDENTIFICATION

SECTION V PARTS IDENTIFICATION

5.0 GENERAL

This section contains Parts Lists, related Assembly Drawings and a list of Recommended Spare Parts for the 9600 Tape Drive. Common commercially-available parts are not listed.

Major components (such as PCBAs, Motor Assemblies, etc.) of the 9600 Drive are not considered field repairable. If a major component is found defective, replace it with a new (spare) component, obtain a Return Authorization Number from the nearest Kennedy Company Customer Service Office, and return the defective component to Kennedy Company for repair.

5.1 PARTS ORDERING INFORMATION

Replaceable parts for the 9600 Drive are listed in Tables 5-1 through 5-4, and illustrated in Figures 5-1 through 5-4. Recommended Spare Parts are listed in Table 5-5.

5.1.1 NEW OR SPARE PARTS

When ordering New Parts or Spare Parts from Kennedy Company, include the following information:

1. Name, Model and Serial Numbers of the 9600 Drive in which the part will be installed.

Send request to:

Kennedy Company
Spare Parts Order Department
1600 Shamrock Avenue
Monrovia, California 91016

5.1.2 PARTS RETURNED FOR REPAIR

Before returning any item for repair, compile the following information:

1. Your Company Name and Address.
2. Name of Person authorized to return the Item.
3. Full Model Number of 9600 Drive.
4. Serial Number of 9600 Drive.
5. Assembly Name and Part Number, and Serial Number (if applicable) of the return Item.
6. Reason for return of Item: description of malfunction.

Then, phone your nearest Kennedy Company Office (See Customer Service Locations, par. 5.2), and ask for Customer Service. Ask the Customer Service Administrator for a Return Authorization (RA) Number. The Administrator will request the the information listed above, then assign a RA Number. **The RA Number must be clearly written on the outside of the package.** Documentation that accompanies the package must include those Items listed above plus the RA Number.

Finally, package **only** the item(s) needing repair. Use standard good packaging procedures. **NOTE:** Kennedy Company will not be responsible for any accessories to the repair Item. **DO NOT SEND ACCESSORIES.** Ship the package containing the information required, and **only** the Item(s) needing repair to the nearest Kennedy Company Customer Service location (See par. 5.2).

5.2 KENNEDY COMPANY CUSTOMER SERVICE LOCATIONS

5.2.1 UNITED STATES DIVISIONS

Kennedy Company	Kennedy Company	Kennedy Company
Main Office	Eastern District	4364 L.B. McLeod
1600 Shamrock Avenue	400 West Cummings Park	Orlando, FL 32811
Monrovia, California 91016	Suite 3650	(305) 843-9335
(818) 357-8831	Woburn, MA 01801	
ITT TELEX 247019KNDY UR	(617) 935-9787	

5.2.2 FOREIGN DIVISIONS

<u>UNITED KINGDOM</u>	<u>CENTRAL EUROPEAN</u>
Kennedy International Inc.	Kennedy Holdings Inc.
Mcgraw Hill House	Koningin Elisabethplein 8
Shoppenhangers Road	B-2700 Sint-Niklaas
Maidenhead,	Belgium
Berkshire SL6, 2QL, England	TEL: (3) 777.19.62
TEL: (628) 73939	TELEX: 71870 KEN CO
TELEX: 847871 KENUKS G	

5.3 FIELD KITS

Some replacement components may be supplied in the form of repair or field change kits. The repair kits contain parts that are matched or assembled and adjusted at the factory because of complexity or to aid the field technician. The components ordered as field kits either by correspondence with Kennedy Service Engineers or by direct order will be supplied with complete installation instructions. The change kits are intended for standard or special options not originally included in the unit.

5.4 PARTS IDENTIFICATION

All major assemblies are itemized in Tables 5-1 through 5-5. All item numbers are illustrated in Figure 5-1 through 5-4.

5.5 RECOMMENDED SPARE PARTS

Table 5-5 contains a list of the Model 9600 recommended spare parts. Refer to Figures 5-1 through 5-5 for the location of these parts.

TABLE 5-1 PANEL ASSEMBLY P/N 190-7321-XXX PARTS LIST

ITEM	PART NUMBER	DESCRIPTION
5-1-1	190-75878-001	Wire Assembly
5-1-2	190-7340-001	Power Switch Cable Assembly
5-1-3	190-7112-001	Operator Control Panel PCBA (Standard)
	109-7112-002	(Alternate)
5-1-4	291-7324-001	Tape Access Door
5-1-5	190-7486-001	Front Panel Cable Assembly
5-1-6	190-7321-101	Panel Assembly (Standard)
	190-7321-001	(Alternate)
	190-7321-201	(Alternate)
	190-7321-301	(Alternate)
	190-7321-401	(Alternate)
5-1-7	122-0008-002	Solenoid, 24 VDC, 24-ohm

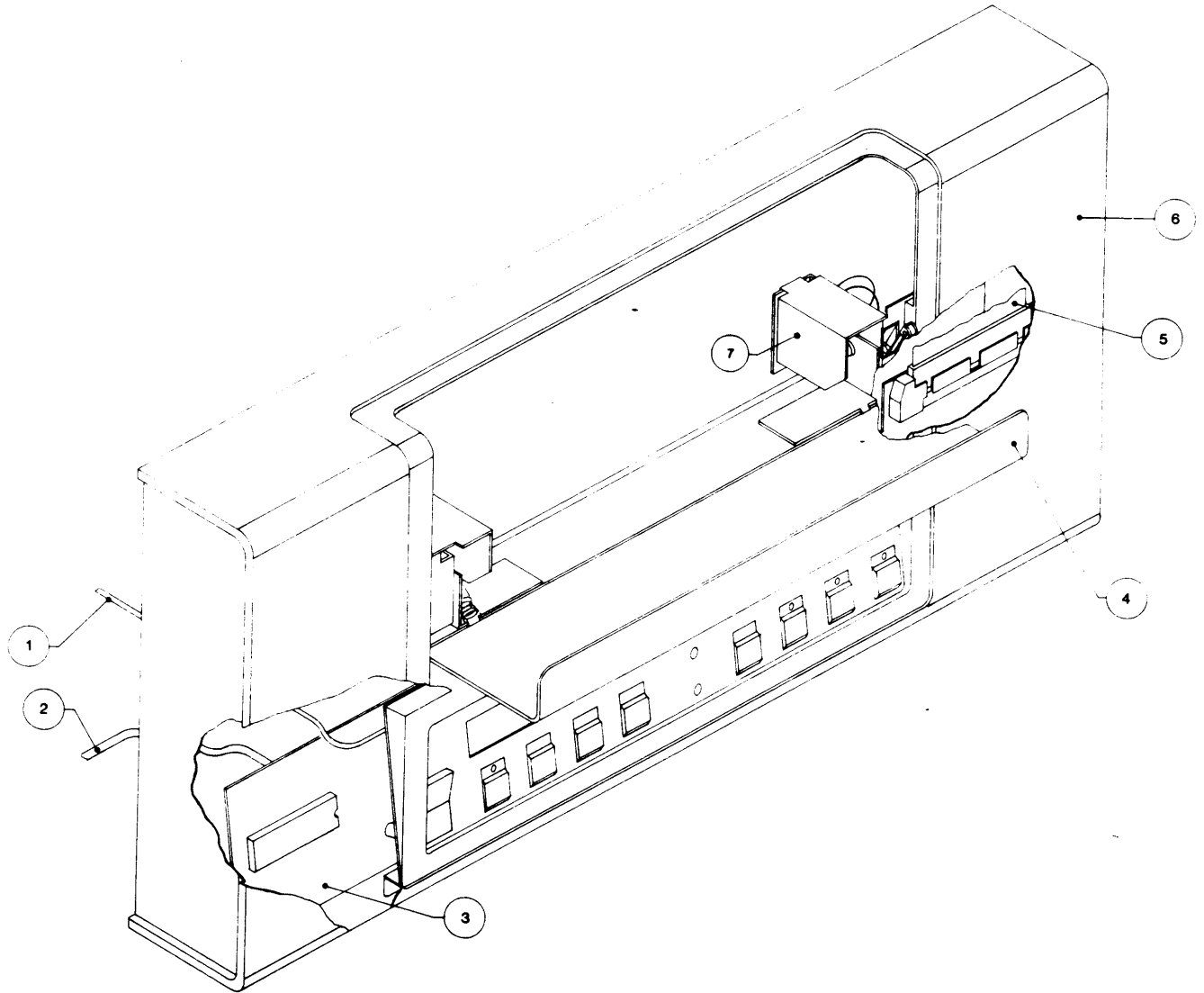


Figure 5-1 Front Panel Assembly, P/N 190-7321-XXX

TABLE 5-2 DECK ASSEMBLY P/N 190-7336-XXX PARTS LIST (TOP VIEW)

ITEM	PART NUMBER	DESCRIPTION
5-2-1	190-7320-001	Retract and Pivot Sensor (Takeup)
5-2-2	291-7211-001	Roller
5-2-3	191-5699-001	Capstan
5-2-4	190-7333-001	Capstan Motor Assembly
5-2-5	190-6842-001	Vacuum Hub Assembly
5-2-6	190-5906-004	EOT/BOT Sensor Assembly
5-2-7	190-7295-001	+/-12VDC Regulator Assembly
5-2-8	190-7332-001	Supply Hub Assembly
5-2-9	190-7483-001	Vacuum Motor Assembly
5-2-10	190-7148-001	12VDC Regulator PCBA
5-2-11	190-7119-001	Reel In Place Sensor Assembly
5-2-12	190-7144-001	File Protect Sensor Assembly
5-2-13	190-7235-001	Supply Arm Limit Sensor PCBA
5-2-14	190-7216-002	Arm Pivot Assembly
5-2-15	190-7319-002	Supply Arm Assembly (Bottom)
5-2-16	190-7320-002	Retract and Pivot Sensor (Supply)
5-2-17	190-7334-002	Tape-in-Channel Emmitter Assembly
5-2-18	190-7334-001	Tape-in-Channel Sensor Assembly
5-2-19	190-7524-001	Magnetic Head Assembly
5-2-20	190-7456-001	Tape Cleaner Assembly
5-2-21	190-7216-001	Arm Pivot Assembly
5-2-22	190-7335-001	Magnetic Head Assembly
5-2-23	190-7319-001	Take-up Arm Assembly (Top)
5-2-24	190-7231-001	Take-up Arm Limit Sensor PCBA
5-2-25	125-0073-006	Spring, Extension
5-2-26	28-00259-001	Fastener, 1/4 Turn, Receptacle, Clip-On
5-2-27	91-07731-201	Torsion Bar
5-2-28	91-07731-101	Torsion Bar

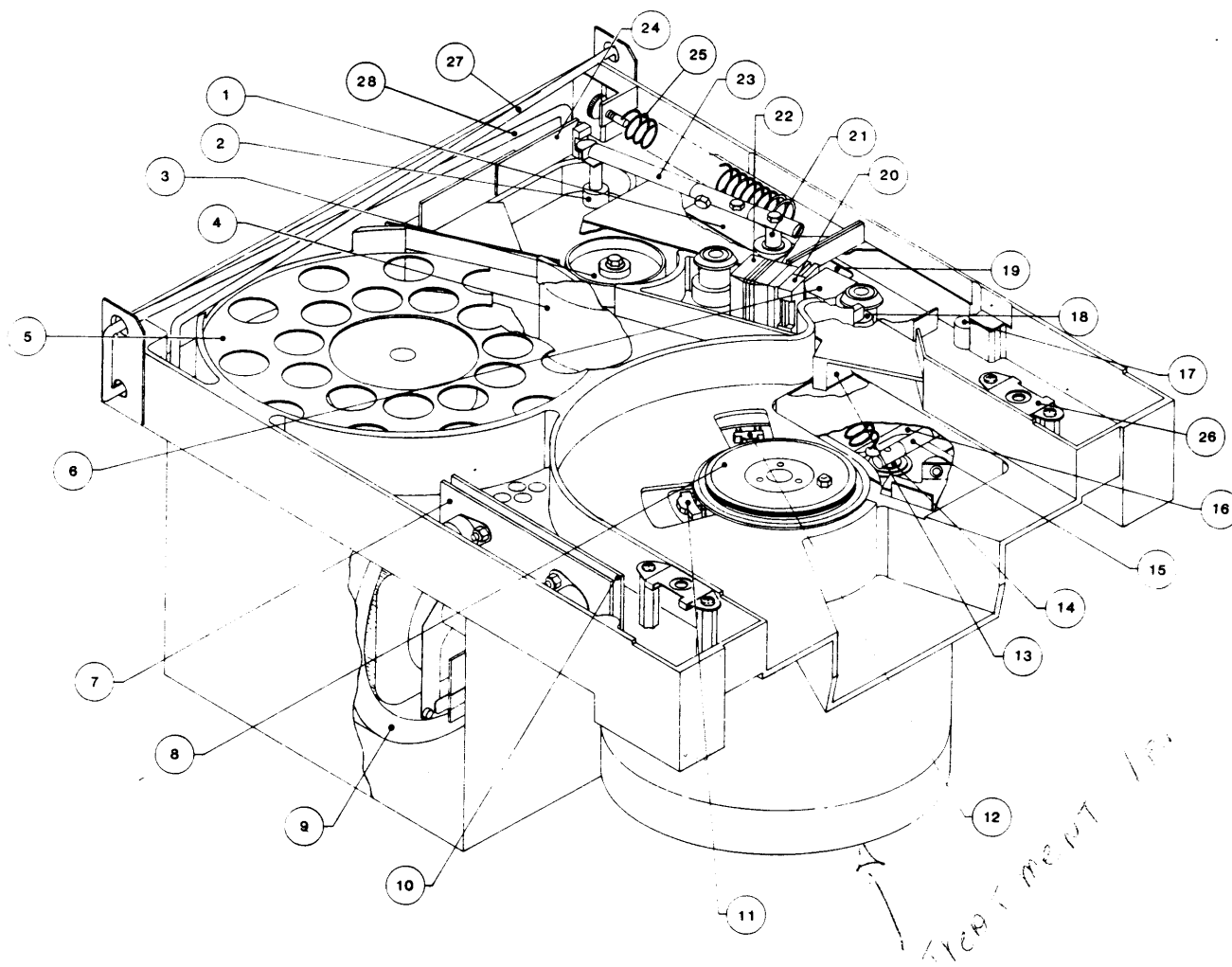


Figure 5-2 Deck Assembly P/N 190-7336-XXX (Top View)

TABLE 5-3 DECK ASSEMBLY, P/N 190-7336-XXX PARTS LIST (BOTTOM VIEW)

ITEM	PART NUMBER	DESCRIPTION
5-3-1	190-6688-001	P.C Card Capacitance Disk
5-3-2	135-0075-001	Gear Motor w/Switch
5-3-3	190-7320-002	Retract and Pivot Sensor Assembly
5-3-4	122-0054-001	Write Hub Lock Solenoid (hidden)
5-3-5	190-7523-001	Reel Motor Assembly
5-3-6	190-7317-001	Blower Assembly
5-3-7	190-7333-001	Capstan/Encoder Assembly
5-3-8	190-7320-001	Retract and Pivot Sensor Assembly
5-3-9	190-6690-001	Position Sensor PCBA
5-3-10	135-0075-001	Gear Motor w/Switch
5-3-11	190-6923-001	Read Preamplifier
5-3-12	190-7228-001	Interconnect PCBA

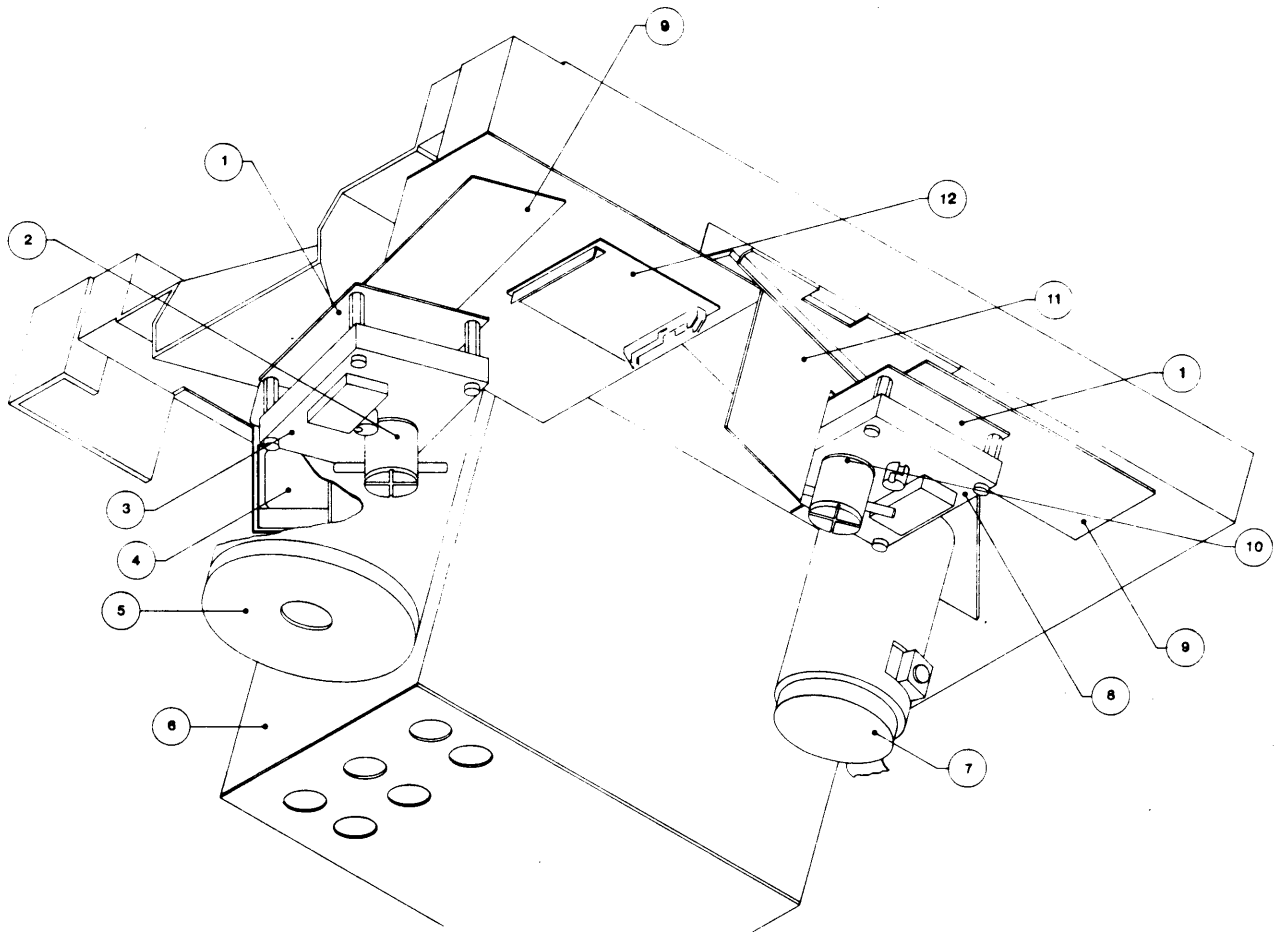


Figure 5-3 Deck Assembly, P/N 190-7336-001 (Bottom View)

TABLE 5-4 CHASSIS ASSEMBLY P/N 190-7316-001 PARTS LIST

ITEM	PART NUMBER	DESCRIPTION
5-4-1	90-07108-001	Mother Board PCBA
5-4-2	90-07339-001	Power In Assembly
5-4-3	51-00133-060	Fuse, Normal 6A
5-4-4	90-07516-001	Servo Power Amplifier Final Assy
5-4-5	90-07318-001	Transformer
5-4-6	90-07316-001	Chassis Assembly
5-4-7	90-07110-004	Drive Electronics PCBA
5-4-8	90-07296-001	+5VDC Regulated Power Supply
5-4-9	90-07109-001	+5VDC Power Supply PCBA
5-4-10	90-07111-004	Servo Amplifier PCBA
5-4-11	90-07147-001	Servo Preamplifier PCBA
5-4-12	26-00027-001	Fan
5-4-13	27-00010-001	Filter, EMI
5-4-14	91-07722-002	Bracket, Fan

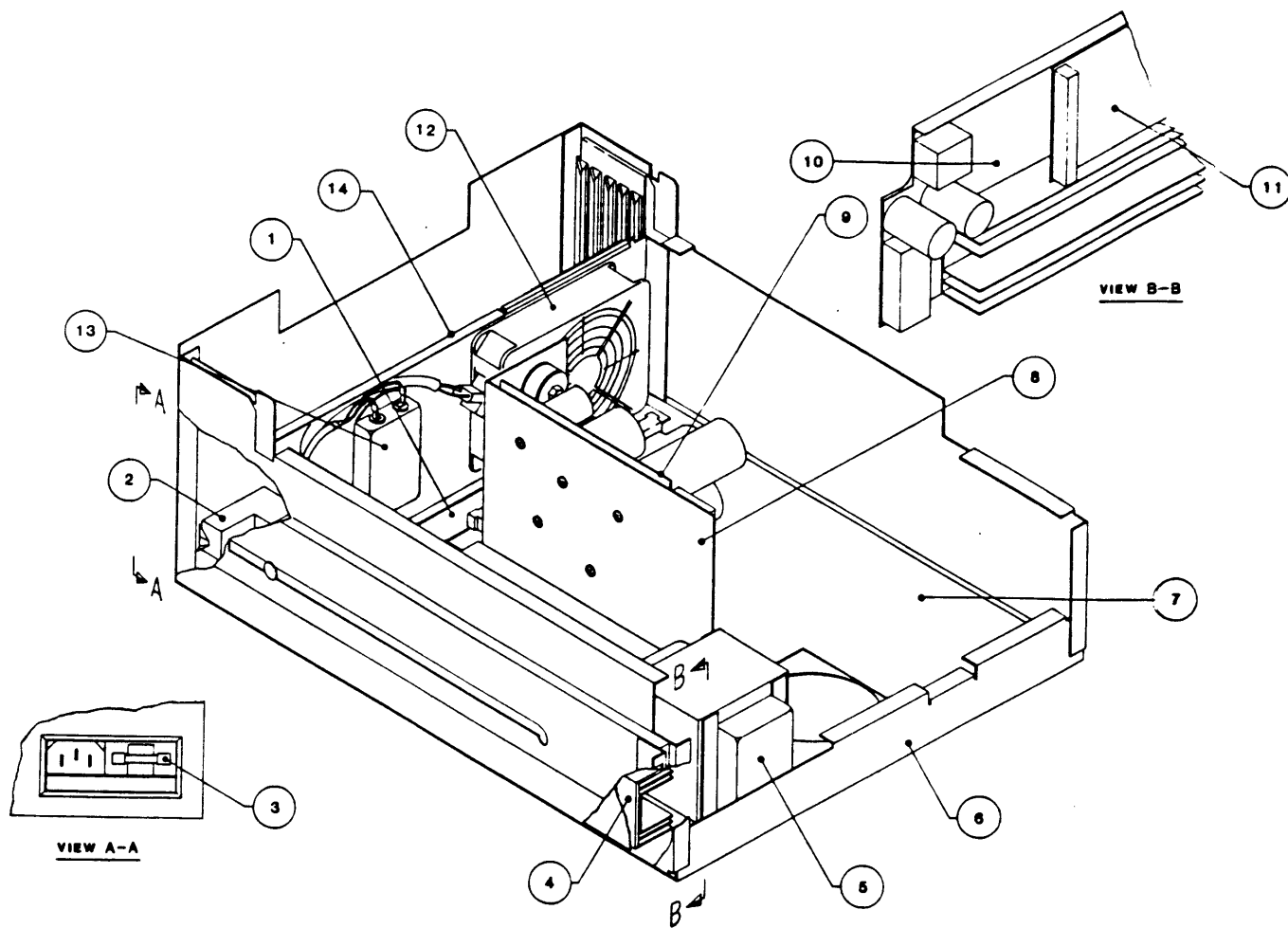


Figure 5-4 Chassis Assembly, P/N 190-7316-001 (Top View)

TABLE 5-5 RECOMMENDED SPARE PARTS LIST

ITEM	PART NUMBER	DESCRIPTION	NOTE
N/A	121-0198-001	Power Cord, 10A 125V	Depot
5-1-7	122-0008-002	Solenoid, 24 VDC	Depot
5-3-4	122-0054-001	Hub Lock Solenoid	Depot
5-2-25	125-0073-006	Spring, Extension.	Depot
5-4-12	126-0027-001	Fan	Depot
5-5-5	146-0153-00x	Prom (U67), Formatter, 8KX8	Both
5-5-6	146-0152-00x	Prom (U27), Drive Electronics	Both
	146-xxxx-xxx	PROM (U78) Diag Formatter, 8Kx8	Both
5-4-3	151-0133-060	Fuse, Normal 6A	Both
5-2-6	190-5906-004	EOT/BOT Sensor Assembly	Both
5-3-9	190-6690-001	Position Sensor PCBA	Depot
5-2-5	190-6842-001	Vacuum Hub Assembly	Depot
5-3-11	190-6923-001	Read Preamplifier PCBA	Depot
5-4-1	190-7108-001	Mother Board PCBA	Depot
5-4-7	190-7110-004	Drive Electronics PCBA	Both
5-4-10	190-7111-004	Servo Amplifier PCBA	Both
5-1-3	190-7112-001	Operator Control Panel PCBA	Depot
5-5-1	190-7113-001	Formatter PCBA	Both
5-5-2	190-7114-001	Read Analog PCBA	Both
5-5-3	190-7115-002	Read Digital PCBA	Both
5-5-4	190-7116-001	Write PCBA	Both
5-2-11	190-7119-001	Read-in-Place Sensor Assembly	Depot
5-2-12	190-7144-001	File Protect Sensor Assembly	Depot
5-4-11	190-7147-001	Servo Preamplifier PCBA	Both
5-3-12	190-7228-001	Interconnect PCBA	Depot
5-2-24	190-7231-001	Take-up Arm Limit Sensor PCBA	Depot
5-2-13	190-7235-001	Supply Arm Limit Sensor PCB	Depot
5-2-7	190-7295-001	+/- 12 VDC Regulator Assembly	Both
5-4-8	190-7296-001	+ 5 VDC Regulated Power Supply	Both
5-3-6	190-7317-001	Blower Assembly	Depot
5-2-23	190-7319-001	Take-up Arm Assembly (Top)	Depot
5-2-15	190-7319-002	Supply Arm Assembly (Bottom)	Depot
5-2-1	190-7320-001	Retract & Pivot Sensor (Takeup)	Depot
5-2-16	190-7320-002	Retract & Pivot Sensor (Supply)	Depot
5-1-6	190-7321-001	Panel Assembly	Depot
5-2-8	190-7332-001	Supply Hub Assembly	Depo
5-2-4	190-7333-001	Capstan Motor Assembly	Depot
5-2-18	190-7334-001	Tape-in-Channel Sensor Assembly	Depot
5-2-17	190-7334-002	Tape-in-Channel Emitter Assembly	Depot
5-2-20	190-7456-001	Tape Cleaner Assembly	Depot
5-2-9	190-7483-001	Vacuum Motor Assembly	Depot
5-3-5	190-7523-001	Reel Motor Assembly	Depot
5-2-19	190-7524-001	Magnetic Head Assembly	Depot
5-2-3	191-5699-001	Capstan	Depot
5-2-2	191-7211-001	Roller	Depot

Note: Depot = Recommended 9600 spare parts for Depot.
Both = Recommended 9600 spare parts for Depot and On-Site.

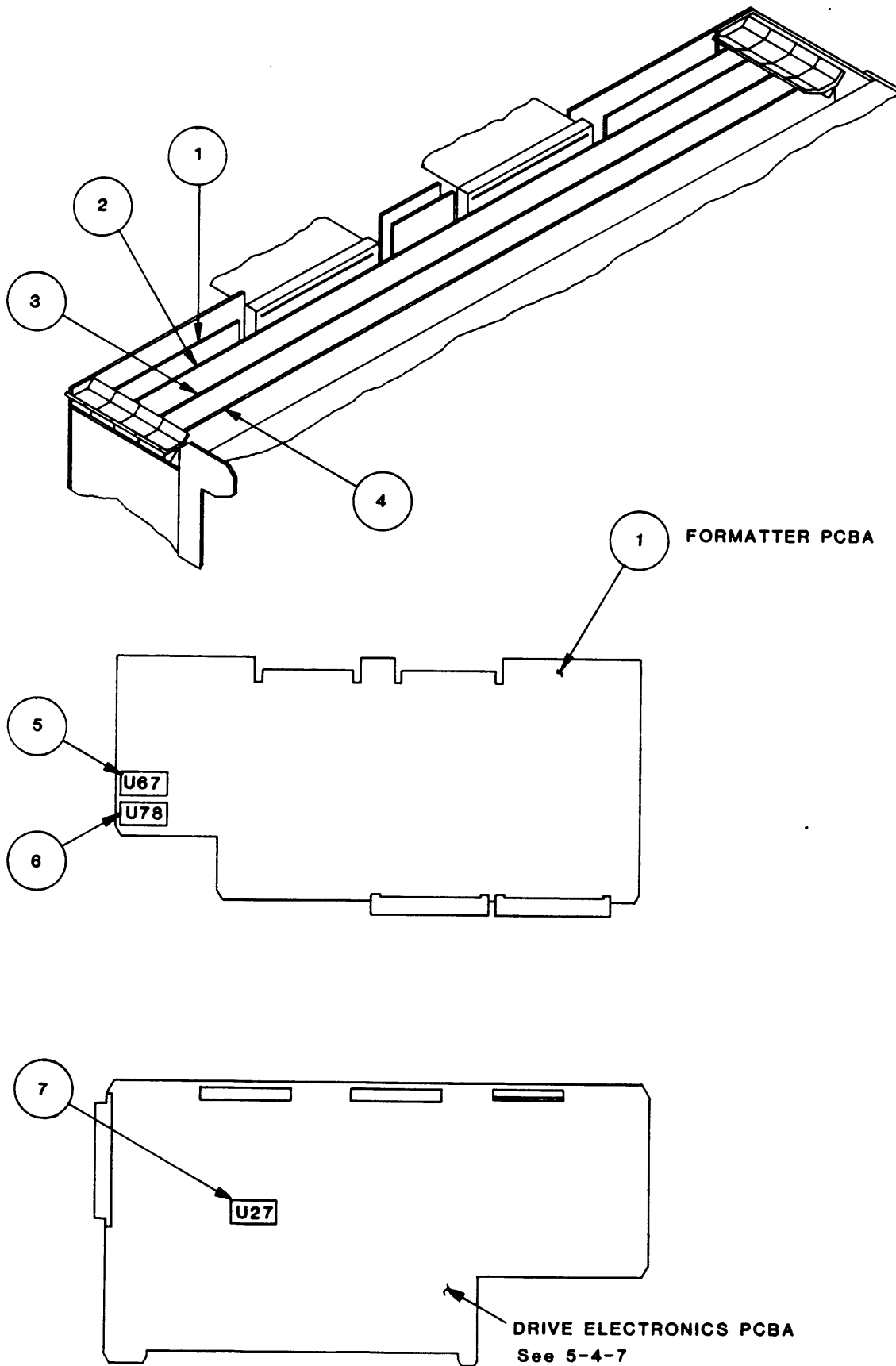


Figure 5-5 Prom Locations

SECTION VI
WIRING AND SCHEMATIC DIAGRAMS

SECTION VI - WIRING AND SCHEMATIC DIAGRAMS

6.0 GENERAL

This section contains wiring and schematic diagrams for the Model 9600 Drive. Unless otherwise specified, electronic symbols conform to ANSI Y32.2, abbreviation to MIL-STD-12, and logic symbols to ANSI Y32.14 (MIL-STD-806C).

6.1 COMPONENTS

- A. Resistor values are in ohms. Unspecified wattage may be either 1/4 or 1/2 watt.
- B. Capacitor values are in picofarads or microfarads. Undesignated values are obvious from circuit function. Filter capacitors that do not have logic significance are not included on schematics. PC board silkscreens designate these filters as CF.
- C. Standard power connections to ICs are as follows:

IC	Pin Connection			
	+5V	GND	-VCC	+VCC
7476, 7492, 7493	5	10		
Op Amp (8-Pin IC)			4	7
14-Pin ICs	14	7		
16-Pin ICs	16	8		

Only non-standard power connections are shown on schematics.

6.2 LOGIC CONVENTIONS AND SYMBOLOGY

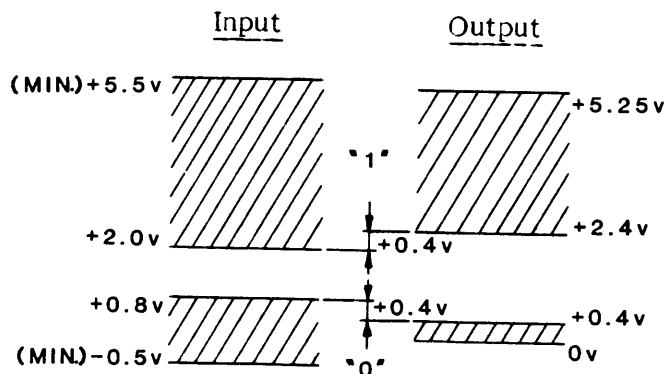
6.2.1 TTL LOGIC

The 9600 Drive uses standard +5V TTL logic with the following state definitions:

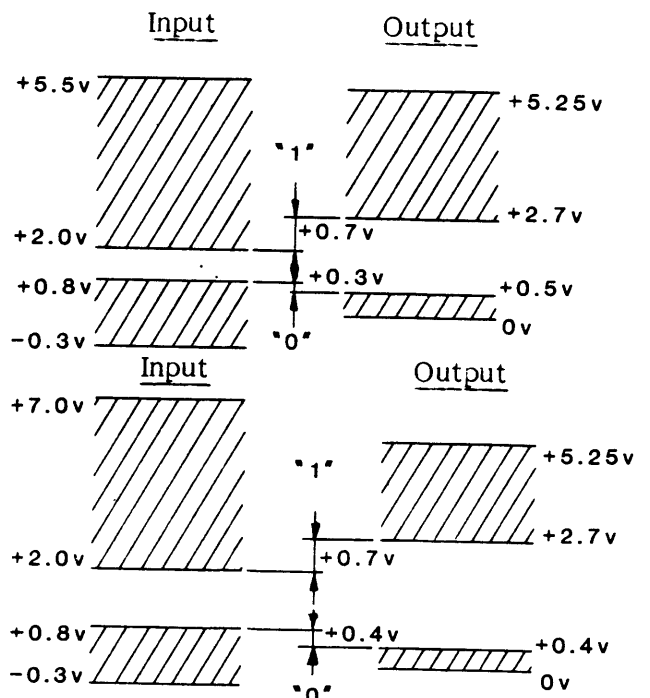
- Logic ONE = high
- Logic ZERO = low

Input/Output logic levels are defined as follows:

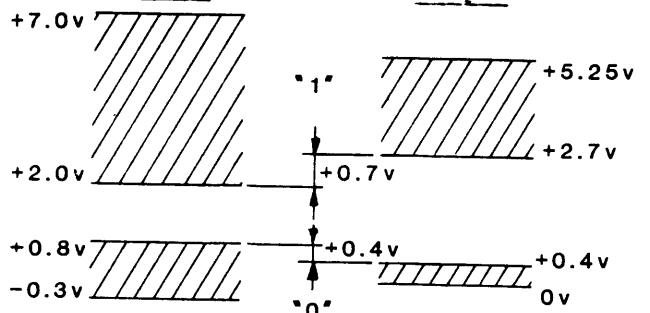
A. TTL Medium Speed IC Levels:



B. TTL Super High Speed IC Levels:



C. TTL Medium Speed Low Power Consumption IC Levels



6.2.2 ECL LOGIC

The 9600 Drive uses 5.3V Emitter-Coupled Logic (ECL) consisting of standard positive levels: Logic ONE = High; Logic ZERO = Low. ECL standard Input/Output levels are:



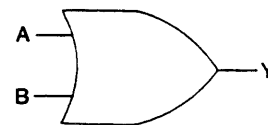
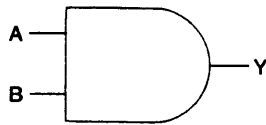
6.2.3 LOGIC SYMBOLOGY

The following illustrations represent standard logic symbols used in the 9600 Drive schematic diagrams.

A. TTL

AND Gate: $Y = AB$

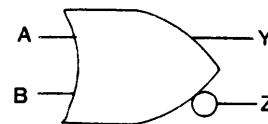
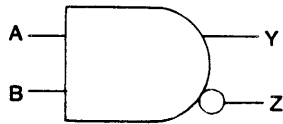
OR Gate: $Y = A+B$



B. ECL

AND/NAND Gate: $Y = AB = \overline{Z}$

OR/NOR Gate: $Y = A+B = \overline{Z}$



6.3 SCHEMATIC FLOW

Schematic diagram are generally organized to show signal and/or function flow from left to right and from top to bottom. Exceptions to this rule may occur only in details where circuit simplicity is preferable.

6.4 TERMINALS

For a double-sided socket, terminals are designated with numbers for component-side connections and letters for circuit-side connections. These correspond to the actual socket designations. For a single-sided socket, all connections are designated by letters of the 22-character alphabet: ABCDEFHJKLMNPRSTUVWXYZ, or standard arabic numbers.

6.5 LIST OF SCHEMATICS

<u>Title</u>	<u>Number</u>	<u>Title</u>	<u>Number</u>
Position Sensor	401-6690-000	Read Digital	401-7115-000
Read Preamplifier	401-6923-000	Write Module	401-7116-000
Motherboard	401-7108-000	Servo Preamp	401-7147-000
+5 Volt Power Supply	401-7109-000	12V Regulator	401-7148-000
Drive Electronics	401-7110-000	Interconnect Board	401-7228-000
Servo Amplifier	401-7111-000	Position Sensor	401-7710-000
Formatter	401-7113-000	Operator Control Panel	401-7947-000
Read Analog	401-7114-000		

6.6 SYSTEM SIGNAL DISTRIBUTION

The following Chart shows signal flow among the circuit boards of the System. The Chart is organized in a "From-To" manner; that is: each listed signal is shown as flowing from one circuit board to another, referencing a schematic sheet and connector. The Circuit Board is identified by an acronym as defined in the Chart.

SYSTEM SIGNAL DISTRIBUTION CHART

FROM HOST

<u>Signal</u>	<u>To FMTR Sheet-Conn</u>	<u>LIST OF CIRCUIT-BOARD ACRONYMS</u>	
ILWD	2-J1	ELEC (7110)	Drive Electronics
IERASE	4-J1	FMTR (7113)	Formatter
IEDIT	4-J1	INTCON (7147)	Interconnect Board
IWFM	4-J1	OCP (7112)	Operator Control Panel
IWRT	4-J1	POSENS (6690)	Position Sensor
IREV	4-J1	READA (7114)	Read Analog
IHSP	4-J1	READD (7115)	Read Digital
ILGAP	4-J1	READPRE (6923)	Read Preamplifier
IGO	4-J1	SERVPA (7111)	Servo Power Amplifier
IREW	4-J1	SERVPRE (7147)	Servo Preamplifier
IOFL	4-J1	WRTMOD (7116)	Write Module
IFEN	4-J1		
ITAD(O,1)	5-J1		
IFAD	5-J2		
ILOL	6-J1		

FROM FORMATTER

<u>Signal</u>	<u>From FMTR Sheet-Conn</u>	<u>To:</u>	<u>Schematic Sheet-Conn</u>
IR(1-7,P)	7-J2	Host	
IRSTB	9-J2	Host	
IWSTB	9-J2	Host	
WD(0-7)	6-P1	WRTMOD	8-P1
LST WORD	8-P1	WRTMOD	11-P1
FDB(0-7)	10-P1	ELEC	3-P1
"	"	READA	3-P1
"	"	WRTMOD	3-P1
FDB(0,2-4,7)	"	READD	10-P1
FSEL(0-6)	10-P1	ELEC	3-P1
"	"	WRTMOD	2-P1
FSEL(3-6)	"	READA	2-P1
FSEL3	"	READD	10-P1
FMTR STRB	11-P1	ELEC	3-P1
"	"	READD	10-P1
"	"	READA	2-P1
FMTR BUSY	11-P1	WRTMOD	2-P1
FMTR ACKN	11-P1	ELEC	3-P1
ERASE PWR EN	13-P1	ELEC	3-P1
WRT PWR EN	13-P1	WRTMOD	11-P1
"	"	READD	6-P1
		WRTMOD	11-P1

TO FORMATTER

<u>Signal</u>	<u>From Sheet-Conn</u>	<u>On PCBA</u>	<u>To FMTR Sheet-Conn</u>
MSTR RES	3-P1	ELEC	2-P1
RD(0-7,P)	7-P2	READD	7-P2
RD DATA STRB	10-P2	READD	9-P2
WRT DATA STRB	11-P1	WRTMOD	9-P1
HRD ERROR	10-P1	READD	10-P1
CRECTD ERROR	7-P1	READD	10-P1
FILE MARK	10-P1	READD	10-P1
DDB(0-7)	3-P1	ELEC	11-P1
DRV SEL(0,1)	3-P1	ELEC	11-P1
TACH	3-P1	ELEC	11-P1
FWD/REV	3-P1	ELECT	11-P1
DRV STRB	3-P1	ELECT	11-P1
RD BUSY	10-P1	READD	13-P1
WRT BUSY	1-P1	WRTMOD	13-P1
DRV BUSY	3-P1	ELEC	13-P1
DRV ACKN	3-P1	ELEC	13-P1

FROM DRIVE ELECTRONICS (ELEC)

<u>Signal</u>	<u>From ELEC Sheet-Conn</u>	<u>To PCBA</u>	<u>Schematic Sheet-Conn</u>
DDB(0-7)	3-P1	FMTR	11-P1
DRV STRB	3-P1	FMTR	11-P1
DRV SEL(0,1)	3-P1	FMTR	11-P1
MSTR RES	3-P1	FMTR	2-P1
"	"	READD	10-P1
"	"	WRT MOD	11-P1
FWD/REV	3-P1	FMTR	11-P1
TACH	3-P1	FMTR	11-P1
DRV BUSY	3-P1	FMTR	13-P1
DRV ACKN	3-P1	FMTR	13-P1
NRZ LED	4-J6	OCP	2-J1
WEN LED	4-J6	OCP	2-J1
SLT LED	4-J6	OCP	2-J1
LP LED	4-J6	OCP	2-J1
PWR ON LED	4-J6	OCP	2-J1
REUN LED	4-J6	OCP	2-J1
LO LED	4-J6	OCP	2-J1
ON LED	4-J6	OCP	2-J1
PE LED	4-J6	OCP	2-J1
RMT LED	4-J6	OCP	2-J1
STRT LED	4-J6	OCP	2-J1
WR	4-J6	OCP	1-J1
DB(0-6)	4-J6	OCP	1-J1
TU OFSE	6-J3	SERVPRE	4-J1
SUP OFSE	6-J3	SERVPRE	3-J1
VEL TUP	6-J3	SERVPRE	4-J1
VEL SUP	6-J3	SERVPRE	3-J1
POS REF	6-J5	INTCON	1-J1
SUMPT CPST	7-J3	SERVPRE	1-J1
E TU POS	8-J3	SERVPRE	4-J1
E TU VL	8-J3	SERVPRE	4-J1
E SU POS	8-J3	SERVPRE	3-J1

E SU POS	8-J3	SERVPRE	3-J1
E SU VL	8-J3	SERVPRE	3-J1
VAC MOT	8-J3	SERVPRE	1-J1
ENB CPST	8-J3	SERVPRE	1-J1
BRAKE	8-J3	SERVPRE	1-J1
SERVO EN	8-J3	SERVPRE	1-J1
CUR SUP	8-J3	SERVPRE	3-J1
CUR TUP	8-J3	SERVPRE	4-J1
HUB LOK SOL	9-J2	INTCONN	2-J2
DOOR LOK SOL	9-J2	INTCONN	2-J2
+24V	9-J2	INTCONN	2-J2
GND	9-J2	INTCONN	2-J2
OPTSW	11-J2	INTCONN	2-J2
MICSW	11-H2	INTCONN	2-J2

TO DRIVE ELECTRONICS (ELEC)

<u>Signal</u>	<u>From</u> <u>Sheet-Conn</u>	<u>On PCBA</u>	<u>To ELEC</u> <u>Sheet-Conn</u>
FDB(0-7)	10-P1	FMTR	3-P1
FSEL(0-6)	10-P1	FMTR	3-P1
FMTR STRB	11-P1	FMTR	3-P1
FMTR BUSY	11-P1	FMTR	3-P1
FMTR ACKN	11-P1	FMTR	3-P1
TARMOT	2-J2	INTCON	11-J2
SURMOT	2-J2	INTCON	11-J2
REUN PB	2-J1	OCP	4-J6
LOAD PB	2-J1	OCP	4-J6
ONL PB	2-J1	OCP	4-J6
DEN PB	2-J1	OCP	4-J6
RST PB	2-J1	OCP	4-J6
STRT PB	2-J1	OCP	4-J6
SCAN PB	2-J1	OCP	4-J6
DIAG PB	2-J1	OCP	4-J6
DSP FUL	2-J1	OCP	4-J6
TPHA	1-J1	INTCON	5-J5
TPHB	1-J1	INTCON	5-J5
SUP POS	1-J1	INTCON	8-J5
TUP POS	1-J1	INTCON	8-J5
TUP MOV	4-J1	SERVPRE	8-J3
SUP MOV	3-J1	SERVPRE	8-J3

FROM OPERATOR CONTROL PANEL (OCP)

<u>Signal</u>	<u>From OPC</u> <u>Sheet-Conn</u>	<u>To:</u>	<u>Sheet-Conn</u>
REUN PB	2-J1	ELEC	4-J6
LOAD PB	2-J1	ELEC	4-J6
ONL PB	2-J1	ELEC	4-J6
DEN PB	2-J1	ELEC	4-J6
RST PB	2-J1	ELEC	4-J6
STRT PB	2-J1	ELEC	4-J6
SCAN PB	2-J1	ELEC	4-J6
DIAG PB	2-J1	ELEC	4-J6
DSP FUL	2-J1	ELEC	4-J6

TO OPERATOR CONTROL PANEL (OCP)

<u>Signal</u>	<u>From</u> <u>Sheet-Conn</u>	<u>On PCBA</u>	<u>To OPC</u> <u>Sheet-Conn</u>
DB(0-6)	4-J6	FMTR	1-J1
WR	4-J6	FMTR	1-J1
NRZ LED	4-J6	FMTR	2-J1
WEN LED	4-J6	FMTR	2-J1
SLT LED	4-J6	FMTR	2-J1
LP LED	4-J6	FMTR	2-J1
PWR ON LED	4-J6	FMTR	2-J1
REUN LED	4-J6	FMTR	2-J1
LO LED	4-J6	FMTR	2-J1
ON LED	4-J6	FMTR	2-J1
PE LED	4-J6	FMTR	2-J1
RMT LED	4-J6	FMTR	2-J1
STRT LED	4-J6	FMTR	2-J1

FROM READ ANALOG BOARD (READA)

<u>Signal</u>	<u>From READA</u> <u>Sheet-Conn</u>	<u>To:</u>	<u>Schematic</u> <u>Sheet-Conn</u>
EGC(1-9)	4-J1	READPRE	1-P2
TD(0-7,P)	6-P2	READD	2-P2
ENV(0-7,P)	6-P2	READD	2-P2

TO READ ANALOG BOARD (READA)

<u>Signal</u>	<u>From</u> <u>Sheet-Conn</u>	<u>On PCBA</u>	<u>To READA</u> <u>Sheet-Conn</u>
FSEL(3-6)	10-P1	FMTR	2-P1
FMTR STRB	11-P1	FMTR	2-P1
FDB(0-7)	10-P1	FMTR	3-P1
TRK(1-9)+	1-P2	READPRE	5-J1
TRK(1-9)-	1-P2	READPRE	5-J1
HD(0-7,P)	11-P2	WRTMOD	7-P2

FROM READ PREAMPLIFIER (READPRE)

<u>Signal</u>	<u>From READPRE</u> <u>Sheet-Conn</u>	<u>To:</u>	<u>Sheet-Conn</u>
TRK(1-9)+	1-P2	READA	5-J1
TRK(1-9)-	1-P2	READA	5-J1

TO READ PREAMPLIFIER (READPRE)

<u>Signal</u>	<u>From</u> <u>Sheet-Conn</u>	<u>On:</u>	<u>To READPRE</u> <u>Sheet-Conn</u>
EGC(1-9)	4-J1	READA	1-P2
TRK(1-9)+		READ HEAD	1-P1
TRK(1-9)-		READ HEAD	1-P1

FROM READ DIGITAL BOARD (READD)

<u>Signal</u>	<u>From READD Sheet-Conn</u>	<u>To:</u>	<u>Sheet-Conn</u>
RD(0-7,P)	7-P2	FMTR	7-P2
CRECTD ERROR	7-P1	FMTR	10-P1
HRD ERROR	10-P1	FMTR	10-P1
RD DATA STRB	10-P2	FMTR	9-P2
RD BUSY	10-P1	FMTR	13-P1
FILE MARK	10-P1	FMTR	10-P1

TO READ DIGITAL BOARD (READD)

<u>Signal</u>	<u>From Sheet-Conn</u>	<u>On PCBA</u>	<u>To READD Sheet-Conn</u>
TD(0-2)	6-P2	READA	2-P2
TD(3-5)	6-P2	READA	3-P2
TD(6,7,P)	6-P2	READA	4-P2
ENV(0-2)	6-P2	READA	2-P2
ENV(3-5)	6-P2	READA	3-P2
ENV(6,7,P)	6-P2	READA	4-P2
WRT PWR EN	13-P1	FMTR	6-P1
DRATE CLK	11-P1	WRTMOD	8-P1
FDB(0,2-4,7)	10-P1	FMTR	10-P1
MSTR RES	3-P1	ELEC	10-P1
FMTR STRB	11-P1	FMTR	10-P1
FSEL3	10-P1	FMTR	10-P1

FROM WRITE MODULE (WRTMOD)

<u>Signal</u>	<u>From WRTMOD Sheet-Conn</u>	<u>To:</u>	<u>Sheet-Conn</u>
WRT BUSY	1-P1	FMTR	13-P1
WRT DATA STRB	11-P1	FMTR	9-P1
DRATE CLK	11-P1	READD	8-P1
HD(0-7,P)	11-P2	READA	7-P2
ERASE HD+	11-J2	Erase Head (Black)	
ERASE HD-	11-J2	Erase Head (White)	
TRK(1-9)	11-J1	Write Head	
WRT VOL	11-J1	Write Head	

TO WRITE MODULE (WRTMOD)

<u>Signal</u>	<u>From Sheet-Conn</u>	<u>On PCBA</u>	<u>To WRTMOD Sheet-Conn</u>
FSEL(0-6)	10-P1	FMTR	2-P1
FMTR STRB	11-P1	FMTR	2-P1
FDB(0-7)	10-P1	FMTR	3-P1
WD(0-7)	6-P1	FMTR	8-P1
MSTR RES	3-P1	ELEC	11-P1
WRT PWR EN	13-P1	FMTR	11-P1
ERASE PWR EN	13-P1	FMTR	11-P1
LST WORD	8-P1	FMTR	11-P1

FROM SERVO PREAMPLIFIER (SERVPRE)

<u>Signal</u>	<u>From SERVPRE Sheet-Conn</u>	<u>To:</u>	<u>Sheet-Conn</u>
VAC MOT	1-J3	SERVPA	3-J3
SUMPT CPST	1-J3	SERVPA	3-J3
ABRAKE	1-J3	SERVPA	3-J3
SERVO EN	1-J3	SERVPA	2-J3
ENB CPST	1-J3	SERVPA	2-J3
OSC	2-J3	SERVPA	3-J3
-REF	2-J3	SERVPA	4-J3
+REF	2-J3	SERVPA	4-J3
SUP MOD	3-J3	SERVPA	4-J3
SUP MOV	3-J1	ELEC	8-J3
TUP MOD	4-J3	SERVPA	4-J3
TUP MOV	4-J1	ELEC	8-J3

TO SERVO PREAMPLIFIER (SERVPRE)

<u>Signal</u>	<u>From Sheet-Conn</u>	<u>On PCBA</u>	<u>To SERVPRE Sheet-Conn</u>
VAC MOT	8-J3	ELEC	1-J1
SUMPT CPST	7-J3	ELEC	1-J1
TU OFSE	6-J3	ELEC	4-J1
SUP OFSE	6-J3	ELEC	3-J1
E TU POS	8-J3	ELEC	4-J1
E TU VL	8-J3	ELEC	4-J1
E SU POS	8-J3	ELEC	3-J1
E SU VL	8-J3	ELEC	3-J1
ENB CPST	8-J3	ELEC	1-J1
BRAKE	8-J3	ELEC	1-J1
CUR TUP	8-J3	ELEC	4-J1
CUR TUP GND	8-J3	ELEC	4-J1
SERVO EN	8-J3	ELEC	1-J1
SUP OFST	6-J3	ELEC	3-J1
CUR SUP	8-J3	ELEC	3-J1
CUR SUP GND	8-J3	ELEC	3-J1
VEL SUP	6-J3	ELEC	3-J1
TU OFST	8-J3	ELEC	4-J1
VEL TUP	6-J3	ELEC	4-J1
I SUP	1-J2	SERVPA	3-J3
V SUP	1-J2	SERVPA	3-J3
I TUP	1-J3	SERVPA	4-J3
V TUP	1-J3	SERVPA	4-J3
I SENS LO	1-J2	SERVPA	4-J3

FROM SERVO POWER AMPLIFIER (SERVPA)

<u>Signal</u>	From SERVPA <u>Sheet-Conn</u>	<u>To:</u>	<u>Sheet-Conn</u>
V TUP	1-J3	SERVPRE	1-J2
I SUP	1-J3	SERVPRE	1-J2
V SUP	1-J2	SERVPRE	3-J3
I TUP	1-J3	SERVPRE	4-J3
V TUP	1-J3	SERVPRE	4-J3
I SENS LO	1-J2	SERVPRE	4-J3
TU MOT DRV	1-J2	TAKEUP REEL MOTOR	
TU MOT RET	1-J2	MOTOR RETURN	
SU MOT DRV	1-J2	SUPPLY REEL MOTOR	
SU MOT RET	1-J2	MOTOR RETURN	
VAC MOT DRV	3-J2	VACUUM MOTOR	
VAC MOT RET	3-J2	MOTOR RETURN	
CPSTN MOT DRV	3-J2	CAPSTAN MOTOR	
CPSTN MOT RET	3-J2	MOTOR RETURN	

TO SERVO POWER AMPLIFIER (SERVPA)

<u>Signal</u>	From <u>Sheet-Conn</u>	<u>On PCBA</u>	To SERVPA <u>Sheet-Conn</u>
VAC MOT	1-J3	SERVPRE	3-J3
SUMPT CPST	1-J3	SERVPRE	3-J3
BRAKE	1-J3	SERVPRE	3-J3
SERVO EN	1-J3	SERVPRE	2-J3
ENB CPST	1-J3	SERVPRE	2-J3
OSC	2-J3	SERVPRE	3-J3
-REF	2-J3	SERVPRE	4-J3
+REF	2-J3	SERVPRE	4-J3
SUP MOD	3-J3	SERVPRE	4-J3
TUP MOD	4-J3	SERVPRE	4-J3

FROM POSITION SENSOR (POSENS)

<u>Signal</u>	From POSENS <u>Sheet-Conn</u>	<u>To:</u>	Schematic <u>Sheet-Conn</u>
POSOUT	1-J1	INTCON	1-J3/J4

TO POSITION SENSOR (POSENS) SERVO POWER AMPLIFIER (SERVPA)

<u>Signal</u>	From <u>Sheet-Conn</u>	<u>On:</u>	To POSENS <u>Sheet-Conn</u>
POS (RED)		CAPACITOR ASSY	1-E2
POS (BLK)		CAPACITOR ASSY	1-E1
POS (BLU)		CAPACITOR ASSY	1-E3
POS (YEL)		CAPACITOR ASSY	1-E3

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401-6690-000 B
SHEET 1 OF 1

190-6660 TABULATION

A

DASH NO	REV
-001	B

B

C

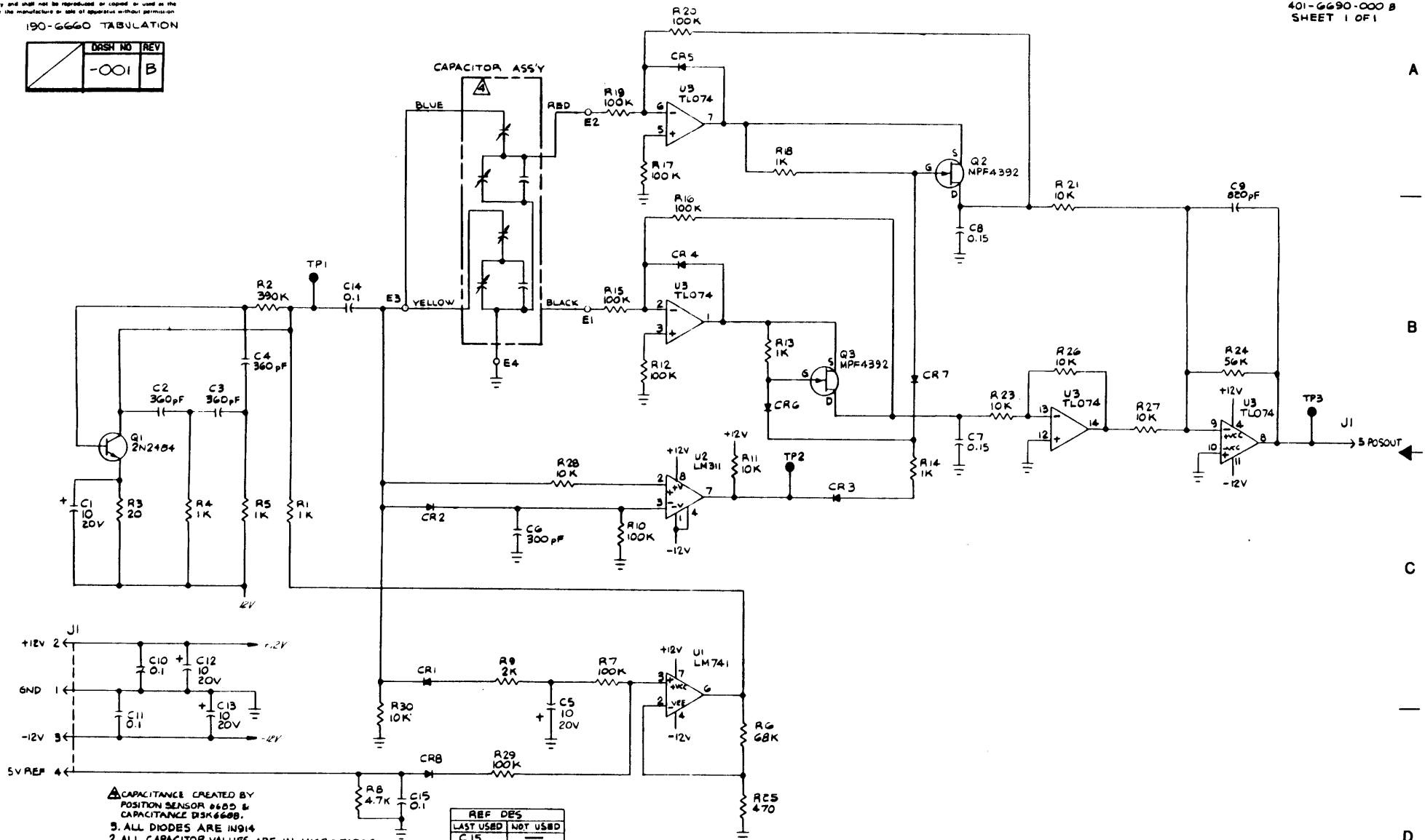
D

A

B

C

D



▲ CAPACITANCE CREATED BY POSITION SENSOR #6690 & CAPACITANCE 23K669B.
 3. ALL DIODES ARE 1N914
 2. ALL CAPACITOR VALUES ARE IN MICROFARADS
 1. ALL RESISTOR VALUES ARE IN OHMS ± 5% 1/4W.
 NOTES: UNLESS OTHERWISE SPECIFIED

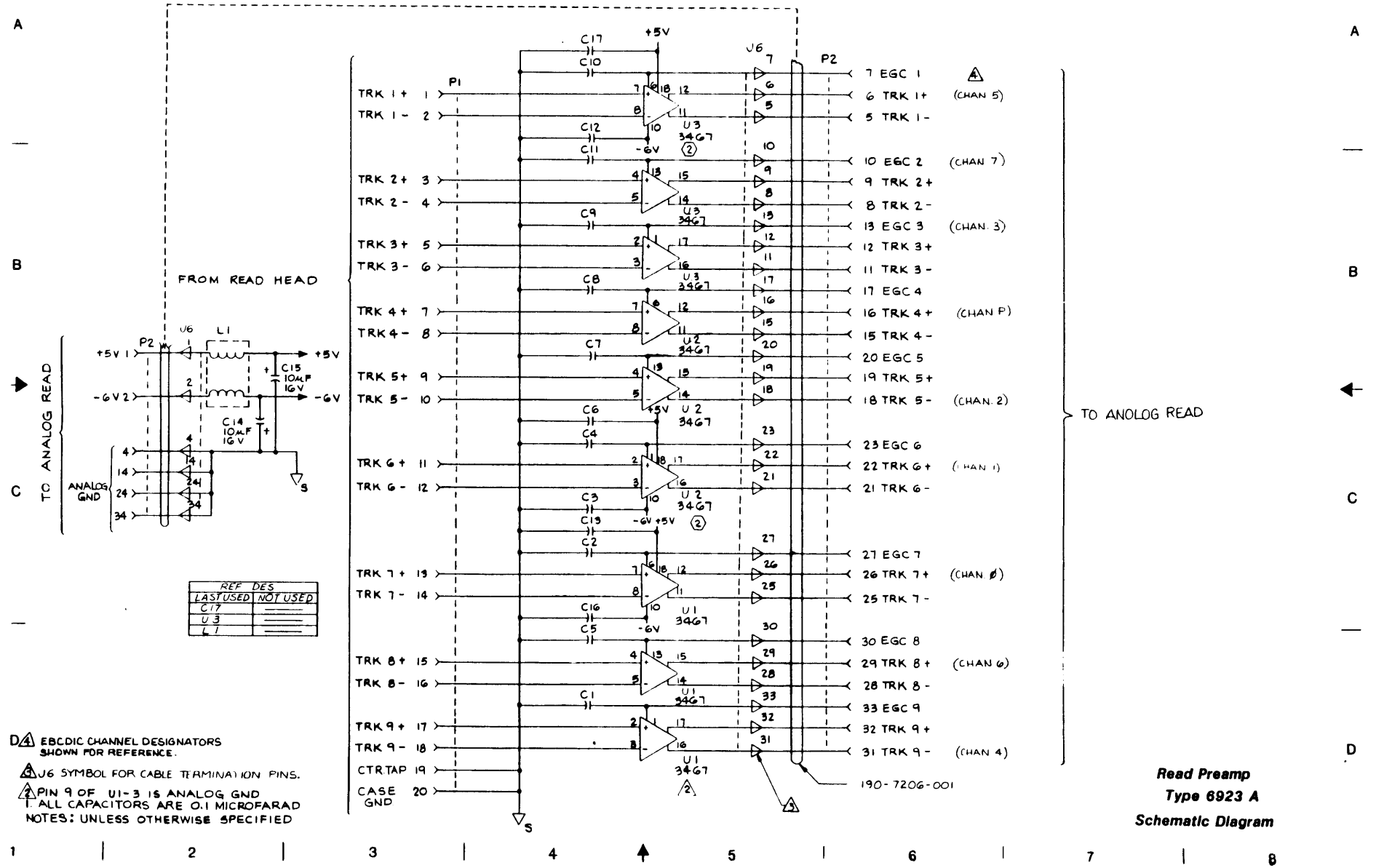
REF	DES	LAST USED	NOT USED
C15		—	—
CR3		—	—
R3		—	—
R30	R22	—	—
TP3		—	—
U3		—	—

REV STATUS	REV	B
OF SHEETS	SHEET	1

Position Sensor
Type 6690
Schematic Diagram

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401-6923-000 REV A
3H 1 OF 1



**Read Preamp
Type 6923 A
Schematic Diagram**

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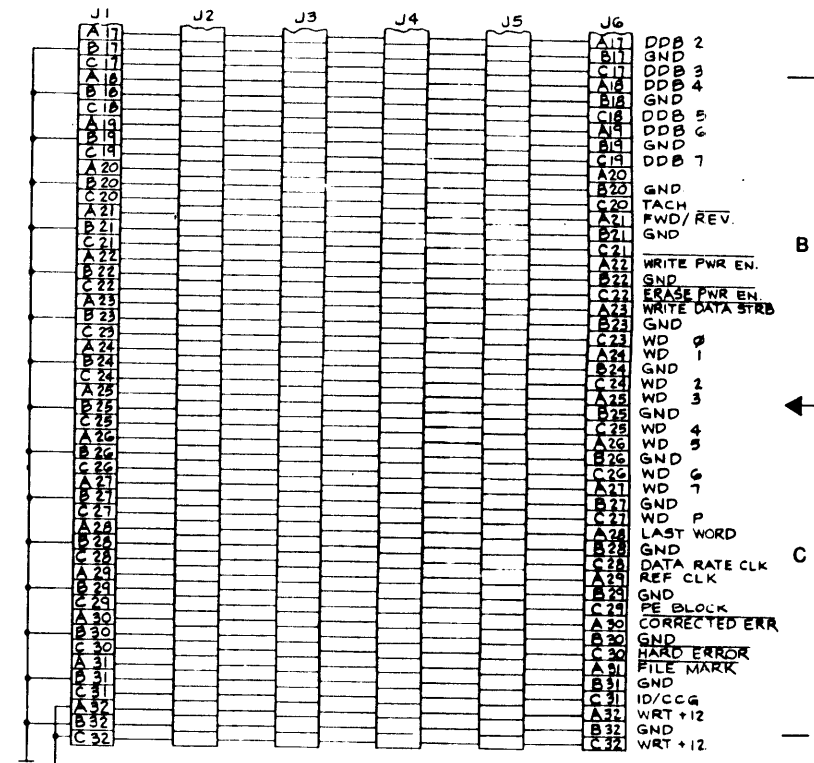
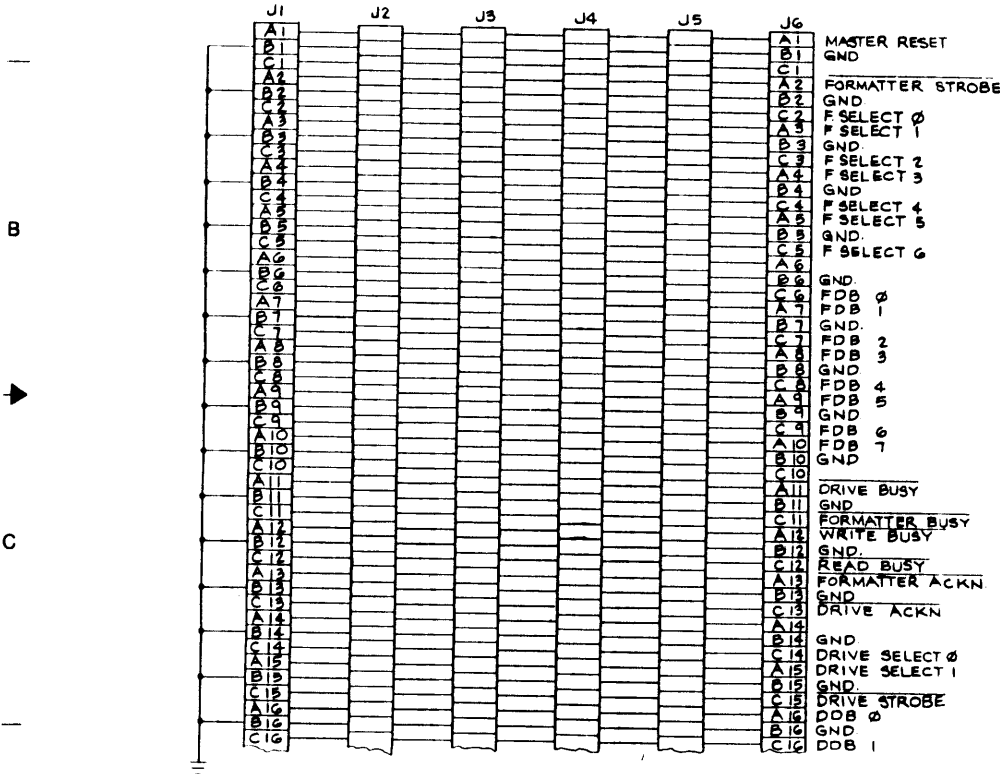
ISO-7108 TABULATION

A	DRASH NO	REV
	-001	C

REF. PI Δ

REF. PI Δ

CONTINUATION



WRT +12
(TO SHT. 2)

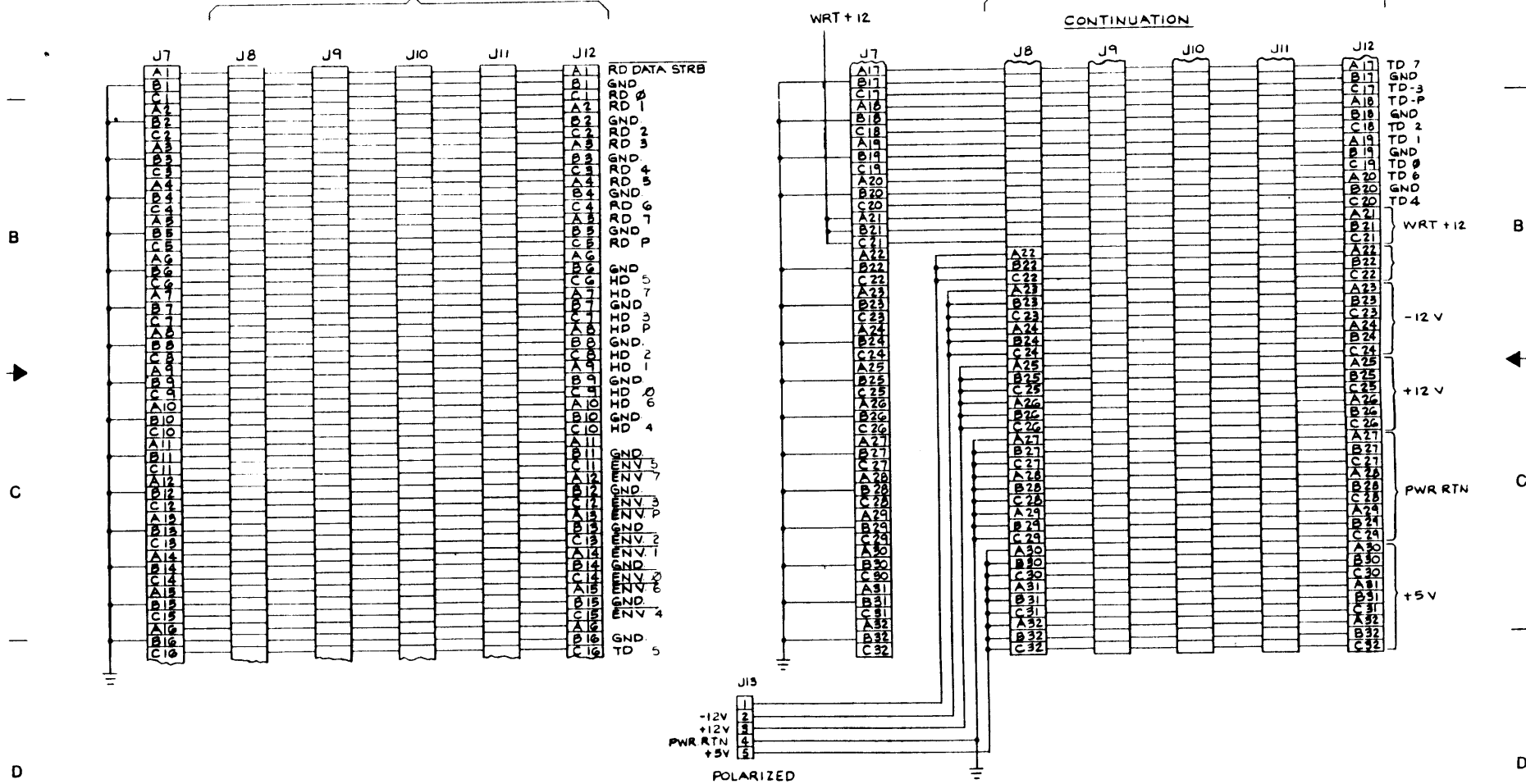
REV STATUS OF SHEETS	REV SHEET	C	A
		1	2

D
3. A CHANGE TO THIS DRAWING SHALL REQUIRE CO-ORDINATION WITH ALL ASSOCIATED DRAWINGS.
ALL BOARDS PLUGGED INTO J2-J6 AND J8-J12 ON THE MOTHER BOARD SHALL HAVE CONNECTORS IDENTIFIED AS P1 AND P2. P1'S MATE WITH J2-J6. P2'S MATE WITH J8-J12.
UNASSIGNED PINS ARE AVAILABLE FOR FUTURE USE.
NOTES: UNLESS OTHERWISE SPECIFIED

9600 Motherboard Signal Assignments
Type 7108
Schematic Diagram

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A REF. P2 Δ CONTINUATION REF. P2 Δ A



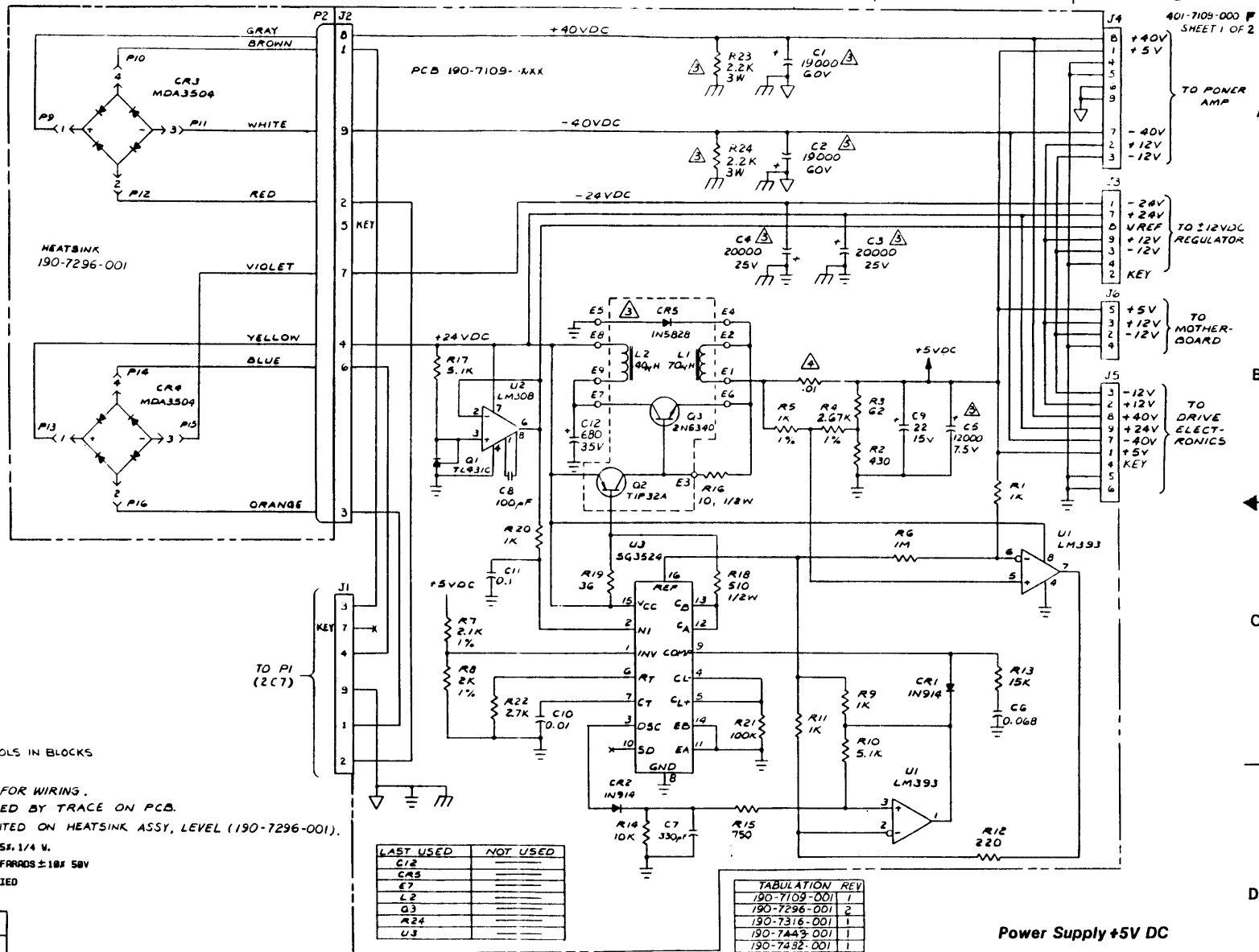
9600 Motherboard Signal Assignments
Type 7108 - A
Schematic Diagram

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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190-7109 TABULATION

DRSH NO	REV
-003	A



- ① LETTERS AND SYMBOLS IN BLOCKS ARE TERMINALS.
 - ② REF 108-0666-001
 - ③ SEE 190-7145-001 FOR WIRING.
 - ⚡ RESISTANCE CREATED BY TRACE ON PCB.
 - Ⓜ COMPONENTS MOUNTED ON HEATSINK ASSY, LEVEL (190-7296-001).
 - ④ RESISTORS ARE IN OHMS ± 5%, 1/4 W.
 - ⑤ CAPACITORS ARE IN MICROFARADS ± 10%, 50V
- NOTES: UNLESS OTHERWISE SPECIFIED

LAST USED	NOT USED
C12	
CR5	
E7	
L2	
Q3	
R24	
U3	

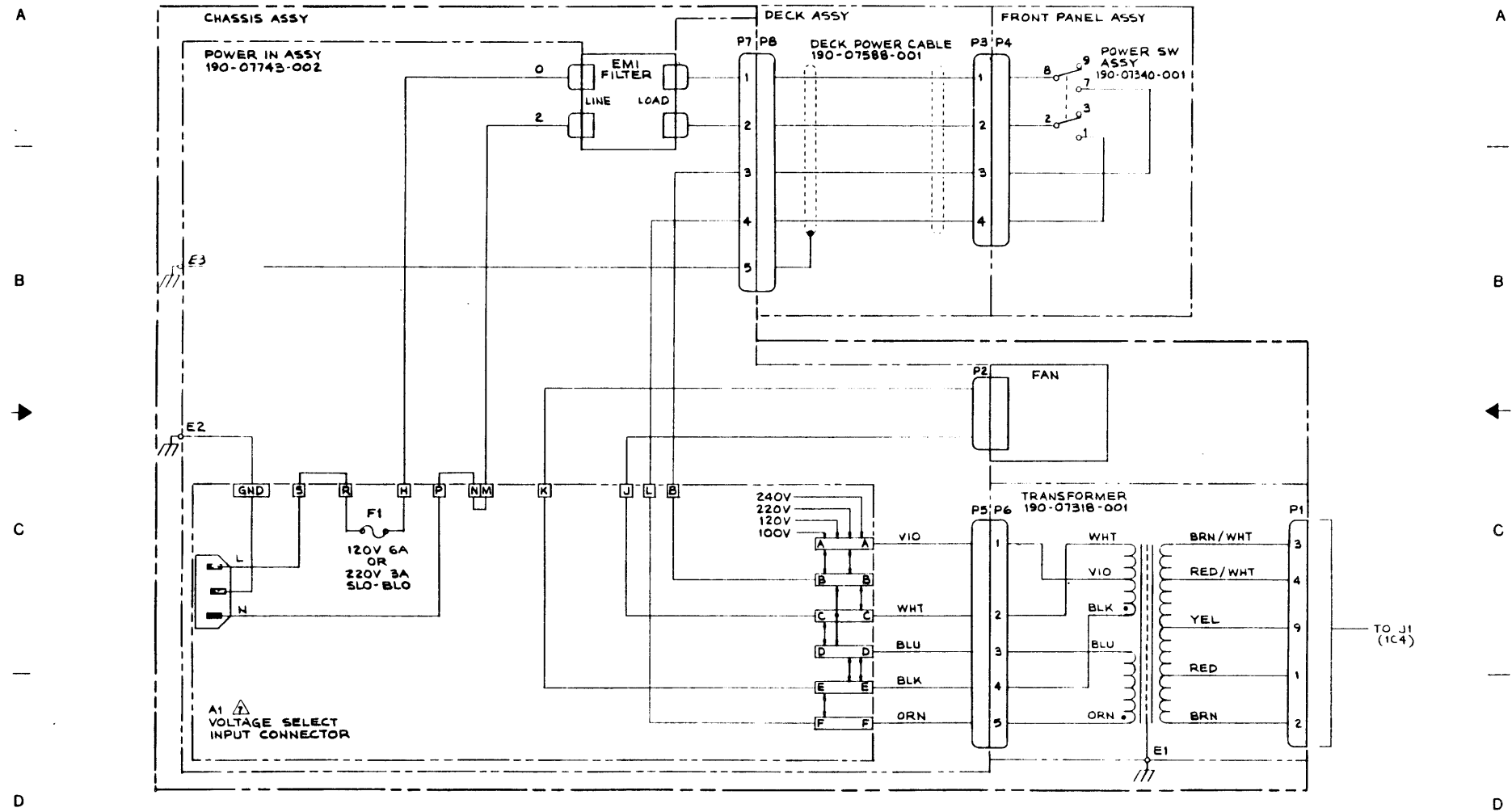
TABULATION	REV
190-7109-001	1
190-7296-001	2
190-7316-001	1
190-7443-001	1
190-7432-001	1

REV STATUS OF SHEETS	REV SHEET	F	F
		1	2

Power Supply +5V DC
 TYPE 7109,7296,7443,7339,7482
 Schematic Diagram

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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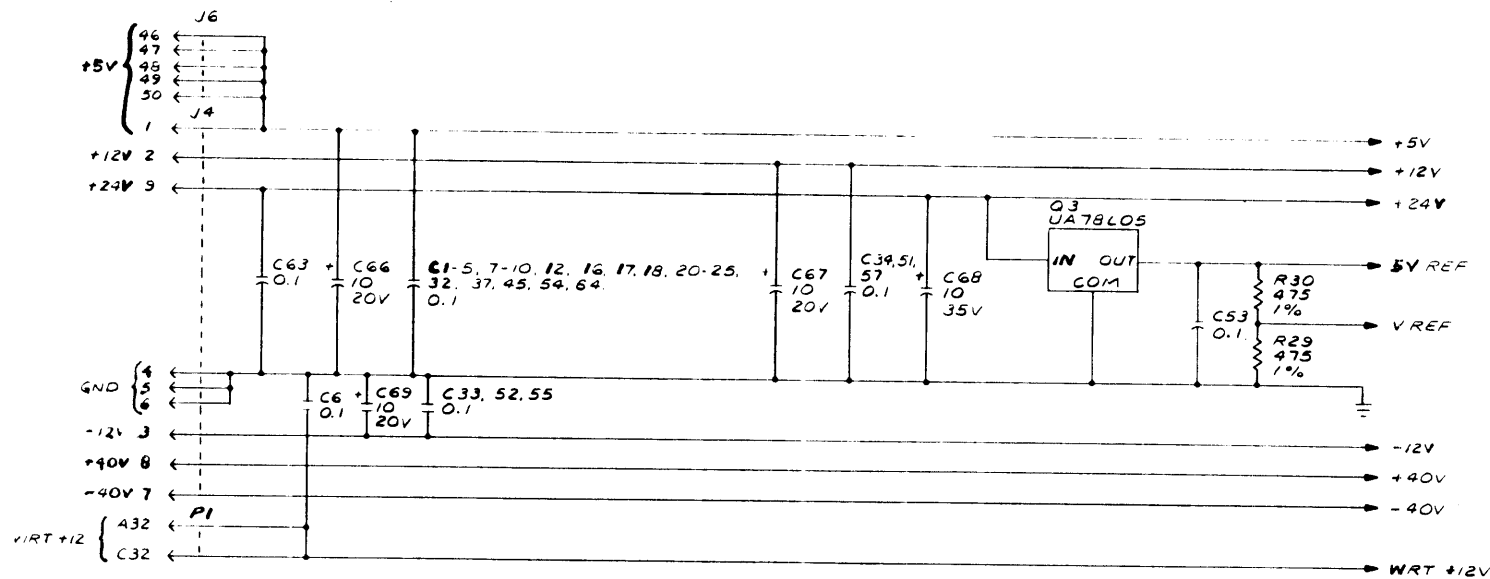
Power Supply +5V DC
TYPE 7109,7296,7443,7339,7482
Schematic Diagram

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401-7110-000 W
SHEET 1 OF 11

193-7110 FACULTATION

REV	DES	BASH NO	REV
		006	B



REF	DES	TYPE	GND	+5V
U30, 37, 53, 58		74LS00	7	14
U10	20, 63	74LS04	7	14
U9		74LS08	7	14
U19		74LS14	7	14
U48		74LS32	7	14
U34, 43, 45, 63		74LS44	7	14
U54		74LS96	7	14
U3		7492A	10	5
U49		7493	10	5
U13		74LS32	7	14
U47, 56		74LS38	8	16
U30		74LS56	8	16
U46		74LS53	8	16
U64		74LS55	8	16
U2		74S04	7	12

REF	DES	TYPE	GND	+5V
U51		74LS74	8	16
U12, 22, 71		74LS34A	10	20
U23		74LS335	10	20
U70		74LS260	7	14
U8, 7, 1		74LS367A	8	16
U31		74LS373	10	20
U69		74LS107	7	14
U66, 67, 72, 73		74LS70	8	16
U27		2764	14	28
U6, 14		MC145848	7	14
U17		8031	-	20
U42		8254-2	12	24
U5, 16, 26, 40		8255A	7	26
U44, 76		HI-201	5	-
U41		EE PROM	-	24
U75, 80		SPARE	10	20
U77, 78		SPARE	-	-

REF	DES	LAST USED	NOT USED
C70			
CR16			
Q8			
R133	R26, 47		
UBC	U4, 11, 15, 21, 25, 33, 36, 38, 39		
Y1			
TP6			
ST1			

⚠ COMPONENT LOCATIONS PROVIDED ON THE PCB BUT NOT USED.

⚠ PI CONNECTOR PIN AND FUNCTIONS SHALL BE COORDINATED WITH THE MOTHER BOARD (401-7110-001) FOR PINS NOT SHOWN ON DRAWING.

3. ALL CAPACITOR VALUES ARE IN MICROFARADS.

2. ALL RESISTOR VALUES ARE IN OHMS $\pm 5\%$, $1/4$ W

1. X INDICATES NO CONNECTION.

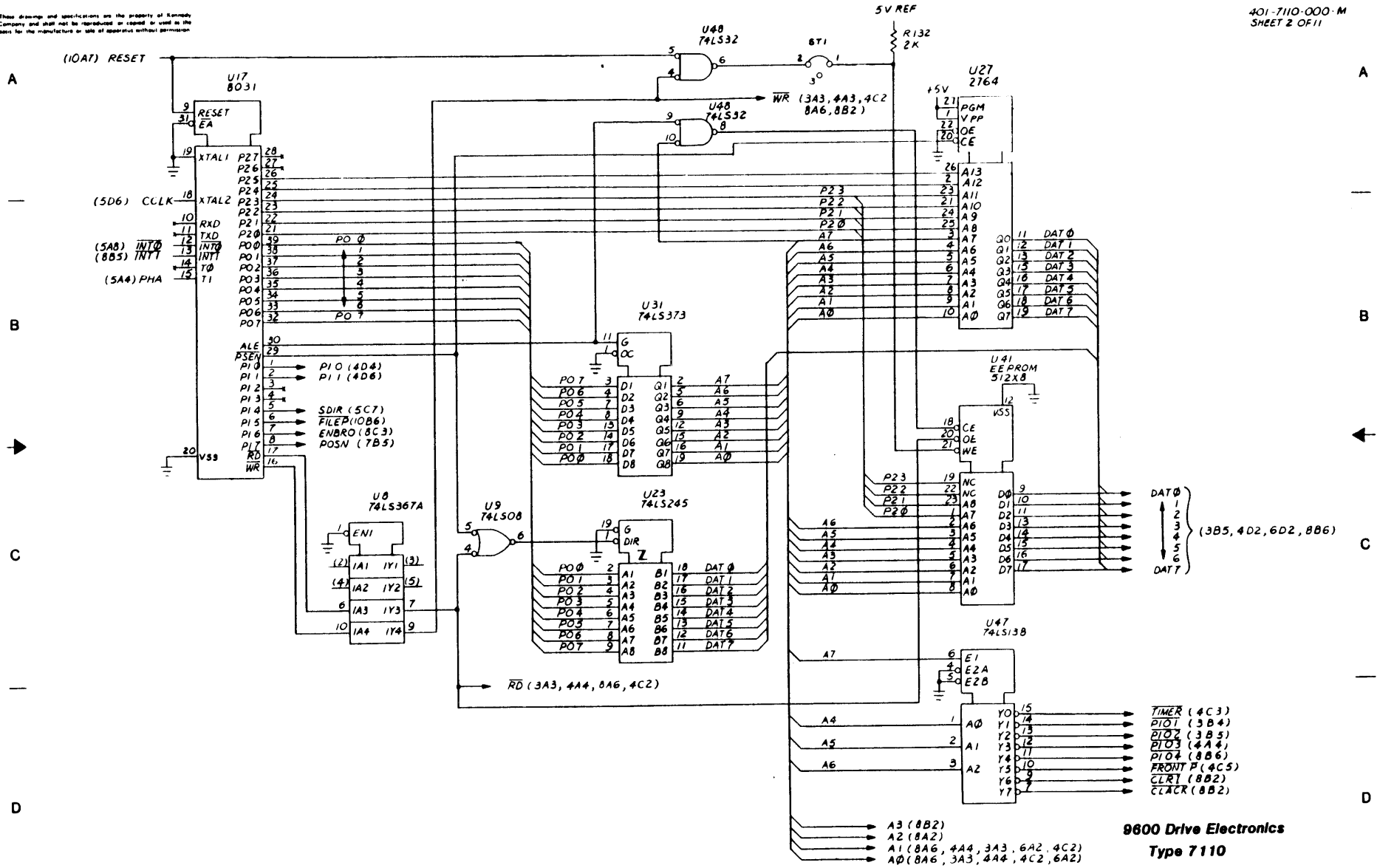
NOTES: UNLESS OTHERWISE SPECIFIED.

REV STATUS OF SHEETS	REV SHEET	W	M	I	F	F	F	F	V	U	F
	1	2	3	4	5	6	7	8	9	10	11

9600 Drive Electronics
Type 7110
Schematic Diagram

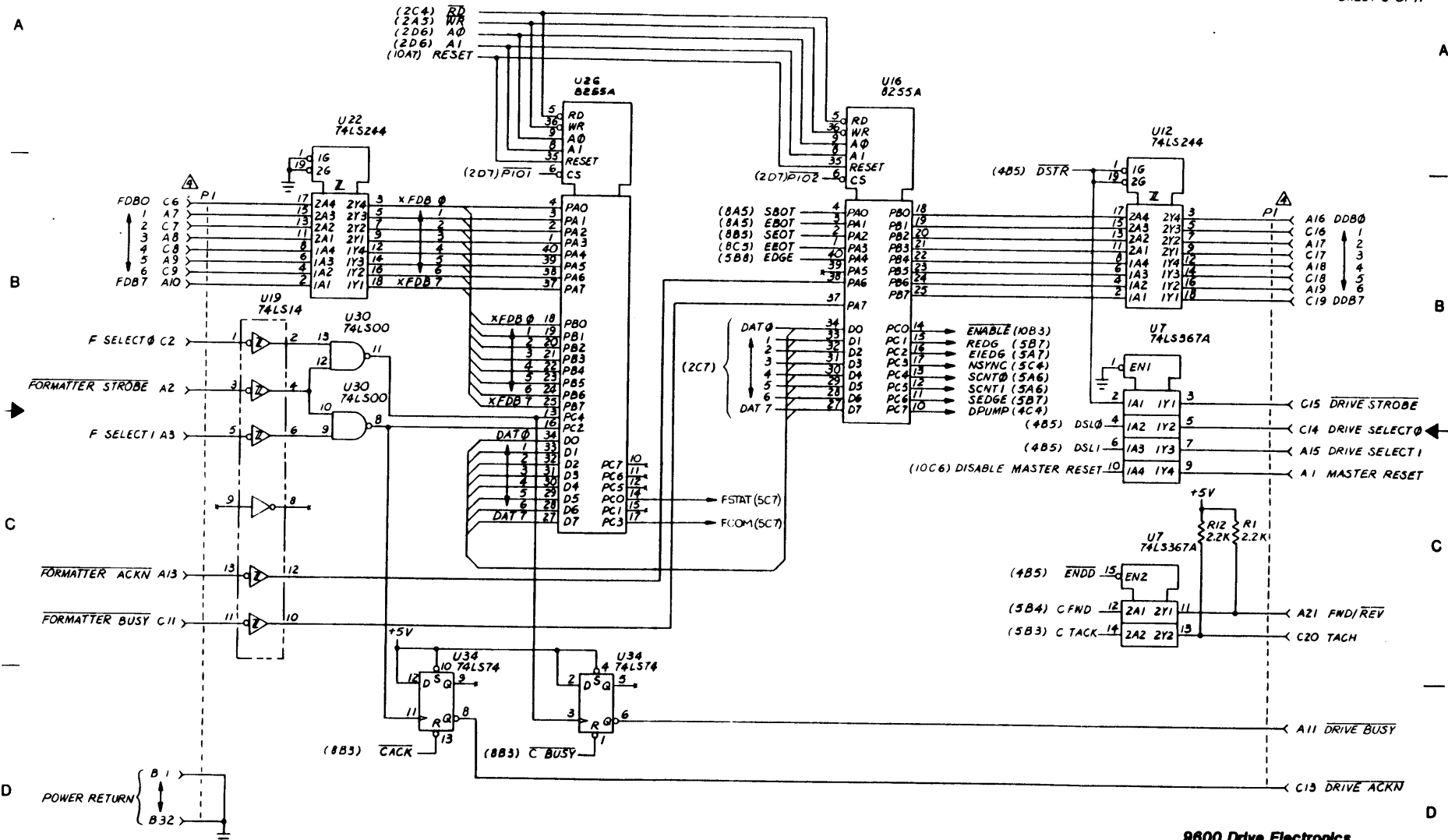
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401-7110-000-M
SHEET 2 OF 11



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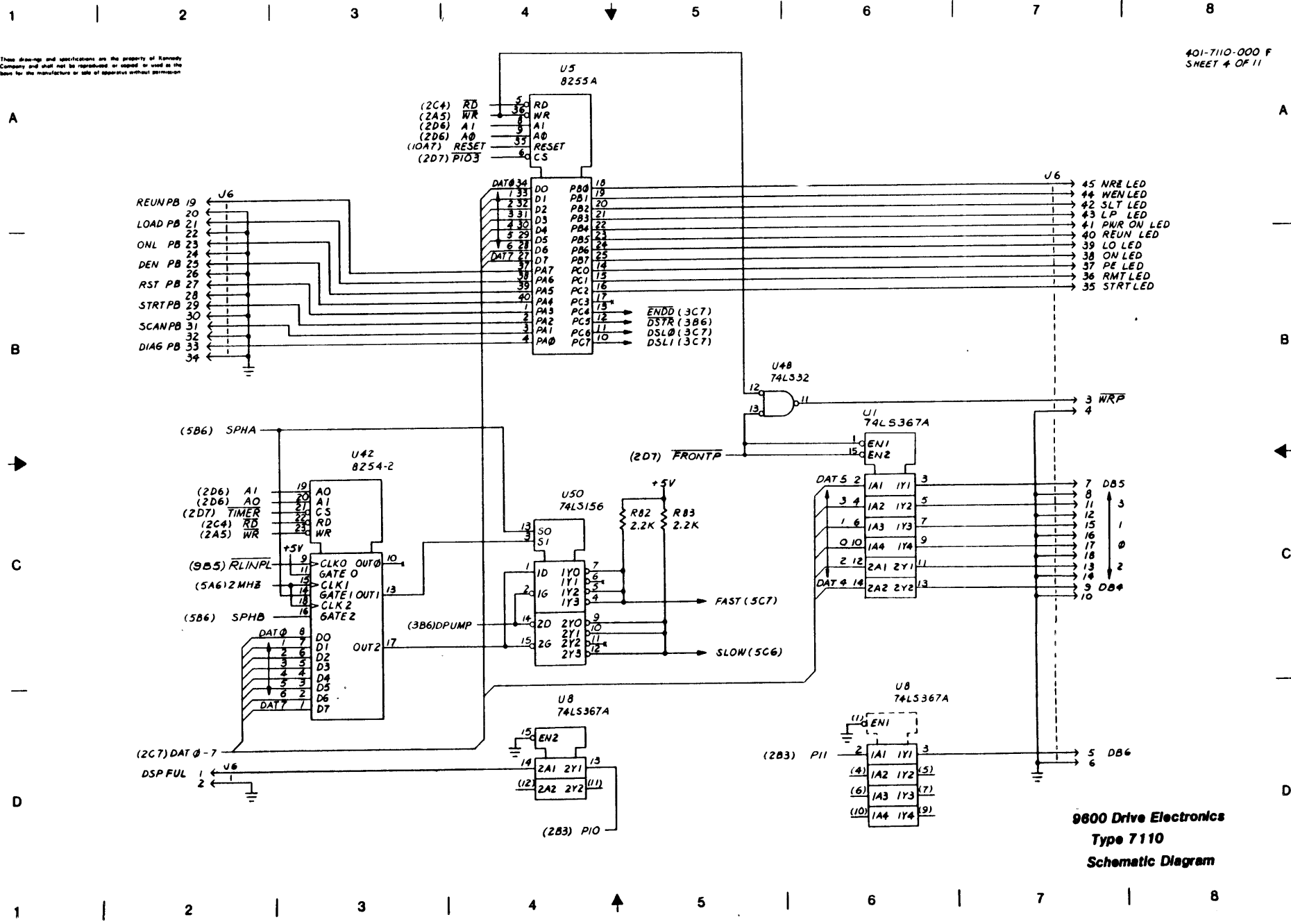
401-7110-000-F
SHEET 3 OF 11



9600 Drive Electronics
Type 7110
Schematic Diagram

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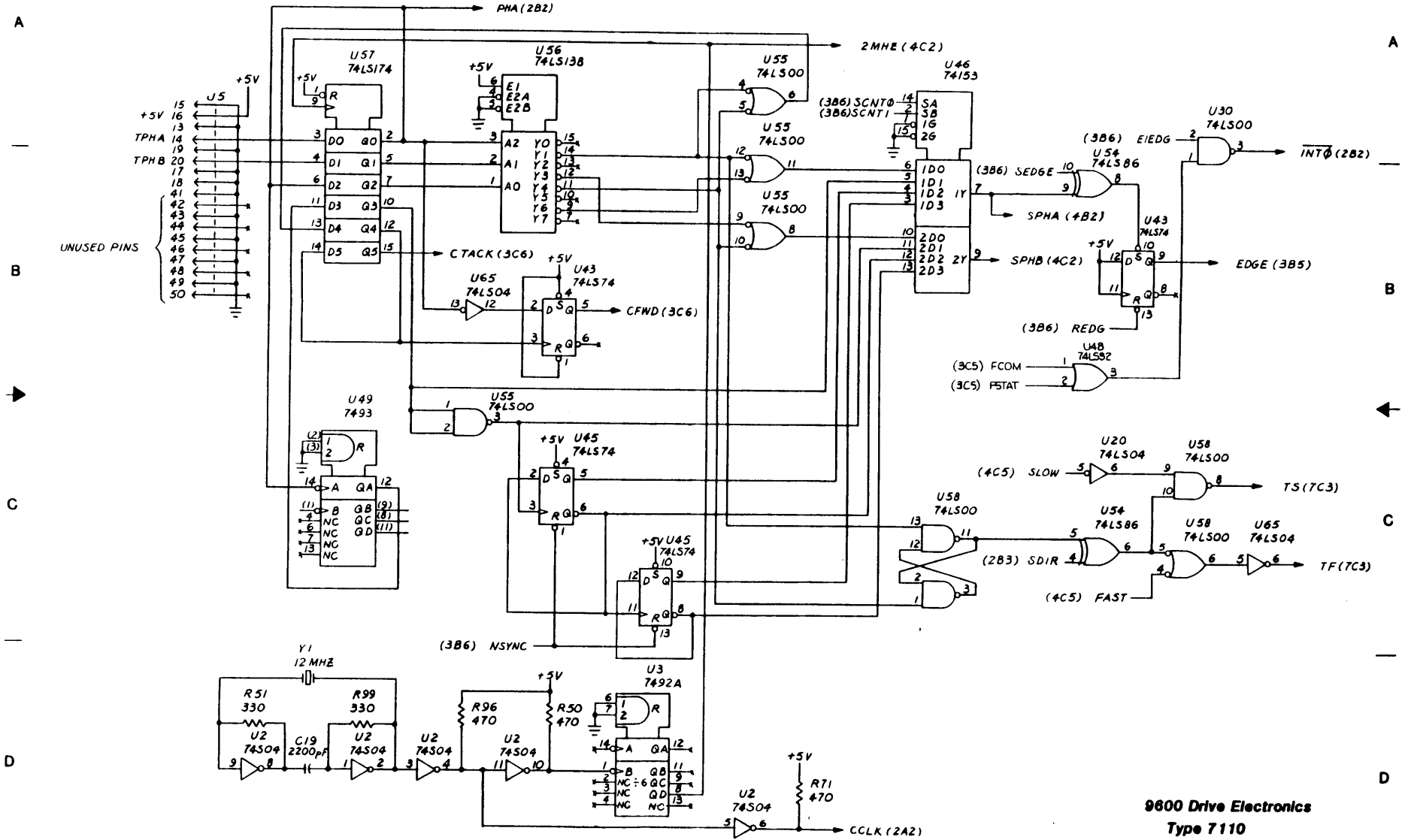
401-7110-000 F
SHEET 4 OF 11



9600 Drive Electronics
Type 7110
Schematic Diagram

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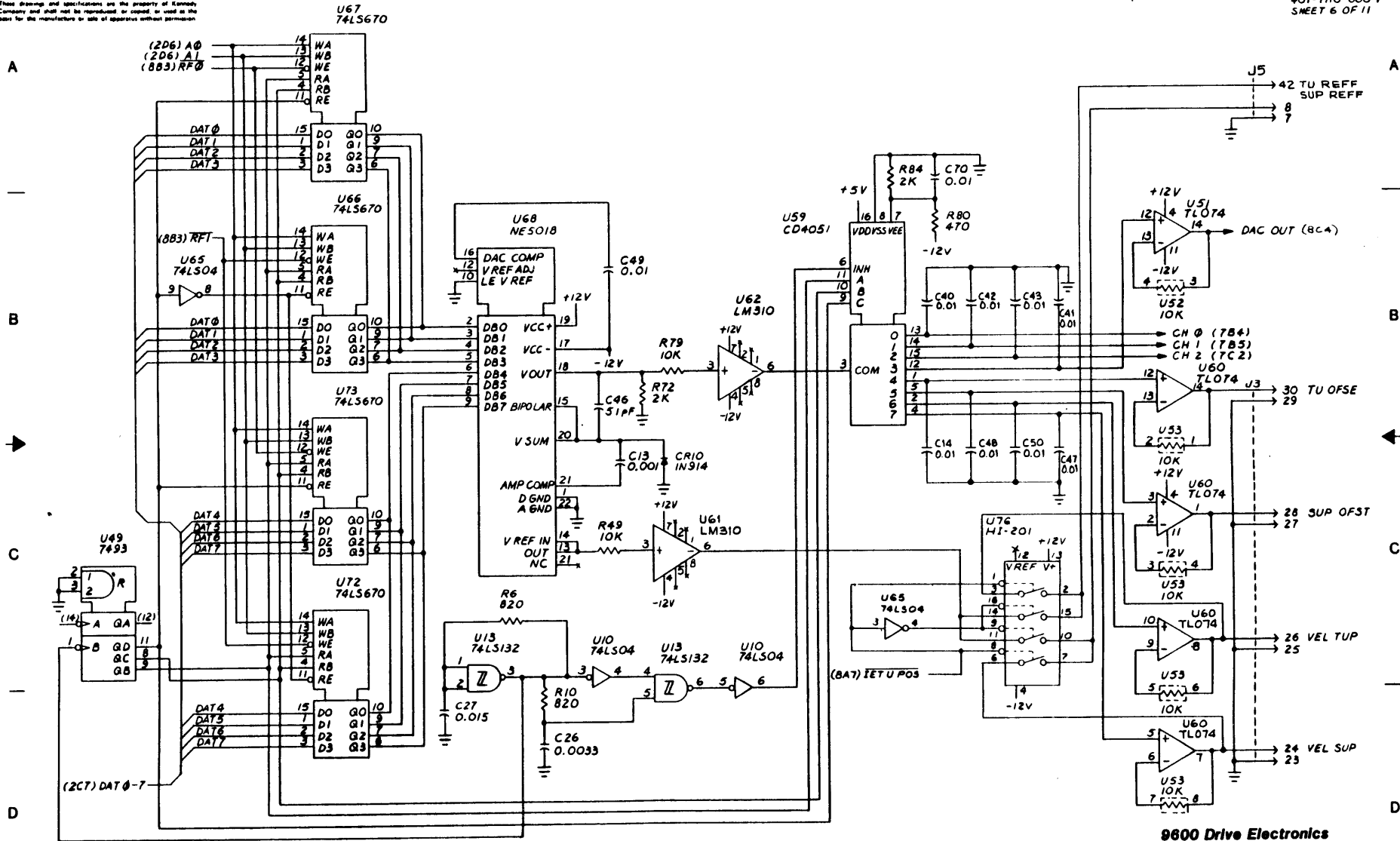
401-7110-000-F
SHEET 5 OF 11



9600 Drive Electronics
Type 7110
Schematic Diagram

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401-7110-000 F
SHEET 6 OF 11



9600 Drive Electronics
Type 7110
Schematic Diagram

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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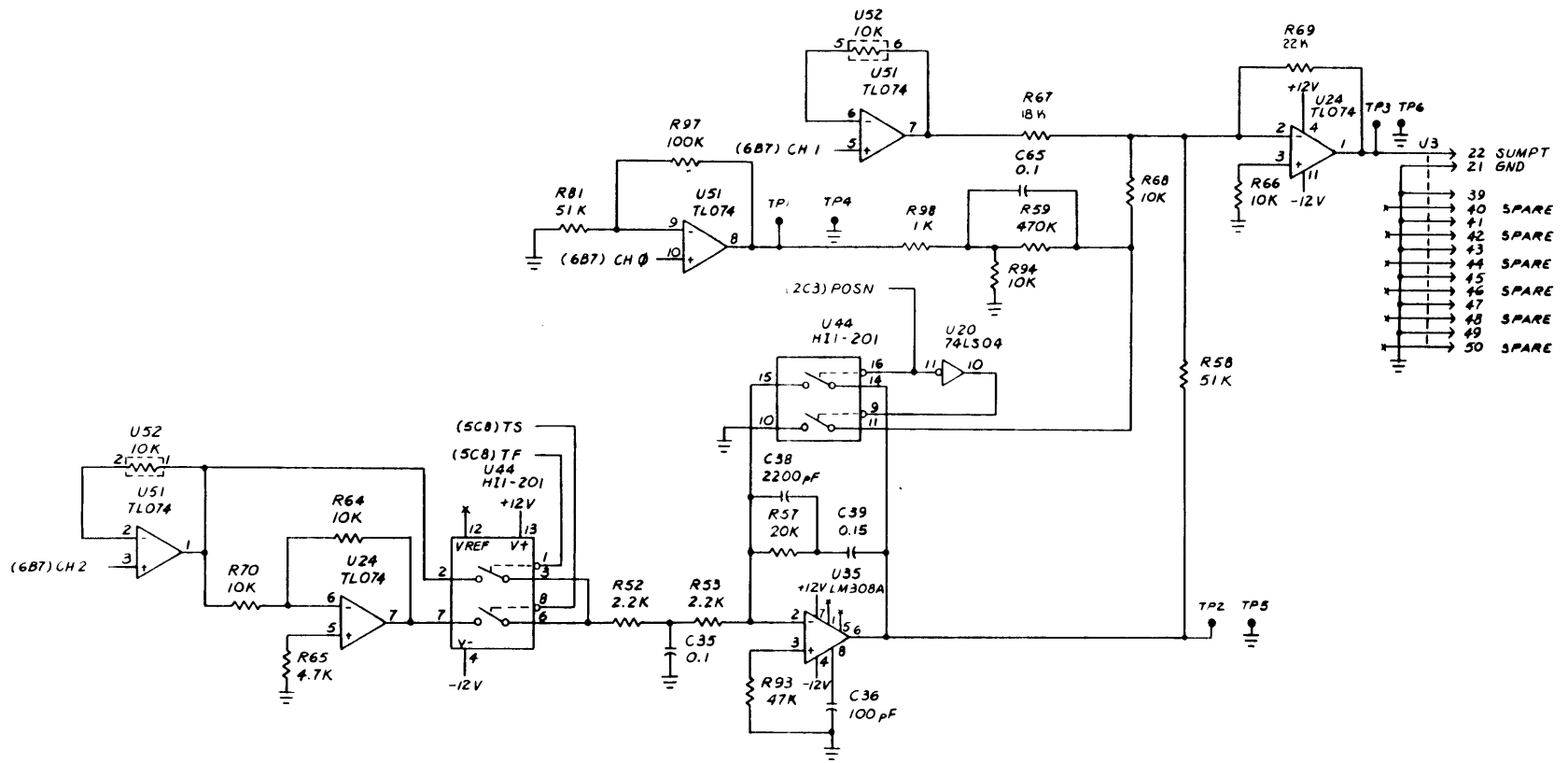
401-7110-000 F
SHEET 7 OF 11

A | A

B | B

C | C

D | D

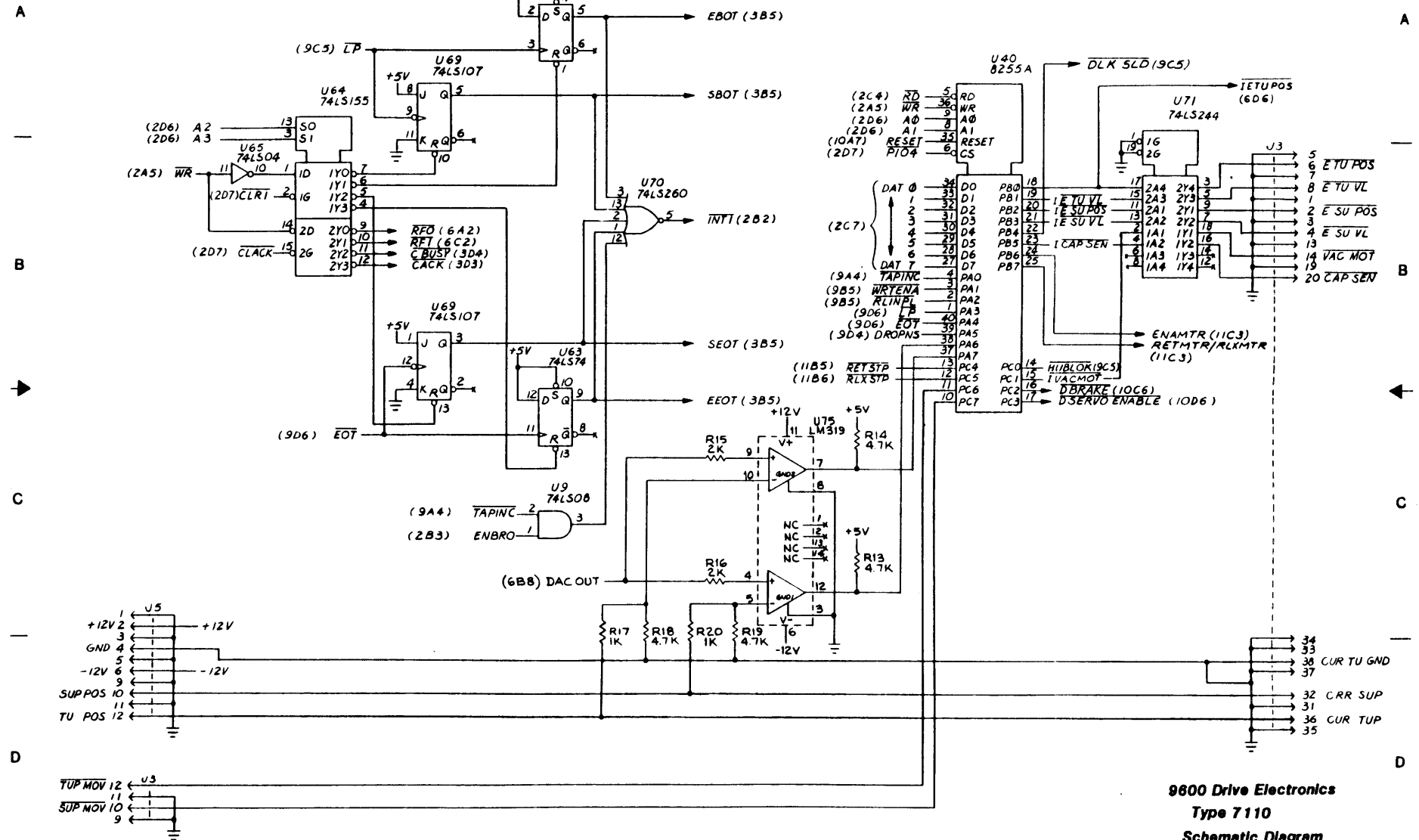


9600 Drive Electronics
Type 7110
Schematic Diagram

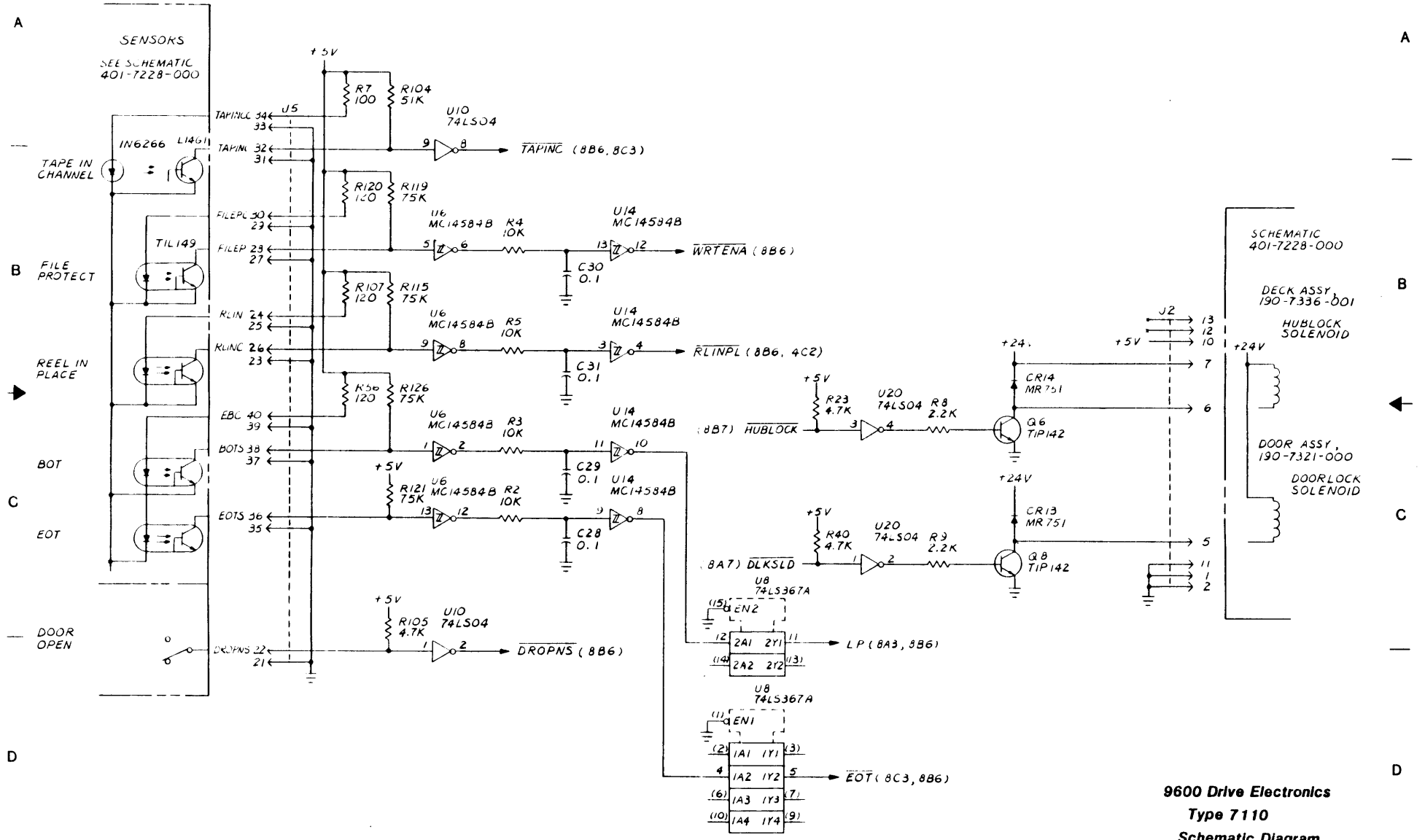
1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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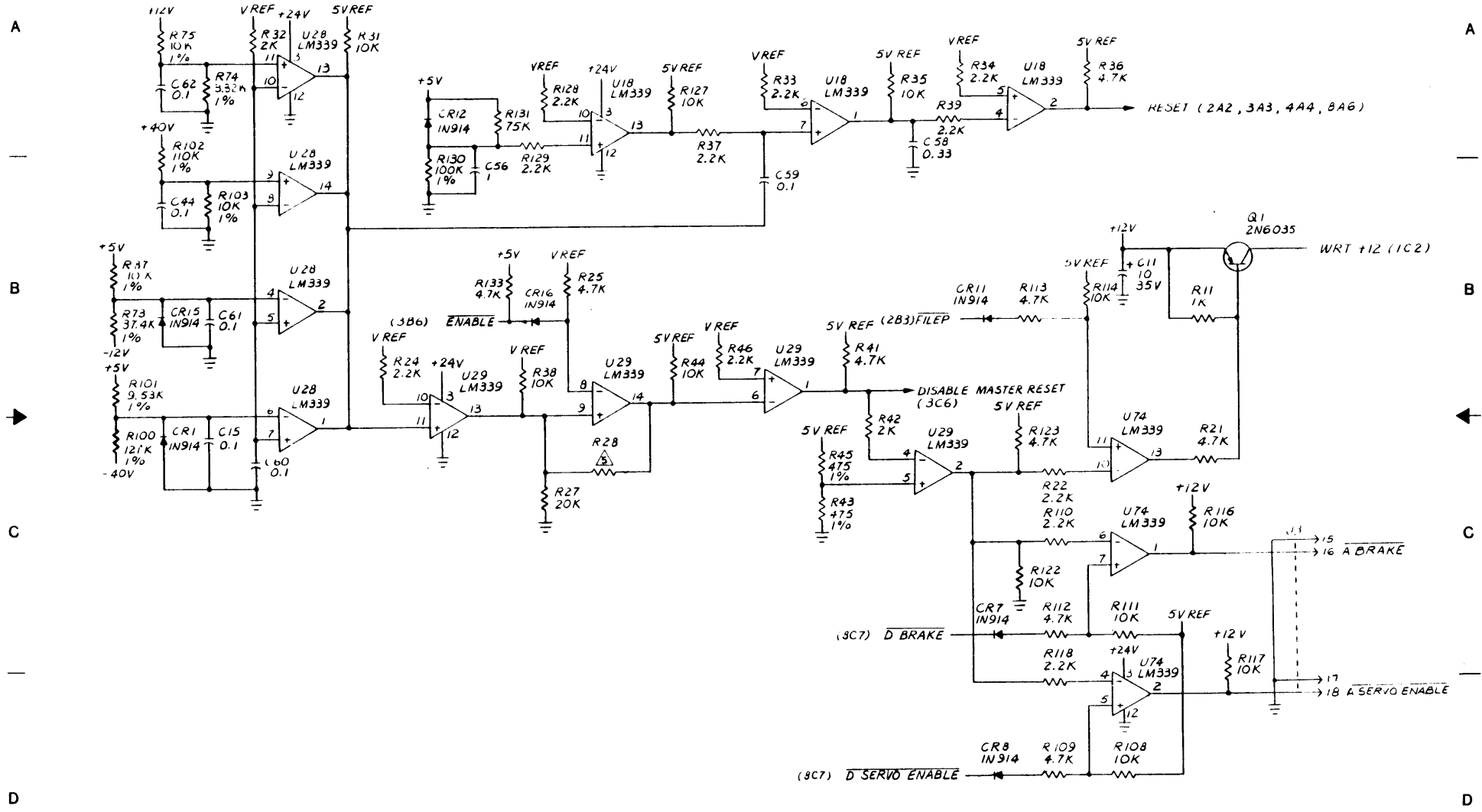
401-7110-000 F
SHEET 8 OF 11



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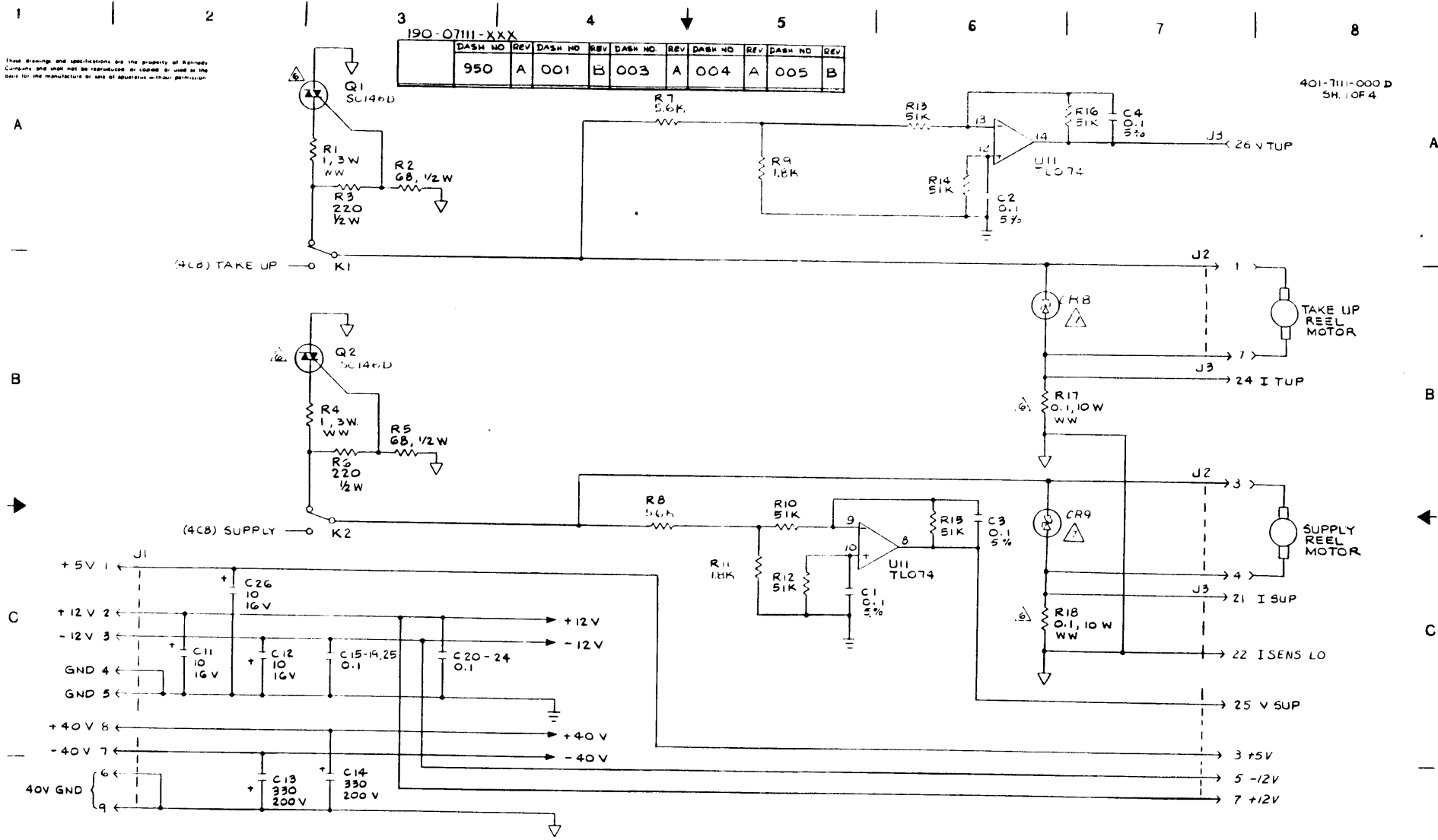
9600 Drive Electronics
Type 7110
Schematic Diagram



9600 Drive Electronics
Type 7110
Schematic Diagram

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401-7111-000 D
SH. 1 OF 4



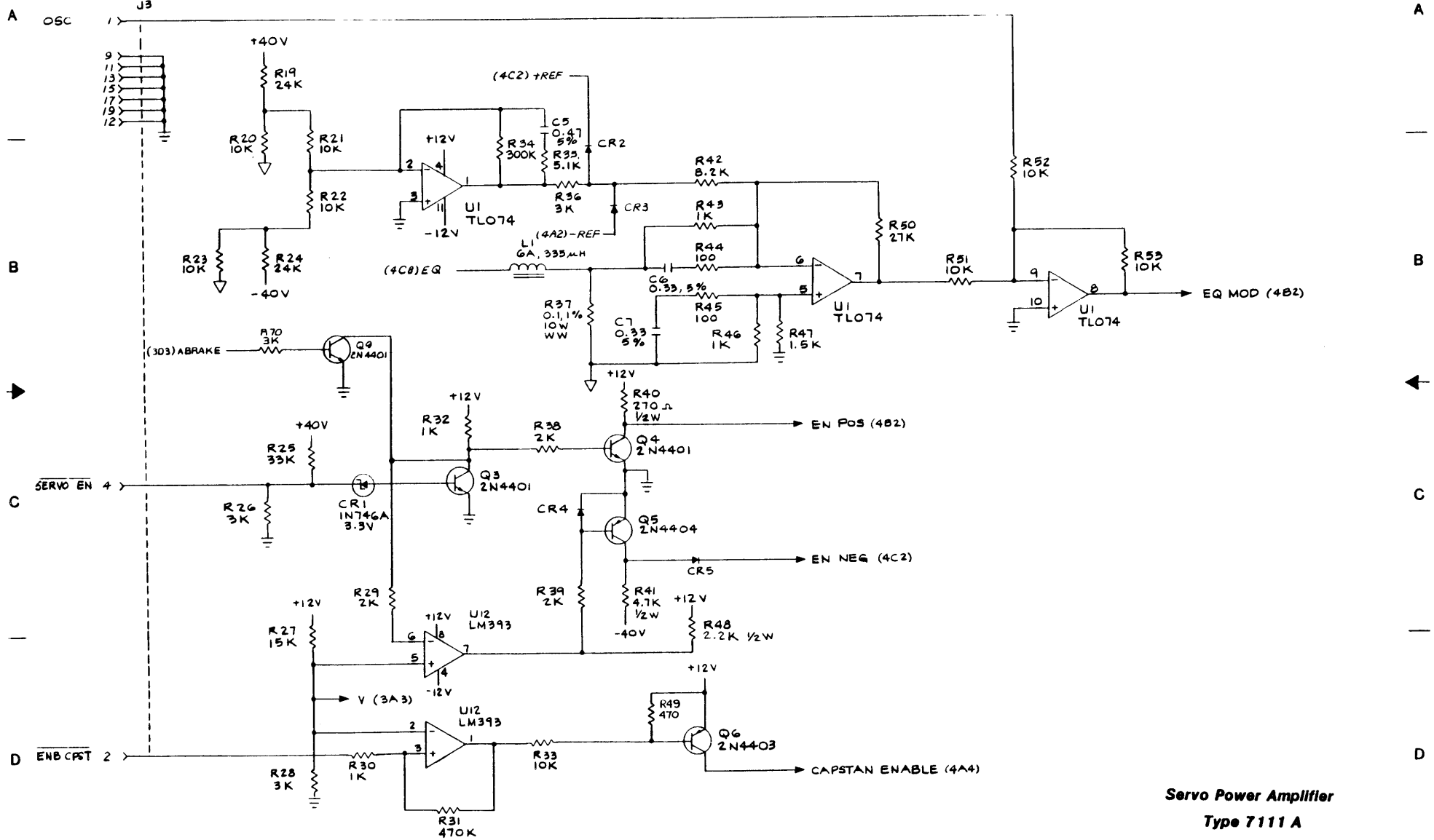
- D
- 1 COMPONENTS NOT USED, SHOWN FOR FULL CAPABILITY OF THE BOARD
 - 2 COMPONENTS MOUNTED ON HEAT SINK 190-7289-001
 - 3 SEE SH 4 FOR NOTES ON TYPICAL SECTION.
 - 4 ALL DIODES ARE 1N914
 - 5 X INDICATES NO CONNECTION
 - 6 ALL RESISTOR VALUES ARE IN OHMS ± 5% 1/4 W.
 - 7 ALL CAPACITOR VALUES ARE IN MICROFARADS.
 - 8 NOTES UNLESS OTHERWISE SPECIFIED

REF	DESIG
LAST USED	NOT USED
C 26	CB, 9
CR 9	
K 2	
L 1	
Q 9	
R 7	RE, 58
U 3	U2, 10

REV STATUS OF SHEETS	REV			
	1	2	3	4
SHEET				

**Servo Power Amplifier
Type 7111
Schematic Diagram**

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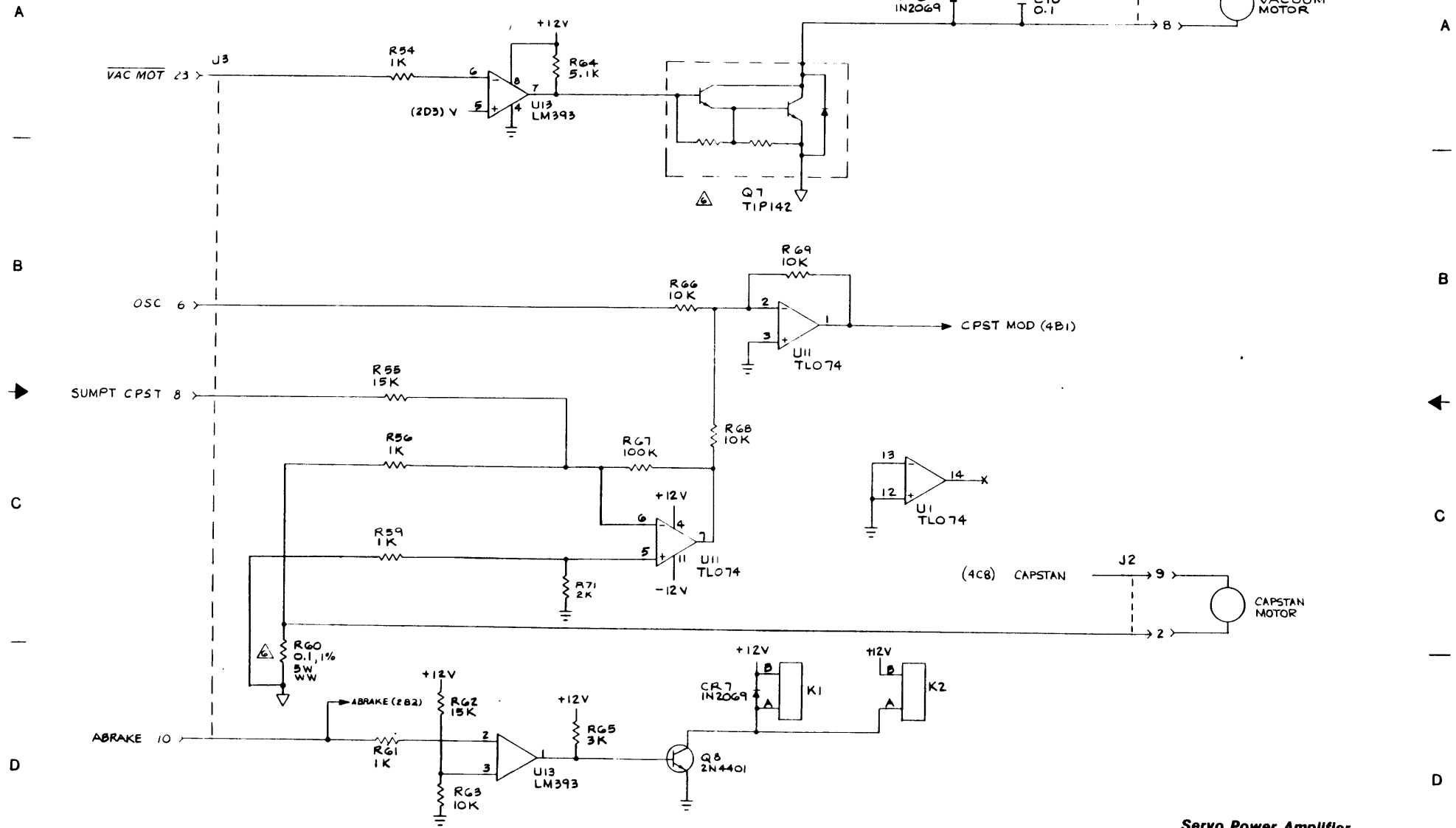


OSC | SERVO EN + | ENB CPST 2 | EN POS (4B2) | EN NEG (4C2) | CAPSTAN ENABLE (4A4)

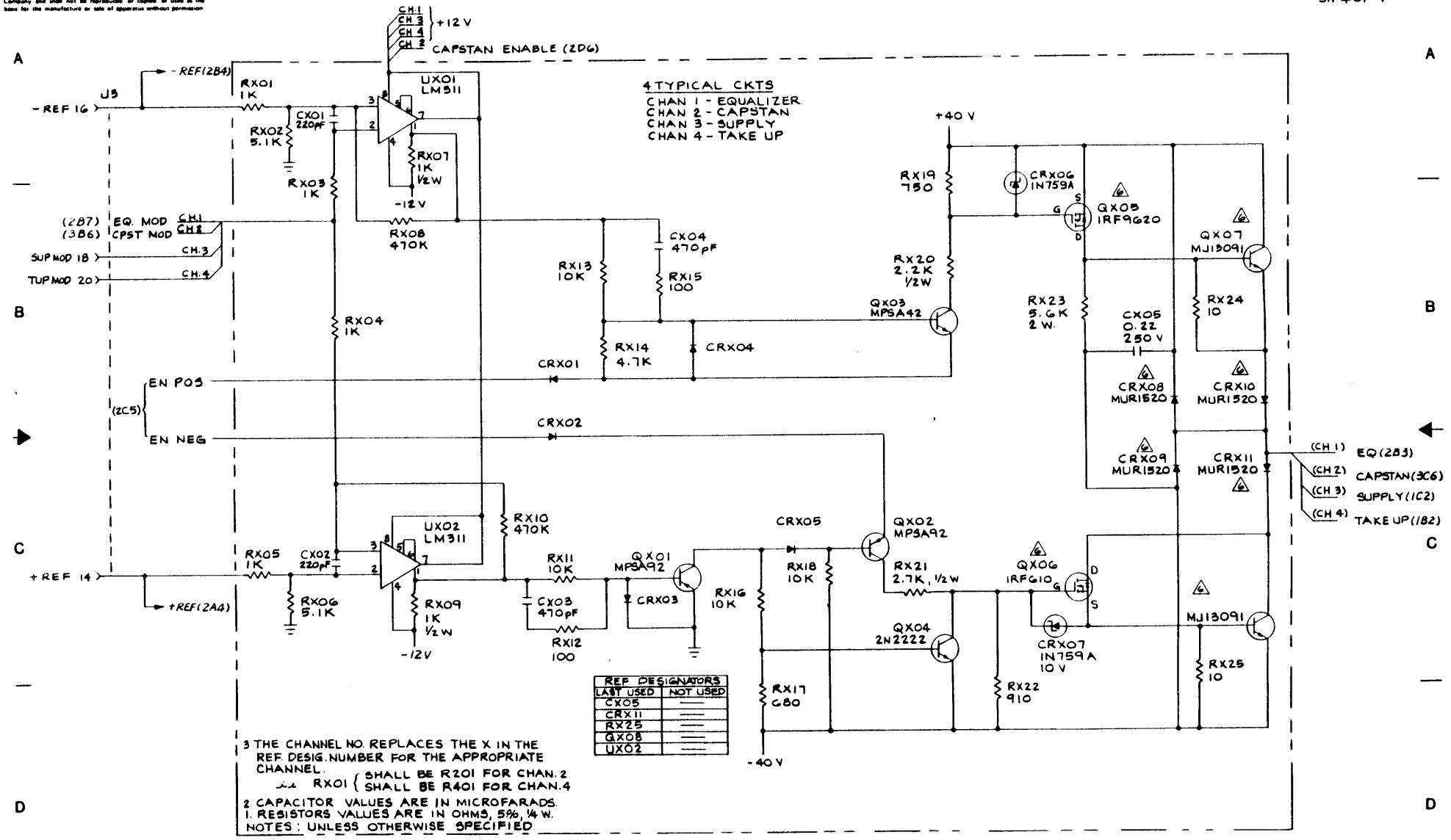
**Servo Power Amplifier
Type 7111 A
Schematic Diagram**

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401-7111-000 A
SH. 3 OF 4



Servo Power Amplifier
Type 7111 A
Schematic Diagram



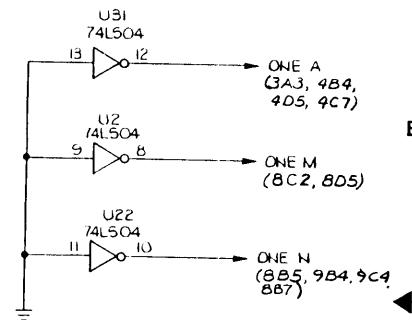
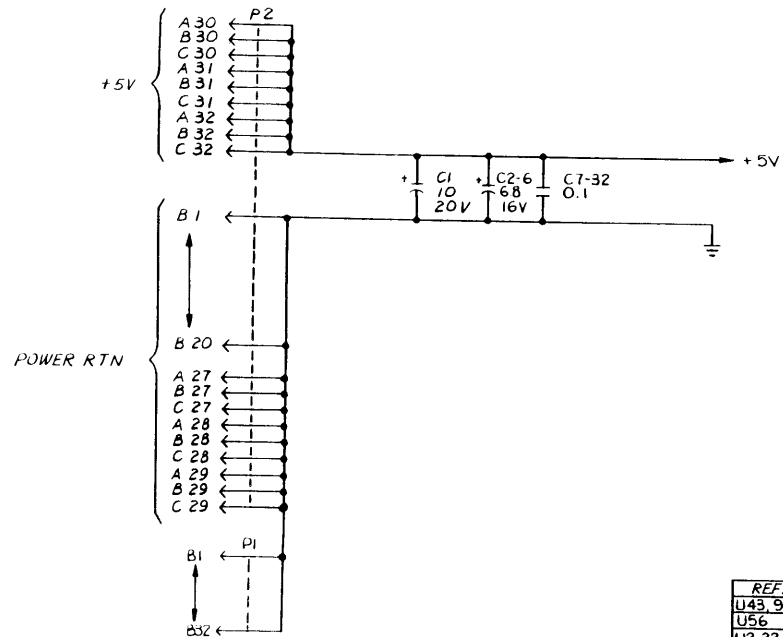
**Servo Power Amplifier
 Type 7111 A
 Schematic Diagram**

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190-7113 TABULATION

401-7113-000 J
SHEET 1 OF 13

A	DASH NO	REV	DASH NO	REV
	-001	K	-002	A



B

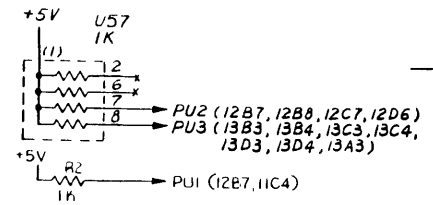
C

D

REF. DES.	TYPE	+5V	GND
U43, 90, 91	74LS00	14	7
U56	74LS02	14	7
U2, 22, 23, 31, 48	74LS04	14	7
U17, 42, 68, 101	74LS08	14	7
U80	74LS10	14	7
U68	74LS11	14	7
U45	74LS20	14	7
U12	7425	14	7
U19	74LS27	14	7
U10, 29, 36	74LS32	14	7
U1, 8, 9, 28, 59, 104, 117	7438	14	7
U3, 18, 24, 26, 35, 47, 54, 55, 58, 65, 66, 77	74LS74A	14	7
U6	74LS85	16	8
U33	74LS86	14	7
U50, 61, 70, 73, 79, 85, 95, 105, 114	74LS138	16	8

REF. DES.	TYPE	+5V	GND
U20	74LS139	16	8
UB2, 83, 92, 93, 102, 112	74LS161	16	8
UA0, 52, 63, 74, 87, 97, 107, 116	74LS169	16	8
U3, 16, 21, 89, 100, 118	74LS240	20	10
U11, 25, 32, 37, 46, 51, 72, 76, 84, 94, 103, 113	74LS244	20	10
U49, 75	74LS245	20	10
U34, 38, 81, 111	74LS279	16	8
U27, 30, 60, 62, 64, 86, 96, 98, 99, 106, 108, 109, 110, 115, 119	74LS374	20	10
U41, 53	2114	18	—
U67, 78	2764	28	14
U44	8031	40	—
U4, 5, 39, 111	△	20	10
U38	74LS683	20	10

REF. DES.	
LAST USED	NOT USED
C35	
CR1	
R2	
S1	
U119	
Y1	



- △ SPARE LOCATIONS PROVIDED ON THE BOARD.
- P1 & P2 CONNECTOR PIN AND FUNCTION SHALL BE COORDINATED WITH THE MOTHER BD (401-7108-000) FOR PIN NOT SHOWN ON THIS DRAWING.
 - X INDICATES NO CONNECTION.
 - RESISTORS ARE IN OHMS 5%, 1/4 W.
 - CAPACITORS ARE IN MICROFARADS 10% 50V
- NOTES: UNLESS OTHERWISE SPECIFIED

REV STATUS OF SHEETS	REV	J	D	D	D	H	D	H	D	D	D	D
SHEET	1	2	3	4	5	6	7	8	9	10	11	13

FORMATTER
TYPE 7113
SCHEMATIC DIAGRAM

1

2

3

4

5

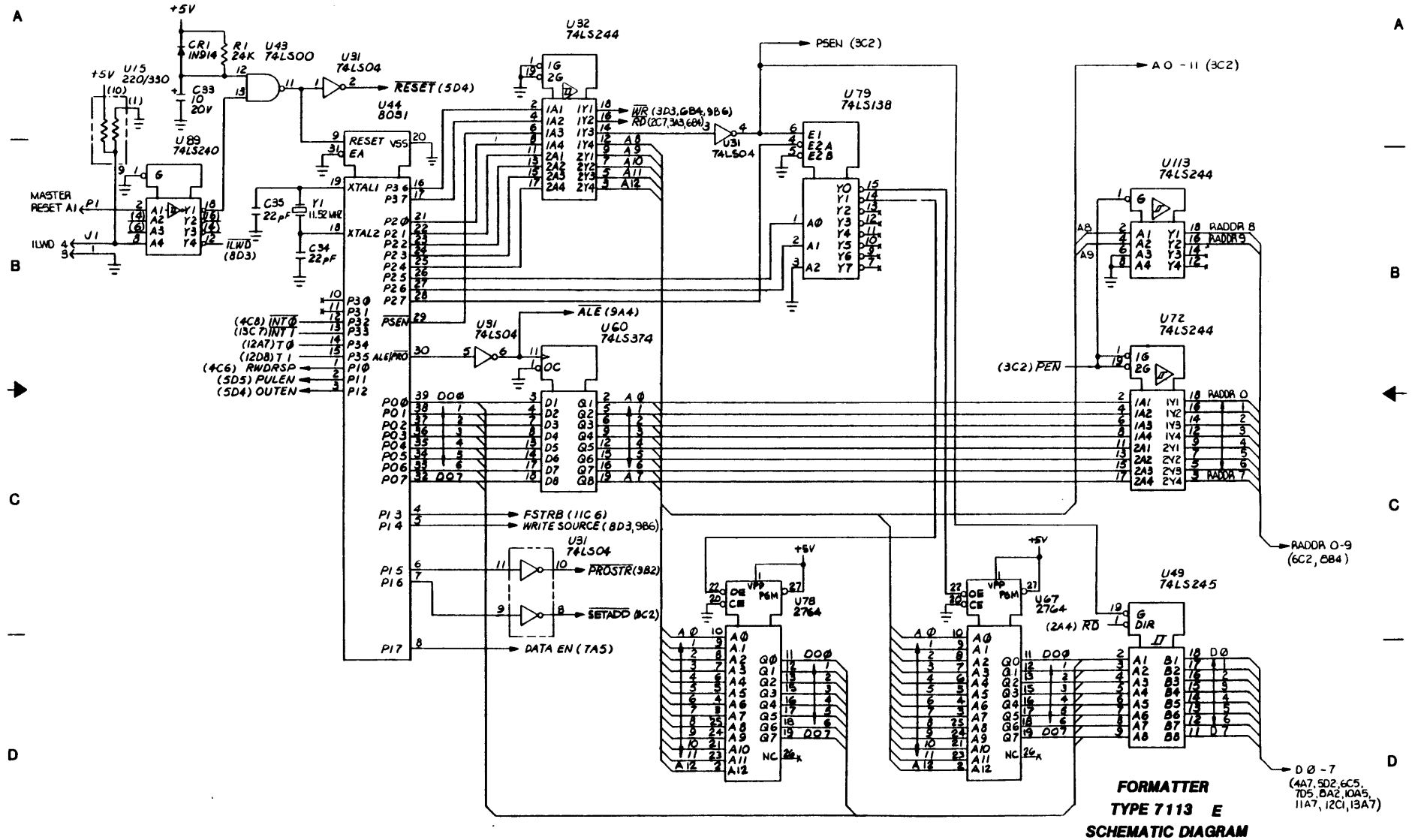
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7

8

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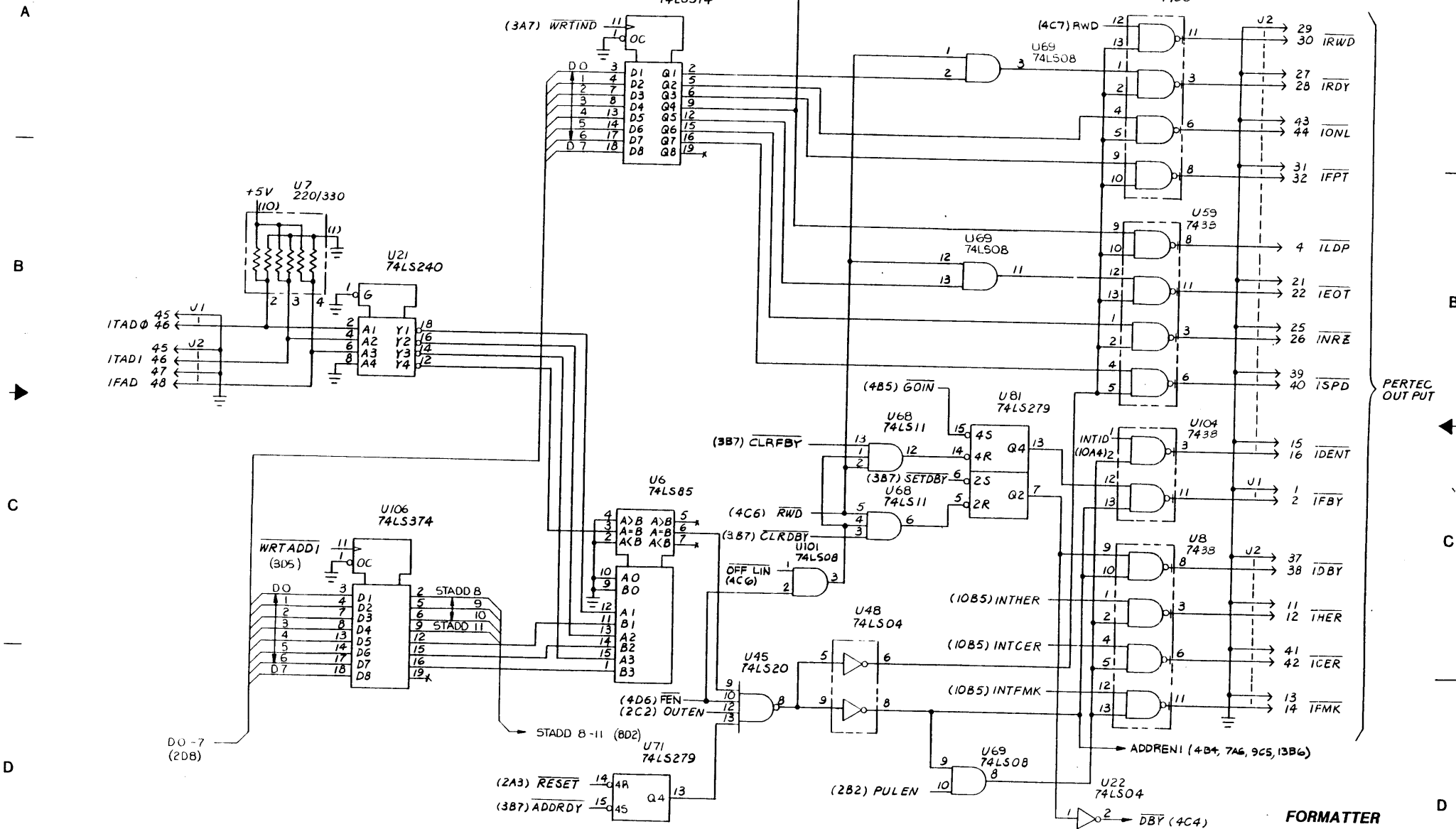
401-7113-000 D
SHEET 2 OF 13



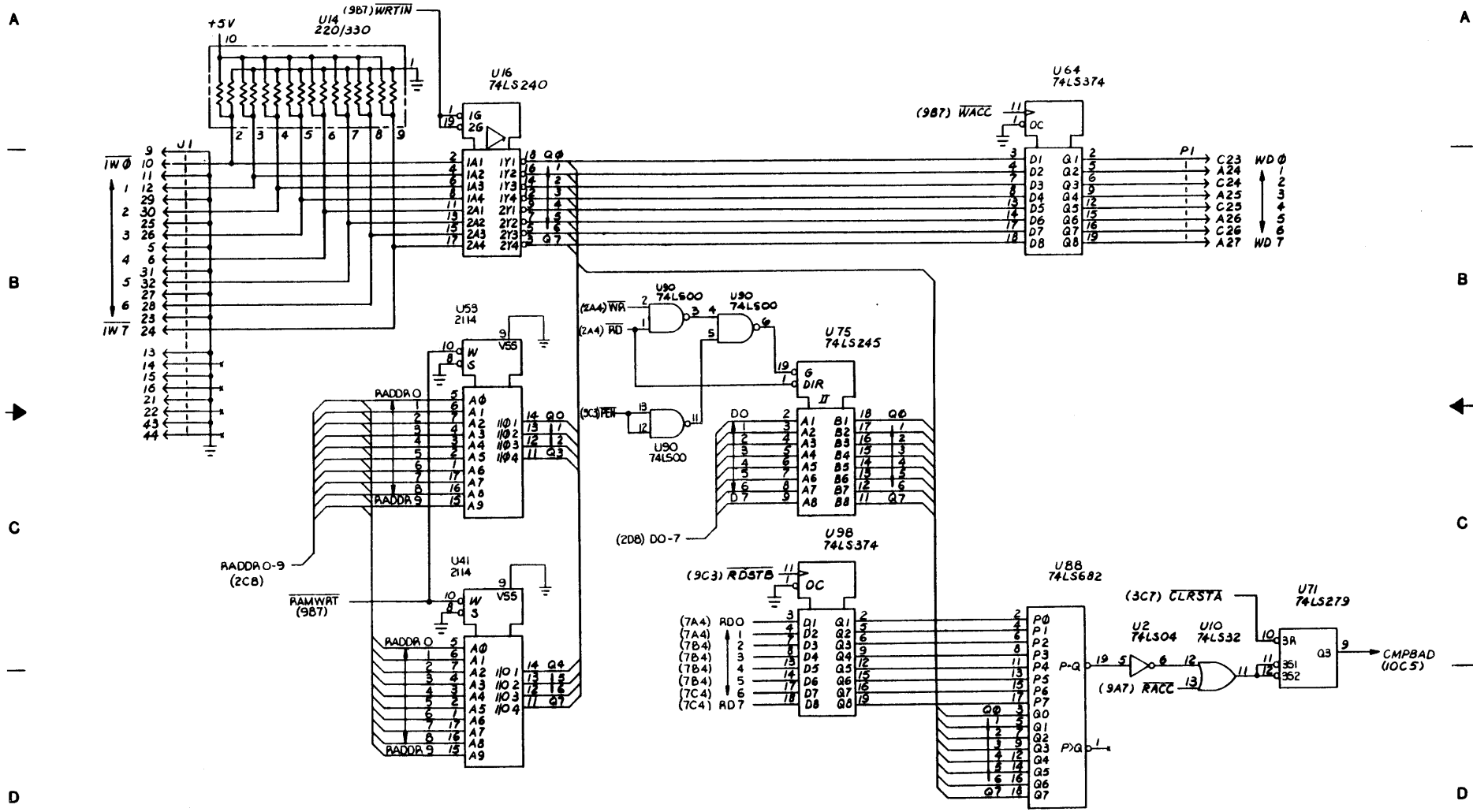
FORMATTER
TYPE 7113 E
SCHEMATIC DIAGRAM

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401-7113-000H
SHEET 5 OF 13



**FORMATTER
TYPE 7113
SCHEMATIC DIAGRAM**



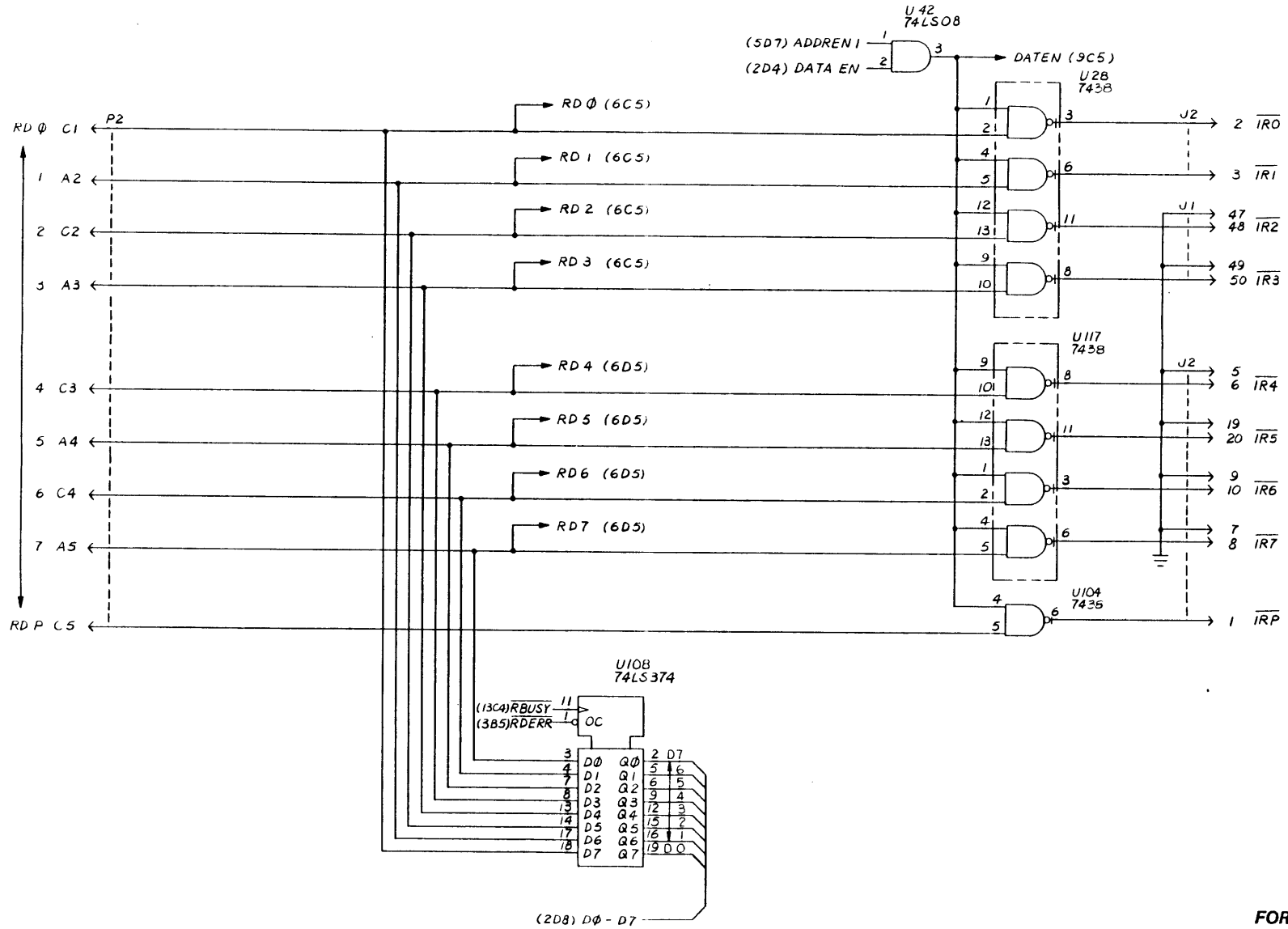
**FORMATTER
TYPE 7113-E
SCHEMATIC DIAGRAM**

A

B

C

D



FORMATTER
TYPE 7113
SCHEMATIC DIAGRAM

1

2

3

4

5

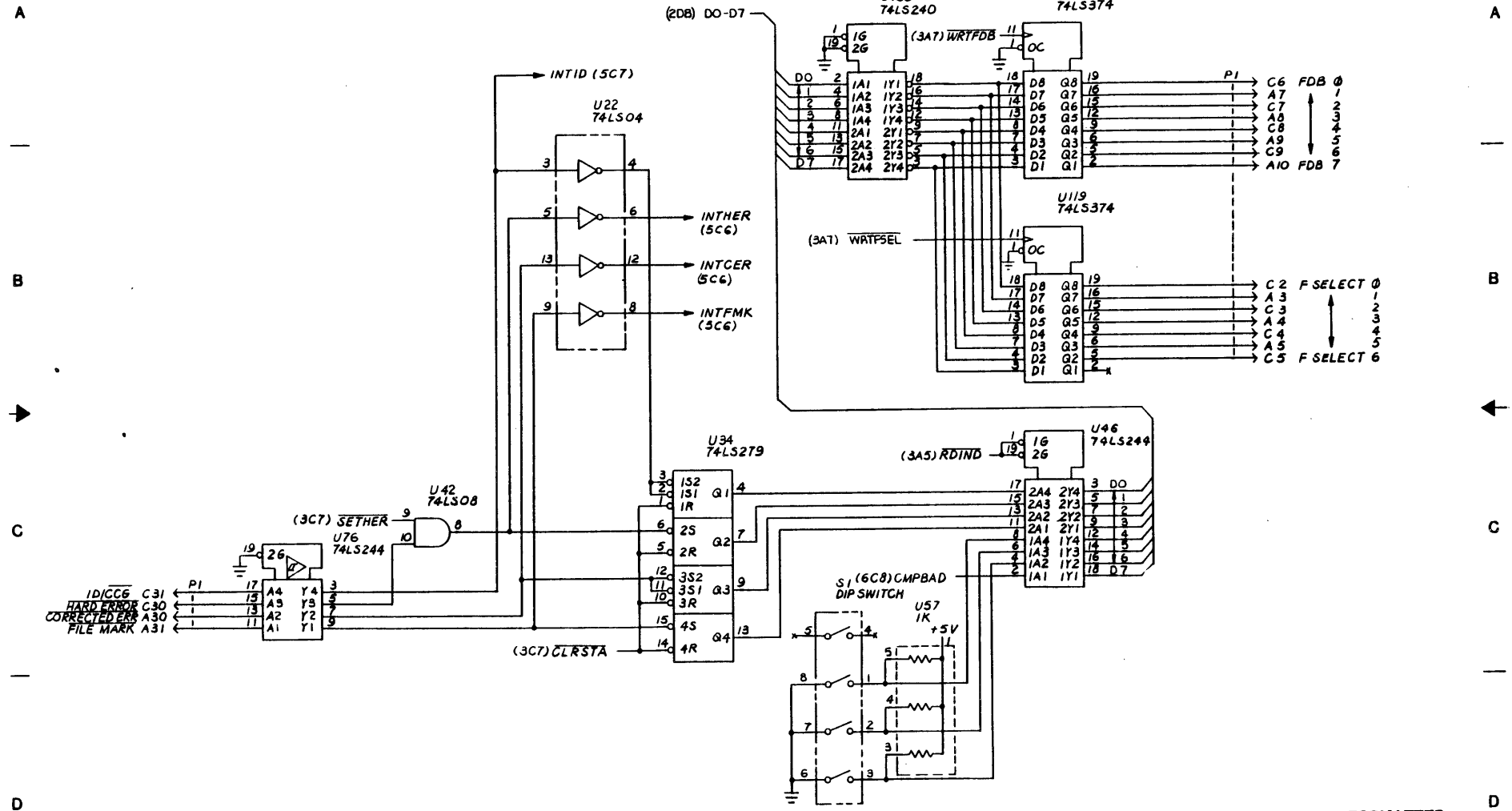
6

7

8

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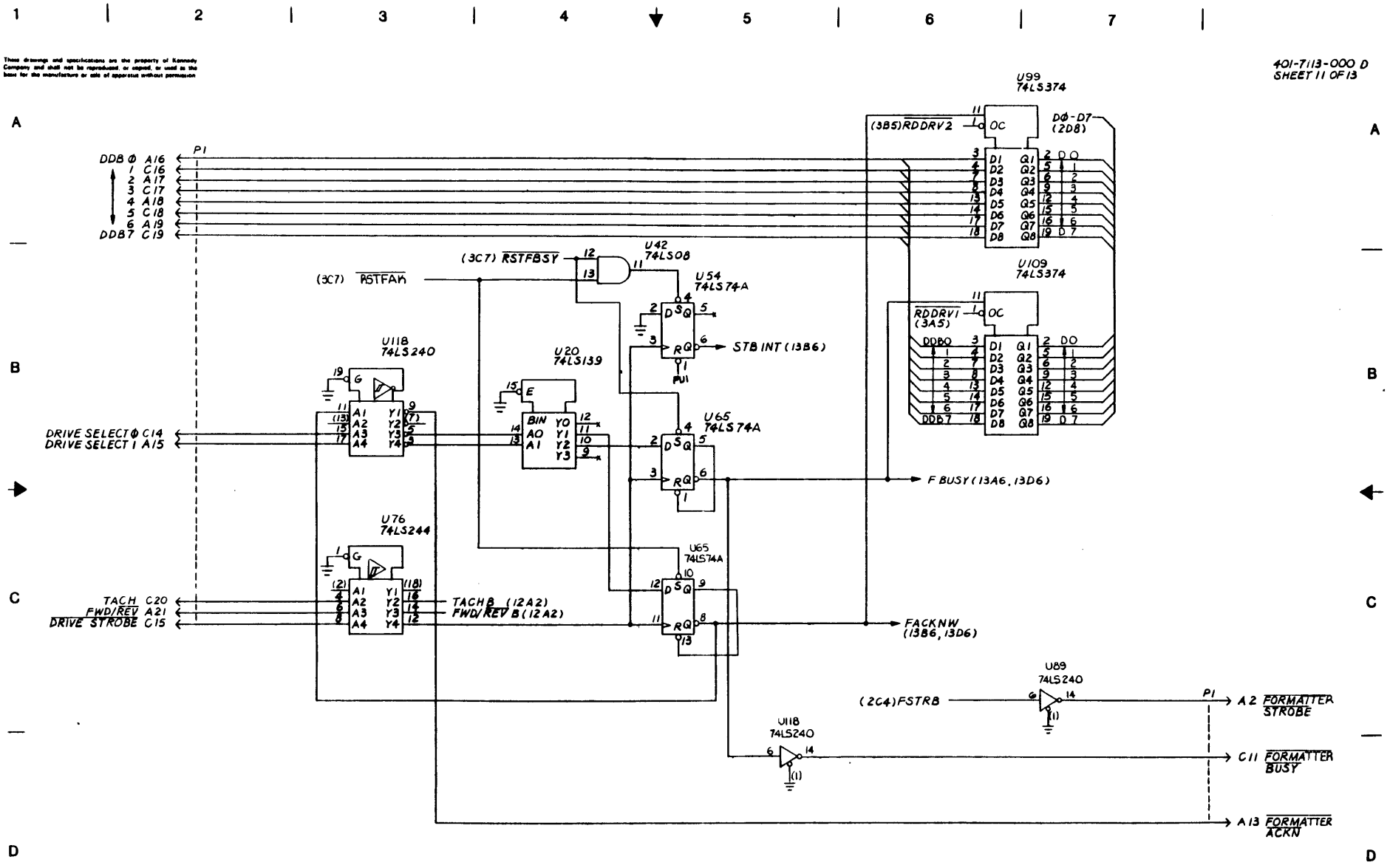
401-7113-000 D
SHEET 10 OF 13



FORMATTER
TYPE 7113-E
SCHEMATIC DIAGRAM

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401-7113-000 D
SHEET 11 OF 13

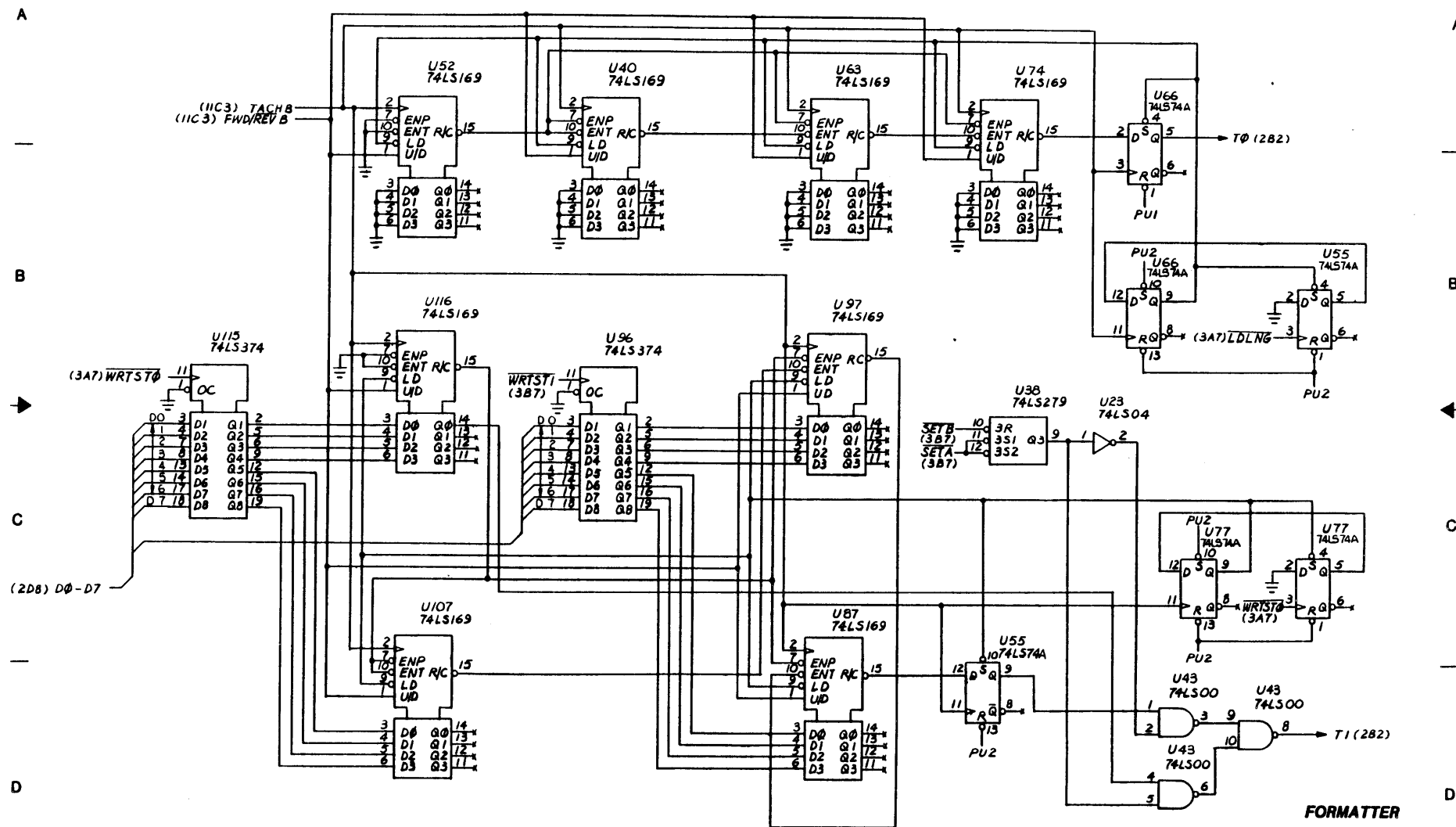


**FORMATTER
TYPE 7113-E
SCHEMATIC DIAGRAM**

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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401-7113-000 D
SHEET 12 OF 13

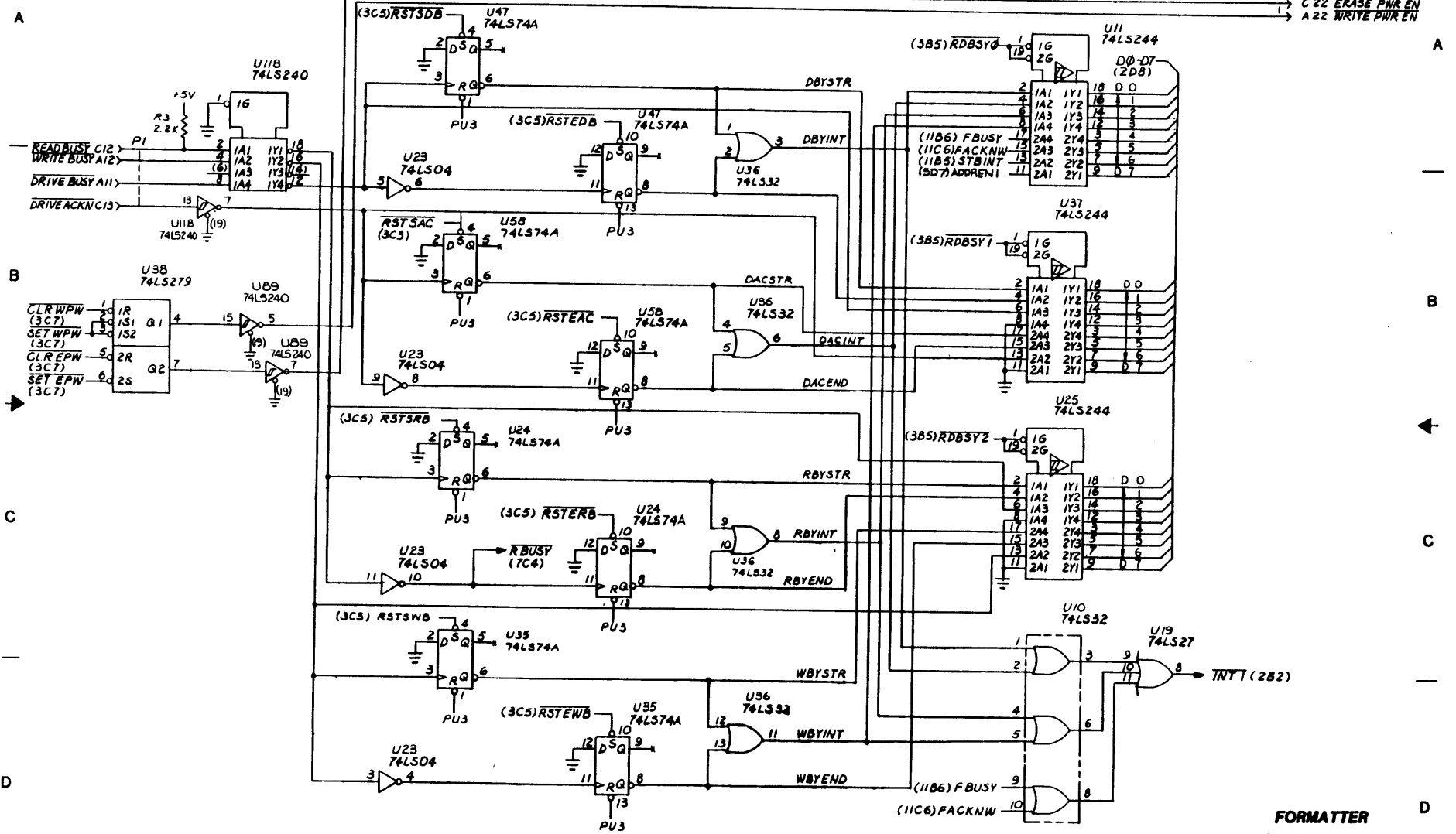


FORMATTER
TYPE 7113-E
SCHEMATIC DIAGRAM

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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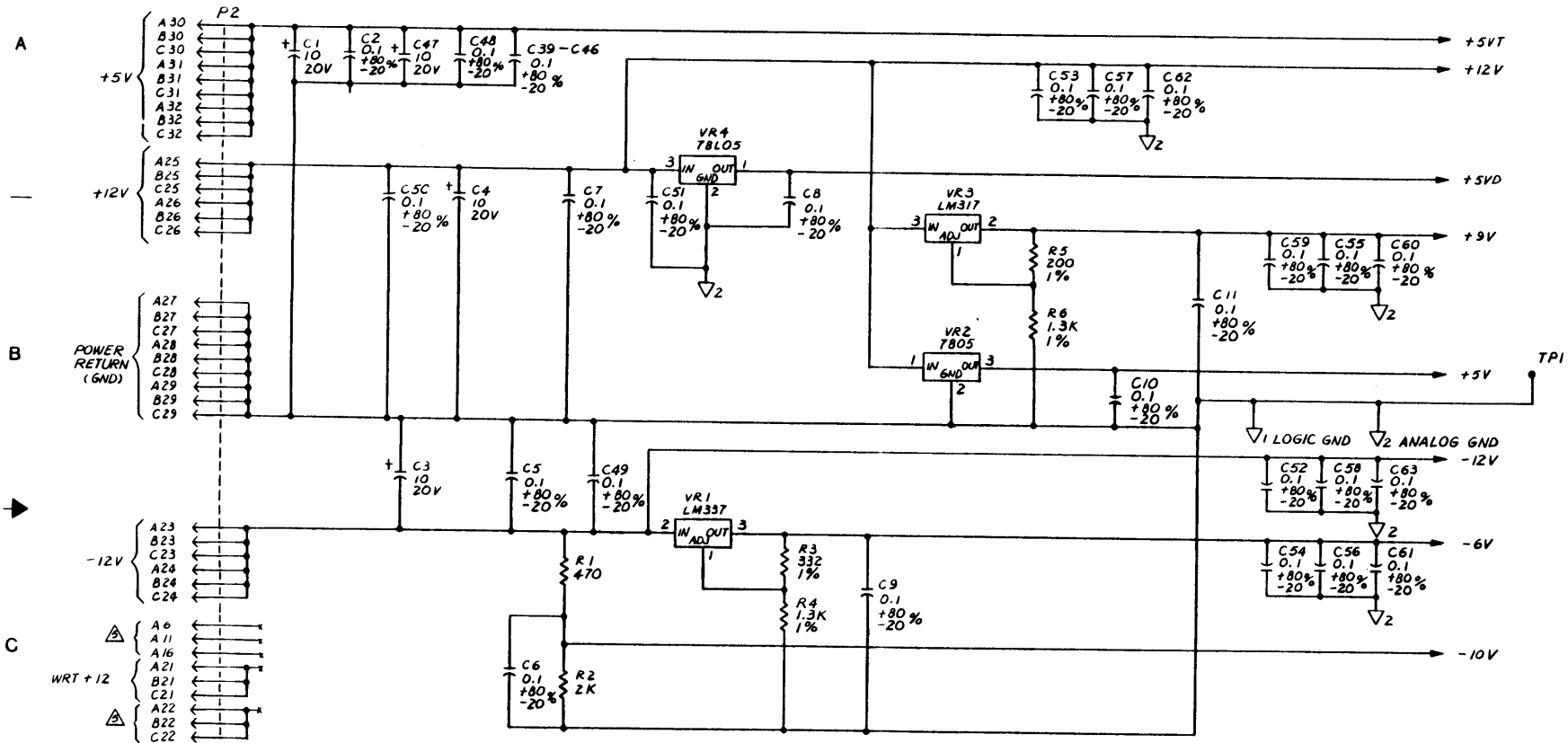
401-7113-000 D
SHEET 13 OF 13



FORMATTER
TYPE 7113-E
SCHEMATIC DIAGRAM

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401-7114-000 F
SHEET 1 OF 7



△ REFERENCE DESIGNATOR TRK, ETC. AND SMPL ARE NUMBERED 1 THRU 9 IN ASSOCIATION WITH HEAD AND TAPE TRACKS 1 THRU 9. THE NUMBERS IN PARENTHESIS (Ø THRU 7, AND P) SHOWN WITH THESE DESIGNATORS REFERENCE THE EBCDIC DATA CHANNEL ASSIGNED TO EACH TRACK.
 △ P1 AND P2 CONNECTOR PINS AND FUNCTIONS SHALL BE COORDINATED WITH THE MOTHER BOARD (401-7108-000) FOR PINS NOT SHOWN ON THIS DRAWING.

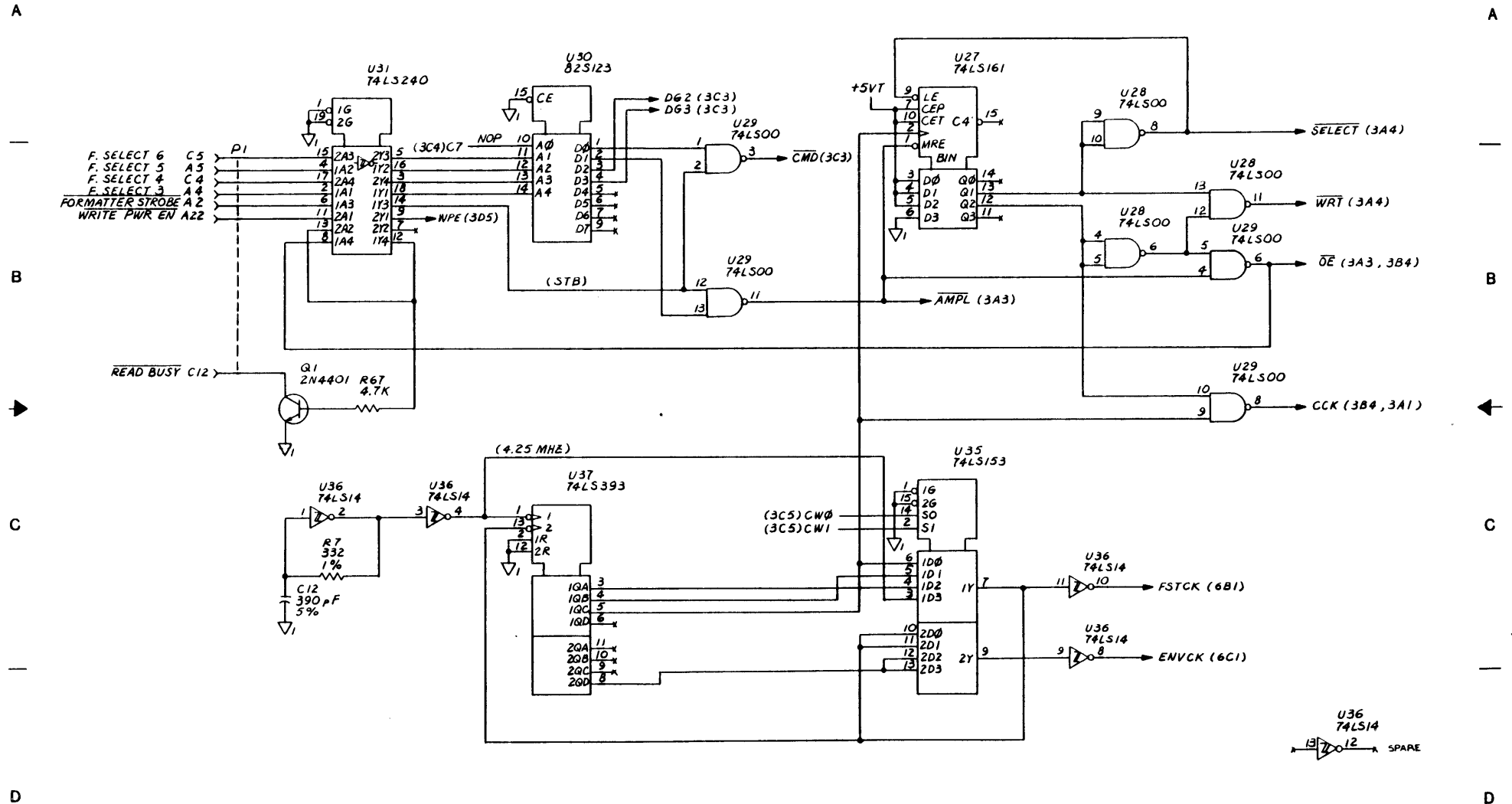
4. NOTES FOR THE TYPICAL CIRCUIT ARE SHOWN ON SHEET 5.
 3. ALL CAPACITOR VALUES ARE IN MICROFARADS ± 10%
 2. ALL RESISTOR VALUES ARE IN OHMS ± 5%, 1/4 W.
 1. X INDICATES NO CONNECTION.
 NOTES: UNLESS OTHERWISE SPECIFIED.

REF. DES.	TYPE	±5	±10
U28, 29, 16	74LS00	14	7
U15	7406	14	7
U36	74LS14	14	7
U19, 30	82S123	16	8
U35	74LS153	16	8
U27	74LS161	16	8
U17	74LS193	16	8
U12, 14, 31	74LS240	20	10
U23, 8, 11	5, 13	74LS244	20
U18, 21, 22	74LS374	20	10
U37	74LS393	14	7
U20	2714	18	9

LAST USED	NOT USED
C 63	
Q 1	
R 6B	R14, 66
U 37	
VR 4	
TP 1	

REV STATUS	REV	F	F	F	F	F	F	F
OF SHEETS	SHEET	1	2	3	4	5	6	7

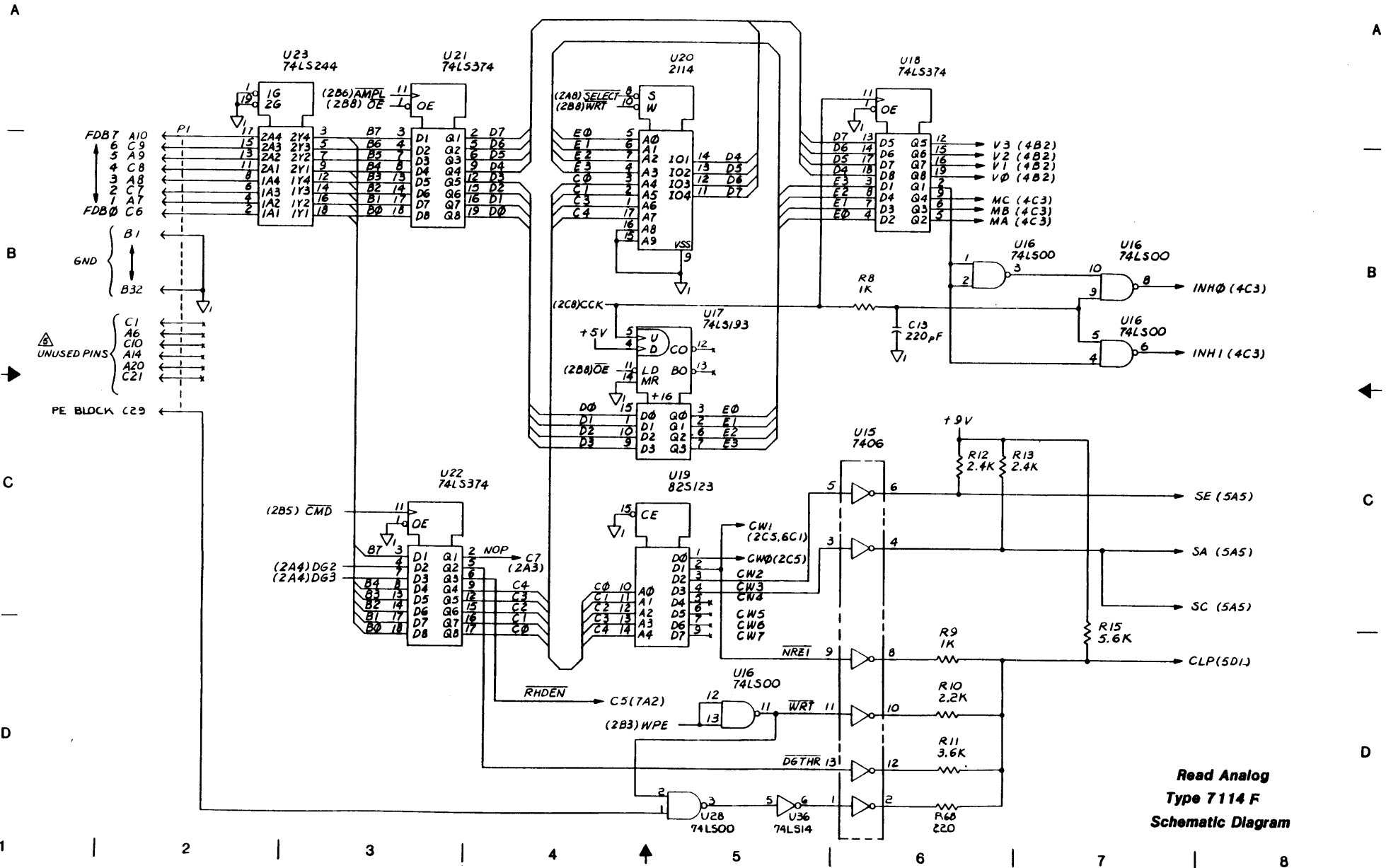
Read Analog
Type 7114 F
Schematic Diagram



Read Analog
Type 7114 F
Schematic Diagram

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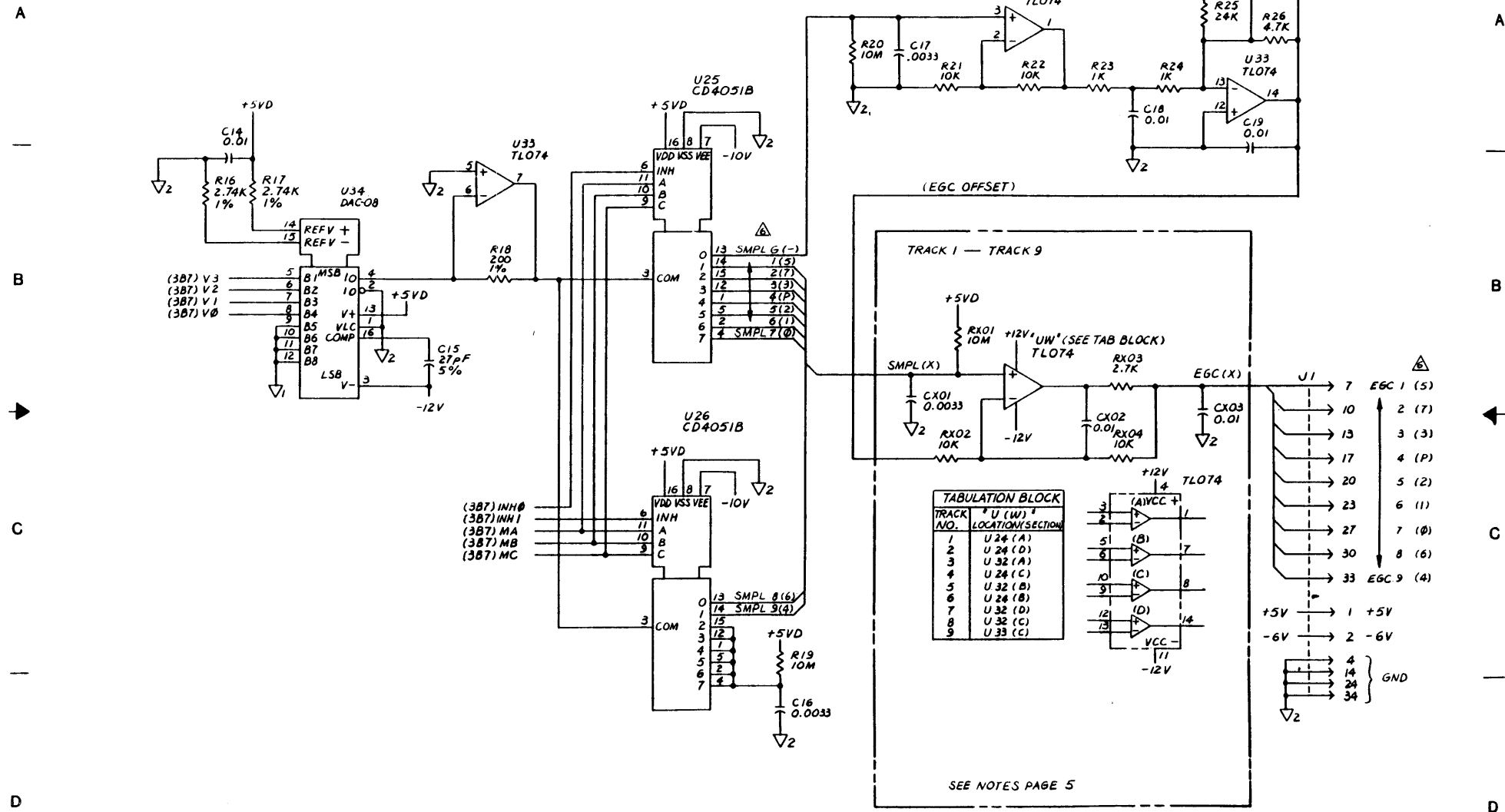
401-7114-000F
SHEET 3 OF 7



Read Analog
Type 7114 F
Schematic Diagram

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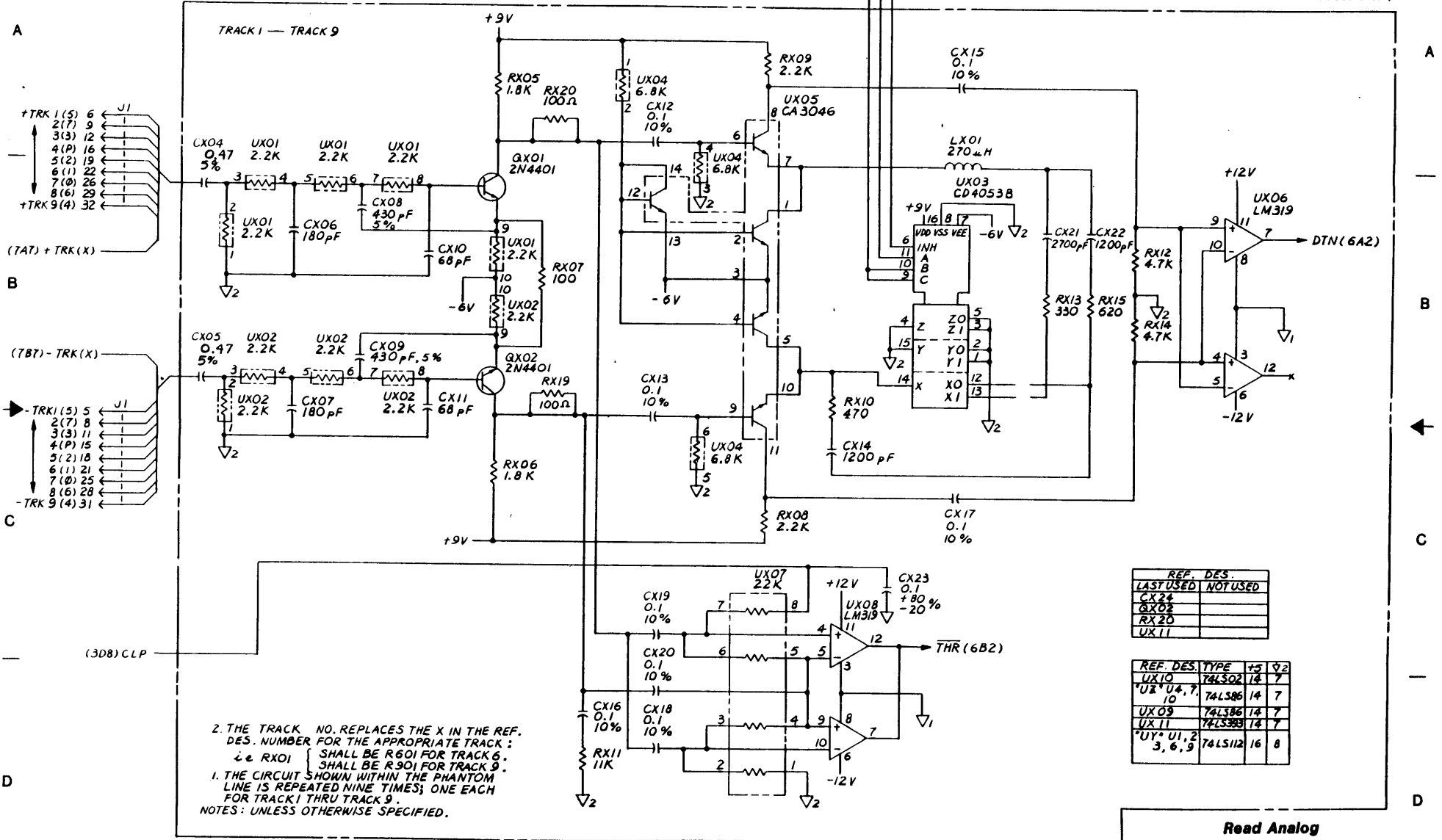
401-7114-000 F
SHEET 4 OF 7



Read Analog
Type 7114 F
Schematic Diagram

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401-7114-000 F
SHEET 5 OF 7



2. THE TRACK NO. REPLACES THE X IN THE REF. DES. NUMBER FOR THE APPROPRIATE TRACK:
 i.e. RX01 { SHALL BE R601 FOR TRACK 6.
 { SHALL BE R901 FOR TRACK 9.
 1. THE CIRCUIT SHOWN WITHIN THE PHANTOM LINE IS REPEATED NINE TIMES; ONE EACH FOR TRACK 1 THRU TRACK 9.
 NOTES: UNLESS OTHERWISE SPECIFIED.

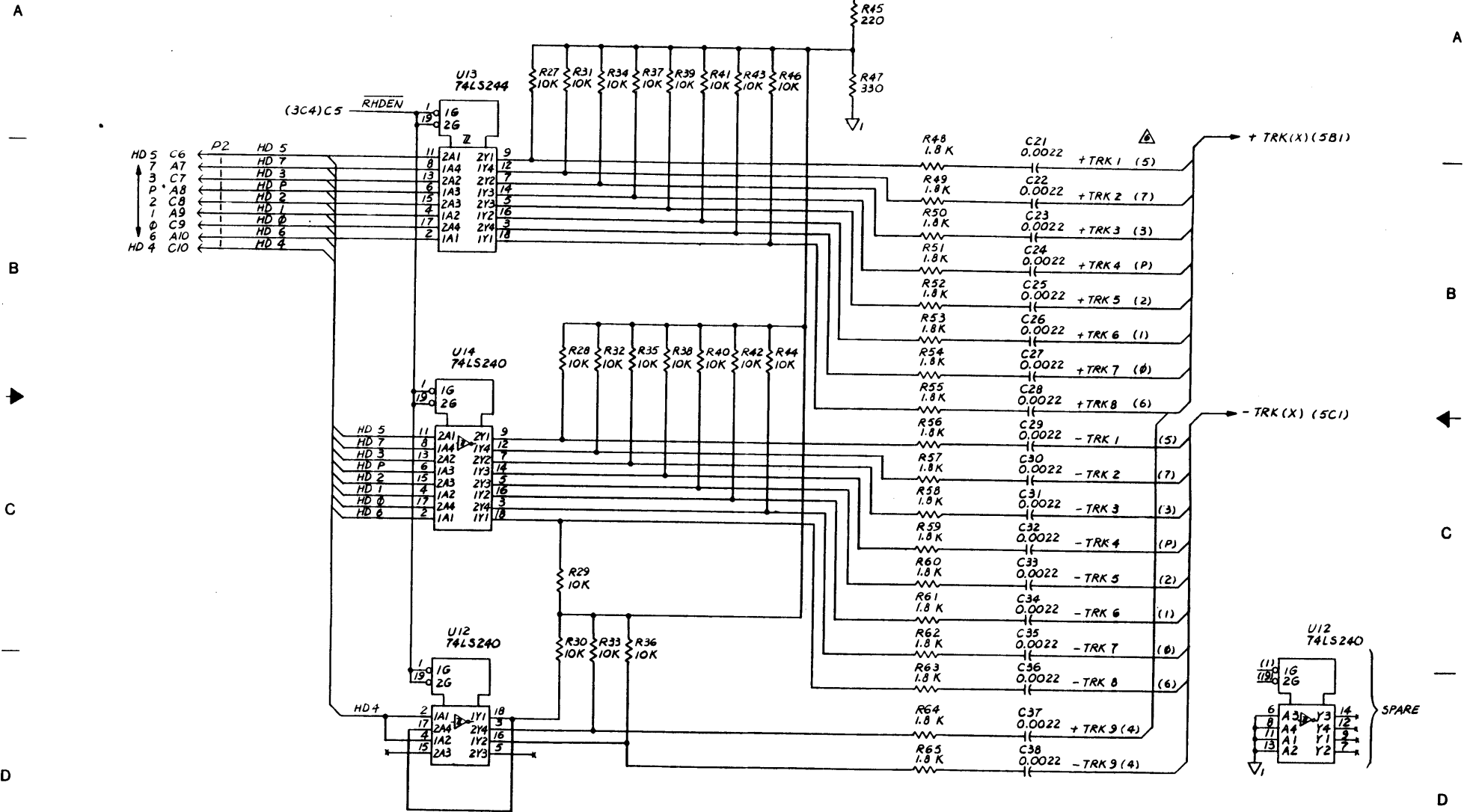
REF. DES.	LAST USED	NOT USED
CX24		
QX02		
RX20		
UX11		

REF. DES.	TYPE	±5	±2
UX10	74LS02	14	7
UX14, 7, 10	74LS06	14	7
UX09	74LS06	14	7
UX11	74LS03	14	7
UY* U1, 2, 3, 6, 9	74LS12	16	8

Read Analog
Typé 7114 F
Schematic Diagram

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*01-7114-000 F
SHEET 7 OF 7



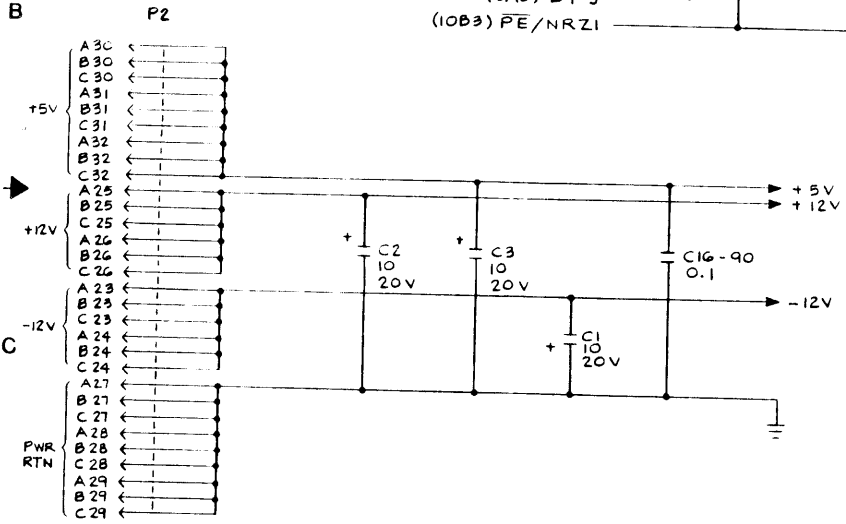
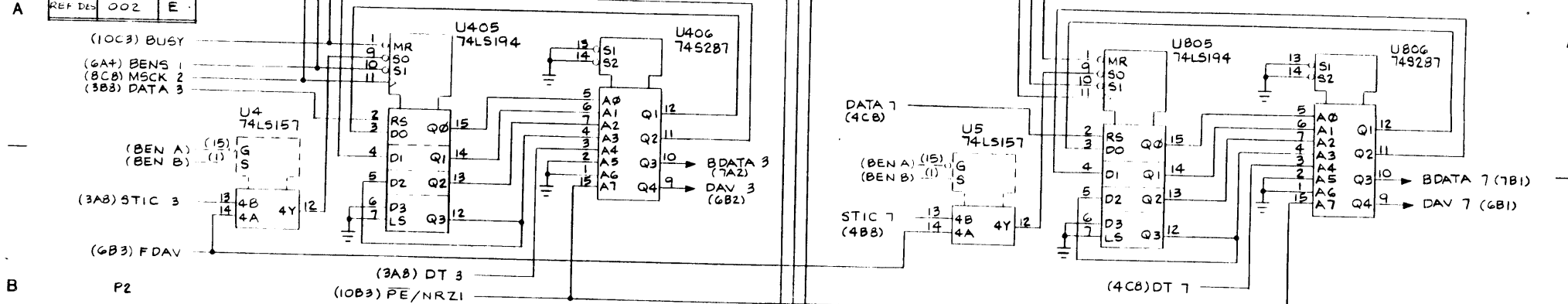
Read Analog
Type 7114 F
Schematic Diagram

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4-01-7115-000 M
SH 1 OF 10

190-07115 TABULATION

REF DES	DASH NO	REV
002		E



REV STATUS	REV	M	A	A	A	A	H	B	K	J	
OF SHEETS	SHEETS	1	2	3	4	5	6	7	8	9	10

REF DES	TYPE	+5V	GND
U21, 25, 52	74LS00	14	7
U56	74LS02	14	7
U1, 2, 2, 8, 43	74LS04	14	7
59, 75	74LS04	14	7
U7, 8, 19, 22	74LS08	14	7
49, 55, 62, 76	74LS08	14	7
U71, 79	74LS26	14	7
U60, 64	74LS54	14	7
U46	7474	14	7
U68, 70	74LS44	14	7
U13	74LS22	14	7
U42	74LS86	14	7
U25, 26, 32, 34			
45, 48, 51, 54			
61, 69, 103, 203			
303, 403, 503, 203	74LS109	16	8
703, 803, 903, 104			
204, 304, 404, 304			
504, 704, 804, 904			
U12	74LS133	16	8
U74, 77	74LS153	16	8
U17	74LS162A	16	8
U39, 40, 72, 73			
102, 202, 302	74LS163A	16	8
402, 502, 602			
702, 802, 902			
U36	74LS164	14	7

REF DES	TYPE	+5V	GND
U24	74LS161A	16	8
U4, 5, 18, 27	74LS157	16	8
50, 63			
U10, 14, 41	74LS166	16	8
U57	74175	16	8
U11	74LS175	16	8
U3, 6, 9, 59	74LS174	16	8
U23, 44, 58, 65			
105, 205, 305	74LS194	16	8
405, 505, 605			
705, 805, 905			
U20, 66	74LS240	20	10
U30, 31, 37, 38	74LS377	20	10
U16	74LS399	16	8
U101, 201, 301			
401, 501, 601			
701, 801, 901	74S287	16	8
106, 206, 306			
406, 506, 606			
706, 806, 906			
U29	82S137	18	9
U15	82S131	16	8
U80	20	20	10
U47	LM339	3	12

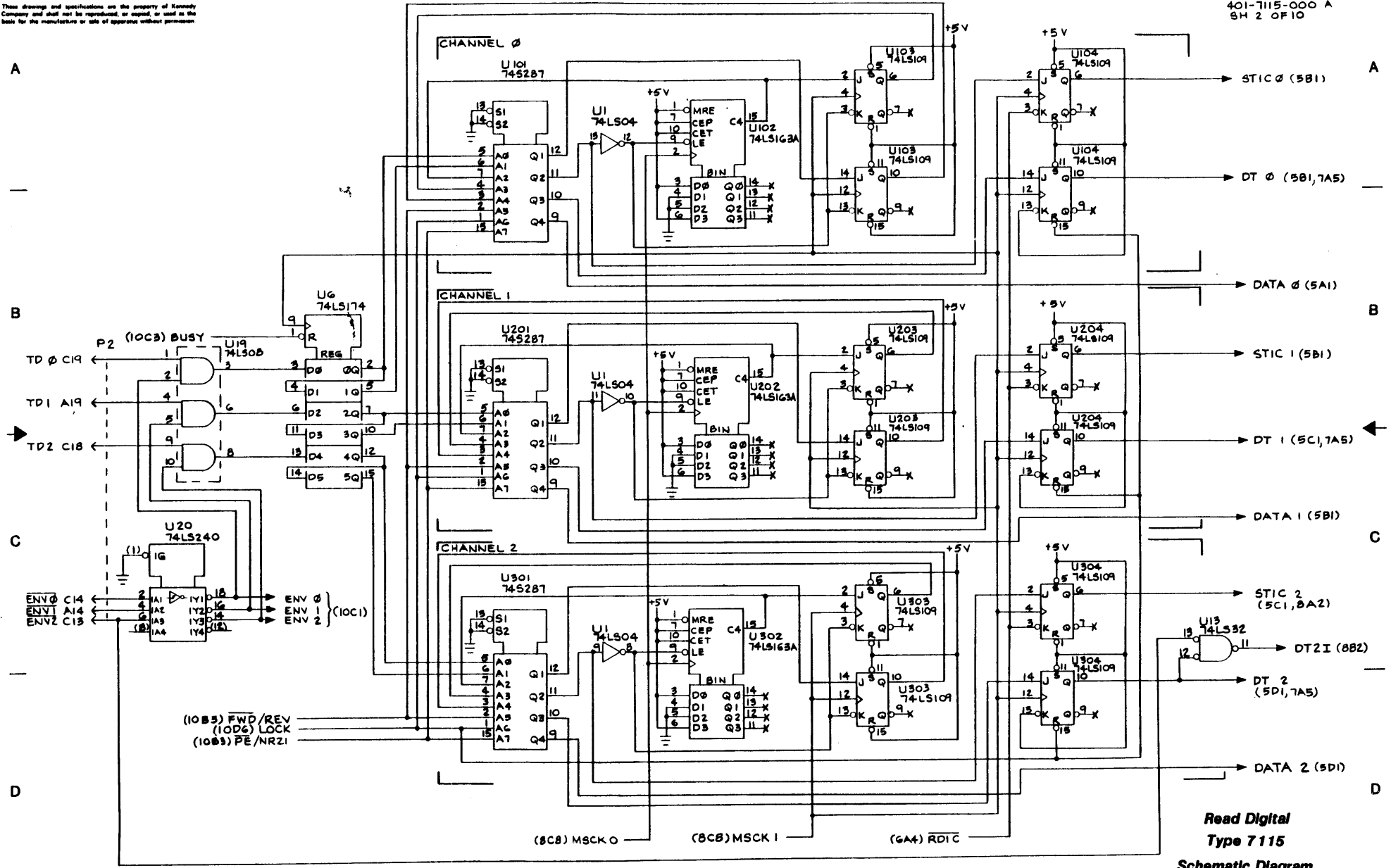
REF DESIGNATORS	LAST USED	NOT USED
C 90		C 15
C 91		
R 29		
U 906		
U 2		
U 80		

5 P1 AND P2 CONNECTOR PIN AND FUNCTION SHALL BE COORDINATED WITH THE MOTHER BOARD (401-7108-000) FOR PINS NOT SHOWN ON THIS DRAWING.
 4 U20 IS A SPARE LOCATION ON THE BOARD.
 3 X INDICATES NO CONNECTION.
 2 ALL CAPACITOR VALUES ARE IN MICROFARADS.
 1. ALL RESISTOR VALUES ARE IN OHMS, 5%, 1/4 W.
 NOTES: UNLESS OTHERWISE SPECIFIED

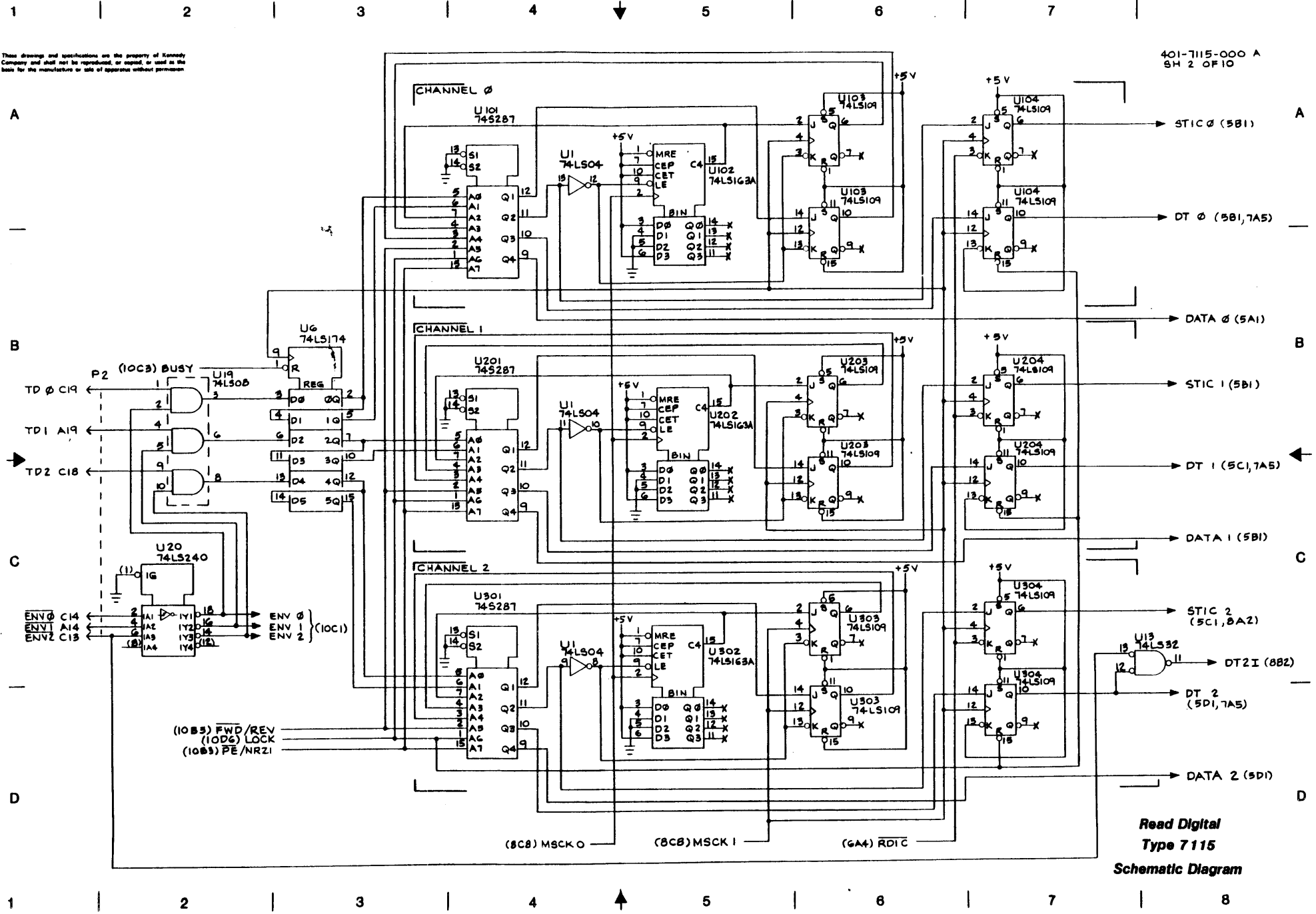
Read Digital
Type 7115
Schematic Diagram

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401-7115-000 A
SH 2 OF 10

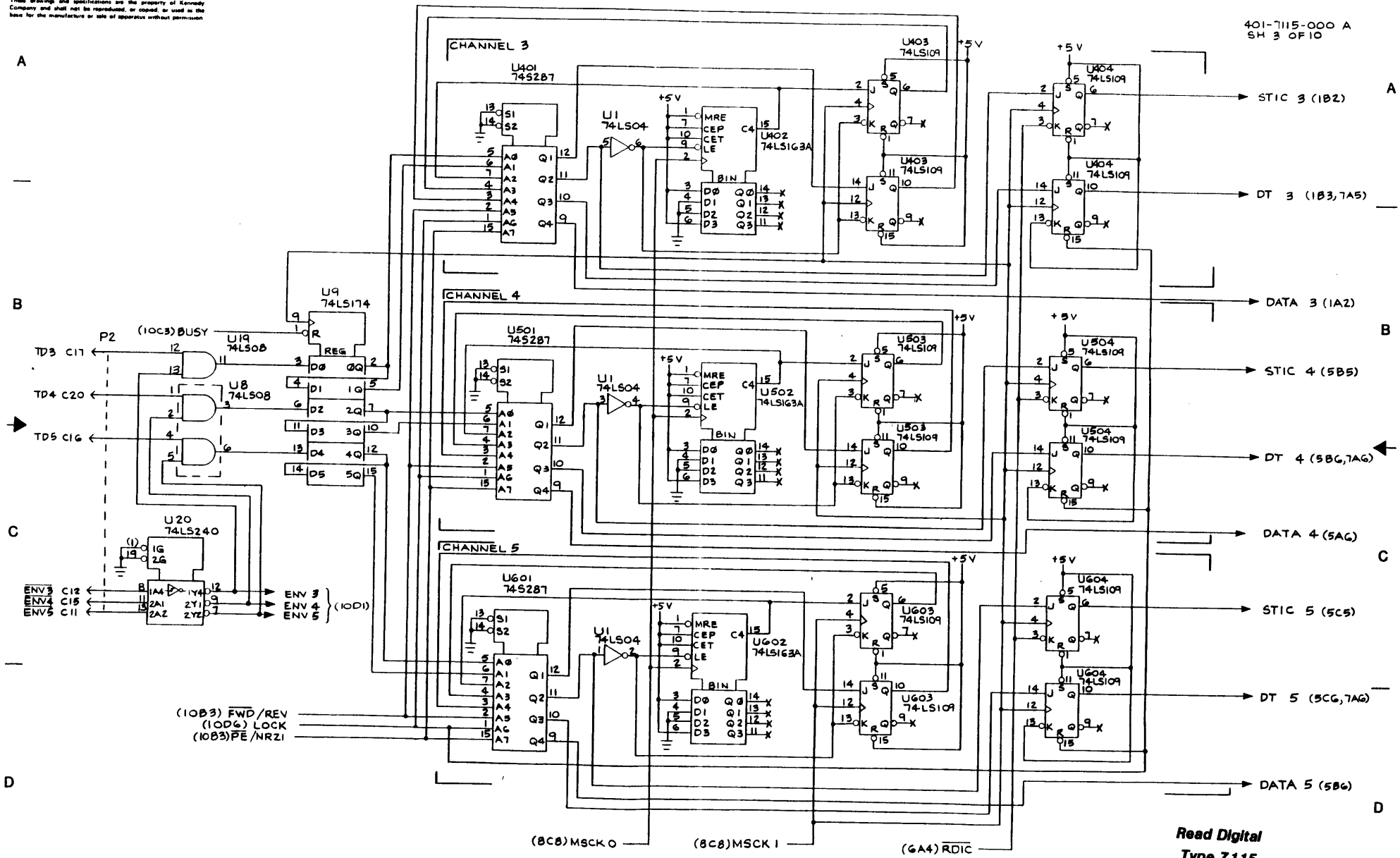


Read Digital
Type 7115
Schematic Diagram



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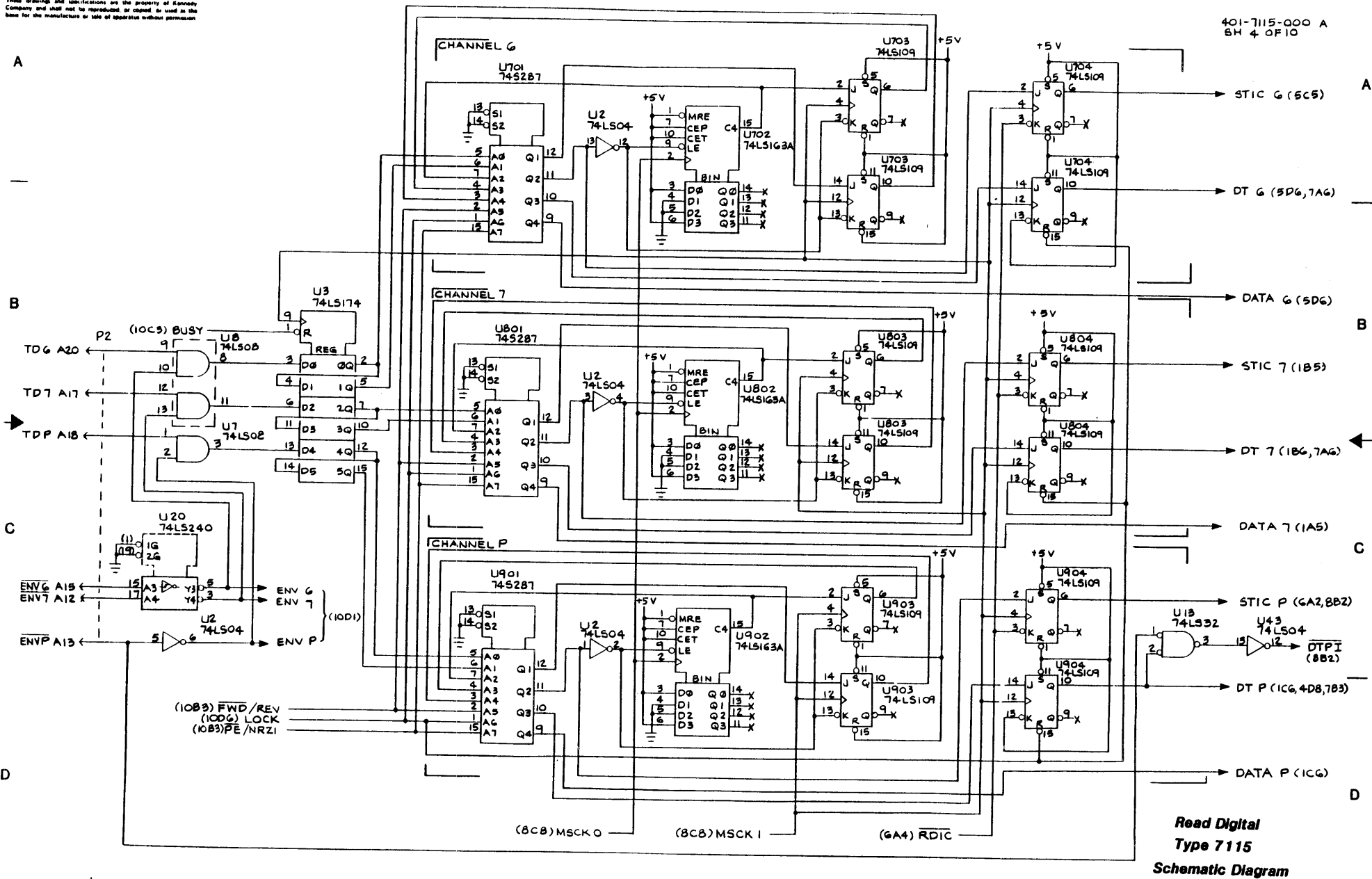
401-7115-000 A
SH 3 OF 10



Read Digital
Type 7115
Schematic Diagram

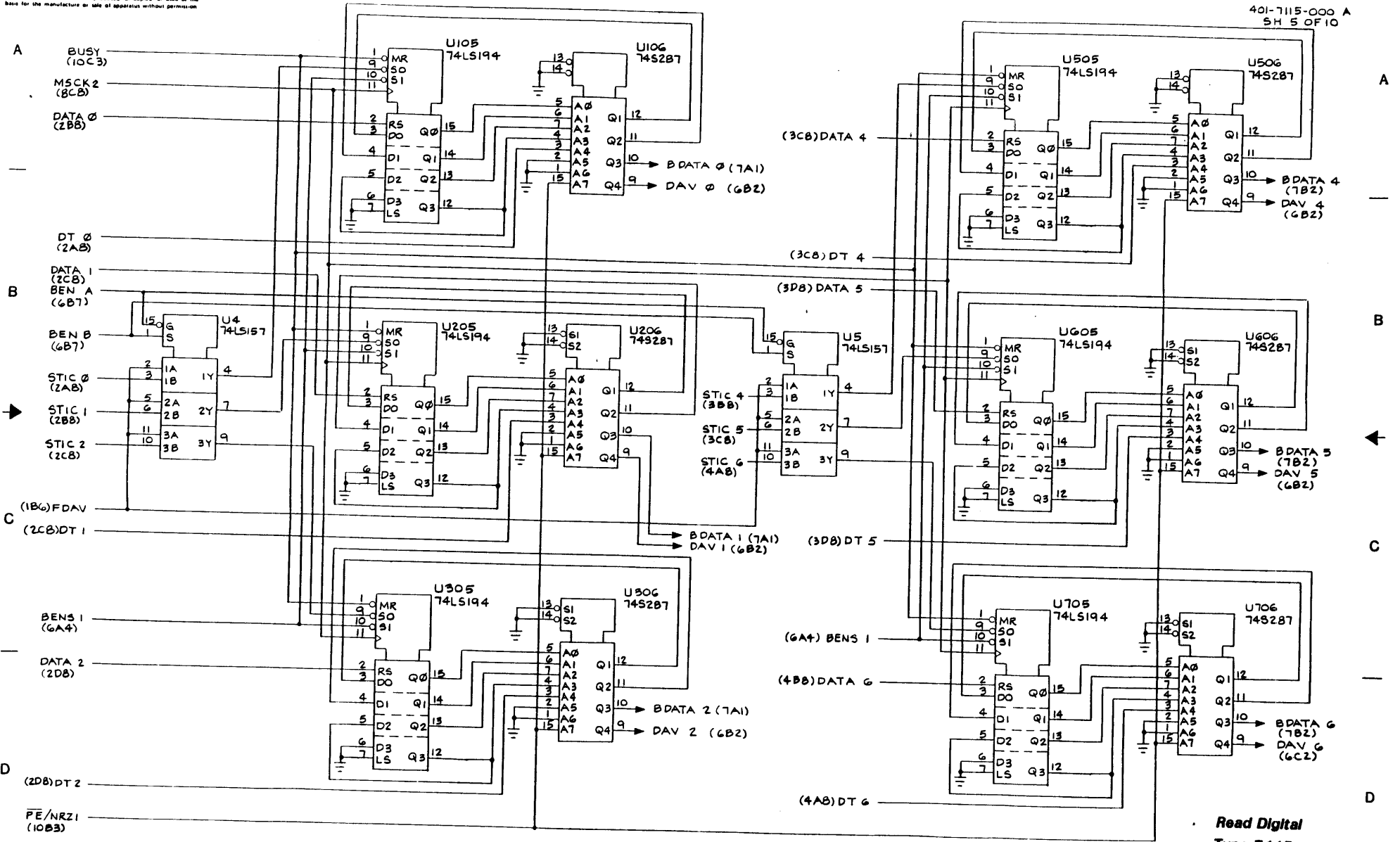
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401-7115-000 A
BH 4 OF 10



Read Digital
Type 7115
Schematic Diagram

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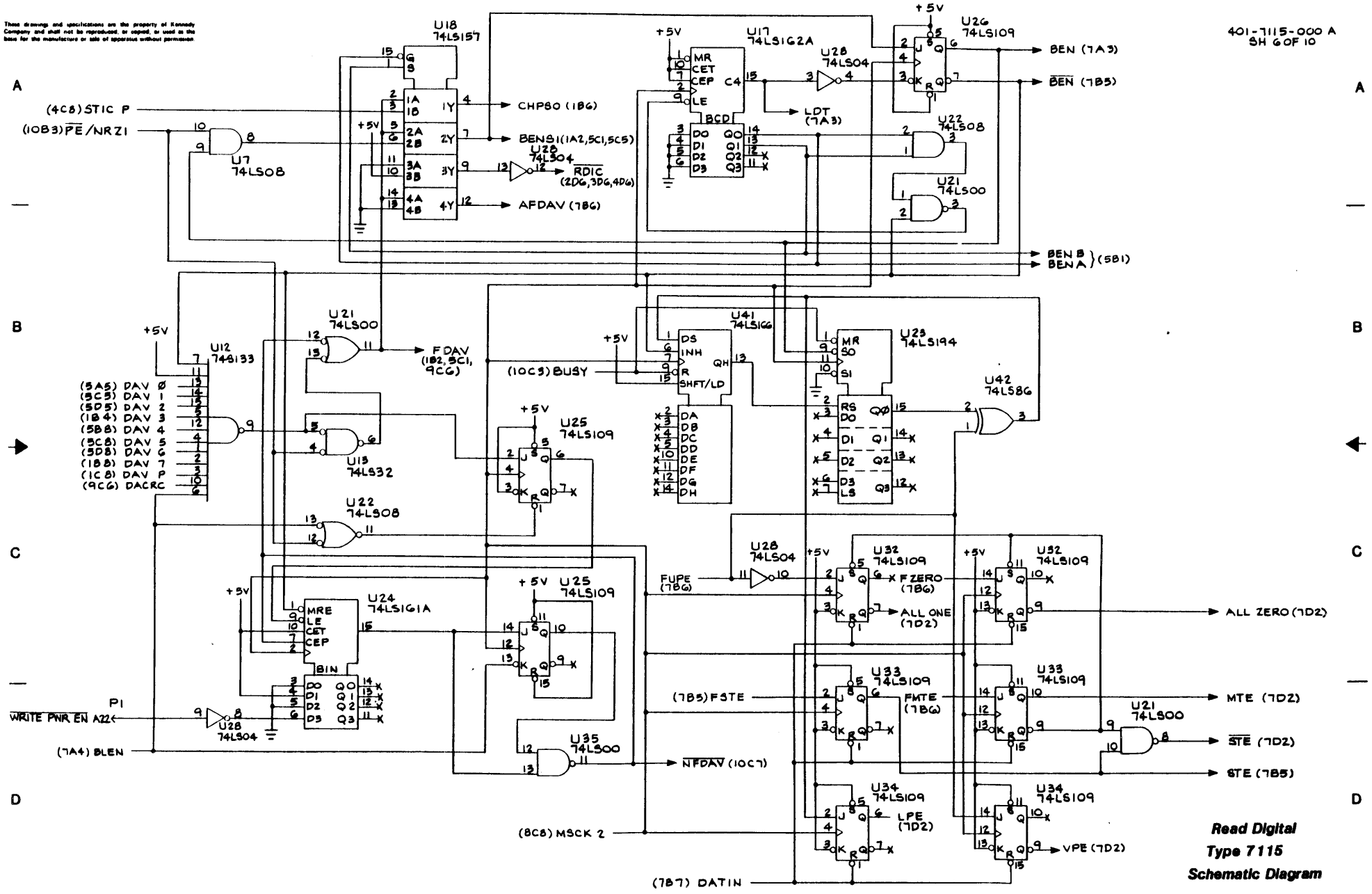


401-7115-000 A
SH 5 OF 10

Read Digital
Type 7115
Schematic Diagram

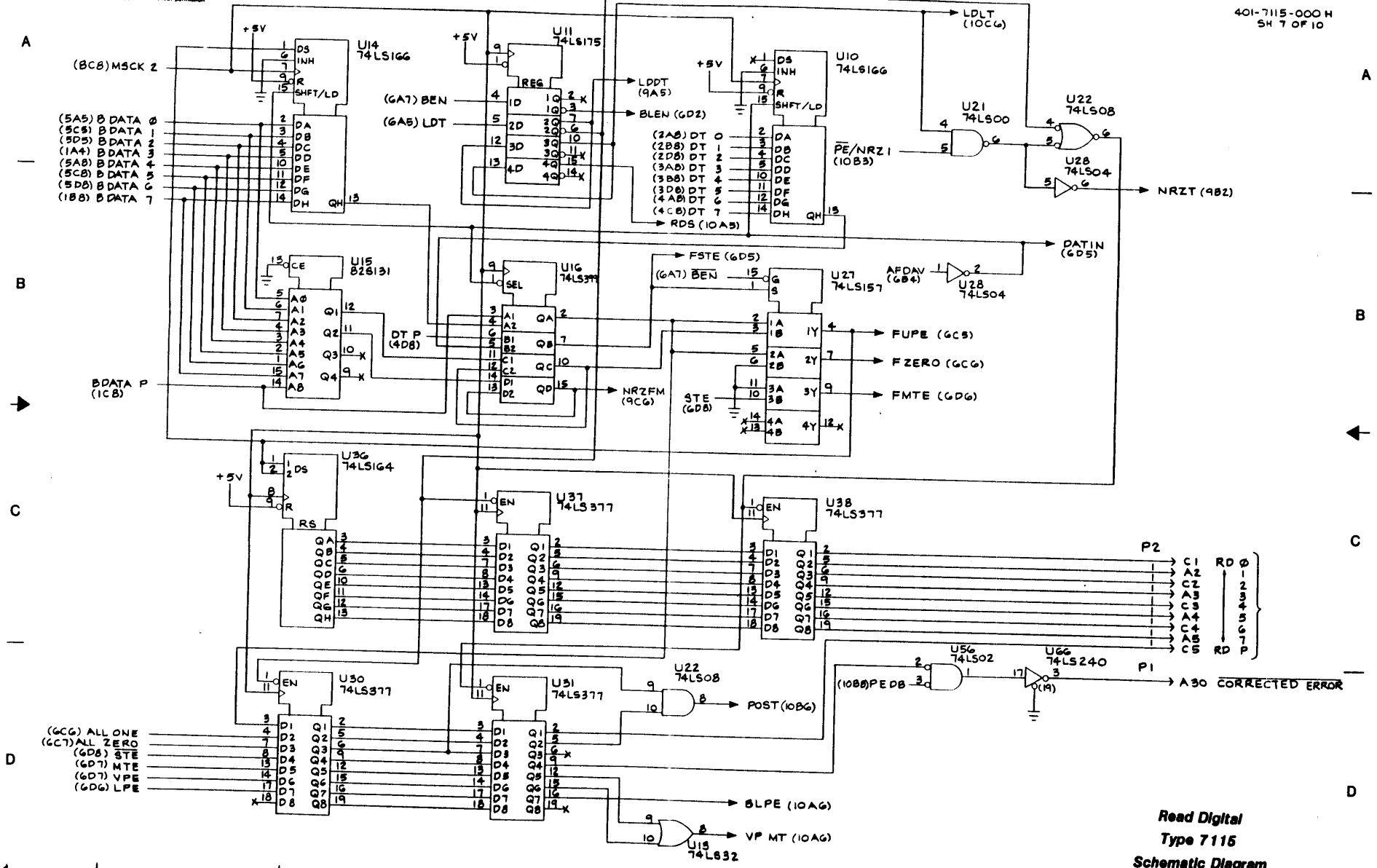
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401-7115-000 A
SH 6 OF 10



Read Digital
Type 7115
Schematic Diagram

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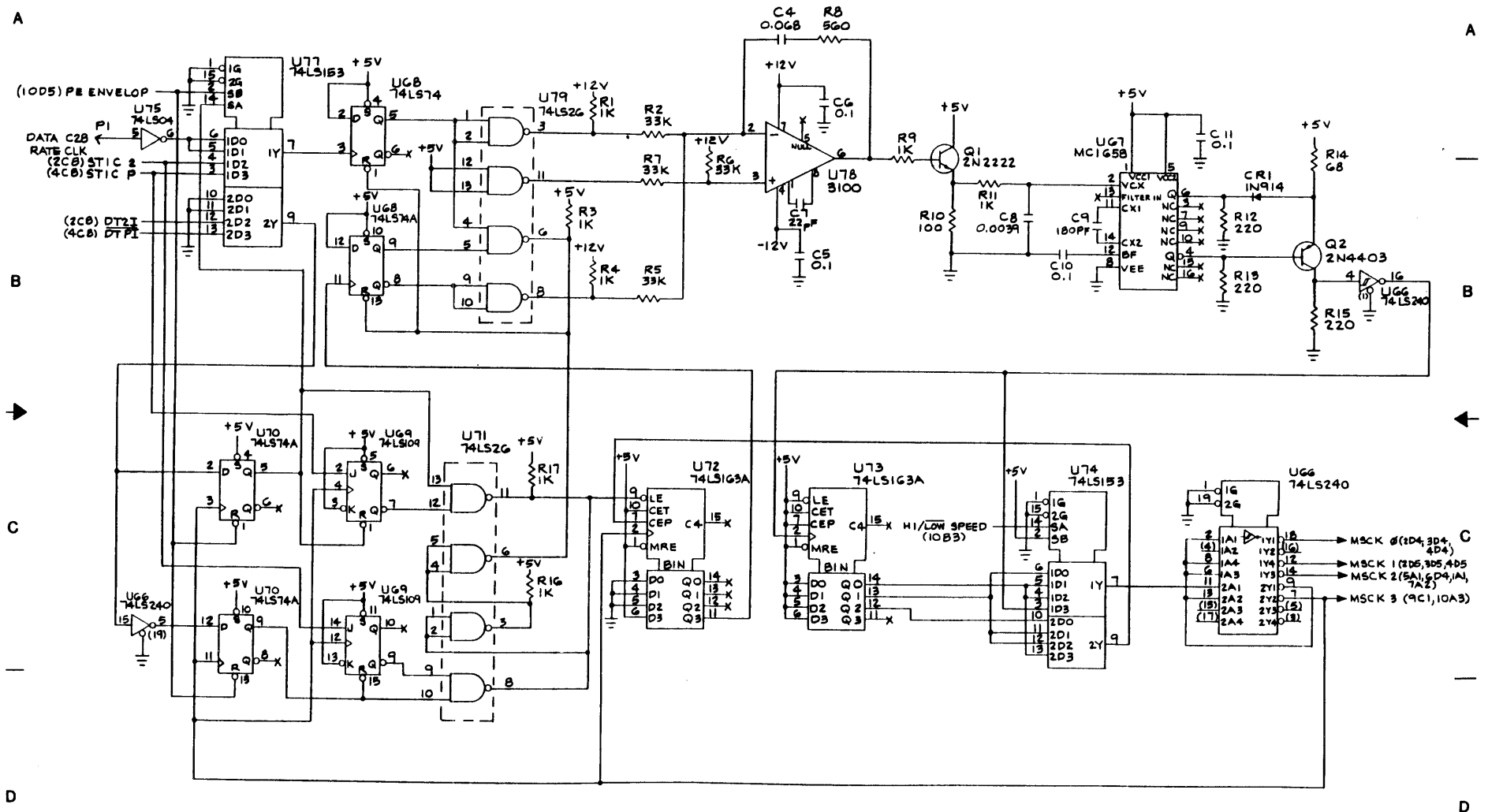


Read Digital
Type 7115
Schematic Diagram

1 | 2 | 3 | 4 | 5 | 6 | 7

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401-7115-000 B
SH 8 OF 10

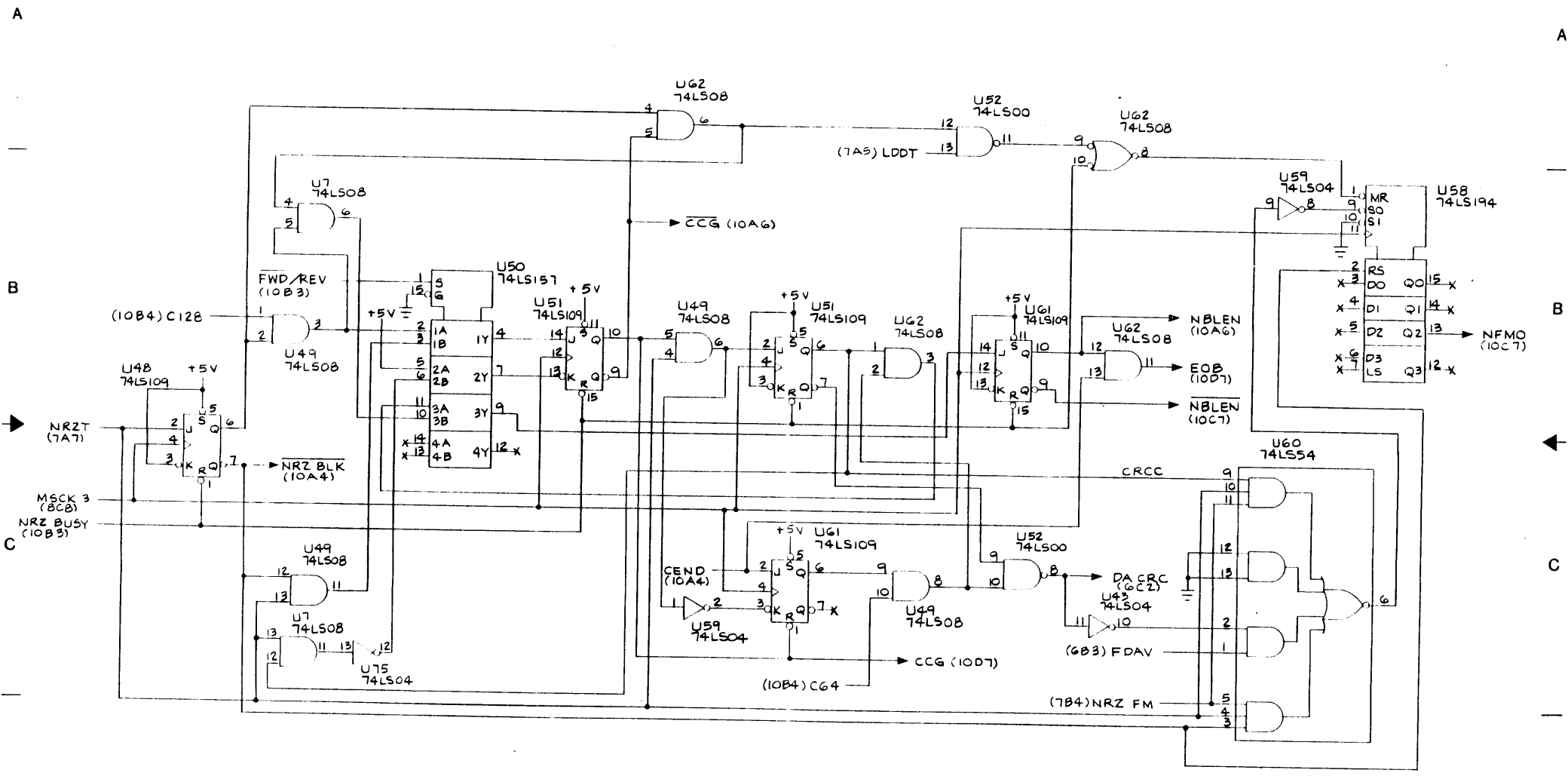


C | D

Read Digital
Type 7115
Schematic Diagram

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

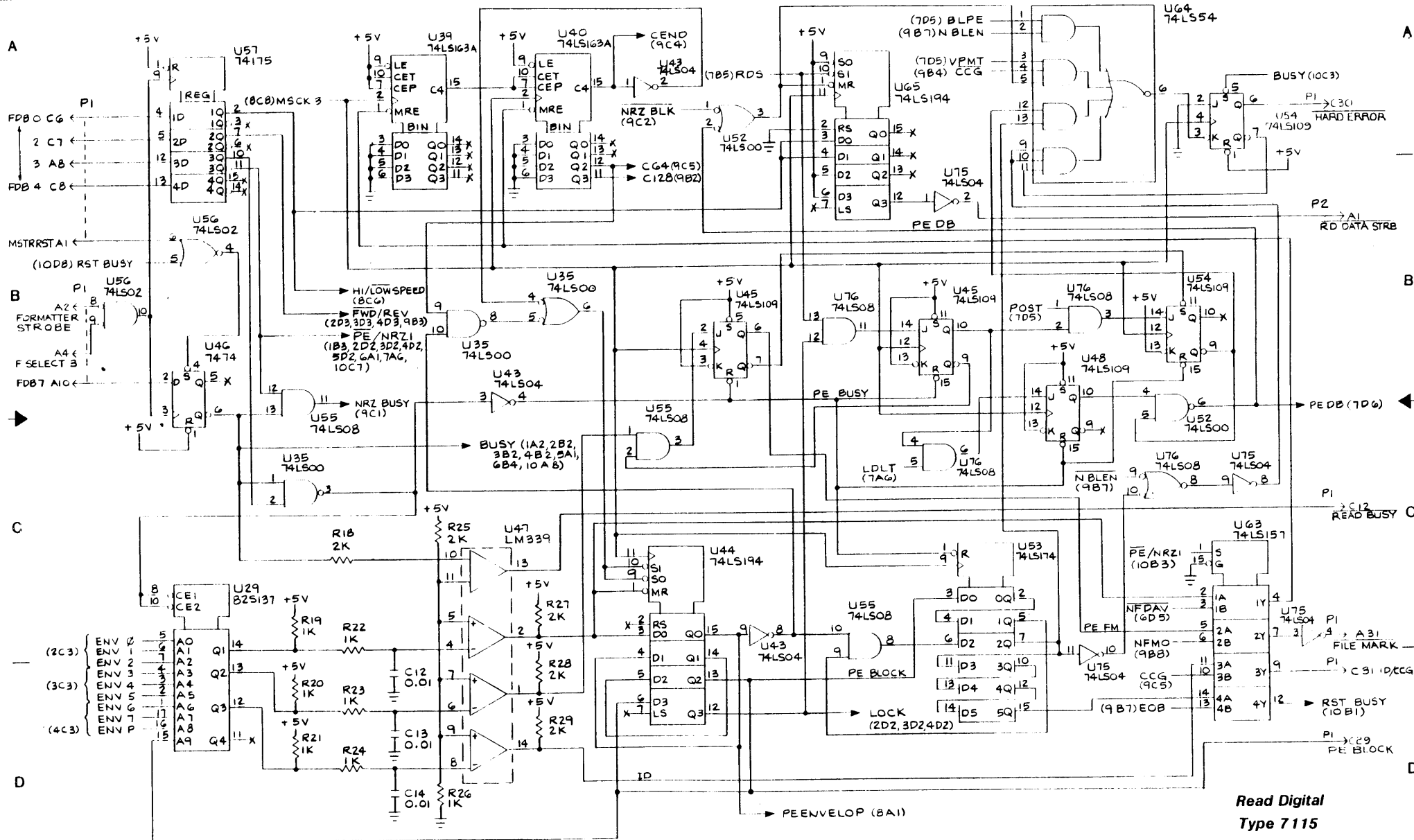
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Read Digital
Type 7115
Schematic Diagram

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401-7115-000 J
SH 10 OF 10



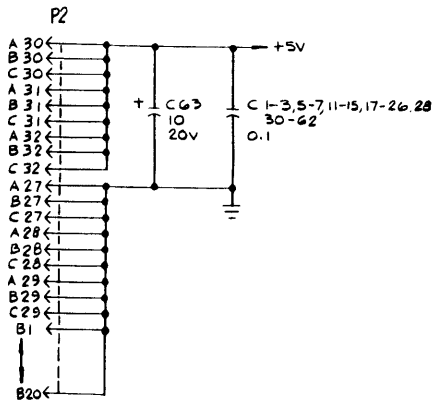
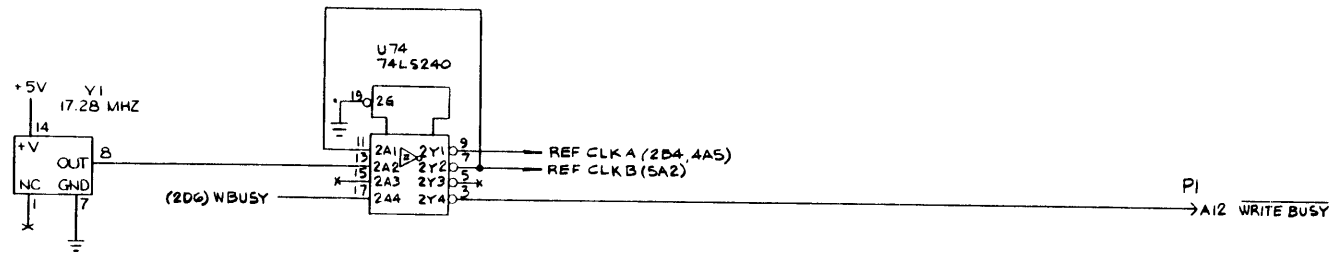
Read Digital
Type 7115
Schematic Diagram

A

B

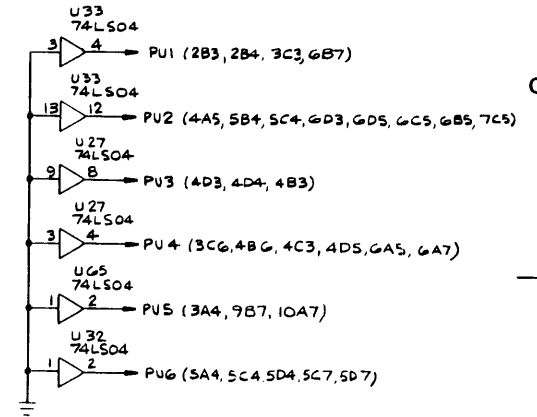
C

D



REF DESIGNATOR	LAST USED	NOT USED
C63	---	---
CR2	---	---
R21	---	---
U112	---	---
Y1	---	---
C9001	---	---
A9004	---	---
U9002	---	---
CA9002	---	---

REFERENCE DES	TYPE	GND	+5V
U43, 58, 92	2716	-	24
U88	MC8500	12	24
U12	7406	7	14
U89	74180	7	14
U78	74LS85	8	16
U26, 84	74LS00	7	14
U101	74225	7	14
U64	74LS27	7	14
U31, 86, 95	74LS138	8	16
U55, 56, 66, 69, 79, 80	74LS157	8	16
U15, 23, 61, 71, 72, 77, 87, 102, 106	74LS161	8	16
U14, 22, 30	74LS161	8	16
U17, 44, 75, 76, 94, 96, 98, 109	74LS74A	7	14
U34, 48	74LS153	8	16
U45, 50, 59, 83, 91, 99	74LS174	8	16
U90, 100	74LS374	10	20
U47, 67, 81	74LS86	7	14
U37, 108, 110, 111	74LS244	10	20
U25	74S02	7	14
U46, 49	74LS02	7	14
U18, 68	74S04	7	14
U27, 32, 33, 54, 62, 65	74LS04	7	14
U16, 19, 36, 52, 53, 70, 73, 82, 107	74LS08	7	14
U20, 24, 28, U35	74LS11	7	14
U85, 93	74LS279	8	16
U38-42	74LS109	8	16
U37, 51	7489	8	16
U57, 60, 104, 5	74LS32	7	14
U13, 63, 103, 105	74LS139	8	16
U11, 74, 112	74LS240	10	20
U1-4, 6, 7	74LS04	10	20
UB-10	74LS04	7-10	20

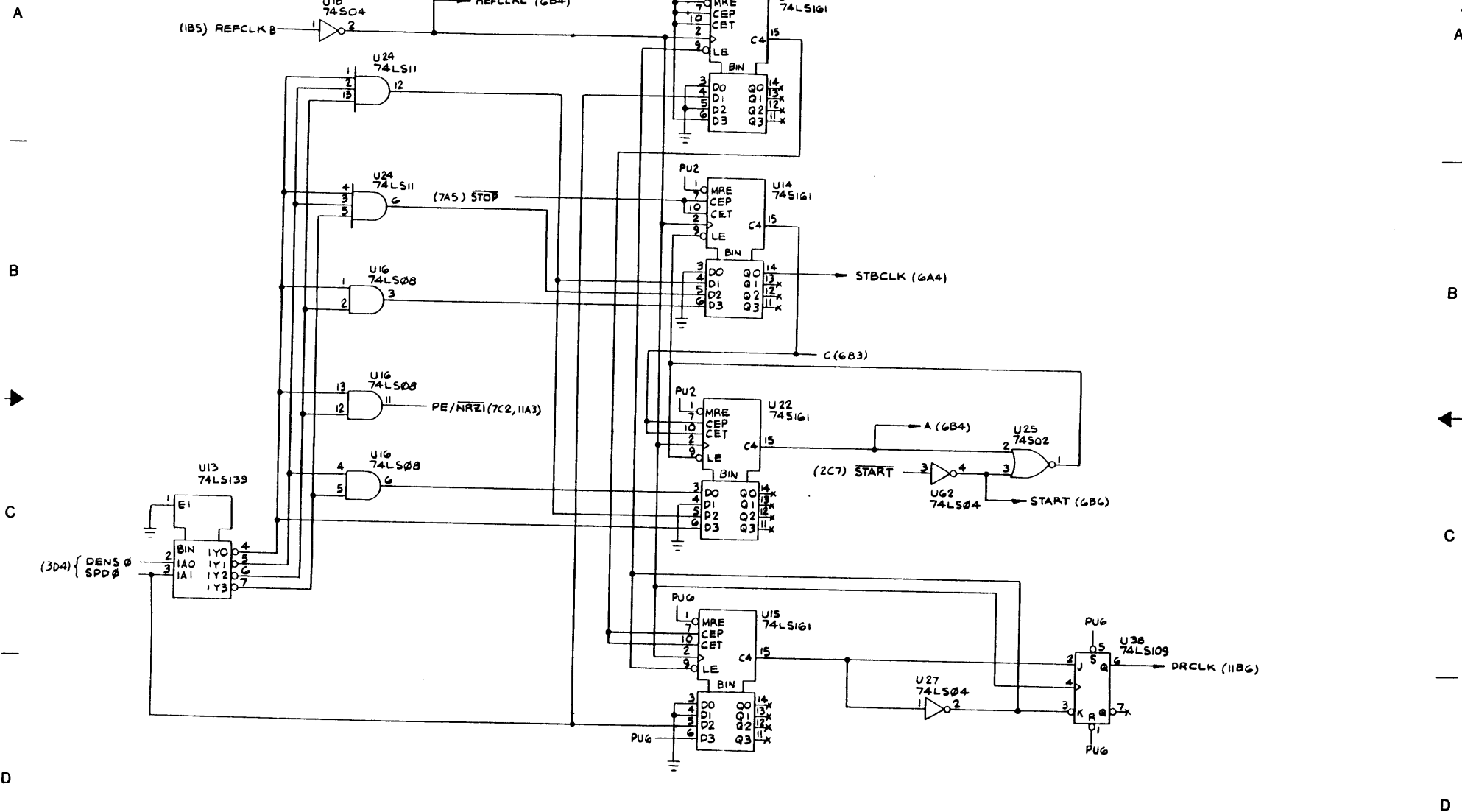


**WRITE MODULE
TYPE 7116 D
SCHEMATIC DIAGRAM**

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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4-01-7116-000
SHEET 5 OF 11



WRITE MODULE
TYPE 7116 D
SCHEMATIC DIAGRAM

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

A

B

C

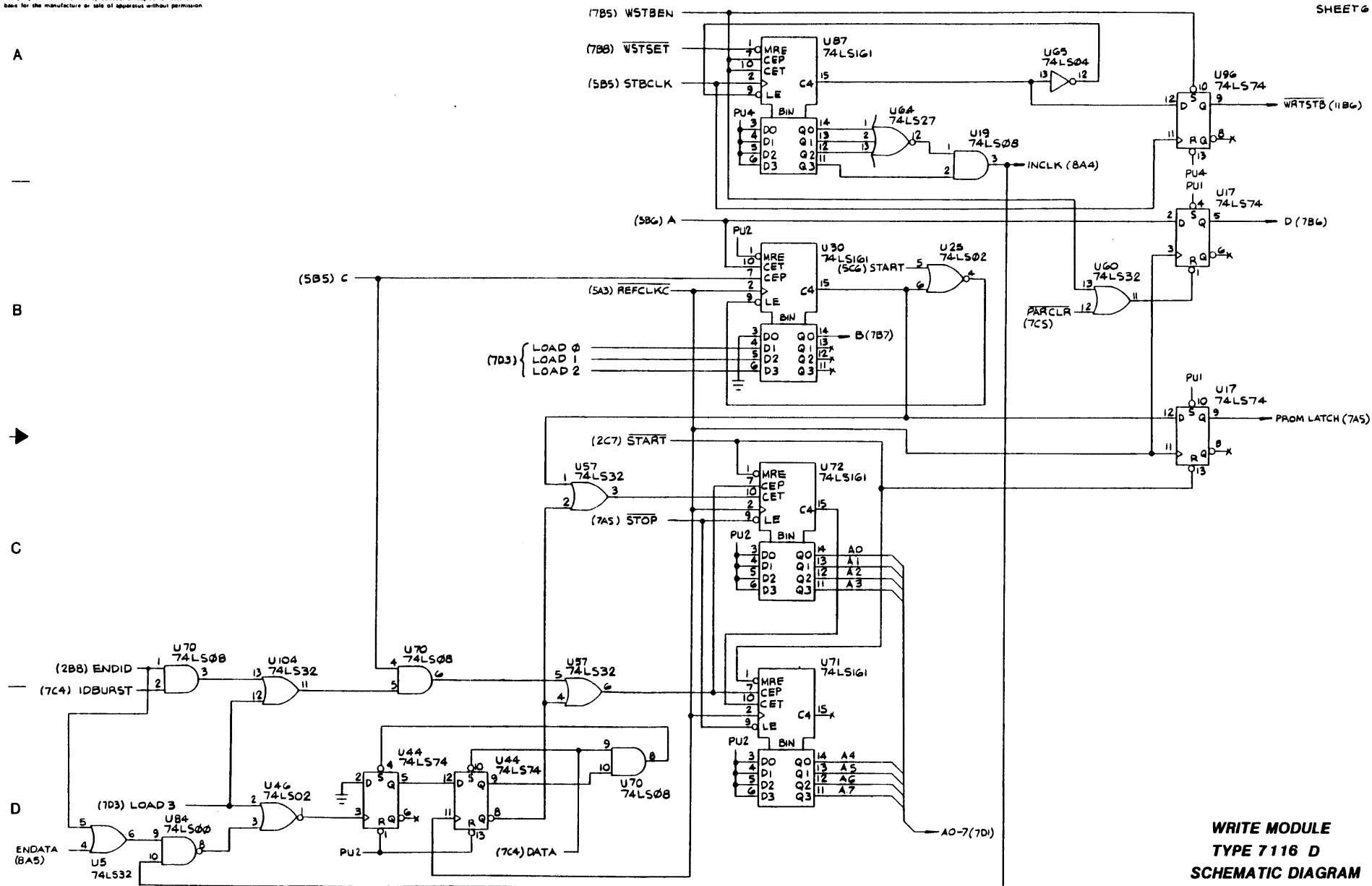
D

A

B

C

D



**WRITE MODULE
TYPE 7116 D
SCHEMATIC DIAGRAM**

1

2

3

4

5

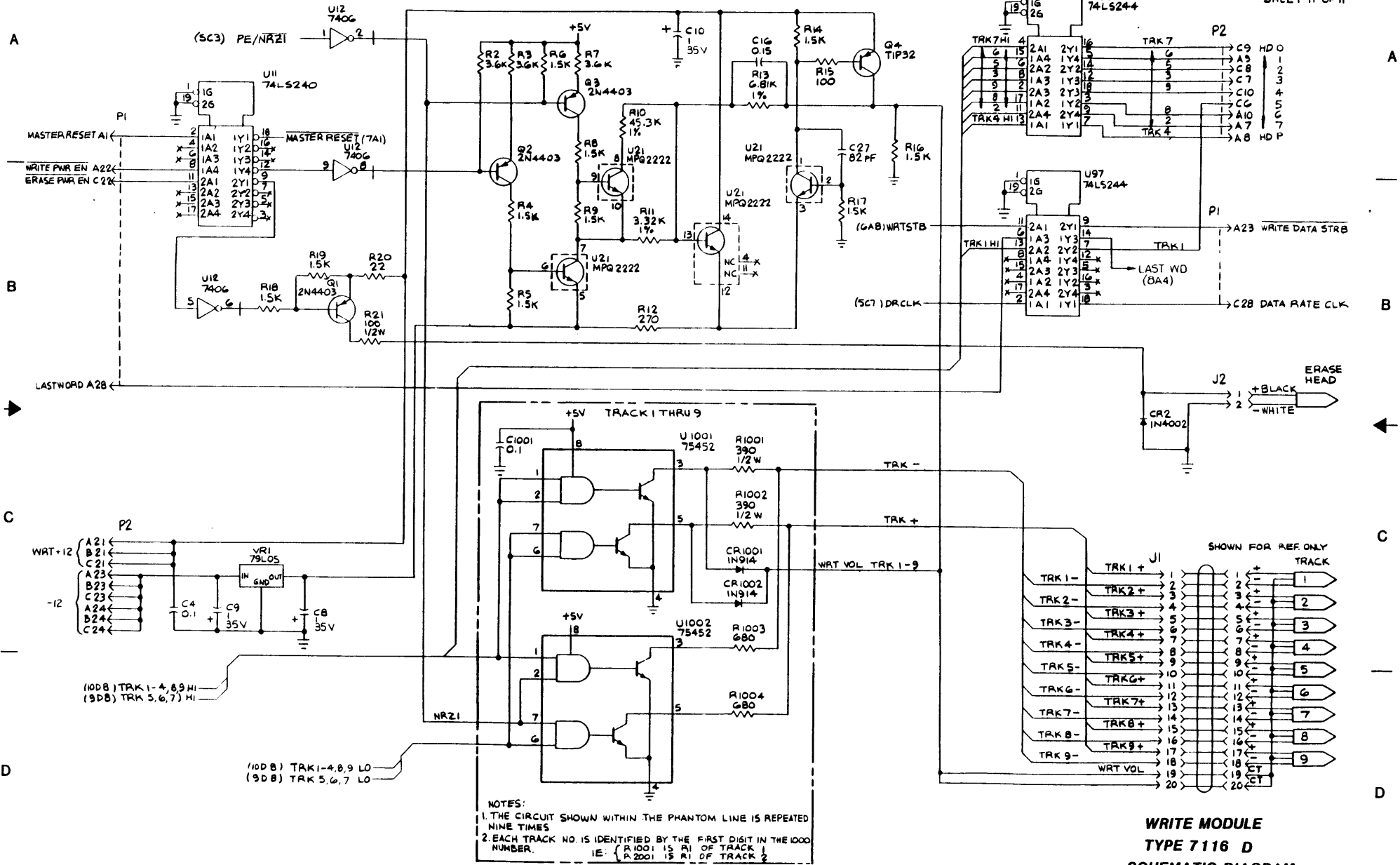
6

7

8

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401-7116-0000
SHEET 11 OF 11



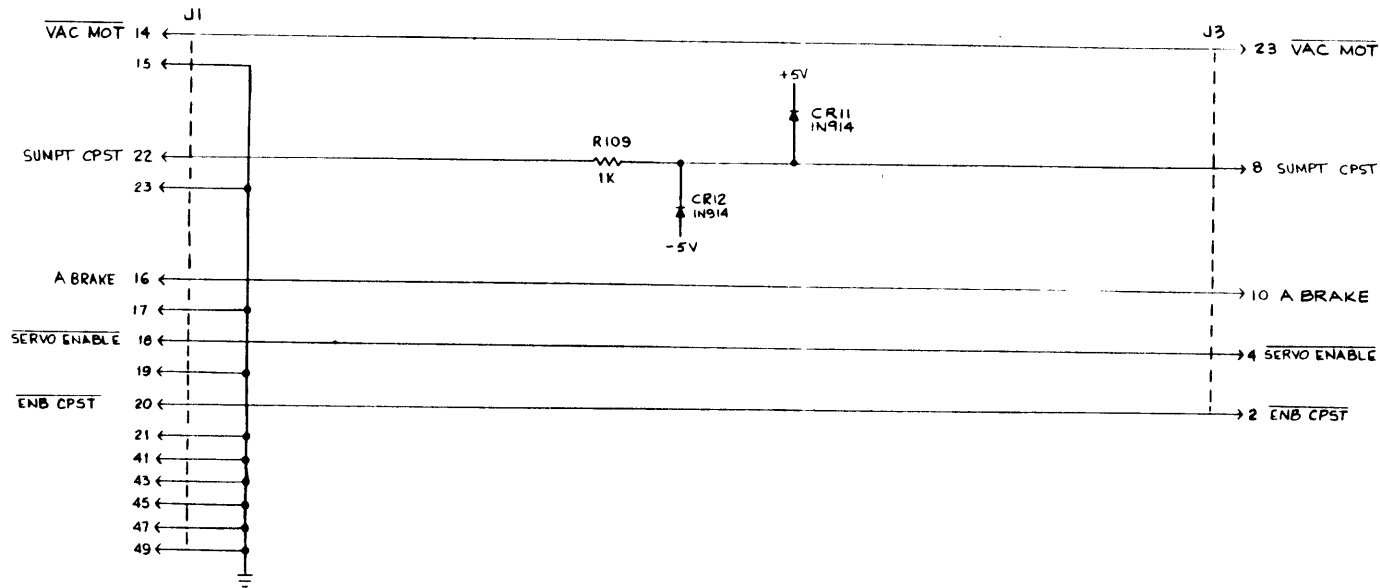
**WRITE MODULE
TYPE 7116 D
SCHEMATIC DIAGRAM**

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401-7147-000 B
SHT 1 of 4

A

A



B

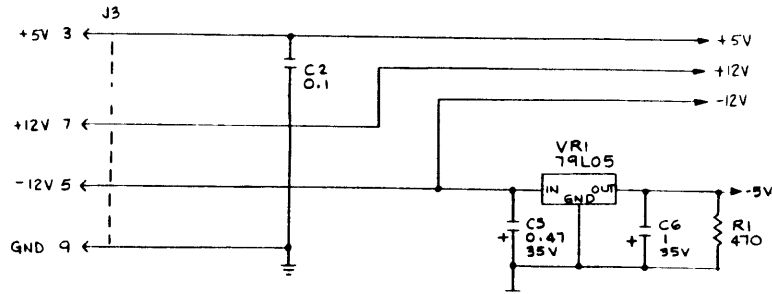
B

C

C

C

C



REF	DES	TYPE	+5V	GND
U4		74LS02	14	7
V5		74LS32	14	7

REFERENCE	DESIG
U4	USED
C1	NOT USED
CR12	
Q2	
R113	
U11	
VR1	

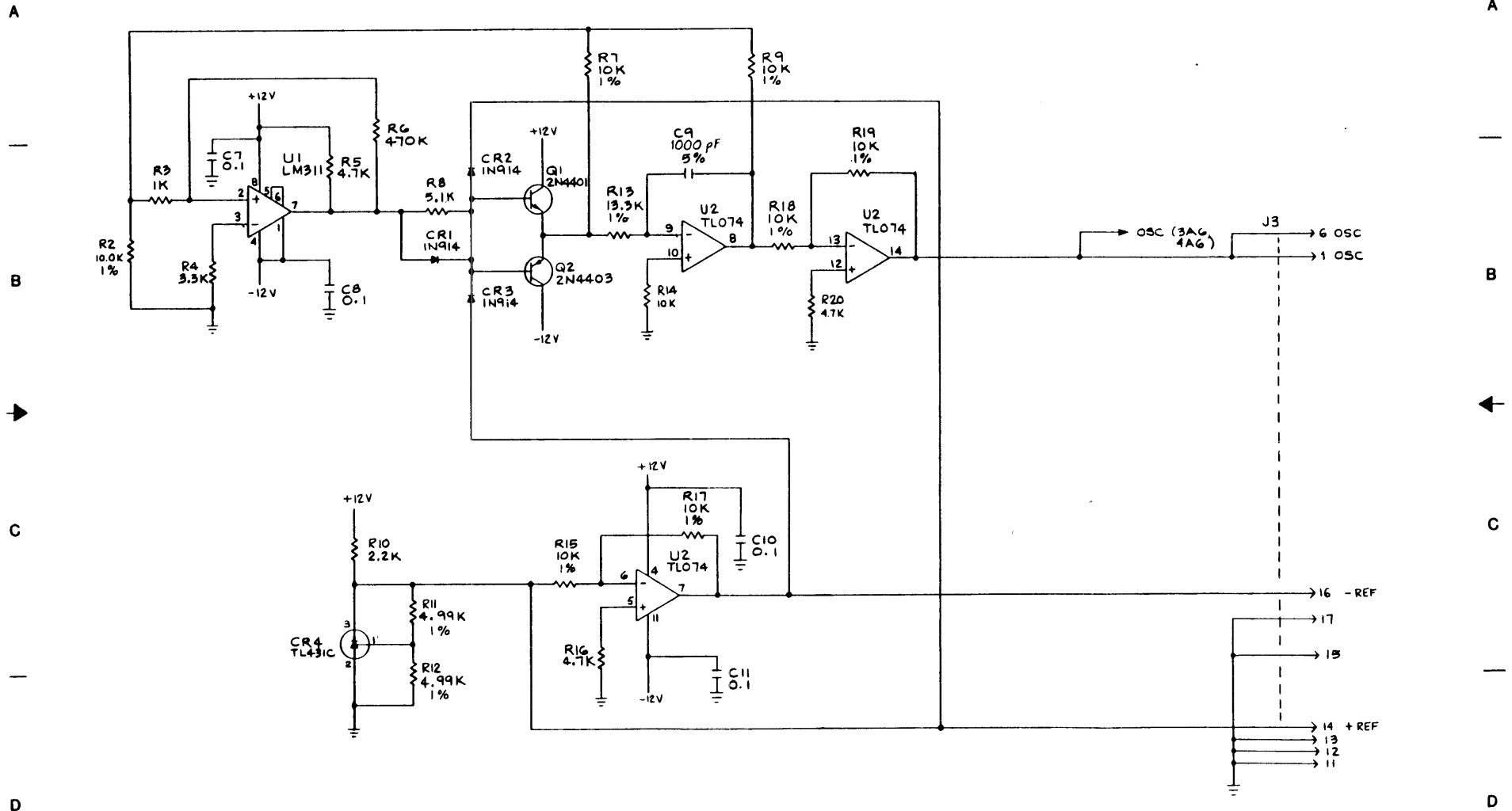
3. ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. ALL RESISTOR VALUES ARE IN OHMS ± 5% 1/4 W.
1. X INDICATES NO CONNECTION.
NOTES: UNLESS OTHERWISE SPECIFIED.

Servo Power Amplifier
Type 7147
Schematic Diagram

D

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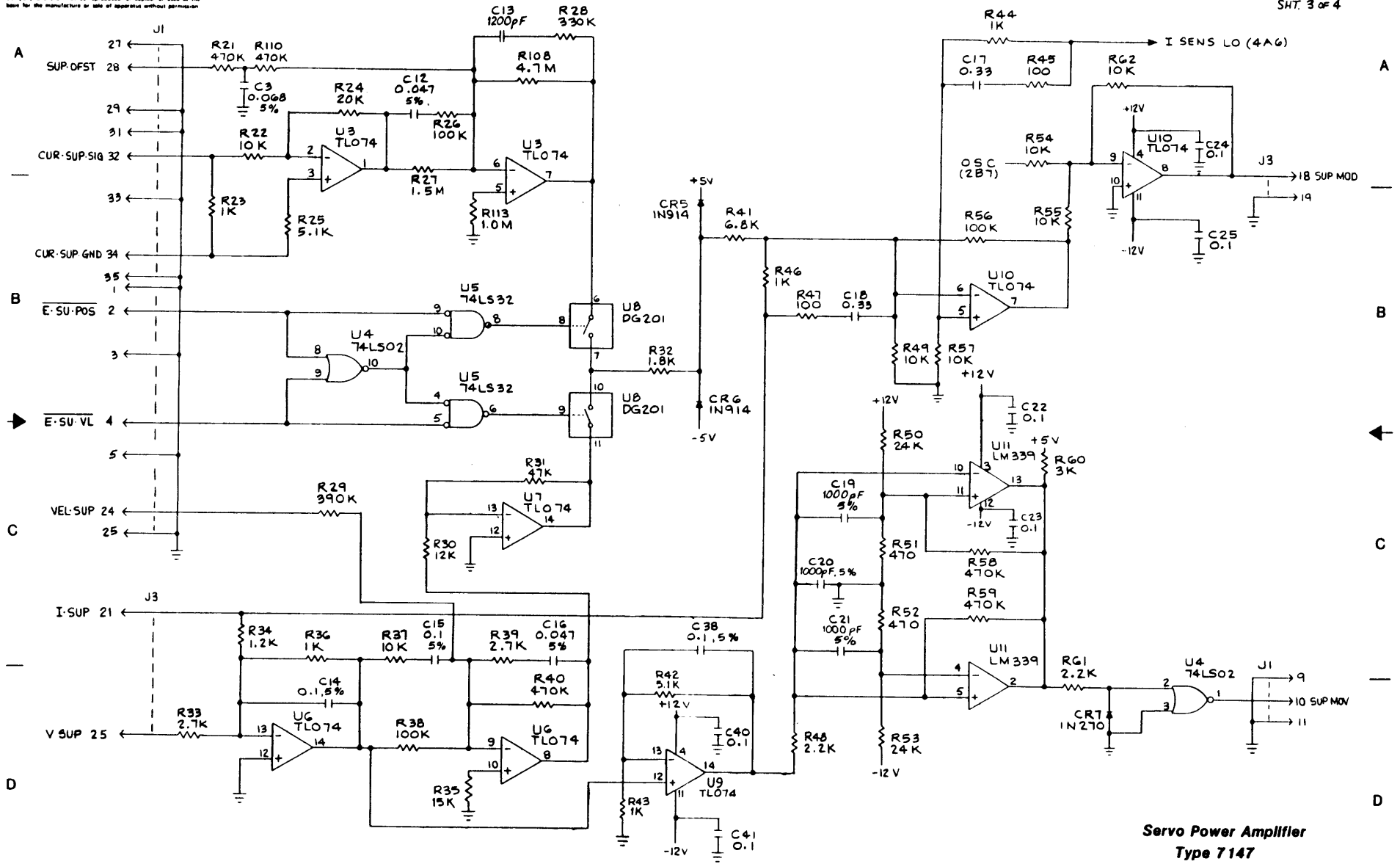
401-7147-000 B
SHT. 2 OF 4



**Servo Power Amplifier
Type 7147
Schematic Diagram**

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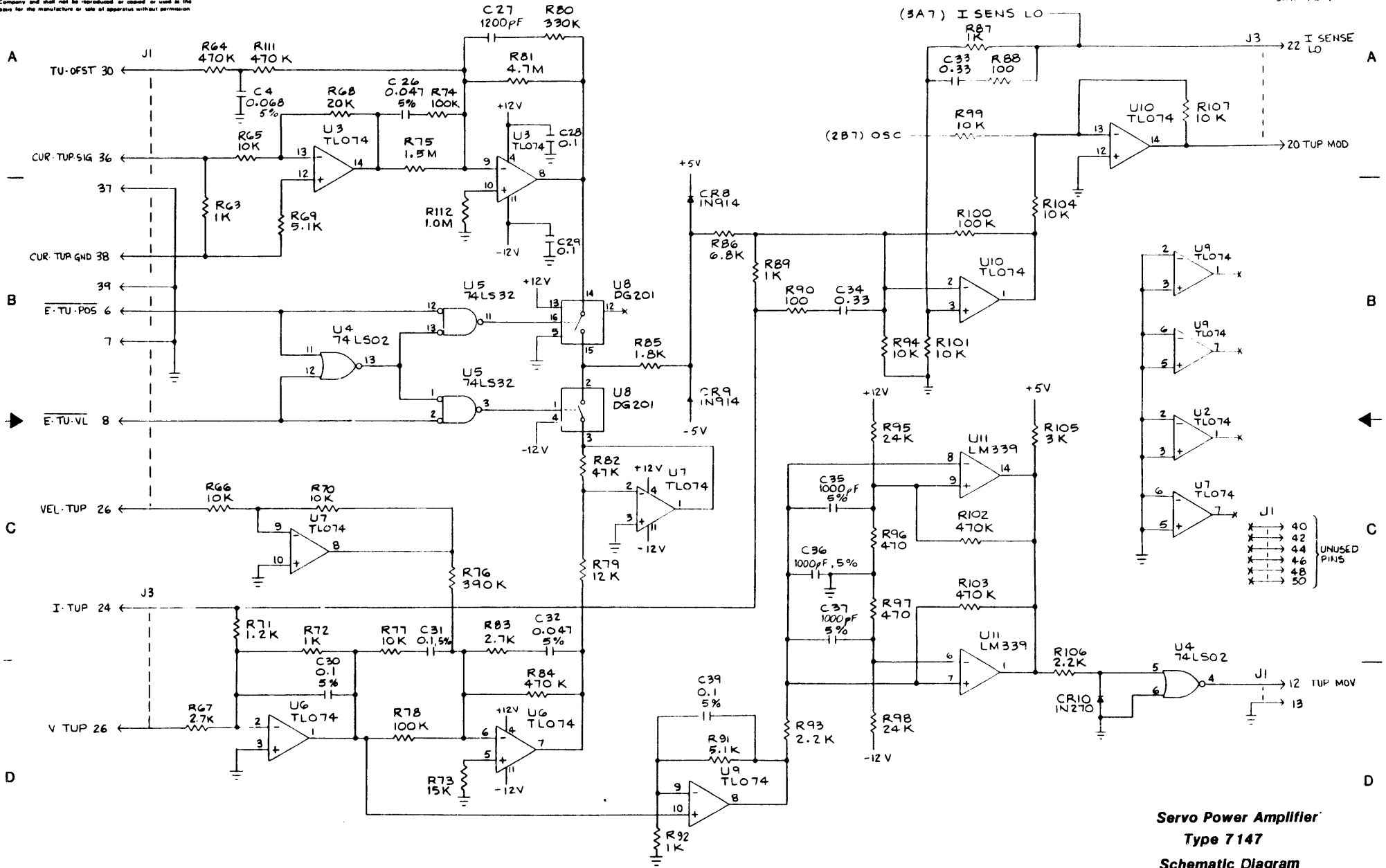
401-7147-000 B
SHT. 3 of 4



**Servo Power Amplifier
Type 7147
Schematic Diagram**

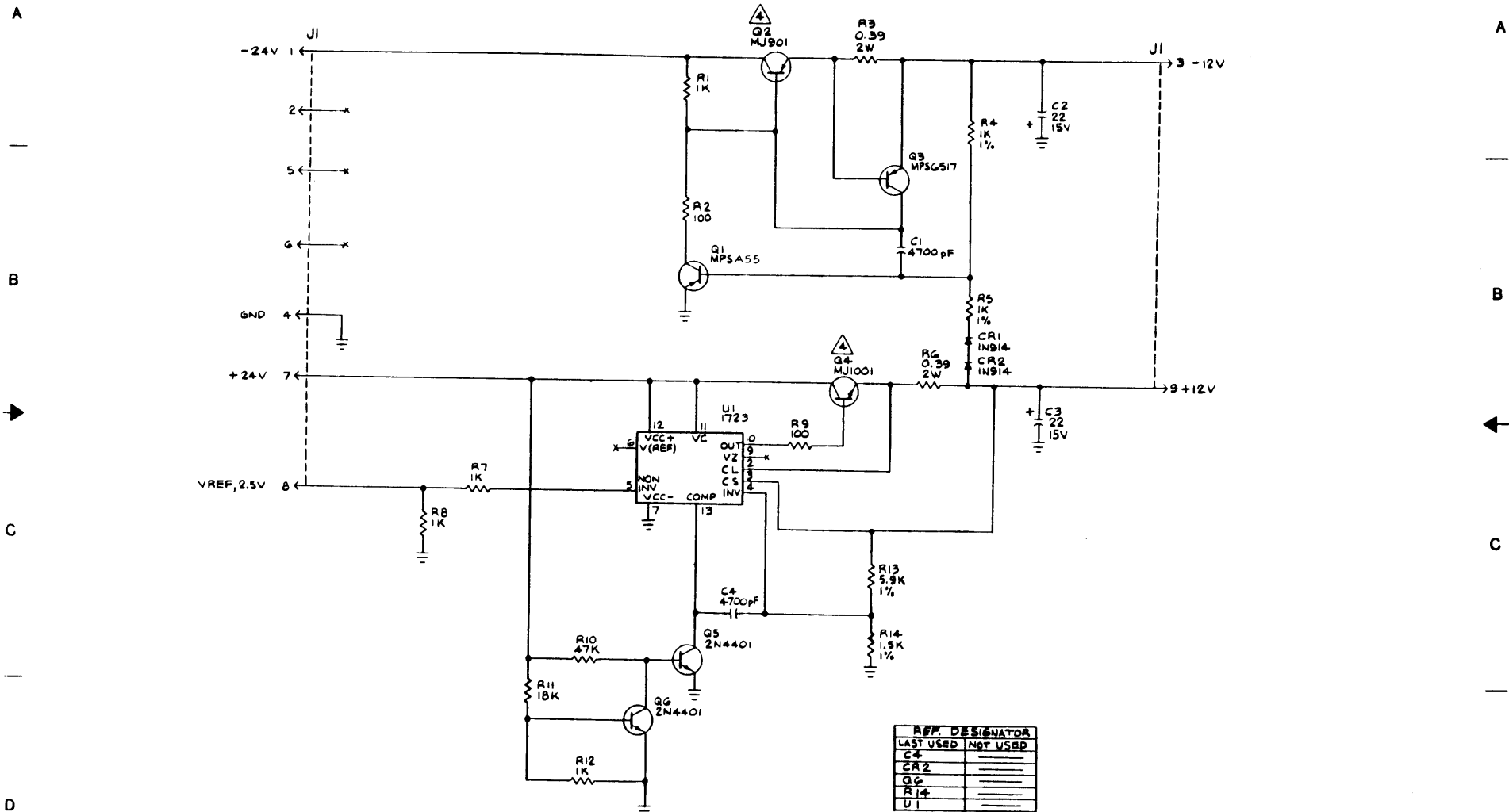
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401-7147-000B
SHT 4 of 4



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401-7148-000 A
SHEET 1 OF 1

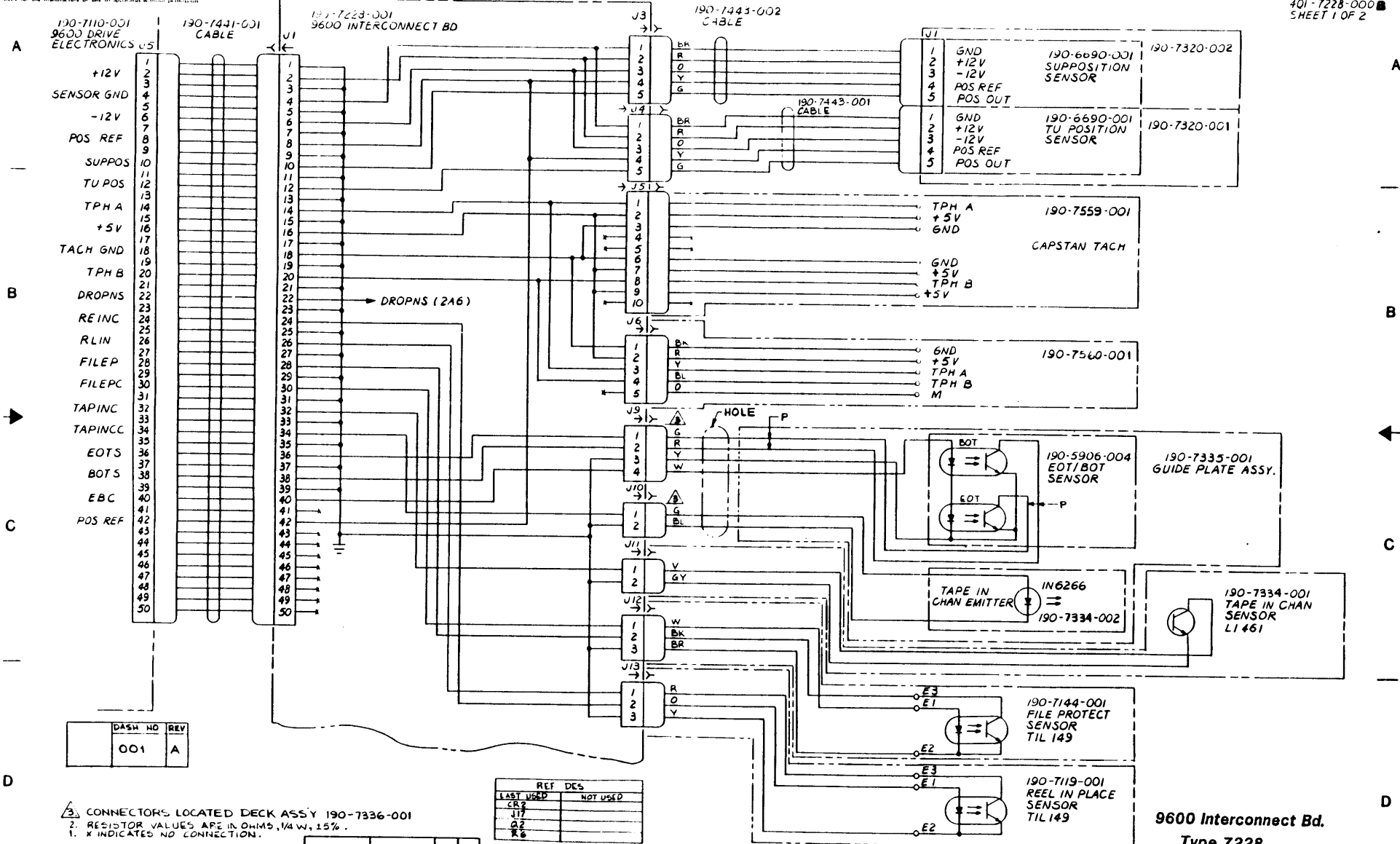


1. MOUNT ON HEAT SINK 304-7295-001.
 2. ALL CAPACITOR VALUE ARE IN MICROFARADS.
 3. ALL RESISTOR VALUE ARE IN OHMS ± 5% 1/4 W.
 4. X INDICATES NO CONNECTION.
 NOTES: UNLESS OTHERWISE SPECIFIED.

± 12V Regulator
Type 7148 A
Schematic Diagram

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401-7228-000
SHEET 1 OF 2



DASH	HO	REV
001		A

1. CONNECTORS LOCATED DECK ASSY 190-7336-001
 2. RESISTOR VALUES ARE IN OHMS, 1/4 W, 15%
 X INDICATES NO CONNECTION.

NOTES: UNLESS OTHERWISE SPECIFIED.

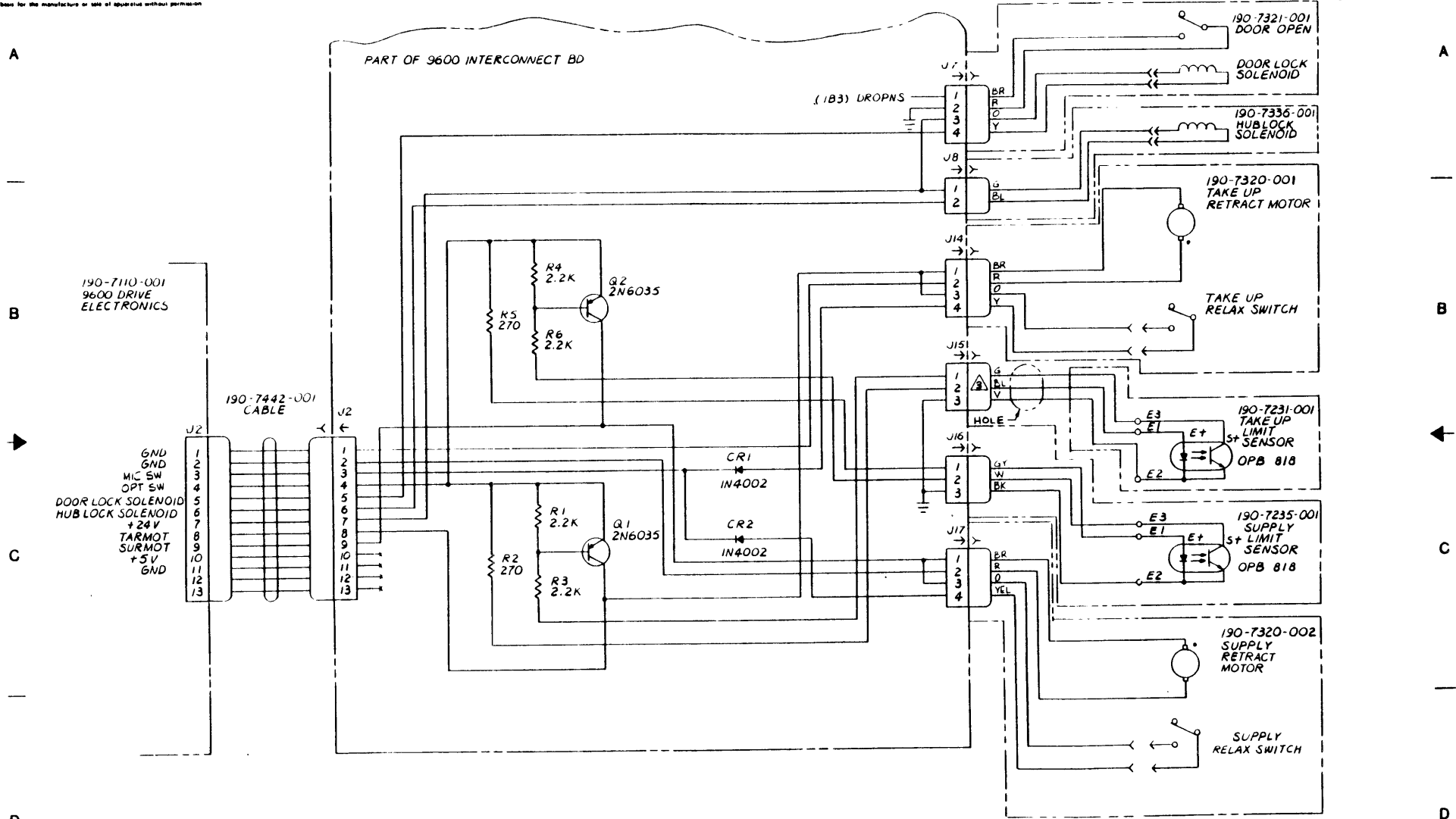
REF DES	
LAST USED	NOT USED
CR3	
J17	
Q2	
R8	

REV STATUS	REV	B	B
OF SHEETS	SHEETS	1	2

9600 Interconnect Bd.
Type 7228
Schematic Diagram

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401-7228 000B
SHEET 2 OF 2



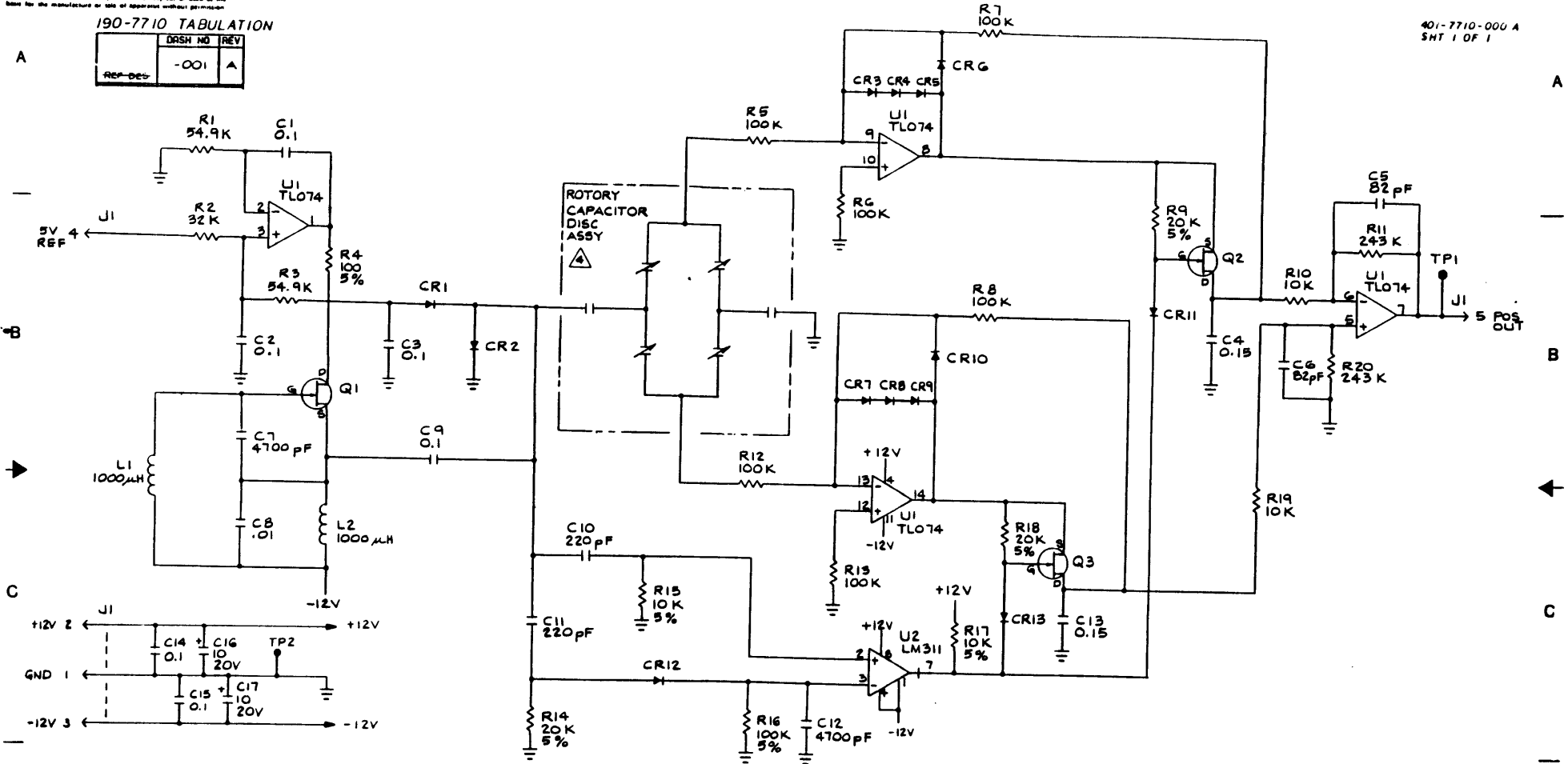
9600 Interconnect Bd.
Type 7228
Schematic Diagram

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190-7710 TABULATION

REF-DES	DASH NO	REV
	-001	A

401-7710-000 A
SHT 1 OF 1



- 5. ALL TRANSISTORS ARE MPF4392
- ⚠ CAPACITOR VALUES ARE CREATED BY CAPACITANCE DISC 204-7709-001
- 3. ALL DIODES ARE IN914.
- 2. RESISTORS ARE IN OHMS 1/8W, 1%.
- 1. CAPACITORS ARE IN MICROFARADS ± 10% 50V.

NOTES: UNLESS OTHERWISE SPECIFIED.

REV STATUS OF SHEETS	REV SHEET	A
		1

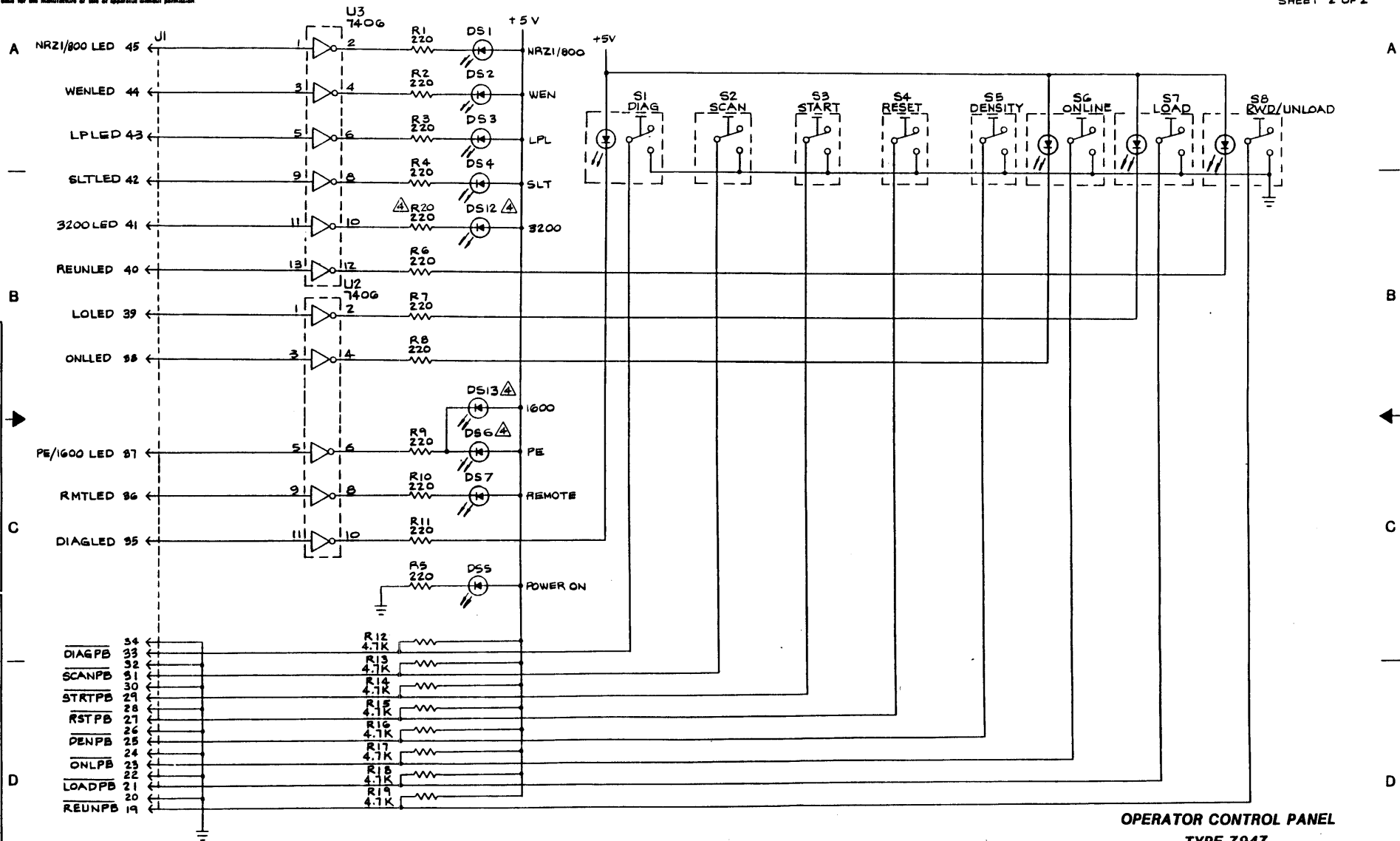
REF. DESIGNATIONS	LAST USED	NOT USED
C17		
CR13		
L2		
Q3		
R20		
TP2		
U2		

POSITION SENSOR
TYPE 7710
SCHEMATIC DIAGRAM

1 | 2 | 3 | 4 | 5 | 6 | 7

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401-07947-000 B
SHEET 2 OF 2



OPERATOR CONTROL PANEL
TYPE 7947
SCHEMATIC DIAGRAM

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

401-07947-000 B

SEE SHEET ONE

KENNEDY COMPANY	
DESIGNER	DATE
CHECKED	BY
DATE	BY
SCHEM. OPERATOR CNTRL. PANEL	
SHEET 2 OF 2 401-07947-000	
9600	

Warranty

The Company warrants its devices against faulty workmanship or the use of defective materials (except in those cases where the materials are supplied by OEM) for a period of one year from the date of shipment to OEM, with the exception of $\frac{1}{4}$ " cartridge products which are warranted for a period of ninety (90) days.

The liability of the Company under this warranty is limited to replacing, repairing, or issuing credit (at the Company's discretion) for any devices which are returned by OEM during such period provided that (a) the Company is promptly notified in writing upon discovery of such defects by OEM; (b) the defective unit is returned to the Company, transportation charges prepaid by OEM; and (c) the Company's examination of such unit shall disclose to its satisfaction that such defects have not been caused by misuse, neglect, improper installation, repair alteration or accident.

Kennedy Company is continually striving to provide improved performance, value and reliability in its products and reserves the right to make these changes without being obligated to retrofit delivered equipment.



KENNEDY



ALLEGHENY
INTERNATIONAL

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(818) 357-8831 • ITT TELEX 4720116 KENNEDY